

# Introduction to Sound

Tsunami<sup>2</sup>

# The Case For Sound

- Sound is addicting!
- Sound adds the fourth dimension in realistic model railroading
- Adding sound is not as difficult as it looks!



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# Different Types of Sound Options

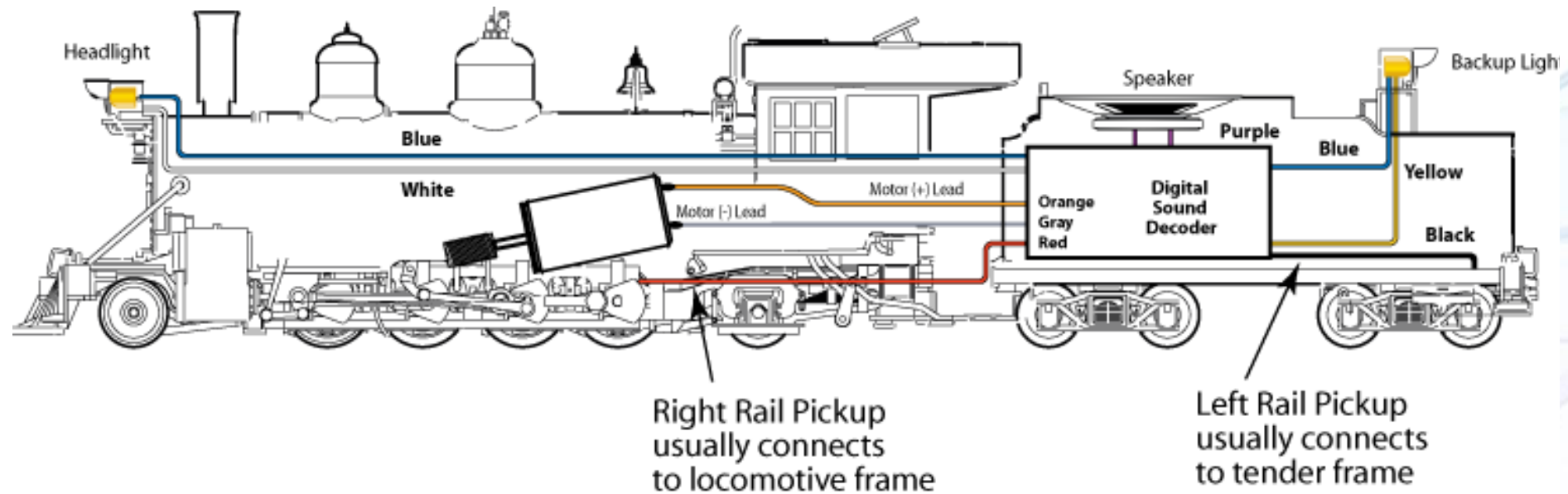
- Stationary
- Onboard



# Stationary Sound Systems



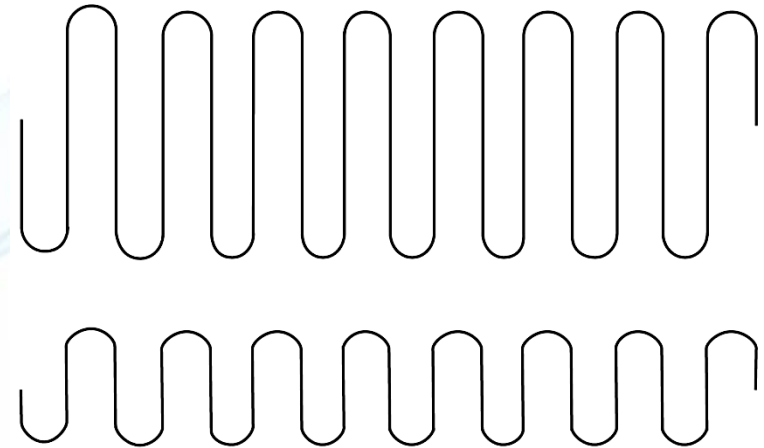
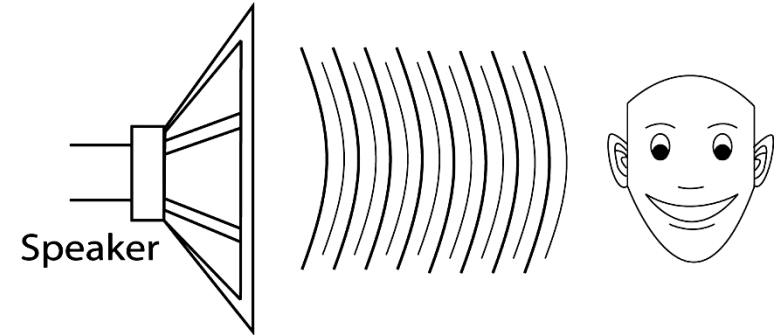
# On Board Sound System





# The Physics of Sound

- Volume, or loudness is proportional to the changes in pressure; higher pressure = higher volume
- Frequency (tone) is the rate of pressure-change vibration



# The Three Ranges of Sound

- **Bass: 20Hz-500Hz**
  - Diesel engine exhaust
  - Steam exhaust chuffs
  - Firebox blowers
  - Some horns & whistles



# The Three Ranges of Sound

- **Midrange: 500Hz-2500Hz**
  - Horns & whistles
  - Airpumps
  - Radiator fans



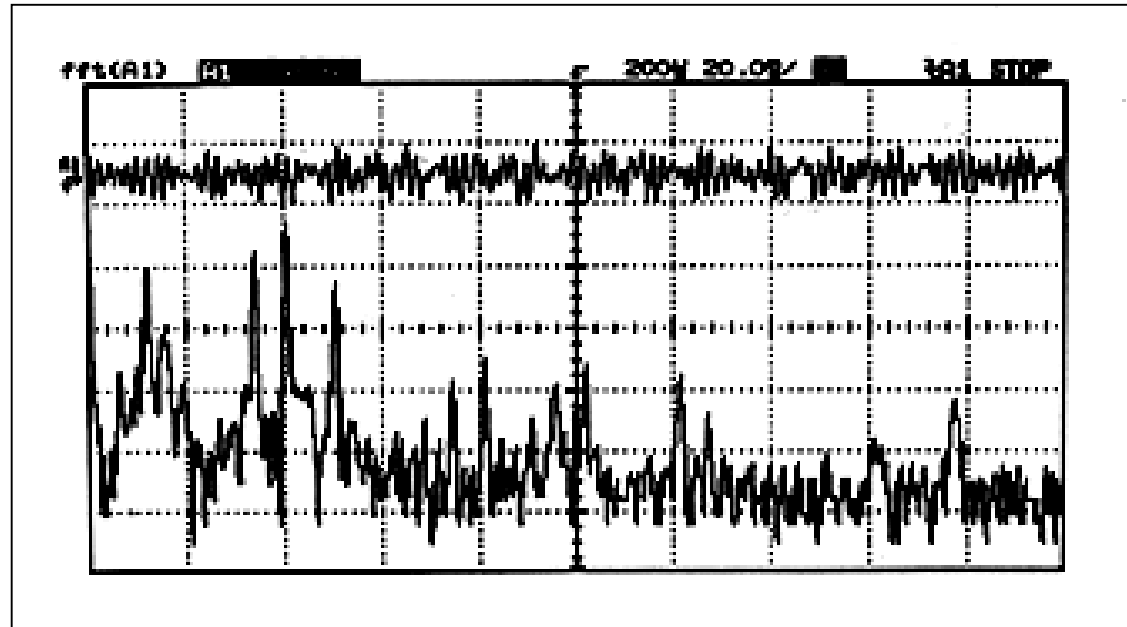


# The Three Ranges of Sound

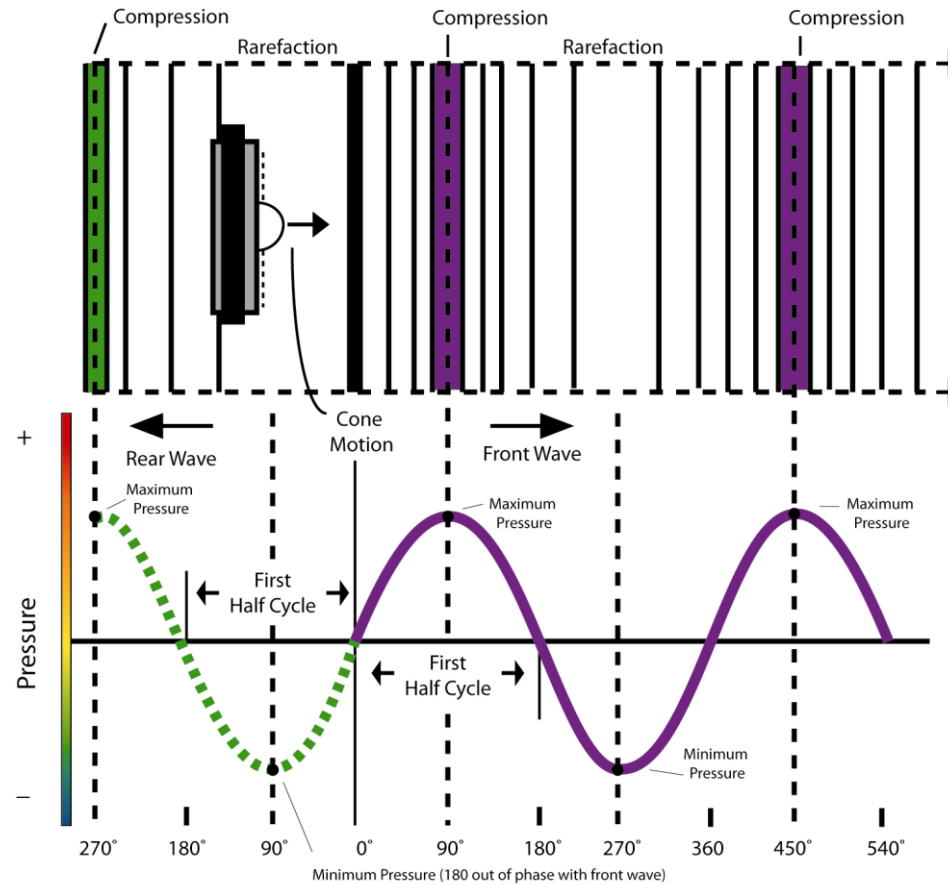
- **Treble: 2500Hz-200kHz**
  - Bells
  - Dynamos
  - Turbochargers



# Frequency Spectrum of a K-28 Mikado and 3-Chime Whistle

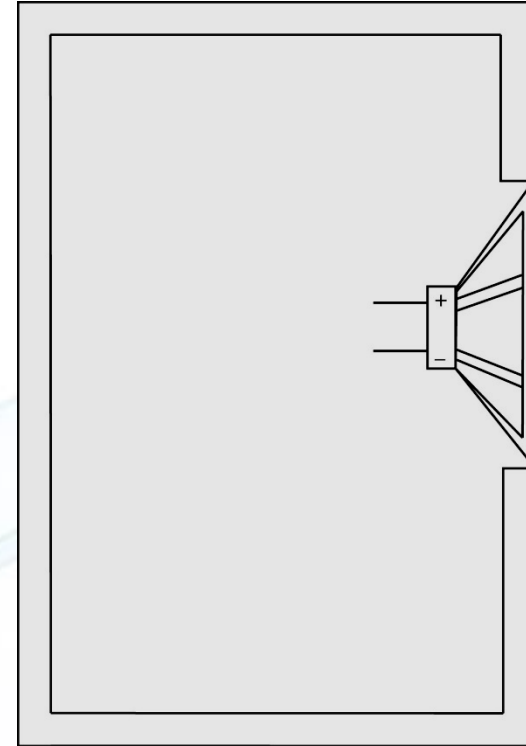


# Analysis of the Front and Rear Pressure Wave in Free Space



# Acoustic Suspension Speaker “Sealed Box”

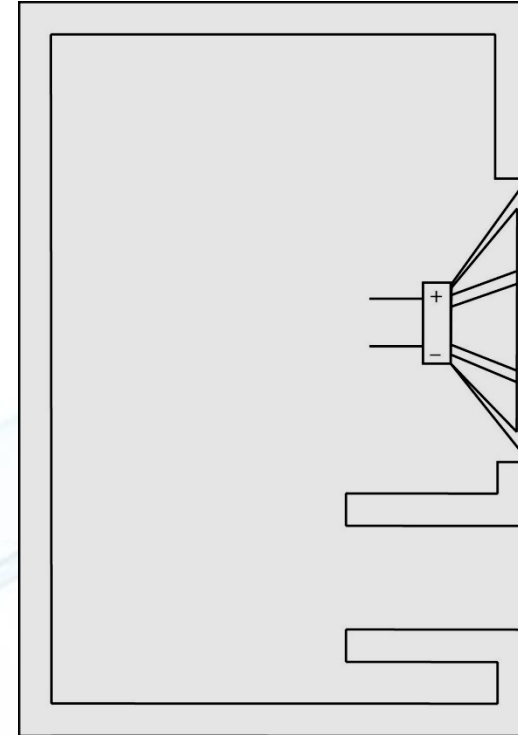
- Easy to build
- Adapts to model trains





# Vented Port Speaker

- Improved efficiency
- Negligible benefits for small speakers

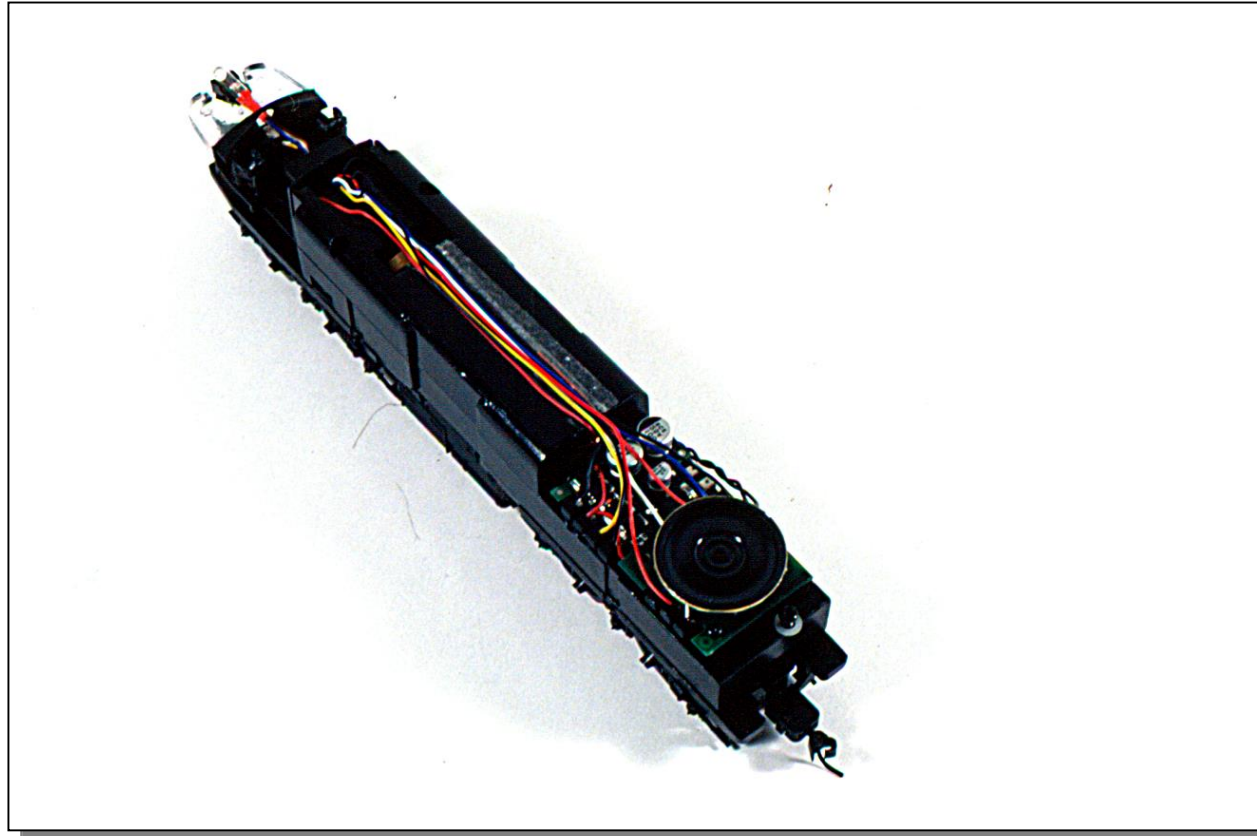


# Four Critical Factors for Quality Sound

- Proper baffling
- Speaker type
- Speaker size
- Speaker quality

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# Don't Do This!



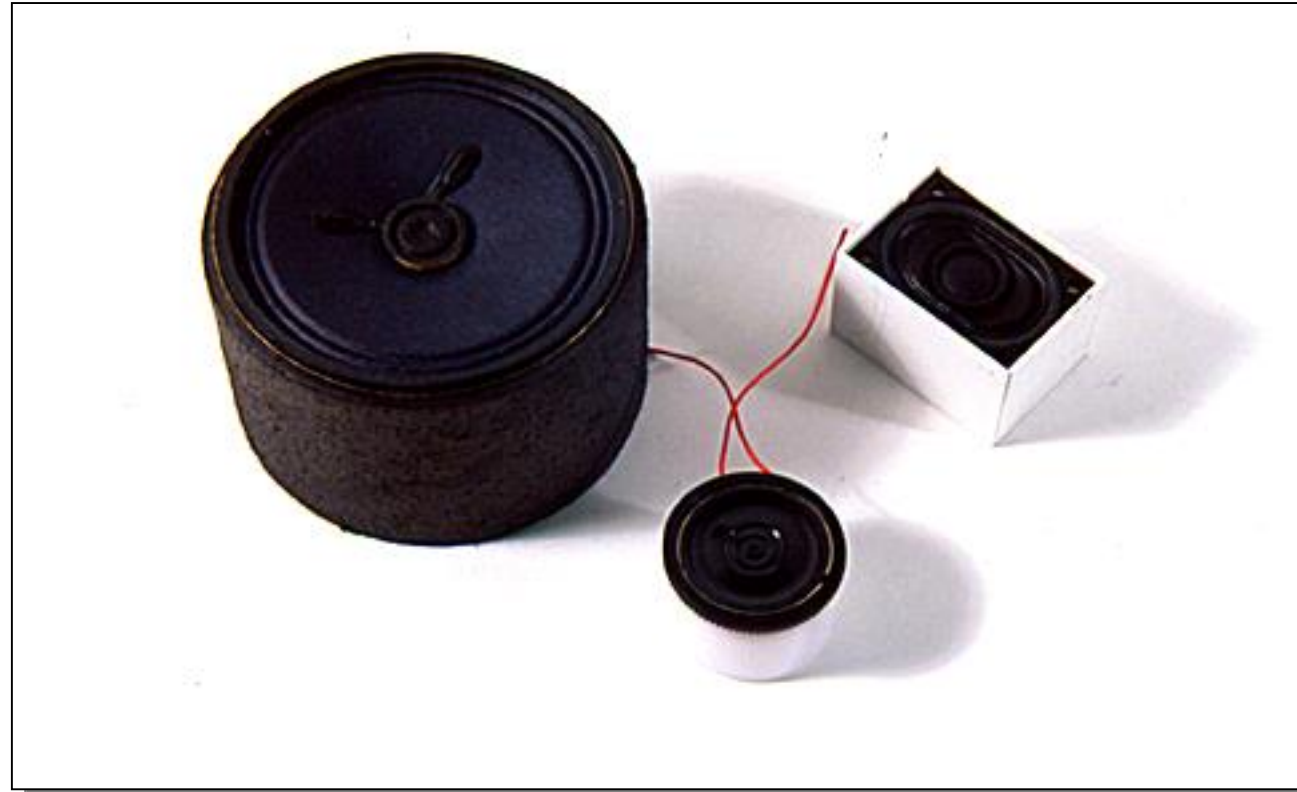
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# Speaker Enclosure Materials

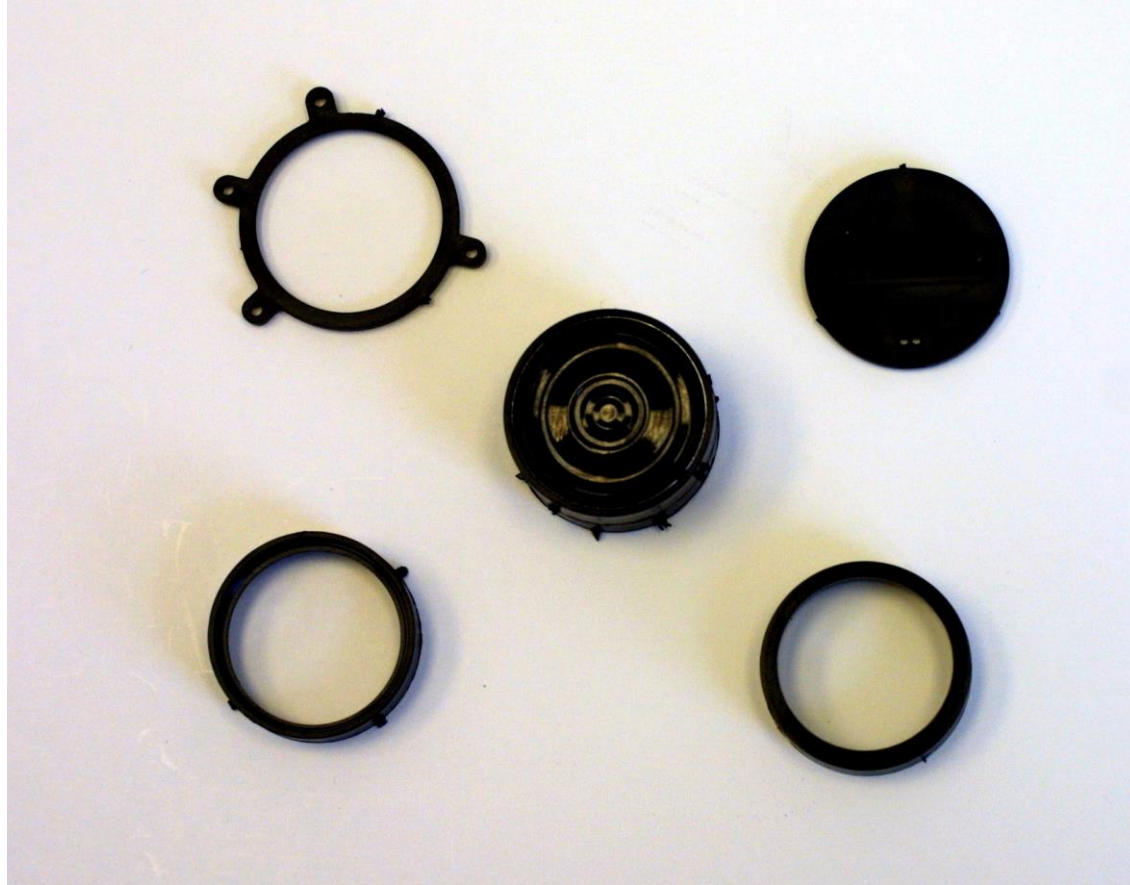




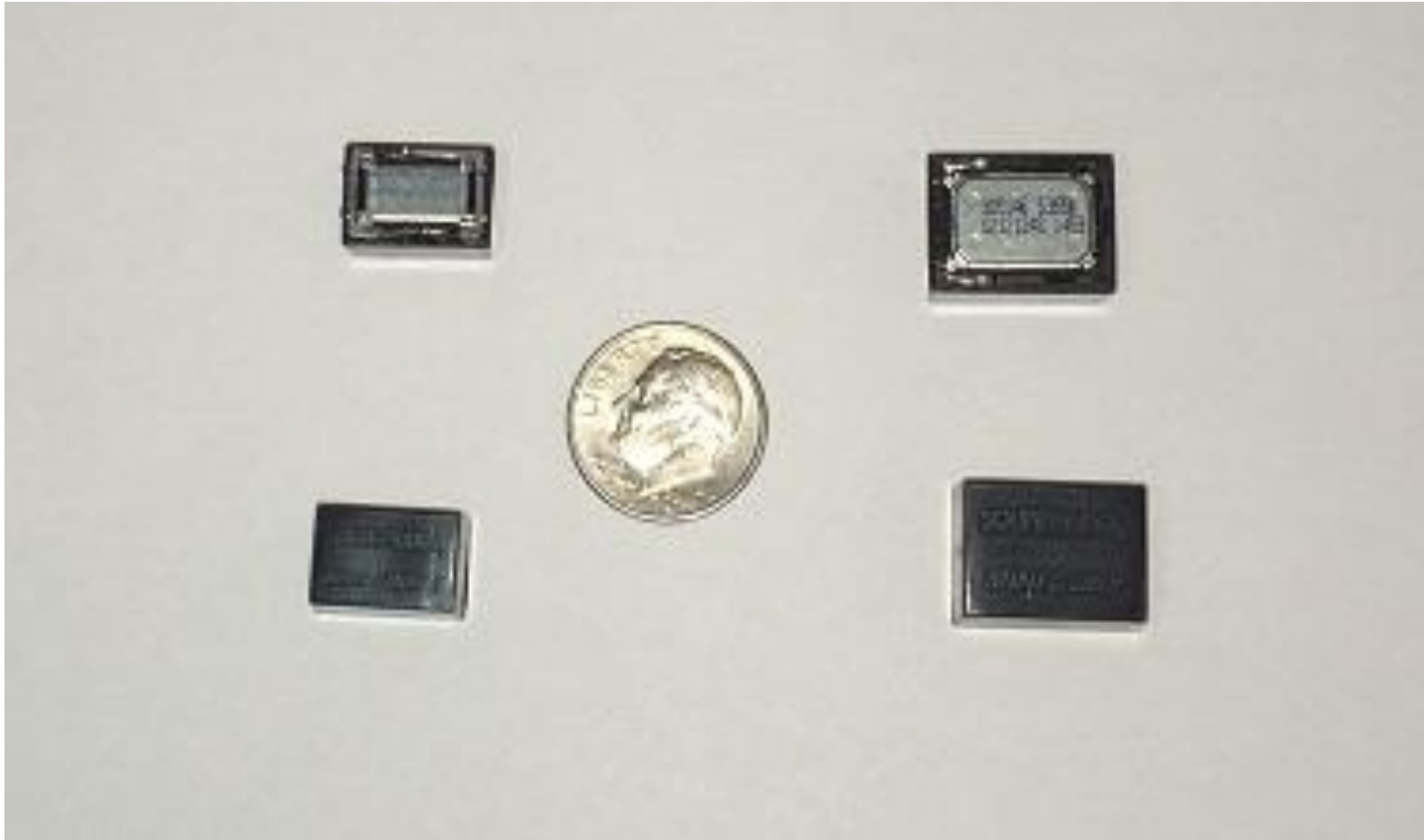
# Speaker Baffle Examples



# Commercial Baffles



# Mini Cube Speakers

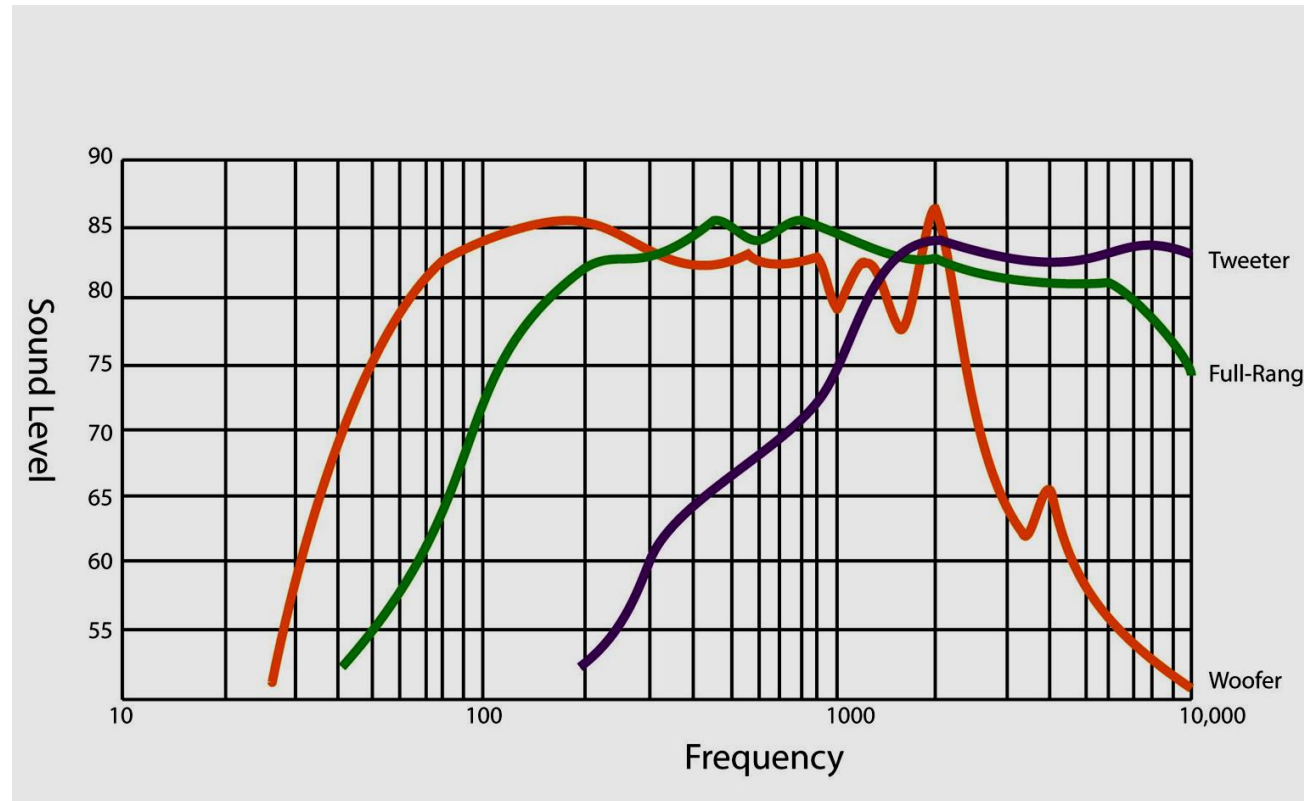


# Types of Speakers

- **Woofers:** Designed for optimal performance at low frequencies, usually large and heavy
- **Tweeters:** Designed to reproduce high frequencies; many small speakers are tweeters
- **Full Range:** a compromise design covering wide frequency ranges; best for model trains



# Speaker Performance



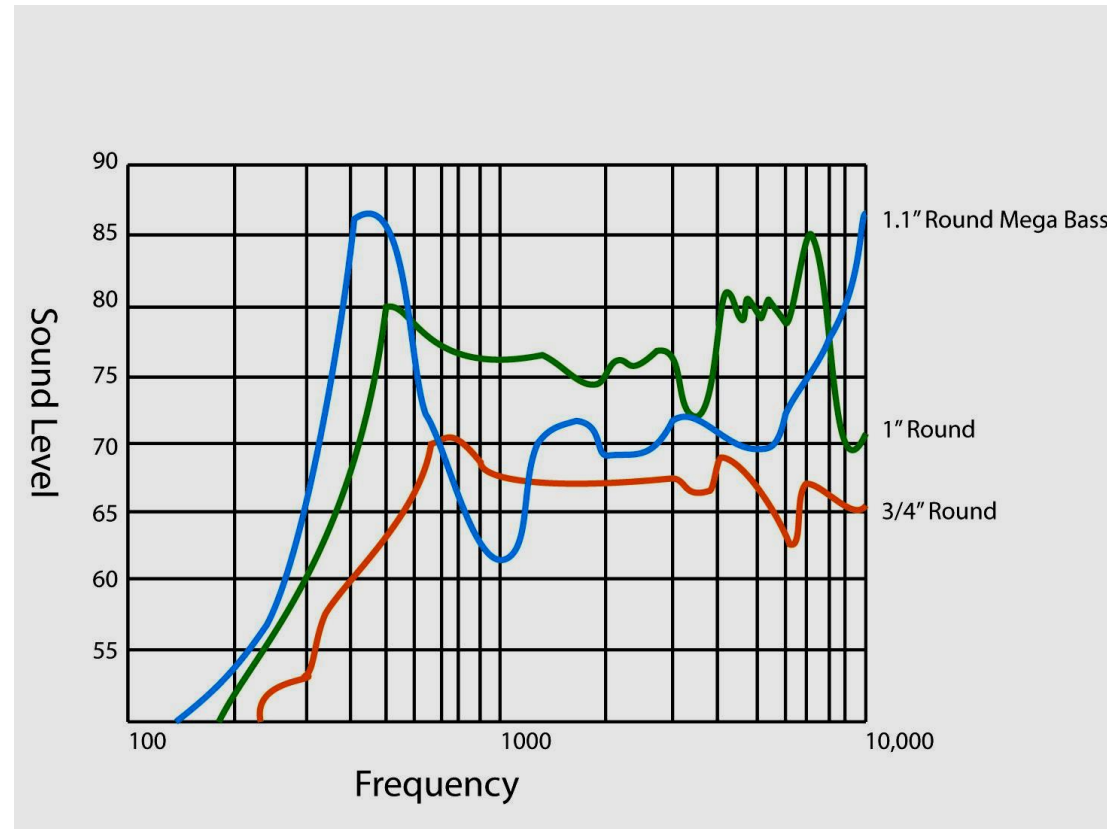
# Speaker Size

- Bigger is better!
- Bigger cone produces more volume
- Bigger voice coil produces deeper bass
- 2-4 smaller speakers as an alternative
- Rectangular/oval speakers as alternatives to round speakers

# Speaker Quality Considerations

- Frequency range
- Cone material
- Suspension
- Impedance
- Power handling
- Magnet size

# Speaker Frequency Response

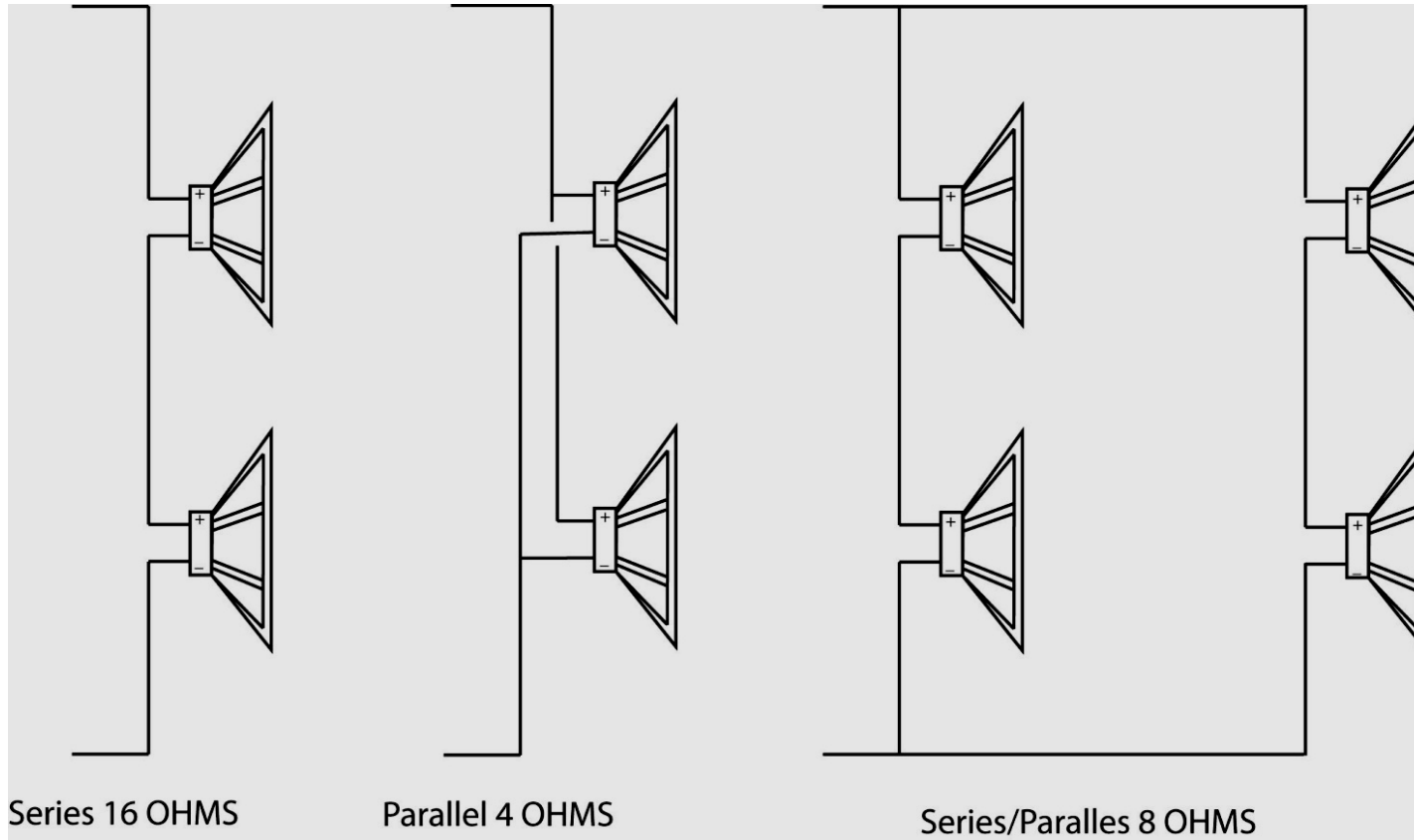




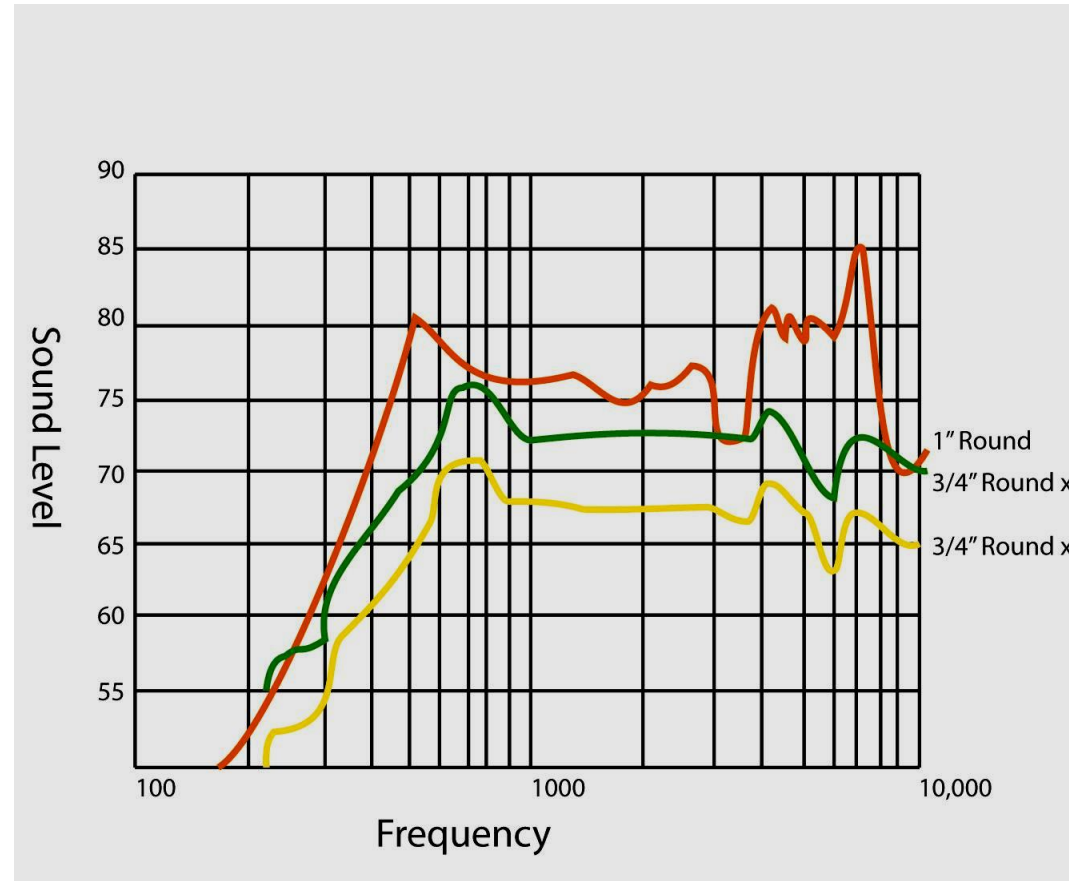
# Advanced Techniques

- Multiple speakers
- Crossover networks
- Subwoofers

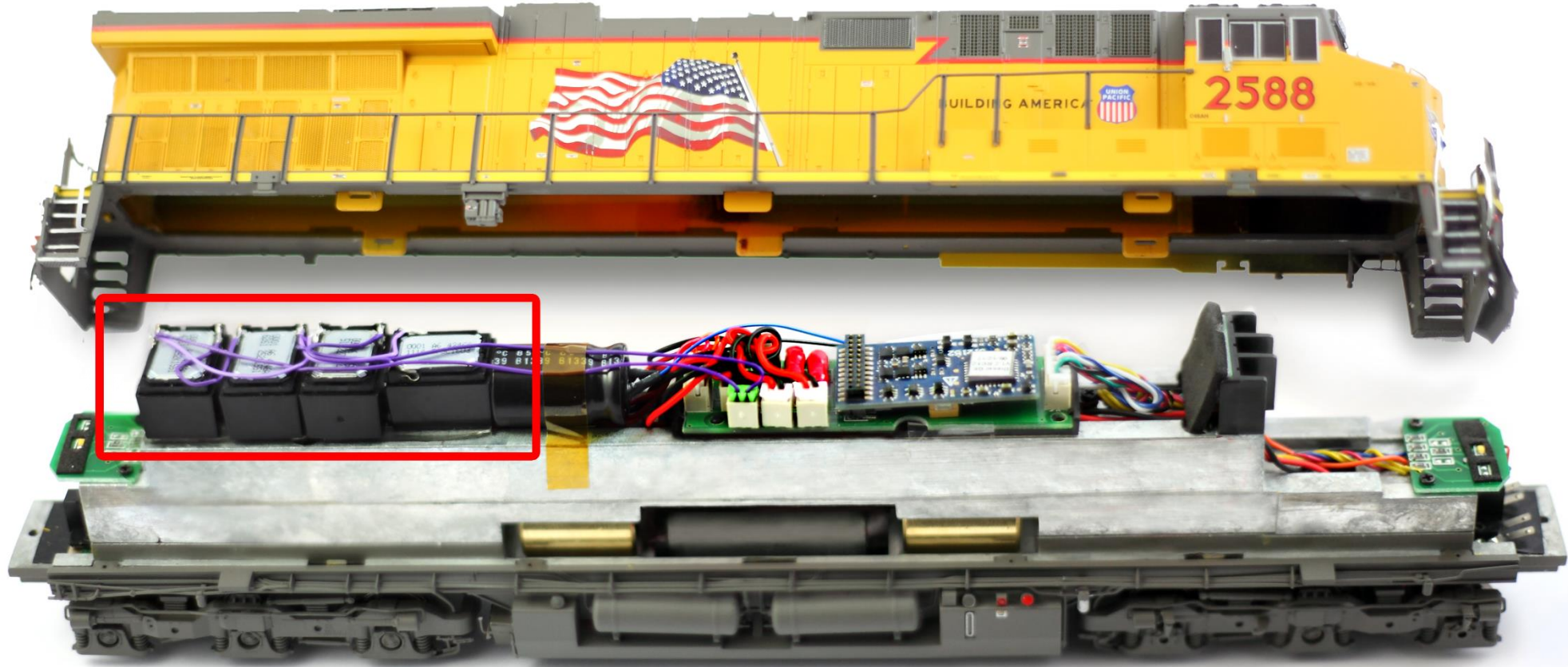
# Wiring Multiple Speakers



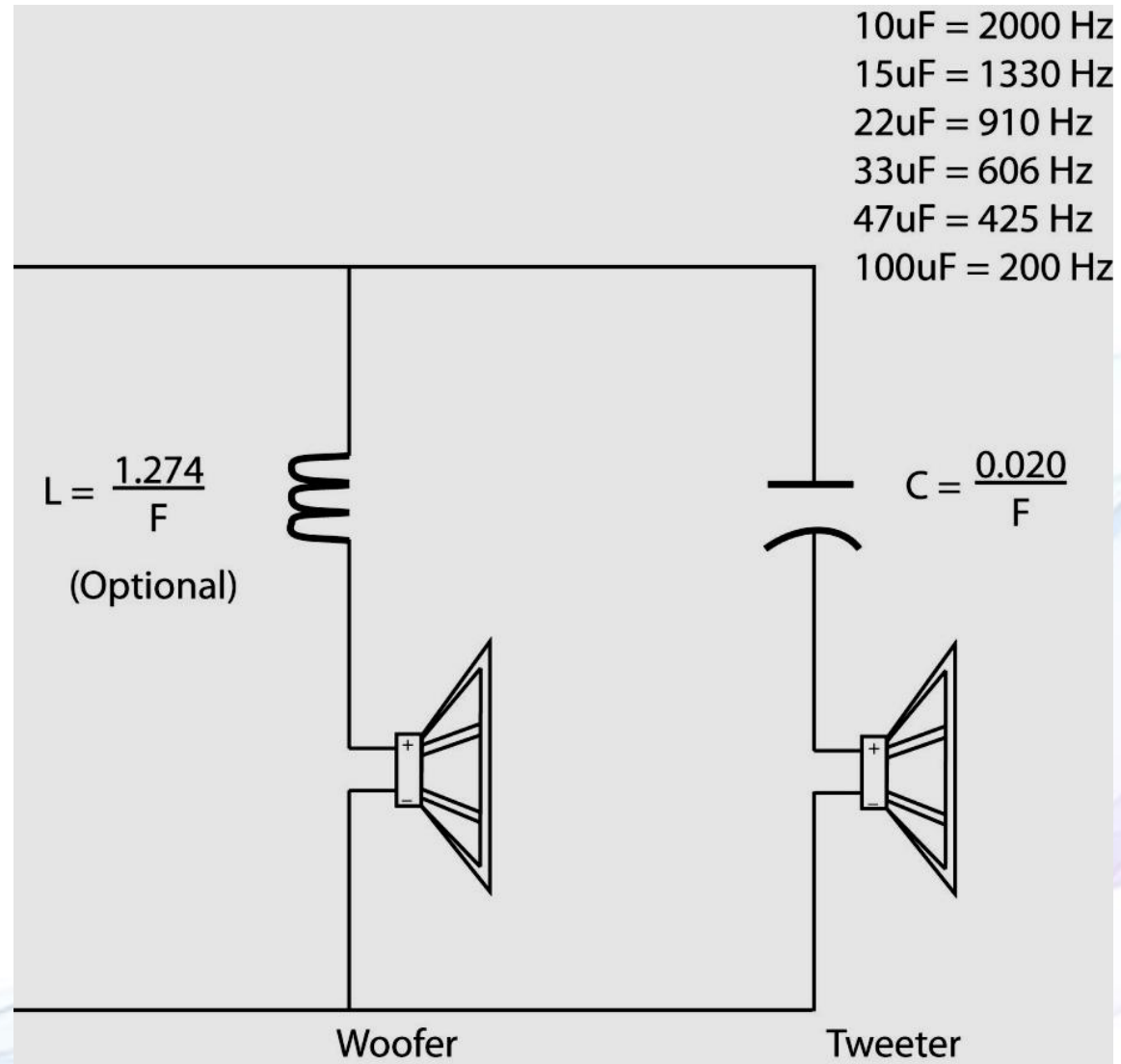
# Multiple Speakers



# Wiring Multiple Speakers

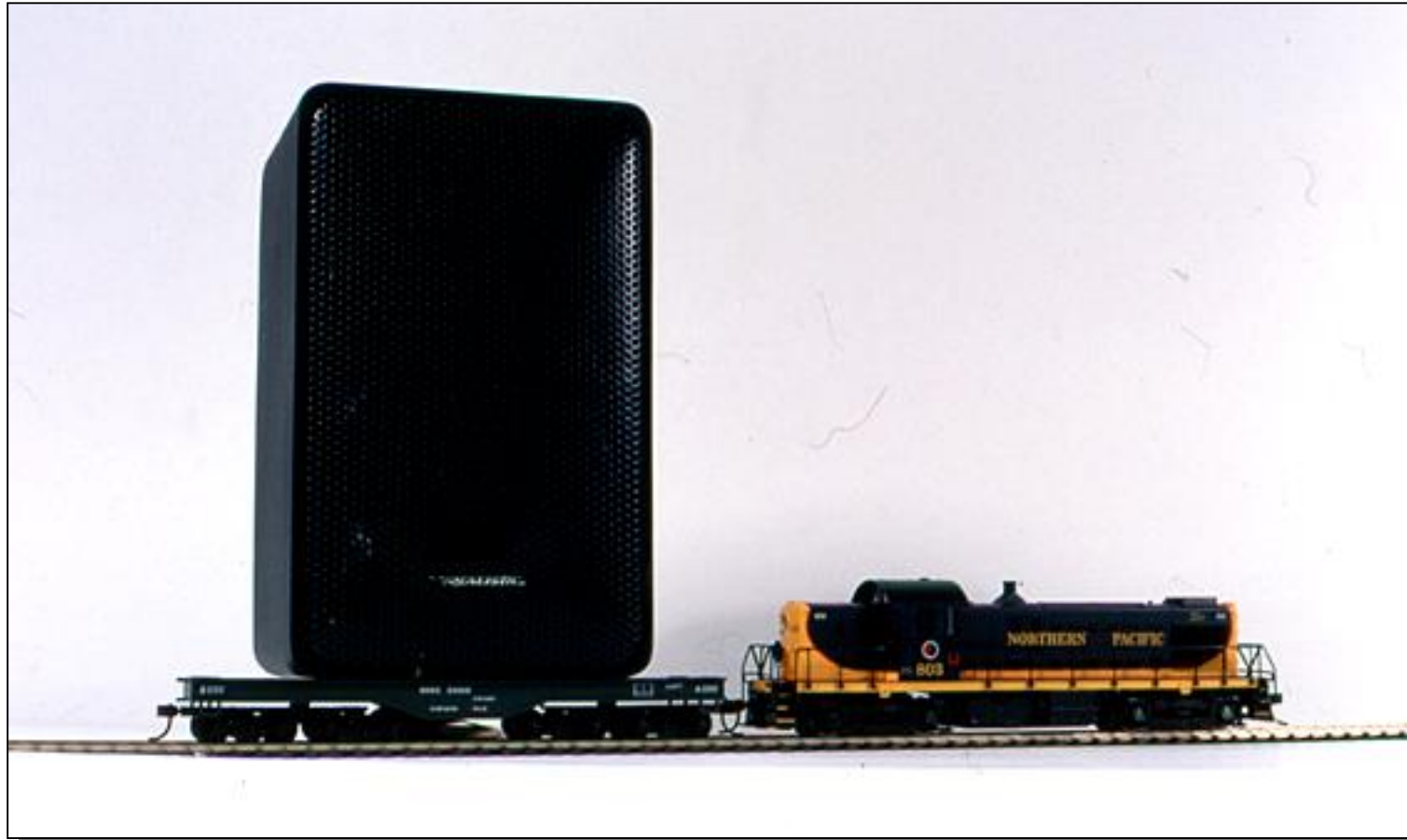


# Crossover Networks



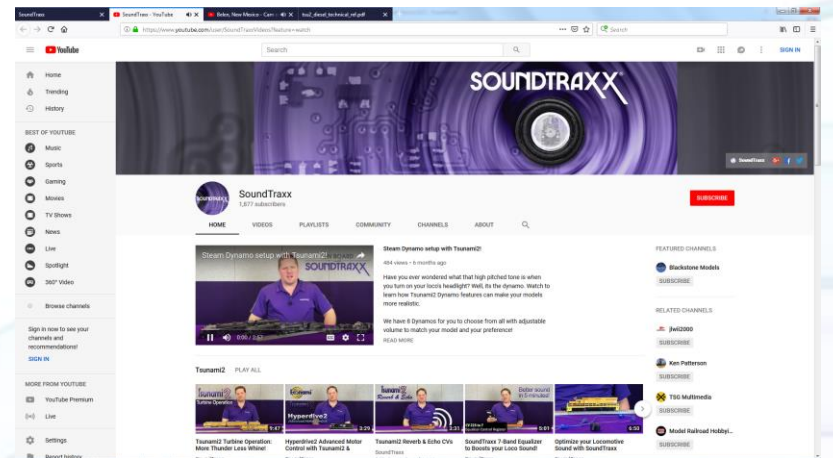


# The Perfect Sound System



# Floobydust

- YouTube channel filled with tips on SoundTraxx products
- Steam and Diesel User's Guide very helpful
- Other tips at SoundTraxx.com
- Next Webinar- March 21<sup>st</sup> 11:00 AM MST
  - Programming CVs, DCC Myths and Troubles, Reset and More!
  - Register now!



Tsunami2™

# Want to learn More? Explore these Links:

- Tsunami2 Manuals

- Manuals Page: <http://www.soundtraxx.com/manuals.php>

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Questions?

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