Microphones

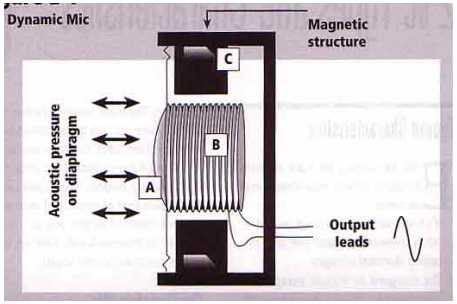
Physics

- Electricity
  - Current (amperes)
    - Important for big amplifiers and speakers
    - too much will melt wires
  - Voltage (volts)
    - Too high and your signal will clip
    - Too low and noise will become more noticeable
    - Input and output levels must be matched for good sound
- Electromagnetic induction
    - Makes dynamic microphones and speakers work
      - Variations on a coil of wire near a magnet
    - Puts noise into cables
      - House wiring creates hum/buzz
      - Motors, switches, fluorescent lights, computers

Dynamic Microphones

- Coil of wire moves in a magnetic field
- Robust
- Requires no power
- Proximity effect: bass response rises
- Favorites
  - Shure SM58 With pop filter for vocals. (live only)
  - Shure SM57 Without pop filter for micing amps and drums, can do studio vocals
  - Shure SM7 Broadcast and studio (vocals mainly)
  - EV RE20 Broadcast and studio
  - Sennheizer MD421 Broadcast + all around live

- Side view of dynamic mic diaphragm ***A*** with coil of wire ***B*** attached

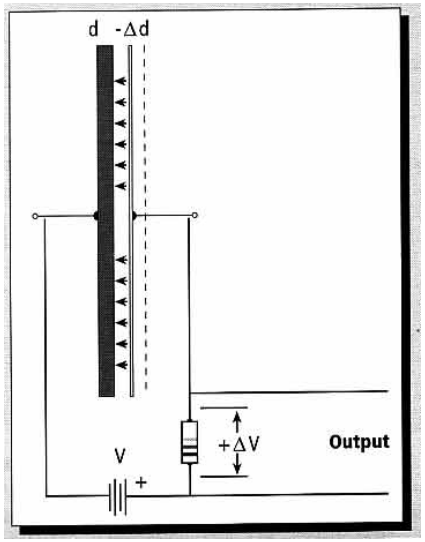


Condenser Microphone

- Very light diaphragm - no coil to move
- Requires a power supply – “phantom”
- Excellent detail
- Excellent frequency response at any distance
- Make a noise if handled
- World favorites: Neuman

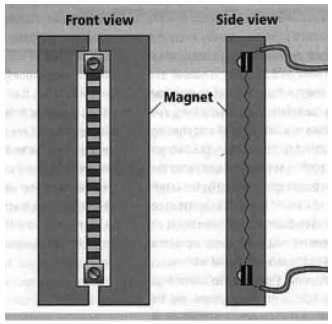
Neuman U87

- Side view of condenser mic diaphragm
- V is a power source, either by a battery or “phantom power” supplied by the mixer through the mic cable.



Ribbon Microphone

- Good detail – “smooth” not bright
- Warm - used for/to mellow voices
- Fragile
- Big proximity effect
- Needs a better preamp
- Usually figure-8



Other Common Mics

- Shotgun
  - Hyper-hyper-cardioid for use while shooting video
  - Long mic looks a little like a shotgun barrel
- Lavalier
  - Attach to the person speaking
- Boundary or pressure zone
  - Lay flat on the floor

Boundary or Pressure Zone Mic

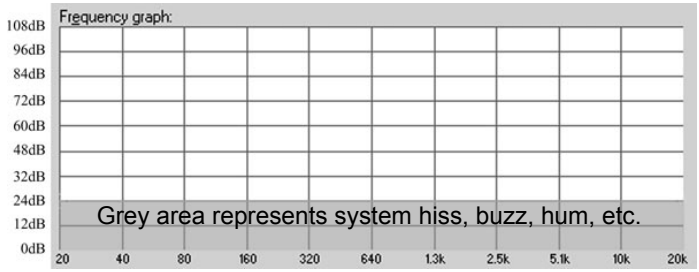
- Lay flat on the floor

Contact Mic

- *"Piezoelectric vibration transducer"*
- Picks up vibrations from materials
- Clamped, taped, or glued to a vibrating surface
- Great example is the Blue Man Group

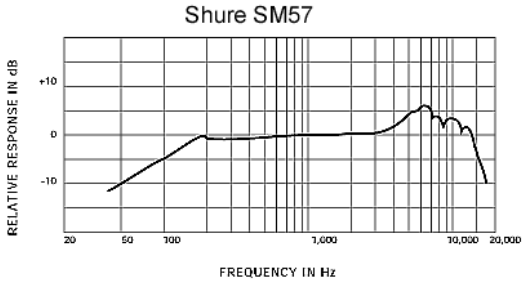
Microphone Dynamic Range

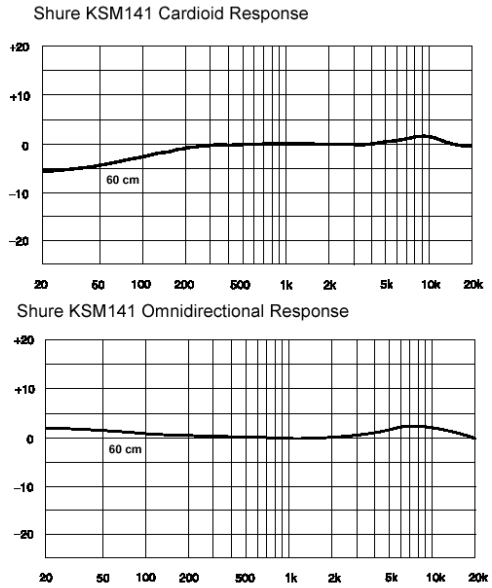
- "Noise Floor" exists in any recording system. *Just how much higher level can the mic handle?*



Frequency Response

- Are all frequencies represented equally?

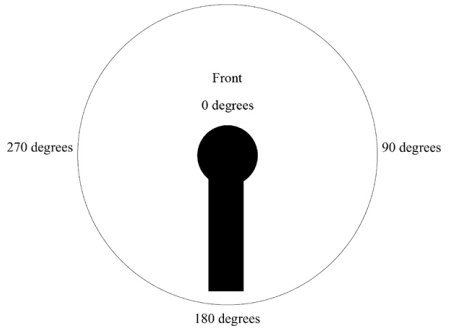




Directionality

- Does the mic pick up sound equally from all directions?
- Does it have better frequency response from a particular direction?
  - In other words, is it “more accurate” from one particular direction?
  - Does it sound duller or lose details from some direction?

Omnidirectional Response

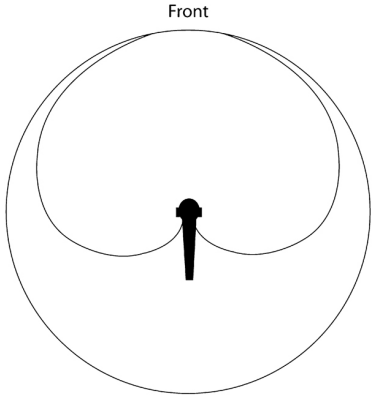


“Natural” sounding recordings with ambient room sounds included.

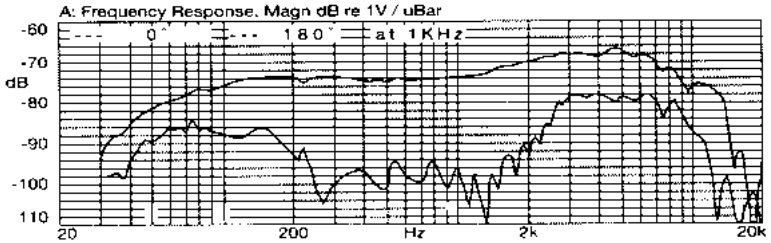
Cardoid Response

Picks up the vocalist without picking up the audience noise.

Picks up the guitar amp without picking up the drums.

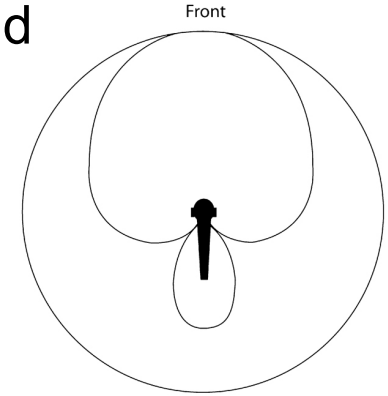


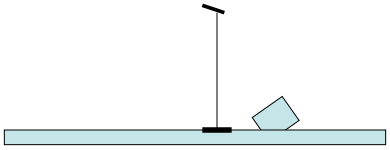
Nady SP9 at 0 and 180 deg



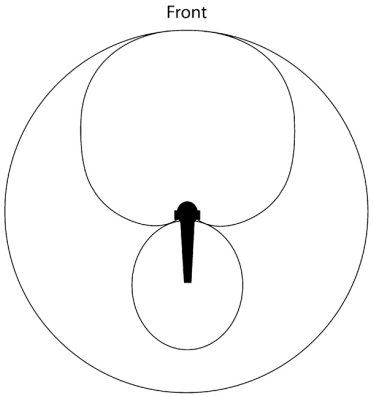
Supercardoid Response

Picks up the vocalist without picking up the sound from the monitor speakers at her feet.



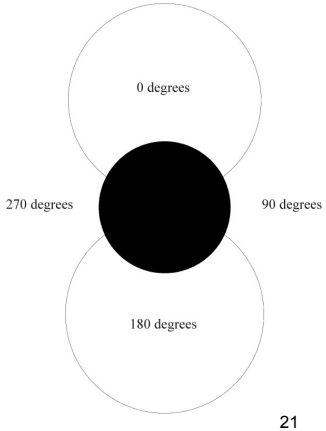


Hypercardoid Response



Bidirectional Response

Could sit between two musicians



Microphone Placement

- Critical to a desired sound characteristic
  - Too close: emphasized bass frequencies enter the recording (“proximity effect”)
  - Too close: the diaphragm might hit the frame - source of a type of clipping
  - Too far away: ambient noise enters the recording
  - In the studio, moving one 2” can change the sound significantly

Sibilance and Plosives

- ***Sibilance*** occurs when high frequencies from the letter “s” for example, enter the microphone. Can be over emphasized.
  - Use a de-esser
- ***Plosives*** occur when low frequencies enter the microphone due to loud percussive sounds such as the letter “p”
  - Use a “pop screen” between person and mic
- Too many low frequencies also enter a microphone if it has a proximity effect

Monitor Configuration For Editing

- Near Field
  - Designed to be 3-6 feet away and angled in toward the engineer. They can actually sound bad if they are at some other location.
- Far Field
  - Designed to fill the room with accurate sound.

Cables

- Unbalanced - usually only 2 connectors
  - Inexpensive
  - Ok for your stereo - keep them short
- Balanced - usually 3 connectors
  - Less chance of noise
  - Hum, clicks, random noise such as hiss
  - Can deliver signal over longer distances
- Common analog types:
  - RCA for home stereo
  - 1/8” TRS for iPods, phones
  - 1/4” TRS for mixers,
  - XLR for microphones

Digital connectors
-MIDI
-USB & Firewire
-Optical

Stereo versus Mono

- A stereo image consists of two tracks, usually interleaved. File is twice as large as mono.
  - The data making up the left and right channels are mixed together as one contiguous block of data. Interleaved stereo files are common in the DAW world, but are also utilized in R-DAT recorders, and other digital tape machines.
- Mono tracks are single tracks containing no interleaved data.