

Report On Surge Protection & Voltage Fluctuation

1. Introduction

Power is the greatest challenge for most installations in the developing world. Where there are electrical networks, they are often poorly controlled, fluctuate dramatically and are susceptible to lightning. Proper surge protection is critical to not only protect the wireless equipment, but all of the equipment connected to it. Power strips and power bars, by definition, don't have surge protection features, so "surge protector" is the proper term. A surge protector protects the computers and others electrical equipment's from the surges, spikes, and other fluctuations in electrical current. The fluctuations in electrical current are emerging problem of today which is causing the rapid problem to the wireless equipment and other electrical equipment installed in villages. Without a surge protector, an electrical surge or spike could destroy the electrical equipment and all of its components within nanoseconds.

Although most of the electrical equipment such as computers, UPS etc., today have some sort of built-in surge guard, it generally isn't sufficient for full protection, so it's good to install the effective surge protector. In this report we have discussed the few terms which we have to consider before buying or choosing, installing, and using a surge protector. And also discussed about the some sort of solutions of preventing the wireless equipment and other electrical equipment from the voltage fluctuation.

Before purchasing the surge protector of any brand we need to consider each unit's features, performance, longevity, manufacturer's reputation, and, of course, price. The surge protectors come in two main types:

1. MOVs (metal-oxide varistors)

MOVs have a series of tiny MOV disks that use semiconductors on each side to connect the hot wire to the grounding wire. When voltage increases, the MOVs lessen their resistance, and excess voltage passes through to the grounding wire. These are typically less expensive

2. Series mode

Series-mode surge protectors absorb excess voltage and then gradually let the current pass through the hot wire after the surge ends. In general, series-mode surge protectors have less inherent risk. These are more expensive compare to MOVs.

2. Before Purchasing the Surge Protector

The following points should be considered while making a purchase of surge protector.

1. Clamping voltage rating

Clamping level or also known as a suppressed-voltage rating is the maximum voltage an surge protector will let the equipment reach before it goes to work and sends electricity to the grounding line. The lower the clamping level, the better it is. The good recommend rating for a clamping level is of less than or equal to 330V.

2. Clamping response time

When a surge protector detects a power surge, it will take some time to respond and halt the surge this is called the clamping response time. The faster the surge protector can react, the more likely it is to protect electrical equipment connected to it. In theory, series-mode surge protectors respond immediately, so this tip only applies to choosing a MOVs surge protector with the fastest response time. Look for a surge protector that responds in less than one nanosecond.

3. Surge Current Rating

The surge current rating provides a relative measure of the surge protector's ability to withstand surge currents and is an indicator of the peak surge current that the device subassemblies and modules are designed to handle on a one-shot basis without failure. The higher rating provides assurance that the surge protector can withstand a number of smaller surges, each of which damages MOV grain boundaries by some amount, without experiencing complete failure of the surge protector. By this approach, the surge protector should have a longer life.

4. Joule rating

This is the amount of energy that the surge protector device can safely handle. A higher number indicates greater protection. Look for a protector that is at least rated at 200 to 400 joules. For better protection, look for a rating of 600 joules or more.

5. Guiding light

Good surge protectors typically include an indicator light or series of lights that shows the MOV is still working.

Beside above things some surge protectors may have coaxial cable surge protection, which will be more advantageous to us. Connect the incoming cable or broadband line to the input coaxial connector on the surge protector and then connect one end of a coaxial cable to the output coaxial connector on the surge protector and connect the other end to the input coaxial connector of the cable modem or other device which we want to protect.

Once we have purchased the surge protector for our device we need it to install properly to get the effective result. Setting up a surge protector is typically a fairly simple process although we need to consider following things while installing the surge protector devices.

- Plug the surge protector into a properly grounded outlet
- Place the surge protector where it's most convenient

I.e. basically we put surge protector on the floor, under the desk, and forget about it, like any other electronic device, a surge protector is sensitive to dirt, dust, water, and other elements that is why surge protector should be kept clean and dry.

Some of the MOVs surge protectors are:

- Pro8TV(<http://www.apcc.com>)
- Model TLP602

Here we have some detailed specification of surge protector device normally found in the local market of Nepal.

<u>Brand Name</u>	<u>Response Time</u>	<u>KVA rating</u>	<u>Joules rating</u>	<u>Others</u>	<u>Price</u>
Legrand	1-3 ns	5	-	Fuse system	Rs.6000
TOR	-	-	177-312 J	Fuse system	Rs.1450
Reyun	<25 ns	10	1.3 JV	Fuse system	Rs.1850
Hager	<25 ns	8	-	No fuse system	Rs.3500

Beside these we have also searched for the various brand of surge protector in internet around the world, some of them are listed below with specification.

WATTRONICS

This company provides various surge protection solution such as for electrical device, data/cable modem etc. some of its products with specifications are listed below:

1. VoIP GUARD

The Wattronics VOIP guard is designed to handle speed in excess of 100 Mbps fully duplex. Surge protection , RJ45 protection ,Available in a 24 port and 8 wire configuration, Transient protection.

GENERAL SPECIFICATIONS :

Normal Conditions:

Voltage rating (Max.) : +- 6.5Vp

Data Rate (Max.) - Duplexed : 100Mbps

Series Resistance (Max.) : <0.5

Earth leakage current : <0.5dB

Transient & Surge Conditions:

Voltage Withstand @ 1.2/50uS (Max.): >5kV

Current Withstand @ 8/20uS (Max.) : >5kA

Protection Levels (TYP) - L->L @ 8/20uS (Max.) : 10V

Protection Levels (TYP) : Line to Earth : 10V

Response Time : <5ns

2. Surge King

This is the 100% “switch-on” protection after a power failure, it prevent from different surge, spike, lightning and interference components. It has low voltage isolation (isolates at 180v), phase problem isolation, Line conditioning (noisy power supplies), High clamping voltage (above 400v), Low clamping voltage (above 275V), Lightning arresting Over-load protection, Internal thermal protection. In this all the appliances are always remain earthed.

GENERAL SPECIFICATIONS :

Shuttered 8-way multi-plug unit for safety and convenience

Isolator (L&N)

High voltage surge protection (L-N)

Low voltage protection (L-N, L-E, N-E)

Reaction time < 25 Ns

Line conditioning (L-N, L-E, N-E)

Internal thermal cut-out 100°C

Lowest clamping voltage 275v

Absorbs up to 16500Amps on L & N

Absorbs up to 13000 Amps on E

Circuitry rated at a nominal max of 15Amps at 230VAC 50 Hz

3. VOLT STABLE (single phase)

This single phase units are not effected by input frequency variations and can be used in most situations where voltage stabilization is required.it Includes a contact voltage regulator with small waveform distortion and High Efficiency ,High Power Factor with Fully automated ,Not effected by input frequency variations .

For the voltage fluctuation there are basically two way to protect the device, one is by using the Volt guard, it could be one as given above (VOLT STABLE) and other method is by using the switching circuit before the power supply to the electrical equipment.

1. Using fully automatic Volt guard

For this we can buy the volt guard from the market of various rating according to our need from various suppliers.

2. Switching circuit

This is the automatic circuit similar to the volt guard but performs differently than it, in this we use the switching system which will switch the whole system to the battery backup during the voltage fluctuation and re switched it to the normal line when the voltage is stable. For this we will prepare the circuit in our lab of Kathmandu University or we may find similar working circuit in the market. The basic working of the switching circuit is given below:

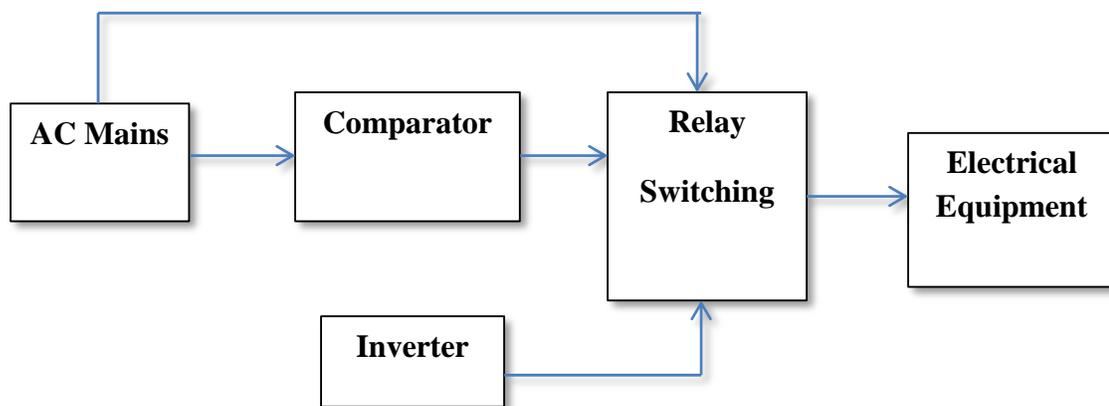


Fig: switching system