Testing BTSC Stereo System Parameters

By Eric Small

As strange as it may seem, the most accurate way to measure the modulation of a BTSC TV stereo system is by measuring its separation, not the modulation. Typically, separation measurements yield modulation data that is 30 to 50 times more accurate than the information you get by measuring modulation directly.

The reason for this paradox lies in the nature of the BTSC stereo system. In any stereo system that transmits its signals as sum-and-difference channels, each channel must be treated identically. Otherwise, the result will be serious degradation of the stereo separation. BTSC stereo challenges this by processing its L–R channel through a complex noise-reduction system while treating the L+R channel linearly.

Tracking error

If the output of the noise-reduction decoder in the receiver is identical in amplitude and phase to the signal that went into the noise-reduction encoder at the transmitter, everything will work out. However, if the decoder and encoder fail to track one another, the stereo separation will be reduced seriously.

Correct tracking depends on the reference level of the encoder in the stereo generator being set to exactly the same modulation level of the aural transmitter—usually 25kHz deviation. In setting the deviation to match the reference level, even an error as small as a few tenths of a decibel would greatly reduce stereo separation. This effect is so dramatic that it can be observed with program material, as opposed to test tones.

Test procedure

The test procedure for making these measurements is simple. Measure the maximum level of one channel, left or right, using an ac voltmeter with approximately VU ballistics. This could be a voltmeter connected to an accurate stereo decoder, or it might be a modulation-monitor indicator that has VU-like, rather than peak-indicating, characteristics.

Observe some wideband program material, such as music or crowd noise, and determine the maximum level. Then remove the program material from that channel wherever it is convenient in the air chain. Determine the maximum level of the residual program material in the now dead channel. Subtract the value of this level from that of the level measured when the channel was driven. This is the dynamic separation.

The separation value is not as important as any sudden decrease in previously measured values. Typically, for a system having 35dB to 45dB of separation in the BTSC mode across the audio midband, the dynamic separation should be 30dB to 40dB.

Test material

It is suggested that these measurements be made at the same time every day, using the same program material if possible. If it doesn't offend your sense of patriotism to use it, the National Anthem, aired every day at the same time, is a good piece of program material for this purpose.

Try alternating channels, maybe using the left channel on even-numbered days and the right channel on odd-numbered days. It should be possible to do the whole test in a few seconds. Of course, log the data so that it is easy to scan across many measurements at a time.

This test, despite its simplicity, provides you with a sensitive test of a critical and easily distributed parameter of a BTSC stereo system. By merely monitoring peak modulation, you cannot detect the extremely small gain errors that will disturb separation.

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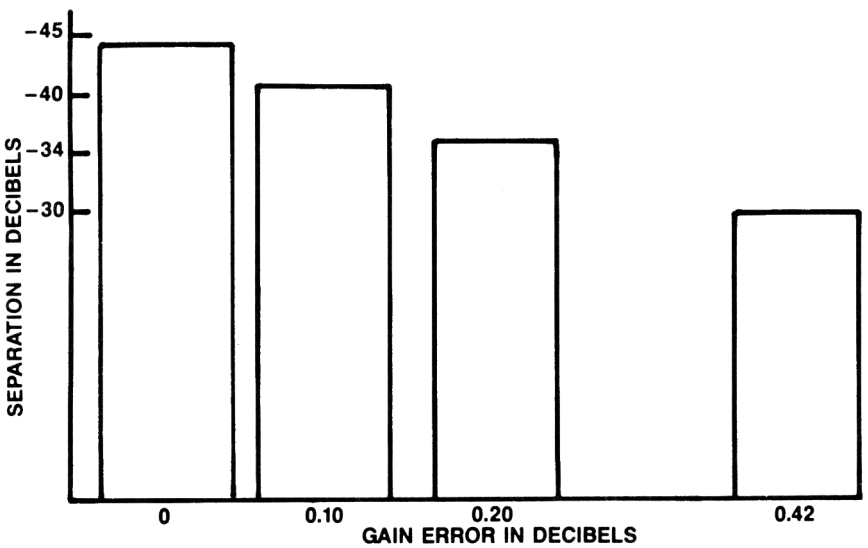

Figure 1. The graph shows how even small changes in gain can greatly affect the dynamic separation of a BTSC stereo system.