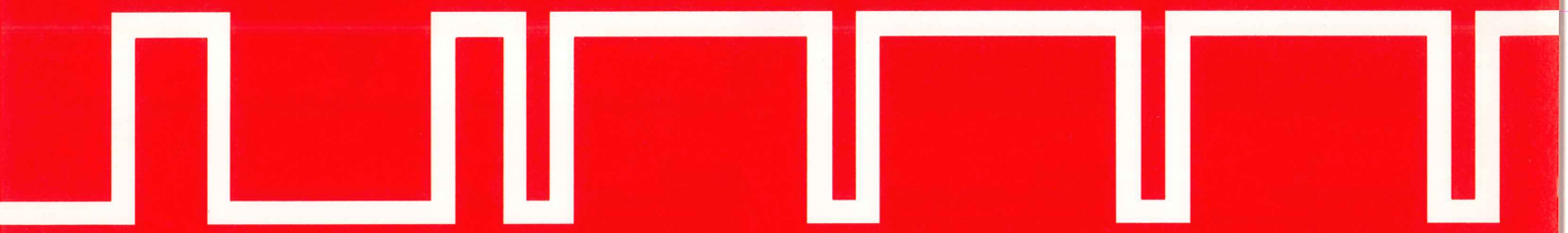
MULTIBURST TESTING WITH THE 1470

BY STU RASMUSSEN

TELEVISION PRODUCTS APPLICATION
23



TEKTRONIX®
committed to
technical excellence

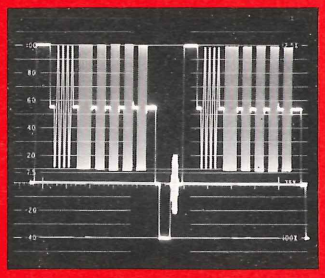


Figure 1:
Full amplitude (90 IRE) multiburst signal as generated by the Tektronix 1470 Test Signal Generator.

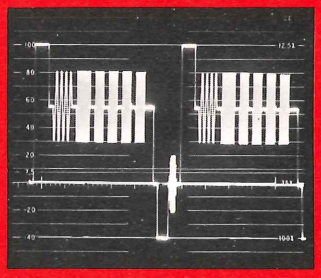


Figure 2:
Reduced amplitude (50 IRE) multiburst signal generated by the Tektronix 1470 Test Signal Generator.

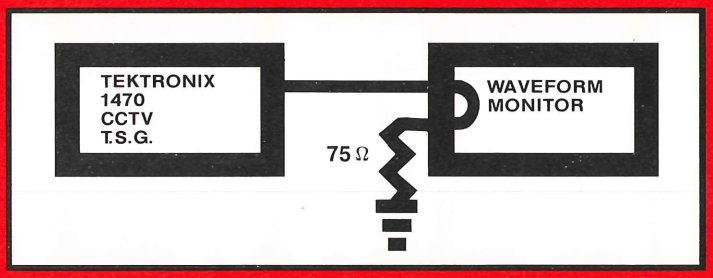
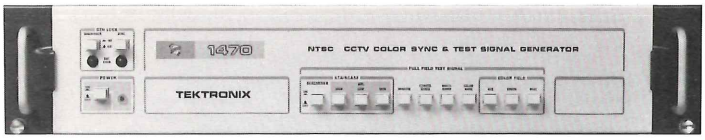
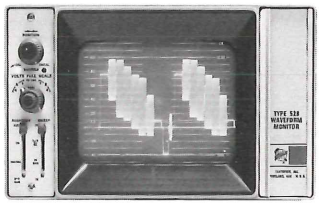


Figure 3:
Setup for verifying performance of test equipment.



Above—1470 NTSC CCTV Color Sync and Test Signal Generator.

Right—528 Waveform Monitor.



In testing television systems, the multiburst signal is useful for checking the mid and upper frequency response characteristics. Figure 1 shows a typical multiburst signal, which is composed of packages of discrete frequencies within the television passband.The highest frequency burst is usually equal to the upper frequency limit of the system being tested, or about 4.2 Mhz in the United States.The next lower frequency in the U.S. is often 3.58 Mhz to check color subcarrier transfer characteristics, and the lower frequency bursts are distributed down to 500 KHz. Also included at the start of the multiburst signal is a flat luminance level.This serves as a reference against which the frequency bursts may be measured.

Certain television equipment, most notably video tape recorders, will appear to distort the full amplitude multiburst even though there is no fault in the equipment.This distortion is a result of intermodulation between the VTR's FM recording system and the multiburst frequencies.To make a valid test on a VTR record/playback system, a reduced amplitude multiburst signal such as the one shown in figure 2 should be used.

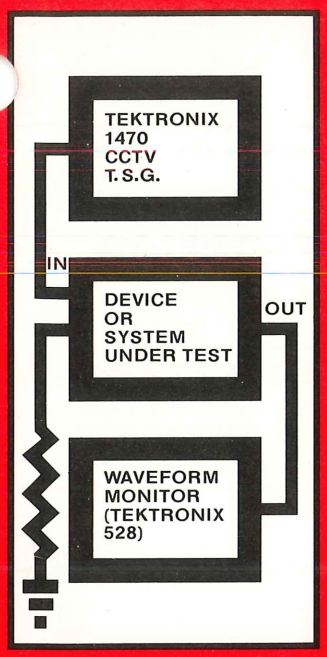


Figure 4:
Equipment connection for system testing; the Tektronix 1470 test signal output is connected to the equipment input, and the output is viewed on a waveform monitor.

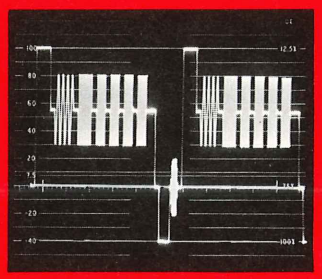


Figure 5:
Reduced amplitude multiburst after passing through system with correct frequency response.

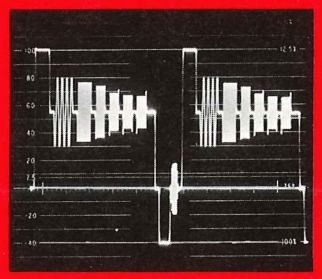


Figure 6:
Multiburst signal after passing through system or device with poor high frequency response. Notice that the higher frequency bursts are "rolled off."

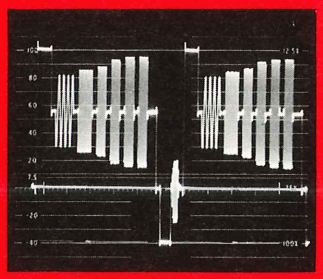


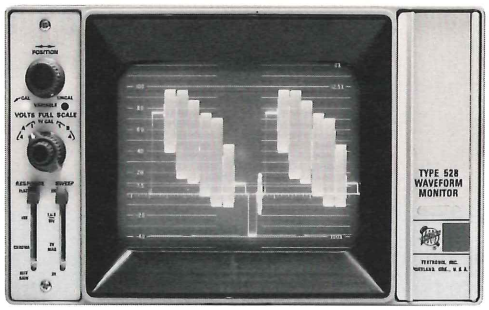
Figure 7:
Multiburst signal after passing through a system with high frequency peaking.

The first step in making any signal measurements is to verify the accuracy of your signal source and measuring equipment.This is done by connecting the output of the test signal generator directly to the waveform monitor as shown in figure 3. Be sure that the equipment is properly terminated before proceeding. Observe the waveform monitor display and check carefully for any distortions in the signal.This signal is coming directly from the signal generator, so distortion should be negligible. If any distortion is evident on the waveform monitor display, either the waveform monitor or test signal generator is faulty, and should be checked before proceeding with any equipment test. After verifying the test equipment accuracy, proceed with the equipment test: Connect the multiburst signal from the test signal generator to the device to be tested, and connect the waveform monitor to the equipment output as shown in figure 4.

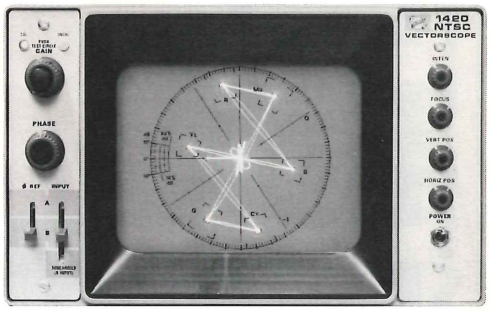
Now, by looking at the waveform monitor, any differences between the signals viewed directly from the generator and those transferred through the device being tested will be apparent.The multiburst is most useful as a check of upper frequency response, so a typical display might look like figure 5. Figure 5 shows an essentially undistorted multiburst, with all the burst packets at the same amplitude, which indicates flat frequency response. Figure 6 shows a device with a high frequency roll-off. Notice that in Figure 6 the higher frequency bursts are lower in amplitude than the reference level and lower frequencies.This condition will cause a loss of fine detail in monochrome pictures, and will make brightly colored objects appear pale in color systems. Another distortion which may be evident is shown in figure 7. Here, the higher frequencies are greater in amplitude than the lower frequencies.This high frequency peaking effect is usually the result of incorrectly adjusted cable-length equalizers or other compensating devices. A certain amount of mid and high frequency peaking is not totally undesirable, as it will increase the apparent detail in the picture. A large amount of peaking, such as that shown in figure 7 however, will probably allow noise components to degrade the received picture. Other distortions in frequency response can be observed using the multiburst signal, such as mid frequency peaking or roll-off, and a gross indication of chrominance to luminance intermodulation can be made.These measurements, however, are not within the scope of this application note.

One final consideration in using the multiburst signal is that it is not a reliable indication of low frequency response, since there is essentially no picture information below 500 KHz included in the test signal. Therefore, for complete system response tests, other measurements of low frequency response must be made using suitable test signals.

TEKTRONIX TELEVISION PRODUCTS TIME, TEST, MEASURE, CORRECT, AND DISPLAY THE TELEVISION SIGNAL.

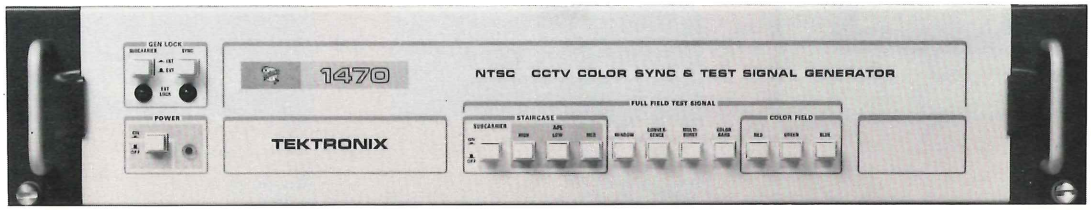


528 Waveform Monitor



1420 Vectorscope

These sync and test signal generators, waveform monitors, and vectorscopes are fundamental tools for evaluating closed-circuit Television system performance. Tektronix, Inc., also manufactures color picture monitors, automatic correctors and sideband analyzers specifically designed for television use. For complete information ask your local Tektronix people for a Television Products Catalog.



1470 NTSC CCTV Color Sync And Test Signal Generator

1474 NTSC CCTV Color Sync Generator

The 1470 CCTV Color Sync and Test Signal Generator is a compact, economical unit designed as a full color, gen-lock sync generator that also provides a selection of high quality full field test signals. The 1474 also is a full color, gen-lock sync generator identical in performance to 1470 but without test signals capability. Among the sync and timing features of the 1470 and 1474 is the ability to color gen-lock to composite video from all normal sources including most helical scan video tape recorders. Only 3.5 inches of rack height is used for the 1470. The 1474 is even more compact at 1.75 inches of rack height. Both generators are shipped ready to bolt into a 19 inch rack.

Each 1420 Series Vectorscope is a compact, half rackwidth instrument designed to display vectors of the chrominance and burst components of the composite video signal. This series provides a low-cost way to meet basic vectorscope requirements in CCU's, VTR's, and similar applications. This instrument is particularly well suited for side-by-side rack mounting with the TEKTRONIX 528 Waveform Monitor. The Vectorscope weighs a little over 15 pounds with an optional carrying case.
The internal graticule is designed for the vector display of color bars and burst. A special graticule feature allows differential gain or phase errors to be determined to reasonable accuracy for many applications—within 2° and 5%.

The 528 Waveform Monitor provides bright, easy-to-read video waveform displays on a 5 inch crt, yet requires only 5¼ inch vertical height and ½ rack width mounting space. This compact instrument is especially well suited for monitoring signals from camera outputs, video system output lines, transmitter video input lines, closed-circuit tv systems, and educational tv systems. A portable version is also available (Option 2).