Model Railroad Hobbyist

DCC IMPULSES

column

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Getting power to my DCC system

This is going to be a short column, as I have a feature article elsewhere in this issue. The reason for the other article is that, at the end of March, I completed the last items to qualify for the NMRA's Master Model Railroader recognition (#574).

This month we will talk about getting power to your DCC system. It can be as easy as plugging the power supply that comes with your system into the wall socket and running trains. DCC allows systems to become bigger and more complex. Added stuff can make for more stuff.

Power supplies

In my May 2012 column, ***Anatomy of a DCC System***, I discussed power supplies and transformers to get the power into your DCC system. Since then, transformer use has seriously diminished. I can see several reasons for this:

- Power supplies [1] can operate on any power line anywhere
- Power supplies [1] are lighter to ship than transformers
- Power supplies [1], unlike transformers, keep current surges away from the power lines

However, the focus of this column is supplying AC power to the transformer or power supply. I recommend a read of the column referenced above, if you are trying to size a power supply or transformer for your system.

A.C. power main needs

Lots of times I hear folks talking about a separate A.C. circuit for their DCC needs. For the most part that is not necessary. Lots of lights are more likely to need special A.C. runs than your DCC system.

1. The NCE SB5 as it is being sold in Australia by DCC Concepts. The power supply (box on the right) is the same worldwide, just the cord changes.

Robust wiring on the track bus is necessary to have the booster (or circuit breaker) to trip in the event of a short on the rails. This may involve wiring as big as 12 AWG for reliable shutdown operation.

Wiring this robust is not needed on the A.C. side. Let's do the math in a simple manner. If everything is 100% efficient and the DCC track voltage is 12 volts and the A.C. supply voltage is 120 volts, the current required from the A.C. side will be 10% of the DCC current (100% x 12 / 120).

In real world numbers, it is somewhere between 10% and 15%. If your 5-amp DCC set is supplying full power to the track, it will need about ½ to ¾ amp of A.C. power at 120 volts. In most of the world where the power mains are a nominal 240 volts, the current is half again or ¼ to ⅜ amp. This is similar to the power draw of a 60-watt bulb.

Folks think nothing of a floor lamp with three 60-watt bulbs in it. They turn one or two or all three on with impunity. They may even have two or three of these lamps on the same circuit. When each bulb comes on, that is roughly the same load on the power line as a DCC set going from zero output to full trip current.

Even the brute of DCC systems, the NCE Powerhouse system, rated at 10 amps, will draw less than 2 amps from the 120 volt A.C. line at full power and maximum voltage.

Surge protection

DCC command stations are basically computers. The decoders are computers, too. Sensitive electronics needs to be protected from surges on the power lines. While lightning is the most frequent cause, power surges can occur for many reasons.

The minimum protection, in my opinion, is a good quality surge protector strip plugged into a grounded outlet. If the outlet is not grounded the surge protection is diminished.

A better solution is to use an Uninterruptible Power Supply (UPS) as designed for home computers. Here's my story about that:

Early on in the history of Litchfield Station, we had a summer place in the mountains near Flagstaff, AZ. That locale gets a lot of thundershower activity in the summer. I was using a Digitrax DCS100 system on my workbench. I had the Digitrax system and my computer (and a shop light) plugged into the computer's UPS. One evening, I was programming a loco for a customer. There was a huge lightning strike -- the kind where you hear it before you see it. The house went dark except for the light in the workshop that was plugged into the UPS. It turns out that the strike hit the transformer on the pole outside our house, about 75 feet from where I was sitting. The transformer was so damaged that it failed about 12 hours later and the power company had to replace it.

None of the DCC or computer equipment was damaged. The decoder that I was programming during the strike was not even corrupted. I compared the decoder as programmed to what I was expecting and it was exactly the same.

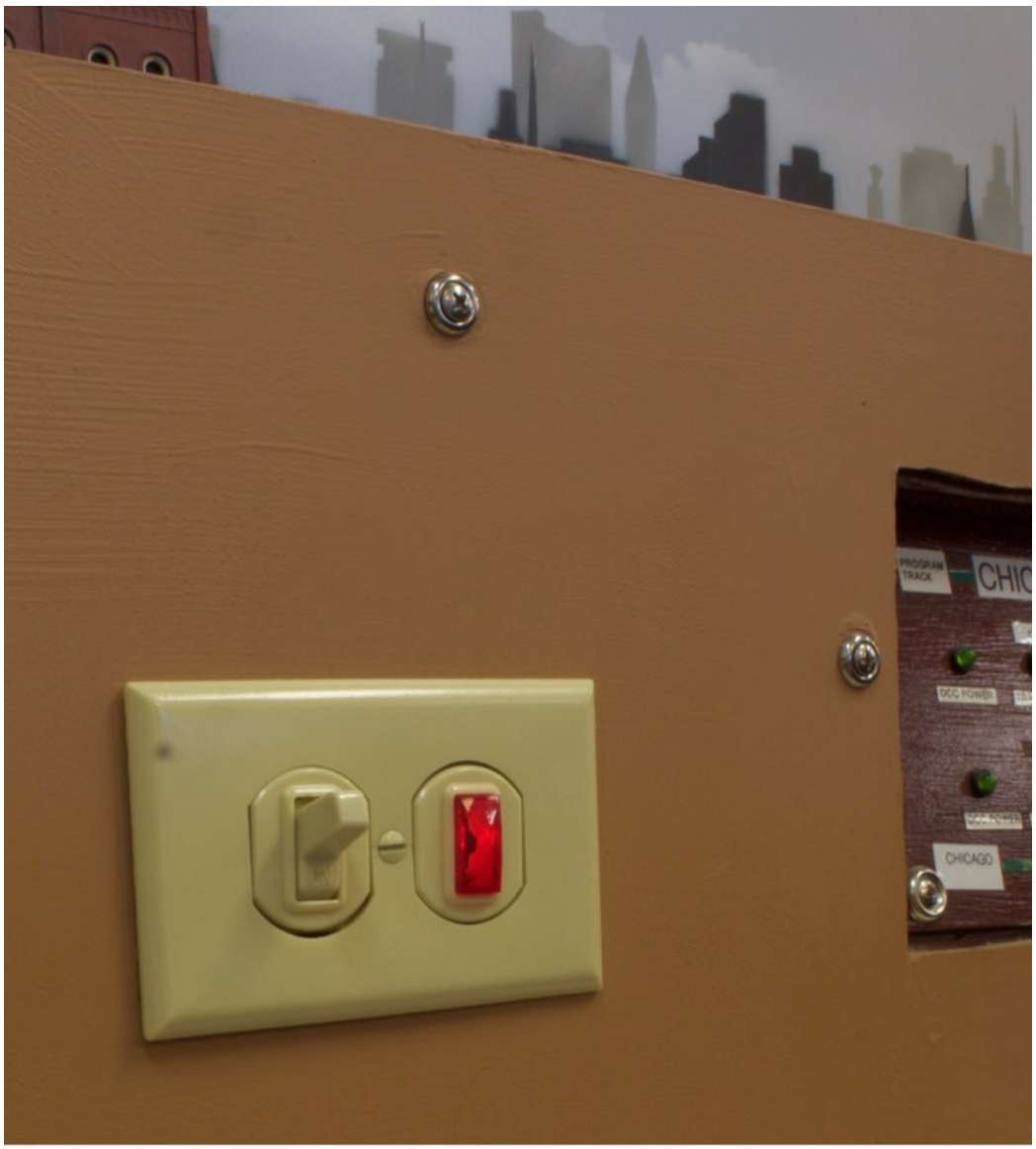
Since then, I use a UPS on all DCC setups and recommend the same to everyone. Be sure to use the connections labeled something like "battery plus surge protection."

"One switch" for everything DCC

It is nice to shut down your entire DCC system with one switch. That can be as simple as the power switch on the UPS. Or a power strip. It needs to be convenient but not too accessible. Don't want to shut things down unintentionally.

At the PebbleCreek Club, we have used a UPS for a decade now. But we want to be able to power up several boosters around the layout with one switch. So, we added a switch and an indicator [2] on the fascia.

2. Power switch and indicator light on the PCMRC layout



Throughout the layout there are outlet boxes wired back to this switch. The wiring uses Romex and meets local wiring codes for a 15-amp circuit. These boxes are the only 120 volt outlets attached to the benchwork. The rule is that you don't plug into the benchwork sockets with anything but DCC stuff. If I were to do it again, I'd use different colored plugs and plates (like the red used for medical), making it easier for folks to not forget. Alternatively, you can paint the sockets and the plates any color you choose, say, purple.

The input to the switch [2] comes from a UPS sitting on a shelf [3]. The Romex and plug were sized to allow them to be plugged into the wall socket in the event of a UPS failure.

3. UPS on the PCMRC layout. Plugged into the wall and feeding the layout switch [2] through the Romex and (yellow) plug.

I like this method better than the switched circuit around the room wired into the walls, as it allows distribution of surge-protected power on the layout.

So, here are this month's ideas:

- Rarely is a special A.C. circuit needed for the DCC system. Most circuits in the USA are rated 15- or 20-amps. Even a 15-amp circuit would power 20 or more 5 amp DCC systems simultaneously, as long as nothing else is connected.

- Use an UPS or, at the very minimum, a surge protector on the A.C. line coming to all DCC systems.

- Check building codes if you are going to run A.C. circuits through your layout.

Folks always seem to have additional ideas to share. Just click on the Reader Feedback icon at the beginning or the end of the column. While you are there, I encourage you to rate the column. “Awesome” is always appreciated. Thanks.

Until next month, I wish you green boards in all your endeavors.

