Stagecraft

Packet #17-21

Hope you all had a relaxing Spring break! We've done a good bit on costumes and props, so now we're going to learn more about sound equipment the next 2 or 3 weeks.

The following PowerPoint was created by a former stagecraft teacher. After reading through the PowerPoint, answer the questions on slides 2 and 3.

1

1. How loud or soft a sound is: _____
2. The frequency of a sound: _____
3. Pitch (or audio frequency) is measured in _____.
4. Volume is measured in _____.
5. According to the chart on slide 5, which instrument has the shortest frequency range and which has the longest?
   Shortest: _____
   Longest: _____
6. Ferrets have a shorter/longer (circle one) frequency range than humans, meaning they can hear lower and/or higher sounds than humans can.
7. What's the difference between an input and an output?

_____

_____

8. A _____ carries the signals from one input or output device to another.
9. What's so special about monitors?

_____

_____

10. Microphones convert sound waves into electrical signals with a _____ or _____ that act like ears to the mic.

2

11. Match up the mic and pick up pattern type with its descriptor.

Cardioid	_____	a. Sound pick up on two sides
Bidirectional	_____	b. Sound pick up on all sides
Omnidirectional	_____	c. Sound pick up on front side
Dynamic	_____	d. Ok sound, very durable
Condenser	_____	e. Excellent sound, fragile
Ribbon	_____	f. Good sound, durable

12. Mic good for an announcer: _____
    Mic good for a choir: _____

3

Sound

Good Vibrations

4

What is sound?

Sound is a Longitudinal wave. It's a compression of air that travels from the source to our ears.

A speaker is literally just pushing air back and forth and our ears feel these pushes and hears them as sound.

In theatre, we use sound for a ton of different things:

- Sound effects
- Orchestra
- Actor amplification
- Pre and post show music

All of these things are specifically tailored by a sound designer to fit the show.

5

CONTROLLABLE QUALITIES OF SOUND:

- ***Pitch:*** The wavelength or frequency of the sound
- ***Volume:*** The loudness or quietness of the sound
- ***Quality:*** How pitch and volume combine
- ***Direction:*** The location of the sound in space and how it travels
- ***Duration:*** The length of time the sound lasts

6

A NOTE ABOUT AUDIO FREQUENCY AND DECIBELS:

- **Audio Frequency,** or audible frequency, is a periodic vibration or air molecules that are audible to the human ear and is measured in **hertz (Hz)**, or cycles per second.
- The generally accepted standard range of audible frequencies is between 20Hz and 20,000Hz.
- **Decibels (db):** Is a referencing system used to measure how loud an audio signal is although it doesn't necessarily relate to a fixed level of signal. Rather, it is a logarithmic ratio. In practice, a set amount of signal power is established as "0"db and all other values are then expressed relative to that value.

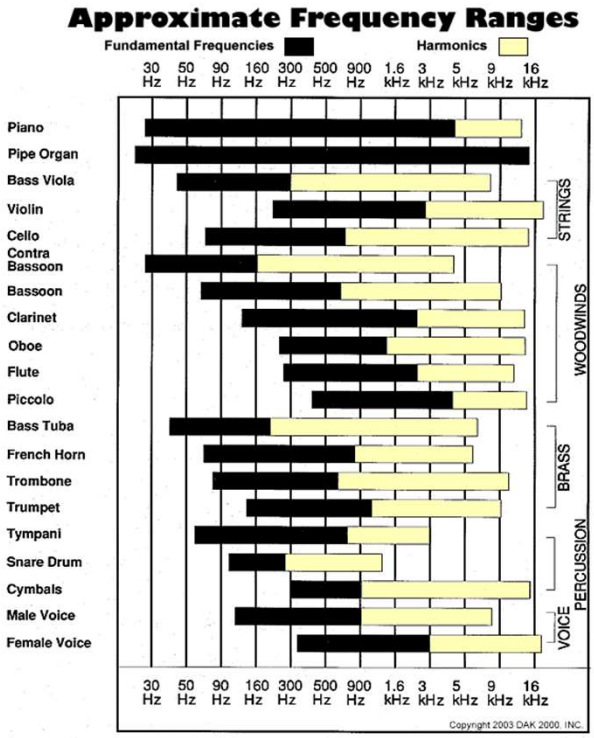
7

Frequency

Humans can hear anything from 20Hz to 20 kHz

Here, you'll see a chart of the range that various instruments produce.

Ferrets can hear anywhere from 14Hz to 44kHz



8

Audio Paths

Simpler Than it Seems

9

Audio Paths

Audio is all about inputs and outputs!

An input is anything that takes sound in, like a microphone, headphone jack and things like that.

An output is something like a speaker.

In between inputs and outputs are processors that do a variety of things. These are things like amplifiers, mixers and effects racks.

10

Super basic, simple system

Microphone

Mixer

Speaker

11

WOAH! SLOW DOWN THERE!

sm58

Microphone - Converts sound into electrical signal.

XLR Cable - The standard sound cable. Carries the signals.

Snake - Many sound cables bundled together (Usually XLR)

Mixer - A console where you can control the signal, primarily by changing its volume and controlling where where it outputs to.

Speaker- A… Speaker. It outputs sound!

Amplifier - Adds power to the signal without changing it.

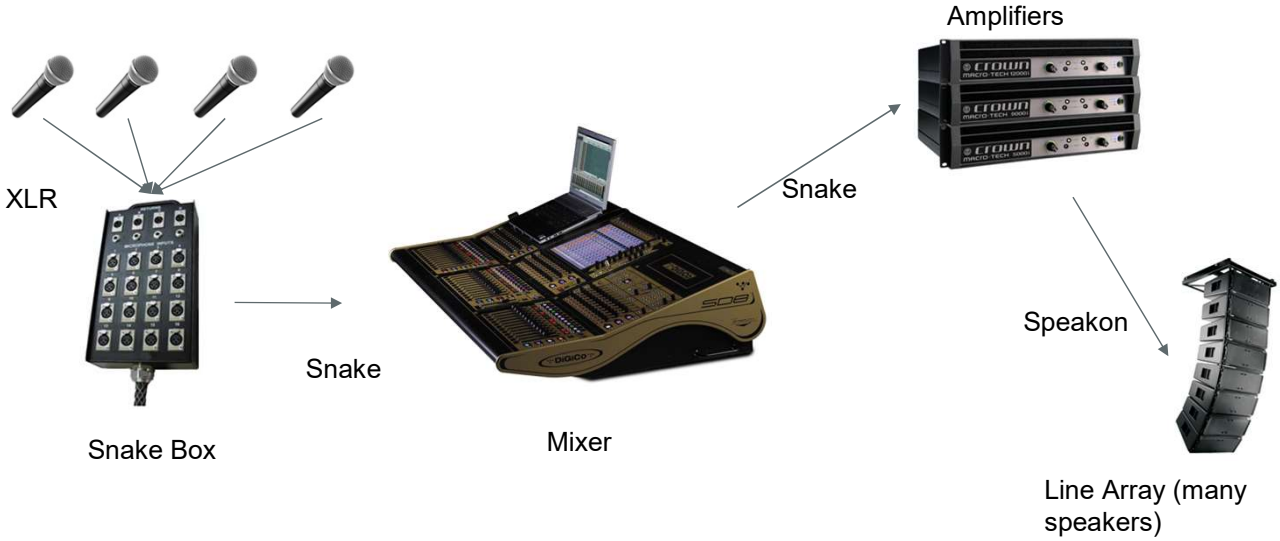
XLR Connectors

Speakon

421

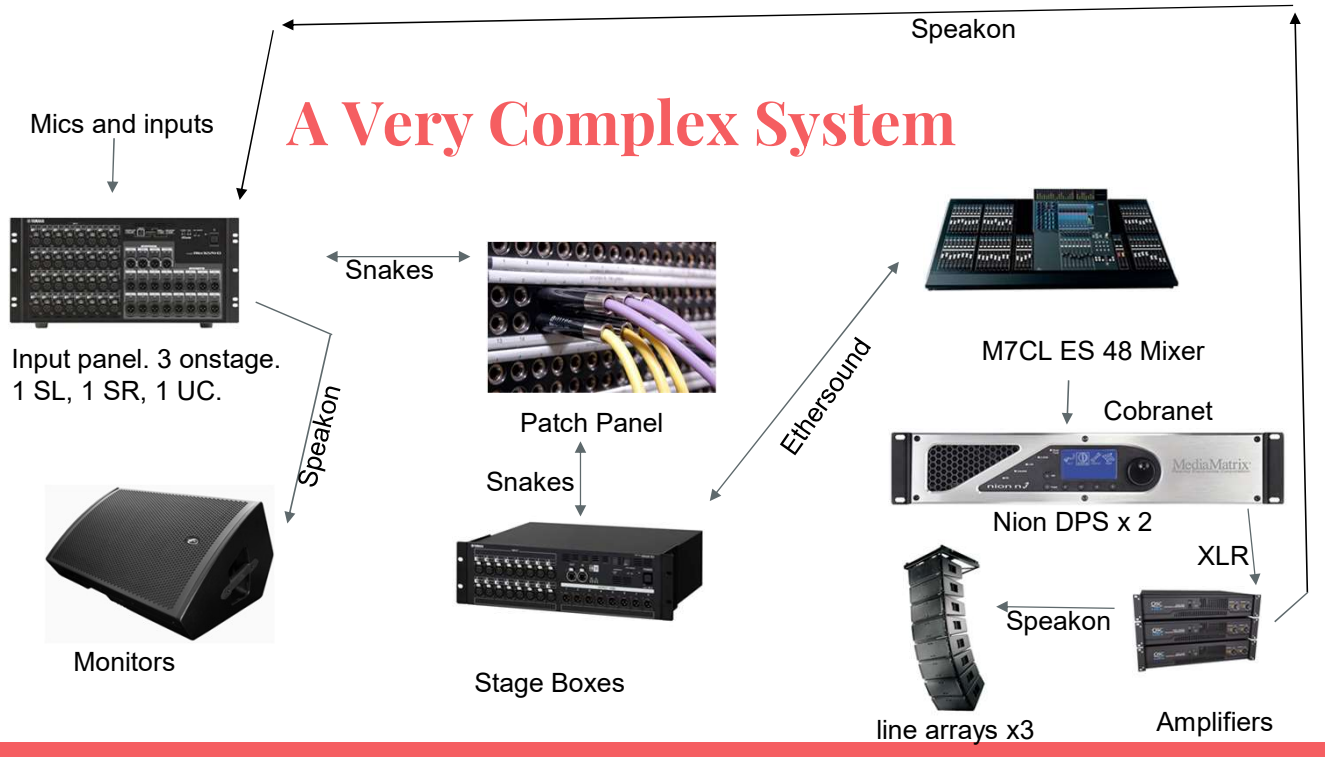
12

A More Complex System



13

A Very Complex System



14

And then another thing

Monitors are special speakers placed onstage for the actors and performers to hear. They are usually connected straight from the board or from an amplifier.

The designer and the performer works together to determine what goes into the monitor. For example, a bass guitarist may want only drums and keyboard in his monitor while the drummer wants only keyboard and the lead singer.

15

WOAH!

That's a lot of stuff going on.

Yes it is, but remember, it's just a bunch of **INPUTS** and **OUTPUTS**. If you follow the **PATH**, it's not that crazy.

So let's learn about our main squeeze here: Microphones

16

Microphones

or: How I Learned to Stop Worrying and Love the Bomb

17

Microphones

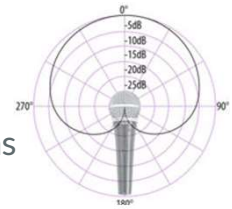
Microphones convert sound waves into electrical signals.

To do this, they have a **diaphragm** or coil which is like the microphones ears. Vibrations from sounds push the thin metal diaphragm (or coil), which pushes electrons that make up the signal.

Microphones can be made to specialize in certain things depending on their diaphragm and how they're constructed. There are three main types of microphone **pickup patterns**

18

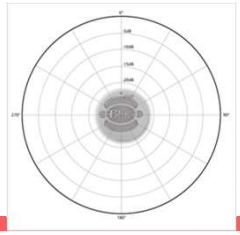
Pickup Patterns



Unidirectional or cardioid: most sensitive to sound produced on the front side of the microphone capsule. **Super-cardioid pickup** patterns have a greater sensitivity than cardioid pickup patterns.

Bi-directional or figure-of-eight microphone

Bidirectional or figure 8: sensitive to signals emanating from the front and back sides of the microphone capsule
while rejecting sounds from the left and right sides of the microphone capsule.

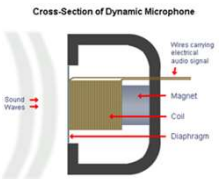


Omnidirectional or boundary: sensitive to sound from all directions of the microphone capsule.

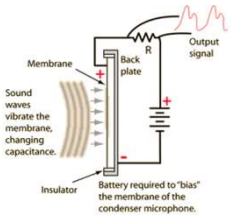
19

Types of microphones

There are three main types of microphones, Dynamic, Condenser and Ribbon.



Dynamic: Dynamic mics make signal by pushing a magnet through a coil of wires. This pushes electrons, making the signal. Dynamic mics are **very durable**, but **not the best at recreating sound**.

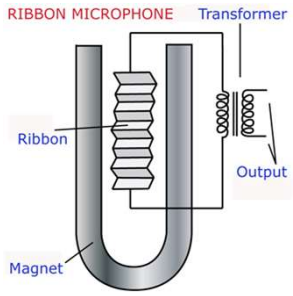


Condenser: A condenser mic has a thin, metal diaphragm next to a metal backplate. When sound waves hit it, it moves the diaphragm. The interplay between the diaphragm and the back plate makes the signal. Condensers are **less durable** than dynamic mics, but **create better sound**. They also require external power.

20

Types of Microphones

Ribbon Microphone: A very, very thin layer is metal is suspended between a magnet with wires connected to either side. Sound hitting the ribbon directly moved electrons, creating signal. Ribbon mics are a **fantastic recreation** of the sound, but are **incredibly fragile** and rarely used in theatre.



21

SO REMEMBER

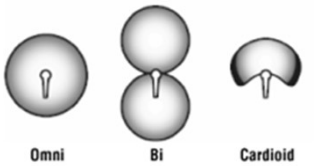
Each Microphone has 2 Properties. It's pickup pattern and type.

Pickup patterns: The direction and pattern a microphone gets sound.

Cardioid: in front of the mic.

Bidirectional: behind and in front of the mic.

Omnidirectional: Everywhere around the mic.



Types: How the mic is made and wired changed its type.

Dynamic: Ok sound recreation. Very Sturdy

Condenser: Good sound recreation. Kinda Sturdy.

Ribbon: Amazing sound recreation. Very Fragile.

22

Mic Inventory

Shure **SM58** Dynamic Cardioid Vocal Mic

Good for vocals

Shure **Beta 57A** Dynamic Supercardioid Mic

Good for vocals and instruments

Shure **SM81** Cardioid Condenser Instrument Mic

Very sensitive. Instruments, large areas

Sennheiser **MD-421** Dynamic Cardioid Mic

Great for loud things like drums, trumpets

23

Mic Inventory

DPA **4061** Omni Condenser Instrument Mic Kit

Very small, for sticking on violins, upright bass, etc.

Crown **PCC-160** Cardioid Condenser Floor Mic

Put onto the edge of stage. Good for tap and gen. audio

Audio-Technica **U853R** Cardioid Condenser Hanging Mic

Mic hung from battens. Good for a chorus

24

Mic Inventory

Shure **Beta 52A** Dynamic cardioid Kick Drum Mic

Used for kick drum

Shure **SM57** dynamic cardioid Drum Mic

Used for toms and cymbals

AKG Pro Audio **C414** XLII Condenser

Can switch between pickup patterns.

Good for vocals, pianos.

25