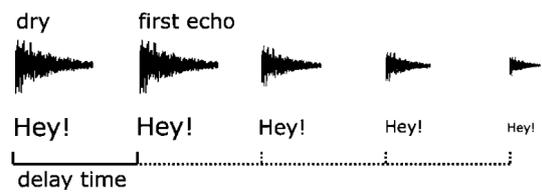DELAY

AoS 1: EFFECTS

https://www.izotope.com/en/learn/understanding-chorus-flangers-and-phasers-in-audio-production.html

What is Delay?

- The **repeat** of a sound after the initial signal

- Initially created by recording the sound onto **tape** or using **bucket brigade chips**

- Modern delay units store the original sound **digitally** and replay it

dry   first echo

Hey!   Hey!   Hey!   Hey!   Hey!

delay time

Delay Terms and Parameters

Delay Parameter	Definition
Delay Time	The time between each repeat (measured in ms)
Feedback	Part of the delayed signal is fed back into the delay input, creating the repeats The higher the feedback, the greater the number of repeats
Pan	Changes the stereo position of the delayed signal
Filter/EQ	Changes the frequency content of the delayed signal

Delay time - Software plug-ins can sync the delay time to a note value in time with the tempo/BPM of the project

Feedback – 50% = original signal is sent back at half its original volume
200% = original signal is sent back at double its original volume

Pan – On some multitap/stereo delays, the individual taps can be placed in different parts of the stereo field

Analogue Delay

- Delay was created by recording the original sound onto **magnetic tape** and then playing it back

- **Delay time** is changed by altering the position of the **playback head**

- **Feedback** is generated by sending some of the **output** signal to the **input**
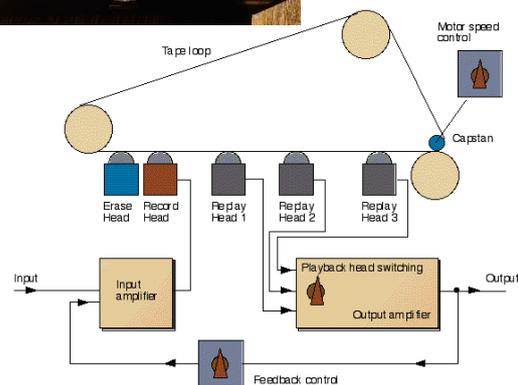
(pictured: Echoplex)

Delay time could also be altered by changing the speed of the tape on some units

The nature of magnetic tape caused the delay to lose some of its high-frequency content, resulting in a warmer sound]
Modern day units try to emulate this analogue warmth

The nature of the tape also meant it would deteriorate over time and would need replacing

Listen to: Queen – Brighton Rock (3:20 delays are used to create counterpoint and harmonies)

Later analogue delays used bucket brigade chips to store the original signal
The signal would be held in each capacitor (bucket) for a short time and then moved to the next virtual bucket which had the effects of delaying the signal
The signal is handed off to each new stage just as old-

fashioned firefighters would pass along buckets of water in a line

> The chips were more convenient and reliable than tape but carried
more noise as the delay time increased

Slapback delay is a type of analogue delay with a single repeat (feedback of 0%) and a delay time between 80-200ms

> Used to create a percussive like effect heard on rock'n'roll recordings
of the 50s

> Used to thicken vocals and electric guitars

> Listen to: Elvis Presley – Mystery Train (e. guitar throughout)

> Listen to: John Lennon – Instant Karma (lead vox from 0:05)

Digital Delay

- The original sound would be stored **digitally** in memory
  - This made it easier to manipulate

- Digital delays allow for the delay time to be **synced** to the **main tempo** in a DAW
  - Most plug-ins allow for a **note value** to be selected

Compare to analogue delay

              Easier to automate/control with MIDI
              Possible to sync delay to global tempo
              Accurate control of delay time in ms
              Can store, share and downloads pre-sets
              No maintenance

Tempo sync is commonly used in dance music
Listen to: U2 – Where The Streets Have No Name (lead guitar in intro 0:42)

Other Types of Digital Delay

- **Multi-tap delay** lets several delay times be used in one effect

- **Ping pong/stereo delay** allows for the delayed signal to be **panned**
  - The pan can either be in relation to **itself** or to the **original signal**

- Delay time above 40-50ms can result in a distinct **echo**

- Delay times below 40-50ms create a **doubling effect,** thickening the signal

Stereo delay can also be used to emulate a wider stereo image by altering the delay time of one of the channels by a small amount

Modulated Delay

- **Modulated** delay effects are produced by the modulation of the **delay time**

- An **LFO** is used to control how much the **wet (delayed)** signal is delayed by over time
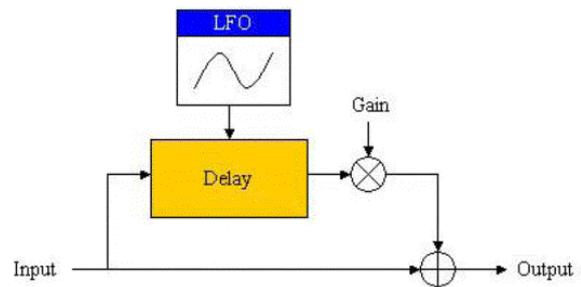
Modulated Delay Terms and Parameters

Modulated Delay Parameter	Definition
Rate	The speed at which the modulation takes place (measured in Hz or a synced note value)
Depth	The range of values for the delay time The greater the depth, the greater the range of values

Chorus

- Makes one track sound like a **chorus** of instruments

- Delays a copy of the initial signal and plays the delayed version **alongside** it

- When an **LFO** is used to change the delay time, it affects the **pitch**
  - Creates a vibrato effect

- Often used on clean electric guitar, fretless bass and synth pads
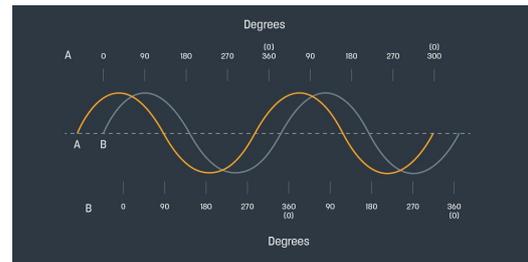
Simulates the subtle pitch and timing differences when multiple people perform together

Set the depth and rate low for a less noticeable effect
Set the depth and rate high for a dramatic 'bubbly'/underwater effect

Listen to: Marillion – Sugar Mice (guitar), Camel – Nimrodel/The Procession/The White Rider (underwater sound)

Flanger and Phaser

- **Flanger** creates a 'swirling', 'whooshing' or 'aeroplane' effect depending on the **rate**
- The high feedback generates a **sweeping**, **pitched** sound **synced** to the LFO
- **Phaser** is similar but subtler
  - Can sound similar to chorus with subtle settings
- Often applied to **distorted guitars**

Extreme setting creates the plane effect

When applied to just the wet signal flanger can produce a shimmering effect

Phaser acts more like a filter with an LFO applied rather than two instruments playing at once

Comb Filtering

- Occurs when a delayed version of a signal **combines** with the direct sound
  - Causes **destructive interference**

- Results in a **thin sound** where a reduction in volume is particularly audible in the **low/low-mid** frequency range

- Can be a **side effect** of **incorrectly set up speakers**

- Can be used **creatively** to create a **flange effect**
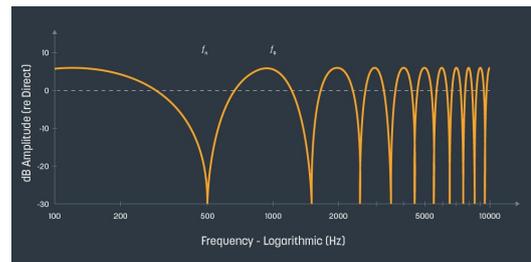
If a set of stereo speakers are placed at different distances from a listener, the signal will reach them at different times, causing destructive interference

In a flanger the 'teeth' of the comb move up and down to create the effect