

Letter to the Editor

Re: Measuring Signal-to-Noise Ratios

Dear Sir:

It has long been felt by people in the television industry that present methods of measuring signal-to-noise ratios are subject to large errors, significantly interfering with the utility of such signal-to-noise measurements. Much of the activity of TR-17, the EIA Committee on Closed Circuit Television, has been centered around writing specifications, many of which require determination of signal-to-noise ratio as a component measurement, though the specification could be one dealing with sensitivity, effective response or other topics. The Committee decided to make signal-to-noise readings to gain common experience with this problem.

A convenient method, that is generally used, of measuring signal-to-noise ratios involves use of a camera (specifically a vidicon camera), for recording black and white information. In the ideal type of waveform half of the field in the horizontal direction is white and the other half black. The white portion of the field immediately determines the peak amplitude and noise is commonly read in the black portion, making sure that the set-up is sufficiently high not to cause clipping of the noise. This technique is referred to in many specifications appearing in governmental, educational, and commercial publications, such specifications usually covering the camera, the scene viewed (normally an EIA test pattern, with half of the test pattern blocked off with a black material) and a wideband scope such as the Tektronix Scope 545 used on a line selection basis. The reading is preferably taken at the center of the picture. The next step is to read the peak amplitude of the white portion, the peak-to-peak noise in the black, and then establish the ratio between the two, thus giving peak-to-peak signal to peak-to-peak noise. If peak-to-peak signal to rms noise is desired, a factor of 6 is commonly used as a multiplication factor to the ratio. Another way of expressing the figure for general purposes is to convert it to decibels; consequently the signal-to-noise ratio is indicated as peak-to-peak signal to rms noise in decibels.

A group of ten engineers met for the purpose of correlating this method. It was generally agreed that there would be some variation in the readings. The readings were taken under a variety of conditions using wide band, narrow band, high

rates of deflection for the oscilloscope, slow rates of deflection for the oscilloscope, high vertical gain, and low vertical gain, and the results were fairly consistent. There appeared to be about a 6-dB variation in readings and it appeared that the distribution of the readings did not have the normal Gaussian curve that one would expect. There was no single reading that was high and no single reading that was low that would establish the limits, but in general the readings were fairly well distributed. The same type of reading was later tried by various companies, using various pieces of equipment, by engineers who frequently made signal-to-noise ratio readings. The results continued to show a 6-dB variation, and again did not have any group of readings with a normal Gaussian curve. A total of 45 individuals participated in these experiments.

This wide variation in readings left considerable doubt as to whether this method has much validity. It seems doubtful whether any standard or proposed method using this technique would be accepted by the industry with this type of variation observed under controlled conditions. It was assumed that even wider variations could be expected in various field locations. Consequently the use of this method is not favored by members of TR-17 as a satisfactory method of measuring signal-to-noise ratios. Other methods are being investigated. It is the hope of this Committee that this effort will result in a method of measuring signal-to-noise ratios that can be performed in the field without elaborate equipment, or without modifications of the equipment to make the measurements. Close coordination is also being maintained by this Committee with IEEE in hopes that not only a field method but also a laboratory method can be arrived at in the not too distant future.

February 4, 1966

R. E. PUTMAN, *Chairman*
EIA—TR-17 Committee on
Closed Circuit Television
General Electric Co.
Bldg. 7, Rm. 307
Electronics Park
Syracuse, N.Y. 13201