

This is N7RTG with tonight's training. Last week I talked about microphones. Tonight I will talk about the other end of a Ham radio—the loudspeaker.

Comparing a loudspeaker to an antenna, a loudspeaker has to respond to a much broader range of frequencies. A two meter antenna for example works from 144 Mhz to 148 Mhz, which is a small fraction of an octave. A Ham radio speaker however must cover almost 5 octaves. While the polar pattern of an antenna is pretty consistent for its intended range, the polar pattern or coverage pattern of a loudspeaker varies with frequency with the lower frequencies being nearly omni directional whereas the higher frequencies are more directional with a coverage angle of as little as 45 degrees.

Most of the speech intelligibility is found in the higher frequencies. So what does that mean to us? Well, our mobile radio that we mount under the dashboard has a down-firing loudspeaker so the higher frequencies that provide intelligibility are directed to the floor and absorbed by the carpet instead of to our ears. If you are using a mobile right now, hold a book or something reflective, even your hand, below the speaker at an angle so the sound is reflected directly to your ears. Notice the change in sound quality.

Besides receiving more of the high frequencies, you are also increasing what we call the direct to reverberant ratio. Sound received directly from the speaker is more intelligible than the sound that is reflected off the floor, ceiling, and walls. That principle applies to a sound system in a sports arena, a church, an auditorium, or a ham radio.

It would be impractical to install a mobile radio so its speaker points to you. A good solution is to use an external speaker and then mount it so the loudspeaker speaks directly to you. There are many external speakers available for less than \$20 that will work just fine.

As you select an external speaker choose the largest one that will fit into the physical location. Another criterion is the magnet weight. Generally, the heavier the better.

The impedance will typically be listed in the specs. Don't worry too much over whether it is 4 ohms, 8 ohms, or 16 ohms. That rating is pretty arbitrary as the actual impedance will vary all over the map with frequency. In general terms, a speaker with a lower impedance will draw more current from the amplifier and the volume will be higher.

If you run across a used speaker at a store that came from a church or commercial installation it may have a transformer on it. Disconnect it and throw it away. The transformer, not the speaker. The transformer is used in a 70volt distribution system and will not work with a ham radio. The speaker will be fine by itself.

By the way, don't try to measure a speaker's impedance with a DC ohmmeter. The reading you get will be absolutely meaningless. Only an AC impedance meter or bridge will measure impedance.

You can improve the sound quality of an external speaker by making sure the enclosure is loosely stuffed with fiberglass or similar material. That will reduce internal resonances that will help the speaker to be more intelligible if not more pleasant to listen to.

The last subject I would like to touch on applies to Ham radio use during an event where we need to monitor several radio channels. Use your ability to hear stereophonically. Your left ear and right ear feeding into your microprocessor that we call a brain enables us to distinguish between sound sources along the horizontal plane. If you are working an event where you need to monitor multiple frequencies, separate the various radios horizontally so you can easily tell what agency you are listening to. Stereophonic listening only occurs horizontally and without other cues, particularly sight, our ears and brain cannot distinguish up from down.

One last principle concerning monitoring multiple frequencies. Avoid what I will call "volume creep." Let's say you are monitoring 3 radios and all three are talking. You need to hear channel A so you turn it up. Then you need to hear channel C so you turn it up. Then B and so on. Pretty soon the volume controls on all three have crept up to rock concert sound levels. Instead of turning the critical channel up, consider turning the secondary channels down. Just remember to restore them when your traffic with the one is completed. Separating the speakers for stereo listening will also reduce the cause of volume creep.

Now a disclaimer: I have taken several technical liberties to put across some general concepts. If I have offended anyone with a gross error you are most welcome to point them out and I will take my stripes.

If there are any questions I would be happy to try to answer them as coordinated by net control.

This is N7RTG turning the channel back to net control.