Decoder for Lo.Co.'s E.646

by Blaine Bachman

Figure 1: Manufacturer's Photo of the E.646.199

I recently obtained an N scale model of an Italian E.646 electric locomotive. It being an artisan product (built and marketed by Lorenzo Colli under the brand Lo.Co – a fortuitous acronym formed from the first two letters of his first and last name), I was prepared for less than stellar performance. To my surprise, the locomotive exhibited better than average running characteristics including smooth starts and stops, a decent slow speed, and very little noise.

Examining the model closer, I could see that the underframes of the two articulated halves are metal castings. Judging from the large exposed gears and unique coupler box (and noting the embossed name on the obviously reused plastic box in which the locomotive was delivered), the trucks are modified Bachmann parts. Attached to each casting mechanism is an etched nickel silver plate, terminating in a circular boss that serves as both the mounting point for the middle truck and as the articulation joint between the two halves of the locomotive. Atop one of these plates rests the 3-pole, skew-wound motor (Bachmann again) that drives both outer trucks via a short length of flexible tubing and a dogbone shaft with universal joint that fits into the truck mounted worm.

However, not all of the above was evident at first glance…

In truth, I started disassembling the locomotive mostly because I was curious to see how Lorenzo had tackled the Bo-Bo-Bo problem. Industrial-grade production of a six-axle articulated in N scale has always been the stuff of dreams. Even though these locomotive types are virtually synonymous with the letters 'FS' (*Ferrovia dello Stato*, the Italian State Railways), no major N scale manufacturer has ever taken the idea much beyond water cooler gossip.

But back to the disassembly…

Removing the four screws visible from the underside of the loco will do nothing initially useful in the quest to remove the body shells. As I was to discover, these are secured to the mechanism with a simple blob of clear silicone sealant deposited on the underside of the roof where the pantograph is attached. Working carefully with a flat blade jeweler's screwdriver, it's not too difficult – but quite scary – to pop the silicone loose from the underside of the roof and slide the body shell off. Once the shells are removed, you'll find a scrap of cloth that serves as the articulation diaphragm attached to one of the underframes; turning it inside out by pulling it back and over its attached end, reveals the beautiful simplicity of the mechanism.

It was at this point that I decided to attempt a DCC decoder installation…

As with all 'wire-and-solder' decoder installs, this one required a good deal of examination, measuring, holding pieces up to the light, and ruminating (or pipe-smoking if that's your thinking aid; it's not mine) before a viable solution presented itself. I determined that by removing part of the mechanism casting, I could secure the decoder atop the mechanism under the highest part of the roof. I could make these modifications and mount the decoder to the half of the mechanism that holds the motor thereby reducing the number of wires that would have to flex across the articulation joint. My chosen decoder is a Digitrax DZ-123.

It's not like anyone else whose first language is English will ever 'DCC' a Lo.Co. E.646, so why am I writing this?

To begin, remove the cloth diaphragm; it is attached to the casting with double-stick tape. Then carefully unsolder the wires from the motor terminals. On one side, the wire connects to insulated power pick-up pads over each of the two outboard trucks; I totally rewired mine, but if you want to minimize the work and don't mind insulating another electrical joint, unsolder the wire then cut it where it was soldered to the motor terminal so that you can separate the two halves, making the frame modification easier.

Note that the motor is affixed to one of the two etched nickel silver plates, thereby keeping the motor rigidly aligned to the attached casting. Disconnect the casting from the etched motor baseplate by removing the two screws visible from the underside (no need to remove the other two screws). Set the portion still attached to the motor aside. Note that there is a groove along each side of the casting designed to hold wires. Using a razor saw, cut along the top edge of this slot until you've completely undercut the raised portion of the casting. Make a vertical cut at the end of the 'hump' to remove the piece.

Test fit the decoder and trim a bit more of the frame as necessary (diagonal cutters work well for this); the idea is to provide a lip for the decoder to rest upon. Smooth any rough edges. Turning to the Digitrax decoder, trim away excess shrink wrap at the blunt (non wire) end of the decoder and reseal the edge by exposing it to heat from your soldering iron. Once you're satisfied with the fit and positioning of the decoder, attach it with silicone sealant, clamp it in place with a rubber band, and set it aside until it dries.

Turning to the other two-thirds of the mechanism, note that there's a tab on the etched nickel silver motor carrier that is soldered directly to one of the motor brushes. This connection must be broken or the decoder will be fried as soon as it's set on powered rails. This is a tricky step because it's easy to damage the brush carriers and the holes they sit in if you use too much heat for too long. Use a desoldering device or desoldering wick if you have it. Once the joint is separated, remove the tab from the motor carrier by bending it back and forth until it fatigues and breaks at the bend.

With the prep work done and the silicone dry, reassemble the mechanism then proceed to make all of the decoder connections. If you obsess about such things (as I do), you might want to determine which end of the locomotive houses the 'anterior' cab before you do the final wiring. The Italian Railway actually cares about such things and, though missing from the Lo.Co. model, the real E.646 is marked with a large yellow 'A' (see photo at left) on each side near the appropriate end. In the case of this model, the body half that has the three panels on the side and the coil of air tubes on the roof contains the 'posterior' cab. With this knowledge, you can wire the decoder accordingly thus ensuring that if you command the locomotive to run 'forward,' it will travel in the direction of the anterior cab.

As you cut the decoder wires and make the connections, allow a bit of slack in every wire that crosses the articulation joint.

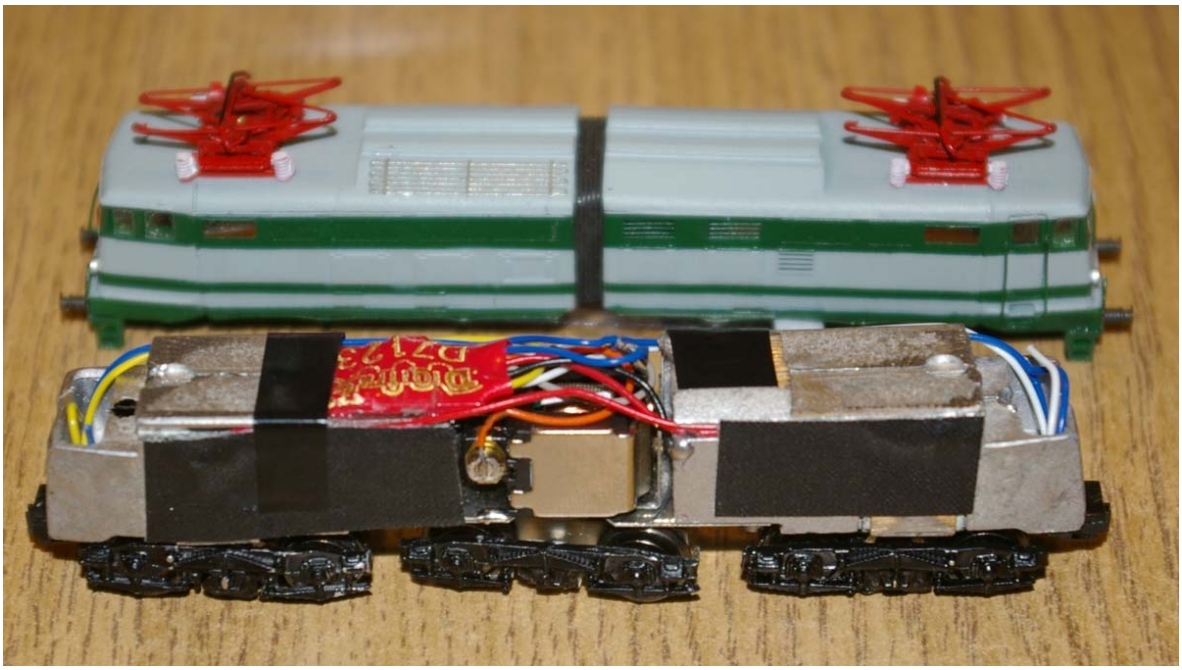

Figure 2: Completed Decoder Installation and Wiring

A Word about Lighting

Lo.Co. made no provision for working headlights in this model. However, each frame casting contains a large end cavity that appears tailor made for a customer-installed light bulb. Drilling out the center of the headlight castings and continuing through the frame casting to the cavity should allow for the installation of fiber optic strands to conduct light to the headlight lenses. The lighting wires can be nested in the grooves cast into the sides of each frame casting.

This particular model, E.646.199 represents this class of locomotive after it was converted to push-pull commuter service. As such, it is perfect for pulling a set of Lo.Co.'s own *Vicinale* a.k.a. *Piano Ribassato* commuter coaches. When traveling in 'push' mode the locomotive's rear-facing lights are covered by red lenses. To have full prototypical control of the locomotive lighting (clear or red light at either end of the locomotive, totally on command) requires the selection of a decoder having two additional function outputs (F1 & F2). Using a simpler decoder like the DZ123 involves a compromise; which configuration you choose depends on what use you plan on making of the loco:

- Connect a clear light source at each end of the model. This is most useful when the loco is to be used in traditional service at the head end of whatever train it is powering;
- Connect a clear light source to the 'forward' headlight circuit (white wire) and a red light source to the 'reverse' circuit (yellow wire) and place both bulbs in the same end of the model. This is most useful for a dedicated push-pull commuter service as the lights at the non-coupled end will correspond to the direction of travel (and no lights will be displayed at the coupled end.

It is also possible to place a clear and a red light source at each end, cross-wiring the circuits to always display clear in the direction of travel and red to the 'rear,' but this configuration is arguably toy-like because the only time such lighting would be displayed is when a locomotive is traveling 'light' on the main line.

Reassembly

Once everything is connected and tested, it's a relatively simple matter to reattach the body shells with silicone sealant (after removing the old). Before doing so reattach the cloth diaphragm across the joint. I happened to have a thin rubber diaphragm that pioneer N scale manufacturer Claudio Cestaro made for his brass articulated

locomotive models so I replaced the cloth with one of these, attached with rubber cement to the inside of the body shell (rather than to the mechanism.

While the silicone dries, place the locomotive on a piece of track with a boxcar at each end to help you see that the body is sitting at the right height. As necessary, use whatever you may have on hand to support the shells in the proper level position as the silicone sets up.