Model Railroad Hobbyist |

DCC IMPULSES

column

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Wireless DCC, part 3, bringing it all together

In the last two months, I've taken you readers on a journey through the background of sending DCC signals wirelessly to your locomotives and the intricacies of batteries. This month, I'm going to bring all that together in a real-life example of what has worked for me. I'm writing this in the afternoon after our PebbleCreek Model Railroad Club held its spring open house [1] on Good Friday, April 14, 2017.

1. Two of the trains running on battery power at the PCMRC open house. ***Bruce Petrarca photo***

I built three battery cars to pull behind the locos in the garden. Here is a bit of how they came together and some lessons learned both for garden and smaller gauge dead track operations.

CNW RS3 #1616

Here's what I did to get our club's RS3 [2] running on batteries.

2. PCMRC's RS3 runs with a trailing battery car. Sharp-eyed readers will see the silver-colored wire antenna just sticking out in front of the exhaust stack and the interconnecting cable of red and black wires between the loco and the Rio Grande box car. *Bruce Petrarca photo*

1616 is one of our older garden locos and has had a QSI Magnum DCC decoder installed for about a decade now. My plan was to add a AirWire miniCONVRTR board with an external antenna to drive the QSI decoder. A connector for the trailing battery car would finish the installation.

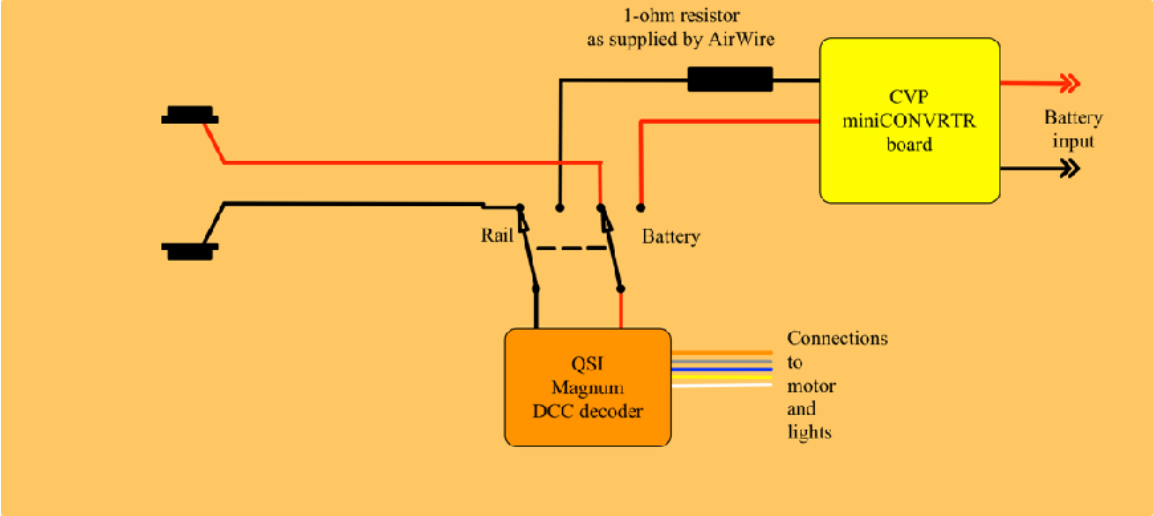
I spent several hours dealing with prior work in the loco, mostly mine, and getting the AirWire board installed. I added a switch to allow either battery or track power operation [3] and a battery connector hanging off the rear. After the installation was done, it wouldn't run on battery. I was frustrated.

Then I found a sheet of paper, an addendum to the miniCONVRTR instructions. No, I hadn't read all the instructions. I did one of these installations in my Bachmann rail truck earlier and knew it all -- so I thought.

The sheet contained a list of a very few DCC decoders that had been tested with the miniCONVRTR, and notes about what it took to work with them. Aha! No QSI decoder was listed. However, it suggested that the use of the included 1-ohm resistor in series between the miniCONVRTR and the decoder might keep the miniCONVRTR from shutting down.

It was worth a try, so I put the resistor in the circuit [3] and the loco came alive.

3. Block diagram of a loco configured to run on track DCC or battery and an AirWire miniCONVRTR board. *Bruce Petrarca diagram*



Run time

As I discussed last month, I was shooting for a run time of 3+ hours of roundy-round operation. I measured a running current of just about an amp (1000 mA) for this loco. We purchased 6800 mAH batteries for all uses. I expected as much as seven hours of running time with these batteries.

While early (less than two-hour) test runs were positive, I was waiting for the open house to really prove my theory. Today, we ran 1616 for 3-¾ hours continuously at about ⅓ maximum speed; a nice show pace. Recharging put only 2532 mAH back into the battery. From that I predict that the loco may run as long as 10 hours on one charge. Far beyond my wildest expectations. BTW, this recharge took just over 1-½ hours with the X1 charger I described last month.

The battery car

Now, I'd like to share some of the details of the battery car with you.

For the basic car, a Piko 40-foot box car looked like a winner. It is era-appropriate, has operating doors with latches, is nicely detailed, has an easily removable roof with full interior access and is reasonably priced at $67.99 MSRP. The photos here are of Piko #38848, D&RGW car #62803. Other road names were selected for the other battery cars.

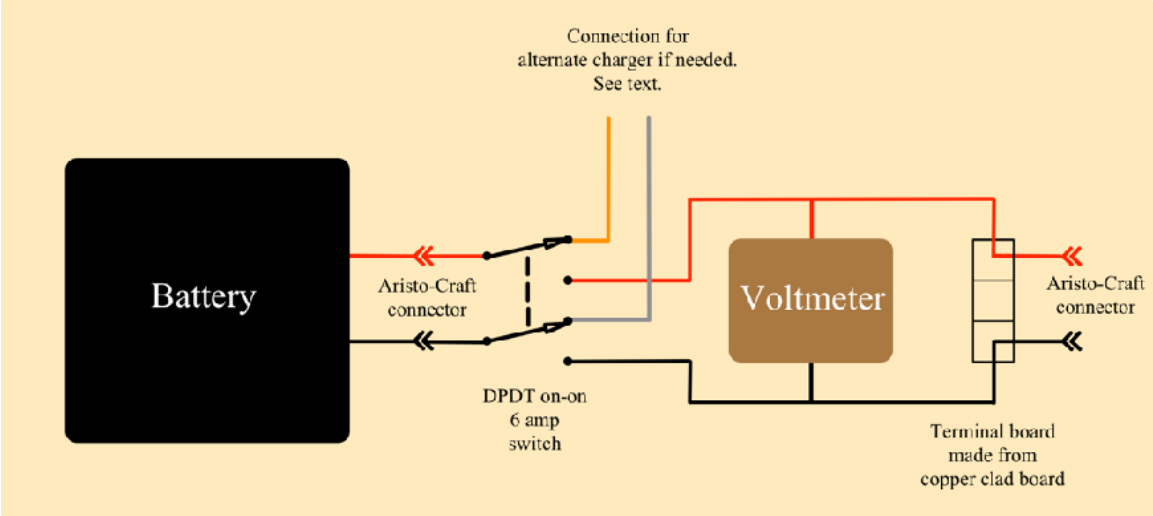
Our coupler standard is Kadee garden couplers and the car comes with the hook and loop couplers popularized by LGB. A Kadee 906 gear box and coupler set mounts nicely under the end lip of the car [9].

A couple of pieces of 0.06 inch thick styrene shims the gear box down about ⅛ inch to clear the lip and sets the coupler at the correct height per the Kadee gauge. I cut the Talgo-style mount off the trucks and turned the trucks around so there is no chance of the remaining nubs catching on the Kadee gear box. One word of caution: the draft gear box limits the truck rotation the wheels hit the draft gear box. Don't use this coupler set if you have the smaller radius garden tracks like LGB 1100 series.

The first trick is to get the roof off the car. It is easy once you know where to push and pull [4].

4. Removing the roof from the Piko box car. Open the doors, pull lightly out on the side wall just above each door. The tabs on the roof that engage the side walls should be able to be popped out, leaving the roof bowed from end to end. A slight tug on the end will release the end tabs.
Bruce Petrarca photo

5. Schematic diagram for the battery car. I had no issues charging this battery with the digital meter connected. I used my X1 charger connected in place of the loco with the switch on. However, if your charger has issues connected this way, the charging connection shown (orange and gray wires in the diagram) could be added and used. If not needed, there is no reason for added confusion. *Bruce Petrarca diagram*



I built an insert [6] that fits between the doors and holds the battery pack, the on-off switch and a digital volt meter. In operation, with the doors closed [2], the car looks normal, except for the battery cable running out of the A end [9].

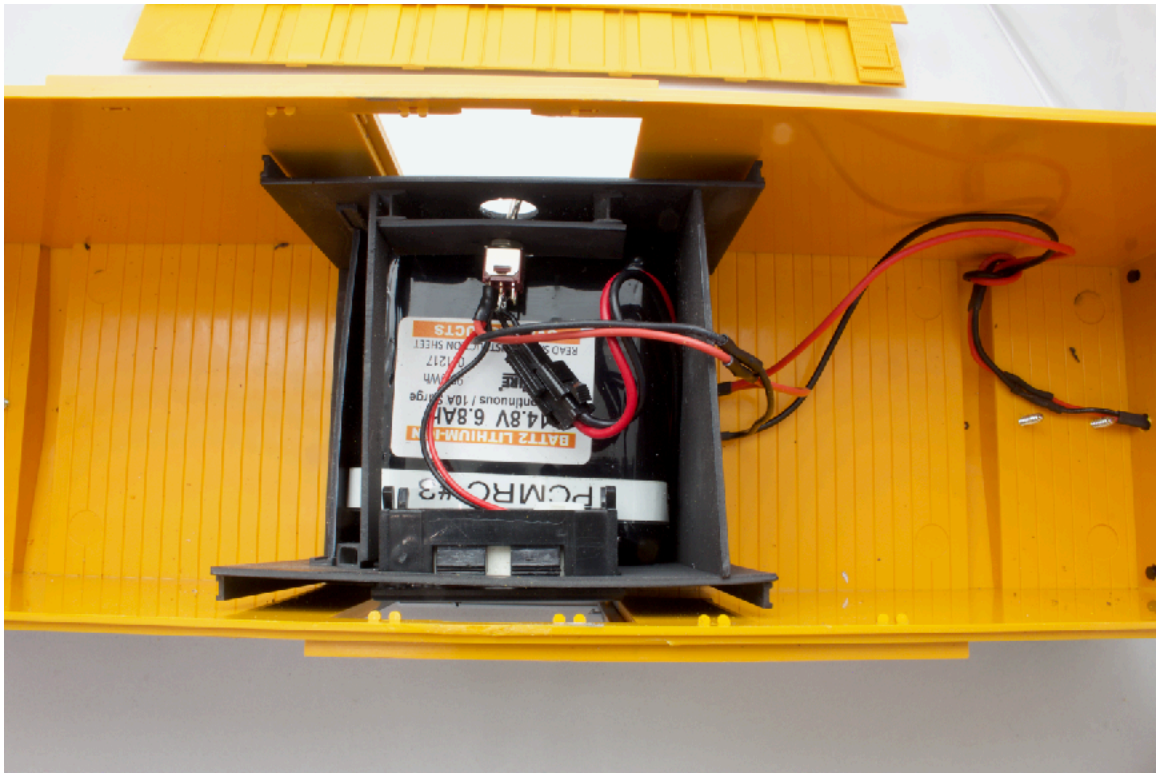
The goal of the insert design was to hold the battery securely yet allow it to be changed easily. To avoid disrupting the car's operation, the battery needs to be centered and as low as possible in the car. This meant having the battery on its side, to keep the center of gravity down.

I purchased a "battery extension" cable from DeadRailInstalls.com. I got ones with Aristo-Craft polarity about 18 inches long. They are inexpensive and have silicone-insulated wire that is nice to work with. I cut the end that goes to the battery (male pins) off about 1 inch from the connector and wired it to the center contacts of the switch.

It seemed logical to me that the B end (brake wheel end) of the car would be away from the loco, so I drilled the A end bulkhead for the cable to fit through. After I put a bit of shrink tubing next to the connector, I inserted the remaining cable through the hole, leaving the connector hanging outside [9].

The shrink tubing will protect the wires against chafing as the loco moves down the track.

6. Battery insert (black) in Piko box car. In the photo, the on-off switch is at the top, the digital volt meter is at the bottom. The battery (CVP 6800 mAH 14.8 V) slides out when a piece of styrene is removed from the left side. Screws for mounting the Kadee couplers can be seen near the battery wires on the right side. Mount the new couplers before installing wires, to avoid shorting out the battery. The wires from the switch are soldered to a small circuit board under the right-side mounting bolt with the connector wires terminating there, too. This keeps the external tugging from pulling the wires off the switch. Also, there is a knot in the wires to keep them from tugging on the solder connection. *Bruce Petrarca photo*



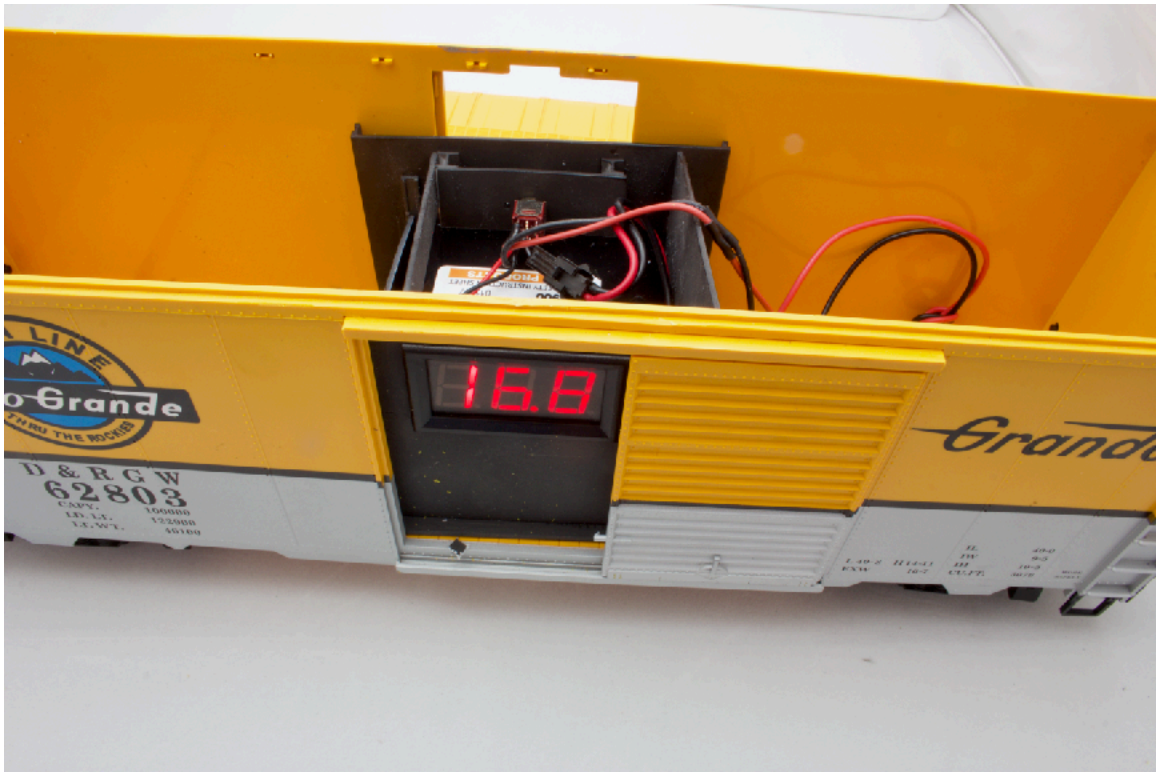
I cut off about six inches of the cable to use to wire between the switch and the terminal board.

To connect the wires and provide some strain relief for the external connector, I built a terminal board out of a piece of copper-clad board. I used my rotary tool to cut through the copper cladding so that I had three sections. The two outside ones are for the connections and the center one for the mounting machine screw. I drilled a hole for the mounting and bolted the terminal board and the battery carrier into the center of the car.

Carefully maintaining polarity, I wired the cable between the PC board and the side of the switch that would be connected to the battery when the switch is thrown toward the A end of the car. I then twisted the wires from the switch to the wires from the connector and soldered them to the PC board.

The car is ready for the battery to be plugged in. Charge it up and run a train.

7. Side view of the Piko battery car showing the voltmeter. 16.8 volts indicates a fully charged battery. The batteries will hover between 15.25 and 14.75 volts for much of their life. Once they drop below 14 volts, it is time to turn off this battery car and charge it. *Bruce Petrarca photo*



After running these cars a bit, I would think of some sort of LED near the switch that would be illuminated when the power is on.

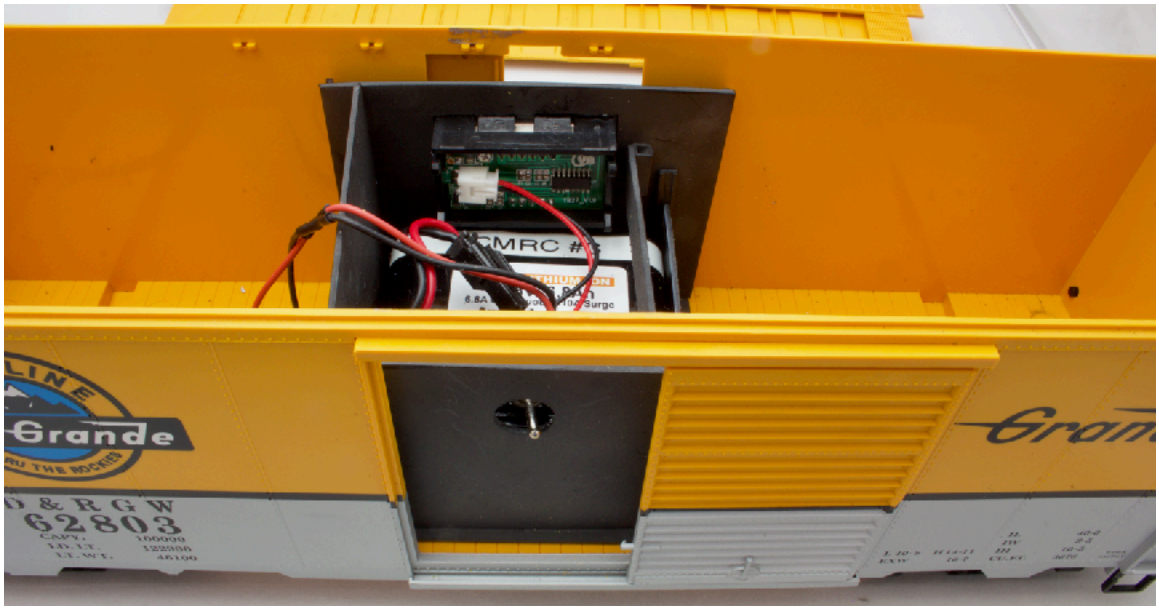
Another addition might be “run-charge” and “off” next to the switch. However, if you use the alternate charging connection [5], the labels would be “run” and “off-charge”. I’d suggest an different connector for this charging input, to avoid confusion.

Please share your experiences and ideas. 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.

8. Opposite side showing on-off switch. I chose not to label “on” or “off.” I may change my mind later. I set the switch so that it pointed forward when on. *Bruce Petrarca photo*



9. A-end of Piko battery car showing the male-pinned connector to mate with a loco. A bit of shrink tubing reduces the chafing on the wires when the connector is pushed back into the car after the loco connection has been made. *Bruce Petrarca photo*

Side bar - parts for battery car

Description	Qty	Manufacturer / source	Part number
Box Car	1	Piko	38848
Kadee coupler set	1	Kadee Quality Products	906
Sheet 6 x 12 inches black styrene 0.06 inches thick	1	Evergreen Scale Models	9516
6800 mAH 14.8 volt bat-	1	CVP	AirWire BATT2
DPDT miniature toggle switch 6A rated	1	AllElectronics.com	MTS-8
3.3 - 30 volt digital meter	1	AllElectronics.com	PM-123
4-40 nut and bolt	2	MicroFasteners.com	
Aristo-Craft style battery extension cable with 18 inch silicone wires	1	DeadRailInstalls.com	

Mr. DCC's Workshop

Changing channels with the AirWire products

Setting these locos up for our club's open house, I needed to migrate the T5000 AirWire throttles off the default radio channel (zero) and have each cab on a separate frequency.

I numbered the cabs with our club abbreviation and a sequential number, i.e. PCMRC #2. I used a Brother P-Touch machine to make the labels and affixed them to the top of the cab [10].

10. P-Touch label on the AirWire throttle to differentiate ownership and channel.

The next requirement was to get both the AirWire loco board (either miniCONVRTR or G3) and the cab onto the same frequency. I read the instructions and tried several different methods with little success.

Here's what I did that really worked and was easy.

1. Make sure that there are no other AirWire cabs turned on in the area. Also no other transmitters on the 900 MHz frequencies, like NCE or Digitrax simplex radio cabs.

2. Turn on the loco and the cab and verify that you are controlling the loco.

3. Press the green PWR key and then the 4 key. This will put you into Service Mode programming. The display should look like this:
   SV-CV - - - -

4. Key in the CV to change frequency (58). Now the display should be:
   SV-CV - - 5 8

5. Press the ENT key. Display should be:
   SV-CV 0 0 5 8
   Value - - - -

6. Key in the desired frequency (0 to 16 are viable numbers). I was programming #2, so the display looked like:
   SV-CV 0 0 5 8
   Value - - - 2

7. One more press of the ENT key and the cab and the loco are on the new frequency. You can verify the frequency of the cab: the lower left portion of the basic display will show the frequency. In this case, it shows:
   RF02

8. You may have to cycle the power on the loco (unplug the battery and reconnect it) before the radio channel changes.

Verify that when you use the cab, the loco responds.

Photo [11] shows the T5000 display panel. Note the RF02 in the lower left.

11. AirWire T5000 throttle on channel 02.

It is that simple.

