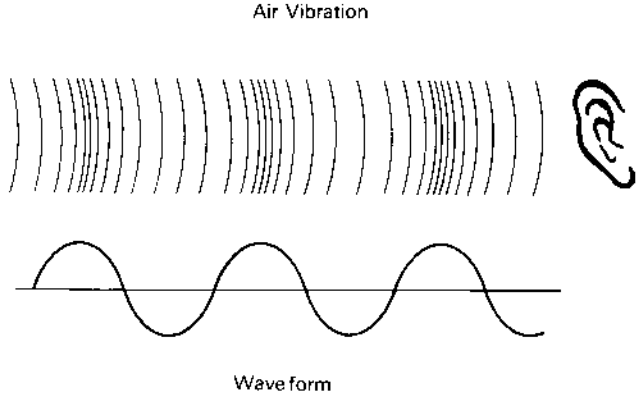
6 LA Synthesis

LA stands for Linear Arithmetic synthesis which is the heart of the new technology. LA synthesis involves a great many technological advances resulting not only in a superior sound quality but also an improved ease of programming. In this way, Roland has succeeded in maintaining a high degree of familiarity to the user despite the technical wizardry involved.

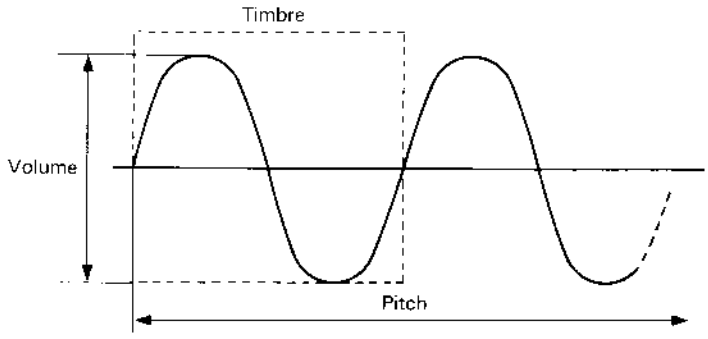
1. What is sound made of ?

[Three elements of a sound]

Sounds are air vibrations reaching our ears. By transforming the vibration into digital signals, it would become visible as a "wave".

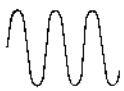


Basically, all sorts of sounds can be considered to consist of "pitch", "timbre" and "volume".



(1) Pitch is determined by the number of waves (=frequencies). Higher frequencies raise the pitch. Usually, pitch (frequency) is represented by Hz.

Low pitch



High pitch

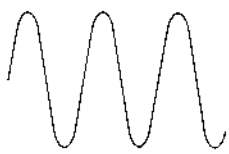
(2) Timbre is determined by the shape of a wave. Generally speaking, roung shaped waves make soft sounds, and sharp shapes make hard sounds.

Soft tone

Hard tone

(3) Volume is determined by the depth of a wave (=amplitude). Larger waves produce higher volumes.

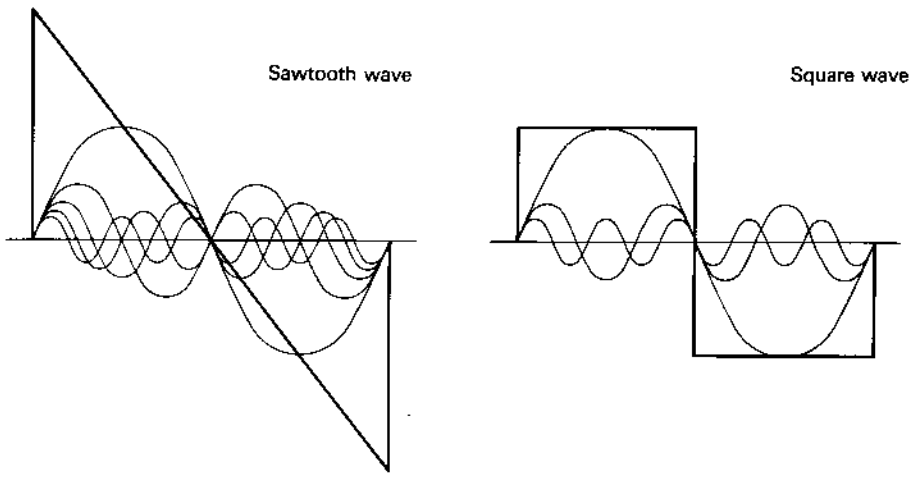
Low volume



High volume

[Harmonics]

Timbre is determined by the shape of a wave. Then, how is the shape of a wave made ? It is believed that a waveform is made by a great many sine waves. For example, a sawtooth is made by adding sine waves of all the possible multiples to the fundamental sine wave. A square wave is made by odd number multiples added to the fundamental.

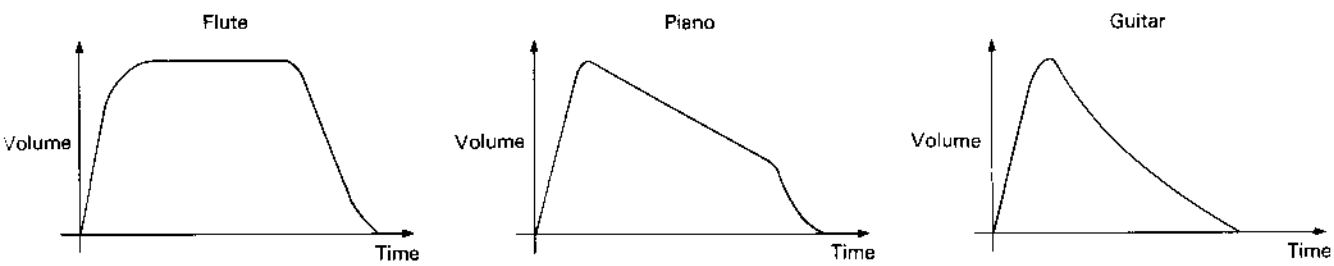


The waves added to the fundamental are called "harmonics" : even number multiple harmonics and odd number multiple harmonics.
A timbre, in brief, is determined by the harmonic content.

[Envelope]

Each of the three elements, pitch, timbre and volume, has its own envelope curve. Each instrument sound has a different envelope.

Envelope of an instrument volume



[Natural Sounds]

A natural sound consists of various different sounds. For example, a piano consists of a sharp attack sound then a decay sound. These two are completely different sounds. Also, the timbre of a piano sound varies depending on the pitch.

2. Understanding LA Synthesis

The LA system allows you to combine various different sections when making a sound. In other words, each independent Partial makes its own sound, and is then combined (synthesized).

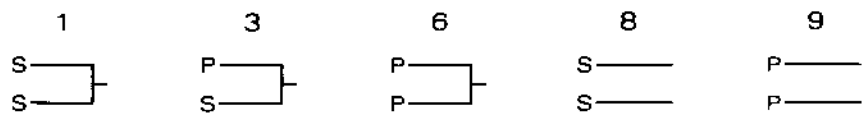
The Structure may be the most important parameter of the D−20, as it decides how to combine the Partials.

a. Structure

Please study the following examples.

13 Structures may be divided into two groups, with the ring modulator, and without.

[Structures that do not use Ring Modulators]

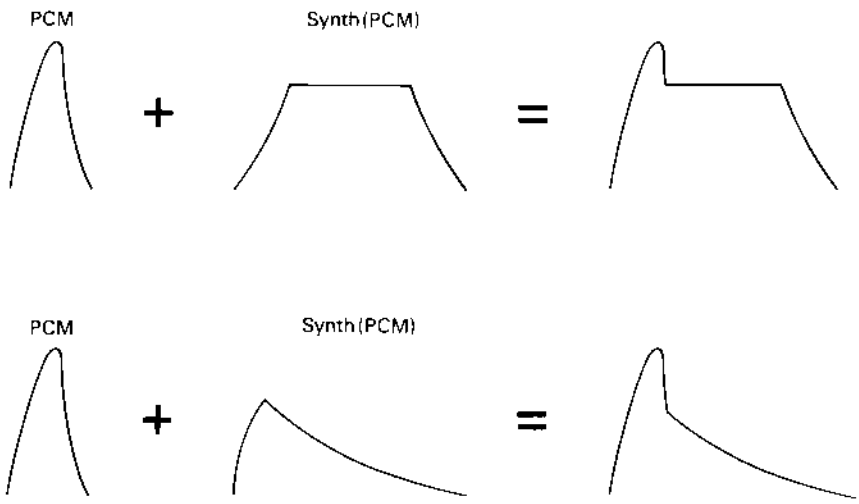


Structure 1/3/6

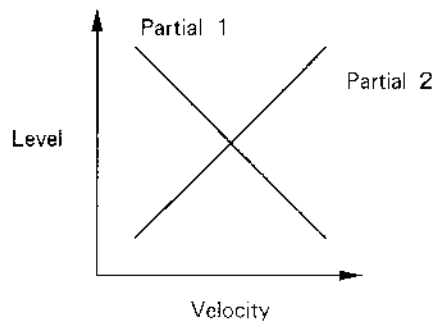
These can be combined as follows.

(1) **By setting each Partial the same, and detuning slightly, a fat sound can be created. Also, shifting the pitch by one octave or a 5th may be effective. This is suitable for strings or organ sounds.**

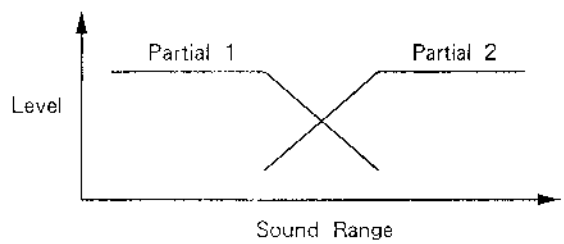
(2) To make a realistic sound, use the PCM sound generators for attack sounds. For example, to create a wind instrument sound, make a blowing sound with the PCM generator, then the sustained sound with a PCM loop or synthesizer generator.



(3) Make a bright and dark sound in each Partial separately, then reverse the polarity of the TVA Velocity. Then the tone can be altered by changing how you play the keyboard.



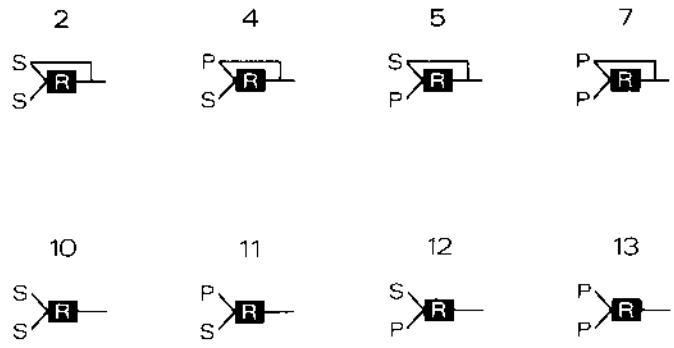
(4) Make the upper and lower section sounds in each Partial separately, then reverse the bias setting of the TVA. Then different tones can be heard by changing the keyboard range.



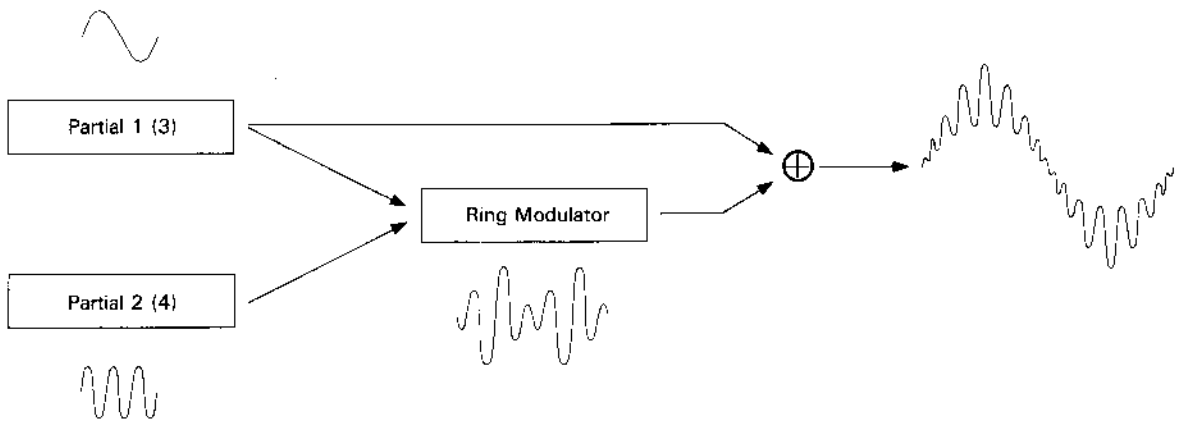
Structure 8/9

These are useful for creating stereo effects. However, the pan setting loses effect in this Structure, so the sound image cannot be changed. (See page 169.)

[Using the Ring Modulator]



The Ring Modulator cross-modulates two Partials resulting in harmonics that are fractional multiples of the fundamental. The key points to using Ring Mudulation are as follows.



○**When the output of either Partial is muted, the other Partial is automatically sent.**

○**Partial 1 (3) always behaves as a fundamental and Partial 2 (4) as harmonic content.**

○**Partial 1 (3) controls the overall volume.**

○**When the pitch ratio of Partial 2 (4) is a multiple of the fundamental, a clear sound is obtained. To create a transparent metallic sound, make Partial 1 (3) as near to a sine wave as possible.**

PCM sounds normally include many odd multiple harmonics, and therefore can become too "muddy" when using the Ring Modulator. Do not set the TVA level of Partial 2 (4) too high.

b. The Editing Procedure

For easier and quicker editing, select a Tone which is similar to the sound you wish to make. Then set the D-20 to the Edit mode, and check the following points to study how the Partials are being used. If you roughly understand the structure of the Partials, you can tell which Partials should be edited.

☞Check the Partial Mute

The Partial Mute is one of the parameters, therefore is written in memory together with other parameters. The muted Partial is not being used.

☞Check how each Partial works

Using the Partial Mute function, listen to the sound of each Partial in use. You may pay attention to how sounds change depending on the sound range, or by the velocity. When using the Ring Modulator, muting one of the Partials will automatically output the other Partial.

☞Check the Structure

Using the Structure number, you can check how each Partial functions and how the Partials are combined.