



## DCC Impulses Column

by *Bruce Petrarca*

Photos & video by the author

### More about getting the sound OUT

In late May and early June another model railroader and I (and our wives) traveled in Europe and just had to ride some trains: a regional from Paris to Giverny, the Metro around Paris, the Thello from Paris to Venice overnight, a regional from Civitavecchia to Pisa, a regional from Barcelona to Montserrat and back, a cog railway up to Montserrat, and a few funiculars. We had fun, but it is good to be back home.

One of the most common areas of discussion when retrofitting sound into a loco is how to achieve the sonic portion of the installation design. In this column, I'm going to hit on how I did it in some representative HO-scale diesel locos. One of the most common areas of discussion when retrofitting sound into a loco is how to achieve the sonic portion of the installation design. In this column, I'm going to hit on how I did it in some representative HO-scale diesel locos.

Why HO? Okay, it's the most popular scale. But also, it is the smallest scale where, in my opinion, reasonable sound can be installed. Smaller scales can make some noise, but the physics of size just limit their capabilities. Not to say that I haven't seen nice sound installations in N-scale. But, and this is the big but, most of them were done by extremely skilled folks with decades of N-scale experience. Not something that I have or can teach. And even those folks score a home run only on a few of the many installations they do.

In my August 2012 column, I discussed the theory of getting the sound out. I suggest reviewing that column and the accompanying video before you go on. This column will show some practical ways to make that happen. I'm not going to belabor the

actual sound pathways. I leave that as an exercise for the reader: figure out the sonic path from the speaker to your ear.

Most of my installations here use a single speaker. However, if you have the room to install a pair (or more), things only get better. I explain how to wire multiple speakers in my January 2014 column. Check that out if you have an installation that can accommodate multiple speakers.

I'm only going to comment on the audio aspect of these installations. The remainder of the installation is the same as a similar non-sound installation: power pickup, motor and lights. Nothing changes there. Nothing about these installations is dependent upon the decoder selected, except for the fact that different decoders want different speaker impedances. Know what your decoder likes and can tolerate and select your speakers accordingly.

Many modern locos have frames designed for speaker installation, whether they were fitted with sound at the factory or not. While these designs may not be the very best sonic design, they are usually much better than what can be easily fabricated after the fact. So, if your loco is set up this way, I recommend that you utilize the manufacturer's design, at least as a starting point.

Beyond that there are many techniques to get the best sound. I'll show you what I've done that I think resulted in "good sound." They are arranged roughly in the order of increasing difficulty. There are many other locos that are set up similarly to those shown, so don't despair if your specific loco isn't shown. Look for something similar and get creative.

“Many modern locos have frames designed for speaker installation...”

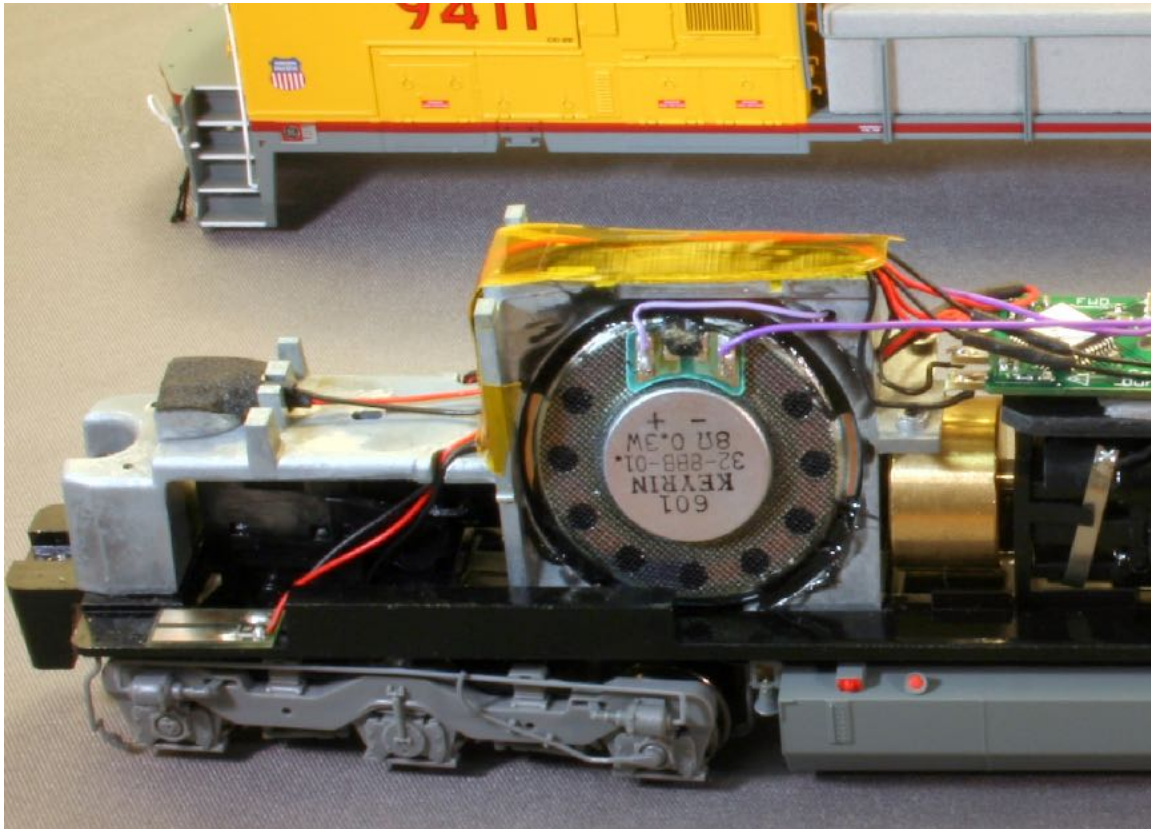
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## Using the manufacturer's design

The installation shown in figure 1 was fairly straight forward, due to the fact that the frame had moulded places for the speakers. Sometimes these come with small weights clamped where the speakers go, sometimes not. Either way it is a matter of locating the speaker(s) that fit the outline and thickness. Then install them. Frequently these speakers are comparatively large (over 30 mm in diameter).

The specific speakers that were available in the proper size at the time I did this installation were 8 ohms and rated at 0.3 watts. Since they share the applied power, they can handle 0.6 watts together. This is marginal for a 1 watt output decoder, but acceptable if you keep the volume down. Check out my January 2014 column for wiring methods.

## 1: Utilizing Atlas' frame design to install 31 mm speakers in a Dash 8-40CW

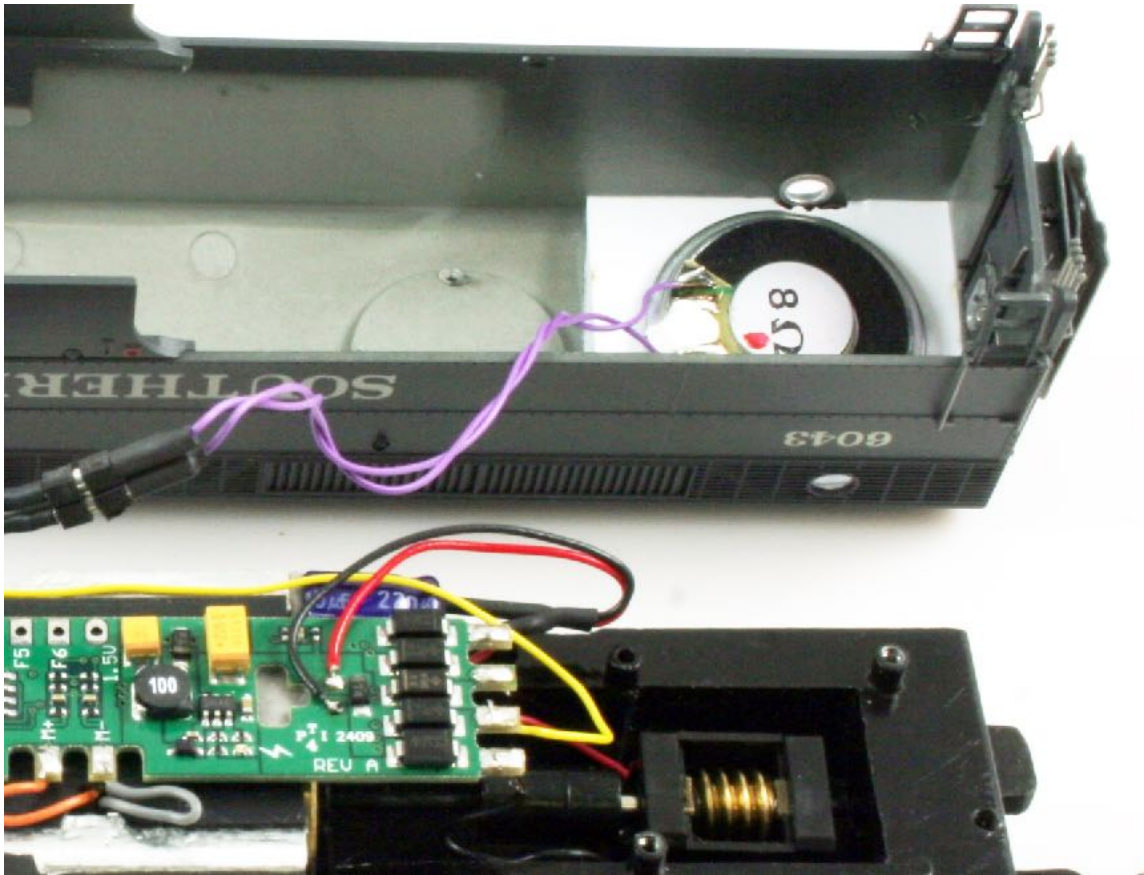


### A Pre-designed Baffle or Enclosure

If you are lucky enough to be working on a model that has a pre-designed baffle or enclosure available for it, I recommend you try that method first. Figure 2 shows an enclosure designed by SoundTraxx for the Life-Like PA using the venerable 28 mm speaker. SoundTraxx has designed these for many of the Life-Like cab diesels. The design was based on the idea of putting the speaker inside the enclosure to leave room for the circuit board mounted on the frame above the truck. Removing the board allows the speaker to be outside the enclosure (2), resulting in a marginal improvement in the sound, as a result of more enclosed air volume. Use caulk to seal the holes designed to bring the wires into the enclosure.

Note the 2-pin connector in the speaker leads. This allows the shell to be completely removed for maintenance or storage. With a bit of carving on the Styrofoam insert to provide room for the speaker, enclosure, and the connector, the shell can even be put back into the original box.

## 2: A SoundTraxx enclosure with a 28 mm speaker in a Proto 2000 PA

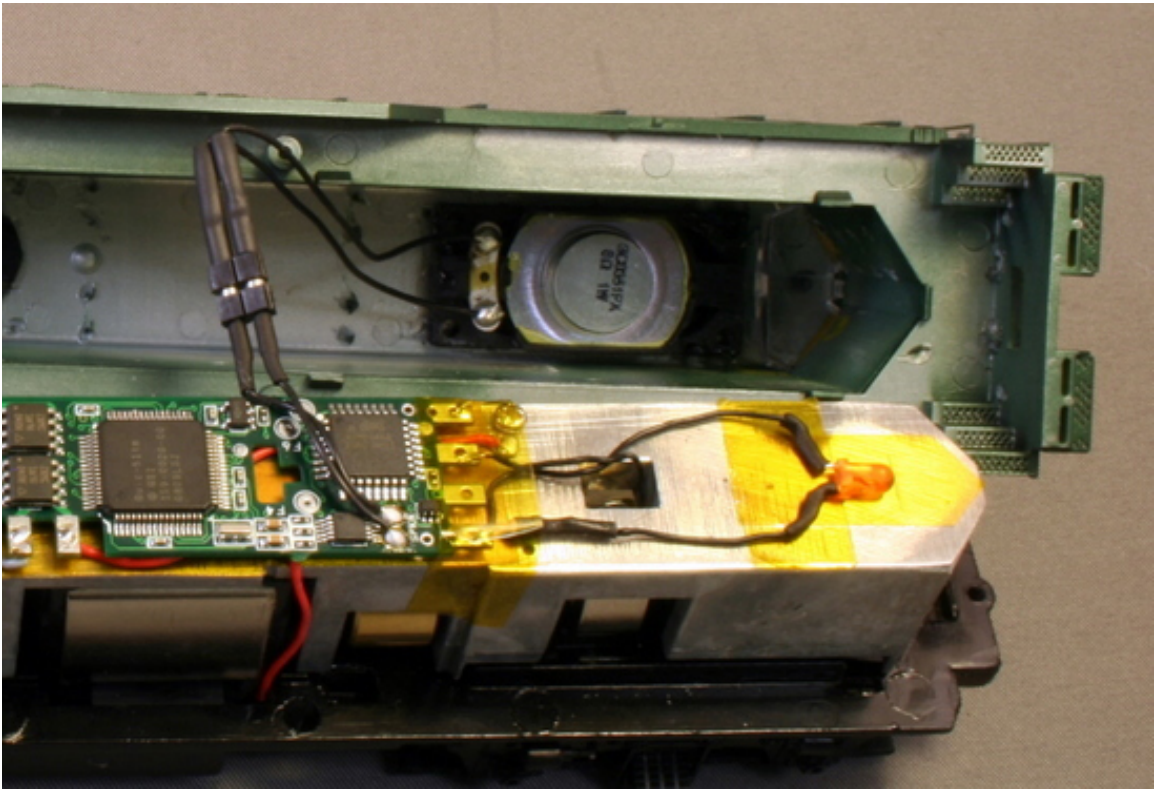


### Behind The Fan Grilles

One of the best sounding installations I do has the speaker(s) behind upward-facing fan grilles. The GP9 shown in figure 3 is a prime example. There is room in front of the rear light lens and the 16 x 35 mm speaker covers the only opening in the top of the shell. The trick is making sure that the speaker cone doesn't contact any plastic nubs hanging down from the shell. Some installations require a shim to move the speaker down away from the shell to accomplish this.

In order to have room for the speaker, height needs to be removed from the weight. The loco in figure 3 had the weight removed and milled down until the motor almost protruded above the weight. In my column 17 DCC Tips from June 2013. I showed how to use a belt sander for this task. So no special tools are necessary for this installation.

**3: 16 x 35 mm speaker installed behind the fan grilles in a Proto 2000 GP9**



**4: Proto 2000 loco with several open grilles - detail**

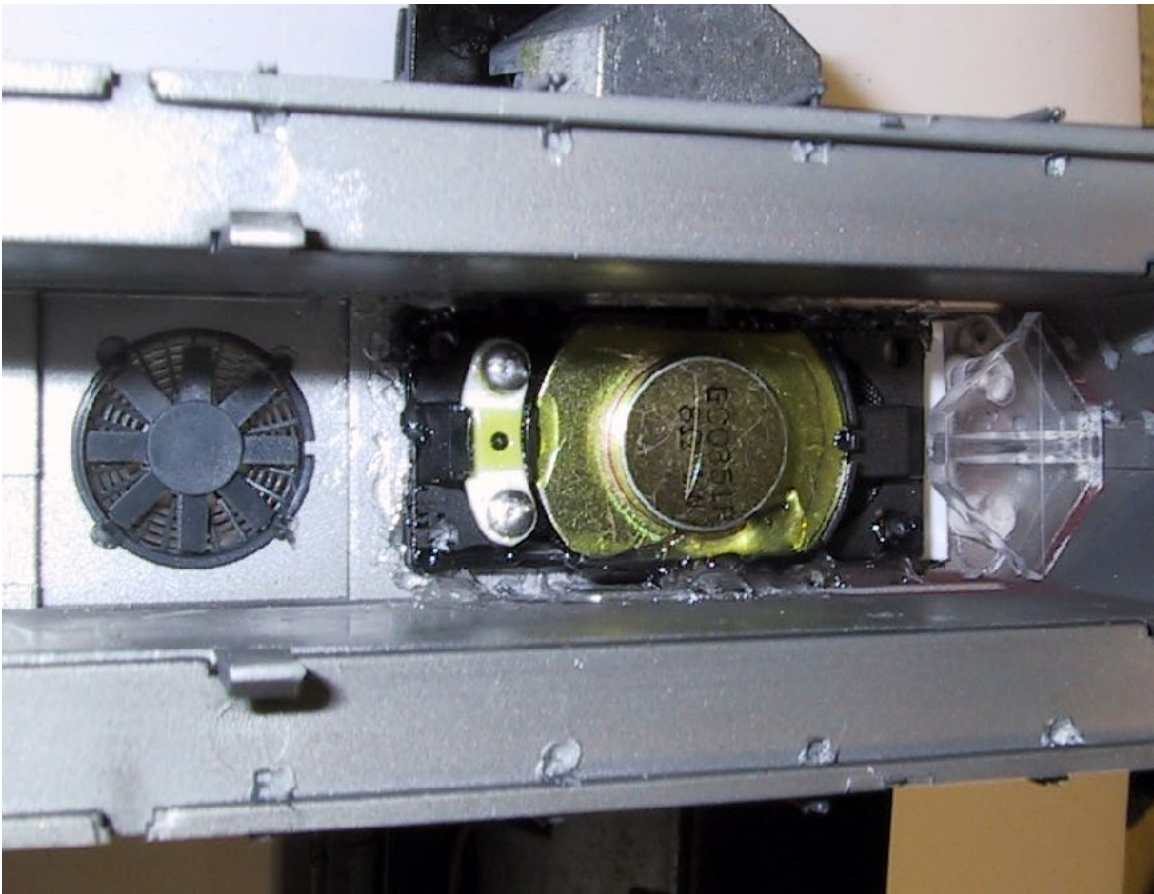


Figure 4 shows a similar shell where there are more grille openings. You can see the speaker held in with clear caulk. Check out the small plastic nubs protruding near the grille. Similar ones above the speaker are what you need the cone to clear. To finish this installation, I put a piece of black plastic over the open grille to seal it. I held it in place with a bead of caulk. The rear LED will rest on top of the weight and needs to be adjusted so it shines on the flat portion of the lens assembly in the shell.

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## Atlas locos with two removable weights

There are a few different versions of the earlier Atlas design with two weights screwed into each end. These locos are fun to install sound into. A 16 x 35 mm speaker will fit on top of the rear weight once a bit over  $\frac{1}{4}$  inch is removed from it.

Figure 5 shows the one-screw version of this weight after it was milled down and a slot cut to allow the sound from the front of the speaker to go out through the truck area. The speaker will be attached to the top of the weight with caulk. Hint: be careful that no caulk gets onto the speaker cone. A similar result can be obtained with a belt sander and by drilling 2 holes  $\frac{1}{4}$ -inch in diameter instead of milling the slot.

### 5: Machined Atlas weight

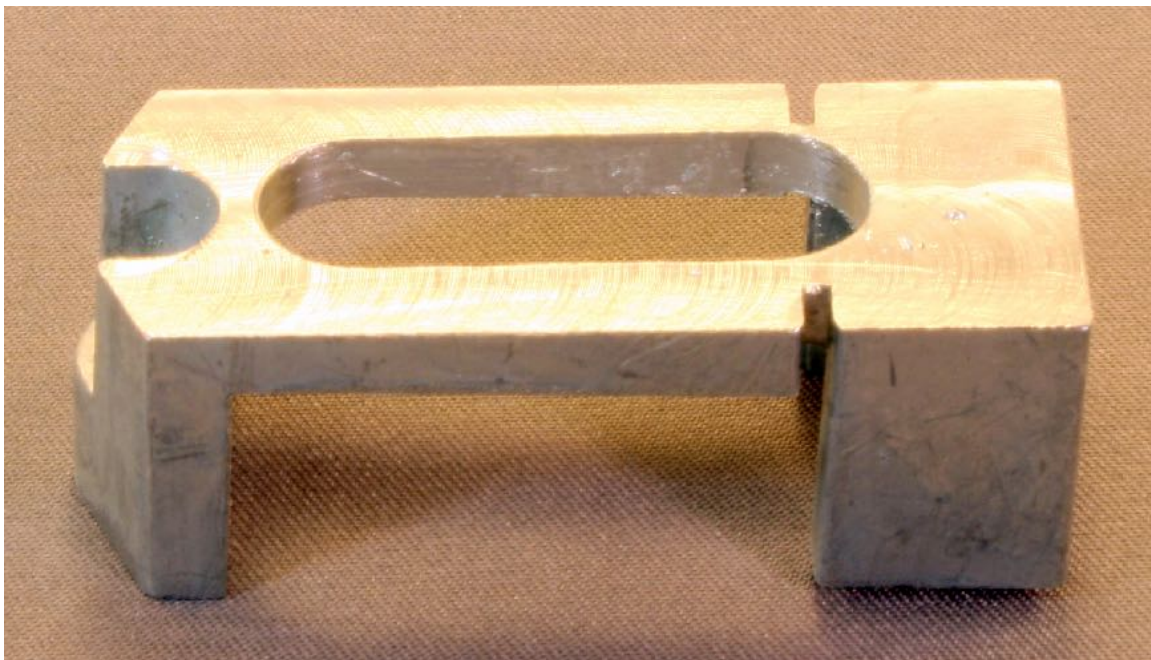
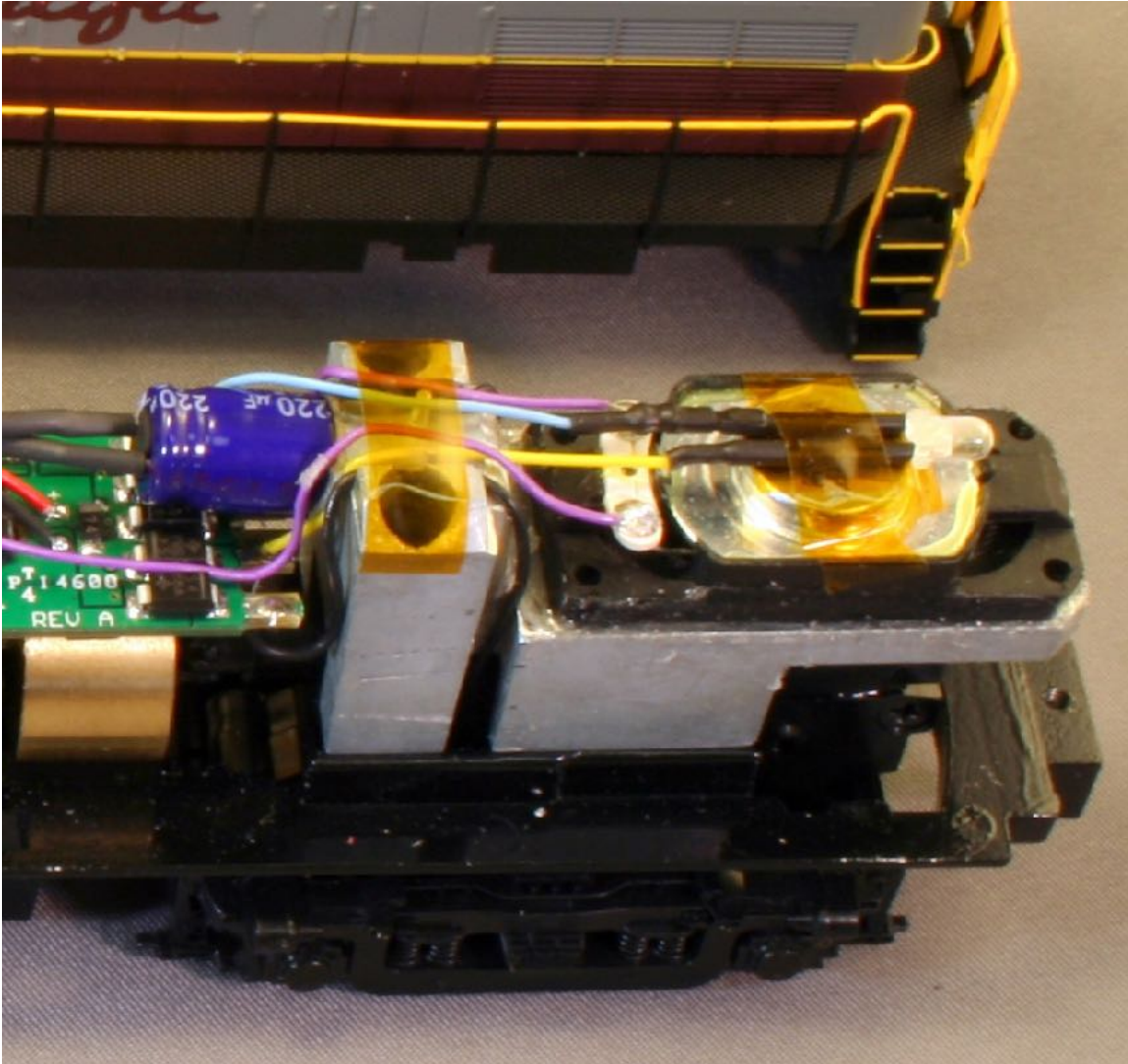


Figure 6 shows a RS32 with the two-screw version of this weight. No caulk is necessary to hold the speaker here. I seal the junction with a small bit of caulk around the exterior perimeter of the speaker. A drill is used to slightly enlarge the mounting holes in the speaker so that the weight mounting screws hold the speaker tightly to the weight. In this installation (6), I milled the weight down, leaving the

original top shape on the rear. This fancy stuff is not needed. The weight can be milled or sanded flat. Don't forget to mill the slot (5) or drill a couple of ¼-inch holes.

You can see slots in the side of the weight as cast to provide room for the truck wires in both figures 5 and 6.

#### **6: Atlas RS32 with a 2-screw rear weight**



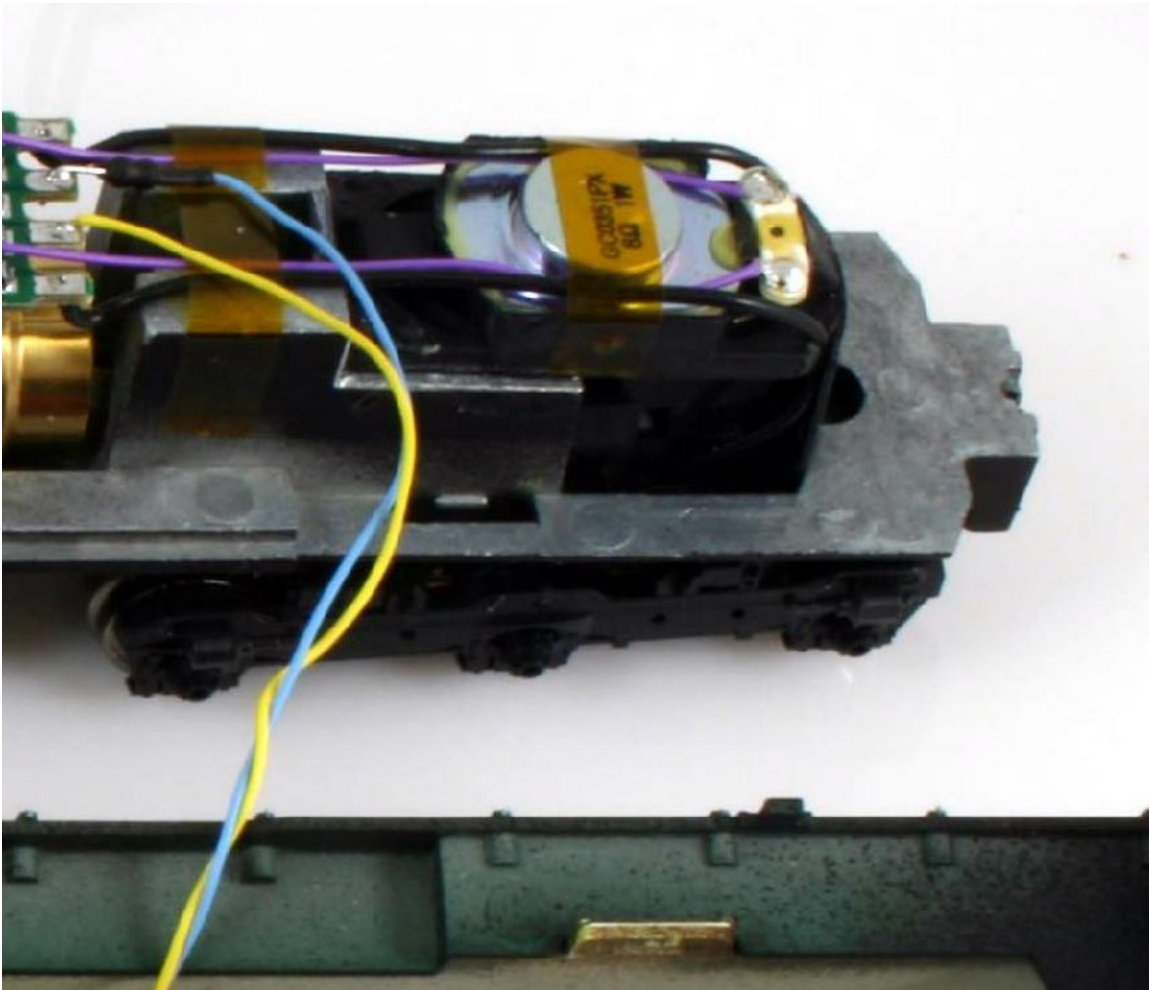
The sound from either of these styles will be almost inaudible until the shell is in place, as the shell is the baffle that directs the sound out the rear truck opening. If you want to test this loco before you install the shell, just wrap your finger around the end of the weight. The sound should come up significantly. It won't achieve the ultimate timbre or volume until the shell is installed.

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## Over the Truck with a baffle

Similar to the Atlas version (5) and (6) is a method that works on a lot of locos. I fit the speaker over the rear truck of the Kato SD45, shown in figure 7. Once I had a good dry fit, I used styrene to build a baffle to keep the sound coming off the front of the speaker directed downward to the truck opening. This was done because the weight is not a with a close fit, like the Atlas version. I've tried this style of installation with and without the bits of plastic baffle. I find the baffle helps. Only takes a few minutes, so why not?

### **7: Kato SD45 with a 16 x 35 mm speaker and baffle over the truck**



The speaker is held down with caulk (remember to keep it off the speaker cone). I glue the styrene to the sides of the speaker with solvent (MEK or a commercial product). A future column will cover some methods to make quick work of this fabrication.

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## Using The Shell As Part Of An Enclosure

Folks who have followed my columns know that I prefer to baffle the sound, rather than to enclose the speaker. However, there are times that an enclosure is about the only possible game. The pre-designed enclosure (2) discussed previously is one case.

Another case is where there is no place to put the speaker except to build an enclosure using the bottom of the cab or part of the shell (8). Of course, the cab needs to be fully glassed and sealed for the enclosure to be effective.

### **8: Atlas RS1 with a 16 x 35 mm speaker mounted in the cab**

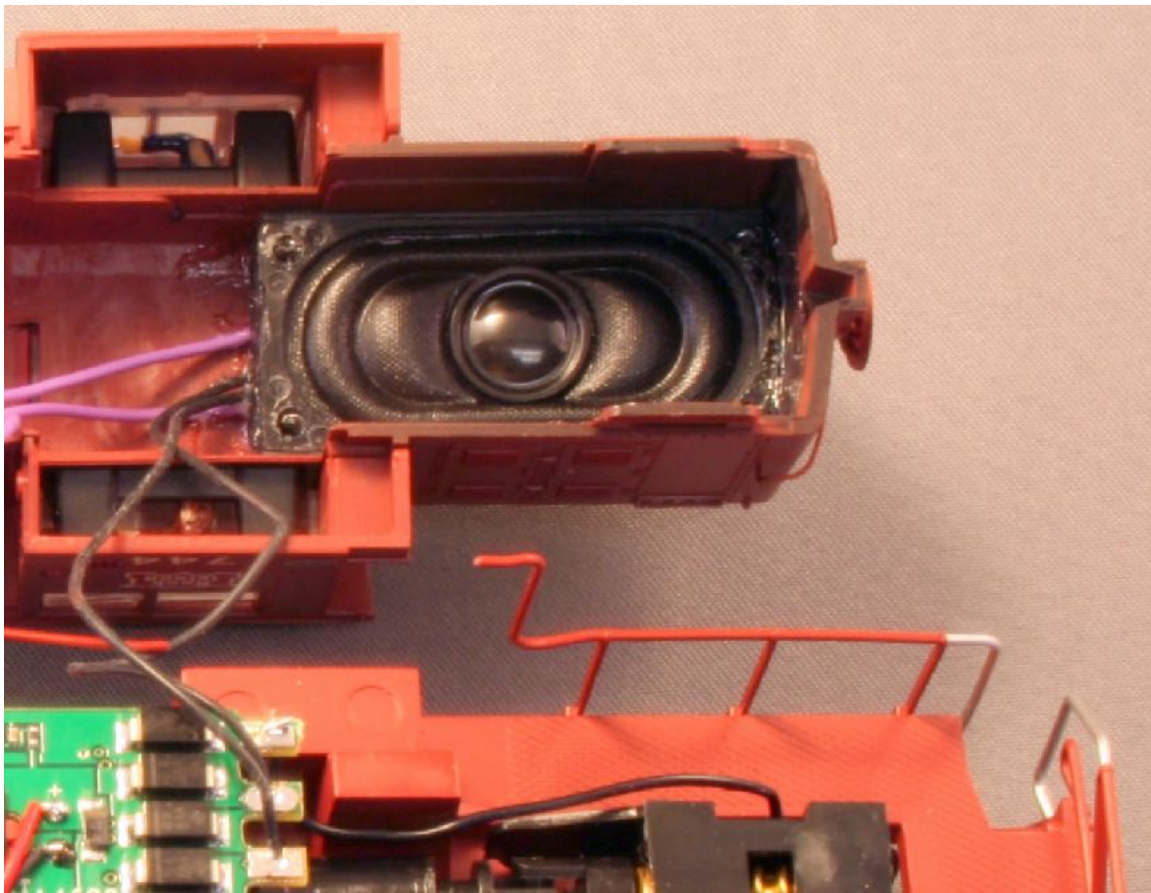


Figure 8 shows one such installation in an Atlas RS1. Here the shell was most of the enclosure. The speaker is caulked into the shell and has a bit of styrene, not visible in figure 8, between the top of the shell and the front of the speaker to complete the enclosure. The speaker wires (purple) and rear LED (black) pass through notches in the styrene wall and are caulked in place. Glue the speaker and the styrene with caulk. That way, they can be removed if necessary, unlike what happens with styrene cement.

I don't recommend this design without a LED light. My luck would be that an incandescent bulb would burn out as soon as I had the loco back together and I'd have to take the loco apart and rip the speaker out to replace it.

One thing to be very careful about. Make sure that the rear truck can twist and turn and articulate up and down. If the speaker constrains the motion of the truck, two things will happen. The truck will dampen the sound and the loco will be prone to derailling. I'd explain how I know this, but that would be an entire column by itself.

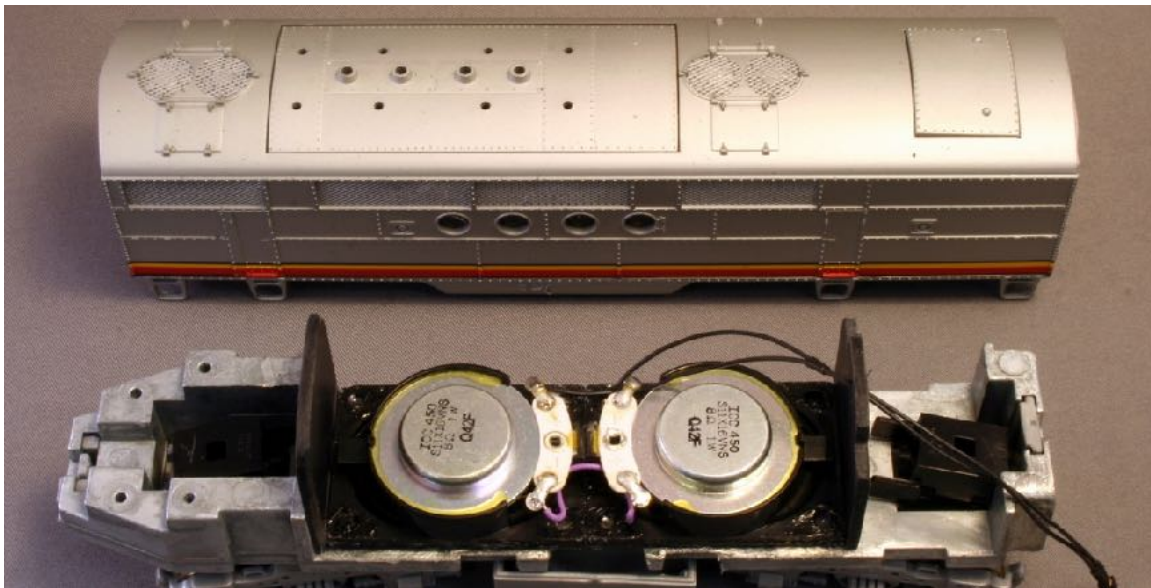
One switcher that I did with the speaker in the bottom of the cab had terrible sound when I tested it. A bit of judicious pressure on the cab showed that there were lots of openings in the cab where the sound escaped. It took a bunch of caulking and gluing to make the sound work. Whew.

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## Large speaker systems in diesel B-units

One of the best sounding installation designs involve putting speakers in a B-unit. Here are two versions: one baffled and one using an enclosure. Both have amazing sound. In both cases, dual speakers were used. Check out my January 2014 column for wiring methods. The connection to the decoder in the A-unit is through a 2-pin connector.

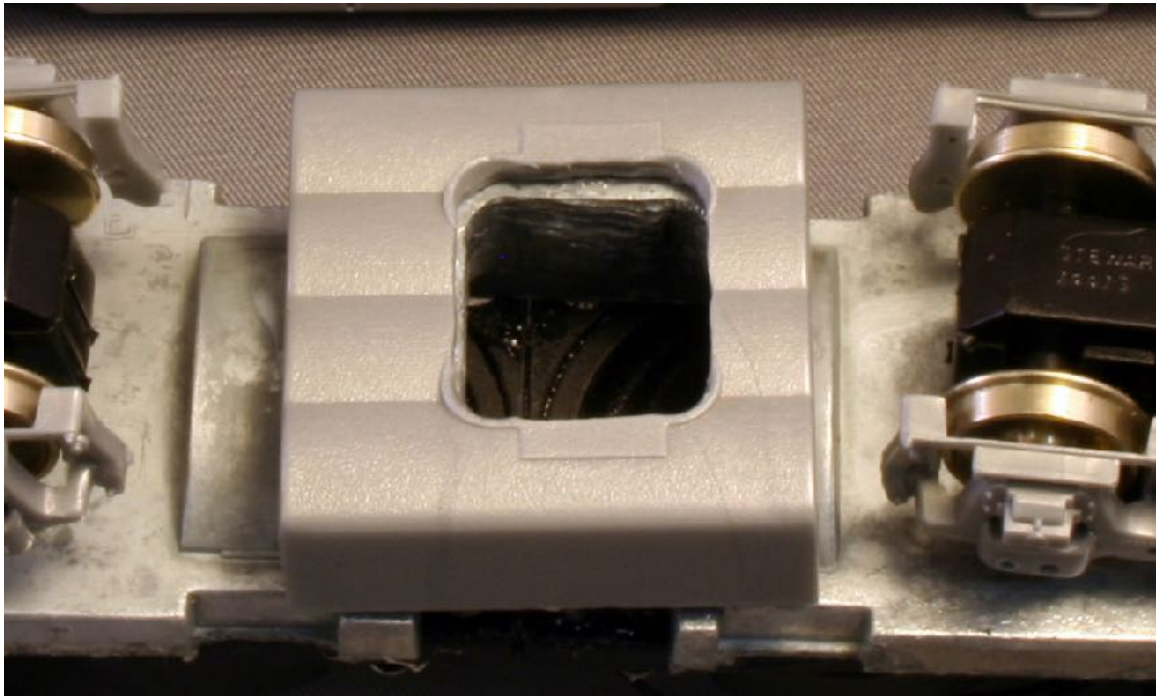
### 9: Stewart FTB with two 28 x 35 mm speakers baffled



First let's look at a design for a Stewart FTA-B pair, shown in figures 9 and 10. The FT is a fine loco pair to do this with, as most of them were drawbar connected A-B units.

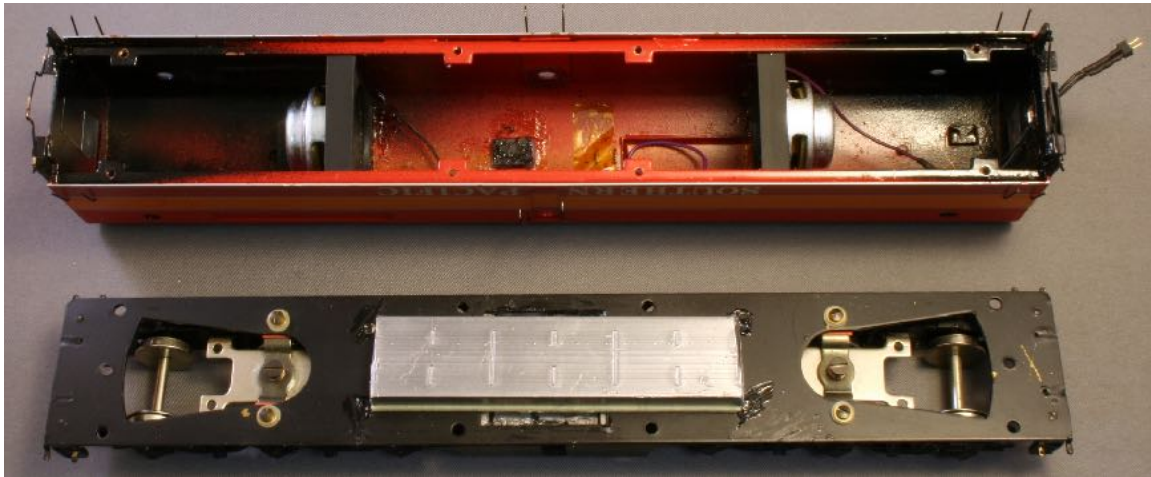
The weight was milled or sanded flat between the trucks. The weight and fuel tank plastic between the motor mount holes was cut away (10). If one had a mill, even more material could be removed, but just cutting between the motor mounting holes is enough. The fuel tank decoration was attached with caulk. Two speakers were stuck down to a piece of styrene. Two vertical baffle boards were fashioned out of thick (0.06 inch or thicker) styrene. The baffle boards run wall-to-wall inside the shell and to the ceiling on the sides. The gap created between the top of the (straight) plastic and the (curved) ceiling allows back pressure to find its way out through the truck openings.

**10: Stewart FTB fuel tank opening to allow the sound out**



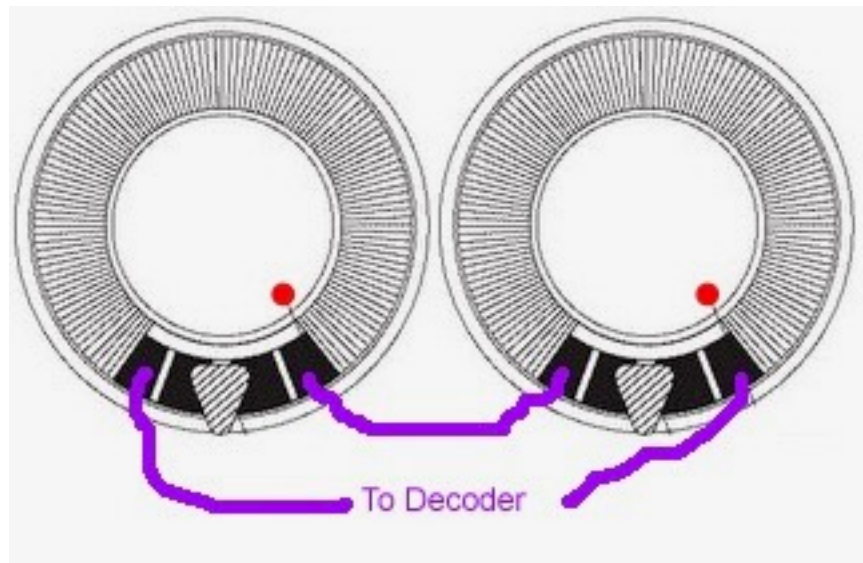
A Westside PB unit was similar. However, the design didn't lend itself to baffling, so I created an enclosure with styrene vertical bulkheads, attached with caulk. I made sure that the area between the bulkheads (11) was sealed on both the shell and the floor.

**11: Westside PB with and enclosure set up with 28 mm high bass speakers**



In this design, be sure to wire the speakers in series with plus to minus [12].

**12: The Westside PB installation needs the speakers wired in series.**



There you have my most frequent methods of installing speakers in HO-scale diesels. More food for thought, including examples in other scales, check out my web site, [Mr-DCC.com](http://Mr-DCC.com).

In my August column I'll show you some quick methods for cutting and fitting these baffles and enclosures.