

Competencies

- Functions of the audio system
- Types of microphones and their advantages and disadvantages
- Brand names and models used in the studio
- Other sound pickup devices
- Microphone pickup patterns and impedance
- Audio wiring, connector boxes, and signal flows
- Studio mixing and monitoring
- Basic components of the audio control room
- The signal flow through the console
- Signal recording
- Monitoring

Functions of Audio System

The basic function of the audio system is to reproduce the original sound faithfully. The best way to ensure that this will actually happen is to have the right equipment to do the job and the knowledge of how each piece of equipment operates and how it interacts with the other equipment.

Using audio (music, sound effects or spatial enhancement of the sound) in a production creates a mood or emotional setting. Except in radio and recordings, audio is usually thought of as a background element. It usually does not call attention to itself except when it is used incorrectly. Specialized audio equipment is utilized to facilitate the following functions:

1. Transducing – Converting acoustic energy to electrical energy
2. Routing – Path of the signal flow
3. Mixing – Combining source signals
4. Shaping – EQ, effects and dynamics processing

5. Amplifying – Increasing the electrical energy level for mixing and shaping; driving speakers
6. Recording and Playback – Preserving and using the audio
7. Monitoring – Changing electrical energy back to sound energy

Microphones

The basic function of microphones is converting acoustic energy to electrical energy, also known as transducing. The various mikes we have in the Tom T. Hall studio are industry standard microphones, including AKG, Audix, Sennheiser and Shure.

Dynamic Microphone

Most common among the semiprofessional and professional microphones is the Dynamic microphone. They are quite rugged and reliable, require no special power supply or batteries and respond to wide range of audio frequencies. The dynamic mike is especially good for close miking applications because they have a high threshold for distortion.

Condenser Microphone

The Condenser microphone has an extremely wide frequency response and is excellent for voice and music. They can be used outdoors but they are more fragile than the dynamic mike. Also, they must be powered by a direct current power source, either from a battery or from an audio board equipped with phantom power (48 volts DC). The condenser mike provides a brighter, sharper sound with a quick reaction time. It is crisper than the dynamic.

Pressure Zone Microphone

The PZM mike is quite different from the others. It is usually attached to a flat surface that acts to reflect the sound waves into the microphone. They are ideal for large discussion groups, audience reactions, and room sounds.

Other Input Devices

The Direct Injection Box converts a high-impedance, unbalanced audio signal to a low-impedance, balanced signal. (Impedance is how much a device resists the flow of an AC signal, such as audio. Impedance is similar to resistance, which is how much a device resists the flow of a DC signal. Both are measured in ohms. When referring to microphones, low impedance is less than 600ohms, medium is 600ohms to 10,000ohms, and high impedance is greater than 10,000 ohms.) The “Direct Box” allows musical instruments to be connected directly to the audio system. They can be connected either before or after the instrument amplifier. Some need phantom power, while others do not.

Pickup patterns

Omnidirectional Pattern

An omnidirectional pickup pattern picks up sounds in every direction. The sensitivity is directly proportional to the distance from the microphone. The two lapel microphones are omnidirectional.

Unidirectional Pattern

Unidirectional microphones are more sensitive in one direction. The pattern is usually a cardioid (heart) shape. Unidirectional microphones are a good choice if there is a high ambient noise level or the possibility of feedback due to close speaker placement. Microphones with extreme directionality are called hypercardioid mikes. All the microphones in the Tom T. Hall are directional except the lapel mics.

Signal Distribution

The microphones in the Tom T. Hall studio are connected (channeled) to the system by attaching the microphone cable connectors to one of two sixteen-input distribution boxes. These distribution boxes are connected by multi-wire cable called snakes to the house sound system and the monitor sound system. The snake is also connected to the studio console. Most of the connectors used in the studio are 600 ohm balanced XLR connectors. They have a locking device that must be squeezed before they can be parted.

Studio Mixing, Channeling, Amplifying, and Monitoring

The monitoring function in the Tom T. Hall studio is provided by two groups of equipment. The audio signal is split at the distribution boxes with a snake going to the Yamaha M7CL, forty eight inputs, 24 for mikes and 24 for the hard drive recorder. It also has sixteen mix outputs, eight matrix outputs. After amplification, separate mixes can then be directed to EAW floor monitors placed in close proximity to the talent.

A second feed is provided to a Midas Heritage, 54 channel house console. The signal is then processed using 24 aux sends, amplified and sent to four full-range EAW speakers hanging from the grid and two sub-woofers on either side of the stage.

Control Room Layout

The snakes from the Tom T. Hall studio are routed under the computer floor in the audio control room. There is also a snake from the Redd Stewart studio and another snake from the isolation booth at the south end of the control room. On the portable rack to the right of the console is a switch box to select the inputs to the console. Positioning the switches selects which input source for the console.

Mixing Console

The heart of the audio control room is the Avid Venue Profile console. The console is used for mixing various audio sources but it also has a variety of routing options and on board processing. The console has EQ and dynamics processors for each input, as well as on board effects. It can also store a virtually unlimited number of different mixes.

It is used to provide a live stereo audio signal to the TV control room where it is recorded to tape. Also, provide a signal to the telecom studio to accompany the video in live cable feeds.

The console has 48 audio input channels (and can be expanded to 96 inputs), plus 16 stereo effects returns. The console has 36 faders, 24 input faders and 8 output faders. The input faders can be “banked” to access all the available input channels. All 48 input channels, plus 16 alternate sources can be routed to the attached Pro Tools system for recording.

The incoming audio channels can be shaped with the built-in digital EQ and dynamics processors on every channel, as well as plug-ins similar to those used in the Pro Tools DAW environment. The built-in EQ section is a 4-band fully parametric equalizer, it can also be switched into an analog EQ emulation mode, which features 2 fully parametric bands and 2 shelving filters (high and low). The console also has a built-in compressor and expander/gate on every channel. Each channel also can access the plug-in racks. The plug-in racks can load a multitude of Avid and third-party processors to shape the audio in any way an engineer might desire, such as Reverb, Delay, Modulated-Delay, Amplifier simulation, and Distortion, to name but a few. The plug-in rack may also be accessed via the Auxiliary Sends built in to every input channel.

Recording

The console operates in two modes. First, it serves as a mixing console for live signals from the studio. These signals can be sent on a per-channel basis to the Mackie HDR 2496 hard disk digital audio recorders where each channel is discretely recorded. The hard disks are removable allowing for students to use the one issued to them. A 20.5 gig hard drive will hold about 100 minutes of 24 tracks of audio at 24 bit/48.1 K sampling rate.

There are 2 channels available to and from the video control room router to connect the video recorders to the audio for video and front of house systems. Time Code sync is available between the video tape recorders and hard disk audio recorder.

Monitoring

There are two sets of monitor speakers in the audio control room that are controlled through the mixing console. The self-powered Mackie HR824s are the main ones used.