Teleline™

Plug-in ADSL2+ Module 751325
Description and Installation Guide

925W751016-03E

POSITRON
Positron Inc.

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Chapter 1

General Information

1.1 Publication Information

1.2 About this Guide

This guide introduces you to the Teleline Plug-in ADSL2+ Module 751325, its features and applications, and describes how to install it in a Teleline shelf. This guide was designed to be read from beginning to end.

1.2.1 Related Documentation

For any other technical document relating this system installation or applications cards and shelves, please refer to the Positron Web site: www.PositronPower.com.

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 Service and Support

1.3.1 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

1.3.2 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.

1.3.3 Customer Training

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

1.3.4 Product Safety

This equipment is compliant with CSA CAN/CSA-C22.2 No. 60950-1-07.

1.3.5   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. Plug-in cards should never be shipped while installed in a shelf; this will cause damage that can extend the repair period.

1.4   Teleline 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 five (5) years 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.

1.4.1   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 STATUTE, TO THE EXTENT PERMITTED BY LAW. POSITRON DOES NOT WARRANT THAT THE SYSTEM WILL OPERATE WITHOUT INTERRUPTION OR THAT IT WILL BE ERROR FREE.

1.4.2   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 The Teleline Plug-in ADSL2+ Module 751325

The Teleline Plug-in ADSL2+ Module 751325 provides high voltage isolation between an incoming ADSL (Asymmetric Digital Subscriber Line) and the customer's ADSL modem and the drop side of the loop start telephone circuit (telephone, dial-up modem, fax, loop start PBX). The ADSL line module consists of two cards, one handling the POTS and one handling the data signal. The ADSL piggyback board also contains a splitter that separates the POTS signal from the data signal.

Its features include the following:

■ Compatibility with ADSL, splitterless ADSL (G-Lite ADSL), ADSL2, splitterless ADSL2, Reach Extended ADSL2 (READSL2) and Extended Bandwidth ADSL2 (ADSL2+).

■ Allows the use of test signature as defined in standards: ANSI T1.413-1998 and ITU-T G.992.

■ Allows one ADSL line to be protected and isolated from Ground Potential Rise and lightning.

■ The module may be used only with the new generation Teleline 3-, 5- and 8-card shelves.

■ On board POTS splitter consisting of:

  ■ Low pass filter to prevent high frequency data signal from creating audible interference on the POTS line.

  ■ High pass filter to prevent POTS signaling from interfering with data signal.

■ The module provides 50 kV$_{rms}$ and 70 kV peak voltage protection while maintaining communication before and after a Ground Potential Rise.

■ The card operates from either -24 Vdc or -48 Vdc supply provided by either the shelf's power supply or from an external source.

■ The Central Office (CO) side circuitry is line-powered.

■ The card withstands 600 V power cross (as per CAN/CSA No. 60950-1-07) with automatic restoration of service.

<u>N**OTE**</u>

- The ADSL2+ Module, 751325 is a replacement and improvement over the ADSL Module 751321B.

- When installing the module, there is no need to install POTS splitters on the customer equipment.

- When installing the module, the CO incoming pair can be wired to the alphabetical or the numerical pair. By default, the card is set to use the alphabetical. If the numerical pair is to be used (first pair of a slot), jumpers W1 and W2 on the piggyback have to be moved to the "LINE 1" position.

- On the station side, the POTS line will be on the numerical pair of the slot and the data will be on the alphabetical pair.

- When interfacing with a PBX, fax or modem, it is strongly recommended to power the module from -48 Vdc.

2.2   Hardware Description

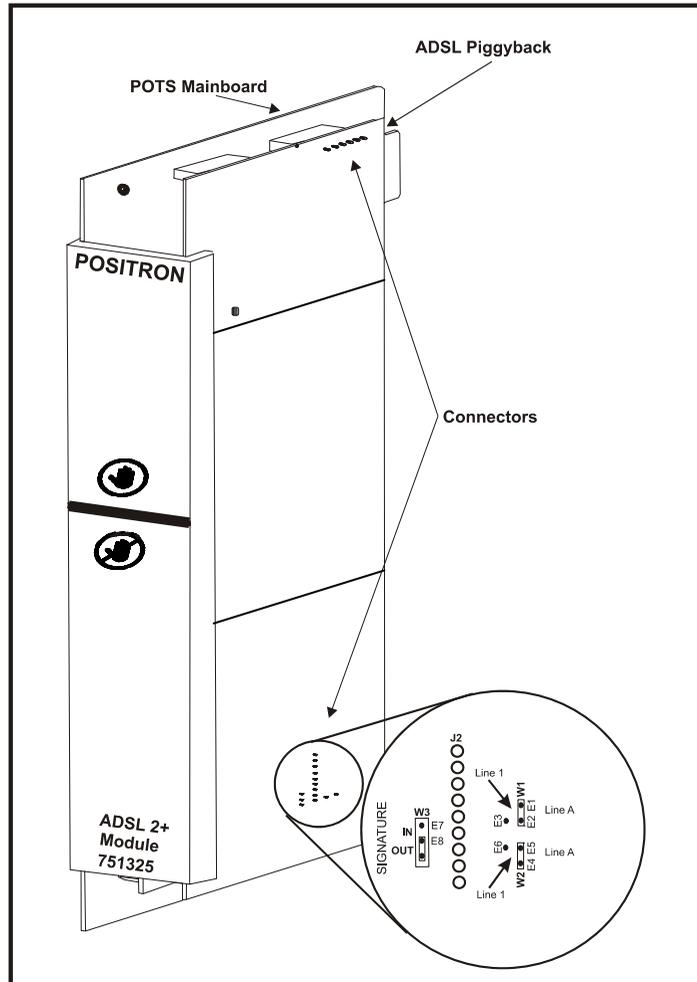**Figure 1: 751325 Mainboard Component Layout**
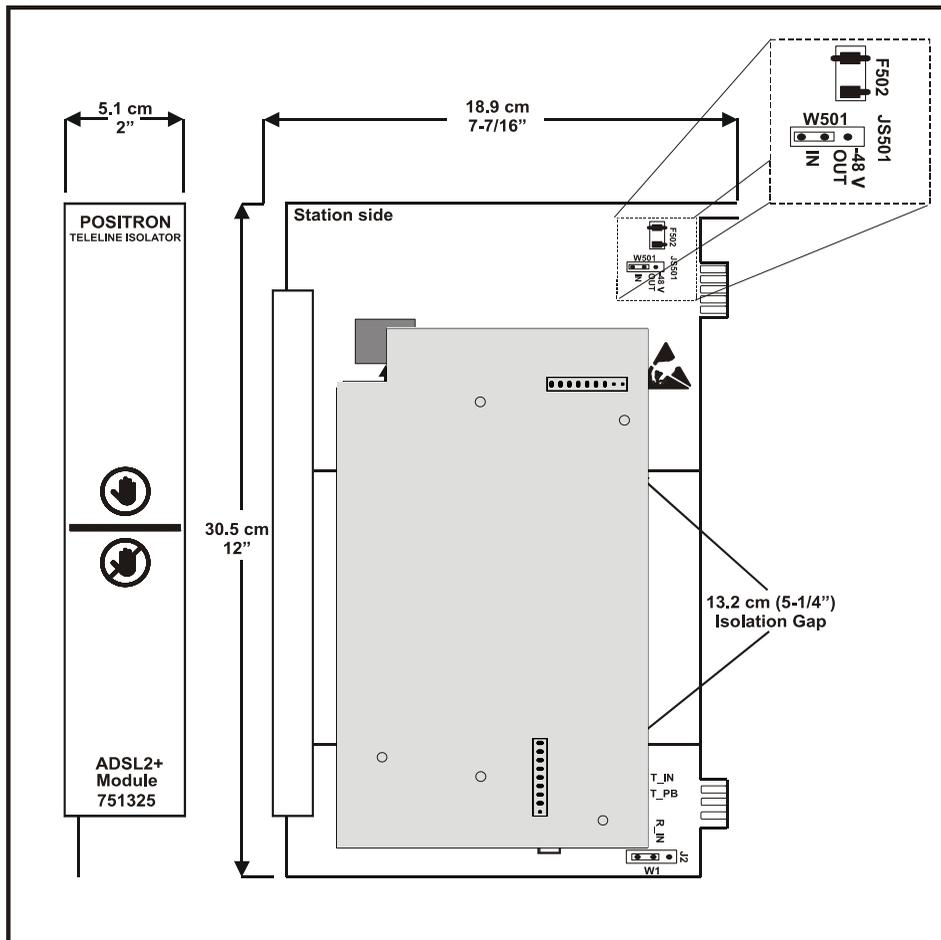
NOTE

■   By default, jumper W1 is set to R_PB, W2 is set to T_PB and W501 is set to -48 V IN.

Figure 2: Complete Plug-in ADSL2+ Module 751325 Component Layout (Only major components shown)

NOTE By default, the CO line is wired to the alphabetical pair. To use the numerical pair of a slot, change jumpers W1 and W2 to "LINE 1" position.

2.3   Applications

The applications of the Teleline Plug-in ADSL2+ Module 751325 include the following:

- ADSL
- ADSL G_Lite (also known as ADSL Lite, splitterless ADSL or Universal ADSL)
- ADSL2
- Splitterless ADSL2
- Extended reach ADSL2 (READSL2)
- Extended bandwidth ADSL2 (ADSL2+)

The POTS portion of the ADSL2+ Module can be used for:

- Loop start telephone (POTS)
- Fax and dial-up "smart" modems (up to 56.6 kb/s modem)
- Loop start PBX
- Dial-up remote meter reading

Figure 3: ADSL2+ Module High Voltage Applications
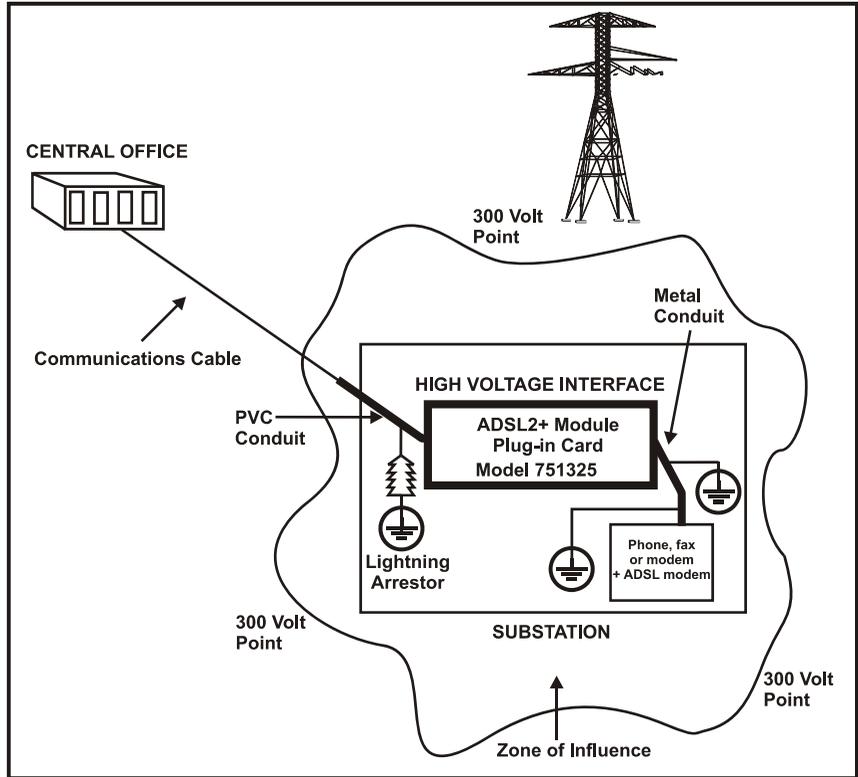
2.4 Hardware Description

The Teleline Plug-in ADSL2+ Module 751325 has two sides. With the card facing you:

■ The CO side is located on the lower portion of the card.

■ The Station side is located on the upper portion of the card.

The CO side and Station side are separated by the opto-isolators and a transformer which create a 5 1/4 inch isolation gap.

Figure 4: Block Diagram, POTS Portion

Figure 5: ADSL2+ Module Block Diagram
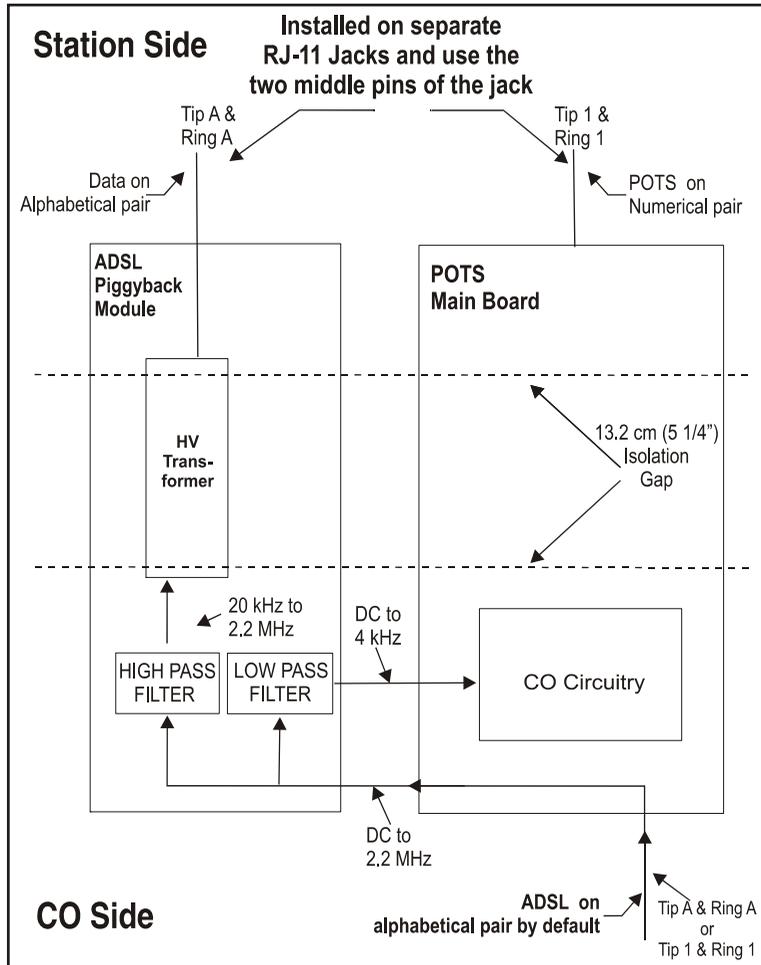
2.4.1   POTS Circuit
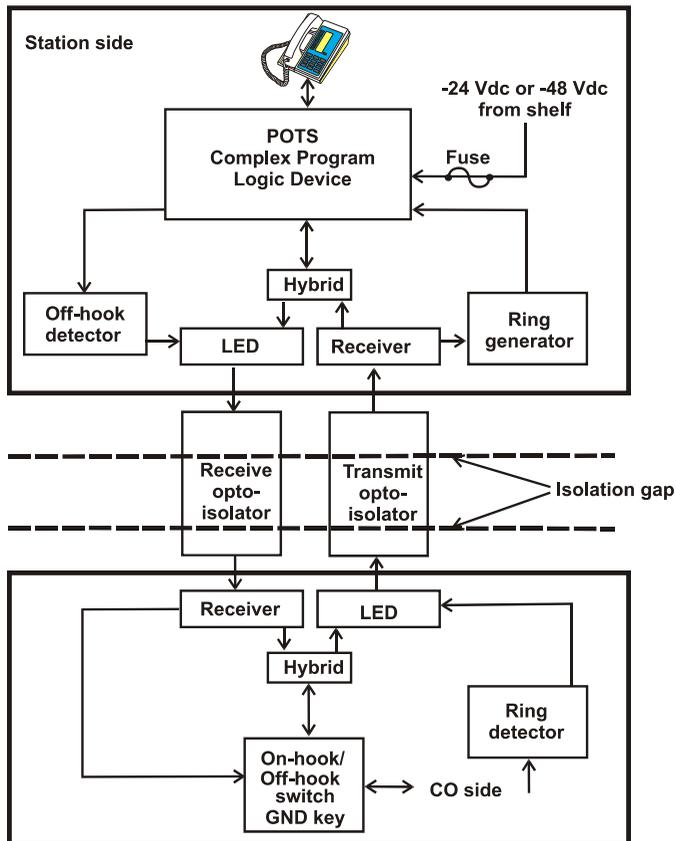
The Teleline Plug-in ADSL2+ Module 751325 has a Complex Programmable Logic Device (CPLD) located on the Station side portion of the card.

The CPLD generates all the clocks used on both the CO and Station sides. It also controls the Subscriber Line Interface Circuit (SLIC).

The SLIC drives the telephone on the Station side and feeds the ringing signal for the phone.

The telephone line is driven using a transformer to provide good longitudinal balance and eliminate common mode noise on the line.

The Station side ringing generator provides 20 Hz for North American networks.

The card's specifications meet EIA/TIA 968 requirements. The CO circuit operates with line currents between 18 mA and 29 mA (the card limits current at 29 mA) allowing the card to operate on a line of up to 1,500 Ω (excluding card). The Station side SLIC will detect off-hook with currents as low as 16 mA and limits the phone current to 26 mA.

The audio signal is modulated and demodulated on both sides, in full duplex.

The CO side has a ringing detector that operates from 17 Hz to 50 Hz, as low as 40 V_{rms}.

2.5   Switch and Jumper Settings

Refer to Figure 1 on page 16 for component locations.

2.5.1   CO Side POTS Jumper Settings for 751325

Jumpers W1 and W2 are used to determine if the CO circuitry will take its signal from the line or the piggyback which is the case for the ADSL.

- T_IN: Tip input
- T_PB: Tip Piggyback (setting for ADSL)
- R_IN: Ring input
- R_PB: Ring Piggyback (setting for ADSL)

NOTE | By default, jumper W1 is set to R_PB, and jumper W2 is set to T_PB.

2.5.2   CO Side ADSL Jumper Settings for 751325

On the piggyback, jumpers W1 and W2 are used to determine if the ADSL CO line is wired on the alphabetical pair or the numerical pair in the shelf.

- Line 1: Use numerical pair for ADSL CO line
- Line A: Use alphabetical pair for ADSL CO line

On the piggyback, W3 is used to insert an ADSL splitter text signature, as defined in ANSI T1.413-1998 and ITU-T G.992 standards.

- IN: test signature circuit active
- OUT: test signature circuit disconnected

2.5.3   Station Side Switch and Jumper Settings for 751325

Jumper W501 is located on the main board station side. The card's -24 Vdc input is permanently connected and the -48 Vdc input is selectable through W501.

If W501 is set to "OUT", the card can only be powered from -24 Vdc present in the shelf. If -24 Vdc is not present, the card will be unpowered.

If W501 is set to "IN", then both the -48 Vdc and -24 Vdc inputs can be used. If both voltages are present in the shelf, the card will power itself from the most negative voltage (i.e. -48 Vdc).

<u>**NOTE**</u>　■　By default, W501 is set to -48 Vdc IN.

In legacy shelves that have floating 48 Vdc or floating 130 Vdc powering some cards, W501 must be set to "OUT" to prevent grounding the station batteries and generating an alarm.

■　When floating 48 Vdc or 130 Vdc is fed through the station cable, it should be set to "OUT."

2.6   Technical Specifications

For 751325 electrical specifications, see Table 1 below and Table 2 on page 26.

For physical specifications see Table 3 on page 26

**Table 1: Electrical Specifications for 751325 POTS Portion
(measured at 25°C or 77°F, 50% R.H.)**

	Parameter	**Specification**
Isolation Data:	Isolation Resistance	100,000 MΩ
	Metallic Surge	1.5 kV max
	Insulation Voltage	50 kV$_{rms}$ (70 kV peak)
Input Voltage Requirement:		-24 Vdc (-21 V to -27 V) default to -48 Vdc (-42 V to -54 V)
Input Power Requirement (-48 Vdc input):	On-hook (idle)	50 mA max
	Off-hook	60 mA max
	Ringing 1 phone	85 mA max
	Ringing 5 REN	200 mA max
Input Power Requirement (-24 Vdc input):	On-hook (idle)	65 mA max
	Off-hook	75 mA max
	Ringing 1 Phone	110 mA max
	Ringing 5 REN	250 mA max
On-hook:	CO Side Input Ringing Detection	40 V to 105 V$_{rms}$, 17 to 50 Hz
	Terminal Resistance (CO side)	$\geq$ 10 MΩ ± 100 Vdc, $\geq$ 10 MΩ at ± 200 Vdc
Off-hook:	Minimum Loop Current (CO)	18 mAdc
	Maximum Loop Current (CO)	Current limiting at 29 mAdc
	Minimum Loop Current (Station)	Will detect off-hook down to 16 mAdc
	Maximum Loop Current (Station)	Current limiting at 26 mAdc
	Echo Return Loss	$\geq$ 20 dB (600 Ω)
	Singing Return Loss	$\geq$ 15dB (600 Ω)

...continued

	Parameter	Specification
Ringing Generator Output (-48 Vdc input):	Maximum Output No Load	102 V_{rms} max
	Minimum Output (5 REN at the end of 400 Ω line)	58 V_{rms} min
Ringing Generator Output (-24 Vdc input):	Maximum Output No Load	103 V_{rms} max
	Minimum Output (5 REN at the end of 400 Ω line)	54 V_{rms} min

Table 2: Electrical Specifications for 751325 Data Portion (measured at 25°C or 77°F, 50% R.H.)

Parameter	Specification
Input Power Requirement	N/A
Power Dissipation	N/A
Insertion loss 25 kHz to 1.2 MHz:	<1.5 dB
Frequency Response (-3dB referenced to 500 kHz):	20 kHz to 5 MHz
Impedance	100 Ω

Table 3: Physical Specifications for 751325

Parameter	Specification
Operating temperature range	-20°C to +65°C (-4°F to +149°F)
Height	30.5 cm (12")
Width	7 cm (2.75")
Depth	18.9 cm (7-7/16")
Weight	<1.4 kg (3 lbs)

Chapter 3

Installation

3.1 Teleline Plug-in ADSL2+ Module model 751325 Installation

|	
ATTENTION ELECTROSTATIC SENSITIVE DEVICES HANDLE ONLY AT STATIC SAFE WORKSTATION	**ESD Precaution** INCORRECT HANDLING MAY VOID WARRANTY These procedures must be followed when handling an electrostatic sensitive device. • A grounded wrist strap must be worn at all times during installation. • When unpacking, place the antistatic bag containing the device on an electrostatic discharge (ESD) safe surface. An ESD safe surface is a conductive surface connected directly to an earth ground. • When moving, carry the device in an ESD safe container or the antistatic bag, provided with the device.

The ADSL2+ Module plugs into any slot of the Teleline 3-, 5- or 8-card shelves.

Each card must be installed into the slot of the shelf, which has been pre-wired according to the installation diagram of the specific shelf.

NOTE

■ Grounding of the card is done through the shelf. See the grounding section of the shelf's installation manual for more information.

Figure 6: Teleline Plug-in ADSL2+ Module model 751325
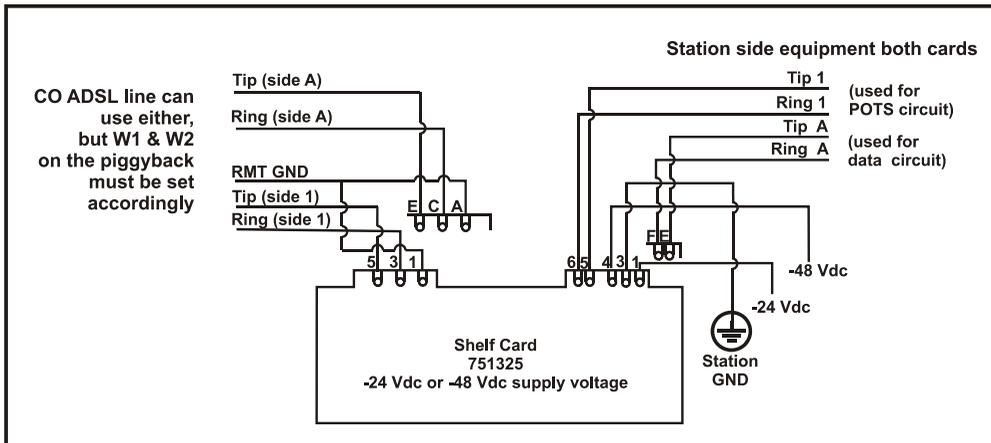
NOTE
- Jumper W501 is located on the main board station side. The card's -24 Vdc input is permanently connected and the -48 Vdc input is selectable through W501.
- If W501 is set to "OUT", the card can only be powered from -24 Vdc present in the shelf. If -24 Vdc is not present, the card will be unpowered.
- If W501 is set to "IN", then both the -48 Vdc and -24 Vdc inputs can be used. If both voltages are present in the shelf, the card will power itself from the most negative voltage (i.e. -48 Vdc).

NOTE
- On the CO side of the piggyback, jumpers W1 and W2 must be set to "LINE 1" if the numerical pair is used. They must be set to "LINE A" if the alphabetical pair is used.
- On the CO Side of the piggyback, jumper W3 is set to "IN" if test signature is required.

➤ **To Install the ADSL2+ Module, model 751325**

CAUTION

Stand on a thick rubber mat and wear rubber gloves during the installation procedure. Perform these procedures on a clear dry day when a Ground Potential Rise (GPR) or transients are less likely to occur.

1. Unpack the ADSL2+ model 751325 Plug-in card from its protective box and shielded anti-static bag.

2. Confirm that the card is an ADSL2+ model 751325 by identifying the name and model number on the front panel of the card.

NOTE

■ Verify that the fuses F501 and F502 are intact. To view the location of the fuses, see Figure 1 on page 16. The fuses are not field-replaceable

NOTE

■ Set W501 to "IN" if there is no floating 48 Vdc or 130 Vdc fed through the station cable. This will let the card power itself from -48 Vdc if present in the shelf, otherwise it will select -24 Vdc automatically. See Figure 1 on page 16.

■ By default, W501 is set to "IN".

3. Verify that jumpers W1 and W2 on the CO Side of the main board are set to "T_PB" and "R_PB."

4. Verify that jumpers W1 and W2 on the CO Side of the piggyback are set to use the wire pair on which the CO line has been wired.

5. Slide the card into its designated pre-wired shelf slot until the two card-edge connectors lock into the shelf and the retaining clip snaps into place.

6. Verify the installation by making and receiving a call.

ATTENTION

■ When installing an ADSL2+ Module, the CO incoming line must be wired to the pair that is selected with jumpers W1 and W2 on the CO side of the piggyback. On the Station side, the POTS line will be on the numerical pair of the slot and the DSL line will be on the alphabetical pair.

NOTE

■ If a fuse is blown, contact Positron Customer Support for a card replacement; see section 1.3.1 on page 8 for contact information.

■ The card must be inserted right-side up and may be plugged into the shelf with the power ON or OFF.

■ If the ADSL2+ Module model 751235 has to be installed in slot 8 of the 8-card shelf or slot 5 of the 5-card shelf, be sure to push the station cable to the side. See Figure 7 below.

Figure 7: Last Slot of a 5- or 8-card Shelf
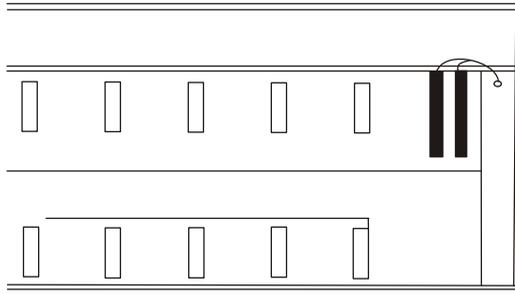
3.2   Maintenance

NOTE ■ Before maintenance, disconnect telecom lines on all cards being serviced in the CO splice case and on the station punch block. If not possible, stand on a thick rubber mat and wear gloves during maintenance. It is preferable to perform these procedures on a clear, dry day when a GPR (Ground Potential Rise) or transients are less likely to occur.

Appendix A

Acronyms

Acronyms

AC	Alternating Current
ADSL	Asymmetrical Digital Subscriber Line
CO	Central Office
CMOS	Complimentary Metal Oxide Semiconductor
CPLD	Complex Programmable Logic Device
CSA	Canadian Standards Association
DC	Direct Current
ESD	Electro-Static Discharge
FCC	Federal Communications Commission
GPR	Ground Potential Rise
LED	Light-emitting Diode
PBX	Private Branch Exchange
POTS	Plain Old Telephone Service
REN	Ringer Equivalent Number
SLIC	Subscriber Line Interface Circuit
UL	Underwriters Laboratories