
# DCC Impulses column

## by Bruce Petrarca

### How to make this switcher sing, plus a look into my techniques ...

#### Photos by the author unless otherwise specified

Welcome to my first column in the new Gen 2 format for MRH. Hopefully, you will find your reading experience better than you did with the old format, regardless of your reading platform.

This month's "***From Mr. DCC's Workbench***" sidebar discusses the long awaited NCE PowerCab upgrade (version 1.65).

The Kato HO-scale NW-2 is a popular loco. There were lots of prototypes and the model runs like a top! However, it is a DCC nightmare. In my ***"DCC Ready? The Good, The Bad and The Ugly!"*** clinic, it is high on ***The Ugly*** list.

Here I'm going to discuss a sound installation into this loco. While this column targets this specific HO loco, the techniques I'll be demonstrating apply to all sorts of locos:

- Locos with split frames (two frame halves that are insulated from each other, but connected to the respective rails) in any scale
- N-scale locos are frequently split frame design. Also, this loco has many common parts with Kato N-scale locomotives.
- My cleaning and lubrication techniques cover a wide range of locos.

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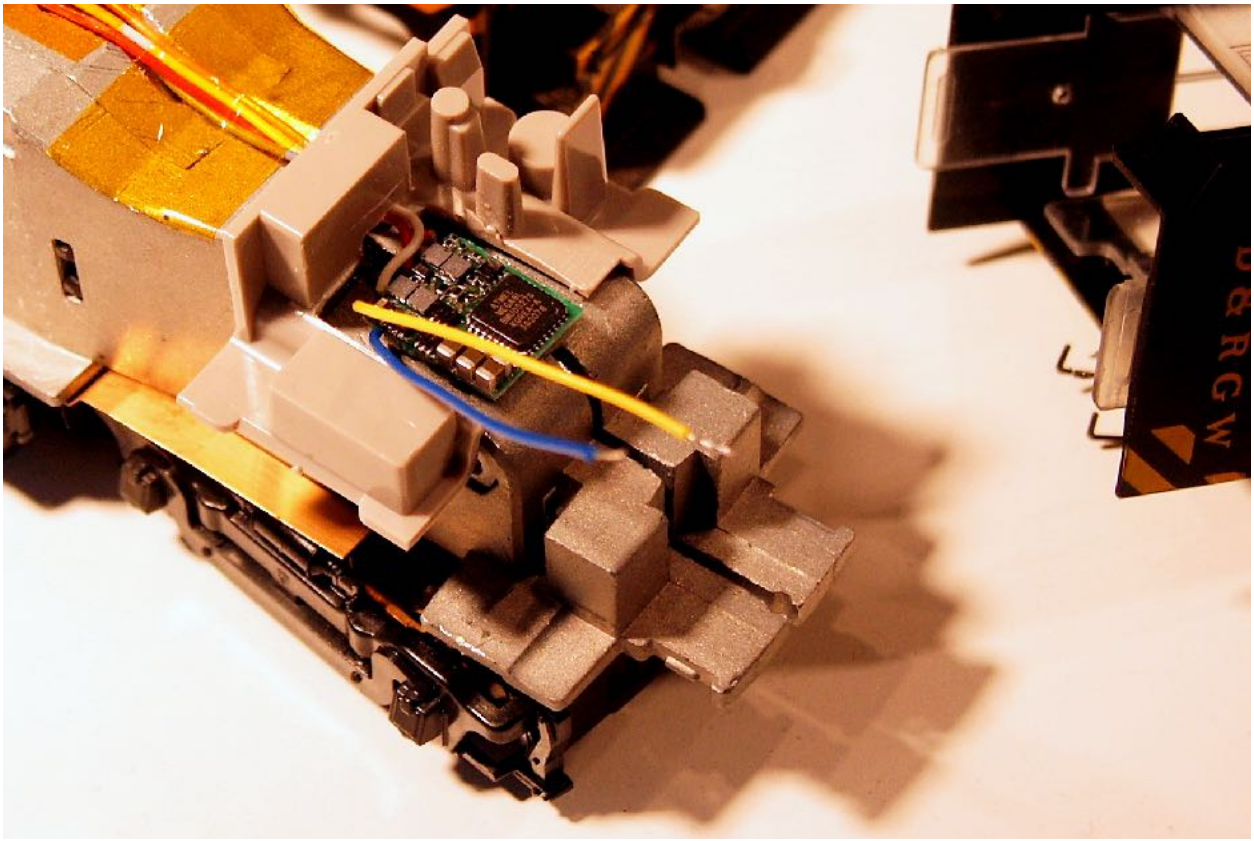
**1: Kato HO-Scale NW-2 loco painted for our club's road**


This column is based on a lot of information presented in my earlier columns, specifically Wired Decoder Installation in January & February 2012.

**2: Kato HO NW-2 ready for final assembly with a non-sound decoder**



In addition, I have compiled a video so that you can look over my shoulder while I do

this installation. I worked very hard to show and explain what I was doing along the way. I hope you'll find it a useful tool. The numbers in the headings in this column refer to the sections of the video. This column plus the video is a "must have" for anybody installing DCC into split-frame locomotives. Information on acquiring your own copy will be coming soon.

Over A DCC installation in any split-frame non-DCC-ready loco requires complete disassembly of the loco, frame machining, motor isolation and reassembly.

For years, I've had folks asking me to install sound in these NW-2s. I've not been happy with any of the ones I've tried. Non-sound installations have been very successful, but difficult to do.

Part of what makes this a great switcher is what causes the installation issues. The entire loco interior is weight. It has a lot of traction.

I've become comfortable with putting a small DCC decoder in the cab floor, as shown in (2). A cable relief needs to be cut into the frame (upper left in the photo). This can be done with a mill or belt sander. The photo also shows some of the cab floor removed to have a place for the decoder.

**3: HO scale Kato NW-2 ready to reassemble with Tsunami decoder**


Early in 2012, I found installation notes on the web from George at TVW Miniatures. His approach appeared to have merit. Since it uses a small (N-scale appropriate) speaker in a small enclosure, I didn't have hopes for room filling sound. When the loco was

done, I was pleasantly surprised to find that it had a reasonable sound from a Tsunami GN series decoder. Since it is a yard switcher, this localized sound is fine.

I had George machine the frames for six of these units and what follows are notes, photos and video from assembling these locos. Some had DCC installed previously, as shown in (2), so some cab repair was needed, too. Don't be confused by the different locos in the photos, ok?

The locomotive disassembled and ready to start reassembly is shown in figure 3. If you don't feel confident building a locomotive from this starting point, I suggest you don't want to even get started on this installation. Have a professional do it!

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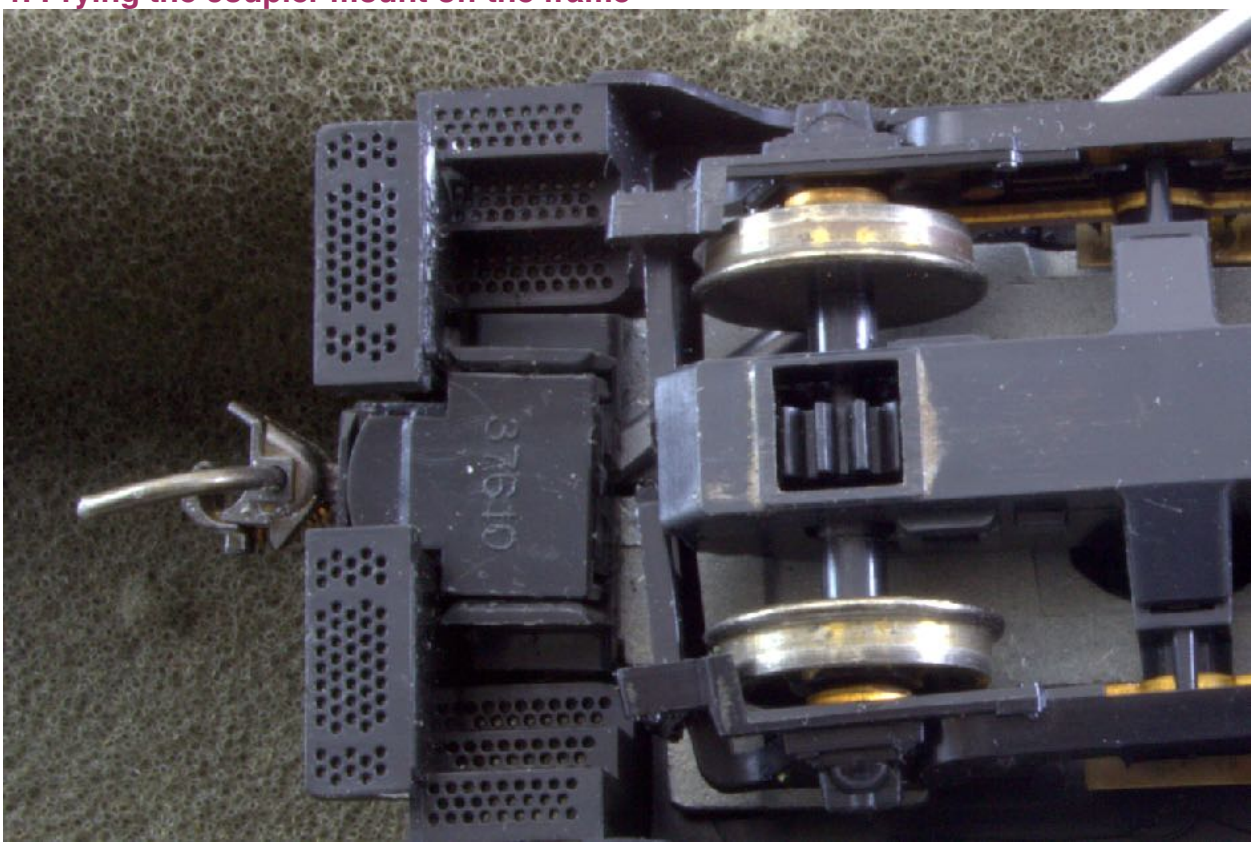
## 1.0 First Steps

Before you can remove the shell, you need to get the couplers out.

## 1.1 Coupler removal

The approved way is to snap the top off the coupler box; remove the coupler and spring; then remove the (upper) box holder.

**4: Prying the coupler mount off the frame**

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### 5: Video showing coupler removal


I prefer to take them out in one piece, as shown on my video (5). I cannot provide a ready 1, 2, 3 method to do this. There is not enough clearance around the coupler box to directly remove it. It needs to be encouraged to twist and turn until it comes out.

Pop the coupler mount off the frame with a screwdriver (4) and then just worry the entire assembly out of the loco, working it past the pilot steps and the truck mechanism.

Store the parts in a container for reassembly. You will understand why I prefer to remove the entire assembly at that time.

## 1.2 Separate shell from frame

Slide the fuel tank shell off and set it into the storage container.

The shell is just a friction fit on the frame. Once the couplers are removed, a screwdriver can pry between the frame and the shell to get it started (6). There is a metal tab on each end of the loco to pry GENTLY against.

Once you have the separation started, just pull straight up on the shell. It should slide off the frame. Be aware, if the loco already has a DCC decoder installed, there may be wires between the shell and the frame to power the rear light. For the ease of following steps, I recommend cutting these wires as far from the decoder as possible.

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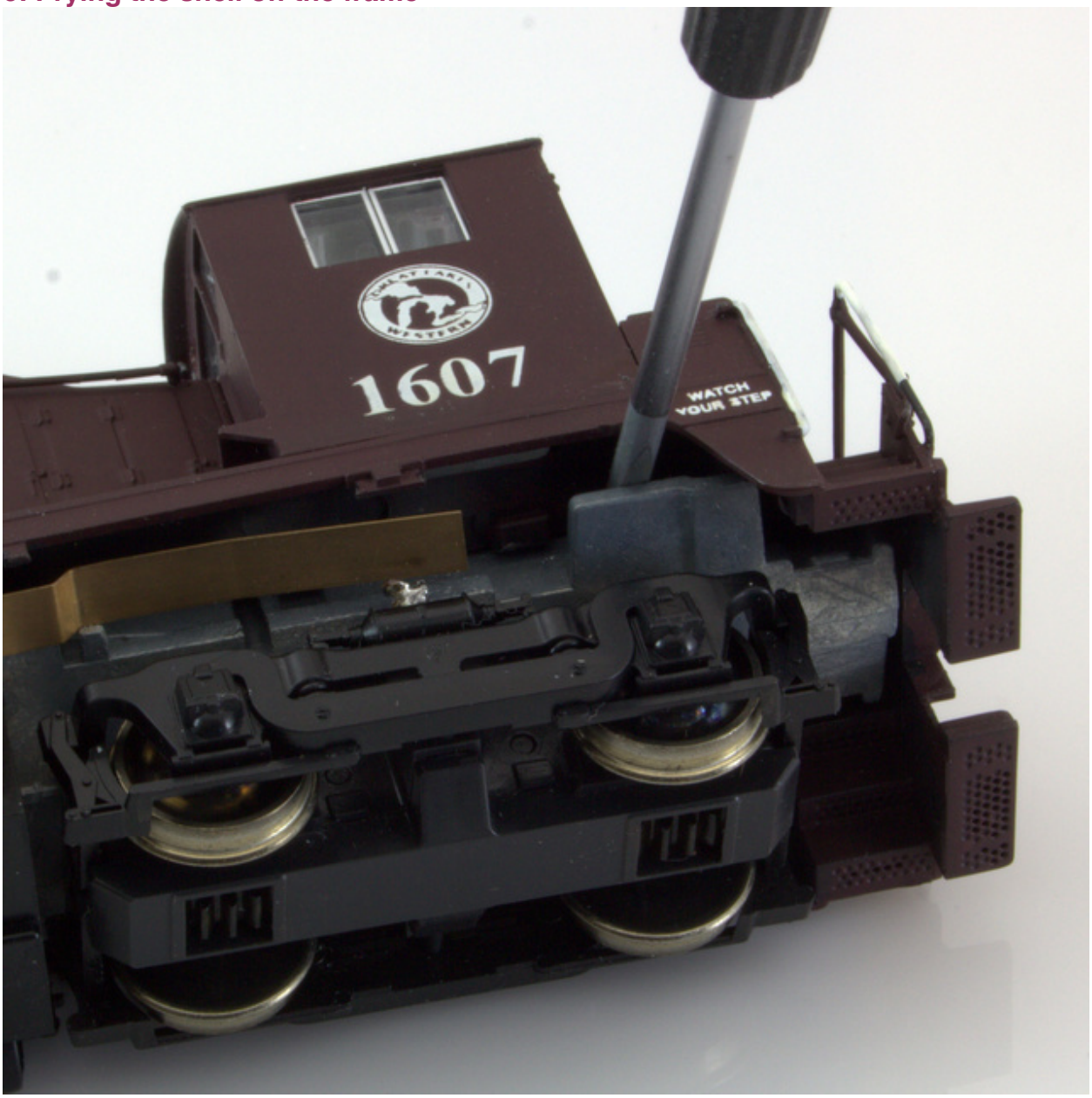
6: Prying the shell off the frame




## 1.3 Remove cab from shell

The next step is to remove the cab from the rest of the shell.

If the railings are installed in the rear of the locomotive, gently pull them from their connection to the cab. Then you release the tabs that are holding the cab into the shell.

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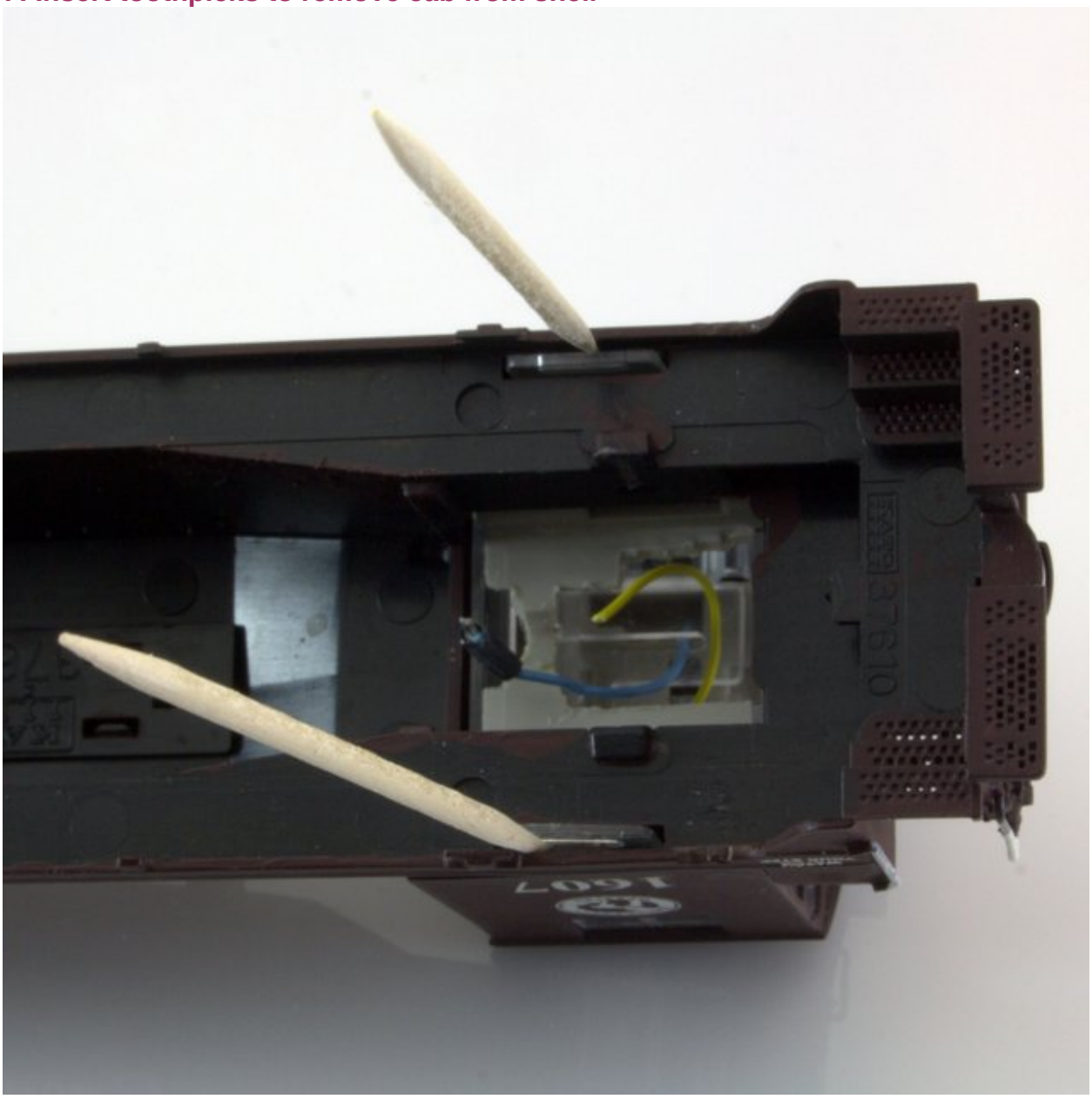
## 7: Insert toothpicks to remove cab from shell



It is a simple matter, once you know where to pry. Look at the bottom of the shell assembly (7) and insert a toothpick or screwdriver between the clear plastic side window extension and the edge of the shell. A bit of coercion and the cab pulls up and away from the shell (8).

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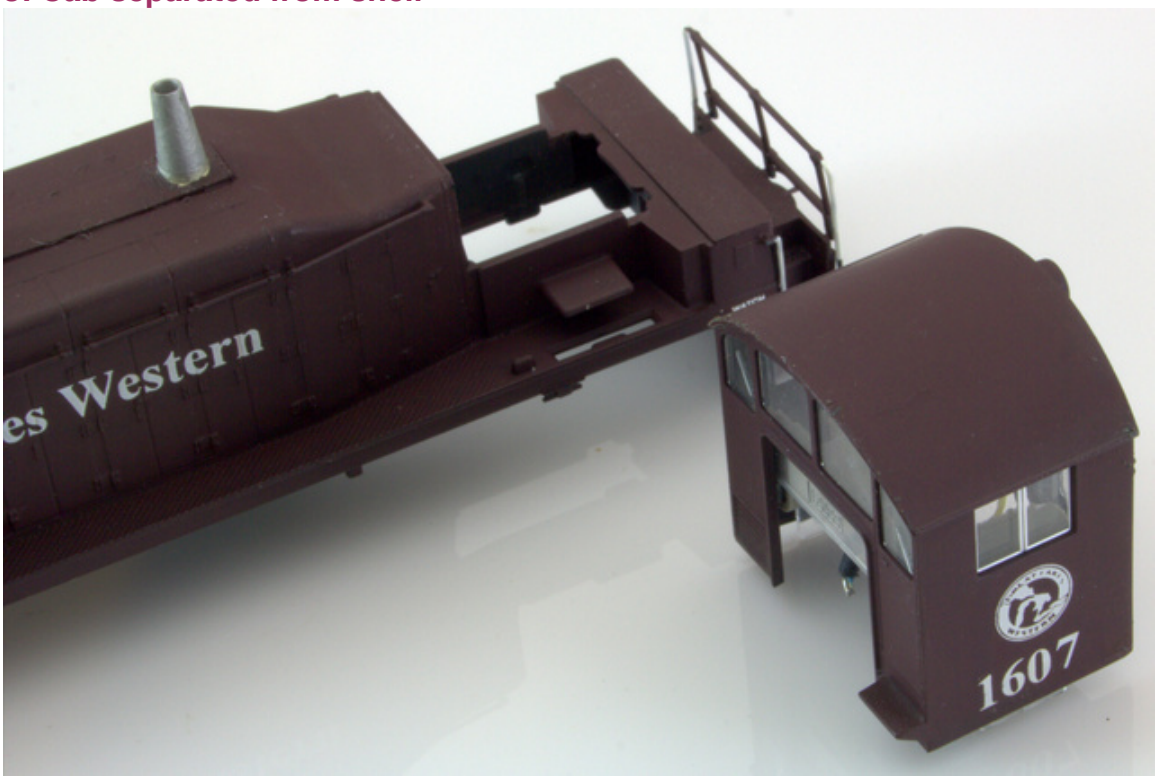
8: Cab separated from shell




## 1.4 Disassemble cab

The loco was built with yellow LEDs for the front and rear lights. Newer technology allows us to replace these LEDs with “incandescent” white LEDs. To do so, the cab needs to be disassembled. This is shown better in a video (9) than in still photos. Once again, this video is just a portion of the full length version.

There are only a few steps, but it helps to see them done, hence the video.

- Remove floor
- Remove side windows
- Remove front and back windows
- Remove rear light assembly

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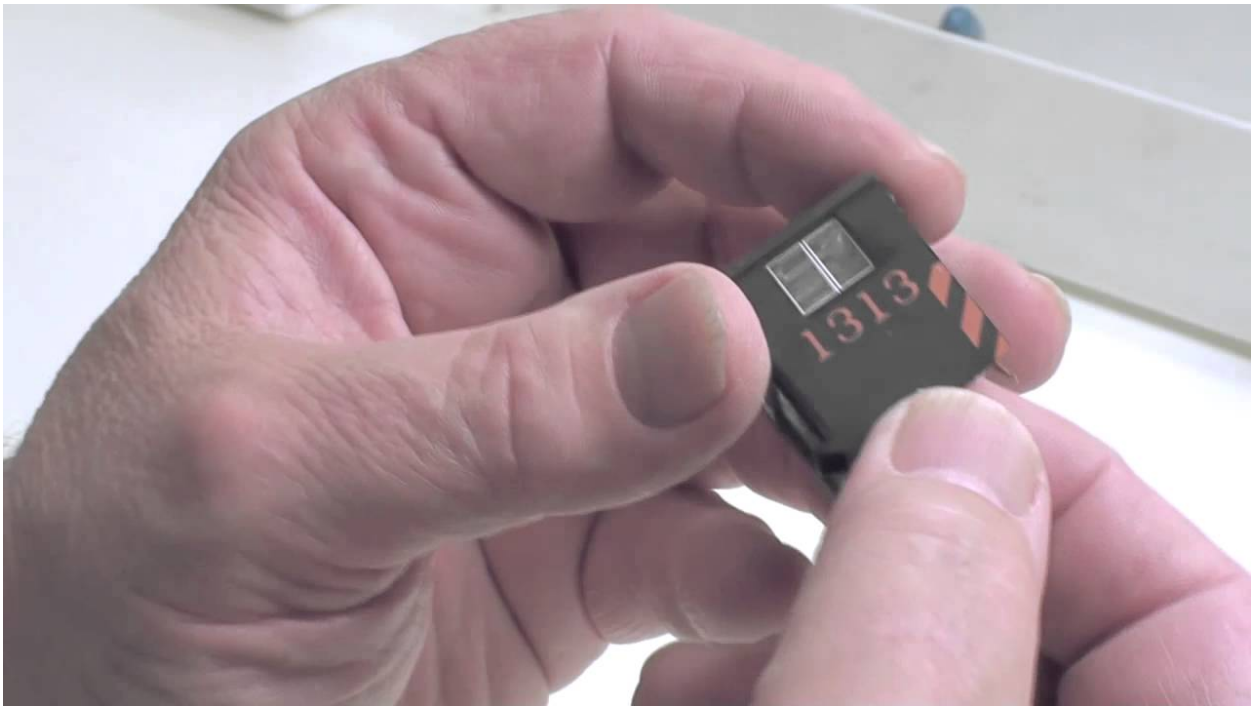
### 9: Video of cab disassembly




## 2.0 Preparation

Before you disassemble the drive train, you will want to mark the motor so that the loco runs the correct direction when you hook the decoder up. If you forget to do this, you can wing it later: if the loco runs backward when you test it, you cab need to reverse the connections to the decoder.

## 2.1 Marking the motor

**Before you split the frame completely apart**, note which motor brush connects to the right-hand frame half (10). Mark the motor near this brush holder in some way that you will be able to use later during the reassembly process. I use a red or orange paint marker. Since this dot is on top of the motor, it tells me which way is up when I reassemble the loco.

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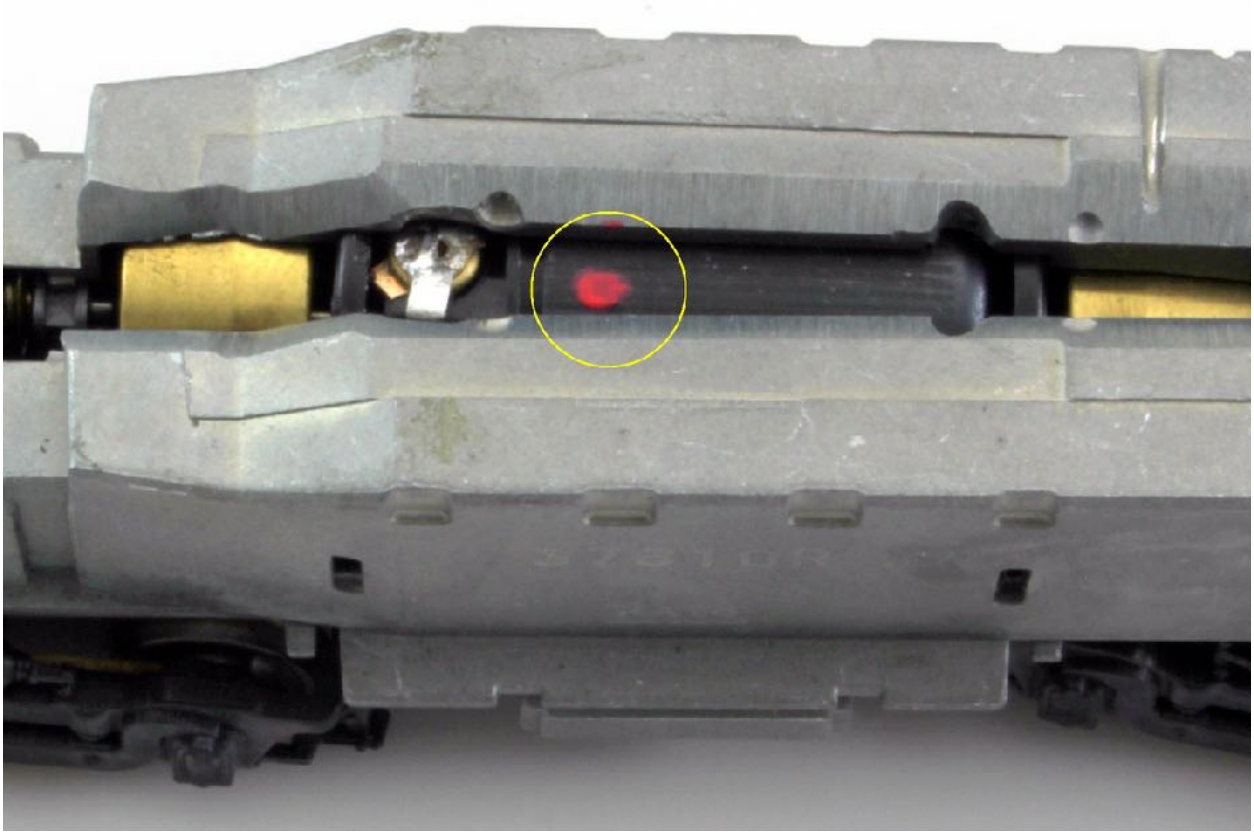
### 10: Marking the motor brush connected to the right rail



This motor, shown in figure 10, has had DCC connected to it, so the tab had been removed. I soldered a tab in place so that you can see the idea. The tab comes toward you in figure 10 and is covered with solder. A factory fresh loco won't have the solder, just the copper parts.

As I split the frame (section 2.2), I used a paint marker to put a red dot on the top of the motor next to the tab.

## 2.2 Disassemble the drive train

The next step is to disassemble the "guts" of the locomotive. Here is where you will really appreciate the details on my video.

Corral the parts in a box or something that can be covered, especially if you are sending the frame off to be milled and won't be reassembling the loco in a few hours.

- Remove the copper pick-up strips and the headlight board – they will not be used in the final loco assembly.
- Remove the screws and nuts.
- Split the frame slightly and mark the motor as explained in section 2.1

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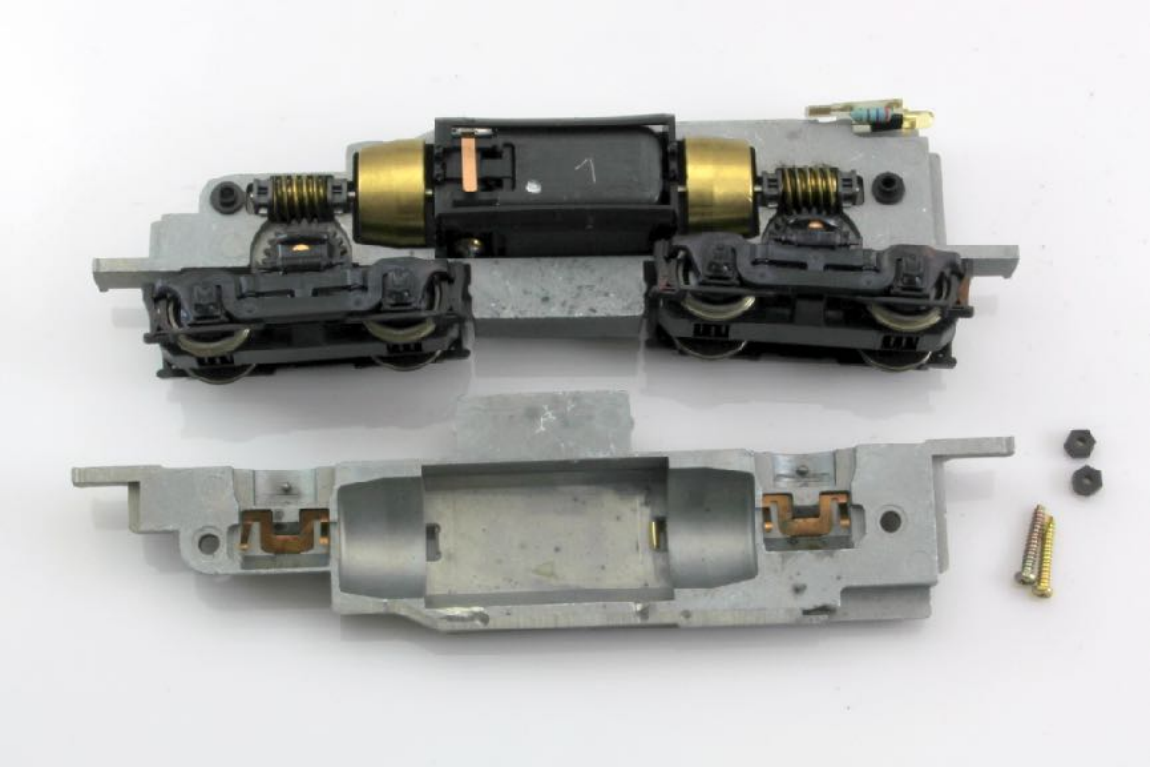
- Set the trucks aside. Some folks like to mark front and rear trucks for and reassembly in the same location. I haven't seen much variation in these locos; so I don't worry about it, at least with this model.
- Remove and store the pieces of the drive train – don't overlook or loose the adapter bushings inside the flywheels.
- Remove the insulating bushings from the frame halves.
- Remove the (copper) bearing retainer clips from the right frame half.

**11: The frame halves split before drive train removal**



You should now have two pieces of gray metal (the frame halves) with nothing on them. Now is a good time to use some denatured alcohol and a stiff brush and some Q-tip(s) to clean the frame halves of built-up lubricants and dirt.

The frame halves are ready to be machined. Whether you do this or send it out is your choice.

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## 3.0 Preliminary Assembly

My next step is to install the new lights in the shell. This way, the glue can be setting up while you are doing other tasks. If you send the frame halves to George for machining, it will be a few days to a couple of weeks before you have them back to reassemble the loco. If you machine the frame yourself, count on a few hours work in the shop.

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## 3.1 Rear Light

Find the rear light assembly you removed from the cab.

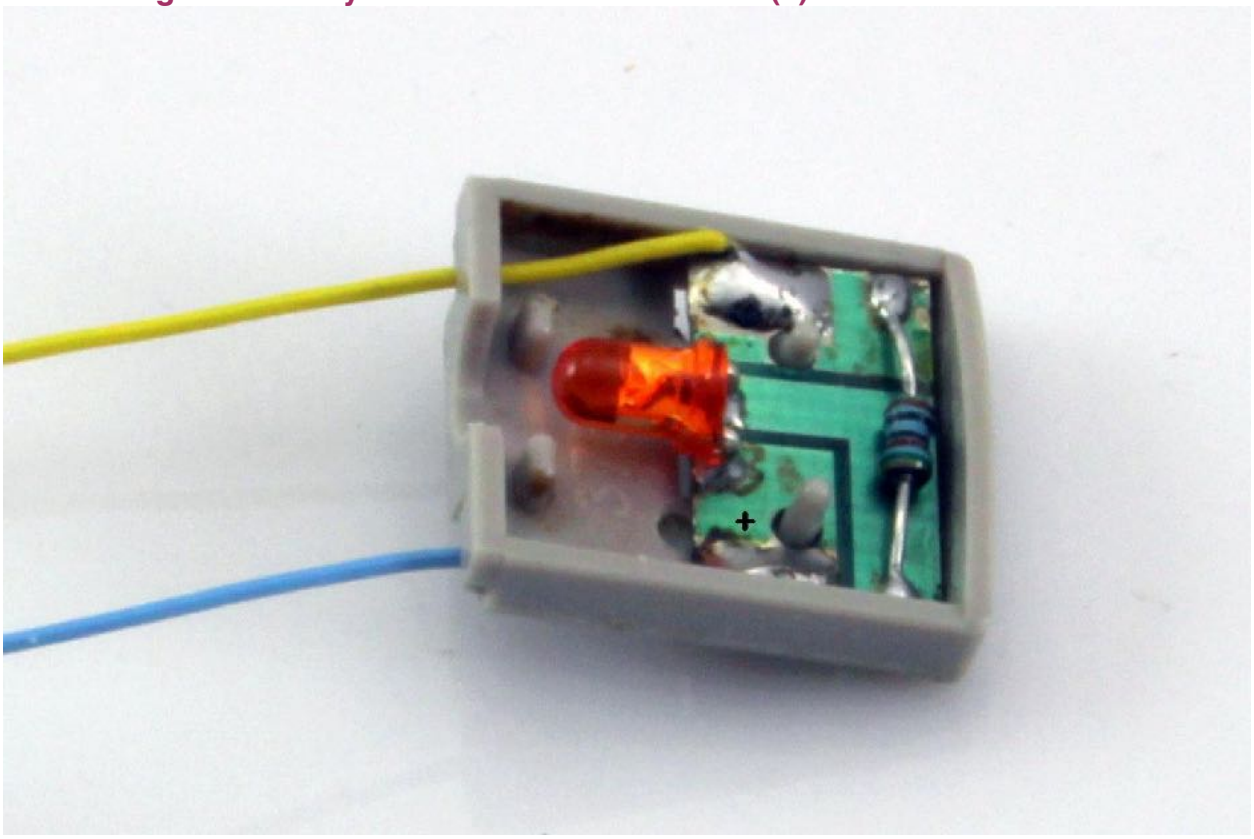
The rear light assembly comes apart by pulling the circuit board out from the gray plastic housing.

Remove the copper strips, the 270-ohm resistor and the yellow LED from the board. Install a 750-ohm 1/4-watt or 1/8-watt resistor and a Golden White 3 mm LED from Richmond Controls. Don't worry about polarity on either item at this point. The resistor has no polarity issues and we'll determine the LED's polarity later.

I selected the Richmond Controls Golden White LED for the rear to have a color balance with their SMD LED in the headlight.

Once the LED and resistor are in place, I use a 9-volt battery to test for operation. With one polarity, the LED should light. With the opposite polarity, it should be dark. Note or mark the tab that is connected to the positive battery lead when the LED lights. See figure 12.

**12: Rear light assembly with blue wire tab marked (+)**




Install about 6 inches of blue wire to the tab that was positive when the LED lit. Install about 6 inches of yellow wire on the other tab. I used the 30 AWG wire from TCS.

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Route the wires out through the gray plastic holder (12). Save this assembly for use when the loco is put back together.

## 3.2 Front Light

I selected a Richmond Controls Golden White SMD LED for the front light, as it saves valuable room inside the loco. Now is the time to install that LED, so that the glue can dry. Richmond sells them with a 6-inch long set of wires connected, so there is no fancy soldering needed to get wires on the LED.

I like to connect the LED to a buzzer (9 volt battery and buzzer combination) that limits the current through the LED and allows me to view the light, as I'm installing the LED. For information on the buzzer, see my January 2012 column.

One of the best-kept secrets in model railroading is ***Formula 560 Canopy Glue***. This glue is well known to the RC plane folks. They use it hold the canopy onto their planes, hence the name. It bonds almost anything and dries clear. I've even made windows out of it. It also dries quickly, so I use it instead of white glue for wood structures, as you can slap things together quickly and they will hold their shape. It will take 24 or more hours for the glue to be fully cured, hard and clear.

**13: Front SMD LED held in place with blue tape while Canopy Glue dries**


A piece of blue painters' tape holds the LED in place by its wires in the top of the shell. Slide the LED into place and observe that it is positioned to shine out through the lens. Then put a drop of Canopy Glue to hold it in place, as in figure 13. Set it aside to dry for at least a few hours before working on the shell again.

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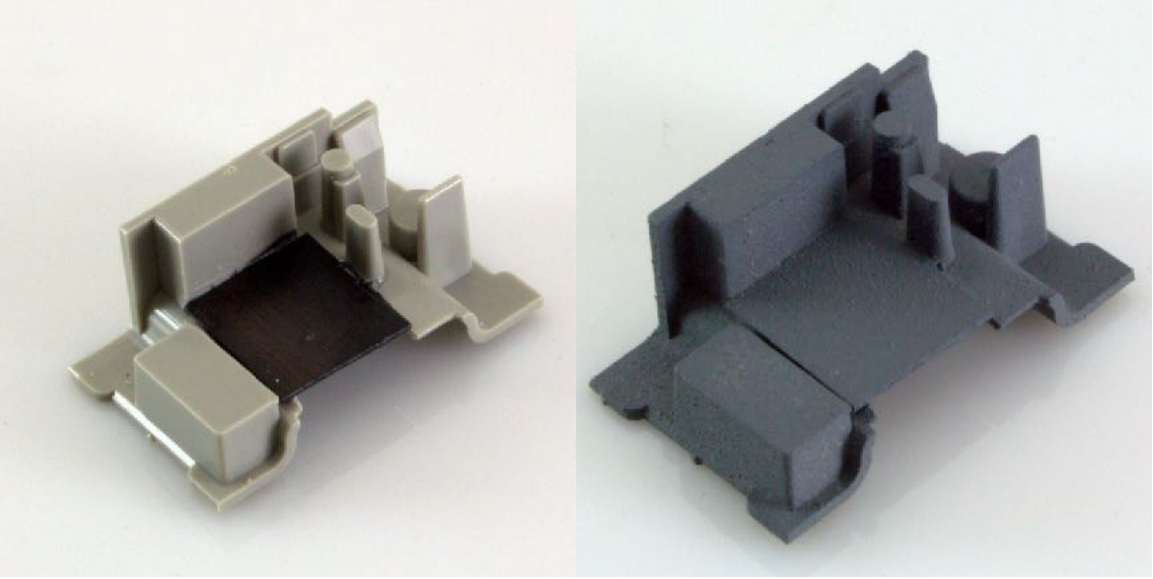
## 3.3 Fix Cab Floor

Several of the locos I did in this batch had had DCC decoders installed previously. The cab detail floor had been cut away to provide a place for a very small decoder to reside. I fixed the cab floor by cutting a piece of 0.02-inch thick plastic (black, in this case) to fit over the hole. I glued it in place and spray painted it with Krylon gray primer. You will only need to do this if your locos has had the integrity of the cab details damaged in a prior installation. Set it aside to let the paint dry. We won't use it until the final assembly. See figure 14.

**14: Cab floor replacement and painting – repairing damage from prior DCC installations**



If you want to enhance the cab detail (add an engineer, for example) now is a good time to do it.

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## 4.0 Machine frame

The key to this installation is to get enough room in the frame for the decoder, speaker and wires. This requires a bit of fancy milling. George at TVW Miniatures designed this installation and offers frame machining services. You can contact him by eMail (TVWMiniatures (a) gmail.com). Even though I have a mill, I had him do the machining. Kato no longer has stock on the frames, so if you mess up your frame, you may never get your loco back running.

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## 5.0 Wire motor

Okay, we are through tearing things down. Time to start putting them back together.

First we will isolate the motor and attach wires to it. More TCS 30 AWG wire is needed, this time in gray and orange.

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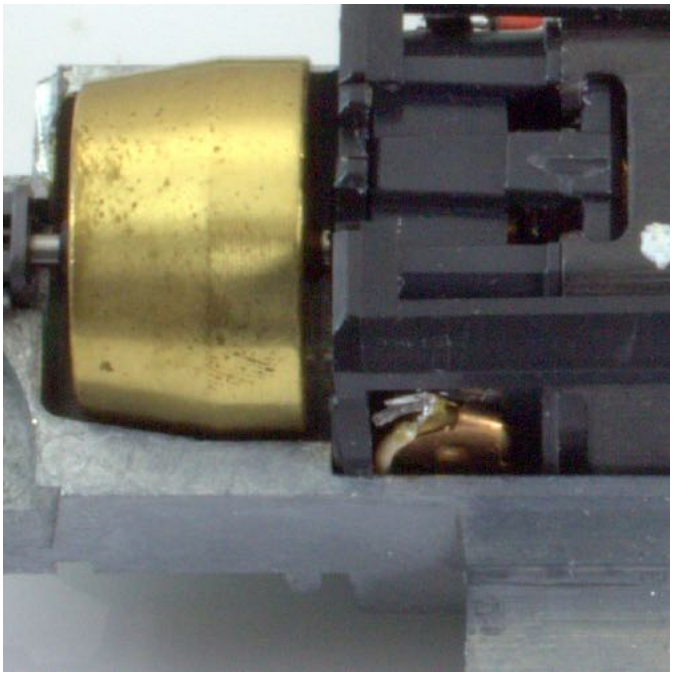
The trick in isolating the motor is to get the copper clip that connected the motor to the frame half off and a wire soldered onto the brush cap without melting the motor body. There are two ways to do this:

**15: Motor wired, sitting in the left frame half**



1) Remove the brush holder from the plastic motor housing – pry it up with a flat bladed screwdriver, without loosing the parts inside. Remove the copper contact strip. Solder the wire to the cap of the brush holder Reassemble the brush unit into the motor. The upside of this is that you have the brush out of the motor and cannot melt the plastic frame. The down side is that you have to keep track of the brush holder, the cap, the spring and the brush and reassemble them correctly.
2) Cut the copper strip off as close to the brush holder as you possibly can and solder quickly to the brush cap. Advantage: don't have to chase a bunch of parts and rebuild the motor. Disadvantage: good soldering technique is necessary to keep from melting the motor frame. If you cannot solder feeder wires to your track without melting ties, I suggest you don't try this at home.

Wire the orange wire to the top (marked) brush. Connect the gray wire to the bottom brush. Cut the wires to about 2 inches long. Figure 15 shows the motor reassembled into the frame so that you can get an idea of how the wires will eventually be routed. Note that the plastic frame clip is positioned to help keep the wires and brush caps from contacting the frame halves.

## 6.0 Assemble drive train

The next step in reassembling this loco is to put the drive train back together. However, at this time we have all of the parts out of the loco. It is a perfect time to clean and lube the loco. While we are doing all this, why not bring it into this millennium with technology?

St. Claire's Nano-Oil is a Model Railroad Hobbyist sponsor (https://www.nano-oil.com/Model%20RailRoad.html). They offer high-tech oil designed to minimize friction, reducing running current and make low speed operation more reliable. Well, with a switcher, what is more

important than low speed operation? In order to take best advantage of the Nano-Oil (16), first the existing lubricant and debris must be cleaned out.

**16: Nano-Oil, available in easy applicators in three weights: 5, 10 & 85**


I was initially skeptical about the claims about Nano-Oil. However, my experiments have shown significant improvement in low speed operation. Your are gonna need to lube it with something, why not go for the best? For this installation, I only used the 10- and 85-weight Nano-Oil.

## 6.1 Clean trucks

If this loco has been used, there will probably be an accumulation of dirt and debris on the wheels. I use a brass brush in my rotary tool to clean the wheels of the trucks before reassembly, as shown in figure 17. I use my finger to limit the rotation of the wheel assembly, while the motor tool is trying to accelerate the wheels. The difference in speed between the brush and wheel allows the brass brush to remove or loosen debris on the wheels and polish them. Then, I use a Q-tip soaked in denatured alcohol to remove the remainder or send them through the ultrasonic cleaning explained in section 6.2

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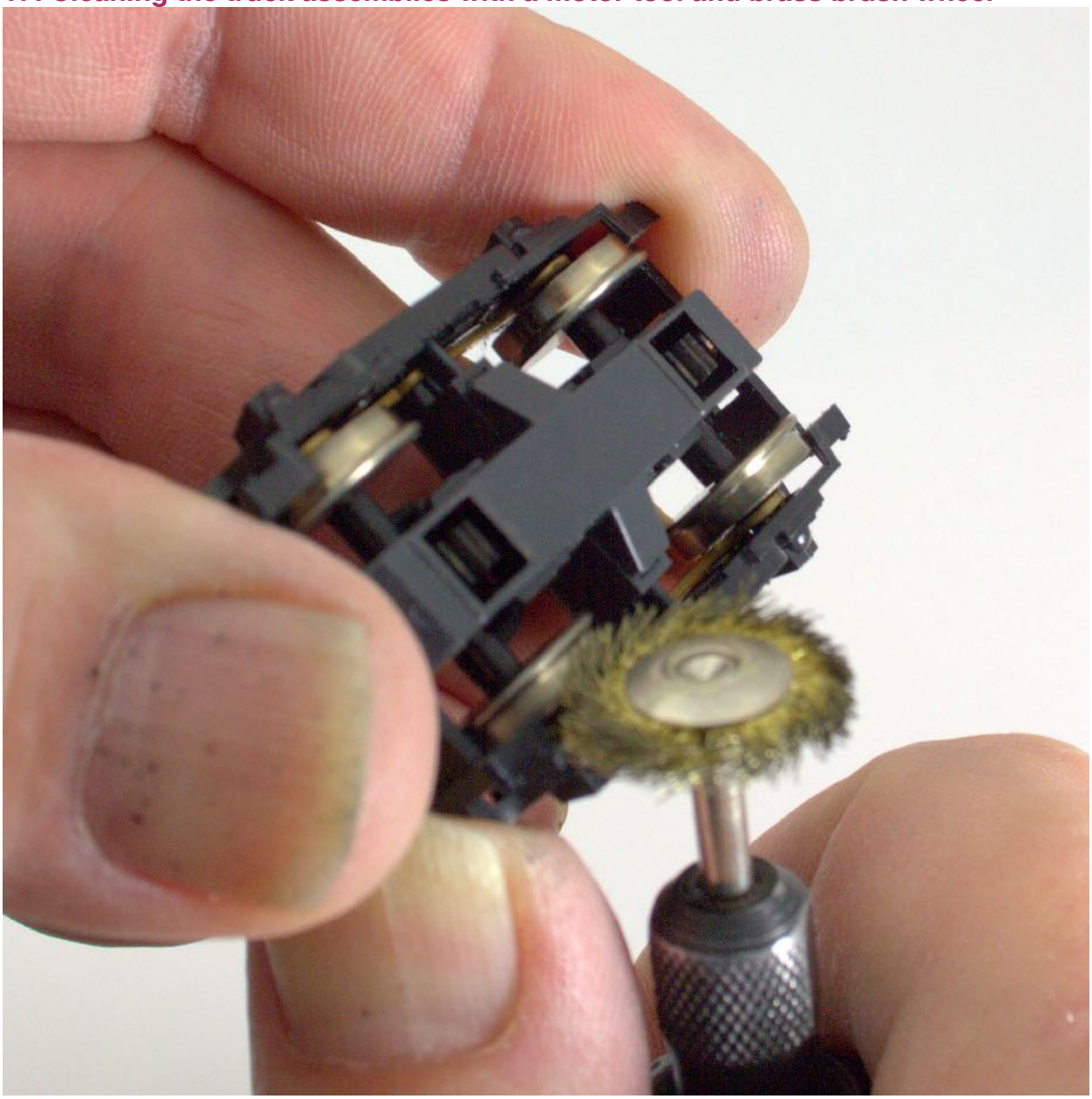
17: Cleaning the truck assemblies with a motor tool and brass brush wheel



If this loco is brand new, the wheels will be blackened overall. This brass brush technique will allow you to remove the blackening and expose new metal, making the electrical connection between the wheels and track more reliable.

## 6.2 Clean the drive train

I took the drive train parts and the truck assemblies and immersed them in a degreasing solution and ran them through my ultrasonic cleaner. My formula for the degreasing solution is half isopropyl alcohol and half water. To this mixture I add about 10% (an ounce to a cup full) Simple Green degreaser. I fill the ultrasonic cleaner bowl

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with water and put the parts in a stainless steel cup with the degreasing solution. I float the cup in the ultrasonic cleaner and run one 3-minute cycle. I examine the parts. If they still have grease and dirt hanging on, I send them through again. When they seem pretty clean by inspection, I finish them off, using my fingernail and a paper towel, as well as a stiff acid brush to clean them. When they seem clean to the eye, I rinse them and allow them to dry – overnight, if possible.

**18: Cleaning drive train parts in ultrasonic cleaner**

## 6.3 Reassemble drive train

Once the parts are clean and dry, I reassemble the drive train.

I put a drop of 10-weight Nano-Oil on every sliding surface: the bearings, the worm gear and the motor bearings. I assemble the worm gears, the adapter sleeves and the motor into the left frame half, as shown in figure 19.

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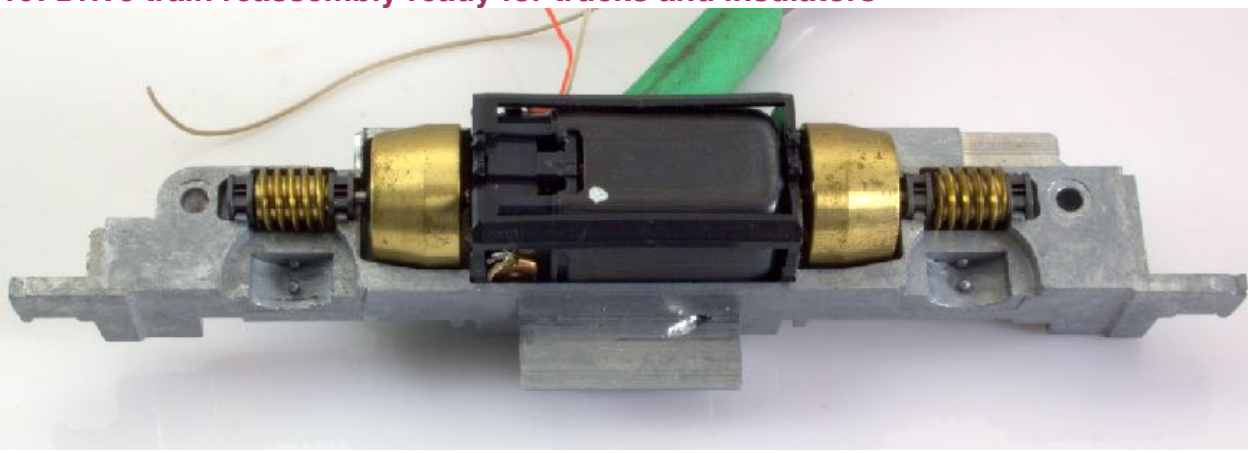
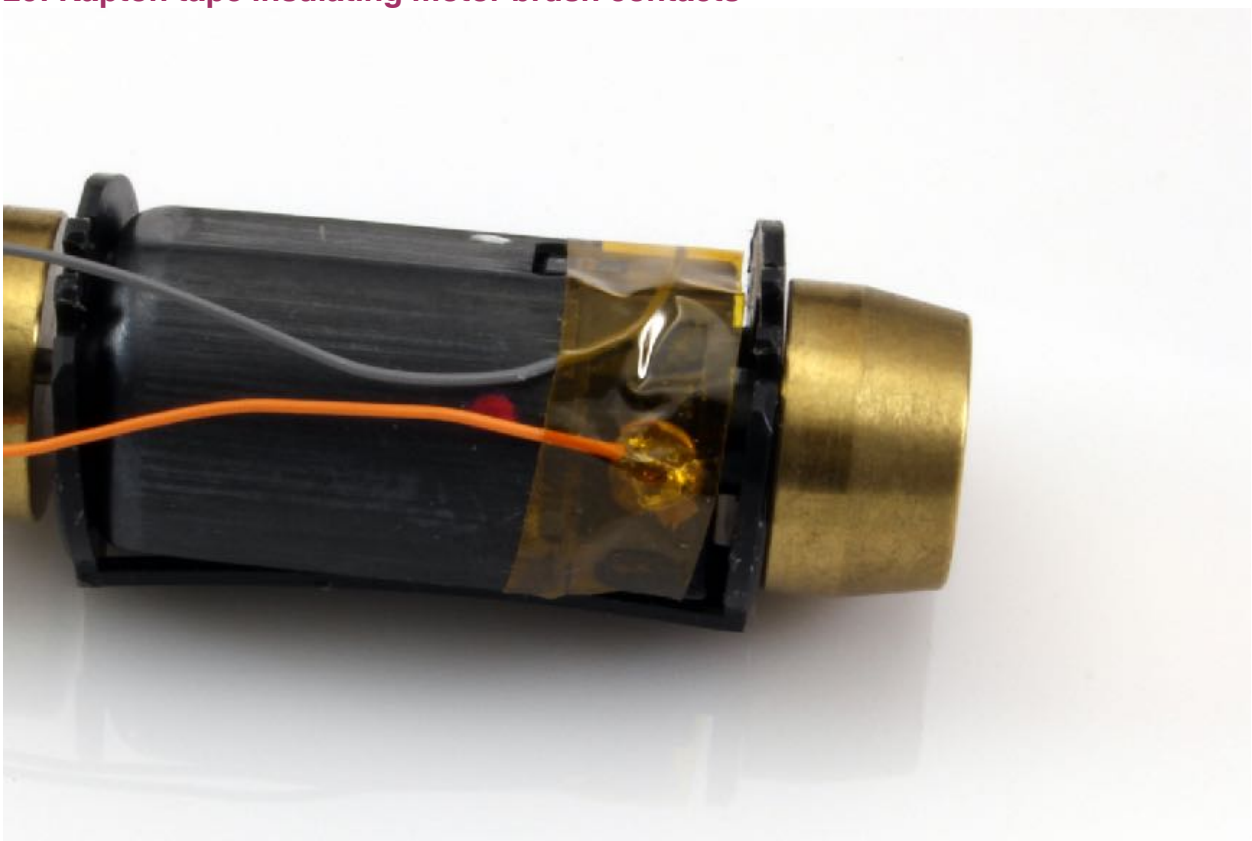
19: Drive train reassembly ready for trucks and insulators



## 6.4 Position motor wires

The motor wires need to be routed out the top of the frame in such a way that they won't be cut by the frame. The wires need to be positioned so that they won't contact either frame half. See figures 15, 19 and 20.

20: Kapton tape insulating motor brush contacts



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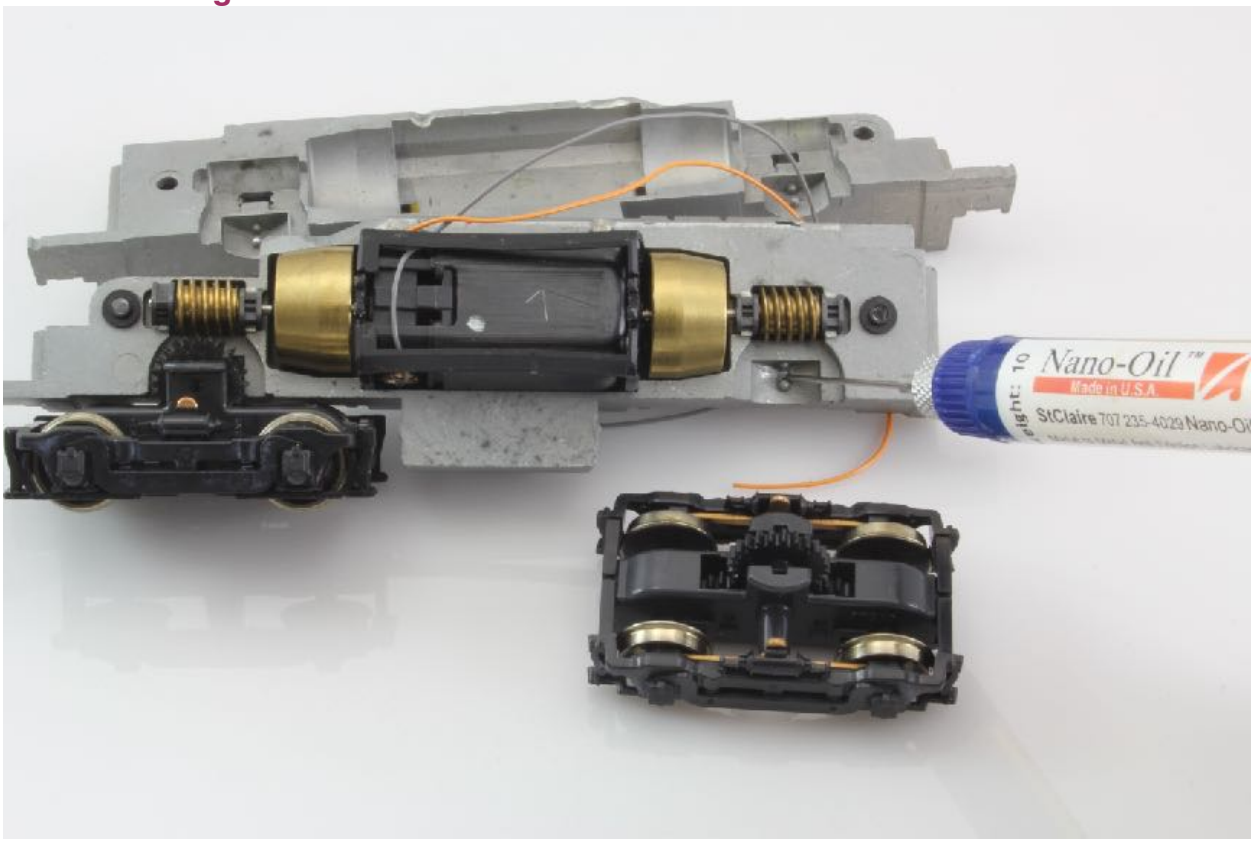
If you have any questions, use a piece of Kapton tape to prevent a short. The motor in figure 19 didn't have any clearance issues. The one in 20 might, so I used Kapton tape, just to be sure. After the photo (20) was taken, the motor mounting clip was rotated around the motor shafts until it was in the position shown in figure 19.

## 6.5 Assemble frame halves and trucks

The next step is to put the cleaned trucks into the left frame half and put a drop of 10-weight Nano-Oil where the truck slides on the frame.

### 21: Lubricating the frame half where the trucks rotate




## 6.6 Lightly tighten screws

Once you have the parts positioned as shown in figure 21, slide the other frame half over the drive train and tighten the screws, ***very lightly***. If you understand the goal of these screws, you won't over tighten them. They are to hold the frame halves and trucks together long enough for you to slip the shell over the assembly. The shell is what eventually holds the loco together. The plastic nuts won't support a lot of tension before they strip. Be gentle.

Alternatively, I'll assembly the frame halves without the trucks in place. The screws are started, but not tightened. Then the frame halves can be split slightly and the trucks

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slid into place. Finger pressure will hold the frame half together while you tighten the screws ***very lightly***. Remember to put a drop of oil (21) on the frame halves before assembly.

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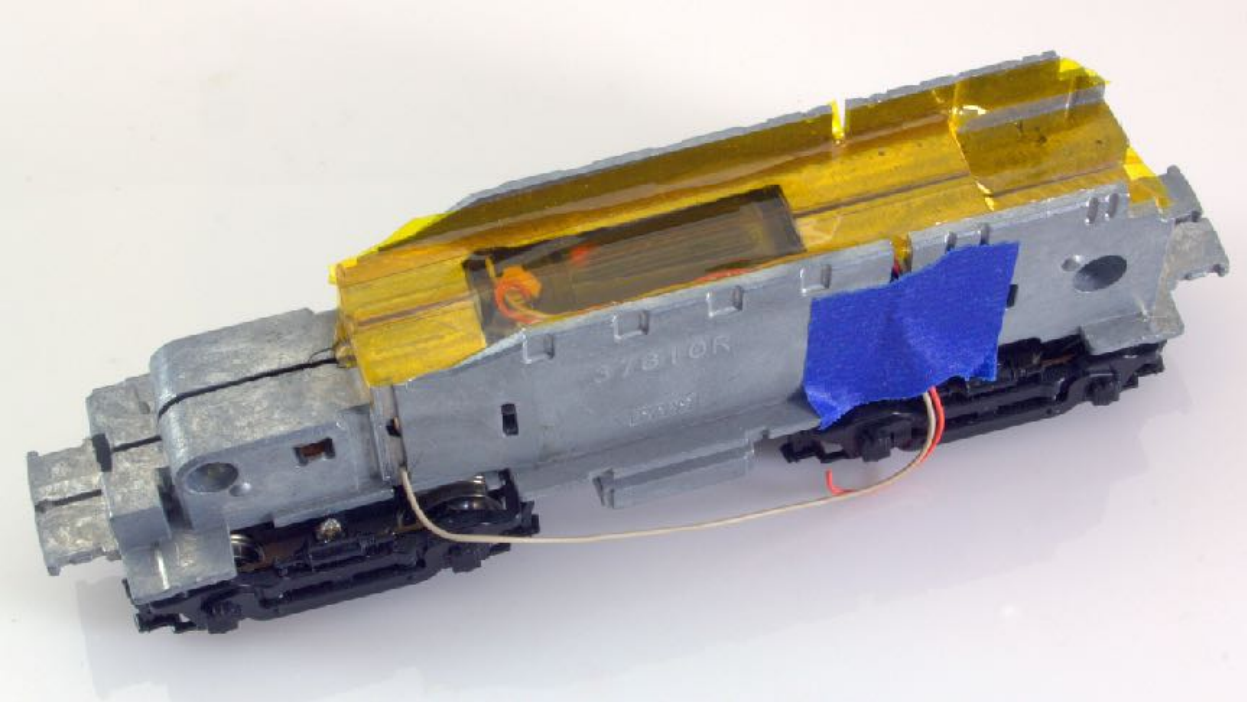
## 7.0 Apply Kapton tape to top of frame

The Tsunami decoder selected for this installation is an un-insulated board. So, to prevent fatal shorts, either to components on the board or our connections to the decoder, the entire channel where the decoder will rest will be covered with a layer of Kapton tape (22).

### 22: Decoder channel insulated with Kapton tape



We need to cover the entire decoder relief with Kapton tape, including the sides. I find that having multiple widths makes the job easier. One of the nice things about Kapton tape is that, being only 0.001 inch thick, it can be overlapped without excessive thickness build up.

Run a length of 3/8-inch Kapton tape down the length of the channel on the right side. Route the motor wires over this tape and through the wire relief hole in the right front of the frame. Use blue painters tape (less messy than traditional masking tape) to secure the orange and gray motor wires out the right front cable relief, as shown in figure 22. Run a length of the 3/8-inch Kapton tape down the left side, slightly overlapping the right piece – the motor wires should emerge from the frame between these pieces of tape. Use two pieces of 1/4-inch Kapton tape, one down each of the two sides to complete the insulation of the decoder cavity.

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Make hobby knife slices through the vertical tape at the cable troughs to allow room for the wires to connect the trucks and speaker to the decoder.

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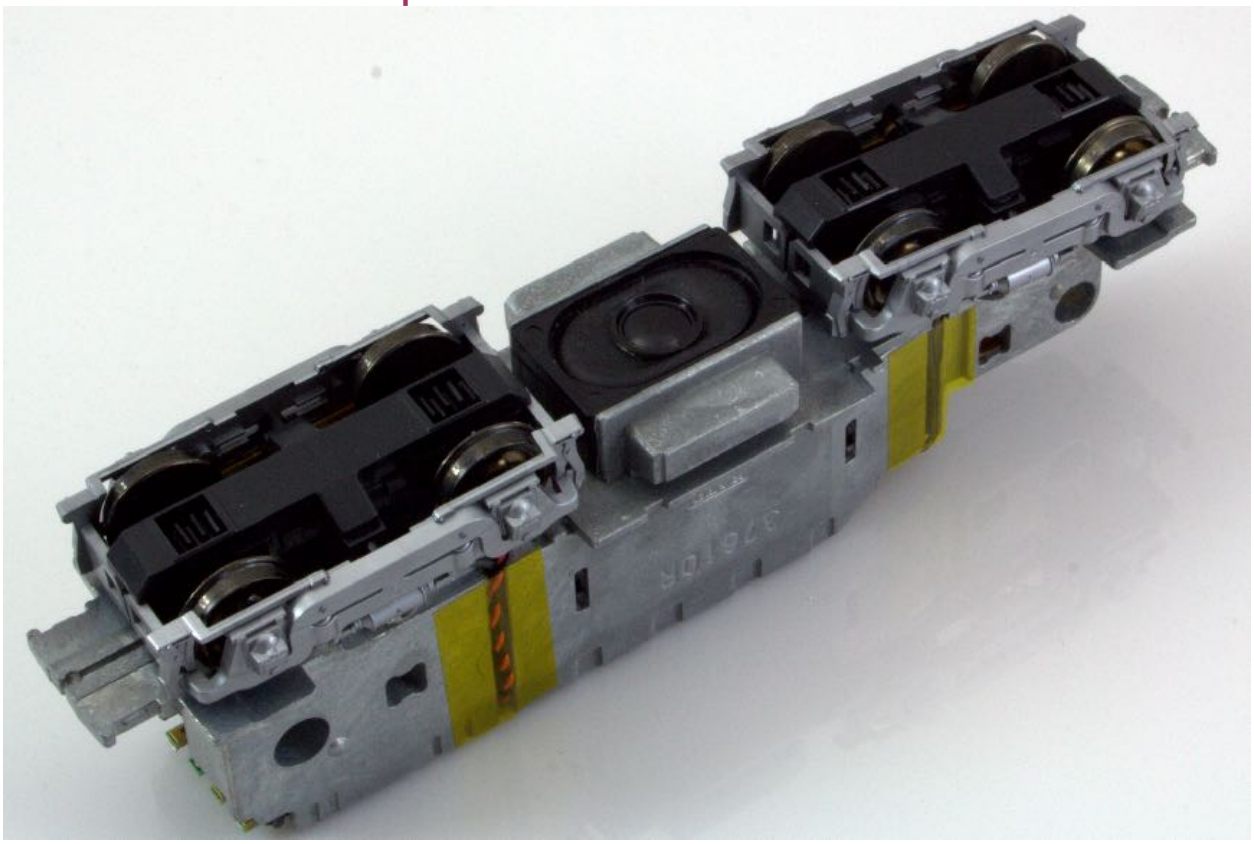
## 8.0 Install speaker into fuel tank and route wires up right front channel

Now things are moving quickly. The next step is to mount the speaker into the fuel tank relief. I selected a speaker from another Model Railroad Hobbyist sponsor, Railmaster Hobbies (http://www.railmasterhobbies.com/). It is a 14 x 25 mm unit with its own enclosure – DS1425-8. The speaker enclosure is just a bit longer than the fuel tank boss on the frame.

**23: Railmaster DS1425-8 speaker mounted in the fuel tank relief**



Put some caulk in the bottom of the relief and then position the speaker front to rear so that an equal amount of the enclosure extends beyond the boss on each end.

It would be best if you set this aside for overnight or for a few hours to cure. If you must press on right now, keep checking back that the speaker enclosure hasn't shifted as you work.

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Figure 23 was taken after the trucks were wired and the wires secured per step 9. At this time you wouldn't have the Kapton tape covering the wire troughs running up the sides of the loco or the trucks in place.

Position the speaker leads up the right front trough and hold them in place with a bit of blue tape. Hint: you don't need to hold the motor wires down the same trough now – the Kapton on top of the loco is holding the motor wires in place.

## 9.0 Wire trucks

I like really flexible wire to connect the trucks to the decoder. At Litchfield Station we sold a product that has 51 strands of very small wire to get up to 29 AWG. It had very flexible rubber insulation. We called it Wire-2951. When I first stocked it, it was available through Northwest Short Line. When they were transitioning owners, it went out of stock. I believed so strongly in it that I found an alternate supplier, even though I had to buy thousands of feet of it. Northwest Short Line has a similar, but less flexible wire now. It is 44 strands, making up 28-gauge (part number 10010-9).

Soldering wire directly to the trucks helps in many ways. It isolates the frame from the rails. It also eliminates several potentially troublesome contact locations: the sliding contact between the trucks and the copper strips and the non-sliding contact between the copper strips and the frame halves. This should improve your operational reliability.

## 9.1 Solder wires to trucks

Use a motor tool and a brass brush to clean off the contact point at the top of the truck. Quickly tin the point. Strip and tin some Wire-2951 and quickly solder it to the tinned contact point. You need to be quick with your soldering so as to not melt the plastic details on the truck side frame. Cut the wire about 2 inches above the frame. This is a bit long, but I don't want to be short and need to redo the solder joint on the trucks.

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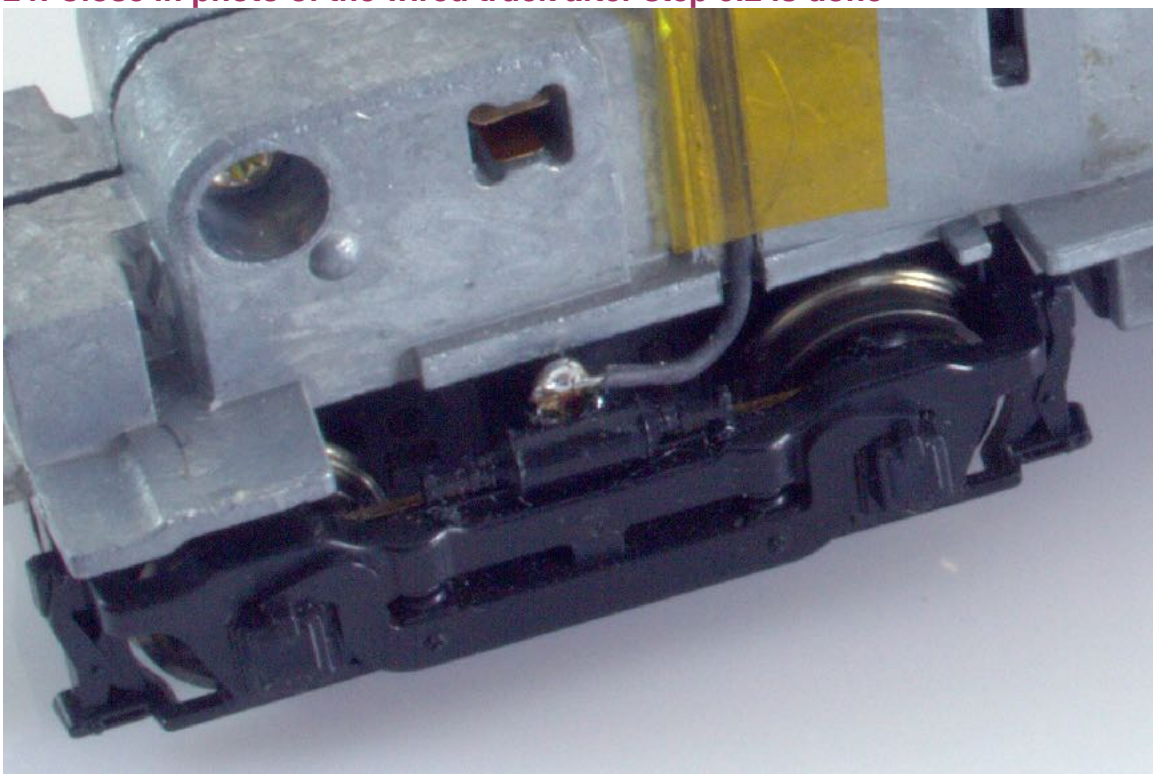
24: Close in photo of the wired truck after step 9.2 is done



## 9.2 Secure truck wires to frame with 3/8 inch Kapton tape

Once you have all four truck pickups wired, apply 3/8-inch Kapton tape to hold the wires in their channels. When you are done with this step, your loco should look like figure 25.

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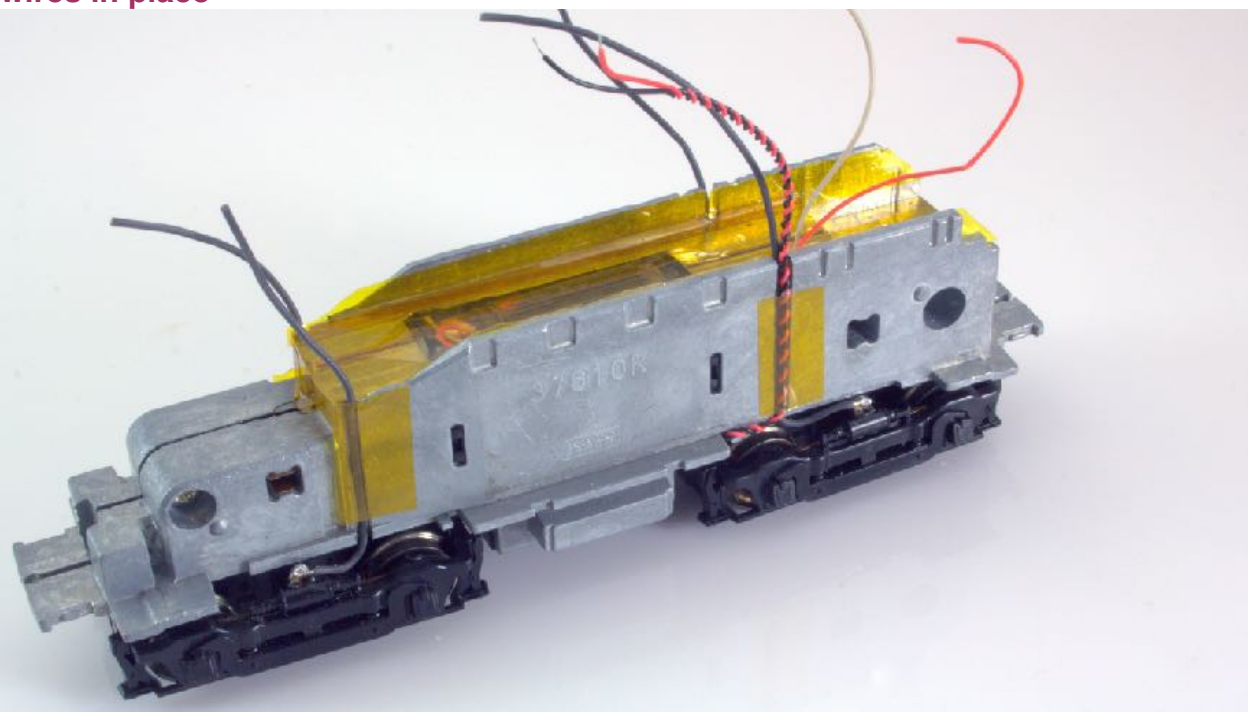
**25: Top view of the trucks wired, after Kapton tape has been applied to hold the wires in place**



## 10.0 Install and wire decoder to trucks and motor

Now, we get down to the fun part. You can see the locomotive return to running.

Figure 26 shows the locomotive at the end of the work here in section 10.

## 10.1 Set decoder in position & secure with blue tape

In the end, the decoder is not held in place by any mechanical method. The sides of the frame will keep it in line (that's why we put Kapton tape on them). The wires will hold it front to back.

This installation is designed for the SoundTraxx TSU-GN1000 decoder (part number 678-828050 for the EMD 567 sound file). The decoder needs to be installed up-side-down with the ***FRONT*** lettering toward the back of the loco and the power supply capacitors in the well behind the headlight. Hold it temporarily in place with a bit of blue tape, as shown in figure 26.

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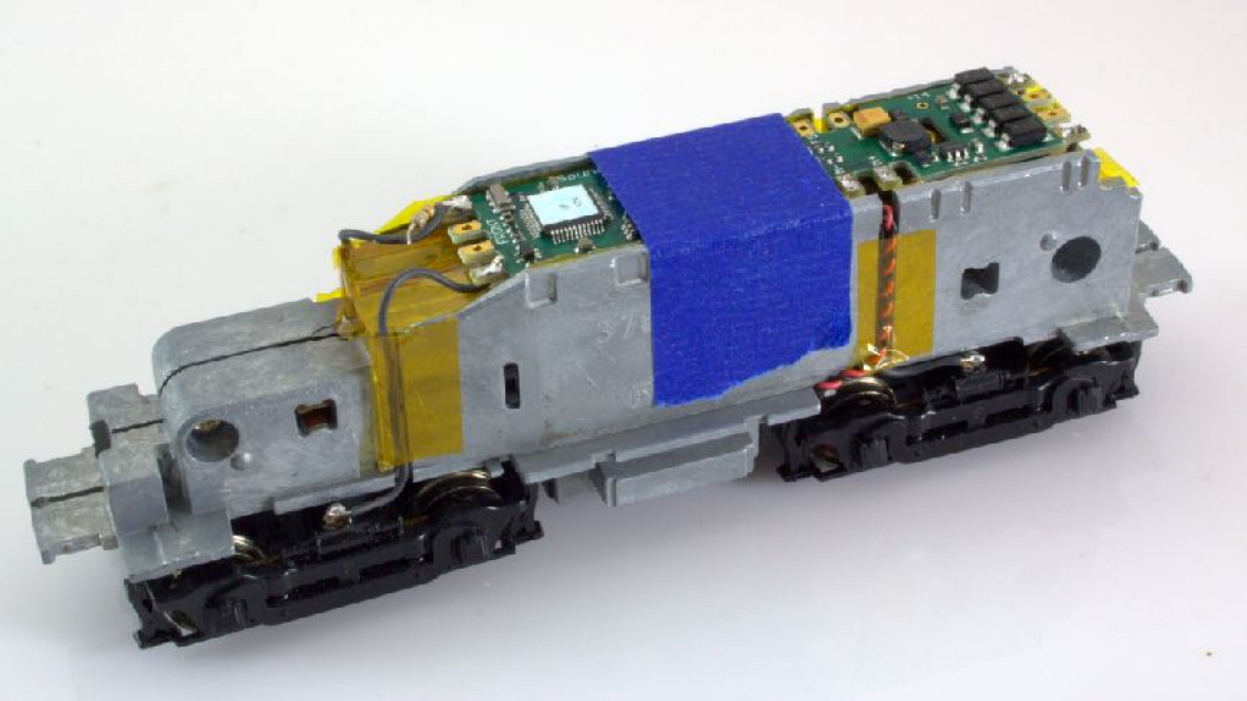
**26: TSU-GN1000 decoder held temporarily in place with blue tape**



## 10.3 Wire motor

Cut the orange and gray wires to length and solder them to the motor pads. If you observed polarity when removing the motor, the orange wire will go to the ***M+*** pad and the gray wire to the ***M-*** pad.

If you are at all unsure as to whether you got the motor polarity right, leave the wires long and just tack solder them into the ***Motor*** pads. After you test the loco, you can cut them to length and dress them.

## 10.4 Wire speaker

Make sure the speaker wires are dressed such that they won't interfere with the swing of the front truck. I like to hook them around the boss that previously held the copper contact strip for the right side of the trucks. If the wires are a bit stubborn, I will even put a dab of caulk between the wires and the enclosure and clamp them in place to keep them out of the way of the wheels.

Solder the speaker wires to the speaker terminals on the decoder. The polarity makes no difference, since this is a single speaker installation. However, I'm anal retentive enough that I wire red to the ***S+*** terminal and black to the ***S-*** terminal.

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## 10.5 Wire Trucks

Connect the Wire-2951 leads from the trucks to the terminals on the decoder. If you are going to use this loco on DC, you will want to observe proper polarity and wire the right hand truck wires to the left side terminals on the decoder. Since I don't plan DC operation, I just ran the wires to the nearest ***Track*** pad, as seen in figure 26.

To facilitate the installation of the lights, wire one end of the remaining 750-ohm resistor to one of the ***Track*** pads, along with the truck wire. On the end of the decoder labeled ***FRONT***, you can choose either side. Figure 26 shows it connected to the left track pad.

Your loco should look like Figure 26 now. Time to remove the blue tape that is holding the decoder on.

---

## 11.0 Test

You should now have a functional loco, minus the lights. So, let's go and test our work.

Go to your ***programming track.*** Do not put the loco on track with full power applied until you verify your installation on the ***programming track.*** If you need a programming track booster to read CVs with your system, make sure it is in place and functional.

Read the short address. It should be 3. Write a different short address and read it back. If you want a long address, write and verify it at this time. I like to do this in DecoderPro and create a file for the new loco at this time. Then future tweaks can be made on the main, where you can hear and see the results of your changes.

If you are unable to read from the decoder, carefully check your wiring for any shorts. Use a buzzer to verify that there is no path from the motor leads either frame half. Likewise, there should be no continuity between the trucks and the frame halves. Check the speaker, too. It should be totally isolated. Check for continuity between the wheels and the rail contacts on the decoder. Check for motor continuity between the ***M***+ pad and the ***M***– pad.

If you are able to read and write CVs on the programming track, then you can operate the loco to the main track and you should get sound and motion, but no lights, yet. Make sure the loco goes forward when the DCC system tells it to do so. If the loco runs backwards, reverse the ***M***+ and ***M-*** leads at the decoder and retest.

---

## 12.0 Final Assembly

Let's get this guy back together.

Finalize the motor wiring and lead dress, if necessary.

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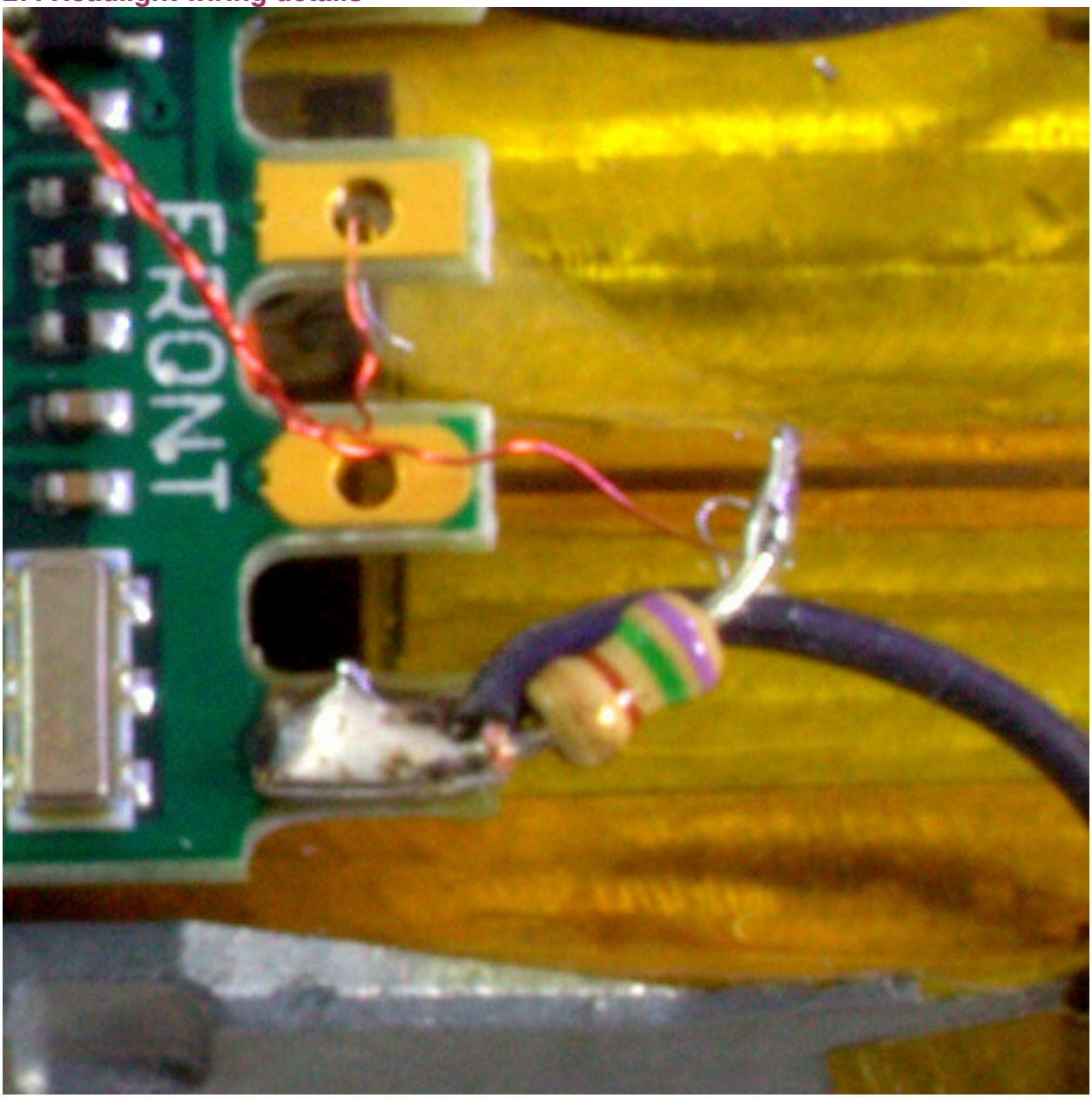
## 12.1 Rebuild Cab

Reassemble the cab, putting the reworked light board assembly into the roof of the cab, hooking it over the tabs on the rear lens. Then install the rear window set, snaking the yellow and blue wires through the troughs molded in them for the original contact strips. Slide the front window set into place. The side windows snap in place securing the front and rear windows and the gray LED housing. Some adjustment may be necessary to seat the front and rear windows so that the side window assembly will seat correctly and hold them all in place. Snap the cab floor into place, hooking its tabs into the holes in the side window assembly.

### 27: Headlight wiring details

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## 12.2 Wire the headlight

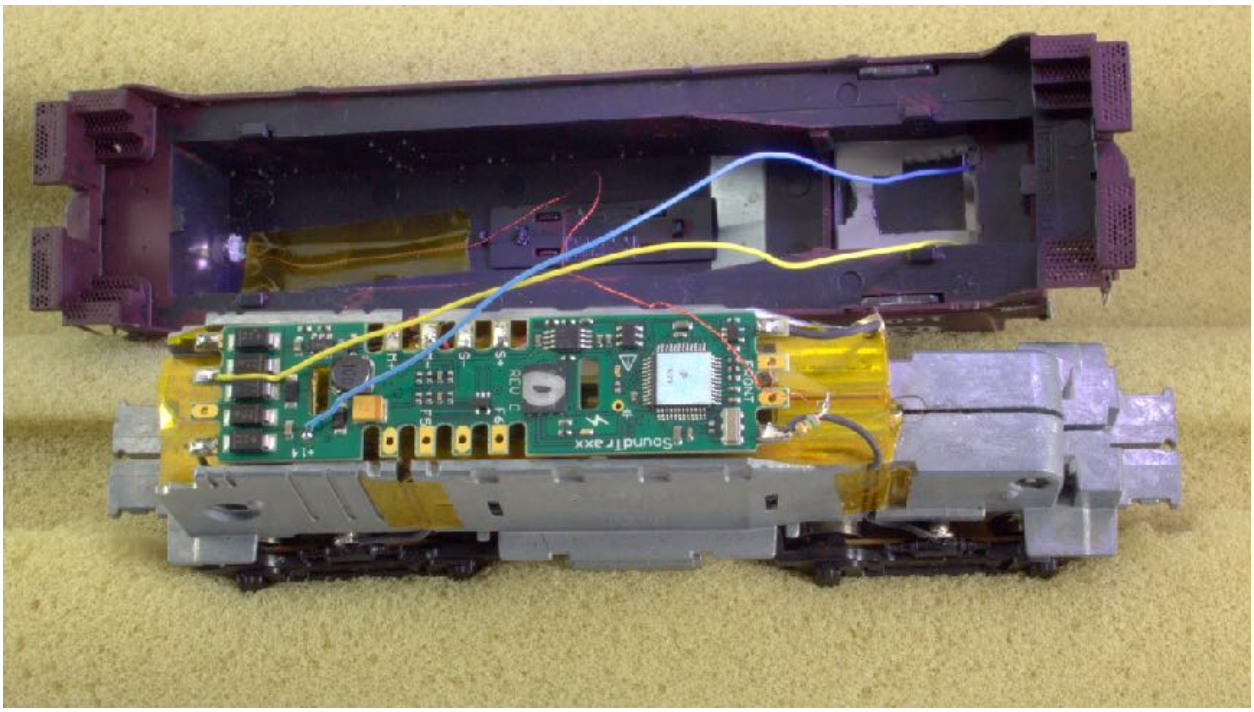
By now the Canopy Glue should have set up. Remove the blue tape and hold the LED down with a bit of 3/8-inch Kapton tape, as shown in figure 28.

Since we are wiring the headlight, The LED needs to connect to the end of the decoder that is marked FRONT, even though those contacts are in the rear of the loco. The long lead on the LED – the one that lit up when the + buzzer lead was connected to it, goes to the resistor you have hanging off the rear of the decoder. The short lead goes to the rectangular pad on the FRONT end of the decoder.

In figure 27, the wires are wrapped around the pad and the resistor, ready to be soldered.

Solder the wires in place.

**28: View inside loco with both LEDs wired to the decode**
**Note the slack so that the shell can lie next to the loco on the foam cradle**



This is what is known as **Half Wave Lighting**. Instead of the positive voltage coming from the blue lead, it comes from one of the track pickups. They are the same voltage for this purpose, but the rail voltage is only turned on about half the time (see the DCC waveform in my December 2012 column. With LEDs this makes a very small difference in the total light output, but makes the wring so much easier. You'll see why later. This technique is frequently used in brass steamers, where the front LED or light is connected to the right rail in the boiler and the decoder is located in the tender. This saves one wire running between the tender and the loco.

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## 12.3 Wire rear LED

The oval shaped pads on this decoder have 1.5 volts on them, as this decoder was designed to replace the light board in the Athearn Genesis locos (hence the GN in the model number). However, SoundTraxx provided a *+14* (volt) terminal on the decoder. A LED and resistor combination (designed for 14 volts) can be connected between there and the function terminal.

Cut, strip and tin the wires from the cab assembly. Solder the blue wire to the *+14* terminal and the yellow wire to the rectangular pad on the end of the decoder that is not marked ***FRONT***. See figure 28.

## 12.4 Slip shell over frame and test lights

Be very careful not to pinch wires, while you slip the shell over the top of the frame. Push it down a bit until the bottom of the shell just touches the nubs on the frame that will hold it in place. The shell is now keeping the frame halves together, not the clamping screws.

Running the loco on the main track, it should be totally functional. If a LED doesn't light, make sure that you have F0 selected and that the LEDs are wired correctly. In a pinch, reverse the leads to the non-functional LED and see if that fixes the problem.

Since it has not been programmed yet, the loco may run faster than you desire and have a really quick start.

---

## 13.0 Program

Program the loco to have the personality you wish.

---

## 14.0 Finish installation

Just a few more steps and you will be done.

## 14.1 Seat shell on frame

Go ahead and seat the shell firmly down onto the frame.

## 14.2 Fuel tank

We've got the speaker in the fuel tank, but it doesn't look pretty. Also, the speaker magnet will attract iron and steel items from your roadbed. If they bounce around on the speaker cone, the sound gets really bad.

Now it is time for the black panty hose. I'm sure that those of you who looked at the parts list ahead of time have been scratching your head on that one.

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Remember that the speaker enclosure was a bit longer than the boss molded into the frame to hold the fuel tank? Okay, here's how we deal with that one.

Cut the sides off the plastic fuel tank detail part. Check the sides to fit against the metal bosses on the frames. Make sure you have the correct detail part on the correct side of the loco. They are not the same. The left hand side has a piece that extends fairly far forward. The right side piece doesn't extend as far back.

**29: Finish the fuel tank with speaker grille cloth and modified plastic parts**


Cut a piece of black panty hose to cover the speaker from front to rear and to extend side-to-side about half way down the air tanks. Carefully (I use a toothpick) apply a bit of caulk all the way around the speaker. Don't get any on the cone, as it will dampen the sound. Slightly stretch the panty hose material and press it down onto the bead of caulk you created. Apply a fairly large bead of caulk on the air tank area and press the sides in place and down against the frame. Use a one-handed bar clamp (29) to hold them in place for a few hours until the caulk sets up – I recommend overnight.

Now you have some grille cloth on top of your speaker to help control the debris pickup. It won't prevent the pick up, but will help keep the debris away from the speaker cone. I recommend checking for accumulation from time to time.

While the caulk is setting up, we can do some of the final work with the loco in the foam cradle. Just be careful not to bump the clamp. 14.3 Final lubrication

Remember that we only put light (10) weight Nano-Oil on the gears? Well, it is time to provide longer-term lubrication with heavier weight Nano-Oil. With the loco still in the

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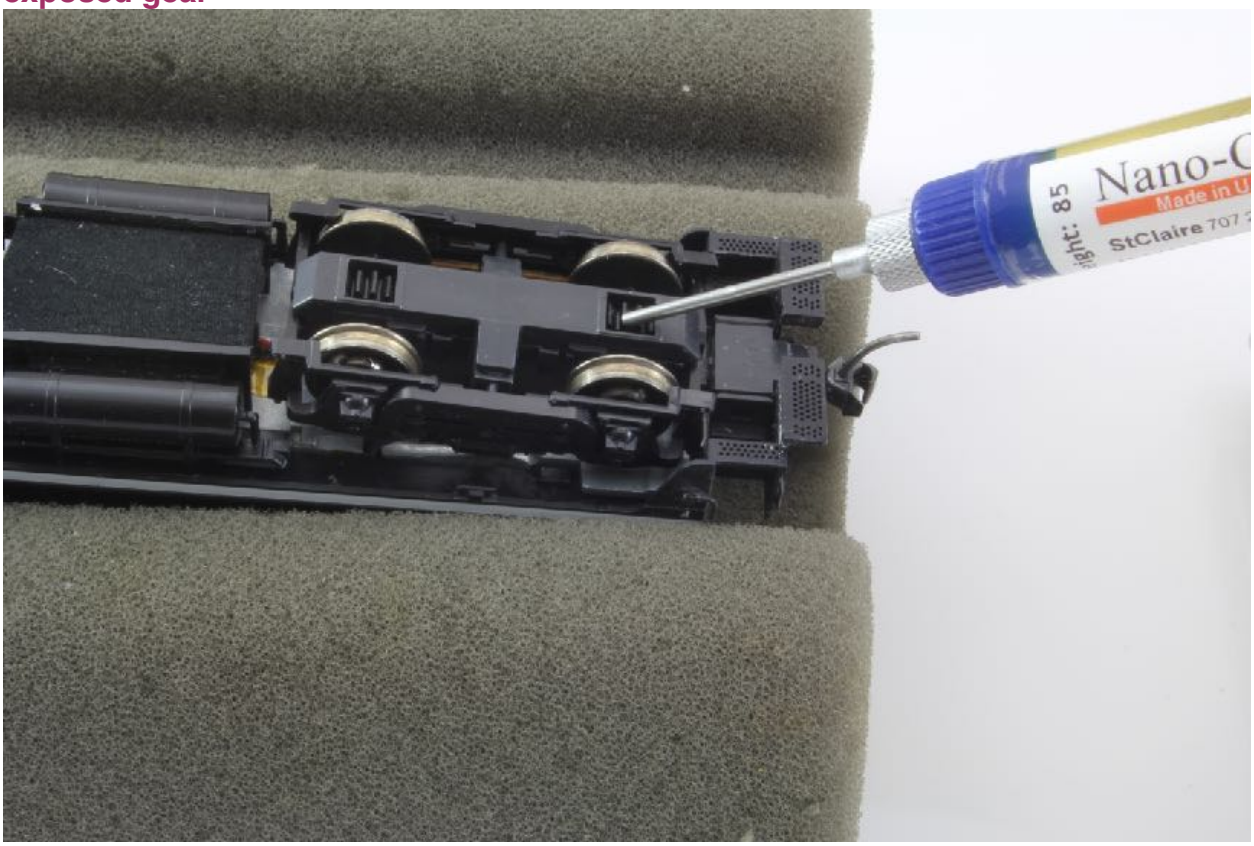
cradle, put one drop of the 85-weight Nano-Oil on each of the four exposed gears on the bottom of the loco. When you run the loco, this will get distributed throughout the entire gear train, all the way up to the worm gear.

### 30: Lubricate the entire gear train with one drop of 85-weight Nano-Oil on each exposed gear




Dirt and corrosion are enemies of electrical contact, making for irregular sound and performance. Daylight Sales provides the electrical equivalent of Nano-Oil, called Never Stall. It lubricates and cleans electrical contacts and inhibits corrosion. Put a drop of Never Stall on each wheel bearing where it contacts the copper pickup plate.

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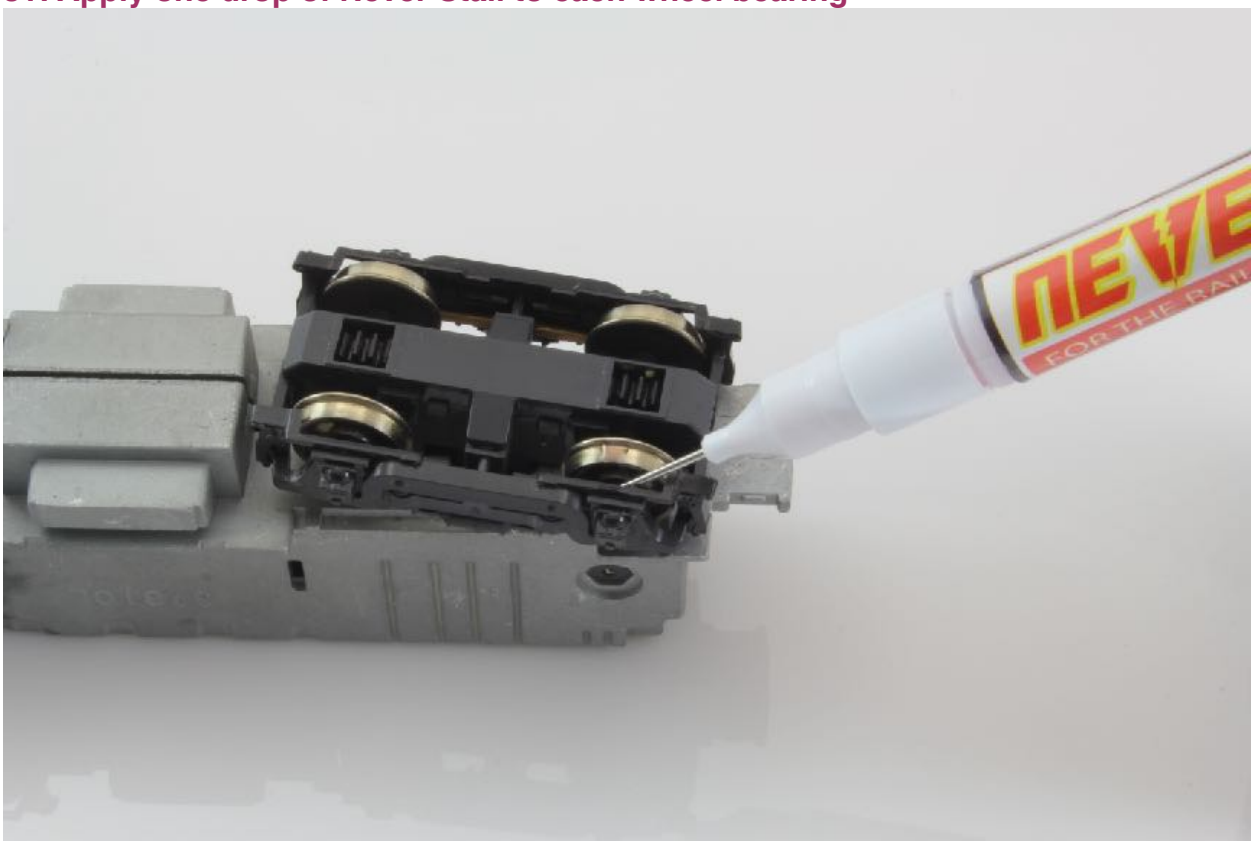
**31: Apply one drop of Never Stall to each wheel bearing**



## 14.4 Reinstall couplers

Now you will understand why I wanted to take the couplers out in one assembly for each end of the loco. You can just snake the assembly back in, somewhat as you got it out. Once in place, just press it down with a screwdriver.

If you disassembled the couplers, you will need to reassemble them onto the frame working around the shell details. That is more difficult, in my opinion.

Now you have a NW-2 switcher with sound, you lucky person!

---

## Non-sound decoder

This same design could be used with a non-sound decoder. You wouldn't have to split the fuel tank or install the speaker. If you used in insulated decoder, you wouldn't have to apply Kapton tape to the decoder relief. However, the installation would be very much the same. But once you have the frame machined, why not put a Tsunami in it and have sound? The cost differential is just a couple of R-T-R boxcars.

I hope you got something out of this column. There are a bunch of tricks and tools that won't fit into this medium that I cover in the video.

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This will probably provoke a bunch of comments on the MRH blog site. Click on the Reader Feedback link below and join the discussion. I hope you are inspired enough to rate the article Awesome on your way by!

I wish you green boards until next month! Don't forget to look at the discussion of the long awaited NCE PowerCab upgrade (version 1.65) in this month's "From Mr. DCC's Workbench" sidebar.

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***Sidebar***

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## Parts & Supplies & Tools

The frame will need to be milled out to provide room for the decoder and speaker, as well as relief to get the wires from the trucks and speaker to the decoder. I had George at TVW Miniatures (TVWMiniatures (a) gmail.com) do the ones for that I used for this column. The raw frames are no longer available from Kato's parts department, so I didn't want to screw one up experimenting with it.

## Parts

All of the parts (except the panty hose) and most of the supplies for this installation are available from Model Railroad Hobbyist sponsors.

- Decoder – SoundTraxx TSU-GN1000 with EMD 567 sound file part 678-828050
- Speaker – Railmaster Hobbies DS1425-8
- Rear LED – Richmond Controls 3mm Golden White LED
- Front LED – Richmond Controls SMD Golden White LED with 6 inch leads
- Resistors – two each 750 ohm 1/8 or 1/4-watt
- Cab floor replacement, if needed – Styrene about 1 inch by 1 inch, 0.020 inch thick
- Truck wires – Super flexible 29 AWG rubber insulated wire (Wire-2951)
- Motor and rear light wires – 30 AWG wire from TCS in colors:
    - Orange
    - Gray
    - Yellow
    - Blue
- Black panty hose – see text – don't just steal your wife's

## Supplies

- Kapton tape (if you can only have one size, I recommend 3/8-inch wide)
    - 3/8 inch wide
    - 1/4-inch wide

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- Blue painters tape
- Styrene cement – I use MEK
- Gray Krylon primer spray paint
- Clear acrylic bathtub caulk – I use Polyseamseal
- Formula 560 Canopy Glue
- Denatured alcohol or Ethyl rubbing alcohol
- Never Stall – electrical lubricant and corrosion inhibitor
- Nano-Oil – a MRH sponsor
    - 10 weight
    - 85 weight

## Tools

In addition to normal modeling hand and soldering tools, I recommend

- Foam Cradle
- Storage box for parts – with cover
- Small one-handed bar clamp
- Ultrasonic cleaner

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## *From Mr. DCC's workbench*

### Release of new software for the NCE PowerCab – version 1.65

In November 2012, NCE announced the long-awaited release of its upgrade software for the PowerCab. Version 1.65 replaces 1.28C, which has stood for quite some time. NCE is supplying the upgrade free of charge to folks who bought their PowerCab in the last 20 months. If yours is older, $25 will fix you up.

This software upgrade is a real boost to folks who use the PowerCab as the basis for a small to medium layout, as I do. If you are mostly using your PowerCab on the workbench and as a Pro Cab on a larger NCE system, there is very little in this upgrade for you. So you may not want to upgrade if you have an older unit and need to pay for the software. Here are NCE's claims for the new version:

1) Support for up to 6 recalls – two recalls remains the default

2) Support for 3 external throttles, using addresses 3, 4 and 5

3) Support for 3 AIU, USB or Mini-Panels in addition to the extra throttles

4) New thumbwheel control of CV programming values. For example, when programming on the main, you can select the CV value for the volume on your sound decoder and ramp it up or down with the knob or the speed buttons. I like this one a lot.

5) Easy operation of the last thrown turnout – press the SELECT ACCY twice in a row and the last used accessory will toggle to the opposite position.

6) Programmable ProCab mode timeout so multiple PowerCabs can be used together more easily.

7) Support for Analog Fast Clocks – I don't know what this means and haven't gotten a response from NCE yet. They are swamped getting the upgrade out to all the users.

8) New, improved USB/computer commands

I got the upgrade for my PowerCab. I can report that installation is a breeze.

First, note any of the settings that you have in your unit, per the instructions. These settings are stored in the chip you are going to replace, so they won't be there once you change to the new chip.

The hardest part is taking all nine screws out of the back of the PowerCab. Once you have it open, a small screwdriver pry under the ROM chip on the main board will remove the old one. I recommend a slight bend of the new leads, as shown in the accompanying NCE documentation, before you insert the new chip. A quick visual

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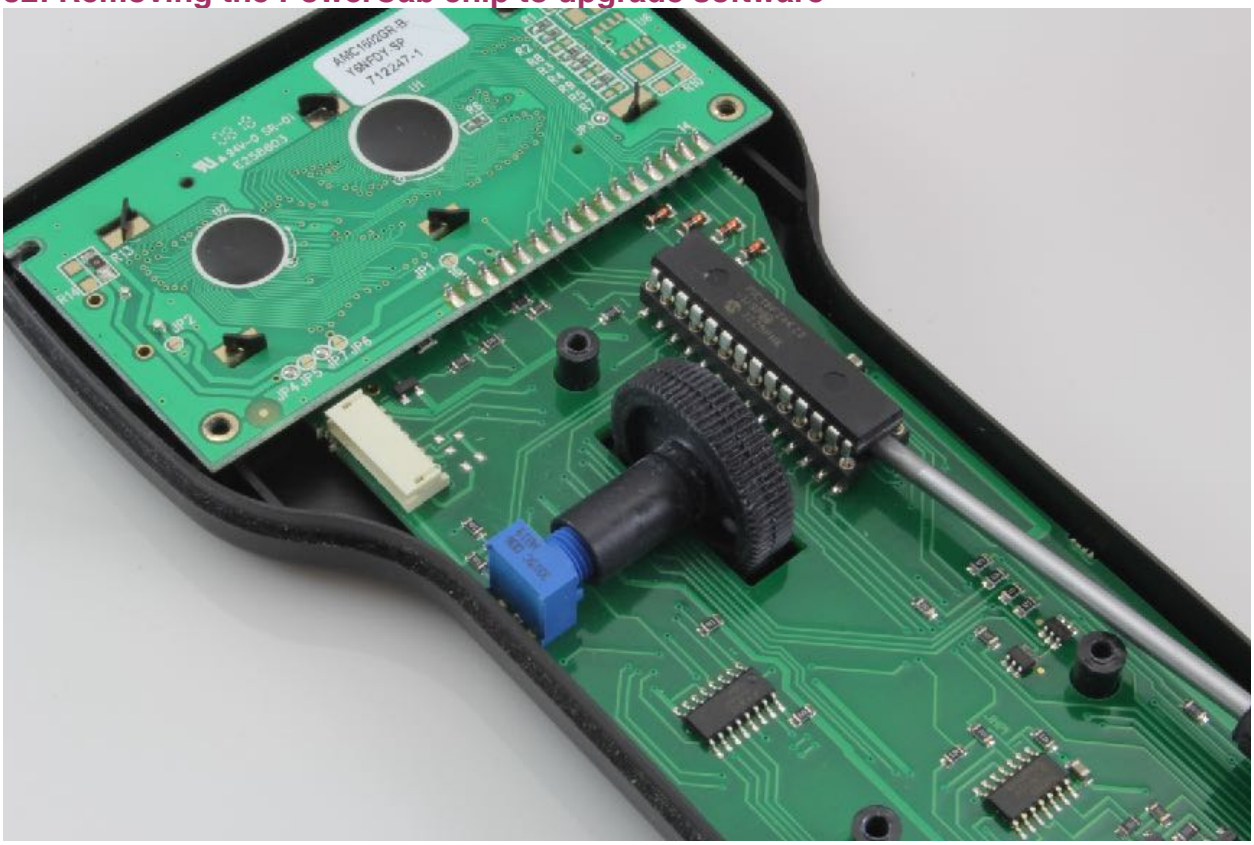
check that all 28 legs are in the correct socket and you are ready to put the cab back together and enjoy your new functions.

### 32: Removing the PowerCab chip to upgrade software



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