TRANSTECTOR

Case Study

Significance of Surge Protection for Radios

smiths microwave

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Significance of Surge Protection for Radios

The Challenge

Long-term performance of wireless radio equipment, withstanding multiple surge events; requires operational functionality of equipment and non-degradation of data integrity and throughput.

The Solution

Dataline surge protection devices (SPD), engineered specifically to protect radio equipment from transients and other power anomalies; ensures a high level of service and minimized interruption of data delivery.

Background

A simple, effective surge protection device (SPD) ensures continued service, minimizing costly site repairs and lost revenue. If the SPD is not engineered to the correct specifications using appropriate technology, it may initially protect network devices. However, the SPD may compromise the integrity of data signals, causing intermittent communication issues.

A test environment clearly demonstrates how a properly engineered and installed SPD protects critical network equipment. Transtector evaluated a series of radios in a lab environment by subjecting the radio units to typical environmental transients. Engineers then recorded the test results.

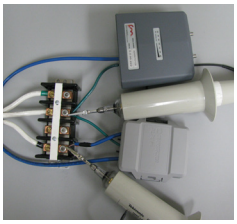
Setup, Tests and Results

Partnering with Fluidmesh, a manufacturer of outdoor wireless Ethernet radio equipment, Transtector tested multiple models of Fluidmesh radio equipment with and without a Transtector ALPU FIT data line surge protection device.

Setup

Step	Details

Initial Performance Check
 
DUT 1
 
DUT 2
	• Device Under Test (DUT)
	  • DUT 1: Fluidmesh FM-3200-ENDO radio
	  • DUT 2: Fluidmesh FM-4200-MOBI radio
	• Power and signal strength checked (Table 1)
	• Ensure throughput, continuity and absence of shorts
	• Functionality of Transtector ALPU-F140 SPD (Table 2) checked

Establish Test Parameter
 
Test Set Up
 
Setup 1 (No SPD)
 
Setup 2 (SPD)
	• Two test setup established for each radio model (DUT) and included:
	  • Setup 1: Each Fluidmesh radio model (DUT) was not protected (no SPD was connected in the setup)
	  • Setup 2: One ALPU-F140 dataline SPD connected to each Fluidmesh radio model (DUT)

Tests

Utilizing a 2 kV/1 kA 8/20 µs combination waveform, engineers initiated the surge test, performing a total of five strikes to the line one input of each radio unit and conducting visual observation of equipment during testing. Finally, engineers measured peak voltage after each surge.

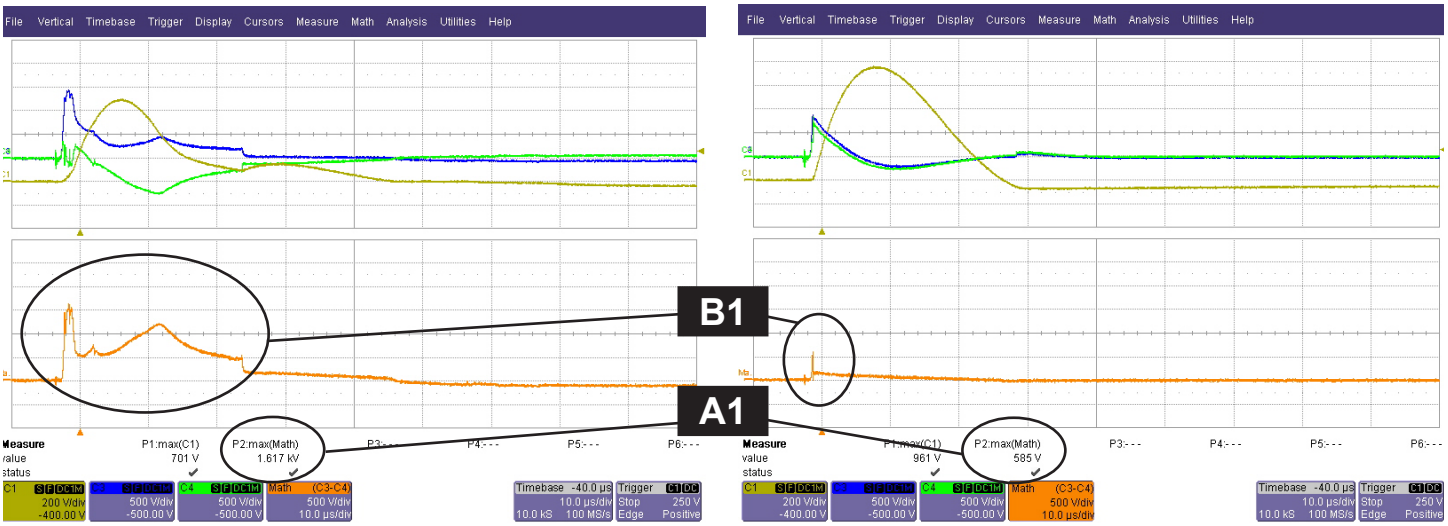
Results

Test results demonstrate signal responses to surge events on setup 1 and 2 captured with oscilloscope. In each setup the following test connections were made with an oscilloscope to enable accurate measurements.

- *Channel 1: Current probe indicates short-circuit waveform levels*
- *Channel 3 and Channel 4: Single ended probes enable differential measurement*
- *Math Function: (C3-C4) – Differential signal*

Result A (For Setup 1, DUT 1)

Result B (For Setup 2, DUT 1)



(Results shown are for Fluidmesh FM-3200-ENDO radio)

Result A	Result B
Differential signal (B1) shows significant length (duration) and amplitude (voltage levels) indicating surge events experienced by DUT	Differential Signal (B1) shows that the surge protector quickly clamped the voltage spike and resulted in short overvoltage duration for DUT
Math parameter that measures max voltage amplitude of 1.617 V injected to DUT in setup 1. Significant voltage is measured during surge event A1	Math parameter that measures max voltage amplitude of 585 V injected to DUT in setup 2. Amplitude is 760% lower. Surge event stabilizes quickly with low clamping voltage (A1)
Visual, audible and measurable arcing occurred during the surge event	Signs of arcing were not observed
Radio non-functional after a single surge event	Radio operating normally after multiple surge events

The radios subjected to testing with a Transtector ALPU FIT connected did not experience damage and were fully functional, while radios subjected to testing without a Transtector ALPU FIT were not functional, and did not transmit or receive data.

Testing on Fluidmesh FM-110M-HW, FM-1200V-HW and FM-3100M-ENDO radios without surge protection setup produced similar results, where the radios without protection setup were not functional after surge events. Comparatively, testing of the same models of radios with ALPU FIT surge protection connected to the radio eliminated arcing, and the radios were operational during post-test review. SPD reduced peak voltage measurements by 60%, with a maximum voltage of 609 V.

Additional post-test analysis of equipment at Fluidmesh facilities corroborated findings by the Transtector lab. Furthermore, testing of other radio brands (and other active transmission equipment) by Transtector engineers provided similar results – absence of SPD in the setup causes irreversible damage to DUT.

The Value of Transtector Surge Protection

Clearly, using the “right” surge protection device is essential to maintaining the integrity of network equipment, as well as ensuring the seamless delivery of data. In today’s networks, the value of data connecting is such that customer expectations for consistent service are higher than ever, and the vital information that networks carry at all times is indispensable to our world.

An expertly engineered SPD prevents degradation and/or destruction of equipment in event of transients or surges. To ensure consistent data connectivity while enduring multiple surge events, a properly installed surge protection device will guarantee:

- Data signal integrity (quality)
- Data throughput (speed)
- Equipment connectivity (services)

It’s critical to consider the following when selecting a surge protection device:

1. **Radio equipment manufacturers are experts in communication technology, and are often not aware of the technical requirements needed for appropriate surge protection.**

   Transtector Systems state of the art surge testing capabilities enable Transtector engineering teams to design, develop and test surge protection devices to meet network application requirements, which may not be available to radio OEM engineering teams.

2. **Users may believe a radio (or other active equipment) features integrated surge protection, but it's not likely to meet the high standards of a standalone SPD.**

   Only high-quality SPDs prevent equipment from being non-functional after multiple surge events. A radio may function after a single minor surge event, but over time and multiple events, equipment degradation and, ultimately, service interruption will occur. Not all SPDs are engineered to provide high data throughput and robust protection against surge events; choosing the right SPD technology for each application is a crucial step that helps to ensure long-term, reliable performance.

3. **SPDs help to improve total cost of ownership by preventing loss of functionality and unnecessary service expenses.**

   Radios can be replaced when damaged; however, if a radio stops functioning due to a surge, costs include:
   - Loss of service, resulting in loss of revenue and quality of service to customers
   - Service/repair call to the site
   - Replacement

Effective surge protection is a critical part of network topologies. This case study demonstrates how surge protection is effective in ensuring operability of communication networks.

Appendix

Table 1: Radio Power Up Test Results Prior to Surge

Serial Number	Power LED	Signal Strength LED
3200010104	ON	ON
3200010106	ON	ON
4200100054	ON	ON
4200100058	ON	ON

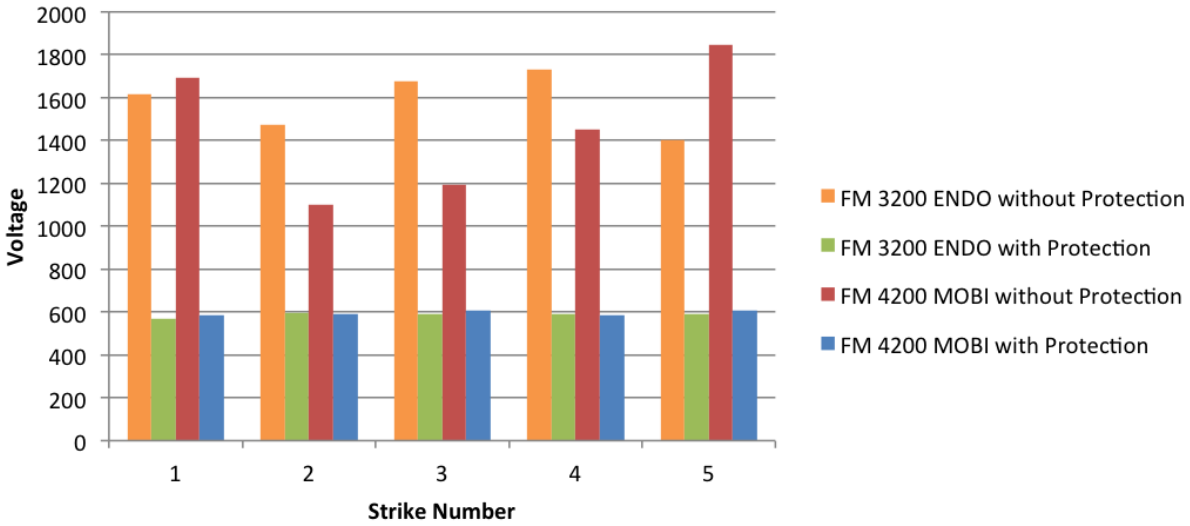
Table 2: Surge Protector Test Results Prior to Surge

Serial Number	1000 Mbps Throughput	Cont |Shorts / Vbr
TR2015000542845	PASS	PASS
TR2015000542846	PASS	PASS

Table 3: Test Equipment Used During Trial

Device	Manufacturer	Model	Serial Number	Calibration Due
Network Analyzer	Anritsu	MU909060A2	6201421500	11/06/16
Source Meter	Keithley	2410	4040811	03/31-17
8/20 Surge Generator	KeyTek	ECat E521	0106193	NA
Surge Generator Remote Controller	KeyTek	ECat Control Center	0106189	NA
Oscilloscope	LeCroy	WaveSurfer 24Xs	LCRY0310M20728	3/31/17
10X Probes	Tektronix	P6015A	B056742, B056743	3/31/17

Graph 1: Peak Voltage Comparison of DUT Setup 1 (without protection) **vs DUT Setup 2** (with protection)



The graph shows setup with protection consistently limits over voltage condition.