Audio Hardware

Transducers
Microphone Types
Directional Response
Transducer

• A device that converts one form of energy into another, analogous form of energy.
  – Microphones
  – Tape recorders
  – Speakers
  – Musical instruments
  – The ear
Digital Audio Transducers

• A/D converter (ADC)
  – converts electrical current into digital signals

• D/A converter (DAC)
  – converts digital signals back into electrical current
The Audio Recording Path

Recording (input)

– Source > Mic > Preamp > ADC > Media

Playback (output)

– Media > DAC > Amp > Speakers > Ear
The Audio Recording Path
Microphones

• Three basic types:
  – Dynamic
  – Ribbon
  – Condenser
Dynamic Microphones

– a diaphragm attached to a coil of wire that’s suspended in a magnetic field
– SP waves move the cone
– the attached coil of wire moves in the field of a magnet
– produces an electrical signal
Dynamic Mics

• Advantages:
  – Rugged - can take a lot of abuse
  – Relatively cheap
  – No external power needed
  – Certain sound coloring, both good and bad

• Disadvantages:
  – response isn’t as flat as other mic types

• Classic Example: Shure SM57
Shure SM57
Frequency Response Chart – Shure SM57
Ribbon Microphones

• The active element is the ribbon
  – very thin corrugated aluminum
  – mounted between the poles of a magnet
• SP waves move the metallic ribbon in the magnetic field, generating a voltage between the ends of the ribbon
Ribbon Mics

• Advantages:
  – Add "warmth" to the tone by accenting lows when close-mic’ed

• Disadvantages:
  – Tendency to accent lows sometimes produces a "boomy" bass
  – Older models are delicate, very susceptible to wind noise
  – Not suitable for outside use unless very well shielded

• Classic Example: RCA 44B
RCA 44B
Frequency Response Chart – RCA 44B
Condenser Microphones

• consists of two thin plates or membranes
• Principle: SP waves change the spacing between a thin metallic membrane and the stationary back plate, producing a proportional electrical signal
Condenser Mics

• Require power to operate
  – older models used a battery pack or power supply.

• Most modern condensers use **Phantom Power**
  – supplied by a console or mixer
    • may be an on/off switch per channel or group of channels
    • may be a master switch
  – sends a voltage of +48V down the mic cable

• Classic Example: **Neumann U47**
Condenser Mics

• Advantages:
  – Very sensitive
  – Wide frequency response - mic of choice for many recording apps
  – Switchable polar patterns

• Disadvantages:
  – More expensive than dynamic mics
  – Very sensitive to humidity
Neumann U47
Frequency Response Chart – Neumann U87
Frequency Response Chart – Shure SM57
Frequency Response Chart – RCA 44B
Directional Response

• How a microphone responds to sound coming in from different directions
• Described by the polar pattern
Omnidirectional Response Pattern

- nearly equally sensitive to sound coming in all directions
- omnis have the best low end of any polar response
Directional Response Patterns

• Cardioid
  – most commonly used directional pattern
  – has a fair degree of lateral (side) response
  – sound is rejected from the back
• **Hypercardioid**
  - front response is more directional than the cardioid
  - some rear axis response
  - less lateral response than cardioid
• **Figure Eight (Bidirectional, Blumlein)**
  – front response is more directional than the hypercardioid
  – equal front and rear response
  – rejects sound from the sides
Preamps

• Mics put out a very low level signal (mic level)
• In order for this signal to be useful it must be boosted
• Accomplished by using a mic preamp
• Quality of the preamp is important to the overall sound