Teleline™

Standalone 4-wire Data Unit, 7501-53
Description and Installation Guide

925W751028-10E

POSITRON
Positron Inc.

Contents

Appendix A – Acronyms

Chapter 1

General Information

1.1 Publication Information

Teleline Standalone 4-wire Data Unit, 7501-53
Description and Installation Guide
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1.2 About this Guide

This guide introduces you to the Teleline Standalone 4-wire Data Unit, 7501-53. 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 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 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 to the Standalone 4-wire Data Unit, 7501-53

The Standalone 4-wire Data Unit, model 7501-53, provides high voltage isolation between an exterior dedicated 4-wire data line, and data transmitting / receiving equipment located inside the substation.

The installation kit consists of an isolator card mounted inside a compact enclosure, a cable, and mounting hardware. The enclosure is molded from fiberglass, making it a lightweight, flame retardant container of high dielectric strength. Its fiberglass body limits the possibility of many kinds of infiltration while providing reliable isolation from external ground potentials.

The shelf is shipped with a 12-conductor cable for connection to the Central Office (CO) incoming cable and mounting hardware.

Its features include the following:

- The unit provides isolation of up to 50 kV_{rms} (70 kV peak) while maintaining full communication at all DDS circuit bit rates from 2.4kb/s to 72kb/s for a 4-wire dedicated data circuit.
- The unit is suitable for transmission at frequencies of up to 200 kHz provided the data line is conditioned for operation at this speed.
- The unit does not require power input from either the CO or an external supply to operate.
- The unit permits the flow of CO simplex sealing current from one pair to another. Simplex sealing current is not transmitted across the isolation gap to the Station side.
- The enclosure resists the infiltration of dust, mist, and water from sprinklers.

For a view of the Standalone 4-wire Data Unit enclosure, refer to Figure 1 on page 15.

For a view of the Standalone 4-wire Data Unit, cover open, refer to Figure 2 on page 16.

Figure 1: Model 7501-53 Enclosure

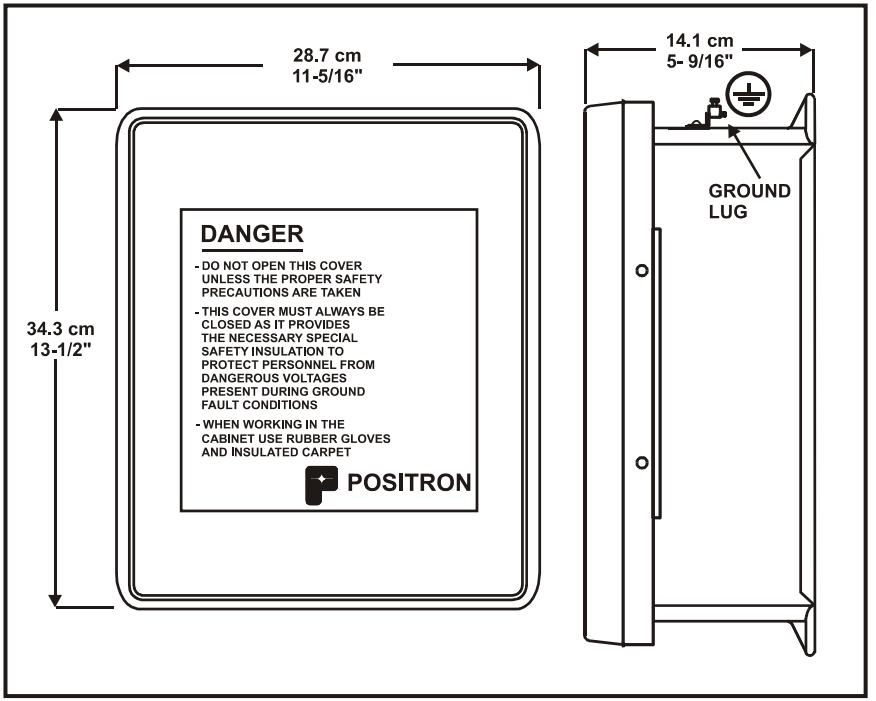
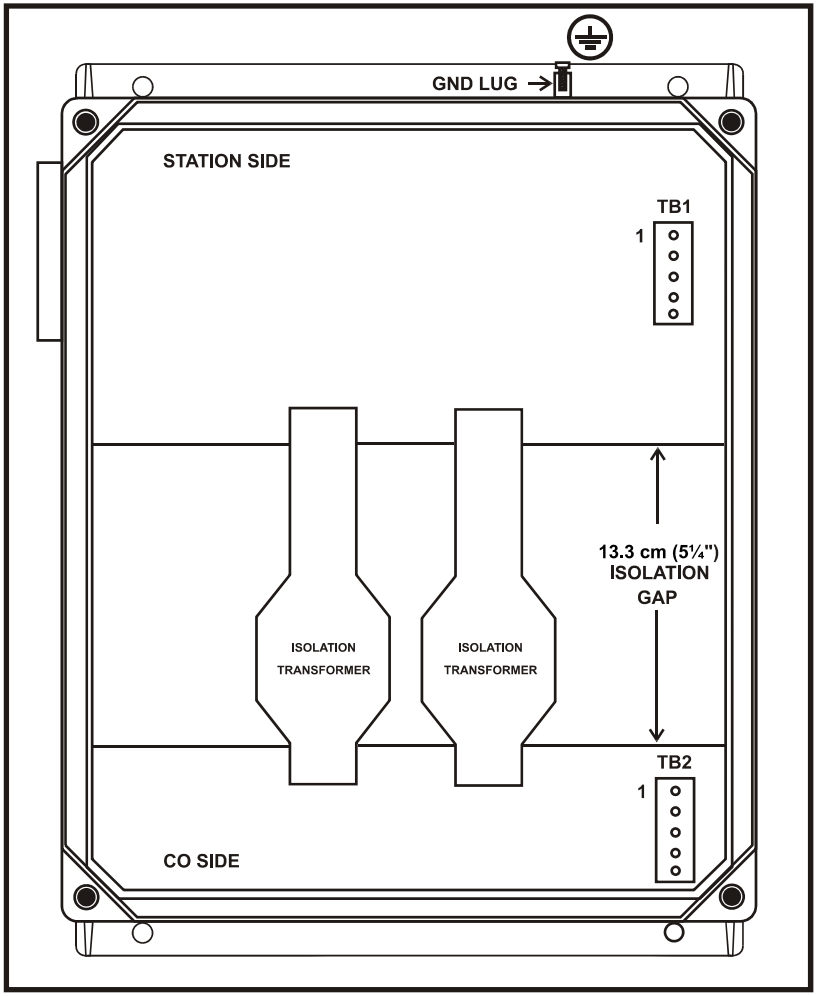


Figure 2: Model 7501-53 Cover Open
(Only Major Components Shown)

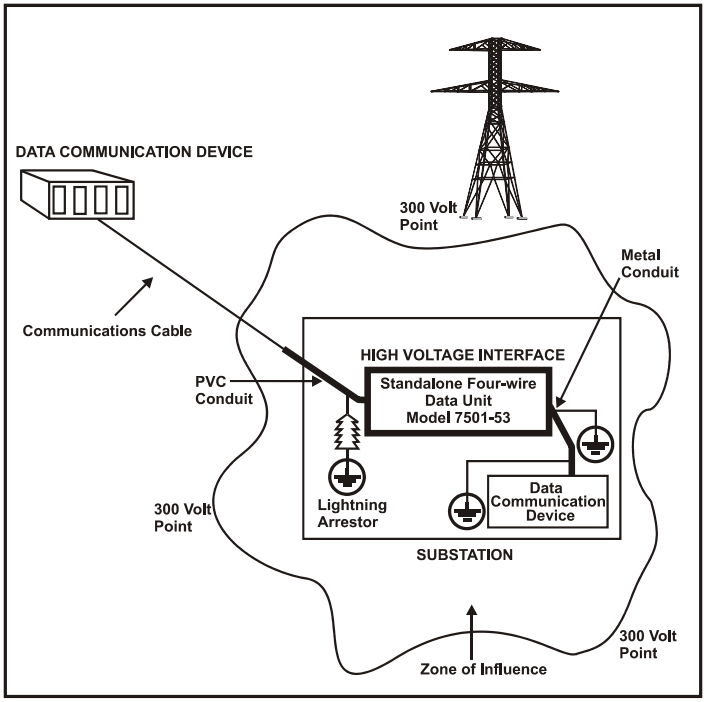


2.2 Applications

The applications of the Standalone 4-wire Data Unit include the following:

- Dedicated line modems,
- Supervisory control and data acquisition (SCADA) systems,
- Tone relay control systems,
- Analog carrier systems,
- Digital data service,
- Any other equipment using tone-related signalling.

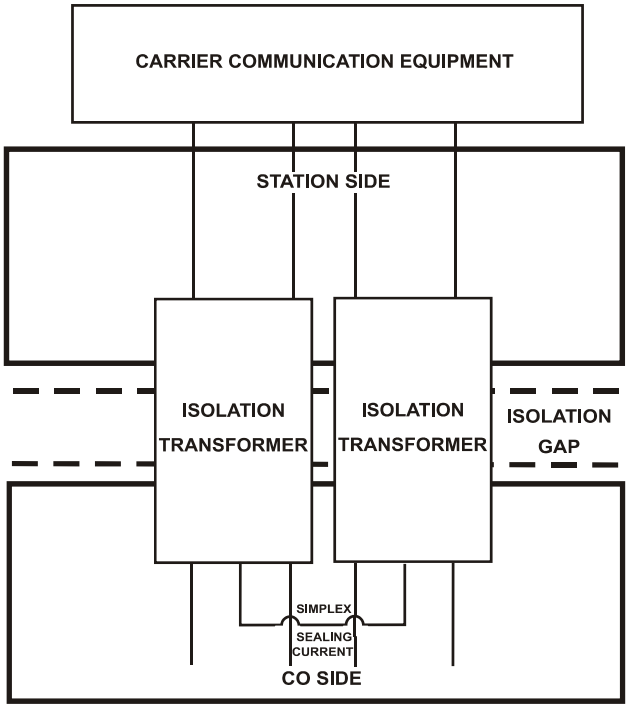
Figure 3: High Voltage Interface Application



2.2.1 Hardware Description

The Standalone 4-wire Data Unit contains the Plug-in Four Wire AC Data card. It is comprised of two sides. The Station side is located on the upper portion of the card and the CO side is located on the lower portion of the card. The Station side is separated from the CO side by the isolation transformers which create a 13.3 cm (5¼”) isolation gap.

Figure 4: Block Diagram



The following is a description of the elements of the Standalone 4-wire Data Unit block diagram.

2.2.1.1 Isolation Transformers

The Isolation Transformers provide the 13.2 cm (5¼”) isolation gap for the card, and are transparent to a data signal that is transmitted bidirectionally.

2.2.1.2 Simplex Sealing Loop

The center taps of the two transformers are shorted together on the PCB to allow the Simplex Sealing current to flow across the pairs.

2.3 Technical Specifications

For physical specifications for model 7501-53, see Table 2 on page 21.

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

Parameter	Specifications	
ISOLATION DATA:		
Isolation resistance	100 000 MΩ	
Metallic surge	3 kV maximum	
Insulation voltage	50 kV_{rms} (70 kV peak)	
INPUT VOLTAGE REQUIREMENT	None	
POWER DISSIPATION	None	
TRANSMISSION DATA:		
Longitudinal balance (CO side)	>80 dB @ 60 Hz; >80 dB @ 300 to 3400 Hz	
Echo return loss at either side with opposite side terminated at 600 or 900 Ω	Better than 25 dB	
Signing return loss at either side with opposite side terminated at 600 or 900 Ω	Better than 14 dB	
Crosstalk	Better than -77 dB from 300 to 3400 Hz measured at + 10 dBm	
Maximum voice level	Up to + 10 dBm with less than 1% harmonic distortion	
NOISE		
2 to 100 Hz	-60 dBm	
Voice band (C weighted message)	< 5 dBrnC	
Phase jitter	< 0.5°, 300 to 3400 Hz	
Impulse noise	Less than 1 count above 48 dBrnC in 30 minutes	
SIGNAL (900 Ω circuit, 0 dBm)	dB typ.	dB max.
Insertion loss @ 50 Hz	0.8	1.5
Insertion loss @ 100 Hz	0.5	1.0
Insertion loss @ 200 Hz	0.3	0.7
Insertion loss @ 1 kHz	0.2	0.7
Insertion loss @ 100 kHz	0.2	0.7
Insertion loss @ 300 kHz	0.5	1.2

Table 2: Physical Specifications

Parameter	Specifications
Operating temperature range	-20°C to +65°C (-4°F to +149°F)
Height	34.3 cm (13-1/2”)
Width	28.7 cm (11-5/16”)
Depth	14.1 cm (5-9/16”)
Weight	3.8 kg (8.4 lbs)

Chapter 3

Installation

3.1 Installation

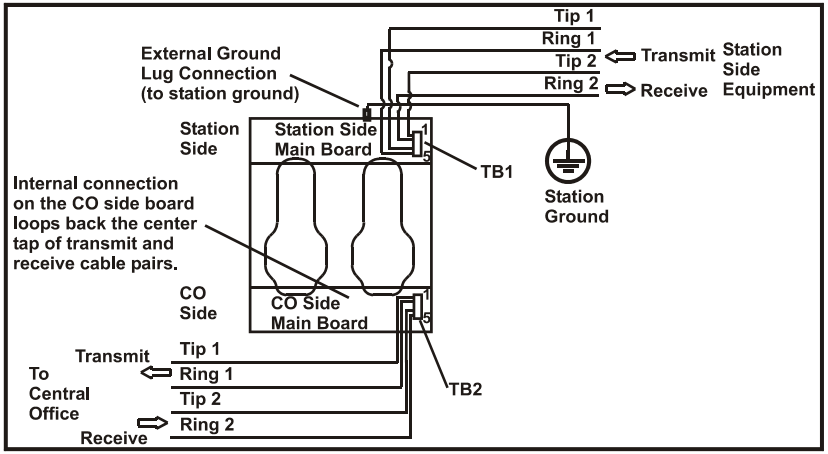
The Standalone 4-wire Data Unit is used when the number of lines to be isolated does not justify the installation of a shelf. It will isolate one 4-wire circuit (RX and TX) or two, 2-wire circuits.

To view the card layout, refer to Figure 5 on page 25.

CAUTION

- Stand on a thick rubber mat and wear rubber gloves during the installation procedures.
- 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.
- When wiring a unit, keep the Station and CO cables at least 15 cm (6”) apart to prevent an electric arc between them in the event of damage to, or degradation of cable insulation.

Figure 5: Layout for Standalone 4-wire Data Unit



CAUTION

- Unit must be connected to the Station ground by the ground lug connection using a #6 AWG wire - green with yellow stripes.

NOTE

- These units are passive devices and do not require any power.
- Station side AC data equipment cannot be powered from the CO line side cable pairs using this type of unit. The simplex sealing current is looped back on the CO side CT of the ‘Transmit’ and ‘Receive’ (see figure) cable pairs.
- These units must be connected to the station ground by the ground lug connection.
- An additional ground connection is provided at TB1.
- The Station side cable pairs are connected to TB1.
- The CO side cable pairs are connected to TB2.
- ‘Transmit’ and ‘Receive’ can be interchanged.
- The unit is usually mounted with the Station side up, but may be mounted in any position.

➤ To install the Standalone 4-wire Data Unit

1. Unpack the unit from its protective box and anti-static bag.
2. Confirm that the isolation unit is a Standalone 4-wire Data Unit by identifying the name located inside the cover and the model number located on a metallic label on the top of the right-hand portion of the unit.
3. Check the contents of your Standalone 4-wire Data Unit kit. For a listing of the items included in the kit, refer to Table 3 below.

Table 3: Model 7501-53 Kit Contents

Items Included	Qty	Part Number
Standalone 4-wire Data Unit	1	244-751202-401
Description and Installation document	1	925W751028 (this document)
“Danger” label (already affixed)	1	7501-02-103
4-wire Data Unit accessory kit	1	241-751202-401
CO side cable (12 conductor), 10 ft	1	207-990000-138
Connector cord grip (1/2” hub)	1	230-990400-027
Connector cord grip (1/2” hub)	1	230-990400-038
Instruction sheet with strain relief	1	241-010006-001
White label	1	612-990000-034
Terminal block 0.2”	2	666-990000-059
Hex nut (1/2-14 NPT)	2	714-990000-005
Hex screw #14A	4	724-990000-011

4. Fasten the 2.5 cm (1”) thick plywood backboard to the wall, and mount the enclosure on it using the four screws supplied.

3.1.1 Ground Connections

CAUTION

- The equipment ground must be connected before any other connection is made to the unit.
- Installations must conform to local electrical code.
- All units must be permanently connected to earth.
- There shall be no switching or disconnecting devices in the earthed circuit conductor between the unit and the earthing electrode conductor.

NOTE

- The Station (subscriber) side of the enclosure is the side connected to the external ground lug. The orientation of the unit does not matter.

5. The strain reliefs supplied each have a cable entry diameter appropriate to one of the two cables employed in this installation. The CO cable strain relief is the largest, accommodating a cable diameter from 1.0 cm to 1.4 cm (0.375” to 0.570”). The station cable strain relief accepts a cable diameter from 0.3 cm to 0.7 cm (0.125” to 0.275”). (All measurements are the outside cable diameters).

NOTE

- Refer to the strain relief instruction sheet provided in the installation kit.

6. Slide the strain reliefs supplied onto the CO and station cables and affix them to the unit.
7. Route the two telephone cables, allowing a length of 13 cm (5”) per cable for the internal connections to the terminal blocks.
8. Cut the excess wire once the exact internal length is established, and tighten the strain reliefs.
9. Strip back the outer jacket of each cable 2.5 cm (1”).
10. Strip the inner insulating jacket of each conductor 0.3 cm (1/8”).
11. Connect these stripped conductors to the designated terminal locations.
12. To locate the connectors, refer to Figure 2.
13. For a list of the terminal block connections, refer to Table 4 below.

Table 4: Terminal Block Connections

Cable	Signal	Color Coding	Connector Position
Station	Tip 1	Customer determined	TB1-4
	Ring 1	Customer determined	TB1-5
	Tip 2	Customer determined	TB1-1
	Ring 2	Customer determined	TB1-2
	Station Ground	Customer determined	TB1-3
CO	Tip 1	Any of the available 12 conductors	TB2-1
	Ring 1		TB2-2
	Tip 2		TB2-4
	Ring 2		TB2-5
	Sheath		No connection

14. Bundle the cable conductors using the tie wraps supplied.

CAUTION

- Connect the ground lug to station ground by using a #6 AWG stranded wire, green with a yellow stripe.

15. Ensure that there are no excess wires dangling into the isolation gap between the Station and CO side circuits.
16. Close and secure the shelf cover with the captive screws.

➤ To verify the installation:

1. Verify the installation by applying a data signal across the isolator and check that it has been received correctly and without errors.

3.2 Maintenance

NOTE

- Before maintenance disconnect telecom lines on the CO side and station side by unplugging the terminal blocks TB1 and TB2.
- 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

CO	Central Office
CSA	Canadian Standards Association
FCC	Federal Communications Commission
GND	Ground
GPR	Ground Potential Rise
HVI	High-Voltage Interface
PCB	Printed Circuit Board
RMA	Returned Material Authorization
RTU	Remote Termination Unit
UL	Underwriter's Laboratories