Teleline™

POTS Standalone Unit (751222)
Description and Installation Guide

925-751052-01E

POSITRON
Positron Inc.

Contents

Appendix A – Acronyms

Chapter 1

General Information

1.1 Publication Information

Teleline POTS Standalone Unit (751222), Description and Installation Guide
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1.2 About this Guide

This guide introduces you to the Teleline POTS Standalone unit (751222), and its features and applications.

1.2.1 How to use this Guide

This guide was designed to be read from beginning to end.

1.2.2 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

1.2.3 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**.

1.2.4 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

1.2.5 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.

1.2.6 Customer Training

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

1.2.7 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

1.3 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.

1.3.1 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.

1.3.2 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 POTS Standalone Unit

The POTS Standalone unit (model 751222) provides high voltage isolation between a telephone line and a drop side of one loop start telephone circuit (telephone, dial-up modem, fax, or loop start Private Branch Exchange (PBX)):

- A standalone unit consists of an isolation card mounted inside a compact enclosure. The enclosure is molded from fiberglass, making it a lightweight and flame-retardant container of high dielectric strength. The 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 Central Office (CO) cable and mounting hardware.
- For a list of the kit contents, refer to Table 4 on page 30.

NOTE Model 751222 is a direct replacement unit for model 751221.

Features of model 751222 include the following:

- Operates from -48 VDC supplied by an integrated, multi-input power supply.
  - 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.
- Unit's power supply provides a -48 Vdc feed to the telephone on the subscriber side of the card. In the event of a power outage, communications are maintained by the on-board battery.
- CO side circuit components are powered from the CO battery feed.
- The unit's ringing generator meets Telcordia GR-506-CORE Section 14 specifications. It provides a sinusoidal unbalanced ringing at 20 Hz. It can ring up to five standard 500-type telephone sets. It will reproduce the ringing cadence from the CO and is therefore compatible with distinctive ringing.
- The unit will withstand 600 V power cross (as per CAN/CSA-C22.2 No. 609-1-07) with automatic restoration of service after a fault.
- Compatible with forward disconnect used in answer supervision.
- The card will reproduce Open Switching Interval (OSI) from the CO at the Station side.

For an illustration of the POTS Standalone unit enclosure and its dimensions, see Figure 1 on page 16.

For an illustration of the POTS Standalone unit without Power Supply piggyback installed, see Figure 2 on page 17.

For an illustration of the POTS Standalone unit with Power Supply piggyback, see Figure 3 on page 18.

Figure 1: POTS Standalone Unit model 751222 Enclosure

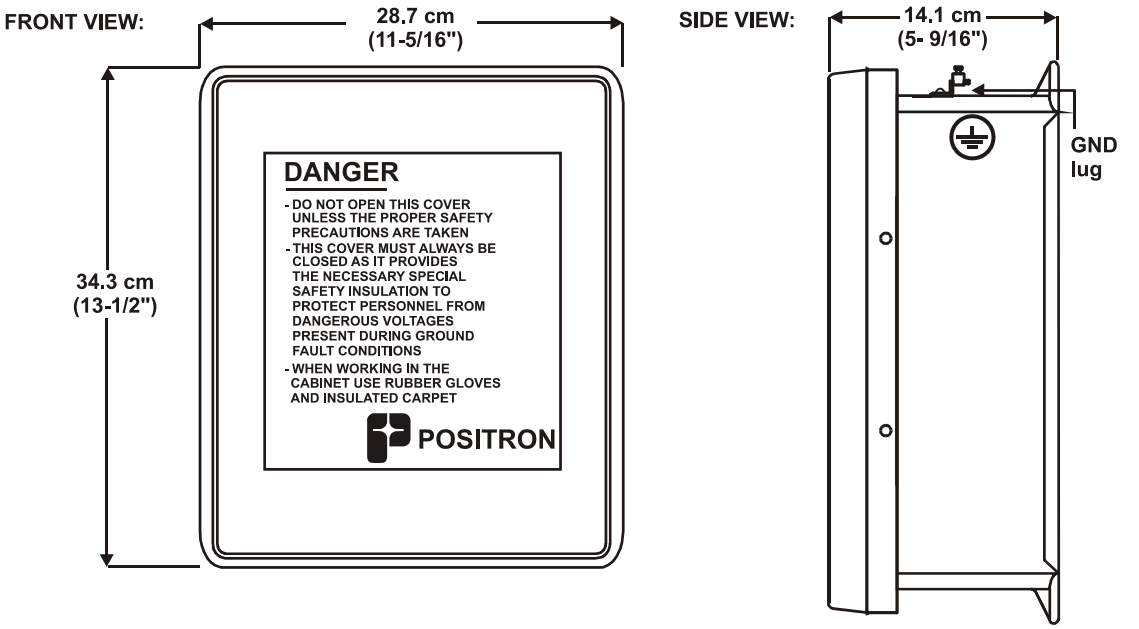


Figure 2: Model 751222 Without Power Supply Piggyback (only major components shown)

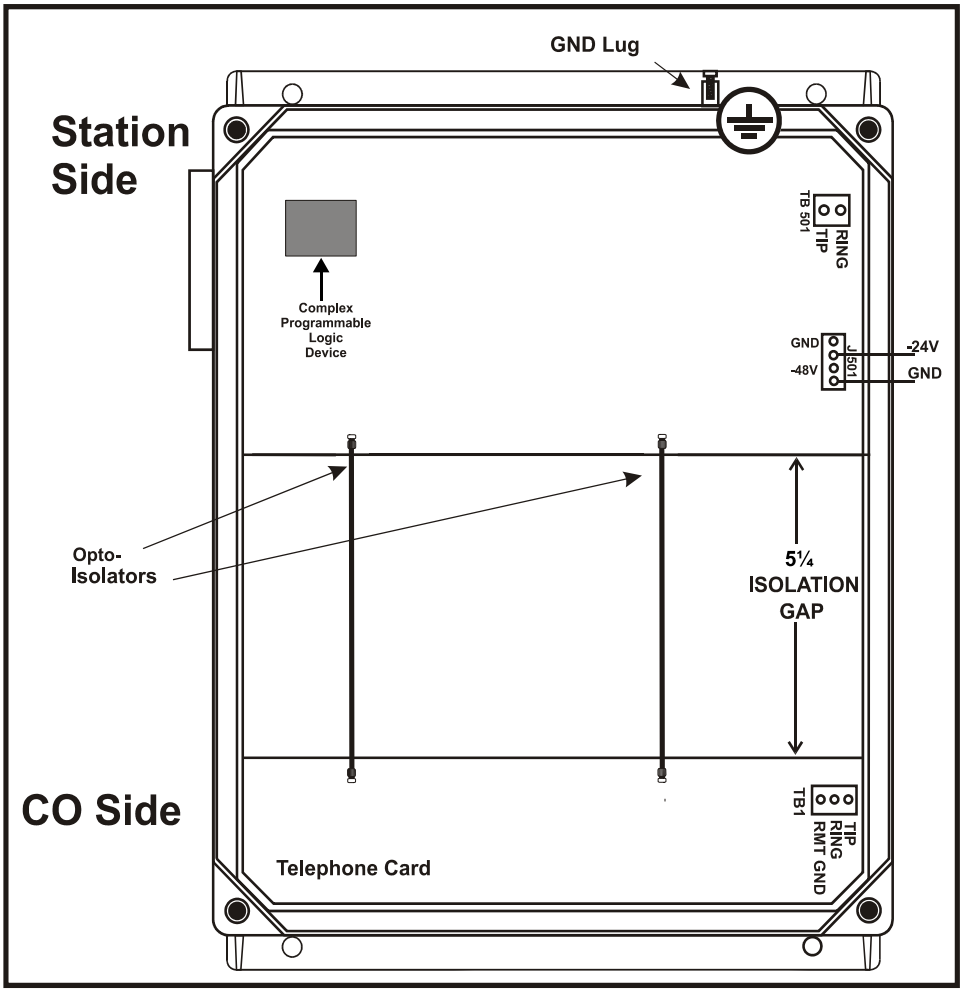
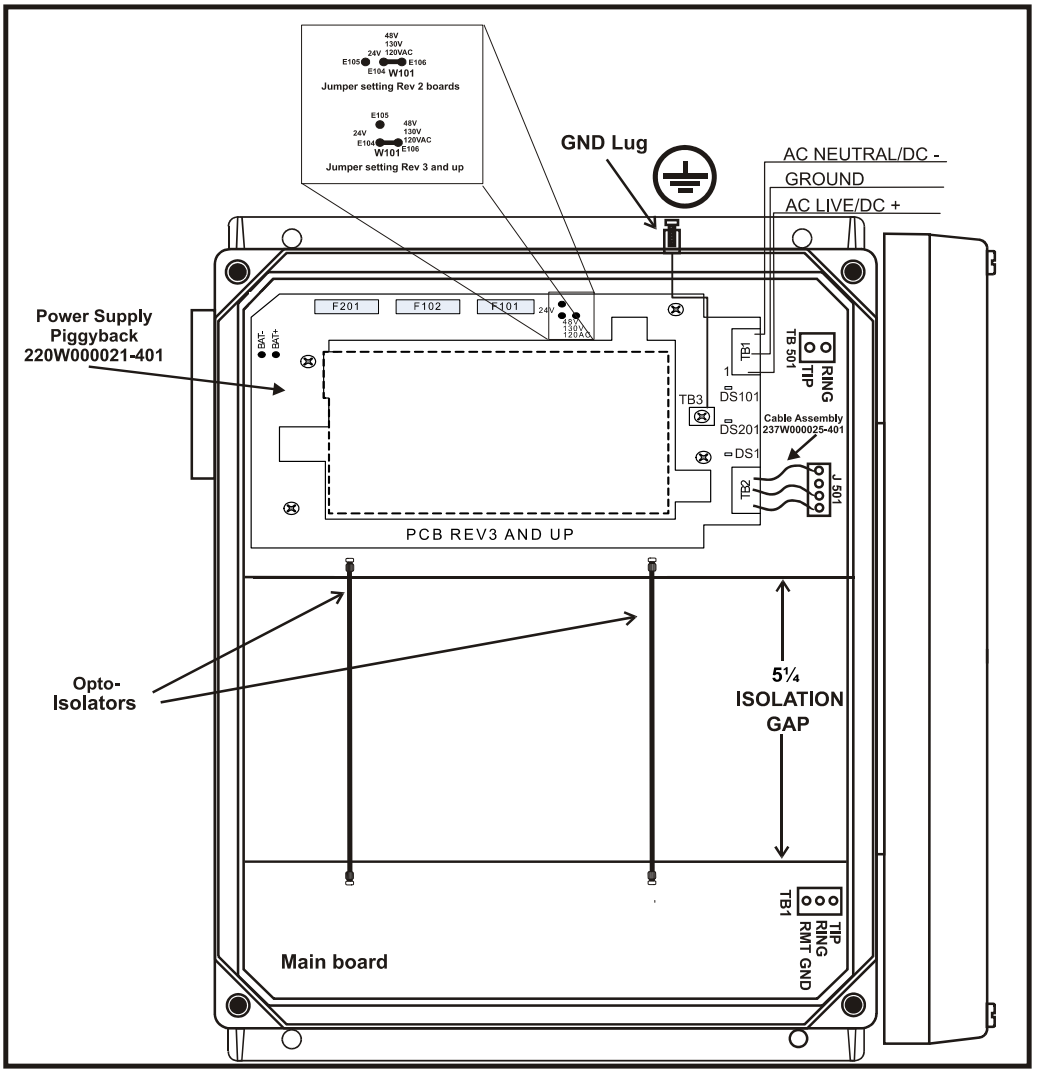


Figure 3: Model 751222 With Power Supply Piggyback (only major components shown)

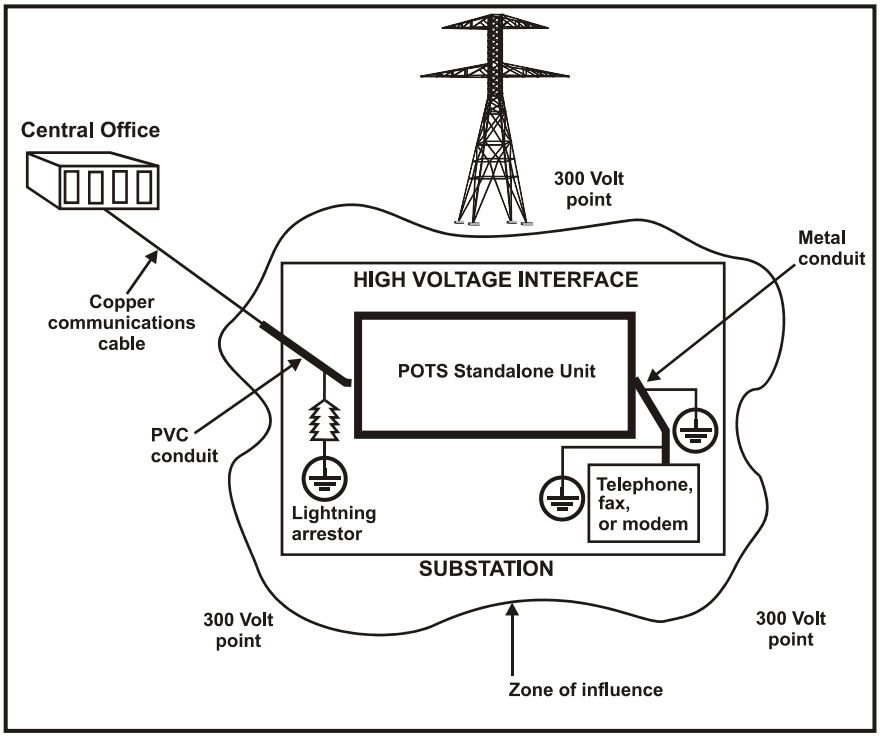


2.2 Applications

The applications of the POTS Standalone unit include the following:

- Loop start telephone (POTS)
- Fax and dial-up “smart” modems (up to 56.6 kb/s modem)
- Loop start PBX
- Dial-up remote meter reading

Figure 4: High Voltage Interface Applications



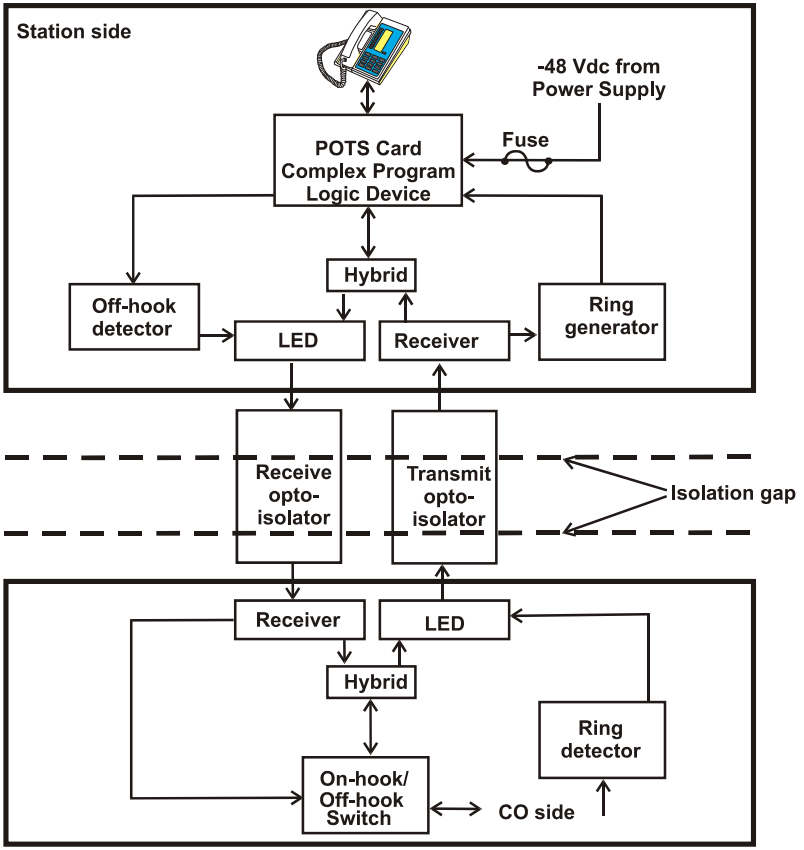
2.3 Hardware Description

The POTS Standalone unit (model 751222) contains a built-in POTS card, which has two sides. With the card facing you:

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

The CO side and Station side are separated by the opto-isolators, which create a 14 cm (5-1/4”) isolation gap

Figure 5: Block Diagram



2.3.1 POTS Circuit

The POTS card has a Complex Programmable Logic Device (CPLD) located on the Station side portion of the card; see Figure 2 on page 17.

The CPLD generates all the clocks used on both the CO and Station sides. It also controls the Subscriber Line Interface Circuit (SLIC).

The SLIC drives the telephone on the Station side and feeds the ringing signal for the phone.

The telephone line is driven using a transformer to provide good longitudinal balance and eliminate common mode noise on the line.

The Station side ringing generator provides 20 Hz for North American networks.

The card's specifications meet EIA/TIA 968 requirements. The CO circuit operates with line currents between 18 mA and 29 mA (the card limits current at 29 mA) allowing the card to operate on a line of up to 1,500 Ω (excluding card). The Station side SLIC will detect off-hook with currents as low as 16 mA and limits the phone current to 26 mA.

The audio signal is modulated and demodulated on both sides, in full duplex.

The CO side has a ringing detector that operates from 17 Hz to 50 Hz, as low as 40 V_{rms}.

2.4 Technical Specifications

Table 1: Electrical Specifications for 751222 (measured at 77°F or 25°C, 50% R.H.)

	Parameter	Specification
Isolation Data:	Isolation Resistance	100 000 MΩ
	Metallic Surge	1.5 kV max
	Insulation Voltage	50 kV_{rms} (70 kV peak)
Input Voltage Requirement:		24 Vdc to 130 Vdc 120 Vac
Power Consumption:	24 Vdc Input	21 W ringing 5 phones and charging battery
	48 Vdc Input	16 W ringing 1 phone and charging battery
	130 Vdc Input	24 W ringing 5 phones and charging battery
		18 W ringing 1 phone and charging battery
	120 Vac Input	24 VA ringing 5 phones and charging battery
		18VA ringing 1 phone and charging battery
Ringing Generator Output:	Maximum Output No Load	102 V_{rms} max
	Minimum Output (5 REN at the end of 400 Ω line)	58 V_{rms} min
Battery:	Backup Time:	7 Hours

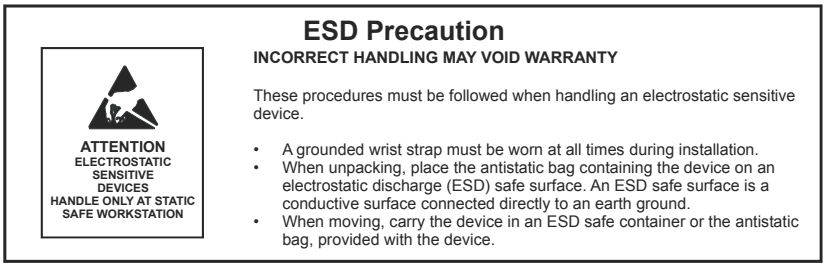
Table 2: Physical Specifications for 751222

Parameter	Specifications
Operating Temperature Range (without battery)	-40°C to 65°C (-40°F to 149°F)
Operating Temperature Range (with battery)	0°C to 40°C (32°F to 104°F)
Height	34.3 cm (13-1/2”)
Width	28.7 cm (11-5/16”)
Depth	14.1 cm (5-9/16”)
Weight	3.9 kg (8.7 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.
- 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.

The POTS Standalone unit is used when the number of lines to be isolated does not justify the installation of a shelf. It will isolate one telephone circuit and is powered from an AC or DC source.

Figure 6: Layout for the POTS Standalone Unit, 751222

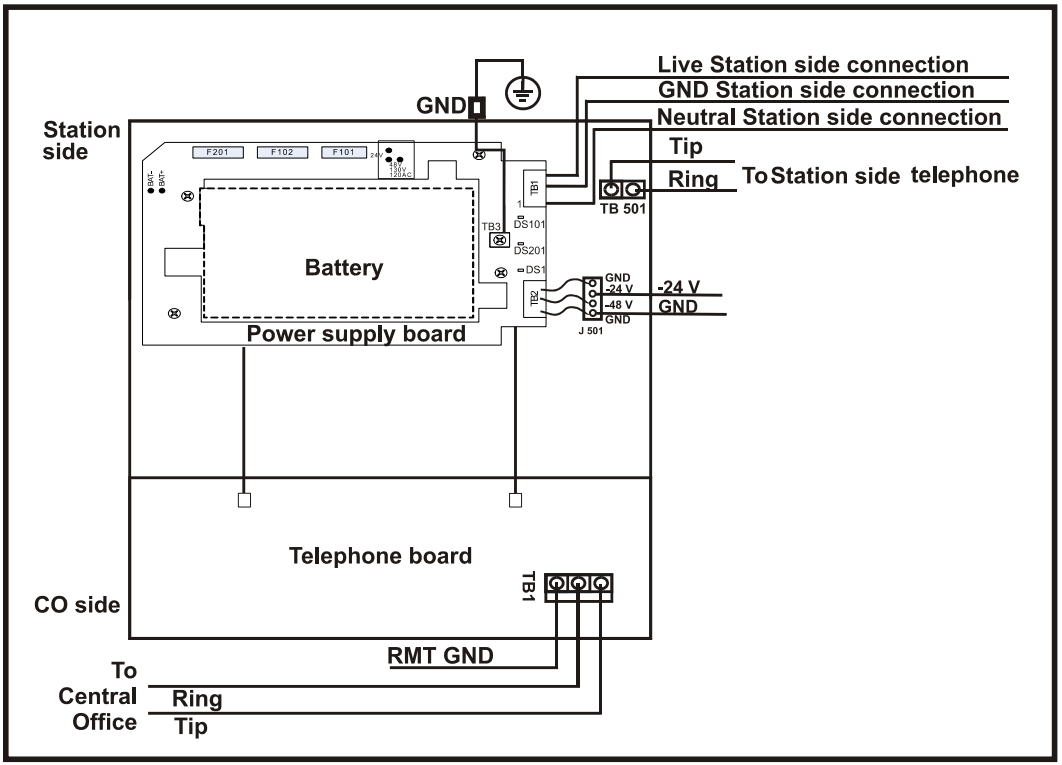


Table 3: Power and Ground Connections for POTS Standalone Unit (model 751222)

Connector	Station Side Connection (120 Vac)	Station Side Connection (24 to 129 Vdc)
TB1-1	Live	Vdc
TB1-2	Ground	Ground
TB1-3	Neutral	Vdc

NOTE

- When operating from 24 Vdc, the power supply is polarity sensitive. When operating from 42 Vdc to 130 Vdc or from 120 Vac, the power supply is not polarity sensitive.
- The power connections are made at TB1 on the power supply board (see Power and Ground Connections in Table 3 on page 27).
- J501 connects the -48 Vdc output of the power supply to the telephone board. The power supply is supplied with the power cable to connect its output terminal block, TB2, to J501.
- Both TB1 terminal 2 and the external ground lug connection may be used to provide a common ground, as long as ground loop limitations are recognized. (GND LUG is the preferred way of grounding).
- The Tip and Ring on the Station side are connected to TB501.
- The loop voltage supplied to the Station side telephone is 48 Vdc.
- The Tip and Ring on the Central Office side are connected to TB1 on the CO side main board.
- The RMT GND on the CO side is shown as a reference only and is not normally connected.
- Do not connect the incoming cable shield to the RMT GND.
- The unit is usually mounted with the Station side up, but may be mounted in any position EXCEPT with the Station side down, which is not recommended for the battery.

➤ To Install the POTS Standalone Unit Model 751222

1. Verify that you have the following customer provided 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 screwdrivers
   - Phillips screwdriver
   - 2.5 cm (1”) thick plywood backboard with appropriate mounting hardware
   - Cable clamps and mounting hardware for routing cables exterior to the shelf (quantity determined by the cable lengths involved)
2. Unpack the model 751222, the Power Supply piggyback (220W000021-401) and the installation hardware.
3. Check the contents of your POTS Standalone unit installation kit. For kit contents, see Table 4 on page 30.

Table 4: Installation Kit Contents for Model 751222

Item	Qty.	Part Number
AC PWR SUP CORD, 3 COND, 6 FT, GRAY	1	207-990000-020
CABLE, SHLD, SEALPIC, 6 PAIR, 22 AWG	10 FT	207-990000-138
DC CABLE, 3X18AWG, 300V, 60C, SJT PVC, BLACK	8 FT	207W000007-001
CON. CORD GRIP, HUB:1/2”, BLK	1	230-990400-036
CON. CORD GRIP, HUB:1/2”, BLK	1	230-990400-037
CON. CORD GRIP, HUB:1/2”, BLK	1	230-990400-038
HEX NUT, NYLON, 1/2-14NPT	3	714-990000-005
INSTRUCTION, STATION RELIEF:A	1	241-010016-001
SCREW, HEX W/WASHR, #14A X 1"L	4	724-990000-011
FASTENER, CABLE, NYLON,.75” DIA.	5	706-990000-010
FUSE, 2A, 250VAC, FAST-ACTING, 5X20mm (INPUT)	2	294W000010-001
FUSE, 6.3A, 250VAC, SLO-BLO, 5X20mm (BATTERY)	1	294W000050-001
TERMINAL, BLOCK,.200”, 2 TERM F	1	666-990000-086
TERMINAL, BLOCK,.200”, 3 TERM F	1	666-990000-071

4. Confirm that the isolation unit is a Model 751222 by identifying the name located inside the cover and the model number printed on a metallic label on the top right-hand portion of the unit.
5. Remove the unit's cover by unfastening the four screws located in each corner.

NOTE

- There are no jumper or switch settings on the telephone board.
- The Power Supply piggyback is NOT fastened to the main isolation card prior to shipment and requires installation.

6. Affix the three strain reliefs to the unit. To install the strain reliefs, refer to the installation instruction sheet supplied in the kit.
   - The strain reliefs supplied each have a cable entry diameter appropriate for one of the three cables used in this installation.
   - The CO cable strain relief is the largest, accommodating cable diameters from 0.40" to 0.56" (All measurements are outside cable diameters).

- The Station cable strain relief accepts cable diameters from 0.125" to 0.275".
- The Power cable strain relief accommodates cables with diameters of 0.25" to 0.40".

7. Fasten the 2.5cm (1") thick plywood backboard to the wall and mount the enclosure on it using the four #14A screws supplied.

NOTE

- The enclosure's Station side is the side connected to the external ground lug.
- The CO side has only one hole for the telephone cable entry.
- Mount the unit with the air vent facing the bottom or the left side. Do not put the vent on the right side (Station side at the bottom) as this would put the battery upside down and is not recommended.

8. If the unit is to be powered from 24 Vdc, then set the input jumper (W101) located near F101 on the Power Supply piggyback, to E104-E105. If the unit is powered from 48 Vdc, 130 Vdc or 120 Vac, jumper W101 should be between E105 - E106 (see Figure 3 on page 18).

NOTE

- If unit is powered from 48 Vdc, 130 Vdc or 120 Vac, it is NOT polarity sensitive. If the unit is powered from 24 Vdc, the unit IS polarity sensitive (see Table 5 on page 32 for proper polarity).

9. Run the Station telephone cable through the strain relief nearest the bottom of the enclosure to the connector TB501 (2 pins). DO NOT TERMINATE THE STATION CABLE TO THE TERMINATING EQUIPMENT YET.
10. Route the black SEALPIC CO cable, and the Station cable through their respective strain reliefs, allowing a length of 13 cm (5") per cable for the internal connections to the terminal blocks.
11. Cut the excess wire once the exact internal length is established and tighten the strain reliefs.
12. Strip back the outer jacket of each cable to a length of 2.5 cm (1").
13. Strip the inner insulating jacket of each conductor to a length of 3.2 mm (1/8”).

14. Connect these stripped conductors to the designated terminal locations. To locate the connectors, see Figure 6 on page 27. For a listing of terminal block connections, see Table 5 below.

Table 5: Terminal Block Connections

Cable	Signal	Color Coding	Connector Position
Station	Tip	Customer determined	TB1-T
	Ring	Customer determined	TB1-R
CO	Tip	Any of the available 12 conductors	TB1-T (CO side)
	Ring		TB1-R (CO side)
	Remote Ground		TB1-RMT GND (CO side)
Power	Live/"+"	White	TB1-1 (Station side)
	Ground*	Green	TB1-2 (Station side)
	Neutral/"-"	Black	TB1-3 (Station side)

* The ground lug is the preferred way of grounding the unit. Use the power cable ground only if no local ground is available.

If the ground lug is used, cut the green wire of the power cable.

15. Remove the screws and lock washers from the standoffs (spacers) mounted on the Station side of the telephone board and put them aside.
16. Position the Power Supply piggyback onto the spacers and align the board holes with the spacers (see Figure 3 on page 18).
17. Secure the Power Supply piggyback to the standoffs using the four screws and lock washers.

3.2 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.

18. Connect the ground cable inside the unit to the ground post TB3 of the Power Supply piggyback (see Figure 3 on page 18).
19. Connect the ground lug on the outside of the unit to station ground using a #6 AWG stranded wire.
20. Using the supplied cable connect the Power Supply piggyback's output connector TB2 to J1 on the telephone board underneath.

CAUTION

- Make sure that there are no excess wires dangling into the 14 cm (5- 1/4”) 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 power to the unit using one of the power cables provided in the kit. If powering the unit from 120 Vac, use the AC cable (with the three prong plug). If powering from DC (24 Vdc, 48 Vdc or 130 Vdc) use the unterminated cable. Refer to Table 5 on page 32 for connections.

NOTE

- MAKE SURE YOU HAVE SET THE INPUT JUMPER (W101) ON THE POWER SUPPLY CORRECTLY (see step 8 above).

22. 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.

NOTE

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

23. Power up the unit.
24. Observe the LEDs on the Power Supply (refer to Figure 3 on page 18). In normal operation the LEDs should illuminate as follows:
    - DS101 (Input LED) should be YELLOW if input power is correct.
    - DS201 (Low Battery LED) should be OFF.
    - DS1 (Output LED) should be GREEN if there is output power.
25. Verify the installation by making and receiving a call.
26. Close and secure the enclosure cover with the captive screws.

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.

3.3 Battery replacement procedure

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

3.3.1 3.3.1 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

3.3.2 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 17), 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 using step 24 in the installation procedure on page 34.
17. Reconnect the input power to the unit.
18. Close and secure the cover.

Appendix A

Acronyms

A 1 Acronyms

CO
Central Office

CMOS
Complementary Metal-Oxide Semiconductor

CPLD
Complex Programmable Logic Device

DC
Direct Current

DIP
Dual-Inline Package

ESD
Electrostatic Discharge

GPR
Ground Potential Rise

LED
Light Emitting Diode

PBX
Private Branch Exchange

POTS
Plain Old Telephone Service

SLIC
Subscriber Line Interface Circuit