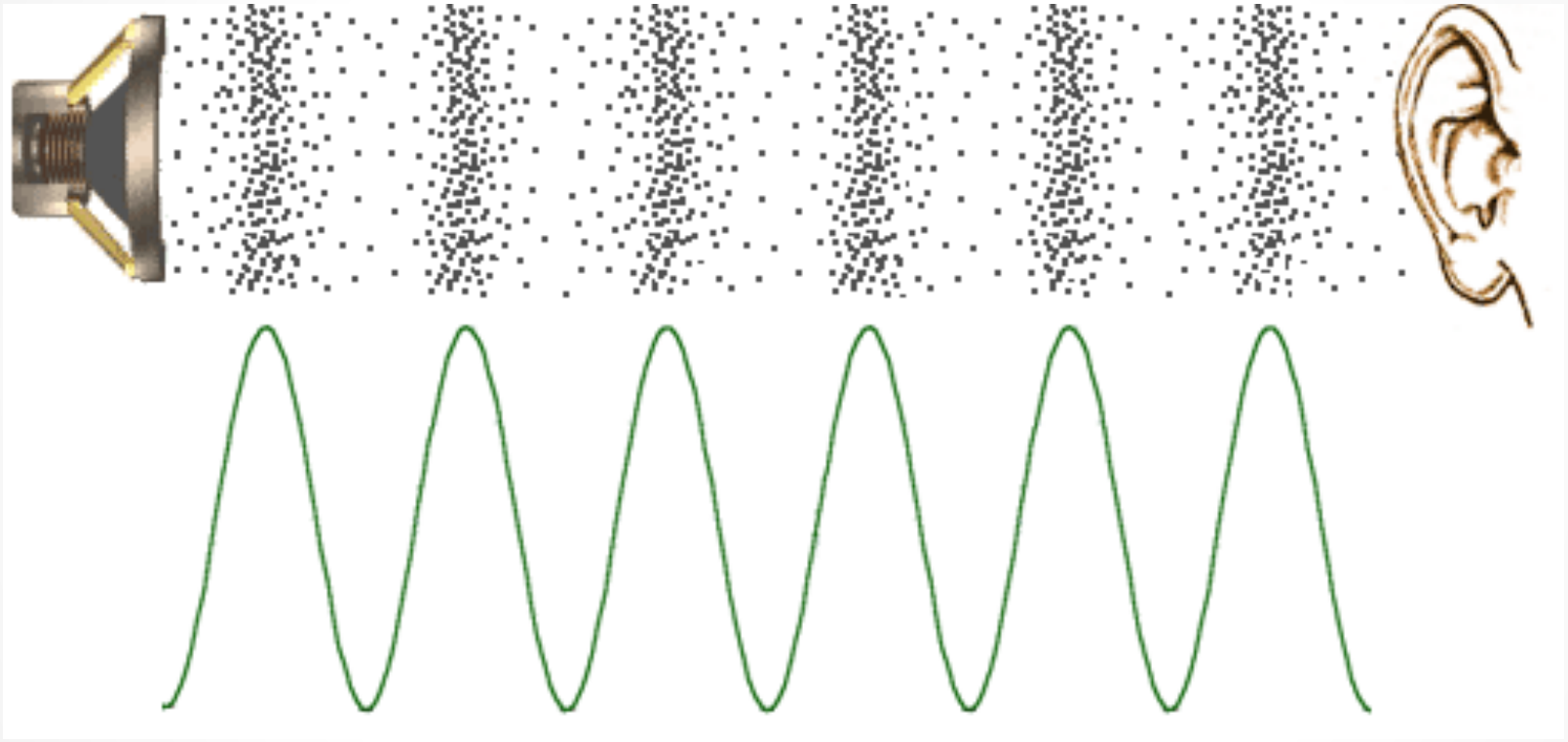
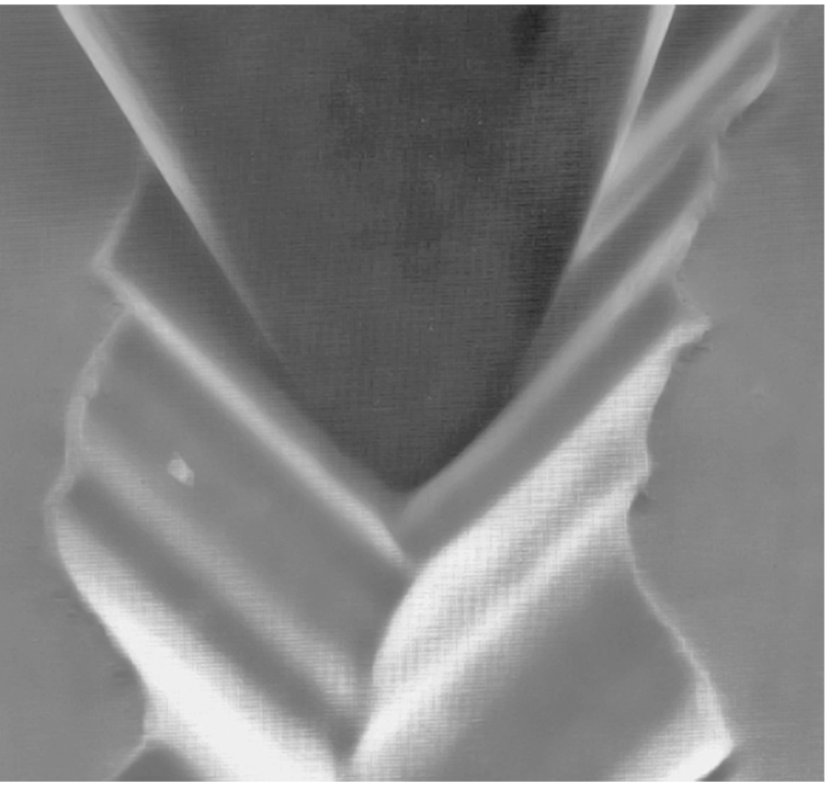
Sound Basics

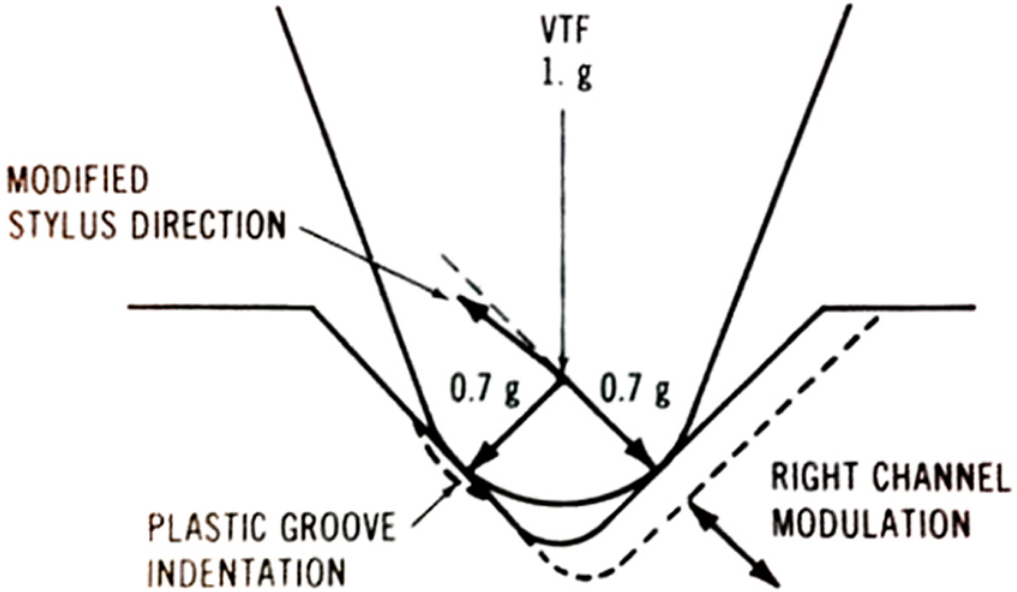
Digital or Analog

- What are they?
- Pros and Cons for both
- Good analog better than poor digital
- If choice, opt for digital

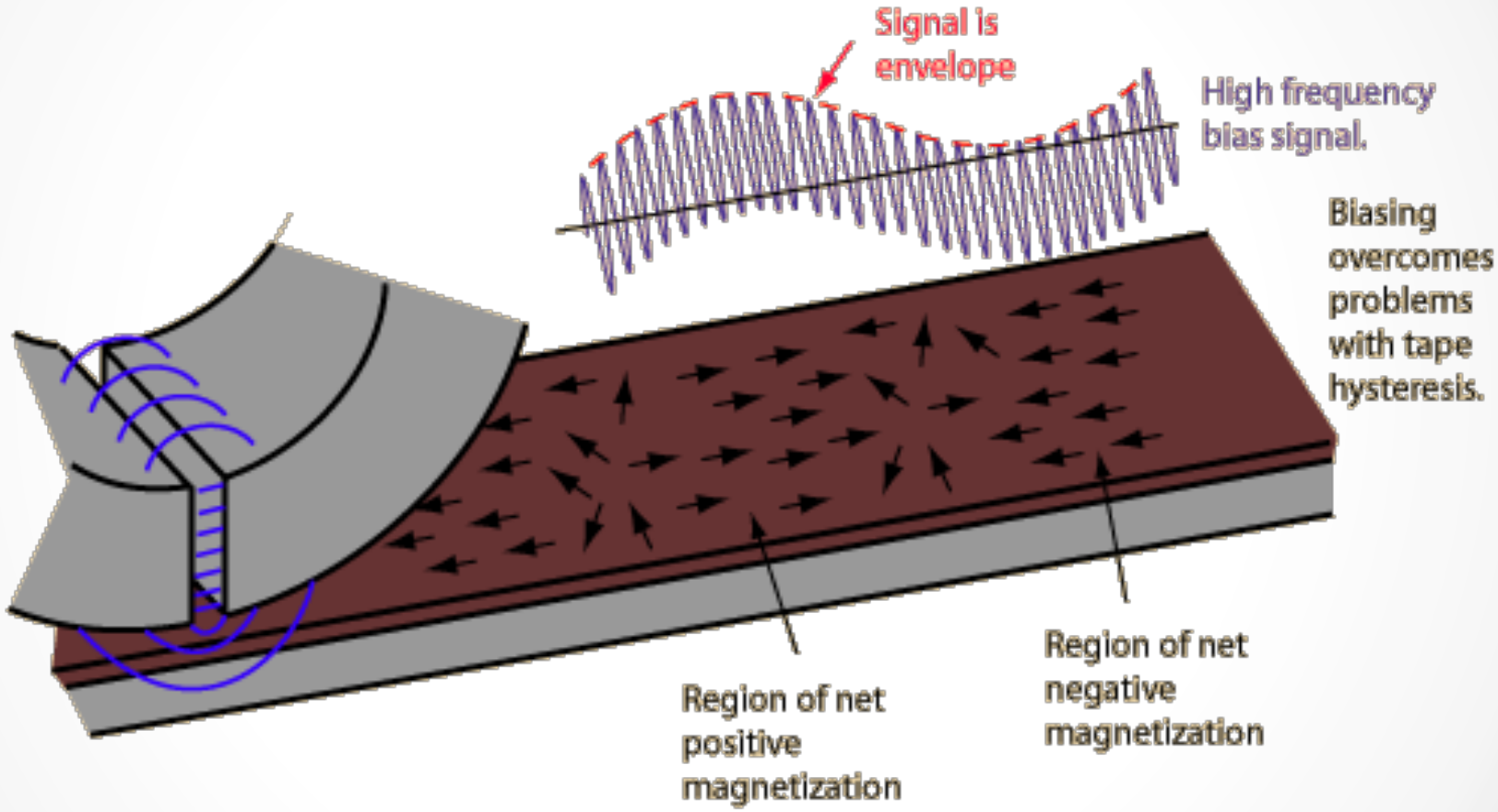




“Its not easy being a stylus. You’re under a lot of pressure”




90


Signal is envelope
High frequency bias signal.
Biasing overcomes problems with tape hysteresis.
Region of net positive magnetization
Region of net negative magnetization


687601

Sound Basics

Digital Pros

- Wider dynamic range
- Increased resistance to noise
- Better Copyability
- Error correction
- Durability of storage

Sound Basics

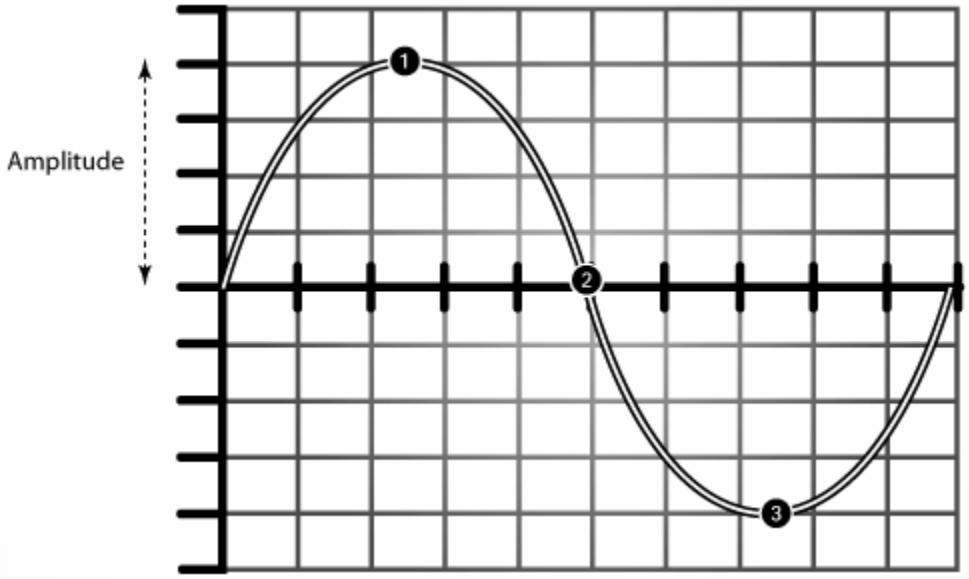
Sound Capture

- Human Voice—20 to 20,000 Hz (20 KHz)
- Minimum Recommendation
  - 44.1 KHz Minimum Sampling Rate
  - 16 Bit Minimum Bit Depth
- Archive Standard
  - 96 kHz/24 bit

Sound Basics

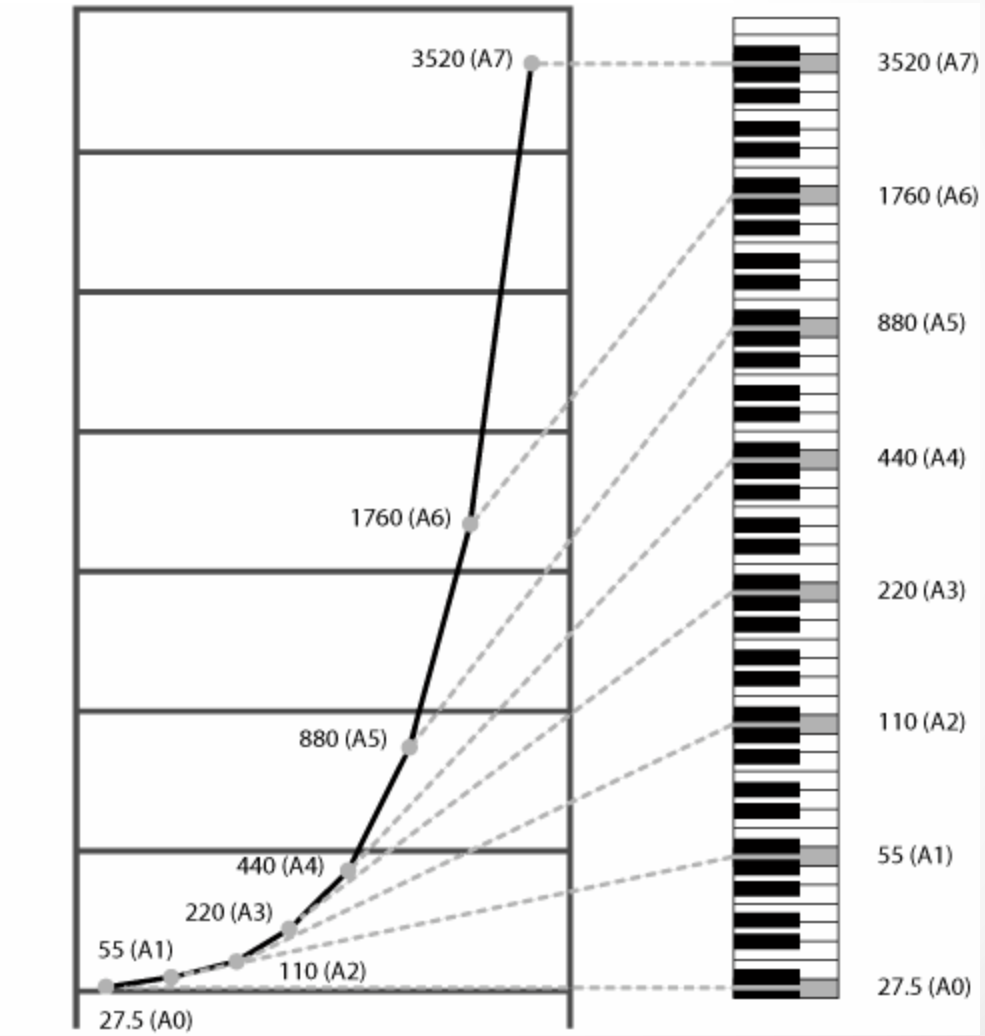
Mapping Air Pressure Change:

- Loudness: Bel (Sound Pressure Level) dB (1/10 Bel) logarithmic scale
- Frequency: Pitch
- Timbre



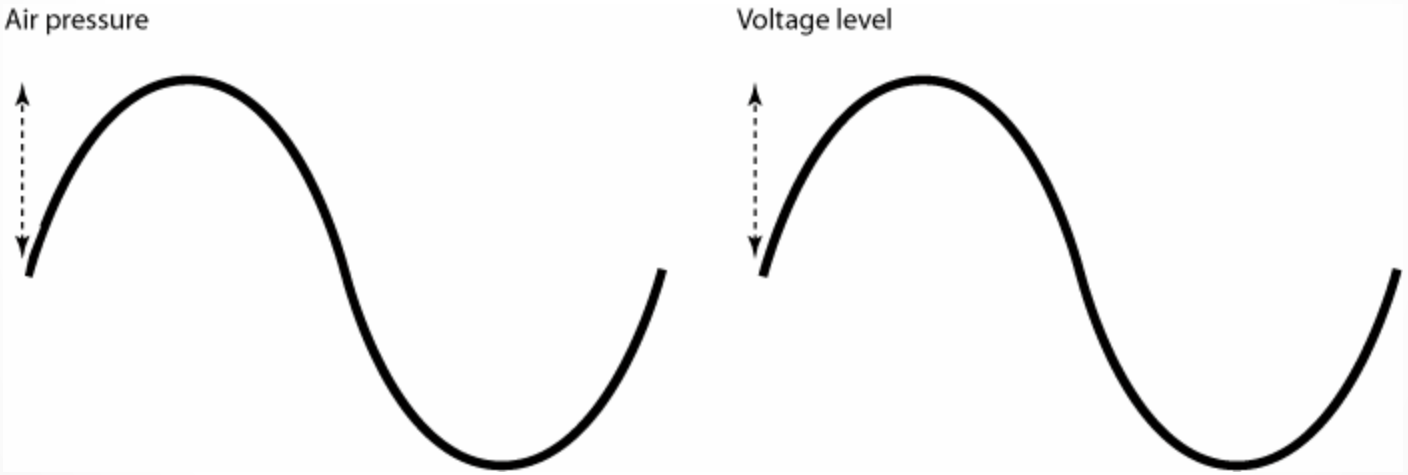
Sound Basics

Octaves



Sound Basics

- Analog

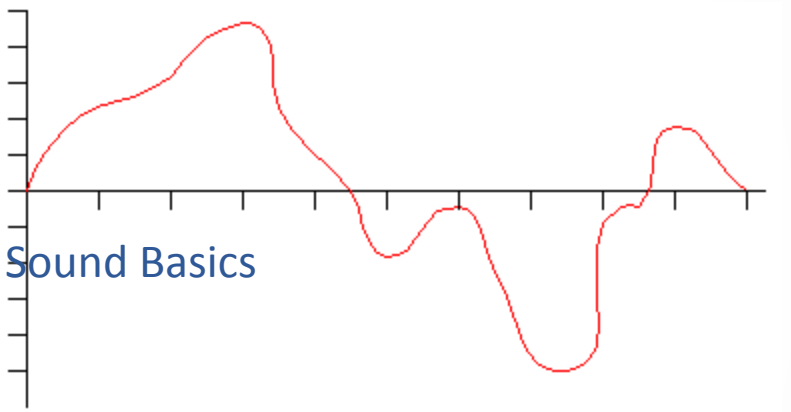


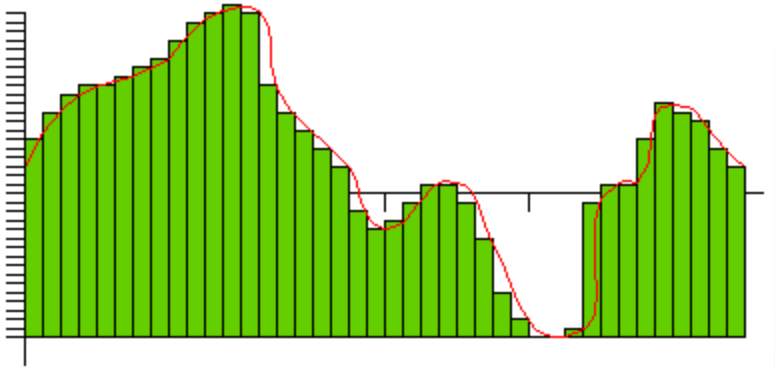
Sound Basics

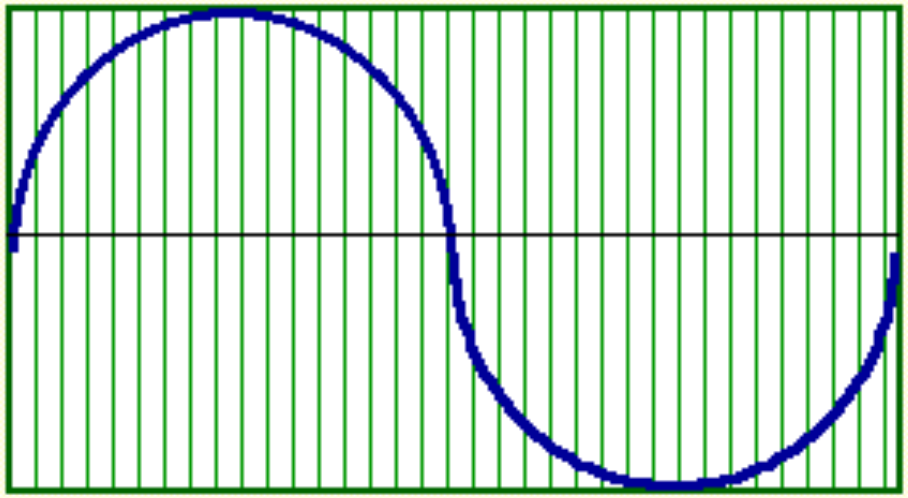
Digital Capture:

Turn into

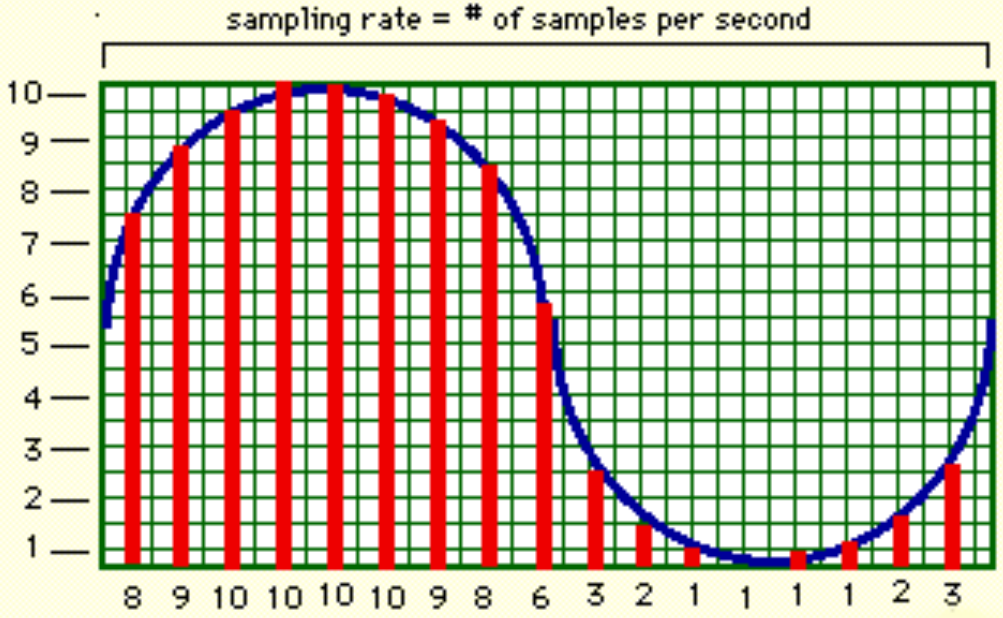
Numbers







Analog waveform represented as sound pressure (SPL) level over time

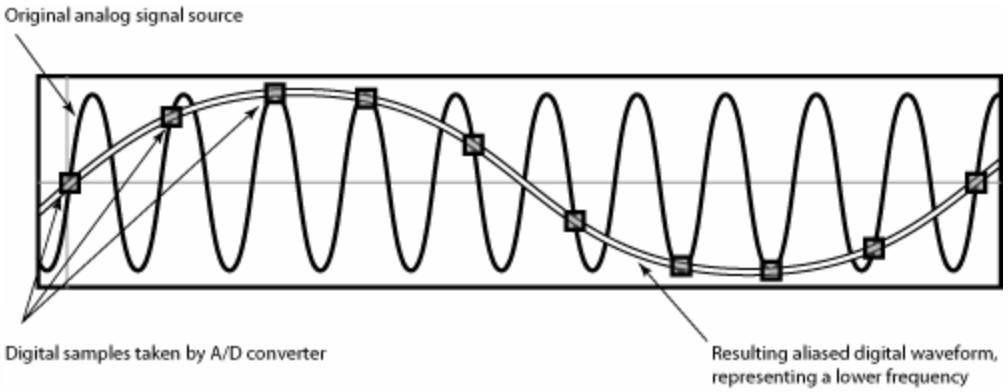


Same waveform quantized proportional to SPL

Each sample is a measurement of the instantaneous amplitude of source signal

Sound Basics

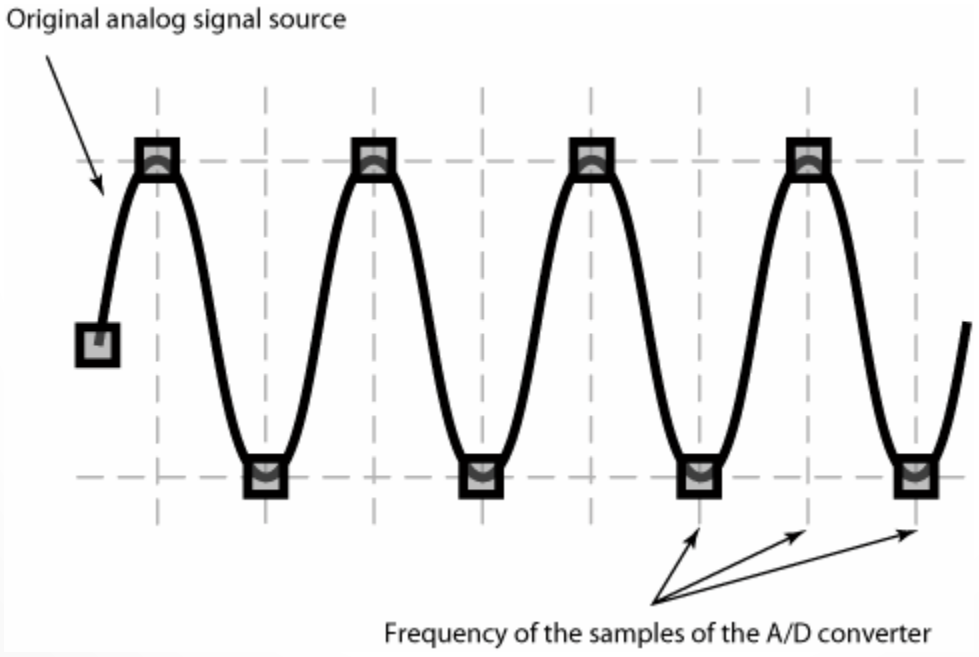
- Nyquist-Shannon theorem



Sound Basics

- Nyquist-Shannon theorem

Remember Humans hear up to 20,000 Hz



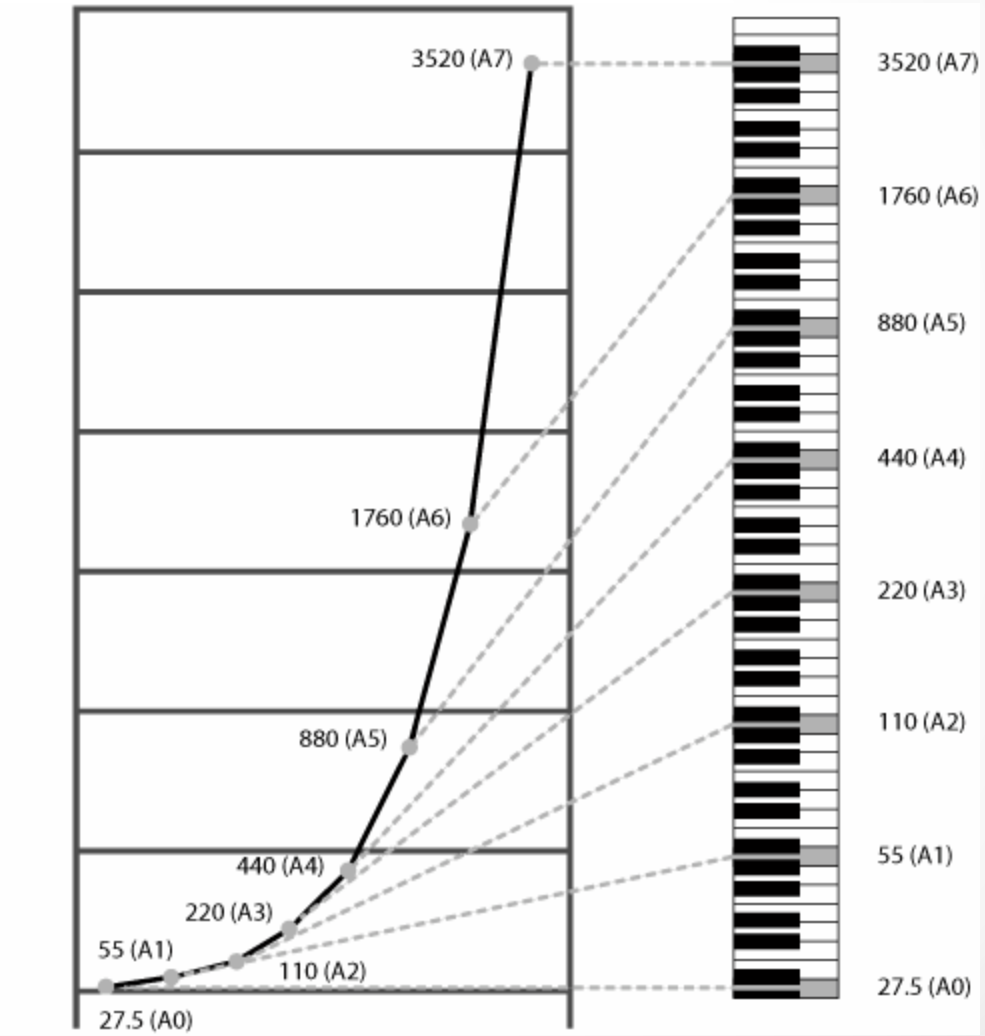
Sound Basics

Sound Capture

- Human Voice and hearing
  - 20 to 20,000 Hz (20 KHz)
  - Voice range 100 Hz – 5000 HZ (5 KHz)
- Minimum Recommendation
  - 44.1 KHz Minimum Sampling Rate
  - 16 Bit Minimum Bit Depth
- Archive Standard
  - 96 kHz/24 bit

Sound Basics

Octaves



Sound Basics

- Bit Depth
  - Values recorded at Capture
  - 16 bit: 65,000 levels of resolution
  - 24 bit: 16 million
- Bit depth increases dynamic range:
  - Rounding Off: quantization error (noise)
  - Low levels—signal submerged in background noise

Sound Basics

Decibel

- Bel (Sound Pressure Level)
- dB (1/10 Bel) logarithmic scale
- 0 dB Arbitrary start
  - 0 The softest sound a person can hear with normal hearing
  - 10 normal breathing
  - 20 whispering at 5 feet
  - 30 soft whisper
  - 50 rainfall
  - 60 normal conversation
  - Over 85: harm over time
  - 110 shouting in ear
  - 120 thunder
  - 140 Damage
  - Voice Recording -12 to -6
  - Music Recording -6 to 0

Sound Basics

- Bit = Binary Digit
  · 8 Bits = 1 Byte
  · 1000 Bytes = 1 Kilobyte
  · 1000 Kilobytes = 1 Megabyte
  · 1000 Megabytes = 1 Gigabyte
  · 1000 Gigabytes = 1 Terabyte
  · 1000 Terabytes = 1 Petabyte
- CD Size: 74 minute/650 MB (12 cm),
- DVD+RW and DVD-RAM discs come in 4.7 GB single and 9.4 GB double-sided (12 cm)
- 44.1 kHz /16 bit depth will run 10MB per minute: (uncompressed)

Sound Basics

File Format

- Uncompressed (lossless)
  - WAV, AIFF
  - Archive and Preservation
- Compressed or down-sampled formats
  - MP3, MP4, Real Audio, Windows Media, Apple AAC (lossy)
  - WMA vs MP3 (Voice or Music)

Sound Basics

Microphones

- Most important puchase
- Never built in or handheld
- Placement key
- Lapel microphone
- Tell shop you are doing voice over music

Sound Basics

Microphones

- Frequency Response (20 hz to 20 kHz)
- Max SPL 130-148 dB
- SNR 75 – 80 db (Usual home one 20 db) (Signal strength relative to background noise)
- Equivalent Noise 10-20 dB (lower the better) (how noisy microphone itself is)