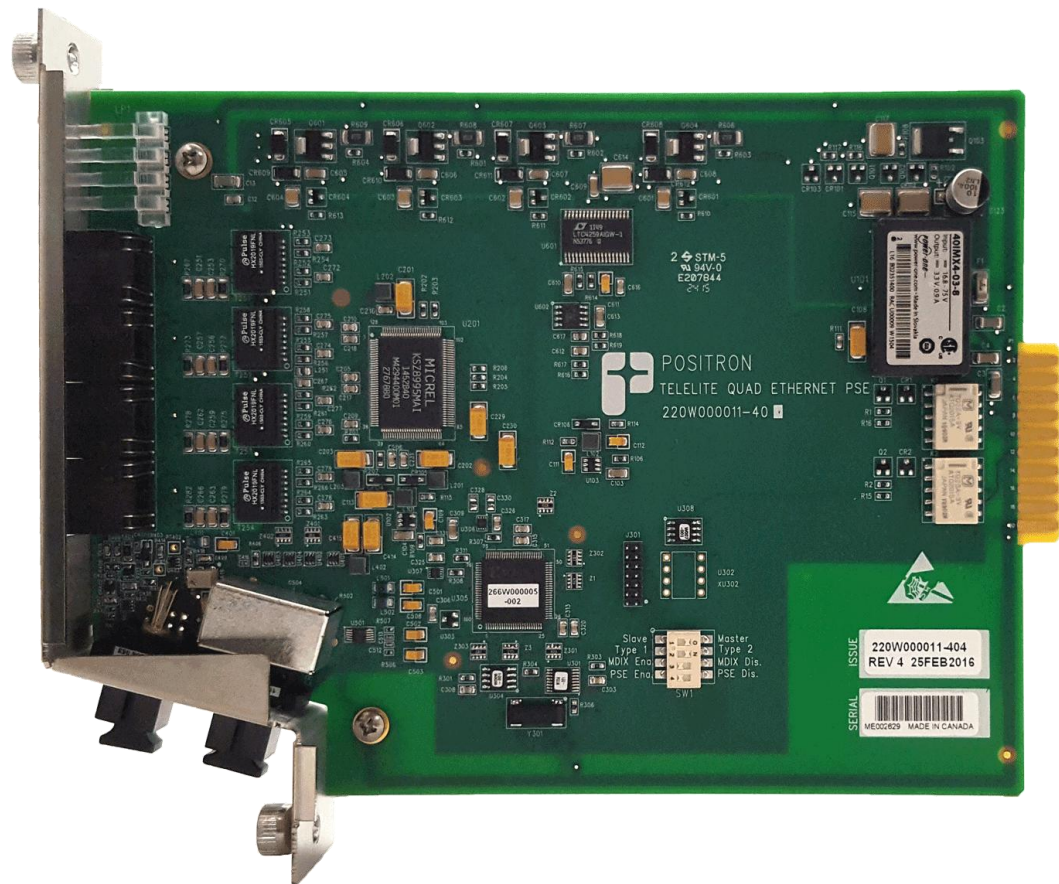




TeleLite Quad Ethernet
POE and PSE Optical Plug-in Cards
Model #s: 720920xxx / 720930xxx



1.1 Publication Information

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Description and Installation Guide**

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1.0 TeleLite Quad Ethernet POE and PSE Optical Plug-in Cards

List of TeleLite 10 Base-T / 100 Base-TX Quad Ethernet Model Numbers:

720920MST	4 Port Ethernet PSE Modem Unmanaged Switch, Multi-mode ST Connector
720920SSC	4 Port Ethernet PSE Modem Unmanaged Switch, Single-mode SC Connector
720920XSC	4 Port Ethernet PSE Modem Unmanaged Switch, Single-mode SC Connector (Extended Reach)
720930MST	4 Port Ethernet POE Modem Unmanaged Switch, Multi-mode ST Connector
720930SSC	4 Port Ethernet POE Modem Unmanaged Switch, Single-mode SC Connector
720930XSC	4 Port Ethernet POE Modem Unmanaged Switch, Single-mode SC Connector (Extended Reach)

1.1 TeleLite Shelves

TeleLite 10 Base-T / 100 Base-TX Quad Ethernet Optical modules can be plugged into any of the following TeleLite shelves:

720000	7-slot wall mount shelf (6 slots for optical modules, one slot reserved for power provisioning, if needed)
720002	2-slot rack or wall mount shelf (3 shelves can be daisy chained together Power can be provisioned using a card slot or -48Vdc can be fed in an external power port, if needed)
720013	3-slot wall mount swing-out shelf Power can be provisioned using a card slot or -48Vdc can be fed in an external power port, if needed.

1.2 Overview

The TeleLite Ethernet cards are modems with unmanaged switch interface card providing copper (10 Base-T and/or 100 Base-TX) to optical media conversion, combining four Ethernet ports to a single fiber port with an unmanaged four-port switch.

Several Ethernet provisioning configurations are possible with these card sets, each requiring two cards with one at either end of the fiber span for conversion back to copper. In each configuration, a CAT 5 Ethernet cable is required to interface with the RJ receptacles on the faceplate of the TeleLite Ethernet cards. Power and Switch settings are common to all versions above. As such, the model numbers herein are referred to with the suffix “xxx” rather than MST, SSC, or SXC.

1.3 General Technical Notes

1.3.1 POE

- Can be powered locally (local power provided by the backplane of the TeleLite shelf)
- Can be powered by -48Vdc in the appropriate polarity from the Ethernet Network Edge Device via the first (top) Ethernet port as per POE specifications (in the appropriate polarity). Its interface supports the two standard modes of powering using superimposed 48 Vdc on the data pair or using the spare pin on the RJ45 in any polarity
- Has DIP switches to set:
 - ✓ Master/Slave
 - ✓ Types 1 or 2
 - ✓ MDIX enabling or disabling (Disabled is default). Check modems if they are MDIX enabled. If they are not, this feature should be enabled to avoid cross-over issues.
 - ✓ PSE enabling or disabling (Used only on 720920xxx. On 720930xxx, this switch (#4) is always to be set to “Disabled”)

1.3.2 PSE

- Can only be powered locally (local power provided by the backplane of the TeleLite shelf)
- Has DIP switches to set:
 - ✓ Master/Slave
 - ✓ Types 1 or 2
 - ✓ MDIX enabling or disabling (“Disabled” is default). Check modems if they are MDIX enabled. If they are not, this feature should be enabled to avoid cross-over issues.
 - ✓ PSE enabling or disabling depending on if the terminating modem is locally powered or not. If modem is not locally powered, set this DIP switch (#4) to the “Enabled”

1.3.3 Ethernet Modem Interface Card Features:

- ✓ Support of single- and multi-mode ST/SC connector type.
- ✓ POE CFJ card can be either remote or locally powered through a jumper setting.
- ✓ The modem/switch ports are auto-sensing with the hardware automatically detecting and setting the speed for any 10 Base-T/100 Base-TX device connected to the interface.
- ✓ Auto-negotiation for half/full duplex operation on every port automatically.
- ✓ Auto Uplink takes care of the MDI/MDI-X connection and eliminates the need for toggle switches or special crossover cables on all 10/100 ports. This results in automatic polarity correction that helps find and fix common cabling problems.
- ✓ Flow control ensures reliable communications during full-duplex operation.
- ✓ Unmanaged switch function provides plug-and-play simplicity.
- ✓ Comprehensive LED display with per-port indicators allows status monitoring and activity of every port at a glance.
- ✓ Switch design delivers dedicated bandwidth to each port.
- ✓ 100mbps of Ethernet through-put is shared equally among the RJ-48 receptacles used

2.0 Type 1 and Type 2 TeleLite Ethernet Configurations

An Ethernet configuration requires two cards; usually a Power Over Ethernet (POE) and Power Serving Ethernet (PSE), however the same TeleLite Ethernet card can be used at each end of the fiber span between the CFJ (Copper Fiber Junction) and Optical Electrical Interface depending on local power arrangements, Network Ethernet Edge Devices and the terminating Ethernet modems.

2.1 Type 1a and Type 1b, General

In a **Type 1a** configuration, the TeleLite Ethernet card at the Central Office (C.O.) as the CFJ (Copper Fiber Junction) and interfaces with the network Edge Devices, providing the Ethernet service.

In a **Type 1b** configuration, the TeleLite Ethernet card as the CFJ (Copper Fiber Junction) is located at the 300v Point of the GPR contour of the electric supply location and interfaces with the network Edge Devices, providing the Ethernet service. See Figures 1 & 2.

2.1.1 Type 1a Detail

Locating the CFJ at the Central Office

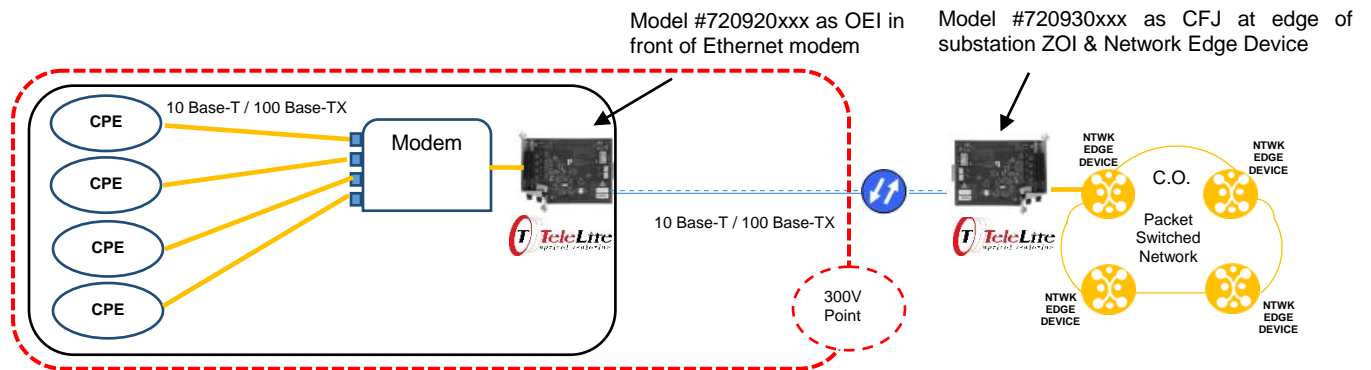


Figure 1: Type 1a

2.1.2 Type 1b Detail

Locating the CFJ at the 300V point of the GPR contour of an electric supply location.

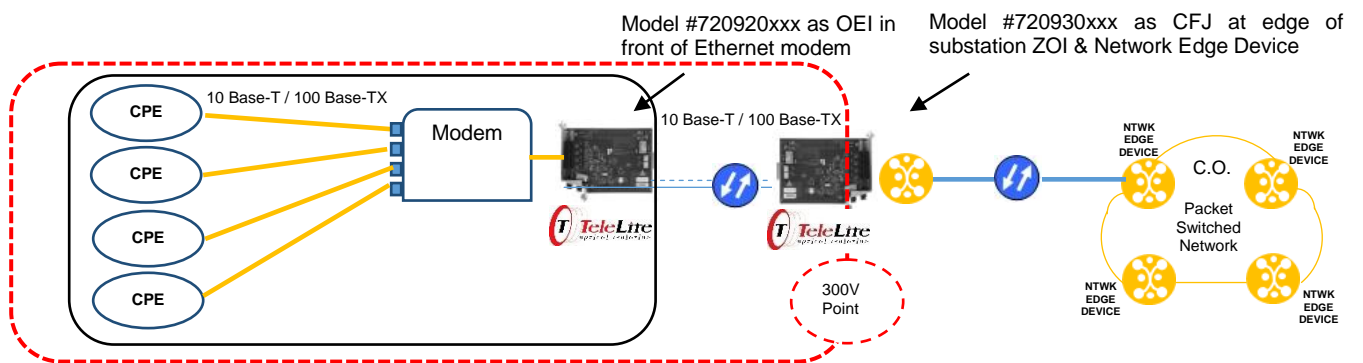


Figure 2: Type 1b

2.2 Type 2, General

In a **Type 2** configuration, the TeleLite CFJ Ethernet card acts as a modem converting the copper-based Ethernet service to fiber across the span. The TeleLite OEI Ethernet card serves as a 4-port Ethernet modem.

2.2.1 Type 2a Detail

Type 2a describes a 10 Base-T / 100 Base-TX multi-port router modem feeding a TeleLite Ethernet card to distribute network connectivity to remote devices. See Figures 3 and 4.

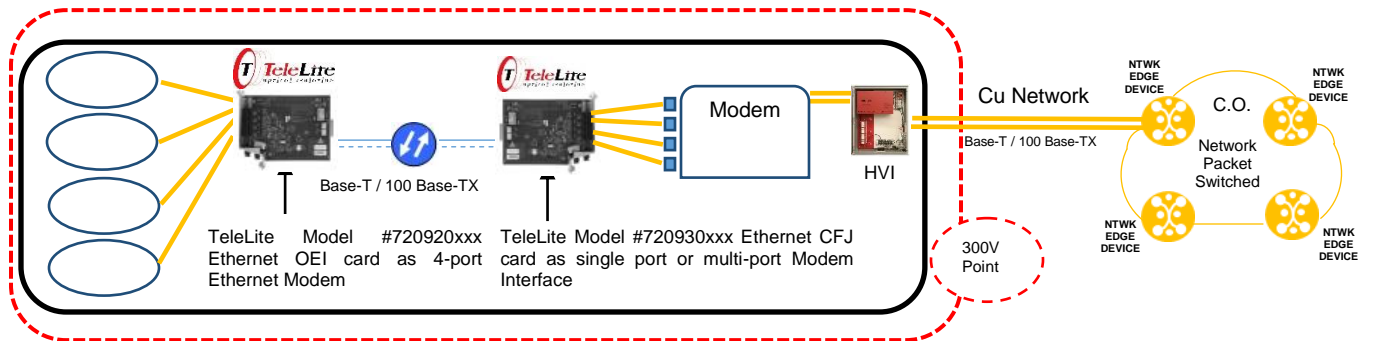


Figure 3: Type 2a, Copper-fed

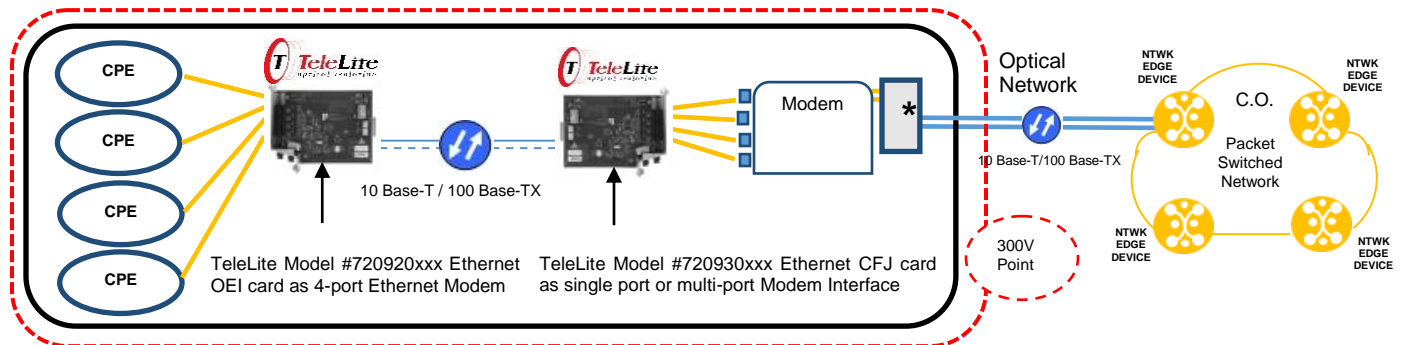


Figure 4: Type 2a, Fiber-fed

* = Fiber to copper conversion

2.2.2 Type 2b Detail

Type 2b describes multiple 10 Base-T / 100 Base-TX single port networked modems feeding a TeleLite Ethernet card to distribute network connectivity to remote devices. See Figures 5 and 6.

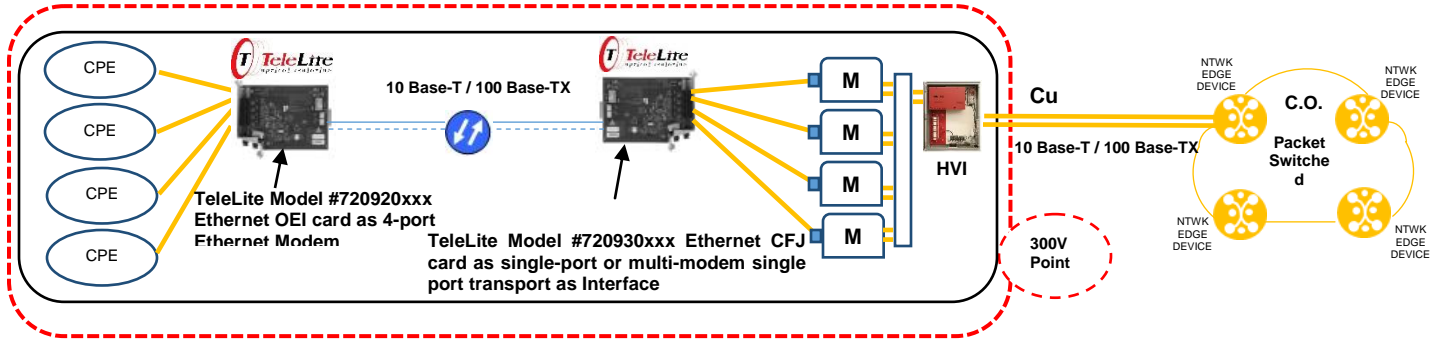


Figure 5: Type 2b, Copper-fed

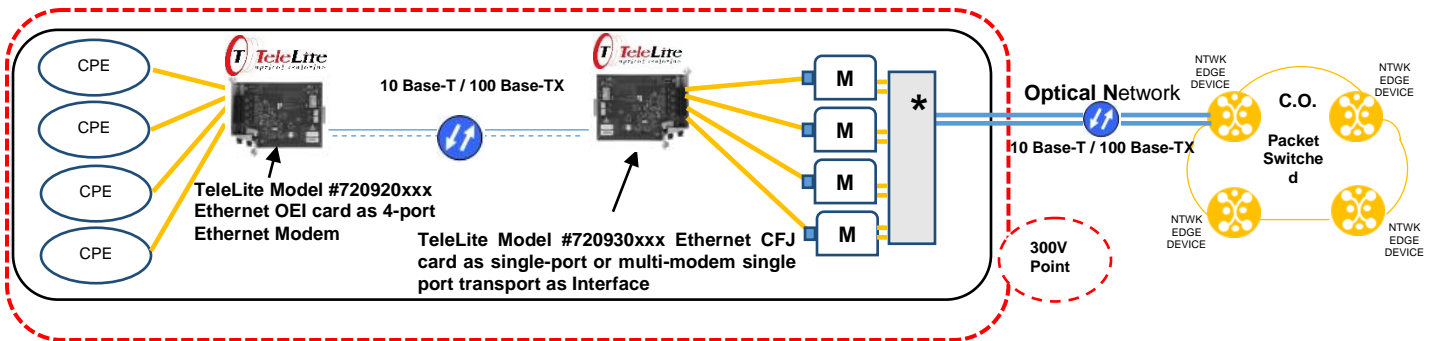


Figure 6: Type 2b, Fiber fed

* = Fiber to Copper Conversion
M = Modem

2.3 DIP Switch Settings on POE and PSE TeleLite Ethernet Cards

The setting of the on-board DIP switches is dependent on the application. In general, there are several things to take into account:

- Is it a Type 1a, Type 1b, Type 2a, or Type 2b scenario?
- Which of the two cards is to be set to master and which to slave
- Is the modem feeding, or being fed by, the TeleLite Ethernet MDIX enabled?
- What POE and PSE settings best suit the application of the cards?

2.3.1 Type 1a: 720930xxx TeleLite POE Ethernet Card

Located at the Central Office (CFJ)

(Note: Default DIP Switch Settings are shown in Figure 8)

- A. If the 720930xxx POE Ethernet card is to be powered by C.O. battery (-48Vdc) then the two on-board Power Option Jumpers should be set in the LOCAL PWR position. (Figure 7)
- B. If the 720930xxx card was to be powered by POE at the C.O. (or CFJ) the Power Option Jumpers are to be set to the remote power (RMT PWR) positions. (Figure 7)
- C. If the 720930xxx TeleLite POE card is placed in the Central Office (C.O.) and is feeding Ethernet to a remote, unmanned site, such as a solar farm, the Master and Slave switches should be set so that the 720930xxx card is set as Master, and the companion 720920xxx card located at the OEI (Optical Electrical Interface) is set as Slave. Alarms will be reported to the manned 720930xxx located at the Central Office. (Figure 9)
- D. If this is a Type 1 Ethernet deployment as described in Section 1.3.1, the 2nd DIP switch should be set to the left. (Figure 9)
- E. If the Ethernet modem that is feeding the TeleLite modem, or is being fed by the TeleLite Ethernet cards is MDIX enabled⁽¹⁾, then the MDIX feature of the TeleLite Ethernet card should be disabled. If the associated modems are NOT MDIX enabled, then this DIP switch should be enabled to remove any need for crossover cables. With this feature enabled or disabled appropriately, there is never a need with TeleLite Ethernet cards to provision the site with anything but a straight CAT 5 cable. In this example the Ethernet Modem is MDIX enabled and the feature on the TeleLite Ethernet card is disabled. (Figure 9)
- F. Since the 720930xxx is a POE Ethernet card, the PSE DIP Switch (4th) on this card should always be in the PSE Disabled position. (Figure 9)

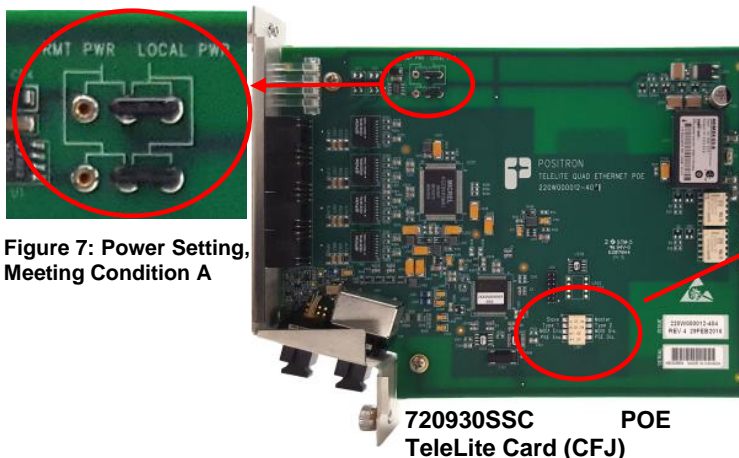


Figure 7: Power Setting, Meeting Condition A



Figure 8: Default DIP Switch Positions

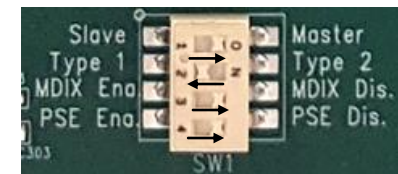


Figure 9: Meeting conditions C, D, E & F

¹ [Ethernet over twisted pair](#) defines a **medium dependent interface crossover** (MDI-X) interface. **Auto MDI-X** ports on newer network interfaces detect if the connection would require a crossover, and automatically chooses the MDI or MDI-X configuration to properly match the other end of the link.

2.3.2 Type 1b: 720930xxx TeleLite POE Ethernet Card

Located at CFJ, placed at the 300V point of the Substation's GPR Contour

(Note: Default DIP Switch Settings are shown in Figure 11)

- A. If the 720930xxx POE Ethernet card is to be powered by a local supply of -48Vdc, then the two on-board Power Option Jumpers should be set in the LOCAL PWR position. (Figure 10)
- B. If the CFJ is located as mentioned above, it is highly likely that the TeleLite 720930xxx Ethernet card will be powered using POE and the Power Option Jumpers should be set to the remote power (RMT PWR) positions unless local a -48Vdc source is used instead. (Figure 10)
- C. If the 720930xxx TeleLite POE card is placed as a CFJ at the 300V point of the Substation's GPR Contour, and then is feeding Ethernet via fiber to an OEI located at a generation or distribution substation, such as at a solar farm, the Master and Slave switches should be set so that the 720930xxx card is set as Slave, and the companion 720920xxx card located at the OEI (Optical Electrical Interface) is set as Master. If the OEI at the solar farm is the manned location and set as Master, the alarms will report to the 720920xxx at the OEI from the 720930xxx at the CFJ. (Figure 12)
- D. If this is a Type 1 Ethernet deployment as described in Section 1.2.1, the 2nd DIP switch should be set to the left. (Figure 12)
- E. If the Ethernet modem that is feeding the TeleLite modem, or is being fed by the TeleLite Ethernet cards is MDIX enabled⁽²⁾, then the MDIX feature of the TeleLite Ethernet card should be disabled. If the associated modems are NOT MDIX enabled, then this DIP switch should be enabled to remove any need for crossover cables. With this feature enabled or disabled appropriately, there is never a need with TeleLite Ethernet cards to provision the site with anything but a straight CAT 5 cable. In this example the Ethernet Modem is MDIX enabled and the feature on the TeleLite Ethernet card is disabled. (Figure 12)
- F. Since the 720930xxx is a POE Ethernet card, the PSE DIP Switch (4th) on this card should always be in the PSE Disabled position. (Figure 12)

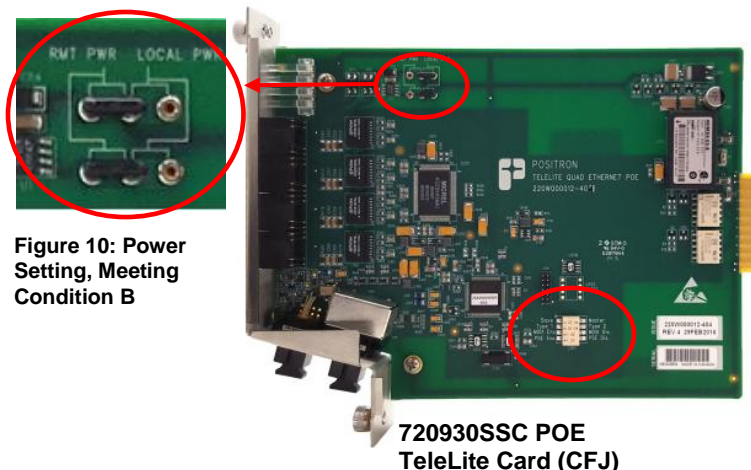


Figure 10: Power Setting, Meeting Condition B



Figure 11: Default DIP Switch Positions

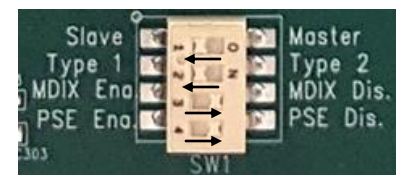


Figure 12: Meeting conditions C, D, E & F

² [Ethernet over twisted pair](#) defines a **medium dependent interface crossover (MDI-X)** interface. **Auto MDI-X** ports on newer network interfaces detect if the connection would require a crossover, and automatically chooses the MDI or MDI-X configuration to properly match the other end of the link.

2.3.3 OEI for Type 1a or Type 1b

720920xxx TeleLite PSE Ethernet Card Located at the Substation OEI

(Note: Default DIP Switch Settings are shown in Figure 13)

- A. The 720920xxx POE Ethernet card can only be locally powered by a source of -48Vdc. As such there are no power jumpers to set on this card.
- B. The 720920xxx TeleLite PSE card is placed at the Substation's OEI. If this location is likely to be manned, the Master and Slave switches should be set so that the 720930xxx card is set as Slave (See Type 1b, 720930xxx), and the companion 720920xxx card located at the OEI (Optical Electrical Interface) is set as Master. Alarms will be reported to the attended 720920xxx located at the OEI at the substation OEI. (Figure 14)
- C. If this is a Type 1a or Type 1b Ethernet deployment as described in Section 1.2.1, the 2nd DIP switch should be set to the left. (Figure 14)
- D. If the Ethernet modem fed by the 720920xxx PSE TeleLite Ethernet cards is MDIX enabled⁽³⁾, then the MDIX feature of the TeleLite Ethernet card should be disabled. If the associated modems are NOT MDIX enabled, then this DIP switch should be enabled to remove any need for crossover cables. With this feature enabled or disabled appropriately, there is never a need with TeleLite Ethernet cards to provision the site with anything but a straight CAT 5 cable. In this example the Ethernet Modem is MDIX enabled and the feature on the TeleLite Ethernet card is disabled. (Figure 14)
- E. If the 720920xxx card is to provide PSE to a terminating modem, the 4th DIP Switch is set to the left. If the Ethernet modem at the OEI is locally powered by a source of -48Vdc, then the 4th DIP switch is set to the right. (Figure 14)

In this example, the Ethernet modem at the OEI location is powered via the PSE output from the 4 ports on the faceplate of the 720920xxx TeleLite Ethernet card. (Figure 15)

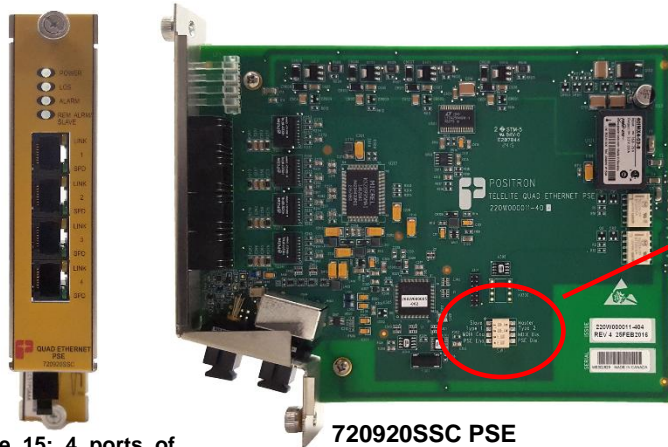


Figure 15: 4 ports of 720920xxx provide PSE, if enable (DIP Switch 4)

720920SSC PSE TeleLite Card (OEI)



Figure 13: Default DIP Switch Positions

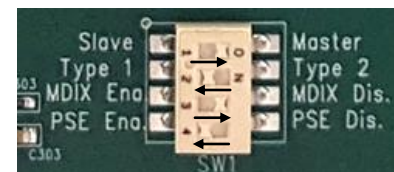


Figure 14: Meeting conditions B, C, D, & E

³ Ethernet over twisted pair defines a medium dependent interface crossover (MDI-X) interface. Auto MDI-X ports on newer network interfaces detect if the connection would require a crossover, and automatically chooses the MDI or MDI-X configuration to properly match the other end of the link.

2.3.4 Type 2a and Type 2b TeleLite “Campus” Configuration

In a “Campus” Deployment of Ethernet, the TeleLite Ethernet cards are used to transport and distribute on-site Ethernet services to other buildings or facilities where it is desired to use fiber instead of copper to carry the Ethernet traffic, either because of the distance limitation on copper or electrical potential differences. A single multi-port modem or several individual modems can feed the TeleLite Ethernet card. The actual location may be fed from a network by copper or fiber. See Figure 16.

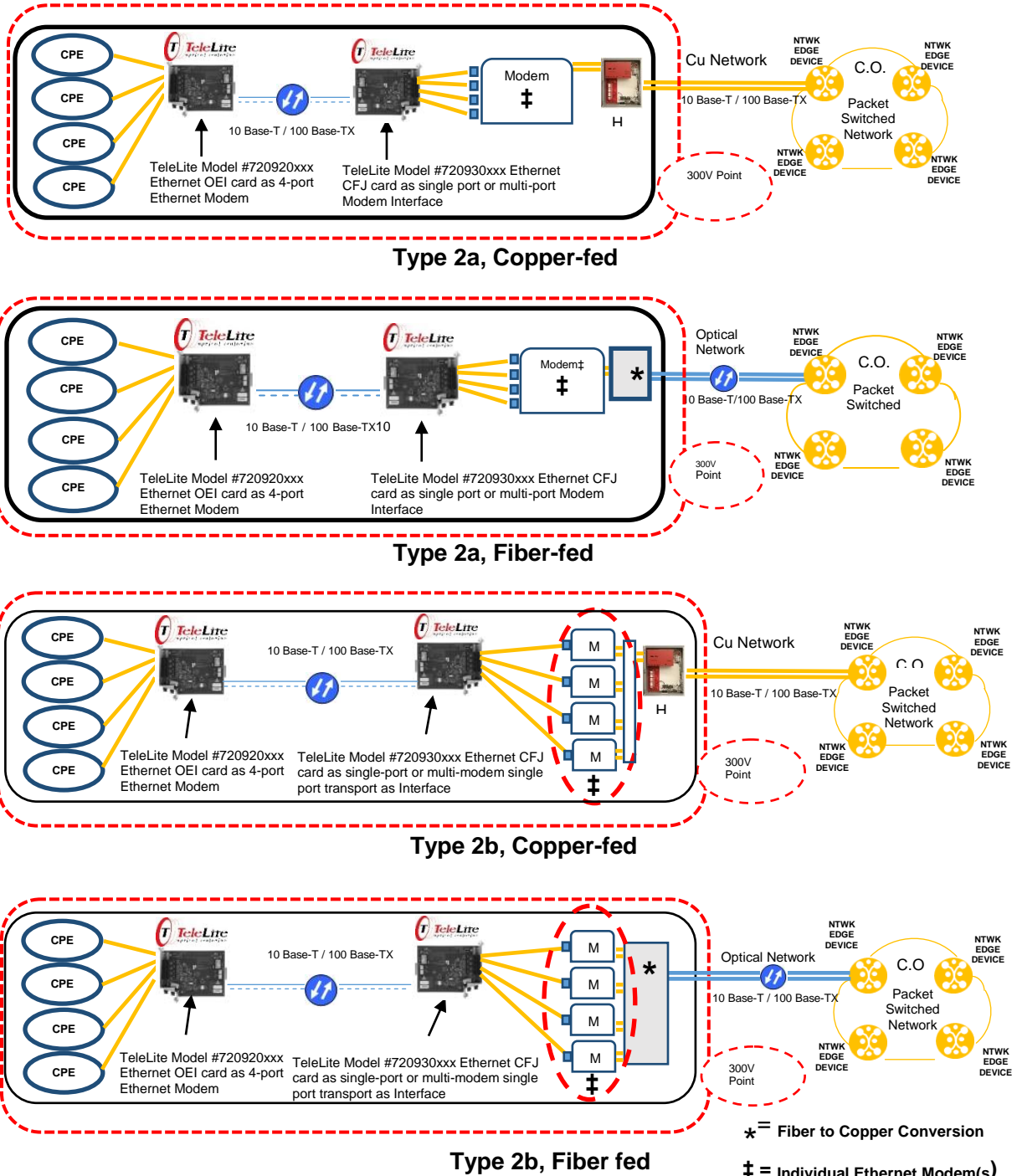


Figure 16

2.3.5 Type 2a and Type 2b, POE

720930xxx TeleLite POE (CFJ) Ethernet Card Fed by On-Site Modem

- A. If the 720930xxx POE Ethernet card is to be powered by a local source of -48Vdc then the two on-board Power Option Jumpers should be set in the LOCAL PWR position. (Figure 17)
- B. If the 720930xxx card was to be powered by POE from the feeding modem (or CFJ) the Power Option Jumpers should be set to the remote power (RMT PWR) positions. (Figure 17)
- C. In a “Campus” Ethernet transport configuration, either the OEI (720920xxx) or CFJ (720930xxx) can be set to Master or Slave since both ends of the transport can be assumed to be attended for alarming purposes. The only criterion is that one card must be set to Slave and the other to Master. (Figure 19) In this example, the CFJ (720930xxx) TeleLite Ethernet card has been set as Master.
- D. This is a Type 2 (a or b) deployment so the 2nd DIP switch should be set to the right, accordingly. (Figure 19)
- E. If the Ethernet modem that is feeding the TeleLite Ethernet card or that is being fed by the TeleLite Ethernet cards is MDIX enabled⁽⁴⁾, then the MDIX feature of the TeleLite Ethernet card should be disabled. If the associated modems are NOT MDIX enabled, then this DIP switch should be enabled to remove any need for crossover cables. With this feature enabled or disabled appropriately, there is never a need with TeleLite Ethernet cards to provision the site with anything but a straight CAT 5 cable. In this example the Ethernet Modem is MDIX enabled and the feature on the TeleLite Ethernet card is disabled. (Figure 19)
- F. Since the 720930xxx is a POE Ethernet card, the PSE DIP Switch (4th) on this card should always be in the PSE Disabled position. (Figure 19)

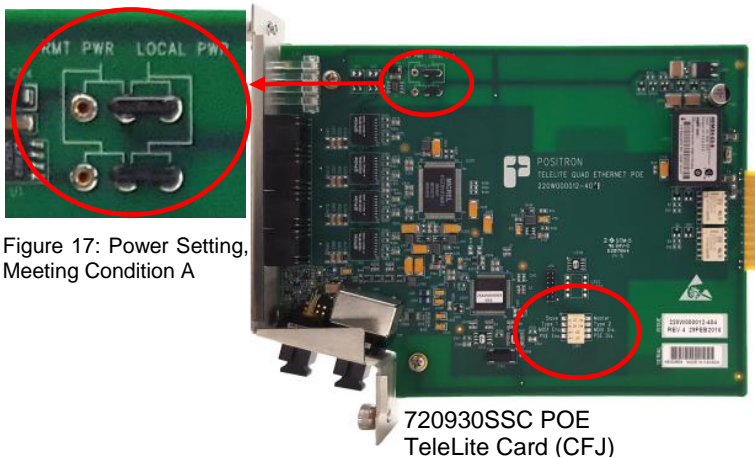


Figure 17: Power Setting, Meeting Condition A

720930SSC POE
TeleLite Card (CFJ)



Figure 18: Default DIP Switch Positions

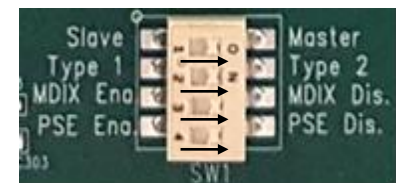


Figure 19: Meeting conditions C, D, E & F

⁴ Ethernet over twisted pair defines a **medium dependent interface crossover** (MDI-X) interface. **Auto MDI-X** ports on newer network interfaces detect if the connection would require a crossover, and automatically chooses the MDI or MDI-X configuration to properly match the other end of the link.

2.3.6 Type 2a and Type 2b, PSE

720920xxx TeleLite PSE (OEI) Ethernet Card Feeding On-Site Modem(s)

- A. The 720920xxx POE Ethernet card can only be locally powered by a source of -48Vdc. As such there are no power jumpers to set on this card.
- B. In a “Campus” Ethernet transport configuration, either the OEI (720920xxx) or CFJ (720930xxx) can be set to Master or Slave since both ends of the transport can be assumed to be attended for alarming purposes. The only criterion is that one card must be set to Slave and the other to Master. In this example, the CFJ (720930xxx) TeleLite Ethernet card has been set as Master. (See 1.5.4.1) This 720920xxx OEI Ethernet card has been set as Slave. (Figure 23)
- C. If this is a Type 2a or Type 2b Ethernet deployment as described in Section 1.5.4, the 2nd DIP switch should be set to the left. (Figure 23)
- D. If the Ethernet modem fed by the 720920xxx PSE TeleLite Ethernet cards is MDIX enabled⁽⁵⁾, then the MDIX feature of the TeleLite Ethernet card should be disabled. If the associated modems are NOT MDIX enabled, then this DIP switch should be enabled to remove any need for crossover cables. With this feature enabled or disabled appropriately, there is never a need with TeleLite Ethernet cards to provision the site with anything but a straight CAT 5 cable. In this example the Ethernet Modem is MDIX enabled and the feature on the TeleLite Ethernet card is disabled. (Figure 23)
- E. If the 720920xxx card is to provide PSE to a terminating modem, the 4th DIP Switch is set to the left. If the Ethernet modem at the OEI is locally powered by a source of -48Vdc, then the 4th DIP switch is set to the right. In this example, PSE is enabled. (Figure 23)

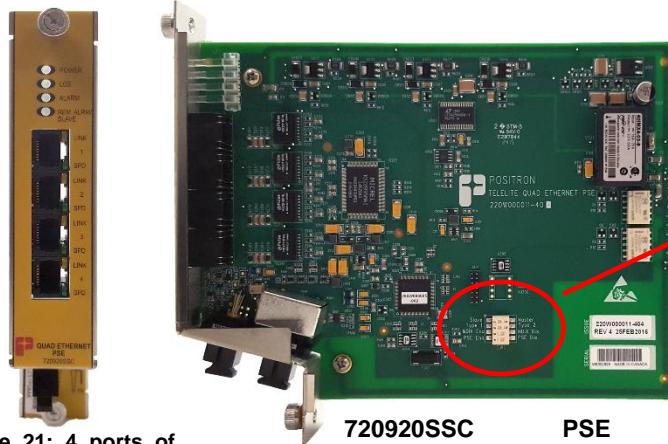


Figure 21: 4 ports of 720920xxx provide PSE, if enable (DIP Switch 4)

720920SSC PSE
TeleLite Card (OEI)



Figure 22: Default DIP Switch Positions

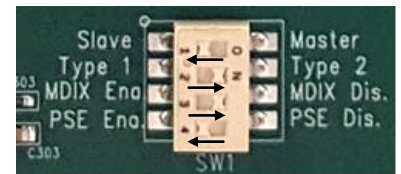
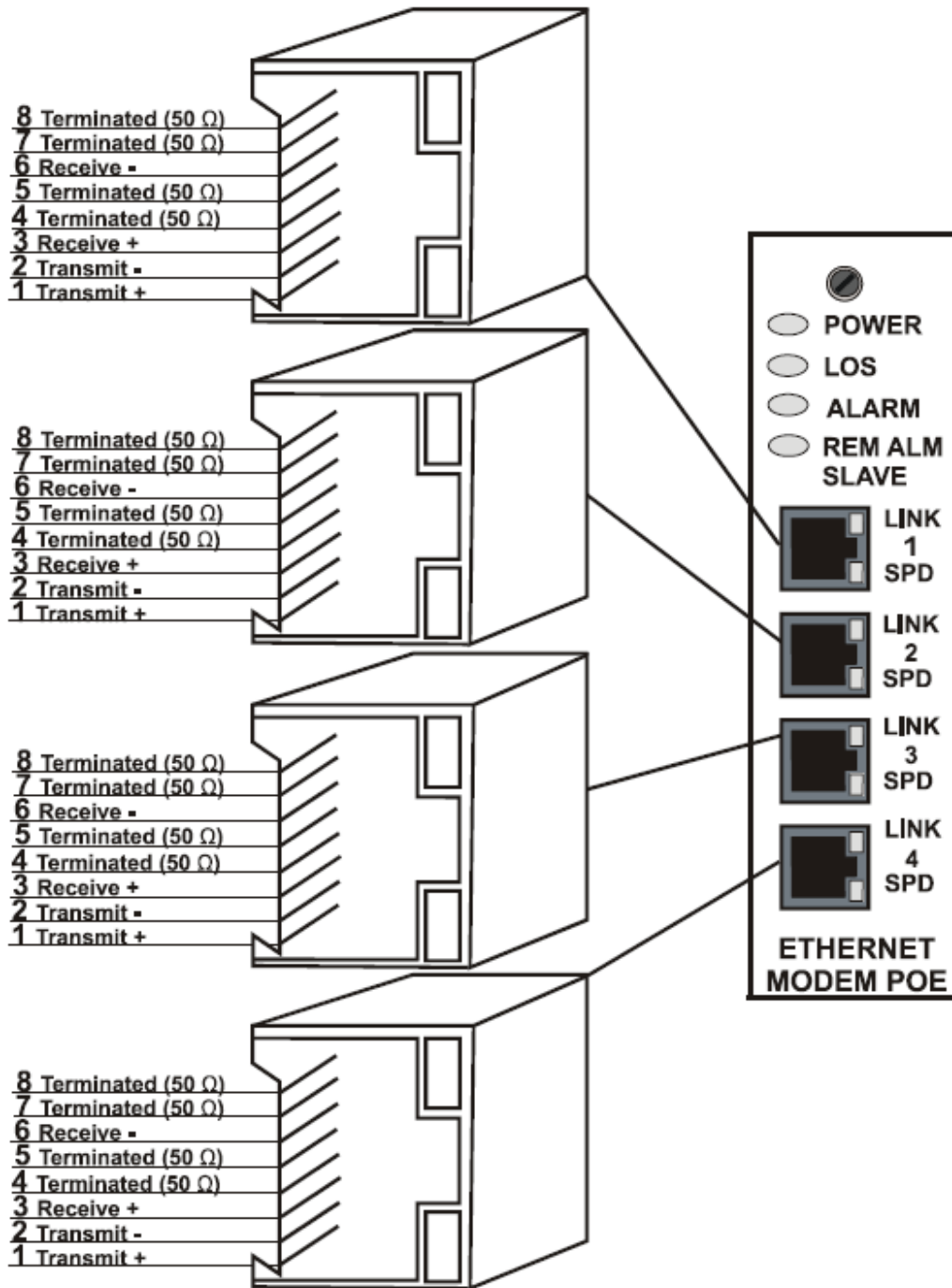


Figure 23: Meeting conditions B, C, D, & E

⁵ Ethernet over twisted pair defines a **medium dependent interface crossover** (MDI-X) interface. **Auto MDI-X** ports on newer network interfaces detect if the connection would require a crossover, and automatically chooses the MDI or MDI-X configuration to properly match the other end of the link.

2.4 RJ-45 Pin-outs

The RJ-45 Receptacles are NOT polarity sensitive.



2.5 Optical Connectors

The optical connectors are dependent on the model number of the TeleLite Ethernet card.

2.5.1 Available Varieties

There are three varieties of TeleLite Ethernet cards:

MST

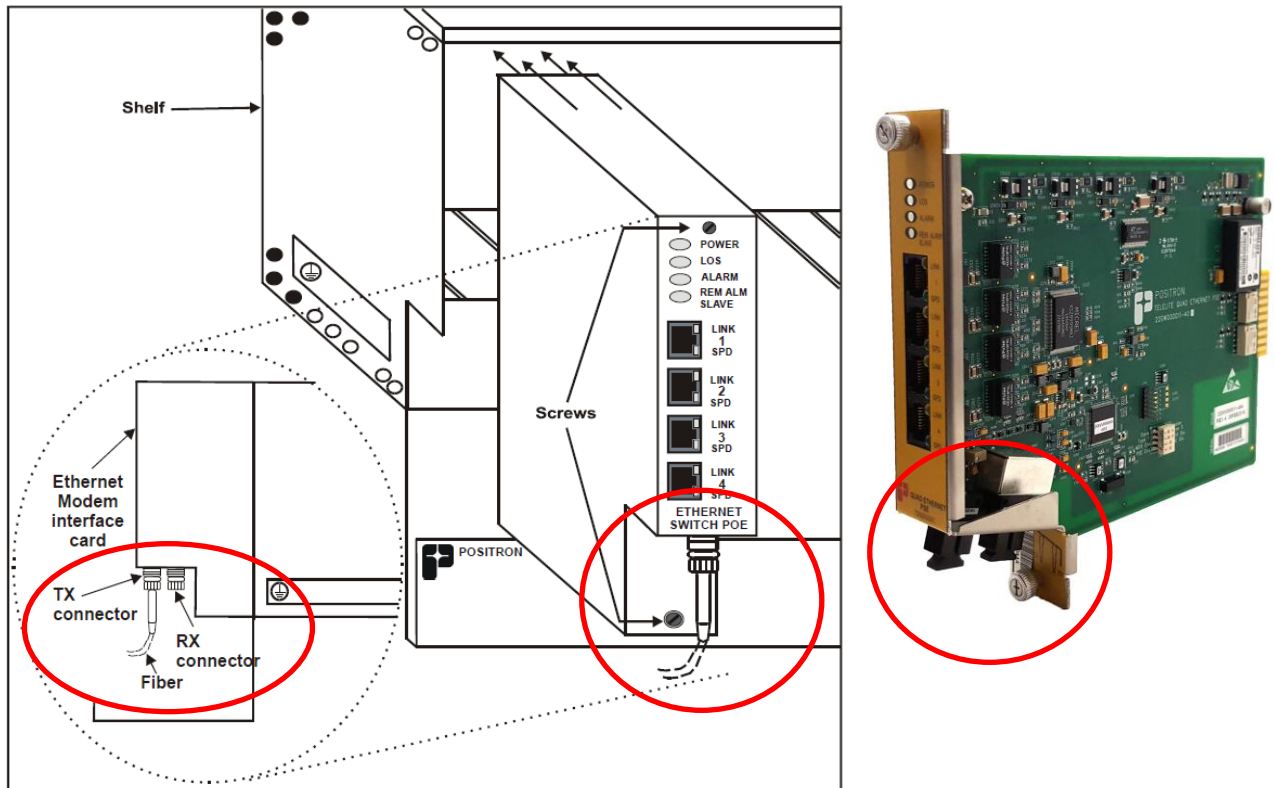
Multi-mode fiber with ST fiber connector (850 nm wavelength LED)
Range: \approx 1.2 miles (2km)

SSC

Single-mode fiber with SC fiber connector (1310 nm wavelength laser)
Range: \approx 30 miles (50km)

XSC

Single-mode fiber with SC fiber connector (1550 nm wavelength laser)
Range: \approx 50 miles (80.5km)

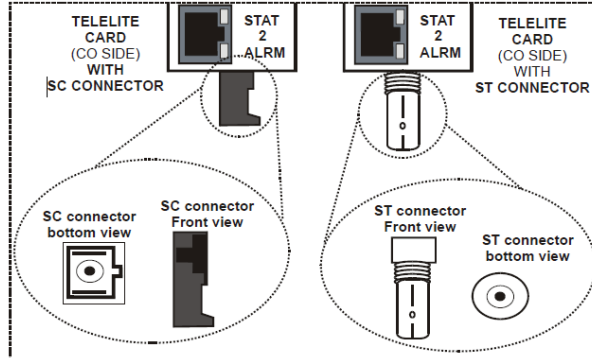


- The foremost optical connector is the TX port to the companion TeleLite Ethernet card
- The rearmost optical connector is the RX port to the companion TeleLite Ethernet card

2.5.2 Types of Connectors

The ST-type connectors are round in nature. Connection is done by inserting and making a ¼ turn to the right to lock in place.

The SC-type connectors are square and simply snap into place.



2.6 Faceplate Read-out LEDs (Both POE and PSE Ethernet Cards)

POWER
GREEN indicates that the card has power
RED indicates a reset condition
OFF indicates no power present

LOS (Loss of Signal)
GREEN indicates synchronizer locked to incoming signal
RED indicates a loss of fiber receive rest condition

ALARM
RED indicates a major alarm
OFF indicates no alarm

REM ALM / SLAVE (DUAL Purpose)
GREEN indicates this card is set to **Slave Mode** (DIP Switch 1)
 On the **SLAVE** unit, there is no other alarm condition reported. This LED will remain **GREEN**.
RED indicates that this card has been set as **Master** (DIP Switch 1), and an alarm condition exists at the companion **Slave** card
OFF indicates this card is set as **MASTER** AND THAT THERE ARE NO ALARMS

RJ-45 Receptacle LEDs	
<p>RJ-45 Receptacle LEDs Upper AMBER LED: ON = Link OFF = No Link Flashing = Activity</p>	<p>RJ-45 Receptacle LEDs Lower GREEN LED: ON = 100 Base-TX OFF = 10 Base-T</p>

3.0 Specifications

Parameter	Specification
Card Power Consumption	3W max for POE 5W max for PSE
Ethernet Copper Max Distance	As per IEEE 802.3
Ethernet Powering	As per IEEE 802.3af
Fiber Optic Interface	ST/SC type connectors
Transceiver Wavelength	850 nm (MST-type cards); 1310 nm (SSC type cards); 1550 nm (XSC type cards)
MST TeleLite Fiber Loss Budget	21dB
SSC TeleLite Fiber Loss Budget	28dB
XSC TeleLite Fiber Loss Budget	35dB
Maximum Fiber Span	Multi-mode (MST Cards): 2km (1.2 miles) Single Mode (SSC Cards): 16km (9.9 miles) Single Mode (XSC Cards): 80km (50 miles)
Transceiver Wavelength	850 nm (MST-type cards); 1310 nm (SSC type cards); 1550 nm (XSC type cards)
Fiber Optic Type	Multi-mode fiber: 62.5/125 μm (MST type cards) Single-mode fiber: 9/125 μm (SSC and XSC type cards)
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	-60m to 3,050m (-200 ft to 10,000 ft) relative to sea level

4.0 Important Information

4.1 Service and Support

Positron Contact Information

General information	Positron Inc. 591 Buchan Street Montreal, Québec, Canada H4P 2R9 US and Canada: 1-888-577-5254 International: 1-514-345-2214 Fax: 1-514-345-2271 E-mail: info@positronpower.com Web site : www.positronpower.com
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Repairs	US and Canada: 1-888-577-5254, Option 1 International: 001-514-345-2220, Option 1
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4.2 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 maintenance and troubleshooting.

For pricing information or assistance in the planning, configuration, use and interpretation of data of the equipment, contact Technical Customer Support (TCS) at 1-888-577-5254, Option 1, Option 3 (US and Canada) or +1-514-345-2220 Option 1, Option 3 (International).

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 at 1-888-577-5254 (US and Canada) or 001-514-345-2220 (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 180 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 and crates and on all shipping documents. Bulk repairs (more than five items) will require additional processing time, so please take this into consideration when requesting an RMA.

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 contact person should our Repair department need further information.

When packing items being returned for repair, please ensure they are properly packed and shipped in their carrying cases to avoid further damage.

4.4 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.

During the warranty period, freight costs to ship defective equipment to Positron are borne by the Customer, while the return of replaced or repaired equipment is at Positron's expense.

4.5 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 LIFE, STAFF INJURY, 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.

4.6 Disclaimer Notice

The equipment covered in this manual should be used and serviced only by competent and trained personnel familiar with and following good work safety practices. This equipment is intended solely for the use by such trained personnel and is not intended as a substitute for adequate training and experience. Appropriate safety procedures must be followed at all times in the use of this equipment.

The descriptive information contained in this manual is not intended to and does not cover all details, usages, or methods of use of this equipment, and such information is not intended to discuss all situations or contingencies which might be encountered with respect to the operation, maintenance or use of the equipment. This information is provided for purposes of description only and is not to be relied upon or utilized by any purchaser as instructions, warranties, specifications or use certifications. Although Positron Inc. has made every effort to ensure the accuracy of the information contained herein, this document is subject to change without notice due to ongoing product development. Any additional information which may be required by any purchaser regarding the use, maintenance, installation or operation of this equipment should be referred to Positron Inc.

4.7 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. Modified 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.

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