



REVIEW

Tejera Microsystems Recording Studio Test CD

By Richard Honeycutt

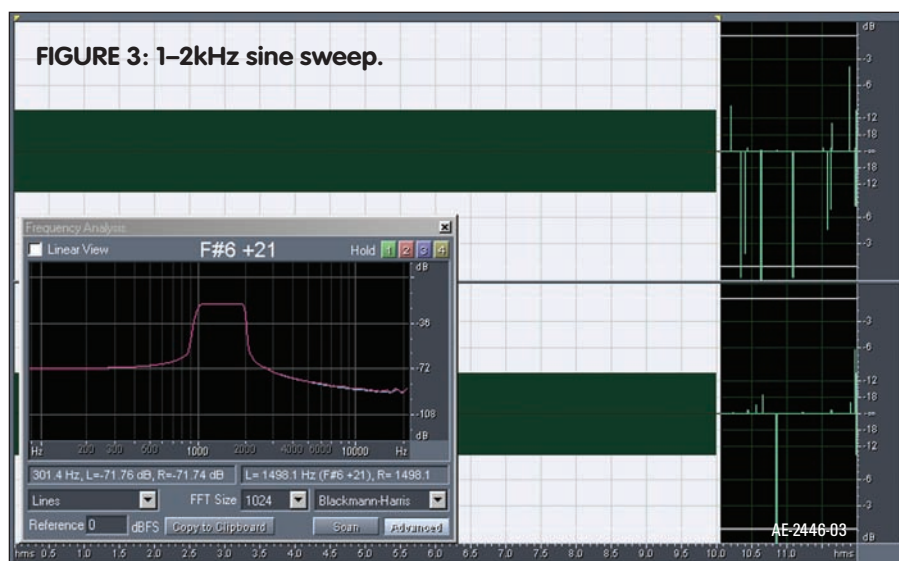
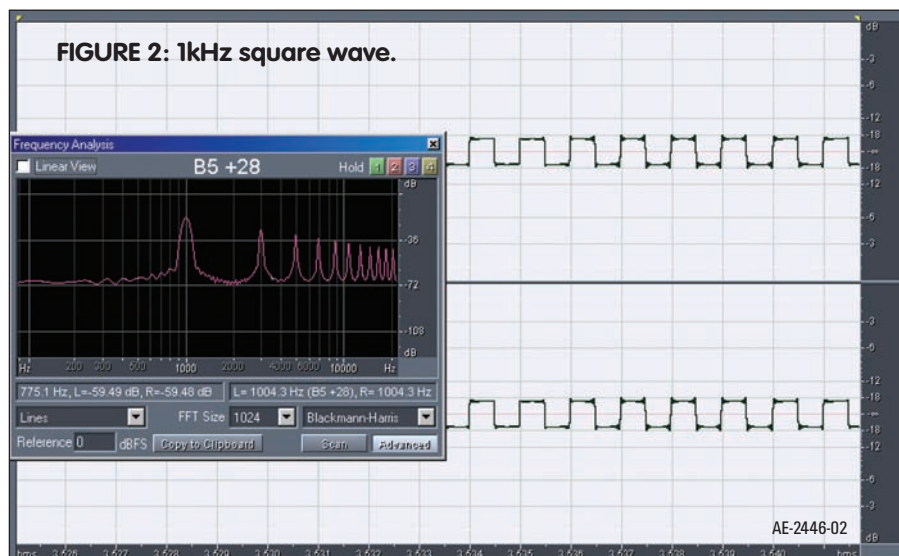
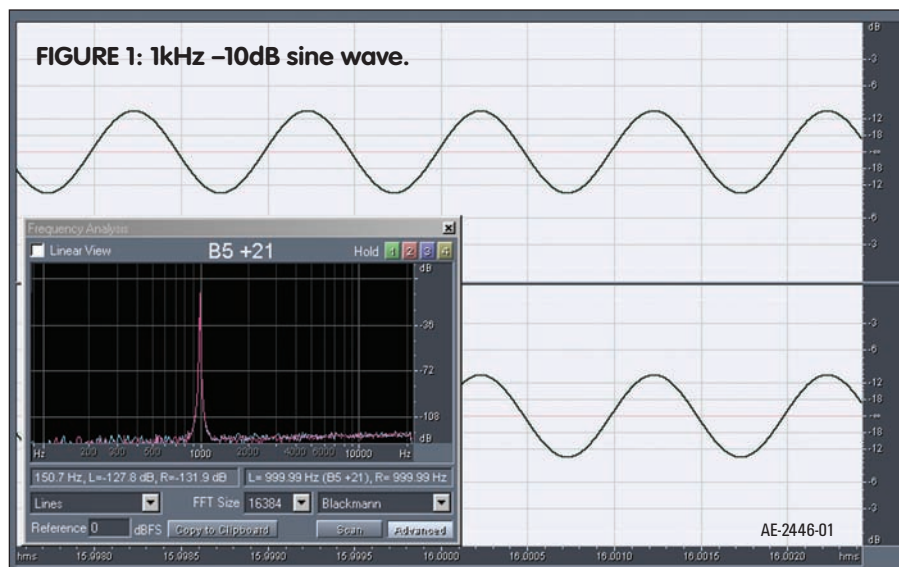
Setup and testing of audio equipment requires test signals. In the shop or lab, these signals are usually provided by signal generators. Today, you need at least a function generator and a pink-noise generator, and a square-wave generator can be very helpful. In years past, much testing was done with tone bursts and warble tones, requiring two more generators. Add in the variety of cables and connectors needed to perform complete system tests, and you have a complex and costly setup.

At least as early as the late '50s, the National Association of Broadcasters (NAB) and others produced vinyl recordings containing the most common test signals. These were indispensable for broadcast engineers or anyone who needed to maintain a vinyl-record-based audio playback system.

TEST SIGNALS ON CD

Fast-forward about 45 years, and you will find that test CDs now provide the functionality of test records. The CD I review here is produced by Tejera Microsystems Engineering (TME), and is specifically targeted to professional and home recording studios. The tracks' contents can be grouped into nine categories:

- (1) Left/right channel identification
- (2) Phasing
- (3) 1kHz reference tones at calibrated



levels from 0 to -80dB

- (4) Tuning tones: 440Hz
- (5) Square waves (1 and 5kHz)
- (6) Sine-wave reference tones: standard $\frac{1}{3}$ -octave center frequencies at -10dB
- (7) Nine one-octave frequency sweeps covering the range 31.5Hz to 16kHz
- (8) Pink noise
- (9) Instructions for performing the tests

In addition to the audio material, there is an enhanced portion readable on a computer, containing .pdf files with printable instructions, graph paper for recording your test results, and a glossary of audio terms.

In order to evaluate the test signals included on the CD, I loaded them one-by-one into Adobe Audition™ and used the FFT analysis function. In this

way, I could avoid any artifacts produced by the sound card in my computer, as the analysis was made directly from the wav file.

TESTING TEST SIGNALS

First, I looked at the 1kHz, -10dB sine wave on track 47. **Figure 1** shows a portion of this sine wave, taken from a screen shot. Also shown is the FFT analysis window, in which you will see only one spike, corresponding to the 1kHz fundamental. The absence of harmonics and the low noise levels are indicative of the purity of the test signal. I chose a Hanning window for this analysis in order to most clearly display the signal purity; other windows cause the skirts of the spike to widen, which would indicate frequency instability of the test signal if it were not an artifact of the windowing.

Next, I looked at the 1kHz square wave, which appears in **Fig. 2**. The FFT analysis of the square wave clearly shows only odd harmonics, decreasing in inverse proportion to the harmonic number, as is proper for a square wave. The ringing at the transition points is an unavoidable consequence of band-limiting: a perfect square wave requires an infinite-bandwidth instrument to display, and a 44.1kHz sampling rate does not qualify as infinite.

The CD contains two 100–400Hz sine sweeps, one with channels in phase, and one out of phase. Also included are nine one-octave sweeps. All of these sweeps are linear frequency versus time, rather than logarithmic. **Figure 3** shows an FFT analysis of the 1000–2000Hz sweep. Note that the curve is flat between the limits of the sweep, indicating constant amplitude and excellent frequency/time linearity. The sweep shows up as solid bands because I did not attempt to expand it out on the computer display.

One of the most commonly used test signals in professional audio is pink noise. However, you are not always sure of the quality of the pink-noise signal you are using. For example, many audio mixing consoles now include pink-noise generators, and in my experience, some of these output a signal that doesn't even sound like pink noise, let alone measure like it.

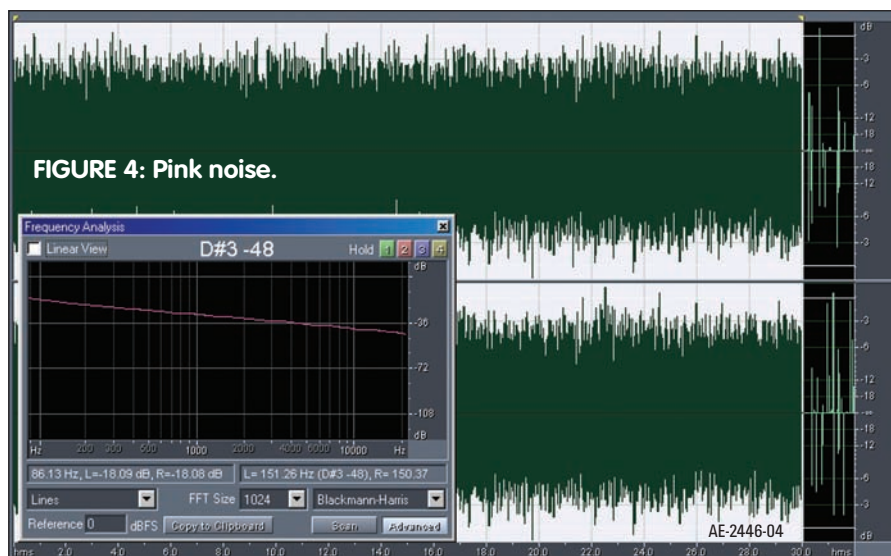


FIGURE 4: Pink noise.

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As **Fig. 4** shows, the Tejera test CD does provide very good pink noise. The FFT analysis is a straight line sloping down at the rate of 3dB/octave, as it should be.

Although I have not reviewed each of the 67 signal tracks, I believe you can see that Tejera has done an excellent job of providing a useful assortment of high-quality test signals. This test CD, coupled with an excellent CD player, will comprise a small, inexpensive, lightweight test generator adequate for most audio system-setup and troubleshooting tasks. *aX*

MANUFACTURER'S RESPONSE:

The reason that there are no aliased frequencies tones (harmonics) present in the sine waves is due to the dithering techniques that were used to mathematically generate the signals. This is especially important in the 1kHz reference tones that go down to -80dB. In the time domain these small signals may look very strange, but to the ear and to the eye when viewing spectral plots, the harmonic distortion caused by aliasing is eliminated. An excellent online article on how dithering affects digital audio may be found at www.mtsu.edu/~dsmitche/rim420/reading/rim420_Dither.html. There are some excellent listening examples near the end of that article that exaggerate, but clearly demonstrate the benefits of dithering.

Albert R. Tejera
President
www.TMEnet.com

Product Data

You can order the CD from Tejera Microsystems' website. Price is \$24.95 plus shipping and handling.

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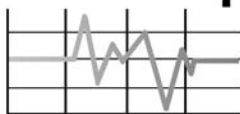
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