

# Teleline™

**Plug-in 2-wire HDSL (751340R2)**

**Plug-in 2-wire HDSL with Span Power (751340SP)**

**Description and Installation Guide**

925W751009-10E





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# **Chapter 1**

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## **General Information**

## 1.1 Publication Information

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**Teleline Plug-in 2-wire HDSL (751340R2)**  
**Plug-in 2-wire HDSL with Span Power (751340SP)**  
**Description and Installation Guide**

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### **Disclaimer Notice**

Although Positron Inc. has made every effort to ensure the accuracy of the information contained herein, this document is subject to change without notice.

## 1.2 About this Guide

This guide introduces you to the Teleline Plug-in 2-wire HDSL model 751340R2 and the Teleline Plug-in 2-wire HDSL with Span Power card model 751340SP, 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 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](http://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 Product Safety**

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

## 1.4 Service and Support

**Table 1: Positron Contact Information**

<b>General information:</b>	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: <a href="mailto:info@positronpower.com">info@positronpower.com</a> Website: <a href="http://www.positronpower.com">www.positronpower.com</a>
<b>Customer Service and Repairs:</b>	US and Canada: 1-888-577-5254 International: 1-514-345-2220 E-mail: <a href="mailto:customerservice@positronpower.com">customerservice@positronpower.com</a>

### 1.4.1 Technical Customer Support

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

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

### 1.4.2 Customer Training

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

### **1.4.3 Repair Service**

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

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

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

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

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

## 1.5 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.

### 1.5.1 Limitation of Liability

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

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

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

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

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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**

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## **Overview**

## 2.1 Introduction

Each Teleline Plug-in 2-wire HDSL model 751340R2 and Plug-in 2-wire HDSL with Span Power card model 751340SP provides high voltage isolation between a 2-wire Remote Termination Unit (RTU) located inside the substation, and an HDSL Data Terminal Unit (DTU) located at the Central Office (CO). These units are designed for use with any of the Teleline Isolator multi-card shelves.

### 2.1.1 Features

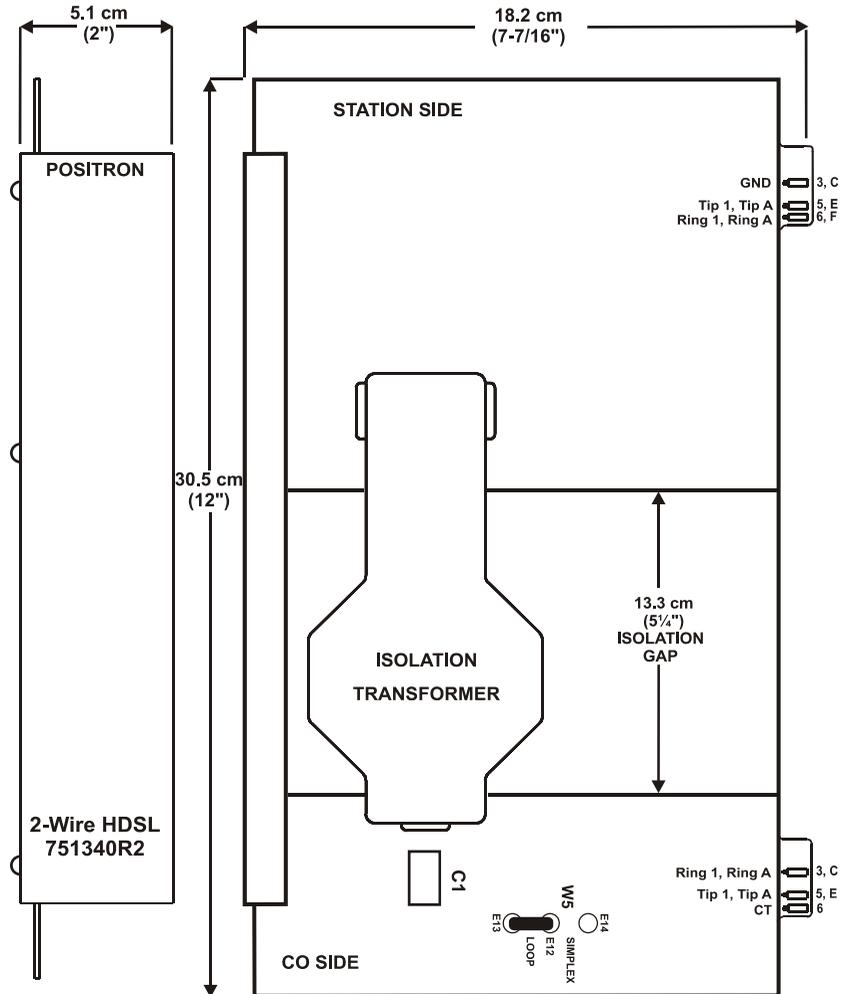
Features for models 751340R2 and 751340SP include the following:

- Isolation of  $50 \text{ kV}_{\text{rms}}$  (70 kV peak) while maintaining full communication between terminals.
- Communication maintained across the gap by isolation transformers that provide low-loss low-distortion transmission.
- Cards are passive and do not require power to operate except when using the span power option.
- Card model 751340R2 requires that a locally powered HTU-R be used on the Station side.
- The Teleline shelf power can be maintained during the installation of the cards.
- Loop sealing current is provided on the CO side. The current will not be transferred to the CO side.
- No jumper settings are required for 751340R2. Jumper setting on the 751340SP provide an option to allow loop sealing current or span power voltage on the Station side.

#### NOTE

A jumper setting on card model 751340SP can provide power to the Station side span for a span powered HTU-R. A local -48 Vdc power source is required for this span power feature. For supported span distances, see Table 2 on page 17 and Table 3 on page 18.

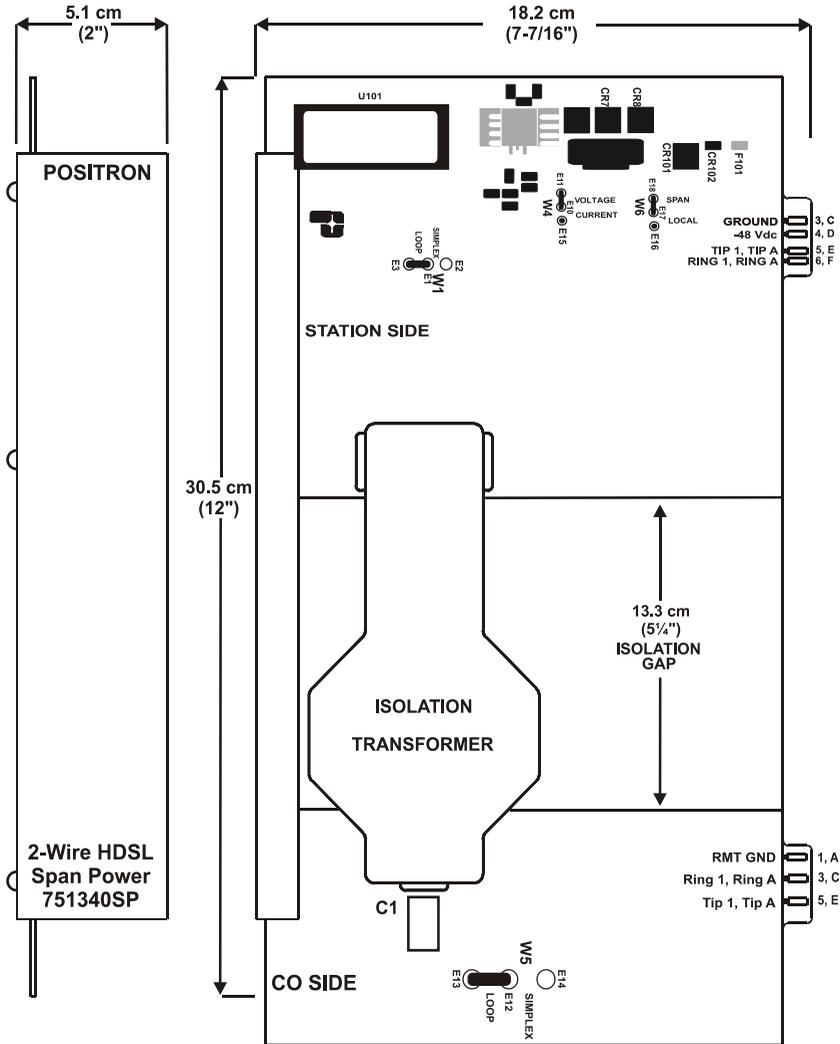
**Figure 1: Model 751340R2 Component Layout  
(only major components shown)**



**NOTE**

The layout shown above illustrates the default jumper setting for model 751340R2.

Figure 2: Model 751340SP Component Layout  
(only major components shown)



**NOTE**

The layout shown above illustrates the default jumper setting for model 751340SP.

## 2.2 Applications

### 2.2.1 Applications for 751340R2

The Plug-in 2-wire HDSL card can be deployed in installations that use:

- 1/2 HDSL Classic (1 card), HDSL Classic (2B1Q) (2 cards), HDSL2 and 2-card HDSL4 with support of -129 Vdc and -190 Vdc on the CO loop. For supported span distances, 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 751340R2**

Application	Local Power Mode
1/2 HDSL Classic (1 card)	305 m (1,000 ft)
HDSL Classic (2B1Q) (2 cards)	305 m (1,000 ft)
HDSL2	305 m (1,000 ft)
HDSL4 (2 cards)	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 use the compatible CO side backplane. See section 3.1 on page 24.

## 2.2.2 Applications for 751340SP

The Plug-in 2-wire HDSL with Span Power card can be deployed in installations that use:

- 1/2 HDSL Classic (1 card), HDSL Classic (2B1Q) (2 cards), HDSL2 and 2-card HDSL4 with support of -129 Vdc and -190 Vdc on the CO loop. For supported span distances, see Table 4 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 751340SP 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.

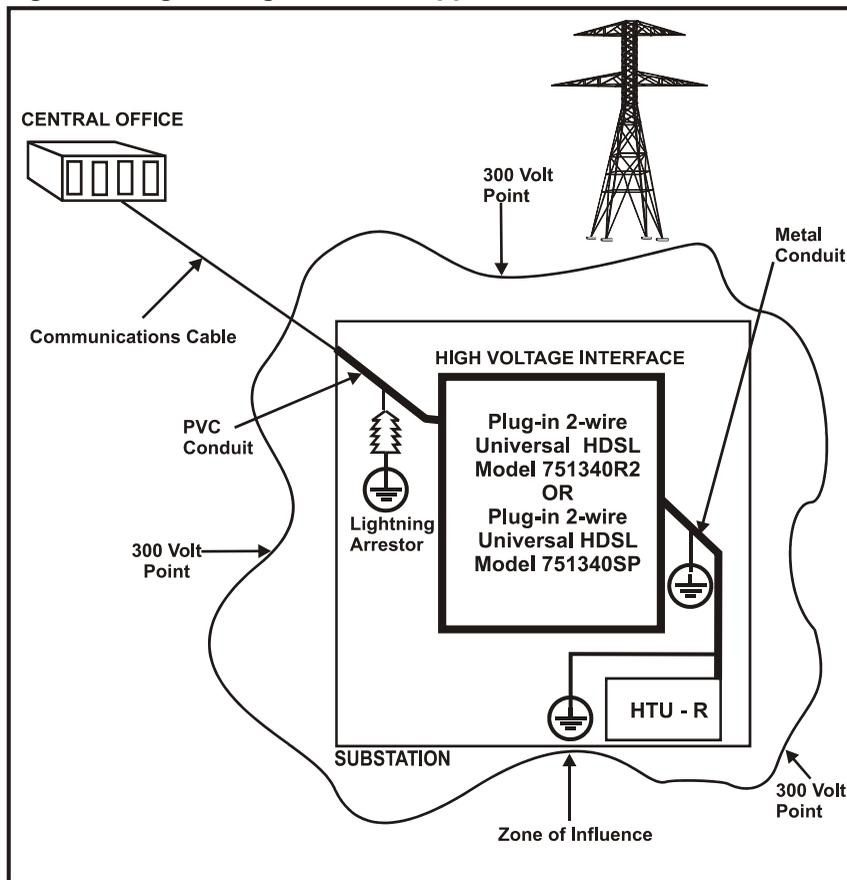
**Table 3: Span Distance Reductions for Model 751340SP**

Application	Local Power Mode
1/2 HDSL Classic (1 card)	610 m (2,000 ft)
HDSL Classic (2B1Q) (2 cards)	610 m (2,000 ft)
HDSL2	610 m (2,000 ft)
HDSL4 (two cards)	610 m (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 the compatible CO side backplane. See section 3.1 on page 24.
- When in local power mode, W6 must be set to “LOCAL”.

Figure 3: High Voltage Interface Application

**NOTE**

- When model 751340R2 is used, the HTU-R must be locally powered.
- When Model 751340SP is used to provide Station side span-power, the HTU-R does not require local powering

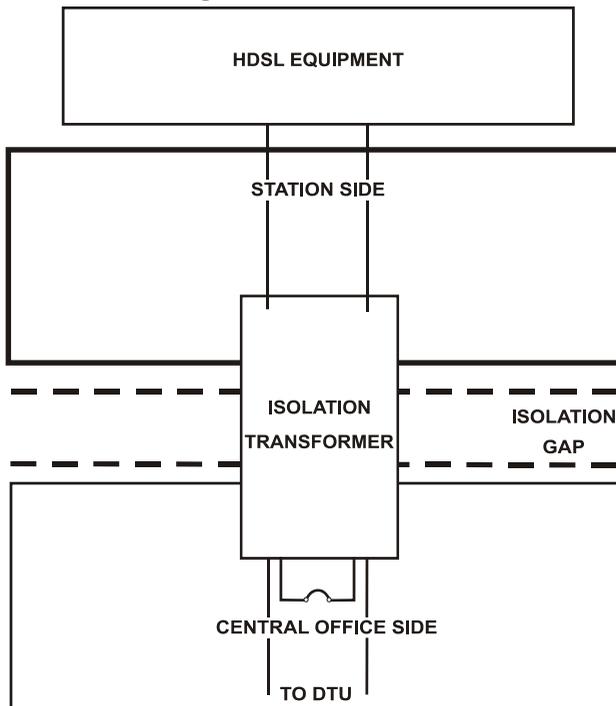
## 2.3 Hardware Description

Each card (751340R2 and 751340SP) 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 13.2 cm (5¼ inch) isolation gap.

**Figure 4: Block Diagram**



**NOTE**

- The 13.2 cm (5 ¼ inch) isolation transformer between the CO and the Station side provides wide bandwidth, and low-loss transmission.

## 2.4 Technical Specifications

- For electrical specifications for model 751340R2, see Table 5 on page 21.
- For electrical specifications for model 751340SP, see Table 6 on page 22.
- For physical specifications, see Table 4 on page 21.

**Table 4: Physical Specifications for 751340R2 and 751340SP**

Parameter	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 751340R2  
(measured at 25°C or 77°F, 50% R.H.)**

	Parameter	Specification
Isolation Data:	Isolation Resistance	100,000 MΩ
	Metallic Surge	3 kV maximum
	Insulation Voltage	50 kV <sub>rms</sub> (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 135Ω)	> 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)	2 W
	Power Consumption (HDSL2)	0 W
	Power Consumption (HDSL4)	0 W

**Table 6: Electrical Specifications for 751340SP  
(measured at 25°C or 77°F, 50% R.H.)**

	Parameter	Specification
Isolation Data:	Isolation Resistance	100,000 MΩ
	Metallic Surge	3 kV maximum
	Insulation Voltage	50 kV <sub>rms</sub> (70 kV peak)
Input Voltage Requirement:		-48 Vdc (-42 Vdc to -54 Vdc)
Output Voltage:	HTU-R Span Power	- 120 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)	<ul style="list-style-type: none"> <li>■ 2 W (add 2 W when in current mode and connected to an SP card)</li> <li>■ 2 W (add 1 W when in voltage mode and connected to an HTU-R)</li> </ul>
	Power Dissipation (HDSL4)	<ul style="list-style-type: none"> <li>■ 4 W (add 2 W when in current mode)</li> <li>■ 4 W (add 1 W when in voltage mode)</li> </ul>
	Power Consumption (HDSL2) based on a typical HTU-R consumption	<ul style="list-style-type: none"> <li>■ 4 W at 190 Vdc in current mode</li> <li>■ MAX 10 W when in voltage mode</li> </ul>
	Power Consumption (HDSL4) based on a typical HTU-R consumption	<ul style="list-style-type: none"> <li>■ 4 W at 190 Vdc in current mode</li> <li>■ 10 W when in voltage mode (on one of the two cards)</li> </ul>

# **Chapter 3**

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## **Installation**

## 3.1 Installation

### 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.

The cards can be used in any of the Teleline 3-, 5- or 8-card shelves. However, they must be installed in the slot which has been pre-wired. (Consult 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.

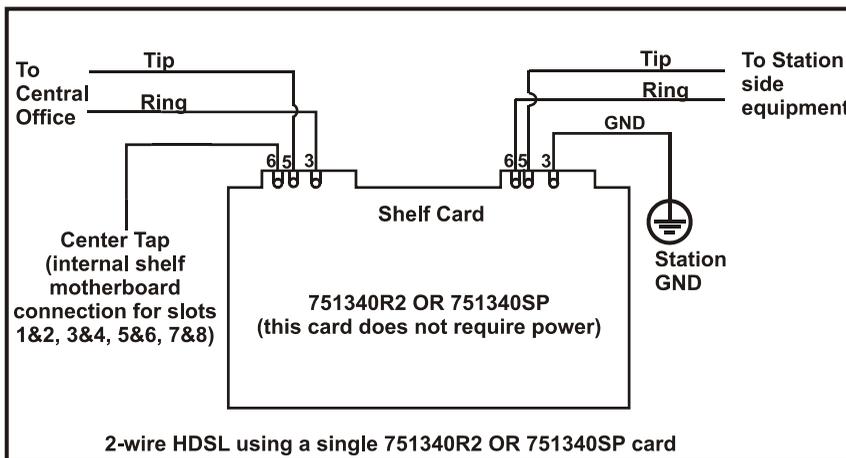
For the use of HDSL circuits, the shelf being used must be equipped with a CO side motherboard with twisted pairs, which can accommodate two pairs per position.

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:

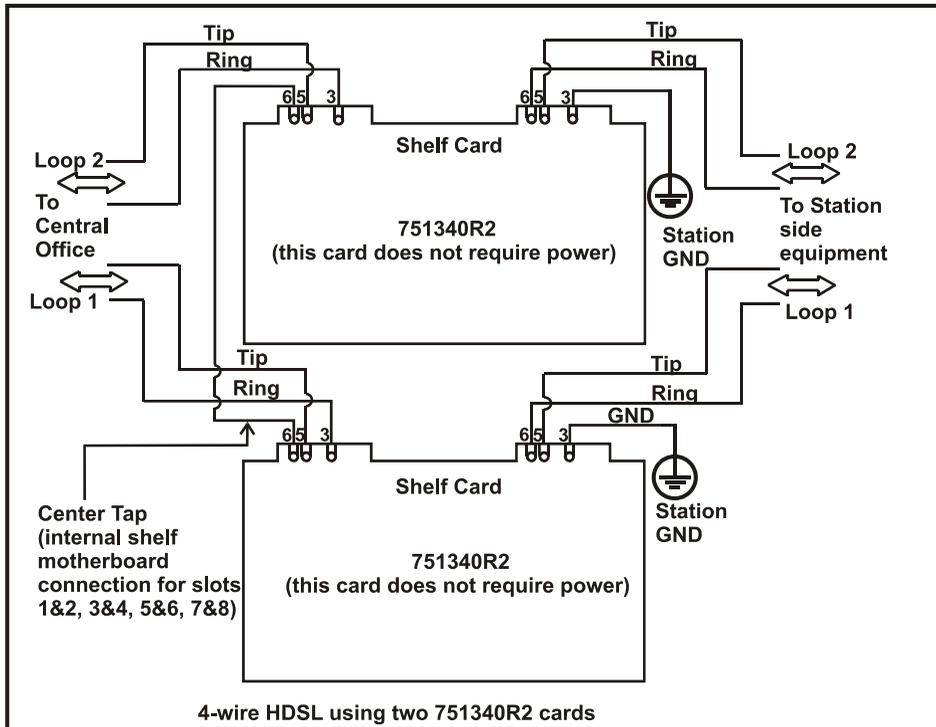
- For the 3-card shelf, use motherboard model 220-000444-401
- For the 5-card shelf, use motherboard model 220-000366-401
- For the 8-card shelf, use motherboard model 220-000365-401

	<b>ESD Precaution</b> <b>INCORRECT HANDLING MAY VOID WARRANTY</b>
	<p>These procedures must be followed when handling an electrostatic sensitive device.</p> <ul style="list-style-type: none"><li>• A grounded wrist strap must be worn at all times during installation.</li><li>• 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.</li><li>• When moving, carry the device in an ESD safe container or the antistatic bag, provided with the device.</li></ul>

**Figure 5: Layout for 1/2 HDSL Classic (2B1Q) or 2-wire HDSL2, Using one 751340R2 or one 751340SP card with a LOCALLY powered HTU-R**



**Figure 6: Layout for a 4-wire HDSL Classic (2B1Q) or 4-wire HDSL4, Using Two Cards using a LOCALLY powered HTU-R**



For an illustration of a setup with a system locally powered for model 751340R2 (which includes the option for -190 Vdc Loop 1 or Loop 2, or -129 Vdc between Tip and Ring), see Figure 7 on page 27.

For an illustration of a setup with system locally powered for model 751340SP, see Figure 8 on page 28.

**NOTE**

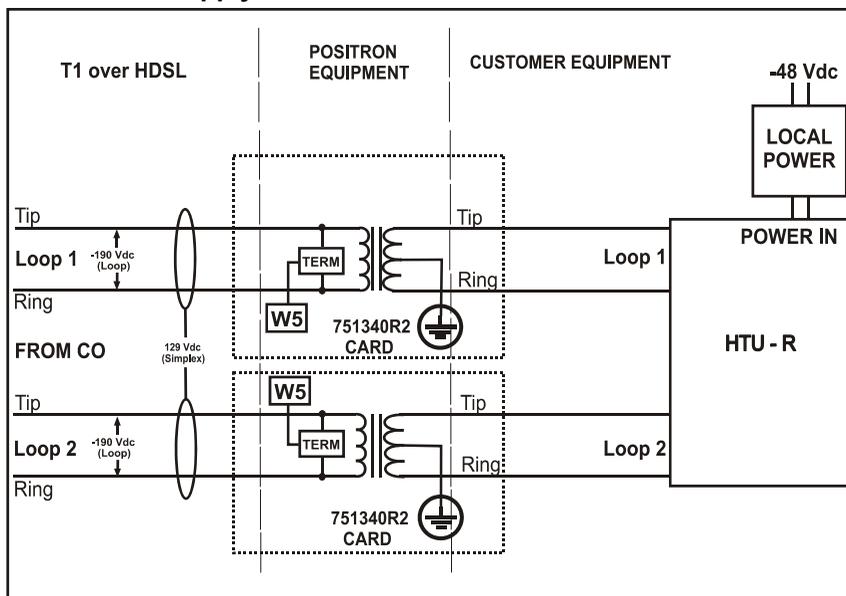
- The W5 jumpers on both cards must be set to “SIMPLEX” if 129 Vdc is used and the cards must be installed in slots 1 & 2, 3 & 4, 5 & 6 or 7 & 8 of the shelf.
- W6 must be set to “LOCAL” on both cards.

For an example of a setup for an extended Span using model 75140SP for the Station side span powering option, see Figure 10 on page 30.

**NOTE**

- Station end HDSL carrier terminal equipment CANNOT be powered from the CO line side cable pairs using the 751340R2 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.

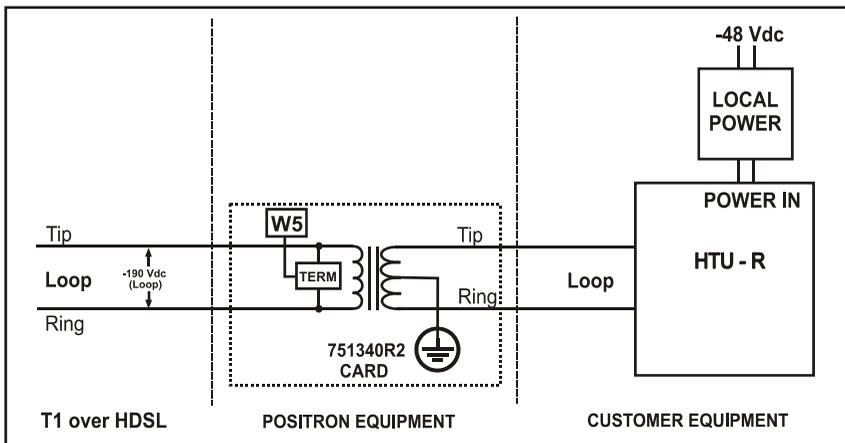
**Figure 7: Setup for Model 751340R2: Powering an HTU-R with a Local Power Supply for HDSL or HDSL 4**



**NOTE**

- Both W5 jumpers must be set for Simplex if 129 Vdc is used.

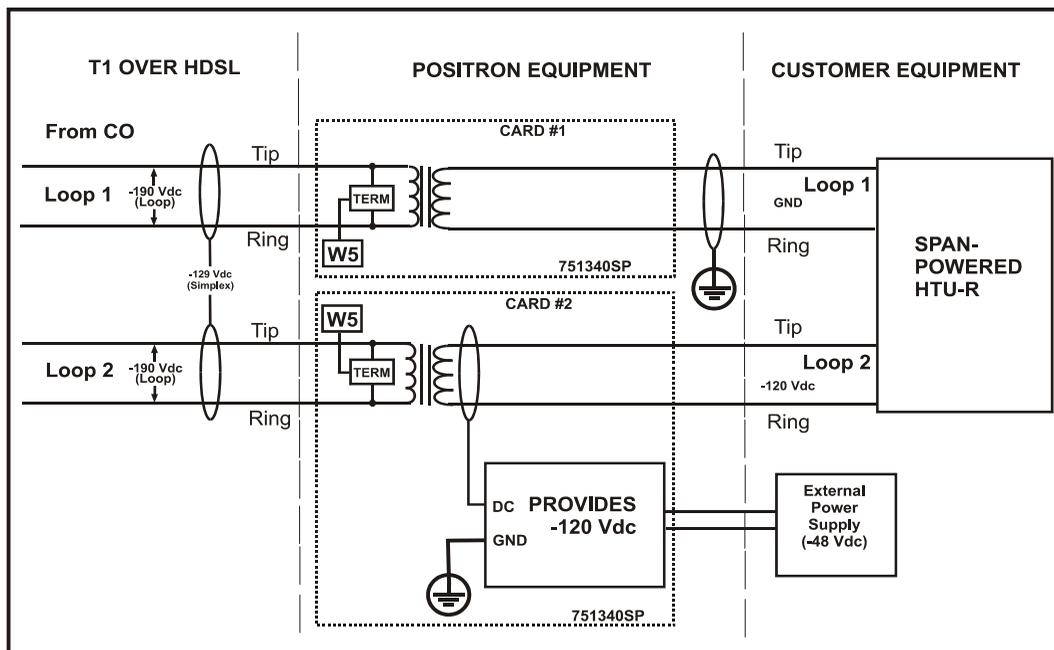
Figure 8: Setup for Model 751340R2: Powering an HTU-R with a Local Power Supply for HDSL 2 Using One Card



**NOTE**

- Jumper W5 must be set for Loop

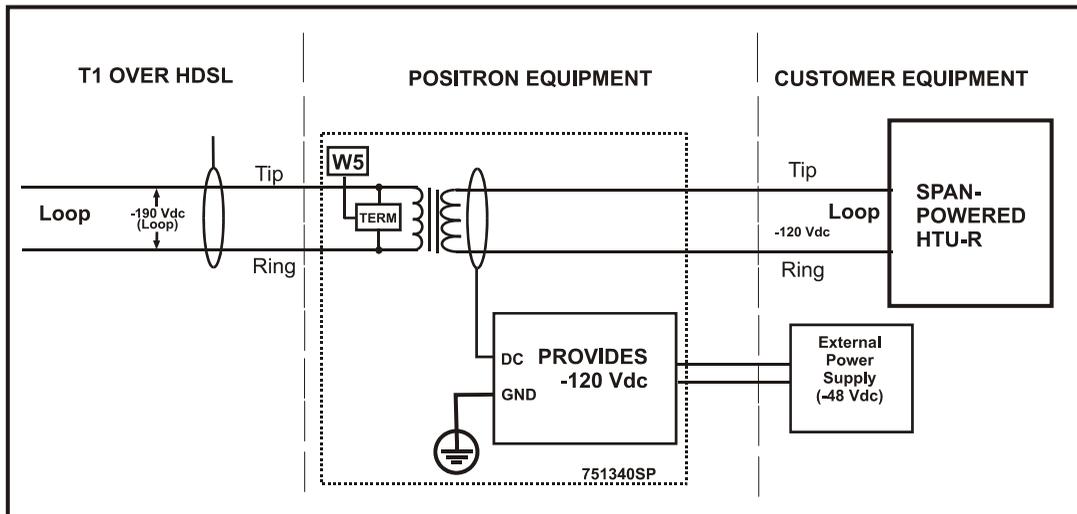
**Figure 9: Setup for Model 751340SP Station Side Span Power: Powering with External Power Supply for HDSL or HDSL 4 Using Two Cards**



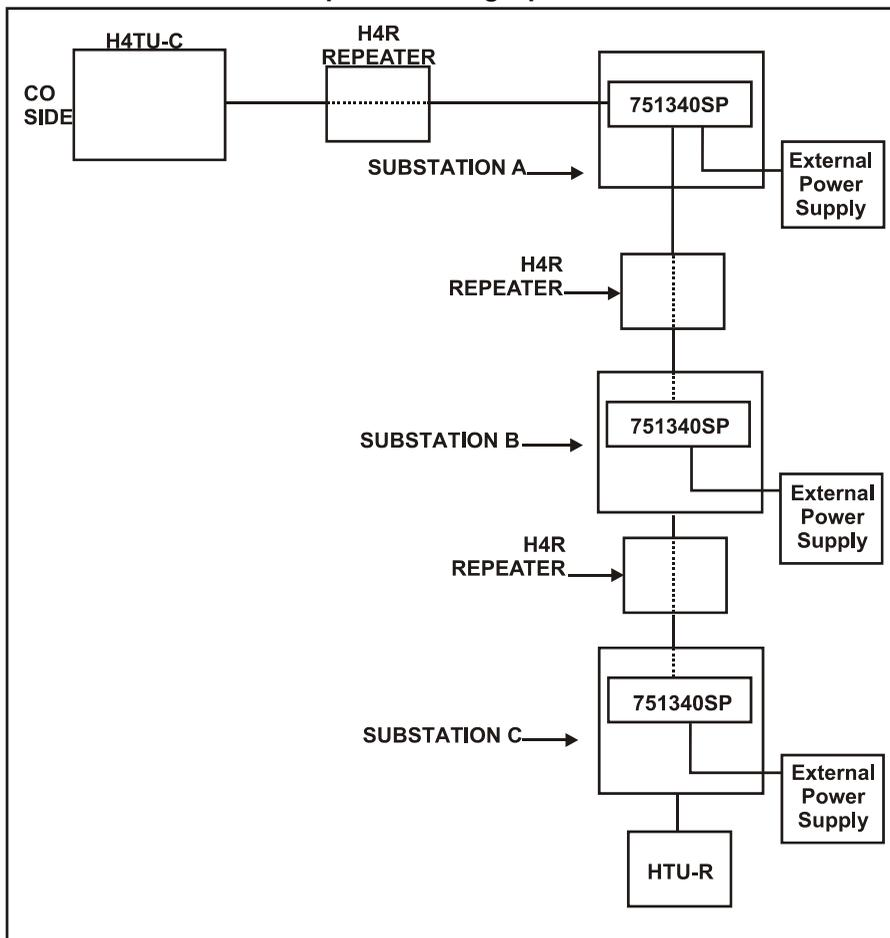
**NOTE**

- Jumpers W5 on both cards must be set to “SIMPLEX” if 129 Vdc is used.
- The cards must be installed in slots 1&2, 3&4, 5&6 or 7&8 of the shelf if 129 Vdc simplex current is used.
- Card #1 can be a 751340R2 or a 751340SP with W6 set to “LOCAL”.
- Card #2 must be a 751340SP with W6 set to “SPAN”.

Figure 10: Setup for Model 751340SP Station Side Span Power: Powering With External Power Supply for HDSL 2 Using One Card



**Figure 11: Example: Setup for an Extended Span Using Model 751340SP for the Station Side Span Powering Option**



**NOTE**

- For supported span distances see Table 3 on page 18

### ► To Install the Plug-in 2-wire with Span Power HDSL Cards Models 751340R2 and 751340SP in a Shelf

1. Unpack the HDSL card from its box.
2. Confirm that the isolation unit is a 2-wire with Span Power HDSL card by identifying the name and model numbers on the front panel of the card.
3. Set jumpers according to your application:
  - See section 3.2.1 on page 33 for possible CO side jumper settings.
  - See Figure 12 on page 33 for possible Station side jumper settings (applicable to model 751340SP only).
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 751340R2 and 751340SP

**Table 7: CO Side Jumper Settings (W5) for 751340R2 and 751340SP**

Applications	Mode of Operation	PIN Location
½ HDSL	Loop (E12-E13)	Set W5 for Loop
2-wire HDSL2	Loop (E12-E13)	Set W5 for Loop
½ 4-wire HDSL4	Simplex (E12-E13)	Set W5 for Simplex

**Table 8: CO Side Jumper Settings (W5) for 751340R2, Using 2 Cards**

Application	Mode of Operation	PIN Location
HDSL Classic (2B1Q)	*Simplex (E12-E14)	Set W5 for Simplex
4-wire HDSL4	*Simplex (E12-E14)	Set W5 for Simplex

\*Simplex setting is never used. It is for internal testing only.

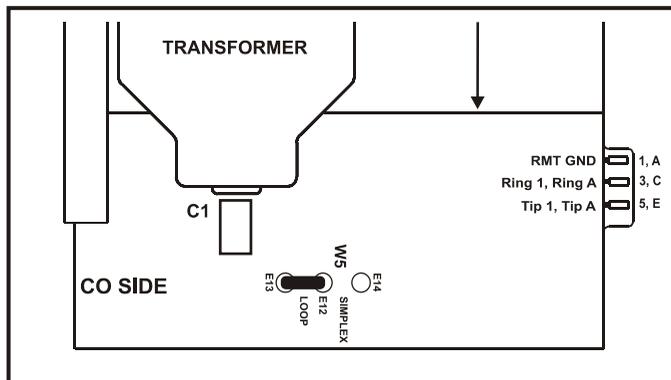
**Table 9: CO Side Jumper Settings (W5) for 751340SP, Using 1 Card**

Application	Mode of Operation	PIN Location
2-wire HDSL2	Loop (E12-E13)	Set W5 for Loop

#### **NOTE**

The default CO side jumper settings for 751340R2 and 751340SP provide Loop sealing current (E12-E13).

**Figure 12: CO side jumper settings**



### 3.2.2 Station Side Settings for Model 751340SP

The following sections include Station side settings options for:

- Sealing Current mode
- Span Power mode

#### 3.2.2.1 Sealing Current Mode

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

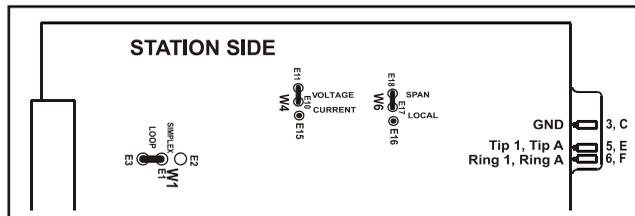
► **To supply sealing current mode (-120 Vdc 20 mA):**

1. Set jumper W4 to Current 20 mA (E10-E15); see Figure 13 below.
2. Set jumper W1 to loop mode (E1-E3).

**NOTE** Loop setting on jumper W1 (E1-E3) must be set for this functionality.

The -48 Vdc can be supplied by an internal or external power supply. The power supply must be CSA certified, be rated at 2A and, if external, be fed through disconnect devices as described in the Teleline shelf manuals.

**Figure 13: Station side jumper settings**



### 3.2.2.2 Span Power Mode

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

**CAUTION**

Span power can be achieved by using a local -48 Vdc power supply, the 751340SP converts it to -120 Vdc to feed the Station span power.

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

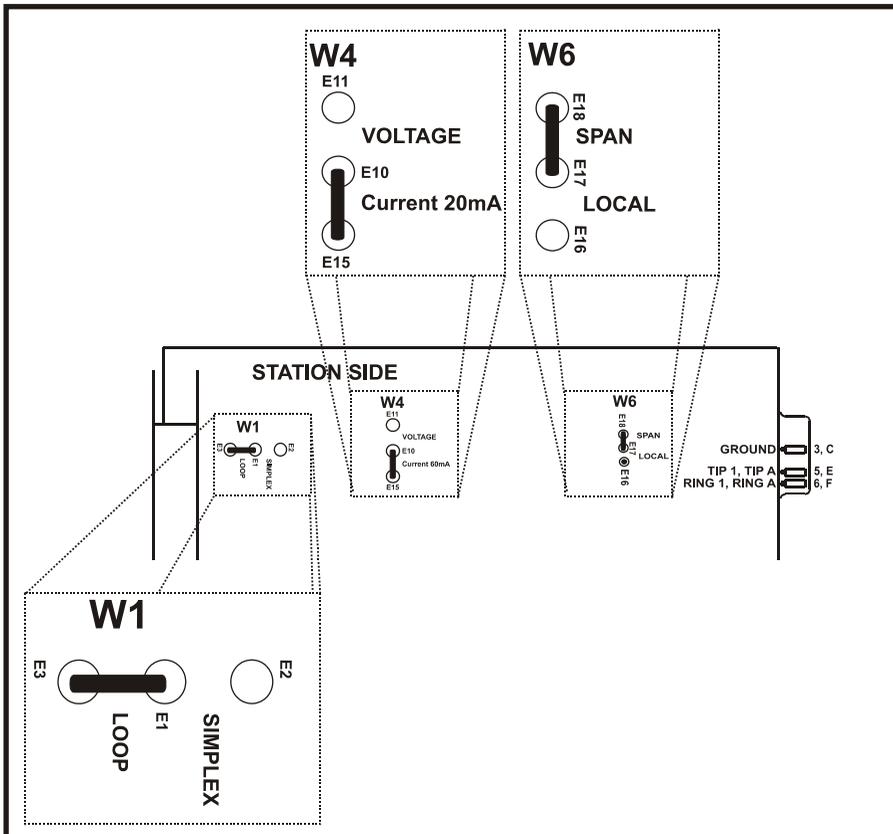
► **To supply -120 Vdc to the Station side span in LOOP mode:**

1. Set W4 to VOLTAGE mode (E10-E11)
2. Set W1 to LOOP mode (E1-E3)

**NOTE**

- When using a 751340SP card to isolate a locally powered HTU-R, W6 must be set to "LOCAL".
- When using a 751340SP card to isolate a span powered HTU-R, W6 must be set to "SPAN".

Figure 14: Station Side Jumper Settings for 751340SP



**NOTE**

The default Station side jumper settings for 751340SP provide:

- Loop current when W1 is set to (E1-E3).
- Current source when W4 is set to (E10-E15).
- Span power when W6 is set to (E17-E18).

### 3.3 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**

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## **Acronyms**

## Acronyms

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