Electrical Considerations For The New Bowser PCC Car

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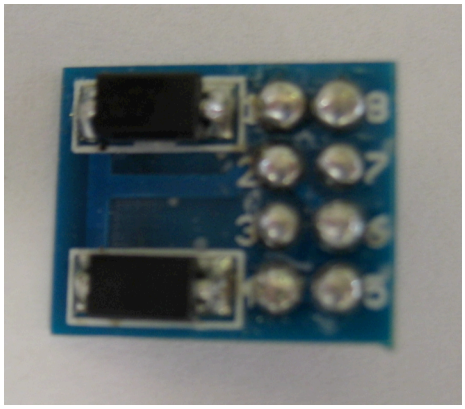
In early September, I had the opportunity to check out and examine an early undecorated production sample of the new Bowser PCC car. Listed below are my observations:

I - TWO-RAIL – OVERHEAD POWER SWITCH.

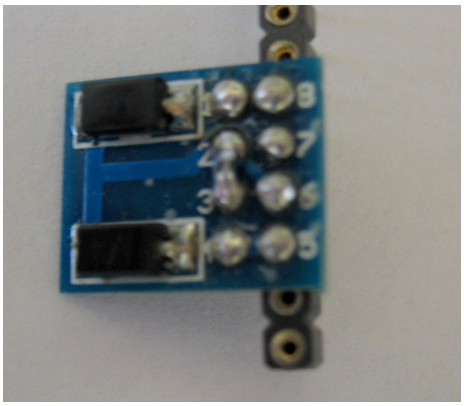
As is the case in the recent Con-Cor Electroliner, there is a slide switch on the circuit board that allows the operator to switch from two-rail operation to overhead wire power. But in the case of this car, it is a double-pole double-throw switch, which means that in addition to transferring power pick-up from the wheels on one side to the trolley poles, the wheels on both sides of the car are grounded to pick-up track power. This allows for both more reliable power return and the activation of any automatic stopping or signal circuits that require all wheels to be grounded. Most other models use only a single-pole switch, which transfers current pick-up from one side of the wheels to the pole. In these cases, the switch needs to be bypassed or jumpers placed across the trucks to give reliable overhead operation especially on a layout or module with a signaling system installed. The Bowser design is excellent and avoids this extra work.

INTERIOR LIGHTS & DESTINATION SIGN LIGHTS.

Modelers who operate this car in the DC mode will note that the interior lights and destination sign light do not work. These two functions were intended for operation only in the DCC mode. The circuit board has the NMRA standard eight pin socket to easily allow most DCC decoders (not supplied) to be connected. For DC operation a dummy plug is installed which connects the power pick-up connections to isolated connections for operation of the motor and lights. The dummy plug also contains a pair of diodes that along with a complementary set on the circuit board insures that the proper polarity DC is fed to the lighting LED's whether the supply polarity is forward or reverse. However, upon close examination, it was determined that these diodes were only connected to pins 2 and 6. Therefore, only the front and rear LED's illuminated. The destination sign and interior LED's are connected to pin 3, which is not connected in the dummy plug, and therefore is the reason they did not illuminate when operated on DC. I made a minor modification to the dummy plug and bridged a small blob of solder between pins 2 and 3 to connect the interior LED's for DC operation. I used a spare set of socket connectors to insure that the pins stayed in alignment as the solder was melted. Before and after photos are shown below.



Dummy Plug – before



Blob of solder connects 2 & 3

THE ELECTRONICS

The car is equipped with 12 surface mount Light Emitting Diodes (LED) replacing the traditional incandescent lamps. One white LED serves as the headlight, two amber LEDs for dash lights, two red LEDs for tail lights, another white LED to illuminate the destination sign and six white LEDs for interior illumination. I would have possibly preferred the dash lights to be white rather than amber and the interior to be amber rather than white as the battery operated lamps in the prototype dash lights have more of a "high intensity" appearance and the series connected line voltage interior lamps along with the heavy glass globes give a more subdued glow to the prototype interior. Also the white background printing of the destination sign is overly opaque so the illumination is not that effective. Each LED is connected to an associated surface mount current limiting resistor. All of the resistors are in turn connected to the NMRA socket pin 7 (blue wire light function common). The headlight and two dash lights are connected to NMRA socket pin 6 (white wire function 0 forward [F0f]), the two tail lights are connected to NMRA socket pin 2 (yellow wire function 0 reverse [F0r]) and the six interior and one destination sign lights are connected to NMRA socket pin 3 (green wire auxiliary function).

DCC Operation

To test DCC operation, I only had a spare decoder from a Bachmann Peter Witt car available. While this unit is only a two function (F0f forward & F0r reverse) with limited CV programming ability, it has a unique feature of incorporating in the 8-pin plug a pair of diodes that supply current to pin 3 when either of the two other functions are activated. The downside is that because the NMRA sockets in the two different cars are oriented at right angles to each other, the plug extension that incorporates the diodes in the Bachmann decoder extends beyond the body shell of the Bowser PCC. Therefore it is only suitable for testing without the PCC body shell installed. In addition, because of the limited functionality of this basic decoder, the only lighting control is with function 0 and when the car is operating forward F0 controls the interior and front lights. The taillights are not illuminated. When the car is operating reverse F0 continues to control the interior lights along with the taillights. The front lights (head and dash) are now not illuminated.

A decoder with more than two functions and greater CV programming flexibility will be a better choice. The rear of the circuit board has two coils (L1, L2) mounted on the bottom and one capacitor (C1) mounted on the top to filter the motor circuit to meet some of the European regulations. Reports are that this may cause problems with some DCC back EMF motor control schemes and capacitor C1 may need to be removed.

BRAKE LIGHTS

In the case of PCC cars and a few conventional cars, the tail lights are actually brake lights and should illuminate only when the brakes are applied and the car reduces speed and while stopped. A similar circuit using an opto-isolator as explained in the Trolleyville Schoolhouse, Room 5-Repowering and Rewiring, Lesson 4 (http://www.trolleyville.com/tv/school/lesson5_4/index.htm) could be possibly fitted to this car but I understand that a team composed of Custom Traxx and Train Control Systems (TCS) is working to develop a decoder with a programmable CV function to simulate an automatic brake or stop light. The fact that the Bowser PCC has NMRA socket pin 2 dedicated to the rear stop light LED's will make this a plug and play installation if the specialized decoder is made available by TCS.