Wireless Microphone Systems – Basics / Notes / Info

Wireless microphone systems are a great way to eliminate all those cables you continuously have to run on stage to your wired microphones. I would say that this is one of the main reasons to switch to wireless systems – to have more freedom on stage to move around. To be mobile without worrying about that microphone cable you've been stepping on during your performances. Currently, wireless microphone technology is very reliable, and the technology is getting more and more advanced (which is making it easier to set up and use wireless systems). It would be safe to assume that wireless microphone systems are more expensive than wired microphone systems, but they are worth the extra expense. Although I have experience with many different brands of wireless systems – the system that ended up being "preferred" over all the others was the "Shure" brand. Ease of use, a large selection, an abundance of frequencies to choose from, advanced technology, and outstanding support. Let's take a look at some wireless microphone basics/info.

The Basic Parts of a Wireless Microphone System

Video Clip!

Handheld Microphone / Transmitter

A wireless "Handheld" microphone is a combination "microphone" and built-in "transmitter." For example, the performer talks or sings into the microphone, which goes directly to the built-in transmitter as an "audio signal." The transmitter then converts the "audio" signals into "radio" signals and sends these radio signals to the Microphones Receiver.

Microphone Receivers

The Receiver "receives" radio signals from the transmitters (handheld mics or bodypacks) and converts these radio signals back into audio signals for playback (Ex: through a channel on the mixing board).

Video Clip!

Video Clip!

Body Pack / Transmitter

Body Packs are also transmitters. Microphones or Instruments (usually Acoustic Guitars) are plugged into a Body Pack. The Body Pack transmits the radio signals to the Receiver. The connector on the Body Pack is a 4-Pin Mini XLR connector (TA4F).

Shure Wireless Microphone Systems Examples

Shure Model SLXD24-SM58

Shure Single Channel System w/Handheld Microphone.

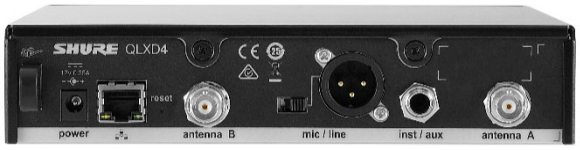
Shure Model QLXD14 SM35

Shure Single Channel System w/ Bodypack and Headset Microphone

Shure Model QLXD124 Combo

Shure Combo System
Use with Handheld or Lavalier mics, Headset mics, or with an adapter cable – you can plug in your acoustic guitar (see adapter next page).

Shure Model QLXD4



Shure Single Channel System w/Handheld Microphone – Rear View

Shure Model AD4D

Shure Dual Channel System w/Handheld Microphones

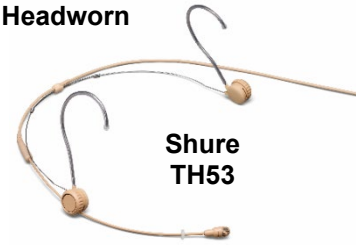
Courtesy of Shure

Microphones / Instruments used with Body Packs

Unlike Handheld Microphones, multiple types of different microphones and instruments can be used with Body Pack Transmitters (refer to images below). Some of the most common are Headsets, Headworn, Lavalier, and Clip-On microphones (commonly used with Violins, Mandolins, Tuba, etc.). Acoustic Electric Guitars can also be connected directly to a Body Pack using an adapter cable (see example below).

Shure WH20

Headsets / Headworn



Shure TH53

Lavalier / Clip-On

Shure MX153

All these microphones will utilize either a Switchcraft #TA4F connector or other brand of 4-Pin Mini XLR in order to plug into the Body Pack.

Switchcraft #TA4F Mini XLR

Instruments (Guitar Example)

The diagram to the right shows how you would connect a Guitar (usually Acoustic/Electric guitars) that have a built-in Pre-Amp to a wireless Body Pack Transmitter.

Guitar Output Jack

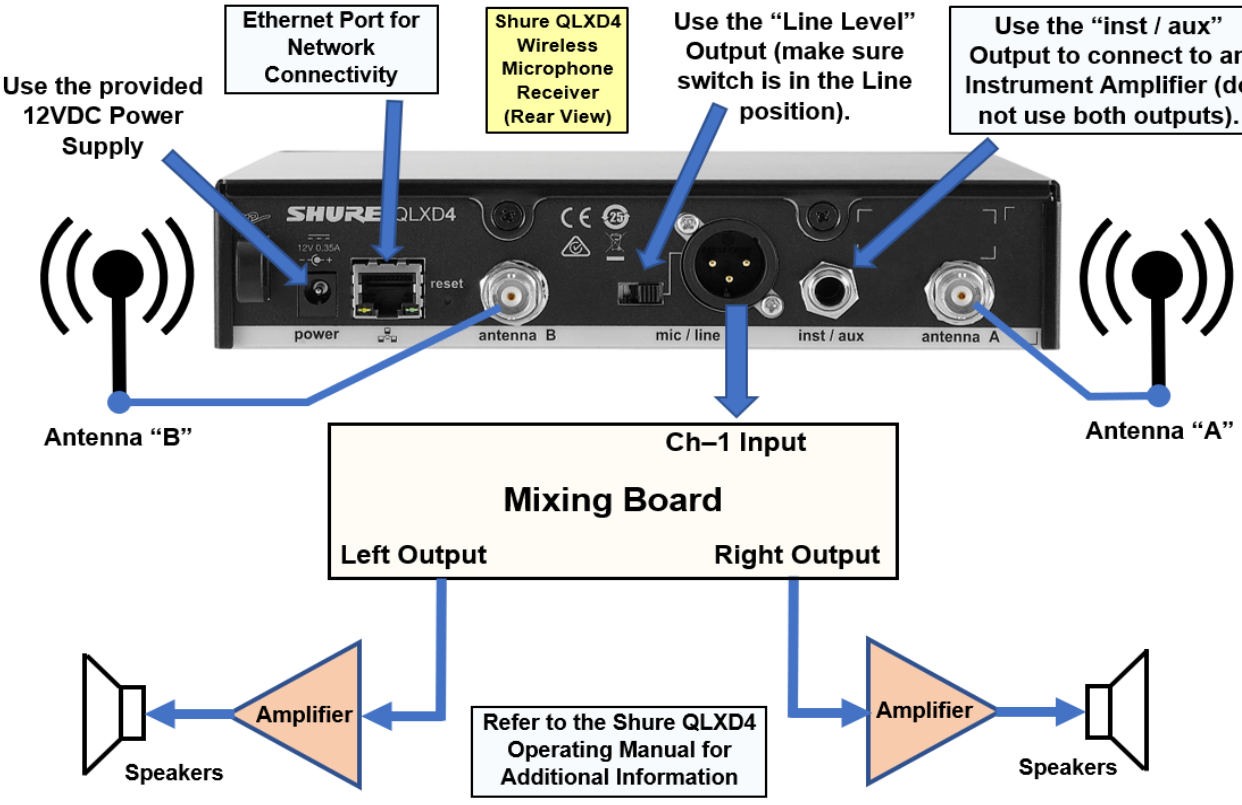
TA4F Mini XLR to TS Mono Instrument Cable

Video Clip!

Body Pack Transmitter

All that's needed is to plug the TS connector into your Acoustic Electric Guitar (which has a pre-amp) and then plug the TA4F connector into the Body Pack. Make sure the Frequency of the Body Pack is Synced with the Receiver, Clip on the Body Pack, set levels on the body pack and the mixing board, and start playing.

Typical Wireless Receiver Connection – Mixing Console all the way to the Speakers.



AVCSS Tech World
Basic Audio & Technical Information

avcsstechworld.com

Wireless Microphone System Technical Notes

Receiver Related:

→ Diversity Receivers have two antennas. Each antenna "A and B" (see diagram on previous page) will connect to the same receiver. The way a Diversity Receiver works is that if the signal weakens or drops out on one of the antennas – the Receiver will shift to the other antenna automatically – so no signal is lost.

→ Antenna Placement:

- Antennas should be mounted as high as possible, and away from metal objects / components.
- As a guide to setting up Antennas - The performer using the transmitter should be able to "see" the receivers' antennas at all times. This is referred to as "line of sight."
- There are Bracket Mounting Kits that will allow you to mount the antennas away from the receiver, and in some cases – you may need to use an antenna booster to help with signal loss.
- The antenna's tips should be pointed away from each other at a 45-degree angle.

Video Clip!

One type of 1/4 Wave Wireless Receiver Antenna

What is Antenna Distribution, and Antenna Boosters? Handout!

Wireless Microphone Interference and Dropouts:

→ Interference – Single System: Do a channel scan on the receiver and use the channel that the scan Auto-Selects. The "Group" does not usually need to be changed (but that also depends).

→ Interference – Multiple systems: On the first receiver do a group scan, then channel scan. Then set the second receiver to the group used on the first receiver, and so on. It is recommended, in order to maximize system performance to set all receivers to the same group and set all the transmitters to different channels within that same group.

→If you are experiencing any interference and / or dropouts you should reference the list below:

- Try a freshly charged or new battery.
- Try a different channel frequency.
- Try repositioning the Antennas so there is nothing obstructing the line of sight from transmitter to receiver. Also, make sure the antenna tips are pointed at a 45-degree angle from each other.
- Keep antennas away from large metal objects.
- Move the receiver out of the "metal" equipment rack if you haven't done so already.
- Keep the transmitters more than 6 feet apart (as much as possible).
- Tip – You should identify any "trouble spots" during the initial system installation and / or during daily sound checks. Make sure to let the performers know to stay away from these areas.

Frequency Scans: On most current wireless microphone systems, you can either use the Automatic Frequency Scan (recommended) or learn how to manually select groups and channels (see manufacturer operating manual for the instructions).

Frequency Scans are essential to setting up Wireless Microphones that all audio technicians must be proficient with. It's an easy process that's very easy to learn. Once you get some initial "hands-on" training (from another technician or by reading the manufacturers operating manual) – you'll be ready to go.

Video Clip!

Both the Mic and Body Pack are set to Group 4 / Channel 3, and Synced to the Receiver – which is also set to Group 4 / Channel 3.

Video Clip!

Wireless Microphone Cabling Notes:

- Use 50-ohm / RG8X/U type Coax Cable for Wireless Microphone Antenna Cables.
- Antenna cables can be run up to 50 feet, any antenna cable runs longer than 50 feet should be used with an "Antenna Amplifier" up to 100 feet (but not recommended to go any further).
- Don't use 75-ohm / RG-59 cable. Wireless systems want to see 50-ohms not a 75-ohms mismatch. There is a possibility signals can "degrade" using 75-ohm cable – keep it matched at 50-ohms.

Other Wireless Microphone Notes:

a) The RF Indicator on the Receiver shows the signal strength from the transmitter.
b) Receiver Audio Outputs
   → Balanced should be connected to a mixing console or another Pro-Audio input.
   → Unbalanced should only be connected to "high impedance" inputs such as a Guitar amplifier.
   → There will be a Mic / Line switch on the back of the receiver. Make sure that the switch is turned to "Line" not "Mic." Line level will provide a stronger signal to the mixing board channel.
c) Transmitter Gain – On both the Body Pack and Handheld Transmitters, there will be a "Gain Control" adjustment. Use caution when adjusting, stay out of the red with only occasional yellow LED flickering.

Choosing Batteries for Wireless Microphone Systems

There are many different brands of batteries that work with Wireless microphone systems. Selecting batteries depends on how much you will be using the microphone. How long is the gig you are playing? Are you performing at a Theater and need batteries that will last 6-7 hours? After testing several different brands of rechargeable batteries and with lots of trial and error, we decided to use the Panasonic "eneloop" (see images below). These batteries worked out great for our applications.

Video Clip!

All batteries will eventually fade away and start losing their ability to hold the same voltage as when they were brand new. The overall reliability was the main factor in staying with these batteries – they worked best for our needs. This should not be taken as an advertisement for this model battery. The information stated here comes from experience with their use.

Powerex Model# MH-C800S
AA / AAA Battery Charger

The charger that was used with these batteries had many features as well. This charger displayed the charge and also when the battery was not holding a charge any longer. Once this occurs, you should dispose of the battery (per the manufacturer's recommendations) and replace it with a new one.

Rechargeable Battery Tips / Notes

→ 750mAh (milli Amp hours) would be a very good starting point for wireless microphone batteries. You should not go any lower than this if you are looking for long lasting and reliability with this type of rechargeable battery.
→ This certain model of battery can be recharged up to 2100 times, and the manufacturer claims that after 10 years the capacity will only go down to 70%. This is a very good specification to be aware of when researching batteries.

Another feature about this battery is they are recyclable.

Important Note: Some wireless microphone manufacturers recommend using only 9V / AAA alkaline or lithium batteries for their wireless systems, and they do not recommend Carbon Zinc, Rechargeable NiCad, or NiMH.

Before committing to using a specific type of battery for your wireless microphone system, you should always refer to the manufacturer's user manual to verify what battery/type they recommend using with their product – using a different battery could void the warranty.

Important information regarding FCC / Illegal Frequency Bands

The FCC announced in January 2010 that it would be "illegal" for wireless microphones to continue using the 700MHz Band in the United States starting June 2010. The 700MHz Band was auctioned off, and Cell phone companies won the auctions. Then, the FCC announced that it would be illegal for wireless microphones to continue using the 600MHz band (616MHz – 698MHz range) in the US after July 2020. When purchasing a new wireless system, look for UHF frequencies in the 470–615MHz range. And be aware of these "illegal" frequencies when purchasing "used" wireless microphone equipment. Note: FCC info is subject to change.

Important Note: As with any audio system, getting to know the equipment you will be working with is always a good idea. Read the equipment manuals before using the equipment. Keep the equipment manual close by for future reference. You can easily set up wireless gear and turn it on. But, understanding how it works, what to do when it fails, performing automatic and manual scans, what frequencies to use, audio levels, and antenna placement (to name a few) – will make you a more reliable, experienced, and knowledgeable audio technician.

Wireless Microphone Clips

Here are a couple types of Wireless mic clips – Spring Loaded Clip-On (left), Pop On (above).

Video Clip!

Microphone clips should be maintenance-free (other than periodically sanitizing and cleaning them). Clips with multiple movable parts, like the spring-loaded wireless clip mentioned above, can eventually have issues. Most microphone clips are made of hard plastic, but they can break when abused or dropped. It is recommended to remove microphone clips off microphone stands after performances and store them in a box or padded bag. Leaving microphone clips attached to the stands during transport can lead to breakage.

AVCSS Tech World
Basic Audio & Technical Information