



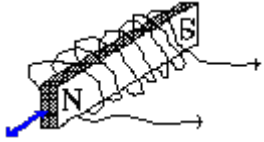


A TRANSDUCER is a device that converts one form of energy into another.

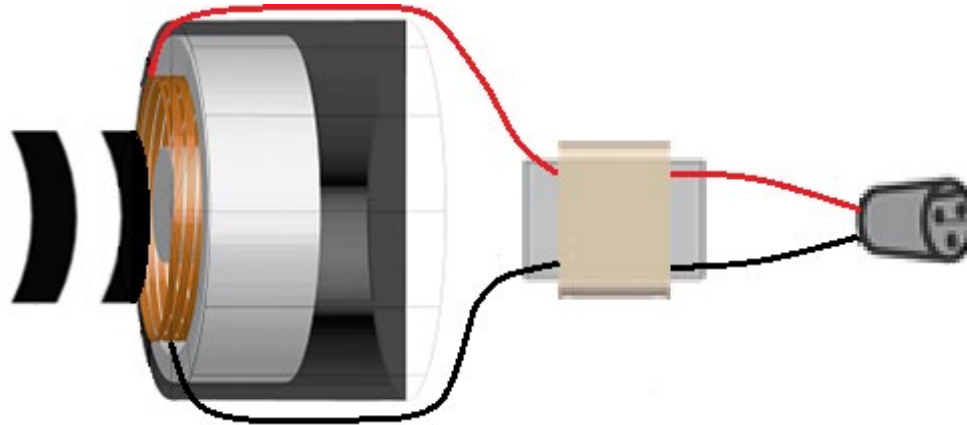
A MICROPHONE is a transducer that converts sound-waves (air vibrations) into electrical-waves.



# Dynamic Microphones



If we take a coil of wire and pass it back and forth over a magnet an electrical charge will be generated in the coil of wire. This is called the '**Dynamo**' effect.

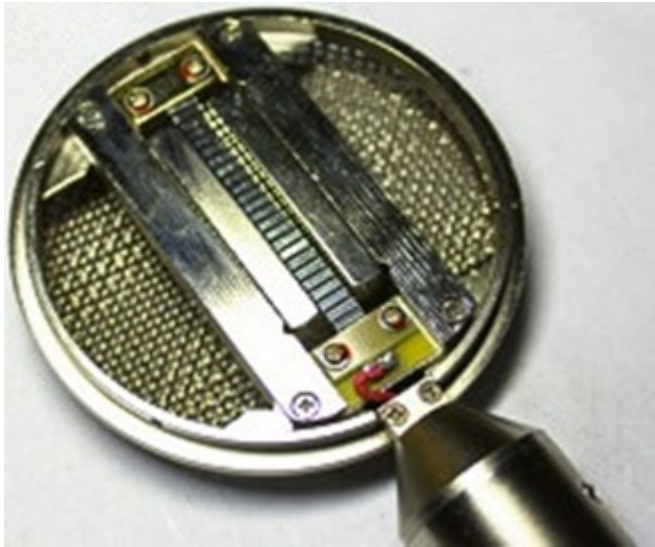


A thin plastic diaphragm is connected to the coil of wire, and suspended inside a round (pot) magnet. This is a **Dynamic Microphone**. *Sound waves vibrate the thin plastic diaphragm which vibrates the coil in the magnet. The electric signal that is generated is an exact electrical copy of the sound vibrations.*

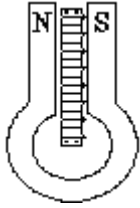
Because Dynamic microphones are electrical generators in their own right, they do not need external powering from a battery. Plug and Go!

Brands and models of microphone are a personal preference, but two dynamic microphones have to be mentioned because they have proved themselves faithful for many decades, and are rightfully the industry standard for dynamic microphones; Shure SM58 (for singers) and the Shure SM57 (for musical instruments) give a consistently high-quality sound and are very robust (even after dozens of people have dropped them... *but please don't*).

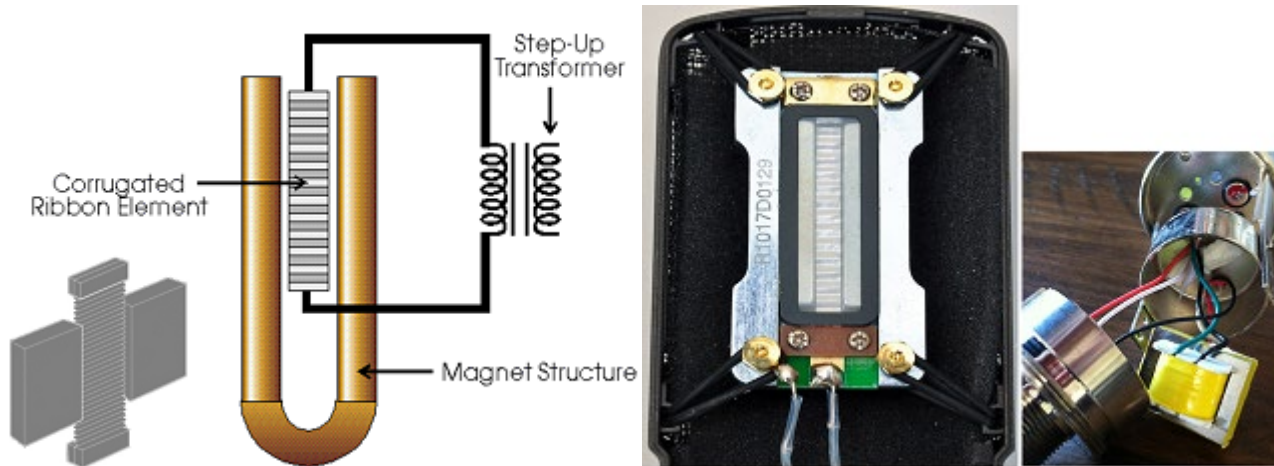
Dynamic Microphones are economical, robust, and a good quality dynamic microphone can be used anywhere. They are the entry-level microphone of choice, and every professional will have at least a dozen of them in their mic box.



# Ribbon Microphones



This kind of microphone has a very thin metal foil that is suspended in a horseshoe magnet. The sound waves vibrate the foil in the magnet causing a *dynamo effect*. Anyone who has heard a Ribbon Microphone in action will tell you what a beautiful sound it makes... particularly with singers. They can often outperform Condenser microphones for sound quality. An old criticism was that the foil is very delicate and can be damaged from sudden blasts of air, and so it was only used in Recording Studios. It has been included in this document because in recent years technology has permitted Ribbon Microphones to become more robust.

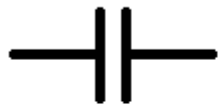


*A Ribbon Microphone requires no external power, it is dynamic.*

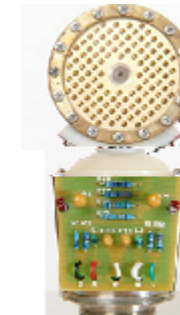
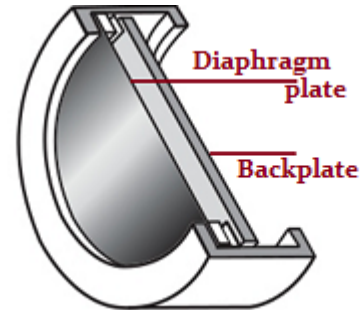
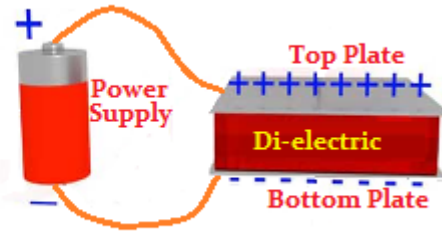
Because Ribbon Microphones look like Condenser microphones you may think to send Phantom Power (48v) to power. Dont! Not a good idea ☹



# CONDENSER MICROPHONES



Electrical Symbol  
for a Condenser  
(Capacitor)



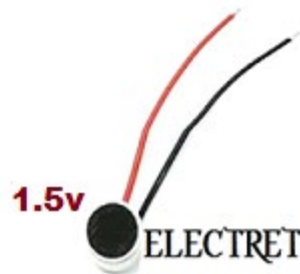
There is an electronic component called a Condenser (or Capacitor). It is made up of two plates. The electrical effect it creates is called *Capacitance*. Condenser Microphones are constructed with one plate (the Back plate) very thick, and the other plate (the Diaphragm) very thin. Sound waves vibrate the Diaphragm, causing fluctuations in the capacitance, that perfectly copy the sound vibrations.

Condenser microphones give a very high-quality sound, but they are sensitive, and you must be careful. They are not cheap, so avoid dropping them.

Condenser Microphones require external power to keep the capacitor plates charged, and to power the electronic circuit inside them. We typically use +48volts (called Phantom Power) which we supply by pushing a button on the Mixer.



Phantom  
48v

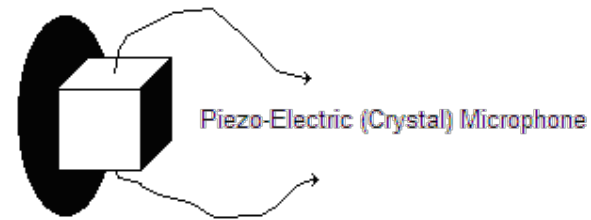
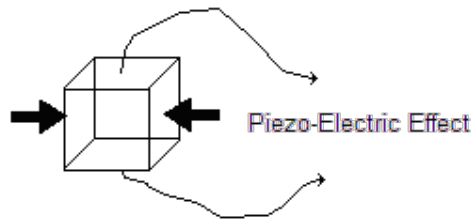


There is a smaller version of condenser microphone whose plates have been permanently charged. These are called **Electrets**. They have the advantage of only needing a low-powered battery inside to operate their electronics. A 1.5 volt battery is often enough.

While not able to give a good vocal sound, they can be used on musical instruments remarkably well.



# PIEZO-ELECTRIC MICROPHONES



If you press hard on two sides of certain natural crystals, they generate a small electrical charge on the other two sides. This is the *piezo-electric* effect.

By attaching a diaphragm to one side, sound waves can vibrate the crystal, which then causes a small electrical current, imitating the sound vibrations.

Crystal Microphones can be small and light, which is their strong point. Modern Piezo pickups and contact microphones offer very good sound quality when used on musical instruments (though they aren't suited to singing).

Now manufacturers even offer us Piezo-tape pickups which can bend and wrap around the curve of a musical instrument.

# Future Transducers

From time to time they will discover new materials and new ideas for building microphone transducers. Remember... whatever their description, they are just transducers, converting sound-waves to electrical-waves.

Don't just buy it because everybody else is buying it. Try it yourself! All wine looks tantalising when swirled in a glass, but some of it tastes terrible.

Listen to the sound quality when placed on the instruments or voices you intend it for, then decide.

Something to consider... some dynamic microphones in the store can sound absolutely wonderful, but after a brief year of being banged around in a church environment they sound really bad. This is why the Shure 57 and 58 are so popular, 10 years later you are still using them, while other dynamic mics (that may have sounded better than a Shure at the beginning) may deteriorate fast. I'm not trying to sell '*Shure*'... I'm trying to show you what quality should look like.

Read the characteristics, and the advertised benefits. How sensitive is it? How is it powered? Be a faithful steward of your budget, not a fashion follower.

## CREDITS

*This material is offered freely to the Christian Churches; downloadable at [Pietango.com](http://Pietango.com)*

**Text:** *Original, by the Author, a Christian Recording Engineer.*

**Images:** *Designed by the Author. Some photographs were sourced from the Internet, then re-worked.*

Ever since the creation of the world, God's invisible attributes and divine nature have been evident. They are clearly understood through his workmanship, and all the wonderful things that he has made. Therefore, those who fail to believe and trust in him are without excuse, or defence. **Romans 1:20**

All of us have sinned and fallen short of God's glory, but God treats us much better than we deserve.

Because of Christ Jesus, he freely accepts us and sets us free from our sins. God sent Christ to be our sacrifice. Christ offered his life's blood, so that by faith in him we could come to God. **Romans 3:23**

If you declare with your mouth, "Jesus is lord," and believe in your heart that God raised him from the dead, you will be saved. For it is with your heart that you believe and are justified, and it is with your mouth that you profess your faith and are saved. **Romans 10:9**

For the Scripture (*Isaiah 28:16*) says, "Whoever believes in Him will not be disappointed." **Romans 10:11**

These things have been written so that you may believe that Jesus is the Christ, the son of God; and that by believing, and relying on him, you may have new life in his name. **John 20:31**