Installation and Use of Scale Sound Systems Speakers

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A basic guide for the installation, wiring and decoder programming for Scale Sound Systems speakers.

- Mounting & Fitting the Speakers
- Solder the speakers
- Wiring the Speakers
- Soundtraxx Decoder Settings
- Other Decoder Settings
- Relationship of Horn Volumes - A Perspective

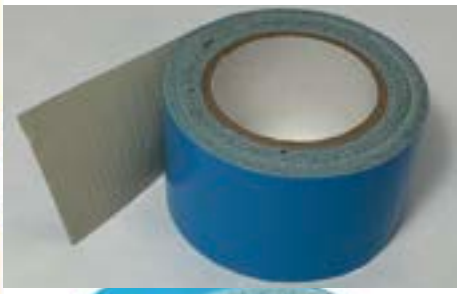
Mounting & Fitting the Speakers

Many of my drop-in speakers utilize the stock screws that hold the factory speaker or weight. Installation of these is exact to how the factory intended.

For speakers that do not use screws, some form of adhesive or tape is required. My preferred mounting-tape is made by Duck. Their packaging simply says “Double Sided” and has a blue film on it. It is identical to all of the “carpet tape” I’ve used in the entertainment business. It’s very sticky and will even hold speakers upside down in shells if required. I’ve never had it dry out on me and it can be removed without leaving a gummy residue. It’s very thin, so it won’t add height to the speaker.

Alternatively, you can use a clear, indoor/outdoor, double-sided mounting tape, which usually has a red film. 3M/Scotch and Loctite both offer this with red film and Gorilla makes it with a clear film. I usually use this stuff for mounting decoders, as it’s rubbery thickness compensates for irregularities. It is about 1.5mm thick, so it does add height to a speaker installation, which may be enough to preclude fitting the shell back on. Thus, I rarely use this tape for mounting speakers.

Rubbery glues can work as well. Walthers Goo works, but some report Goo drying out and cracking in their environments. I prefer to use Microscale Kristal Kleer if I need to mount a speaker with glue. It’s very strong, remains flexible and won’t dry out. Other silicon-based adhesives would probably work. Epoxy is probably overkill. Hot-glue is not recommended.



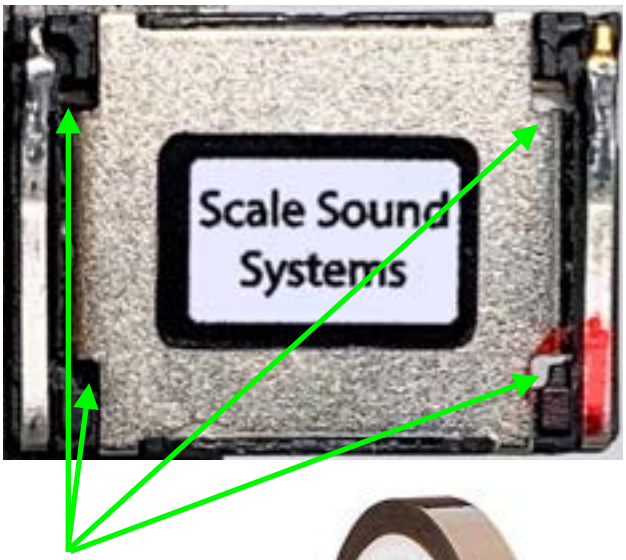
Avoid using double-sided foam mounting tape for any installation work. This tape is designed for temporary uses and will dry-out and crumble after even short periods of time. Yuck.

Some applications only need a strip of tape going over the enclosure to hold it to the frame. Use Kapton tape for this. Electrical tape is designed for temporary uses and will gum-up, loose its grip and cause a mess in short time. Electrical tape was never designed for permanent uses, which is why it's not approved with most (all?) building codes for permanent electrical work.

If taping over the enclosure, be sure that you do not cover over the entire back-side of the driver (the silver part with my label). If you look closely, you will notice four small holes in the corners beside the contact strips. These are ports and this is where the high-frequencies are emitted. Covering these ports will result in a speaker that can sound a bit muffled.

In some instances, the speaker's solder contacts could come in contact with the frame (or shell in brass locos). If there is risk of this, insulate that part of the frame/shell with Kapton tape or strips of mounting tape. If thick tape is used to stand-off the driver, place it in the middle over the label. Do not cover the ports of the driver with tape to insulate it; you'll compromise the speaker's sound-quality.

Lastly, my speaker enclosures are not able to be sanded or filed to make them smaller. If there is a minor ridge along the top or bottom edges that needs knocked off for a good fit, that is fine. Sanding/filing the enclosure to make it smaller will destroy the enclosure. Most of my enclosure sides run somewhere around 1mm thick. Removing any amount of this material can result in holes (greatly reducing low-frequency reproduction) or making the walls too thin (creating a wall that will "chirp" at higher-frequencies).



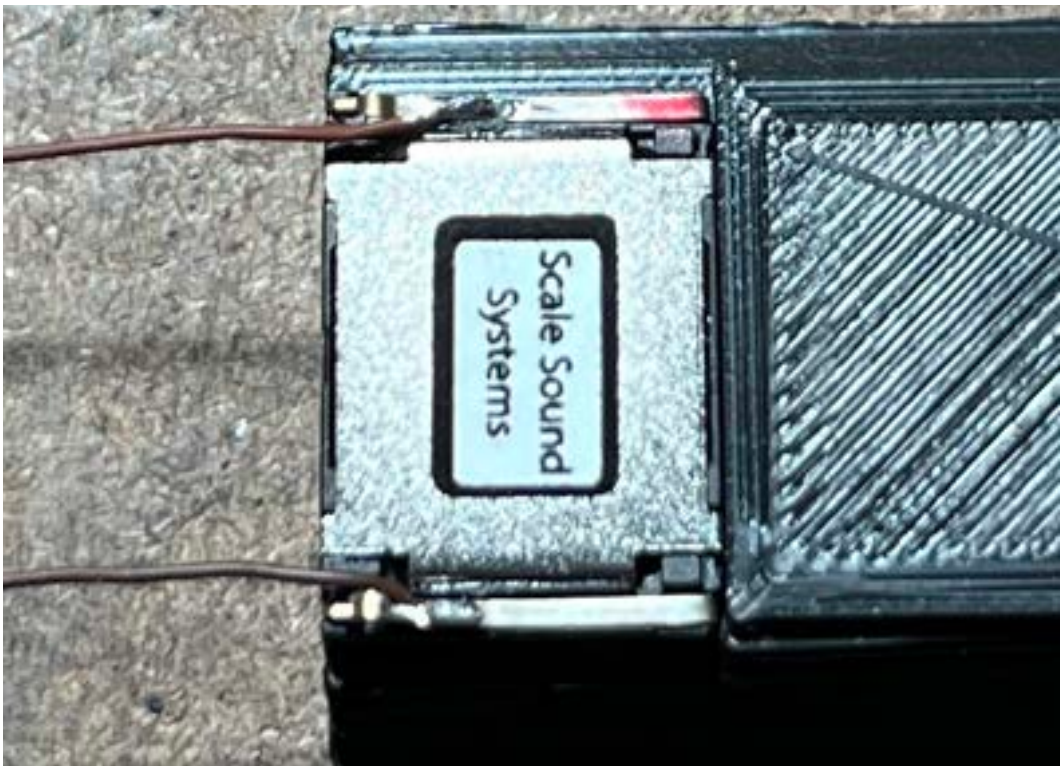
Use Kapton tape to secure speakers and do not cover the driver's ports.

Soldering the Speakers

#1 - Use a CLEAN iron tip set around 750°F and rosin-core solder; do not add more flux!
#2 - Tin the speaker contacts below the gold nub on Rectify speakers, or the two small pads on Force.
#3 - Strip about 1/16” of wire and tin the wires with solder
#4 - Mate the two and quickly touch the joint to bond the wire to the terminal - it should only take a second!

When soldering the wires to the solder-tabs, be sure that no solder or bare wire touches the driver’s metal backplate. The red marking indicates absolute-positive polarity. This is only important if using two or more speakers together.

RECTIFY SPEAKER TABS



FORCE FULL-RANGE SPEAKER TABS

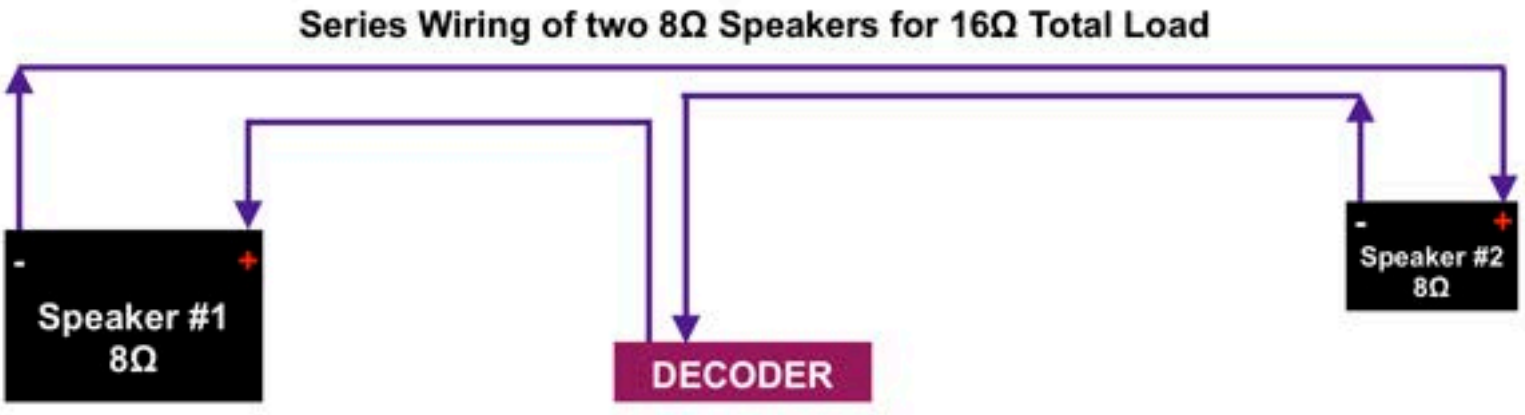
Wiring the Speakers

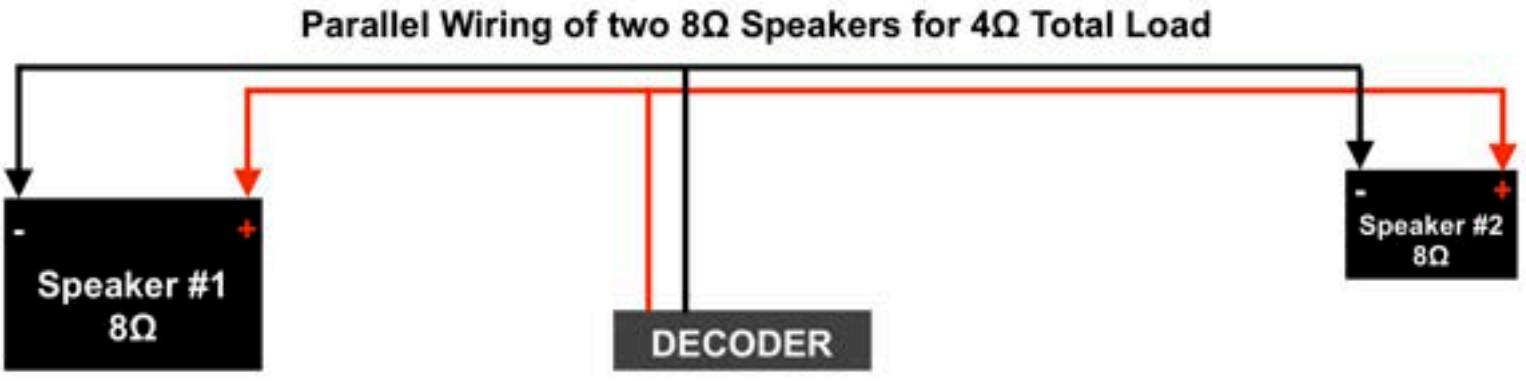
Yes, you can use a single 1-watt speaker with a decoder that has a rated power-amp of 2-3 watts. Just because a power-amp has the potential to deliver two or more watts does not mean it has to. A power-amp will only deliver the power it is asked to produce. Thus, by lowering the master volume, a two-watt power-amp can be limited to only one-watt output….or even a quarter-watt maximum output.

If you're using a single Rectify speaker, it's 8Ω impedance is compatible with ESU Loksound Select/V4, Loksound 5, Ring Engineering Railpro, Soundtraxx Tsunami/Tsunami2/Econami and TCS WOWSound. I believe most (all?) of the QSI decoders are 8Ω compatible. The same is true for Zimo, MRC and Digitrax sound decoders.

ESU Loksound 3.5 requires a 100Ω speaker and is not compatible. I have also observed some early Paragon decoders using 50Ω speakers and are not compatible. I believe newer Paragon2/3/4 uses 8Ω; check to make sure.

If you're using two speakers, you will need to determine the recommended minimum impedance your decoder can do its work. ESU Loksound and Ring Engineering Railpro can safely run at 4Ω, so wire the two 8Ω speakers in parallel for a 4Ω total load. Soundtraxx and TCS recommends 8Ω minimum impedance, so wire the two 8Ω speakers in series for a 16Ω total load. I have observed at least one Athearn Genesis SDP locomotive that came factory-equipped with Soundtraxx Tsunami2 running at 4Ω with two 8Ω speakers wired in parallel. TCS also makes a 4Ω speaker. In short, you *can* safely run Soundtraxx and TCS at 4Ω *if* you keep the master volume below half. This will limit the current-strain on the power-amp and prevent failure. I still recommend 16Ω series-wiring for Soundtraxx and TCS just to be fool-proof. You can safely run any decoder at an impedance that is higher than the minimum.





Soundtraxx Decoder Settings
Settings vary based on the sound-files being used and how loud you want the overall sound to be.

Note that not all of the files produce the same volume for a given CV value. For instance, an M5 horn set at a volume of 140 may produce the same volume as one of the K5-style horns set at 70 (just an example - I do not readily know if these values are accurate for these two horn examples). This applies to prime-movers and bells as well.

Programming mixer volumes and EQ settings should be performed with “programming on the main” so that you hear your adjustments in real-time. Decoder Pro is easiest and faster, though entering CVs with a throttle will work just as well.

This is how I setup my Soundtraxx T2/ECO locos:

1. *Before connecting the speaker*, start with your master volume around 80. Some of the sounds can cause harm to a single speaker at the default volume. The EQ should be FLAT or turned off and the high-pass filter in Tsunami2 should be set to 20.

2. Start with the horn volume at 100. The horns are all different levels in the decoder, so some horns need to be louder, some quieter. I’ve set them anywhere from 60 to around 180.

3. Turn the prime-mover volume all the way up. I feel that the compressor and other auxiliary sounds are too loud relative to the prime-mover’s default volume. This is my personal preference.

4. Turn the radiator fans down; anywhere from 30-50. The fan sound has a lot of low-frequencies and at the default level is too loud and masks the prime-mover sounds using my speakers.

5. If you’ve not already done so, choose which sounds you want; prime-mover, horn, bell, etc. Adjust the horn, bell and other sound volumes to your liking relative to the prime-mover. Once you have a mix that you’re happy with, move on to the EQ.

6. Be sure the EQ is set to “user setting”, the HPF is set to 20 (for T2 only) and all of the EQ-bands are set midway at 128.

7. You can add more bass-frequencies if you like your locomotive volumes at lower-moderate levels. Feel free to increase 125Hz to around value 200 and 250Hz to value 160. If you want louder volumes, leave them at 128. *Do not reduce the 63Hz band. Leave it at 128.*

8. If the sounds seem too muffled, boost 4KHz, anywhere from value 140 to maybe 180. If you do boost 4KHz, you may find you now need to turn the horn and/or bell down a little. This is normal.

9. If the sounds seem a little too “stuffy” or “cloudy” sounding, you can reduce 1KHz and 500Hz; anywhere from values 110 down to around 60. This will give you a “deep” sound.

10. Once you’re happy with the mixer and EQ settings, you can then adjust the master volume to your overall liking. Note that with a single speaker, master volume levels can rarely be higher than 110-130 without producing distortion.

You can see/hear the methods I use for programming Soundtraxx decoders at around 59:36, which covers volumes, lighting, EQ and reverb: https://youtu.be/AS9J2q4_LHw?si=Qx3Q1p3tDZTmZ4e7

Other Decoder Settings
Again, settings vary based on the sound-files being used and how loud you want the overall sound to be. I have observed variances in sound-level when changing sounds among all of the manufacturers. If you change a horn or some other sound, a volume adjustment may be required.

Most ESU Loksound files come default at around 50-75% maximum volume. This is a fine place to start. Once you've chosen your sounds, adjust the levels of each until you're happy, then finish with the overall loudness using the master volume.

The ESU tone controls on updated LokSound 5 decoders are:

"Bass" CV196; flat, default value is 16; values of 17-32 increase "bass", values 15-0 decrease "bass".
Treble CV197; flat, default value is 16; values of 17-32 increase treble, values 15-0 decrease treble.

I have found that increasing the "bass" tone control much beyond value 24 or so tends to make the sound quite stuffy and sometimes distorted. I prefer the "bass" tone control between 16 and 24. The ESU "bass" tone control is too high of a center frequency to be qualified as bass; it is centered more in the low-midrange. It is still a useful tone option.

The treble tone control simply makes the sound "brighter" or more "muffled" and will vary with the sound-file, the speakers and its placement and the user's ears.

Ring Railpro and TCS WOWSound usually come default at the maximum volume. Before connecting your speaker, set the master volume to 50% maximum. Once you've selected all of your desired sounds and their relative levels, you can finish by setting the master volume to its final value. Note that the TCS Audio Assist voice, while nice enough to listen to, is rather loud. Keep your master volume around half while programming with her.

Relationship of Horn Volumes - A Perspective

This is a very personal topic and one that can start hot-debate. I will refrain from personal opinion about overall loudness and pass no judgement on those who feel differently. I would like to share some perspective you may find useful.

Some claim that when a diesel blows its horn, the sound of the horn drowns out the sound of the prime-mover. This can be true under some circumstances.

1. Where you're standing in relation to the train has an impact.

2. The era of the locomotive also has an impact (many first/second generation diesels were louder than today's diesels).

3. The load of the prime-mover has an impact. If a train is coasting or easily maintaining momentum, the prime-mover is running quieter. On the contrary, if the train is starting from stop (such as a local pulling out of town, a passenger train leaving a station stop, a yard switcher) or working up even a modest grade in the plains, the prime-mover is substantially louder.

4. The quantity of locomotives in the consist.

To address point #1, diesel horns are quite directive in their sound projection, forming somewhat of a beam of sound emitting from the horn-bells. The prime-mover is encased within the hood and more non-directional in sound dispersion. Thus, if you're standing trackside and a train is a few hundred yards/meters off and coming toward you, you're likely to only hear the horn with only a subtle drone of the prime-mover below. As the train comes closer and closer, the beam of sound from the horn will progressively shoot past you and the prime-mover becomes louder. Finally, as the train is passing by you, the horn's primary dispersion is well away from you and the prime-mover sound comes much more into focus. When you operate your trains, do you stand a few scale-hundred yards/meters in front of them? Most will follow their train, choosing rather to be "trackside" as it rolls along. With this in mind, the more prototypical approach would be to mix the horn and prime-mover volume a little closer together. The horn should still be louder, but the distinct sound of the prime-mover should also still be present.

Point #2 can be harder to judge. With many first-gen diesels being gone and not regularly operating alongside modern diesels, it can be hard to know for sure. I still feel it has some validity.

Point #3 can be hard to replicate. While some decoders do offer features that cause the prime-mover to increase in sound and volume under load verses coasting, it's not a universal feature. Even then, many owners never take the time to calibrate the decoders that have such features. This is another reason I tend to favor the relationship between the horn and prime-mover to be a little closer.

Point #4 is very valid. If one prime-mover creates "X" dB-SPL, two will double that volume, yet there is still only one horn being blown. As locomotives are added, the overall prime-mover volume increases relative to the single horn's constant volume.

Considering all of these factors, I have measured various prototype trains under all of these conditions. In many instances of the "railfan" perspective, I've measured differences as little as only a few dB-SPL between the prime-mover and horn. Under "average" conditions standing trackside, it seems that the horn tends to be around 6dB-SPL louder than the prime-mover.

One last viewpoint; when we run our trains, the vast majority of time is spent listening to the prime-mover and other random sounds such as compressors. I believe that if the volume differences between the horn and prime-mover are a little closer and less drastic, we find that we can enjoy the experience of listening to our train more of the time without excessive volume that may annoy others in the room.