

Glossary

Balanced Circuit

There are two types of microphone output circuits - Balanced and Unbalanced.

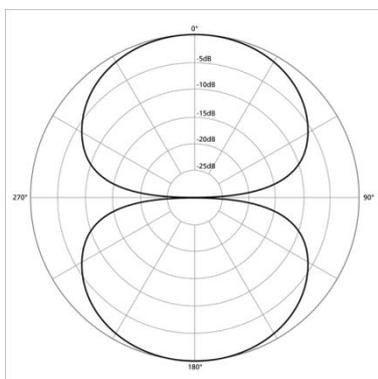
Unbalanced output carries the signal on a single electrical conductor and a shield. Electromagnetic fields induced from nearby power cables and electrical appliances can easily be picked up by this kind of circuit and will be heard as an audible hum causing degradation of the sound quality.

Balanced output uses a number of techniques to reduce noise. One method used is typically a cable containing two identical wires which are twisted together and then wrapped with a third conductor (foil or braid) that acts as a shield. Each wire is connected to identical impedances at the source and the load. Any electromagnetic interference will induce an equal noise voltage in each wire this is a balanced cable. A differential balanced input amplifier at the far end measures the difference in voltages between the two signal lines. Any induced hum / noise that appears on the second / inverted line will be 180 degrees out of phase with that appearing on the first and will be cancelled out and is rejected by the amplifier leaving only the wanted original signal.

Bi-Directional

A bi-directional polar pattern is also called a "figure of eight". A microphone with a figure of eight polar pattern picks up the sound from in front and from the rear of the microphone but not from the side (at a 90° angle). Microphones with this Figure of Eight polar pattern are typically large diaphragm or ribbon microphones.

Bi-Directional polar pattern



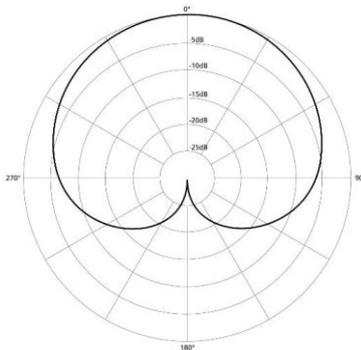
Boundary

When sounds meet a large flat surface they will bounce / reflect off and travel along the surface this effect is called Boundary Layer. Boundary microphone enclosures exploit this and designers will critically position the microphone diaphragm to the flat surface on which the enclosure is placed to ensure that the direct sound source and also reflected sound from the flat surface arrives at the same time (no delay) at the slot (front of the enclosure) between the microphone diaphragm and the boundary sound layer. This design is for use on conference tables, ceilings, floors and any large flat surfaces. The sound reproduced from these microphones results in clear and natural tone quality and enhances the room's acoustics.

Cardioid

A Cardioid microphone has the most sensitivity at the front and is least sensitive at the back. This isolates it from unwanted ambient sound and gives far more resistance to feedback than omnidirectional microphones (equal sensitivity at all angles). This makes a cardioid microphone particularly suitable for stage work containing loud sounds.

Cardioid polar pattern



Compression

Reduces data rate and storage size of analogue audio signals by converting analogue signals to a digital format. There are very many types available and each has a specific task and purpose and quality according to their application.

Below are just a few of the different types of digital audio compression formats:

- AAC – Advanced Audio Compression Apple compression format
- FLAC – Free Lossless Audio CODEC Lossless compression format
- MP3 – Moving Pictures Expert Group compression format.
- WAV – Waveform Audio File.
- WMA –Windows compression format

Compressor

A compressor is a device that reduces the dynamic range of an audio signal. First the audio is sampled and a threshold is then established. When the audio signal is louder than this threshold its gain is reduced. The amount of gain reduction applied depends on the compression ratio setting. For example with a 2:1 ratio for every 2 decibels the input signal increases, the output is allowed to increase only 1 decibel. A variety of other parameters in the compressor will also affect its performance processing specific signals; attack time, release time and others are very important.

Condenser

Condenser (capacitor) microphones are more sensitive than a coiled / dynamic microphone and gives a smooth natural sound but needs to be powered by a DC Voltage. They use an electrically charged diaphragm and back plate to form a capacitor that is sensitive to sound. Sound pressure moves the diaphragm and the distance between the diaphragm and the back plate changes. This change of distance alters the value of the capacitor and produces an analogue electrical signal that is identical to the sound / pressure exerted on to the diaphragm. All condenser microphones need to be powered either by batteries in the microphone (typically 6VDC) or by phantom power (typically 48VDC) and a phantom power adaptor to reduce the Voltage to 6 – 9 VDC.

Decibel dB

The decibel (dB) is not a unit of measurement such as metres, millimetres feet, inches, or pounds. The decibel is a comparison between two values and is an expression used in electrical and acoustic measurements. The decibel is a number that represents a ratio of two values of a quantity such as voltage. It is a logarithmic ratio and its main purpose is to scale a large measurement range down to a much smaller and more useable range. The form of the decibel relationship for voltage is:
$$\text{dB} = 20 \times \log(V1/V2)$$

Diversity

Radio microphone receivers often feature two separate aerials to ensure consistent signal reception “diversity reception” a microprocessor is constantly checking signal strength and quality of reception. If the radio signal becomes weak, poor or noisy on one aerial then the second aerial will handle the reception. This results in drop outs and noisy signals being dramatically reduced. Systems that do not boast diversity reception will have just one aerial and cannot ensure reliable reception under difficult conditions.

DSP

Digital Signal Processing. These electronic devices can be standalone or used in conjunction with a computer and are used primarily to convert analogue audio to digital audio. In addition to this they can perform very many other operations such as enhancing and control of the audio signal by compression and filtering. There are many manufacturers of these types of equipment including Creston, Biamp, ClearOne to name a few.

Dynamic Microphone

Dynamic microphones have a relatively simple construction and are rugged and economical to manufacture. They can handle extremely high sound pressure levels and are largely unaffected by extreme temperatures or humidity. A diaphragm, voice coil and a magnet is the basic make up of a dynamic microphone. The underside of the diaphragm is attached to a voice coil which is surrounded by a strong magnetic field. The sound pressure picked up by the diaphragm moves the voice coil within the magnetic field and generates an analogue electrical voltage in sympathy to the sound being picked up. This small voltage is then further amplified by an external audio amplifier and finally fed to loudspeakers.

Dynamic range

This is the difference between the quietest and loudest sound that a microphone can pick up. The two extremes of this range are the self induced noise of the microphone and the highest sound pressure level the microphone can pick up. It is measured as a ratio in decibels (dB).

EQ Equalizer

Equalization (EQ) or tone control is used to shape the frequency response (and sound quality) of an audio signal according to the listeners preferences or rooms resonances. An equalizer has the ability to boost and/or cut the energy (amplitude) in specified frequency ranges. It may also be used to achieve a flat frequency response of a whole system or might be used creatively to change the sound of a specific instrument.

Back Electret

An Electret film is applied to the back plate of the microphone capsule and the diaphragm is made of an uncharged material which may be mechanically more suitable for the transducer design being realized.

An Electret mic is similar to a Condenser microphone and are sensitive and give a smooth natural sound. The capsule of a condenser microphone requires a polarising

voltage to charge the condenser element. An electret is a synthetic material that is permanently polarised. This is attached to the back plate and does not require an external polarizing voltage. An electret condenser microphone does however require power either by battery (3V) or phantom power to operate the inbuilt preamplifier. An electret capsule has an advantage over capacitor capsules having ultra flat frequency response.

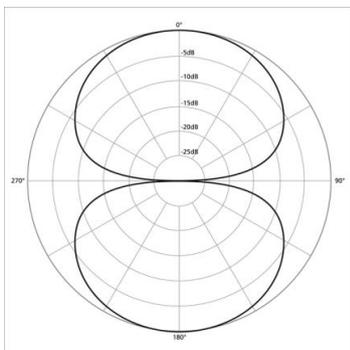
Feedback / Howl back

During normal operation of any sound system, sound produced by a loudspeaker is often picked up by a microphone. This sound re-enters the system and is re-amplified and reproduced again by the loudspeakers. This sound is picked up by the microphone yet again and so the cycle continues faster and faster and an uncontrolled loud noise is heard. This is known as howl or feedback as the sound is literally feeding back into the system. Left uncontrolled this can cause serious damage to the loudspeaker and amplifier and distress to the audience. The use of cardioid, super cardioid, hyper cardioids and rifle / shotgun microphones can eliminate this problem. Hypercardioid has minimum handling noise.

Figure of Eight

A microphone with a Figure of Eight polar pattern picks up the sound from in front of the microphone and also from the rear of the microphone but not from the side (at a 90° angle). Microphones with this Figure of Eight polar pattern are typically large diaphragm or ribbon microphones.

Figure of 8



Frequency

This is how many times a sound or radio wave oscillates in one second and is measured in Hertz (Hz). The frequency of sound vibrations is directly linked to what we hear as pitch. The term 'frequency' along with the values associated with it allows us to speak about a sounds characteristics rather than just referring to pitch alone.

In a wireless radio microphone system the audio is carried on a radio wave at a specific frequency. Both the transmitter and receiver must be set to the same radio frequency if the microphone is to be heard.

Frequency Response

This is the range of frequencies from the lowest to the highest that a microphone can pick up. It also describes how sensitive a microphone is to particular frequencies. The microphone will be more sensitive to some frequencies than others. There are generally two types:

Flat Frequency Response: All audible frequencies (20 Hz – 20 kHz) are picked up and outputted equally by the microphone. This is most suitable for applications where the sound source has to be reproduced without changing the original sound, e.g. for studio recording purposes.

Tailored Frequency Response: A tailored response is designed to a customer's specific requirements to enhance a sound source for a particular installation or application. For instance, a microphone can be made to be more sensitive in the 2 – 8 kHz range to increase intelligibility for live vocals, or be made to be less sensitive between 50 -250/Hz to eliminate low frequency booming sounds of a particular installation. Frequency response curve of such microphones will look mountainous or have large areas with dips or troughs when compared with a microphone with a flat response.

GSM

Global System for Mobile Communications formally Groupe Special Mobile. Most prevalent mobile radio system in use globally. GSM networks operate in a number of different carrier frequency ranges 2G = 900 or 1800 MHz bands and in countries where this frequency is occupied by other electronic devices, the frequency is from 850 – 1900MHz. 3G networks used in Europe operate within 2100 MHz frequency

GSM Friendly Microphones and Shock Mounts

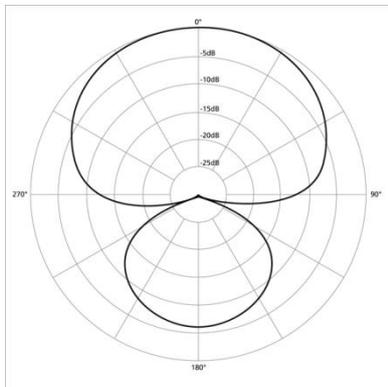
Clockaudio RF (Radio Frequency) product range has been developed in direct response to ever increasing interference from GSM devices such as mobile phones, PDAs (Personal Digital Assistant), laptops that most people carry around as part of their normal everyday business activities. These devices if not tuned off will from time automatically send out a radio signal to keep in contact with the network cell tower being used and this frequent contact can interfere with very sensitive audio devices such as microphones and preamplifiers and can ruin a conference / meeting or recordings. Clockaudio's RF immunity series of microphones and shock mounts will eliminate this interference whilst maintaining high quality audio reproduction and you can be safe in the knowledge that your event will not be suffer from such interference problems. Non-Radio Frequency protected models may be available. Contact Clockaudio for availability.

Half Cardioid

Microphones with a half cardioid polar pattern are usually boundary microphones that are mounted on a flat surface. They pick up sound in a cardioid manner only in the hemisphere above the mounting surface.

Hyper Cardioid

Hyper cardioid microphones offer an even narrower pickup than super cardioids and a greater rejection of ambient sound. But they also have some pickup directly at the rear so it is important to place any monitor speakers correctly. Hyper cardioids are most suitable when single sound sources need to be picked up in loud environments. They are the most resistant type of microphone to feedback.



Impedance

This describes how resistant an electrical circuit is to the flow of alternating current (electricity) passing through it. It is measured in Ohms and expressed as Z . The lower the impedance (less opposition) the more current can flow through the microphone. The impedance value will change according to what frequency is being presented. The output impedance of a microphone should be much smaller than the input impedance of a microphone input of a mixer. If it is any higher then there will be a loss of high frequencies. High impedance microphones (10,000 Ohms) are usually cheap and their main disadvantage is that they do not work well over distances longer than approx. 5 - 8 metres when performance drops dramatically / loss of high frequency. There are 3 main categories that microphones impedance fall into Low impedance = less than 600 Ohms, Medium impedance 600 – 10,000 Ohms and high impedance greater than 10,000 Ohms. Low impedance microphones in general are better quality than high impedance microphones.

LED

Light Emitting Diode is a solid state (no moving parts) DC powered light source. They are supplied in various sizes, brightness, colours and working voltages to suit different applications. They are extremely robust and have very long life cycles in excess of 50,000 hours (5.7 Years) and consume very little energy when compared to other light sources.

Line Level Source

Normally associated to audio inputs commonly found on amplifiers, recorders, mixers and other audio devices. Microphones voltage output level is very small and requires boosting before they can be used. Sometimes an inbuilt mic preamplifier on the device already exists and the microphone (usually dynamic microphone) can be used directly. In cases where a condenser microphone is being used then these will need to be connected to a separate amplifier (Line Level amplifier) to boost the microphone audio voltage level before it is connected. It should be noted that line level varies according to what specifications / country that the device is manufactured to. There are many specifications around the world (German DIN, Japanese JIS etc) and there is no one global standard. You will need to check the specifications of the device being used. Shown below are some general specs on typical levels:

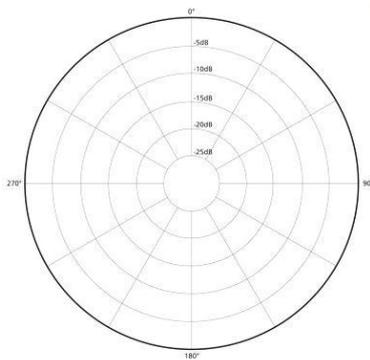
ARD: Germany nominal level +6 dBu (1.550 VRMS) 2.192V Peak Amplitude.

USA: professional audio nominal level +4 dBu (1.228 VRMS) 1.737V Peak Amplitude.

Consumer audio nominal level -10 dBV (0.316 VRMS approx) 0.447 Peak Amplitude.

Omnidirectional

The omnidirectional microphone has equal sensitivity at all angles (omni = everywhere). This means it picks up sound evenly from all directions and does not need to be aimed in a certain direction. This feature is useful especially with Lavalier microphones (clip on lapel). A disadvantage is that an omni cannot be aimed away from undesired sources such as loudspeaker which may cause feedback.



Operating Frequency

Every wireless microphone system transmits and receives on a specific radio frequency known as the operating frequency. You cannot combine randomly selected radio frequencies as the microphones may compete with each other, and each system may experience noisy interference and/or drop outs (loss of the wireless signal altogether). It is also not possible to use two wireless systems on exactly the same frequency in the same venue. Also serious distortion and reception problems will exist if two wireless microphones with just one receiver are used at the same time. More advanced systems (PLL / Phase Loop Locked) offer greater frequency selection, flexibility and the ability to combine more receivers and transmitters to serve more users.

'Phantom Power'

Phantom power was first used in 1964. All condenser microphones require a DC supply in order for condenser capsule to be polarised and also energise the inbuilt preamplifier and phantom power supply fulfils this need. The phantom power supply 48 Volts (sometimes 12 V) is usually supplied to the microphone by a mixer and is carried along the microphone cable. Some condenser microphones can be operated with an internal battery and are therefore suited for use with mixers & PC sound cards without phantom power. Condenser microphones terminating in bare wires will require a phantom power adapter before being connected to a phantom power supply. Alternatively a series current limiting resistor of 2200 Ohms with 3 - 12VDC supply may be used. Many high end mixers have the ability to turn On/Off the 48 VDC phantom power supply. It should be noted that an electret condenser microphone does not strictly require an external phantom supply as the capsule is permanently self polarised. However the impedance convertor amplifier still requires a separate supply.

Polar Pattern

The polar pattern of a microphone displays a pictorial view of its sensitivity to sound relative to the direction or angle from which the source sound arrives. In other words how well the microphone hears sound from different directions. The most common types of directionality are: Omnidirectional, Cardioid and Supercardioid.

Proximity Effect

Every directional microphone (i.e. cardioid, supercardioid) has a so-called proximity effect. When a microphone moves closer to the sound source, there is an increase in bass response and, hence, warmer sound. Professional singers often work with this effect. To test this out, experiment with bringing the microphone closer to your lips when singing and listen for the change in sound. When used close to your lips the P, T and S sounds will predominate.

Self Noise

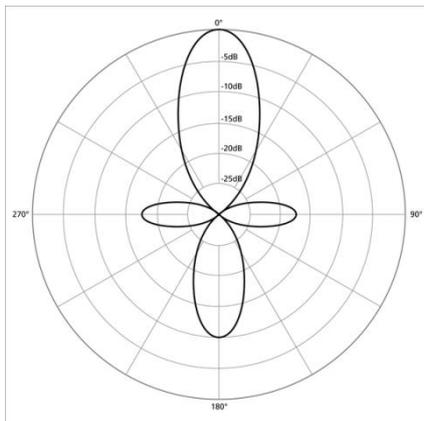
Self noise is electrical noise in a system that is inherently produced by the system itself. In electronics all components produce their own noise. It is an unavoidable fact that when electrons are moving there will always be noise. Add the noise of the components to the circuits that they are in plus the combined audio path and you then have the total self noise of the device. Further when you combine many such devices together in an audio system you have the self noise of the entire system. This self noise represents the noise floor of the device or system. The difference between this noise level and the level of a signal in the device is the ratio of the signal to noise (s/n ratio).

Sensitivity

This is how much electrical signal a microphone produces for a given input of sound pressure level (SPL). In most cases sensitivity is measured with a sound pressure level of 94 dB (1 Pascal). The higher the sensitivity the louder the microphone. Sensitivity is measured in mV/Pa or dB/Pa.

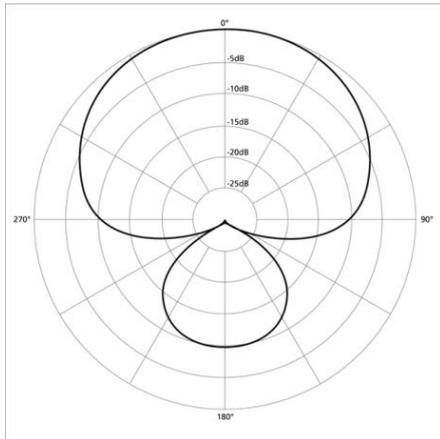
Shotgun

Shotgun microphones are highly directional. They have small lobes of sensitivity to the left, right, making them significantly less sensitive to noises / sound pickup from the side and rear than any other design of directional microphones. Due to the extreme focus of sound pickup shotgun microphones are used in specialised areas and are commonly used on television, film sets, stadiums, and for field recording of wildlife.



Super cardioid

Super cardioid microphones reproduce a narrow field sound pickup than cardioids and as a consequence offer a greater rejection of ambient noises and sounds. They also have some pickup directly at the rear of the microphone so it's important to place any monitor speakers correctly so as to avoid any feedback. Super cardioids are most suitable when single sound sources need to be picked up in loud environments. They are very resistant to feedback.



Tini Q

High quality miniature audio connector used for electrical connections having excellent reliability with good robust mechanical strength. They have been used and accepted as an industry standard for high quality balanced audio connections for microphones and audio equipment. Tini Q connectors are designed to be fool proof (cannot reverse connection) and can be quickly connected and disconnected repeatedly. They are manufactured with different numbers of pins ranging from 3 pin to 7 pin and are available as a male and female plug connections.

Warning: Clockaudio use different pin configurations to the standard.
Please make sure you follow the connections as shown below:



Clockaudio Tini Q wiring

- PIN 1 Phase – (Cold)
- PIN 2 Phase + (Hot)
- PIN 3 Not Used



Total Harmonic Distortion

Total Harmonic Distortion (THD) is a measure of how much electrical noise including harmonics that a device produces in addition to the main signal being reproduced. The test is conducted using single sine wave frequency of known distortion which is passed through the unit under test and then into a distortion measuring instrument. Filtering of the electrical signal is made and what remains is the noise, hum, interference generated by the unit. This is expressed as a percentage over the fundamental frequency presented to the device being tested i.e 0.1% THD.

Transducer

A transducer converts energy from one form into another. In the case of a microphone it converts sound energy into an electrical signal. The two most common transducer types are Dynamic and Condenser.

XLR

Unable to find why it's called XLR but these connectors are electrical connectors having excellent reliability with good robust mechanical strength. They have been used and accepted as an industry standard for high quality balanced audio connections for microphones and audio equipment. XLR's are designed so that they are fool proof (cannot reverse connection) and can be quickly connected and disconnected repeatedly. They are manufactured with different numbers of pins ranging from 3 pin to 9 pin and are available as a male and female plug connections.

XLR connections shown below:

