Snubber Networks……. For Electronic Loads what they do and how they work by Executive Engineering February 26, 2004

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The basic purpose of a snubber is to absorb current flowing in wires or circuits in electronic networks. There second purpose is to stop arcing of electrical contacts. The third reason for using a snubber is to speed up the ring or response time of a circuit.

Here is where you start: What is the maximum current in the circuits. How much capacitance is required to dampen the current flowing in that circuit and at what speed do you want to be stable.

If you look at figure two in the schematic you will see typical values on snubbers circuits, in most cases customers want to stop the arcing of contacts or just speed up the setting time of a circuit. Snubbers help with this problem, they can increase the life of contacts many time over from what they would be without the networks.

The ideal conditions you are looking for is a 3 or 4 ring cycle going from overshoot to base line in some time period. That is the very best you are going to do with any pulse damping circuit. In some cases you may make the circuits worse by adding a snubber. The voltage overshoot may not be acceptable. In almost all cases you want none-inductive resistors and very low inductive capacitors for the best operation of the snubber circuit.

Remember that removing pulse energy is heat and that is what the snubber is doing. Never under size your components of a snubber circuit or the values may change over time. Capacitor voltages should be 10 times whatever you are checking, resistor voltages should be 8 times what you are checking and power should be 2 to 3 times what you think you need. If you follow these rules you will have a long life circuit that works well.

So how do you calculate these circuits well if you are a BSEE you might know a little about how to do this. From a lay persons point of view the best way is just experiment taking some guesses, in the end the engineer will also do the same thing so you are just cutting out the middle man. If you follow the values on the schematic, in most cases somewhere in that value set is the correct setting. You will also need an oscilloscope you cannot do this with a meter.

How to test your snubber. Connect the snubber across the electronic load and attach your oscilloscope to the high and low side of the snubber run your program or circuit make sure you are getting good reading. In the real world you will not get an ideal wave that rings down. You are going to get noise and other information in addition to the wave you are trying to optimize.

Something you may run into is an over damped wave, that is a wave that has 2 or less cycles of ring. This kind of wave is undesirable because it can cause a longer time in ring down than a 3 or 4 cycle wave and may have poor electrical qualities for stopping arcing of terminals. It is more desirable to have a 5 or 6 cycle wave than to have a 2 cycle wave.

Optimize your circuit for the smallest peak voltage over shoot and best looking waveform these are the qualities you want in a snubber circuit. By adjust your R's & C's you should be able to come up with an almost ideal waveform. This is not a quick process, it does take some time but the results are well worth it. Remember that burning terminals and contacts cost money and this is one of the few ways to stop or reduce that problem.

If you are using diodes or other clamping devices you will not get a full negative ring waveform, this is ok and will help in speeding up the dampening of the circuits current.

So what happens if you don't us a snubber on a terminal contact? The answer is this, you get an electrical arc and some plasma (burning metal) this is very small, you will also see pitting on the metal contact, that is the plasma the arc removed from the terminal. Every time the circuit is energized the same thing happens after hundreds or thousands of operation the contact fails.

All high speed electrical circuits have the same type problem, the energy that was flowing in the circuit comes to a stop and you have a buildup of energy at some point, if it's a lot of current then you have a lot of energy to dissipate. The snubbers are the current dissipaters of this current.