MICROPHONES & TECHNIQUES

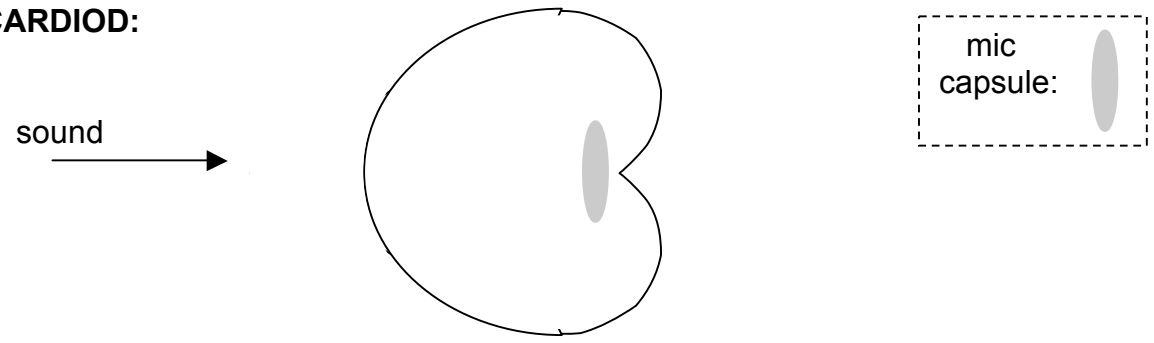
Ideally a microphone should faithfully transfer the air pressure waveform into an identical electrical signal.
In practice some mics come close to this (and are described as 'transparent' or 'natural') however most are less than ideal (this is not necessarily a bad thing) and the choice has to be made whether their character suits the application.

Polar Patterns

Microphones of different types exhibit differing spatial responses, meaning that their sensitivities vary not only with distance but with direction as well.

> Note in practice these patterns are 3-dimensional, and can be slightly altered for high frequencies

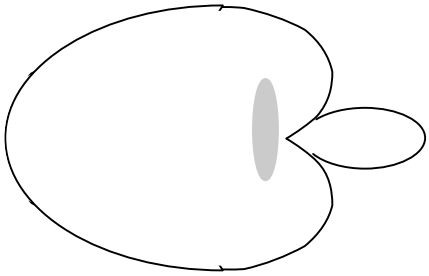
CARDIOD:



Cardiod picks up sound very well from the front and sides, but response tails off toward the back.

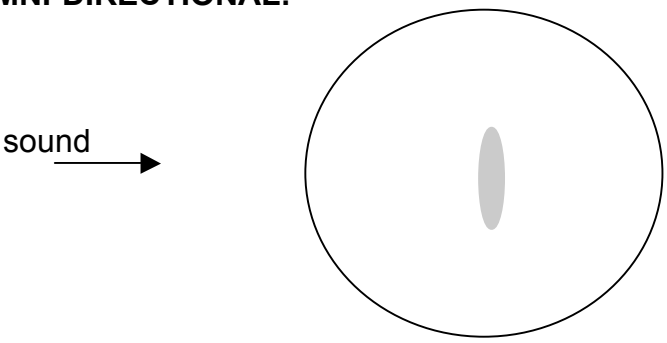
Most mics, due to their construction, naturally exhibit this pick-up pattern.

Hyper-cardiod has a narrower pick-up pattern but a ‘lobe’ in the response appears at the back.



Both cardiod and hyper-cardiod exhibit the **proximity effect** i.e. the closer the mic is to the sound source, the more the bass response is exaggerated. This can be used to enhance the ‘body’ of a sound, but care needs to be taken that not too much ‘muddiness’ is created.

OMNI-DIRECTIONAL:



Omni mics pick up sound equally from all directions.

Largely preferred by Classical music engineers and those seeking the most natural and pure sound.

FIGURE-OF-EIGHT:

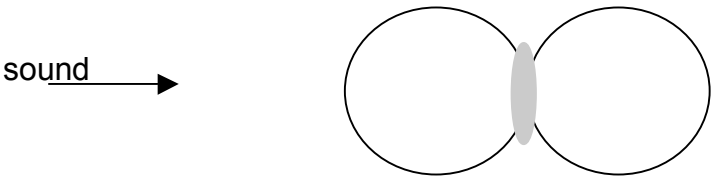
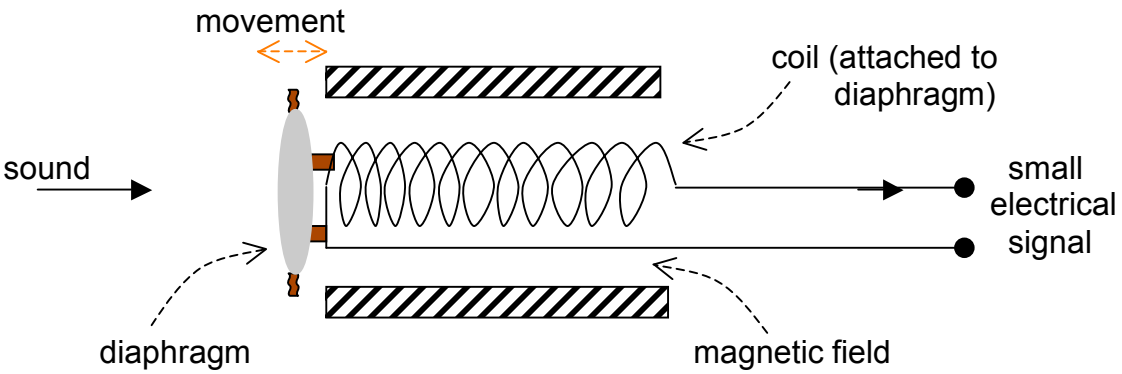


Figure-of-eight mics pick up very well at the front and back and not so well at the sides.

Types of Microphone

DYNAMIC MICS:

Dynamic mics work by the principle of 'electromagnetic induction' i.e. the motion of a conductive coil in a magnetic field produces an electrical signal proportional to the motion.
The incoming soundwaves vibrate the light suspended diaphragm ,which moves the attached coil back and forth, thus generating an alternating electrical signal



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Characteristics of dynamics

- relatively inexpensive to produce
  (most affordable mics use this principle, though this has become less so in recent years)

- robust construction
  (they will withstand rough treatment, hence their popularity for live work)

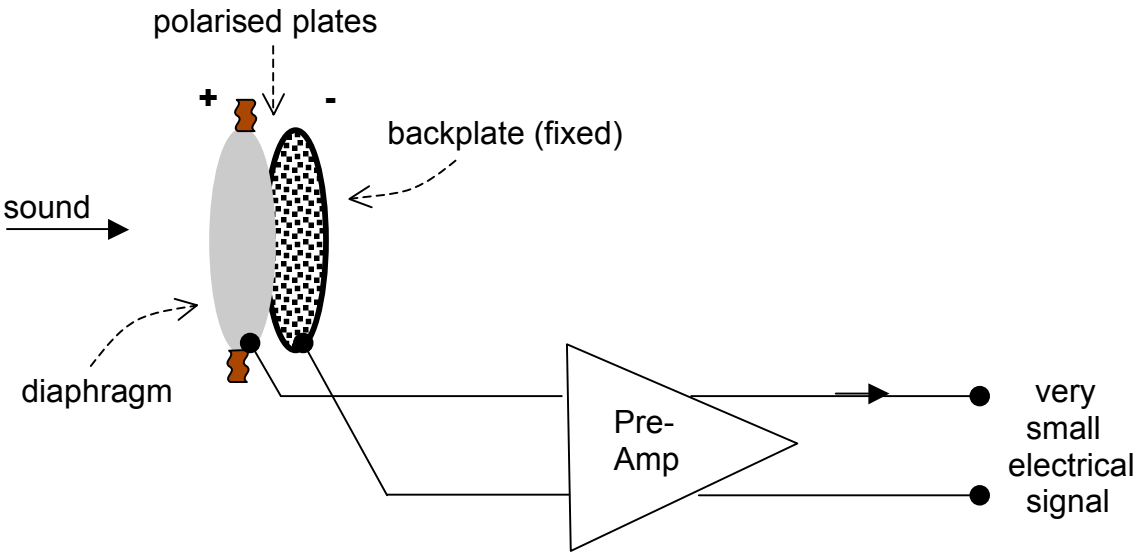
- limited high frequency response
  (the diaphragm/coil assembly, though as light as possible, has enough weight to limit the speed of motion and high frequency components are damped)

- not very sensitive
  (similarly due the weight of the diaphragm/coil assembly, low level vibrations suffer non-responsiveness)

- only simple polar patterns possible
  (the construction is inherently cardiod, though hypercardiod is also possible)

CONDENSER MICS:

Condenser mics work by the principle of capacitance, which can be expressed as the difference in electrical energy between two already charged conductive plates is proportional to the distance between them.
The incoming soundwaves vibrate the diaphragm (conductive this time, usually mylar sprayed with gold film), constantly varying the distance between it and the fixed backplate (perforated to so that air pressure does not impede the motion). Provided that the plates hold a difference of charge (i.e. some energy has been introduced into the system), a minute electrical waveform is induced between the two plates. This is then passed to the pre-amp for careful buffering (deriving the signal with minimal losses) and amplification.



These mics need power to work, to charge the plates and provide the energy for amplifying, which is usually supplied by **phantom power** on the mixer or external mic amp.

<u>Characteristics of condensers</u>

- relatively expensive to produce
  (has been traditionally the expensive studio mic, though this has become less so in recent years)

- delicate construction
  (they will not withstand rough treatment, hence their 'studio mic' tag but are used for professional live shows too)

- very good high frequency response
  (the light diaphragm is very responsive and can easily deliver a 'flat' frequency response)

- very sensitive
  (for similar reasons, low-level components and ambiences are captured ... even the undesired noises!)

- any polar pattern possible
  (a single capsule is inherently cardiod but adding the signal from another placed back-to-back produces omni, subtracting the signals gives figure-of-eight, etc.)

Other facilities that can be easily added to this design are:
- attenuation before the pre-amp (to accommodate the wider dynamic range of the **capsule** itself and, of course, loud sound sources)
- high pass filtering (for minimising low frequency rumble or vibration, but will also alter the LF components of the desired sound too)
- switchable polar patterns (if two capsules are placed back-to-back, they can be connected in different ways to produce differing spatial responses)

RIBBON MICS:

Similar in principle to dynamics, but the diaphragm/coil assembly is replaced by a conductive ribbon.
This lighter construction imparts an extended HF response and sensitivity with a characteristic sound, though less robust.
They are inherently figure-of-eight.

BOUNDARY MICS:

Also known as **pressure zone microphones (PZM)**.

A capsule is placed very close to a hard surface so as to pick up only reflected sound, whose constituent components (because of the minute distance from a reflective node) are effectively in phase.

These are useful in situations where phase relationships can be a problem
e.g. for room ambience, or instruments which are prone to LF exaggeration (such as bass marimba or tympani).

Mic Placement

Here is where the art can take over from the science.
Taking into consideration:

- the characteristics of the mic types (not forgetting the proximity effect)
- giving some thought to where the desired sound from a source occurs
- how much direct (as opposed to reflected) sound is required
- AND (most importantly) using our ears to make the final judgement

... then we can make good decisions about where mics are placed.

No apologies about being non-specific here, by all means copy positioning shown to you (it's how we all start), but ultimately YOU have to be confident that you're recording the best signal!

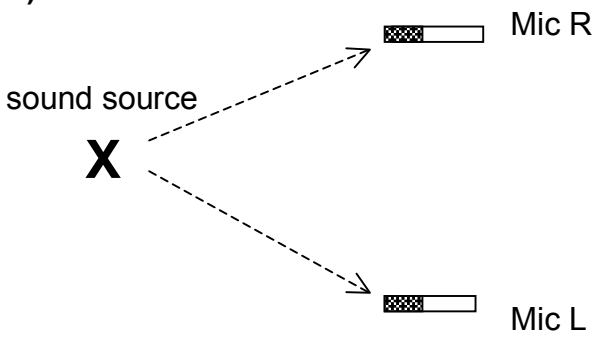
It's already been mentioned that the skill is to CAPTURE the acoustic sound, it's crucial to have as accurate a monitoring system as possible and it's a good idea to make comparisons at similar levels (ref. perception of hearing!).

Mono or Stereo

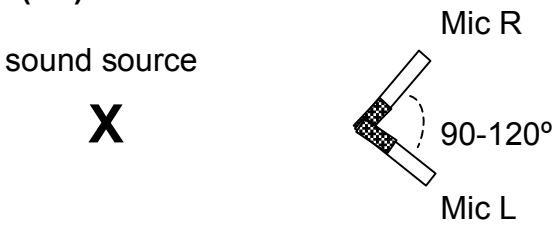
Simply put, mono is one mic (or signal channel) stereo requires two (a left and a right). More mics could help capture more of a spatial dimension, which could be useful if recording for a surround format but also for normal stereo too.

Standard Stereo Techniques

SPACED PAIR (AB):



CROSSED PAIR (XY):



M-S PAIR: *Research this technique yourself*. [Note: much useful information about mics and techniques can be found at www.dpamicrophones.com]

PRACTICAL: Try mic'ing up as many sources as possible in different ways and note the results with reference to the characteristics explained here.