



TRANSONIQ HACKER

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ESQ80 Tips Understanding Formants

By Jim Johnson

Without a doubt, one of the ESQ series' main attractions, for beginning and experienced synthesists alike, are the many waveforms available on each oscillator. While waveforms aren't the only factor that affect an instrument's sound quality, or even the most important factor, having a good variety of raw waveforms to use as building blocks greatly eases the process of designing a sound.

But of course, the addition of new and unusual features in any synthesizer not only brings new power to the instrument, but new questions as well. Anyone who has worked with a stripped down synth like the Roland Jupiter or Juno series should be familiar with the SAW, PULSE, and SQUARE waveforms, and sampled waveforms like PIANO and BASS are also easily understood, but what on earth is a FORMT wave, and how is it used? According to the ESQ owner's manual, a FORMT wave is a wave with "a sharp peak in its frequency spectrum", and has a nasal tone quality. This isn't a very appealing description, and certainly doesn't seem to be related to the "warm" or "fat" sound that so many of us crave. Actually, there are a lot of uses for the FORMT waves other than simulating a Prophet 5 with a head cold, and in this article, I'll explain some of the theory behind these waves, and then examine some of these applications.

In Ensoniq parlance, FORMT is short for formant. The word "formant", which you may have trouble locating in a dictionary, has its origins in research into the frequency characteristics of the human voice, performed at Bell Labs and other locations in the middle of the twentieth century. A formant, in this sense, is one of two or three peaks in the frequency response of the human mouth and throat. The frequencies and amplitudes of these peaks have an enormous effect on the timbre of vocal sounds, so much in fact that the human ear can distinguish all the various vowel sounds solely on the basis of the locations of these formants. (This is why we can recognize a word even when spoken by two different people whose voices may "sound" quite different.) This a frequency response plot of an "ideal" formant. The frequency of the peak is called, not surprisingly, the "formant frequency". (See Figure 1.)

Formants are also present in the sounds of all acoustic instruments. Depending on the shape of the instrument, there may be only one or two formants in an instrument's frequency spectrum, as in the brass and woodwinds, or there may be so many formants that none are separately identifiable, as in the piano and violin. As with the human voice, the characteristics of an instrument's formants play a major role in helping our ears identify that instrument, so it should come as no surprise to learn that some synthesists began making practical use of this knowledge almost as soon as the technology was available. At one point, some advanced modular synthesizers came equipped with "formant filter banks", which were actually specialized graphic or parametric equalizers, as an aid in duplicating the frequency response of vocal or string sounds. Unfortunately, since the constraints of modern synthesizer design make oscillators much simpler to produce than complex filters, this is one innovation from the analog era that isn't found on today's synths.

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