

025:250 Composition: Electronic Media I

Fall 2012

Microphones in the Electronic Music Studio

Prepared by Zach Zubow

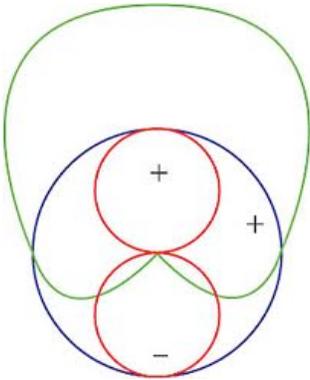
1. Dynamic Microphones

- A moving-conductor microphone in which the flexible diaphragm is attached to a coil positioned in the fixed magnetic field of a permanent magnet that produces sound using electromagnetic induction. Also known as moving-coil microphone.
- Resistance to moisture makes dynamic microphones very suitable for solo voice, sound reinforcement and recording.

2. Condenser Microphones

- Microphones consisting of a capacitor with one plate fixed (usually the diaphragm) and the other a movable plate is then moved by sound waves (capacitance change).
- Majority of uses include stage performance for solo voice or instrument in sound reinforcement and recording.
- Some condenser microphones use *phantom power* to produce power for these components. This is done by DC signals sent from the mixing board to the microphone. Some Direct Input boxes also use phantom power.

3. Polar Patterns for Microphones



- The diagram above shows the three basic polar patterns found in microphones. All other patterns are variations on these themes.
- The complete circle is an omni polar pattern.
- The figure eight pattern shows the bi-directional polar pattern.
- The misshapen, heart shaped pattern shows the cardioid polar pattern.

4. Omnidirectional polar patterns



- Omnidirectional microphones are most commonly used for recording and sound
- Both work by interpreting vibrations of sound via a vibrating coil or movable diaphragm that is then converted to electrical waves.
- Omnidirectional microphones can pick up sounds from any direction (room sounds or environmental sounds) in a spherical pattern.
- The image above shows a circle, but it is actually spherical

5. Unidirectional polar patterns

- Unidirectional microphones are most commonly used for recording and sound reinforcement.
- The most common unidirectional microphones are cardioids.
- These microphones reject sound outside of it's polar pattern, making them essential for vocal or speaking microphones.



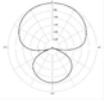
- Cardioid polar pattern



e. Subcardioid polar pattern



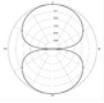
f. Supercardioid polar pattern



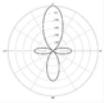
g. Hypercardioid polar pattern

6. Bi-directional polar patterns

- a. These microphones are designed to receive sound from both the front and the back of the units.
- b. Bi-directional microphones are commonly used for television and film sets, for stadiums, and field recording of wildlife.



Bi-directional



Shotgun

c. Bi-directional microphone polar patterns include bi-directional and shotgun as shown above.

7. Microphones available in the Electronic Music Studios (product descriptions taken from online sources)



- a. The legendary **Shure SM57** microphone is exceptional for musical instrument pickup and vocals. With its bright, clean sound and contoured frequency response, the SM57 is ideal for live sound reinforcement and recording. It has an extremely effective cardioid pattern, which isolates the main sound source while minimizing background noise. In the studio, it is excellent for recording drums, guitar, and woodwind instruments. (Dynamic and Cardioid)

<http://www.shure.com/proaudio/products/wiredmicrophones/us_pro_sm57-lc_content>



- b. With a compact, lightweight design, the **AT882** (audio technica) is ideal for DAT recording as well as television, FM and field applications. The microphone is equipped with unbalanced outputs for use with readily available audio and video equipment. Its closely matched elements provide the spatial impact and realism of a live sound field. The mic offers excellent channel separation and switchable low-frequency roll-off. Camera mount enhances width of stereo image. (Condenser/Stereo Cardioid)

DO NOT TURN ON PHANTOM POWER WITH THIS MIC! DAMAGE TO MICROPHONE WILL OCCUR!

<http://www.audio-technica.com/cms/wired_mics/665bdf92967733dc/index.html/>



- c. The **AT4041** (audio technica) is a premium electret condenser microphone that is engineered to meet the most critical acoustic requirements of professional recording, broadcast and live sound. This microphone cardioid studio condenser microphone features a smooth, extended frequency response with a slight rise in the high-frequency region and a transformerless output for very high SPL-handling capability. A unique combination of audio excellence and moderate cost, the AT4041 is a rugged microphone housed in a case of turned brass with black chrome plating for durability and low reflectivity. The element back plate holds a fixed charge and has been aged to provide energy stabilization. The surface of the back plate is precision milled to ensure maximum charge linearity, resulting in a reduction in both frequency response peaks and diaphragm break-up distortion. (Condenser/Cardioid)

<http://www.audio-technica.com/cms/wired_mics/b43bffe4d4295274/index.html/>



- d. The **Beyerdynamic M 201 TG** dynamic microphone lets you capture instrument sounds accurately, while its low-profile size and rugged construction allow you to place it just about anywhere. The M 201 TG also works well for vocals, but it really shines when you need a low-maintenance, dependable mic to pick up all manner of instruments. Its voice coil rejects hum from CRT video monitors, allowing you to use this mic at close range to your desktop setup. Whether you're miking drums, piano, guitar, or nearly anything else, the hypercardioid M 201 TG will work for you! (Dynamic/Hypercardioid)

< <http://www.sweetwater.com/store/detail/M201TG/>>



- e. The **Neumann KM 184** microphone is the successor of the well proven KM 83 and KM 84, which have been used since the seventies worldwide with great success. The KM 185 rounds out the series with a hypercardioid microphone. The KM 183 is a pressure transducer with a boost of approximately 7 dB at 10 kHz in the free field. In the diffuse sound field it has a flat frequency response. The pressure gradient transducers KM 184 and KM 185 feature very smooth frequency responses not only for the 0° axis, but also for lateral (off-axis) sound incidence. In typical usage, there is no coloration of sound over a wide pickup angle. (Omnidirectional/Hypercardioid)

<http://www.neumann.com/?lang=en&id=current_microphones&cid=km180_descriptio>



- f. The **Heil PR 40** represents completely new dynamic microphone technology designed for a wide range of professional applications such as sophisticated recording, live sound, and commercial broadcast. Producing the widest frequency range available in a dynamic microphone, the PR 40 outperforms most condenser microphones, and can withstand huge amounts of SPL. At the same time, it maintains the 25-year Heil Sound tradition of superbly natural voice articulation.
(Dynamic/Cardioid)

< <http://www.heilsound.com/pro/products/pr40/>>



- g. The **Earthworks QTC50** is an exciting new addition to the Earthworks microphone line. It has all of the exceptional attributes of our popular QTC40 (same as QTC1). The QTC50 has an extended high frequency response to 50kHz and better impulse response. The QTC 50 is our top of the line omni microphone that will capture sounds with incredible precision. This ideal for quieter, more detailed sources and does not have most of the problems and limitations generally associated with competitive microphones. Its unrivaled accuracy, impulse response and transparency make it the only choice for those seeking the very best in omni microphones. This microphone is for the sterling purist who demands the very highest quality.
(Condenser/Omnidirectional)

< <http://www.earthworksaudio.com/our-microphones/qtc-series-2/qtc50/>>



- h. The Discreet Class A Low-Noise FET circuitry of the **Avantone CK-33** will yield pleasing professional results comparable to much more expensive designs. Any studio can proudly offer the STEREO CK-33 as a group vocal mic, room mic piano mic, or utility condenser due to its versatility...It exudes class visually as well as sonically. The versatile AVANTONE CK-33 Stereo Class A FET microphone features twin LARGE 32mm center terminated pressure gradient CARDIOID transducers. Their close physical proximity places them in a tight vertical array to allow accurate stereo imaging without phase issues arising. The top capsule/grill assembly rotates 90 degrees relative to the lower capsule/grill assembly. The CK-33 operates on standard 48-volt phantom power and includes a 5-Pin mic cable that plugs into the included 1x2 stereo splitter box. Two standard XLR mic cables are then all that is required to connect to a phantom powered mic preamp/console channel. (Condenser/Stereo Cardioid)

< <http://www.avantelectronics.com/CK-33%20Stereo%20FET%20Mic.htm>>



- i. **The Baby Bottle**'s unique sonic signature has a rich and present midrange response, a smooth top-end and neutral bottom-end creating an extremely present classic and contemporary sound. It is an ideal choice for recording vocals, room mixing for drums, electric guitar amps, and difficult brass instrument sources like saxophones and horns. With a unique proprietary circuit polarizing the capsule film at 100 volts, the Baby Bottle yields large output, creating the quietest microphone in its class. (Condenser/Cardioid)

< <http://www.bluemic.com/babybottle/> >



- j. Piezo Contact Mic with alligator clip. A classic brass piezo contact microphone optimized with electronics and equipped with a strong metal alligator clip. This mono mic requires standard 48v phantom power and terminates in a high quality male 3-pin XLR output. The low noise preamp built into the piezo head lowers the impedance and provides 3dB of amplification, giving you a louder, wider, and more natural sounding frequency response.

Microphone Quick Guide

Brand and Model	Type	Polar Pattern	Quantity
Audio-Technica 4041	Condenser	Cardioid	1
Audio-Technica AT822	Stereo Condenser	Cardioid	1
Avantone CK33	Stereo Condenser	Cardioid	1
Beyer-Dynamic M201 TG	Dynamic	Hypercardioid	3
Blue Baby Bottle	Condenser	Cardioid	1
Brass Piezo to XLR with Alligator	Clip Contact	N/A	2
Earthworks QTC50	Condenser	Omnidirectional	2
Heil PR40	Dynamic	Cardioid	2
Neumann KM84	Condenser	Hypercardioid	2
Shure SM57	Dynamic	Cardioid	5