Photo by Susy Shearer Photography

INTRODUCTION TO WIRELESS MICROPHONE SYSTEMS

Conventional wired microphones convert sound into an electrical audio signal that is sent to the sound system through a cable. Live music stages that are crowded with cables from microphones for vocals, guitars, drums and other instruments can become a snake pit of overlapping wires.

Wireless microphones convert audio signals created by microphones into radio signals, which are sent by a transmitter through the air to a receiver. The receiver converts the radio signals back into audio signals which are then sent through the sound system. They eliminate the need for cables, so you're no longer tethered to a sound system or tripping through messy performing environments.

With continuous technological advances and improvements in sound quality and reliability, wireless microphones are more affordable and popular than ever. Their potential uses go far beyond the stage. You can find wireless microphones anywhere a performer or presenter wants true freedom of movement.

SIMPLICITY: Set up and go for it. Your stage is cleaner and your mics are less intrusive, so you can concentrate on your performance.

MOBILITY: Be even more expressive. Wireless microphones cut you loose wherever you perform.

VERSATILITY: Multiple microphone choices, system configurations and features mean wireless systems can adapt to nearly anything you do and any place you go.

Key Components

Wireless Microphone Systems range from simple to sophisticated. But they all include various combinations of these key components:

Transmitters: Convert the audio signal from the microphone to a radio signal. There are two types:

Handheld Microphone Transmitter – Combines handheld microphone element and transmitter in one unit.

Bodypack Transmitter – Wearable unit with a connector that accepts microphones or guitar cables.

Microphones (for Bodypack Transmitters): Headworn, lavalier and instrument microphones ideal for a variety of vocal and instrument applications

Receivers: Modules that receive radio signals sent from transmitters and convert them back to audio.

Transmitting

Two types of transmitters—handheld or bodypack–convert audio signals to radio signals so they can be sent, without a cable, to a wireless receiver at the mixing console.

Handheld Microphone Transmitter: This microphone/transmitter integrates the transmitter into the microphone handle, so both functions are contained in one unit. Like conventional wired microphones, wireless handheld vocal microphones are tailored to meet diverse performance vocal requirements and musician preferences. Many different choices are available.

Bodypack Transmitter: Lavalier, Headworn and Instrument Microphones, as well as guitar cables, must plug into a Bodypack Transmitter to send their audio signals. Sleek, lightweight bodypacks can be easily clipped to clothing or a guitar strap.

Headworn Vocal Mic: Rugged, comfortable, easy-to-position headsets provide superior voice pickup in any active user setting.

Lavalier Vocal Mic: A range of sizes combine low visibility with high-quality professional audio. They provide full, clear sound for speech applications.

Clip-On Instrument Mic: A versatile solution for high volume wind, brass and percussion players. Gooseneck and clamp ensure secure fit and positioning.

Guitar/Bass Cable: Connects any guitar to a Bodypack for wireless performance.

Receiving

Wireless receivers convert RF signals sent from a Handheld Microphone Transmitter or a Bodypack Transmittter back to an audio signal. They come in these receiver configurations:

Single Channel Receivers: This is the most common type of receiver. Receivers usually have XLR and ¼" audio outputs for connection to a variety of devices. Units may be free standing or rack-mountable and are typically AC-powered. Indicators for power and signal levels may be present. Diversity receivers utilize two antennas, which may be removable or permanently attached.

Multi-Channel Receivers: This type provides two or more channels of wireless, allowing multiple users to be wireless. These systems generally come with various transmitter combinations. Common options are dual or quad receivers.

Portable Receivers: These resemble portable transmitters externally; they are characterized by small size; one or two outputs; minimal controls and indicators, and are typically battery powered. Portable receivers are great for mounting directly to a camcorder or DSLR camera.

Guitar Pedal Receiver: This receiver type is designed with the guitarist or bass player in mind. It mounts on a pedal board, and can be powered by the pedal board itself.

Setup: Vocals

This wireless system setup example follows the wireless signal path for common vocal system configurations using a handheld microphone. A handheld wireless setup is great for performers who want a handheld vocal microphone that's not connected to a bodypack transmitter.

Concept Guide

These technical and operating concepts help define how a wireless microphone system functions and which is best suited to a specific application.

ANALOG OR DIGITAL

Analog systems utilize proven radio technology that offers quality audio performance and high channel count, even with entry-level systems. Digital systems feature exceptionally clear audio, but potentially fewer on-air channels. High-end digital systems, however, offer the best of both worlds, combining superb audio with the ability to use many wireless systems in crowded RF environments.

Frequency Ranges

Every wireless microphone system transmits and receives audio on a specific radio frequency, known as the operating frequency. These frequencies are typically divided into these bands, or ranges.

The UHF-TV Band – Unused television channels in this range are available for wireless microphones and other wireless audio devices. Most cities have a significant number of television stations and the largest cities

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may also have public safety operations, but there are sufficient unused television channels available for most wireless users to find a clear channel. However, this spectrum is becoming increasingly crowded. Users may be licensed or unlicensed in the UHF Band.

Multiple frequency range options are available throughout the UHF band, and the best one to use will vary from city to city. In order to determine the best range for your area, you may want to consult with the manufacturer. The 900 MHz Range – This band (specifically, 902 – 928 MHz) offers additional channels outside of the TV channel range. Users are allowed to operate without a license in this range. There are several high quality wireless microphone systems that operate in this range, most of them fully digital.

The 2.4 GHz Band has attracted some interest for wireless microphone use. Advantages of this band are: worldwide, license-free operation, and very short antennas, but there is some potential for interference from Wi-Fi devices. This band is great for users who only need a few channels of wireless, but for applications with many channels of wireless, the UHF-TV band may be preferred.

Frequency Selection

Fixed Frequency – Fixed-frequency systems are pre-set to their operating frequency and cannot be changed by the user. They are suitable for use in one particular area or installation, but due to their limited capabilities are not commonly available anymore.

Frequency Agile – Frequency-agile (tunable) systems allow users to quickly change frequencies to avoid local TV channels, other wireless users, or other interference sources. Most modern wireless microphone systems offer some degree of frequency agility.

Tips! Many newer wireless systems include easy to use features, such as Scan and Sync which quickly and easily sets up the system with a clear channel. Some wireless manufacturers have online tools and resources such as wireless frequency finders to help users find the best frequency for their location.

Using Multiple Wireless Microphones

Each microphone needs its own frequency to operate and transmit properly. So it is not possible to use two wireless systems on the same frequency in the same venue or to use two wireless microphones with just one receiver (unless you are using a dual-channel receiver).

The individual frequency used by each microphone requires a certain amount of space within a particular frequency band. When two wireless systems are used together, the frequencies must be separated by some minimum amount that depends on the design of the system. If frequencies are set too close, microphones will compete with each other, and each system will experience noisy interference and/or sound dropouts.

As more transmitters and receivers are added to a particular setup, interaction between frequencies increases. This interaction produces more interfering frequencies that need to be avoided. More advanced wireless systems offer greater frequency selection, flexibility and the ability to combine more receivers and transmitters to serve more users. Many of these systems offer pre-configured groups of compatible frequencies to accommodate multiple users, as well as software that can scan for the clearest frequencies in any one particular location.

Information provided courtesy of Shure. Learn more by reading "Wireless Microphone Systems: Selection & Operation Guide." This booklet provides greater technical detail about specific wireless microphone systems, components, frequency selection, usage applications, setup suggestions and system expansion. You can download a PDF of this guide at: http://www.shure.com/americas/support/downloads/publications.

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