

How Sound Systems Work Detailed Course Outline

Introduction

Welcome to Course 50 - How Sound Systems Work. This lesson contains some introductory videos regarding sound and sound systems. It provides our first look at "The Signal Chain." SynAudCon courses are layered, so as you advance through this and other SAC courses we'll go into more detail on the signal chain and the individual stages, adding a bit more detail each time.

This introduction is to give you the big picture. There are no quizzes on this lesson. Watch the videos several times and when you are ready, proceed with the course.

Four video clips covering these topics.

1. What is Sound?
 2. Detriments to Communication
 3. Why Don't We Hear the Wind?
 4. Sound Outdoors
 5. Sound in Rooms
 6. Communication Systems
 7. Early Amplification Systems
 8. Terminology
 9. Active Sound Reinforcement Systems
 10. The Sound System
 11. The Signal Chain
12. How Sound Systems Work

The Signal Chain

The key to understanding sound systems is to understand the signal chain. It is the "common denominator" among audio systems big and small. After this lesson you should understand the components that are in the chain and why they are there. This will aid in a "divide and conquer" approach to optimization and troubleshooting.

Four video clips covering these topics.

1. The Signal Chain Overview
2. Program Sources
3. Interface Boxes
4. The Mixer
5. Signal Processing
6. Power Amplifiers
7. Loudspeakers
8. The Acoustic Environment
9. The Listener
10. Conclusion

Signal Types and Characteristics

If you working with sound systems, you are in the wave business. Both audio and acoustic signals travel as waves and can be analyzed as such. In this lesson, we cover fundamental concepts like time, frequency and wavelength and learn how to use these to understand the signals that are propagating through our systems.

Five video clips covering these topics.

1. Audio and Acoustic Signals

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2. Audio Signal Level
3. "0 dB"
4. Level Classifications
5. Acoustic Levels
6. Acoustic Level Changes
7. Frequency and Pitch
8. Frequency Ranges
9. Frequency Change
10. Spectral Balance
11. Wavelength
12. In Review

(3) Train your hearing tracks

Hooking Up the Sound System - Part 1

The mixer sitting by my desk has 12 different types of connectors. Balanced, unbalanced, high impedance, low impedance, input, output - these are just a few of the terms needed to describe the differences between them and why it has so many [Three video clips covering these topics.](#)

1. The Interface
2. Interface Types
3. Wire and Cable
4. Connectors
5. The Unbalanced Interface
6. The Balanced Interface
7. I/O Level
8. Consumer vs. Professional I/O

Hooking Up the Sound System - Part 2

We've looked at how to interface audio components. Just hook outputs to inputs, right? There's a little more to it for some of the interfaces in the signal chain. In this lesson I'll cover some caveats, exceptions and special cases for some audio interface types.

[Three video clips covering these topics.](#)

1. Microphone Interfaces
2. Amplifier Interfaces
3. What Am I Connecting
4. Cable Caution
5. Impedance
6. A Consumer Gear Interface Example
7. A Professional Gear Interface Example
8. Wrap Up

Demo Video on Wire and Connectors
Demo Video on Mixer I/O

Common System Problems

We've made it through the "boot camp" of understanding signals and interfaces. Now we get to the good stuff. When a sound system has a problem, it usually means that someone broke a rule. There are rules for avoiding regenerative feedback and hum and buzz problems. This lesson presents those rules.

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Three video clips covering these topics.

1. Regenerative Feedback
2. Maximizing Acoustic Gain
3. What About Feedback Filters?
4. Electromagnetic Interference
5. Safe Power
6. A Simple Audio Interface
7. Electrical Appliances
8. Ground Loops
9. A Dangerous "Fix"
10. EMI Summary

Loudspeakers Types

This lesson has 3 videos covering these topics.

1. Definitions 0:08
2. The Point Source 2:41
3. The Line Source
4. Beam-Steered Line Arrays
5. Powered Loudspeakers
6. Sound System In a Box
7. The Combinations
8. Loudspeaker Arrays
9. Which is Best?

Loudspeaker Specifications

Why do microphones and loudspeakers get a dedicated lesson? It's because they are the weak links in the signal chain with regard to the performance of the sound system. If you don't get this part right there's no way to "fix it in the mix." As usual, I'll start with some of the underlying principles. With those in place, the choice and placement of microphones and loudspeakers is just common sense.

One videos on Loudspeaker Specifications

1. Specifications
2. Radiation Pattern Control
3. Selection and Placement
4. Multichannel Systems
5. Summary

Microphones

Two videos on microphones.

1. Introduction
2. Common Types
3. Selection and Placement
4. Polar Patterns
5. Placement

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Miscellaneous Microphone Demonstration

Microphone Polars Demonstration

Putting It All Together

In this final lesson, I will walk through the signal chain for several types of sound systems. You will see the form that each component takes on in each system, and this will build an overall understanding of how sound systems work. The "take away" is that all sound systems work the same way, and our signal chain is universal for describing them. The differences between system types are in form factor and scale. Seeing how a mixer or signal processing is deployed in one system type adds understanding to how they work in the system you must work with.

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There are no quizzes for this lesson, nor is this information necessary for the final exam. The outline is exactly the same for each system. Just watch the videos a few times to help solidify what you have learned in this course.

And, oh yes. Thanks for taking the course. - pb

Three video clips covering these topics.

Portable Sound Systems

1. Introduction
2. Program Source
3. The Mixer
4. Signal Processing
5. Power Amplifiers
6. Loudspeakers
6. Challenges

Fixed-Installation Systems

1. Introduction
2. Program Source
3. The Mixer
4. Signal Processing
5. Power Amplifiers
6. Loudspeakers
6. Challenges

Conference Room Systems:

1. Introduction
2. Program Source
3. The Mixer
4. Signal Processing
5. Power Amplifiers
6. Loudspeakers
6. Challenges