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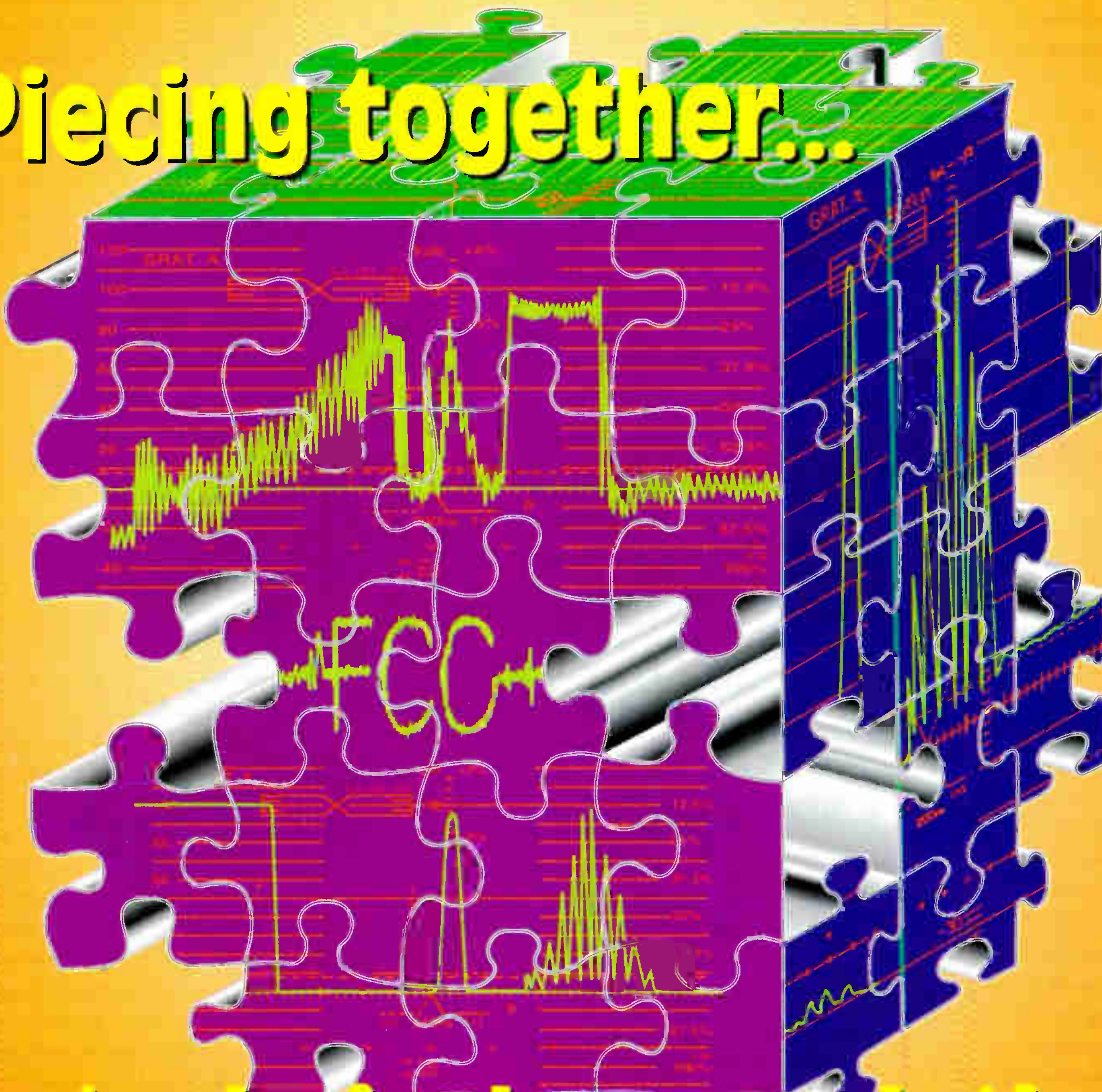

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720 576 30 10.4 million	720 576 30 10.4 million	720 576 30 11.06 million

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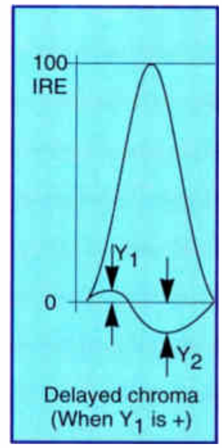

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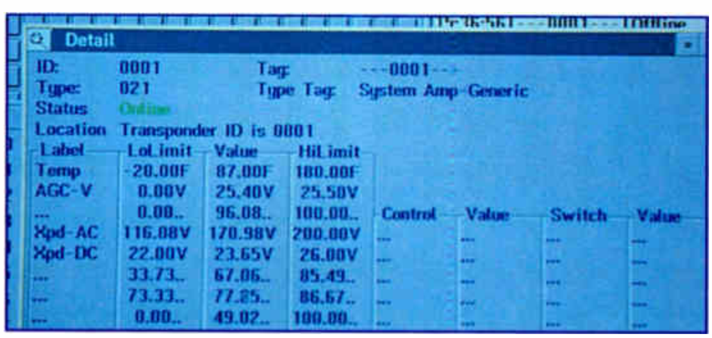

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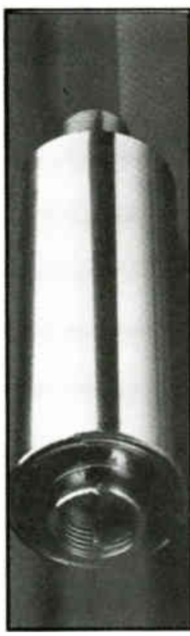

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C-COR announces financial results, business deals

C-COR Electronics Inc. announced its financial results for the fiscal year ending June 25, 1993, and for the fourth quarter of fiscal year 1993. For the year, the company reported net income of over $3.3 million on sales exceeding $55.9 million. This compares to net income of $2.28 million for fiscal year 1992 on sales exceeding $52.1 million. Earnings per share for fiscal year 1993 were 74 cents, compared to 50 cents for fiscal year 1992.

During the fourth quarter, the company recorded net income of $805,000 on sales over $14.6 million. A net income of $853,000 on sales over $16.5 million was reported for the fourth quarter of fiscal year 1992. Earnings per share for the fourth quarter of fiscal year 1993 were 18 cents, compared to 19 cents for the fourth quarter of fiscal year 1992.

In other news, the company announced that Rogers Cablesystems of Canada is purchasing RF and digital fiber equipment from C-COR including line extenders, status monitoring modules, 550 MHz trunk amplifiers and digital fiber-optic equipment.

Also, the company announced that Atlantic Telephone Membership Corp. is using C-COR equipment and services for its Brunswick County, NC, upgrade. Atlantic is purchasing new equipment for portions of the upgrade, along with module upgrades from C-COR's equipment service center for portions of existing installed equipment.

Racotek raises $20 million

On the heels of recent software announcements with Arrowsmith Technologies Inc. and Ubiquinet Inc. to cater its RacoNet data/voice fleet management service for cable TV, Racotek Inc. announced that the company has raised an additional $20 million through a private placement offering.

The company already provides its system for mobile data/voice communications over two-way (trunked) wireless infrastructures to other industries for fleet management.

☛ Albin F. Moschner was elected president and chief operating officer of Zenith Electronics Corp. Previously senior vice president, operations, he will continue to report to Jerry Pearlman, chairman and CEO.

☛ Daniel Akerson replaced Donald Rumsfeld as General Instrument Corp.'s chairman and CEO. Akerson, president and chief operating officer of MCI Communications Corp., was named to GI's board in July. Rumsfeld will remain a director. In other news, the company signed a $250 million deal with Primestar Partners for DigiCipher compression technology.

☛ PowerTronics Equipment Co. Inc. acquired Control Technology, a manufacturer of CATV power supplies, and will continue production of the PWM-based standby power supplies previously made by Control Technology.

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Table 2: Profiles and levels of MPEG-2

Level	Parameter	Simple Profile	Main Profile	Next Profile
High Level (up to 60 Mbits/s)	Pixels/line	1,920	1,920	1,920
	Lines/frame	1,152	1,152	1,152
	Frames/s	60	60	60
	Pixels/s	62.7 million	62.7 million	62.7 million
High Level-1440 (up to 60 Mbits/s)	Pixels/line	1,440	1,440	1,440
	Lines/frame	1,152	1,152	1,152
	Frames/s	60	60	60
	Pixels/s	47 million	47 million	47 million
Main Level (up to 15 Mbits/s)	Pixels/line	720	720	720
	Lines/frame	576	576	576
	Frames/s	30	30	30
	Pixels/s	10.4 million	10.4 million	11.06 million
Low Level (up to 4 Mbits/s)	Pixels/line	352	352	Not decided
	Lines/frame	288	288	
	Frames/s	30	30	
	Pixels/s	2.53 million	2.53 million	

Note 1: 720x512x30 has been considered to accommodate 483 active lines of 525/60 TV.
Note 2: Data rates for other than Main Profile/Main Level are to be determined.

Key
- U.S. HDTV
- NTSC, PAL, SECAM
- European HDTV

CCIR-601 is the internationally agreed upon standard for digitization of all international analog TV standards — NTSC, PAL and SECAM. The video resolution in NTSC is 720x480 and in PAL is 720x576. (See Table 1 on page 16.)

MPEG-1, having been developed so that it could be used in the computer world, is progressive scan only. MPEG-2, to be used in the TV world, had to have interlaced scan capability, and it does. The input to the MPEG-2 encoder/compressor is required to be digital component video.

During the development of MPEG-2 for broadcast-quality compression, work on compression at the HDTV level started under the rubric of MPEG++ or MPEG-3. In an MPEG meeting last year in Rio de Janeiro it was decided that the requirements for HDTV compression should be included in MPEG-2. All the various requirements that MPEG-2 must offer resulted in a document, "Agreements on Profile/Level," produced at an MPEG meeting in New York City in July 1993.

MPEG-2 profiles and levels

A matrix of the profiles and levels is shown in Table 2. (A note of caution: The tables alone are not self-explanatory, they must be carefully related to the text). The MPEG-2 committee decision was to split MPEG-2 into three related "profiles" and to further divide each profile into four "levels." The levels are for various resolution capabilities in each profile. In terms of image definition, the Main Level conforms to the CCIR-601 standard, "High" corresponds with HDTV resolution and "Low" provides SIF (source input format) resolution equivalent to the current MPEG-1 resolution. The numeric values in the matrix are not the *only* values that the parameter may have, but are the *maximum* values that the parameter may have.

The MPEG-2 Next Profile is still in the progress of firm definition. It is called the "Next" because European HDTV advocates desire additional features in MPEG-2 that would allow them to scale HDTV images. The MPEG committee will work on these issues next. Essentially the Europeans want to be able to extract from

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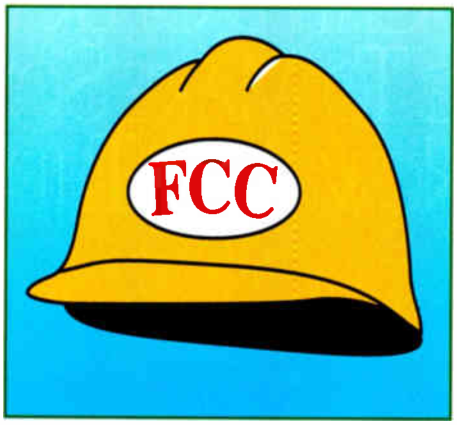
Before you begin secondary testing under tech rereg

By Ron Hranac

The following is adapted from a technical paper that appeared in the proceedings manual of the Society of Cable Television Engineers Cable-Tec Expo '92.



The new Federal Communications Commission technical standards in §76.605 (11), (12) and (13) provide for the measurement of three baseband video parameters that are quite likely unfamiliar to many in the CATV industry. Ours has historically been a world of RF measurements, and other than basic video and audio level adjustments at the inputs to modulators, baseband distortion performance simply has not been a major concern.

The three baseband parameters we now have to deal with are chrominance-to-luminance delay inequality, differential gain and differential phase. These are video distortions that cannot be measured with a signal level meter or spectrum analyzer. Welcome to the world of precision demodulators, video waveform monitors and vectorscopes!

Video distortions defined

What are these distortions, you ask? Let's start with chrominance-to-luminance delay inequality, or C-L delay as it's sometimes called. This falls into the category of linear distortions, which are video distortions that are independent of signal amplitude. Linear distortions occur when a device, system, or signal path is not able to uniformly pass a video signal's amplitude and phase characteristics at all frequencies. (Remember, a video signal generally has a bandwidth of at least 4 MHz.)

Chrominance-to-luminance delay inequality is defined as the difference between the time it takes for the luminance portion of a video signal to pass through a device or system and the time it takes for the chrominance portion of the same video signal to pass through that device or system. Ideally the chrominance and luminance should pass through with no time difference, but when a difference does occur, you have C-L delay. The amount of C-L delay is specified in nanoseconds, which can be either positive or negative. When it's positive, the video signal's chrominance is said to be delayed relative to the luminance; when it's negative the chrominance is advanced relative to the luminance. C-L delay will show up in the picture as the familiar "funny paper effect," where the color is smeared or offset from the main image. This color smearing or bleeding is most noticeable at the edges of objects in the picture, and sometimes can be confused with close-in ghosting. This distortion can occur at baseband or at RF.

Differential gain and phase distortions belong to the family of nonlinear distortions. These are video distortions that are dependent on signal amplitude. In general, the video signal path (primarily active components) should be linear in nature. When operation occurs in a device's nonlinear range, compression and/or clipping is the result. Nonlinear distortions manifest themselves most often during average picture level (APL) changes or instantaneous signal level changes.

Differential gain is the result if chrominance gain is affected by the luminance level. For example, if a constant amplitude chrominance signal (e.g., 40 IRE peak-to-peak) is superimposed on a luminance signal whose amplitude does vary, the amplitude of that chrominance signal should remain the same as the luminance level is changed. If the chrominance signal does not remain constant as the luminance changes, you have differential gain distortion. The visible effect in the TV picture is a variation in color saturation (chrominance) as the scene brightness (luminance) changes, and especially improper color saturation at high luminance levels.

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similar to differential gain distortion, except that the phase of the chrominance signal will change as the luminance level varies. If the picture's tint (hue) changes when scene brightness changes, you have differential phase distortion.

According to §76.609 (j), the measurement of these three video distortions "shall be made in accordance with the *NCTA Recommended Practices for Measurements on Cable Television Systems*, Second Edition." If you don't yet have a copy, I suggest that you contact the National Cable Television Association and purchase one. (NCTA, 1724 Massachusetts Ave., N.W., Washington, DC 20036). It will be a good addition to your system's technical library.

In a nutshell, you'll need to demodulate the RF signals from the output of your headend, and then make the necessary baseband measurements. However, before you begin, there are a few other things you should attend to first.

Your headend's baseband levels (for example, the outputs of satellite receivers, VideoCipher descramblers and commercial insertion gear) need to be correctly adjusted. This includes both video and audio levels. While the audio levels themselves won't affect your final video performance measurements, as long as you're setting the video levels, it's also a good idea to take care of audio levels.

When adjusting both, make sure you do it to provide the correct levels at the inputs to the modulators. This will compensate for cable or other loss between the source outputs and modulator inputs. If your headend has other equipment (commercial insertion gear, video distribution amplifiers, etc.) between the primary source and the modulator, try to set the baseband path to unity performance. Don't just set the proper level at the first or last device's output.

For example, the video output of the satellite receiver would be set to ensure that 1 volt peak-to-peak (140 IRE units) is present at the video distribution amplifier input port, and the video distribution amplifier output would be set so that 1 V p-p is present at the modulator input. The reason for this is that video equipment usually is not designed to accommodate substantial variations from the 1 V reference.

"Welcome to the world of precision demodulators, video waveform monitors and vectorscopes!"

Degraded video signal-to-noise ratios will occur if the levels are too low, and clipping or distortion may occur if they're too high.

As far as video level adjustments are concerned, keep in mind that the 1 V p-p video level is specified as a luminance level, measured from sync tip to peak white. In many cases the chrominance level may exceed this, which is normal. If you aren't careful when measuring video levels, you may find yourself incorrectly using chrominance information as the peak reference.

This shouldn't be a problem if you use a waveform monitor to measure the video signal, since most waveform monitors have an internal luminance filter (sometimes labeled "IRE") that can be selected from a front panel button or switch. This filter will effectively remove most of the chrominance signal, leaving only the luminance information. If you use a conventional oscilloscope for video measurements, you may need to add an external in-line filter. This may or may not be necessary, depending on the particular video signal you're measuring. Some test signals contain a 100 IRE luminance or white reference flag that is suitable for basic level adjustments.

One major source of error when measuring video is improper termination. Video circuits are almost always 75 Ω impedance, which requires that the last component in the video signal path (for example, the modulator input or the input to the test instrument you are using to measure levels) be terminated with a 75 Ω terminator. Waveform monitors normally have an internal termination that can be switched in or out of the signal path, although some have an external termination that can be installed on the second port of a loop-through input. Some modulators also have an input termination that can be switched in or out, while others are self-terminating. Just make sure that only one termination is used in the entire video path. If two or more are in the path, measured video levels will be much lower than normal (conversely, no termination will result in higher than normal levels).

If you use an oscilloscope for video measurements, you can terminate its input with either a commercially made feed-through 75 Ω termination, or make your own with a BNC tee, a BNC-to-F adapter, and a conventional 75 Ω F terminator (measure it with a digital multimeter to ensure that it is exactly 75 ohms). Put the F terminator on the BNC-to-F adapter, then install the adapter on one leg of the BNC tee. Connect your video source to another leg of the tee, and the remaining leg of the tee to the oscilloscope input. After you have correctly set baseband levels, it's time to move on to the next step. This is more familiar territory: the RF world.

RF levels

A very important next step before the final video distortion measurements is RF level adjustments. This includes both RF carrier amplitudes as well as visual carrier depth of modulation (and while you're at it, aural carrier deviation). Before setting RF levels, make sure that appropriate baseband level adjustments have been performed.

First set modulator and processor RF carrier amplitudes (visual and aural carriers) to their normal operating levels. When setting processor levels, verify that RF inputs are correct, and check output levels in both manual and AGC modes. (Refer to the manufacturer's instructions for proper AGC adjustment if applicable.) For this you can use either a signal level meter or a spectrum analyzer. From here you can proceed to the modulation adjustments on the modulators.

Visual carrier depth of modulation should be 87.5% relative to a 1 V p-p video input. In addition to a washed-out picture, white clipping, audio buzz and sometimes incidental carrier phase modulation (ICPM), overmodulation of the visual carrier can cause nonlinear distortions such as differential gain and differential phase. Undermodulation can degrade the baseband video signal-to-

(Continued on page 60)

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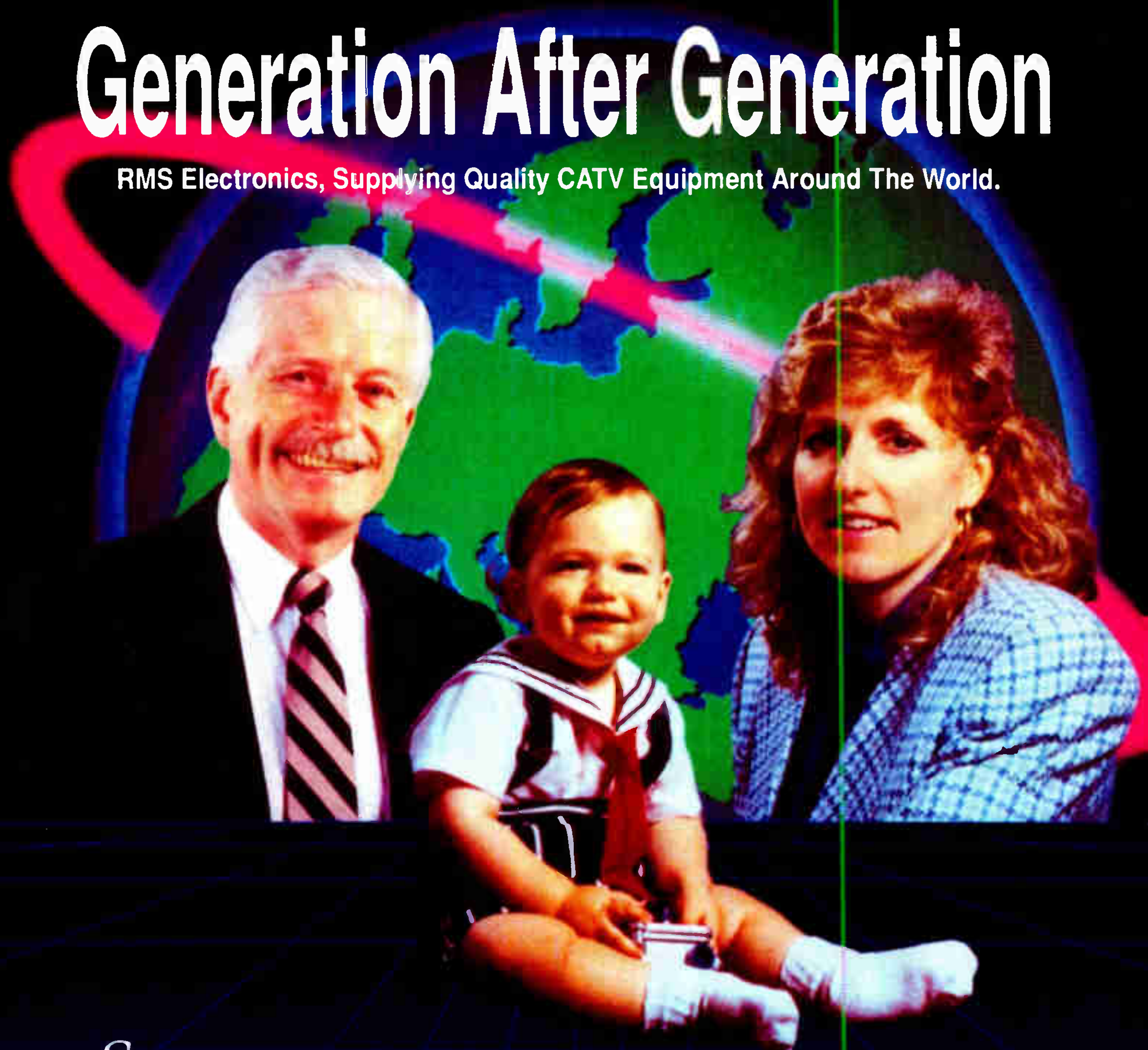

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computer chips are made.

The technology has been around for a while. Allied Technology even had one on the market about seven years ago, but at that point it was still too early for the market and it soon stopped offering them. Nippon Glass from Japan is working on a planar coupler based on microlenses, but those have not reached commercialization. Corning has started selling a planar coupler based on technology it has developed. Although the cost is still higher than fused biconic couplers, it is likely to drop if and when these are mass-produced, because they can be manufactured in large batches and production can be scaled up relatively easily.

What really matters?

Not all couplers are created equal. Bellcore has published a technical report on couplers entitled TR-442 that goes into considerable detail about the requirement for putting couplers into the optical loop. It specifies design criteria for coupler characteristics such as insertion loss (the total loss reduction in power of a coupler) and achromicity (the range over which a coupler will operate).

Improved coupler performance may be able to help reduce the requirements and hence costs of the active components in the network. In a properly designed network, uncooled lasers with less power, and a broader operating wavelength, can replace more expensive thermoelectrically cooled lasers. By some estimates, the coolers for these lasers can increase the cost of operating by 50% to 90%.

Uncooled lasers with a larger passband can be used only if the couplers do not impede the source optical energy. Couplers with a wide operating bandwidth allow the source wavelength to vary outside a narrowly defined region without large losses. Less sensitive receivers with a reduced operating range also can cut costs. But the limited range of these cheaper receivers requires that optical power is distributed very evenly throughout a network. If the signal strength can be predicted with a high level of accuracy, operators can reduce the need for receivers with exotic pre-amplifiers or automatic gain control circuits.

Toward this end, Bellcore defines uniformity requirements for coupler performance. These range from differences of only 0.5 dB for 1x2 couplers, to as much at 2.5 dB in a 1x32 coupler. Corning claims to have planar couplers that can improve passband uniformity by a factor of 2 to 6 on the market today.

Bellcore also quantifies insertion loss, defined as the amount of optical energy that goes into a coupler, minus that which leaves. Its worse-case scenario for insertion loss from a 1x2 coupler is 1 dB, while a 1x32 coupler may have a loss as high as 20 dB.

But all of these characteristics are done once the coupler first comes off the assembly line. What about after the coupler has been outside getting hot, cold and moist for a few years. How does it hold up then? Bellcore has defined a series of standards that provide for a maximum allowable insertion loss after a period of environmental and mechanical stresses.

In the field, cable engineers are more concerned with other things (like failure rate, packaging and engineering support). GRC's Oleksyn tests every coupler that goes into his plant and finds that often the specifications are not accurate and most are not even close.

Oleksyn says failure rate is another important parameter, since one downed coupler can leave thousands without cable. With Ipitek couplers, he has had only two breakdowns out of about 500, and he adds, "that could be operator error."

The type of glass used in the coupler also is important to Oleksyn. He says that splice losses to a coupler tend to be better when couplers use the same glass as in the fiber-optic cables. (In GRC's case the glass is Corning's.)

The most critical thing for Oleksyn is engineering support. Oleksyn says there are very few companies that can handle tough engineering questions, like how to properly build a network with two wavelengths.

Even a simple thing like the coloring on a package can make one coupler more attractive than another. Ipitek, for example, is now selling color-coded 80:20 couplers. A red fiber always signifies the fiber carrying 80% of the light energy, so that technicians can quickly see how to configure them.

Soaring market, diving costs

As the need for couplers increases, so will the number of couplers produced — and following the learning curve, the price will drop accordingly. The price for a basic single-mode coupler went from $300 to only $200 this year, and the prices are still dropping. ElectroniCast's Montgomery predicts that in high volume applications like fiber-to-the-curb, we will see the price of couplers drop 20% to 30% per year. If planar couplers ever take off, they may very well slice the cost even more to the point where a coupler can be had for as little as a few dollars.

One thing is for sure: As the cost of couplers drops drastically in relation to lasers, operators are going to be exploring more and more ways in which they can use them to cut more lasers out of the network without sacrificing reliability. As Oleksyn says, "The name of the game is to split the signal as much as you can get away with." **CT**

Figure 5: Zero differential gain

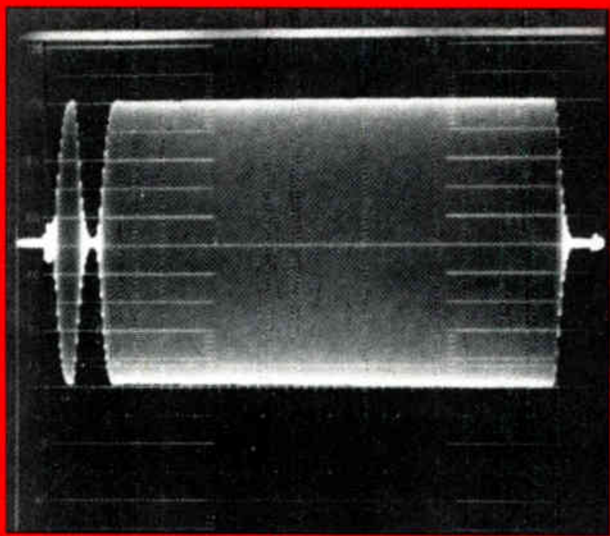
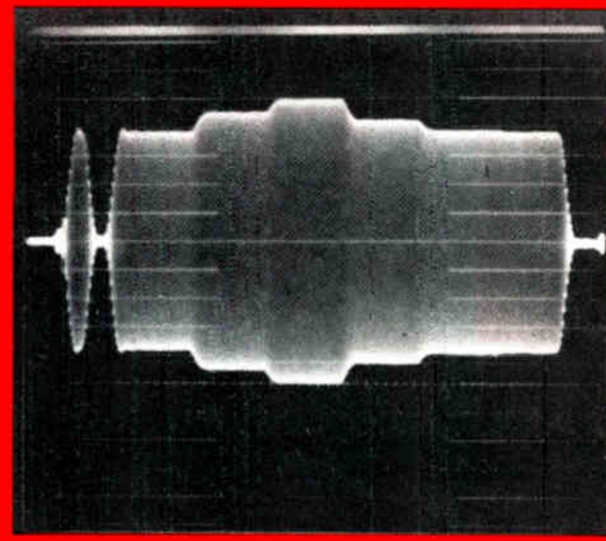


Figure 6: Differential gain (24% in this example)



Measurements are to be made at the output of the modulating or processing equipment, which would typically be in the cable system headend. The standards will become effective June 30, 1995, three years from the effective date of the FCC Report and Order. Proof-of-performance tests must be performed for these three parameters by that time and once every three years thereafter. Since these three measurements are to be made after the modulating or processing equipment, a demodulator must be used to bring the signals to a baseband video format. However, the demodulator also can introduce differential gain, differential phase and chroma delay. It is important to use a high quality demodulator to minimize the amount of distortion introduced by the demodulator itself. →

Reader Service Number 36

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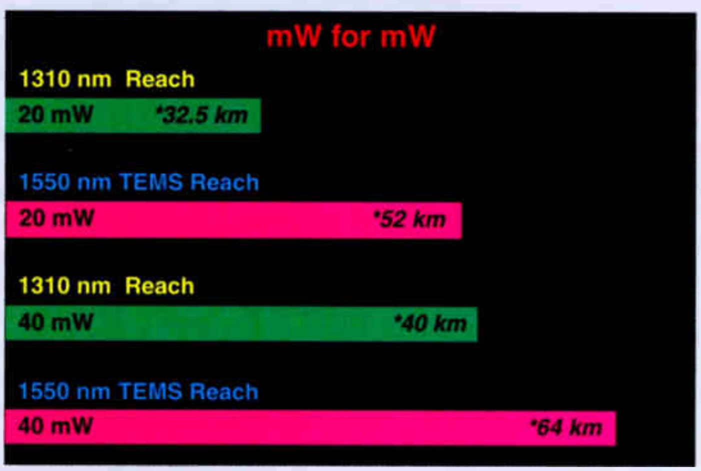

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The TEMS 1550 is available in outputs up to 50 milliwatts (17dBm) allowing you to reach the farthest regions of a system, to connect a network of systems, or to supply sufficient optical power for true "fiber-to-the-curb" system architectures. Complementing the TEMS 1550 is Texscan's Erbium Doped Fiber Amplifier, model EDFA 1550. The EDFA 1550, in conjunction with the TEMS 1550, form a true distributed (not "re-lased") optical system. The TEMS 1550 allows you to take full advantage of the low fiber loss at 1550 nm and the EDFA 1550's high output power as a solution that, until now, required "re-lasing," FM or digital schemes.

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For years, cable operators have built RF systems using lower loss coaxial cable. The same should apply to fiber optic systems: It wouldn't make sense to build an RF system using "high loss" .412-type coaxial cables, and it certainly doesn't make sense to build a fiber system using "high loss" 1310 nm transmission wavelengths when a lower loss path is available. It does, however, makes sense to get the most for your fiber dollars now with Texscan's lower loss, greater reach TEMS 1550 External Modulation and Distributed Lightwave Systems.

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OCTOBER 1993

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Best,
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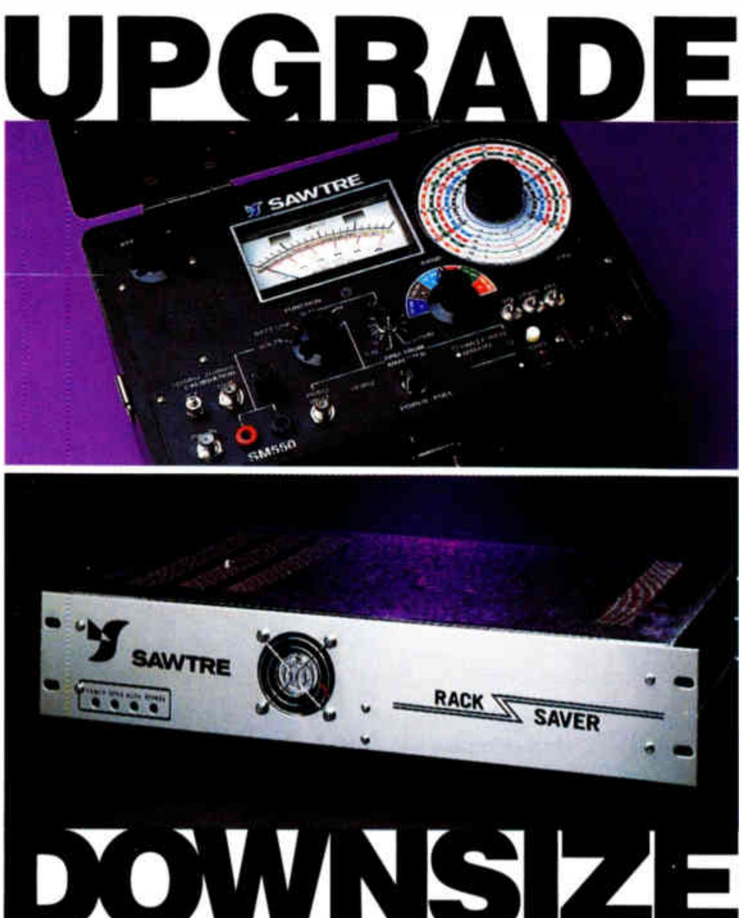

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Reader Service Number 210

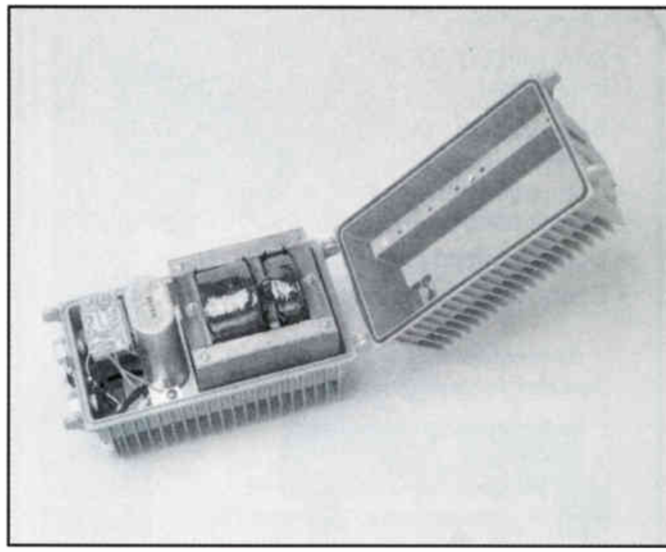
Power Guard's 60 VAC Power Cast power supply

The following originally appeared as "CT's Lab Report" in the August 1990 issue of "Communications Technology."

By Ron Hranac

Most cable systems use 60 volt ferroresonant power supplies to operate the active devices in the trunk and feeder portions of their plant. These power supplies are generally either nonstandby or standby designs, with features and capabilities varying somewhat from manufacturer to manufacturer. Most evolutions in power supply technology occur in the standby versions, with improved charging circuits, inverter designs and battery management.

It's difficult to improve upon nonstandby designs, other than perhaps incorporating more efficient ferroresonant transformers to help systems reduce long-term operating costs. But one manufacturer has made a change in conventional power supplies; not so much the contents but the packaging. Power Guard introduced its Power Cast power supply, which is one of those ideas you see every now and then that inspires you to think, "Why didn't someone think of that before?" So we obtained one for testing and gave it a good workout in the lab.

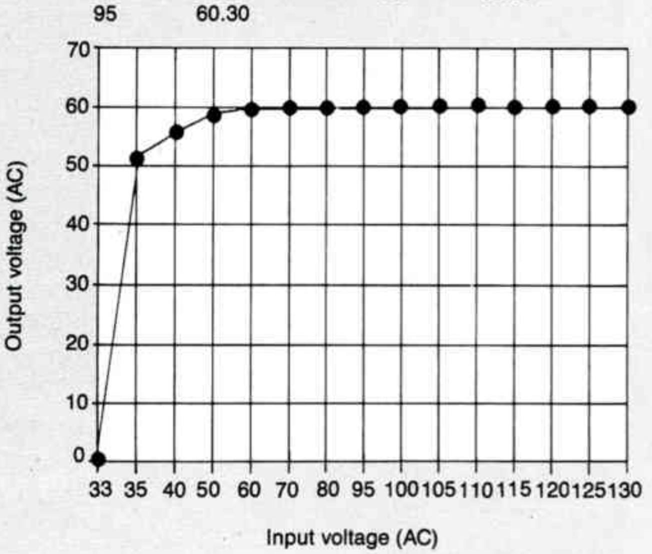


Courtesy Power Guard

Internal components are mounted to dissipate heat effectively. An optional PIP surge protector module for the unit's output is shown at the left of the capacitor.

Figure 1: Regulation test (7 ampere load)

Input voltage	Output voltage	Input voltage	Output voltage
33	0.00	100	60.30
35	51.40	105	60.40
40	55.90	110	60.40
50	59.10	115	60.40
60	59.70	120	60.30
70	60.00	125	60.30
80	60.10	130	60.30
95	60.30		



About the product

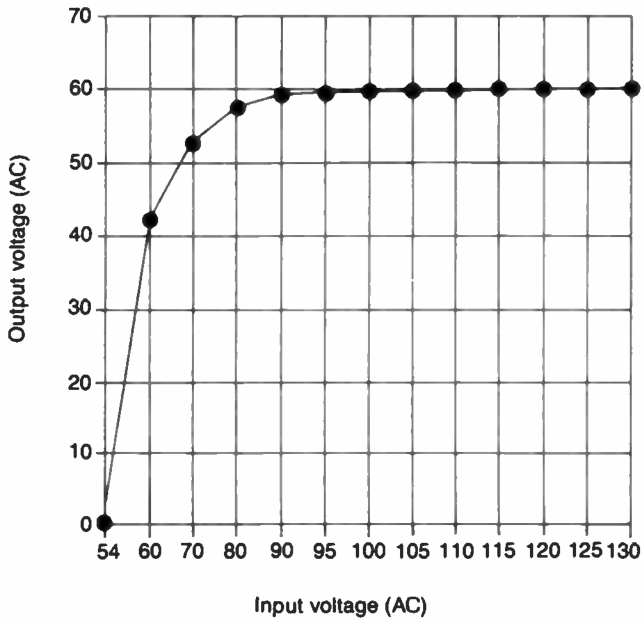
Instead of the more typical stamped metal box, the Power Cast power supply is inside a cast aluminum housing about the size of a line extender or small trunk amplifier. The obvious benefit is the flexibility that this packaging provides. The power supply can easily be mounted on the pole, pedestal, wall *or even the strand.*

It is designed to operate over a 95 to 130 VAC input while maintaining a regulated 60 VAC quasi-square wave output. The version we tested (PC1-6015) is rated at 15 amperes maximum output at 90% efficiency — performance fairly typical of modern CATV ferroresonant power supplies.

The power supply is inside a finned cast aluminum housing that is 6 inches wide, 8 inches deep and 12.5 inches long. Out-of-the-box weight is about 36 pounds. The unit is shipped with strand-mount brackets, and optional pole/wall-mount brackets are available from the manufacturer. Also available is a breaker box assembly that includes a line cord, utility outlet, circuit breaker and an MOV-type (metal oxide varistor) input surge protector that plugs into the 120 VAC utility outlet. Power Guard also can provide an optional output time delay plug-in module, as well as a PIP (transzorb) or crowbar output surge protection. List price for the Power Cast without options is $305.

Figure 2: Regulation test (15 ampere load)

Input voltage	Output voltage	Input voltage	Output voltage
54	0.00	100	59.80
60	42.50	105	59.80
70	53.00	110	59.90
80	57.70	115	59.90
90	59.40	120	60.00
95	59.60	125	60.00
		130	60.10



Lab measurements

The regulation of the Power Cast was tested with a 7 ampere load (low efficiency) and a 15 ampere load (maximum efficiency). The input voltage was varied from what produced no secondary output up to a maximum of 130 VAC. Figures 1 and 2 summarize the power supply's output voltage regulation performance, which was quite good and exceeded the manufacturer's own specs.

Power Cast also was tested at full transformer saturation, which was found to be 25 amperes with the output short-circuited. This load was maintained over an entire weekend and resulted in the output PIP surge protector module failing (as it was designed to do). When this module fails it allows the power supply to continue operating. The short circuit was removed from the supply's output and it resumed normal operation.

Perhaps the biggest concern evaluating this product was how well it dissipates heat. Placing a ferroresonant transformer and its related components in an enclosed environment is certainly asking for possible problems. Power Guard considered this, so the transformer is well sunk to the housing and the fins do an excellent job of removing excess heat.

Numerous temperature measurements were made of the transformer, capacitor and other internal components using a remote probe and Fluke 51 K/J digital thermometer. Various spots on the housing's exterior (including the fins) also were measured with a special surface probe. Since ferroresonant transformers generate more heat with reduced loads, all temperature measurements were done with a 7 ampere load.

At 68° F ambient (in the lab), the highest transformer temperature was 182.6°. The highest capacitor temperature was 138.6° and the housing just below the transformer was 132.2°

Further measurements were made with the power supply in direct sunlight and an ambient temperature of 100° F. The transformer maximum was 172°, the capacitor 135.2° and the housing 125.2°. With a mild breeze and an ambient temperature of 97° F, the transformer measured 168.2°, the capacitor 132.2° and the housing 121.4°. From this, it is apparent that the Power Cast adequately dissipated heat. In fact, it ran cooler outside in the sun (with open air circulation) than it did inside an air-conditioned lab with no air circulation!

I was further concerned about the life expectancy of the capacitor operating at those temperatures. Should the power supply's capacitor dry out and fail because of the heat, the ferroresonant transformer circuit would no longer be self-regulating and its output voltage would drop. However, the capacitors used in the Power Cast are rated for operation at 90° C (194° F) at 660 VAC.

I called Cornell-Dublier, the manufacturer of the capacitors used by Power Guard. The engineer I spoke with explained that the capacitor is designed to last a minimum of 60,000 hours (6.85 years) at its maximum ratings. He then performed the calculations of MTBF (mean time between failure) for operation of the particular capacitor used in the Power Cast at its measured temperature and actual operating voltage. His comment was something to this effect: "This capacitor should last forever."

For weatherproofing, the power supply housing includes a perimeter gasket in the lid. Moisture ingress that sometimes occurs with conventional device housings should not be a problem, though, because the housing is vented through the external AC connection (utility box). Therefore, no opportunity should exist for a pressure differential to develop with temperature changes. Any moisture that might accumulate inside would be evaporated via the venting action and internal heat.

Comments

Power Guard thought this product through rather thoroughly when designing it. Possible heat-related problems have been addressed by good heat sinking of internal components, the use of high temperature parts and adequate dissipation with a finned housing. Surge protection is available for both the input and output, affording a higher level of comfort.

Ferroresonant supplies have been with us for a number of years, and this design is not a radical departure from what is already available. Its packaging is what sets it apart from other nonstandby designs, allowing system operators quite a bit of flexibility for creative installations including on the strand.

For more information, contact Power Guard, P.O. Box 2796, Opelika, AL 36801, (205) 742-0055.

Reader Service Number 223

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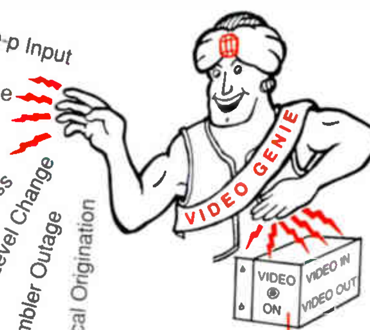

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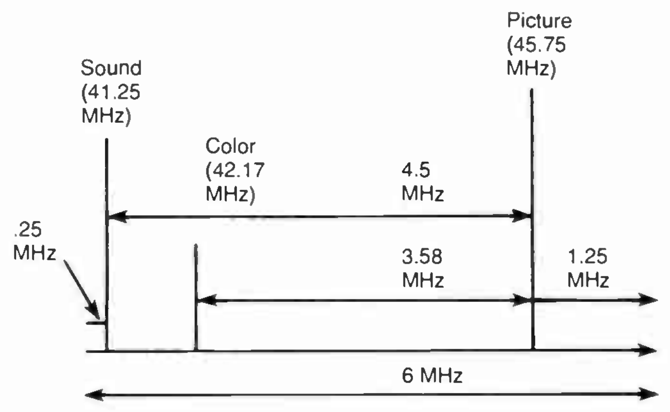
Reader Service Number 225

General information

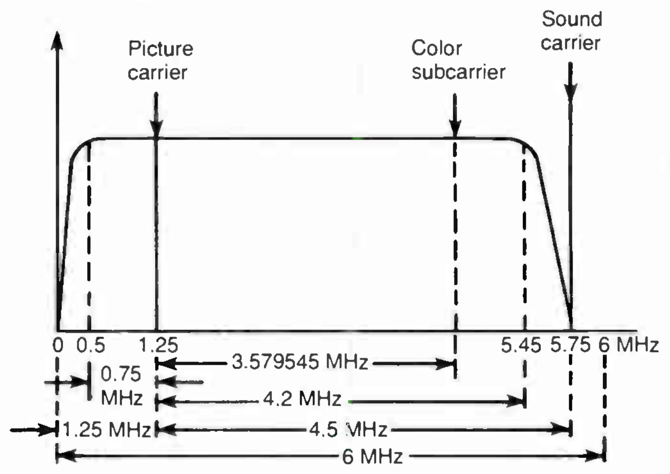
Channel bandwidth at RF: 6 MHz
Visual carrier location: 1.25 MHz (±1 kHz) above lower channel edge
Color subcarrier frequency: 3.579545 MHz (±10 Hz) above visual carrier
Sound carrier center frequency: 4.5 MHz (±1 kHz) above visual carrier
Scanning lines: 525 lines per frame, interlaced 2-to-1
Scanning sequence: horizontally from left to right, vertically from top to bottom
Horizontal scanning frequency: 15,750 Hz (monochrome), 15,734.264 Hz (color)
Vertical scanning frequency: 60 Hz (monochrome), 59.94 Hz (color)
Aspect ratio: 4 horizontal units, 3 vertical units

Per the new FCC requirements in §76.605 (11), (12) and (13), video baseband performance* as measured at the *output* of headend processing and modulating equipment shall not exceed the following:
Differential gain: 20% **Differential phase:** 10° **Chrominance-to-luminance delay inequality:** 170 nanoseconds
*System operators will have to start doing these video measurements by June 30, 1995.

TV channel at IF



TV channel at RF



Measuring video with an oscilloscope

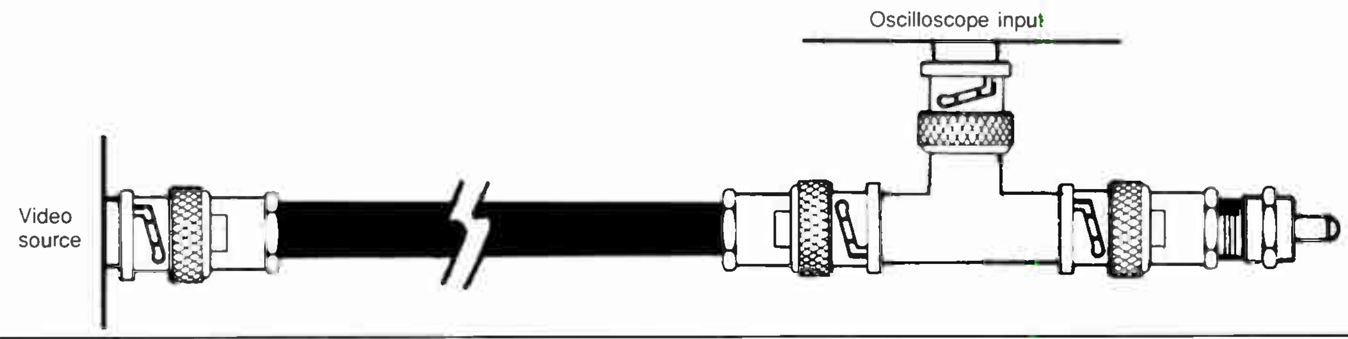
To make video measurements:

• Use an oscilloscope with at least 5 MHz bandwidth.
• Turn on the oscilloscope and let it warm up for 30 minutes. Check to make sure that all knobs are in the "CAL" position, and verify instrument calibration per the manufacturer's directions.
• Remove the oscilloscope probe from the input BNC connector (most probes are X10; the oscilloscope should be in the direct or X1 mode).
• Because the impedance of an oscilloscope is typically 1 million ohms or greater, a 75-ohm feedthrough termination must be used at the oscilloscope's input when measuring video. You can use a commercially made feedthrough termination or you can make your own with a BNC "T," a BNC-to-F adapter and a conventional 75-ohm F terminator (see figure). Install your 75 ohm feedthrough termination on the oscilloscope's input BNC connector and connect the video source being measured to the termination. If you don't use a 75-ohm feedthrough termination for this procedure, the oscilloscope will indicate a much higher video level than is actually present.
• Adjust the oscilloscope's controls to the following settings:

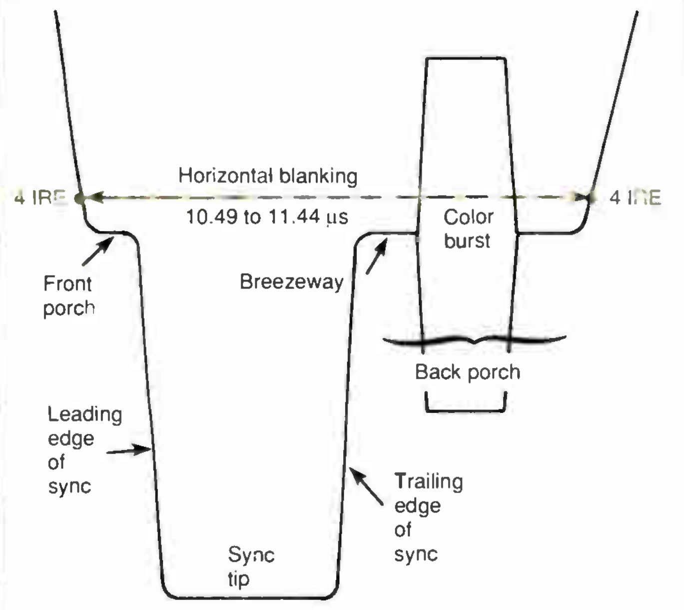
Vertical sensitivity (volts/division)	0.2 V
Sweep rate (time/division)	5 ms
Trigger	TV field
Coupling	DC

(If your oscilloscope does not have field or video triggering, use line triggering. This will lock the instrument to the 60 Hz AC power line.)
• Center the displayed video signal with the vertical and horizontal position controls. Then, using the vertical position control, adjust the position of the video signal on the oscilloscope CRT to align the sync tips with a graticule near the bottom of the display.
• Adjust your video source until the oscilloscope indicates 1 volt peak-to-peak, or five vertical divisions from sync tips to peak white (peak luminance, not peak chrominance). Depending on the video source you are measuring, it may be necessary to install a luminance filter at the input of the oscilloscope (before the 75-ohm feedthrough termination) to remove the chrominance energy for an accurate measurement of the video's luminance amplitude.

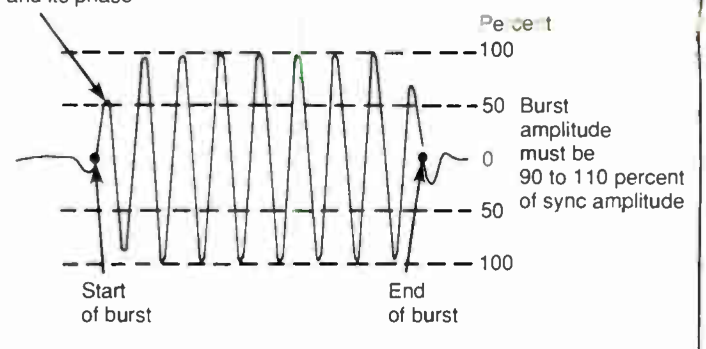
Connection to oscilloscope with homemade 75-ohm feedthrough termination



Elements of horizontal sync



Burst characteristics



Compiled by Ron Hranac, Senior Technical Editor

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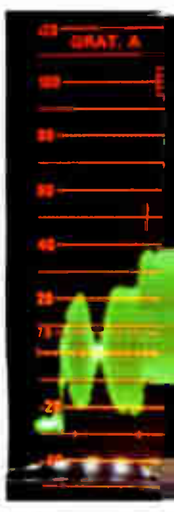

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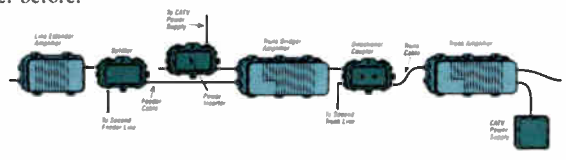
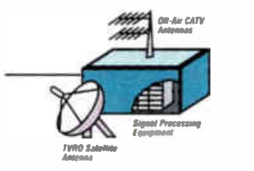
oubleshoot, and maintain your system.

When you are maintaining the feeder and trunk portion of your system, signal measurements are critical to overall system performance. That's why the SL750M was designed to performance test every channel, in any distribution system, to FCC specifications. Test C/N and HUM on active channels automatically and faster than ever before.



SL750A
Analyze

The headend system is one of the most critical areas to maintain. If the signals at the headend aren't clean, you'll have a real mess in the downstream. That's why many systems run performance tests regularly; so they know that the quality of signal is the best it can possibly be. Programmable automated measurements and data storage make remote measurements and 24 hour testing simple and fast. The SL750A was designed with your time in mind.

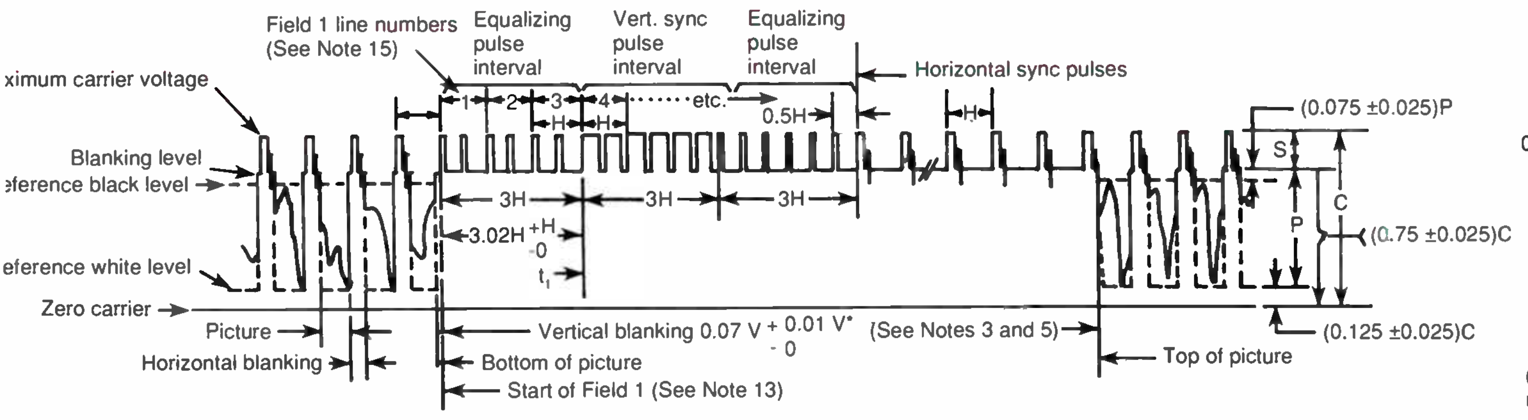


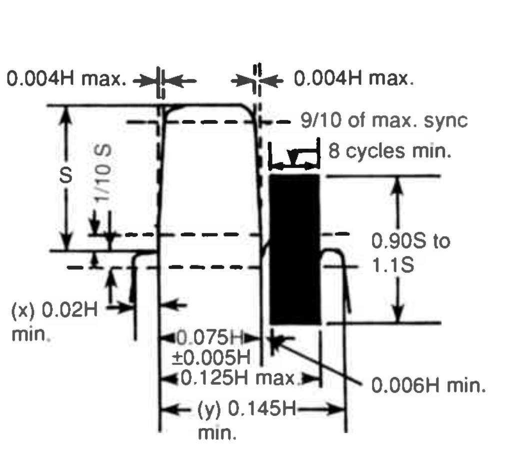
The SL750A helps you pinpoint RF/video problems and performance tests any headend, trunk, or line equipment in any RF distribution system more accurately than with any other signal level meter on the market.

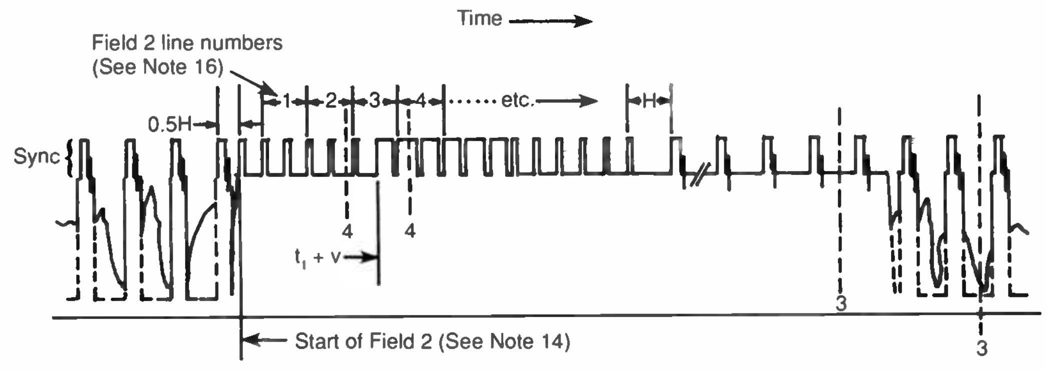
OMMUNICATIONS ECHNOLOGY's

VIDEO REFEREN DATA

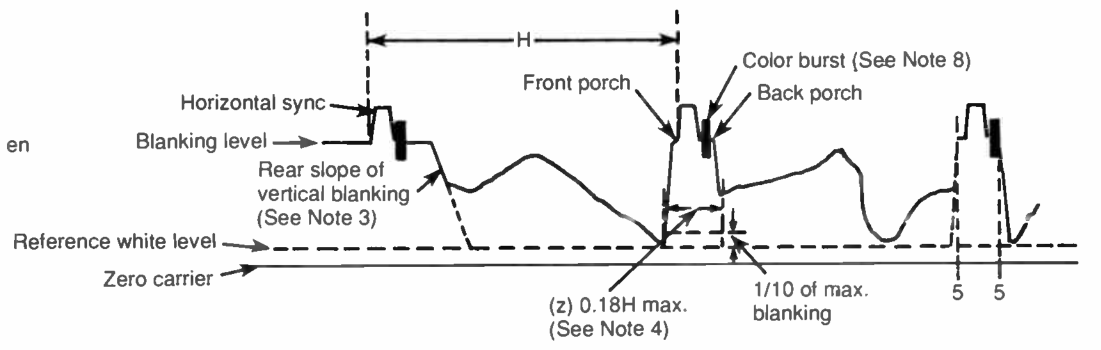
video/sync waveform for color transmission

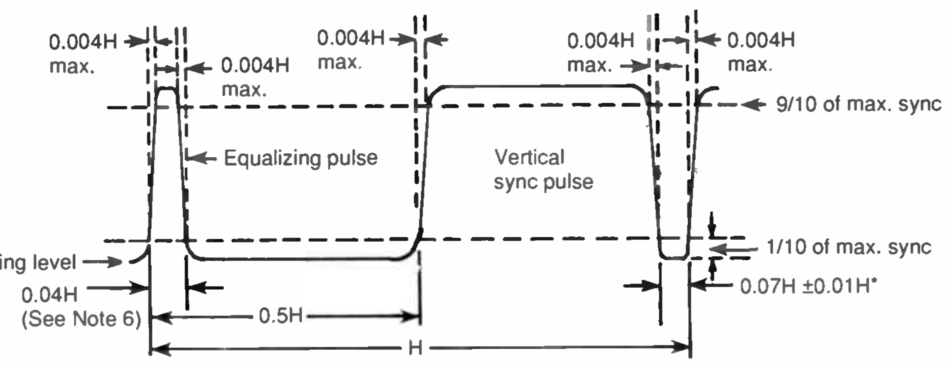




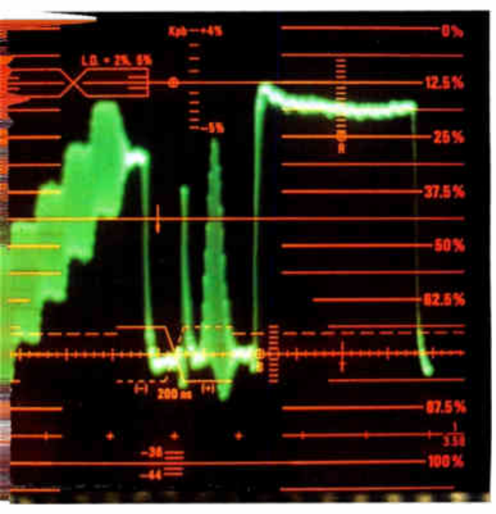


Horizontal dimensions not to scale in 1, 2 and 3

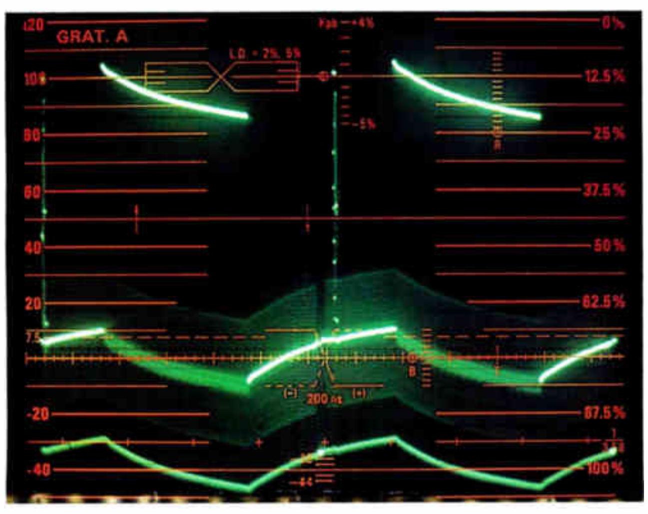




Notes
1) H = Time from start of one line to start of next line.
2) V = Time from start of one field to start of next field.
3) Leading and trailing edges of vertical blanking should complete in less than 0.1H.
4) Leading and trailing slopes of horizontal blanking mus steep enough to preserve minimum and maximum values (+ y) and (z) under all conditions of picture content.
*5) Dimensions marked with asterisk indicate that tolera given are permitted only for long-time variations and not for s cessive cycles.
6) Equalizing pulse area shall be between 0.45 and 0.5 of a of a horizontal sync pulse.
7) Color burst follows each horizontal pulse, but is omitted lowing the equalizing pulses and during the brood vertical puls
8) Color bursts to be omitted during monochrome transmissi
9) The burst frequency shall be 3.579545 mc. The tolerance the frequency shall be ±10 cycles with a maximum rate change of frequency not to exceed 1/10 cycle per second second.
10) The horizontal scanning frequency shall be 2/455 times burst frequency.
11) The dimensions specified for the burst determine the ti of starting and stopping the burst, but not its phase. The c burst consists of amplitude modulation of a continuous s wave.
12) Dimension "P" represents the peak excursion of the lu nance signal from blanking level, but does not include chrominance signal. Dimension "S" is the sync amplitude ab blanking level. Dimension "C" is the peak carrier amplitude.
13) Start of Field 1 is defined by a whole line between equalizing pulse and preceding H sync pulses.
14) Start of Field 2 is defined by a half line between first equ ing pulse and preceding H sync pulses.
15) Field 1 line numbers start with first equalizing pulse in Fiel
16) Field 2 line numbers start with second equalizing puls Field 2.



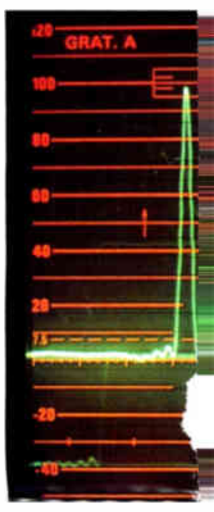
distortion manifests itself as tilt in 1-64 ms duration) video compo- as the top of the 100 IRE bar, essed as peak-to-peak tilt in IRE ercentage of the bar amplitude. listortion causes horizontal bright- tions in large picture details, and streaking or smearing.



Field time distortion results in tilt in field-rate (64 ms-16 ms) video components, and requires a field square wave or window signal to measure. It is expressed as peak-to-peak tilt in IRE units or percentage of a reference amplitude. Field time distortion causes vertical brightness variations in large picture details.

Courtesy Tektronix

Chrominance-to-luminance gain inequality causes the baseline of the 12.5T pulse to have a concave or convex shape. It is expressed in IRE, percent or dB (after normalizing the pulse amplitude to 100 IRE). Chrominance-to-luminance gain inequality causes incorrect color saturation in the picture.



Chrominance causes the 1 sine wave sh pulse amplitu excursions nanosecon nomograph (nance delay smearing (s paper effect")

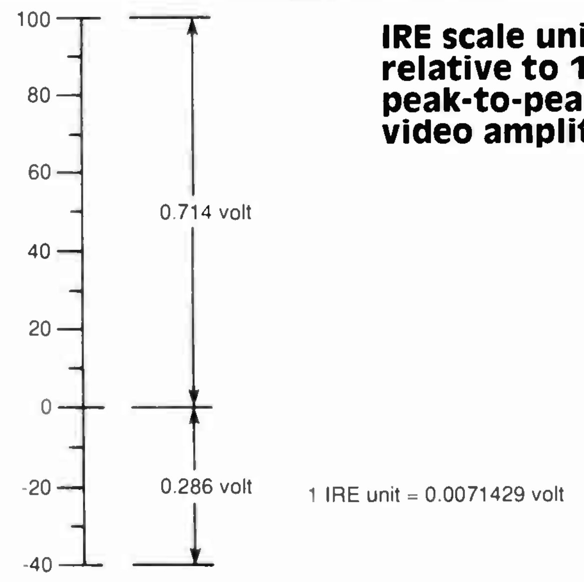
CE

Video levels

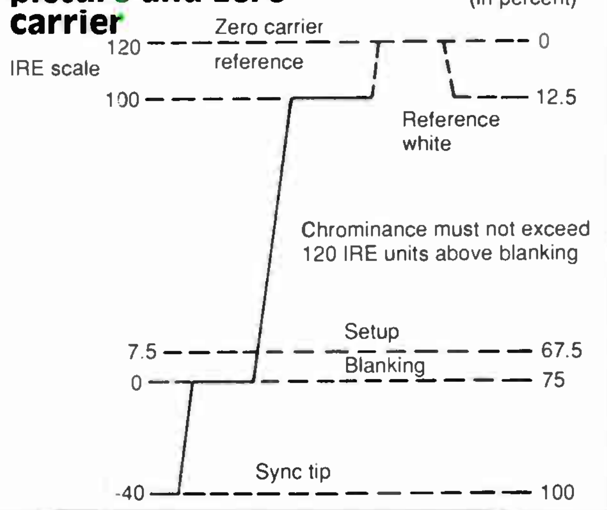
Waveform monitor IRE units and oscilloscope peak-to-peak voltages

Video parameter	Waveform monitor IRE units	Oscilloscope peak-to-peak voltage
Reference	1	0.00714 volt
Horizontal sync amplitude	40	0.286 volt
Color burst amplitude	40	0.286 volt
Setup	7.5	0.054 volt
Video (blanking-to-peak white)	100	0.714 volt
Total video signal amplitude	140	1 volt

IRE scale units relative to 1 volt peak-to-peak video amplitude



Relative levels of sync, picture and zero carrier



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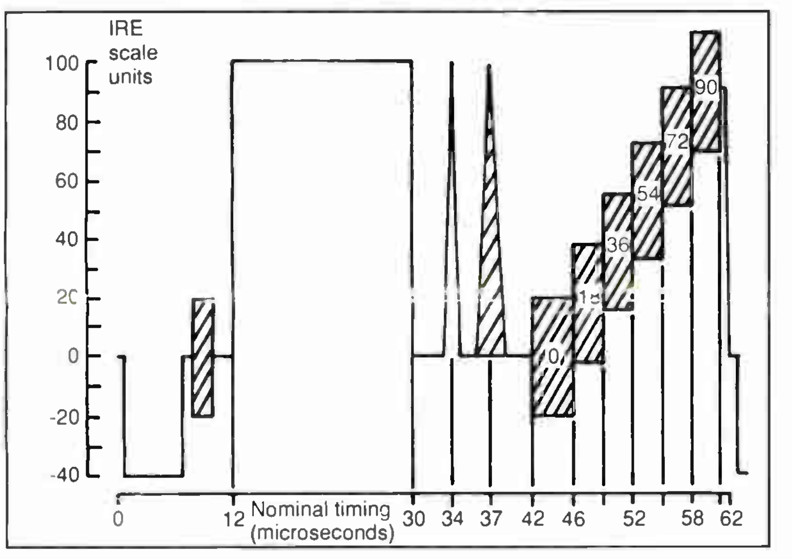
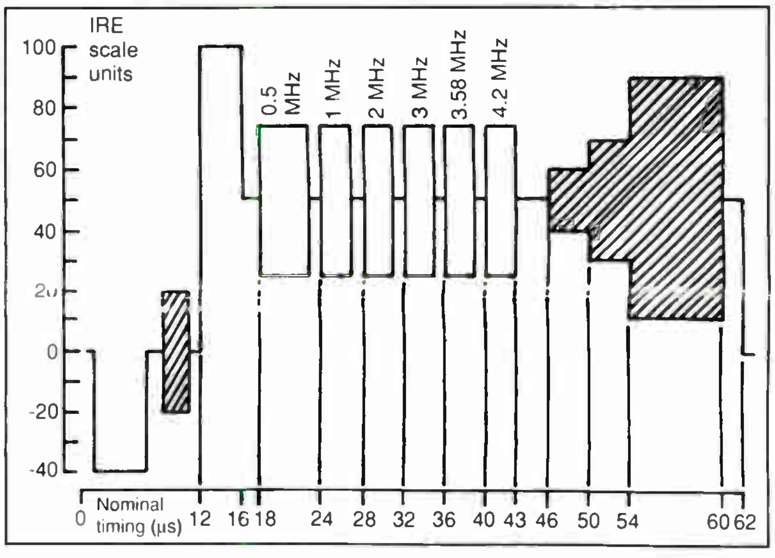
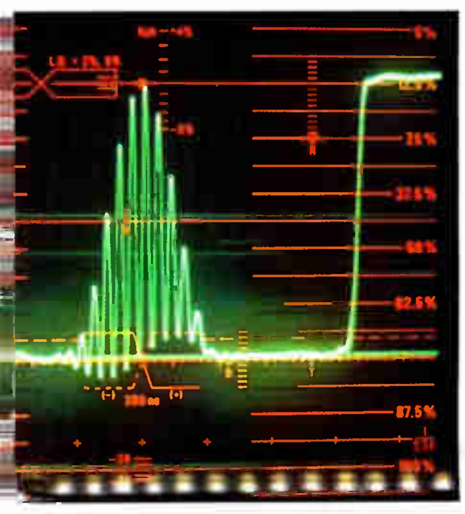
Test signals for measuring video distortions



Composite test signal
This contains a 100 IRE white reference (bar), 2T pulse, 12.5T pulse and modulated staircase. The 100 IRE white reference is useful for setting video levels, and also for measurements of short time and line time distortions. The 2T pulse also can be an indicator of short time distortion (pulse-to-bar ratio and K Factor measurements). The 12.5T pulse is used to determine chrominance-to-luminance gain and delay, and the modulated staircase differential gain and phase.

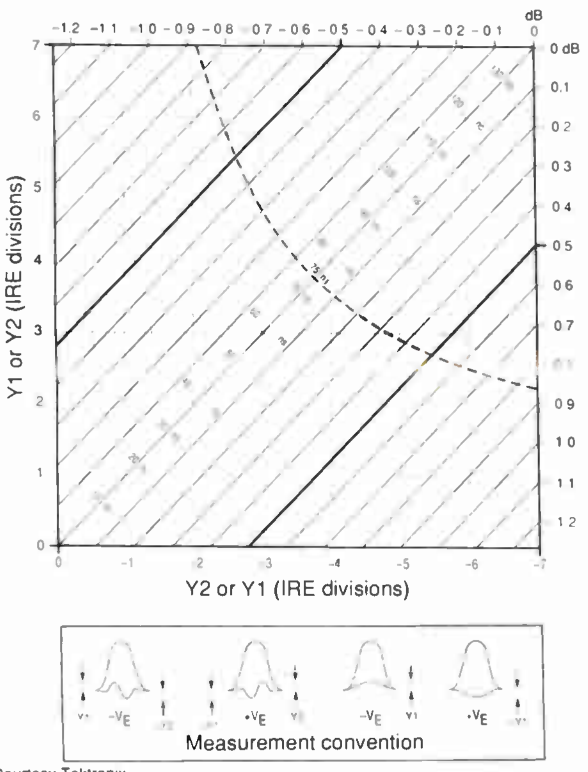


Combination test signal
This includes a 100 IRE white reference, multiburst and modulated pedestal. The white reference can be used to set video levels, and the multiburst is a good indicator of frequency response problems (gain-frequency distortion). The modulated pedestal is used to measure chrominance non-linear phase and gain, as well as chrominance-to-luminance intermodulation.



-to-luminance delay inequality ...2.5T pulse baseline to have a ...hape. After normalizing the ...le to 100 IRE, the sine wave ...an be converted to delay in ...s using the accompanying ...ight). Chrominance-to-lumi- ...inequality results in color ...ometimes called the "funny

Chrominance-to-luminance gain and delay nomograph



Courtesy Tektronix

Gain-frequency distortion is a degradation of video frequency response, and can be seen as a variation in a multiburst signal's ideally flat packet amplitudes. It is expressed in dB, percent or IRE units relative to either the 100 IRE bar or some low frequency such as the 0.5 MHz packet. Gain-frequency distortion can cause other video distortions such as short, line, field and long time distortions and their visible effects in the picture.

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VITS

The vertical interval test signals (VITS) are signals that are inserted in the baseband video's vertical blanking interval (VBI). The blanking interval is normally not displayed in a TV picture, so a program originator can insert VITS without affecting the active video. Most programmers insert VITS into their video before transmission. Many video parameters can be measured using VITS without the need to disrupt regular programming.

Two common types of VITS are the composite test signal and the combination test signal. The composite test signal is normally inserted on Line 17, Field 1 of the VBI. It includes a reference white bar, a 2T sine-squared pulse, a modulated 12.5T sine-squared pulse and a modulated five-riser staircase. Many video parameters, including the three being regulated by the FCC, can be measured using the composite test signal. Figure 1 on page 32 shows a picture of the composite test signal and Figure 2 on page 32 gives its nominal timing.

Figure 7: Vectorscope display showing zero differential phase

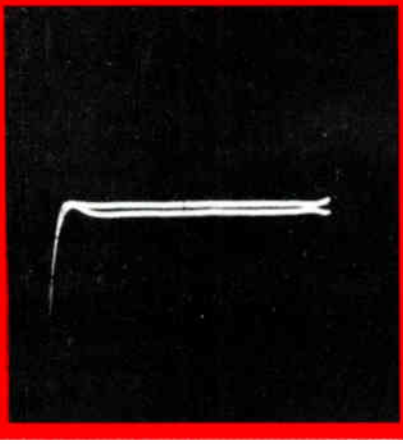
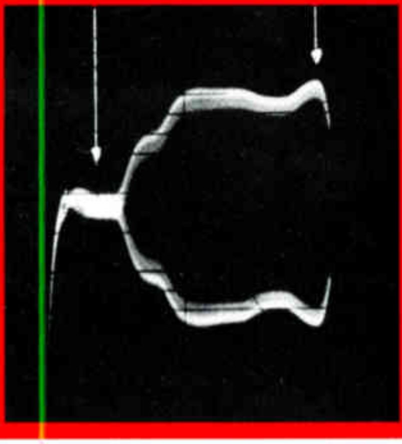


Figure 8: Vectorscope display showing differential phase distortion



The combination test signal is normally inserted on Line 17, Field 2 of the VBI. It is comprised of a reference white bar, a multiburst signal and a superimposed three level chrominance signal. Frequency response, chrominance-to-luminance intermodulation and chrominance nonlinear gain and phase can be measured with the combination test signal. Figure 3 on page 48 is a picture of the combination test signal and Figure 4 (page 48) gives its nominal timing.

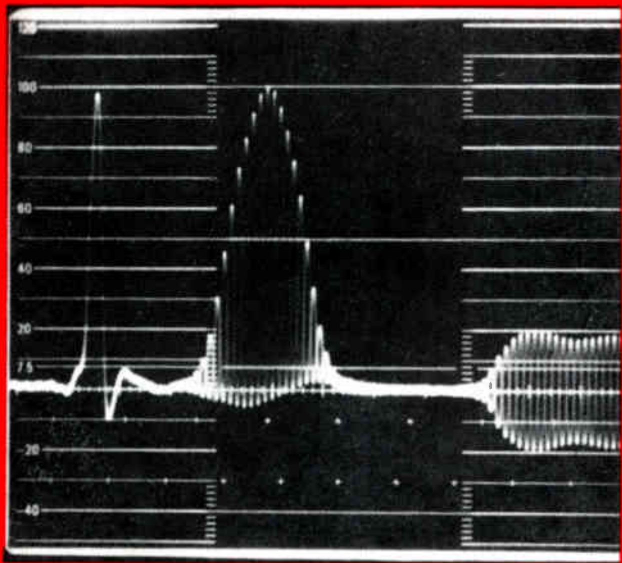
Other video parameters, such as insertion gain, line-time distortions, short-time distortions and signal-to-random noise ratio can be measured using either the composite or the combination test signals.

Differential gain

Differential gain is a change in the amplitude of a chrominance signal because of varying luminance level. The amount of distortion is typically expressed in percent, but it also can be given in dB or units of IRE. Differential gain also is referred to as "diff. gain" or "DG."

In an ideal environment with zero differential gain, a change in the luminance would not have an effect on the chrominance level. If differential gain is present, the chrominance level changes and color saturation varies as an object becomes darker or brighter. →

Figure 9: Example of chrominance-luminance delay inequality



> ***"Measurements are to be made at the output of the modulating or processing equipment, which would typically be in the cable system headend."***

The modulated five-riser staircase of the composite test signal can be used to measure differential gain. This test signal consists of a constant amplitude chrominance signal superimposed on a luminance signal that steps from blanking level to white level.

Differential gain can be measured with a waveform monitor, an oscilloscope or a vectorscope. In this example, a waveform monitor will be used.

The staircase is displayed on a waveform monitor and passed through the monitor's high pass filter, which will remove the luminance and pass the chrominance. The variable gain control is adjusted so that the largest peak-to-peak amplitude of any part of the chrominance is 100 IRE. The peak-to-peak amplitude of the most attenuated part of the chromi-nance is then measured. The differential gain, measured in percent, is the larg-est part of the chrominance (which was normalized to 100 IRE) minus the smallest peak-to-peak amplitude.

Figure 5 (page 50), where there is no difference in chrominance attenuation, shows an example of zero differential gain. Figure 6 (page 50), where the most attenuated chrominance is 76 IRE peak-to-peak, shows an example of 24% differential gain.

Differential phase

Differential phase is a change in the phase of a

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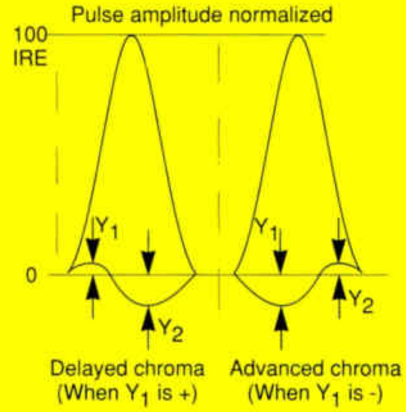
chrominance signal due to varying luminance level. It is similar to differential gain, but with differential phase, the phase of the chrominance is affected instead of the amplitude. Differential phase, which is measured in degrees, also is referred to as "diff. phase" or "DP." Unacceptable levels of differential phase are seen as a change in hue as an object becomes darker or brighter.

Figure 10: Chroma delay amplitudes



The modulated five-riser staircase of the composite test signal that was used to measure differential gain also can be used to measure differential phase. With differential phase, we are interested in the constant phase relationship of the chrominance as it is superimposed on a luminance signal that steps from blanking level to white level.

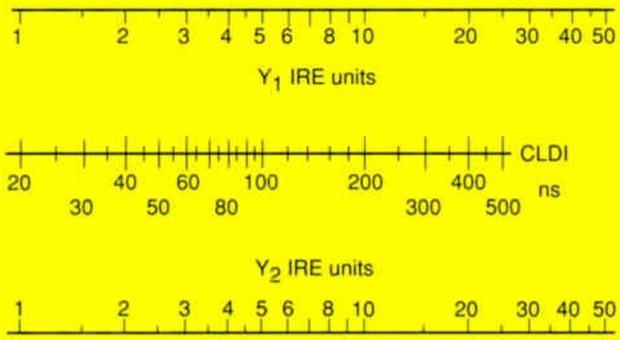
A vectorscope is used to measure differential phase. The vectorscope is calibrated and the five-riser staircase is passed through the scope's high pass filter to remove the luminance. The gain of the vectorscope is adjusted to place the tip of the staircase vector on the perimeter of the vectorscope circle. The two lines that are displayed are used to measure the amount of differential phase. Figure 7 (page 55), where the two horizontal lines do not separate, demonstrates an example of zero differential phase. Figure 8 (page 55), where the lines diverge, shows a case where differential phase exists.

Chrominance-to-luminance delay inequality

Chroma delay is a difference in the time it takes for the chrominance and luminance parts of a signal to pass through a system. Chroma delay is measured in

"The standards will become effective June 30, 1995, three years from the effective date of the FCC Report and Order. Proof-of-performance tests must be performed for these three parameters by that time and once every three years thereafter."

Figure 11: Chroma delay nomogram



Nonogram courtesy IEEE

units of time, typically in nanoseconds. It can result in chrominance either leading or lagging the luminance. Chroma delay manifests itself as color ghosting or color smearing.

The modulated 12.5T sine-squared pulse of the composite test signal is used to measure chroma delay. When displaying this signal on a waveform monitor (with the high pass filter removed), chroma delay is seen as deviations in the pulse's baseline. A single peak in the baseline, either positive or negative, indicates that there is a chrominance-to-luminance gain inequality (chroma gain) present, but no chroma delay. The presence of both a positive and negative peak indicates chroma delay. The positive and negative peaks will be equal in amplitude when there is only chroma delay. When chroma gain and chroma delay are both present, the positive and negative peaks will have unequal amplitudes.

Figure 9 shows the presence of chroma delay, which is indicated by the positive and negative peaks in the baseline of the modulated 12.5T sine-squared pulse. Although it is not a parameter regulated by the FCC Report and Order, chroma gain also is shown (since the amplitude of the peaks are not equal).

Figures 10 and 11 show how chroma delay is calculated using a nomogram and the amplitudes of the positive and negative baseline peaks. A straightedge is placed on the top and bottom scales at the amplitudes of the positive and negative peaks. Chroma delay is indicated at the intersection of the straightedge and the middle scale.

Conclusion

Differential gain, differential phase and chroma delay are technical parameters that will now be regulated by the FCC. If their values are unacceptably high, artifacts from the interaction of the chrominance and luminance parts of a signal will be perceptible.

Using the VITS that most programmers normally send, these parameters can be measured with a waveform monitor and vectorscope. Evaluations can be made without disrupting programming. Monitoring these and other baseband video parameters is needed to ensure that subscribers are receiving the highest quality signals possible. **CT**

Secondary testing under tech rereg

(Continued from page 24)

noise ratio. Use a spectrum analyzer for the best accuracy when measuring depth of modulation. I've yet to find modulator front panel indicator lights or meters that are accurate enough, especially with program video.

The same goes for aural carrier deviation adjustments. The proper setting is 25 kHz peak deviation (for monaural audio) relative to a peak reference audio level input, normally 0 or +10 dBm. Refer to your modulator manufacturer's instructions for the proper input audio level.

After visual carrier depth of modulation and aural carrier deviation have been adjusted, recheck the RF carrier amplitudes and adjust as necessary. One final RF measurement that you may want to consider performing is in-channel frequency response on both processors and modulators. RF frequency response problems will degrade the baseband video signal's C-L delay inequality performance.

To check processor in-channel frequency response will require that you sweep the processor. Modulator frequency response can be measured with a video sweep signal or sin x/x test signal and a spectrum analyzer. Alternatively, you can use a sideband adapter and spectrum analyzer combination. (This latter setup is more commonly used for TV broadcast transmitter measurements.) A multiburst test signal can be used to give you an idea of gross frequency response performance, but it doesn't show response problems between the burst frequencies.

Ready, set, go

After you have verified proper baseband levels and RF levels, you can move on to the measurement of video distortions. There are several ways to do this, ranging from manual measurements with a waveform monitor and vectorscope to fully automated measurements with instruments such as the Tektronix VM700 automatic measurement system.

The important thing is to demodulate the RF outputs from your headend without adding additional distortions in the demodulation process.

"If you can't correlate your measurements to what the FCC would measure with its equipment, you'll be wasting your time."

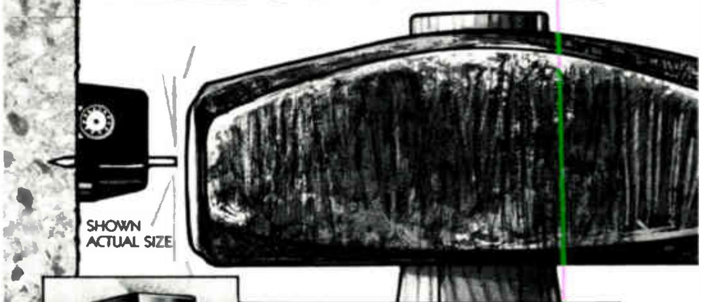
For accurate measurements (that is, ones that will agree with what an FCC field engineer would measure), a set-top converter with a baseband video output or your headend TV monitor with its video output jack won't be good enough. You will need a high-quality demodulator for this job, most likely one that has a frequency agile front end. But sit down when you take out your checkbook. The precision demodulators used by the FCC sell for $20,000 or so.

If you can't correlate your measurements to what the FCC would measure with its equipment, you'll be wasting your time. That doesn't necessarily mean you need a $20,000 demod, but your measurement procedure and equipment should at least be calibrated against that kind of reference.

You'll find specific measurement procedures for many of the items discussed in this article in publications or articles listed in the following references. Good luck, and welcome to the world of video! **CT**

References

1) *Television Measurements — NTSC Systems*, Tektronix 25W-7049.
2) *NCTA Recommended Practices for Measurements on Cable Television Systems*, Second Edition, National Cable Television Association.
3) "How to set video levels with an oscilloscope," January 1988, *Communications Technology*.
4) "Measuring video performance in CATV," December 1988, *Communications Technology*.
5) "How to set video depth of modulation, " December 1988, *Communications Technology*.
6) "How to adjust audio carrier deviation, " November 1989, *Communications Technology*.
7) "NTSC broadcast TV reference data," (Techbook), July 1989, *Communications Technology*.
8) *HBO Transmission Test Manual*, Home Box Office.



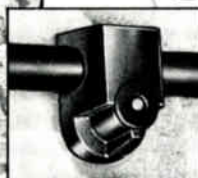
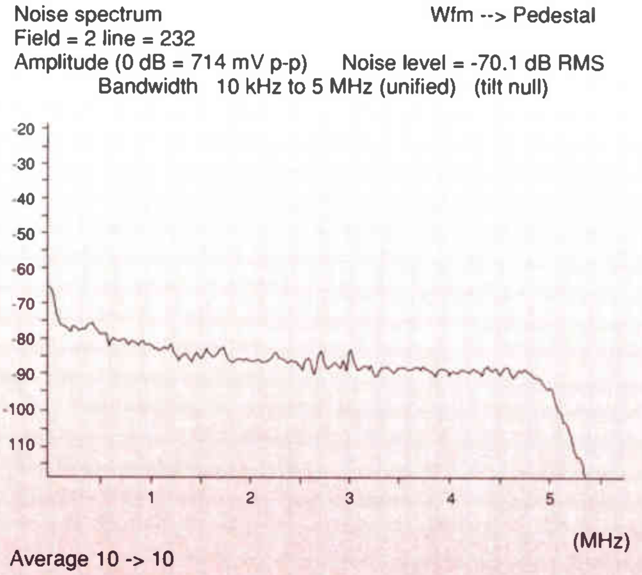


Figure 9: Results do not vary with DC offset at input of video encoder



Video performance

(Continued from page 38)

within the generator. Figure 6 on page 38 shows a measurement of the characteristic performance of the 10-bit generator as recorded on the VM700. Although this could be normalized out, a proper stored reference is not always available.

Note the piecewise discontinuities because of quantizing errors in the generator. This phenomenon is similar to an analog test setup of a VSB/AM system where the noise floor is not sufficiently lower than the signal being measured, and therefore affects the test results. In this case, the S/N of the generator is not sufficiently above the S/N of the transmission system to allow accurate performance measurements.

Therefore, the noise contribution of the generator must be considered. Use of a 10-bit signal generator for measurement of 10-bit transmission system performance was found to be inadequate, and only marginal for 8-bit based video transmission. Ten-bit digital signal generators are probably too expensive to be justified as a standard piece of test equipment in the CATV headend.

A proposed inexpensive solution to this problem is to build a low noise, shallow ramp generator with S/N contribution greater than 80 dB, which is sufficient to ensure that it does not contribute appreciably to the test results. Using a simple enhancement to a sync tip DC restorer circuit[3] such a shading circuit can be made with 5 IRE rise. The video input is an NTSC white ped. A current source with a capacitor is added between the two buffers. This creates a very linear analog shallow ramp. The current is adjusted to limit the ramp magnitude to 5 IRE. Figure 7 on page 38 shows the block diagram of this circuit. A number of these circuits were built for internal testing purposes by ALS. Figure 8 on page 38

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shows the S/N performance of this circuit as measured by the VM700.

Results from characterizing various uncompressed digital video fiber-optic systems with this generator yield consistent, repeatable results that do not vary with the DC offset at the input of the video encoder. Figure 9 (page 62) shows the same 10 bit system as tested previously (Figure 5 on page 38) with the digital signal generator.

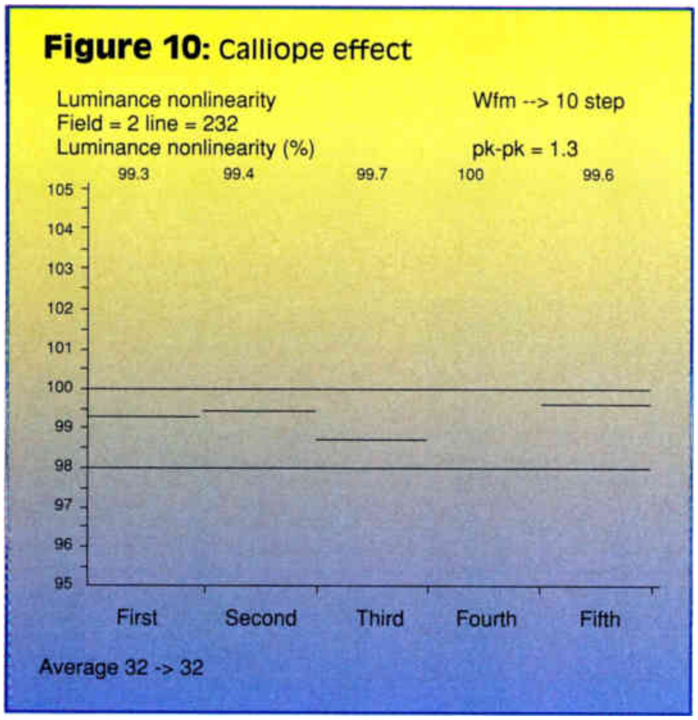
Along with elimination of some of the spiking that was visible in Figure 5, an improvement of 2 dB in the S/N performance measurement is observed, thus showing the previous contribution of the digital generator to the noise performance.

The results of testing various uncompressed digital systems with the highly linear shallow ramp generator show that there may be a difference of up to -20 dB in the measurement of S/N by exercising the quantizing process vs. the results of tests by the quiet line and RMS noise approaches. By this testing method it can be seen that the variables that affect S/N performance in uncompressed digital systems are much more than simply the encoding resolution.

Notably, the S/N performance of the 8-bit encoder based systems from various manufacturers tested with the shallow ramp technique ranged from 54 dB S/N to 60 dB S/N. Performance for individual systems was fairly consistent from channel to channel. This is consistent with the video S/N equation presented earlier. However, this has very significant implications when examining the result on subscriber signal quality as shown in Table 1 (page 34). A digital uncompressed system that delivers 54 dB S/N is worse than an FM-based supertrunk with less than three repeaters. Therefore, performance of any uncompressed digital system should be looked at via shallow ramp for S/N performance noise contribution due to quantizing noise, since this is the overwhelmingly dominating factor.

Ten-bit video encoding yields excellent video performance as shown in the previous figures. Only the ALS DV6000 was tested at 10 bits. An examination of 12-bit encoding also was done. Video S/N performance of 12-bit based encoding was not appreciably better than 10-bit S/N performance. Twelve-bit encoding has significantly higher power consumption than 10-bit encoding because of the requirement for wider dynamic range of the A/D input. The number of discrete levels required (12^{12} - 1 = 4,095 levels) means that there are more analog comparators required. The lack of improved S/N at 12 bits is probably due to a combination of the type of flash conversion performed in 12-bit A/D encoders, the maximum sampling speed achievable and uncorrectable differential nonlinearity errors.

In general, the use of higher quality flash A/D converters, higher sampling rates and/or better filters yields higher video S/Ns. However, manufacturers' specifications are somewhat sketchy when it comes to these areas. Some manufacturers actually sample at up to 8x the Nyquist cutoff (oversampling), which places artifacts much higher above the video. This is a highly advantageous approach and allows use of filters with superior group delay characteristics. This fact is usually not found in manufacturers' specifications, but shows up



very noticeably in performance measurements.

Distortion measurements

In addition to S/N, the greatest performance variations of uncompressed digital systems will be in the areas of differential gain and luminance nonlinearity. Differential gain is highly dependent on encoding resolution (bits per sample) and comparator technique. Some comparators use a two-step flash conversion approach in which the signal range is divided into two halves then sampled (subranging). In 8-bit systems, there is a difference in performance between systems that use subranging and those that do not. In testing various A/D converters, the standard RS-250C performance testing procedures with heavy averaging proved adequate and repeatable for this test, unlike video S/N measurements.

Luminance nonlinearity is highly dependent on the quantizing resolution. Interpretation errors of the input signal to the wrong quantizing state show up significantly. The standard RS-250C test for this defines a differentiating network to measure the difference between levels in a five-level stair step input. The difference in level between the lowest and highest level, divided by the highest level gives the luminance nonlinearity as a percentage. In uncompressed digital systems, the result of quantization errors is referred to as the calliope effect, because of the way the various steps move up and down in relation to each other (Figure 10) as slight DC offset corrections are made.

Summation

The RS-250C performance parameters most variable in uncompressed digital video transmission systems are S/N, differential gain and luminance nonlinearity. The latter two may be characterized fairly accurately using standard analog measurement techniques as defined in the RS-250C specification. S/N of uncompressed digital

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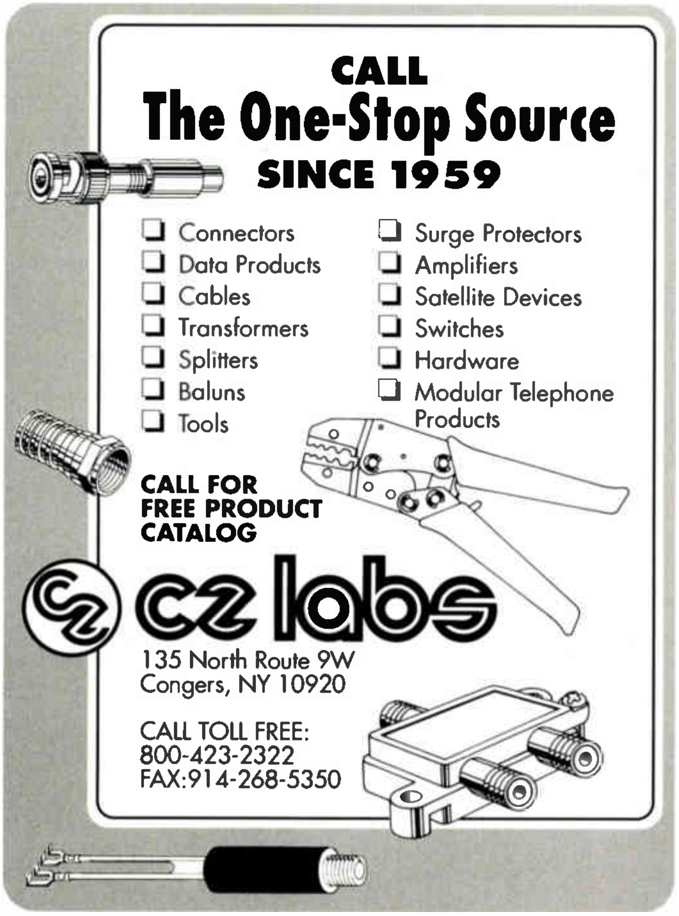


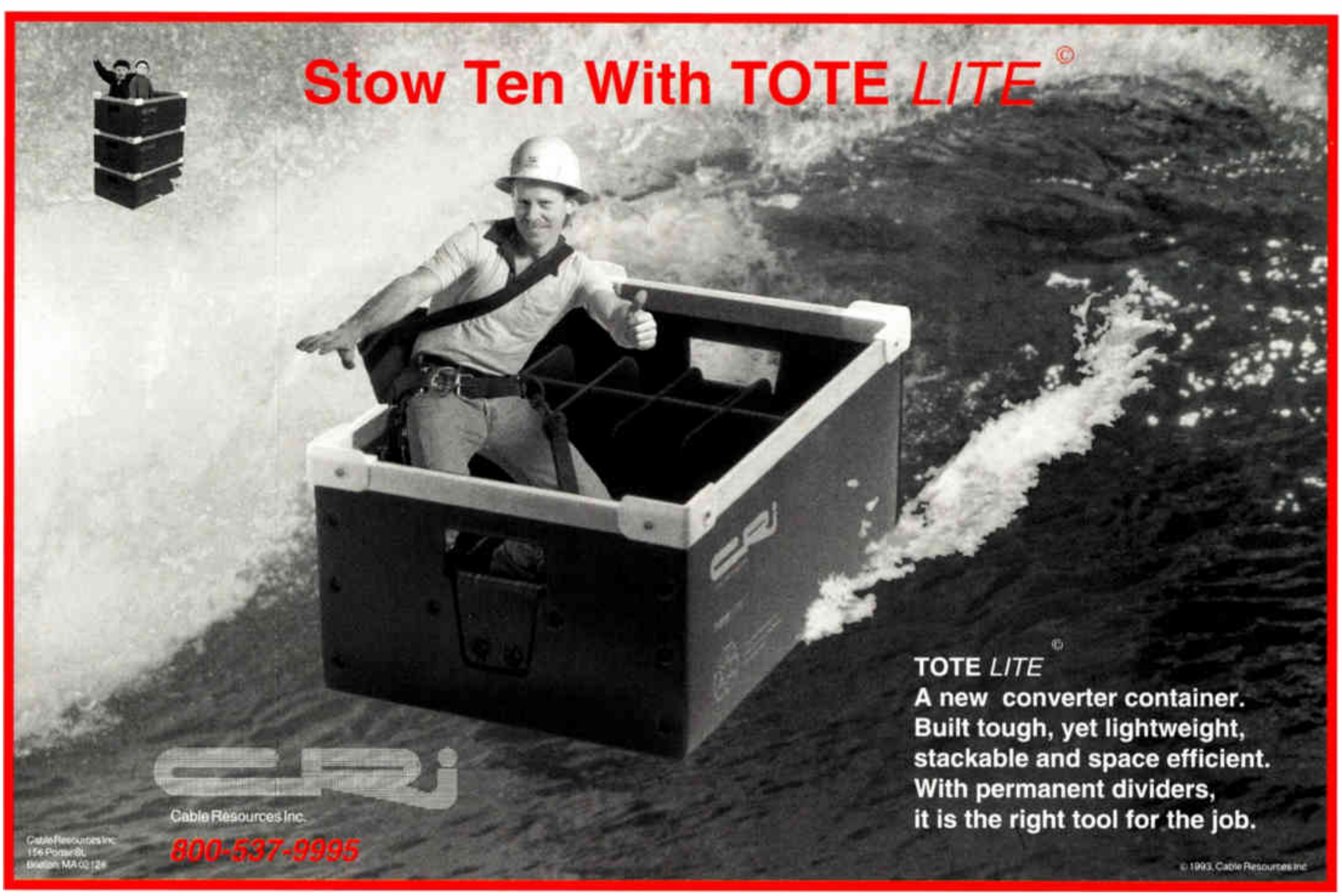
video transmission systems is not accurately characterized using analog techniques. This article has demonstrated that use of an analog shallow ramp generator for S/N measurements has shown to be a highly consistent, accurate way of measuring the S/N performance of uncompressed digital systems. Since the signal quality of various uncompressed digital video systems varies significantly, accurate performance characterization of these systems is of great importance.

Compressed video transmission systems

So far this article has addressed performance in uncompressed video transmission systems. In such systems, all of the encoding data gathered is transmitted, with perhaps the exception of signal oversampling. In compressed systems, the video signal is initially sampled. The resulting data is consolidated, decimated and approximated by various algorithms in order to reduce the effective data transmission rate. Compressed digital transmission systems fall into two basic categories: Those that are used for broadcast or near-broadcast quality transmission between headends and to hubs (DS-3, etc.) vs. those used for distribution of program material (MPEG, MPEG-2, etc.).

In compressed systems used for "broadcast quality transmission," the video signal is first encoded, then various algorithms including DCT, DPCM, FFT and others, are used to reduce the effective video channel data rate while maintaining the highest possible performance. The question on these systems is how to characterize performance.

In uncompressed digital systems, the signal generated at the far end is basically an approximation of the input



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signal. In contrast, the decoder in compressed systems is basically a signal generator that creates a new image based on the assumptions of the compression and decompression algorithms. Therefore, the video can be thought to be a locally generated signal. Measurement of the signal parameters via RS-250C techniques will yield information that in some ways reflects primarily the quality of the locally generated signal, vs. how accurately that signal represents the original signal at the system input.

The first attempt at establishing standards for DS-3 video transmission performance quality were undertaken originally by the T1.Q1.1 Committee of ANSI. In parallel, the ANSI T1.Y1.1 Committee attempted to create a standard algorithm for DS-3 encoding. Performance of the proposed algorithms varied based on the types of pictures transmitted. Whereas one algorithm worked best in some scenes, another was superior for other scenes. Ultimately, no standard was established.

The outgrowth of these committees is the T1.A1.5 Committee that is working to create a means of quantifying picture quality in high quality compressed systems. The EIA RS-250C standard for video performance has 29 basic parameters, which do not correlate totally to perceived video quality in compressed systems. Today one proposed testing standard is defined by the Technical Report 16.

The T1.A1.5 Committee also is working on defining a group of image-based tests that can be used to measure picture quality. Compression errors can be categorized into two main areas: Spatial errors involve misrepresentation of still scenes while temporal errors are associated with moving scenes. Individual test scenes have been defined that correlate back to statistical data taken from subjective viewing tests. There are approximately 30 of these scenes that identify particular compression error types. Once stored onto a D2 format digital tape with clocking information, these can be individually input to the codec under test. The goal is to achieve a quantifiable correlation between codec performance and subjective picture quality by analyzing the results against statistical data.

Conclusion

The migration to digital video transmission systems must be accompanied by a migration in testing standards and understanding of the sources of performance degradation in digital systems. Digital systems can vary significantly in performance for the same sampling size. Uncompressed digital systems require special attention to S/N, differential gain and luminance nonlinearity. Compressed systems require additional methods to quantify performance. **CT**

References

[1] Demler, Michael J., *High Speed Analog to Digital Conversion*, 1991, Academic Press Inc.

[2] Demler; ibid.

[3] Kester, W., *Amplifier Applications Guide - Analog Devices*, 1992, R.R. Donnelly & Sons; Section 8, page 15.

[4] Meisselle, Howard, "DS-3 Motion Artifacts," *SMPTE Journal*, March 1990.

Preparing headend for the future

(Continued from page 42)

gency restoration needs. Coiled cable slack can be placed above the ceiling, below the floor, on walls, in separate closets, or in enclosures mounted to the outside of the building.

Patch cables and jumpers influence the operation and maintenance of the headend network as well. Fiber cables used for interconnection or cross-connection will require routing with unlimited access. Jumper slack must be stored and protected. Today, this slack typically is stored in limited space areas in the interconnect cabinet or end equipment cabinet. This is acceptable when the number of fibers is low. However, when interconnect cabinets are completely populated, there will be limited storage space available. In these cases, jumper storage cabinets that store slack jumper length may be needed. Keep in mind, however, use of storage cabinets will reduce FDF bay termination capacity.

Once cable and fiber densities have been determined, jumper routing mechanisms must be designated. In each FDF bay, sufficient jumper troughs should be installed to provide an organized and protected path for placing jumpers. These troughs must allow access up and down the bay and across the frame. (See Figure 3 on page 42.) Adequate routing mechanisms can reduce congestion when the FDF reaches full capacity or when new stages of growth are added.

Where applicable, the 1993 National Electrical Code specifies that optical cables must be listed as resistant to smoke and flame propagation if they will run more than 50 feet within a building. This requires that any unrated (i.e., outdoor) cables be protected by fire-rated conduit or raceway, or the unrated cable must be transition-spliced to a fire-rated cable. The use of a transition splice, ideally at the last splice point, can eliminate many concerns. If an armored cable system is in use, an all-dielectric cable can be spliced onto the system, thereby eliminating the need for grounding at the headend. Or, a fire-rated cable may be spliced at this point for continuation within the building.

Finally, cable identification and documentation is required to define the destination of each cable. Documentation should be kept current with any additions or reconfigurations of the system.

Cable termination

Using interconnect cabinets in fiber-rich systems allows equipment testing and the patching of fibers to be moved, reassigned or even rerouted to other cabinets to achieve maximum system flexibility. These cabinets also permit simple rearrangement for additions as well as simple connect/disconnect in the event of an emergency. For example, if a laser gets damaged, fiber can be disconnected from the damaged laser and attached to a backup laser or through a coupler to another laser with the use of a splitter. The power will be temporarily reduced until permanent laser replacement, however, the system continues to operate.

Outside plant cable is terminated into a splice cabinet as part of an in-

"Using interconnect cabinets in fiber-rich systems allows equipment testing and the patching of fibers to be moved, reassigned or even rerouted to other cabinets to achieve maximum system flexibility."

terconnect cabinet, or within an FDF. Rack space should be reserved so cabinet(s) can be added as required. Cabinet type and size selection is important; consider capacity, space requirements and system layout.

It is often advantageous to install a "stubbed" or prewired cabinet or frame to terminate outside plant cable and manage the interconnect system. A stubbed cabinet consists of a factory-made cable assembly of a predetermined length, unterminated on one end and terminated with optical connectors into an interconnect cabinet on the other. Most often the cable is listed to meet 1993 NEC smoke and flame retardancy requirements. With the stubbed cabinet's fibers directly connectorized at the factory and preinstalled into the cabinet for protection, the product package is ready to place in the rack. The unterminated end is pulled to the proper location and spliced.

A stubbed frame takes the stubbed cabinet concept one step further. Coupler housings with preinstalled splitter sequences connected to predesigned and installed interconnect cabinets are terminated with an indoor/outdoor NEC-rated cable. The entire assembly is factory-installed into a frame and packaged as a unit. The operator simply uncrates and positions the frame into its designated location. Upon completing fiber splices at a transition point, the system is ready for activation. This approach saves serious installation costs and provides immediate service and documentation for this high density environment.

Electronics interconnection

Typically, the system electronics are placed in a rack separate from the interconnect cabinet system. This allows for system expansion and a more organized network, while also separating the electronics from any grounding of metallic cable elements.

With electronics and cabinets separated, fibers and cables must be guided within and between racks (using jumper storage and raceways) to protect fibers and organize the cables. An adequate amount of cable slack also should be stored to permit future growth. And, the necessary jumper storage, routing guides and raceways should be determined as part of upfront planning.

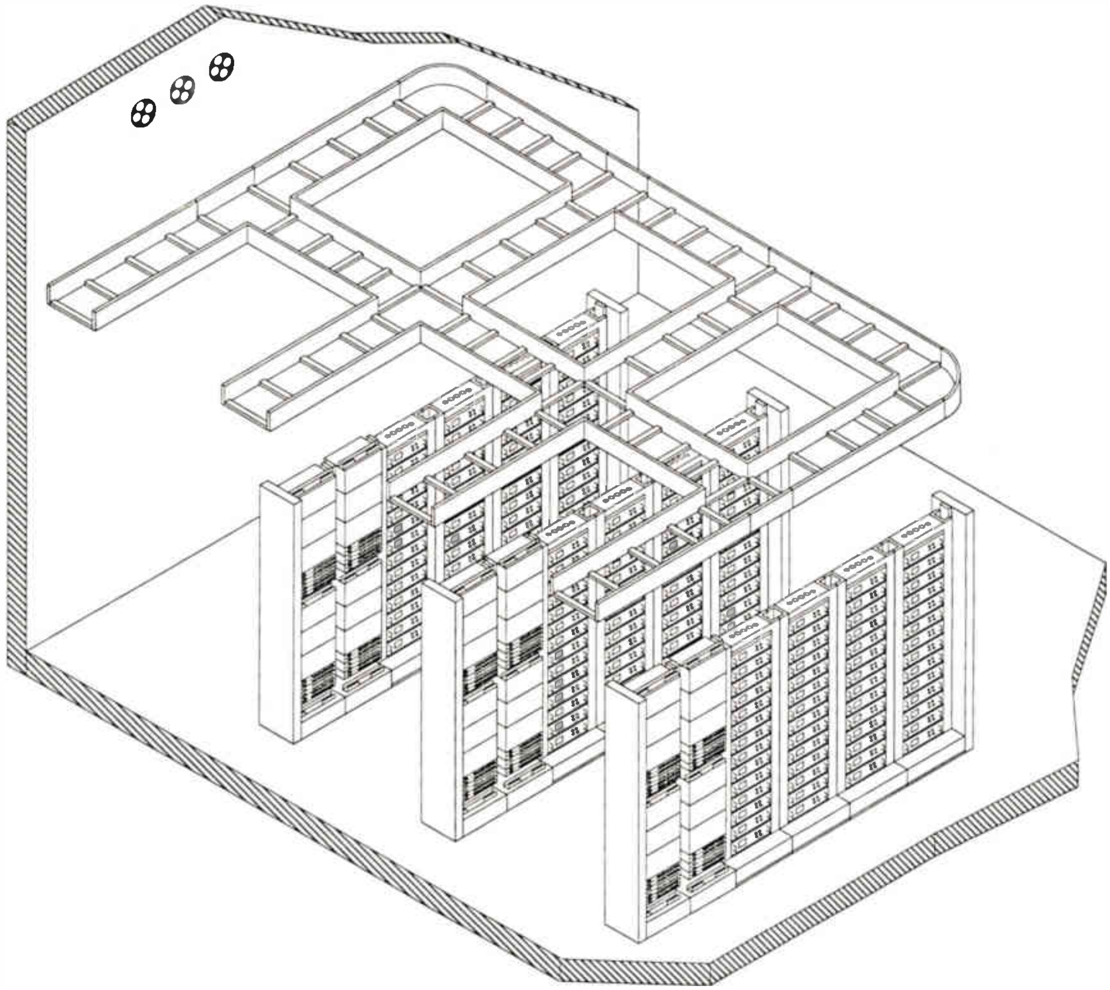
In addition, coupler housings should be planned into a cable TV interconnection system to maximize system flexibility. With a coupler housing, couplers can be disconnected and isolated to permit accurate system testing.

Future growth

A major design decision for any network planner is to finalize a layout to be implemented with a growth strategy. A staged growth strategy specifying network layout will reduce construction delays, materials acquisition problems, excessive or unused capacity, and cutover difficulties. Spare fibers and additional cabinets or bays are on standby. As the system demand for capacity increases, the next stage of growth can be initiated. (See Figure 3 on page 42 and Figure 4 on page 72.)

Space allocation (including rack space and vertical placement) should

Figure 4: Future expansion



be defined. Space required for one rack or multiple racks and accessories is called the footprint. Space requirements for personnel to install, operate or configure components also must be allocated.

Vertical placement of the cabinets is dictated by headend ceiling height and company policy. Currently, most bays are 7, 9 and 11.5 feet high. If no bay height parameters exist, a 7-foot bay is recommended because it provides sufficient fiber densities at a height where special equipment (ladders, steps, etc.) is not necessary. This is important not only during initial construction but during fiber jumper installation, reconfiguration and testing, so access to all levels of the bay can be accomplished with minimal or no step devices.

Conclusion

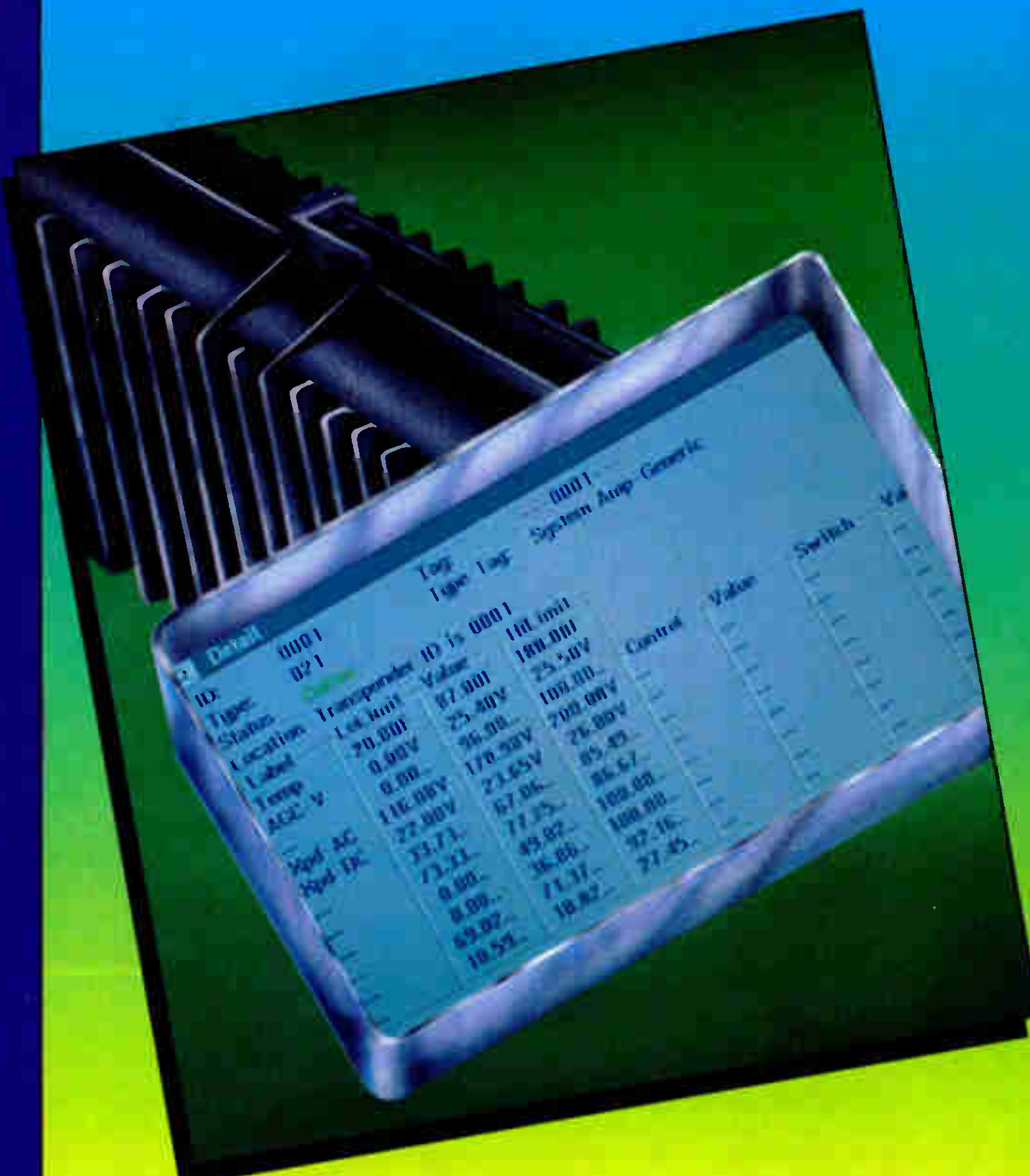
Fiber plant management is becoming more critical as technology improvements and new applications become available. The number of optical cables and their fiber counts are on the rise, requiring new headend system designs. As with any system, proper planning and documentation of the fiber-optic FDF network is the key to flexibility. Operators must plan cable management into the headend system to effectively introduce new services and increase system reliability. **CT**

October 1993

BACK TO BASICS

Focus on spectrum analysis

The training and educational supplement to Communications Technology magazine.



Dennis Wright

Table of Contents

Status monitoring the end of the line

By Theodore R. Chesley
Director of Engineering, Rock Associates

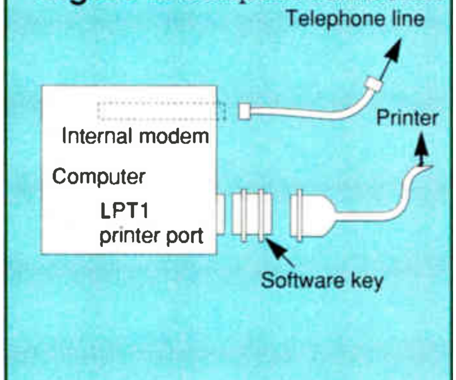
Status monitoring systems for evaluating individual amplifier and power supply performance have been around in our industry for a long time. These systems basically incorporate a device installed in the amplifier or power supply that monitors some basic operating parameters, such as RF levels, AC and DC voltages, etc., and communicates these measurements to a headend computer via return data carriers.

The downside of a full status monitoring system is the necessity for a large number of installed transponders in the amplifiers, and the requirement for return system configuration to carry the data. For many smaller systems this can be cost-prohibitive. Fortunately, however, there are the stand-alone, telephone modem controlled transponders from manufacturers such as AM Communications (LANGuard) and Superior Communications (Cheetah).

By placing a monitoring transponder on the ends of major lines, the condition of the system at that point can be evaluated from a remote location, measurements made and out-of-spec operating alarms reported, all through the telephone line. Monitoring of system end-of-line test points will provide a definitive indication of operating status of that particular line, focusing attention on plant that needs work, and not on plant that is operating properly. The engineer also has a tool with which he can evaluate the operating parameters of his system (or any system with installed equipment) from his desk, or from any location he can connect a computer to the telephone line.

In our company, Rock Associates, we operate systems spread out over the northwestern U.S., and as far north as Kotezebue, AK, above the Arctic Circle. To effectively monitor conditions in all of our systems, both within the system and from regional and corporate locations, we have installed LANGuard transponders in all of our cable plants — in the smaller systems one or two units on the end of major lines, to six or seven transponders at Federal Communications Commission test points in the larger plants such as Coeur d'Alene, ID. Using these units on a regular basis has allowed us to identify and resolve problems well before customer complaints appear, as well as giving the regional engineer a tool by which he can assist the local techs in evaluation of problems without the necessity of physically traveling to the location with equipment.

Figure 2: Computer connection



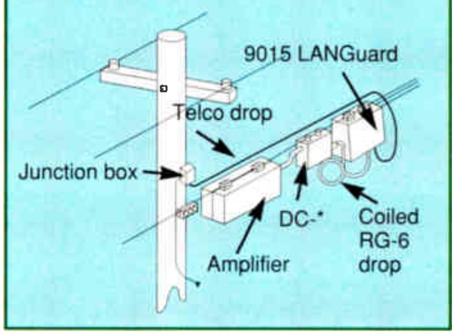
The equipment

The LANGuard 9015 telephone transponder consists of an electronics package enclosed in an outdoor strand-mounted housing. Figure 1 shows transponder installation. Incorporated in the electronics package is a digital spectrum analyzer, digitized level and temperature monitoring and storage circuitry, and a standard telephone modem. On-board provision is made for installation of several auxiliary boards for customized monitoring and control, return line sweep generation and frequency measurement. Input/output connections consist of a F-81 RF port supplying input RF level and 60 VAC to power the unit, and a standard telephone RJ-11 plug on a short cord.

Installation is accomplished by strand-mounting the transponder in the desired location, preferably at an FCC test point or other location on an end-of-line, interfacing the RF port with the system at a point with 60 VAC and enough signal available to supply +20 dBmV to the unit. Our systems use a directional coupler off the last line extender output to accomplish this end, and in the case of FCC test points, a 100-foot coiled drop.

The telephone company installs a phone drop and RJ-11 jack to the pole adjacent to the transponder that is plugged into the phone line. At the office, the system software is installed on the computer, a software key is installed on the printer port to allow use of the program, and a modem is connected between the computer and the telephone line. Figure 2 shows the installation.

Figure 1: Example of transponder installation



Operation

The AM software is designed to be used with either the telephone or data carrier controlled 9015 transponder, or any of a variety of individual amplifier and power supply transponders used with AM's full status monitoring system. For the full status monitoring, or data carrier controlled end-of-line monitors, another piece is used in the headend, the master control unit (MCU). The MCU is not used with the telephone controlled version of the transponder, however, software setup routines are accomplished as if MCUs were used.

Each transponder is identified by an address entered into the setup information in the computer and can be called up at will or on an automatic basis. The transponder also can be programmed to call either of two phone numbers when preset parameters go out of specifications, to report the problem.

The 9015 is used in two measurement modes: spectrum analysis and channel scan. In spectrum analysis, real-time digitized analyzer traces are available with settable time base (MHz/division), detector mode (peak or average), dB/division (1 or 5 dB), sampling rate (10 or 50 smp/div), IF bandwidth (250 kHz or 10 kHz), a full range of markers with delta mode capability (frequency and power differential), and a special zero scan hum measurement function. Spectrums can be saved to a catalog for future retrieval, comparison and analysis. The analyzer trace is color coordinated, and cataloged vs. real-time traces and can be overlaid in different colors for comparison, or carrier-to-noise (C/N) measurement. Figure 3 on page 76 shows the full cable spectrum.

The channel scan mode operates much as a sweepless sweep system. Individual channel levels are stored and presented on the screen as a level graph. →

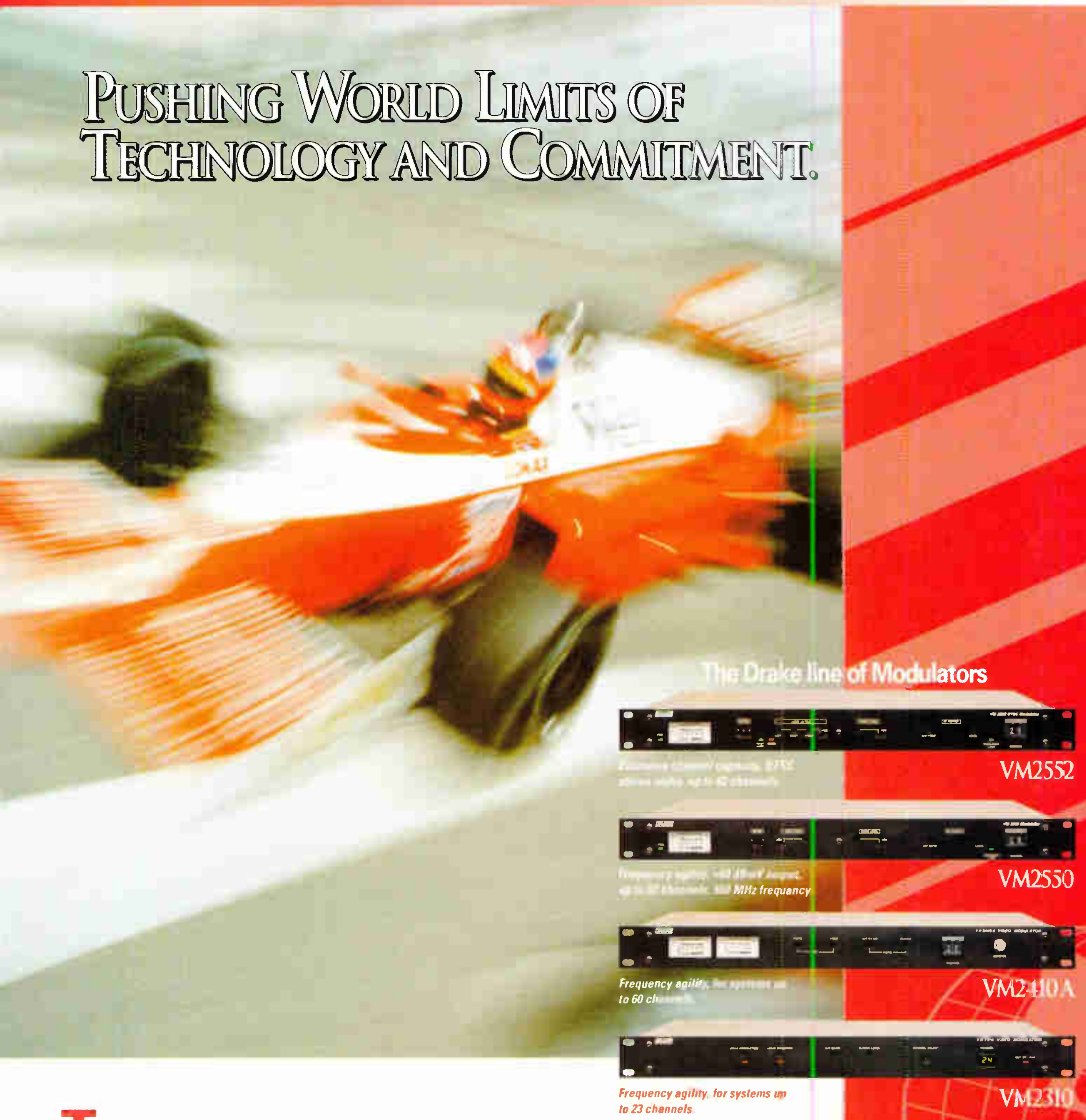


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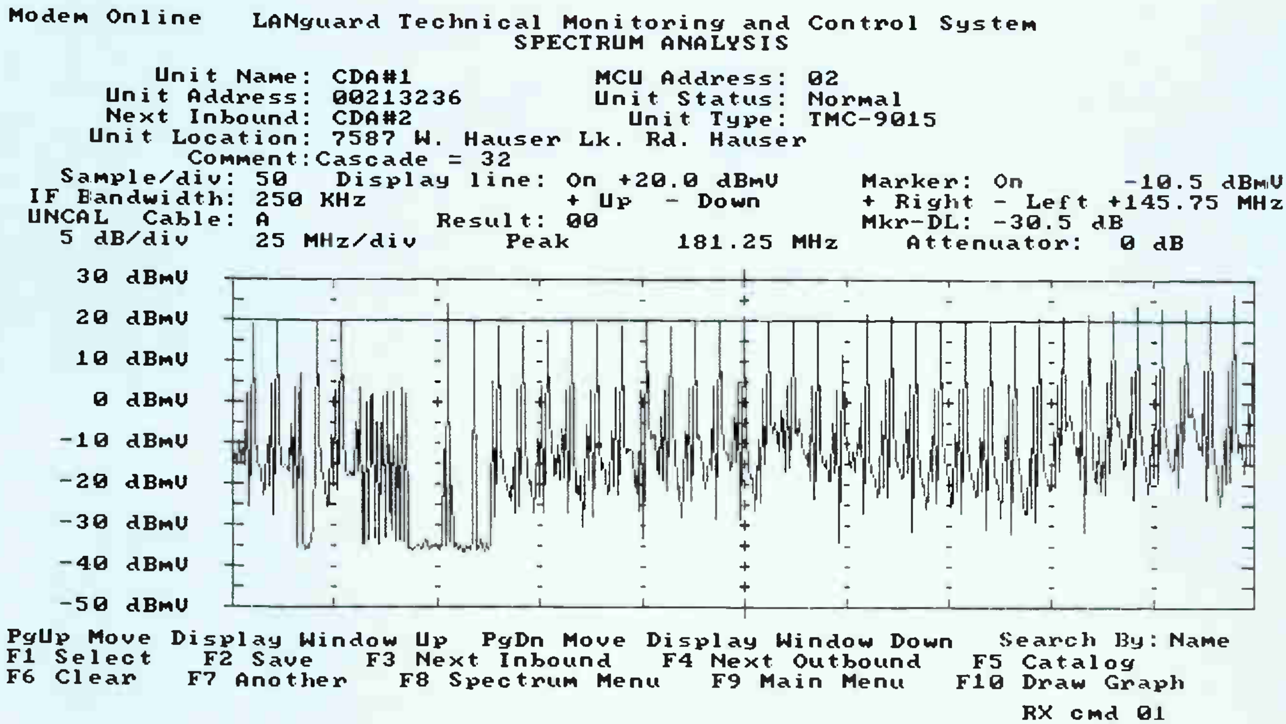
Figure 3: Full cable spectrum



A marker can be placed at each individual channel causing the text table to indicate the present visual carrier level, audio/video differential and the highest and lowest channel variation, similar to a signal level meter. Alarm windows can be set to automatically call if any visual carrier, or aural/visual difference moves out of range. Figure 4 is a channel scan mode.

The system exhibits versatility in that level information can be measured, as well as performance criteria such as C/N, intermodulation and hum. Other parameters such as unit temperature, and AC voltage to the unit (thus on the line) are monitored. And a function called AUTOEXPORT is available to automatically measure channel levels at selected intervals and print out a graph for 24-hour tests. Figure 5 shows the C/N spectrum.

Figure 4: Channel scan mode

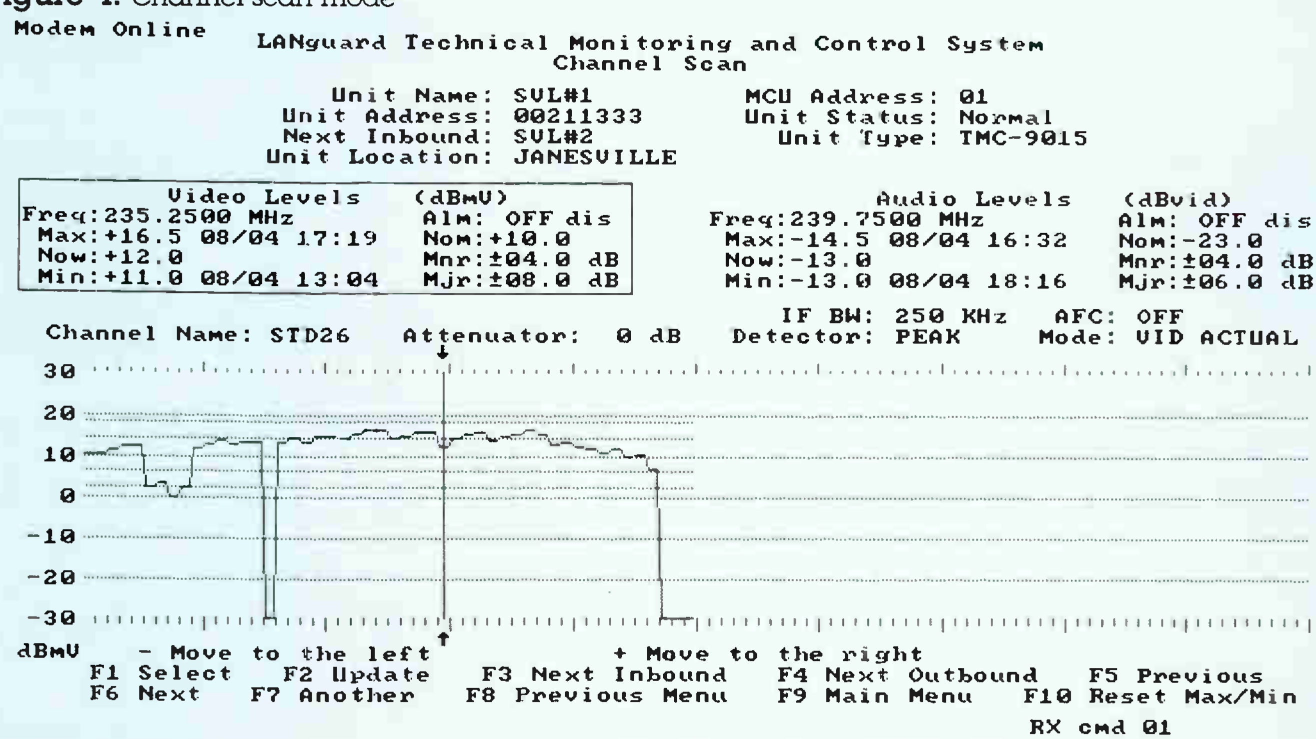
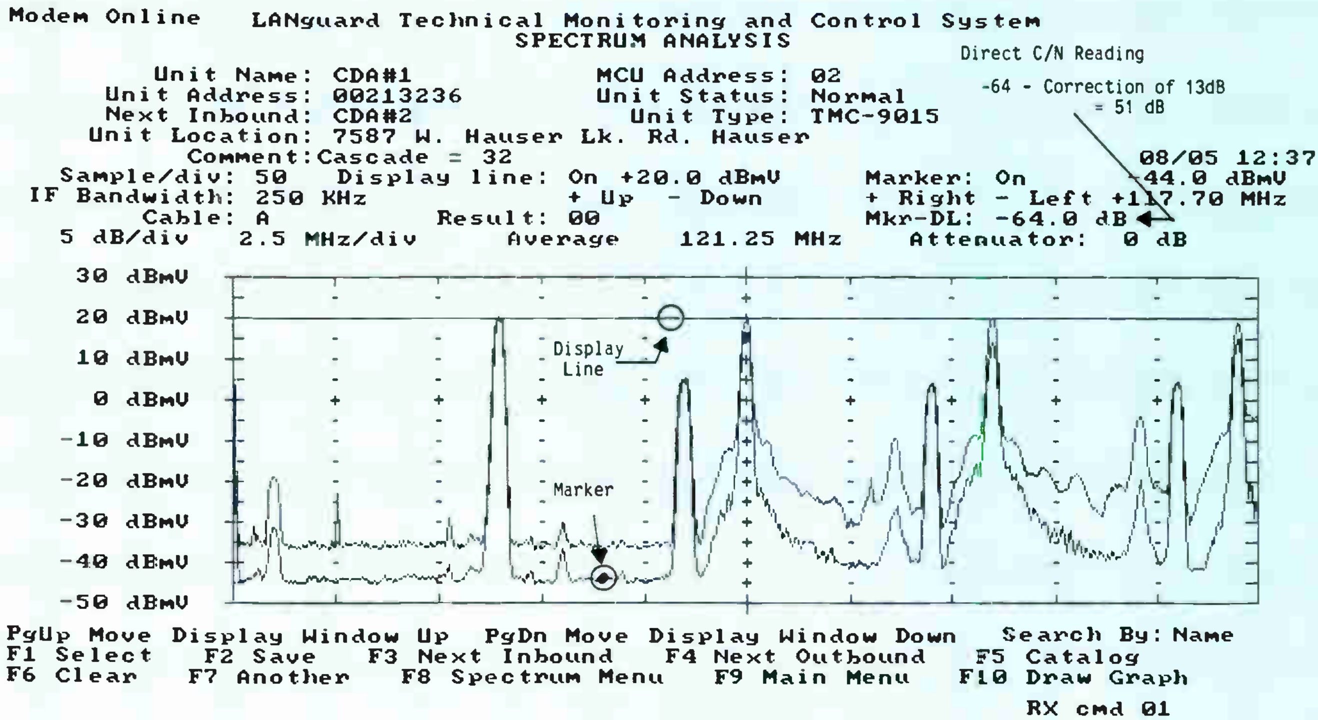


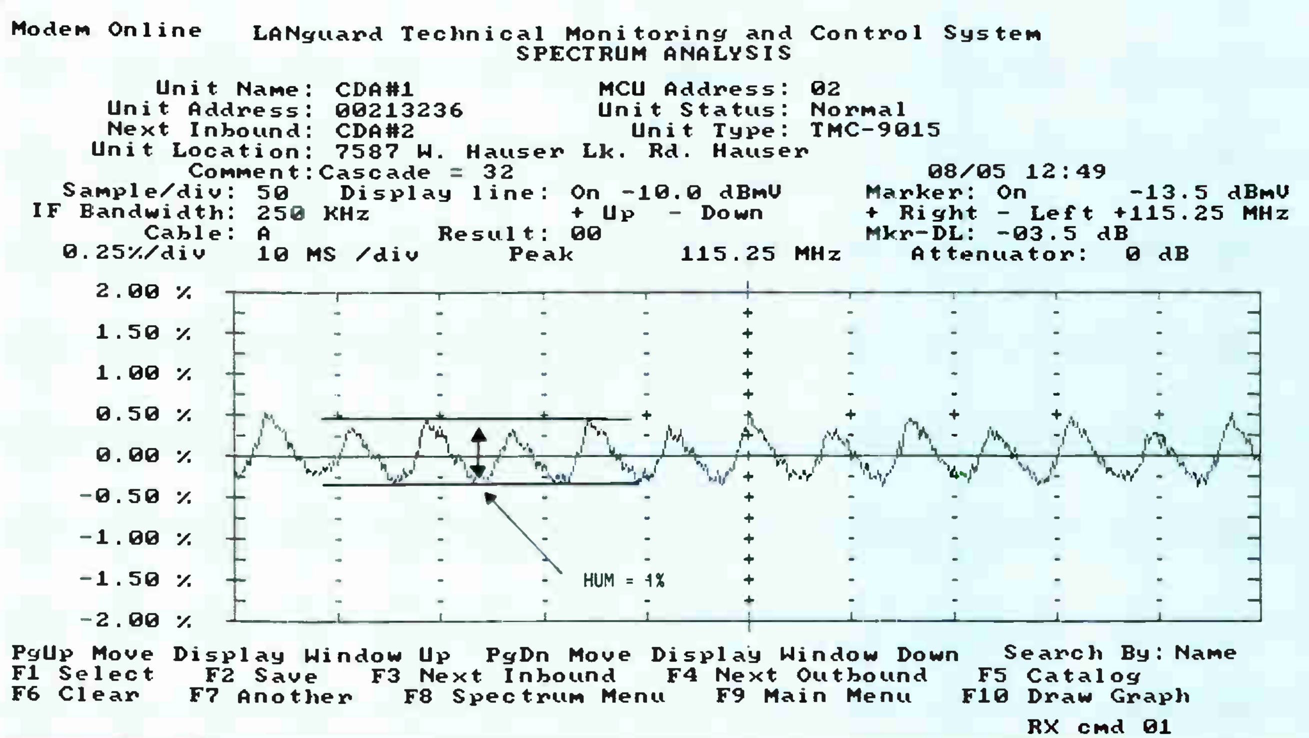
Figure 5: Carrier-to-noise spectrum



In practice

We have found the system extremely useful in long distance troubleshooting as well as assisting in functions of the FCC proof-of-performance testing program. The channel scan mode allows a quick overview of system slope and level, and can identify problems at a glance, while the spectrum analysis mode allows individual analysis of in channel beats, C/N, hum and other spectral conditions. Figure 6 shows the hum spectrum. Frequent checking of the transponders has allowed us to identify problems before the crisis stage is reached. Carrying a notebook computer equipped with a modem, allows me to check transponders from any location and provide needed analysis and advice to field techs. **BTB**

Figure 6: Hum spectrum



Status monitoring: The network "glue" of the '90s

By Lee Thompson
Vice President of Transmission System Engineering
And John Skrobko
Staff Engineer of Fiber Products Engineering
Scientific-Atlanta Inc.

As today's cable systems are considered for much more than just delivery of analog TV pictures, there is a genuine need to monitor the status and the performance of the network and its components. Other services that are now being deployed on these broadband networks include full digital audio systems as well as two-way events such as impulse pay-per-view (IPPV) and near video-on-demand (NVOD) services. Future services will include new offerings like compressed video delivery, high-speed two-way data and perhaps even telephony (video and audio).

In light of these new services, a much higher level of routine performance verification is required and downtime becomes a very critical dilemma. Status monitoring or operational support systems (OSS) have long been used by the phone companies on their networks, while such systems have seldom been deployed in traditional cable TV systems. The requirement for two-way RF communications has been a significant hurdle to deploying these systems. A paradigm shift is occurring with a high percentage of new CATV systems intending to deploy two-way RF. Adding monitoring equipment becomes a much simpler economic justification after the RF return path is in place.

This article will discuss how a status monitoring or operational support system can be used effectively to generate real-time performance in an integrated telecommunications system in a broadband environment. Such a system will allow diagnostics to operate quickly to guarantee a high level of service quality.

The issues of software interoperability at all levels will be explored. To be successful, interoperability must occur between subscriber hardware, transmission hardware (coaxial, fiber optics and headend) as well as conditional access and mapping software. The highest level would tie to yet undefined network elements like established telephone networks. This daunting task will be outlined and examined.

Figure 1: Small to medium system with simple remote dial-up from home (short-term) or dispatcher office

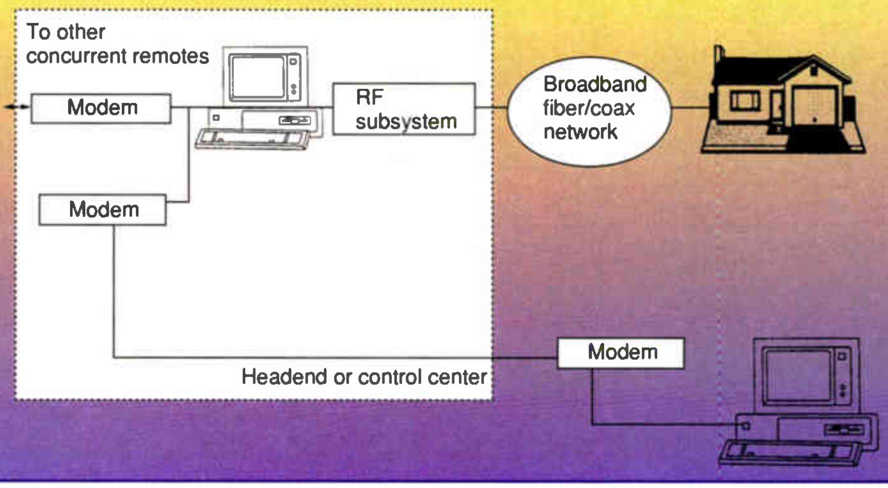
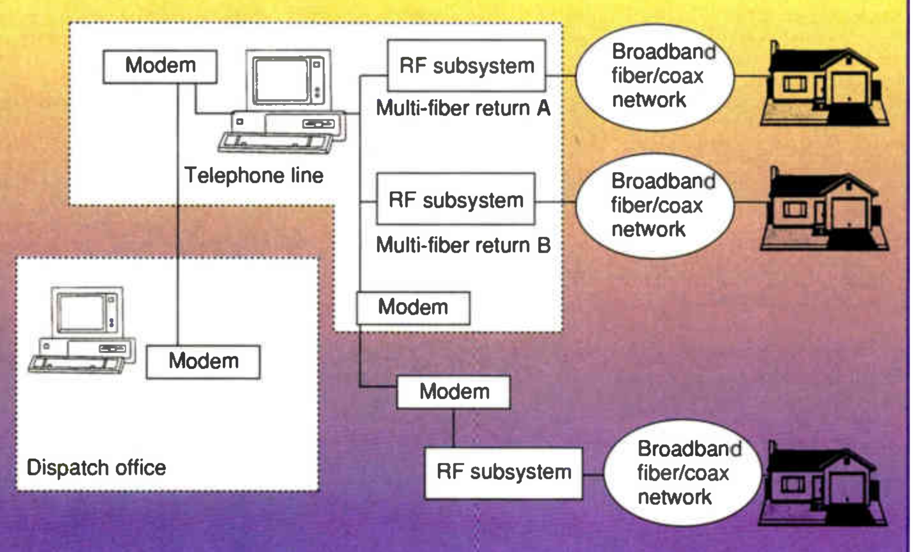


Figure 2: Fiber hub/AML or any connected CATV equipment to be monitored



Architectural issues

The second generation of the Scientific-Atlanta status monitoring software (1986-92) operates in a DOS environment and resides on a personal computer (286/386). This system was limited because there only could be one control point at any given time. That meant that if the PC that operated the system resided in the dispatcher's office, then it was awkward for another location to interrogate the system and its transponders. This could be accomplished by transferring control to another location by a telephone modem connection to the RF subsystem (or RF modem). After this transfer of control occurred, the dispatcher office was unable to monitor and control the system until the remote location was disconnected and local control was re-established. (See Figure 1.)

A further limitation to DOS-based software on a 286/386 machine is that multitasking is quite difficult. This results in a PC that is typically dedicated to the status monitoring task and thus is unavailable for other activities.

The preferred solution to the problem is to permit multiple control and monitoring points. This approach allows a dispatcher to report the alarm conditions to the appropriate technicians and direct their efforts while the engineering office is interrogating the system and separately diagnosing the situation. Concurrently, the regional or national engineering office can be observing the system and progress in solving the problem at hand. (See Figure 2 on the facing page and Figure 3 on page 80.)

This has been accomplished by redesigning the software in an OS/2 environment. This platform is ideal for multitasking applications and offers all the advantages of a graphical user interface such as Windows. Scientific-Atlanta's third generation software release has been in beta-test for the last six months. The functional operation and user interface will now be described further.

How does the system work?

The basic system is PC-controlled and utilizes a frequency shift key (FSK) modulated RF data carrier generated in the headend to communicate with individually addressed transponders. A rack-mounted modem or RF subsystem is used to generate the RF data carrier that is selected to avoid interference with other video and FM signals.

The system can be simply described as a computer terminal (IBM PC or equivalent) that is continuously talking (9,600 baud) and listening to transponders located throughout the CATV or local area network (LAN) plant. Transponders are simply two-way radios in conjunction with a microcomputer and a remote controlled digital voltmeter (DVM). The DVM can be utilized to measure temperatures, voltages and currents in the station or standby power supply. In addition, the transponder also can observe switch lines or activate/deactivate other switches.

These transponders can be located, for example, within an amplifier housing or mounted near a standby power supply. They function essentially the same because all transponders have a receiver that is always listening to a data carrier (typically at 109 MHz) for its unique ID code. Only when the transponder's microcomputer recognizes its ID code is its transmitter (29.8 MHz) activated, and an appropriate response is sent to complete the transaction. For the mid-split cable, a 301.25 MHz (or 149.7 MHz) carrier is utilized for the downstream data.

In this system, all of the intelligence is located locally, inside the transponder, thus making it free to decide which message to send back to the controller. This can save precious polling time since on most occasions there should be no status changes to report.

When there is an error condition, all details of the alarm parameters are sent to the controller when polled. One common misconception is that an alarm is sent back independent of a polling cycle. If this were the case, imagine the communications conflict when a problem exists that affects more than one transponder. All affected nodes would report back at the same time with a garbled result. It is for this reason that a transponder reports back only when interrogated.

User interface

One of the most important aspects of an effective status monitoring system is the control system interface. As an ex-

Figure 3: Multiple control and monitor points

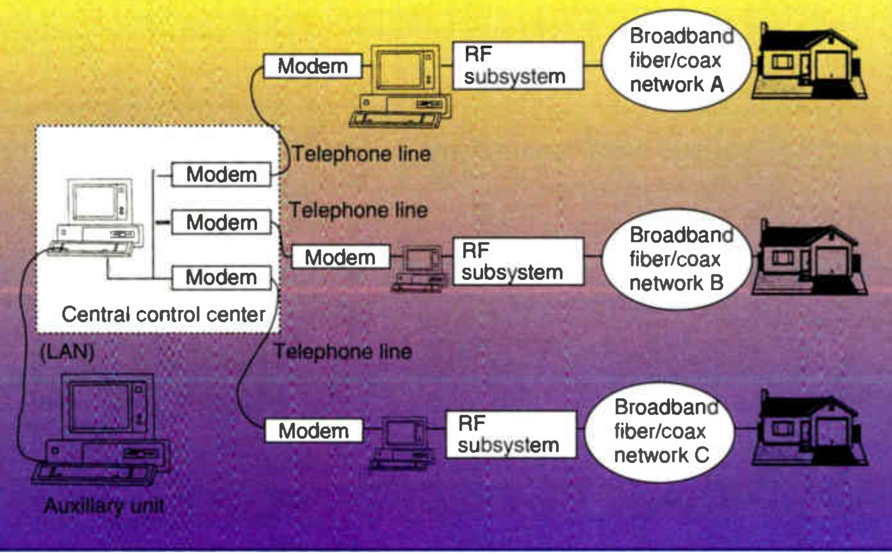


Figure 4: A macro screen for system overview

ample, the Scientific-Atlanta system uses a color graphics environment to offer a simple way for a non-technical operator to screen problems as quickly as possible.

A "macro" screen is provided to give a system overview. (See Figure 4.) Pull-down menus are utilized to access the features of the system. The transponder activity and alarm status are summarized by using a graphical block for each 10 contiguous unique addresses. The color of the block is the color corresponding to the most grievous alarm existing in those 10 transponders. (For example, if one of the 10 has a serious alarm, the block turns red.)

The mouse is used to choose a block for further information. Upon "clicking" on the appropriate block of 10 transponders, a "tag" list is pulled up, which is a summary screen for the 10 transponders within the block. (See Figure 5 on page 83.) If all parameters are within the preprogrammed limits, the button adjacent to the transponder number and optional 10 character tag and "type" field will be green. Otherwise, the button color will correspond to the individual transponder alarm condition.

Detailed information on the transponder of interest is obtained by "clicking" the mouse once again on the appropriate button. (See Figure 6 on page 83.) The detail screen is different for each "type" of transponder and includes all parameters such as limits, actual measurements, control status and switch monitoring status. Note that in this screen, real-time monitoring of a particular site is established and observations of voltage and current changes are possible as the transponder is polled.

The screen descriptions for each analog and digital line can be modified by the operator so that the language can better suit the user (including other languages). Limits can be changed at will — remotely, from the terminal, or locally by means of a hand-held control device.

A 40-character line is present on the detail screen and can be customized to include such important information as map location, power supply source, street addresses, etc. This string can be extremely useful for a dispatcher giving directions to an on-call technician in an unfamiliar area and also can tie a map-

Figure 9: Optical receivers report

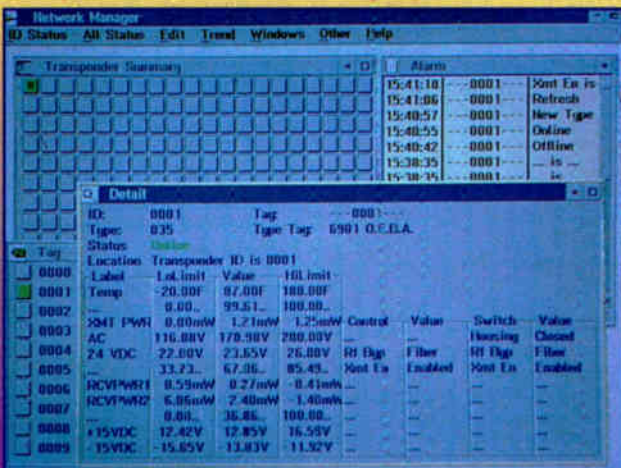
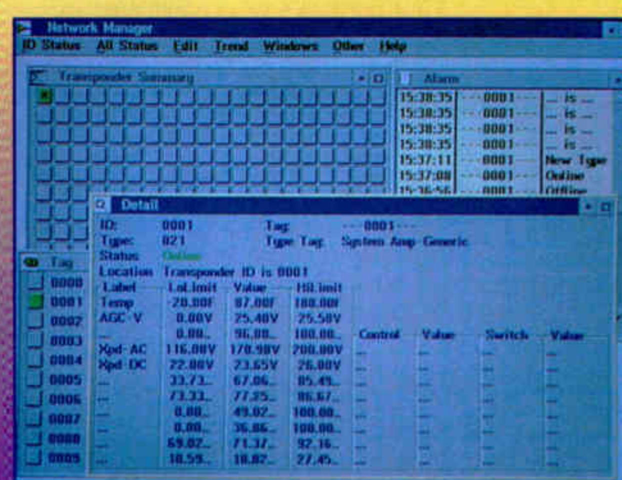


Figure 10: 60 VAC and station temperature monitored



Model 6223 provides a 4:1 passive switch matrix intended to be controlled exclusively by the status monitoring system. The 6220 digital I/O (open or closed relay contact output, low or high voltage input) provides "digital" signal control and monitoring capability in the headend or in the network via the SMIU.

Future activities

Efforts are underway to tie many new headend products and test equipment into the system. At the same time, many users are requesting a direct tie to the advanced system design and mapping software packages and we are involved in complying with this request. Intelligent communication with subscriber conditional access systems and telephone network OSS standards remain as opportunities for development.

Building on the industry acceptance of the status monitoring protocol, a new series of products with increased control and monitoring is envisioned. Whereas the current generation of equipment has limited control and monitoring of functions, the next generation will provide control for every parameter. For example, an OSS controlled gain and slope control can make minor system level adjustments easier. More important, the instructions to make the adjustment can be made manually by an operator at the controller computer or automatically by the continuous monitoring of end-of-the-line instrumentation. The same type of manual and automatic adjustment of headend parameters (IF modulation, RF level, RF input level, etc.) can make monitoring and maintaining the proper levels easier and possibly automatic.

The network of the near future will be a sophisticated one requiring automatic communications across many data bases, the stated objective being reliable transmission of any service at minimal downtime. **BTB**

Reference

Lee Thompson, "Advances in Status Monitoring," *Communications Technology*, July 1989, pages 76-79.

Special gratitude to Dale Hefner, Steve Morgan, Ron Hanson, Steve Idler and Nina Schrider for their special assistance in preparing this article.

Fiber strength, endurance and reliability

By Douglas E. Wolfe
Senior Applications Engineer
Corning Inc.

☛ Is it true that optical fiber loses strength as it gets older? If so, what is the realistic life span of fiber?

All of us have been reminded since we were children to be careful with glass. But glass can be made much stronger than you might think.

In fact, optical fiber, a glass strand thinner than human hair, actually is one of the world's strongest substances. For example, one square inch of fiber suspended in air theoretically could support 216 six-ton elephants in a stationary elevator.

Fiber's theoretical strength is 2 million pounds per square inch. Fiber can withstand tensile stress (stress caused by pulling) up to 600,000 pounds per square inch, far more than coaxial cable's capacity. That figure refers to the ultimate tensile breaking strength of fiber produced today.

Specifically designed to operate for more than 40 years, fiber has a much longer life span than any other transmission medium. Cable TV operators can be secure in the knowledge that the fiber they install today will last many decades.

☛ Since all glass is liquid with distinct flow characteristics, can we expect the fiber cable plant to degrade over some period of time?

Contrary to popular belief, glass is not a liquid and therefore does not "flow." Glass is an amorphous solid.

That common misconception may exist because of stories about old windows that were thicker at the bottom than the top, because of the way the glass flowed when the windows were manufactured. However, 100 years ago, when glass was hand blasted or pressed, it was common practice to place the heavier (thicker) end of the window pane at the bottom to avoid any handling issues. It had nothing to do with flow characteristics.

Fiber is made from ultrapure silica, which is almost 200,000 times purer than window glass. As discussed, fiber is designed and manufactured with an expected service lifetime of 40 or more years, provided it is cabled and installed according to recommended procedures.

Therefore, plant degradation due to fiber flow characteristics is not an issue for cable TV engineers. **CT**

If you have a question about some aspect of fiber optics and are seeking an answer, mail or fax your inquiry to: Ask a Fiber Expert, c/o Communications Technology, 1900 Grant St., Suite 720, Denver, CO 80203; (303) 839-1564.

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Reader service Number 1

Analyzer

The new HP 8591C cable TV analyzer from Hewlett-Packard Co. is a portable, single-box unit that performs RF and video measurements according to FCC regulations and IEC standards. The unit is designed for regulatory compliance testing as well as system monitoring and maintenance. It supports NTSC, PAL and SECAM formats.

The unit performs required FCC proof-of-performance RF measurements and, with Option 107, also performs video measurements that will be mandatory in 1995. This feature allows uninterrupted service to the customer with nonintrusive measurements and enables the unit to operate as a TV receiver, delivering the sound on the built-in speaker as well as the picture on the display for quick identification of picture quality problems such as noise, distortion, hum and ingress.

The unit's noninterfering RF and video measurement capabilities are an industry first in a portable, single-box analyzer, according to the company. For faster tuning, the unit offers a selection of 14 built-in channel plans for all major worldwide configurations. For any channel plan, measurements can be made manually or automatically. The unit performs automatic, unattended measurements and data collection for system monitoring and FCC-required 24-hour system tests.

Custom test plans for different cable systems, test locations and test conditions can be designed by using the unit's test plan menu. Measurements for each channel or range of channels can be selected. An on-screen help menu simplifies the measurement process. Test plans can be stored in the analyzer or on RAM cards.

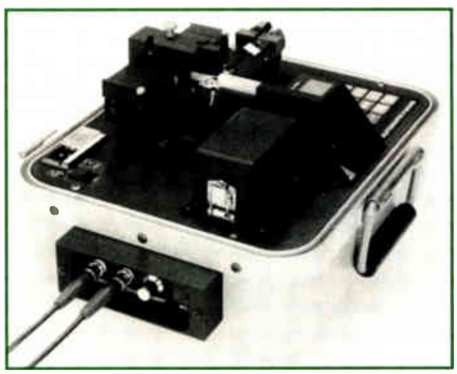
Reader service #203

Overlash block

The new fiber-optic overlash block from GMP is designed for lashing to new messenger strands 1/4 to 3/8 inches in diameter or overlashing to existing lashed cable bundles up to 2 inches in diameter. It is said to be easy to raise and attach with the company's wire raising tool and securely retains the cable and messenger strand for lashing.

The unit weighs 1.5 pounds and features an electro-galvanized steel frame equipped with an anti-friction roller and lever-actuated keeper bar that encloses the cable within the block and strand.

Reader service #198



Current supply

An external source current supply for Aurora Instruments Inc.'s FW-310 automatic fiber-optic fusion splicers has been introduced by the company. The unit can drive any external light source with a DC current from 0 to 150 mA. It may be used when optical power launched into the fiber from the instrument's LID injector is not optimal for proper splicing, such as when aligning polarization maintaining optical fibers on their rotational axes prior to splicing. For this kind of application, an external light source such as a laser diode would be used to inject light directly into the fiber.

In addition to facilitating the use of polarized light, the splicer modification incorporates a detector to enhance its operating wavelength range. This permits its use with 1,550 nm external light sources, for example. The unit can drive any LED or laser up to 150 mA, according to the company, permitting the use of virtually any light source desired to increase the operating flexibility of the splicer.

For automatic splicing with the unit's internal detector, the AC component is synchronized with the splicer's internal circuitry. The modulation of the external light source signal may be monitored with an oscilloscope.

The unit incorporates a front panel switch for selection of light source from internal LED to external laser diode. A rotary adjustment knob varies the current and voltage through their entire ranges. BNC connectors are provided for external connections and other standard electrical connectors are available.

Reader service #208

Portable locator

The new 8870 portable locator from Rycom is capable of long or short range locating, inductive or conductive locating, active or passive locating. The choice of multiple frequencies optimizes performance for specific locating situations. The HI power setting on the transmitter allows AF or RF signals to transmit simultaneously, enabling the user to switch between signals without having to return to the transmitter to select a new frequency.

Additional features include current amount reading, 60 Hz passive power, peak and null antenna, LCD display and 45° depth measurement.

Reader service #206

CALENDAR

October

4-6: Society of Cable Television Engineers technical sessions, in conjunction with Atlantic Cable Show, Atlantic City, NJ. Contact SCTE national headquarters, (215) 363-6888.
5-6: Atlantic Cable Show, Atlantic City, NJ. Contact (609) 848-1000.
5-7: C-COR basics of fiber optics seminar, Anaheim, CA. Contact Kelly, (814) 231-4422.
5-7: Philips Broadband Networks mobile training seminar, RF and video distortions, headend basics, amplifier applications and operation, record keeping and maintenance, Orlando, FL. Contact (800) 448-5171.
6: SCTE Ark-La-Tex Chapter seminar, back to basics, Installer and BCT/E exams administered. Contact Randy Berry, (318) 238-1361.
7: SCTE Chesapeake Chapter seminar, telephone systems in CATV, Columbia, MD. Contact Scott Shelley, (703) 358-2766.
7: SCTE Great Plains Chapter meeting, Installer and BCT/E exams administered, Courtyard Cafe, Bellevue, NE. Contact Randy Parker, (402) 292-4049.
7: SCTE Upper Valley Chapter seminar, bucket truck operation and maintenance, road regulations, Holiday Inn, White River Junction, VT. Contact Chip Winchell, (315) 682-1446.
7: SCTE Upstate New York Chapter seminar. Contact William Grant, (716) 827-3880.
7-8: ATM Technology Symposium, understanding asynchronous transfer mode, Sheraton Hotel, Chicago. Contact (617) 834-4703.
11-14: ONI Fiberworks '93 training seminar, cable TV systems, fiber-optic system training, Denver. Contact 1-800-FIBER ME.
12: SCTE Chattahoochee Chapter seminar. Contact Hugh McCarley, (404) 843-5517.
12: SCTE Desert Chapter seminar, transportation systems and fiber optics, San Gorgonio Inn, Banning, CA. Contact Greg Williams, (319) 640-1312, ext. 277.
12: SCTE Heart of America Chapter seminar, in conjunction with the Mid-America Cable Association Show, Kansas City, MO. Contact Don Gall, (816) 358-5360.
12: SCTE Southeast Texas Chapter seminar, Warner Cable, Houston. Contact Tom Rowan, (713) 580-7360.
12-14: Mid-America Cable Show, Hilton Plaza Inn, Kansas City, MO. Contact (913) 841-9241.
12-14: Philips Broadband Networks mobile training seminar, RF and video distortions, headend basics, amplifier applications and operation, record keeping and maintenance, Hickory, NC. Contact (800) 448-5171.
12-15: Siecor fiber-optic training course, fiber-optic installation, splicing, maintenance and restoration for cable TV applications, Hickory, NC. Contact 1-800-SIECOR1, ext. 5539 or 5560.
13: SCTE Delaware Valley Chapter seminar, computers in cable and data transmission, BCT/E exams administered, Willow Grove, PA. Contact Louis Aurely, (215) 675-2053.
13: Scientific-Atlanta training session, digital audio systems, Philadelphia. Contact Bill Brobst, (404) 903-6306.
14: Society of Cable Television Engineers Satellite Tele-Seminar Program, *Digital Compression (Part One)*, to be shown on Galaxy I, Transponder 14. Contact SCTE national headquarters, (215) 363-6888.
14-15: Scientific-Atlanta training session, 8600 System operation and maintenance (System Manager 10), Atlanta. Contact Bill Brobst, (404) 903-6306.
16: SCTE Cactus Chapter seminar, OSHA and cable construction. Contact Harold Mackey, (602) 352-5860, ext. 135.
18-20: Society of Cable Television Engineers Technology for Technicians II seminar, hands-on technical training program for broadband industry technicians and system engineers, Harrisburg, PA. Contact SCTE national headquarters, (215) 363-6888.
19-20: Scientific-Atlanta training session, distribution, Secaucus, NJ. Contact Bill Brobst, (404) 903-6306.
19-21: Jerrold/General Instrument technical seminar, digital transmission, fiber optics, advanced addressability, rebuild/upgrade planning, FCC compliance, system design and corrective maintenance, St. Petersburg Hilton, St. Petersburg, FL. Contact Ginny Morris, (215) 956-6445.
19-21: Philips Broadband Networks mobile training seminar, RF and video distortions, headend basics, amplifier applications and operation, record keeping and maintenance, Baltimore. Contact (800) 448-5171.
20: SCTE Big Sky Chapter seminar, fiber in the system, BCT/E and Installer exams administered, Locomotive Inn, Laurel, MT. Contact Marla DeShaw, (406) 632-4300.
20: SCTE Palmetto Chapter seminar, plant maintenance and outage control. Contact John Frierson, (803) 777-5846.
20: SCTE Rocky Mountain Chapter seminar, outage reduction, data, compression. Contact Ron Upchurch, (303) 790-0386, ext. 403.
20: SCTE San Diego Chapter seminar. Contact Kathleen Horst, (310) 532-5300, ext. 250.
21: Society of Cable Television Engineers OSHA/Safety Seminar for system managers and safety coordinators on maintaining records and developing safety training programs, Harrisburg, PA. Contact SCTE national headquarters, (215) 363-6888.
21: SCTE Big Sky Chapter seminar, fiber in the system, BCT/E and Installer exams administered, Elk Lodge, Helena, MT. Contact Marla DeShaw, (406) 632-4300.
21: SCTE New England Chapter seminar, communication networks of the future, network applications and deployment, Radisson Inn, Marlboro, MA. Contact James Kelley, (401) 943-7930, ext. 230.
21-22: Scientific-Atlanta training session, headend and earth station, Secaucus, NJ. Contact Bill Brobst, (404) 903-6306.
22: SCTE Greater Chicago Chapter meeting, BCT/E exams administered. Contact Bill Whicher, (708) 362-6110.
25-28: ONI Fiberworks training seminar, digital systems, digital networks training, Phoenix. Contact 1-800-FIBER ME.
26-27: Scientific-Atlanta training session, design considerations, sweep and balance, Atlanta. Contact Bill Brobst, (404) 903-6306.
26-28: Philips Broadband Networks mobile training seminar, RF and video distortions, headend basics, amplifier applications and operation, record keeping and maintenance, Boston. Contact (800) 448-5171.
28: SCTE New Jersey Chapter seminar, new technology update, BCT/E exams administered. Contact Linda Lotti, (908) 446-3612.
28-30: Private Cable Show, the Nugget, Reno, NV. Contact (713) 342-9826.

Planning ahead

Dec. 1-3: Western Cable Show, Anaheim, CA. Contact (510) 428-2225.
Jan. 1-5: SCTE Emerging Technologies Seminar, Phoenix. Contact (215) 363-6888.
Feb. 22-24: OFC '94, San Jose, CA. Contact (202) 223-8130.
Feb. 23-25: Texas Cable Show, San Antonio. Contact (512) 474-2082.

November

1-3: Society of Cable Television Engineers Technology for Technicians II seminar, hands-on technical training program for broadband industry technicians and system engineers, Savannah, GA. Contact SCTE national headquarters, (215) 363-6888.
2-4: Philips Broadband Networks mobile training seminar, RF and video distortions, headend basics, amplifier applications and operation, record keeping and maintenance, Plattsburgh, NY. Contact (800) 448-5171.
4: Society of Cable Television Engineers OSHA/Safety Seminar for system managers and safety coordinators on maintaining records and developing safety training programs, Savannah, GA. Contact SCTE national headquarters, (215) 363-6888.
4: SCTE Chesapeake Chapter seminar, fiber optics, Arlington, VA. Contact Scott Shelley, (703) 358-2766.
4: SCTE Ohio Valley Chapter meeting, in conjunction with the Ohio Cable TV Association annual show, Columbus, OH. Contact Weldon Feightner, (513) 941-7000.
8-11: ONI Fiberworks training seminar, digital systems, digital networks training, Orlando, FL. Contact 1-800-FIBER ME.
9: SCTE Cascade Range Chapter meeting, Holiday Inn, Wilsonville, OR. Contact Cynthia Stokes, (503) 230-2099.
9: SCTE New York City Chapter seminar, emerging technologies. Contact Rich Fevola, (516) 678-7200.
9: SCTE Wheat State Chapter meeting. Contact Lisa Hewitt, (316) 262-4270, ext. 191.
9-10: Scientific-Atlanta training session, fiber optics, sweep and balance, Milwaukee. Contact Bill Brobst, (404) 903-6306.
9-11: Philips Broadband Networks Mobile Training seminar, RF and video distortions, headend basics, amplifier applications and operation, record keeping and maintenance, Syracuse, NY. Contact (800) 448-5171.
9-12: Siecor fiber-optic training course, fiber-optic installation, splicing, maintenance and restoration for cable TV applications, Hickory, NC. Contact 1-800-SIECOR1, ext. 5539 or 5560.
10: SCTE Badger State Chapter seminar, power design and system reliability, Fondulac, WI. Contact Brian Revak, (608) 372-2999.
10: SCTE Heart of America Chapter seminar, Kansas City, MO. Contact Don Gall, (816) 358-5360.
10: SCTE Mid-South Chapter meeting. Contact Bob Allen, (901) 365-1770, ext. 4110.
11: Society of Cable Television Engineers Satellite Tele-Seminar Program, *Digital Compression (Part Two)*, to be shown on Galaxy I, Transponder 14. Contact SCTE national headquarters, (215) 363-6888.
11: SCTE Gateway Chapter meeting. Contact Chris Kramer, (314) 949-9223.
11: SCTE Lake Michigan Chapter seminar, fiber architecture. Contact Karen Briggs, (616) 941-3783.
11: SCTE Penn-Ohio Chapter seminar, video and audio measurements, Installer and BCT/E exams to be administered, Sheraton Hotel, Warrendale, PA. Contact Marianne McClain, (412) 531-5710.
13: SCTE Cascade Range Chapter meeting, BCT/E exams to be administered, Paragon Cable, Portland, OR. Contact Cynthia Stokes, (503) 230-2099.
13: SCTE Upstate New York Chapter meeting, BCT/E exams to be administered. Contact William Grant, (716) 827-3880.
15: SCTE Bluegrass Chapter meeting, BCT/E exams to be administered. Contact Alan Reed, (502) 389-1818.
15-18: ONI Fiberworks '93 training seminar, cable TV systems, fiber-optic system training, Denver. Contact 1-800-FIBER ME.
16: SCTE Chattahoochee Chapter meeting. Contact Hugh McCarley, (404) 843-5517.
17: SCTE Appalachian Mid-Atlantic Chapter meeting, BCT/E exams to be administered, Chambersburg Holiday Inn, Chambersburg, PA. Contact Richard Ginter, (814) 672-5393.
17: SCTE Bluegrass Chapter seminar, safety, Elizabethtown, KY. Contact Alan Reed, (502) 389-1818.
17: SCTE Golden Gate Chapter meeting. Contact Mark Harrigan (415) 358-6950.
17: SCTE Great Lakes Chapter meeting, BCT/E exams to be administered, Holiday Inn, Livonia, MI. Contact Jim Kuhns, (313) 445-3712.
17: SCTE North Country Chapter meeting, Sheraton Midway Hotel, St. Paul, MN. Contact Bill Davis, (612) 646-8755.
17: SCTE Piedmont Chapter vendor show and technical sessions, Installer and BCT/E exams to be administered, Winston-Salem, NC. Contact Mark Eagle, (919) 477-3599.
18: SCTE Greater Chicago Chapter seminar, system design, Holiday Inn, Willowbrook, IL. Contact Bill Whicher, (708) 362-6110.
18: SCTE Mount Rainier Chapter seminar, Silverdale, WA. Contact Gene Fry, (206) 747-4600, ext. 107.
18: SCTE Rocky Mountain Chapter seminar, Installer Certification review. Contact Ron Upchurch, (303) 790-0386, ext. 403.
19: SCTE Great Plains Chapter seminar, troubleshooting techniques, Lincoln, NE. Contact Randy Parker, (402) 292-4049.
20: SCTE Cactus Chapter meeting, Installer and BCT/E exams to be administered, Phoenix. Contact Harold Mackey, (602) 352-5860, ext. 135.
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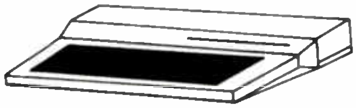

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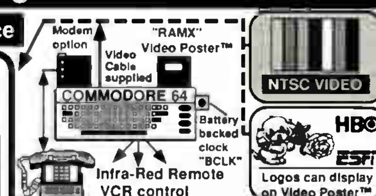

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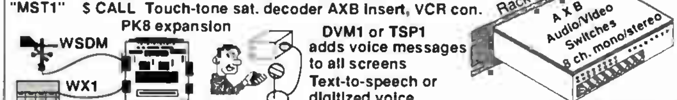

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22	48	74	100	126	152	178	204	230	256	282	308
23	49	75	101	127	153	179	205	231	257	283	309
24	50	76	102	128	154	180	206	232	258	284	310
25	51	77	103	129	155	181	207	233	259	285	311
26	52	78	104	130	156	182	208	234	260	286	312

A. Are you a member of the SCTE (Society of Cable Television Engineers)?
01. ___ yes
02. ___ no

B. Please check the category that best describes your firm's primary business (please check only 1):
Cable TV Systems Operations
03.___ Independent Cable TV System
04.___ MSO (two or more Cable TV Systems)
05.___ Cable TV Contractor
06.___ Cable TV Program Network
07.___ SMATV or DBS Operator
08.___ MDS, STV or LPTV Operator
09.___ Microwave or Telephone Company
10.___ Commercial TV Broadcaster
11.___ Cable TV Component Manufacturer
12.___ Cable TV Investor
13.___ Financial Institution, Broker, Consultant
14.___ Law Firm or Govt. Agency
15.___ Program Producer or Distrib.
16.___ Advertising Agency
17.___ Educational TV Station, School or Library
18.___ Other (please specify)_____

C. Please check the category that best describes your job title:
19.___ Corporate Management
20.___ Management
21.___ Programming
Technical/Engineering
22.___ Vice President
23.___ Director
24.___ Manager
25.___ Engineer
26.___ Technician
27.___ Installer
28.___ Sales
29.___ Marketing
30.___ Other (please specify)_____

D. Do you plan to rebuild/upgrade your system in:
31.___ 6 months
32.___ 1 year
33.___ 2 years
34.___ 5 years

E. In the next 12 months, what cable equipment do you plan to buy?
35.___ Amplifiers
36.___ Antennas
37.___ CATV RF Distribution/ Distribution Electronics
38.___ CATV Passive Equipment Including Cable
39.___ Cable Tools
40.___ Compression/Digital Equip.
41.___ Computer Equipment
42.___ Connectors
43.___ Converters
44.___ Controllers
45.___ Descramblers
46.___ Fiber-Optic Cable
47.___ Fiber-Optic Electronics
48.___ Headend Equipment
49.___ Interactive Software
50.___ Lightning Protection
51.___ MMDS Transmission Equip.
52.___ Microwave Equipment
53.___ Other Security Equipment
54.___ Receivers and Modulators
55.___ Remotes
56.___ Safety Equipment
57.___ Satellite Equipment
58.___ Splitters
59.___ Subscriber/Addressable Security Equipment
60.___ Telephone/PCS Equipment
61.___ Power Suppls. (Batteries, etc.)
62.___ Vehicles
63.___ VideoCiphers
64.___ 2-Way Radio

F. What is your annual cable equipment expenditures?
65.___ up to $50,000
66.___ $50,001 to $100,000
67.___ $100,001 to $250,000
68.___ $250,001 to $500,000
69.___ $500,001 to $1,000,000
70.___ over $1,000,001

G. In the next 12 months, what cable test & measurement equipment do you plan to buy?
71.___ Fiber Optics Test
72.___ Oscillators
73.___ Service Monitors
74.___ Signal Level Meters
75.___ Spectrum Analyzers
76.___ Sweep Tester
77.___ CATV RF Test Equipment

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SCTE Engineering Committee update

By Bill Riker
President, Society of Cable Television Engineers

The Society's board of directors held its fall meeting on Sept. 17 in St. Louis. Among many other items, the directors reviewed the activities of the Society's six engineering subcommittees. Created to set standards that will greatly impact our industry, these subcommittees are as follows: CLI (Terry Bush, chairman), Design and Construction (Keith Burkley, chairman), EBS (Ken Wright, chairman), Interface Practices (Jim Haag, chairman), In-Home Cabling (Larry Nelson, chairman), and Maintenance Practice and Procedures (Bruce Weintraub, chairman).

The subcommittees report directly to the SCTE Engineering Committee, which is comprised of the following members: Michael Smith (chairman), Norrie Bush, Dave Franklin, Dan Pike and Wendell Woody. In the April 1993 issue of the Society's newsletter, *Interval*, we summarized their responsibilities and recognized the need for increased membership within each group as they work to shape the future of the cable industry. The purpose of the "President's Message" this month is to update the subsequent progress of some of the subcommittees.

Interface practices

The Interface Practices Subcommittee presently has the following specifications and test methods under review:

- *Flexible RF coaxial drop cable specification (preliminary)*
- *"F" specifications:*
  - Female (adopted)
  - Male/feed-thru (adopted)
  - Male/push-on (submitted for adoption)
  - Male/trap (preliminary)
  - Connector-to-cable interface (preliminary)
- *Mainline specifications:*
  - Female 5/8-24 (adopted)
  - Male 5/8-24 (adopted)
  - Connector-to-cable interface (preliminary)
- *Mainline and drop electrical and RF test methods:*
  - Ampacity (preliminary)
  - Attenuation (submitted for adoption)
  - Shield effectiveness (preliminary)
  - Structural return loss (submitted for adoption)
  - DC loop resistance (submitted for adoption)
  - Impedance (preliminary)
  - Dielectric withstand (preliminary)
  - DC contact resistance (proposed)
- *Mainline and drop mechanical and environmental test methods:*
  - Jacket impact (submitted for adoption)
  - Jacket longitudinal shrinkage (submitted for adoption)
  - Jacket cold bend (submitted for adoption)
  - Interface tightening torque (preliminary)
  - Interface ink submersion (submitted for adoption)
  - Center conductor/dielectric bond (submitted for adoption)
  - Axial cable/connector pull (preliminary)
  - Axial load temperature cycling (proposed)
- *Drop mechanical and environmental test methods:*
  - Cable/connector insertion force (preliminary)
  - Jacket/messenger web separation (preliminary)
  - Cable diameter over jacket (preliminary)
  - Moisture inhibitor corrosion resistance (submitted for adoption)
  - Aerial cable corrosion protection flow (submitted for adoption)
  - Hex crimp tool verification/calibration (submitted for adoption)
- *Mainline mechanical and environmental test method:*
  - Core depth verification (submitted for adoption)

Emergency broadcasting

In summarizing its activities, the Emergency Broadcast Subcommittee informed the board that it has had several meetings with the FCC at various locations throughout the U.S. The purpose of these meetings has been to interface with other industries to see where and how the cable industry will be a part of the new EBS plans. The subcommittee reports that it has consulted with Helena Mitchell, head of the FCC's EBS group, as to the workability of some of the new parameters that the FCC is investigating for the plan. It asserts that the subcommittee's main interest is to ensure that the cable industry is represented, and to offer its opinion as to how the industry can and will participate. One of its main objectives is to address the issue of possible undue expenditures and regulations that may create hardships on the industry as a whole.

Maintenance practices and procedures

The Maintenance Practices and Procedures Subcommittee continues to recruit and develop its membership. To date, it has formed six working groups: Headend, Preventative Maintenance, Outages, Damage Prevention, Utility Company Interface, and Customer Service (Technical) Standards.

Leaders have been appointed to the following groups:

- Headend — Mike Dowling (Hughes Microwave)
- Preventative Maintenance — John Ridley (Jerrold)
- Outages — Ron Hranac (Coaxial International)
- Utility Company Interface — Kenneth Knoche (Wilson Lee Co.)
- Damage Prevention — David Lisco

These leaders are formulating outlines of the tasks embedded within each of their groups, consulting with vendors, manufacturers and publications. They also have written a mission statement:

"To make available to the cable industry as a whole, recommendations of procedural activities to bring cable systems of all sizes into compliance and to exceed federally mandated technical specifications in a realistic, cost-effective and practical manner."

Construction and design

The Construction and Design Subcommittee reports that it has formulated four working groups. The Basic Construction group has obtained resource commitments from Times Fiber, Comm/Scope and Trilogy, and feels it is a positive step to have the cable manufacturers involved. Progress has been excellent in the Fiber Construction group. It has completed its outline and is into the composing stages for most sections. The final outline of the Upgrade group has also been completed, and the Design group reports it has finished a symbology update and is currently working on standardized specification sheets. Presently this group also is developing a standardized CAD layering scheme.

Each of the subcommittees will meet on Tuesday, Oct. 12, at the Atlantic Cable Show. Future meetings have tentatively been scheduled to be held prior to the Western Cable Show, the Texas Cable Show and Cable-Tec Expo '94.