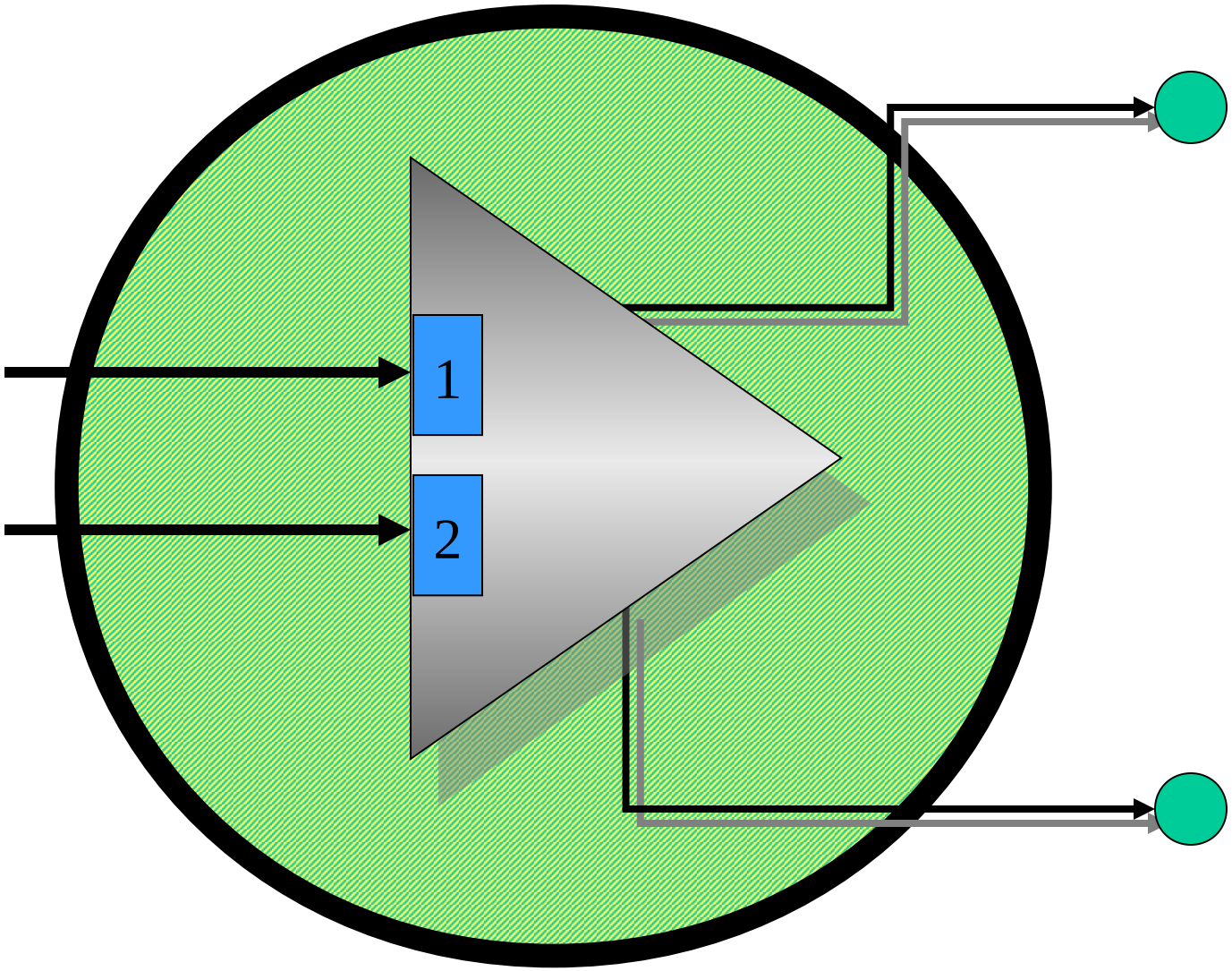
Amplif ers



Def nition

- A device which increases the level of a signal from line level to power level.
- Always the f nal active component in the signal chain.
- Simple in appearance
- Simple but important job.
- Often now built into speakers.

Ratings

- Power Output Level
- Power Bandwidth
- Slew Rate

Power Output Level

Continuous average sin wave power
at < 0.05% THD, 20 Hz - 20 kHz

8 ohms = 240 W/ch

4 ohms = 400 W/ch

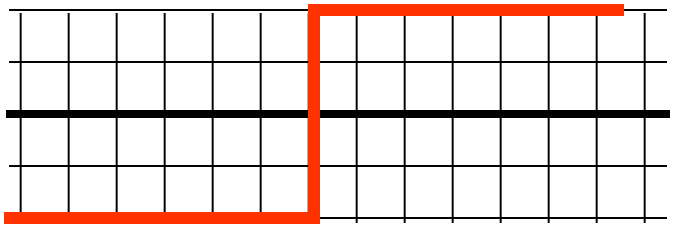
Note that even though impedance has dropped by factor of 2, power does not quite double.

Protective current limiting, due to power supply limitations or heat restrictions.

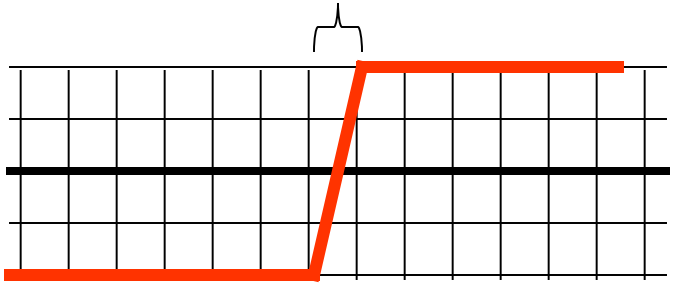
Power Bandwidth

- Ability to produce high output power over a wide frequency range.
- Def ned as the frequency range lying between those points at which an amplif er will produce at least half its rated power (-3 dB) before clipping.
- Modern amplif ers (output transformerless) have excellent power bandwidth.

Slew Rate

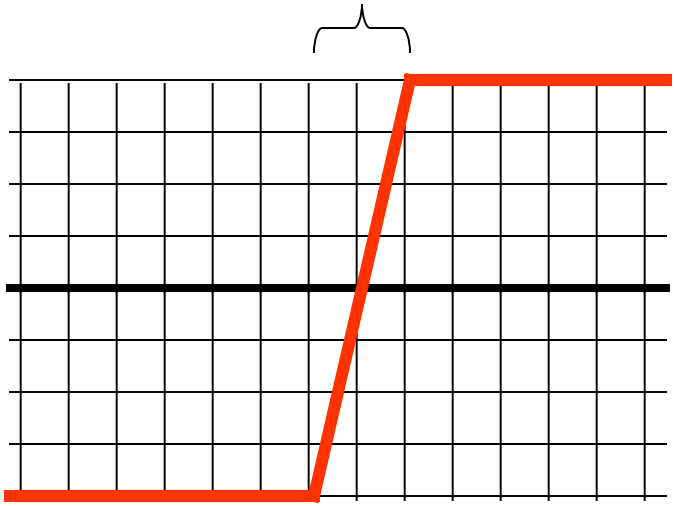


Input signal



Output signal has a ramping factor.

This will effect the reproduction of higher frequencies, as the signal “blurs”

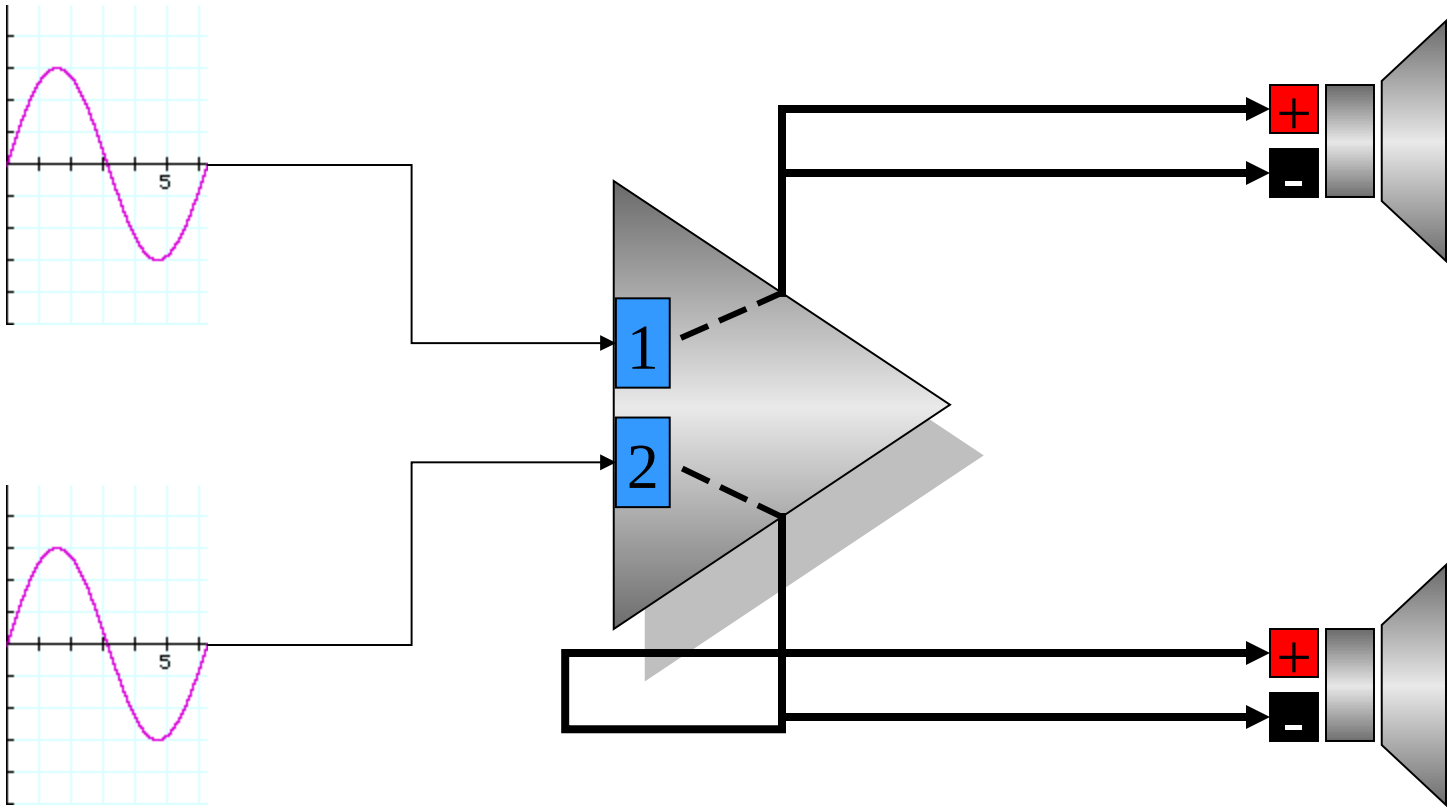


At higher gain levels, the delta time increases by 2 for every 6 dB of voltage difference. This lowers the frequency response by half.

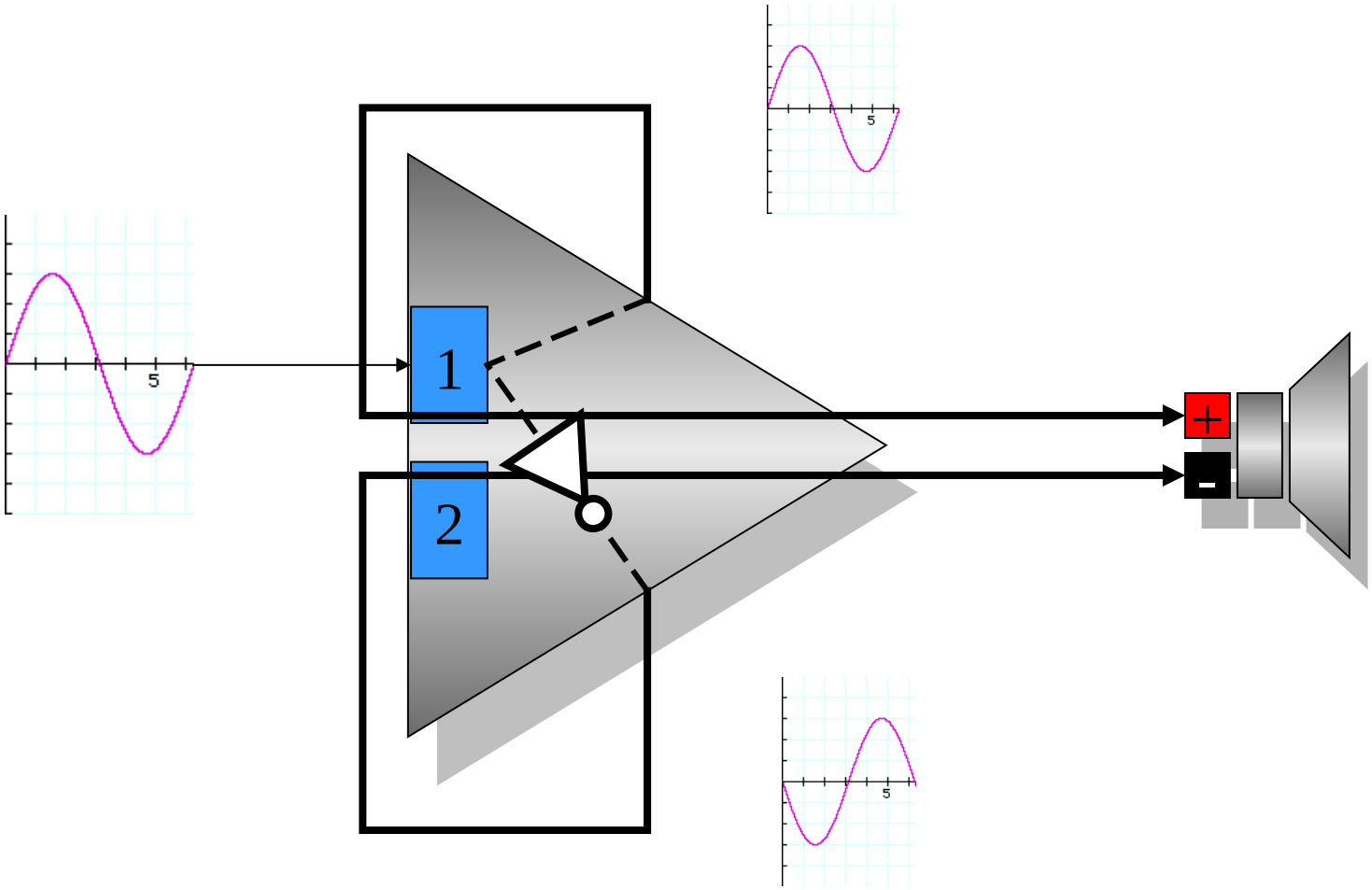
Output Specif cations

- Ratings based on impedance of load
- Usually 2 4 8 16
- Each Amplif er will have a minimum impedance rating.
- Professional Amps will rate at 2
- Usually power rated as RMS average power.

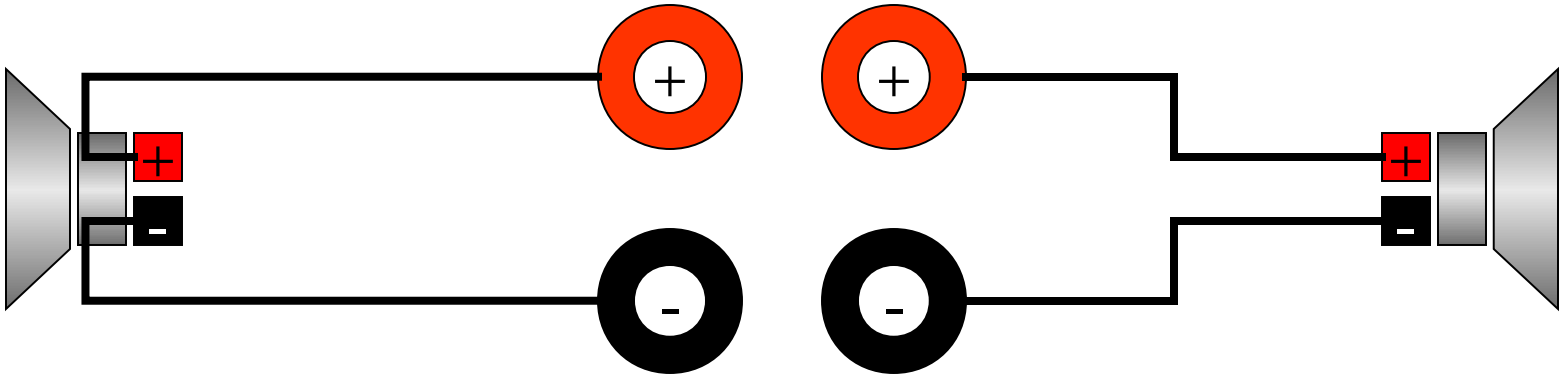
Stereo Mode
(also called “Dual” or “Two Channel”)



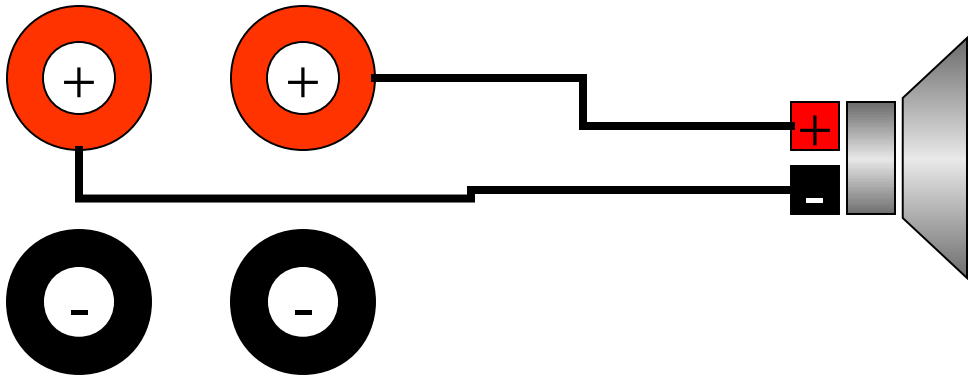
Bridged Mono Mode



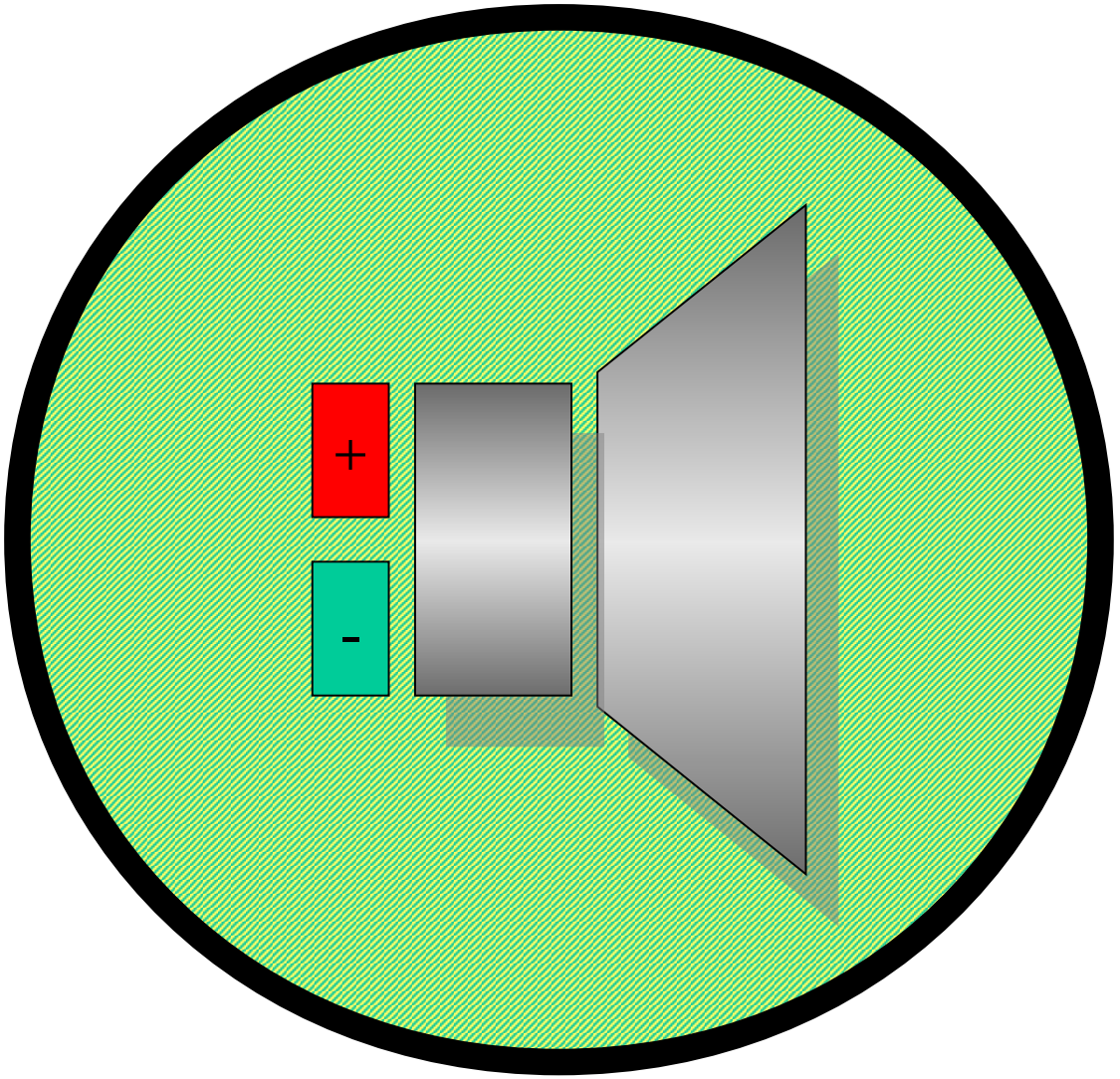
Stereo Connection



Bridged Mono Connection



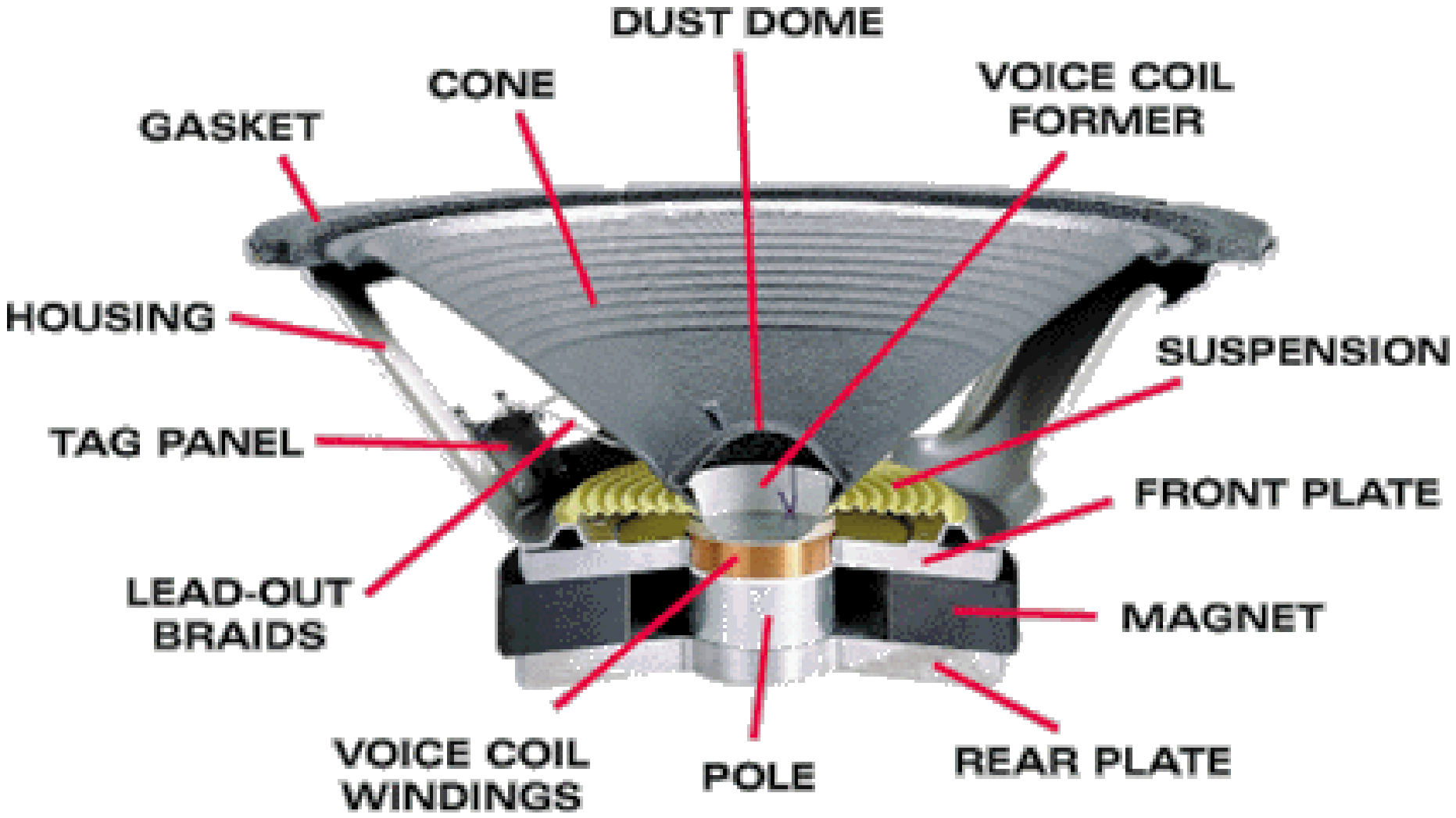
Speakers



Basic Types

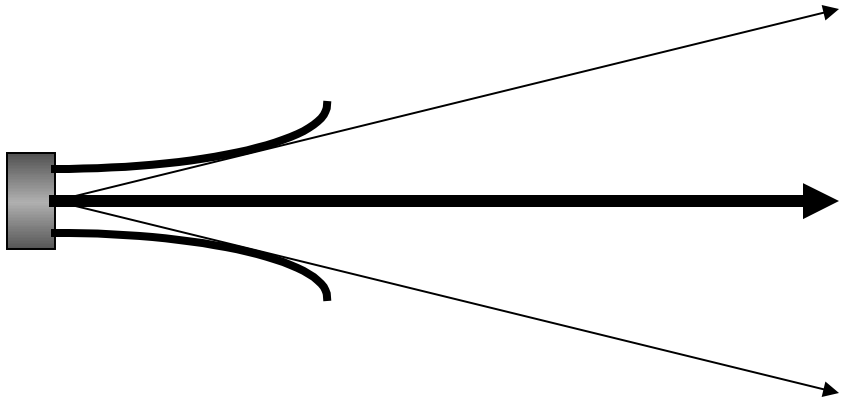
- Diaphragmatic Speakers
  - Direct Radiator
  - Horn/Driver
- Distributed Mode Loudspeakers

Direct Radiator - “Cone”



Beamwidth:

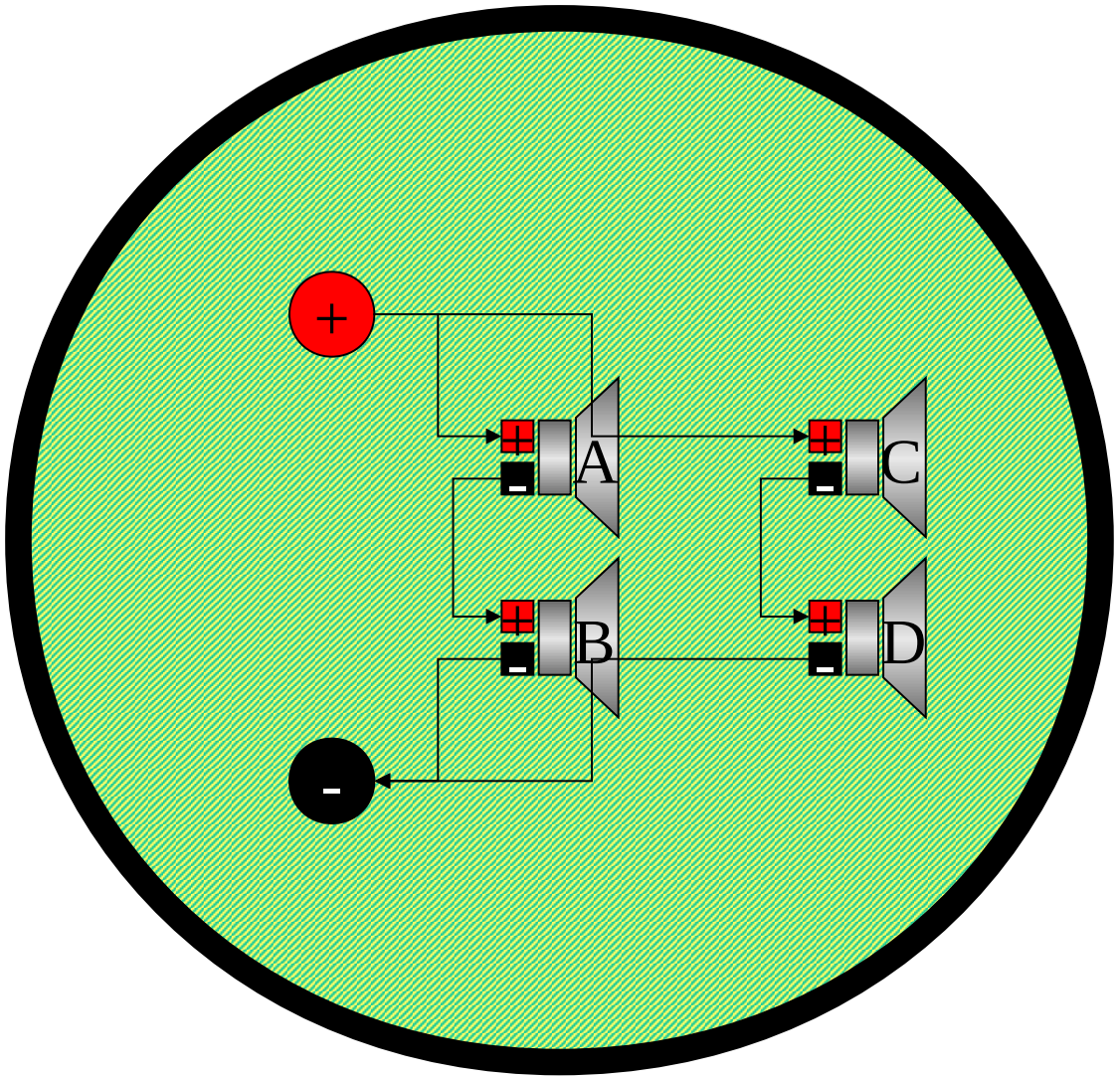
The angle at which SPL is attenuated to -6 dB from its on-axis level



Excursion

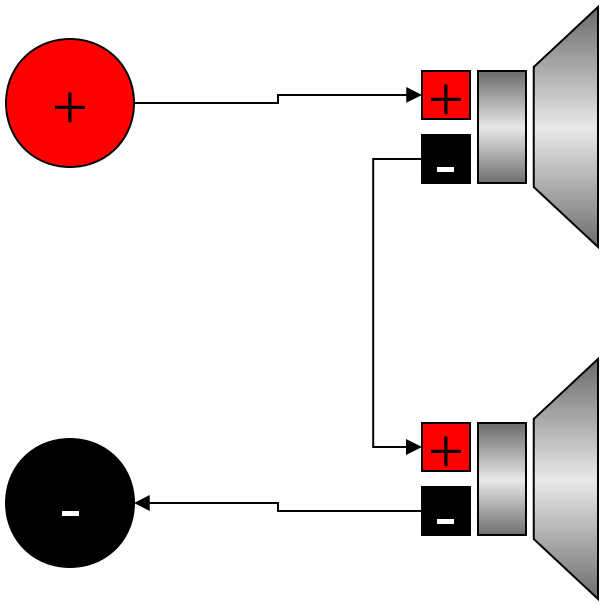
- How far does the speaker cone move?

Loads



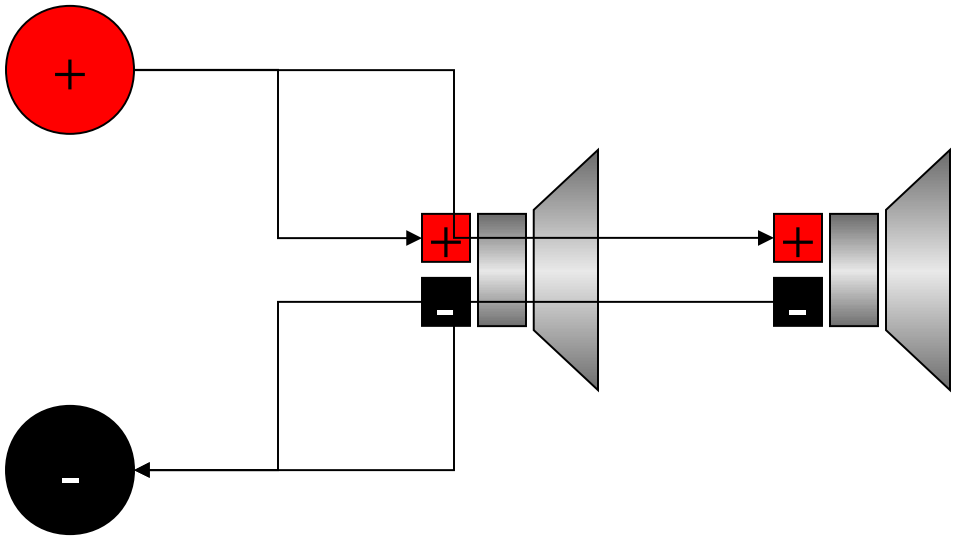
Series Circuit

Impedance = S1 + S2



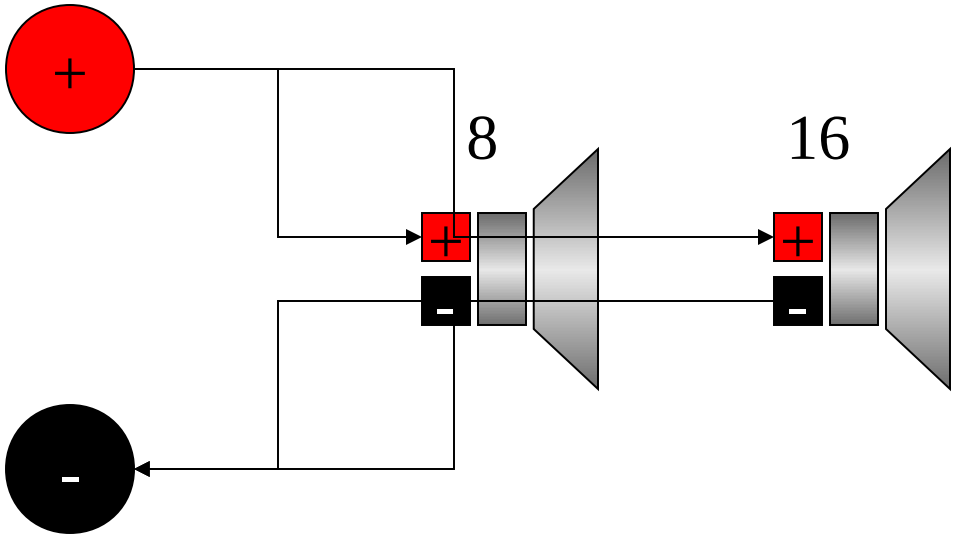
Parallel Circuit

Impedance = S1/2



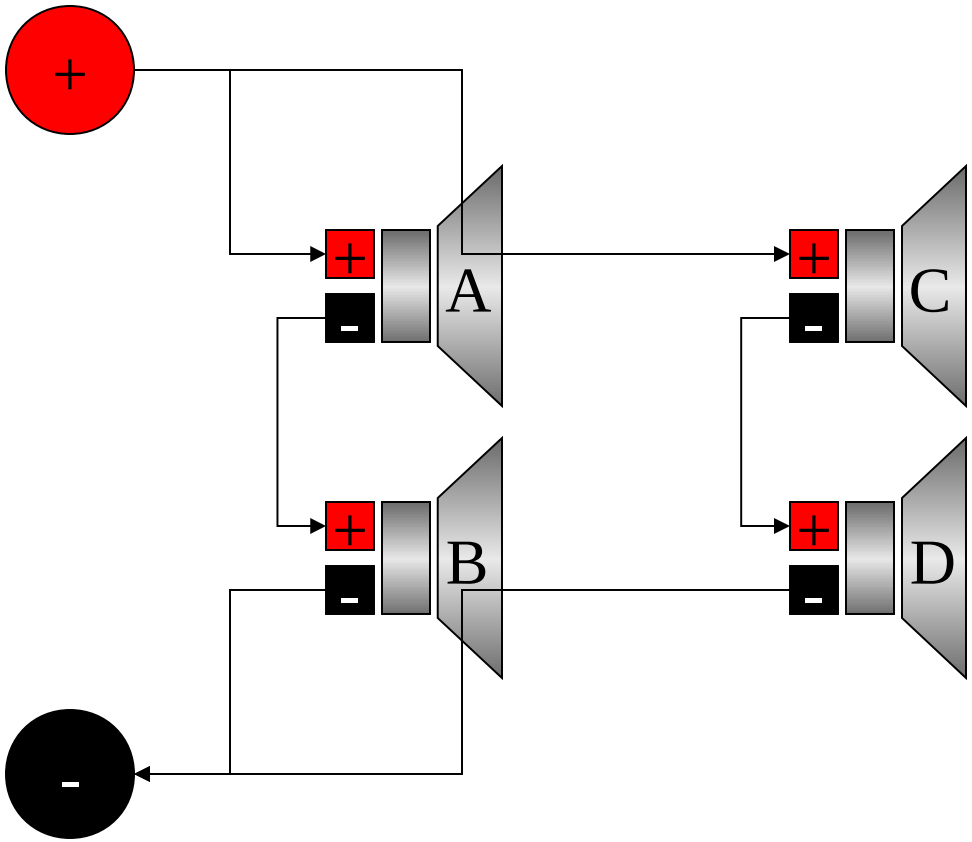
Complex Parallel Circuits

Two loads of different impedance



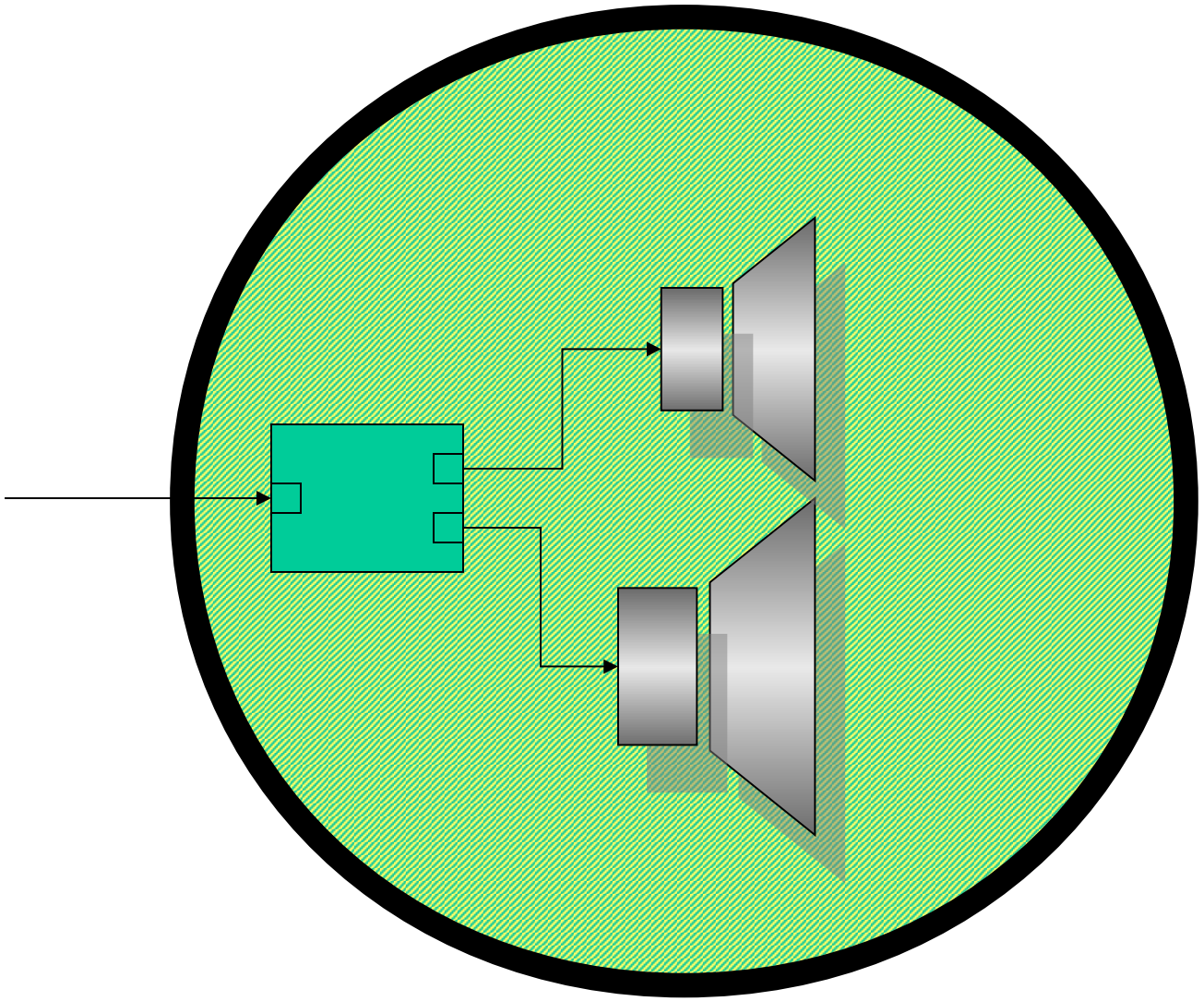
$$R_t = \frac{R_1 \bullet R_2}{R_1 + R_2}$$

Series/Parallel Circuit



$$R_t = \frac{A + C}{2}$$

Multi-Speaker Enclosures



Most Speakers contain more than one element

- 2 way
- 3 way
- Etc.

Each component is usually for a different frequency band

- No traditional speaker is ideal for the entire frequency spectrum
- Speakers are therefore “optimized”

A 2-Way System

- Tweeter
- Woofer

A Three Way System

- Lows
- Mids
- Highs

Each Speaker will have it’s own impedance and power rating

- Low range speakers generally need more power than high frequency speakers

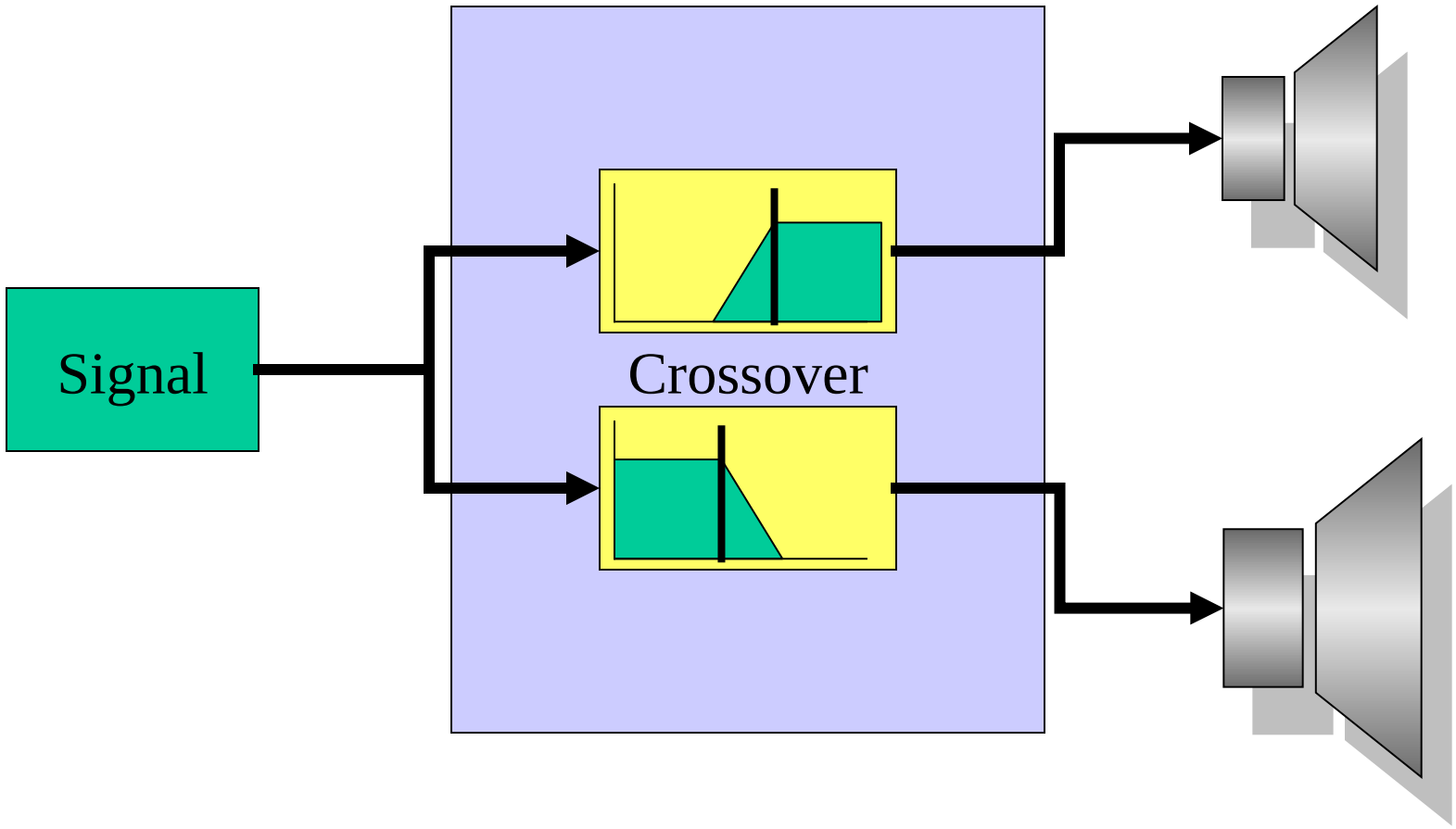
However, we do not want to send the complete signal to each speaker

- Overlapping outputs will create phase issues, and color the signal
- Transient response further colors low frequency speakers trying to send high frequencies
- High frequency speakers can easily be blown by too much power

The solution is to use a “Crossover”

- Splits a signal into two separate frequencies
- Sends appropriate signal to the correct speaker

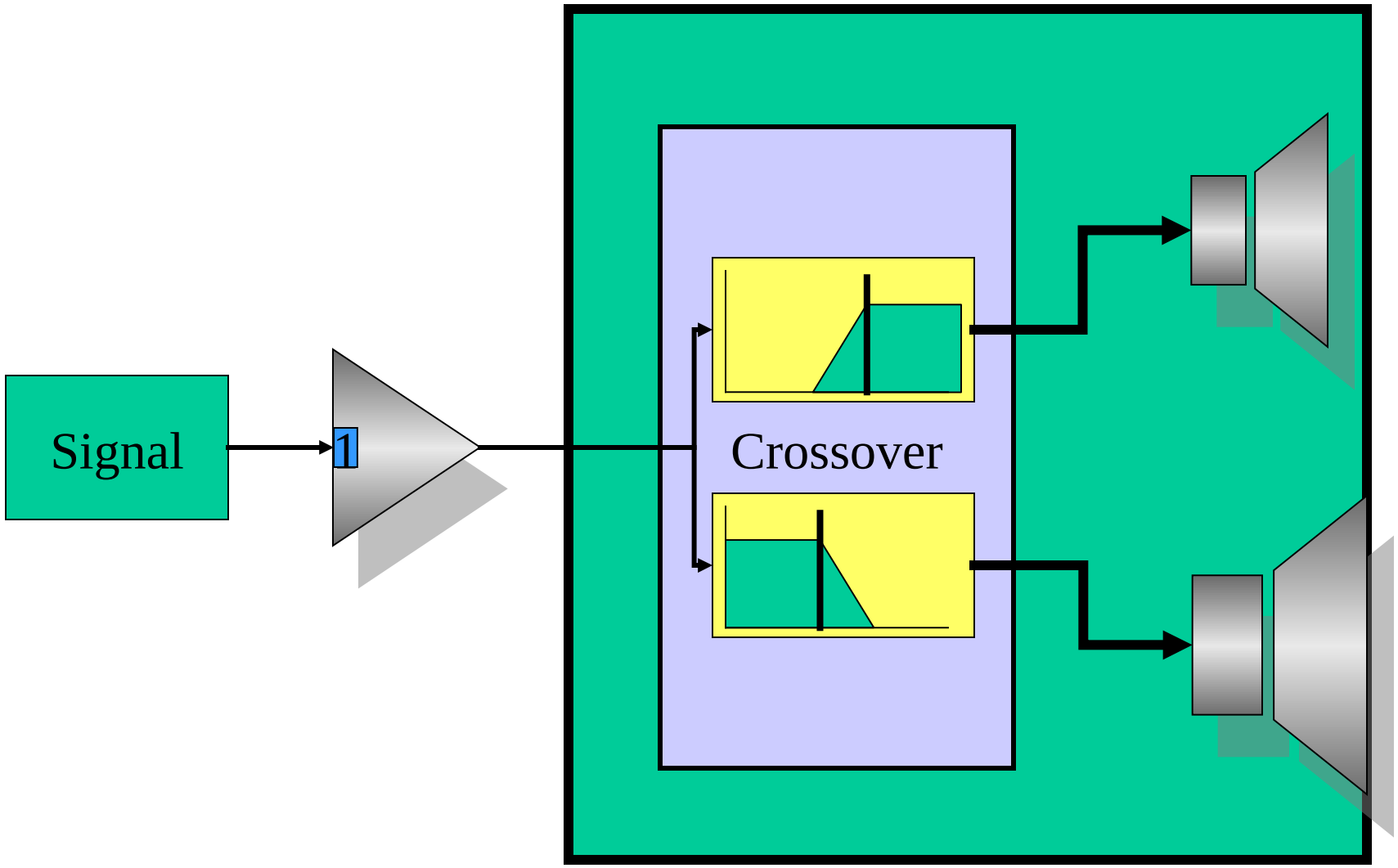
Basic Conf guration of a Crossover



There are Two Types of Crossovers

- Passive
- Active

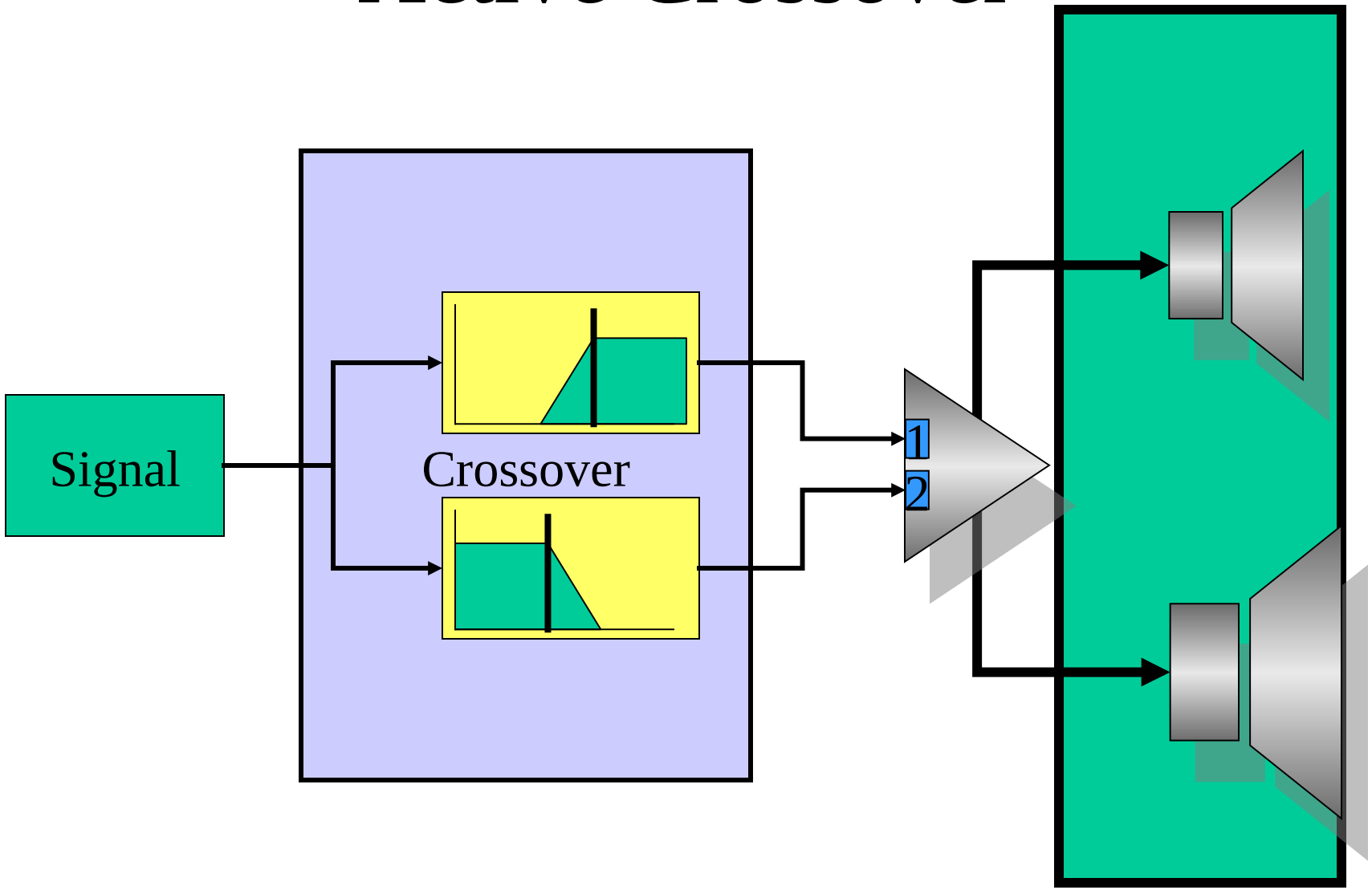
Passive Crossover



Passive Crossover

- Splits the signal AFTER the amplif er
- No active electronics
- Usually integrated within the speaker enclosure

Active Crossover



Active Crossover

- Splits the signal before the amplif er
- Therefore requires more amplif ers
- Active electronics are used
- More expensive
- Better control

Biamplif cation

- Using two channels of amplif er to power different frequency ranges of the same speaker enclosure or group of enclosures.