Microphones, Cables, Mixers, and Speakers

Weaver Academy

What and Why?

- What?
  - Sound systems.
- Why?
  - You are not going to get around it if you are going to get into technology.
  - All programs use some type of mixer in technology.

Microphones – Short and Sweet

How Does It Work?

- A microphone has some internal device that when sound hits a plate, the plate vibrates.
- The vibration sends electricity down a cable, and to a preamp on a mixer or an interface.
- The rest we will cover in the mixer section.

Two Types of Microphones

- Types of Microphones
  - Dynamic
  - Condenser

Microphones: Dynamic

- Tends to have rougher frequency response
- Rugged and reliable (Hammers)
- Handles heat, cold, and high humidity
  - This is the microphone that goes outside!
- Preferred for high volume: guitar amps, drums (Bartlett and Bartlett, 83)
- Performer needs to be closer to the microphone. Hands distance.

Microphones: Condensers

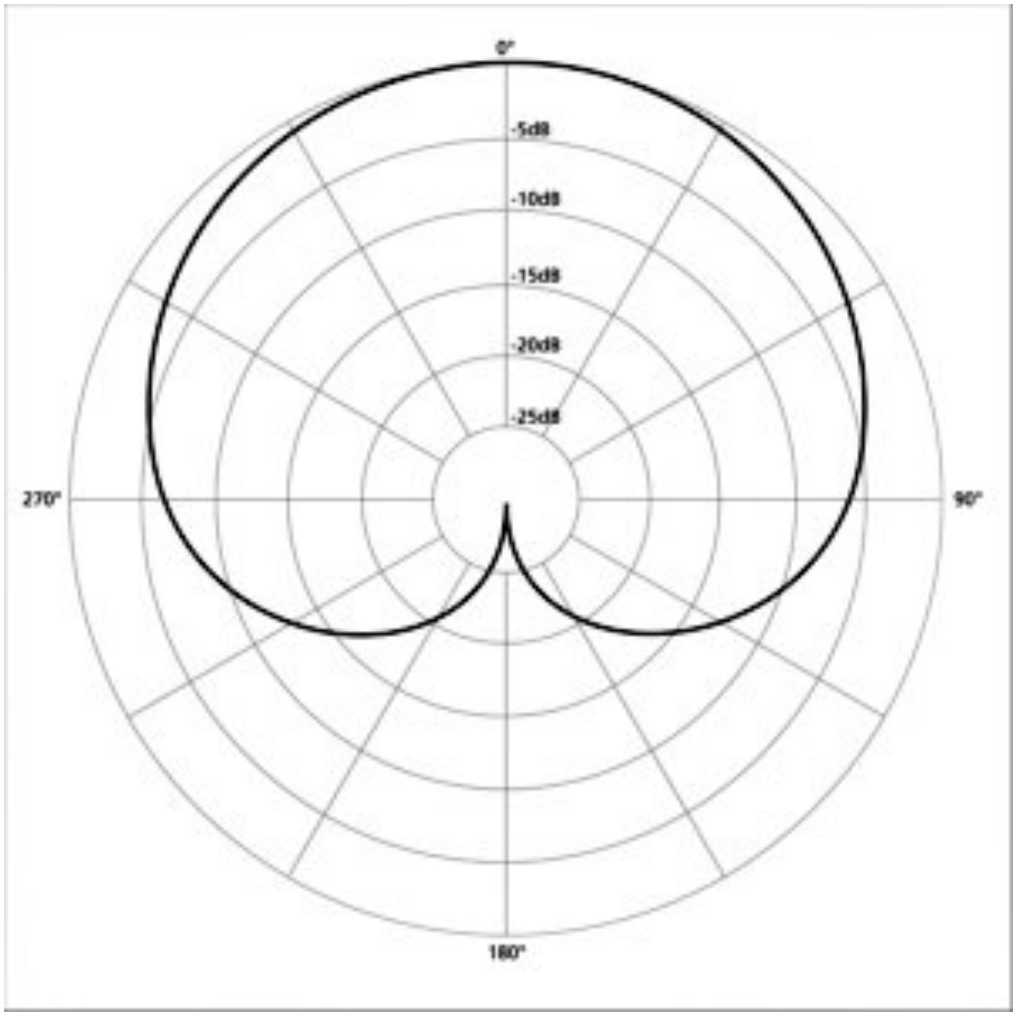
- Condenser microphones need external power supply (battery or phantom power)
- Phantom power: 12 to 48 volts supplied through XLR cable (Microphone Cable)
- Most mixers have a switch to turn on phantom power
- Has a flatter frequency response (Bartlett and Bartlett, 82)
- Has a wider area of pick-up.

Suggested Models for Each

- Dynamic Microphones
  - Instrumental SM 57 - $100
  - Voice SM 58 - $100
- Rode M3 $133 – Backwards engineered KM184 (Great Mic also $800)
  - Good for ensemble recording.
- Vocals
  - AT 2020 Condenser Microphones $100 (Really great price)
  - AKG P170 $79

Polar Patterns

Microphone: Cardioid



Microphones: Polar Patterns

- Polar pattern refers to the way a microphone responds from different directions.
- Graph based on sensitivity measured in decibels.
- Uni-directional, Omni-directional, Bi-directional (figure-8)
- Three types of unidirectional patterns: cardioid, supercardioid, and hypercardioid (Bartlett and Bartlett, 83-86)

Cardioid Microphone

- I will bet money that this is the type of microphone music teachers have.
- Most microphones have this type of polar pattern.
- It looks like a kidney bean (or whatever your mind thinks it looks like).
- They have selective pickup
- Rejection of room acoustics, background noise, and leakage.
- Up-close bass boost
- Has more gain before feedback. (Bartlett and Bartlett, 84)

Cables

Cables

- Balanced Microphone Cable: A microphone cable sends electricity down a wire to emulate sound. These wires have positive, negative, and ground. The TRS cable has a ground. This will take out the extra hum in the cables.
- Unbalanced Cable. This cable only has positive and ground wires. This cable if long enough and does not have the proper shielding can be an unintentional radio antenna. I have had it happen in my room at Weaver.
- TRS ¼" Cable – This is a balanced guitar cable
- TS ¼" Cable – This is an unbalance guitar cable. Keep this one short and you will be okay.
- XLR – Microphone cable - Balanced
- Speakon – Used for passive speakers and amps. For studio/indoor purposes not today.
- Banana Clips – Used to connect speaker wires into speakers

XLR Cable

Guitar Cable Difference

Balanced

Unbalanced

Right Cable for the Job

- Take the time to figure out what cable go in what hole. The male end of a cable goes to the proper female receiver. If you have a problem understanding that, please consult your parents or your biology teacher.
- If it does not fit do not force it.
- Square pegs do not go in round holes.
- Balanced cables do not work in unbalanced outputs unless marked. This is primarily dealing with quarter inch cables. I found that out the hard way. It is a lesson that has served me well since.

Where to Buy Cables

- There is one place to buy cables.
- http://www.monoprice.com
- This place is the cheapest place on the internet to buy cables. This is where UNCG and I gets cables.
- Side-by-side comparison.

Snakes

- A snake is a bunch of cables tied together to make hooking up instruments easier. The head of the snake is the big box, and the tail is all the small chords on the other end.

Mixers

Two Types: Analog vs. Digital

- Learn on Analog FIRST!!!!!!!!!!!!!
- Digital has a lot junk that will confuse you.
- Graduate to a Digital because they have a lot of cool toys, but learn analog first if possible.
- If someone happens to donate a big digital mixer, take it and smile.

Parts of a Mixer

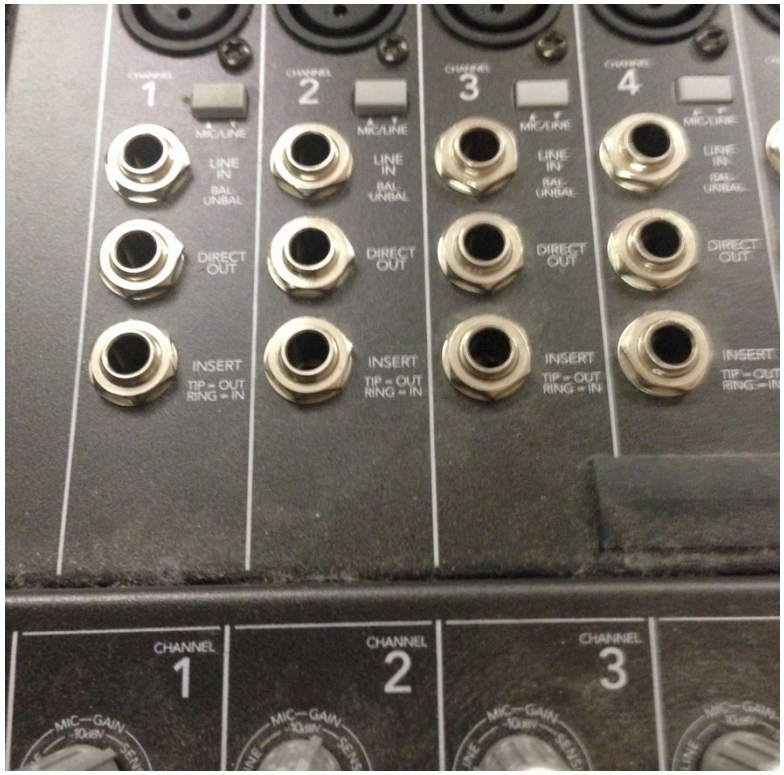
- Channel – The lane where the sound runs. Not to be confused with tracks.
- Input Section – Where the sound goes into the mixer
- Auxiliary Sends – The way to get out of the mixer into an effects box(es) or Monitor Mix
- EQ – Equalization. This controls the loudness of the harmonics.
- Panning – Balance between speakers.
- Faders – Controls volume of the channel.
- Mute/Solo – Mutes the channel. Solo: Plays only the channel.
- Sub routing – Tape outs, Control Room Out, External Out, and other outs beside the main out.
- Auxiliary Returns – One of the places where an Aux Send can come back too.
- Master Fader – The main fader that controls the volume of the board.

Input Section

Info

- This is where the cable from the snake or the instrument goes.
- This is where sounds go into the mixer.

Picture



EQ – The Fancy Volume Knobs

- Handouts

Panning

- Two Speakers Left and Right.
- If all the sound is coming out L, they are panned hard left.
- If all the sound is coming out R, they are panned hard right.
- If they are balanced between L and R, they are panned center.
- There can be variations between panned hard and center.

Mute/Solo

- These are pretty self-explanatory.
- Mute – The channel does not get played.
- Solo – Only that channel gets played.

Faders

- The volume controls at the bottom the mixer board. This is what you will use to control volume for the show or recording.
- Theses do not have to be sliders. They can be pots.

Master Fader

- This fader is the fader that controls the house mix. This is the most important fader on the console. If there is an emergency, turn this down first.

Outputs

- Can be XLR, TRS, TS, S/PDIF, AES3, or anything else.
- They will typically go to speakers, headphones, or other inputs.

What to Buy

- We go back to Sweetwater for this one.
- The mixer size depends on what you need.
- A four-eight channel mixer should do fine. $50-$200
  - Mackie - I am a huge fan. They are simple and straight ahead. The most non-confusing boards out there.
  - Yamaha
  - Behringer

Speakers

- These are almost important as the microphone. These need to be something that you want hear music come out of.
- There are two types of speakers. Active and Passive
  - Active Speakers do not need an amp.
  - Passive Speakers need an amp.
- I will highly recommend getting active speakers. For two reasons.
  - 1. They are easier to use.
  - 2. You do not need an amp.

When Buying Speakers

- Ask yourself what are they going to be used for. For the majority of us, we want speakers that will fill up the outside space or a gymaudtorium.
- Look to see what type of inputs they have. If your mixer has ¼” outs then you might want a speaker with ¼” inputs. If the mixer has XLR outputs then you might want to consider XLR inputs on the speaker.
  - This does not mean that if you already have a mixer with ¼” outs that you cannot buy a speaker with XLR ins, but you will have to buy an adapter.
- You can always turn down, but you can only reach a certain amount of volume.
  - SPL: Make sure this is high. This is measured in DB’s.

What to Buy

- These should do you.
- JBL EON610 – These will cost you a little, but they are worth the money you are going to spend on them. $349
- Mackie Thump 12 or 15 - $299, 349 respectively.

Beware of the Little Things

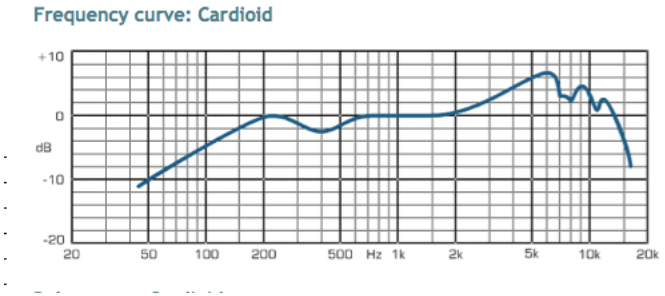
- When you buy speakers the other little things.
  - Adapters – Monoprice these
  - Stands – Sweetwater - $50 a stand.
  - Extension Cords

Frequency Response (FR)

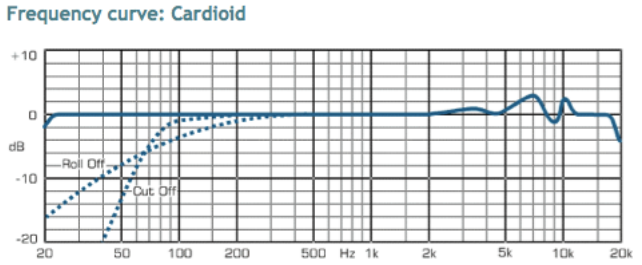
- Also called an EQ Curve
- Range of frequencies that an audio device (mic, mixer, speaker, etc…) will REPRODUCE at an equal level (within a tolerance, such as ±3dB) (Bartlett and Bartlett, 567)
  - X-Axis = Frequency/Pitch and Y-Axis = Volume/db
- Devices respond differently to different frequencies.
- Flatter the frequency response, the higher the fidelity or accuracy. (Bartlett and Bartlett, 88)
- Microphone may be non-flat on purpose: cut low frequency, equalizer, boost high frequencies to add presence/sizzle. (Bartlett and Barlett, 88)

Frequency Response Graphs from Microphone-Data.com.

SM57-Dynamic



KSM32-Condensor



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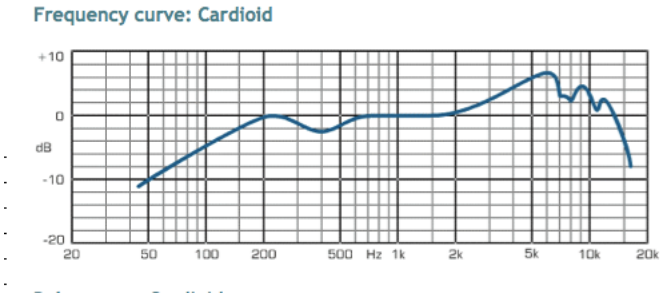

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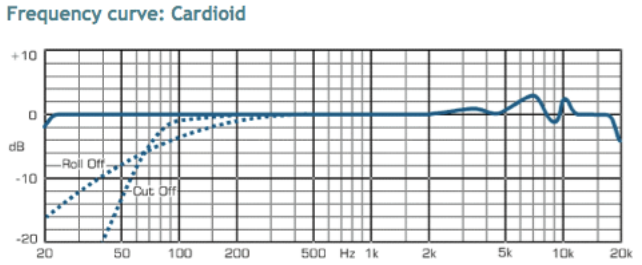


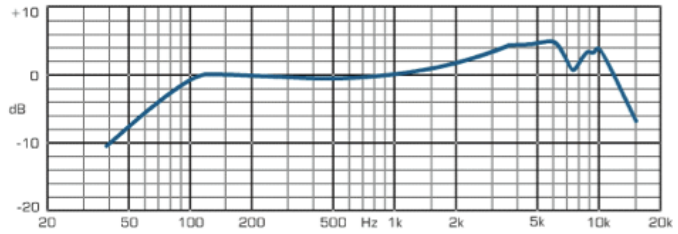
What is the FR of my microphone?

- Every microphone comes with a guide that shows graphs of the frequency response for that certain microphone.
- If you have lost your guide, there is a website that has this information. It is www.microphone-data.com

Frequency Response of SM58

Shure: SM58

Frequency curve: Cardioid



Auxiliary Sends (Aux Sends)

- I used to think this was some big French word. When you say Aux Sends really fast.
- This takes the sound and duplicates it and sends it to an auxiliary send or out.
- This is where effects can be sent, or a monitor mix can be made.

Aux Sends

Monitor/House Mix

- Monitor Mix – The mix that the performers can hear.
- House Mix – The mix that the audience can hear.

How Effects Boxes Work
Demonstration *Reason 8*

Pre/Post Fader

- Prefader – The send is independent of the fader. If the fader is down all the way, signal can still come out the Aux Sends.
- Postfader – The send is controlled by the fader. This means if the fader is up, sound goes through the Aux Send. If the is DOWN, no sound will go through the send.

Aux Returns: Two Methods

- Method One: Take the output of your effect and put it into the input of the Aux Return inputs on your mixer, and use your Aux Return pot.
- Method Two: Simpler Method. If you have open channels that you are not going to use, put the outputs into a new channel and control it by the fader. Less hassle in a lot of ways.