

**Teleline™**

**Standalone ADTRAN Total Reach Unit  
with Battery Back-up model 751233/2A  
Description and Installation Guide**

925W751015-07E





---

# Contents

## Chapter 1 – General Information

1.1 Publication Information .....	6
1.2 About this Guide .....	7
Related Documentation .....	7
Positron Products and Services .....	7
1.3 Service and Support .....	8
Positron Contact Information .....	8
Technical Customer Support .....	8
Customer Training .....	8
Repair Service .....	9
1.4 Teleline Warranty .....	10
Limitation of Liability .....	10
Cancellation and Rescheduling Charges .....	11

## Chapter 2 – Overview

2.1 Introduction .....	14
2.2 Applications .....	19
2.3 Hardware Description .....	21
Power Supply Piggyback .....	22
Battery Feed Circuit .....	23
Power Supply .....	23
Isolation Transformer .....	23
Termination and Battery Detector .....	23
Power Supply Piggyback Fuses F101, F102 and F201 .....	24
Isolation Card Fuses F1, F2 and F3 .....	24
2.4 Specifications .....	25

## Chapter 3 – Installation

3.1 Installation .....	30
Mainboard Settings .....	34

Installing the Power Supply Piggyback . . . . .	41
Ground Connections . . . . .	42
3.2 Battery replacement procedure . . . . .	46
Replacement Batteries . . . . .	46
Replacement procedure . . . . .	46

**Appendix A – Acronyms**

Acronyms . . . . .	50
--------------------	----

# **Chapter 1**

---

## **General Information**

## **1.1 Publication Information**

© 2013 Positron Inc.

**Teleline Standalone ADTRAN Total Reach Unit with Battery Back-up model 751233/2A  
Description and Installation Guide**

Part number: 925W751015-07E

Publication date: January 7, 2013

**Published By**

Positron Inc.

5101 Buchan Street, Suite 220

Montreal, Quebec, Canada

H4P 2R9

Telephone: US and Canada: 1-888-577-5254

International: 1-514-345-2220

**Trademarks**

Teleline is a trademark of Positron Inc.

Product names, other than Positron's, mentioned herein may be trademarks and/or registered trademarks of their respective companies

**Confidentiality Notice**

The information contained in this document is the property of Positron Inc. Except as specifically authorized in writing by Positron Inc., the holder of this document: 1) shall keep all information contained herein confidential and shall protect same in whole or in part from the disclosure and dissemination to all third parties, and 2) shall use same for operating and maintenance purposes only.

**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 Standalone ADTRAN Total Reach Unit with Battery Back-up model 751233/2A and its features and applications. 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 High Voltage Interface (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 Service and Support**

### **1.3.1 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>

---

### **1.3.2 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 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. TeleLine 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, MERCHANTABILITY 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**

The Teleline Standalone ADTRAN Total Reach Unit with Battery Back-up model 751233/2A provides high-voltage isolation between either an Adtran Total Reach ISDN or Total Reach DDS remote unit located inside the substation and the Total Reach CO unit.

A standalone unit consists of an isolator card mounted inside a compact enclosure. 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 standalone unit is shipped with an installation kit that includes a 12-conductor cable for connection to the incoming CO cable, power cables, spare fuses and mounting hardware.

Features for model 751233/2A include the following:

- Isolation of 50 kV<sub>rms</sub> while maintaining full communication between terminals.
- Communication maintained across the gap by an isolation transformer that provide low-loss, low-distortion transmission.
- When set to feed battery, the unit can be set to provide -50 Vdc, -65 Vdc, -100 Vdc or -130 Vdc on the line to the equipment on the Station side of the card. The Tip is always positive and the Ring negative. The unit is factory set to provide -130 Vdc.
- The CO side components are powered from the line sealing current.
- The unit can operate without battery feed if selected through jumper settings.
- The main unit operates from -48 Vdc provided by an integrated multi-input Power Supply piggyback board.
- When operating from a 24 Vdc source, the power supply is polarity-sensitive.
- When operating from 42 Vdc to 130 Vdc or from a 120 Vac source, the power supply is not polarity-sensitive.
- Battery backup is provided by Power Supply piggyback board.

- The enclosure resists the infiltration of dust, mist and water.

**NOTE**

If 120 Vac operation is not required, a 751233/1A can be used instead.

For illustrations of the model 751233/2A:

- Front and side views and unit dimensions, see Figure 1 on page 16.
- Mainboard major components without attached Power Supply piggyback, refer to Figure 2 on page 17.
- Major components with attached Power Supply piggyback, refer to Figure 3 on page 18.
- High voltage interface diagram, refer to Figure 4 on page 20.

Figure 1: Standalone ADTRAN Total Reach Unit

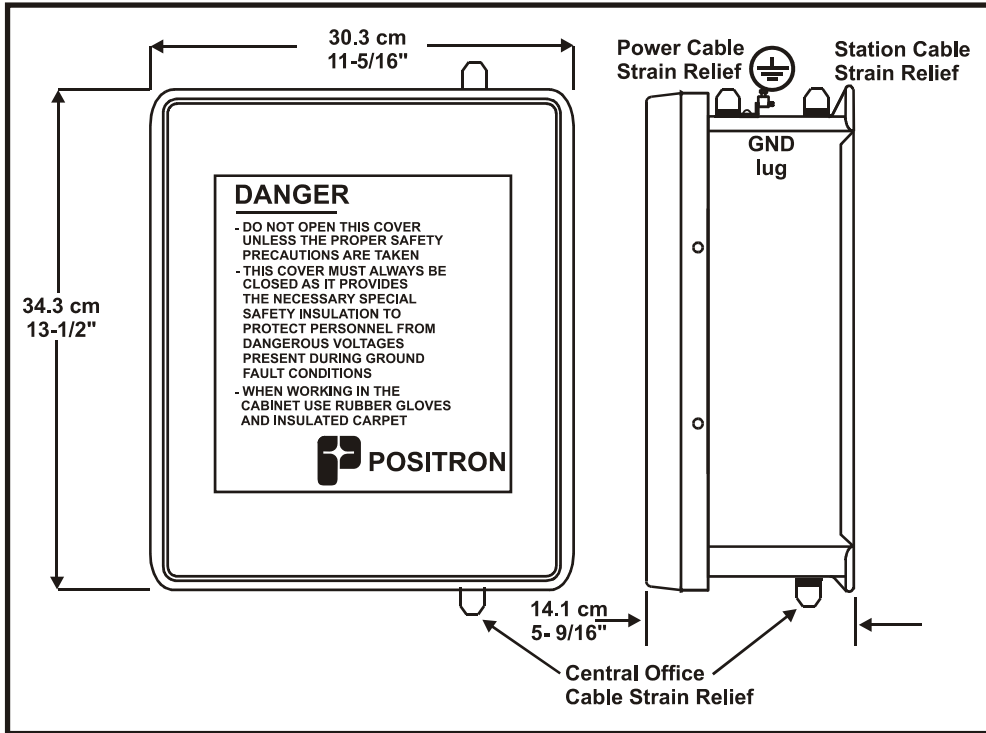
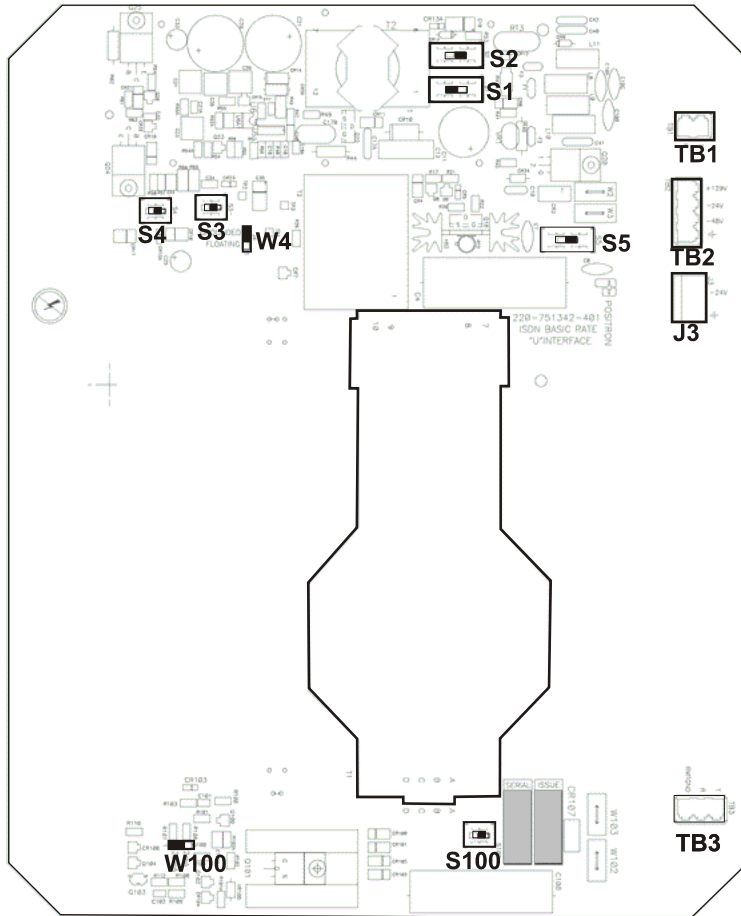
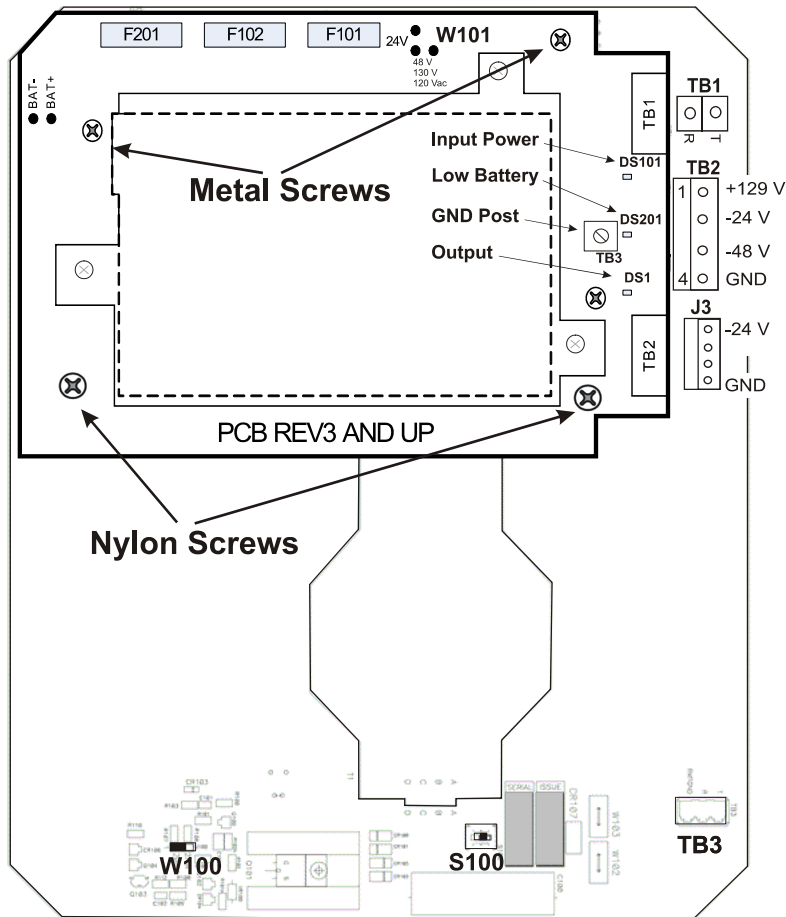




Figure 2: Mainboard without Power Supply piggyback board



**Figure 3: Mainboard with Power Supply piggyback board**



**NOTE**

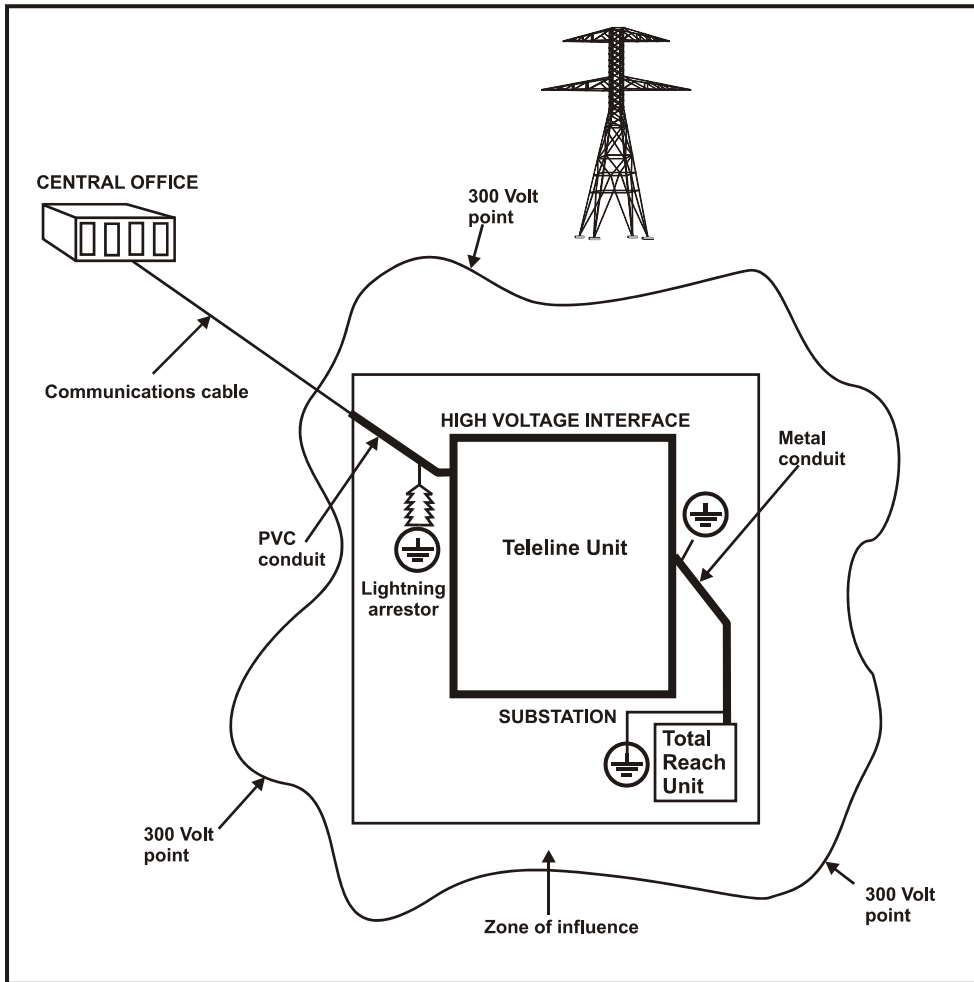
Power input connections are from 24 Vdc, 42-130 Vdc or 120 Vac.

## **2.2 Applications**

The model 751233/2A can be deployed in installations that use:

- Adtran Total Reach ISDN
- Adtran Total Reach DDS
- Data transmission lines within the passband of the card (120 kHz)
- Station side span powered Terminal Unit
- Station side locally powered Terminal Unit

Figure 4: High Voltage Interface

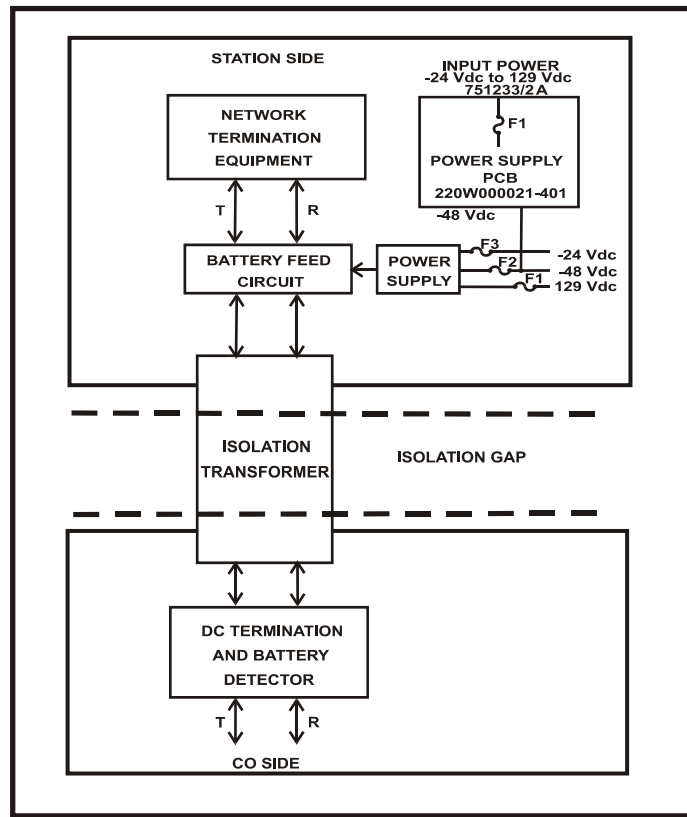


## 2.3 Hardware Description

The Standalone ADTRAN Total Reach Unit is comprised of two printed circuit boards (PCB), the mainboard that is the core of the unit and the Power Supply piggyback that provides conversion from input power to the -48 Vdc required by the mainboard.

The mainboard 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 separation between the Station side and the CO side creates a 14 cm (5.25") isolation gap. The transmission of the data signal is accomplished in full duplex by the isolation transformer that spans the gap.

**Figure 5: Block Diagram**



### 2.3.1 Power Supply Piggyback

The Power Supply piggyback is a switch mode power supply (SMPS) that is fed either 24 Vdc, 42 to 130 Vdc or 120 Vac and generates -48 Vdc to be used by the mainboard. The Power Supply piggyback provides battery backup in the event of power interruption.

The Power Supply piggyback has three LEDs to facilitate troubleshooting of the unit. Location of the LEDs is shown in Figure 3 on page 18 and their functions are shown below.

**Table 1: LED Functions**

LED Indicator	State	Description
Input LED DS101	OFF	No input power or input fuses damaged
	YELLOW	Input power present
Low Battery DS201	OFF	With Input LED ON, means battery charged and normal operation
	OUTPUT GREEN	With Input LED OFF, means operating from battery, battery charged
	RED	With Input LED ON, means battery charging from input
	OUTPUT GREEN	With Input LED OFF, means operating from battery, battery low and failure is approaching
Low Battery DS201	OFF	With Input LED Yellow, means defective unit
	OUTPUT OFF	With Input OFF means battery fully discharged
	RED	With Input LED Yellow, means defective unit
Output LED DS1	OUTPUT OFF	With Input OFF means battery fully discharged
	OFF	No output voltage
	GREEN	Output voltage present

The Power Supply Piggyback has a jumper setting to select either low voltage input (24 Vdc) or high voltage input (42 to 130 Vdc or 120 Vac). When operating from high voltages, the Piggyback is NOT polarity-sensitive but when operating from low voltage (24 Vdc), the Piggyback IS polarity-sensitive, if input power is reversed, the unit will not function.

For a view of the jumper settings, refer to Figure 14 on page 45.

## 2.3.2 Battery Feed Circuit

The Battery Feed Circuit supplies the line with a voltage of -50 Vdc, -65 Vdc, -100 Vdc or -130 Vdc depending on the selected switch settings of the card.

## 2.3.3 Power Supply

The Power Supply is a switched mode power supply. Although it can operate from -24 Vdc, -48 Vdc or 130 Vdc, it MUST be set to -48 Vdc, the output voltage of the the Power Supply Piggyback. The selection is done through input switches on the mainboard.

The Power Supply generates the required voltages used by the card itself. In addition, the Power Supply generates line voltages of either 50 Vdc, 65 Vdc, 100 Vdc or 130 Vdc, as selected on the output switches on the mainboard.

For a view of the input switches and output switches, refer to Figure 7 on page 35 and Figure 9 on page 37.

### NOTE

When mainboard switch S5 is set for “no battery,” the mainboard’s power supply is turned off and the unit draws little current.

## 2.3.4 Isolation Transformer

The Isolation Transformer is a high voltage, low-loss, full duplex component that permits the transmission of data through the isolation gap while maintaining an isolation between the CO and Station sides of the card.

## 2.3.5 Termination and Battery Detector

The DC Termination and Battery Detector circuit presents a low DC impedance to the CO and detects CO battery. The amount of sealing current can be set to 2 mA or 20 mA with default setting of 20 mA.

The DC impedance can be turned off through mainboard switch S100 if no sealing current is provided on the line.

### **2.3.6 Power Supply Piggyback Fuses F101, F102 and F201**

Fuses F101 and F102 (2A fast-acting, 250 V<sub>rms</sub>) protect the input of the power supply from overvoltages. Fuse F201 (6.3A, 250 V<sub>rms</sub>) protects the battery circuitry in case the battery is connected in reverse.

### **2.3.7 Isolation Card Fuses F1, F2 and F3**

The fast-blow Fuses F1 (1A 125 V<sub>rms</sub>), F2 and F3 (both 2-1/2A 125 V<sub>rms</sub>) provide overcurrent protection in case of unit malfunction or input overvoltage. They are not field-replaceable.



## 2.4 Specifications

**Table 2: Standalone ADTRAN Total Reach Unit 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 <sub>rms</sub>
Insulation voltage	50 kV <sub>rms</sub> (70 kV peak)
NOISE	
THD (1 kHz @ -3 dBm)	Better than -68 dB
Impulse noise (both sides)	Less than 1 count in 30 minutes above 48 dBnC
Phase jitter	< 0.5°, 300 to 3400 Hz
Noise (2 Hz to 100 Hz)	-60 dBm
Circuit noise (quiet termination, 50 kHz flat filter)	<10 dBm
S/N ratio (50 kHz flat filter)	45 dB with 1 kHz sine @ 2.5 Vpk
SIGNAL	
Return loss (@ 2.5 Vpk, either side, opposite side terminated with 135Ω)	≥ 0 dB @1 kHz; increases 20 dB/dec, 1 kHz to 10 kHz; ≥ 20 dB, 10 kHz to 25 kHz; decreases 20 dB/dec, 25 kHz to 250 kHz; 0 dB @ 250 kHz
Insertion loss (@ 2.5 Vpk, with CO and Station side circuits ON or OFF; connected directly)	≤ 0.5 dB @ 40 kHz; ≤ 0.5 dB @ 3 kHz
Insertion loss (@ 2.5 V pk, with CO and Station side circuits ON or OFF; 5 miles of 22 gauge on CO side)	≤ 2 dB @ 40 kHz; ≤ 2 dB @ 3 kHz
Longitudinal balance (CO side)	≥ 24 dB @ 5 Hz; increases 20 dB/dec to ≥ 55 dB @ 281.2; ≥ 55 dB, 281.2 Hz to 40 kHz; decreases 20 dB/dec above 40 kHz
Bandwidth (-3 dB)	200 Hz to 120 kHz

## Teleline Standalone ADTRAN Total Reach Unit with Battery Back-up model 751233/2A

Parameter(Continued)	Specifications
<b>DC CHARACTERISTICS</b>	
Maximum CO side voltage	200 V
Current limiting on CO side	2 mA ± 1 mA or 20 mA ± 4 mA
Minimum operating current on CO side	≤ 1.5 mA
Line voltage on Station side	50 Vdc, 65 Vdc, 100 Vdc, 130 Vdc
Current limit on Station side	25 mA ± 2 mA
DC voltage drop (when on)	<30 V
DC termination when dropped (off)	10 μF ± 10%; R ≥ 2 MΩ
DC resistance Tip-Ground or Ring-Ground	> 5 MΩ for V ≤ 100 Vdc
<b>Max. input current:</b>	
-24 Vdc	≤ 620 mA
-48 Vdc	≤ 270 mA
129 Vdc	≤ 110 mA
When S5 set without battery feed	≤ 5 mA
<b>Input Voltage</b>	120 Vac or -24 to 129 Vdc (not polarity-sensitive)
<b>Max. Input Current with Max. Load at:</b>	
-24 Vdc	≤ 825 mA
-48 Vdc	≤ 360 mA
129 Vdc	≤ 150 mA
120 Vac	≤ 175 mA <sub>rms</sub>
When S5 set without battery feed	≤ 50 mA
<b>Battery Backup Time:</b>	
With battery feed	4 hours minimum
Without battery feed	36 hours minimum
(Card does not require power, it functions even when the battery is discharged.)	
<b>Battery Service Life</b>	4 years (minimum)
<b>Battery Replacement</b>	- Power Sonic #PS1221S - Enersys #NP2-12FR - Yuasa #NP2-12 - MK Battery #ES2-12SLM

**Table 3: Standalone ADTRAN Total Reach Unit Physical Specifications**

Parameter	Specifications
Operating temperature range with battery	0°C to + 50°C (+32°F to +122°F)
Operating temperature range without battery	-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	6.6 kg (14.5 lbs)




# **Chapter 3**

---

## **Installation**

## 3.1 Installation

 <p><b>ATTENTION</b> ELECTROSTATIC SENSITIVE DEVICES HANDLE ONLY AT STATIC SAFE WORKSTATION</p>	<p><b>ESD Precaution</b> <b>INCORRECT HANDLING MAY VOID WARRANTY</b></p> <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>
--	--

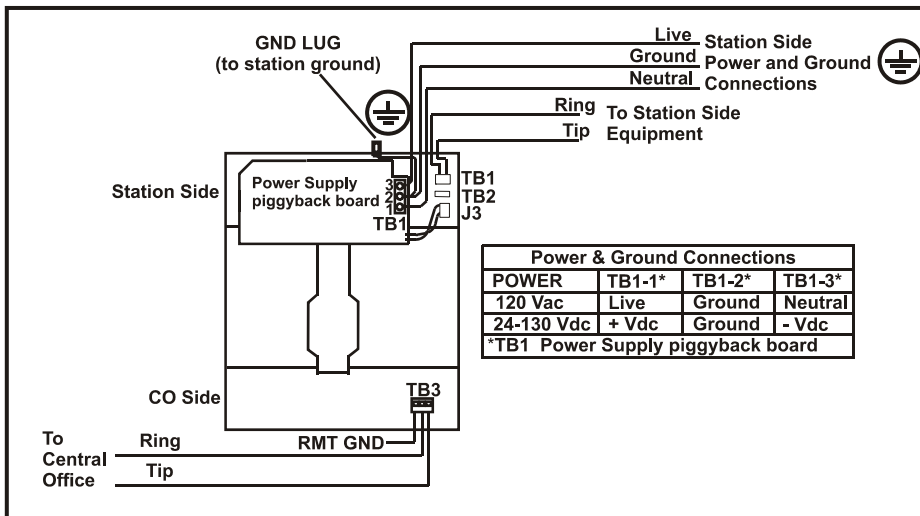
**CAUTION**



- 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.
- 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 the cable insulation.

The Standalone ADTRAN Total Reach Unit is used when the number of lines to be isolated does not justify the installation of a shelf. It will isolate one Total Reach ISDN or Total Reach DDS line (two wires) and is powered from a DC or AC power source.

Figure 6: Teleline Standalone ADTRAN Total Reach Unit



**CAUTION**



- The equipment must be installed in a restricted area.
- The Standalone ADTRAN Total Reach Unit can be powered from 120 Vac or -24 to 130 Vdc via the Power Supply piggyback board.
- A solid station ground connected to the station ground grid must be available.
- The external ground lug connection is the preferred way of grounding the unit.
- When using the ground lug, do not connect TB1-2 of the Power Supply piggyback board.

► To Install the Standalone ADTRAN Total Reach Unit

1. Verify that you have the following customer supplied tools and hardware, which are required to install the unit:
  - Station cable
  - Center punch
  - Electric drill with a 5/32" diameter bit
  - 7/16" hex wrench
  - 1/8" and 1/4" common blade screw drivers
  - 2.5 cm (1-inch) thick plywood backboard with appropriate mounting hardware
  - Digital voltmeter
  - Cable clamps and mounting hardware for routing cables exterior to the unit (quantity determined by the cable lengths involved).
2. Unpack the Standalone ADTRAN Total Reach Unit and installation hardware from the protective box.
3. Check the contents of your Standalone ADTRAN Total Reach Unit kit. For kit contents, see Table 4 on page 33.



**Table 4: Installation Kit Content for Standalone ADTRAN Total Reach Unit kit**

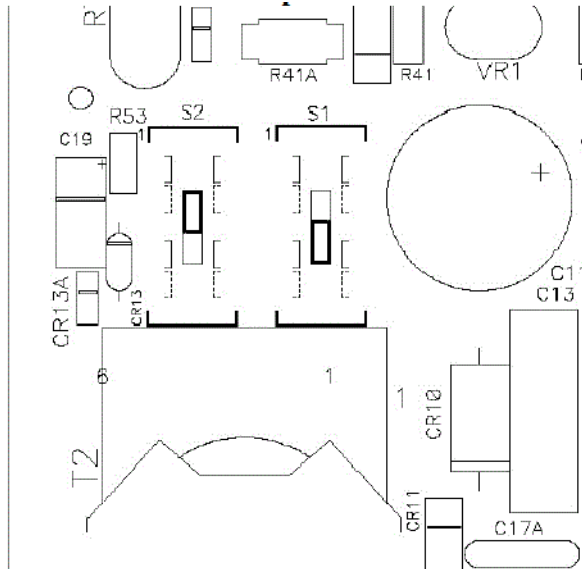
Description	Qty.	Part Number
DESCRIPTION AND INSTALLATION DOCUMENT	1	925W751015-XXE (this document)
AC POWER CABLE, 3 CONDUCTORS	6 ft.	207-990000-020
SEALPIC CABLE, 6-PAIRS, #22AWG	10 ft.	207-990000-138
DC POWER CABLE, 3 X #18AWG, 300V, SJT PVC, BLACK	8ft	207W000007-001
CONNECTOR CORD GRIP (1/2" HUB)	1	230-990400-036
CONNECTOR CORD GRIP (1/2" HUB)	1	230-990400-037
CONNECTOR CORD GRIP (1/2" HUB)	1	230-990400-038
INSTRUCTION SHEET, STRAIN RELIEF	1	241-010016-001
SCREW, HEX W/WASHER, #14A X 1"L	4	724-990000-011
NYLON CABLE FASTENER (3/4" DIA)	5	706-990000-010
FUSE, 2A, 250 V <sub>rms</sub> , FAST-ACTING, 5X20MM (INPUT)	2	294W000010-001
FUSE, 6.3A, 250 V <sub>rms</sub> , SLO-BLO, 5X20MM (BATTERY)	1	294W000050-001
HEX NUT, 1/2-14NPT	3	714-990000-005

4. Confirm that the isolation unit is a model 751233/2A by identifying the name located inside the cover, and the model number printed on a label on the top right-hand portion of the unit, near the ground lug.
5. Remove the cover of the unit by unfastening the four screws located at each corner.
6. Set the jumpers on the mainboard according to your application. Refer to section 3.1.1 on page 35 for more information. For standard Total Reach, the unit should be set to -48 Vdc input, -130 Vdc grounded output, with battery, 20 mA loop current. (These are the default settings.)
7. The strain reliefs supplied each have a cable entry diameter appropriate for one of the three cables used in this installation. All measurements are outside cable diameters.
  - The CO cable strain relief is the largest, accommodating cable diameters from 10mm (0.40") to 14mm (0.56").

- The Station cable strain relief accepts cable diameters from 3mm (0.125") to 7mm (0.275").
  - The Power cable strain relief accommodates cables with diameters of 6.4mm (0.25") to 10.2mm (0.40").
8. Affix the three strain reliefs to the unit.

### 3.1.1 Mainboard Settings

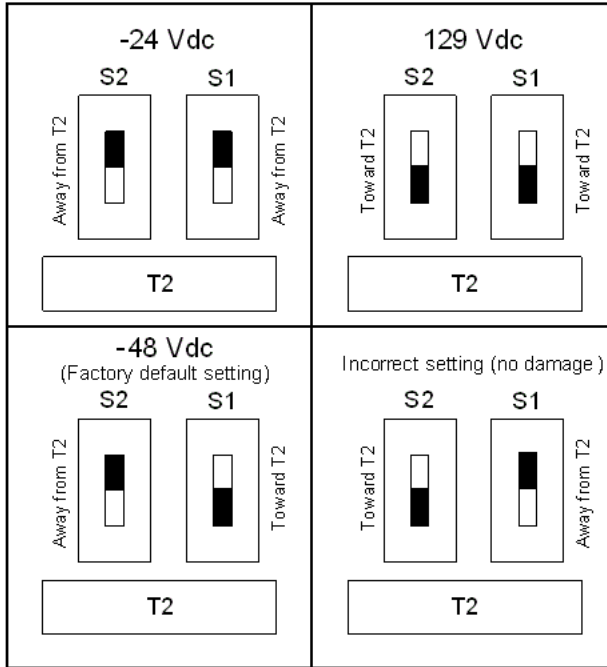
Figure 7: View of Mainboard Input Switches



**Figure 8: Mainboard Power Supply Input Switches Options**

**INPUT SWITCHES (S1 & S2)**

Used to determine the unit's input voltage



**Figure 9: View of Mainboard Output Switches**

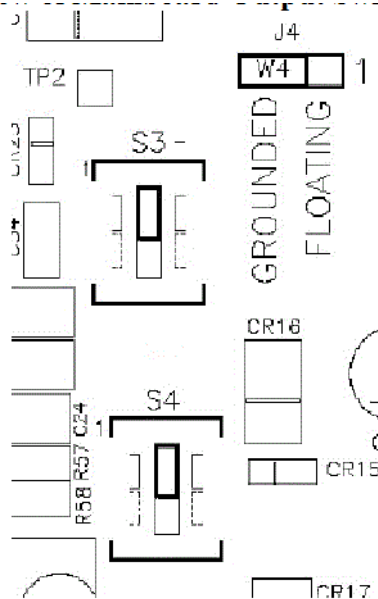
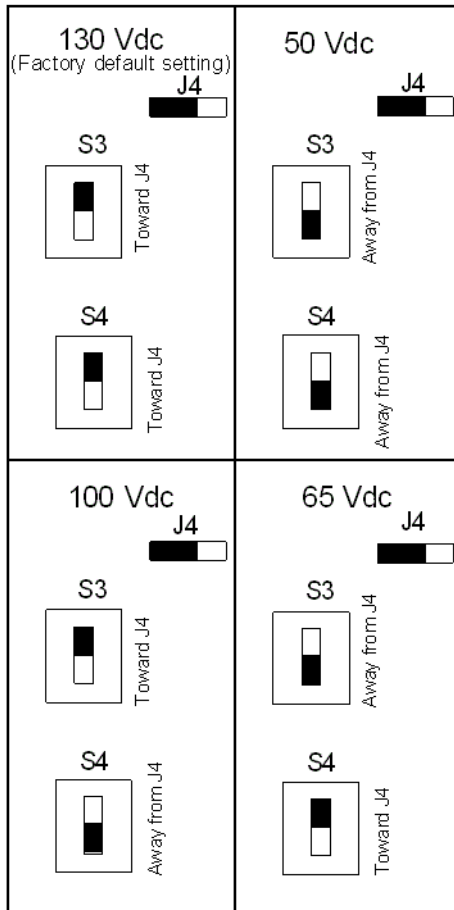


Figure 10: Mainboard Power Supply Output Switches Options

OUTPUT SWITCHES (S3 & S4)  
Used to determine the unit's line voltage



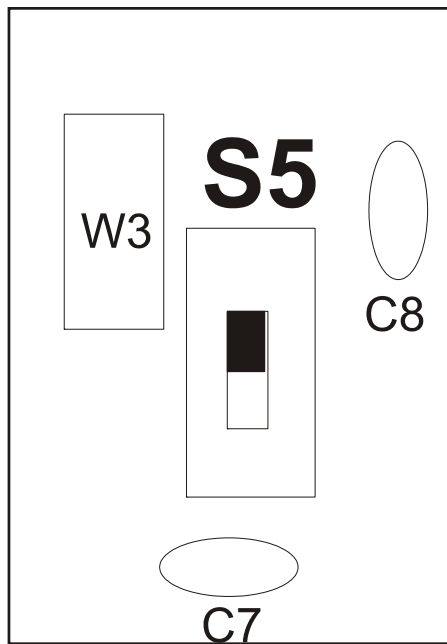
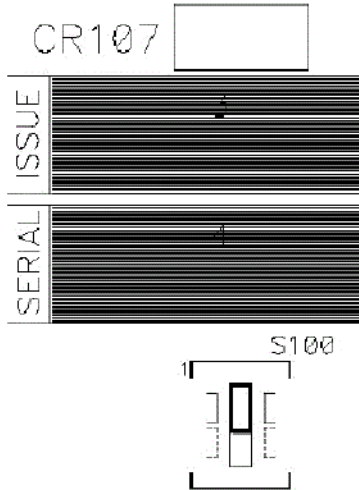
**Figure 11: View of Mainboard Station Side Battery Enable Switch**

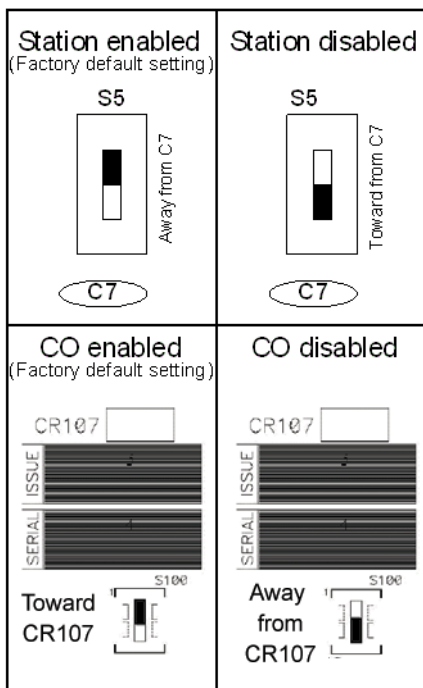
Figure 12: View of Mainboard CO Side Battery Enable Switch





**Figure 13: Mainboard Battery Enable Switches Options**

**BATTERY ENABLE  
SWITCHES (S5 & S100)**  
Used to enable/disable loop current



**Table 5: Jumper J100 Settings**

Jumper	Description	Jumper Position
J100	20 mA current sink	1 - 2
J100	2 mA current sink	2 - 3 *
		* factory setting

**Table 6: Jumper J4 Settings**

Jumper	Description	Jumper Position
J4	Floating	1 - 2
J4	Grounded	2 - 3 *
		* factory setting

**CAUTION**



- When set to Grounded, the Tip side of the line is grounded. If the battery is enabled, the Ring is then negative
- Incorrect settings will not damage the card, but may damage the equipment connected to the line

### 3.1.2 Installing the Power Supply Piggyback

The Power Supply Piggyback board is not fastened to the main isolation card prior to shipment and requires installation.

9. If the unit is to be powered from 24 Vdc, then set the input power jumper (W101) located near F101 on the Power Supply piggyback board to E104-E105. If the unit is to be powered from 42 Vdc to 130 Vdc or 120 Vac, set the Power Supply piggyback board jumper W101 to between E105-E106. See Figure 14 on page 45 for information.

**NOTE**

- If unit is powered from 42 Vdc to 130 Vdc or 120 Vac, it is NOT polarity-sensitive. If the unit is powered from 24 Vdc, it IS polarity-sensitive, it will not function if input power is reversed. See Table 7 on page 46 for proper polarity.

10. Run the Total Reach (Station side) cable through the strain relief nearest the bottom of the enclosure to mainboard connector TB1 (see Figure 2 on page 17).
11. Remove the screws and lock washers from the standoff (spacers) mounted on the Station side circuit board.
12. Position the Power Supply piggyback board onto the spacers and align the board holes with the spacers. (See Figure 3 on page 18)
13. Secure the Power Supply piggyback to the standoffs. The two nylon screws must be installed on the two standoffs that are in the gap of the mainboard (Figure 3 on page 18). The two metal screws along with the two lock washers are installed on the two standoffs that are closest to the side of the box.
14. Fasten the 1" thick plywood backboard to the wall.
15. Position the enclosure on the backboard with the air vent facing down or to the left, and mount it to the backboard using the four screws supplied.

### 3.1.3 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.
16. Connect the ground cable inside the unit to connector TB3 on the Power Supply piggyback board. (See Figure 3 on page 18)
  17. Connect the ground lug on the outside of the unit to Station ground using a #6 AWG stranded wire.
  18. Using the supplied cable connect the Power Supply piggyback's output connector TB2 to J1 on the main isolation card. Refer to Figure 3 on page 18.

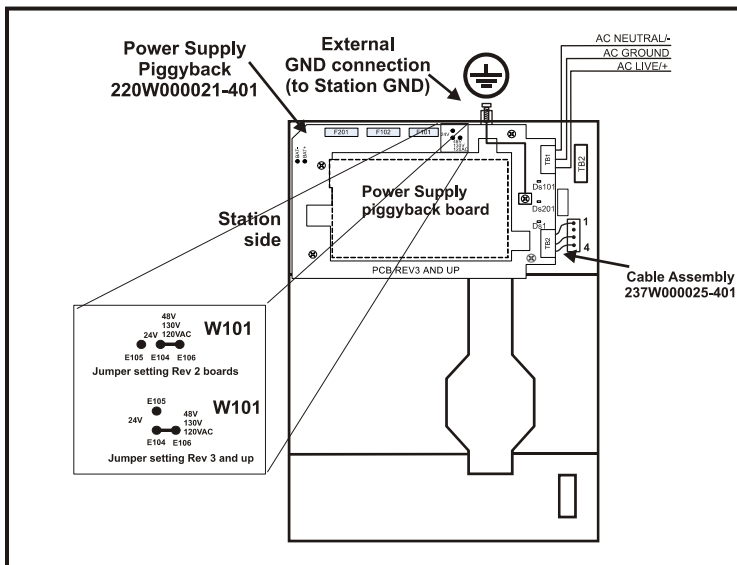
To prevent discharge during shipping, the Power Supply piggyback board is shipped with both leads of the battery disconnected.

19. Route the power to the unit using one of the power cables provided with the kit. If powering the unit from 120 Vac, use the AC cable (with the prong plug) and if powering from DC (24 Vdc, 48 Vdc or 130 Vdc) use the unterminated cable.

**NOTE**

- Make sure you have set the input power jumper W101 on the Power Supply piggyback board correctly (see step 9). Refer to Table 7 on page 46 for connections.
  - The Station side of the enclosure is the side connected to the external ground lug. Mount the unit with the air vent facing the bottom or left.
20. Make sure that there are no excess wires dangling into the 14 cm (5.25") isolation gap between the Station and CO side circuits inside the enclosure. If necessary, bundle the individual cable conductors with tie wraps to prevent them intruding into the isolation gap.
21. Route the Black PIC CO cable, and the Grey Station cable through the strain reliefs, allowing a length of 13 cm (5") per cable for the internal connections to the terminal blocks. Cut the excess wire once the exact internal length is established, and tighten the strain reliefs.
22. Strip back the outer jacket of each cable to a length of 2.5 cm (1"). Strip the inner insulating jacket of each conductor to a length of 3.2 mm (1/8)". Connect these stripped conductors to the designated terminal locations.
- To locate terminal block connectors, see Figure 2 on page 17 and Figure 3 on page 18.
  - For a listing of terminal block connections, see Table 7 on page 46.

Figure 14: Power Input Jumper Setting



**Table 7: Terminal Block Connections**

Cable	Signal	Color Coding	Connector Position
Station side line	Tip	Customer determined	TB1-1 (on mainboard)
	Ring	Customer determined	TB1-2 (on mainboard)
CO side line	Tip	White	TB3-1 (on mainboard)
	Ring	Blue	TB3-2 (on mainboard)
	Not Connected		TB3-3 (on mainboard)
Power	Live/"+"	Black	TB1-1 (on Power Supply piggyback)
	Neutral/"-"	White	TB1-3 (on Power Supply piggyback)
	Ground	Green	TB1-2 (on Power Supply piggyback)

23. Connect the battery cables to their respective PCB cables: Red wire from PCB (+) to red wire from battery and Black wire from PCB (-) to black wire from battery.

- DS201 (Low Battery) might turn RED if battery is low.

**NOTE**

Should the polarity of the battery be reversed when connection is made to the leads on the PCB, the fuse F201 of the Power Supply piggyback will blow to protect the Power Supply circuit. If this happens, correct the polarity of the red and black wires and replace the fuse using the spare fuse in the kit.

24. Power up the unit.

**CAUTION**



- Keep the Station and CO cables outside the unit at least 15 cm (6") apart to prevent an electric arc between them in the event of, damage to, or degradation of cable insulation.

### 3.2 Battery replacement procedure

After its expected life of 5 years, the battery will need to be replaced.

#### 3.2.1 Replacement Batteries

The battery has to be UL approved with a UL94V rated casing. The following sources are approved to be used as replacement.

- Power Sonic #PS1221S
- EnerSys #NP2-12FR
- Yuasa #NP2-12
- MK Battery #ES2-12SLM

#### 3.2.2 Replacement procedure

► To replace the battery:

1. Disconnect input power to the unit.
2. Disconnect the output cable of the power supply from the mainboard underneath.
3. Disconnect the black & red wires of the battery from the black and red wires of the PCB.
4. Remove the screws holding the Power Supply piggyback to the spacers, put the screws and lock washers aside.
5. Remove the Power Supply piggyback from the unit.
6. Remove the screws, lock washers and nuts (if applicable) holding the battery bracket (see Figure 3 on page 18), put them aside.
7. Remove the battery from the power supply.
8. Move the wires from the old battery to the new battery. Be sure to install the black wire to the “-” and the red wire to the “+” of the new battery.
9. Install the new battery on the Power Supply piggyback in the same orientation as before (battery posts near the PCB wires location).

10. Put the battery holding bracket onto the battery and secure it using the screws, lock washers and nuts (if applicable).
11. Install the Power Supply piggyback into the unit, aligning it with the spacers from the mainboard underneath.
12. Secure the Power Supply piggyback using the four screws and lock washers.
13. Connect the output cable of the power supply to the connector of the telephone card underneath.
14. Connect the red wire from the battery to the red wire from the PCB (+) and the black wire from the battery to the black wire from the PCB (-).

**NOTE**

- Should the polarity of the battery be reversed when connection is made to the leads on the PCB, the fuse F201 of the Power Supply piggyback will blow to protect the Power Supply circuit. If this happens, correct the polarity of the red and black wires and replace the fuse using the spare fuse in the kit.

15. Connect the input power back to the unit.

**NOTE**

- The new battery might be partially discharged when you install it, leave it to charge for a couple of hours before verifying the LED statuses.

16. Verify the LEDs statuses, (see Table 1 on page 22).
17. Reconnect the input power to the unit.
18. Close and secure the cover.



# **Appendix A**

---

## **Acronyms**

## **Acronyms**

<b>CO</b>	Central Office
<b>CT</b>	Center Tap
<b>DTU</b>	Data Terminal Unit
<b>GND</b>	Ground
<b>GPR</b>	Ground Potential Rise
<b>H4TU-C</b>	HDSL4 Terminal Unit - Central Office
<b>HDSL</b>	High-speed Digital Subscriber Line
<b>HTU-R</b>	HDSL Terminal Unit - Remote user
<b>HVI</b>	High Voltage Interface
<b>PCB</b>	Printed Circuit Board
<b>PIC</b>	Polyethylene Insulated Cable
<b>RTU</b>	Remote Termination Unit
<b>RMA</b>	Return Material Authorization
<b>RMT</b>	Remote
<b>RX</b>	Receive
<b>SMPS</b>	Switch Mode Power Supply
<b>SP</b>	Span Power
<b>TX</b>	Transmit