Teleline™

Plug-in 4-wire HDSL (751339R2)
Plug-in 4-wire HDSL with Span Power (751339SP)
Description and Installation Guide

925W751007-14E

POSITRON
Positron Inc.

Contents

Chapter 1

General Information

1.1 Publication Information

Teleline Plug-in 4-wire HDSL (751339R2)
Plug-in 4-wire HDSL with Span Power (751339SP),
Description and Installation Guide
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1.2 About this Guide

This guide introduces you to the Teleline Plug-in 4-wire HDSL/Plug-in 4-wire HDSL with Span Power cards, models 751339R2 and 751339SP, their features and applications, and describes how to install them in a Teleline shelf. This guide was designed to be read from beginning to end.

1.2.1 Related Documentation

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

- Teleline System Manual
- Teleline System Overview
- Teleline Product Guide

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 pre-configured 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

1.2.3 Product Safety

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

1.3 Service and Support

Table 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

1.3.1 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.

1.3.2 Customer Training

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

1.3.3 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. 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 Introduction

Each Teleline Plug-in 4-wire HDSL model 751339R2 and Plug-in 4-wire HDSL with Span Power model 751339SP card provides high-voltage isolation between two, two-wire or one four-wire Remote Termination Unit located inside the substation, and an HDSL Data Terminal Unit (DTU) located at the Central Office (CO).

NOTE Due to technology change, these units cannot be used with some older shelves - the 3-card shelf model 7501-27, 5-card shelf model 7501-09 and 8-card shelves 7501-08/CS8.

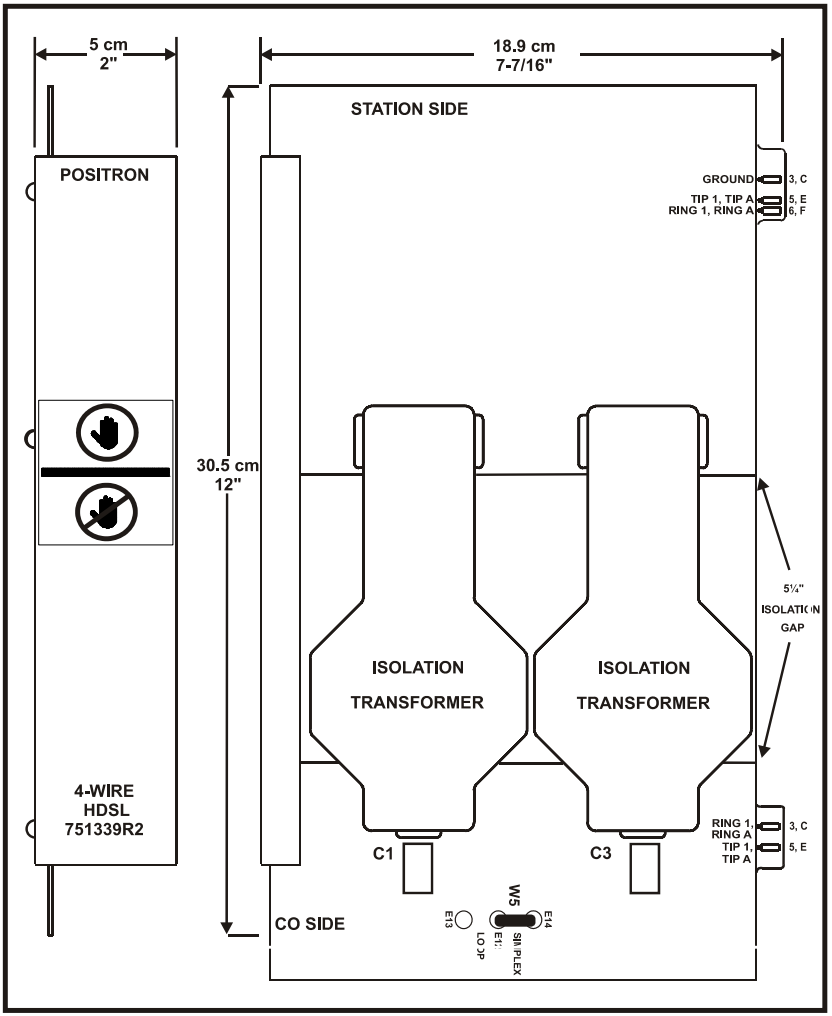
2.1.1 Features

Features for models 751339R2, and 751339SP include the following:

- Isolation of 50 kV_{rms} (70 kV peak) while maintaining full communication between terminals.
- Communication maintained across the gap by isolation transformers that provide low-loss low-distortion transmission.
- The 751339R2 cards are passive and do not require power to operate.
- The model 751339R2 card requires a locally powered HTU-R on the Station side.
- The Teleline shelf power can be maintained during the installation of the cards.
- Jumper settings allow you to configure all cards to provide a simplex sealing current or a loop sealing return path on the CO side. The current will not be transferred to the Station side. Cards are shipped with these options disabled

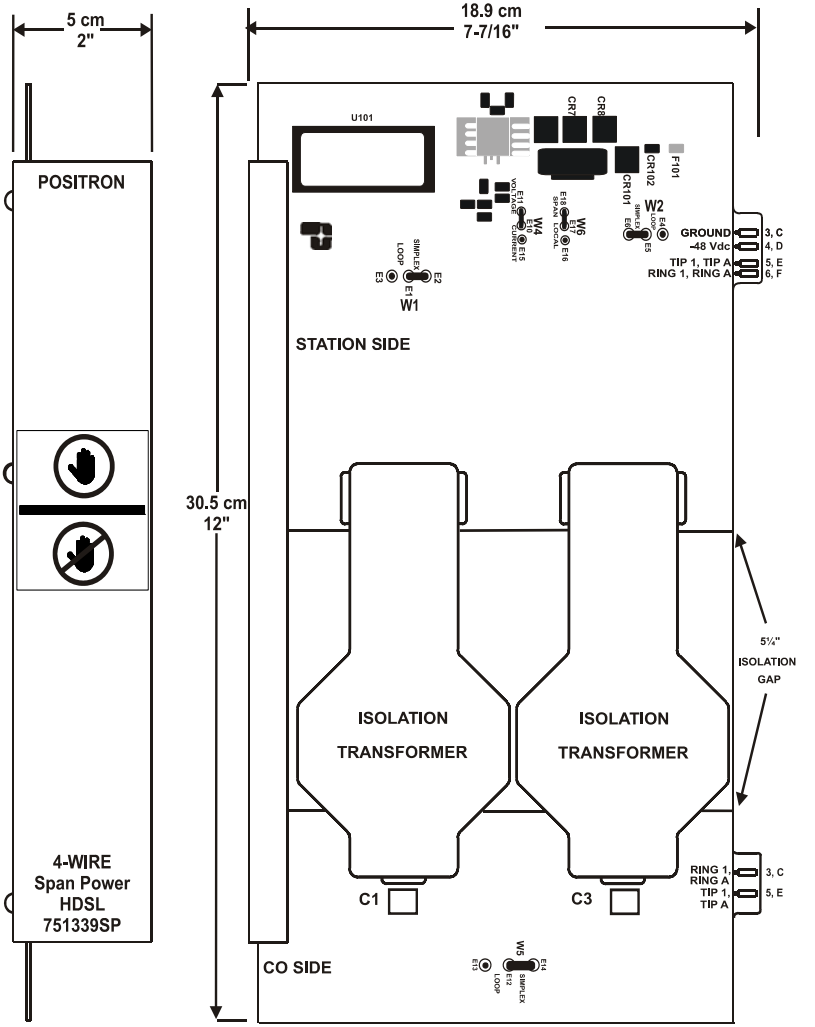
NOTE A jumper setting on card model 751339SP enables power to the Station side span for a span powered HTU-R. A local external or internal -48 Vdc source is required for this span power feature. A loss of 610 m (2,000 ft.) is introduced in the span for each 751339SP card installed.

Figure 1: Model 751339R2 Component Layout (only major components shown)



NOTE The layout shown above illustrates the default jumper setting for model 751339R2.

Figure 2: Model 751339SP Component Layout (only major components shown)



NOTE The layout shown above illustrates the default jumper setting for model 751339SP.

2.2 Applications

2.2.1 Applications for 751339R2

The Plug-in 4-wire HDSL card can be deployed in installations that use:

- HDSL Classic (2B1Q), one HDSL2, two HDSL2 or one HDSL4 with support of -129 Vdc and -190 Vdc on the loop. For supported span distance, see Table 2 below.
- Data transmission lines within the passband of the card (1.544 Mb/s).

For an illustration of how the card is used as part of the high voltage interface, see Figure 3 on page 19.

Table 2: Span Distance Reductions for Model 751339R2

	Local Power Mode
HDSL Classic (2B1Q)	305 m (1,000 ft.)
HDSL2	305 m (1,000 ft.)
Two HDSL2	305 m (1,000 ft.)
HDSL4	305 m (1,000 ft.)

NOTE

- The total span is the distance between the Central Office and the Station side equipment.
- These span distance reductions are valid for the Teleline 3-, 5-, or 8-card shelf that uses compatible backplanes. See section 3.1 on page 24 for more information.

2.2.2 Applications for 751339SP

The Plug-in 4-wire Universal HDSL card can be deployed in installations that use:

- HDSL Classic (2B1Q), one HDSL2, two HDSL2, or one HDSL4 with support of -129 Vdc and -190 Vdc on the loop. For supported span distance, see Table 3 below.
- Data transmission lines within the passband of the card (1.544 Mb/s).
- Station side span powered HTU-R.
- Station side locally powered HTU-R.

For an illustration of how the card is used as part of the high voltage interface, see Figure 3 on page 19.

NOTE

- JUMPER SETTINGS ALLOW THE CARD MODEL 751339SP TO PROVIDE POWER TO THE STATION SIDE SPAN FOR A SPAN POWERED HTU-R. A LOCAL POWER SOURCE (-48 VDC) IS REQUIRED FOR THIS SPAN POWER FEATURE.

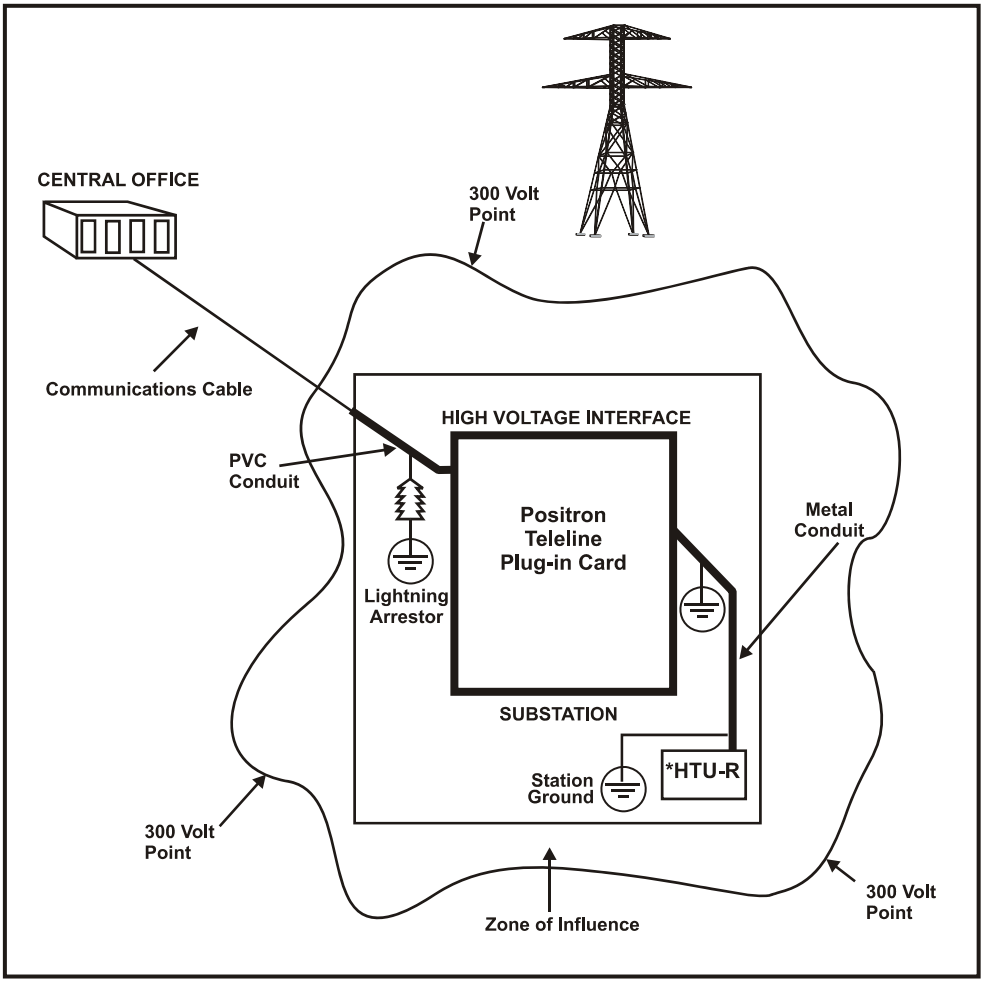
Table 3: Span Distance Reductions for Model 751339SP

	Local Power Mode
HDSL Classic (2B1Q)	610m (2,000 ft)
HDSL2	610m (2,000 ft)
Two HDSL2	Half of the total span distance
HDSL4	610m (2,000 ft)

NOTE

- The total span is the distance between the Central Office and the Station side equipment.
- These span distance reductions are valid for the Teleline 3-, 5-, or 8-card shelf that uses compatible backplanes. See section 3.1 on page 24 for more information.
- When in local power mode, W1 & W2 must be set to “SIMPLEX” and W6 must be set to “LOCAL”.

Figure 3: High Voltage Interface Application



NOTE

- When model 751339R2 is used, the HTU-R must be locally powered.
- When model 751339SP and a -48Vdc power supply is used to provide Station side span power, the HTU-R does not require local powering

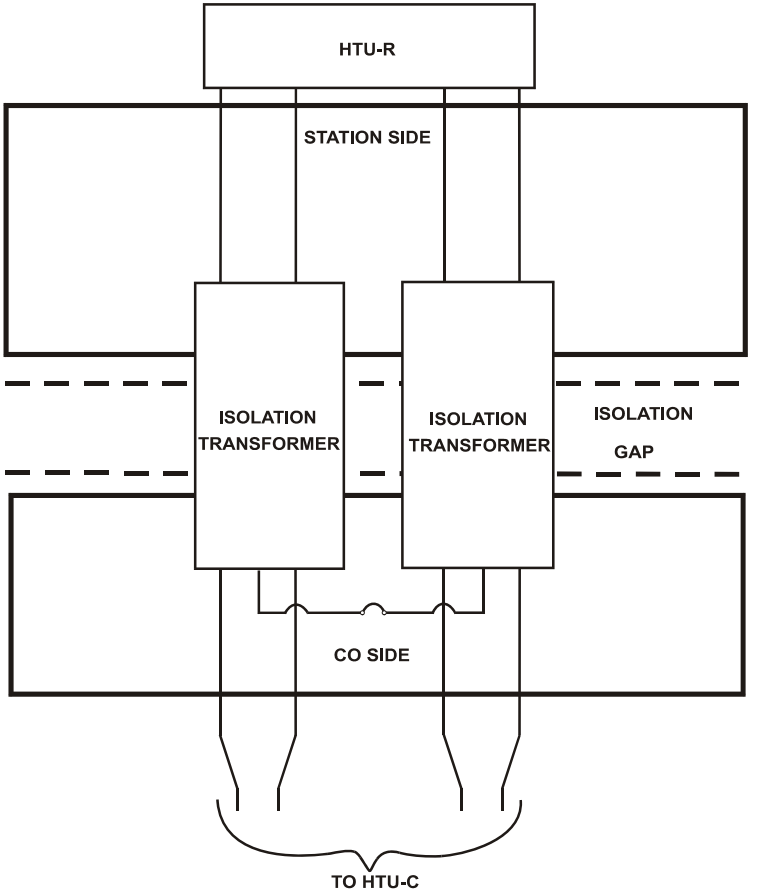
2.3 Hardware Description

Each card (models 751339R2 and 751339SP) has two sides:

- The Station side is located on the upper portion of the card
- The CO side is located on the lower portion of the card

The isolation transformer, which separates the CO side from the Station side, creates a 13.3 cm (5¼ inch) isolation gap.

Figure 4: Block Diagram



2.4 Technical Specifications

- For physical specifications, see Table 4 on page 21.
- For electrical specifications for model 751339R2, see Table 5 on page 21.
- For electrical specifications for model 751339SP, see Table 6 on page 22.

Table 4: Physical Specifications for 751339R2 and 751339SP

	Specification
Operating Temperature Range	-20°C to 65°C (-4°F to 149°F)
Height	30.5 cm (12”)
Width	5.1 cm (2”)
Depth	18.9 cm (7-7/16”)
Weight	1.6 kg (3.5 lbs)

Table 5: Electrical Specifications for 751339R2 (measured at 77°F or 25°C, 50% R.H.)

		Specification
Isolation Data:	Isolation Resistance	100,000 MΩ
	Metallic Surge	3 kV maximum
	Insulation Voltage	50 kV_{rms} (70 kV peak)
Input Voltage Requirement:		None
Transmission Data:	Longitudinal Balance (CO side)	> 80 dB at 60 Hz
	Return Loss (at either side with opposite side terminated at 135 Ω)	> 25 dB, 2.5 kHz to 350 kHz
Signal:	Insertion Loss at 100 kHz	< 0.5 dB
	Frequency Response	-1 dB at 2.5 kHz, 300 kHz
		-3 dB at 1.5 kHz, 650 kHz
	Total Harmonic Distortion at 22 dBm, 10 kHz	< -70 dB
Power:	Power Dissipation (HDSL2)	2 W
	Power Dissipation (HDSL4)	4 W
	Power Consumption (HDSL2)	0 W
	Power Consumption (HDSL4)	0 W

Table 6: Electrical Specifications for 751339SP (measured at 77°F or 25°C, 50% R.H.)

		Specification
Isolation Data:	Isolation Resistance	100,000 MΩ
	Metallic Surge	3 kV maximum
	Insulation Voltage	50 kV_{rms} (70 kV peak)
Input Voltage Requirement:	HTU-R Span Power	129 Vdc - 190 Vdc
751339SP Input Voltage:		- 42 Vdc to - 54 Vdc
Transmission Data:	Longitudinal Balance (CO side)	> 80 dB at 60 Hz
	Return Loss (at either side with opposite side terminated at 135 Ω)	> 25 dB, 2.5 kHz to 350 kHz
Signal:	Insertion Loss at 100 kHz	< 0.5 dB
	Frequency Response	-1 dB at 2.5 kHz, 300 kHz -3 dB at 1.5 kHz, 650 kHz
	Total Harmonic Distortion at 22 dBm, 10 kHz	< -70 dB
Power:	Power Dissipation (HDSL2)	■ 2 W (add 2 W when in current mode and connected to an SP card) ■ 2 W (add 1 W when in voltage mode and connected to an HTU-R)
	Power Dissipation (HDSL4)	■ 4 W (add 2 W when in current mode) ■ 4 W (add 1 W when in voltage mode)
	Power Consumption (HDSL2) based on a typical HTU-R consumption	■ 4 W at -48 Vdc in current mode ■ MAX 13 W when in voltage mode
	Power Consumption (HDSL4) based on a typical HTU-R consumption	■ 4 W at -48 Vdc in current mode ■ 13 W when in voltage mode

Chapter 3

Installation

3.1 Installation

ESD Precaution

INCORRECT HANDLING MAY VOID WARRANTY

The following steps must be followed when handling an electrostatic sensitive device.

- A grounded wrist strap must be worn at all times during the 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.

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.

NOTE

- Due to technology change, these plug-in cards cannot be used with some older shelves - the 3-card shelf model 7501-27, 5-card shelf model 7501-09 and 8-card shelves 7501-08/CS8.
- The plug-in cards must be installed in the slot which has been pre-wired according to the installation diagram for the shelf used

NOTE

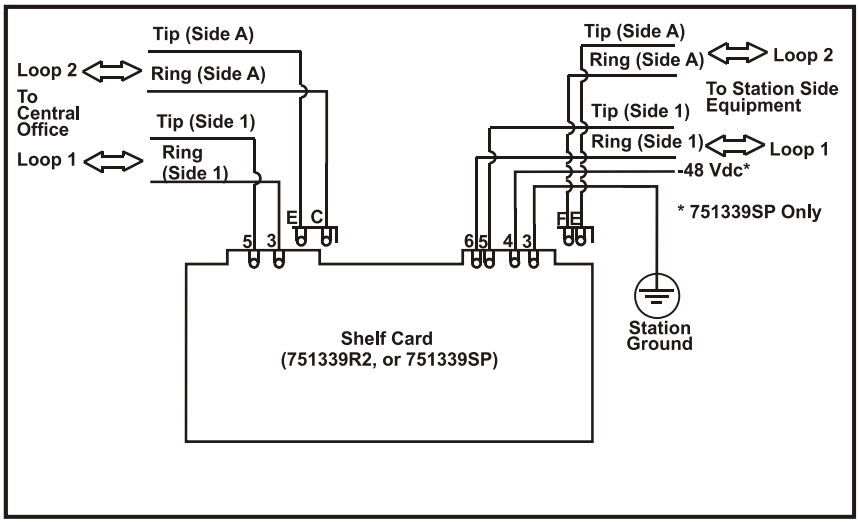
- Grounding of the card is done through the shelf. See the grounding section of the shelf's installation manual for more information.

For the use of HDSL circuits, the shelf being used must be equipped with a CO side motherboard with twisted pairs, which can accommodate two pairs per position.

Before deploying the HDSL card, it is important to verify the motherboard model number inside the shelf on the CO side. This will indicate if the shelf being used is compatible with the HDSL circuit:

- For the 3-card shelf, use motherboard model 220-000444-401
- For the 5-card shelf, use motherboard model 220-000366-401
- For the 8-card shelf, use motherboard model 220-000365-401

Figure 5: Layout for 4-wire HDSL Classic (2B1Q) or 2-wire HDSL2 or 4-wire HDSL4, using one 751339R2 or one 751339SP card



NOTE

- Model 751339R2 does not require power.
- When using model 751339SP to provide simplex or loop current to the Station side span, an external or internal -48 Vdc source is required.
- Station end HDSL carrier terminal equipment CANNOT be powered from the CO line side cable pairs using this type of card.
- An internal connection of the board can loop or simplex the current back to the CO side CT of Loop 1 and Loop 2.
- Loop 1 and Loop 2 can be interchanged.

For an illustration of a setup with a system locally powered for model 751339R2 (which includes the option for -190 Vdc Loop 1 or Loop 2, or -129 Vdc between Tip and Ring), see Figure 6 on page 26.

For an illustration of a setup with system span powered for model 751339SP, see Figure 7 on page 27.

Figure 6: Setup for Model 751339R2: Powering an HTU-R with a Local Power Supply

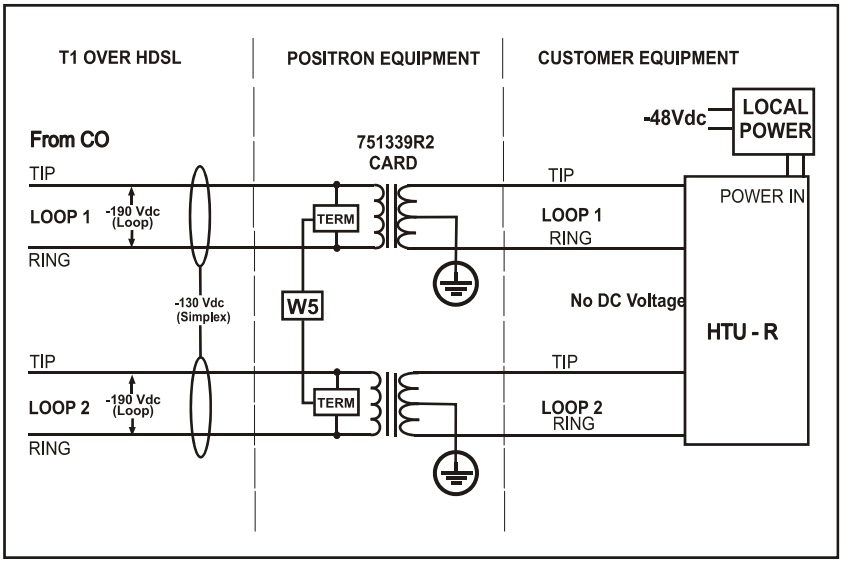
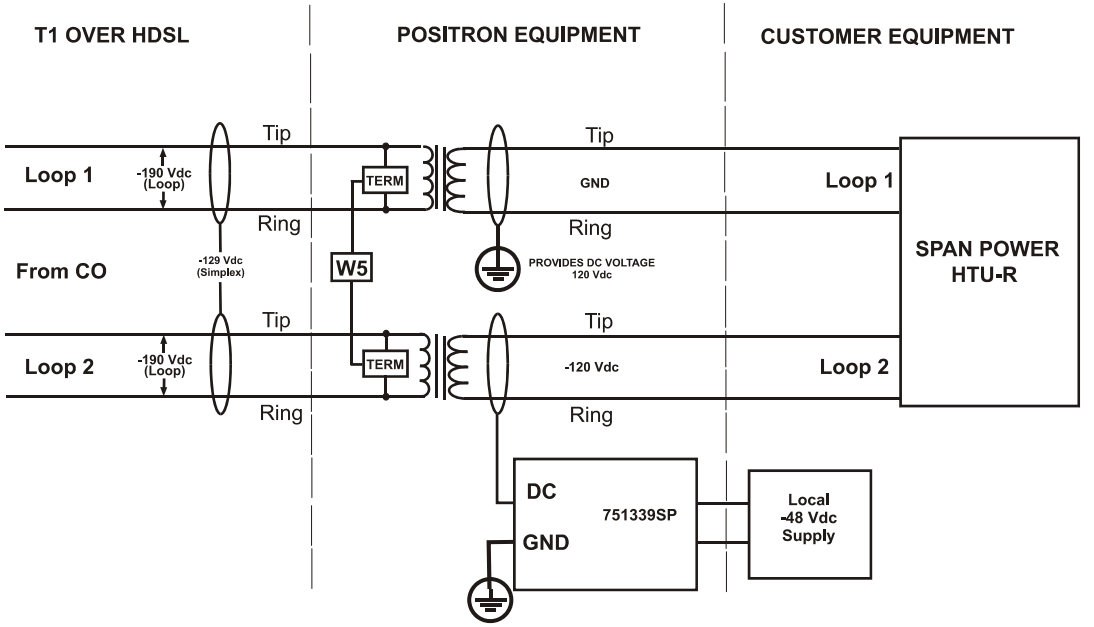


Figure 7: Setup for Model 751339SP Station Side Span Power: Powering with External Power Supply

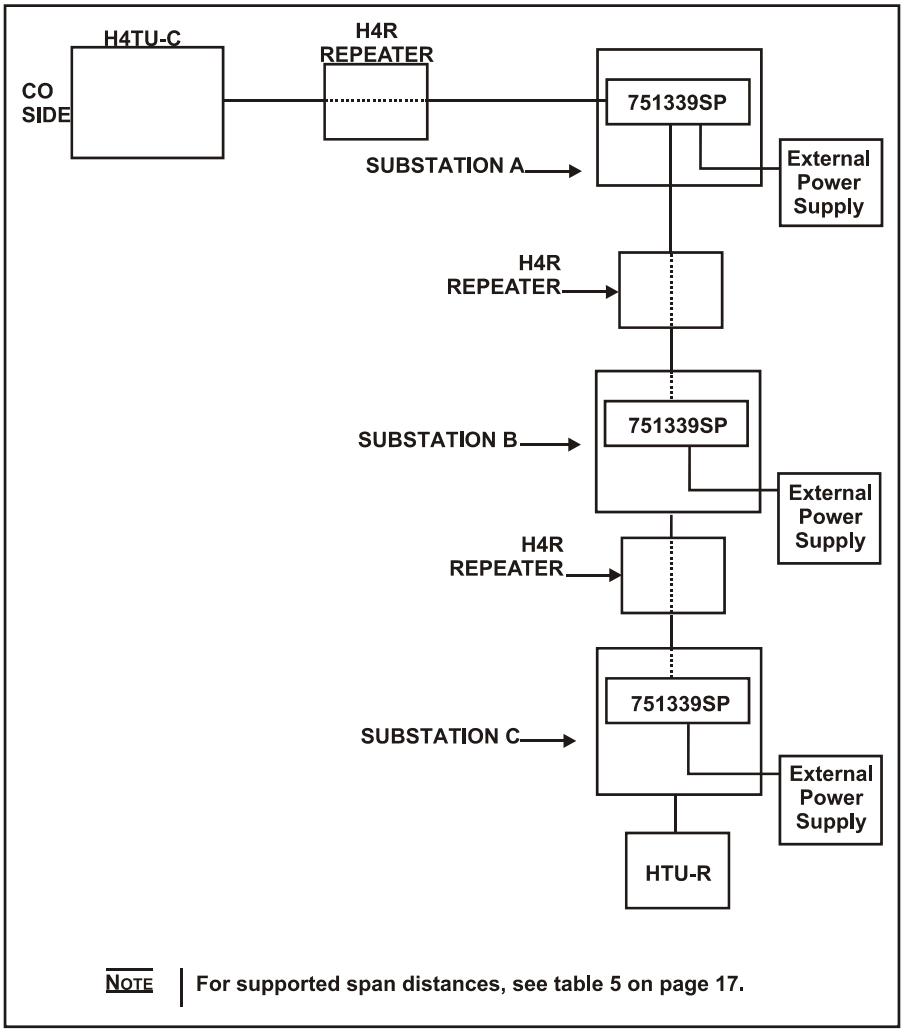


NOTE

When connected to a 3-, 5-, or 8-card Shelf:

- **Span power** = -120 Vdc.
- **Card model 751339SP input voltage**, external or internal = -48 Vdc

Figure 8: Example: Setup for an Extended Span Using Model 751339SP for the Station Side Span Powering Option



NOTE

- **A loss of 610 m (2,000 ft.) is introduced in the span for EACH 751339SP card installed.**

➤ To Install the Plug-in 4-wire Universal HDSL Cards Models 751339R2 and 751339SP in a Shelf

1. Unpack the HDSL card from its box.
2. Confirm that the isolation unit is a 4-wire HDSL card or a 4-wire Universal HDSL card by identifying the name and model numbers on the faceplate of the card.
3. Insert pin according to your application:
   - See section 3.2.1 on page 30 for possible CO side jumper settings.
   - See section 3.2.2 on page 31 for possible Station side jumper settings.
4. The card must be inserted right side up and may be plugged into the shelf with the power ON or OFF.
   - Slide the card into its designated pre-wired shelf slot until the two card edge connectors lock into the Teleline shelf and the retaining clip snaps into place.
5. Verify the installation by establishing communication.

3.2 Settings

3.2.1 CO Side Settings for Model 751339R2 and 751339SP

Table 7: CO Side Jumper Settings (W5) for Locally Powered HTU-R using 751339R2 or 751339SP

	Mode of Operation	PIN Location
½ HDSL	Loop	Insert pin in W5 Loop (E12-E13)
2-wire HDSL2	Loop	Insert pin in W5 Loop (E12-E13)
½ 4-wire HDSL4	Simplex	Insert pin in W5 Simplex (E12-E14)

Table 8: CO Side Jumper Settings (W5) for Span Powered HTU-R using 751339SP

Application	Mode of Operation	PIN Location
HDSL2	Loop	Insert pin in W5 Loop (E12-E13)
HDSL4	Simplex	Insert pin in W5 Simplex (E12-E14)
	Loop	Insert pin in W5 Loop (E12-E13)

NOTE The default CO side jumper settings for 751339R2 and 751339SP provide Simplex sealing current (E12-E14).

3.2.2 Station Side Settings for Model 751339SP

The following sections include Station side settings options for:

- Sealing current mode
- Span power mode

3.2.2.1 Sealing Current Mode

This source provides sealing current of 20 mA when set in current mode.

➤ **To supply sealing current mode (120 Vdc, 20 mA):**

1. Set W4 to current mode (E10 - E15).
2. Set jumper W1 to loop mode (E1-E3).
3. Set jumper W2 to loop mode (E4-E5).

NOTE

- Loop setting on jumper W1 (E1-E3) and W2 (E4-E5) must be set for this functionality.

3.2.2.2 Span Power Mode

Span power can be achieved by using a -48Vdc power supply. The 751339SP converts it to -120 Vdc to feed Station span.

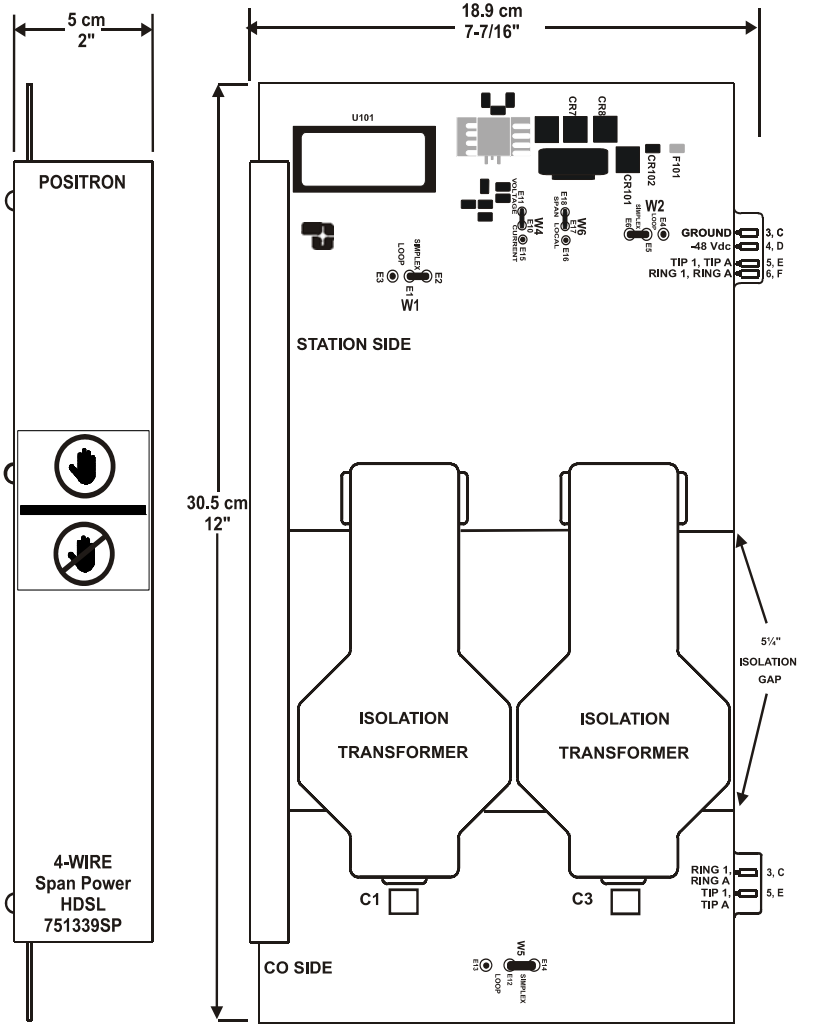
➤ **To supply 120 Vdc to the Station side span in SIMPLEX mode:**

1. Set W4 to VOLTAGE mode (E10-E11).
2. Set W1 to SIMPLEX mode (E2-E1).
3. Set W2 to SIMPLEX mode (E5-E6).

NOTE

- When using a 751339SP card to isolate a 2-wire HDSL2 or 1/2 HDSL, span power has to be applied across the loop. Set W1, W2 and W5 to “LOOP”.
- When using a 751339SP card to isolate a locally powered HTU-R, W6 must be set to “LOCAL” and W1 & W2 must be set to “SIMPLEX”.
- When using a 751339SP card to isolate a span powered HTU-R, W6 must be set to “SPAN”.

Figure 9: Model 751339SP Component Layout (only major components shown)



NOTE The layout shown above illustrates the default jumper setting for model 751339SP.

3.3 Maintenance

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

Appendix A

Acronyms

Acronyms

	Canadian Standards Association
CO	Central Office
DTU	Data Terminal Unit
FCC	Federal Communications Commission
GND	Ground
GPR	Ground Potential Rise
HDSL	High bit-rate Digital Subscriber Line
H4TU-C	HDSL4 Terminal Unit - Central Office
HTU-R	HDSL Terminal Unit - Remote Unit
RMA	Returned Material Authorization
RMT	Remote
RTU	Remote Termination Unit
RX	Receive
TX	Transmit
UL	Underwriter's Laboratories