

## Re: VFDs, Noise, and RS-485

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- *From:* Joerg <[notthisjoergsch@xxxxxxxxxxxxxxxxxxxxxxxxxxxx](mailto:notthisjoergsch@xxxxxxxxxxxxxxxxxxxxxxxxxxxx)>
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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.

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 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

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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.

Regards, Joerg

<http://www.analogconsultants.com>

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