BENOIT LÉVEILLÉ • RF ELECTRONICS TECHNICIAN

Hawk eyes, analog equipment trump expensive digital test set

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A few years ago, I was a repair technician in RF electronics at a service center for cable-TV equipment. This equipment included everything from commercial satellite receivers and cable amplifiers to head-end TV modulators. My co-workers and I worked with old analog spectrum analyzers, and we interpreted most good and bad signals through visual analysis with instruments at the appropriate setting and scale.

I had been working as a bench technician for about eight years in the company, so my eyes were experienced in seeing problems in any kind of signal.

One day, one of our best customers, complaining of a "noisy picture," sent us a well-known company's TV modulator. Because we were not the authorized repair center, we advised the customer that we would send it to the nearest authorized service shop. Nevertheless, when we received the modulator, we hooked it up to a TV set; the noise on the display was evident at first glance. I took some readings with my old Hewlett-Packard spectrum analyzer and found that the inband noise floor was 40 dB below that of the video carrier, whereas it should have been 60 dB below—and even lower with equipment from this recognized manufacturer. The out-of-band spectrum, on the other hand, was excellent for all signals. We sent the unit to the authorized service shop with our description of the problem.

We received the unit back three weeks later and were astonished to see that it was still defective even after the service shop claimed it had no problem; it was exactly as it was when we sent it. Our engineer called the service shop's technicians and told them the whole story, and they asked us to send the unit back to them. Because we had the unit in hand, however, our engineer asked me to troubleshoot—but not repair—the unit. I deduced that the noise was inband, meaning that something was wrong with the modulation circuit. I traced the problem to the video circuit and found that a faulty transistor was attenuating the video baseband signal. As a result, the AGC (automatic gain control) was boosting the tiny signal and, thus, the noise, explaining why the out-of-band response was so clean. We noted the problem and sent the unit back to the service shop.

A few days later, our engineer received a call from the shop. The manufacturer's technician told him that his shop had found no problem with the unit. Incredulous, our engineer started to argue about the high inband noise level, the noisy picture, and so on. After a few minutes of arguing, the technician at the shop ended the discussion by declaring, "Don't tell me I am wrong! I checked this modulator on a $50,000 test set!" The technician's big, expensive digital unit had probably displayed a "unit complies" message with some mystic numbers and readings. Our technician asked theirs to ship it back, and we decided to repair the unit at no charge to our customer.

Now that most instruments are digital, I am suspicious of what they tell me. Do I see a difference between the scope's sampling rate and the signal rate I measured? I double- and triple-check each response at different settings. From this experience, I learned that nothing replaces the knowledge and skill you learn over the years. A keen eye, some common sense, a good deal of logic, and a simple and appropriate instrument are worth more than the most expensive digital apparatus you work with as a "pushbutton" operator. EDN

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