POTS/Data Field Cabinet, 751231

Description and Installation

POSITRON

Positron Inc.

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CONFIDENTIALITY NOTICE

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.

TECHNICAL CUSTOMER SUPPORT

Should a problem arise, contact your customer support department. If the problem cannot be resolved by your support department or if you have any questions, contact Positron's Technical Customer Support department at 1-888-577-5254.

1. The POTS/Data Field Cabinet

The Plain Old Telephone Service (POTS)/Data Field Cabinet, model 751231, is a cabinet which contains the POTS/Data Unit (model 751232). The POTS/Data Unit is comprised of two Teleline isolation cards to provide high voltage isolation between:

- A POTS line and the drop side of one loop start telephone circuit. This circuit is protected by the PCB contained within model 751221, the Standalone Single Card Telephone unit.
- A dedicated four-wire data line and data transmitting/receiving equipment located inside the substation. This circuit is protected by the PCB contained within model 7501-53, the Standalone Four-wire Data Unit.

The POTS/Data Unit is mounted inside an isolator box that has terminal strips for the CO and station cable termination. This isolator box is then mounted inside a larger enclosure, the POTS/Data Field Cabinet. The Field Cabinet is NEMA-4 rated and has entrance holes for the Central Office (CO) and Station side cables. The inner isolator box and the Field Cabinet are molded from fiberglass, making them lightweight, flame-retardant containers of high dielectric strength. Their fiberglass bodies limit the possibility of many kinds of infiltration, while providing reliable isolation from external ground potentials. The POTS/Data Field Cabinet is designed to be installed in extreme environmental operating conditions.

The POTS/Data Field Cabinet features include:

- Communication is maintained across the gap by a low-loss, low-distortion isolation device for the data board, and by fiber optic links for the telephone board.
- The Field Cabinet is rated for outdoor installations, with ambient temperatures between -20°C to +65°C outside unit.
- The CO side loop back equipment can be safely installed in the cabinet (<8W power dissipation).
- The isolation cards inside the cabinet can be powered from -24 to -150V dc, or 120 V ac (with no batteries). Power is for POTS only; the four-wire data portion does not require power.
- The enclosures resist the infiltration of dust, mist, and water, given the proper installation and sealing of the access holes in the Field Cabinet.

For an interior view of the POTS/Data Field Cabinet, refer to Figure 1.

For a front and side view of the POTS/Data Field Cabinet, refer to Figure 2.

Figure 1 Model 751231 Interior View

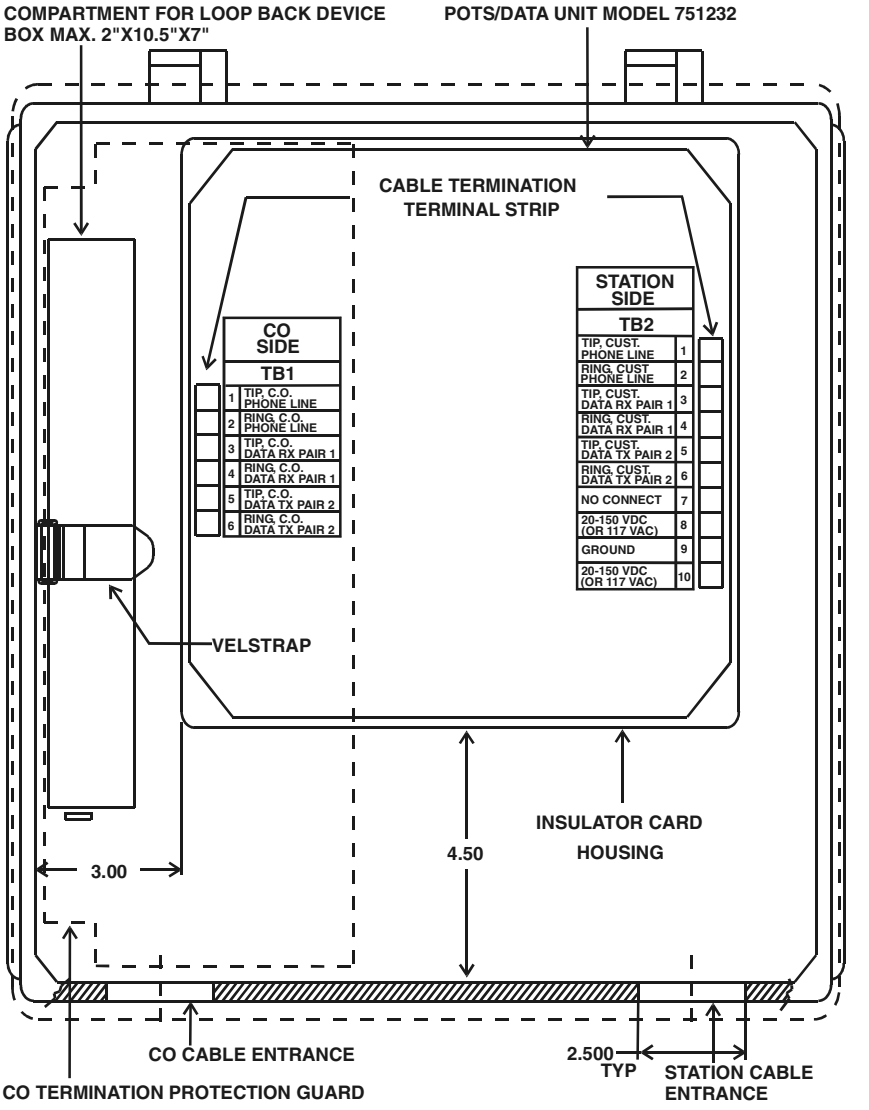
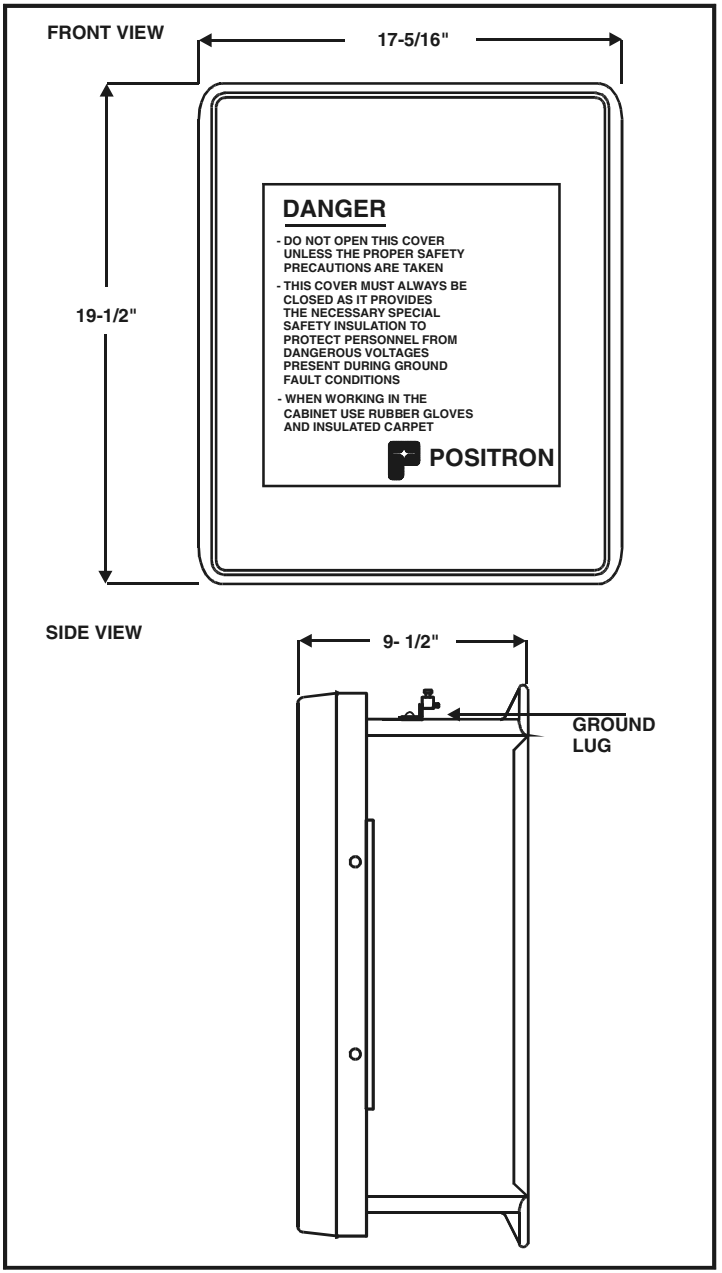


Figure 2 Model 751231 Front and Side View



2. Applications

The applications for the four-wire data portion of the POTS/Data Field Cabinet include the following:

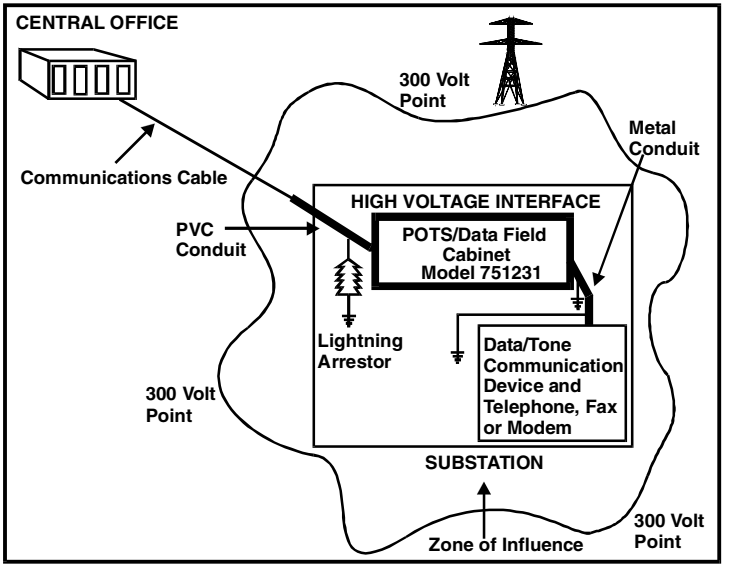
- Dedicated line modems
- Supervisory control and data acquisition (SCADA) systems
- Tone relay control systems
- Analog carrier systems
- Any other equipment using tone-related signalling
- Digital data service

The applications for the POTS portion of the POTS/Data Field Cabinet include the following:

- Loop start POTS
- Fax and Dial-up "smart" modems (up to 56.6 Kb modem, speed of 45.3Kb/s if line permits)
- Loop start private branch exchange (PBX)
- Dial-up remote meter reading

For an illustration of the cabinet's applications, refer to Figure 3.

Figure 3 High Voltage Interface Applications



3. Hardware Description

The POTS/Data Field Cabinet contains the printed circuit board (PCB) found within model 751221 and the PCB found within model 7501-53. Each of these PCBs is comprised of two sides. The Station side is located on the upper portion of the PCB and the CO side is located on the lower portion of the PCB. The Station side of the 7501-53 PCB is separated from the CO side by isolation transformers which create a 5¼ inch isolation gap.The Station side of the 751221 PCB is separated from the CO side by opto-isolators which create a 5¼ inch isolation gap.

For a view of the Standalone Four-wire Data Unit, model 7501-53 block diagram, refer to Figure 4.

For a view of the Standalone Single Card Telephone unit, model 751221 block diagram, refer to Figure 5.

Figure 4 Model 7501-53 Block Diagram

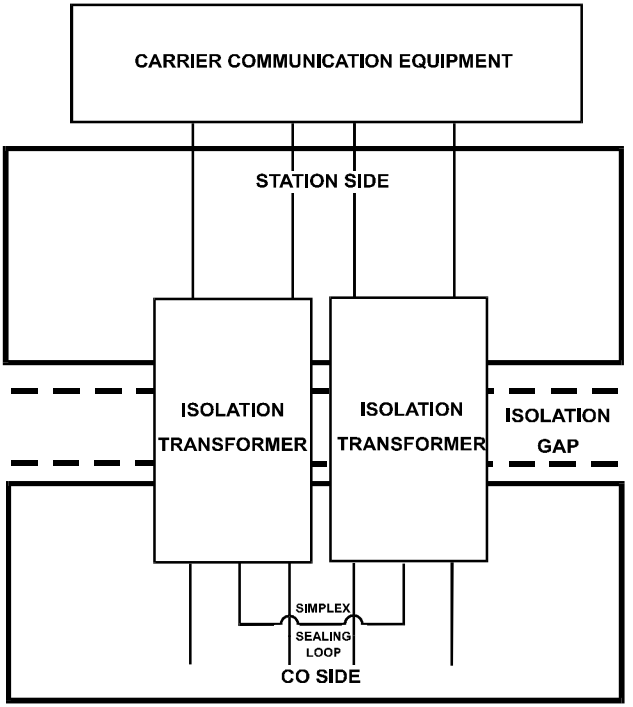
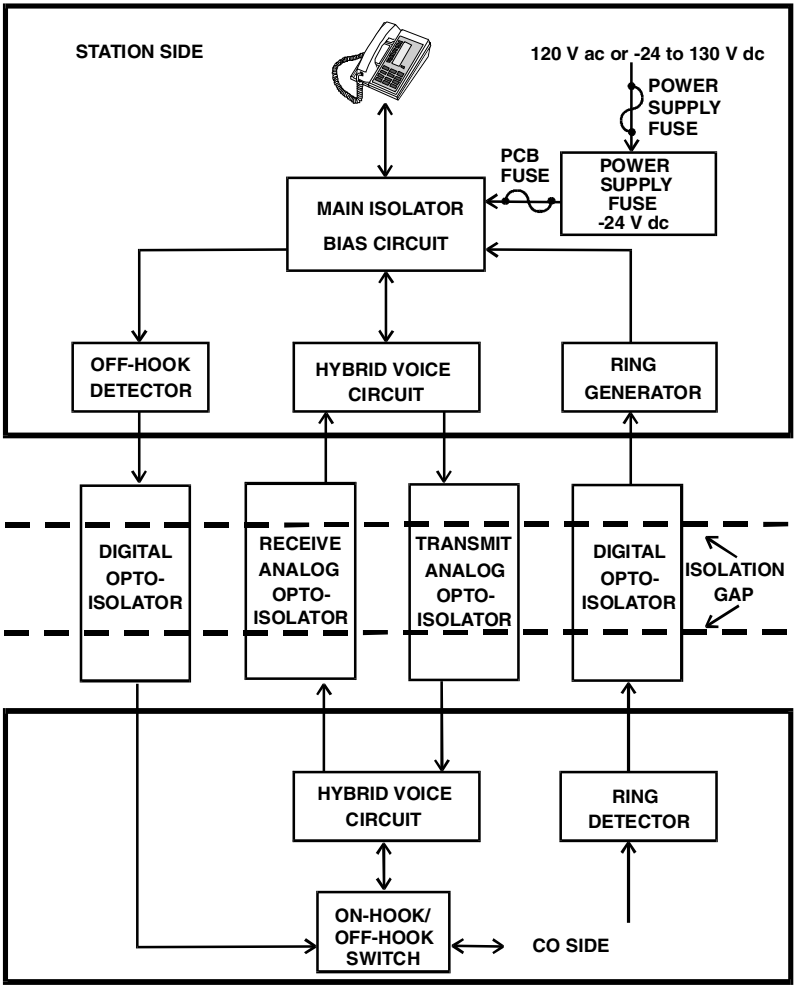


Figure 5 Model 751221 Block Diagram



Model 7501-53 Block Diagram Description

Isolation Transformers

The Isolation Transformers provide the 5¼ inch isolation gap for the card, and are transparent to a data signal that is transmitted bidirectionally.

Simplex Sealing Loop

The Simplex Sealing Loop current is allowed to flow across the pairs as a result of the center taps of the two transformers having been shorted together on the PCB.

Model 751221 Block Diagram Description

Hybrid Voice Circuits

The Hybrid Voice Circuits located on both the Station and CO sides of the card form a two-wire to four-wire to two-wire configuration that permits the separation of Transmit (TX) and Receive (RX) signals. These circuits also perform an impedance matching function such that the Station side impedance is reflected to the CO side. This renders the card effectively transparent for communication purposes.

Ring Detector

The Ring Detector is a bandpass filter centered about 20 Hz. It detects ringing signals and sends 40 Hz pulses to the ring generator on the Station side, via a digital opto-coupler.

Digital Opto-Isolators

Each Digital Opto-Isolator consists of a light emitting diode (LED) and a phototransistor pair, connected with a plastic fiber optic cable for isolation. They provide digital signal transmission across the isolation gap.

Transmit and Receive Analog Opto-Isolators

Each Transmit and Receive Analog Opto-Isolator employs feedback circuitry to “linearize” the behavior of their LED/photodiode pairs, thus providing for undistorted lightwave analog signal transmission across the air gap. Feedback also makes it possible to compensate for the aging of the LEDs, ensuring that the performance of the unit does not degrade over time.

Ring Generator

The Ring Generator receives 40 Hz pulses from the CO side and regenerates a ringing signal at the same frequency and synchronism as the CO side.

On-Hook/Off-Hook Switch

The On-Hook/Off-Hook Switch is a metal oxide semiconductor field effect transistor (MOSFET) current limiting circuit that is turned on by the off hook signal. When switched on, it permits modulation of the hybrid voice circuits.

Off-Hook Detector

The Off-Hook Detector transmits a signal to the CO side to go off-hook when the telephone is lifted.

Main Isolator Bias Circuit

The Main Isolator Bias Circuit generates the off-hook and ring trip signals, and feeds a -24 V dc (on-hook potential) bias to the Station side telephones.

Power Supply PCB

The Power Supply PCB accepts either 120 V ac or -24 to 130V dc, and provides -24 V dc to the Station side circuitry. It also keeps the onboard battery backup charged.

Fuse F1 and F2

Fuse F1 limits the power supply's input current in case of input power overvoltage or power supply circuit failure. Fuse F2 protects the power supply circuitry if the battery is reversed when connected.

4. Technical Specifications

For a listing of the electrical specifications for the POTS/Data Field Cabinet, four-wire data portion, refer to Table 1.

For a listing of the electrical specifications for the POTS/Data Field Cabinet, POTS portion, refer to Table 2.

For a listing of the physical specifications for the POTS/Data Field Cabinet, for both the four-wire data portion and the POTS portion, refer to Table 3.

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

Parameter	Specifications
ISOLATION DATA	
Isolation resistance	100 000 MΩ
Metallic surge	3 kV maximum
Insulation voltage	50 kVrms (70 kV peak)
INPUT VOLTAGE REQUIREMENT	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 900Ω	Better than 25 dB
Singing return loss at either side with opposite side terminated at 600 or 900Ω	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

Parameter	Specifications
Impulse noise	Less than 1 count above 48 dBrnc in 30 minutes
SIGNAL	
Insertion loss (@ 1000 Hz, 0 dBm)	< 0.4 dB
Frequency response (300 to 3400 Hz)	± 0.1 dB relative to 1000 Hz
Flatness	1 dB max from 50 Hz to 300 kHz
Rolloff	12 dB / octave from 400 kHz

Table 2 POTS Portion: Electrical Specifications (measured at 77°F or 25°C, 50% R.H.)

Parameter	Specifications
ISOLATION DATA	
Isolation resistance	100 000 MΩ
Metallic surge	3 kV maximum
Insulation voltage	50 kVrms (70 kV peak)
ON-HOOK	
Ringing generator voltage	> to 84 RMS with 5 ringers (type 500) at 20 Hz
CO side input ringing detection	50 V to105 Vrms, 17 to 50 Hz
Terminal resistance (CO side)	> to 5 MΩ at ± 100 V dc
Metallic impedance (CO side)	> 17 KΩ at 20 Hz; > 82 KΩ from Hz to 3.2 KHz
OFF-HOOK (40 mA dc)	
Minimum loop current (CO)	20 mA dc
Maximum loop current (CO)	Current limiting at 110 mA dc
Minimum loop current (station)	Will detect off-hook down to 20 mA
Maximum loop current (station)	Current limiting at 60 mA dc
Maximum loop resistance (station, 20 mA dc)	850 Ω maximum
Longitudinal balance (CO side)	> 80 dB @ 60 Hz; > 56 dB @ 4 KHz
Dial pulse distortion	< 1%, measured at 14 mA threshold (output duty cycle w.r.t. input duty cycle)
NOISE (off-hook), 40 mA dc)	
Impulse noise (both sides)	less than 1 count in 30 minutes above 48 dBrnC
Phase Jitter	< 0.5°, 300 to 3400 Hz
Common mode rejection ratio (from CO to Station side, terminated in 600 to 900Ω	> 80 dB, 300 to 3400 Hz

Parameter	Specifications
Noise (2 Hz to 100 Hz)	-60 dBm
Message circuit noise (quiet information)	< 5dBrnC
S/N ratio (C message filter)	50 dB at 0 dBm
SIGNAL	
Echo return loss (either side, opposite side terminated in 600 or 900 Ω)	Better than 23 dB
Singing return loss (either side, opposite terminated in 600 or 900 Ω)	Better than 14 dB
Insertion loss (at 0 dBm)	< 0.35 dB @ 1000 Hz
Frequency response (300 to 3400 Hz)	± 0.2 dB relative to 1000 Hz
Flatness	1 dB max from 100 to 10,000 Hz
Rolloff	12 dB/octave from 30 kHz
POWER SUPPLY	
Input voltage	120 V ac or -24 to 130 V dc (not polarity sensitive)
Input current with maximum load at: -24 V dc -48 V dc 130 V dc 120 V ac	 600 mA 300 mA 125 mA 150 mA rms

Table 3 Physical Specifications

Parameter	Specifications
Operating temperature range	-4°F to +131°F (-20°C to +65°C)
Height	19-1/2” (49.53 cm)
Width	17-5/16” (43.97 cm)
Depth	9-1/2” (24.13 cm)
Weight	30.8 lbs. (14 kg)

5. Installation

The POTS/Data Field Cabinet must be installed as close as possible to the CO cable's entrance point into the building.

Caution

- Stand on a thick rubber mat and wear rubber gloves during the installation procedure. 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.
- The isolation cards inside the POTS/Data Field Cabinet utilizes CMOS circuitry that can be damaged by static electricity. Observe normal CMOS handling procedures to avoid static discharge. Manipulate the unit exclusively in the box to prevent any damage to the card and to limit the possibility of electric shock. Failure to follow ESD precautions may void the warranty. For further information concerning ESD precautions, contact Positron's Customer Support department.

1. Verify that you have the following tools and hardware which are required to install the unit:

- Station cable
- CO cable (direct from CO)
- Electric drill with a 5/32" diameter bit
- 7/16", 9/16", 5/8" hex wrenches
- 1/8" and 1/4" common blade screw drivers
- Phillips screwdriver
- 1" thick plywood backboard (24" x 22") with appropriate mounting hardware
- Cable clamps, non metallic conduit, termination hardware (for 2.5" entry hole), and mounting hardware for routing cables exterior to the shelf (quantity determined by the cable lengths involved)
- Silicone sealant

2. Unpack the POTS/Data Field Cabinet unit and its installation hardware from its protective box.

3. Fasten the 1" thick plywood backboard to the wall, and mount the cabinet on it using the four screws supplied.

4. When installing the cabinet outdoors, non-metallic NEMA-4 conduit and connectors should be routed to both the CO and station entry holes. A weather-resistant sealant should be used when attaching the conduit to the cabinet, to maintain the NEMA-4 rating of the cabinet.
5. Route the two (2) telephone cables (CO and station) into the cabinet (allowing a length of 14" per cable for the internal connections to the terminal blocks). Cut the excess wire once the exact internal length is established.
6. To limit access to remote ground potentials, the CO side of the cabinet is fitted with a plexiglass covering (hinged). In order to access the CO side terminal strip, loosen the plexiglass captive screws on the left side and gently lift the cover.
7. Strip back the outer jacket of each cable by 3". Strip the inner insulating jacket of each conductor by 1/8". Connect these stripped conductors to the designated terminal locations. For a view of the terminal locations, refer to Figure 1.
8. Bundle any unused cable conductors with tie wraps, and maintain a 6" gap between CO and station cables at all times.
9. Connect the ground lug to station ground by using a #6 AWG stranded wire. Connect the ground connection on the station terminal strip using a #18 AWG stranded wire.
10. A compartment for CO power loop back equipment is located on the left side of the cabinet (under the plexiglass). This area can hold a device which measures no more than 2" x 10.5" x 7". A Velcro strap is provided to secure the loop back device in place. Standard loop back wiring instructions should be followed when using this device. The maximum allowable power dissipation of loop back equipment is 8W.

Note

Loop back equipment mounted in this area should not be powered from sources located in the substation.

11. Route the power cable into cabinet (proceed as per step 6).
12. Connect power to TB2 (unit is not polarity sensitive). The unit can also operate from 120 V ac, with no battery back-up.
13. Ensure that there are no excess wires dangling into the isolation gap between the Station and CO side circuits. Then close and secure the cover with the captive screws.
14. Close and secure the cover with the captive screws.
15. Verify the installation by applying the appropriate signals across the input isolator and check that they have been received.

- data signal for the four-wire portion
- loop start line for the POTS portion

6. Replacement of the Internal Unit

For a view of the removal and assembly instructions, refer to Figure 6.

Note

The ordering information, should the internal unit fail, is model 751232.

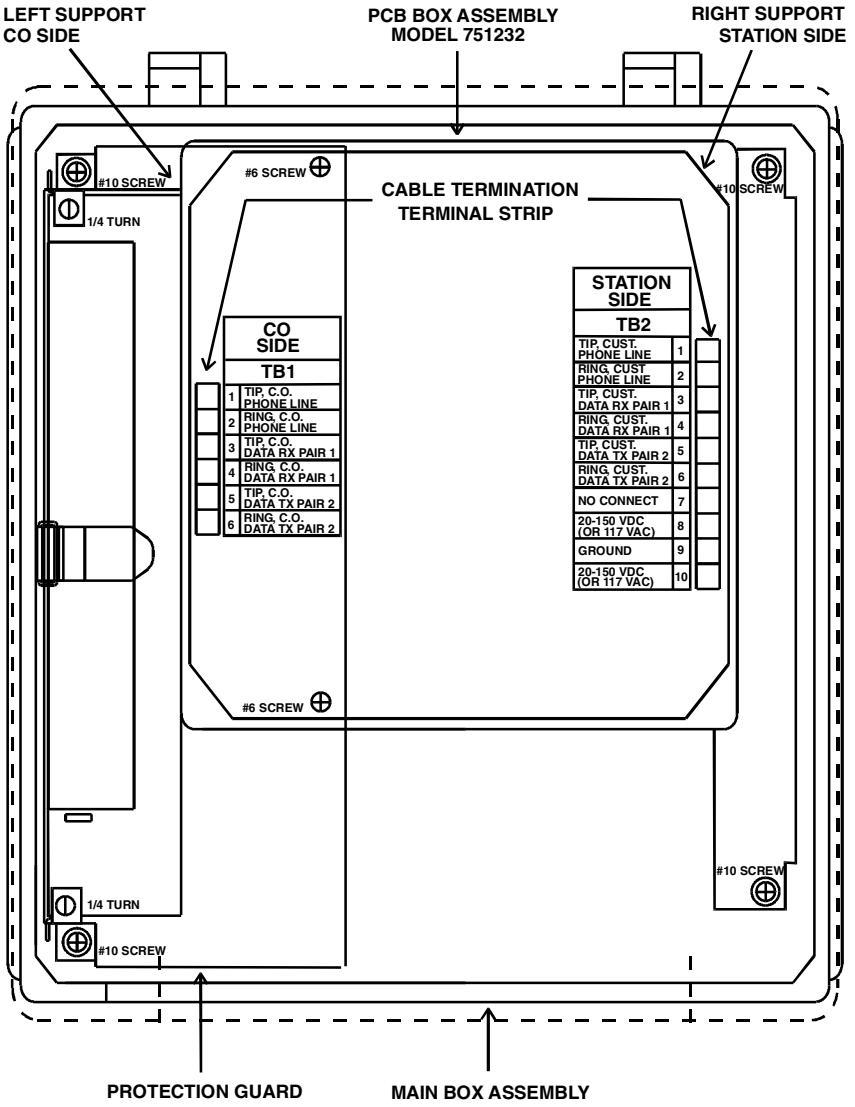
6.1 Removal Instructions

1. Open the main box cover.
2. Remove guard held by two #6 screws and two quarter-turns.
3. Disconnect all PCB box assembly connections.
4. Remove right support (Station side) held by two #10 screws.
5. Hold PCB box assembly while loosening left support (CO side) held by two #10 screws.
6. To remove PCB box assembly, slide it from below the left support towards the right.

6.2 Installation Instructions

1. Slide PCB box assembly below left support as shown in Figure 6. It will lock securely into place when fitted into the slots on the left and right supports. Ensure that the 751232 is oriented properly with the left CO side support.
2. Install right support on PCB box assembly flange using two #10 screws and lock washers, without tightening screws.
3. Check PCB box assembly position; then, tighten four #10 screws on supports.
4. Make all connections.
5. Install guard on PCB box assembly on spacer hinge using two #6 screws and lock washers.
6. Fix guard on left support using two quarter-turns.
7. Close main box cover.

Figure 6 POTS/Data Field Cabinet: Removal and Assembly Instructions



7. Service and Support

Technical Customer Support

Positron is committed to providing excellent ongoing technical support to its customers. A team of specialists is always available at our Technical Support Center in Montreal for either telephone consultations or on-site visits, to assist Field Technical personnel in the maintenance and troubleshooting of Positron equipment. During normal business hours, (8:30 a.m to 5:00 p.m. EST), any one of our Technical Customer Support (TCS) staff may be reached by dialing 1-888-577-5254 from anywhere in the continental United States or from Canada. Customers outside North America should dial 1-514-345-2200. Staff may also be contacted via fax at 514-345-2271 or e-mail at powerdivision@positron.qc.ca.

Positron TCS staff are available to provide technical assistance and/or to supervise the installation of Positron equipment. Assistance in the planning, configuration, and implementation of the installation will be provided as requested. Arrangements and pricing information regarding field assistance may be obtained by contacting the Technical Customer Support department. Please contact Positron for scheduling at least four weeks prior to the actual requested visit date.

Customer Training

Positron offers full customer training courses, as requested. Seminars are also available on High Voltage Interface (HVI). For more information, contact a customer representative by dialing 1-888-577-5254 or use our e-mail address, powerdivision@positron.qc.ca.

Warranty

Positron warrants that all equipment shall perform in accordance with Positron's specifications. The warranty remains valid for five (5) years from the date of shipment. The warranty will be honored provided that the equipment has not been abused and provided that the equipment has been installed and used in accordance with Positron's installation instructions and specifications. The warranty fully covers workmanship, materials and labor.

This warranty is in lieu of all other warranties, whether expressed or implied, including warranties of merchantability and fitness for a particular purpose. Positron guarantees that all equipment shall perform in accordance with Positron's specifications. Positron disclaims any warranty that Positron

equipment will meet customer requirements beyond the product specification. Positron disclaims any warranty that operations will be uninterrupted or error free.

Repair Service

Positron Inc. offers repair services by which customers can count on timely and quality repairs, regardless of customer location.

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

For information about out-of-warranty repairs, contact Positron's Repair department at 1-800-661-4911 (from anywhere in the continental United States or from Canada) or dial 514-345-2228. Due to the varied nature of repairs, no one time frame for turnaround can be guaranteed. However, average turnaround time is two weeks from date of receipt. In emergency situations, special arrangements can be made by contacting our Repair department. All repaired items are warranted for a period of 90 days. Bulk repairs (more than five items) will require additional processing time, therefore, please take this into consideration when requesting a Return Material Authorization (RMA) number.

Before returning any items to Positron for repair, warranty repair or replacement, call the Repair department to obtain an RMA number. Parts returned without RMA numbers cannot be accepted. The RMA number must always be clearly marked on all boxes and crates and on all shipping documents.

Items under warranty are to be shipped prepaid to Positron and will be returned prepaid to the customer. Items that are not under warranty are to be shipped prepaid to Positron and will be returned prepaid with freight charges included on the invoice. Positron cannot accept items shipped collect. A purchase order number is required for all repairs.

To accelerate the repair process, whenever possible, customers should include a report detailing the reason for return with the unit(s) being returned. 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 that the item(s) is properly packed to avoid further damage. Teleline Isolator cards should never be shipped while installed in a shelf; this will cause damage and will almost invariably extend the repair period.

Ordering Information

Positron's Teleline equipment can be ordered by telephone, facsimile, or by mail. All orders should be directed to the Positron Inside Sales department. Ordering by telephone, or facsimile will eliminate any delays arising from postal services. However, a hard copy purchase order is required as a confirmation. In addition to the model numbers of the items being ordered, the following information is required:

- Company name, contact name and telephone number
- Purchase order number
- "Ship To" address
- "Bill To" address
- Date required on site

All orders must be followed by a confirming order. Equipment will not be shipped until such confirmation is received.

For a list of our contact information, refer to Table 4.

Table 4 Positron Contact Information

Address	Positron Inc.
	5101 Buchan St.
	Montreal, Quebec, Canada
	H4P 2R9
Main telephone number	514-345-2200
Customer Service department telephone number	514-345-2200, 1-888-577-5254
General e-mail address	powerdivision@positron.qc.ca
Customer Service department fax number	514-345-2271
TCS department toll-free number	1-888-577-5254
TCS department fax number	514-345-2271
TCS department e-mail address	scarbonaro@positron.qc.ca
Repair department telephone numbers	514-345-2228 or 1-800-661-4911
Customer representative e-mail address	customerservicepower@positron.qc.ca