codeRED Boom Microphone Overview

Here Comes The BOOM!

WHAT ARE THEY?

Everyone knows what a Boom Microphone, or Boom Mic, is: It is a microphone on an extended arm that positions it close to where audio is emanating. Picture Madonna in her hey day or the "Key Grip" on a movie set. Boom mics basically get the microphone as close to a sound source as possible. Why "boom"? A boom, in days of yore, was a wooden beam at the base of a sail that extends the reach of the sail to catch more air. In construction you will see "boom cranes" that can extend out over their base to allow work on a distant location. Hence, a boom mic extends the microphone out to a remote location.

On a tactical headset, the boom arm extends down from the ear cups and allows you to get the microphone as close to your lips as necessary. That is pretty easy to understand. The confusion comes in marketing claims of "noise reducing" or "noise cancelling" on many products in the market place. Boom mics are usually the best choice for audio transmission, but differences do exist. In this tech bulletin we try to help make sense of what is really going on.

DIFFERENT TYPES

All microphones are transducers, which means they convert one form of energy into another. In this case, they convert vibrations from sound waves into an electric current that can be reproduced as sound in a speaker or transmitted to another sound reproducing device. Typically microphones are considered either condenser/electret mics or dynamic mics. In general, most small microphones included in devices are electret mics. You will also see dynamic mics, and amplified mics advertised.

Although there are fundamental design differences, impedance will have a major influence on microphone performance. The impedance, or electrical resistance, can be measured on the US NATO connector by putting your multi-meter leads across the microphone connections (the tip and ring #2 on the TRRS plug).

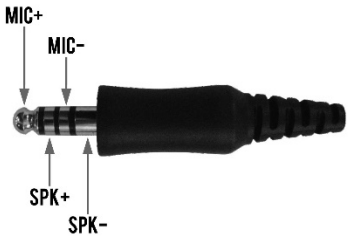

Diagram: US NATO assignments.

Here is a description of some of the more common boom mics on the market:

- **Electret microphone** (***Electrostatic Magnet***): Electret mics use Field Effect Transistors (FETs), which is solid state transistor technology. FETs can be made very small, are very inexpensive, and very robust as there are few moving parts. Also called condenser mic or condensing mic, they use induced field effect forces from a vibrating diaphragm to generate electrical current. Electrets are unique in the family of condenser mics. They are usually a more sensitive mic and are better at reproducing accurate sound. Electret mics will typically have higher impedance, or inherent resistance, above 1000 ohms.
- **Dynamic microphone:** A Diaphragm with a coil of wire suspended in a magnet field. As the diaphragm vibrates, an electrical current is induced in the wire creating a sound signal. Dynamic mics are durable and temperature resistant, but not as accurate as condenser mics. You will see Dynamic mics used in high noise applications as their low sensitivity will tend to "ignore" back ground noise and help isolate your voice. This can also be described as a higher "activation energy", meaning it needs more sound to create an audible signal. Dynamic mics will typically have low impedance, around 150 ohms.
- **Amplified Dynamic mics:** This term really just refers to the amplification of the signal coming out of a dynamic mic. Since a dynamic mic has a higher activation energy level than an electret mic, you can amplify the signal to get a more audible sound at the receiving end. This also amplifies any received ambient sound, so amplification may have a negative effect on the "noise cancelling" property of the microphone. It may be better to just use the more sensitive electret mic, but situations will dictate the best choice.

Below is a comparison of impedance values for our current products as well as the Peltor Comtac dynamic mic for comparison:

Microphone Impedance Data

	Mic Impedance (Ω)	Sensitivity
CR-TAC (Electret Boom Mic)	1,400	High
TBCH-Pro-B/M (Electret Boom Mic)	1,000	High
CQB (Electret Boom Mic)	1,000	High
CR-TAC-DB/M (Dynamic Boom Mic)	150	Low
Peltor Comtac (Dynamic Boom Mic)	150	Low
CR-TAC-Assualt (Throat Mic)	800	Medium
Assault (Throat Mic)	600	Medium
TBCH-Pro-S/R (Bone Conduction Mic)	6,800	Medium
Battle Zero (Bone Conduction Mic)	14,000	Medium

NOISE CANCELLATION FUNCTION EXPLAINED

High noise situations are interesting. First, there is significant ambient noise that can overwhelm the microphone inputs. This also makes the user tend to raise their voice to overcome the ambient sounds. For these reasons the use of a "dynamic" mic is typically a better application. Dynamic mics are actually less sensitive than an electret mic. They require a higher decibel input in order to transmit. This has two effects: it eliminates much of the ambient sound while transmitting mostly only your voice, at an elevated level. This may seem counter intuitive, but it works. There is no actual noise cancelling going on, it is more accurately "noise ignoring".

codeRED PRODUCT OFFERING

At codeRED we currently have two styles of earmuff headsets. We have an industrial solution in our “High Noise” ear muffs (HNOH, HNDM, HNSH), including Blue Tooth capability. It is more of an Industrial product line and does not have the “Hear Through” technology. This product line also includes electret and dynamic microphone options.

We have recently created a dual muff tactical headset offering with “hear through” technology (CR-TAC). The headset has external microphones on the ear muff cups that pick up ambient sound and amplify it so the user still has situational awareness. We are still developing the full product line, including microphone options and helmet rail adapters as well as a hardened Military specific design. For microphone we offer an electret boom mic as standard, and dynamic and throat mics as options.

You can see our full offering for high noise headsets at the link below:

[High Noise Headsets (coderedheadsets.com)]

CONCLUSION

We are in the final testing of a design we think “ticks all of the boxes”. We launched this design in Q4 of 2021. The first launch was SWAT team specific and will complement our Pro series PTT family. Initially it will be available only as a complete unit with the Pro series PTTs. If this initial launch goes well we will follow up with a headset only version, and possibly a military specific design. The Mil-Spec design will have to meet additional specifications that Law Enforcement typically do not require, and this will impact cost. Keep an eye on our social media and look on the website for announcements. We hope this product meets a need in the market place.

THANKS FOR READING!

***codeRED* Tech Support**