



Application Note:

Home Medical Device Protection with Bantam Clean Power

Background

According to the IEEE, a respected independent, international body of engineers and researchers, radio frequency noise and other types of electrical pollution are on an accelerated growth rate in the American home due to notably, the proliferation of cell phones and the Internet of Things (IoT), especially those things using WiFi and other wireless communication. The copper electrical wires that distribute power throughout a typical home are also excellent antennae for absorbing all this noise. The absorption results in more than just a power signal flowing to medical devices like a vitals monitor, CPAP machine or a ventilator – there is also noise flowing through these critical devices. At minimum, this noise can be the cause of additional heat and also some fault conditions that are difficult to locate or troubleshoot. This type of noise blends with other variables and different times of day, locations or rooms of a house, and number and type of other appliances that may, or may not, be running.

Noise resulting from radio transmissions, however, is not the only threat to the reliability of home medical devices. Lightning strikes can cause tremendous amounts of energy to enter a home's electrical wiring in the blink of an eye, causing damage both immediately apparent and nefariously undetectable for days, months or years. Electric utilities suffer outages or implement brown-outs, both of which cause unexpected rushes of current and sudden increases of heat in any device found in a home, and especially sensitive electronics.

With all these electrical dangers either present or looming, or both, medical devices used in the home are in need of power protection of a unique kind. The only type of solution that has proven itself to eliminate the electrical harm imposed on home medical equipment is an all-wire, bi-directional conditioning product as found in Bantam Clean Power's patented portfolio.

Problems and Symptoms

Radio Frequency and transient electrical noise pollution abound in residential areas. IEEE researchers noted that while driving through certain neighborhoods as part of a research project, electrical noise at frequencies above 100MHz were at significant levels. Home healthcare medical devices can be quite vulnerable in the presence of these noisy conditions and may exhibit the following problems.

- Unpredictable lockups of the controller or screen;

- Inaccurate measurements of weight or volumes;
- Hotter or noisier than normal operation;
- Electrical noise being pushed back into the home from the medical device.

Generally speaking, the power supplies that are part of many home medical devices are standard, off-the-shelf commodity solutions that are meant to operate in nominal conditions. These power supplies are low-cost, and therefore do not contain any, or minimal, power conditioning and surge suppression components. The user manuals of most of these medical devices advise the user to supply some sort of surge suppressor or protective device. That is a clue that there is a gap, and therefore a need for electrical conditioning. The Bantam Clean Power Vanguard series is designed, tested and intended to fill this gap.

Product Options for Protection

The Bantam Clean Power Vanguard series offers the most complete power conditioning solution available for home health care devices. The Vanguard is available in three configurations, optimized for the home medical device provider and for the consumer.

Major highlights of the differences between the three available models.

- Vanguard PP3002B – 120V, 3 Amps, 2 outlets
- Vanguard PP3004A – 120V, 3 amp, 4 outlets
- Vanguard PP18004A – 120V, 15 amp, 4 outlets

Immediate benefits the Vanguard offers.

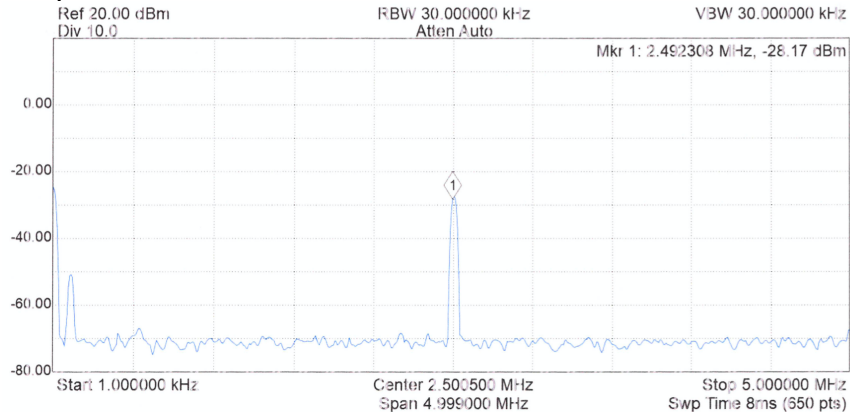
- A compact, noiseless, ventless design with a 6-foot long SJOW power cord
- Sturdy, widely-spaced and rotated outlets
- Tested and listed to UL 1449 Surge Protective Device and 1363 Relocatable Power Tap standards, which includes compliancy to UL 1283 EMI Filtering.
- Further independently tested under real-world application scenarios to continue operation during and after hundreds of surges while still powering the home medical device.
- At only 1.5 lbs, Vanguards can be mounted or located anywhere and be part of a portable stand or pedestal (e.g. infusion pumps, monitoring devices, etc.)
- Filters each incoming wire – line, neutral and ground – providing an electrically quiet and safe power supply for the device.
- Has a non-intrusive green power LED that indicates power is on at the outlets.
- Contains a supplementary thermal circuit breaker, that, if tripped, will cause the LED to be off and power removed from all outlets.
- Will not fail to protect connected healthcare devices in any poor power condition – from radio signal noise all the way up to a full-on lightning transient or power utility surge.

Product Performance

EMI/RFI and low-energy electrical noise filtration results.

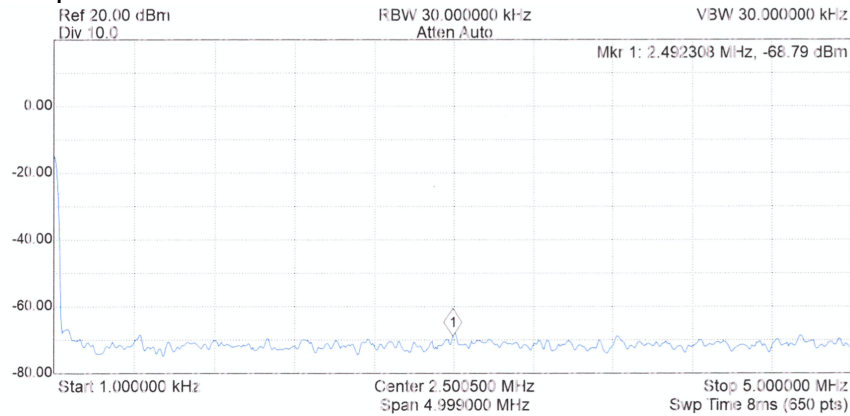
Filtration of commonly found noise is clear with the Bantam Clean Power Vanguard series. What follows are examples of the real-world noise found in homes throughout the U.S. and the results of Bantam Clean Power's filtering of that noise.

Graph A



In Graph A, a 2.5MHz noise signal (found at marker "1") is injected onto a clean power line and is visible in the center of the graph.

Graph B

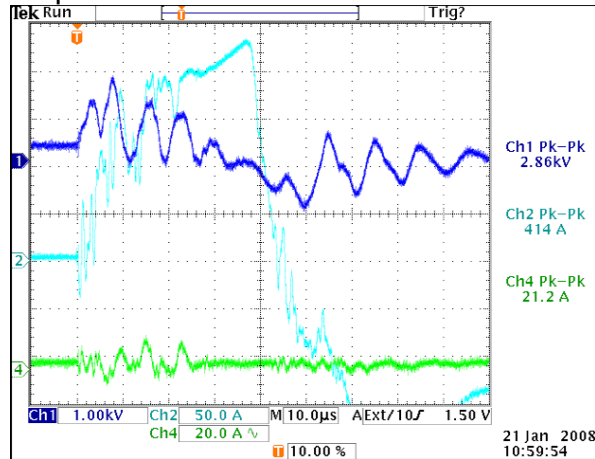


In Graph B, that same power line with the noise still being injected, is now measured on the output of a Vanguard PP18004A, showing the noise is eliminated (again found at marker "1").

High-Energy Lightning and Surge Performance

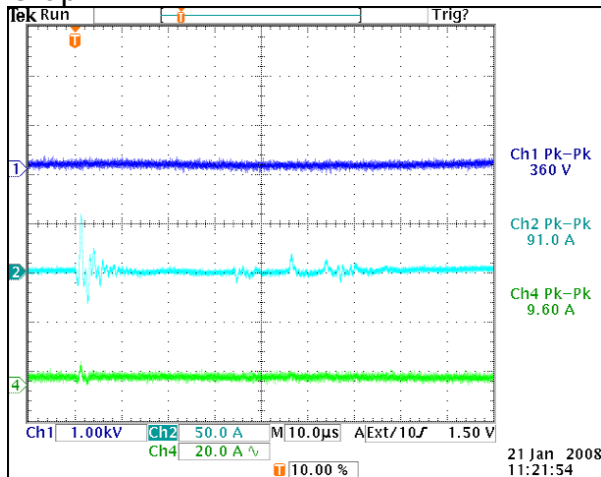
High-energy surges can originate from natural weather in the form of a transmitted lightning strike or from an equipment failure such as a blown utility transformer. No other solution on the market demonstrates the filtering capability of Bantam Clean Power Vanguard products.

Graph A



In Graph A, an incoming high-energy surge is observed. The dark blue line represents the Line and Neutral Voltage, the bright green line is current on the ground safety path. The blue/green line is the line current. All of these measurements occur between the wall outlet and the typical home medical device. From the moment of the surge at the "T" marker to the rightmost end of the graph, the home medical device experienced over 1.18kVA of surge energy, enough to destroy it during a time when it should only have experienced 120VA.

Graph B



On the other hand, Graph B illustrates the results of the same energy surge shown in Graph A, measured between a Bantam Clean Power Vanguard and the typical home medical device. The same three lines represent the same voltage and current setup as in Graph A - notice there are no changes to the scales of measurement located on the bottom left. Of special importance is the added protection of no surge energy on the ground path (bright green.) There should never be energy on this path unless the test device is experiencing a fault. Compare this result with the current on the ground path in Graph A. The home medical device in this test continued to operate without interruption or damage.

Synopsis

There is an increasing use of medical devices in the home for medical care and treatment because it offers the patient many benefits in terms of comfort, cost, and convenience. However, one trade-off is that the very robust and conditioned power infrastructure of a hospital or medical facility (which have very stringent electrical standards) is replaced with the not-so-strict electrical supply found in the typical home. Home medical devices are built and marketed at a lower price point than their hospital counterparts, so again, trade-offs in durability and noise tolerance are made. But the need for the care and service offered by these devices for the good of the person is no less important. Bantam Clean Power has recognized this gap in power protection and has undertaken intense research, development, testing and manufacturing to offer the market the best solution possible. Vanguard models are an easy to use and affordable to own or deploy. Bantam Clean Power has over twenty years of experience and trust in the marketplace, positioning it to be your premier partner in the home medical care industry.

Further Information

Source: <https://spectrum.ieee.org/electronic-noise-is-drowning-out-the-internet-of-things>

Keywords: electrical appliance noise; electrical noise; radio frequency noise;