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 processed by analog-to-digital converters into binary form.

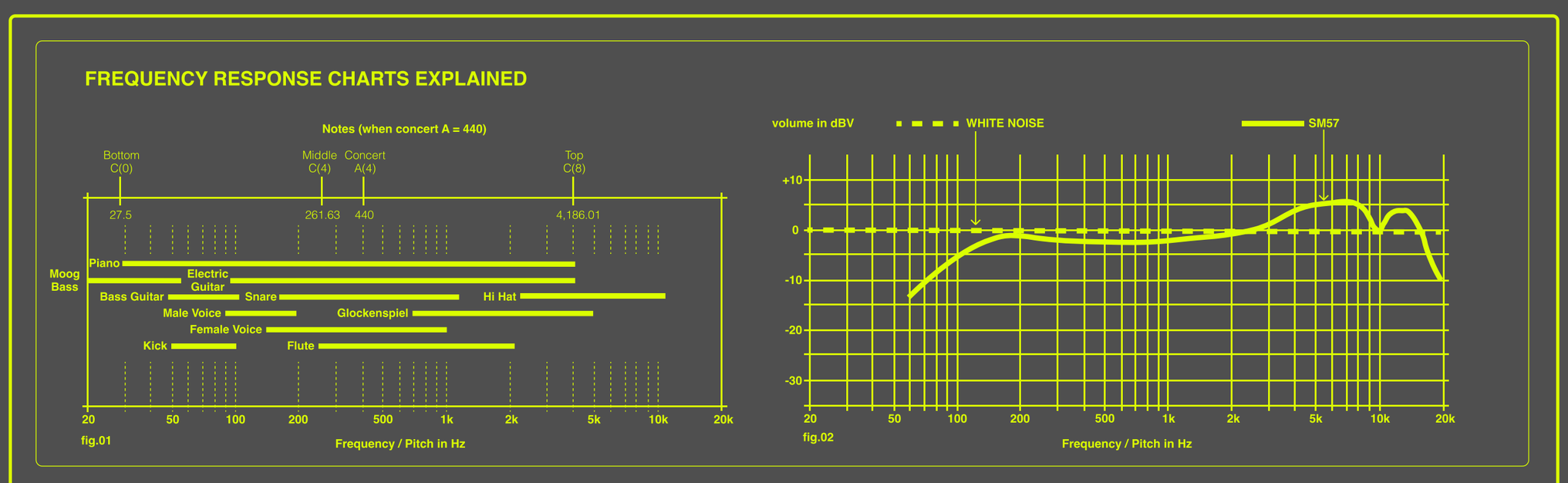
This curated list features some of the most celebrated and, therefore, the most commonly found in professional recording studios. They range in price from mass produced $100 to $20,000, which will largely be handmade or, indeed, out of production and only available at staggering prices second-hand.

Price doesn't determine how useful, robust, or versatile a microphone is. Which is why this specially curated list centres on microphones that have gained a reputation as market leaders in what they do best. Whether that be a mic best suited for live amplified vocal performances all the way to mics best suited to recording dialogue on location for films. As a consequence, they are sound investments that, with care, will last you a lifetime and hold their value.

A common mistake is buying an expensive microphone in the hope that it will instantly improve your recordings. This isn't always the case. No microphone will perform well if poorly placed in front of the object being recorded. Moreover, the they are electric devices that produce an incredibly low-voltage signal which always require amplification. Using an expensive microphone with a cheap or poor mic preamp is akin to buying an expensive guitar only to plug it into a cheap transistor radio. Finally, there is nothing a microphone can do to fix bad playing or poorly set-up instruments recorded in a poorly treated room. A microphone is the first line of defence when making an excellent recording, but many factors beyond that can undermine the outcome, not least treating them with care.

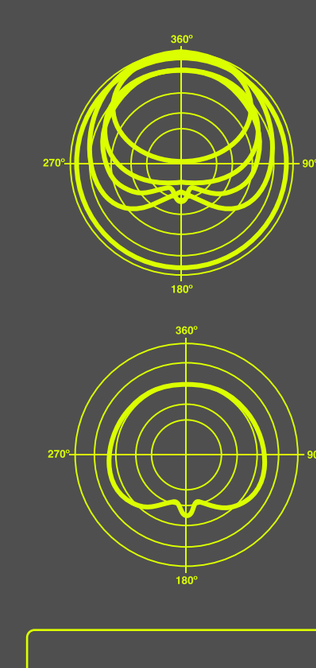
You may be surprised to learn that a microphone's price or desirability is also not a reflection of how "accurately" they reproduce the input signal. The price of microphones tends to reflect more on build quality and engineering complexity (or scarcity of the parts and/or expertise in manufacture). The human ear is an incredibly well-tuned instrument. No one microphone offers a one-stop solution. The many quirks and vagaries of this technology has led from mere facsimiles of live performance being preserved for future "record" to an entirely new representation of the art-form that is music. To be part of this relatively new and rich heritage we urge experimentation and exploration. Whilst your ears should always guide to making great recordings it is also wise to be responsive to how these devices make you feel whilst performing, recording, mixing and listening,

FREQUENCY RESPONSE CHARTS EXPLAINED



A frequency response chart illustrates how any device responds to a signal by comparing the signal across a wide frequency spectrum (in this case, the top end of human hearing versus the low end). Most high-end microphones are tested in anechoic chambers - essentially rooms with no "sound" - but particularly no room ambience, reverb, or echo, which would form part of the input to the microphone. The analysis required is to record the impact of a microphone's design has on a signal, not the room it is being recorded in. White noise - a sound that contains all the frequencies of the spectrum being measured (it sounds like a continuous ocean wave) - is fed into this room via a speaker, and the signal is recorded by the microphone. The frequency chart is a graphical representation of how the signal, once recorded, differs from the original. Measured in decibels (loudness) across frequency (in hertz (or Hz). The original signal is referred to as the "flat" signal as all frequencies being produced have equal amplitude. The differences measured in the new, recorded signal are called the "response". How the microphone effects or "colours" that signal.

Fig. 02 is the frequency response chart of the hugely popular SM57. You can see it doesn't pick up anything below a frequency of around 50 Hz (most humans can hear down to about 20 Hz). It has a bit of a boost in signal around the 150 Hz mark. This is where you hear "bass," such as from a bass guitar or indeed a male human voice. The signal remains fairly "flat," i.e. representative of the white noise played into it, until a noticeable boost at around 2,000 Hz (or 2 kHz), which is where the human voice is most "intelligible for language." It has a sudden dip around 8 kHz, which is where a lot of "sibilance" peaks in a human voice, before providing response at the brighter end of the voice, followed by 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: It has a rich tone at the bottom, is true to the character of the voice in the middle range, and is nicely audible in the important high mids, scooping out some unwanted sibilance before providing some attractive bright top end.



POLAR RESPONSE

A common mistake when using microphones is thinking of them as recording the instrument, when in fact they are simply recording what that instrument (aka the source) is doing to the air around it. This is when other factors, such as proximity, room acoustics, background noise, and spill (sounds being made by other musicians around the source), come into play.

A secondary characteristic of a microphone, therefore, is its sensitivity to subtle changes in air pressure around it, influenced 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

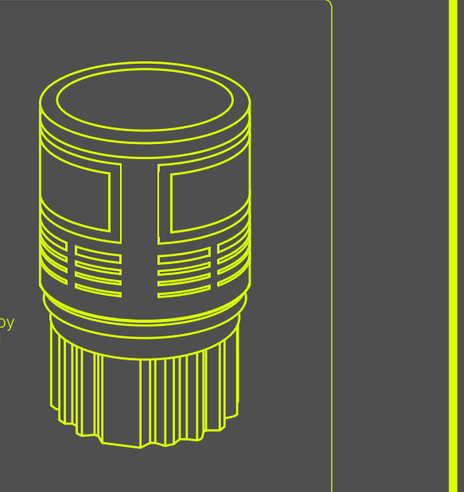
Cardiod	Sensitive to what is directly in front ot it.
Super Cardiod	Narrower pickup making it more directional.
Hyper Cardiod	Small rear lobe offers greater side rejection
Omni	Picks up sound equally from all directions
Bi-directional	Picks up equally from front and back
Ultra-directional	Picks up sound 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 uses three key components to do this: a diaphragm, which is highly sensitive to changes in air pressure, a metallic 'voice coil,' where this kinetic pressure-sensitive energy is transferred; 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. They are also durable in real-world situations. Their construction is suited to taking a knock here and there, and they aren't as susceptible to the effects of moisture or humidity as 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 will have a dynamic mic in it (usually the Sennheiser MKH416)—and nine times out of ten, your favourite podcaster will be sat in front of a Shure SM7B dynamic microphone.



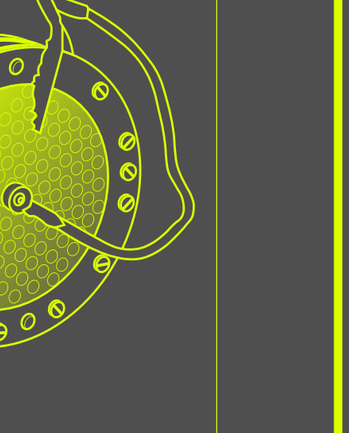
The "Unidyne III" Capsule employed by the Shure 57,58 and in modified form the Shure SM7B

CONDENSER

What condenser mics lack in robustness and durability, they 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.

Condenser mics require power to operate, whereas dynamics don't.



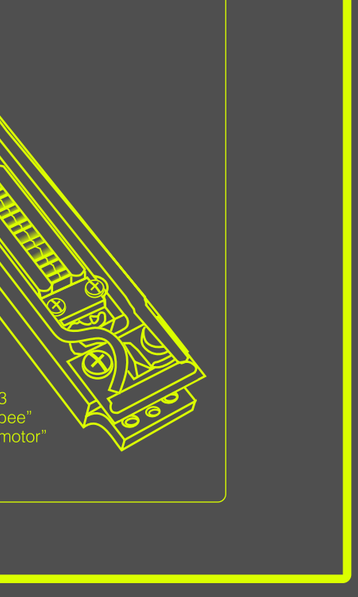
The K47. The most widely distributed condenser capsule in the world.

RIBBON

Ribbon mics are, despite being by far the most temperamental and precious of objects, in fact, a type of dynamic mic when strictly breaking down the technology behind them. They use 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 range of sources with a warm and flattering character, especially in the age of digital recording, where everything is laid bare in its sometimes bright and brash nature. A ribbon mic 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 those that don't often do not respond well to power, so a degree of nurture, care, and attention is always called for when employing them.

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



An RE323 "Bumblebee" Ribbon "motor"

48V THE PHANTOM MENACE

If there's one thing that makes an engineer stop a mere civilian from handling microphones, it is phantom power. It poses no risk to humans; however, it can really damage certain microphones. Yet, on pretty much all mic preamps, it is just a mere switch and an XLR cable away. This is because some microphones simply won't work without it, namely condenser microphones, which use "phantom" power for their internal amplifiers.

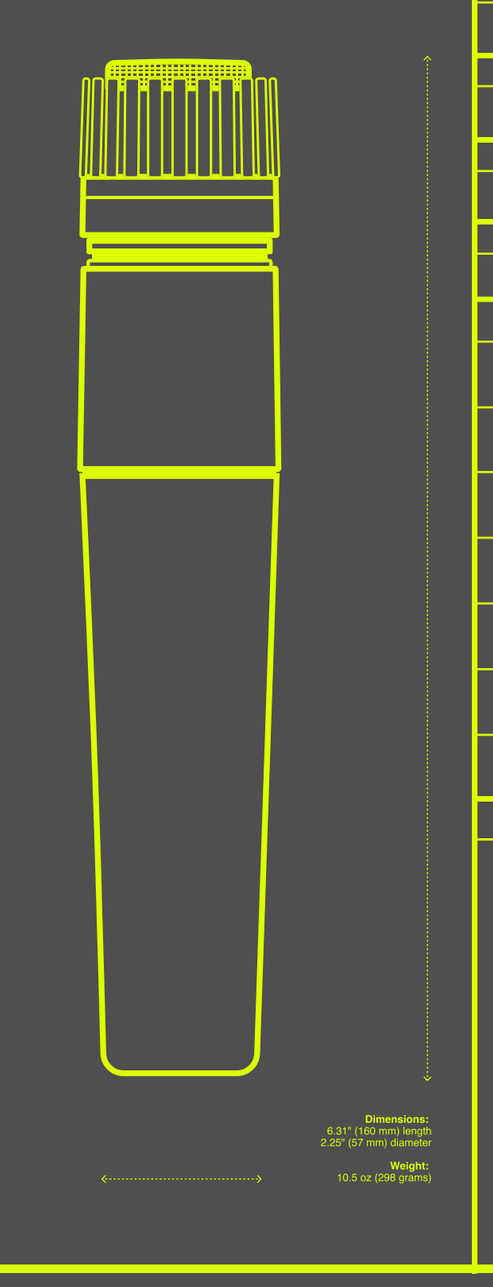
Phantom power runs from mic pres via balanced cables to the microphone. It is a direct current (DC) voltage (+48V with a tolerance of +/- 4V). The DC voltage is equally applied to both Pin 2 and Pin 3; hence the term "phantom"—when measured between Pin 2 and Pin 3, the voltage appears to be zero (0V).

Phantom power is indicated on mic pres by the label "48," "48V," or "P48." It is advisable to have it switched off when first connecting any microphone.

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 its SM58 sister) vocal mic in the history of recording technology. The SM57 is known for its affordability, sound quality, and durability, often making 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 three 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' and 'M' stand for 'studio microphone.'

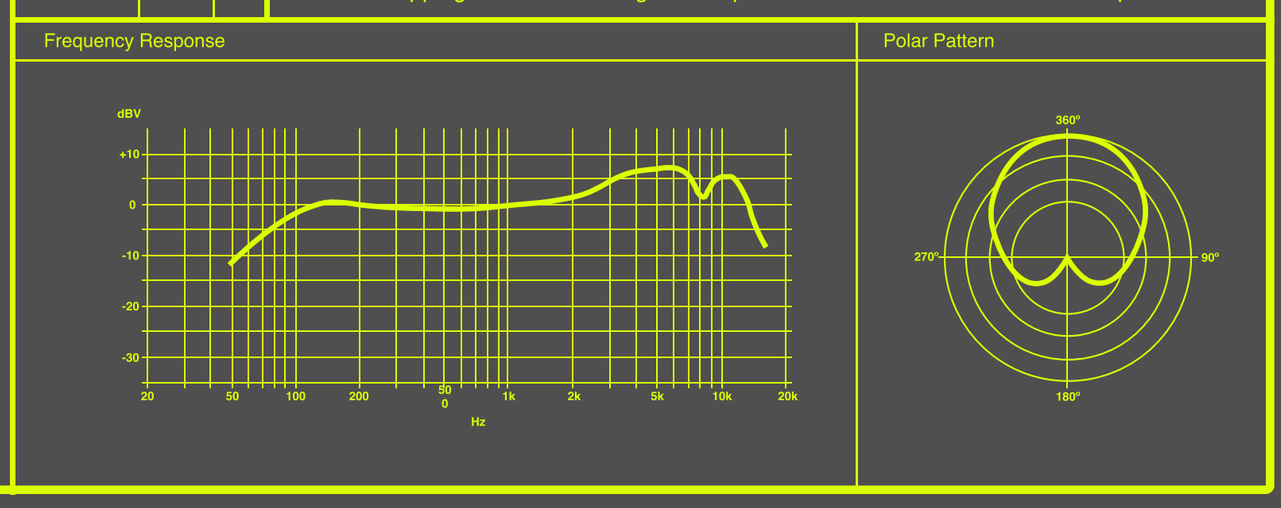
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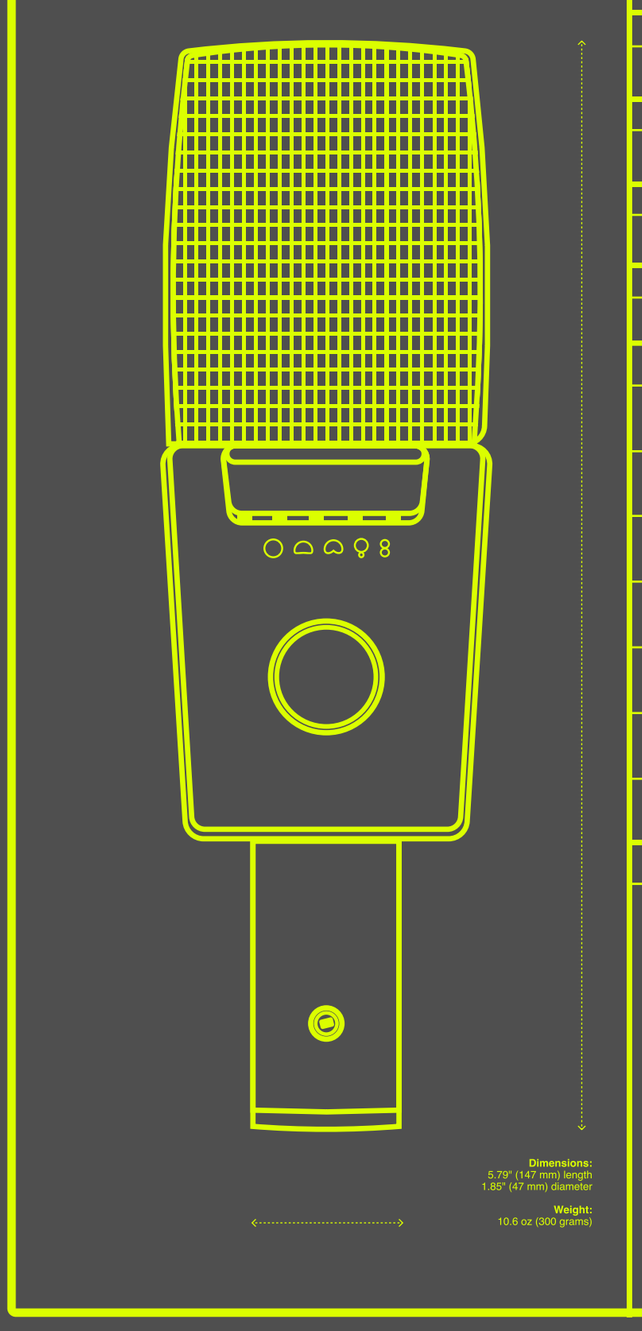
The build of the SM57 is almost identical to that of the SM58, with the only difference being the mouthguard on the latter. Its robust and durable nature is what made "mic drops" possible. You can throw these things against the wall, and they will live to fight another day. The SM57 is designed for sound reinforcement, which means it copes well in live environments and when recording high-pressure sources like vocals, drums, and backline. It has a notable high-mid boost and a 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. Its robust build, sound quality, and ability to really focus on what you're aiming it at, with limited surrounding crosstalk, make it ideal for home or project studios. Needless to say, its almost surprising affordability makes it highly popular everywhere. It is a microphone that will always remain in your mic cupboard and will offer you utility for the rest of your life. While designed for vocals, the SM57 is also highly popular as a microphone for drums (rack toms and snares are common uses). Or indeed strapping 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, perhaps due to its ubiquity. However, suspicion should be afforded to any recording facility that doesn't possess at least one of these stalwarts. Its heritage couldn't be richer, stemming from a direct lineage to the AKG C12, using the same capsule but with a more practical form factor. To 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 to do away with the C12 capsule. The new capsule is darker in character, and the only way to distinguish between these vintage C414s (some with the C12, some without) is to dismantle them!

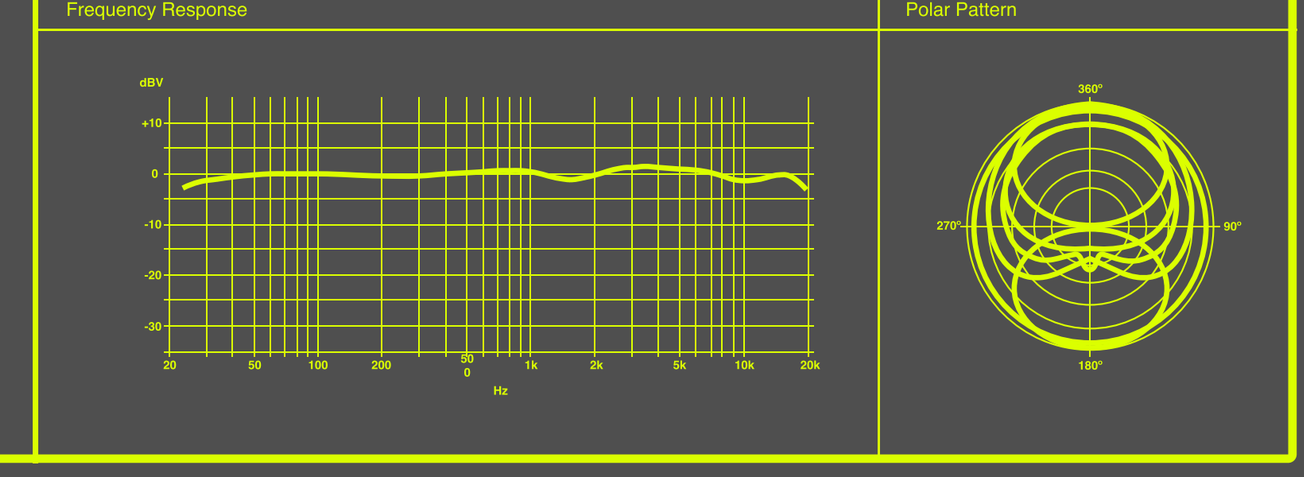
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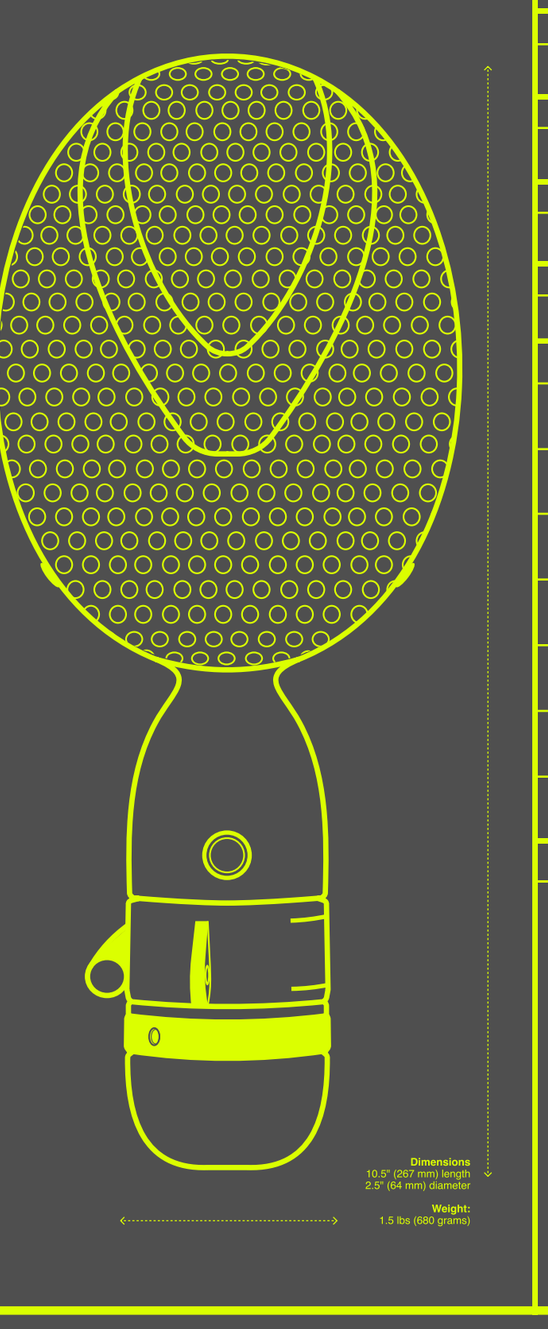
The C414 is a condenser microphone with nine selectable polar patterns, switchable from the body of the mic. Modern iterations of the mic use phantom power to light an LED clearly indicating the polar pattern selected. Because of this multi-pattern capability, the C414 could arguably be called the most versatile mic on this sheet. Most studios have a whole clutch of them. While they may not be the first choice for engineers (who often sneer at them), they are often deployed in situations where numerous mics are required (for example, as drum overheads). It is a robust mic that can take some punishment, 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 with multiple mic setups, such as 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 excellently 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 tracking" 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 was called BBC PGS/1. This design was developed further to become the STC 4038, utilising 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. While techniques used in the production of the components have evolved over the years, 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.

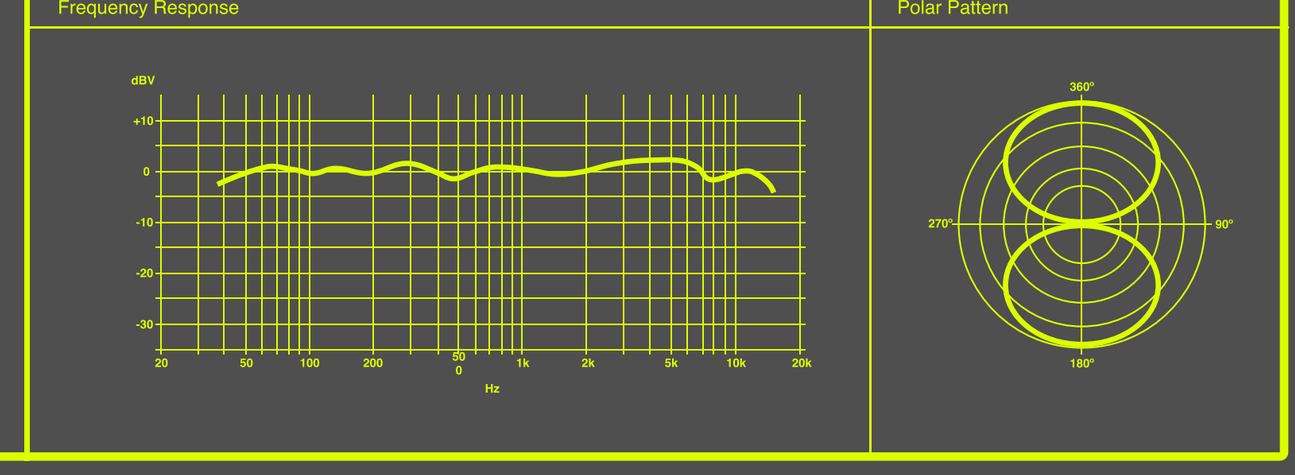
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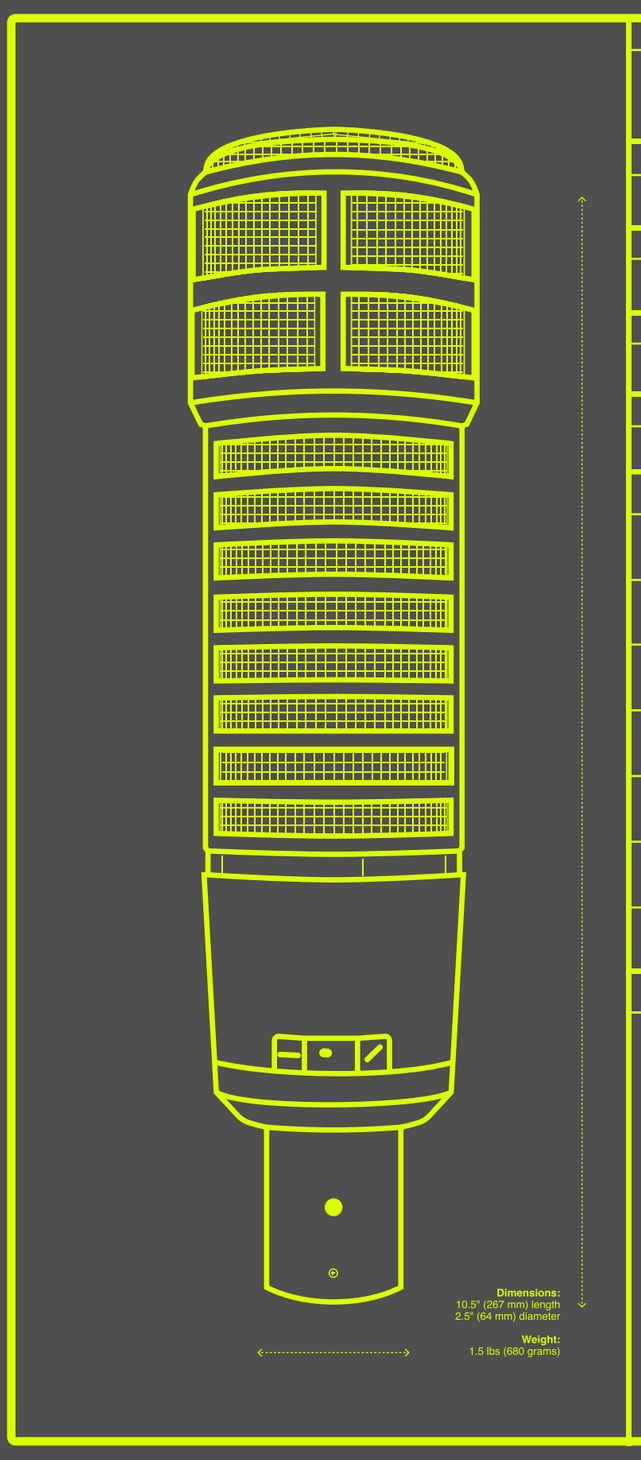
If there is one piece of advice anyone could give you about the Coles 4038, it would be "don't drop it on your foot." With a "waffle iron" casing made of solid cast iron, these things are almost guaranteed to make your mic stands droop. While the build is robust, it is a ribbon microphone and has a few Achilles' heels common to all ribbon mics. Huge pressure differences (i.e., 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 exercised 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 sibilant-free. Its 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-eight pattern, it is ideally suited to recording the air around the instrument, not just the instrument itself, which is why one of its 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 condenser microphone, the RE20 embodies a number of design and technological idiosyncrasies that give it a well-earned place in recording environments. Its unique design and iconic look (think of famous images of Stevie Wonder, James Brown, and the fictional DJ Frasier Crane using them to record) are intended 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.

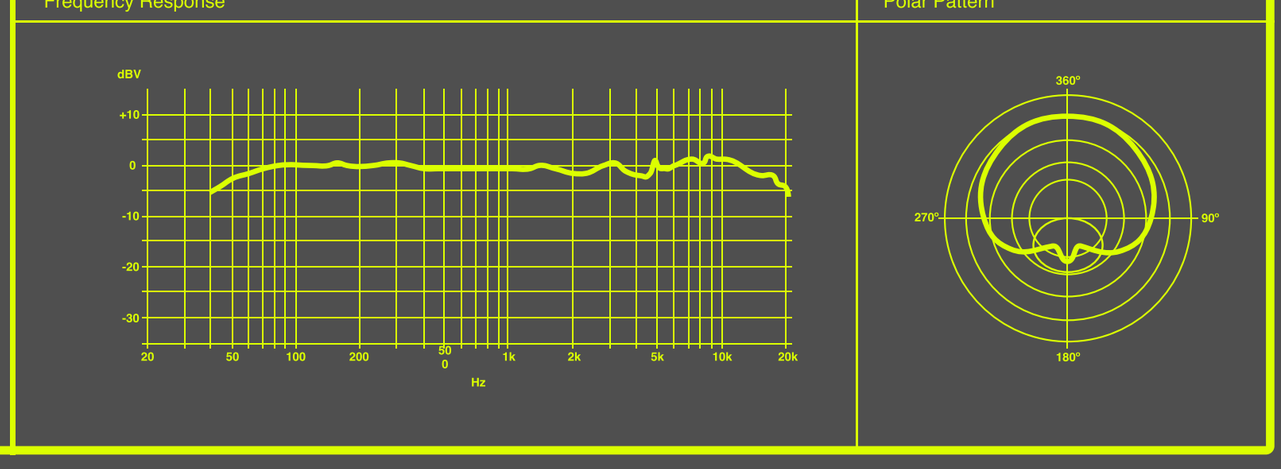
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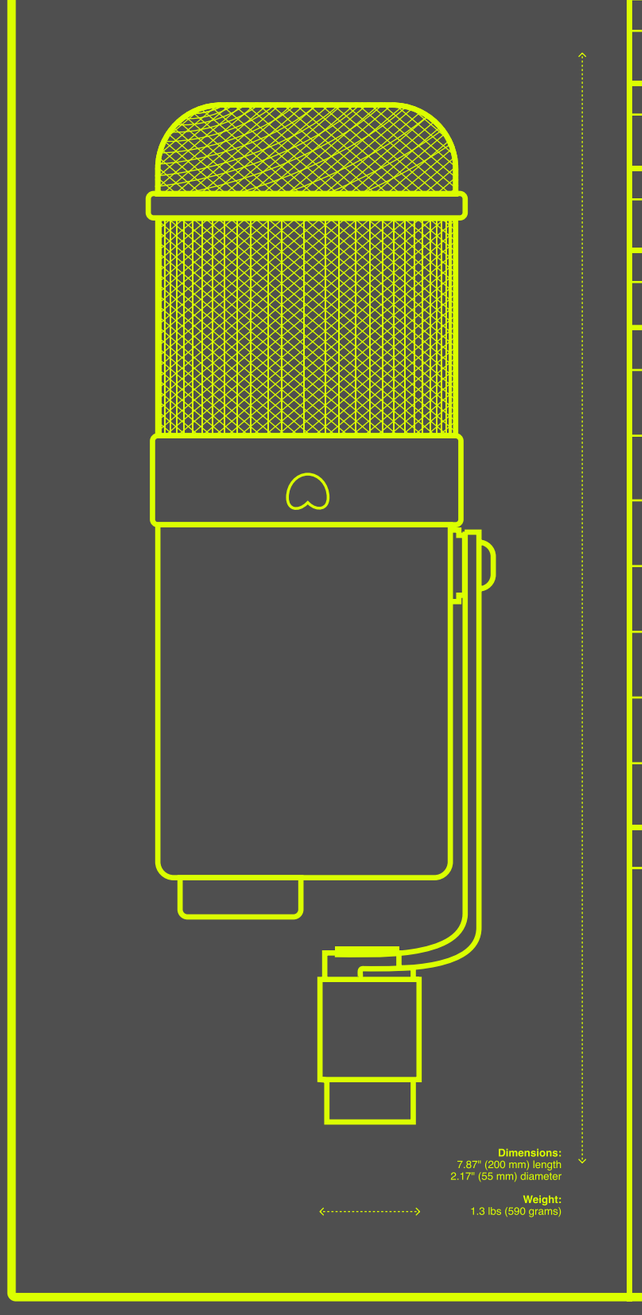
The RE20 is an incredibly robust microphone. However, because of its size and weight, it offers little practical use in the live environment. With radio announcers in mind and the dynamic nature of speech as a prime concern, the RE20 is designed to prevent sudden gain spikes and the ensuing distortion. This does, however, mean that the gain response of the microphone is less than that of most dynamic mics, requiring careful selection of a microphone preamp to get the best out of it. Podcasters who use this mic often pair it 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. While 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 its ability to provide clean, tight, and intelligible vocal recordings. Because of its shape and colour, it is known in German recording environments as "elefantenhahn," or "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), houses a Telefunken VF14 tube developed specifically for the microphone. It broke every mould, not least with its revolutionary (for the time) compact design. Manufacture stopped in 1965 when Telefunken halted 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.

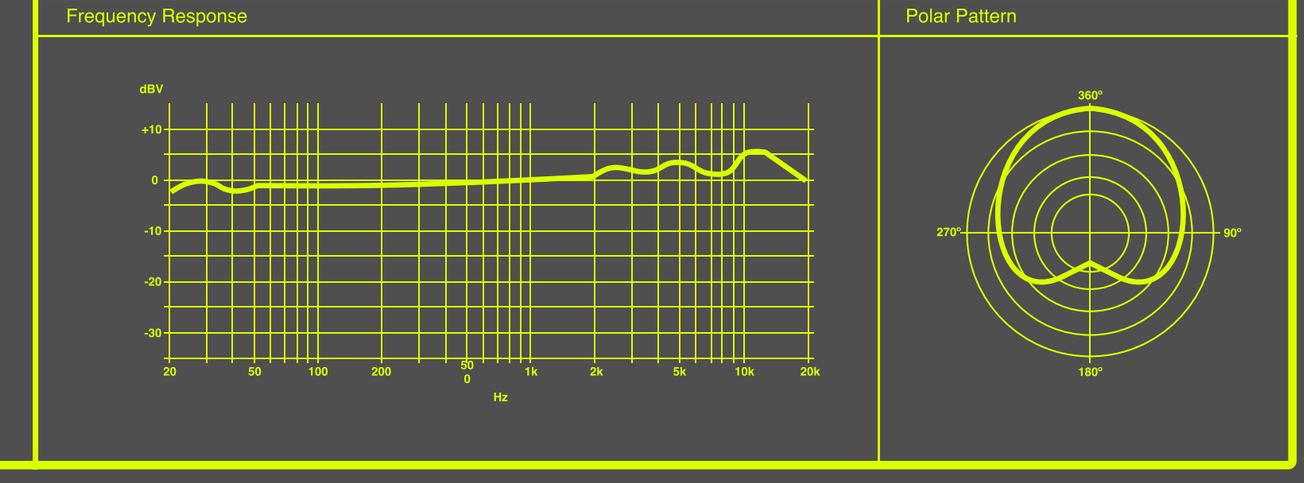
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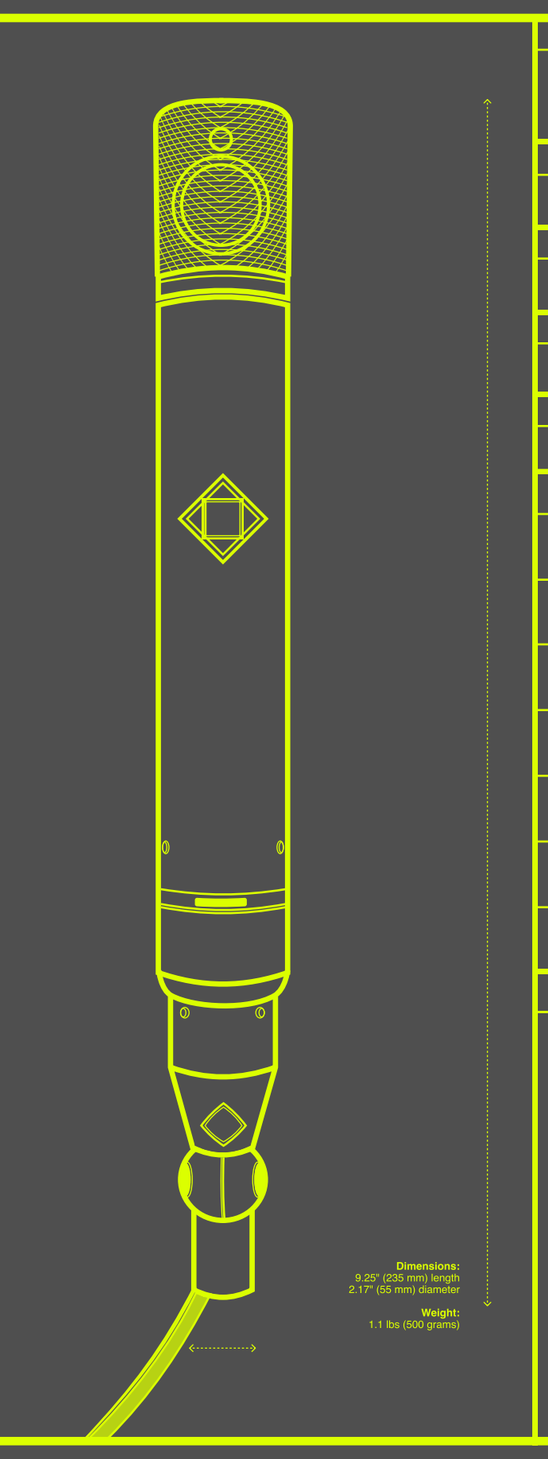
The U47 introduced several innovations to microphone technology, including switchable polar patterns without changing the capsule, a relatively compact and lightweight design, and the use of high-end components, including the VF14 tube. Despite being discontinued over 50 years ago, the U47 continues 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 achieve the same phenomenal success as the original.

Use(s)

The U47 has a distinctive "warm" sound that defines a "retro" quality, keeping the original models in demand and for high prices. It works well with 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 its arch-rival Neumann. It is commonly considered to be the holy grail of vocal mics, with Sinatra and Presley 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 its ubiquity, meaning the C12 was never manufactured in the same volume as its rival. This is 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, causing confusion due to numerous different specifications being given to both labels. Needless to say, the modern AKG C12s are not the same mic as the vintage ones, hence their revered status.

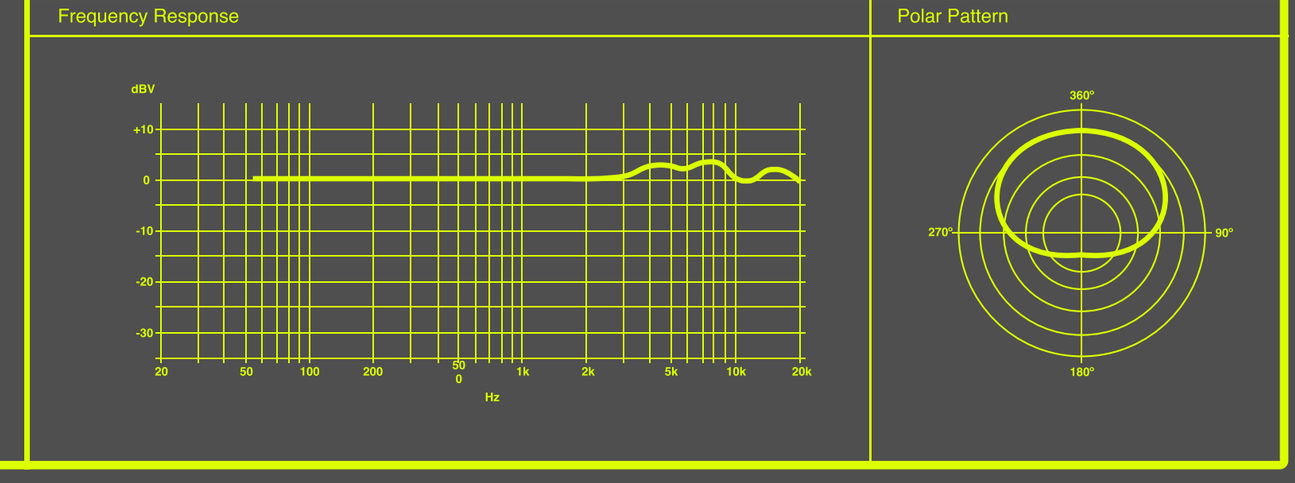
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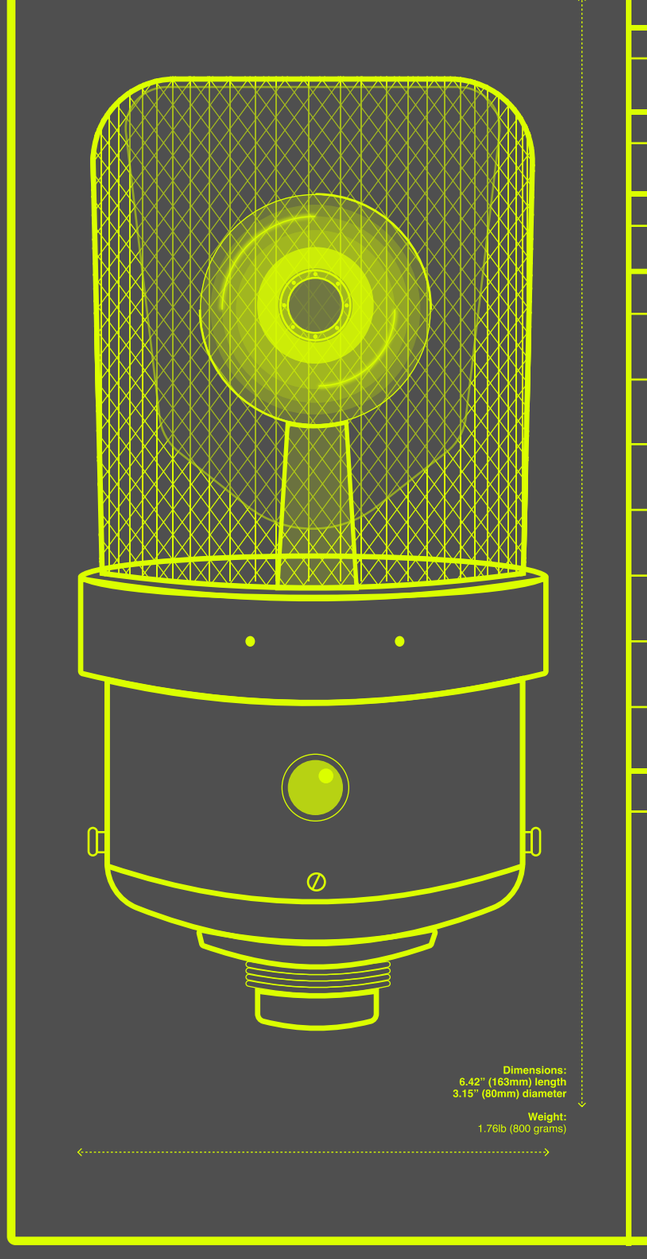
Part of the C12's struggle to achieve dominance was in the complexity of its manufacture, with a capsule alone comprising over 100 hand-assembled parts. Being later to the game than the U47, it made up for time with technical versatility not offered by its nemesis, namely nine polar patterns via a remote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

Use(s)

The C12 has been featured on numerous recordings by Led Zeppelin, The Beatles, and famously in a 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:

Developed in consultation with Nordwestdeutscher Rundfunk and Northwest German Radio, the M50 is an undeniable legend in its field. Its use in 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 capsule to a Telefunken one, as denoted by the addition of M50A to its 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.

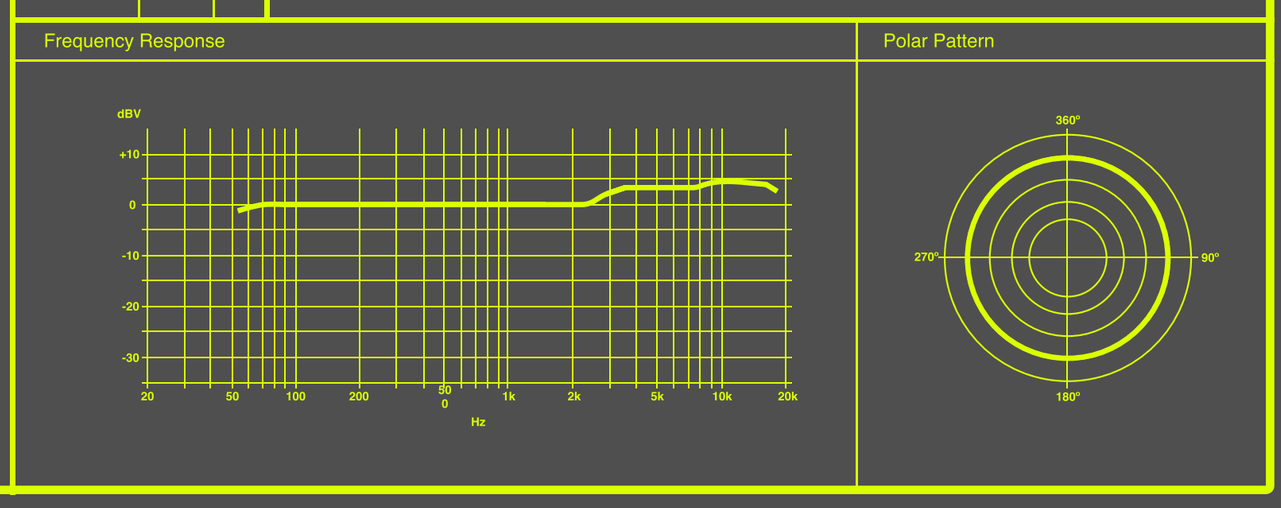
Build & Care

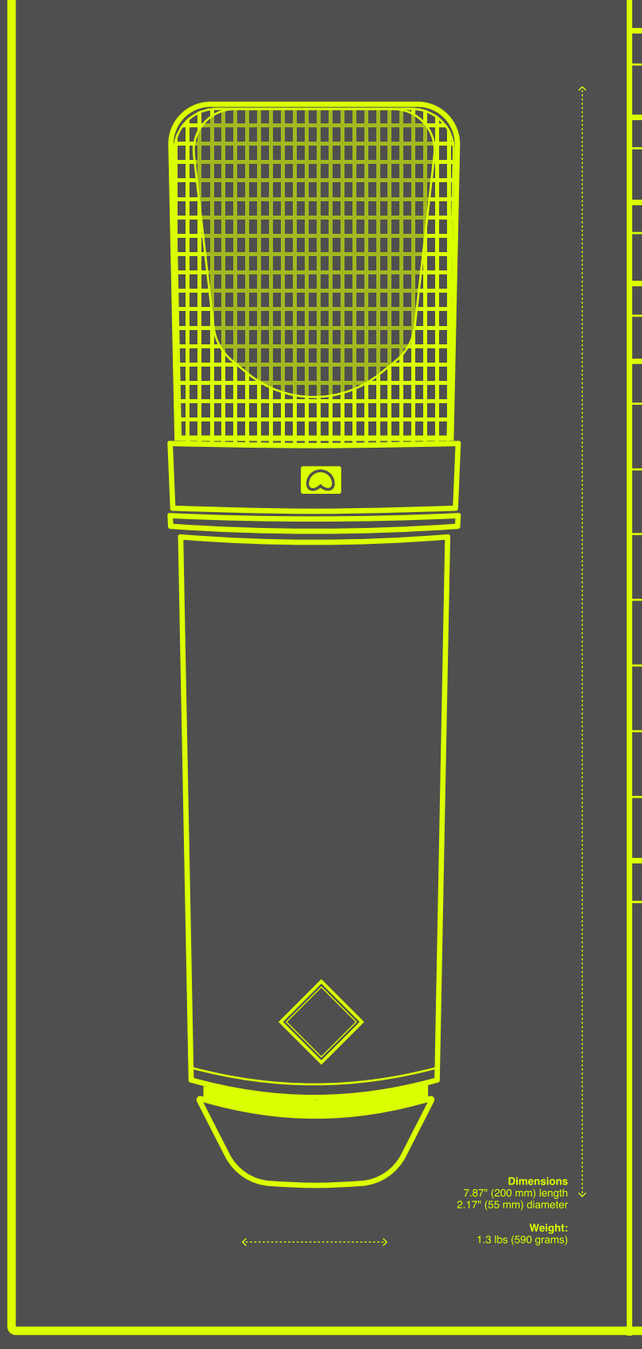
Despite its bulk, the M50's body conceals a very small capsule encased in a novel see-through acrylic globe. This creates a unique polar pattern that is highly omnidirectional throughout the frequency spectrum, becoming more directional at high frequencies. This pattern naturally favours the orchestra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

Use(s)

Because of their sought-after status and unique brilliance in a Decca array, studios that play host to these rarely 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. Nothing is better than the original "king of mics," which is why finding them second-hand is a tiresome and expensive business.

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, the U67 features a number of technical innovations. Its mid-range is often quoted as "authoritative," with a very musical roll-off of the very top end that gives it a smoothness not found in its younger brother and arguably more commercially successful sibling, the U87. Its three-pattern functionality and flat frequency response across all polar patterns contribute to its versatility. Reissues have been created in both 1990 and 2016, leading to differing views on how they truly perform compared to the older models.

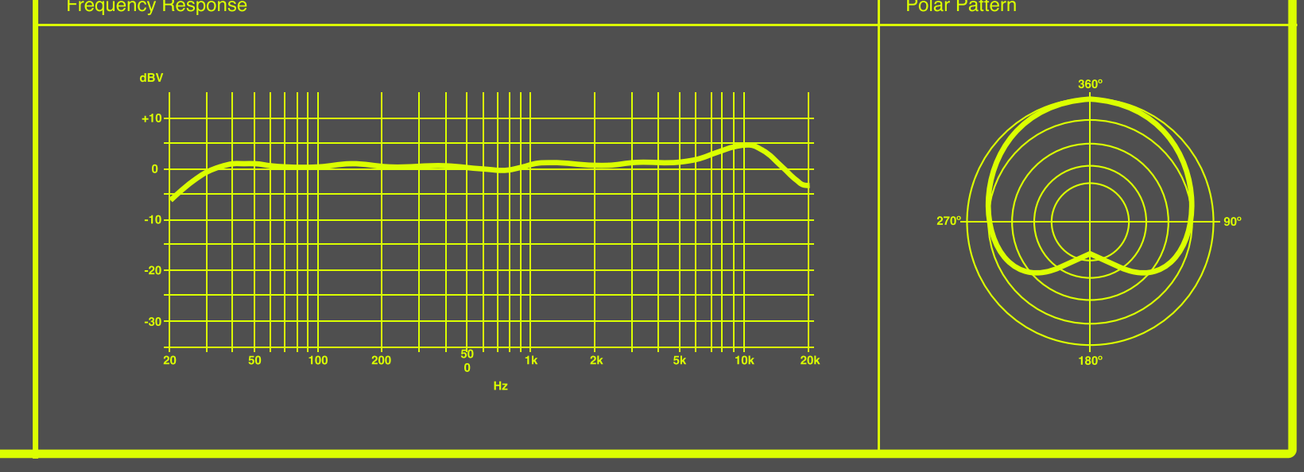
Build & Care

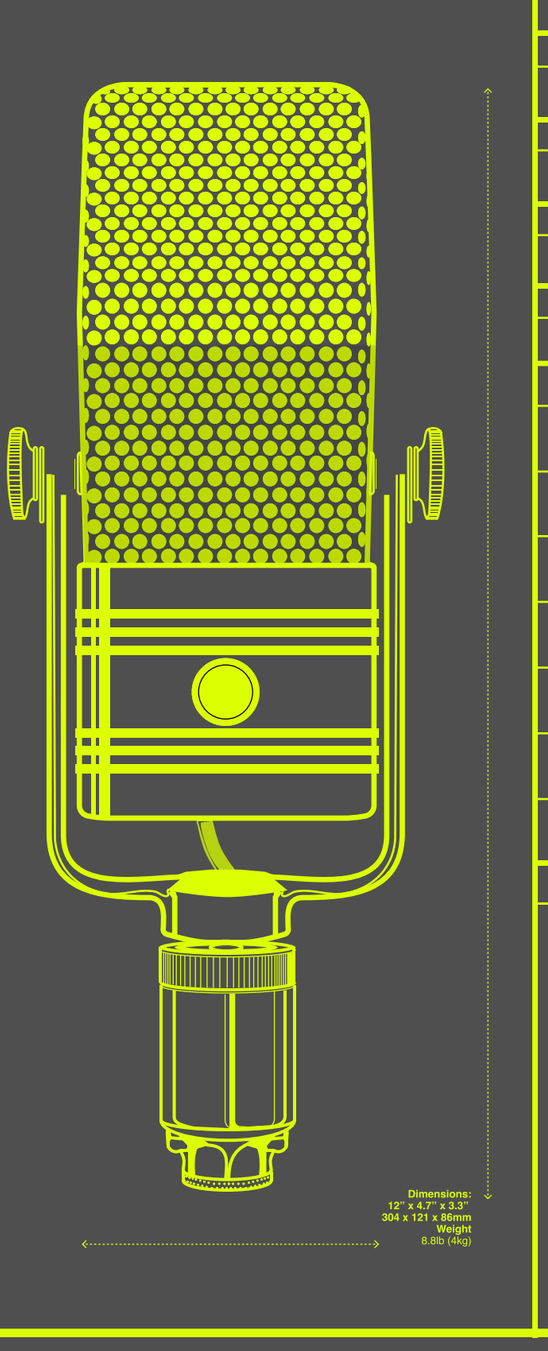
The U67 introduced the K67 capsule to the world, which has since become the most widely used (and widely copied) capsule on the marketplace today. It is a large-diaphragm dynamic capsule made of a thin, lightweight metal foil. The capsule is suspended in a magnetic field and features a neodymium magnet 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 body shape for a condenser microphone is one of the most familiar and most imitated profiles in recording technology.

Use(s)

Not only suitable for vocals but also highly effective for recording strings, woodwinds, brass, piano, drums, acoustic and electric guitars, bass guitar, and upright bass. A useful comparison between the U47 and U67 can be found in recordings of Paul McCartney with the Beatles. Largely tracked at Abbey Road solely on 47s and 48s, 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 acclaimed for its smooth, warm, and detailed sound, making it a favourite among engineers and musicians. Its iconic form factor and design house a 1.2-micron thin, corrugated aluminium ribbon suspended between two poles of a strong Alnico magnet.

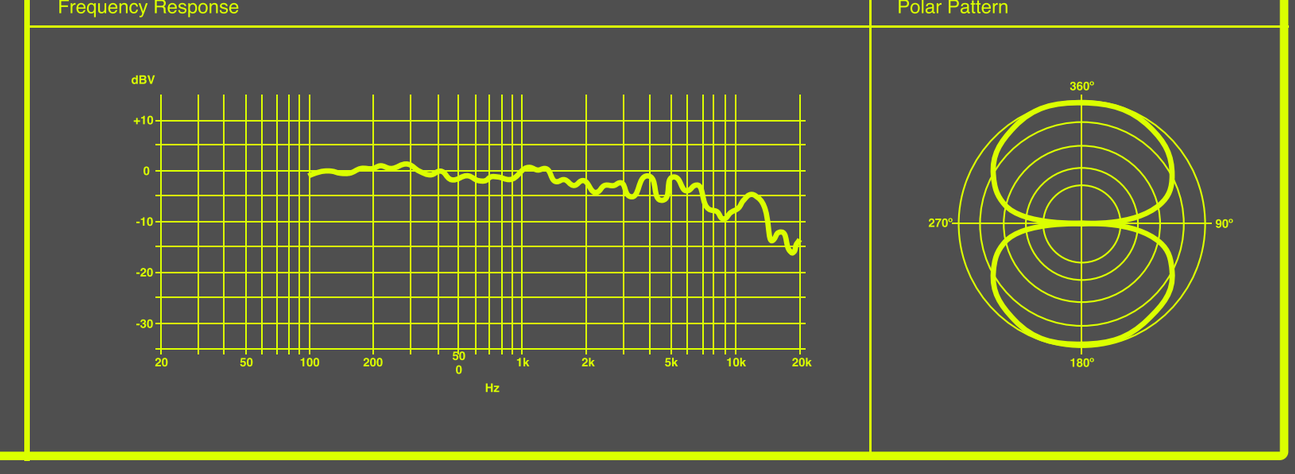
Build & Care

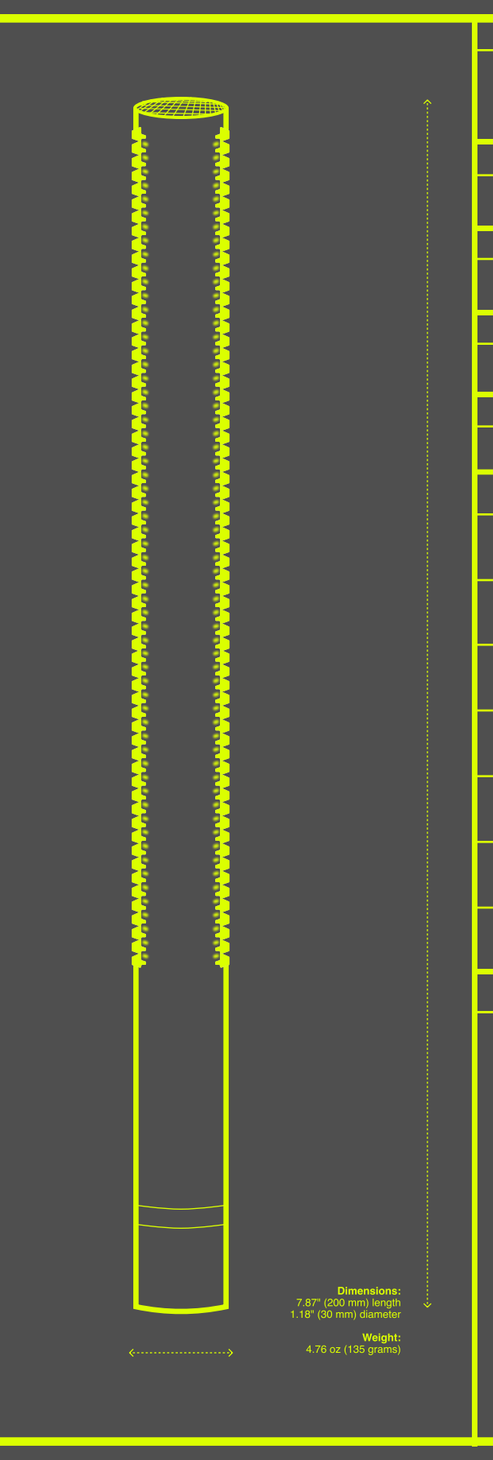
Wes Dooley, a specialist in ribbon microphones, began servicing and repairing thousands of existing RCA 44s. By 1998, AEA had acquired 100% of the interchangeable parts used within the original RCA 44, allowing them to recreate the microphone to its original specifications. Inspiration had come from 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 is likely to cause serious damage to anything in its path should it not be correctly cantilevered to remain upright!

Use(s)

Its warm, iconic sound lends itself well to vocals, strings, woods, and guitars. Care should be taken when pairing this with a mic preamp. AEA makes one suited purely for the purpose of giving ribbons the oomph they need. You should see the mic as half the story here. Once correctly amplified, it suits recording sources set back further from the microphone. Its 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. It has been favoured by location sound recordists for over four decades. If you spot a mic dropping into the top of the frame, and 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 and silky bass-end, but primarily for their hyper-directionality, while predominantly used in mobile location settings, their value (with caution) in stationary positions indoors has become more popular. Recent sightings include the ever-popular Tiny Desk YouTube series.

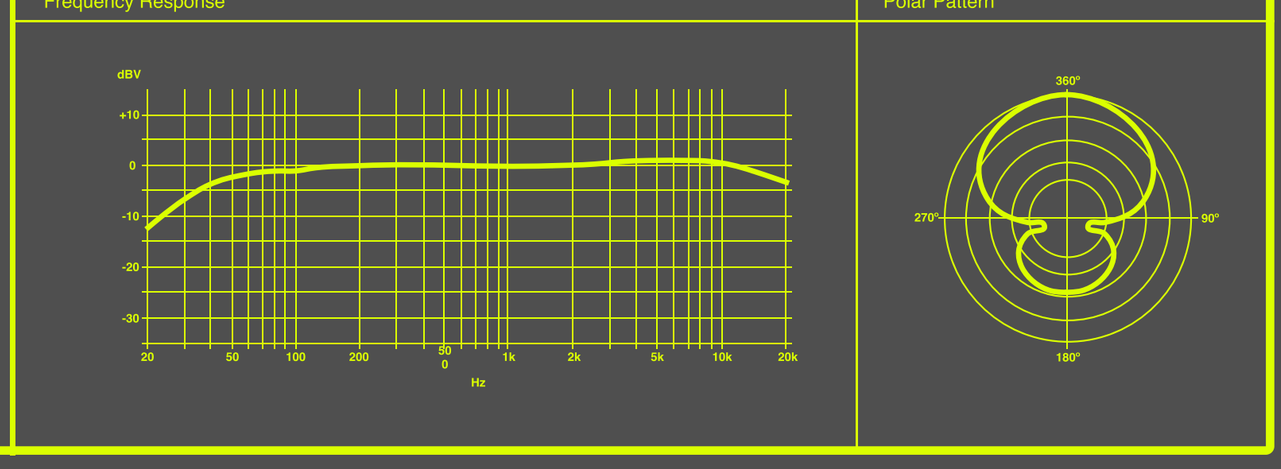
Build & Care

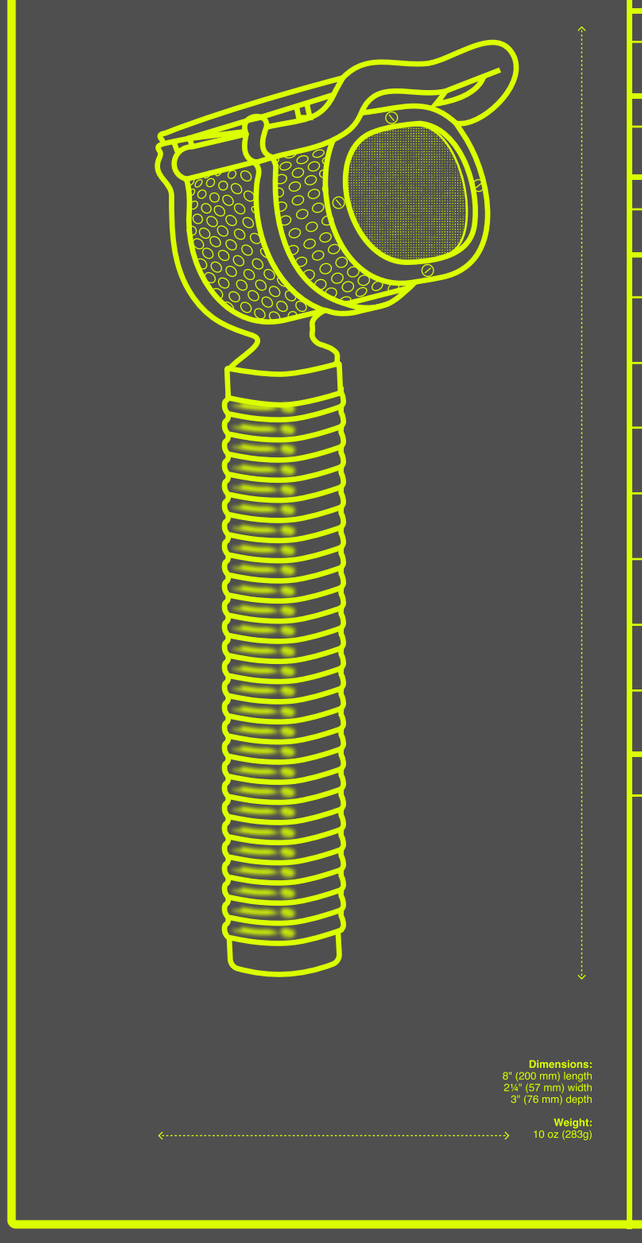
Part of its popularity, alongside practical recording considerations, is its reliability and robustness in a variety of conditions, including high wind, extremes of heat, and humidity. The 416 has several innovations that have elevated it to its stalwart status, namely its ultra-cardioid polar pattern and short interference tube design, both of which suit high directionality in noisy environments. Moisture resistance is part of its fundamental construction, and its wide frequency response 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 swivel 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 in a large blimp, and in windy conditions, these blimps will use a "dead cat" (a 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," it is a true icon of cinema, not for its practical use for sound recordists, but more often as a prop. Whether a character is commenting on a boxing match or a horse race, chances are they will be sporting one of these pressed against their mouth. The technology behind it was originally commissioned by the BBC to provide war reporters with a microphone to use in high-noise environments—namely battlefields. With a direct lineage to the Marconi "L1" (developed in 1937), this all-too-familiar form factor dates back to 1971. It was originally developed by STC, but is now manufactured under licence by Coles.

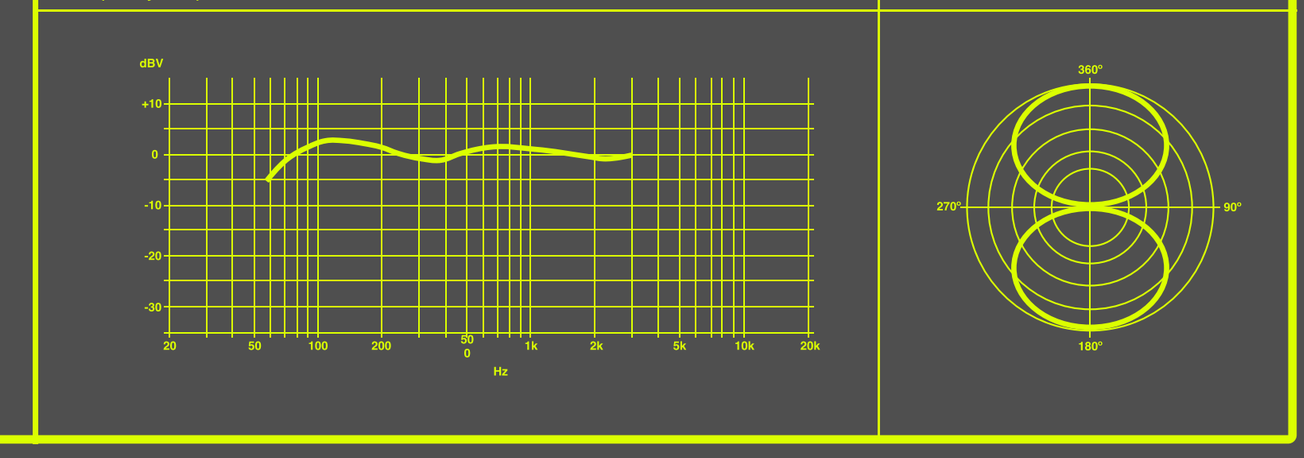
Build & Care

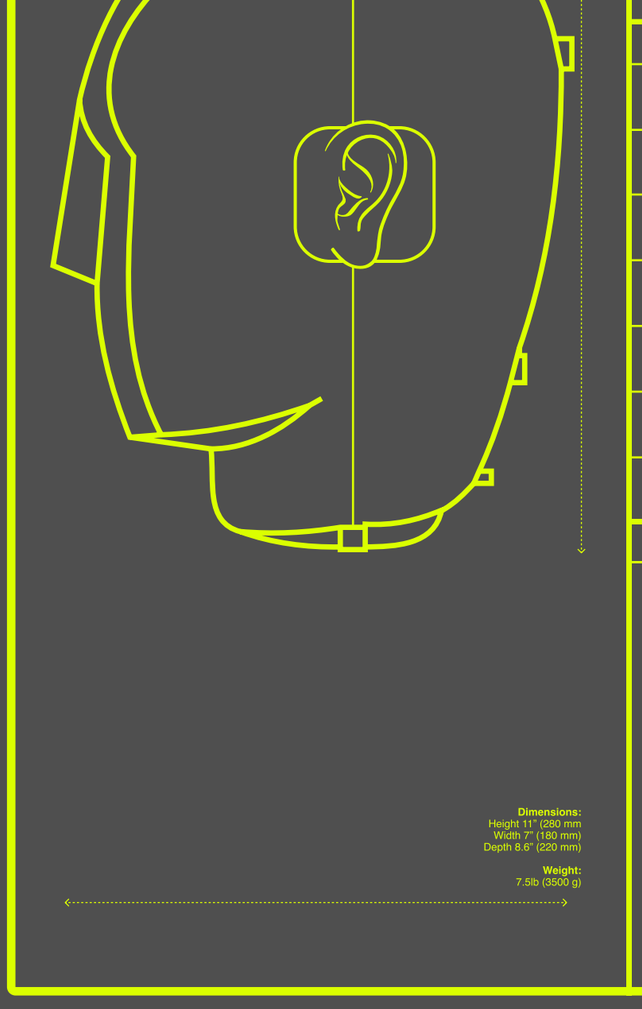
It uses a low-mass corrugated aluminium ribbon protected by fine woven nylon gauze. Its iconic lip guard ensures optimum efficacy of its noise-cancelling characteristics by employing the proximity effect (increased bass response) in conjunction with a low-frequency cutoff and its (highly dampened) corrugated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

Use(s)

Whether at sports events with screaming crowds or indeed screeching engines, the microphone is still very much in use despite its 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 from 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 (the Coles 4115).

Frequency Response | Polar Pattern





Model Name: **KU100** | Manufacturer: **NEUMANN**

- Type: **Condenser**
- Date: **1971** | 48V: **X**
- Nationality: **Germany**
- Corporation: **Georg Neumann GMBH**

Pattern(s)

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

History:

Both iconic and terrifying in appearance, the Neumann "dummy head," is a microphone designed to imitate human hearing, providing a set of stereo signals that offer an immersive 3D or surround experience, provided certain listening conditions are met. By introducing nose, ear, and head profiles into the recordings, it captures the countless ways airwaves interact with these depending on proximity and direction, creating a binaural experience. However, because everyone's ear shape, nose, and head shadows vary greatly, the playback experience can differ widely between listeners, leading to somewhat surprising results.

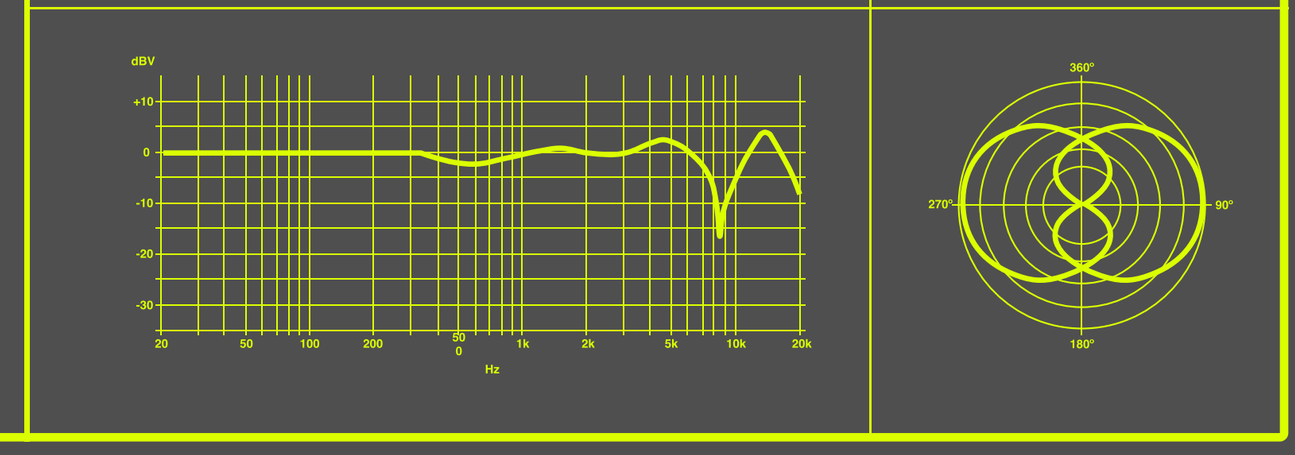
Build & Care

Two high-quality omni-directional capsules have been built into the cavity of two accurately rendered human ears, complete with rubberised material that emulates the elasticity and absorbency of the real thing. The fake head is a solid mass that also contains all the circuitry and a dedicated mic preamp. The KU100 delivers a balanced stereo output (from the neck) via a single bespoke breakout cable (that splits into two male XLRs externally from the device) or indeed two unbalanced outputs via BNC cables. The head is the same weight as that of a human, so care should be taken when mounting it onto any microphone stand or boom.

Use(s)

Whilst there is no doubt about the immersive quality of the signal being recorded, the recreation and efficacy of the experience are limited to the listener using headphones. When switching to speakers, crosstalk and your own nose, ear, and head shadows interfere with our own cranial decoding, and the sense of proximity and direction is lost. However, due to the high quality of the components within, engineers have found that it delivers a very high-quality diffused signal that integrates the recording into a stereo mix like no other.

Frequency Response | Polar Pattern



NOTABLE OMISSIONS
A note from the curator

I have no doubt the engineers amongst you will raise your eyebrows at some omissions. No PZM mics? What about the D112 kick drum mic. Lavaliers, KMs. Nothing by Sony, Rode, Audio Technica? But possibly most noticeable omission the eponymous U87. The mic most studios are judged to be "worth their salt" by owning? Just like it would be possible to make an authorative guide to Red Wine without leaving the region of Bergundy. It would also be very possible to simply make a list of mics that ventures no further than the factory walls of Neumann. It is this author's opinion that the U87 is more of a 'compilation' mic based on technology developed for the show-stoppers included on this sheet. It is the lazy recommendation of so many salespeople simply because of its ubiquity. They're not best suited to home or project studios. Whacking one of these in front of any singer shows a lack of empathy for the individualism of the human voice we so vehemently celebrate. For any instrument or style of performance you're capturing we feel that there will always be a mic well within the U87 price range which is better suited to the job. Unless you have simply vouched for a mic that "pretty much does anything" which betrays the spirit of this list.

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Design, layout & written by Christian Henson

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