

Tranzeo EMC Labs Inc.  
#2 - 11720 Stewart Crescent  
Maple Ridge, BC  
Canada V2X 9E7

## **Tranzeo Surge Protection board**

09 September 2004

Report Number: TRL090904



Bruce Balston, EMC Lab Manager



Andrew Marles, Technical Writer

---

---

## 1 Introduction

This report describes the results of lightning simulation surge testing performed on the Tranzeo surge protection/POE adapter when used with the Tranzeo TR-3000, TR-4000 and TR-CPE product lines. The tests performed are in accordance with the International Standard IEC 61000-4-5 for surge immunity testing. This standard provides guidelines for test methods and range of recommended test levels for equipment immunity to unidirectional surges caused by overvoltage from switching and lightning transients. Direct lightning is not considered in this standard.

Where appropriate, open level test voltages and nonstandard test setups have been used.

In addition, this report shows that the surge protection product passes environmental resistance requirements.

### 1.1 Test Conditions

#### 1.1 EUT List

Manufacturer	Model	Description	Serial Number
Tranzeo Wireless Technologies Inc.	TR-SUR-001	Surge protection POE Adapter	EUT1
Tranzeo Wireless Technologies Inc.	TR-SUR-001	Surge protection POE Adapter	EUT2
Tranzeo Wireless Technologies Inc.	TR-SUR-001	Surge protection POE Adapter	EUT3

### 1.2 Test and Auxiliary equipment

Manufacturer	Model	Description	Serial Number	Cal Due Date
Thermo Keytek	CE Master	Waveform Generator	9610265	25-Feb-05
LR Technologies	SD-302	Environmental Chamber	8826	N/R

In addition, the following auxiliary equipment was used for performing the tests:

Manufacturer	Model	Description	S/N
Soyo	PW-930S	Laptop PC	6188
Pheenet	SW-05P	5 port switch	C0104260954
Toshiba	Satellite	Notebook PC	92043812P
Pheenet	SW-05P	5 port switch	C0104260954

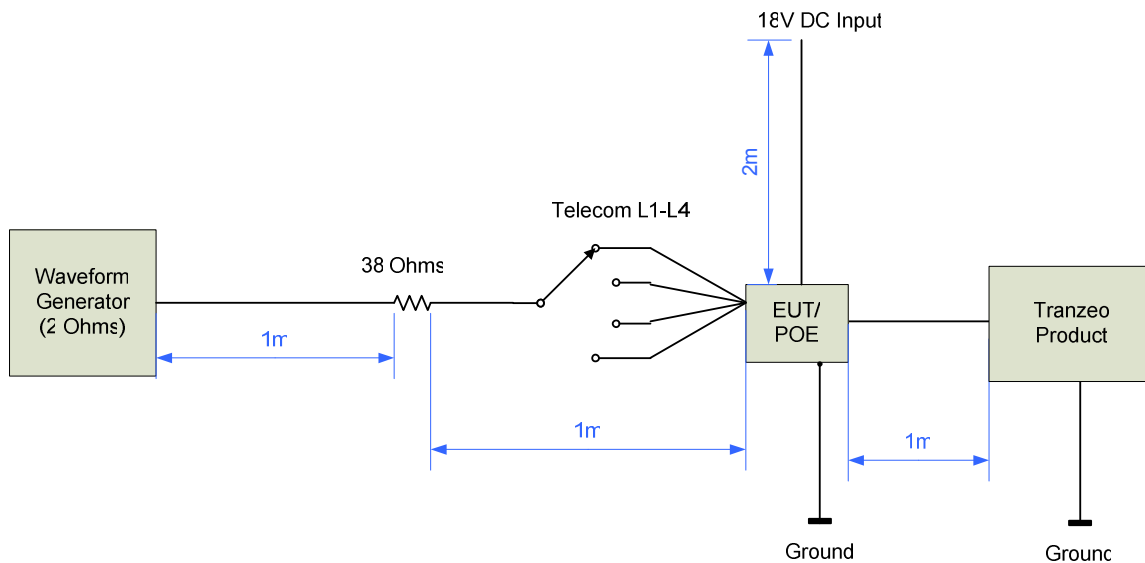
## 2 Telecom Port Surge Test

### 2.1 Test Standard

These tests are performed in accordance with International Standard IEC 61000-4-5. The specified maximum voltage level for this test is 1kV. All Tranzeo products have been tested to comply with this standard.

The surge protection POE adapter is tested to an open voltage standard of 2.25kV.

### 2.2 Test Set up



The surge protection POE adapter is located 0.8m above ground reference inside a 6m x 3m shielded enclosure, connected to AC mains through a CDN, and grounded to protective earth. Direct surge is applied to each of the 4 telecom lines in sequence, both positive and negative pulses. Voltage is increased in 250V increments from 1000V. Unit operation is confirmed through ping commands sent via the Ethernet port after each voltage increment and each successive line.

In accordance with IEC 61000-4-5, 40 Ohms of resistance are used when surge testing telecommunication ports.

## 2.3 Abbreviated Test results

### TR-4000, TR-3000 product family

Line	Source Impedance	Voltage	Source	Angle	Tests	Delay	Result
1	2 Ohm	2250V	Direct	Rnd	3	30s	ping confirmed
1	2 Ohm	-2250V	Direct	Rnd	3	30s	
2	2 Ohm	2250V	Direct	Rnd	3	30s	ping confirmed
2	2 Ohm	-2250V	Direct	Rnd	3	30s	
3	2 Ohm	2250V	Direct	Rnd	3	30s	ping confirmed
3	2 Ohm	-2250V	Direct	Rnd	3	30s	
4	2 Ohm	2250V	Direct	Rnd	3	30s	ping confirmed
4	2 Ohm	-2250V	Direct	Rnd	3	30s	

Note: Unprotected surge immunity established at 1 kV.

### TR-CPE

Line	Source Impedance	Voltage	Source	Angle	Tests	Delay	Result
1	2 Ohm	2250V	Direct	Rnd	3	30s	ping confirmed
1	2 Ohm	-2250V	Direct	Rnd	3	30s	
2	2 Ohm	2250V	Direct	Rnd	3	30s	ping confirmed
2	2 Ohm	-2250V	Direct	Rnd	3	30s	
3	2 Ohm	2250V	Direct	Rnd	3	30s	ping confirmed
3	2 Ohm	-2250V	Direct	Rnd	3	30s	
4	2 Ohm	2250V	Direct	Rnd	3	30s	ping confirmed
4	2 Ohm	-2250V	Direct	Rnd	3	30s	

Note: Unprotected surge immunity established at 1 kV,

**Ethernet Switch**

Line	Source Impedance	Voltage	Source	Angle	Tests	Delay	Result
1	2 Ohm	2250V	Direct	Rnd	3	30s	ping confirmed
1	2 Ohm	-2250V	Direct	Rnd	3	30s	
2	2 Ohm	2250V	Direct	Rnd	3	30s	ping confirmed
2	2 Ohm	-2250V	Direct	Rnd	3	30s	
3	2 Ohm	2250V	Direct	Rnd	3	30s	ping confirmed
3	2 Ohm	-2250V	Direct	Rnd	3	30s	
4	2 Ohm	2250V	Direct	Rnd	3	30s	ping confirmed
4	2 Ohm	-2250V	Direct	Rnd	3	30s	

Note: Unprotected surge immunity established at 1.5 kV,

**2.4 Conclusion**

When properly installed the surge protection POE adapter extends surge immunity of both Tranzeo products to 2.25 kV.

In addition, when properly installed the EUT protects host Ethernet hardware to 2.25 kV.

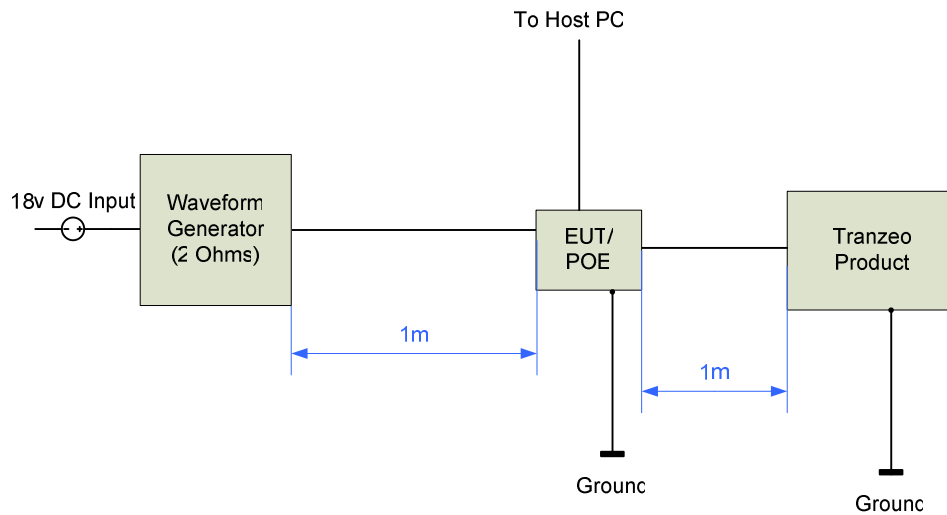
### 3 DC Line Surge

#### 3.1 Test Standard

These tests are performed in accordance with International Standard IEC 61000-4-5. The specified maximum voltage level for this test is 0.5kV. All Tranzeo products have been tested to comply with this standard.

The Tranzeo surge protection POE adapter is tested to an open voltage standard of 1kV.

#### 3.2 Test Setup



The surge protection POE adapter is located 0.8m above ground reference inside a 6m x 3m shielded enclosure, connected to DC mains through a CDN, and grounded to protective earth. Direct surge is applied to the DC main input, both positive and negative pulses. Voltage is increased in 250V increments from 500V. Unit operation is confirmed through ping commands sent from the Host PC throughout the test.

In accordance with IEC 61000-4-5, 2 Ohms of resistance are used when surge testing DC power ports. Due to different immunity characteristics of DC circuits compared to telecommunication lines, a different waveform is required.

### 3.3 Test Results

#### 3.3.1 TR-4000, TR-3000 product family

Line	Source Impedance	Voltage	Source	Angle	Tests	Delay	Result
1	2 Ohm	1000V	Direct	Rnd	3	30s	
1	2 Ohm	-1000V	Direct	Rnd	3	30s	ping confirmed

Note: Unprotected surge immunity established at 0.5 kV.

#### TR-CPE

Line	Source Impedance	Voltage	Source	Angle	Tests	Delay	Result
1	2 Ohm	1000V	Direct	Rnd	3	30s	
1	2 Ohm	-1000V	Direct	Rnd	3	30s	ping confirmed

Note: Unprotected surge immunity established at 0.5 kV.

### 3.4 Conclusion

The EUT extends surge immunity on the DC input to 1kV

*Note: If the applied surge exceeds 1kV destruction of the EUT may occur. In this case the DC power circuit will be disabled, however equipment on the DC circuit protected by the EUT will not be damaged.*

## 4 Distant Location Telecom Surge

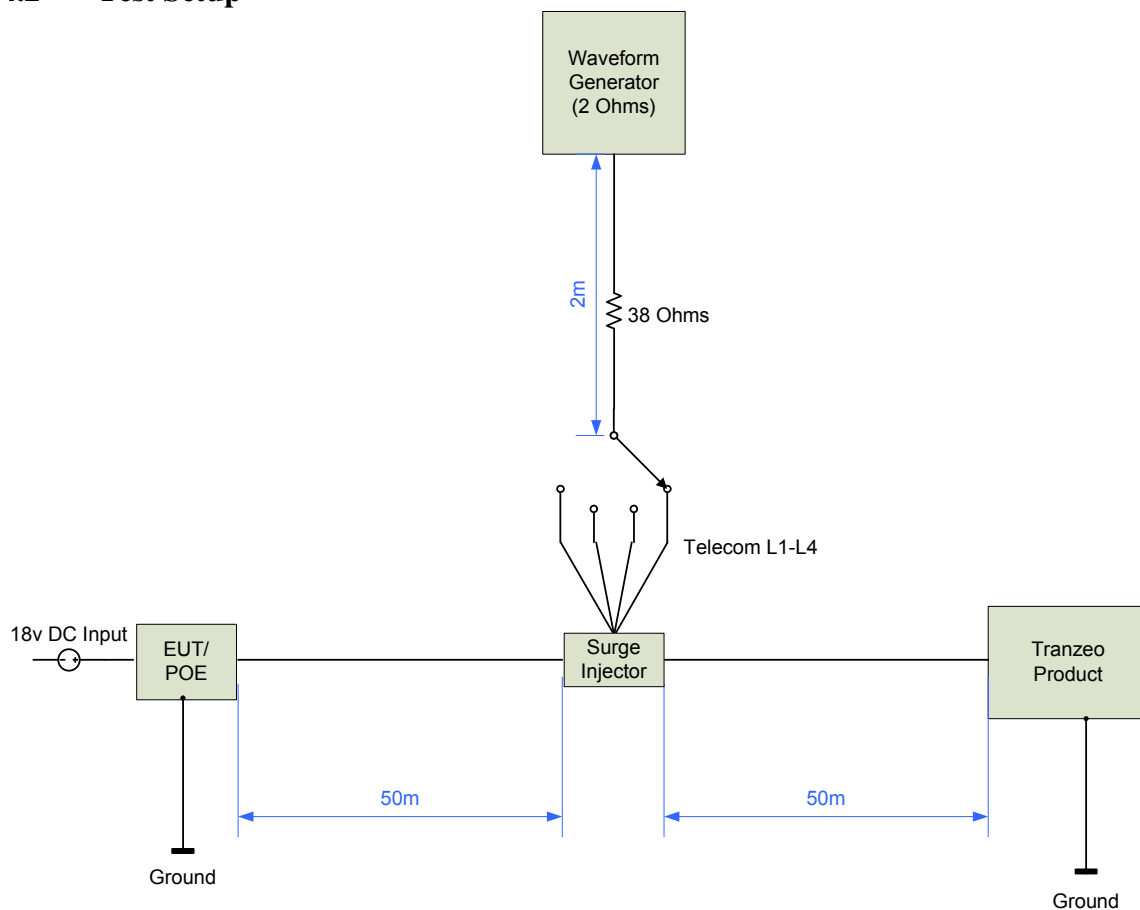
### 4.1 Test Standard

These tests are performed in accordance with International Standard IEC 61000-4-5. The specified maximum voltage level for this test is 1kV. All Tranzeo products have been tested to comply with this standard.

The surge protection POE adapter is tested to an open voltage standard of 2.25kV.

NOTE: The test setup is modified from the manufacturer's guidelines for product installation.

### 4.2 Test Setup



The surge protection POE adapter is located 0.8m above ground reference inside a 6m x 3m shielded enclosure, connected to AC mains through a CDN, and grounded to protective earth. The surge adapter is connected through 100m of CAT5 cable. Surge is injected via an injection box in 50m away from the surge adapter and the Tranzeo Product. Direct surge is applied to each of the 4 telecom lines in sequence, both positive and negative pulses. Voltage is increased in 250V increments from 1000V. Unit operation is confirmed through ping commands sent via the Ethernet port after each voltage increment and each successive line.



In accordance with IEC 61000-4-5, 40 Ohms of resistance are used when surge testing telecommunication ports.

### 4.3 Test results

#### TR-4000, TR-3000 product family

Line	Source Impedance	Voltage	Source	Angle	Tests	Delay	Result
1	2 Ohm	2000V	Direct	Rnd	3	30s	ping confirmed
1	2 Ohm	-2000V	Direct	Rnd	3	30s	
2	2 Ohm	2000V	Direct	Rnd	3	30s	ping confirmed
2	2 Ohm	-2000V	Direct	Rnd	3	30s	
3	2 Ohm	2000V	Direct	Rnd	3	30s	ping confirmed
3	2 Ohm	-2000V	Direct	Rnd	3	30s	
4	2 Ohm	2000V	Direct	Rnd	3	30s	ping confirmed
4	2 Ohm	-2000V	Direct	Rnd	3	30s	

Note: Unprotected surge immunity established at 1 kV.

#### TR-CPE

Line	Source Impedance	Voltage	Source	Angle	Tests	Delay	Result
1	2 Ohm	2250V	Direct	Rnd	3	30s	ping confirmed
1	2 Ohm	-2250V	Direct	Rnd	3	30s	
2	2 Ohm	2250V	Direct	Rnd	3	30s	ping confirmed
2	2 Ohm	-2250V	Direct	Rnd	3	30s	
3	2 Ohm	2250V	Direct	Rnd	3	30s	ping confirmed
3	2 Ohm	-2250V	Direct	Rnd	3	30s	
4	2 Ohm	2250V	Direct	Rnd	3	30s	ping confirmed
4	2 Ohm	-2250V	Direct	Rnd	3	30s	

Note: Unprotected surge immunity established at 1 kV.

### 4.4 Conclusion

The surge protection POE adapter offers a reduced level of immunity when located at the extreme end of the maximum allowable cable length.

## 5 EUT Ungrounded Surge

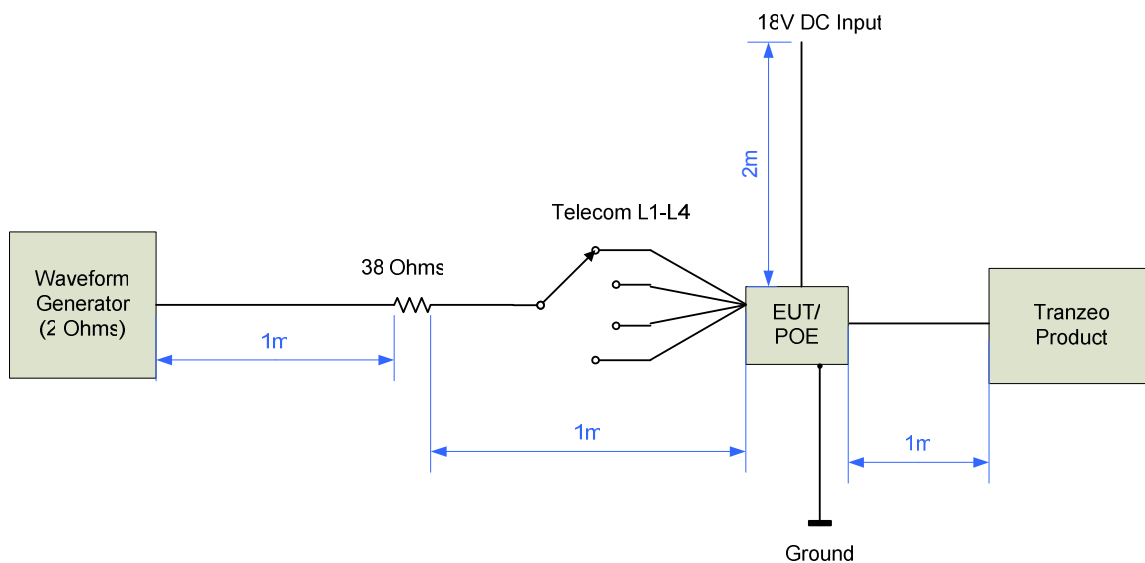
### 5.1 Test Standard

These tests are performed in accordance with International Standard IEC 61000-4-5. The specified maximum voltage level for this test is 1kV. All Tranzeo products have been tested to comply with this standard.

The Tranzeo surge protection POE adapter is tested to an open voltage standard of 2.25kV.

NOTE: The test setup has been modified from the manufacturer's guidelines for product installation.

### 5.2 Test Setup



The surge protection POE adapter is located 0.8m above ground reference inside a 6m x 3m shielded enclosure, connected to AC mains through a CDN, and grounded to protective earth. Direct surge is applied to each of the 4 telecom lines in sequence, both positive and negative pulses. Voltage is increased in 250V increments from 750V. Unit operation is confirmed through ping commands sent via the Ethernet port after each voltage increment and each successive line.

In accordance with IEC 61000-4-5, 40 Ohms of resistance are used when surge testing telecommunication ports.

NOTE: For this test the Tranzeo product is ungrounded.

### 5.3 Test Results

#### TR-4000, TR-3000 product family

Line	Source Impedance	Voltage	Source	Angle	Tests	Delay	Result
1	2 Ohm	1750V	Direct	Rnd	3	30s	ping confirmed
1	2 Ohm	-1750V	Direct	Rnd	3	30s	
2	2 Ohm	1750V	Direct	Rnd	3	30s	ping confirmed
2	2 Ohm	-1750V	Direct	Rnd	3	30s	
3	2 Ohm	1750V	Direct	Rnd	3	30s	ping confirmed
3	2 Ohm	-1750V	Direct	Rnd	3	30s	
4	2 Ohm	1750V	Direct	Rnd	3	30s	ping confirmed
4	2 Ohm	-1750V	Direct	Rnd	3	30s	

Note: Unprotected surge immunity established at 1 kV.

#### TR-CPE

Line	Source Impedance	Voltage	Source	Angle	Tests	Delay	Result
1	2 Ohm	2250V	Direct	Rnd	3	30s	ping confirmed
1	2 Ohm	-2250V	Direct	Rnd	3	30s	
2	2 Ohm	2250V	Direct	Rnd	3	30s	ping confirmed
2	2 Ohm	-2250V	Direct	Rnd	3	30s	
3	2 Ohm	2250V	Direct	Rnd	3	30s	ping confirmed
3	2 Ohm	-2250V	Direct	Rnd	3	30s	
4	2 Ohm	2250V	Direct	Rnd	3	30s	ping confirmed
4	2 Ohm	-2250V	Direct	Rnd	3	30s	

Note: Unprotected surge immunity established at 1 kV.

### 5.4 Conclusion

The surge protection POE adapter offers a reduced level of immunity when the associated product is ungrounded.

## 6 Environmental Testing

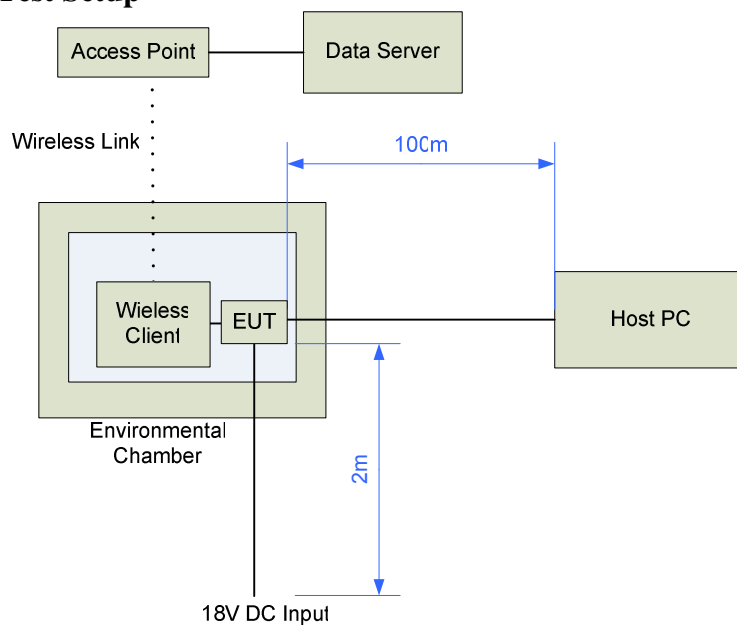
### 6.1 Test Standard

The surge protection POE adapter is subjected to a minimum of 24 hours of temperature fluctuations between  $\pm 50$  degrees Celsius on a four hour cycle. Both temperature extremes are maintained for at least one hour during the cycle.

Pass/Fail criteria is defined as:

Throughout the test, the POE adapter must maintain a 450 kbps data stream over wireless link between the auxiliary PC and the data server.

### 6.2 Test Setup



The surge protection POE adapter is located inside the environmental chamber and connected to the wireless client. It is connected to the host PC via Ethernet through 100m of Cat 5 cable. A wireless link is established to the data server and maintained throughout the test. The data rate, temperature, relative humidity and current drain are logged throughout the test period.

### 6.3 Test Results

Product	Test start time		Test end time		Data Stream
EUT3	10 Sep 04	0928	13 Sep 04	0945	PASS

### 6.4 Conclusion

The surge protection POE adapter achieves the required level of environmental resistance.

---

## 7 Conclusion

The Tranzeo surge protection POE adapter offers the following increased surge immunity characteristics:

- a) **When properly installed** the surge protection adapter extends telecom port surge resistance of Tranzeo products to 2.25 kV.
  - b) **When properly installed** the adapter protects host Ethernet hardware to 2.25 kV.
  - c) The surge protection adapter extends surge immunity on the DC input to 1kV. If the applied surge exceeds 1kV destruction of the POE adapter may occur. In this case the DC power circuit will be disabled. Equipment on the DC circuit protected by the POE will not be damaged.
  - d) The surge protection adapter offers a reduced level of immunity when located at the extreme end of the maximum allowable cable length.
  - e) The surge protection adapter offers a reduced level of immunity when the associated product is ungrounded.
  - f) The surge adapter achieves the required level of environmental resistance
-