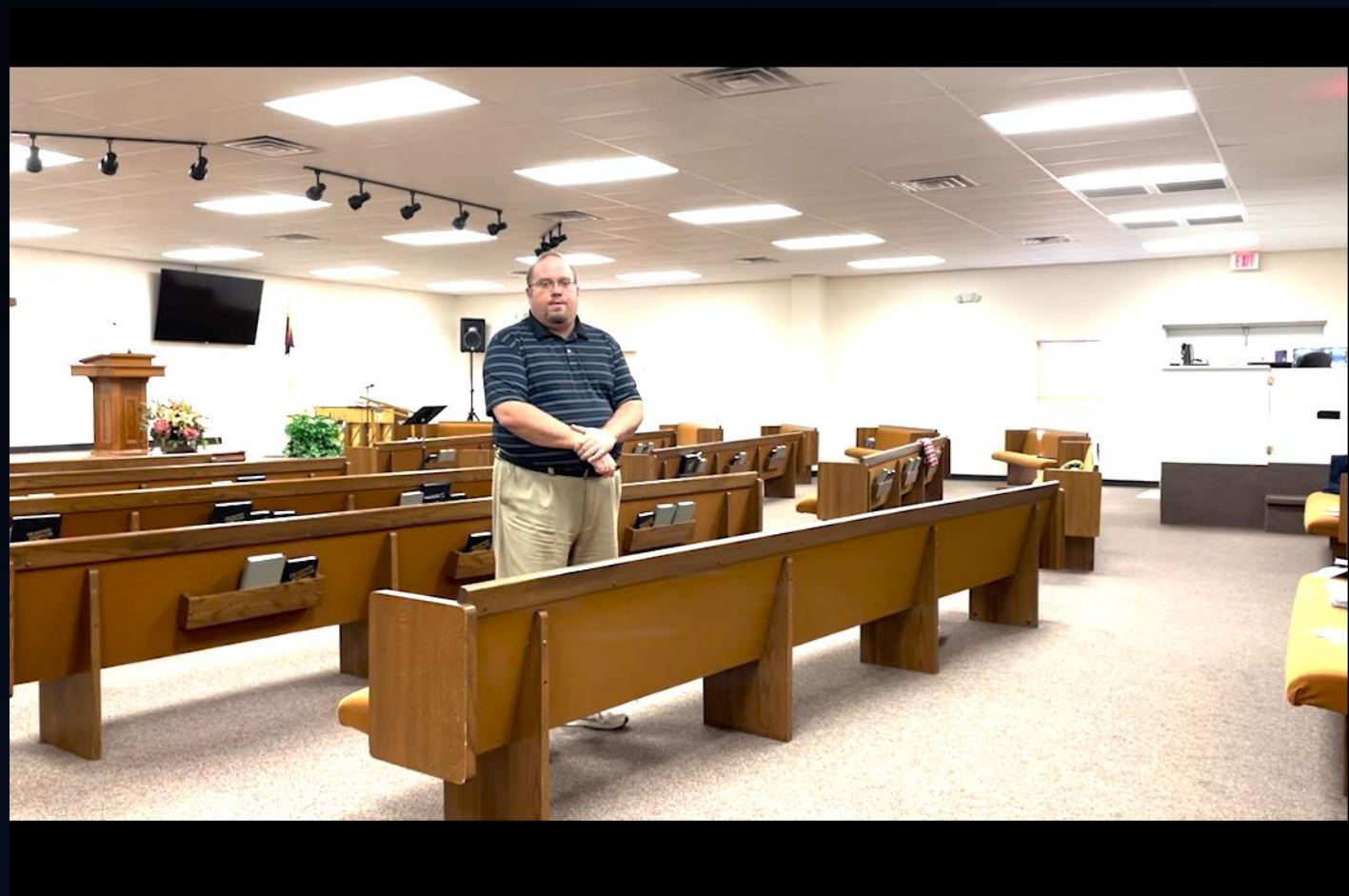# Sound System Basics

FUNDAMENTALS OF CHURCH MUSIC

Four Steps for Processing Sound

- Converting sound to electronic signal.

- Mixing the signal.

- Amplifying the signal.

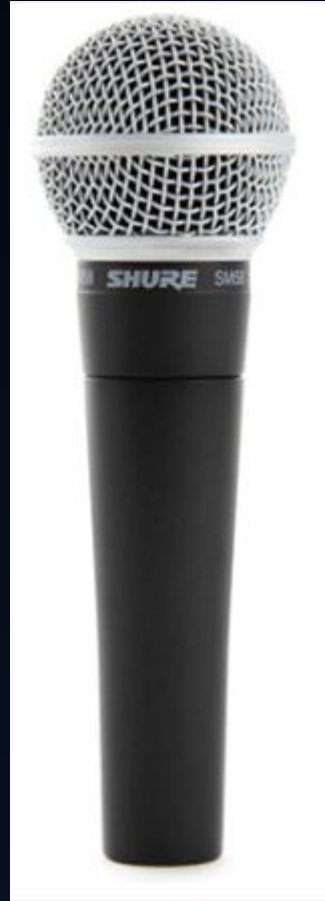- Converting signal to sound.

Intro Video

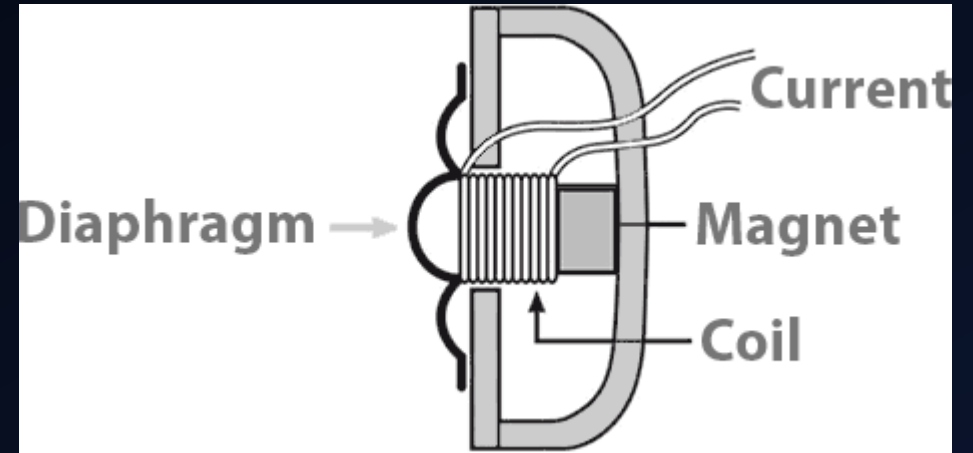# Step One – Converting Sound to Electronic Signal

Types of Microphones

- The three primary types of microphones are Dynamic, Condenser, and Ribbon.

Dynamic Microphones

- Signal is created by sound waves vibrating a metal diaphragm.
- The diaphragm vibrates a metal coil which produces a magnetic field.
- The magnetic field generates and electric signal

Condenser Microphones

- Signal is created by sound waves vibrating a metal diaphragm.
- The vibration of the diaphragm changes spacing compared to the backplate, which creates a change in capacitance.
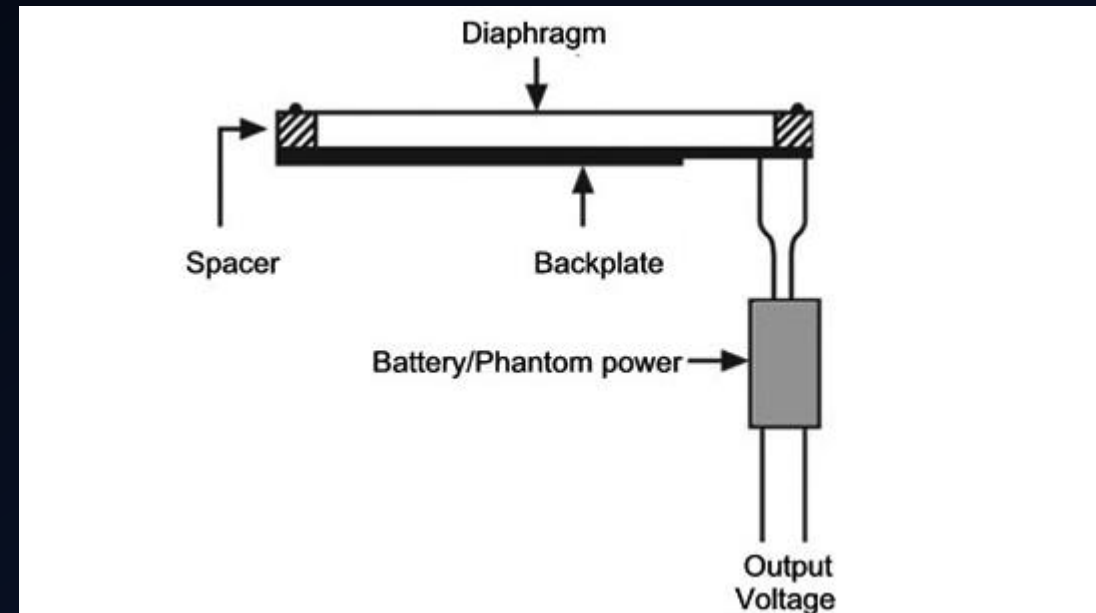
Ribbon Microphones

- Signal is created by sound waves vibrating a metal ribbon that is suspended between the poles of a magnet.

Sound Waves

Signal

Magnets

N

S

Ribbon
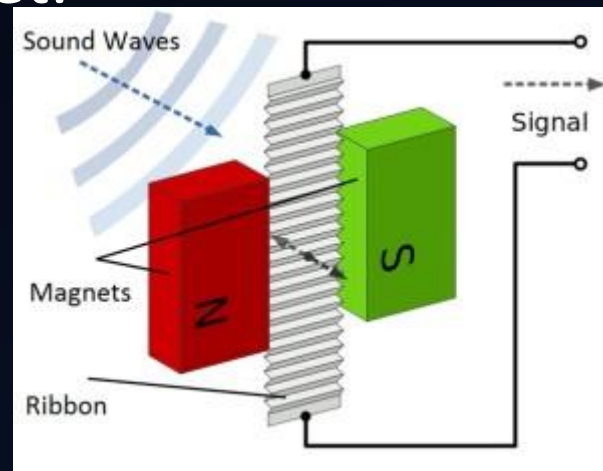
Cables – Balanced vs. Unbalanced

- What's the difference between balanced and unbalanced cables?
  - **Unbalanced** cables have a bigger chance of picking up radio interference and noise. If you were to cut open an unbalanced cable you'd see two wires: a conductor wire and a ground wire.
    - For unbalanced connections keep your cables under 6 feet (about 1.8 meters) to prevent interference.
  - **Balanced** cables on the other hand are designed to cancel out those interferences and electrical hums. They do it with the help of an added wire inside – so two conductor wires and a ground wire. With the help of that second wire, both wires cancel out the noise.

Source - https://blog.landr.com/audio-cable-types-guide-infographic/

Cables – XLR connection

- Name comes from the original Cannon X series, L for latching, and R for neoprene insulation – XLR.

- Most have three wires – ground, positive, negative.

- Used for most wired stage microphones, amplifiers, and other equipment.

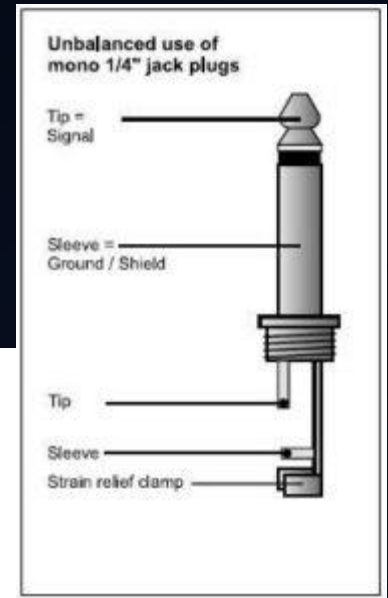- Balanced.

- Use up to 200 ft.

Cables – TRS connection

- Name come from the **T**ip, **R**ing, and **S**leeve design.

- Two primary sizes
  - 1/4 inch (6.35 mm)
  - 1/8 inch (3.5 mm)

- Used for headphones and some instruments.

- Can be Balanced or Unbalanced depending on application.

< Tip

< Ring

< Sleeve

Cables – TS connection

- Like TRS, but only have one ring on connector and two wires (ground and signal).

- Two primary sizes
  - 1/4 inch (6.35 mm)
  - 1/8 inch (3.5 mm)

- Only transmits a single channel

- Always Unbalanced

Unbalanced use of mono 1/4" jack plugs

Tip = Signal

Sleeve = Ground / Shield

Tip

Sleeve

Strain relief clamp

Cables – RCA connection

- Named after the RCA company.

- Will likely have 1 to 3 connectors
  - Red – right stereo channel
  - White – left stereo channel
  - Yellow - Video

- Unbalanced.

Step Two – Mixing the Signal

Mixer

Step Three – Amplifying the Signal

Speakon Connecter

- "speaker twist connector"

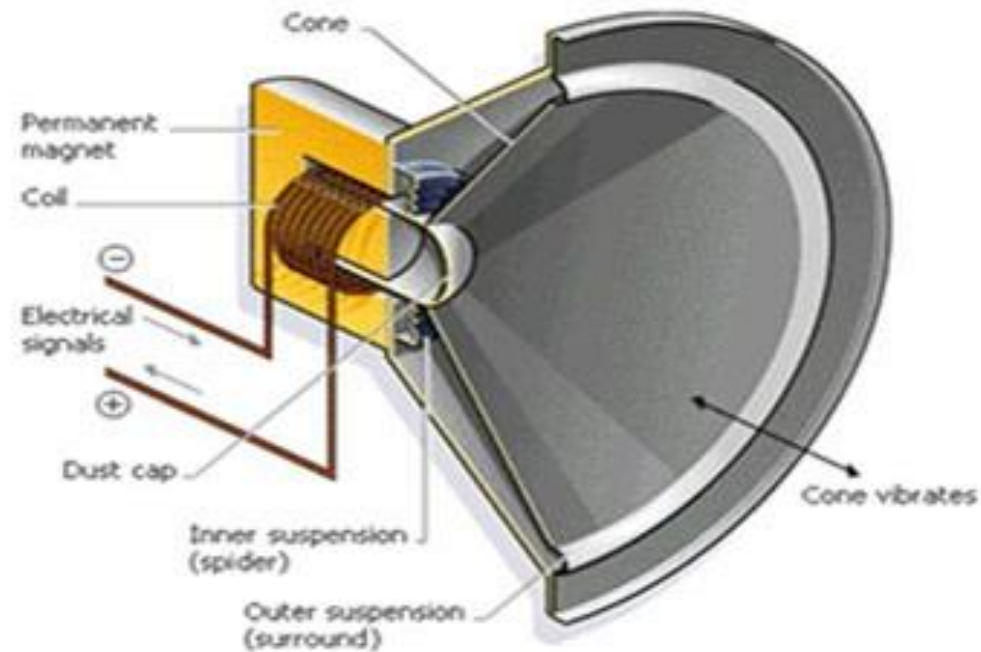- A specialized connector sometimes used for connecting amplifiers and speakers.

Step Four – Converting the Signal to Sound

How Speakers Work

Monitors

Monitors

- Terms that may be used: stage monitor system, monitor speakers, stage monitors, floor monitors, wedges, or foldbacks.

- Without these, the people on the platform will hear the projected sound of the outward facing speakers after it bounced back off the back wall, creating a critical delay.

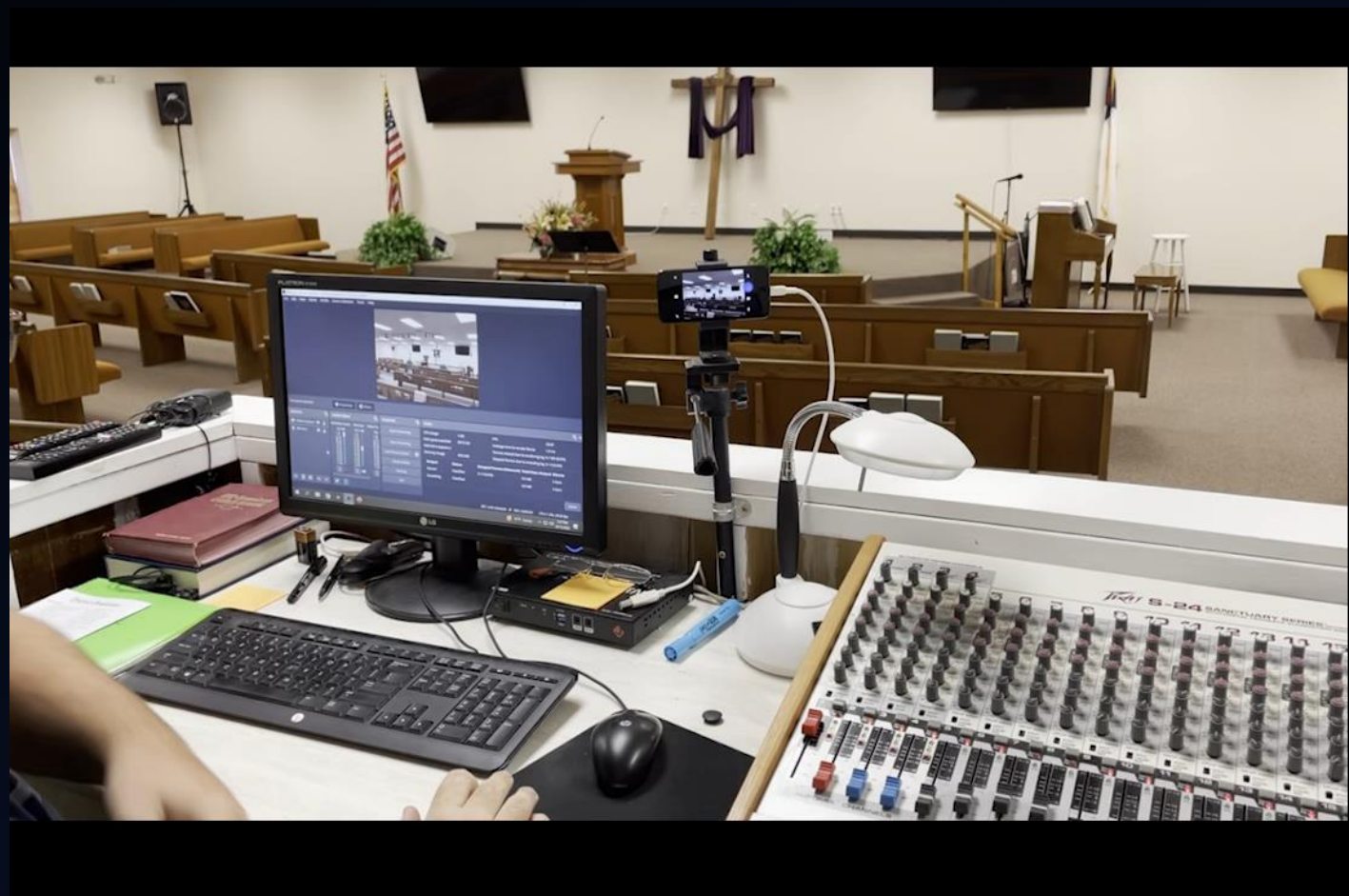- Wireless earpieces have become very popular alternatives.
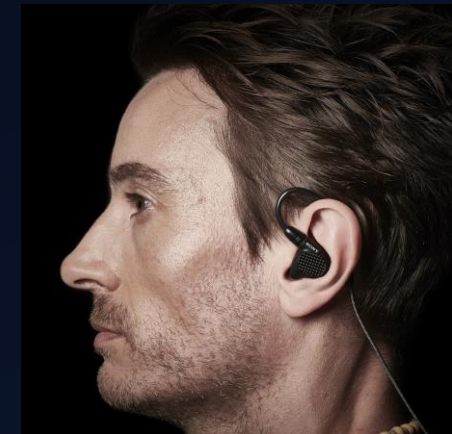
Nursery Speakers

Wireless Microphones

Streaming Audio

Our Streaming Setup

- Video from iPod camera
  - Transmitted to the PC over Wi-Fi connection using EpocCam App - $7.99

- Audio from the Soundboard
  - Transmitted to the PC using TRS 1/4 to 1/8 cable.

- Audio and Video processed in OBS
  - Open Broadcaster Software – FREE!
  - Combines the video and audio signals.
  - Transmits to Facebook streaming.

Some Alternatives

- Software
  - vMix - $60+
  - ProPresenter - $400+
  - Restream.io -
- Hardware
  - Roland
  - Blackmagicdesign
  - Elgato
- Expert
  - Tim Hartman – ProclaimAV.com