BLAGSHEET #05
MICROPHONES

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THE ELECTRIC EARS THAT ALLOW US TO HEAR THE WHOLE WORLD

By courtesy of The Crow Hill Company

CHARACTERISTICS OF A MICROPHONE

A microphone is a device that is highly sensitive to changes in air pressure and converts those fluctuations into voltage which can then be amplified and used to control speaker cones, vinyl lathes, magnetic record heads or indeed be coded by analogue to digital converters into binary form.

Microphones vary greatly in price and this has no bearing on how "accurately" they reproduce the signal going in. The price of microphones tends to be based more on the build quality and engineering complexity. As mentioned before the ear is a hugely well tuned bit of kit. In order for a microphone to even compete with the microphones stuck on each side of our head so a lot of care and attention is required when selecting, placing and amplifying their signals.

The microphones represented here are the most celebrated and therefore most commonly found in professional recording studios. Ranging in price between $100 (mass produced, but no less useful) to $20,000 which will by and large be hand-made or indeed out of production and only available at eye watering prices second hand (see the AKGC12).

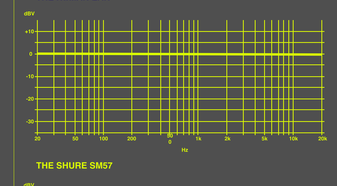
Price doesn't determine how useful, robust or versatile a microphone is. Which is why this specially curated list of microphones centres in on ones that have been at the top of the tree for each of their specialities and as a consequence are sound investments that, with care will last you a lifetime and hold their value.

A mistake often made is buying a massively expensive microphone in the hope it will instantly make your recordings sound better. Again this isn't always the case. No mic will compete when poorly placed in front of the object being recorded. Moreover the mic is an electronic advice that produces an incredibly low voltage signal. Using an expensive microphone with a cheap or poor mic pre-amp is akin to buying an expensive guitar only to plug it into a cheap amp. Finally there is nothing a mic can do to fix bad "playing", cheap poorly set-up instruments recorded in a bad sounding room". A microphone is the first line of defence when making an excellent recording, but there are many factors beyond that which can let the side down.

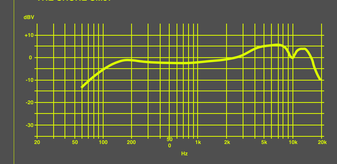
Before we dig deeper, here's a brief explanation of how we judge the characteristics of a microphone.

FREQUENCY RESPONSE

THE HUMAN EAR



THE SHURE SM57

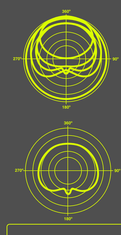


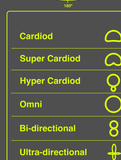
A frequency response chart illustrates how any device responds to a signal by comparing the signal going across a wide frequency spectrum (in this case the top end of human hearing vs low end). Most high-end microphones are tested in anechoic chambers. Basically a room with no-'sound'. Particularly no room ambience, reverb or echo which would form part of the input in the microphone which would be then recording a room as well as the input source. White noise (a noise which contains all the frequencies of the spectrum being measured) is fed into this room via a speaker and the signal recorded by the microphone. The frequency chart is a graphic representation of how the signal is then effected measured in decibels (loudness) across frequency. Is it less or more than the volume of white noise played into the microphone and if so at what points.

A frequency response chart illustrates how any device responds to a signal by comparing the signal going across a wide frequency spectrum (in this case the top end of human hearing vs low end). Most high-end microphones are tested in anechoic chambers. Basically a room with no-'sound'. Particularly no room ambience, reverb or echo which would form part of the input in the microphone which would be then recording a room as well as the input source. White noise (a noise which contains all the frequencies of the spectrum being measured) is fed into this room via a speaker and the signal recorded by the microphone. The frequency chart is a graphic representation of how the signal is then effected measured in decibels (loudness) across frequency. Is it less or more than the volume of white noise played into the microphone and if so at what points.

Above is the frequency response chart of the hugely popular SM57. You can see it doesn't pick up anything at a below a frequency of around 50Hz (most humans can hear down to about 20Hz). Has a bit of a boost in signal around the 150hz mark. This is where you hear "bass" say from a bass guitar or indeed a male human voice. The signal remains pretty "flat" ie representative of the white noise played into it until a noticeable boost at around 2,000hz (or 2kHz) which is the where the human voice is most "intelligible for language". It has a sudden dip around 8k which is where a lot of "sibilance" peaks in a human voice before providing response at the brighter end of the voice before a sudden drop that coincides with the upper limits of most people's hearing. This is why the SM57 (and SM58) is so popular with vocalists because it has a rich tone at the bottom, is true to the character of the voice for the middle part and then is nice a audible at the important high mids, scoops out some unwanted sibilance before providing some useful bright top end.

POLAR RESPONSE





A common mistake when using microphones thinking of it as recording the instrument. Where actually it is simply recording what that instrument (aka the source) is doing to the air around it. This is when other factors like proximity, room acoustic background noise, and spill (sound being made by musicians in and around the source) come in to play.

A secondary characteristic of a microphone therefore is its sensitivity to the in subtle changes in air pressure around it. By proximity (distance from the source of the sound), loudness and polarity (what that sound source is doing not just in front of the mic, but around it). Different styles of sensitivity are categorised by these patterns.

PATTERNS		
Cardiod		Sensitive to what is directly in front of it.
Super Cardiod		Narrower pickup making it more directional.
Hyper Cardiod		Small rear lobe offers greater side rejection
Omni		Picks up sound equally from all directions
Bi-directional		Picks up equally from front and back
Ultra-directional		Picks up sound from a very narrow angle
Binaural		Imitates human hearing, a 3D style of recording that requires specific playback conditions.

THE "BIG THREE" TYPES OF MICROPHONE

DYNAMIC

A dynamic microphone employs electromagnetism to convert sound waves (fluctuations in air pressure) into electric signals. It employs 3 key components to do this, a diaphragm which is highly sensitive to changes in air pressure (ie sound waves). A metallic 'voice coil' where this kinetic pressure sensitive energy is transferred to and a magnet. Dynamic mics are popular for their ability to withstand radical changes in air pressure as experienced in loud environments, when recording drums, guitar amps etc. But also their durability out in the wild. Their construction suits taking a knock here and there and they aren't as susceptable to the effects of moisture or humidity experienced by other types of microphone.

By far the most widely distributed microphone in the world the SM58 (used more often than not by vocalists singing live) is a testament to their robustness. With many fields being dominated by dynamics. The eponymous sanken COS11D lavalier mic, the AKG D112 kick drum mic, if you see a blimp on a boom it'll have a dynamic mic in it (usually the Senhesier MKH416) and nine times out of ten your favourite podcaster will be sat in front of a Shure SM7B dynamic microphone.

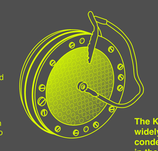
The "Unidyne III" Capsule employed by the Shure 57,58 and in modified form the Shure SM7B

CONDENSER

What condenser mics lack in robustness and duarbility condenser mics make up for in sensitivity and accurate recreation of sound sources of all shapes and sizes.

Condenser mics by and large create a higher quality signal than dynamics, have a wider bandwidth and due to their sensitivity require a higher degree of scrutiny when being selected and placed in front of their source. They employ electrostatic, or capacitor, technology to convert acoustic energy into electrical energy. It consists of two plates: a fixed plate (usually a metal diaphragm) and a moveable plate (usually a metal backplate) separated by a thin layer of air or a dielectric material. The fixed plate is charged with a fixed voltage, and the moveable plate is connected to the ground. When sound waves hit the microphone, the moveable plate vibrates, changing the distance between the two plates. This change in distance causes a change in capacitance, which is converted into an electrical signal. This signal is then amplified and processed to produce a high-quality audio output.

Condensers require power to run where dynamics are 'self' powered.



The K47.cThe most widely distributed condenser capsule in the world.

RIBBON

Ribbon mics are, despite by far being the most temperamental and precious of objects, in fact a dynamic mic when strictly breaking down the technology behind them. It uses a thin corrugated 'ribbon' (where standard dynamics use a 'coil') of metal suspended in a magnetic field to induce a signal.

They are revered for their versatility in recording a wide ranging sources with a warm and flattering character. Especially in the age of digital recording where all is laid to bare in its sometimes bright and brash nature. A ribbon can be brought into play to "take the edge off". From orchestras, to vocals, to drum overheads ribbons can be found in many different configurations. Some do not require power whilst others do, and the ones that don't, often don't like getting power so a degree of nurture, care and attention is always called for when employing them.

Ribbon mics have a cult style following of their own. Whilst they may not be as accurate as their condenser cousins, their warm, some say vintage-sounding, quality have many fans.

An RE323 "Bumblebee" Ribbon "motor"

48V THE PHANTOM MENACE

If there's one thing that make an engineer stop a mere civilian from handling microphones it is phantom power. It provides no risk to humans. However it can really damage certain microphones. Yet, on pretty much all mic pre-amps it is a mere switch and an XLR cable away. That is, because some microphones simply won't work without it. Namely condenser microphones who use "phantom" to power their internal amplifiers.

Phantom runs from mic Pres via balanced cables to the microphone. It is a direct current (DC) voltage (+48V with a tolerance of +/- 4V). The DC voltage is equally applied to both Pin 2 and Pin 3, hence the term "phantom" - when measured between Pin 2 and Pin 3, the voltage appears to be zero (0V). Powering active devices: Phantom power is used to operate condenser microphones, which contain internal amplifiers.

Phantom is indicated on mic-pres by the label "48" or "48V" or "P48". It is advised to have it switched off when first connecting ANY mic.

A good rule of thumb to protect your gear.

1. Dynamic mics dont need but don't mind.
2. Condensers need
3. Ribbons don't need and really mind.

But the best rule of all is don't switch on the phantom until you're sure.

Model Name: SM57
Manufacturer: SHURE INCORPORATED

Type: Dynamic
Date: 1965 — **48V:** No
Nationality: USA
Corporation: The Shure Radio Company

Pattern(s):

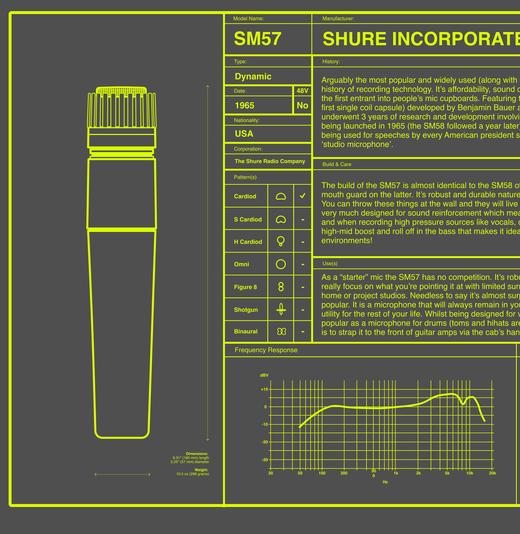
Cardiod		✓
S Cardiod		-
H Cardiod		-
Omni		-
Figure 8		-
Shotgun		-
Binaural		-

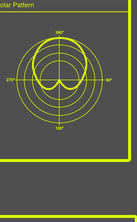
History:
Arguably the most popular and widely used (along with it's SM58 sister) vocal mic in the history of recording technology. It's affordability, sound quality and durability often makes it the first entrant into people's mic cupboards. Featuring the "unidyne iii" capsule (the world's first single coil capsule) developed by Benjamin Bauer and Ernie Seeler. The SM57 underwent 3 years of research and development involving numerous "torture tests" before being launched in 1965 (the SM58 followed a year later). It has the prestigious accolade of being used for speeches by every American president since 1966. The 'S' abd 'M' stand for 'studio microphone'.

Build & Care:
The build of the SM57 is almost identical to the SM58 of which the only difference is the mouth guard on the latter. It's robust and durable nature is what made "mic-drops" possible. You can throw these things at the wall and they will live to fight another day. The SM57 is very much designed for sound reinforcement which means it copes well in live environment and when recording high pressure sources like vocals, drums and backline. It has a notable high-mid boost and roll off in the bass that makes it ideal for vocals cutting through noisy environments!

Use(s):
As a "starter" mic the SM57 has no competition. It's robust build, sound quality, ability to really focus on what you're pointing it at with limited surrounding crosstalk makes it ideal for home or project studios. Needless to say it's almost surprising affordability make it highly popular. It is a microphone that will always remain in your mic cupboard and it will offer you utility for the rest of your life. Whilst being designed for vocals the SM57 is also highly popular as a microphone for drums (toms and hihats are popular uses). A common practise is to strap it to the front of guitar amps via the cab's handle. No stand required!

Frequency Response / Polar Pattern





Model Name: C414
Manufacturer: AKG ACOUSTICS

Type: Condenser
Date: 1971 — **48V:** Yes
Nationality: Austria
Corporation: Samsung

Pattern(s):

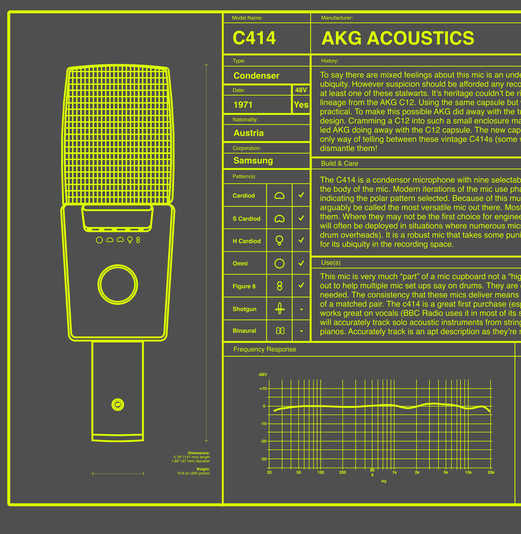
Cardiod		✓
S Cardiod		✓
H Cardiod		✓
Omni		✓
Figure 8		✓
Shotgun		-
Binaural		-

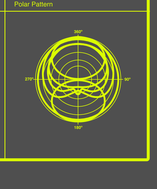
History:
To say there are mixed feelings about this mic is an understatement. Maybe because of its ubiquity. However suspicion should be afforded any recording facility that doesn't possess at least one of these stalwarts. It's heritage couldn't be richer though. Stemming in direct lineage from the AKG C12. Using the same capsule but with a form factor that was more practical. The make this possible AKG did away with the tube in favour of a FET based design. Cramming a C12 into such a small enclosure made for a very complex build which led AKG doing away with the C12 capsule. The new capsule is darker in character and the only way of telling between these vintage C414s (some with the C12, some without) is to dismantle them!

Build & Care:
The C414 is a condensor microphone with nine selectable polar patterns selectable from the body of the mic. Modern iterations of the mic use phantom power to light an LED clearly indicating the polar pattern selected. Because of this multi pattern capability the C414 could arguably be called the most versatile mic out there. Most studios have a whole clutch of them. Where they may not be the first choice for engineers (who often sneer at them) they will often be deployed in situations where numerous mics are required (often for example as drum overheads). It is a robust mic that takes some punishing which may be partly to blame for its ubiquity in the recording space.

Use(s):
This mic is very much "part" of a mic cupboard not a "highlight". You will see them wheeled out to help multiple mic set ups say on drums. They are often used when a stereo pair is needed. The consistency that these mics deliver means they match well even when not part of a matched pair. The c414 is a great first purchase (especially when bought as a pair). It works great on vocals (BBC Radio uses it in most of its studios as an announcer mic), and will accurately track solo acoustic instruments from strings to woodwinds, to brass to pianos. Accurately track is an apt description as they're not known for their flattery.

Frequency Response / Polar Pattern





Model Name: 4038
Manufacturer: STC / COLES ELECTROACOUSTICS

Type: Ribbon
Date: 1953 — **48V:** No
Nationality: United Kingdom
Corporation: BBC

Pattern(s):

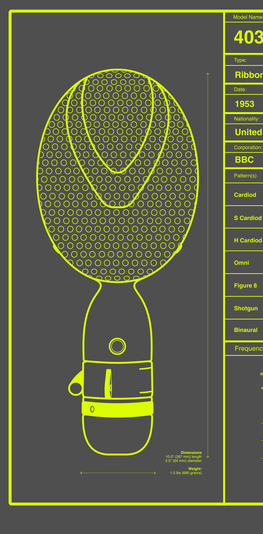
Cardiod		-
S Cardiod		-
H Cardiod		-
Omni		-
Figure 8		✓
Shotgun		-
Binaural		-

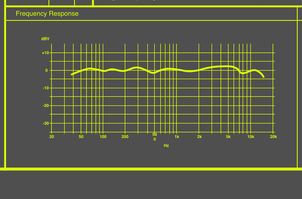
History:
Designed by BBC engineers in the 1950s, the prototype for the 4038 being called BBC PGS/1. This design was developed further to become the STC 4038 using the technical expertise of Michael Gayford, a brilliant microphone engineer at Standard Telephone and Cables Ltd. The design of this microphone has remained unchanged, as has its reputation for being a world-renowned ribbon microphone. Whilst techniques used in the production of the components have evolved over the years, but every microphone is still hand-built and remains faithful to the original design and specification. At one point, Bush House (home of the BBC World Service) used the 4038 almost exclusively.

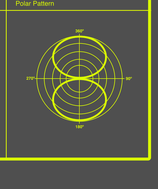
Build & Care:
If there is one piece of advice anyone could give you about the Coles 4038 it would be "don't drop it on your foot". With a "waffle iron" casing made of solid cast iron these things are amongst the heaviest mics of this size you will lose. Whilst the build is robust it is a ribbon microphone and has a few Achilles heals common to all ribbon mics. Huge pressure differences (ie sticking it right in front of a loud bass amp or kick drum) can cause damage, alongside humidity, moisture or indeed feeding it phantom power. Because of its weight caution should be used when working above a player or instrument. Make sure your mic stand is firmly tightened with a counterbalance to prevent toppling.

Use(s):
With a character described as "politely British" the Coles is surprisingly versatile. It is a mic that provides an excellent antidote to ultra bright digital recording. Vocals will be warm and radiant free. Use as overhead drum mics is very popular along with some using them as a taming influence on hi-hats. Because of its wide figure of 8 pattern it is ideally suited to recording the air around the instrument not just the instrument itself which is why one of it's most gratifying uses will be tracking brass instruments and woodwinds like saxophones. Legendary engineer Steve Albini said of the 4038 "if I had one mic this would be it".

Frequency Response / Polar Pattern







Model Name: RE20
Manufacturer: ELECTRO-VOICE

Type: Dynamic
Date: 1968 — **48V:** No
Nationality: USA
Corporation: Bosch Security

Pattern(s):

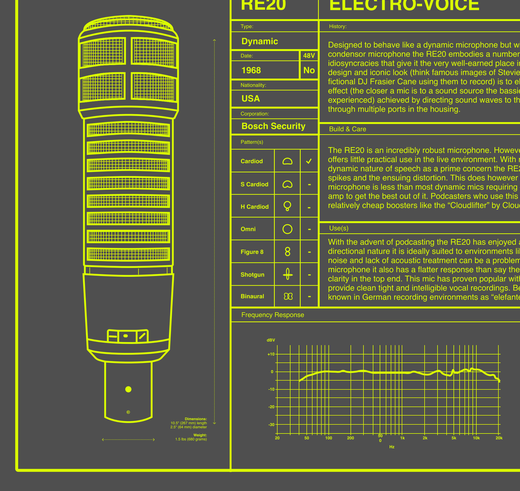
Cardiod		✓
S Cardiod		-
H Cardiod		-
Omni		-
Figure 8		-
Shotgun		-
Binaural		-

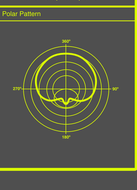
History:
Designed to behave like a dynamic microphone but with the frequency response of a condensor microphone the RE20 embodies a number of design and technological idiosyncracies that give it the very well-earned place in recording environments. It's unique design and iconic look (think famous images of Stevie Wonder, James Brown and the fictional DJ Frasier Cane using them to record) is to eliminate problems with the proximity effect (the closer a mic is to a sound source the bassier it is - or rather bass "tip up" is experienced) achieved by directing sound waves to the rear of the transducer element through multiple ports in the housing.

Build & Care:
The RE20 is an incredibly robust microphone. However because of its size and weight offers little practical use in the live environment. With radio announcers in mind and the dynamic nature of speech as a prime concern the RE20 is designed to prevent sudden gain spikes and the ensuing distortion. This does however mean that the gain response of the microphone is less than most dynamic mics requiring careful selection of a microphone pre-amp to get the best out of it. Podcasters who use this mic often use it in conjunction with relatively cheap boosters like the "Cloudlifter" by Cloud Microphones.

Use(s):
With the advent of podcasting the RE20 has enjoyed a renaissance. Because of its highly directional nature it is ideally suited to environments like home studios where background noise and lack of acoustic treatment can be a problem. Whilst behaving like a dynamic microphone it also has a flatter response than say the SM57 and is notable for its bright clarity in the top end. This mic has proven popular with rappers because of it's ability to provide clean tight and intelligible vocal recordings. Because of its shape and colour it is known in German recording environments as "elefantenhahn" trans: "elephant penis"

Frequency Response / Polar Pattern





Model Name: U47
Manufacturer: NEUMANN

Type: Condenser
Date: 1949 — **48V:** Yes
Nationality: Germany
Corporation: Georg Neumann GMBH

Pattern(s):

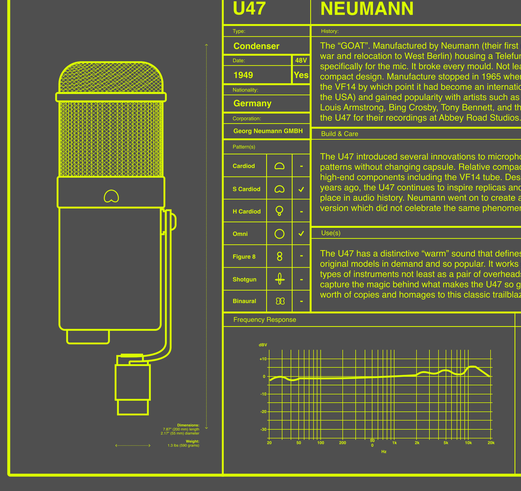
Cardiod		-
S Cardiod		✓
H Cardiod		-
Omni		✓
Figure 8		-
Shotgun		-
Binaural		-

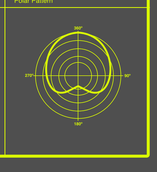
History:
The "GOAT". Manufactured by Neumann (their first new mic after the second world war and relocation to West Berlin) housing a Telefunken VF14 tube developed specifically for the mic. It broke every mould. Not least its revolutionary (for then) compact design. Manufacture stopped in 1965 when Telefunken hited production of the VF14 by which point it had become an international studio staple (particularly in the USA) and gained popularity with artists such as Frank Sinatra, Ella Fitzgerald, Louis Armstrong, Bing Crosby, Tony Bennett, and the Beatles who relied heavily on the U47 for their recordings at Abbey Road Studios.

Build & Care:
The U47 introduced several innovations to microphone technology. Switchable polar patterns without changing capsule. Relative compact and lightweight design. Use of high-end components including the VF14 tube. Despite being discontinued over 50 years ago, the U47 continues to inspire replicas and emulations, cementing its place in audio history. Neumann went on to create a solid state (FET, pictured) version which did not celebrate the same phenomenal success of the original.

Use(s):
The U47 has a distinctive "warm" sound that defines a "retro" quality that keeps the original models in demand and so popular. It works great on a number of different types of instruments not least as a pair of overheads for a drum kit. The desire to capture the magic behind what makes the U47 so great has resulted in decades worth of copies and homages to this classic trailblazing design.

Frequency Response / Polar Pattern





Model Name: C12
Manufacturer: AKG ACOUSTICS

Type: Condenser
Date: 1953 — **48V:** Yes
Nationality: Austria
Corporation: Harman International

Pattern(s):

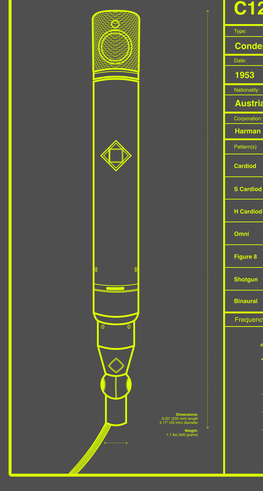
Cardiod		✓
S Cardiod		✓
H Cardiod		✓
Omni		✓
Figure 8		✓
Shotgun		-
Binaural		-

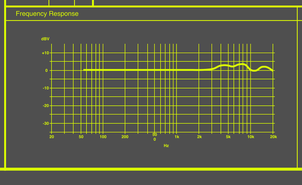
History:
The C12 was AKG's answer to the dominance of the U47 manufactured by it's arch-rival Neumann. It is commonly considered to be the holy-grail of vocal mics with Sinatra and Pressley both swapping between this and the U47 throughout their golden eras. Having been introduced in 1957 the U47 had a six year head-start to achieve it's ubiquity meaning the C12 was never manufactured in the same volume as it's rival. This being the reason why vintage C12s from this era are more sought-after and command a higher resale price. The C12 became part of the C414 lineage and confusion caused by numerous different specifications being given both labels. Needless to say the modern AKG C12s are not the same mic as the vintage ones hence their revered status.

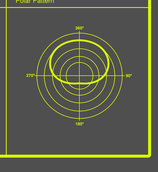
Build & Care:
Part of the C12's struggle to achieve dominance was in the complexity of its manufacture with a capsule alone comprising of over 100 hand assembled parts. Being later to the game than the U47 it made up for time with technical versatility not offered by it's nemesis. Namely 9 polar patterns via a remote control unit, not to mention an incredibly compact design (despite its length). The C12 adopted not one but two 10 (and then 6) micron thick diaphragms coupled with a pair of triode glass vacuum tubes. To have a vintage C12 is to be a custodian not owner.

Use(s):
Featured on numerous recordings by Led Zeppelin, The Beatles and famously in trio fanned out in front of the luminaries assembled by Quincy Jones for the historic "We Are The World" session at A&M (now Henson) studios in 1985. Quincy was a fan of the C12 and it is said he introduced it to Frank Sinatra who in turn encouraged Elvis to give it a go. Favoured for vocals the C12 is also excellently suited as a leader or soloist mic for sessions with larger bands.

Frequency Response / Polar Pattern







Model Name: M50
Manufacturer: NEUMANN

Type: Condenser
Date: 1950 — **48V:** Yes
Nationality: Germany
Corporation: Georg Neumann GMBH

Pattern(s):

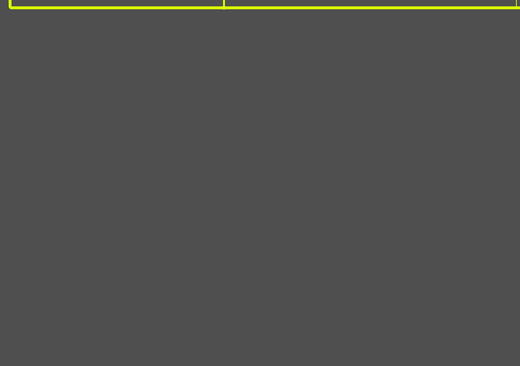
Cardiod		-
S Cardiod		-
H Cardiod		-
Omni		✓
Figure 8		-
Shotgun		-
Binaural		-

History:
Introduced in 1950 and developed in consultation with both Nordwestdeutscher Rundfunk and Northwest German Radio the M50 is an undeniable legend in its field. It's use recording orchestras at the beginning of the stereophonic era contributed to the development of the decca tree formation of mics still used today. Components have been changed over the years including switching from a Hiller tube capsule to a Telefunken one as denoted by the addition of M50A to it's model name. It has been used on countless recordings and is considered the gold standard in microphone technology. M50s were built from 1950 through to 1970 and are now greatly sought after.

Build & Care:
Despite its bulk the M50's body conceals a very small capsule encased in a novel see-through acrylic globe. This creates a very unique polar pattern which is highly omnidirectional throughout the frequency spectrum becoming more directional at high frequencies. This pattern naturally favours the orchestra leaders when playing under M50s in a Decca formation which is why with the right room and right players little else is needed when making traditional orchestral recordings. So saught after are these that prices in excess of $20,000 per unit are to be expected (along with white glove delivery from it's vendor).

Use(s):
Because of their sought-after status and unique brilliance in a Decca array, studios who play host to these rarely will remove them from the stands. Abbey Road has the largest collection in the world where most studios will have enough to deck out a tree with one spare. If an artist bigger than you has nabbed the M50s at Air Studios for example you'll be seeking lesser alternatives! There is however, nothing better than the original "king of mics" which is why finding them second hard is a firesome and expensive business with specimens asking north of $20,000.

Frequency Response / Polar Pattern



Model Name: U67
Manufacturer: NEUMANN

Type: Condenser
Date: 1960 — **48V:** Yes
Nationality: Germany
Corporation: Georg Neumann GMBH

Pattern(s):

Cardiod		-
S Cardiod		✓
H Cardiod		-
Omni		✓
Figure 8		-
Shotgun		-
Binaural		-

History:
A truly legendary vocal mic introduced in 1960 to replace the U47 with a number of technical innovations. It's mid range is often quoted as "authorative" with a very musical roll off of the very top end that gives it a smoothness not found in the younger brother and arguably more commercially successful U87. It's 3 pattern functionality and flat frequency response across all polar patterns lends to its versatility. Reissues have been created both in 1990 and 2016 with differing views on how it they truly perform compared to the older models.

Build & Care:
The U67 introduced the K67 capsule to the world which has since become the most widely used (and widely copied) capsule on the marketplace today. It is a large-diaphragm, dynamic capsule made of a thin, lightweight metal foil. The capsule is suspended in a magnetic field and features a neodymium magnet and a copper-wound coil. Another notable innovation of the U67 is its form factor. Built to be easy to handle and highly durable, this shape of body for a condensor microphone is one of the most familiar and most imitated profiles in recording technology.

Use(s):
It offers three polar patterns with a relatively flat response across them all making it not only suitable for vocals but also highly effective on including strings, woodwinds, brass, piano, drums, acoustic and electric guitar, bass guitar, and upright bass. A useful comparison between the the U47 and U67 are recordings of Paul McCartney with the Beatles. Largely tracked at Abbey road solely on 47s and 48's there are several contemporaneous recordings (not least *Hey Jude*) recorded at Trident studios where Paul was tracked with a U67. Check out its distinctive mid-range.

Frequency Response / Polar Pattern

Model Name: R44
Manufacturer: RCA / AEA

Type: Ribbon
Date: 1933 — **48V:** No
Nationality: USA
Corporation: AEA Ribbon Mics

Pattern(s):

Cardiod		-
S Cardiod		-
H Cardiod		-
Omni		-
Figure 8		✓
Shotgun		-
Binaural		-

History:
Often renowned as one of the most 'musical' microphones ever made. The RCA 44 was introduced by RCA (Radio Corporation of America) in the 1930s and remained a staple in recording studios until the 1950s. The microphone was renowned for its smooth, warm, and detailed sound, making it a favourite among engineers and musicians. It's iconic form factor and design houses a 1,2 micron thin, corrugated aluminium ribbon suspended between two poles of a strong Alnico magnet.

Build & Care:
Wes Dooley, a specialist in ribbon microphones, began servicing and repairing thousands of existing RCA 44s. By 1998, AEA had acquired 100% of the interchangeable parts used within the original RCA 44, allowing them to recreate the microphone to its original specifications. Inspiration had come from a cancer diagnosis that made Wes reassess his life and set about making an exact replica of RCA'S R44BX. Great care should be taken when mounting and placing this mic. To say it is heavy is an understatement and likely to cause serious damage to anything in its path should it not be correctly cantelevered on its stand to remain upright!

Use(s):
Its warm iconic sound lends well to vocals, strings, woods and guitars. Care should be taken when pairing this with a mic pre. AEA make one suited purely for the purpose of giving ribbons the oomph they need. You should very much see the mic as half the story here. Once correctly amplified it suits recording sources set back more from the microphone. It's unique colouration of sound ideally marries a player to its surroundings producing a deep, diffused and natural acoustic sound.

Frequency Response / Polar Pattern

Model Name: MKH416
Manufacturer: SENNHEISER

Type: Dynamic
Date: 1971 — **48V:** X
Nationality: Germany
Corporation: Sonova Holdings

Pattern(s):

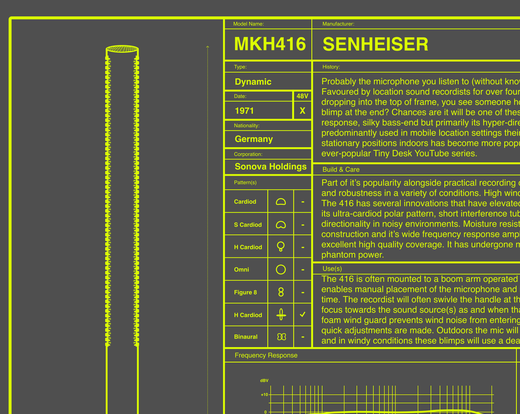
Cardiod		-
S Cardiod		-
H Cardiod		-
Omni		-
Figure 8		-
H Cardiod		✓
Binaural		-

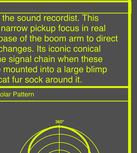
History:
Probably the microphone you listen to (without knowing) more than any other. Favoured by location sound recordists for over four decades. If you spot a mic dropping into the top of frame, you see someone holding a large pole with a big blimp at the end? Chances are it will be one of these. Favoured for their flat response, silky bass-end but primarily its hyper-directionality. Whilst most predominantly used in mobile location settings their value (with caution) used in stationary positions indoors has become more popular. Recent citings include the ever-popular Tiny Desk YouTube series.

Build & Care:
Part of it's popularity alongside practical recording considerations are its reliability and robustness in a variety of conditions. High wind, extremes of heat and humidity. The 416 has several innovations that have elevated it to it's stalwart status namely its ultra-cardiod polar pattern, short interference tube design, both of which suit high directionality in noisy environments. Moisture resistance is part of it's fundamental construction and it's wide frequency response amply offers sound recordists excellent high quality coverage. It has undergone many updates including the use of phantom power.

Use(s):
The 416 is often mounted to a boom arm operated by the sound recordist. This enables manual placement of the microphone and its narrow pickup focus in real time. The recordist will often swivle the handle at the base of the boom arm to direct focus towards the sound source(s) as and when that changes. Its iconic conical foam wind guard prevents wind noise from entering the signal chain when these quick adjustments are made. Outdoors the mic will be mounted into a large blimp and in windy conditions these blimps will use a dead cat fur sock around it.

Frequency Response / Polar Pattern





Model Name: 4104
Manufacturer: STC / COLES ELECTROACOUSTICS

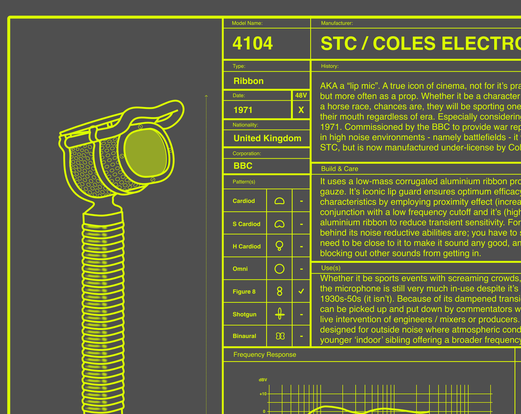
Type: Ribbon
Date: 1971 — **48V:** X
Nationality: United Kingdom
Corporation: BBC

Pattern(s):

Cardiod		-
S Cardiod		-
H Cardiod		-
Omni		-
Figure 8		✓
Shotgun		-
Binaural		-

History:
AKA a "lip mic". A true icon of cinema, not for it's practical use for sound recordists, but more often as a prop. Whether it be a character commentating a boxing match, a horse race, chances are, they will be sporting one of these pressed firmly against their mouth regardless of era. Especially considering these were not introduced until 1971. Commissioned by the BBC to provide war reporters with a microphone to use in high noise environments - namely battlefields - it was originally developed by STC, but is now manufactured under-license by Coles Electroacoustics.

Build & Care:
It uses a low-mass corrugated aluminium ribbon protected by fine woven nylon gauze. It's iconic lip guard ensures optimum efficacy of its noise cancelling characteristics by employing proximity effect (increased bass response) in conjunction with a low frequency cutoff and it's (highly dampened) corrugated aluminium ribbon to reduce transient sensitivity. For the lay-person, the principal behind its noise reductive abilities are; you have to shout into it to get it to work, you need to be close to it to make it sound any good, and by being so close you're also blocking out other sounds from getting in.

Use(s):
Whether it be sports events with screaming crowds, or indeed screeching engines the microphone is still very much in-use despite it's appearance as a relic of the 1930s-50s (it isn't). Because of its dampened transient response the microphone can be picked up and put down by commentators wishing to contribute without any live intervention of engineers / mixers or producers. The 4104 is specifically designed for outside noise where atmospheric conditions may be a factor with a younger 'indoor' sibling offering a broader frequency response in the Coles 4115.

Frequency Response / Polar Pattern