

Re: VFDs, Noise, and RS-485

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- *From:* Terry Given <my_name@xxxxxxxx>
 - *Date:* Thu, 28 Jul 2005 21:58:14 +1200
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Hi Joerg,

Joerg wrote:

Hello Phillip,

I'm definitely NOT an RF guy. I'm just a poor firmware coder who got hoodwinked into this VFD fiasco.

It's the other way around for me. I am an RF/analog/EMC guy who sometimes ends up digging through firmware, like when my usual tools found another bus contention and everybody thought it just can't be so. Then I probably feel a similar pain.

hear hear. I've had some hilarious hardware/software arguments too - me and the s/w guy basically saying "its your fault". Usually its s/w, perhaps 75% of the time - I suspect because its so easy to be careless with s/w, and so hard to spot (not looking is also the most common technique used for s/w peer reviews and testing).

That we can usually do calculations to prove the efficacy of our designs is a huge bonus to us, along with spice, design-rule checking etc. A whole host of reasons not to write firm/software.....

When you mention transformer isolation, you are suggesting that use one transformer at each end, correct? I'll try that tomorrow.

Yes, pretty much like Ethernet. It is important to wind them carefully and bifilar. Bifilar means twisting primary and

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secondary wires about two twists per inch and then winding them onto the core together. For signals in the MHz range I use toroids of #43 ferrite material and for stuff below a MHz mostly #77 material (Fair-Rite, bought via Amidon). The required number of turns increases with circuit impedance and with how low in frequency the signals can be. Use wire with a beefy insulation for better capacitive isolation. Not quite the stuff electricians use, maybe half the insulation thickness and much thinner wire.

Good quality LAN transformers can also work. But they would have to be from a reputable mfg such as Murata.

As far as current transformers... I think we tried using a current transformer and combined it with various types of LPFs. The problem we were having was that the DMM we were using would pick up the VFD noise. Noise Noise Noise! Argh!

As Terry said DMMs are not a good tool here. Their leads pick up noise, create loops and the internal circuitry of a DMM might not be designed to handle large electro-magnetic interference loads. If you have the time try the same with an old-fashioned analog meter. The really old kind, no battery and certainly no electronics in there.

In fact I had a DMM die on me after an RF susceptibility test and I was only blasting about 100 watts or so in an RF cell. It was a good name brand in a fancy holster, not some hobbyist version.

bugger. I havent killed a DMM yet, but I did have one of the leads on my fluke 87 break while I was testing a 50kW regenerative rectifier. Suddnely the sytem went bonkers, it took about half an hour to figure out my DMM was lying and that it all worked fine. Funny how we always assume the worst with complex things. Customers are like that too - if something is wrong it must the the drive, but is usually the wires :)

a few years back I did my limited electrical registration (allows me to fiddle with 3-ph fixed wired 400Vac doodads). The instructors were at pains to recommend test-measure-test with DMMs for exactly that reason, a strategy I immediately adopted. I fitted a relay to a VFD in a milking shed yesterday for the local sparky, who laughed at me when I did the TMT. But I'm still here.....

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we had a showering arc generator for EMC susceptibility, and every time we turned it on the R&D/production door swipe-card died, so all foot traffic had to go thru the power lab. The mfg eventually fixed it. The first time the SAG was powered up, the photocopier died too, so we bunged a line filter in front of it and that kept it alive. Phone conversations were tricky with the SAG on too :)

The SAG is a great little toy, easy to make, fun to use and highly destructive. Rather than using a coupling clamp, we attached a multimeter probe to the output, and probed directly to the I/O terminals. We could write our names on the alodised metalwork with the spark. One product I designed had no clamping on one input, just an 0603 cap. the SAG made the cap flash over, emitting bright flashes - caught a glimpse, turned the lights out and voila, weakness glows in the dark. BAV99 to the rescue....

If you're interested, I posted the PDF showing how to make one to abse.

Regards, Joerg

Cheers
Terry

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