Using the HP 4396A for Digital VTR Testing

Product Note 4396A-5

Introduction

The recent trend in VTR requires digital technology to improve picture quality, to prevent dubbing deterioration, and to downsize the tape cassette. These requirements are pushing the limits of the current analog techniques. The industry is now developing a high density record technique and a picture data compression technique to meet these requirements. Digital VTRs need to be tested for performance of recording and signal playback. These capabilities affect the quality of both the audio and picture. Therefore, a network, spectrum, and impedance analysis are required for specifying and evaluating magneto heads, amplifiers, and other parts. This solution note introduces effective solutions using the HP 4396A for digital VTR measurements.

The HP 4396A

The HP 4396A combines a network analyzer (NA), a spectrum analyzer (SA), and an impedance analyzer (ZA) into a single instrument. This combination provides the following major advantages:

1. Reduced capital equipment cost

The HP 4396A costs less than a comparable network analyzer and spectrum analyzer if they were purchased separately.

2. Simplicity

The HP 4396A operation is always the same for every mode of the combination analyzer. Knowing how to operate the HP 4396A means you can operate 3 analyzers without constantly connecting and reconnecting the cables.

3. Speed and Accuracy

The HP 4396A uses the latest digital signal processing (DSP) techniques to enhance its performance. This technique is used in digital filters and a stepped FFT to provide speed and accuracy.

4. Power

The HP 4396A has several powerful functions that enhance your testing capabilities. For example, it has a zero-span sweep for time-domain analysis, a time-gated spectrum analysis for a burst signal, a built-in floppy disk drive (FDD), and a controller option using HP IBASIC to automate testing or test systems.

VTR measurement parameters

The main parameters for testing VTR are as follows:

Network Measurement

- Gain/loss
- Phase/group delay

Spectrum Measurement

- Carrier-to-noise
- Noise
- Harmonics
- Spurious

Impedance Measurement

- Precise measurement accuracy

When testing the above parameters, the following capabilities are required:

Network Measurement

- Precise amplitude and phase measurement
- Fast sweep

Spectrum Measurement

- Low noise floor
- Fast measurement with narrow Resolution
- Band Width (RBW)
- Gate sweep for a burst signal
- Various marker function

Impedance Measurement

- Precise measurement accuracy

Using the HP 4396A for testing C/N using time-gated spectrum analysis

One test required for a digital VTR is Carrier-to-Noise ratio (C/N). Testing the C/N requires time-gated spectrum analysis for a burst signal and a low noise floor at higher frequencies. To set he gate, two parameters must be specified. Delay time (Td) to specify the gate start time after triggering and the gate time (Tg) to specify the gate length.
An external trigger synchronous with the burst signal is also necessary for time reference. The low noise floor allows wider RBW (Resolution Band Width). The time-gated spectrum analysis is shown in Figure 1. A sample C/N result is shown in Figure 2.

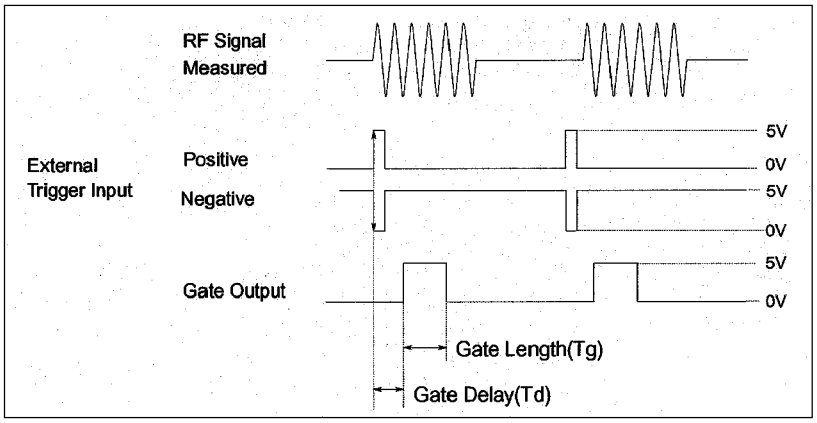

Figure 1. Time-gated spectrum analysis.

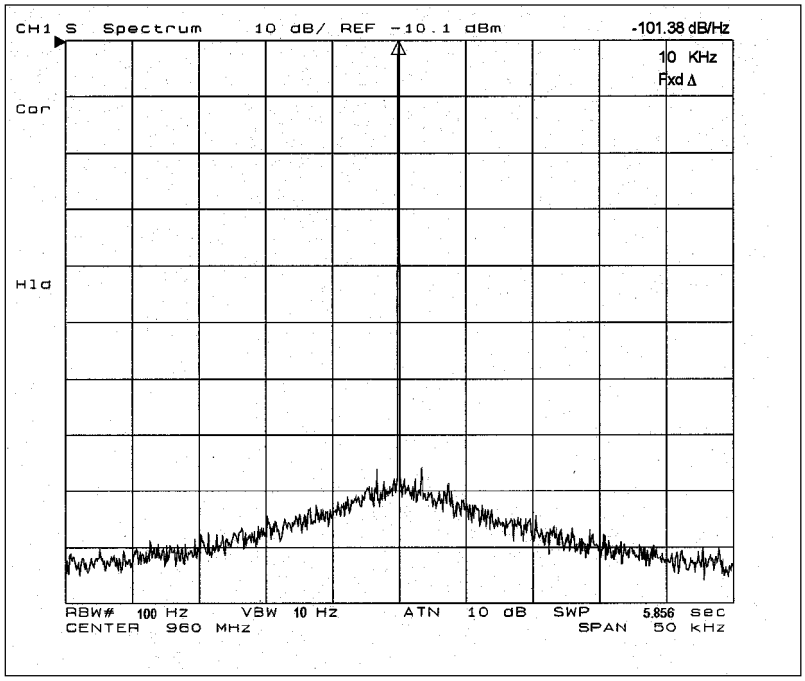

Figure 2. C/N test result.

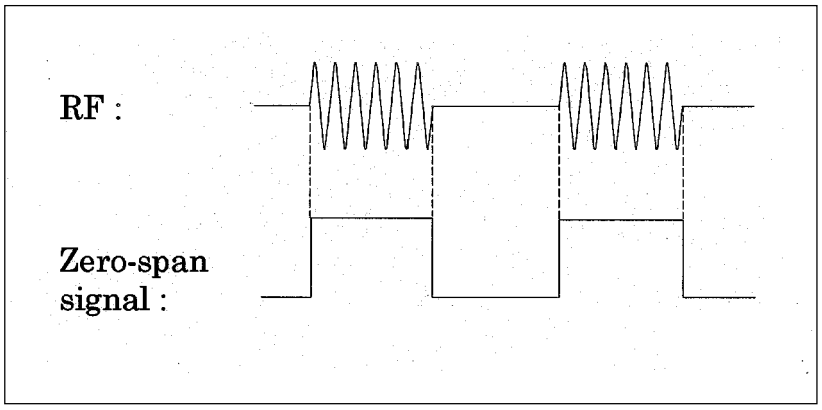

Figure 3. Zero-span test result.

Using the HP 4396A for testing a VTR magneto head

Magneto head characteristics are very important for recording and playing audio and picture signals. One test of the magneto head is the burst signal level. Time-domain analysis, using a zero-span sweep, tests the distance between the head and tape to find the best position in order to get the most appropriate signal level in real time. A screen from a zero-span test is shown in Figure 3.

Conclusion

This VTR test example and the related discussion illustrates how the HP 4396A combination analyzer improves device characterization and reduces test time. High performance features like low noise floor, time-gated spectrum analysis, and high accuracy mean that the results are not compromised.

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