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DCC IMPULSES
column

Bruce Petrarca

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DCC stationary decoders ...

Mobile decoders are the first decoders that come to mind when folks talk DCC. They control the motor, lights, sound and animation in locos and other rolling stock.

One of the strengths of DCC comes with the use of stationary, or accessory, decoders. What are they and why do I care?

As one might infer from the name, stationary decoders [1] are part of the layout, not part of the rolling stock. They are most commonly used to control turnout motors. However, they also have uses in signaling and layout animation, where they may drive motors, LEDs, light bulbs, or even the room lights.

I'd like to thank Jim Scorse, the founder of NCE Corporation. When I mentioned to him my interest in doing a column like this, he sent me samples of his wide range of decoders. Thus, I can give you, my readers, firsthand knowledge and good photographs of the NCE products.

System compatibility

There are many manufacturers of stationary decoders. Some decoder manufacturers also make systems. Some don't. Like all NMRA-compliant DCC products, all DCC systems should work just fine with any stationary decoder, at least as far as the basics go: throw #1, close #1, etc.

If you are headed toward computer control of the layout, you will want units that are compatible with your control bus (Digitrax' LocoNet, or whatever you use).

In its simplest form, a stationary decoder will connect to the same DCC power sent to the track and then to one or more turnout motors. The DS44 [1] is a prime example. The DCC signal connects to the red and white wires on the right and four stall motors connect to the wires on the left. Starting from there, you get increasingly more

1. Stationary decoder: the Digitrax DS44 looks a lot like an HO mobile decoder, just with more wires. It handles four stall motors. Digitrax photo

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complex decoders with features like external power inputs and feedback to your DCC system.

Configuration

Most stationary decoders [2] come as an open board that needs to be mounted with standoff washers. I recommend non-conducting (nylon) washers to avoid any shorts on the board.

Activating a stationary decoder

Most DCC systems offer throttles that can control

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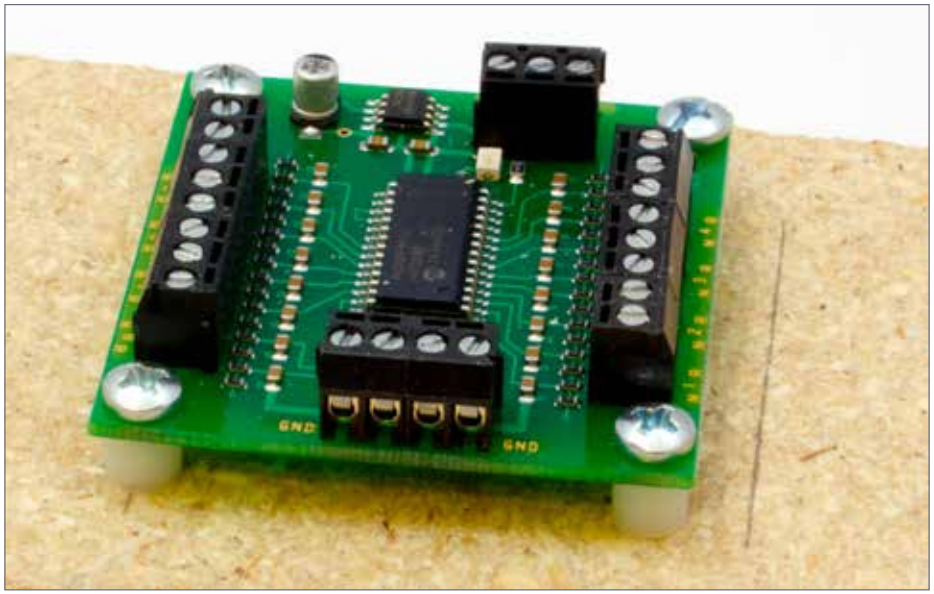
stationary decoders and some that can't. Virtually all high-end throttles will do so. Many of the low end throttles won't. In many systems, the only throttles that support stationary decoders are also the ones that provide programming and consisting. So you need to decide who will be allowed to use these potentially dangerous throttles.

It is possible to control stationary decoders from switches on the fascia or elsewhere. One of the simplest ways to do this is to connect pushbuttons or double-throw center-off toggle switches to the NCE Button Board [2]. This innovative board connects to the NCE Switch 8 [6] with just three wires, allowing direct operation of the turnouts connected to the decoder.

Some decoders, such as the Digitrax DS64 [3] will control turnouts, send feedback to the DCC system and allow connection of



2. NCE Button Board mounted to particle board using #6 x ¾ screws and nylon standoffs.

3. Digitrax DS64 has it all. It will work with any turnout motor except a servo, accepts fascia switch inputs and provides LocoNet feedback. Digitrax photo

fascia switches to operate the turnouts. Finally, a computer connected to the DCC system can automate moving turnouts.

Addresses

Stationary decoders have addresses just like mobile decoders. Don't worry about conflicts or short or long addresses. An address of 1 stationary is a different address than 1 mobile or 0001 mobile. So, use stationary addresses as best suits your layout.

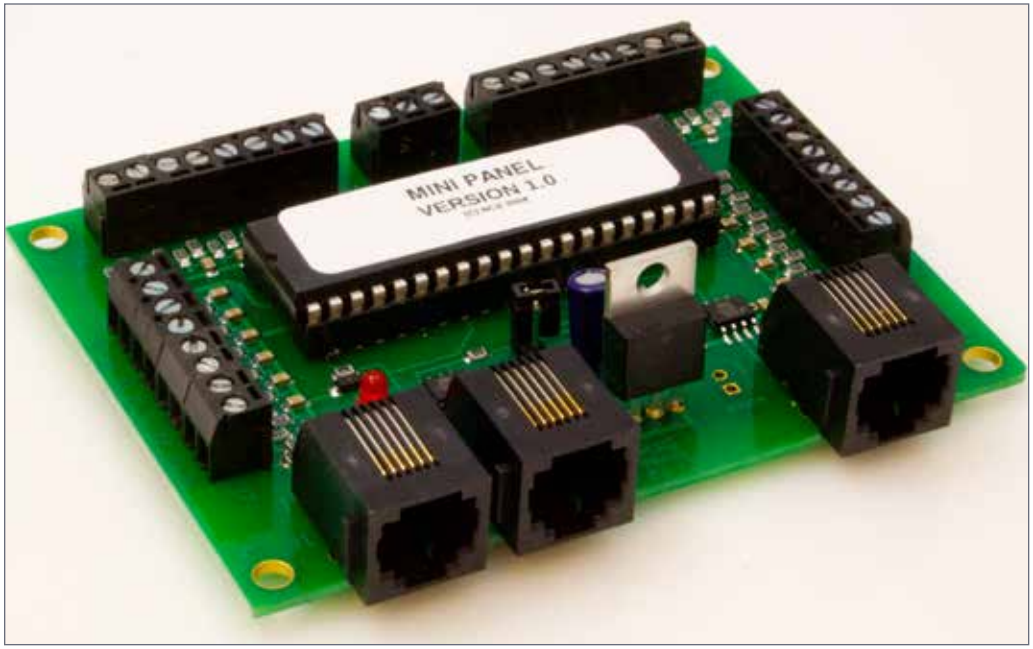
The stationary addresses can be in the range from 1 to over 2000. Be aware that some decoders don't support addresses over 1024 or so.

The most popular method of deciding addresses is to start around the layout and number the turnouts sequentially. Some folks use very small numbers for mainline turnouts and then use three-digit addresses for yards, restarting the numbering within the yard with a different significant digit.

If you got lost in that explanation, here's an example: the mainline turnouts might be 50, 51 . . . 99, while the main yard would be 101, 102 . . . 199 and the next yard 201, 202 . . . 299. This leaves the desirable single digit and low double-digit addresses for macros.

Macros and routes

Now that I brought it up, I had better explain it. "Macro" is shorthand frequently used in the world of computers. It comes from the Greek for "long." The actual term is "macro instruction."



4. The NCE Mini-Panel is one way to create routes or other macros.

What it really refers to is a single instruction that will cause the system to execute many more instructions. Using macros in DCC requires a command station or other controller, like NCE's Mini-Panel [4], which supports routes or macros.

NCE's Mini-Panel is a small board [4] that connects to NCE's cab bus. It is fully functional with NCE systems and partially functional with the older Wangrow systems. Routes or other sequences of commands are stored in non-volatile memory, so that they will stay available even when the power is off. The Mini-Panel can also connect to up to 30 switches or block detectors. When a command is received, from a switch, block

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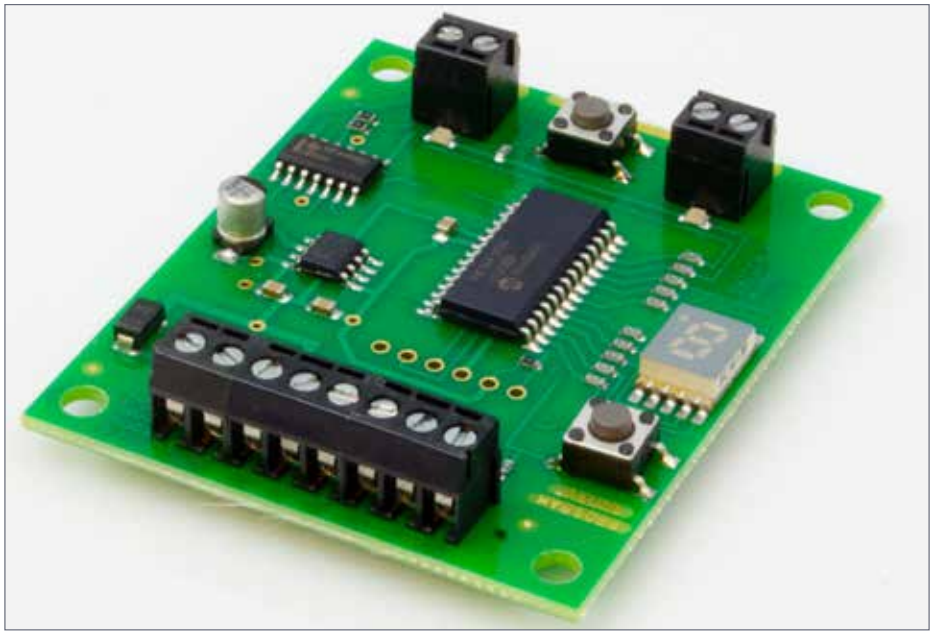
detector or a cab, the Mini-Panel sends out the appropriate commands through the NCE system.

One of the most frequent uses of macros is to create "routes." The user decides that when he selects route 1, for example, he wants to be routed from the yard entrance to the loco service area. This is accomplished by telling the controller what route you wish to be assigned to address 1. For example: turnout 201, thrown; 202, closed: 203, closed, etc. This programming is done once during layout construction, not for each operating session, thankfully. Now, when you are approaching the yard, you issue a command of "throw 1" and the route is set to the loco service area for you.



5. NCE's Switch-It MK2 decoder for two stall motors.

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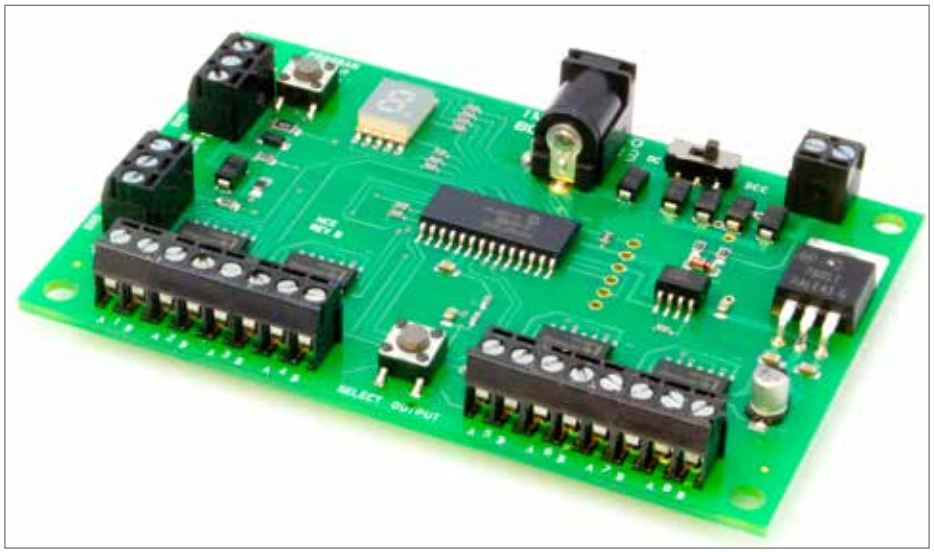
Types of turnout motors controlled

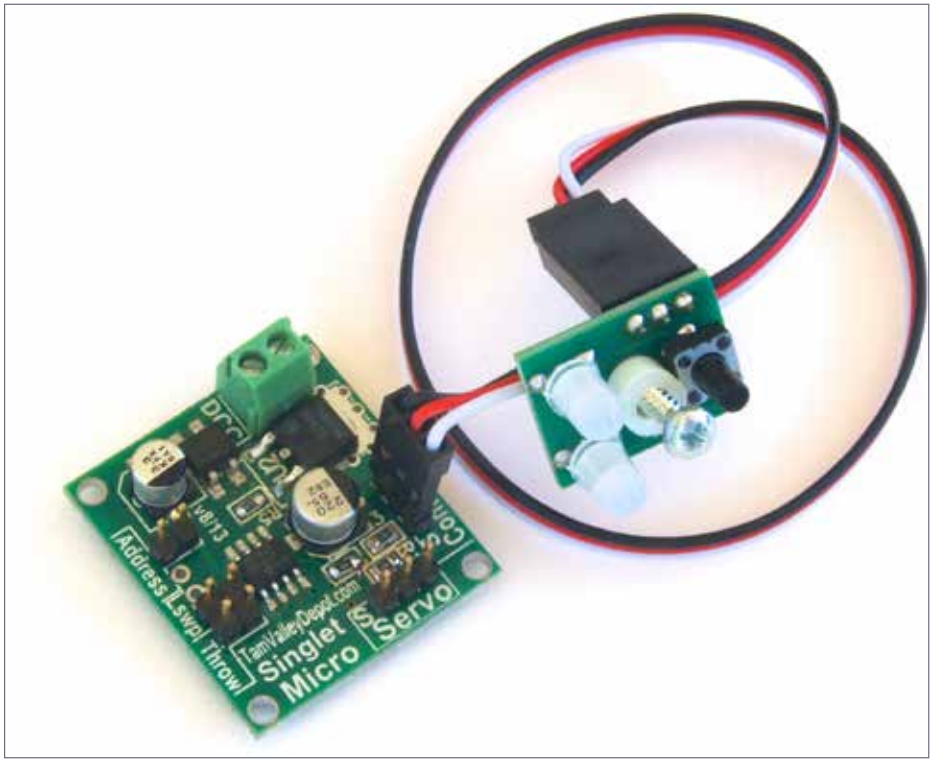
The version of stationary decoder selected must coincide with the type of turnout motor being controlled. There are three major styles of motor that stationary decoders are designed to work with: stall, servo and snap.

Stall motors (also known as slow-motion motors), such as Tortoise by Circuitron and Cobalt by DCC Concepts, work on the principle of allowing a motor to run to the end of its travel and then stall – that is, not turn – but still draw a very small current. They need stationary decoders designed for such use, such as NCE's Switch-IT MK2m [5], which controls two stall motors.

A decoder that controls one or two motors is more expensive per turnout than one that controls many, like the NCE Switch 8 MK 2 [6] that controls eight stall motors. However, consider the wiring between the board and the controller. If you only have a few turnouts in the area, a simpler decoder may be the way to go. In a yard, with lots of turnouts, the models with more outputs are perfect.



6. NCE's Switch 8 MK2 for eight stall motors includes a jack for external power.



7. Tam Valley Depot's Singlet decoder for servo motors. Tam Valley Depot photo

Servo motors, such as have been used in RC planes for years, are coming into favor due to the increasing costs of the stall motors. Tam Valley Depot has been at the forefront of this wave. They supply decoders [7], servos, cables, etc., truly a one stop shop for servo turnout control. Duncan McRee, the owner, is a model railroader, so, dealing with him, one knows that he is getting a model railroader's view, not that of an RC plane guy.

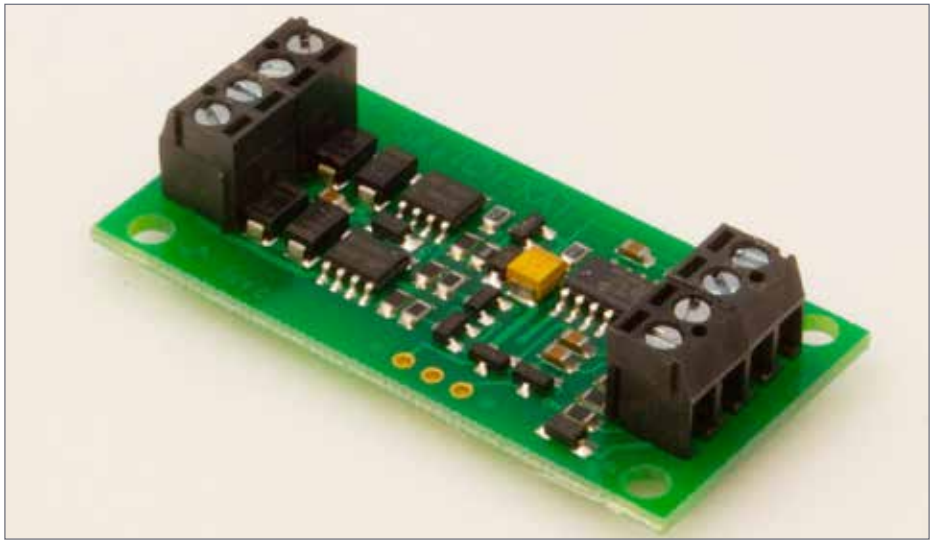
Snap motors are, perhaps, the oldest version of turnout motors. There are several versions of snap motors, but they can be loosely grouped into single-coil and dual-coil.

Some stationary decoders, such as Digitrax' DS52 [8] can operate both styles of snap motor. The DS52 can even control two stall motors. Most others are limited to one type or the other.

NCE's Switch-Kat [9] is an example of a decoder designed for a single-coil motor, such as Kato's Uni-Track or LGB's turnout motors.

Dual-coil motors, such as Atlas or Bachman's EZ track can be activated by the NCE Snap-It [10] decoder. The NCE Q Snap will tame four dual-coil snap motors.

8. Digitrax has the DS52 for any style snap motor or two stall motors. Notice the large storage capacitor in the front. Digitrax photo



9. The NCE Switch-Kat is for single coil snap motors, like Kato or LGB.

10. NCE's Snap-It will handle one dual-coil snap motor.

One of the terms that came to light about 20 years ago was CD control for snap motors. The CD term here doesn't have anything to do with music discs. It refers to capacitive discharge. To avoid the large current load of a very low resistance snap motor on the power supply, a capacitor was charged up and then quickly discharged through the motor.

Since most of the stationary decoders take their power from the DCC bus, they are mostly of the CD design, providing a quick and powerful throw of the turnout with a small draw from the DCC bus. I would highly recommend CD designed decoders for snap motors.

Hares and Wabbits

DCC Specialties Corp looked at the issue of wiring a decoder to a Tortoise and came up with the Hare [11]. It is a single decoder

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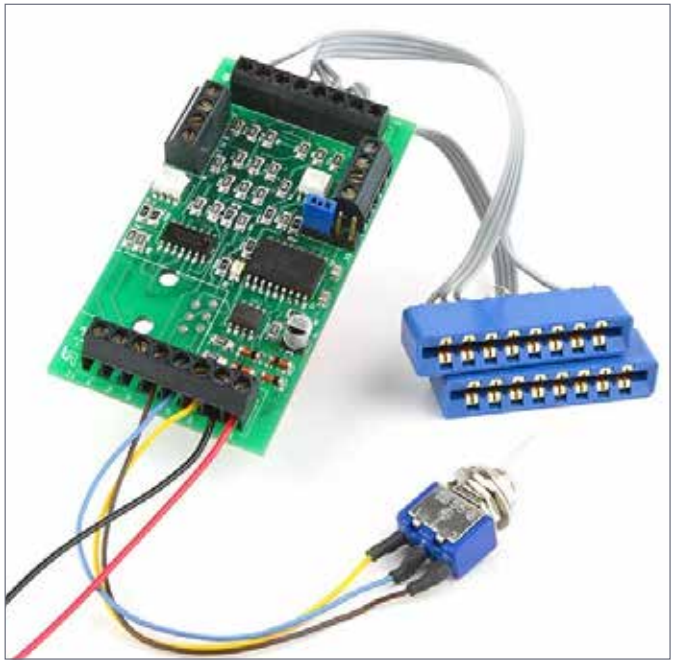
with an integral plug to connect directly into the Tortoise. In the simplest installation, the stationary decoder bus connects to the Hare and the Hare plugs into the Tortoise.

The Hare is a bit pricey, in that every turnout will need the full brains of a decoder attached to it. On a layout with only a few motors, Hares may very well be cost- and time-effective.

To mitigate the cost issues, DCC Specialties came up with the Wabbit [12]. It is one brain driving two sets of motor control electronics. While it reduces the cost per turnout, it is not as simple an installation as the Hare. Later this year, look for the Jack Wabbit from them to operate four stall motors.

11. DCC Specialties Hare mounted on a Tortoise. American Hobby Distributors photo



12. DCC Specialties Wabbit dual stall-motor decoder with connectors for two Tortoises. American Hobby Distributors photo

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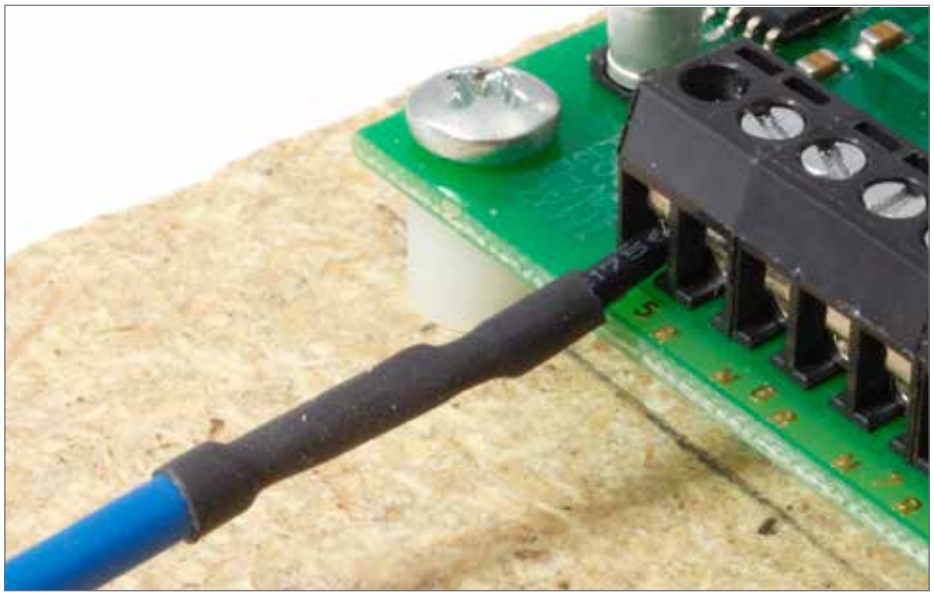
Stationary decoder bus design

I recommend a separate DCC bus for your stationary decoders.

Follow the normal DCC recommendations for wire gauge versus length on this bus. See my column on DCC wiring (issuu.com/mr-hobbyist/docs/mrh11-12-dec2011-ol?viewMode=presentation&mode=embed) or Joe Fugate's article (mrhpub.com/2015-04-apr/port) for more recommendations.

Some stationary decoder connector boards will not accept wire as large as the desired bus. Two solutions I recommend are:

Pigtail the large bus wire with a smaller bus wire [13] as large as the stationary decoder will handle. Make this pigtail short, less than a foot.



13. Large gauge (16 AWG) stranded bus wire pigtailed with smaller gauge (20 AWG) solid wire to connect to a stationary decoder.

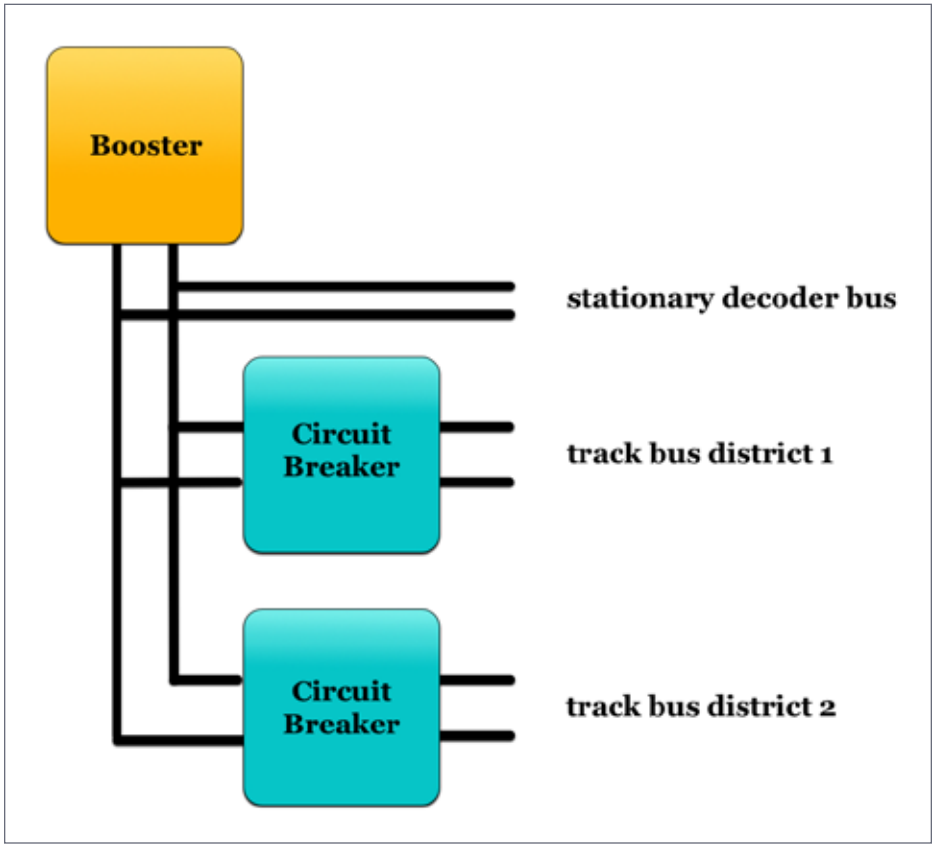
My other recommendation is to terminate the bus in a barrier terminal strip, and connect from the terminal strip to the stationary decoder with smaller gauge wire [14].

The stationary decoder bus should be connected directly to the DCC booster or to its own circuit breaker. This way, there is still power and control to the stationary decoders when the layout is shut down by a short. Since most shorts come from running a turnout, this gives you a better chance of being able to resolve the situation without manual intervention.

The simplest version is shown in [15]. Here the DCC system feeds two DCC track buses through circuit breakers. The decoders are fed directly from the DCC system.

As the layout complexity increases, more circuit breakers can be added to the diagram [15].

14. Large gauge (16 AWG) stranded bus connected through a barrier terminal strip to a smaller gauge (20 AWG) solid wire.



15. Block diagram of a simple circuit breaker system to isolate the stationary decoder bus from two track buses.

External power

Some decoders, such as the NCE Switch 8 [6] allow you to supplement the power supplied by the DCC bus with external power. Frequently this is 12 volts DC.

The advantage here is that the power needed to activate your motor is not reducing your ability to run trains by sucking up some of the power from your DCC system. Stall motors draw

about 10 mA all the time and more when they are actually moving. When you add up 50 or so of these plus the decoders to activate them, you have reduced your DCC power by about an amp.

The disadvantage is that you have to supply the power from another bus and power supply or from wall-warts spread around the layout and switched with the DCC system power.

Feedback to the DCC system

"Where am I?" is the age old question.

Some decoders will tell the command station what position they have told the turnout motor to move to. This feedback is helpful when a computer is running trains. However, nothing in this form of feedback tells the system that the turnout actually moved to the requested position. Any number of things can keep the turnout from completely throwing: a rock between the points and the stock rail, a defective motor, a broken or loose wire, and so on.

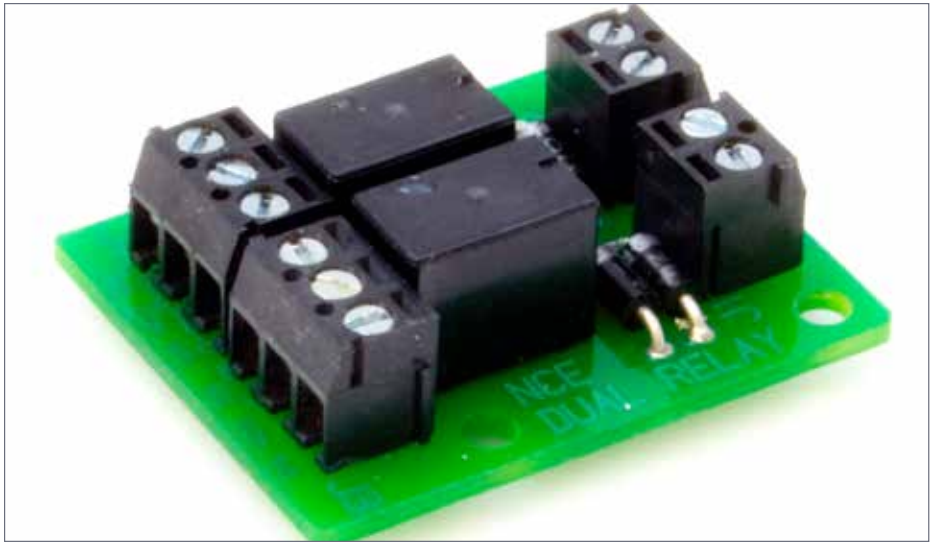
Another form of feedback involves having the motor tell the stationary decoder or an interface board that it has actually moved to the requested direction. Most often this is done with a stall motor that has a switch mechanism built in. When the motor moves, the contacts on the motor will change position. This change of switch position can be fed back to the computer.

While this is better than just relying on a decoder saying, "I told it to move," it still isn't foolproof. A rock between the points and the stock rail, keeping the turnout from throwing completely, would still report as thrown. The motor would move and report back that it had changed position. However, the rail wouldn't move due to the obstruction. The turnout could be in the original position or in the no-man's land in the middle, and the switch would still report that it had moved.

LEDs and relays

Stationary decoders are mostly designed to drive turnout motors. They can be adapted to LEDs for signaling, too. With the decoders designed for stall motors, an appropriately sized resistor in series with a LED will allow you to activate the LED with a throttle or from a system computer or a fascia switch. The LED lighting changes can be coordinated with other activities via macros.

To control other lights or track power, a relay is needed. The stationary decoder drives the relay which switches the desired power. NCE has a Dual Relay board [16] containing two relays, designed to work with their Switch-It series of decoders. It should work just fine with any stall motor type decoder. The Dual Relay board can be used as a pair of single-pole switches or a single double-pole switch. The relays on this board are rated at 2 amps and are designed for low voltages, below about 30 volts.



16. An NCE Dual Relay board is a way to control higher power items from your throttle or computer.

If you need to control power mains voltages and currents, say for room or area lights, then I recommend you use the NCE Dual Relay board and drive a 12 volt coiled relay with contacts rated to control the voltage and current you need. If you are at all unsure about working with power main voltages and currents, get help from someone who knows how to protect you and your layout from electric shocks and fires.

On NCE's web site there is a note about using the Dual Relay board to control the power to a staging track (ncedcc.zendesk.com/hc/en-us/articles/202180045-Using-a-Dual-Relay-to-Control-Staging-Track-Power). If you were to use one relay on the board to control track power and one to control another relay which powered lights, you could power up the track in hidden staging and turn on the light so you can see what you are doing with one command.

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. There will be no Mr. DCC's Workbench segment this month. This entire column would qualify. ☑

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