Teleline™

Plug-in 4-wire Enhanced T1 (751329R2 and 751329SP) Description and Installation Guide

925W751000-14E

POSITRON
Positron Inc.

Contents

Chapter 1

General Information

1.1 Publication Information

Plug-in 4-wire Enhanced T1 (751329R2 and 751329SP)
Description and Installation Guide
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1.2 About this Guide

This guide introduces you to the Teleline Plug-in 4-wire T1/Plug-in 4-wire Enhanced T1 cards, models 751329R2 and 751329SP, their features and applications, and describes how to install them in a Teleline shelf.

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 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.

1.4 Service and Support

1.4.1 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

1.4.2 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 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.

1.4.3 Customer Training

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

1.4.4 Product Safety

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

1.4.5 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

1.5 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

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.

1.5.2 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 plug-in card (751329R2 and 751329SP) provides high voltage isolation between an incoming 4-wire T1 carrier line and a data transmitting/receiving device located in the substation. These units are designed for use with any of the new generation Teleline Isolator multi-card shelves.

Model **751329R2** is an enhanced T1 card. The key enhancement consists of more effective use of Surface Mount Technology (SMT) for increased reliability and greater Mean Time Between Failures (MTBF).

Model **751329SP** is an enhanced T1 card with span power. Its key enhancement consists of more effective use of SMT for increased reliability and greater MTBF, and offers a span powering option using -48 Vdc to provide 60 mA simplex current on the station side.

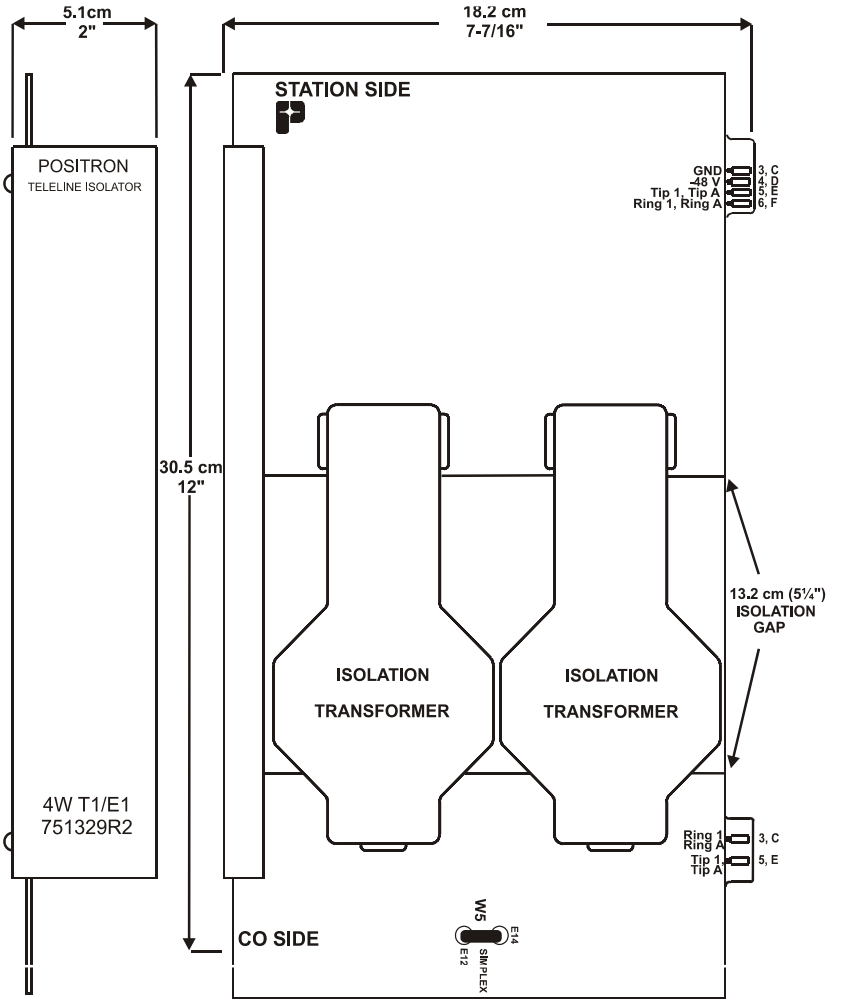
NOTE Model **751329** has been manufacture discontinued and is replaced by the new enhanced T1 cards.

2.1.1 Features

Features for models 751329R2 and 751329SP include the following:

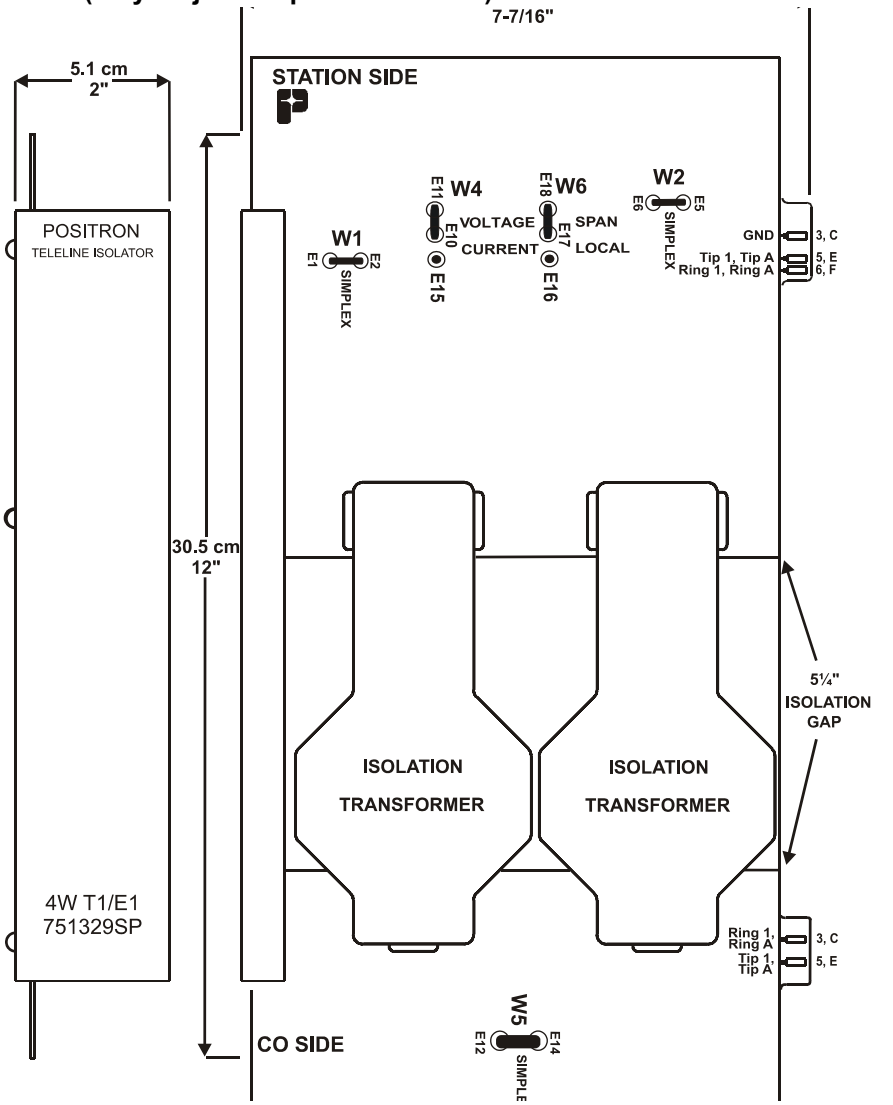
- Cards are suitable for transmission at frequencies up to 5 MHz provided the data line is conditioned for operation
- Isolation of 50 kV_{rms} (70 kV peak) while maintaining full communication between terminals
- Communication maintained across the gap by isolation transformers that provide low-loss low-distortion transmission
- Cards are passive and do not require power to operate, except when using the span power option
- The Teleline shelf power can be maintained during the installation of the cards
- Simplex current termination is provided on the CO side. The current will not be transferred to the Station side with Span Power

Figure 1: Model 751329R2 Component Layout (only major components shown)



NOTE The layout shown above illustrates the only jumper settings for model 751329R2.

Figure 2: Model 751329SP Component Layout (only major components shown)



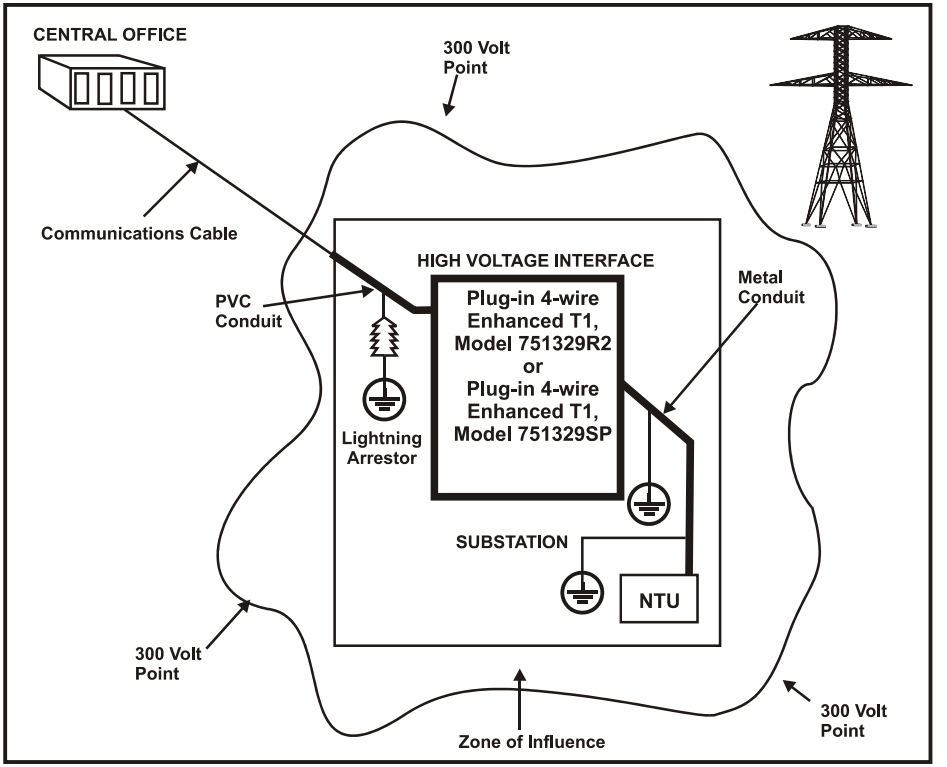
NOTE The layout shown above illustrates the only jumper settings for model 751329SP.

2.2 Applications

The applications of the Plug-in 4-wire T1 Carrier card include the following:

- T1 Carrier (1.544 Mb/s)
- E1 Carrier (2.048 Mb/s)

Figure 3: High Voltage Interface



NOTE

- When model 751329R2 is used, the NTU must be locally powered.
- When model 751329SP is used, an internal or external -48 Vdc power supply is required to provide Station side simplex current, the NTU will not require local powering. (Refer to the appropriate Positron Power shelf manual for power supply information.)

2.3 Hardware Description

Each card (751329R2 and 751329SP) 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.

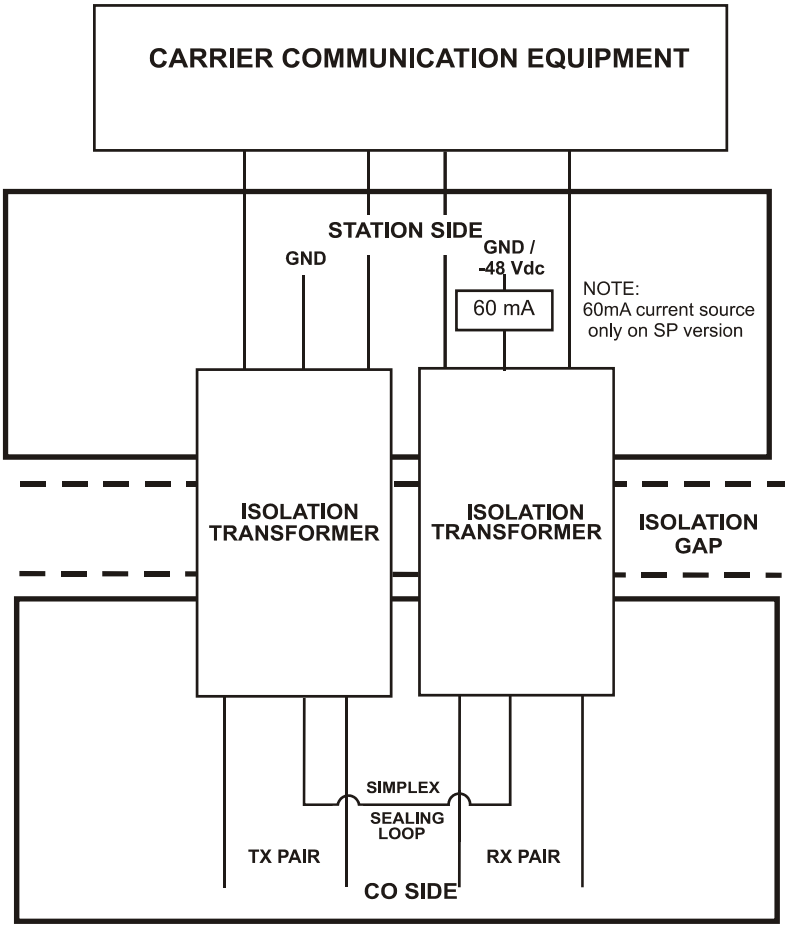
The isolation transformers separate the Station side from the CO side, creating a 13.2 cm (5¼ inch) isolation gap.

For the 751329R2 station side, both transformer center taps are grounded,

For the 751329SP station side, the NIU's RX pair (Tip1 & Ring1 of 751329SP) center tap is grounded, the NIU's TX pair (TipA & RingA of 751329SP) center tap is connected to -48 Vdc via a 60 mA current source.

On the CO side, the TX and RX pair center taps are connected with an effective 200 Ohm impedance to allow simplex loop current to flow across the pairs.

Figure 4: Block Diagram for 751329R2 and 751329SP



NOTE

- Only the 751329SP card has a -48 Vdc connection on the station side. The 751329R2 card is passive on the station side

2.4 Technical Specifications

- For electrical specifications for model 751329R2, see Table 2 below.
- For electrical specifications for model 751329SP, see Table 2 on page 21.
- For physical specifications for both models, see Table 3 on page 21.

Table 1: Electrical Specifications for 751329R2 (measured at 25°C (77°F), 55% R.H.)

	Parameter	Specification
Isolation Data:	Isolation Resistance	100,000 MΩ
	Metallic Surge	1.5 kV maximum
	Insulation Voltage	50 kV_{rms}
Input Voltage Requirement:		None
Transmission Data:	Longitudinal Balance (CO side)	> 80 dB at 60 Hz
	Return Loss	> 25 dB at 350 kHz
	Insertion Loss	< 1.0 dB at 350 kHz
Signal:	Frequency Response in 120 Ohms	-3 dB, 2.5 kHz to 5 MHz
	Total Harmonic Distortion at 22 dBm, 10 kHz	< -40 dB
Power:	Power Consumption	None
	Power Dissipation	0.75 W

Table 2: Electrical Specifications for 751329SP (measured at 25°C (77°F), 50% R.H.)

	Parameter	Specification
Isolation Data:	Isolation Resistance	100,000 MΩ
	Metallic Surge	1.5 kV maximum
	Insulation Voltage	50 kV_{rms}
Input Voltage Requirement (when span powered):		-48 Vdc
Transmission Data:	Longitudinal Balance (CO side)	> 80 dB at 60 Hz
	Return Loss	> 25 dB at 350 kHz
	Insertion Loss	< 2.0 dB at 350 kHz
Signal:	Frequency Response in 120 Ohms	-3dB, 2.5 kHz to 5 MHz
	Total Harmonic Distortion at 22 dBm, 10 kHz	< -40 dB
Power:	With Typical span powered NTU	
	Power Consumption	3W
	Power Dissipation	2.5W

Table 3: Physical Specifications for 751329R2 and 751329SP

Parameter	Specifications
Operating Temperature Range	-20°C to 65°C (-4°F to 149°F)
Height	30.5 cm(12”)
Width	5. cm (2”)
Depth	18.9 cm (7-7/16”)
Weight	1.6 kg (3.5 lbs)

Chapter 3

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 plug into any slot of the new generation Teleline 3-, 5- or 8-card shelf. However, they 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.

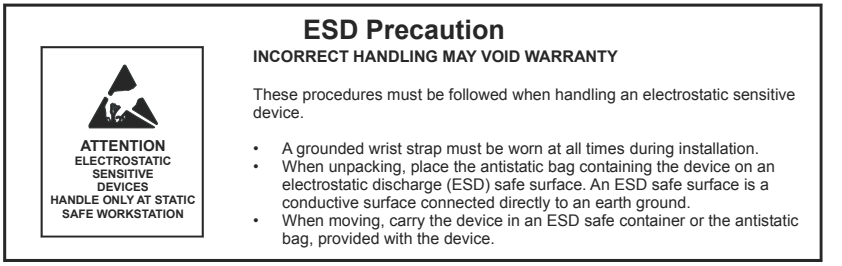
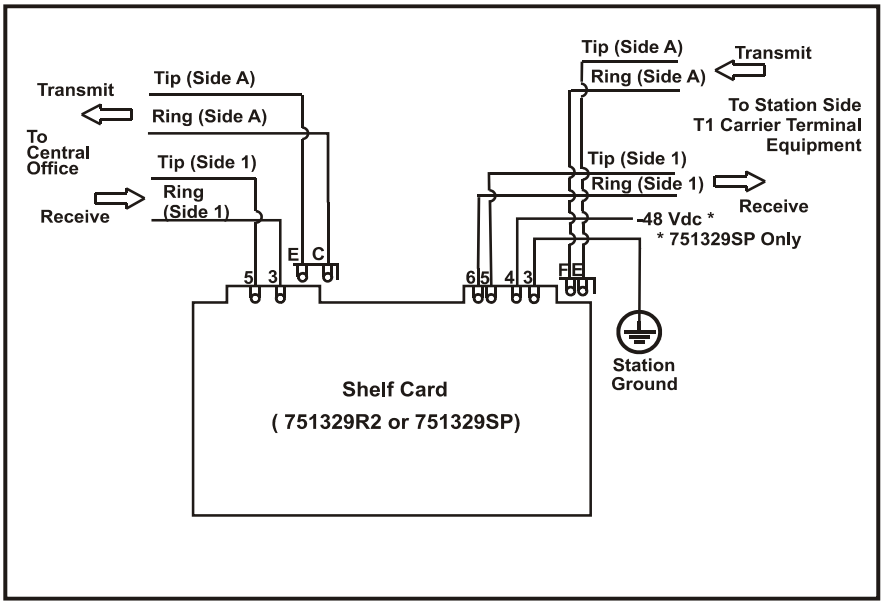


Figure 5: 4-wire Enhanced T1 Circuit Using a Single 751329R2 or 751329SP Card



NOTE

- Model 751329R2 does not require power.
- When Model 751329SP is used to isolate a locally powered NTU, -48 Vdc is not required and jumper W6 must be set to “LOCAL”.
- ** When Model 751329SP is used to isolate a span powered NTU, -48 Vdc is required and jumper W6 must be set to “SPAN”.

➤ **To Install the card in a Shelf**

1. Unpack the T1 card from its box
2. Confirm that the isolation unit is a 4-wire Enhanced T1 card by identifying the name and model numbers on the front panel of the card
3. Verify jumper settings are as per section 3.2 on page 27.

NOTE

- This is the only setting valid for T1 applications.

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

➤ **Verify the card installation:**

- On the CO Side, loopback the TX pair into the RX pair at the demarcation block
- On the Station side, using the Bit Error Rate Test unit, verify data transmission between the TX pair and RX pair at the punch block

NOTE

Pairs polarity for span powered NIU:
On the Station Side.

- The numerical pair of the 751329SP (Tip1 & Ring1) has to be connected to the RX pair (T1 & R1) of the NIU.
- The alphabetical pair of the 751329SP (TipA & RingA) has to be connected to the TX pair (T & R) of the NIU.

3.2 Settings

3.2.1 Station Side Jumper Settings

The Station side default jumper positions for the 751329SP are as follows (see Figure 6: on page 28.):

- W1 pins (E1-E2) Simplex
- W2 pins (E5-E6) Simplex
- W4 pins (E10-E15) Current
- W6 pins (E17-E18) Span

NOTE

- When using a 751329SP card to isolate a locally powered NTU, W6 must be set to “LOCAL”.

3.2.2 CO Side Jumper Settings

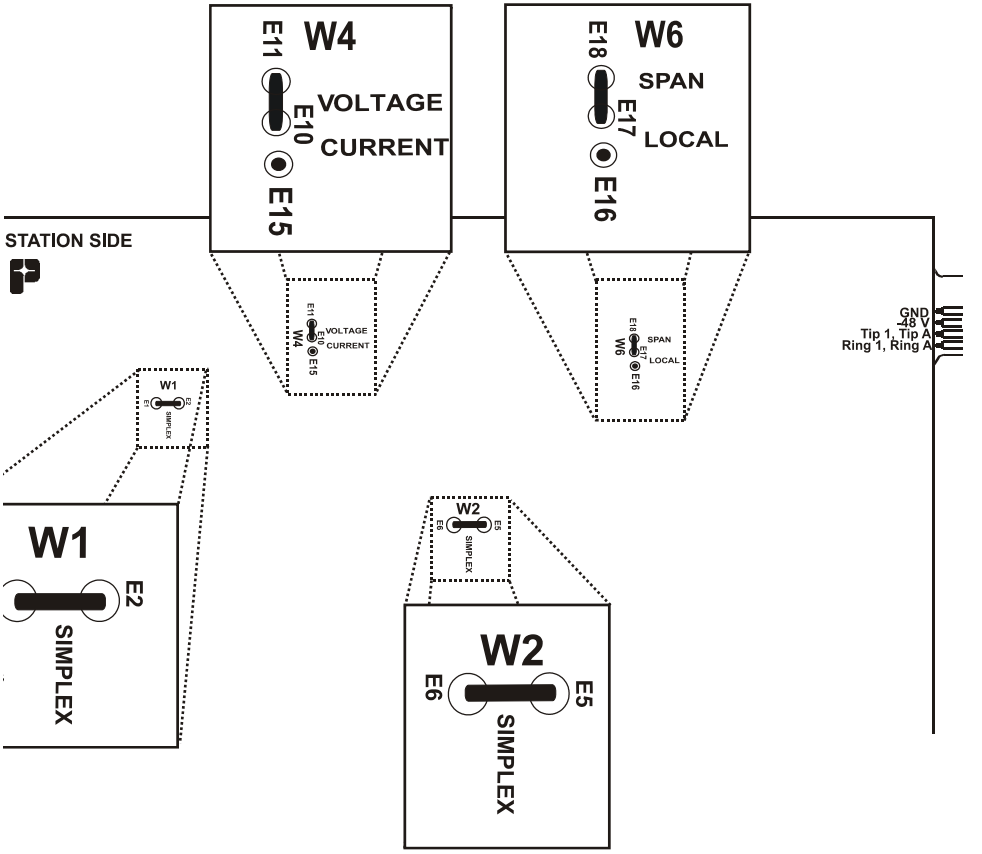
The CO side default jumper position for the 751329R2 and 751329SP is as follows:

- W5 pins (E12-E14) Simplex

NOTE

- When using this card as a two-wire T1, only T1 & R1 pairs are used.

Figure 6: Station Side Default Jumper Positions for Model 751329SP



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

Acronyms

Acronyms

CO Central Office

CSA Canadian Standards Association

CT Center Tap

FCC Federal Communications Commission

GND Ground

GPR Ground Potential Rise

MTBF Mean Time Between Failure

NIU Network Interface Unit

NTU Network Terminating Unit

RMA Return Material Authorization

RMT Remote

RX Receive

SMT Surface Mount Technology

TX Transmit