

### Bantam Revolutionary Technology

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The technology in the Bantam series of power filter/surge protectors developed by Leveler was awarded US and International patents because of its revolutionary concept and design. This overview will explain this technology, the value, and then provide links to additional analysis, third party evaluations, and user testimonials.

The patents were awarded to a revolutionary **circuit** that protects sensitive electronics from power pollution in the form of surge, spikes, swells, transients, ripple, and harmonics, while providing power factor correction; all in a surprising small package. This unique circuit filters and protects Line, Neutral and Ground without dumping power pollution to ground as older technology does. Instead harmful spikes, transient energy and harmonics are absorbed into inductors before being released back into the circuit as useful energy. Dumping to ground is a holdover from the days prior to digital technology. Today's technology needs to use ground as a voltage reference for digital components in addition to a required safety path for faults. Surges and spikes on ground will corrupt digital signals that use a zero ground voltage for reference.



Common consumer surge protectors and power filters use MOVs that divert sudden surges and spikes to the ground circuit. (Corrupting the ground reference) This simplistic traditional technology is sacrificial by design as the MOV can tolerate a limited number of surge-to-ground diversions before they become ineffective. After a handful of surge events, this technology will no longer divert damaging energy to ground, leaving connected electronics unprotected.

Filtering of continuous power pollution is generally accomplished with additional frequency specific power filter technology to augment the MOV surge protection. Since power filtering over a large frequency range is expensive, these traditional power filters cover a limited frequency in an effort to reduce cost.



The single Bantam circuit provides both surge protection and power filtering. It will outperform traditional surge technologies, absorb dangerous energy and purify power at less than half the cost of competitor's surge protection and filter technology, within a smaller form factor.

Modern device designers understand the dangers of power pollution and will also incorporate traditional protection into their product's circuits. The abundance of separate surge and filter products on the market attests to the lack of confidence in internal protection alone.

#### Surge and Transient Protection



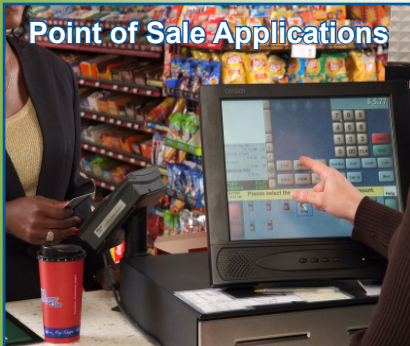
#### Surge and Transient Protection

The Bantam circuit was tested at 6000 volts, 3000 amps, and absorbed this energy over 1800 times in 24 hours without damage to protected electronics or loss of Bantam effectiveness.

- Protection from Lightning, Certified to UL1449, 3rd Edition
  - No delay in protection, Bantam is working at the inception of the surge.
  - Extreme Joules of energy will be delayed and absorbed.
- No power pollution is dumped to ground.
- The Bantam technology will delay Arc Flash Energy long enough to allow breakers to trip.
- Bantam does not use capacitors for surge diversion, unlike typical Series Mode suppressors.
- Bantam products using the Patented Circuit have a Lifetime Warranty

Energy Surges and spikes usually originate outside the wiring in your home or business. They are random, and represent less than 20% of the power anomalies equipment will experience. Lightning is an extreme example of an outside energy surge, but power spikes and surges caused by the starting and stopping of heavy equipment, motors, elevators, air-conditioners, and spa pumps originating in adjacent facilities are more common examples.

**Surge and Transient Protection**



Point of Sale Applications



Industrial Applications



Marine Applications

The technology in the Bantam will absorb these dangerous energy surges on Line, Neutral and Ground, then release the energy back into the circuit as safe usable energy. The circuit does not divert the energy pollution to ground where it can interfere with digital coding. (Which is why an isolated ground wire is often run from computers and sensitive electronics to an unpolluted earth ground.)

Bantam is a wave-shaping device, reducing the amplitude and stretching the wavelength of all non-fundamental frequencies. The technology is based on amperage and can be scaled to any energy level. Bantam technology is never sleeping, working at surge inception so there is zero delay in protection. Bantam does not affect 60Hz frequencies, but will increase filtering effectiveness as higher frequencies join the 60-cycle signal, absorbing unwanted energy and ensuring a clean unpolluted 60-cycle sine wave. Short duration, high-energy pulses like lightning, spike, surges, arc flash, and conducted EMP (not air bursts) are extreme energy events the Bantam circuit can delay and absorb, protecting the connected device.

MOV based products advertise their effectiveness using Joules as a proxy for how much energy can be dumped to ground before MOV failure. Joules of energy tolerance before failure is not a very useful measure because it only tells the consumer how much energy a MOV suppressor can tolerate, not how much energy the MOV let through to the protected device. The point of suppression protection is to keep harmful energy away from devices. A better measure is how much energy as measured in Surge Destructive Energy got through the SPD to the protected device, the **Surge Residual %**.

**Surge Destructive Energy**

$$SDE = \text{Volts (Pk-Pk)} \times \text{Amps (Pk-Pk)} \times \text{Time (microseconds)}$$

$$\text{Surge Residual Percent, SR (\%)} = \left( \frac{SDE_{\text{initial}} - SDE_{\text{suppressed}}}{SDE_{\text{initial}}} \right)$$

**Effective Surge Protection is a Surge Residual under 1%, keeping 99% of Destructive Energy from reaching protected devices.**

If you calculate the total possible Surge Destructive Energy of a 6,000 volt, 3,000 amp surge at 10 microseconds the result is 180,000,000 total Destructive Units. A true measure is to compare total possible SDE to the SDE that get through the Surge Protector to the protected device.

For a 10 microsecond burst, a typical MOV based suppressor will have a Surge Residual of about 7% of the total SDE. The other 93% was diverted to ground. When the MOV degrade and fail, so does the surge protector.

The Bantam will allow less than 0.5% of the total of the Surge Destructive Energy to reach the protected device. The remaining 99.8% of the damaging energy being absorbed and re-distributed as clean power, and not diverted to ground. The Bantam has been shown to mitigate over 1500 such events in 24 hours without damaging the protected device, and with no loss of Bantam effectiveness. **This is how you should measure protection.**

Because Bantam does not rely on MOVs, it has no Joules limitation and zero reaction time. The always active Bantam circuit senses a surge, delays and extends the energy wave absorbing the damaging energy, (does not dump to ground), and returns safe energy to the power system.

**Technical Papers**

- [Surge Destructive Energy to Measure Surge Protection.pdf](#)
- [Winterhaven Florida, City Manger Testimonial](#)
- [https://en.wikipedia.org/wiki/Surge\\_protector](https://en.wikipedia.org/wiki/Surge_protector)
- [DCIP \(Theater Projector\) Presentation.pdf](#)
- [Hospitality Solution-POS Case Study.pdf](#)
- [Arc Flash Test Results.ppt](#)



## Power Conditioning Harmonic Attenuation



PLC Process Controllers



Audio & Video Applications



Medical Equipment

## Power Conditioning • Harmonic Attenuation • EMI/RFI Filtering

The same Bantam circuit described on previous pages will also Condition, Attenuate, and Filter non-fundamental frequencies starting above 60Hz and going up to 1Ghz as reported by National Test Labs (NTS) in Huntsville AL and Plano TX.

- The Bantam filter technology is bi-directional
- Bantam provides up to 20dB of bi-directional common mode insertion loss up to 30MHz.
- Bantam provides up to 30dB of bi-directional Differential mode insertion loss up to 30MHz.
- Bantam provides up to 15dB of bi-directional Current Harmonic Suppression up to 10KHz.
- Bantam's 20dB suppression provides significant EMI/RFI suppression from 1MHz to 20MHz.

70% of power pollution is persistent and the result of power pollution from other electronics that are either on local shared home or business wall power circuits, or from wireless devices. This form of power pollution is usually generated within a home or business environment. With the abundance of electronic products plugged into the shared wall power circuits, harmful signals and frequencies are passed between devices like a cold or flu. Anywhere a device must switch one level of power to another level or turn off and on, errant signals and pulses are generated and pollute the common power connections. Switch Mode Power Supplies (SMPS) found in many digital devices are a common pollution source.

In addition, signals generated by wireless and Blue Tooth devices at various frequencies are a source of power pollution. (EMI/RFI) Power cords and wall wiring act like antennas and capture these numerous signals and conduct them to and from connected devices. The effect on the devices can range from video and audio interference to software malfunctions. "Software Glitches" get the blame, but power line pollution is usually the culprit.

In addition to degrading audio and video signals, polluted power laced with unwanted frequencies can generate heat in components and also rob the device of efficient operation. The result is a device that runs hotter, uses more energy than it should, and has a shorter operating life span. The Bantam technology will condition, filter, absorb, attenuate, or otherwise smooth the power curve so that only pure, clean, efficient energy reaches your electronic device or audio/video system, keeping it cooler and clearer.

Bantam technology is bi-directional, filtering power going from the wall through Bantam to a protected device, but also filtering the power returning to the wall from the protected device, helping to keep the shared wall power line clean.

The Bantam is a cost effective way to accomplish several methods of device protection and power conditioning in a single inexpensive solution. Bantam advantages:

- Improves battery charging efficiency
- Reduce system reboots
- Cooler device operation
- Lower power consumption
- Reduce process delays or hang-ups
- Reduce audio "hum" and video "flicker"
- Reduced data corruption
- Reduced component failure

### Technical Papers

*National Test Labs (NTS) Test Report PR043871-01 Rev-2 Sept 25, 2017.pdf*

*National Test Labs (NTS) Test Report PR070961-01 Rev-2 Jan 15, 2018.pdf*

*Energy Savings White Paper.pdf*

*Common Mode Protection-Leveler-2.pdf*

*Yahoo Presentation by Leveler.pptx (2013)*

*Leveler Audio-AV-Newsletter 2012.pdf*

*[http://en.wikipedia.org/wiki/Switched-mode\\_power\\_supply](http://en.wikipedia.org/wiki/Switched-mode_power_supply)*

*[http://en.wikipedia.org/wiki/Power\\_quality](http://en.wikipedia.org/wiki/Power_quality)*

*X-Box in Active Play, Before and After Bantam.pdf,*

*Power Grounding Audio & AV-Jim Brown.pdf*

## Filtering and Protecting Ground

### Filtering and Protecting Ground



The same Bantam circuit described above filters Ground in addition to Line and Neutral, ensuring a pollution free ground important to sensitive electronics and audio equipment.

- Bantam helps maintain a stable ground reference important to digital coding.
- Eliminates the need for expensive Isolated or Dedicated Grounds for computers.
- Bantam will block hackers from using ground signal infiltration.

Computers use a "stable ground reference" to distinguish ones from zeros in digital coding. Digital circuits compare the presumed zero voltage on the ground as a reference to differentiate the positive volts on line or neutral. As little as 0.1 volts (100mV) can pollute this ground reference. If a surge or spike of energy over 0.1V is traveling along the ground at the instant the code checks for a reference, 1s or 0s can be miss-interpreted. The more polluted power that dwells on the ground, the larger the chance for a code error. "Software Glitches" get the blame, but power pollution is usually the culprit.

Computer servers utilize isolated grounds (IG) for this very reason. Since the Bantam Technology also filters ground, plugging your computers and sensitive electronics into the Bantam can eliminate the need for an isolated wire running back to earth ground at the power service panel. Having an electrician install a dedicated ground is expensive and the quality of the earth ground at the panel is often suspect, especially if a grounding bar is used. A Bantam is less than a 10% the cost of a specially installed isolated ground.

Ground infiltration is a hacking method that uses ground to capture sensitive information or to deliver unwanted signals. The bi-directional nature of the Bantam technology filters ground signals leaving a device as well as unwanted signals trying to reach your device. No power pollution or sensitive signals in or out on Line, Neutral or Ground.

#### Technical papers

[http://en.wikipedia.org/wiki/Isolated\\_ground](http://en.wikipedia.org/wiki/Isolated_ground)

*Michael J's paper on Ground Infiltration*

<https://www.hackread.com/hacking-offline-computer-and-phone/>

## Improved Power Factor

The same Bantam circuit described above will also improve capacitive power factor by up to 30%, depending on the initial power factor level.

**Bantam will improve Power Factory by up to 30%, saving power.**

**Improved Power Factory will reduce stress on components and extend their life.**

Power factor is a term used to describe the efficiency of the sine wave power signal utilized by a device. Suffice it to say the closer the power factor is to 1, the more efficient the use of the power. Modern electronics strive for a power factor in the .90 to .98 range. Good power factor is hindered by either inductive or capacitive devices in the circuit. Since the Bantam technology is inductor based, it will counter-act any harmful capacitive influence, usually generated by digital electronics and SMPS. The Bantam technology does not counter-act inductive influences generated by motors and pumps.

#### Technical papers

*Leveler/Bantam Power Factor Advantage.pdf*

*X-Box in Active Play, Before and After Bantam.pdf*

[http://en.wikipedia.org/wiki/Power\\_factor](http://en.wikipedia.org/wiki/Power_factor)

*Energy Savings White Paper .pdf*







