

TOMMASO ROSATI
SOUND ART

DELAY

ECHO, DELAY, FLANGER,
CHORUS, COMB FILTER,
ALLPASS FILTER, PHASER

THE
BOOK IS
NOW
AVAILABLE!

PLAY WITH SOUND

MANUAL FOR ELECTRONIC
MUSICIANS AND OTHER SOUND
EXPLORERS



TOMMASO ROSATI
TIMOTHY HSU

A Focal Press Book

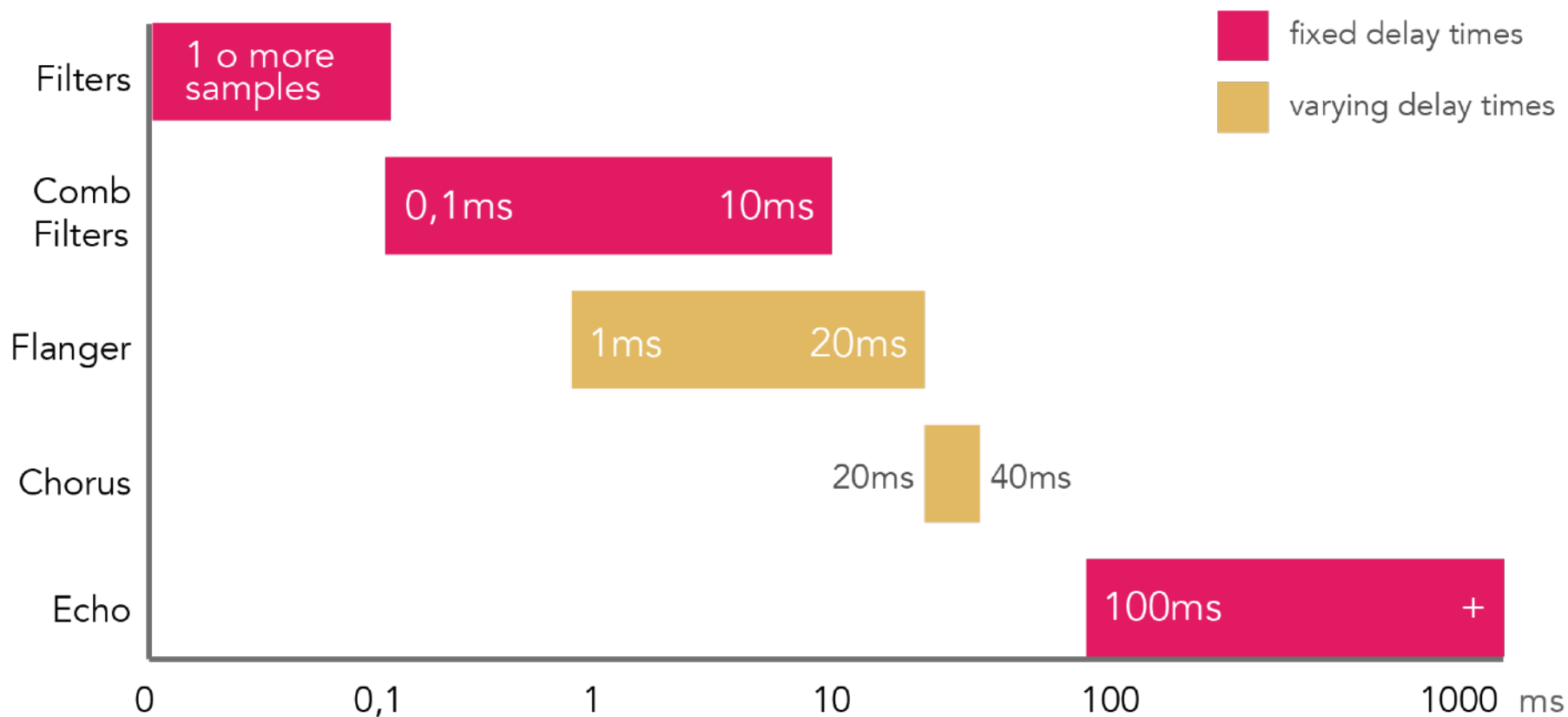
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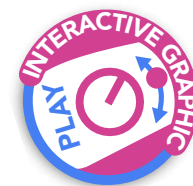


Delay

A delay is the time lag that is applied to an incoming sound.

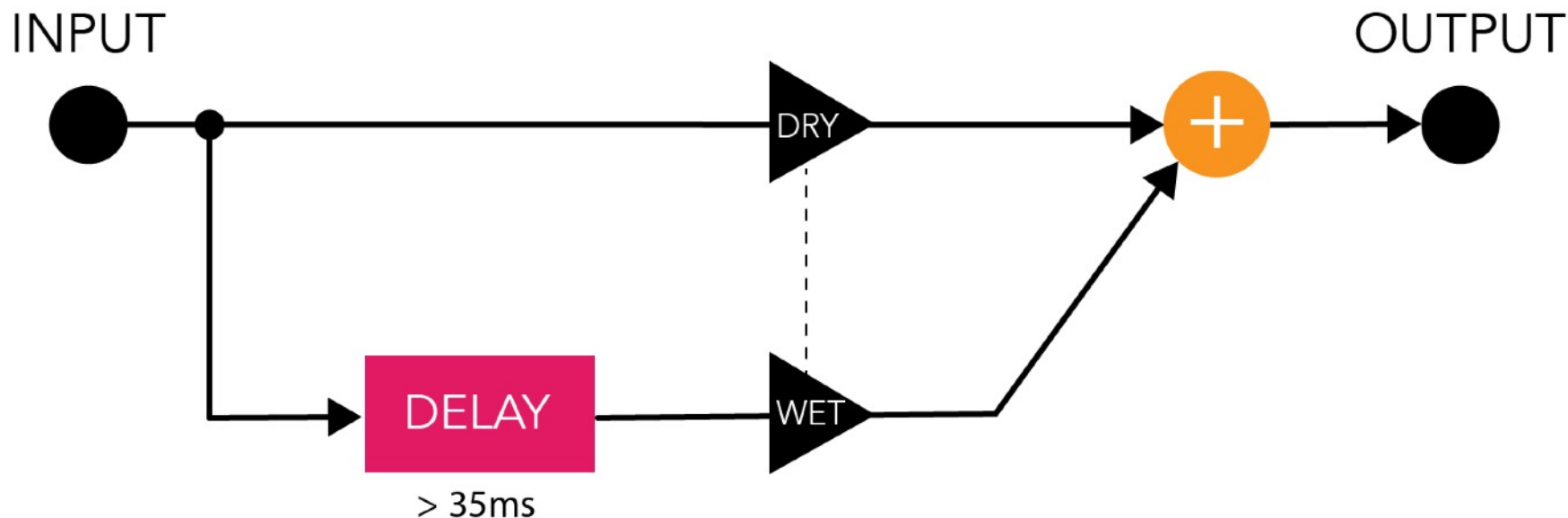
Many of the common effects we use are based on the concept of delay.





Echo > 100ms

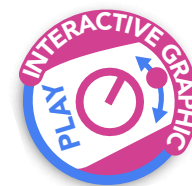
An **Echo** is the repetition of a sound and is a phenomenon we experience in nature. Generally, if the second sound arrives less than 35-50 ms after the first sound, our ears fuse the sounds together and we hear only one sound, not two. Sounds greater than 100 ms apart are perceived as the classic echo effect.



PARAMETERS

Delay time (or Length) how much delay I apply to the input sound. You can express in **ms** or **musical note types** like quarter, eighth, or sixteenth notes.

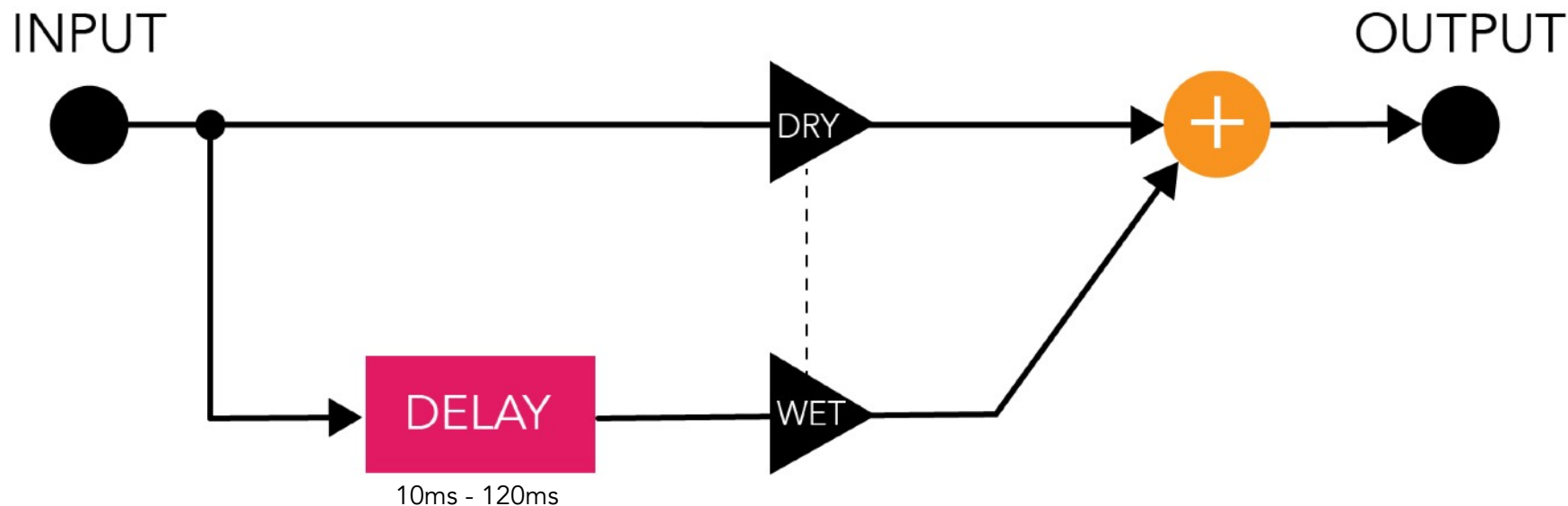
Dry/Wet is the amplitude ratio between the original and the delayed sound



Slapback delay

10ms - 120ms

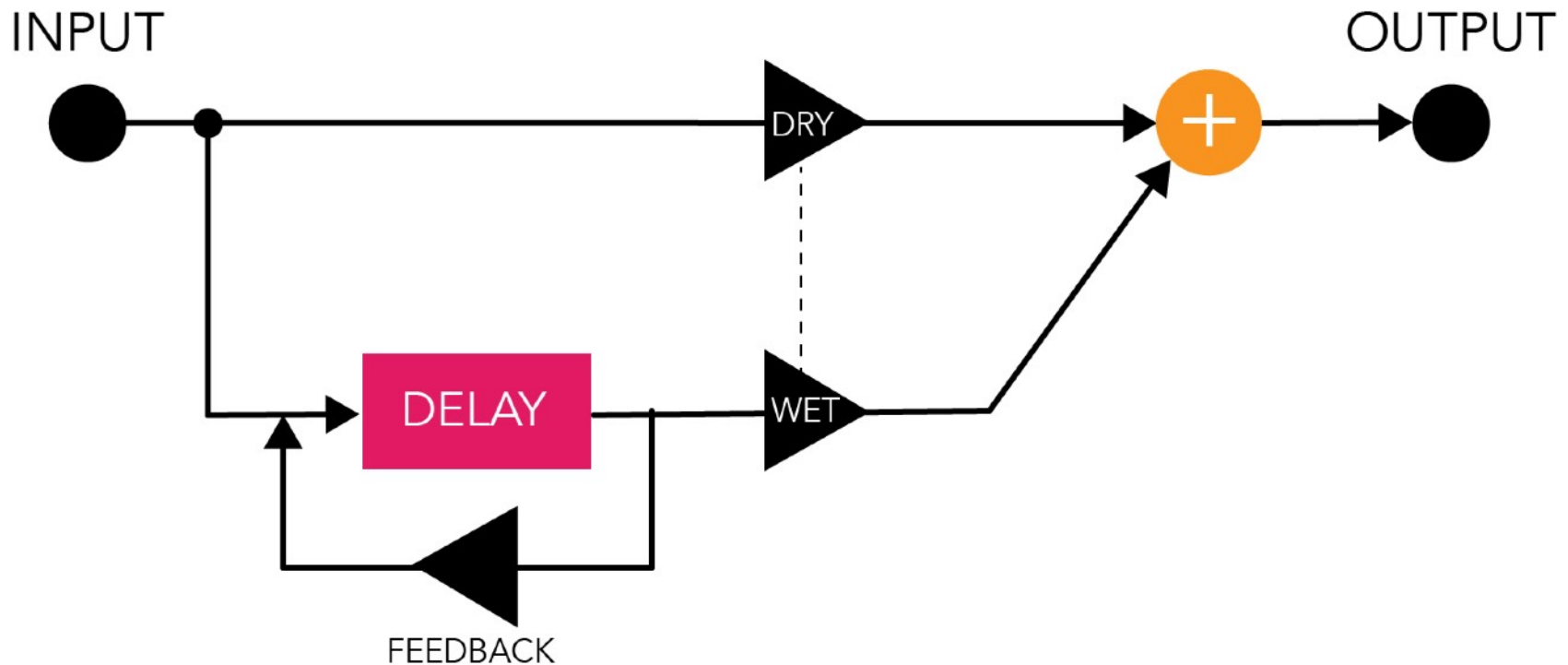
Delay between 10 and 120 ms. The effect is that a sound rebounding off a wall or sound duplication.





Multiple echo

When you create many more repetitions of the sound with feedback.



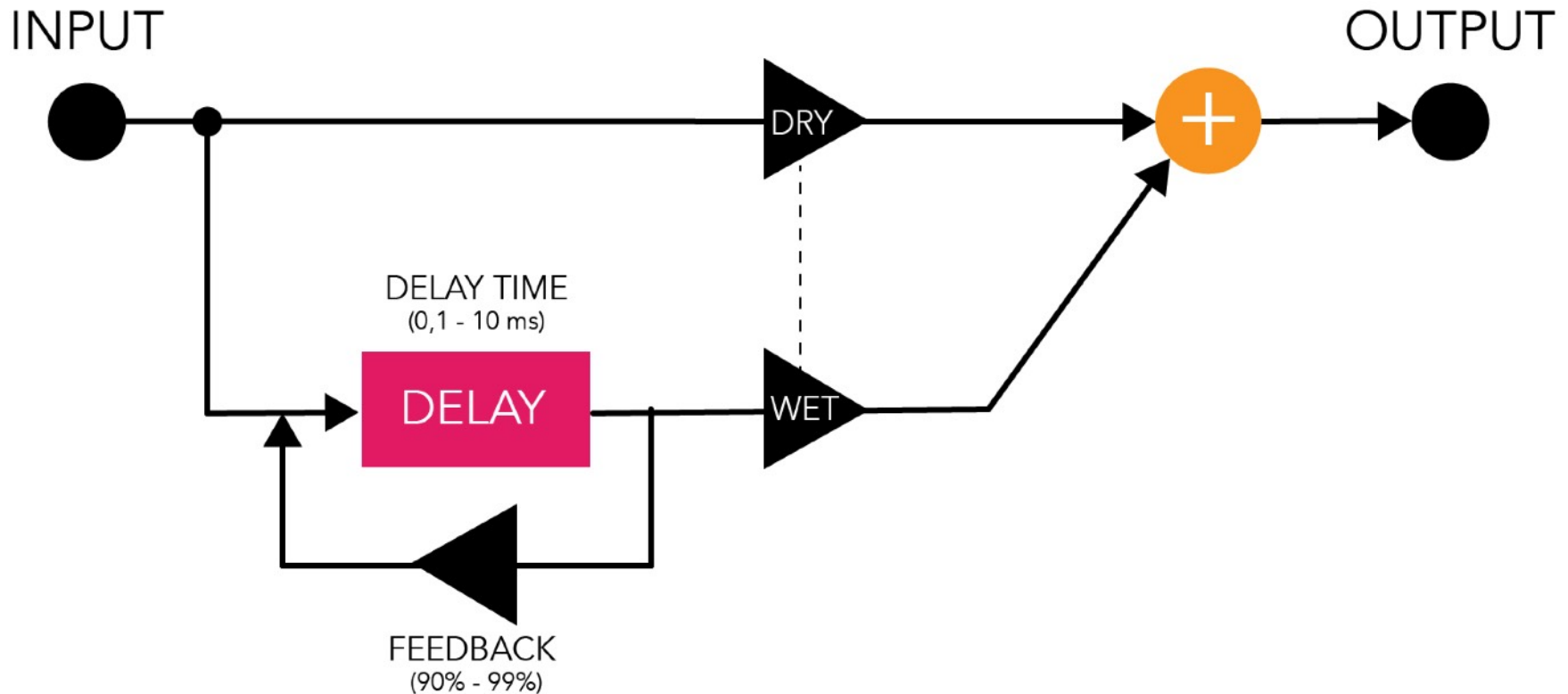
PARAMETERS

Feedback amount (commonly simplified to Feedback) is a value that indicates how much of the original amplitude of the sound I send back. It can be expressed as a percentage or in dB.



Comb Filter 0,1 - 10 ms

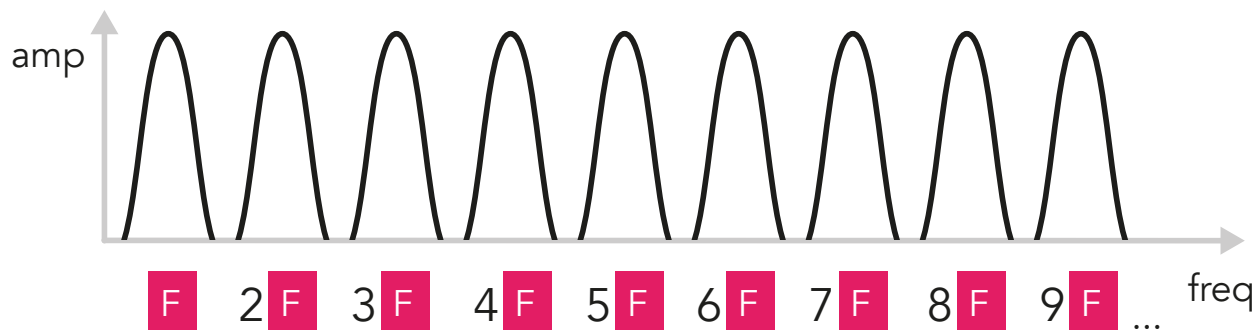
Comb filters as a specific type of Multiple echo that use minimal delay time values and high feedback.



Comb Filter

The comb filter can **tune a sound** that would otherwise not be in tune, because it brings out several bands in the spectrum at integer multiples of a fundamental frequency.

$$\text{fundamental Frequency} = \frac{1 \text{ second}}{\text{delay time}}$$
$$\text{delay time} = \frac{1 \text{ second}}{\text{fundamental Frequency}}$$



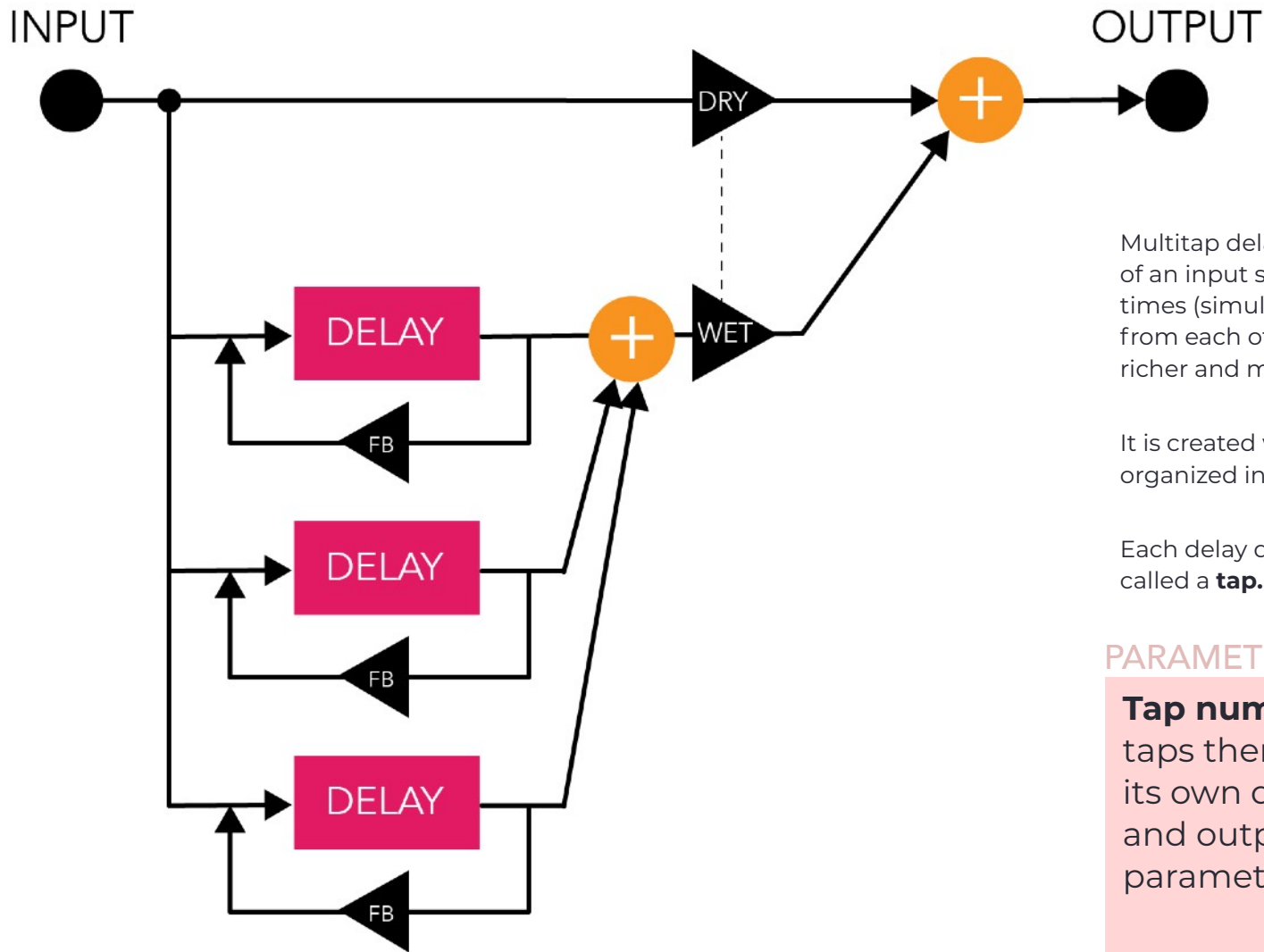
PARAMETERS

Feedback is how much of the original amplitude of the sound I send back. .

Delay time is how much delay we apply to the input sound. It relates directly to the fundamental frequency or the note that the comb filter creates.

Multitap delay

In parallel



Multitap delay features multiple copies of an input sound at different delay times (simulating different distances) from each other, thereby achieving a richer and more complex effect.

It is created with a set of delays organized in parallel or in series.

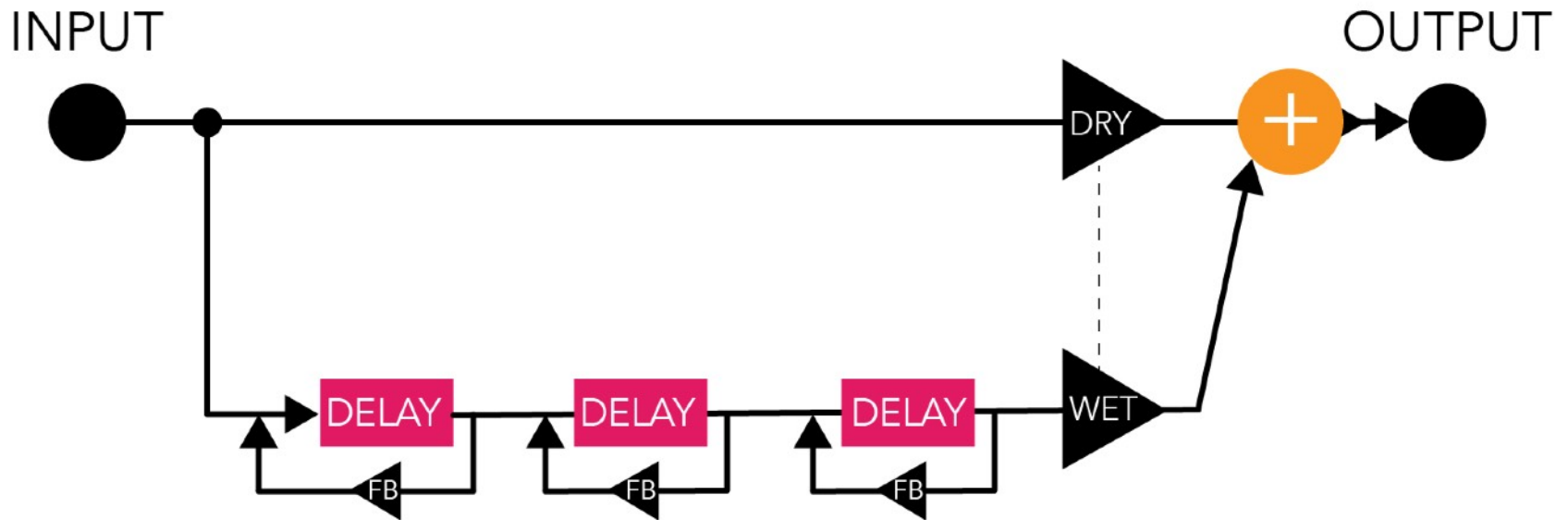
Each delay device with feedback is called a **tap**.

PARAMETERS

Tap number: how many taps there are. Each tap has its own delay time, feedback, and output volume parameters

In series

Multitap delay



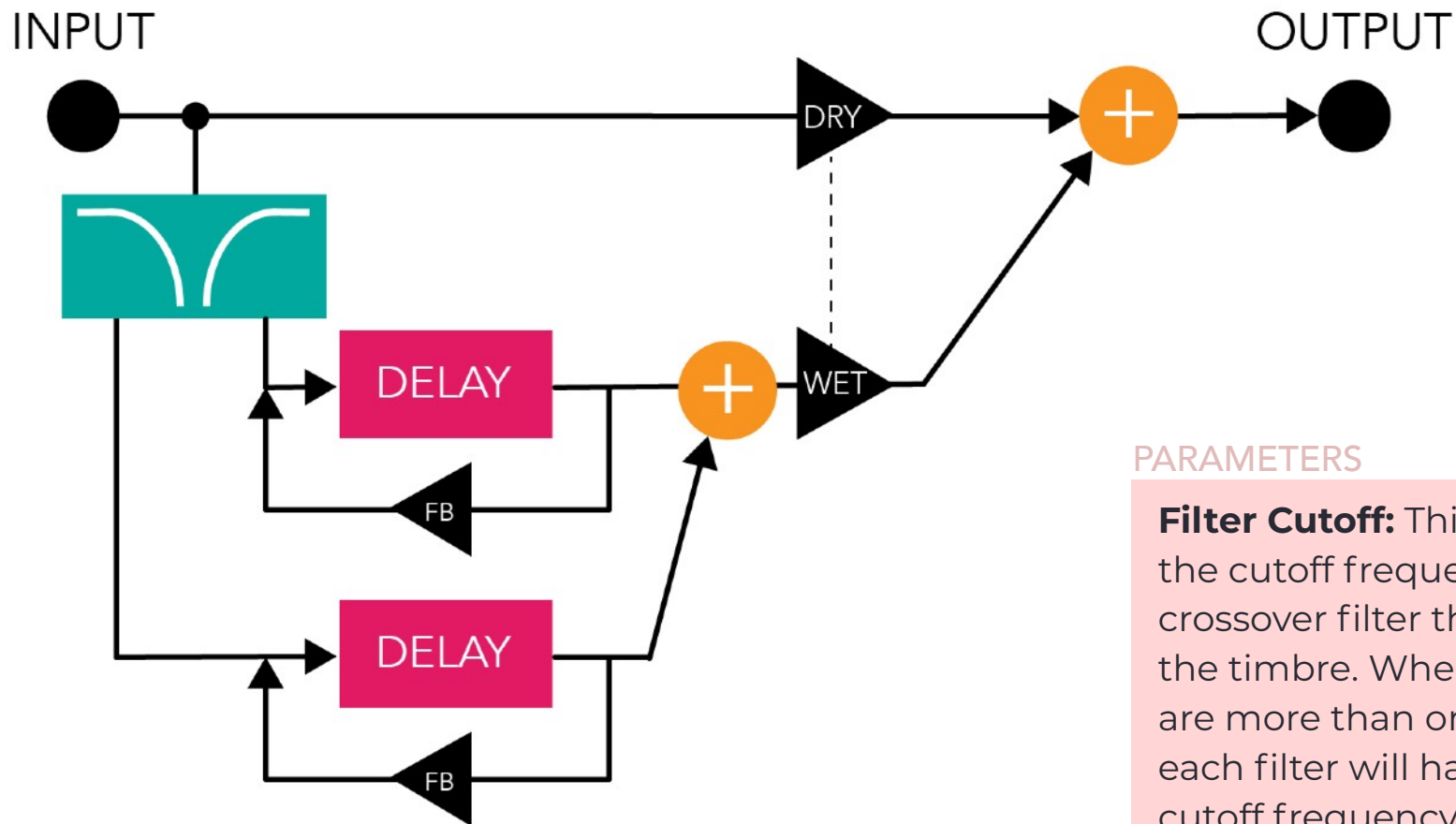
PARAMETERS

Tap number: how many taps there are. Each tap has its own delay time, feedback, and output volume parameters

Multitap-Multiband delay

When I utilize filters and divide the sound into multiple frequency bands and send each band to a different tap, I get **Multitap Multiband delay**, also sometimes called **Filter delay**.

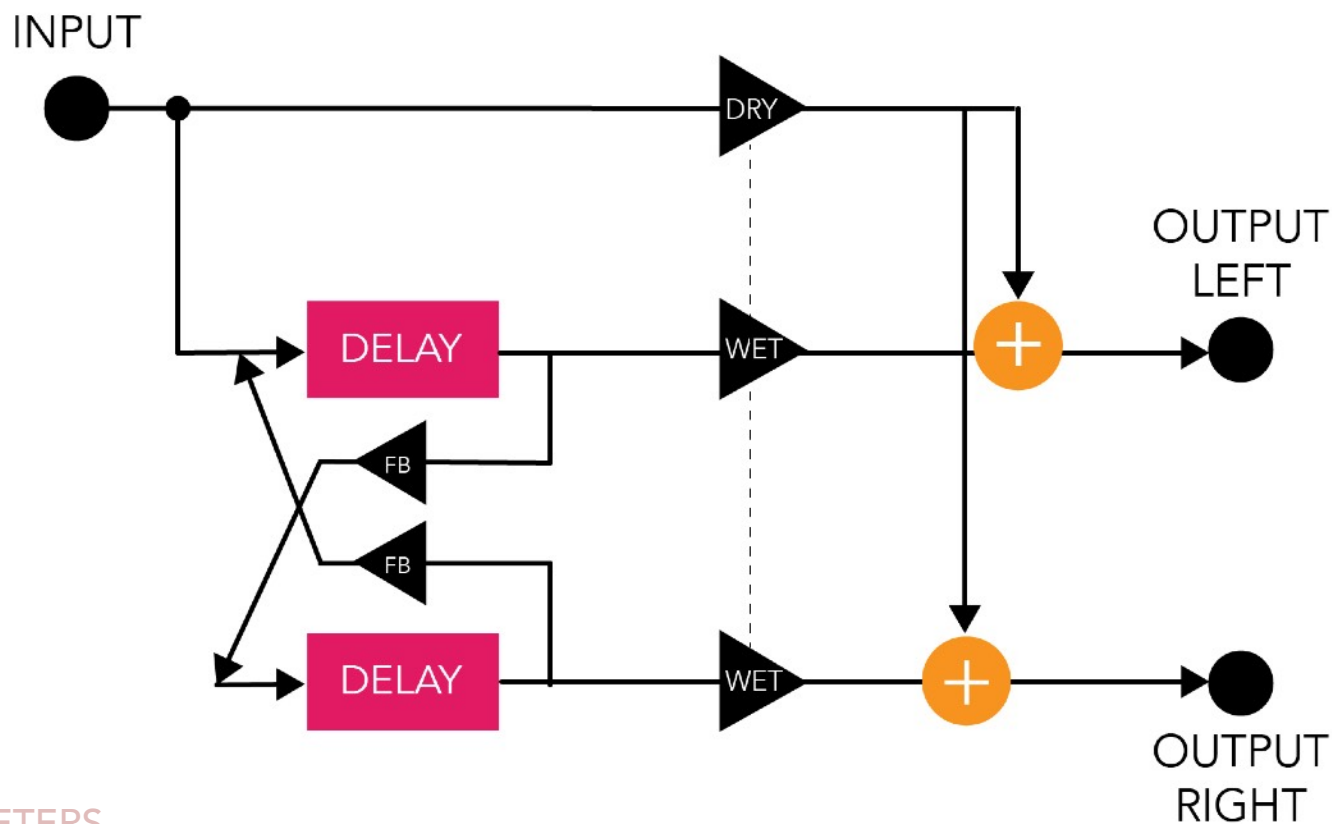
They are created with one or more crossover filters that split the signal and send it to a set of delays.



Ping-pong delay

Ping Pong delay, an effect that creates a series of delayed copies of my sound that are played back alternately between the left and right channels.

It is created with two delays that deliberately cross feedback paths and then have their outputs sent to different output channels.



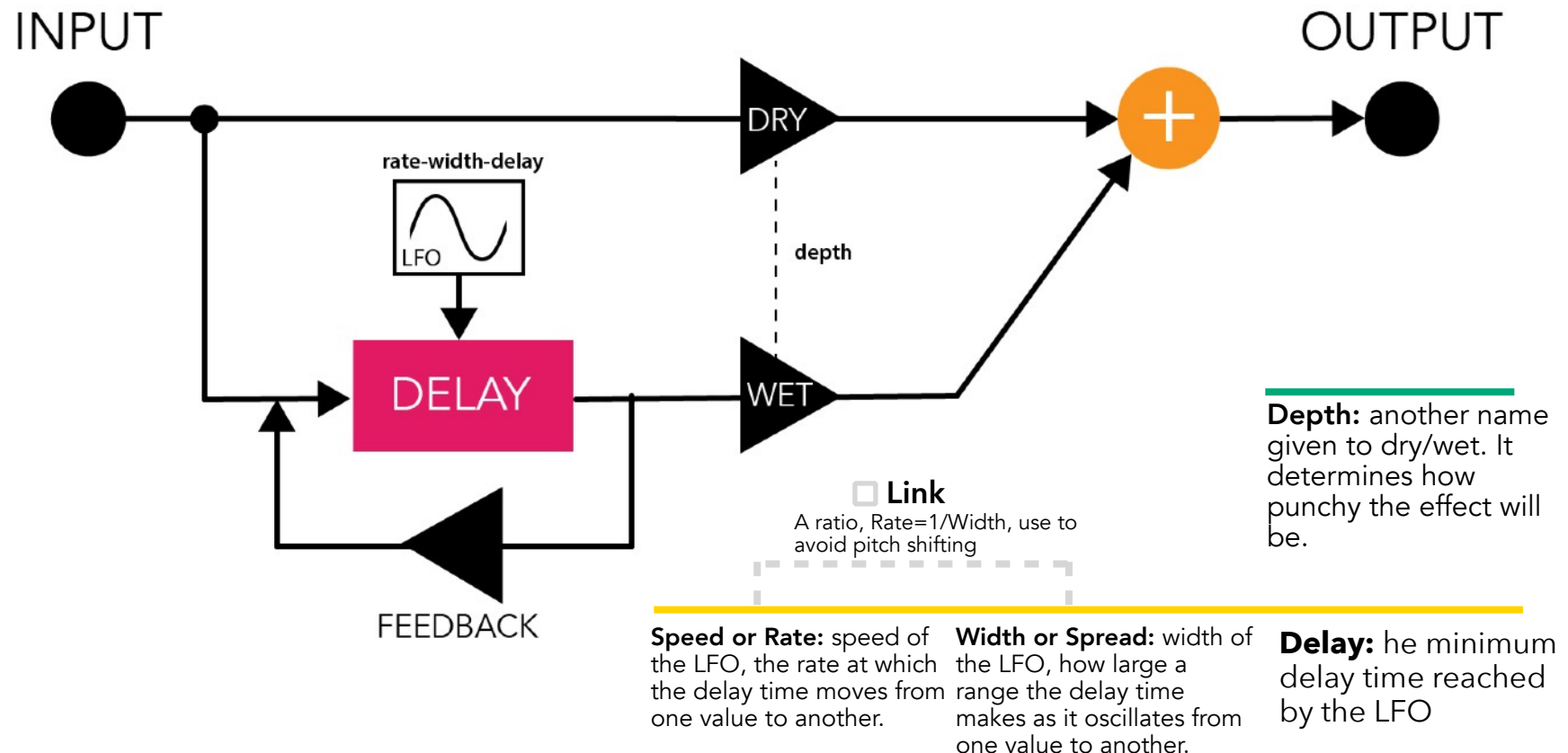
PARAMETERS

Delay time can be synchronized between the two channels or independent.

Flanger 1-20 ms Variable

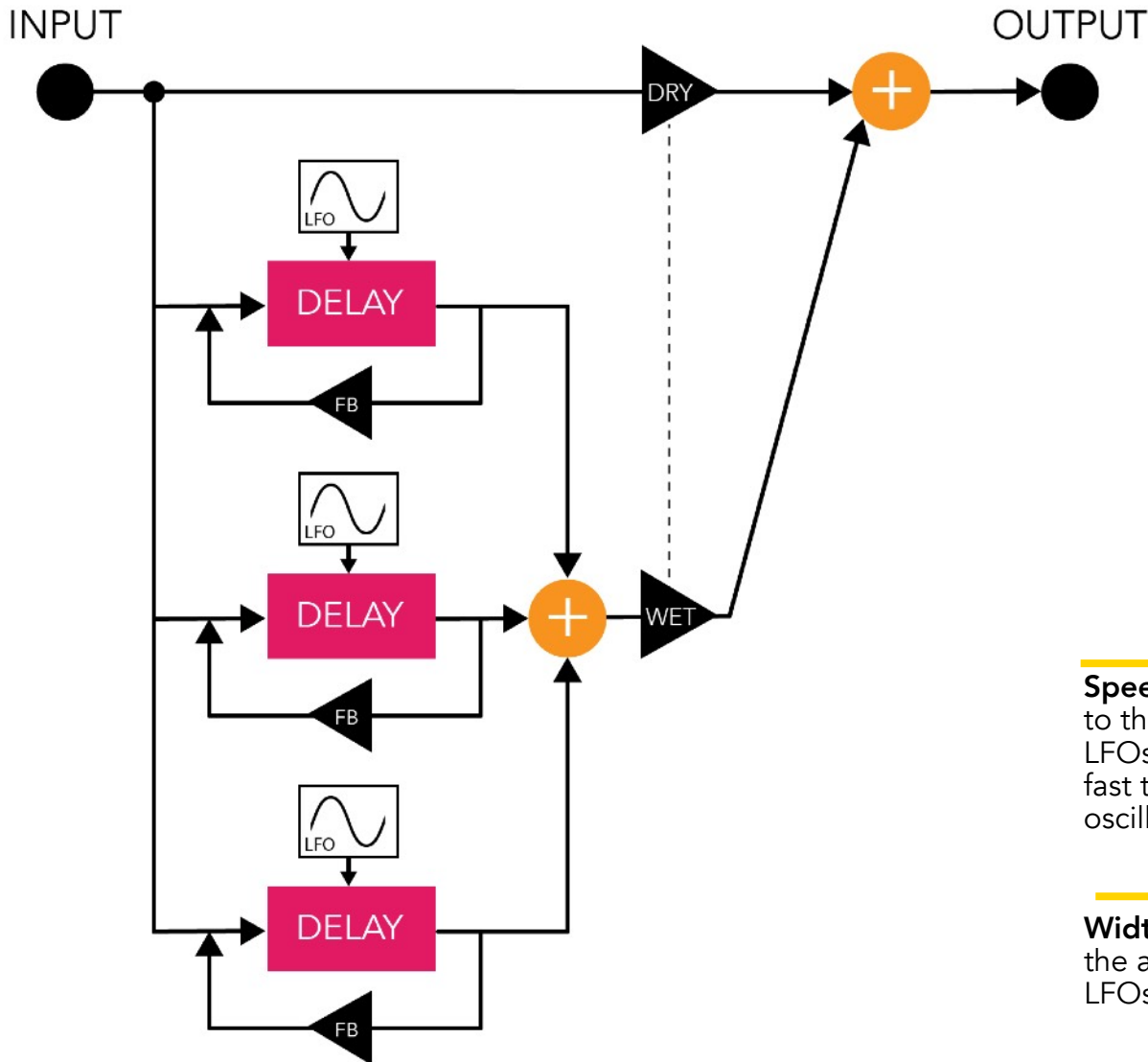
A **flanger** is created by summing a sound with a copy of itself that has a variable moving delay between 1 and 20 ms. The result is variable filtering.

Practically, we use an LFO to continuously change the delay.



Chorus

20-30 ms Variable



Chorus is a multitap delay in which multiple taps have delay times controlled by individual LFOs.

Speed or Rate refers to the frequency of the LFOs, dictating how fast the delay times oscillate.

Wave form indicates the shape of the LFO's output.

Width corresponds to the amplitude of the LFOs

Delay is the minimum delay time reached by the LFOs

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