

 **DISC MAKERS**® PRESENTS

VOLUME 4: The Home Studio Microphone Guide

Finding the right mics for every situation and every budget

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After the instrument, and the player, the microphone is arguably the most important element in the recording chain. The preamp matters, as does the console, the speakers, and the entire signal path, but the microphone and your mic placement techniques are the means of capturing the sounds you are trying to record. A poor quality or ill-suited mic, or a mic placed in the wrong spot at the wrong angle, will make the best performance sound sub-par.

There are different types of microphones, but they share a few things in common. All are transducers, converting energy from one form to another. In this case, a microphone is a transducer that turns acoustic energy (sound) into electric energy, or an audio signal. In addition, every microphone has a diaphragm, which vibrates when sound waves move the air and converts those vibrations into the audio signal.

One thing that sets mics apart — oftentimes universes apart — is the price tag. As a rule, the type of mic, the quality and expense of the components, the artistry involved in crafting the mic, and the science behind the construction all factor into the final price. While a higher-quality microphone does tend to result in a higher price tag, i.e. the more expensive the mic, the better it is, there are many gems that outperform their contemporaries in similar (and sometimes higher) price ranges, and others that are simply better suited to particular situations.

So when you're ready to pull the trigger and lay good money out for a microphone — or a set of microphones — for your home studio, where should you begin? First, ask yourself, "what am I recording, and what kind of sound am I going after?" There's no doubt that a huge arsenal of mics of varying types and character can help make a producer/engineer/studio's reputation, but any quality mic collection takes time (and money) to assemble. If you're just starting out, working within a budget, or hungry for the next great mic to add to your stable, here are some ideas to get your motor running.

Types of Mics

Different types of mics are categorized by the type of element used: condenser, electret (condenser), ribbon, and dynamic. There are a number of other types of mics (carbon, piezoelectric, fiber optic), but condensers, ribbons, and dynamic mics are the mainstays of music recording.

Condenser Microphones

Very popular for all types of recording situations, condenser microphones provide a very accurate representation of the source. They work well on quiet and subtle sound sources, like an acoustic guitar, and can also pick up loud sound sources, like a drum kit, without losing detail.

A condenser mic houses one or two electrically charged plates, usually Mylar sputtered with gold or nickel, and built into most is a transformer. Because they are electrically charged — through a battery, phantom power, or in the case of electrets, by the electric charge inherent in the mic's materials — a condenser's capsule is very active and sensitive to even slight pressure fluctuations, which is the main reason condensers are so accurate.

There are different sized condenser mics, and it's the size of the diaphragm that dictates the area of concentration. A vocal

condenser mic will typically have somewhere between a $\frac{3}{4}$ " and $1\frac{1}{4}$ " diaphragm. In general, a 1" diaphragm mic is ideal for vocals and other instruments where you're trying to pick up the low end, and particularly with a vocalist, you can achieve a proximity effect, meaning that when the vocalist gets closer to the mic, it makes it sound like the voice is closer to your ear (bass frequencies are also boosted).

Small diaphragm condensers have a diaphragm that's anywhere from $\frac{1}{2}$ " to $\frac{3}{4}$ ", and are a good choice for instruments that have a lot of high-end energy, such as acoustic guitar and drum overheads. You will often find small diaphragm mics set in a stereo pattern.

Different model condensers all have different characteristics: some have multiple pickup patterns, low-frequency rolloffs, attenuator pads — some of them are tube, some of them are FET (field-effect transistor), some are transformerless, with and without IC chips, and they all produce a very different sound. Five different types of condensers used on the same instrument are going to sound very different, depending on the technologies used, materials, diaphragm, etc.

Condensers are not commonly used in live situations as they generate feedback fairly easily and are more fragile than a dynamic microphone. Moisture or good knock from a drumstick can permanently damage a condenser mic.

Ribbon Microphones

Ribbon mics go back to the late 20s, when RCA embraced the technology and made it popular. Think of those images of Frank Sinatra standing in front of the RCA 77DX, the pill-shaped mic that was incredibly popular from the '30s through the late '60s. They were a studio staple: they looked cool, they were cool, and they were large because magnet technology hadn't been perfected until after WWII. After that, ribbon mics were manufactured with smaller, more powerful magnets, and the size of the mics shrank.

Ribbons faded out of favor for many years for a number of reasons. First, you need a very strong preamp to use them, like the original RCA preamps that could provide a 50 Ohm boost (preamps today often come equipped to handle a ribbon). More notably, ribbon mics were incredibly fragile. Drop a vintage ribbon mic, blow into it, or slam a door in a tight room and the element is broken and it was off to the shop. The element is literally a pressed ribbon of corrugated material (usually aluminum) stretched across a magnet, and that thin ribbon was liable to break with any amount of air pressure. Ribbon mics are still fragile, compared to dynamic mics and even condensers, but windscreen technology has advanced to make them much less prone to destruction.

A ribbon mic is not the most versatile mic, but what makes them so enduring is their unparalleled midrange detail. Ribbons were, and still are, really popular for some types of vocalists, but what they were used for all the time were horns. A saxophone, and all kinds of brass, has a signature midrange that plays to a ribbon mic's sweet spot. They're still popular on horns and strings, and you'll find them being used on guitar cabinets and drums as well. A ribbon mic on a vintage Vox AC30, or used as a room mic, will produce a very organic sound.

Ribbon mics tend to be on the more expensive side of the scale, though there are a number of Chinese-made ribbons that can be found new for under \$300. Be aware that you may find inconsistencies from mic to mic in the lower price ranges, due to the variation in tensioning of the ribbon element. For the more adventurous, vintage ribbon mics can show up at flea markets and garage sales. Find an old ribbon mic at a flea market for \$50, take it to a professional who can re-ribbon it, and there's a chance you'll be sitting on a \$500-\$3,000 microphone.

Dynamic Microphones

Dynamic mics were originally designed to be a replacement for ribbon mics because they can handle high sound pressure levels (SPL) and can handle being thrown around. Dynamic mics don't have nearly the character or articulation of a condenser, but they are very resilient to damage, even if they're dropped.

Dynamic mics are probably the most commonly used mic (think Shure's SM57). Dynamic mics are relatively inexpensive, and there are a host of uses for them, including recording drums, guitar cabinets, bass cabinets, horns... almost everything. In a studio, you won't usually see them on vocals or acoustic guitar, or anything that has a lot of detail in the top end, though there are

notable exceptions to this rule.* In a live setting, a huge percentage of the mics being used are going to be dynamic. They're designed to withstand a ton of abuse and keep feedback in check.

**One famous exception is Bruce Swedien, who engineered the bulk of Michael Jackson's catalog, using a Shure SM7B to record Jackson's vocals for the bulk of the Thriller album. A quick search reveals that Metallica and the Red Hot Chili Peppers use the same mic (the list goes on). Considering these are industry giants working in the best studios in the world with producers and engineers who can demand whatever they want, the fact that they choose a \$349 dynamic microphone for vocals is the ultimate case in point that a higher price tag doesn't always mean it's the right mic for the job.*

Pickup Patterns

A microphone's pickup pattern (or polar pattern) refers to the breadth of its area of concentration. In other words, it refers to how sensitive the microphone is to picking up a sound source relative to its central axis. Most mics have a fixed pattern, though some studio mics include a range of pickup pattern choices by way of a switch on the mic or a remote control unit. (See Pickup Pattern diagrams on page 4.)

Omnidirectional

An omnidirectional pattern will pick up 360 degrees around its element. While it picks up sound sources equally from every angle, you may find that there is a slight flattening of the response from sources coming in from the back of the microphone. But if you have one mic and you want to pick up everything going on in the room, like a choir or a circle of singers or strings, an omni mic setting is the one to use.

Bi-directional (Figure-8)

A bi-directional (or figure-8) mic will pick up sound sources equally from the front and back of the mic. A bi-directional mic has two elements, one is negatively charged and the other positive. Most ribbon microphones have a bi-directional pattern, which is useful if you have two sound sources you want to record, like a duet of singers or instruments.

Cardioid

Cardioid is a tighter pickup pattern, and gets its name from the heart-shaped pattern seen in the diagram. The most popular mic pickup pattern, cardioid mics will pick up sound sources in a fairly wide range from the front of the mic, will taper out sources not directly in front, and have almost no sensitivity to sounds coming directly from the rear of the mic. This helps reduce feedback and focuses on the sound source.

Hyper-Cardioid

Compared to a Cardioid pattern, a hyper-cardioid microphone has a tighter area of front sensitivity plus a small area of rear sensitivity. A hyper-cardioid microphone is not unlike a bi-directional, but with a larger area of concentration in the front and a smaller area in the back.

Super-Cardioid

A super-cardioid pattern is similar to a hyper-cardioid, with a slightly larger area of concentration in the front and a thinner area in the rear.

Unidirectional

A unidirectional pattern has extreme off-axis rejection, meaning it will only pick up sound sources that are directly in front of the microphone.

Shotgun

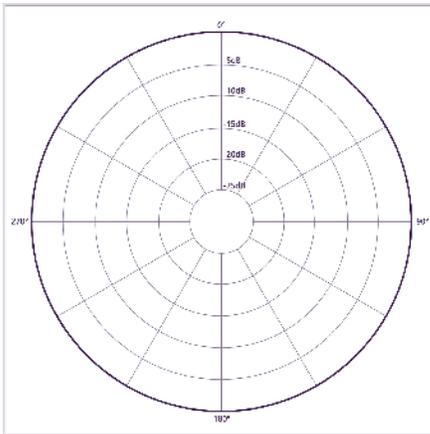
A shotgun mic is a unidirectional mic designed to pick up things that are far away, with a high degree of focus, so as not to pick up sources it isn't directly pointed at. They're typically electret condensers, and are often used for TV and field recording, though they can be used to isolate instruments in a studio setting, like a bass drum or piano.

Pressure Zone Microphone (PZM)

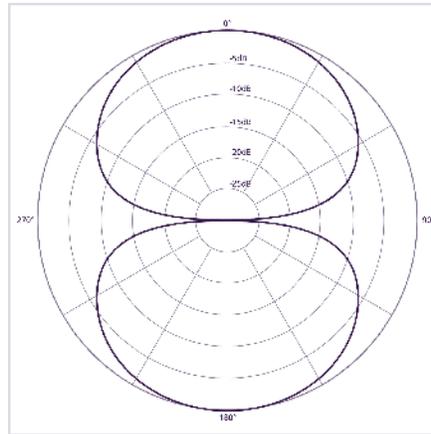
Pressure Zone Microphones are a unique type of mic capsule (usually omnidirectional) mounted to a plate. While not ordinarily used to record instruments during multitrack recording, they can be used as room mics. A PZM also allows for recording in enclosed spaces, like being taped to the underside of a grand piano's lid, which may need to be closed when recording with a band in the same room.

Pickup Patterns

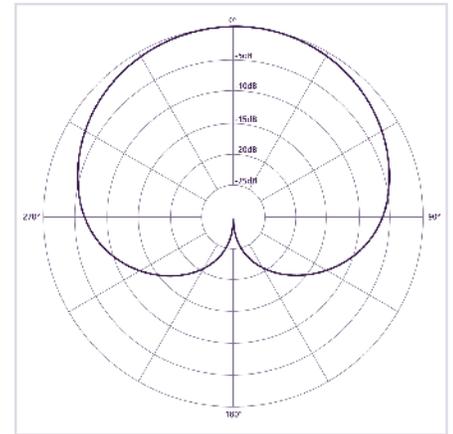
(Polar Pattern images ©Galak76)



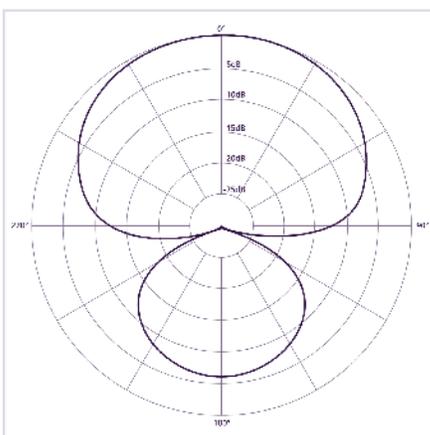
OMNIDIRECTIONAL



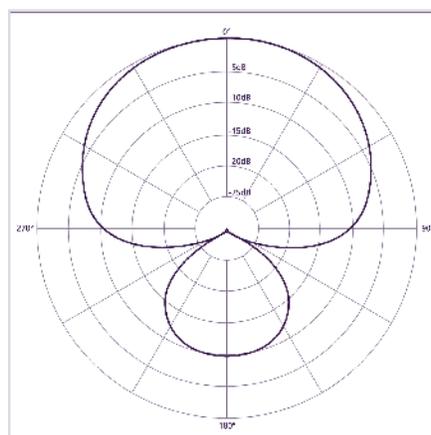
BI-DIRECTIONAL (FIGURE-8)



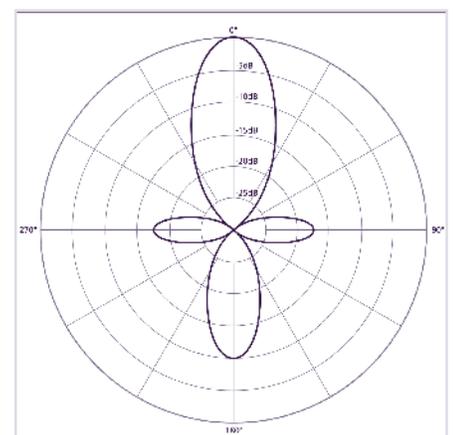
CARDIOID



HYPER-CARDIOID



SUPER-CARDIOID



UNIDIRECTIONAL

Beyond the pickup pattern

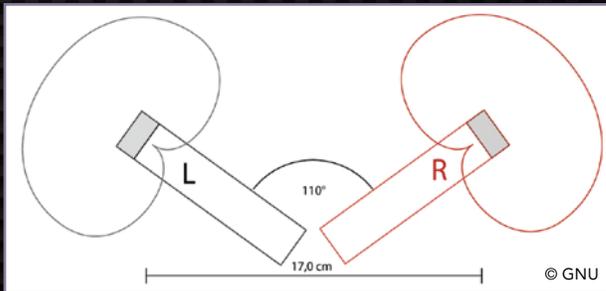
Additional pickup patterns can be achieved using multiple microphones, including:



XY — Small or large diaphragm condensers, crossed at a 90° angle, which provide a wider pickup pattern than you'll get from a single mic. Often used for a stereo field, but sometimes just used for coverage on a drum kit or a piano, for instance.



MS (Mid-Side) — The MS technique provides more control over the width of the stereo spread. Set a cardioid or hypercardioid mic facing the sound source (the "mid" mic), then aim a bi-directional mic 90° off axis from the source (the "side" mic) placed as close as possible above the mid mic.



ORTF — Devised in the '60s at the Office de Radiodiffusion Télévision Française (ORTF), this technique uses two cardioid mics mounted on a stereo bar, typically 17 cm apart at a 110° angle. This technique can be used to create depth in the stereo field for a single instrument, or used in mono to create a wider pickup pattern. Rather than using multiple mics around a room, you can use this technique to limit and control the width of your pickup pattern.

36 Mic Picks for the Home Studio (and beyond)

UNDER \$250



Behringer C-1 \$44

Condenser (Large Diaphragm)

For anyone working with a small budget, this cardioid mic delivers crisp, clear voice recordings and accurate reproduction of acoustic instruments. It's a lot of mic for the price.



Shure SM 57 \$99

Dynamic

The cardioid dynamic microphone you see everywhere, on so many different instruments and applications — amp cabinets, drum kits, horns — so its versatility is a big plus. It's also very rugged, dependable, and incredibly affordable. Good for studio and live situations.



Shure SM 58 \$99

Dynamic

The sibling of the SM 57, includes the ball grille with the foam lining to provide an extra degree of pop and wind protection. For the record, "SM" stands for "studio microphone," as this was originally to be an alternative to the notoriously fragile ribbon mics (the grey matte color was designed to cut down the glare of the typical silver mics). Its durability has made it a live performance staple.



Audio Technica AT2020 \$99

Condenser (Medium Diaphragm)

This medium diaphragm condenser was designed with the home studio owner in mind. Use it to record vocals, acoustic instruments, strings, and even as an overhead mic for drums.



Shure Beta 57A \$139

Dynamic

The supercardioid cousin of the SM 57, the Beta 57A provides a slightly brighter sound and higher output level. It has a bit more warmth and presence than the 57, and works well on drums, guitar amplifiers, brass, and woodwinds.



Shure Beta 58A \$159

Dynamic

The supercardioid cousin of the SM 58, the Beta 58A is really designed to be a live vocal mic, but its home studio applications can be likened to the 57 and Beta 57As (you can always remove the ball grille and stick it on an amp).



Shure KSM141 \$399

Condenser (Small Diaphragm)

Switches from cardioid to omnidirectional with a full midrange sound that works well for drum overheads and snare, vocals, percussion, and nylon and steel-string acoustic guitars.



MXL 990 \$200

Condenser (Medium Diaphragm)

Cardioid condenser that is quiet and smooth with enough mids to cut through the mix when recording vocals, acoustic guitar, and piano.



Blue Mic. Baby Bottle \$400

Condenser (Large Diaphragm)

Blue's entry-level large-diaphragm cardioid condenser is a lot of mic for the money, recommended for vocals, percussion, and "any acoustic instrument." By the way, "Blue" stands for Baltic Latvian Universal Electronics. Impress an engineer with that next time you're in a studio.

\$250 – \$500



Rode NT3 \$269

Condenser (Small Diaphragm)

Cardioid condenser recommended for acoustic guitars, percussion, and anything where you're looking to capture mids and highs.



Rode NT5 \$429

Condenser (Small Diaphragm)

The price listed is for a matched pair of these cardioid condensers. For stereo field recording, the NT5 provides depth and detail in most any recording situation.



Audio Technica AT4022 \$349

Condenser (Small Diaphragm)

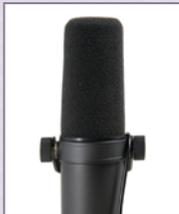
Omnidirectional condenser at an affordable price — well-suited for midrange frequencies. As with any omnidirectional mic, a good acoustic environment is key to capturing great tones.



Electrovoice RE20 \$449

Dynamic

Designed for broadcasting, this dynamic cardioid is well-suited for vocals and works great on upright bass and bass drums.

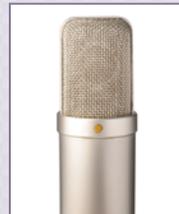


Shure SM7B \$349

Dynamic

Classic cardioid vocal mic with bass roll-off and an impressive resume, including many of Michael Jackson's most famous vocal recordings. Also widely used in broadcasting, e.g. Robin Quivers from The Howard Stern Show.

\$500 – \$1,000



Rode NTK \$529

Condenser (Large Diaphragm)

A cardioid vacuum tube condenser that works equally well on wooden flutes and loud vocals (it boasts being used on vocals for Nickelback's *The Long Road*). Described as "warm" and "flattering" without adding its fingerprint to the recorded track.



Sennheiser MD 421 II \$380

Dynamic

Cardioid mic with a five-position bass roll-off switch, which allows you to filter out unwanted low frequencies. Good mic for live and recording situations, particularly for bass drum, brass, and narration.



Audio Technica AT4050 \$699

Condenser (Large Diaphragm)

A condenser with three polar patterns — omnidirectional, bi-directional, and figure-8 — this mic can handle walloping sound levels and is suited for vocals, acoustic instruments, and loud percussion.



Mojave Audio MA-100 \$795

Condenser (Small Diaphragm)

Tube condenser with interchangeable cardioid and omnidirectional capsules, the MA-100 gets rave reviews for use on string ensembles, snare drums, toms, guitar amps, and acoustic guitar.



Rode K2 \$699

Condenser (Large Diaphragm)

Another vacuum tube condenser from this Australian company (note, that's Australia, not Austria). A warm and versatile mic that sounds particularly good on acoustic guitar. Has multiple polar patterns (omni, cardioid, figure-8, and everything in between).



Royer R-101 \$799

Ribbon

The little (less expensive) brother of the R-121 gets accolades for sounding almost exactly as good. Both are ribbon mics with a bi-directional polar pattern, Royer has sound clips of the 101 vs. 121 on their website.



Beyerdynamic M 160 \$699

Ribbon

Hypercardioid mic with two ribbons with a wide range of uses, including strings, horns, electric guitar amps, and drums. Ever hear "When The Levee Breaks" by Led Zeppelin? That's an M 160 on Bonham's drums.



Neumann KM 184 \$850

Condenser (Small Diaphragm)

A studio staple cardioid condenser described as "accurate and exceptional" on all things stringed. Best used in rooms with good acoustics as its accuracy can accentuate your room's trouble spots, particularly if there are any extraneous sound sources (computers, fans, etc.).



Beyerdynamic M 130 \$699

Ribbon

Figure-8 (bi-directional) dual ribbon brother of the M 160.



Shure KSM44A \$999

Condenser (Large Diaphragm)

Multi-pattern (cardioid, omnidirectional, and figure-8) condenser mic that works well on just about any sound source, including piano, acoustic guitar, and strings. Also a nice choice when a little more richness in tone would benefit a vocalist.



Neumann TLM 102 \$700

Condenser (Large Diaphragm)

Neumann has "owned" the studio mic universe for years, and while the TLM 102 isn't exactly a budget mic, it's the entry-level Neumann. The TLM 102 is a transformerless (TLM stands for "transformerless microphone"), fixed cardioid condenser with no switches, no pad, and no additional pickup patterns. This is specifically designed to sweeten vocals, but is a great choice for amps and drums kits as well.



AKG C414XLII \$999

Condenser (Large Diaphragm)

The C414 features multiple pickup patterns (omni, wide cardioid, cardioid, hypercardioid, figure-8, and four intermediate pickup patterns) and can handle high SPL. An excellent mic for acoustic instruments, and one that adds a bit of brightness on guitar amps.



AKG C414 XLS \$999

Condenser (Large Diaphragm)

Featuring nine polar patterns for a wide variety of uses, the C414 is a thoroughbred vocal mic with a long history (it was first introduced in 1971). Also exceptional on acoustic guitar and piano.

\$1,000 – \$2,000



Blue Mic. Woodpecker \$1,000

Ribbon

An active (accepts phantom power) ribbon, the Woodpecker has an output signal that exceeds typical ribbon mics. Great for brass, acoustic guitars, and amps, though the higher output might require mic placement experimentation to quiet down some of the high end output.



Blue Microphones Kiwi \$1,999

Condenser (Large Diaphragm)

Multiple polar patterns (controlled by a rotary switch) range from omni to cardioid to figure-8 with three intermediate positions in between. The Kiwi is described as “smooth as silk” and is ideal for all kinds of acoustic instruments and percussion and provides clarity for male and female vocalists.



Neumann TLM 103 \$1,100

Condenser (Large Diaphragm)

The next step up from the 102, the TLM 103 is also a cardioid mic used by professional broadcasters and pro studios around the world. Boasting a very natural sound, for a “high-level” home studio, this is a high-quality general purpose mic.



Rode Classic II \$2,099

Condenser (Large Diaphragm)

Tube mic with a warm and rich tone. It’s primary purpose is for vocals, but with nine polar patterns (cardioid, omni, figure-8 and all the in between) it’s great for use on all sorts of acoustic instruments and even drum overheads (with a good sturdy mic stand).



Mojave Audio MA-300 \$1,295

Condenser (Large Diaphragm)

Mojave, which is Royer’s non-ribbon division, expanded on the MA-200 tube condenser (a fixed cardioid) to include multiple patterns (continuously variable from omni to figure-8). Use on vocals, as overheads, percussion, and especially acoustic guitar.



Neumann U 87 Ai \$3,200

Condenser (Large Diaphragm)

Professional-studio, multi-pattern (omni, cardioid, figure-8) condenser mic that delivers unparalleled detail and dynamic sound. The U 87’s sonic signature can be heard on many hit records. Selected by *Sound on Sound* magazine readers as “the best microphone, period.”



Royer R-121 \$1,295

Ribbon

A figure-8 ribbon mic that delivers clean and warm tones and can take a huge amount of SPL. Use them on everything, from vocals to drums to horns.



AKG C12 VR \$4,999

Condenser (Large Diaphragm)

The AKG C12’s history dates back to the early ‘50s. Manufactured in Austria, it is widely regarded as the most “exclusive and sought after mic ever built.” A vacuum tube mic with nine polar patterns, AKG’s C12 VR is a modern take on the original.



sE Electronics Gemini II \$1,599

Condenser (Large Diaphragm)

A dual tube cardioid condenser that is physically heavy (a big mic with two tubes will tend to be), that provides a balanced sound with good string definition on acoustic guitars and colored, detailed mids on vocals.

OVER \$2,000