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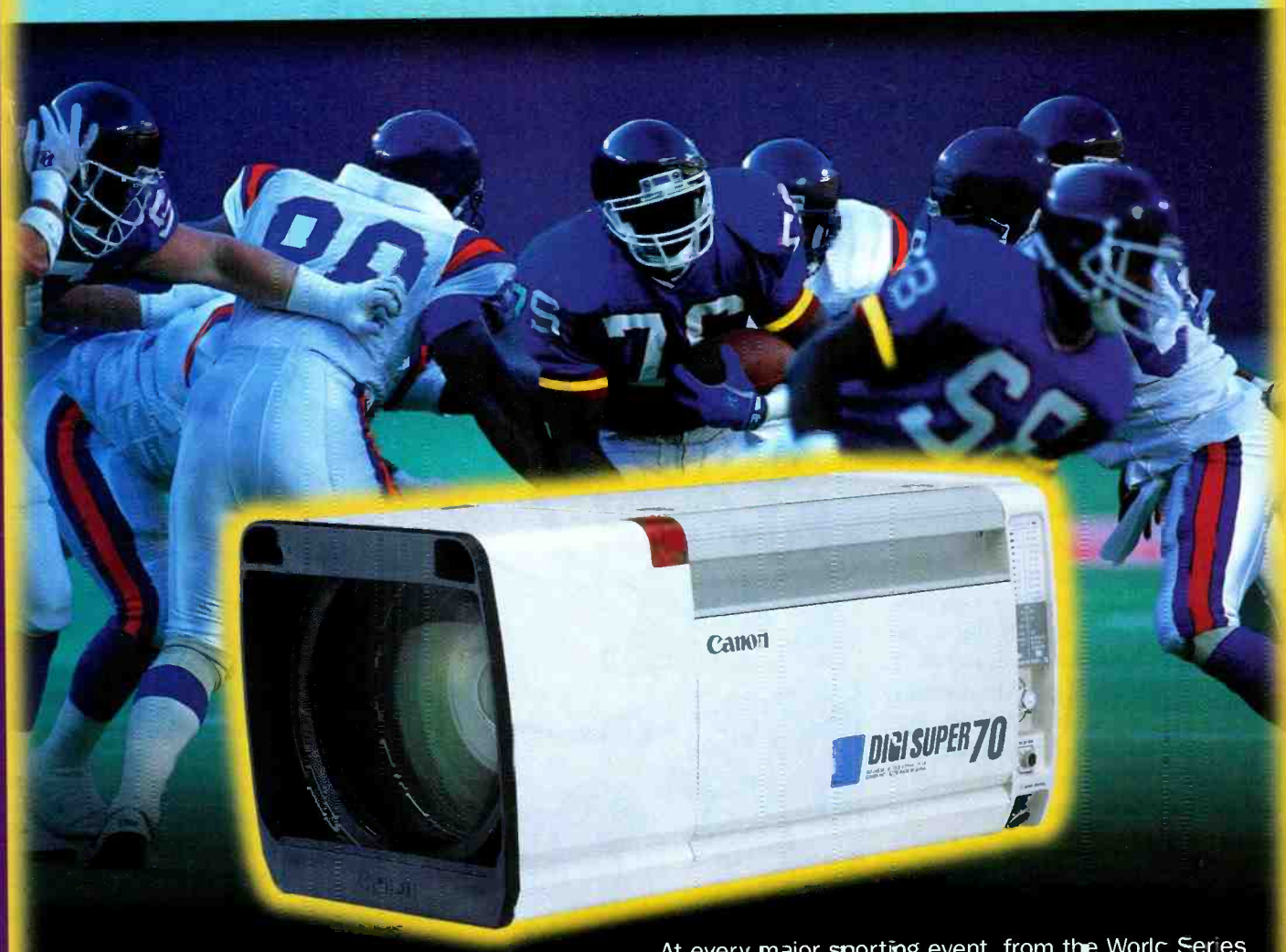

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The Granny Factor

A headline in the recent *Los Angeles Times* reads: "FCC's digital channel allotments may leave 2 million out of (LA) picture." The article discussed the millions of Los Angeles viewers that will be left without TV service in Reed Hundt's shell game.

The *Times* article noted that the commission's own estimates predict that KCBS-TV will lose 19% of its current audience when it moves to Channel 60 in 2006. Station KTLA-TV stands to lose almost a million viewers. And, the numbers continue to grow for other LA stations.

Keep in mind that we're talking about only one city. Multiply this tragedy by hundreds and you'll then begin to understand the impact a short analog-to-digital conversion time frame will have on American society. Consider the societal impact of entire sections of cities without TV service. How many disadvantaged populations will soon be without access to any local TV service for news, public affairs and lifesaving weather information?

Is access to American airwaves going to be limited to the rich? I ask, who among you is willing to turn off your grandmother's or parent's TV set? At what point will you tell your grandmother or parents that they can no longer watch their favorite TV programs because the digital nuts in Washington want to play money games with the analog spectrum? Are you going to be the one to tell granny she can't have her TV anymore?

I've called this the "Granny Factor" and Washington has severely underestimated its power in their equation to balance the budget on the backs of these people.

Last month, at my 1997 NAB presentation, I predicted that the scheduled time frame for dismantling the analog TV industry wouldn't hold up to real-world scrutiny. That viewpoint is increasingly being shared by others. Articles from the Dow Jones news service, the Associated Press and others are pointing out the holes in Mr. Hundt's 'trust me' plan to trash every analog television in America — primarily to balance his boss's budget.

We've been tilting at Reed's windmill for years. But now, the mainstream media and elected politicos are finally awaking from their Potomac naps and discovering the same thing. As viewers begin to wake up to the realities (read that as costs) of the FCC's fast-track schedule, the wisdom of cramming digital television down the throats of American consumers on a bent-for-hell pace will be questioned.

What looked good on paper in Washington smells like TP everywhere else. It's not just broadcasters that have to shell out big bucks to keep their televisions. There are real consumer costs to this conversion and bureaucrats and politicians are trying to pretend it's not true.

Wake up Washington. The battle for viewers' eyeballs (and pocketbooks) isn't over yet. Despite your claims to the contrary, analog doesn't cause acne. And (unfortunately) digital doesn't cure arrogance. Your actions prove it.

Brad Dick

Brad Dick, editor

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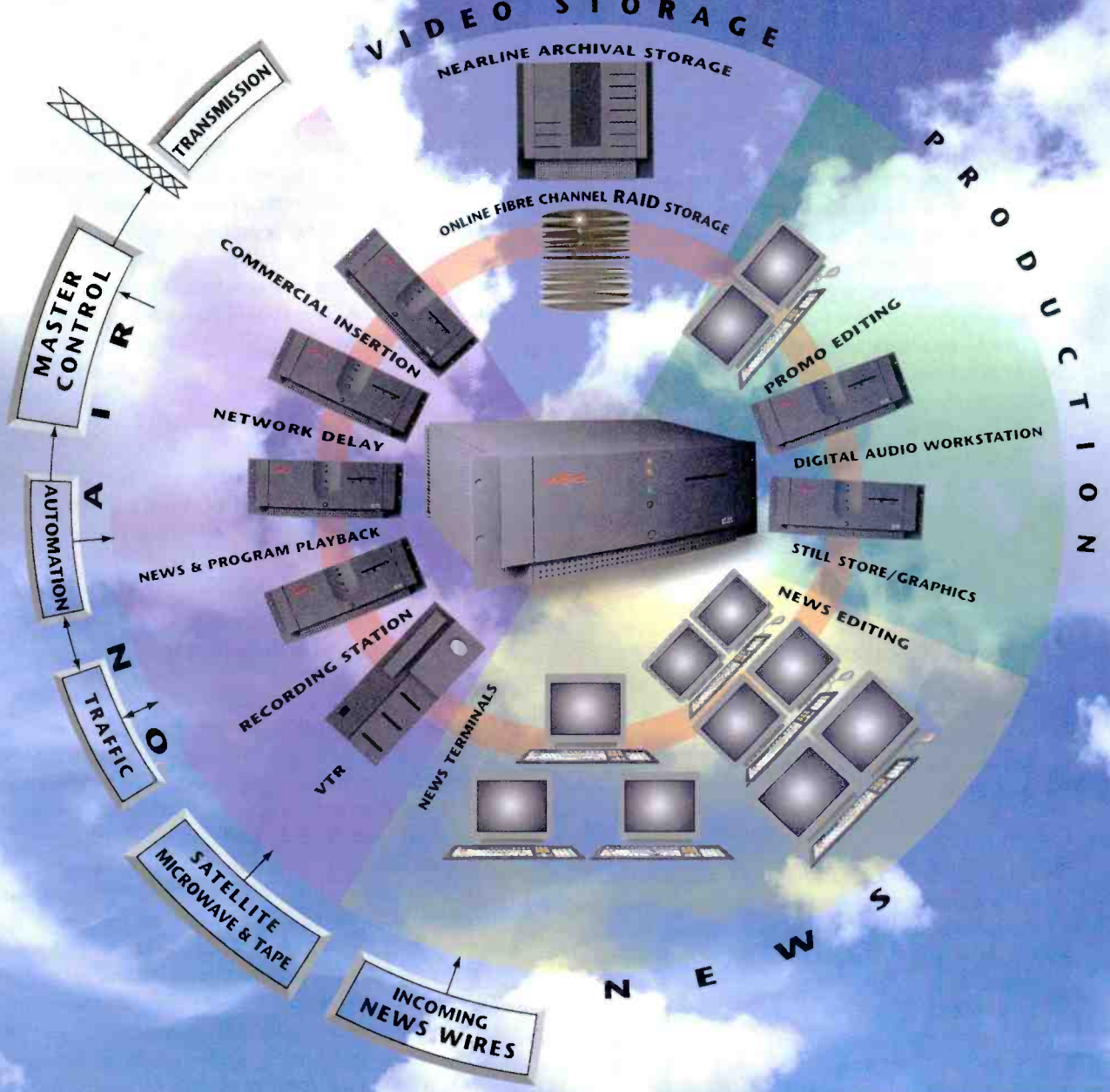

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letters to the editor

Unions want DTV

Today, it makes perfect sense for the IBEW to support DTV because its members will spend years installing, operating and overhauling new generations of transmitters and studio consoles even more complex than the hardware replaced. Digital audio and video chains will no doubt need regular service and upgrades, which means good jobs for many people.

And why worry about the TV industry turning off its NTSC transmitters? In the event of this unlikely scenario, some entrepreneur will offer the disenfranchised a DTV-to-NTSC converter for $29.95. I expect that "old" TV sets will continue to operate satisfactorily so long as there is anyone around still willing to look at them.

Don Mennie
Technical editor
Mendham, NJ

Don:

If you think there's gonna be a $29.95 DTV-to-NTSC converter in five or six years, you've been smelling too much correction fluid. As far as still being able to fix "old" televisions. . . have you tried to get your Beta VCR fixed lately?
Brad Dick

Nice editorial. I agree that DTV replacing NTSC will not wash down the American political throat as easily as the broadcasters hope. To my mind, messing with the American people's television is like messing with their currency. Sure fire way to get them in the streets with torches marching to the local affiliate.

Jerry Baber

Hey Jerry:

The last thing we want is to blame the local station. If we're going to hold anyone responsible for the problems being created, it's Washington. Let's keep the fire to the right feet — politicians.
Brad Dick

Sticker shock

I agree with the points that you made in your March '97 editorial ("DTV: A new saddle on an old horse"), however, all I ever hear about is the expense to the consumer to purchase a new television. I think that the real sticker shock for the consumer is going to come when they go out to purchase a recorder for the high-definition signals. Making a television with a different aspect ratio, scan rate, resolution, etc., is nothing compared to making a recorder with enough bandwidth to tape the digital signals. Hopefully, the consumer hasn't been too comfortable purchasing VHS VCRs for $129. This should bump the price of a video recorder back up to the $1,500 range.

Mark D. Bulla
Chief engineer
University of Maryland ITV

Great point Mark. I can hardly wait to spend $3,000 to replace my television and VCR just so I can *continue* to receive and record free over-the-air broadcasting. Did I say free?
Brad Dick

More on Frankenstein TV

I was gratified to see a sane voice regarding this PC/TV controversy. My sense is that this notion was embraced by a cadre of candy bar munching, Coca Cola drinking, loner computer types. Their idea of a good time is using their computers to watch The X-Files, *while sending E-mail, playing an "interactive" computer game and chatting with their fellow travellers at the same time.*

Personally, I cannot think of anything that would send me up the wall faster than to have to watch someone else "surf the net." I assume that most people watch television in a community environment. Imagine going to a movie theatre, for example, and having other people in the audience be able to stop the action of the movie to replay a part, or perhaps view an alternative scene. Who would sit still for that? I certainly wouldn't! And, I sure don't want anyone bringing text up on the television while I am watching.

My point is that "interactive" media is primarily a "lone" activity. I certainly hope this is not the wave of the future. I spend a fair amount of time on the computer, particularly the Internet, but I make a strong distinction between that activity and watching television.

Once again, thanks for taking a stand on this subject.

Alan S. Binus
Northeastern University
Boston, MA

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By Dawn Hightower, senior associate editor

Rushed deadline may raise the price of ATV rollout

Now that stations are rushing to meet the 18- to 24-month ATV rollout, they may have to make do with interim solutions to get on the air. Because of this, it may cost stations up to $3 million to make the conversion instead of the estimated $1 million. This push to accommodate the deadline could result in underdeveloped products rushed to the marketplace to meet an artificial deadline.

The stepped-up ATV schedule will force broadcasters to make decisions before all of the technological facts are in. Several aspects of ATV service implementation need more work and specification, including the ability to smoothly incorporate local ads into the MPEG-compressed network stream, and right now, there is no standardized approach for this. Other issues include closed-captioning and the V-Chip.

NBC and Microsoft launch MSNBC

As the latest joint venture between NBC and Microsoft, the web site MSNBC Business Video has been launched that offers live streaming audio and video and multimedia archives of unfiltered coverage of business news worldwide. MSNBC Business Video (www.businessvideo.msnbc.com) is part of the new company, MSNBC Desktop Video, formerly known as NBC Desktop Video.

MSNBC Business Video will offer key news events in several formats, including live, unfiltered audio and video coverage; on-demand multimedia reports; full-text transcriptions and an on-demand archive.

A cheer goes up for FCC's flagging auction bidding

TV broadcasters are cheering the fact that the latest federal auction of licensees to use the public airwaves has fallen flat. The current wireless auction brought bids totaling $13.6 million, which was a long shot from the $1.8 billion projected in this year's budget.

According to a letter from NAB president Eddie Fritts, which was sent to key lawmakers, the spectrum auctions have reached the point of diminishing returns. Broadcasters are pointing to the fact that because of low auction bidding, Congress should scrap plans to auction some of the broadcasters' existing rights to use the airwaves.

The FCC is in the process of giving broadcasters a free second channel to use during the transition to digital television, and by 2006, broadcasters will have to give back their existing analog licenses. Broadcasters oppose setting a definite date, however, for the analog auction or the give back because it's not clear if most of the consumers will have switched to DTV sets by 2006.

Sony, Panasonic and BTS agree on SDI transport layer

The Society of Motion Picture and Television Engineers (SMPTE), Sony, Panasonic and BTS have forged an agreement where manufacturers, system integrators and users of digital video facilities will have only one transport layer to contend with instead of two.

The companies have been pitching their own versions of the SMPTE Serial Digital Interface (SDI or SMPTE 259M), leading to the possibility of another layer of incompatibility in the digital infrastructure.

The agreement comes down to a decision on how to divide the digital bitstream with regard to where to put the header information, the packets containing the actual data and other components. The agreement will allow devices within a facility to talk the same language when it comes time to deliver a video file from one machine to another.

Right now, there is contention surrounding the transport's common name, but the European Broadcast Union wants to designate it as the Serial Data Transport (SDT). Panasonic is enthusiastically in favor of the new name.

Comark awarded damages in infringement lawsuit

Comark has been awarded $7.7 million after a federal jury found that Harris Broadcast Division willfully infringed on a Comark aural carrier corrector patent for 3½ years. Harris has included the infringing technology in its TV transmitters marketed under the Sigma and the Sigma Plus brand names.

Now, a federal judge will have to decide what additional damages will be awarded to Comark for the "knowing and intentional infringement of the company's intellectual property." ■

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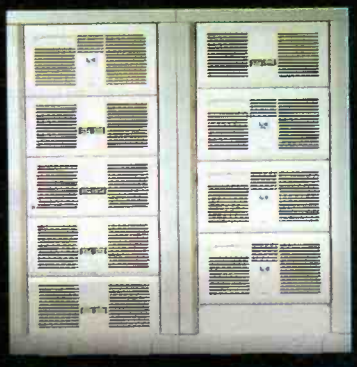

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By Harry C. Martin and Andy Kersting

FCC adopts rules for digital TV

The FCC has concluded its proceeding on DTV, which will permit the delivery of high-definition pictures, multiple digital-quality program streams, as well as CD-quality audio programming and advanced digital services. Affiliates of NBC, ABC, CBS and Fox in the top 10 markets will be required to begin airing a digital signal by May 1, 1999. Many broadcasters in these markets have committed to begin digital operations within 18 months. Affiliates of these networks in markets 11-30 must begin digital operations by Nov. 1, 1999. The top 10 markets cover 30% of all TV households and the top 30 markets cover 53% of TV households.

Harry Martin

If a licensee cannot meet the build-out requirement, but has taken reasonable steps to resolve the problem, the FCC will grant extensions. Broadcasters will be required to return their analog spectrum at the end of the DTV transition period. Existing NTSC service is scheduled to cease in 2006. Reviews will be conducted every two years, however, to evaluate DTV progress and make any necessary changes in its rules.

Broadcasters' public-interest obligations extend to DTV. The FCC will issue a notice seeking views on public-interest obligations in the digital world. The existing public-interest requirements will continue to apply to all licensees, and the FCC may also adopt new public-interest rules.

Table of allotments adopted

The FCC also adopted a DTV table of allotments, rules governing initial allotments, procedures for assigning frequencies, and plans for spectrum recovery. The table provides broadcasters with a new channel that will allow them to provide DTV service to areas that are comparable to their existing NTSC service areas. During the transition, more than 50% of all broadcasters will receive a DTV channel that provides 100% replication, and more than 93% of all broadcasters will receive a channel that provides at least 95% service-area replication.

The table plans for the eventual location of all DTV channels in a core spectrum of VHF and UHF channels that are technically most suited to DTV. The plan is based on the use of Channels 2-51. At the end of the transition, a core DTV spectrum of either Channels 2-46 or 7-51 will be specified.

The table minimizes unavoidable interference between analog and new DTV service. In this regard, 99% of NTSC stations should receive less than 10% new interference from DTV operations. The table is based on a minimum power level of 50kW and a maximum power level of 1MW. The 50kW minimum power level is designed so stations will have a sufficient service area to compete in providing DTV services and is consistent with the maximization concept supported by the industry. The 1MW level should be enough to provide a high degree of service replication for stations. It should also allow for a more equal distribution of opportunities to maximize service areas to full-service DTV stations of all sizes.

Although LPTV and TV translator stations continue to maintain secondary status, many administrative and technical measures have been adopted to minimize the impact of DTV implementation on low-power operations. The FCC also removed the conditions that applied to applications for modification of existing NTSC stations that were granted subsequent to July 25, 1996, the date of the NPRM addressing DTV allotments. The table also provides interference protection for more than 100 new stations for which applications have been filed, and provides 30 new DTV allotments for stations that have begun operation or received CPs since it issued its draft DTV table. ■

Harry Martin and Andy Kersting are attorneys with Fletcher, Heald & Hildreth, P.L.C., Rosslyn, VA.

TV auxiliary spectrum reallocated

A total of 70MHz of spectrum has been reallocated to the Mobile Satellite Service (MSS), including the 1,990-2,025MHz band, which is allocated to the Broadcast Auxiliary Service. To maintain auxiliary operations, 20MHz of spectrum has been added for use at the 2,110-2,130MHz band and reallocated to the 2,165-2,200MHz band, which is currently allocated to the fixed service.

The frequencies affected are those used by TV stations. The result is that many STLs, remote pickups and relays will be forced to relocate to the new spectrum. The costs of the relocations will be borne by MSS licensees. The timing and procedures for the transition haven't been established. ■

dateline

TV stations in Michigan and Ohio must file their renewal applications on or before June 2. Commercial TV stations in the following states must file their annual ownership reports on or before June 2: Arizona, Idaho, Maryland, Michigan, Nevada, New Mexico, Ohio, Utah, Virginia, West Virginia, Wyoming and Washington, DC. Tower owners in Colorado and Minnesota must register their towers between June 2 and June 30.

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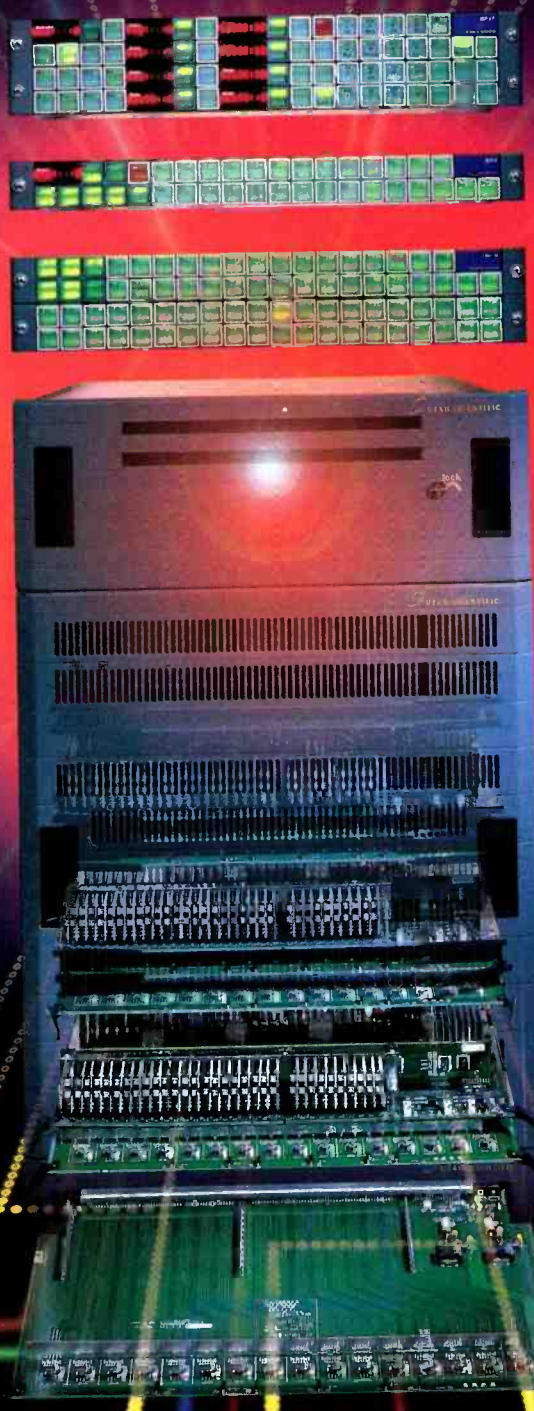

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By Jerry Whitaker

The problem with concatenation

If you're not quite sure what is meant by *concatenation*, don't feel left out. First of all, the word means different things to different people. Second, a check of the "IEEE Standard Dictionary of Electrical and Electronics Terms" (an ANSI standard, no less) defines concatenation only from the standpoint of optical fiber cables: "The connection of optical fiber elements end-to-end." Clearly, there is more to concatenation than that.


Jerry Whitaker

Broadcast Engineering's "Information Age Dictionary" is more helpful, defining concatenation as "to connect together as in a chain." Both of these dictionaries are comprehensive and well-respected in their various disciplines. The problem is that concatenation as it relates to chained video and/or audio compression schemes is a relatively new problem. It is, however, a problem we'll all be dealing with sooner or later.

One of the issues of concatenation that we face is a lack of knowledge about just what the problem is — or will be. As part of researching this article, I did an exhaustive search of the proceedings of the spring NAB Convention engineering conferences and the fall World Media Expo shows for the last few years, looking for background information. I didn't find any; not one paper addressed concatenation. This tells me: 1) either the problem doesn't really exist, or 2) nobody knows what do about it, so why bring it up? (Most likely it's the latter.) Undaunted, let's push ahead.

Compression

The next key technology issue that broadcasters will face in piecing together their digital future is the various compression schemes being used in differing, often interconnected, products. The issue is not whether these schemes work, but whether they are best-suited to the specific applications under consideration and then — if used — what effects result from chaining them in a signal path.

When trying to answer these questions, the solutions and answers will be based upon a number of factors, not the least of which are coder costs, bit rates, latency and the ability to switch and manipulate the input pictures and sounds. These factors are important because television isn't just a continuous flow of data. Rather, it is switched and manipulated regularly. The production sequence of a commercial, public service announcement or news program is a serial process. A single scene may go through four or five different stages before it's sent to the transmitter. At each stage, the sequence may be manipulated in some form or fashion.

This serial production process demands many steps where compression and decompression could take place. Compression and decompression within the same format isn't normally considered concatenation. Concatenation, rather, is where the values of the data are changed, forcing the compression technology to once again recompress the signal.

The compression of a video signal is not, generally speaking, the same as compressing a word-processing file. If you take an Excel spreadsheet, for example, compress it with PKZIP, then decompress it, then use another compression utility (let's say, WINZIP), then decompress it again, the end result will be identical to the original. Each step in the process returns the data file to its original collection of bits and bytes. For video signals, such lossless bit-rate reduction is practical only at the lowest compression ratios. Lossless compression is possible and is used for such applications as medical imaging. Such systems, however, are less than efficient in terms of bit usage.

For common video applications, concatenation results in artifacts and coding problems when several compression schemes are cascaded and/or when recompression is required. Multiple generations of coding and decoding are practical, but not particularly desirable. In general, the fewer generations, the safer you will be. It should be noted, however, that if the signal was taken back to analog for switching, distribution or other functions, these multiple generations would likely result in some measurable degradation. Each time an analog signal is digitized and thereby coded, something is thrown away. The portion that is discarded may not be noticeable or significant, however, given the right set of conditions, noticeable artifacts will usually surface.

When the same compression algorithm is used repeatedly (MPEG-2, for example) within a chain, multiple generations — if you will — should not present problems, so long as the pictures are not manipulated (which would force the signal to be recompressed, as noted previously). If, on the other hand, different

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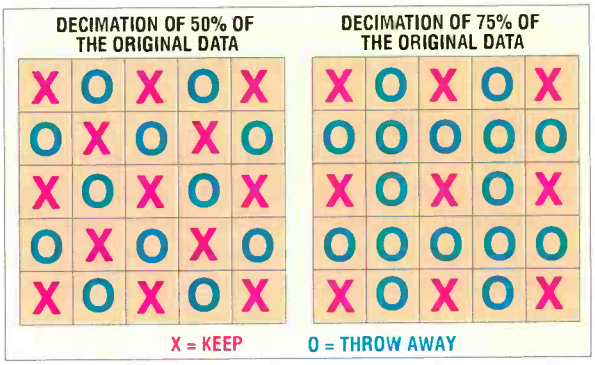
compression algorithms are cascaded, all bets are off. A detailed mathematical analysis will reveal that such concatenation can result in artifacts ranging from insignificant and unnoticeable to considerable and objectionable, depending on a number of variables, including the following:

- The types of compression systems used;
- The compression ratios of the individual systems;
- The order or sequence of the compression schemes;
- The number of successive coding/decoding steps; and
- The input signals themselves.

At another level, an argument can be made against using the same algorithm multiple times. If, for instance, a compression algorithm was to result in a particular artifact, using the same algorithm repeatedly could result in that artifact becoming more and more noticeable with each successive use. Conversely, if different algorithms were used, the artifacts could likely be more random, making their presence less noticeable in the final images.

Stepping back for a moment to the input signals, artifacts from concatenation are most likely when viewing scenes that are difficult to code in the first place, such as rapid movement of objects or noisy signals. Almost everyone is familiar with test tapes containing scenes that are intended specifically to point out the weaknesses of a given compression scheme or a particular implementation of that scheme (usually developed by a competitive vendor). To the extent that such scenes represent real-world conditions, such "compression-killer" images represent a real threat to picture quality when subjected to concatenation of systems.



As part of many compression processes, images are first decimated, depending on the compression scheme, various amounts of data are simply thrown away. During decompression, pixels that were thrown away are regenerated using interpolation. If, for any reason, an image is shifted by a single pixel, the next decimation could remove all that is left of the original data.

In the TV facility of the future, and even in the facility of today, it's conceivable that the signal will go through at least five codecs between network acquisition and delivery to the home. In reviewing compression technologies, therefore, it's important that the selected bit

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rate is compatible with the storage availability, transfer rates of the format and bandwidths on the network.

Compression artifacts

Eliminating redundant data for transmission and then regenerating most of it on reception is a lossy process. For mathematicians, the trick in writing the algorithms lies in making the best compromise between preserving the perceived original scene detail and reducing the amount of data actually transmitted. At the limits of these compromises lie artifacts, which vary depending upon the compression scheme employed. Quantifying the degradation is difficult because the errors are subjective. What is obvious to a trained observer may be unnoticed by a typical viewer or by a trained observer in less-than-ideal conditions. Furthermore, such degradation tends to be transient, whereas analog system degradations tend to be constant. As yet there is no single method of objectively measuring compression artifacts, although work is in progress to develop one, or at least a family, of measurement techniques.

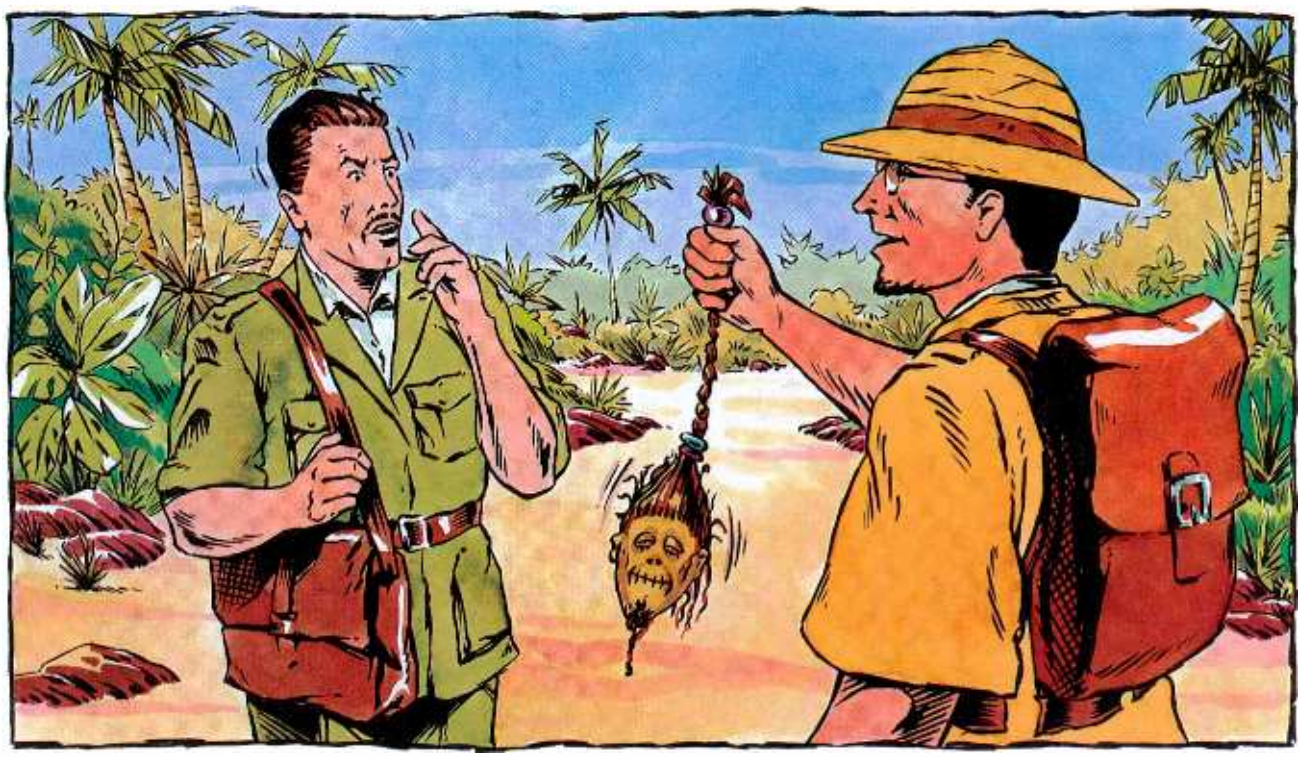
This discussion invariably brings up the topic of just what is "broadcast quality," and how important is it today? As computer-based digital images become more commonplace in the broadcast industry, vendors are increasingly touting their ability to use compression technologies to achieve a quality level comparable to Betacam SP, a reasonable benchmark for broadcasting.

To maintain image quality in computer-based imaging systems, bottlenecks must be eliminated throughout the signal path. In any system, the signal path is only as good as its weakest element or its worst compression system. It is a logical assumption that the lower the compression ratio, the better the image quality. In fact, however, there is a point of diminishing return, with the increased data simply eating up bandwidth with no apparent quality improvement. These trade-offs must be made carefully because once picture elements are lost, they cannot be recovered.

Furthermore, what looks good for one program may yield results that are nothing short of embarrassing for another. Take, for example, a compression chain that works fine for typical news and entertainment programs, which probably account for 90% of the broadcast schedule. What happens, however, on Monday Night Football? Does the system still perform or does it simply fall apart, with wide-shot pans looking like a multicolored quilt?

Viewers have come to expect a certain level of quality from television. They don't like to be disappointed. ■

Jerry Whitaker is a consulting editor for Broadcast Engineering *magazine.*



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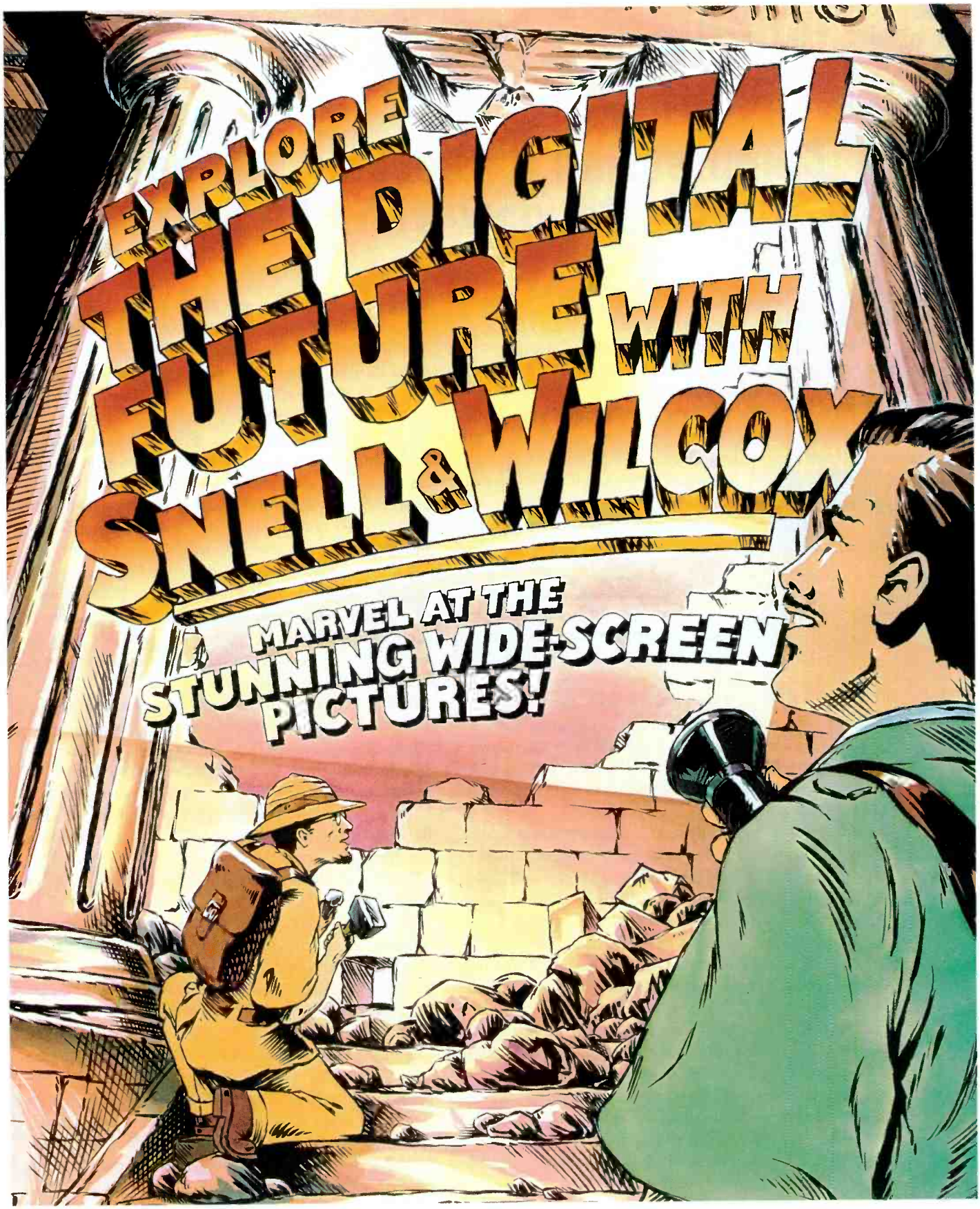

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By Brad Gilmer

Compression for desktop computers: An interview with Phil Katz

Long before there was MPEG, JPEG and AC-3, computer programmers were trying to figure out how to put more data on a disk. Phil Katz, one of the foremost authorities on the subject and a true pioneer in the field, invented the program PKZip. It, and other data compression utilities from PKWare, have allowed millions of desktop computer users to fit more data into less space.


Brad Gilmer

I caught up with Phil at a trade show in Washington, DC, and asked him about the history of desktop compression, and about his vision of the future.

BG: You have been in the compression software business for quite some time. Can you give us a brief history of compression as it relates to desktop computers?

PK: PKWare was incorporated 10 years ago, so we are celebrating our tenth anniversary this year. Compression has actually been around for a long time. In fact, some of the algorithms that are part of the compression used in PKZip were invented in the 1940s and 1950s.

The technology really has come a long way. Computers have become more powerful and sophisticated — more memory, faster processors and larger disk drives. This has allowed the algorithms to become more powerful and more sophisticated too. There are more things you can do in terms of the compression.

BG: What was the initial drive behind PKWare? Why were people originally interested in your product, PKZip?

PK: People were interested in compression then for the same reasons they are interested in it today; the need to store more information on a hard disk or a diskette, the need to reduce the transfer time when downloading or uploading a file, the same things that people use PKZip for today. Even as modems and networks get faster and hard disks get bigger, the data tends to get bigger with it.

BG: What kind of changes have occurred in the field of data compression? In the early days, there was Run Length Limited (RLL) and other technologies. What is new?

PK: Nearly all compression algorithms rely on there being some kind of pattern in the data. In the English language for example, certain letters, certain words, certain phrases appear more often than others. So, those can be encoded in less space. Least-occurring words or phrases can be encoded in more space. The result is data compression.

You mentioned RLL. This is a technique that simply says, rather than encode 10 spaces or some other repetitive string of characters, let's put in a special character followed by the number 10. This means that there are 10 spaces following. Rather than encoding the original 10 characters, you can do it in two or three.

Another method of data compression, Huffman coding, has been around since World War II. It assumes that certain letters in the English language appear more often than others. R, S, T, L and E — all the letters you see on the Wheel of Fortune, appear more often than other letters.

Currently, the algorithms that are used in PKZip assume that entire words, phrases, sentences or patterns of data in binary files, spread sheets and databases repeat. If there is a pattern of bytes that starts occurring frequently, the program checks to see if that pattern has occurred before. Then, rather than storing the next 100 bytes, it says go back 1,000 bytes and copy the data that occurs there.

BG: The whole basis is repetition. Is that what enables compression?

PK: If you have a file that is completely totally random, or any datastream that is totally random, no compression can be achieved whatsoever. There has to be some kind of repetition or pattern, something that occurs more often than others to be able to compress the data.

In video compression, for example, you will have areas of the video frame that are the same color. Or between frames, there is little difference in the pixels, so if you just record the difference between each frame, rather than the entire frame, you can achieve compression. There is always the assumption that there is some pattern within the datastream.

BG: You mentioned video compression — this has been a big topic in the broadcast industry over the last few years. Efficient video compression algorithms enabled computers to handle high-quality video, where they never really could before. Do you see PKWare

Continued on page 27

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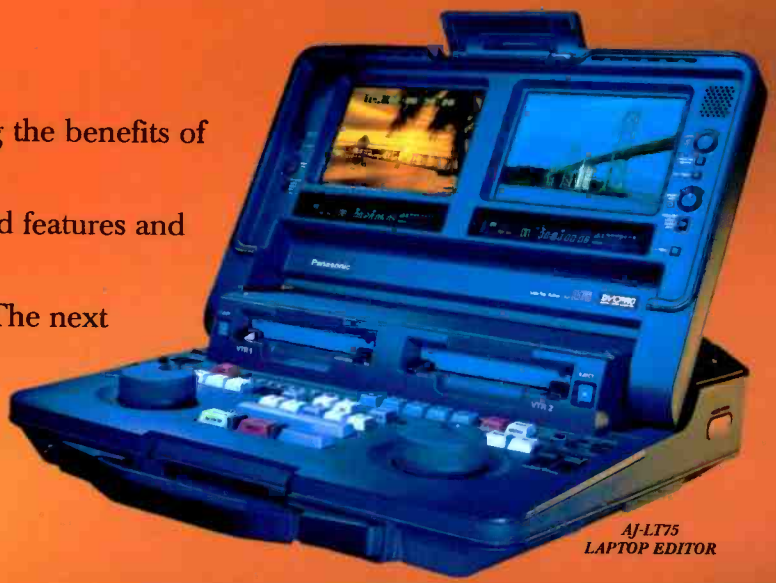

AJ-LT75
LAPTOP EDITOR

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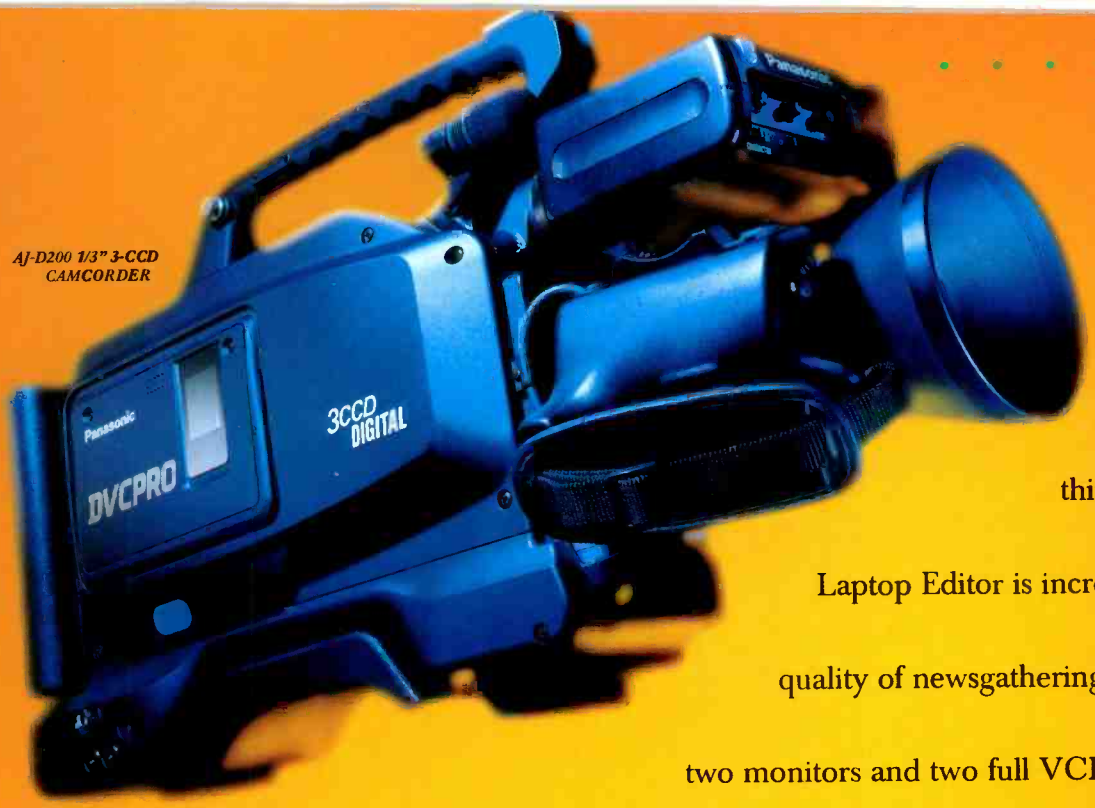

AJ-D200 1/3" 3-CCD CAMCORDER

DVCPRO is traditional quality but not traditional thinking. The DVCPRO Laptop Editor is increasing the speed and quality of newsgathering today. It provides two monitors and two full VCRs in a briefcase for

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For standard 4X transfer within the facility or system, there's also the new AJ-D780 4X transfer recorder/player.

AJ D780 4X TRANSFER RECORDER/PLAYER

Next is the economical DVCPRO 200 Series, designed for a broader range of professional users, from multimedia producers to educators and event videographers. The 200 Series features the compact AJ-D230 desktop VTR and the AJ-D200 1/3" 3-CCD camcorder that are "multimedia-ready" with digital interfaces.

The migration to DVCPRO has reached critical mass. Bold new products are introduced

next?

regularly by Panasonic and other leading companies who are DVCPRO Partners. For example, DVedit™ is an affordable, all-digital DVCPRO-based nonlinear editing kit. It features the DVCPRO version of Truevision's TARGA 2000 RTX video engine, powerful POSTBOX editing software, jog island edit controller and RS-422 VTR control... all working on a Windows NT platform.

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AJ-D800 2/3" CCD CAMCORDER

While a principal goal of DVCPRO is its affordability for broad-based applications, it is equally designed to meet the needs of customers requiring higher video quality and improved chroma resolution for high-end post-production. The new AJ-D800 adds a 2/3" CCD camcorder for EFP to the DVCPRO family.

For 1997, there's Panasonic's new DVCPRO 50™ with 4:2:2 signal processing. This compatible extension of DVCPRO uses a data rate of 50Mb/s to produce virtually transparent 3:3:1 compressed DV-based intra-frame video and four 16-bit, 48 kHz sampled channels of uncompressed audio.

AJ-D950 4:2:2 VTR

The 1997 products in the Panasonic DVCPRO 50 line are the AJ-D950 VTR (switchable between the original 25 Mb/s 4:1:1 signal and the 50 Mb/s 4:2:2 signal), and the AJ-D900 2/3" Camcorder, which records 4:2:2 and is 16:9/4:3 switchable.

With products like these and many more to come, there is only one limitation on the next DVCPRO innovation. *Your imagination.*

DVCPRO 50

AJ-D900 2/3" 4:2:2 CAMCORDER

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Continued from page 18

developing products in the future to compress video and audio?

PK: There are two classes of compression. One is the area where PKWare has focused, and that is called lossless compression. If you compress something with PKZip or other desktop compression products, and you extract it, the extracted file or datastream is exactly like the original — there is no loss. If someone compresses their database, and extracts it, and a few bits are changed, that would not be a good thing.

> Nearly all compression algorithms rely on there being some kind of pattern in the data

On the other hand, for video and audio compression, most of the algorithms, such as JPEG and MPEG are lossy algorithms. In these compression systems, if a few pixels or a little bit of the sound has a few bits that are in error, as long as it is not perceivable to the human eye or human ear, it really does not matter. By allowing some error into the data, you are able to achieve better compression. Using this technique, you would say that there is a pattern in the data that is not identical to what you have seen before, but it is similar. You can say that they are identical. If a few bits are off in this environment, it will not be perceivable to the human eye, depending on where the error occurs.

I think in the future, we will expand into lossy compression. I cannot say exactly what area, whether we are talking software drivers or working with hardware companies, but that is a big area of data compression, as you know. Our primary focus right now, and I think for some time, will be lossless compression, and continuing to improve that type of technology.

We are working with Intel for example. We are also working with board manufacturers to integrate compression into hard disk drives, LAN, WAN, Internet connection hardware — all of these, using lossless compression.

Whatever direction Phil Katz and PKWare decide to take, it is sure that broadcasters will have a lot of uses for desktop computer compression programs for many years to come. ■

Brad Gilmer is director of advanced network operations & technology for Turner Entertainment Networks.

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By Michael Erbschloe

Developing your staff

I like management strategies that provide multiple benefits. I get pleasure from practicing a management style that facilitates staff development, makes work more interesting, and helps builds an environment where people can work and grow in harmony — all while I'm getting my work done. OK, this may sound a bit touchy-feely, but it can be accomplished.


Michael Erbschloe

The first step is to recast how you view yourself as a manager. Yes, you control, coordinate, direct, evaluate, analyze and report. But that's only half of what you do and it should only be half of how you view yourself. The other half of you is mentor, coach and teacher. You can blend both of these halves into the well-integrated manager who gets better performance and more productivity out of your staff, while at the same time enjoying your job more.

Your role as mentor

Once you have accepted yourself as mentor, coach and teacher, it's time to take the second step. You need to know your staff and understand their skill levels, ambitions, inhibitions and self-imposed obstacles, how they work with others, how they view themselves and how they view you. Taking notes on each staff member and keeping a file is a good place to start.

This may sound like a lot to internalize, but there is an easy way to go about it, which is part of your next step. As you're performing your control, coordinating, directing, evaluating, analyzing and reporting functions, you're also interacting with your staff. During this interaction, pause and think about how you're involving them and what you can teach them.

When you think of your role as teacher, you start to integrate your two halves and move toward the goal of developing your staff. As your two halves meet, accomplishing your daily functions will yield multiple results. You will get your job done while simultaneously developing the skills and abilities of your staff.

Translating this goal into daily practice is easier if you focus on how you delegate work and assign duties and responsibilities. This is your third step. During the course of a week or a month you are constantly forming teams, assigning projects or directing staff to accomplish specific tasks. It's during this process that you get to exercise your development role by assigning work to your staff that will help them learn and develop their skills.

This is not difficult. As you are assigning jobs, just stop and think about the big picture and how all your staff fits into that picture. Most of the time, you will see an opportunity to develop one or more of your staff.

Sound good? Give it a try, but there are a few things that will stand in your way.

Obstacles

One obstacle is old habits. Many managers assign work based on the existing skills and abilities of their staff with one goal in mind — get the job done as soon as possible. There are situations where this may be necessary, however, it should be avoided when possible.

A second obstacle is the staff member that you want to develop. Sometimes, your staff may resist doing new things because they fear something will go wrong and they will look bad. This can happen, but this is where you get to use your coaching and mentoring skills. You need to let your staff know that you understand that they are taking on something new and that you are there to help them. You can also assign another senior staff person to act as a resource for them.

A third obstacle is resistance on the part of some of your staff to let new people into their area of responsibility. This may be the toughest of obstacles. Some of your staff may never change. However, you shouldn't react negatively in these situations. It's your chance to be a role model.

Take a stand with the resisters. Let everyone on your staff know your philosophy and that one of your primary goals is to develop your staff. Let everyone know that whenever possible you will take steps to develop your staff and that you expect your senior staff to do the same. This makes you look good. You may also want to note resistance on the performance evaluations of the culprits.

Stay steadfast. You may be surprised at what happens. Your staff wants to learn. They will be willing to take on new tasks and expand their contribution, all because they feel that you're a good mentor, coach and teacher and that you will help them learn and grow. ■

Michael Erbschloe is a management consultant, author and technical editor and teaches management courses at Oklahoma State University.

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By Jim Starzynski

Understanding ISDN

The Integrated Services Digital Network (ISDN) is a telephone service capable of sending voice, video, audio, data and control signals on a single digital dial-up subscriber loop — a circuit from the telephone company's central office to the customer. ISDN is a worldwide standard used in more than 100 countries to date with more than eight million channels in use. About 75% of the U.S. population can now access ISDN, which is expected to be a greater than $600 million dollar business in 1997.

ISDN is centered on an intelligent central office switch — a large mainframe computer with many input/output ports routing signals to and from phone system customers. Of course, so is the standard analog or POTS (Plain Old Telephone Service) system. Today, nearly all voice switching in the United States is digital within the telephone network. ISDN simply carries the digital part of the network all the way to the customer in a standardized fashion.

Demystifying the acronym

"Integrated" service obsoletes the use of separate coax for video, balanced pairs for audio and twisted pairs for voice and data. These signals are all available on a single circuit over the same network and through the same cable facility. ISDN also allows on-demand networking with automatic bandwidth-adjustment capability and on-the-fly connectivity.

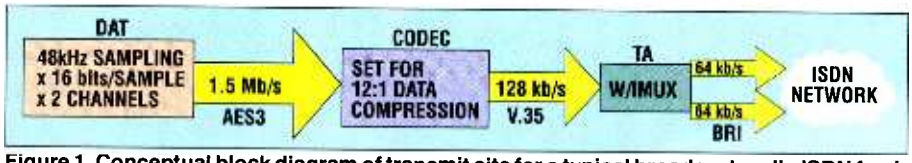

Figure 1. Conceptual block diagram of transmit site for a typical broadcast audio ISDN feed, showing data rates and interconnection standards. Equivalent equipment at receive site(s) reverses the process back to full data-rate digital or high-fidelity analog audio. Only one direction of audio flow is shown (bidirectional operation is possible at the same data rates). Codec and TA are often integrated into a single device.

ISDN is a digital network that doesn't stop at the local station, announcer's home studio or even national boundaries. You can think of it as a continuously reconfigurable wide area network (WAN), offering connectivity from down the block to across the world.

Ordering the service

The most popular ISDN service is the basic rate interface (BRI). It consists of two *bearer* (or "B") channels operating at 64kb/s each, plus a single *delta* (or "D") channel — used for call direction and other telco overhead — at 16kb/s. (Unlike POTS, in which dial pulses or DTMF tones travel on the same circuit as the program audio, ISDN's use of a separate D channel for call direction — called *out-of-band signaling* — allows the on-demand bandwidth and connection/routing flexibilities alluded to earlier.)

ISDN BRI is brought into the facility on a standard copper pair. It connects to the customer's terminal adapter (TA), a device that interfaces the customer's data to the digital network, and serves as the "telephone instrument" of ISDN. The TA takes the single twisted pair and establishes the three separate circuits described above. It also selects and manages the particular network services you require for a call. Multiple B channels or BRIs can be ordered and combined for wider bandwidths, using a technique called inverse multiplexing (IMUX), also typically implemented in the TA.

All ISDN circuits and hardware operate bidirectionally, meaning that the connectivity established to transmit from an ISDN-equipped site is also available for receiving there. In broadcast applications this means that high-fidelity return or foldback is included with the program circuit at no extra expense. Speaking of dollars, ISDN costs vary among local telephone companies, but most price the service fairly close to their POTS schedules. You will pay a one-time installation fee (ranging from $50 to $500), plus a monthly service charge ($30 to $100 a month per BRI). Most phone companies offer different business and residential rate plans, and all rates continue to drop as ISDN deployment progresses.

Some phone companies also charge a per-minute fee for local connect time, while others offer flat fees (like POTS) or include a certain number of free minutes (like cellular rate plans). Again like POTS, long-distance ISDN connections are always billed on a per-minute (or per-tenth-minute) basis, with rates about the same as or slightly higher than POTS. Note that all timed charges are levied *per B-channel*, so IMUX calls are billed at a multiple of the call time.

Be aware that ISDN connectivity is not always "plug-

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and-play." A variety of TA settings and network configurations must be set compatibly, and this can be a frustrating exercise when establishing service. Confusion in this area is abating, however, as phone companies and hardware manufacturers are cooperating to produce more friendly interconnection.

Typical applications

ISDN is often used for real-time transport of broadcast-quality audio today. In such cases, the TA sets up the required amount of bandwidth based on type of audio transmission (i.e., whether stereo or mono, the desired frequency response and S/N). The TA also dials or receives the call(s) (a separate call is activated for each B channel), then sets up the IMUX (if required), maintains the calls and hangs up after transmission is completed.

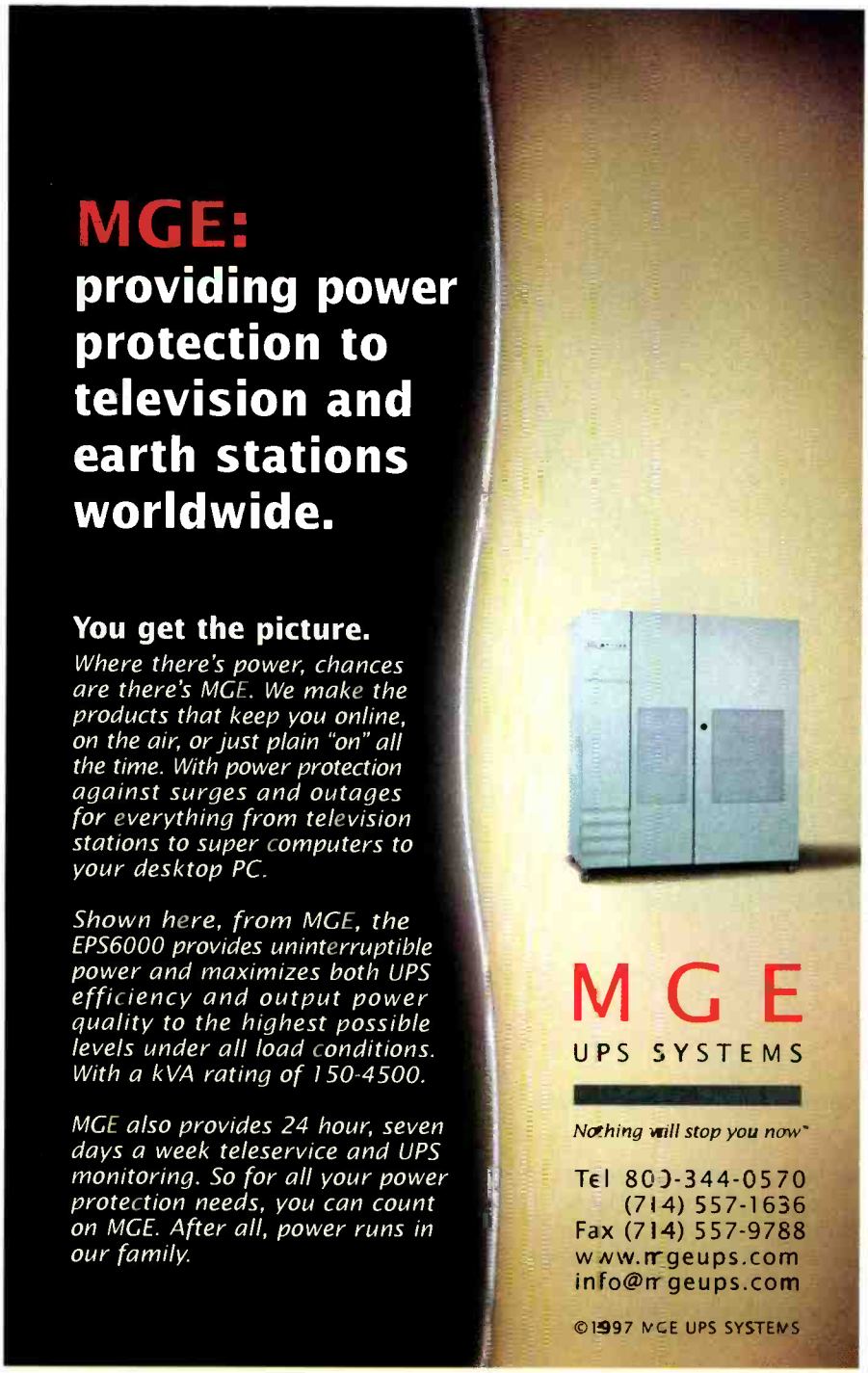
Note, however, that even ISDN's wide bandwidth is inadequate to carry broadcast-quality audio in any economic fashion without some data compression. This function is provided by a coder/decoder or *codec*. Its primary job is implementing the coding algorithms that reduce bit-rich digital audio signals from any PCM source (e.g. 1.5Mb/s for CD-quality stereo) or from a standard analog audio source, to a data rate suitable for ISDN (e.g., 128kb/s via two 64kb/s B channels). A codec on the receive end reverses the process. (See Figure 1.) These devices use so-called *perceptual coding* to provide this data compression without significant audible penalty. But it's critical that the transmitting and receiving codecs share a compatible algorithm (several different systems are in use today).

Today's ISDN audio equipment often combines codec and TA, and may include optional IMUX capabilities or audio mixing/monitoring for single-box remote solutions.

ISDN applications reach farther than just this audio example. Internet connectivity or video file transfer is at least 4x faster than with today's typical POTS modems. Future data-compression schemes may allow real-time, broadcast-quality video, exceeding today's limitations of teleconference quality. With all this capability, the telephone system we're used to will definitely have a different ring to it. ■

Jim Starzynski is a project engineer at NBC headquarters in New York.

Acknowledgment: The author wishes to thank Digifon and Bell Atlantic for their contributions to this article.



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Circle (201) on Free Info Card. See also "Audio Compression Equipment," p.10 and "Telco Interface Equipment," p.44 of the 1997 *BE Buyers Guide*.

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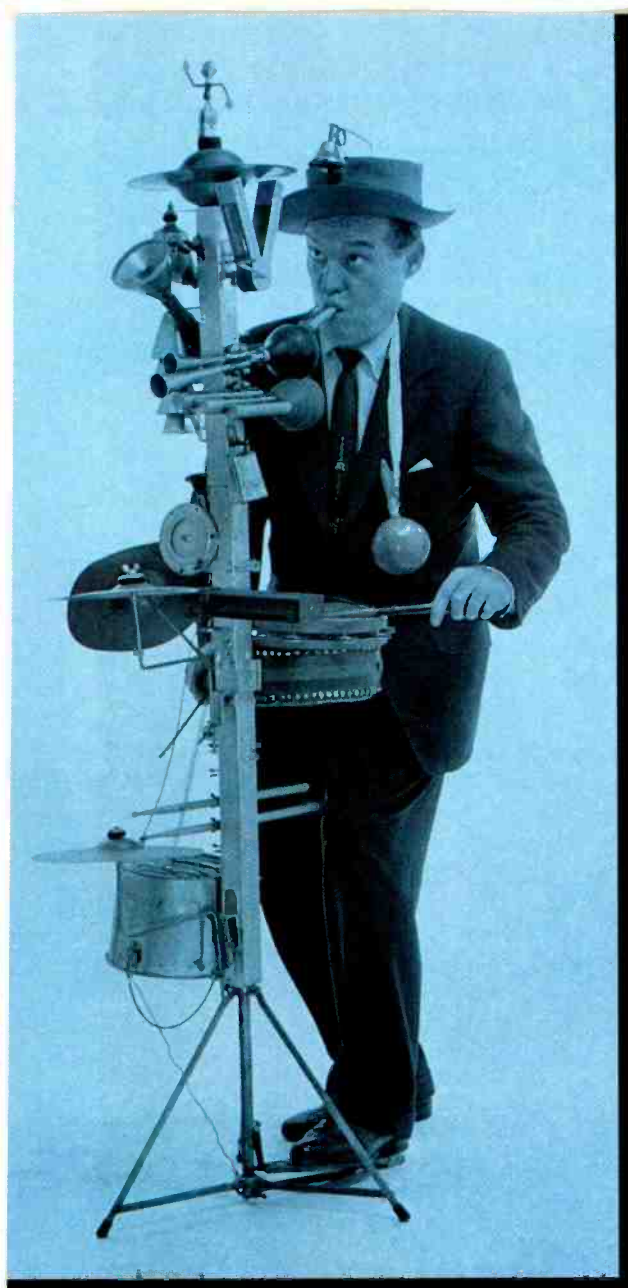

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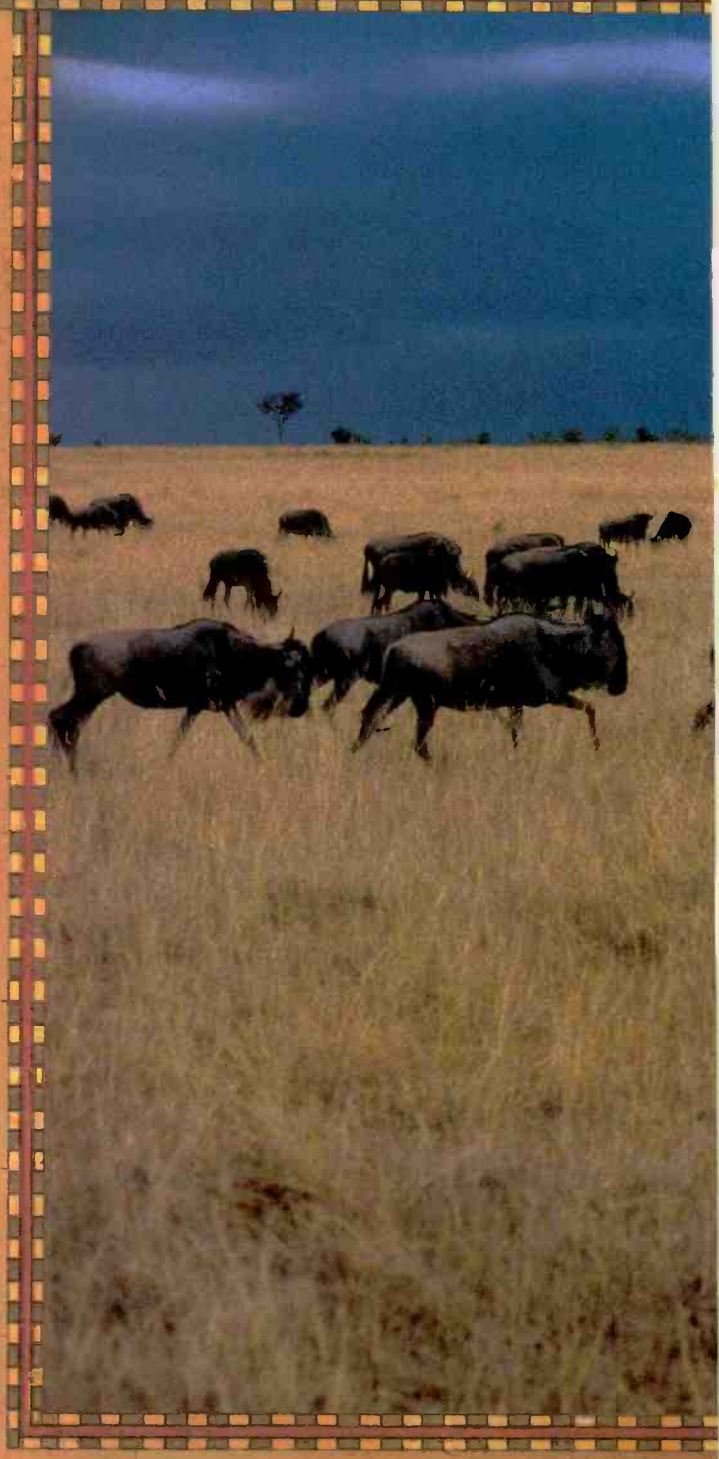

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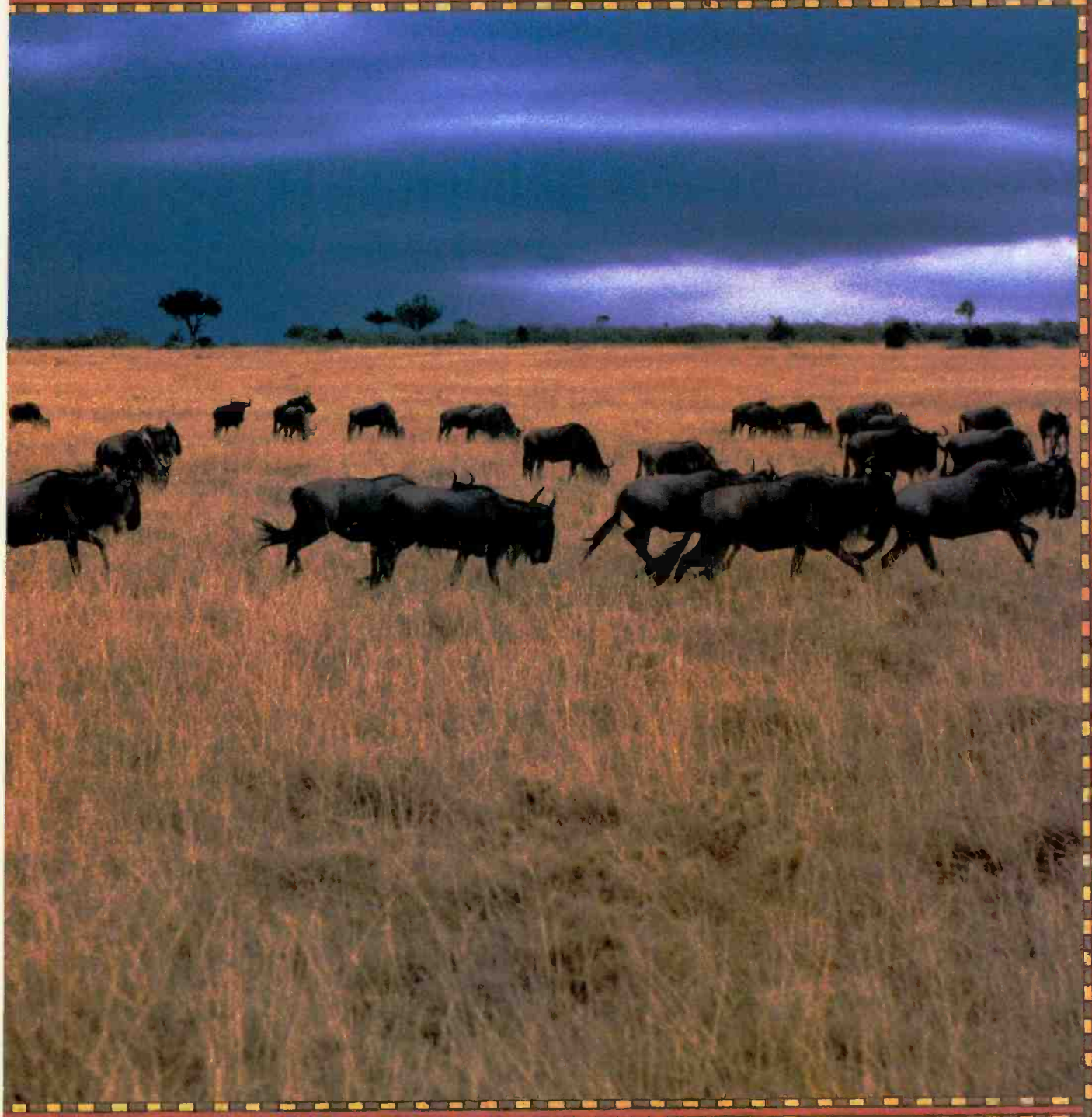

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By Steven Blumenfeld and Mark Dillon

Beware of Internet TV

The focus of this month's column is on a new class of device. It has been claimed that this device will take over your television and reduce the time you have for watching broadcast. Another claim is that there will be more than five million of these devices by 1998. This has already happened with video game boxes, and now broadcasters have to be aware of this new device — it is the Internet television.

Mark Dillon and Steven M. Blumenfeld

Information please

These pseudocomputers are being marketed as appliances that connect directly to your television and give you access to a wealth of information. They come with everything you need to get on-line, including wireless keyboard, wireless remote control, all the cables you need and easy-to-follow instructions.

A message on the information card states, "You are now just one click away from a medley of on-line information, entertainment and communications. In fact, we have made it easy for you to start on your Internet journey. Now you can have Internet access wherever you have a television and a standard phone line. No special computer skills are needed to get you up and running and enjoying your access to the world's greatest information source, The Internet."

Anything that is available on the Internet is available to these new devices — but wait, is that true? Of the various boxes that I have seen, they all deal with the Internet in a slightly different way. Some have open access to all Internet content, while others limit the kind and type of information the box can acquire. As it stands today, the only commercial readily available Internet TV set-top box is the WebTV brand, which is in the process of being purchased by Microsoft; but watch, there will be a lot more.

Can these new boxes display all that the Internet has to offer? The answer is no. Units are limited in many ways. First, there is a need to control downloads and plug-ins. We do not want the user to have his or her television crash, then not know how to get out of it, so it is important for the system to control what can and cannot run on the Internet set-top boxes.

Next, is viewing static graphics on a television acceptable entertainment or is it just not desirable? We could go on about the pros and cons of Internet television, but the truth of the matter is that Internet appliances are here to stay, and as broadcasters, we actually have a major leg up on the competition. WE KNOW TV. We have been designing and perfecting television for five decades. We know what can and cannot be done on the display device. Let's not get hung up on the transmission; yes it is different, but users will see this stuff on their televisions and we know that.

Broadcasters know about title safe, lower thirds, NTSC color spectrum, saturation, 7.5 IRE, ghosting, anti-aliasing, text readability and all the other things we have had to deal with using the television as our display device. Now let's put it to good use. Broadcasters should have Internet television's premier sites.

How do you go about it? First, you need to make sure your web artists are working with a computer monitor and a TV display (just like in your graphics rooms). Make informed decisions about what works and what does not. Just like broadcast, single-pixel vertical lines flicker, small text is hard to read and extremely busy graphics can be confusing. Make graphics/hot spots large enough to be able to navigate to them with a remote control from across the room. Make sure they adhere to all the color and saturation rules that they already know. In other words, start treating your Internet site just like you would your production graphics for the 6:00 news.

Experience counts

While we are talking about the news, another advantage you have over other web sites is the trend toward local information on the web. As these devices begin to infiltrate into the mass market, there will be a need for more local information. Already companies are spending a lot of time and money developing local services.

Broadcasters already know about local information — we have been doing it for years; who better to claim the right to local Internet information over the television. The time to start putting this in motion is now. The competitors are lining up: Microsoft, the newspapers and a whole slew of city guides. Let's not allow these newcomers to take over our domain — the living-room television. ■

Steven Blumenfeld is general manager for GTE Internet Television, and Mark Dillon is vice president, on-line services with GTE, Carlsbad, CA.

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By Louis Libin

Microsoft and Co. continue their assault

Many in the computer industry want badly to be the only ones to define the entertainment media of the future. If the computer industry has its way, television as we know it will only be a small part of the whole entertainment picture.

Was it just a coincidence that in the middle of the NAB convention in Las Vegas, Microsoft, Intel and Compaq brazenly announced their long-touted specifications to make future digital TV broadcasts more compatible with personal computers? The recent Microsoft purchase of WebTV Networks, Inc. for $425 million could play an integral part in the computer industry's attempt to break into the TV business. The WebTV acquisition is clearly designed to place Windows technology into every TV set. Such a move would surely capture all future revenues from programming guides, targeting advertising and specialty programming subscriptions. Broadcasters would be left "in the dark" with few options.


Louis Libin

Interlace vs. progressive

The computer industry wants broadcasters to switch from the interlace format to the progressive scan format currently used in PC monitors. The computer industry argues that new revenue streams are possible for broadcasters who adopt the new computer industry standard because those broadcasters will provide programming to devices with the processing power and storage capabilities of PCs.

With the acceptance of digital television, there will be a paradigm shift in the way television is viewed. However, consumers will have to be "won over" in order for the technology to be widely accepted. The TV industry wants to minimize the transitional impact by lessening the changes from the analog viewing experience.

Now that the FCC has assigned TV stations a second channel, the next step is DTV implementation. To a great degree, the future of broadcast television will be in the hands of the TV manufacturers. The broadcast TV industry would like to be in charge of the conversion process, instead of handing off control to the manufacturers of personal computers.

The controversy

Late in 1996, representatives of the broadcasting, consumer electronics and computer industries reached an agreement on technical standards for advanced television. As with any new technology, the DTV system needs to be fully implemented before all of its characteristics can be fully documented and the set of rules finalized. An agreement was sought because the computer industry and the FCC were positioned to delay the standard-setting rulemaking. Delays in embracing the DTV standard would have negatively impacted the industry in three ways. First, there would be confusion in the marketplace. Second, the reassignment of spectrum for other uses would be delayed. And third, the major investments leading to DTV would have been severely damaged.

The FCC adopted the ATSC standard, except for the video formats. This means that full flexibility is available to broadcasters on video formats, all the way from high-definition pictures to multichannel broadcast.

It's all about data

Broadcasters will now be able to transmit data services by devoting portions of the 6MHz channel to other uses. The computer industry believes that mixing TV signals with traditional computer information does not work well. The computer industry's position is that moving to high-resolution progressive scan formats of 720, and ultimately 1,080 lines, of resolution is the best way to implement DTV. The compromise agreement signed last December called for adoption of the Grand Alliance HDTV standard, without specification of any of the picture standards that divided broadcasters and computer manufacturers.

The format selection

The coverage of different events and different TV programs have different performance requirements. Combining their requirements with the fact that the transmission will be digital means there will be space available for other data and provides the great appeal of multiple formats. The choice of multiple formats allows trade-offs specific to each family of program material. All the while, interoperability can be facilitated among the formats and different video services

Continued on page 136

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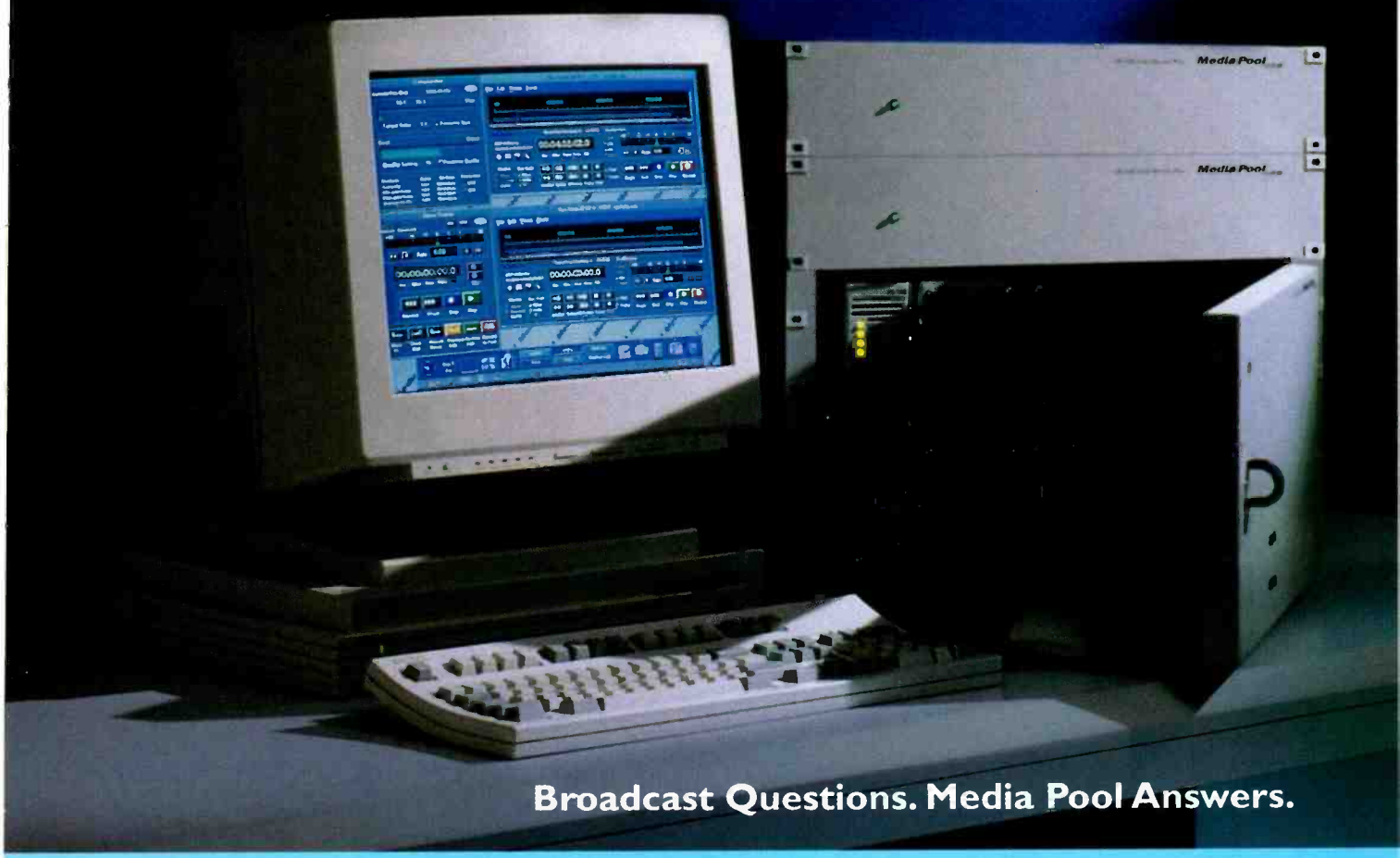

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Standard has been agreed

existing equipment is incompatible

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By Ken Freed

Digital ad insertion: The promise meets reality

Anywhere, anyplace, anytime. That's the promise of digital ad insertion. Point to multipoint. Point to point. Multipoint to point. Name any demographic or other profile factor and an on-line ad buyer can generate a digital-to-digital or digital-to-analog order to reach an audience with a taste for your advertisers' products.

The dream is insertion of interactive advertising for "impulse purchase-on-demand." The technology is available, but the chief challenge is driving down costs. Digital ad insertion must be cheap enough to deploy anywhere.


Ken Freed

Vendors offering enhanced video and audio functionality claim their equipment can meet the demands of digital ad insertion. Yours for the asking are multichannel encoders and decoders backed by video server networks. Products are priced for a variety of cable head-ends and other multichannel operations. The emergence of branded servers has a de facto standardizing influence toward interoperability.

Many core issues wait to be settled. Digital ad insertion invokes the dispute between centralized and decentralized network topologies, an argument that transcends system architecture.

Network topologies

Examples of centralized digital ad insertion are found on cable systems in Boston, Pittsburgh, Atlanta and other metro areas. A "superhead-end" server inserts ads into as many as 400 channels at 20 or so local and regional head-ends, each head-end averaging 20 "ad-insertable" channels. A centralized system for tracking where space is allotted for automated inserts has its attractions.

A decentralized solution is automatically mirroring all ad-insertion content on a cluster of servers with one extra server in the loop. Select channels may be assigned to specific servers for routine ad traffic, yet that free server could take over playback almost seamlessly if any node fails.

Digital ad insertion in multichannel applications happens too fast for human hands to handle. How much automation is enough or too much? What best enables you to market reliable and effective insertion services to your advertisers? How narrow do you want to go with your narrowcasting? When the network goes to break, for instance, wealthy suburbs can get ads for luxury cars as their working class neighbors in another zip code get ads for used cars on bad credit.

Targeting your needs

Targeted ad insertion requires scalable digital video servers with enough inputs and outputs to do the job. Every server needs a backup, yet is RAID the only path for play-to-air? In case the server goes down, perpetually updated external storage is worth the risk of redundancy.

Compression is the secret to digital ad insertion. MPEG-2 satcasts of premium and pay-per-view channels to local cable head-ends are not "ad-insertable." The datastream can't be interrupted. A solution may be 4:2:2 Studio MPEG-2, which supports manipulation of single channels within the multiplex, but all MPEG is not created equal.

Matching compression rates is critical for channel-by-channel ad insertion on cable and other multichannel operations. A solution may be to use a variable-rate encoder and multiplexer to mix ads and interstitials into separate channels with varying bit rates. The longer-term solution, especially for ad insertion on satellite feeds, is "digital splicing" of MPEG-2 video into the datastream of any selected channel, assuming the SMPTE digital splicing working group reaches accord.

Still missing is a standard for how systems trigger the act of digital ad insertion. Old analog ad insertion systems use audio dual tone multiple frequency (DTMS) to identify an ad-insertion event. Why do we still lack an agreement on a digital equivalent?

The advertising industry is floating a proposal for all channels to automatically switch to one standard bit rate whenever their ad-insertion tone arrives in the datastream. A sturdy statistical multiplexer could do the trick, however, no bit rate has been fixed.

While we wait for technology to catch up with our visions, consider that insertion of interactive advertising already is possible. The latest generation of analog set-tops support VBI authoring tools for interactive graphical overlays or full screens of seamlessly branching video. You can ask for what you want. Just press that button on the remote. And what if viewers have a choice about having no ads at all? ■

Ken Freed is a technical writer specializing in cable and interactive television, and is based in Denver.

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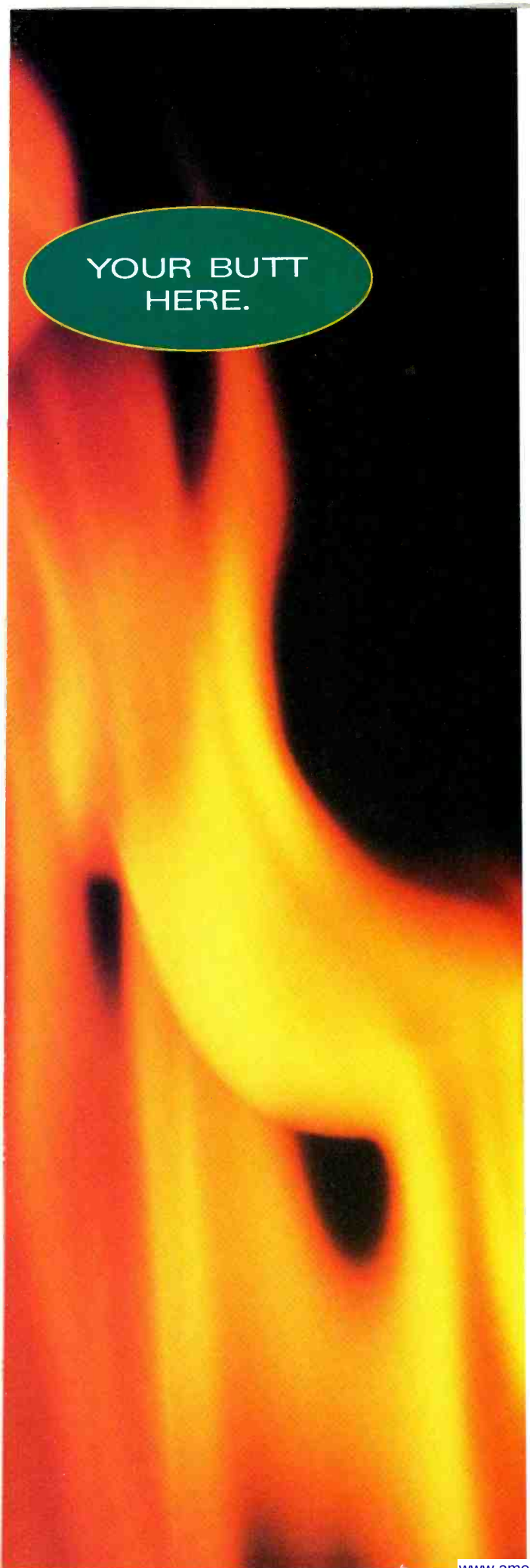

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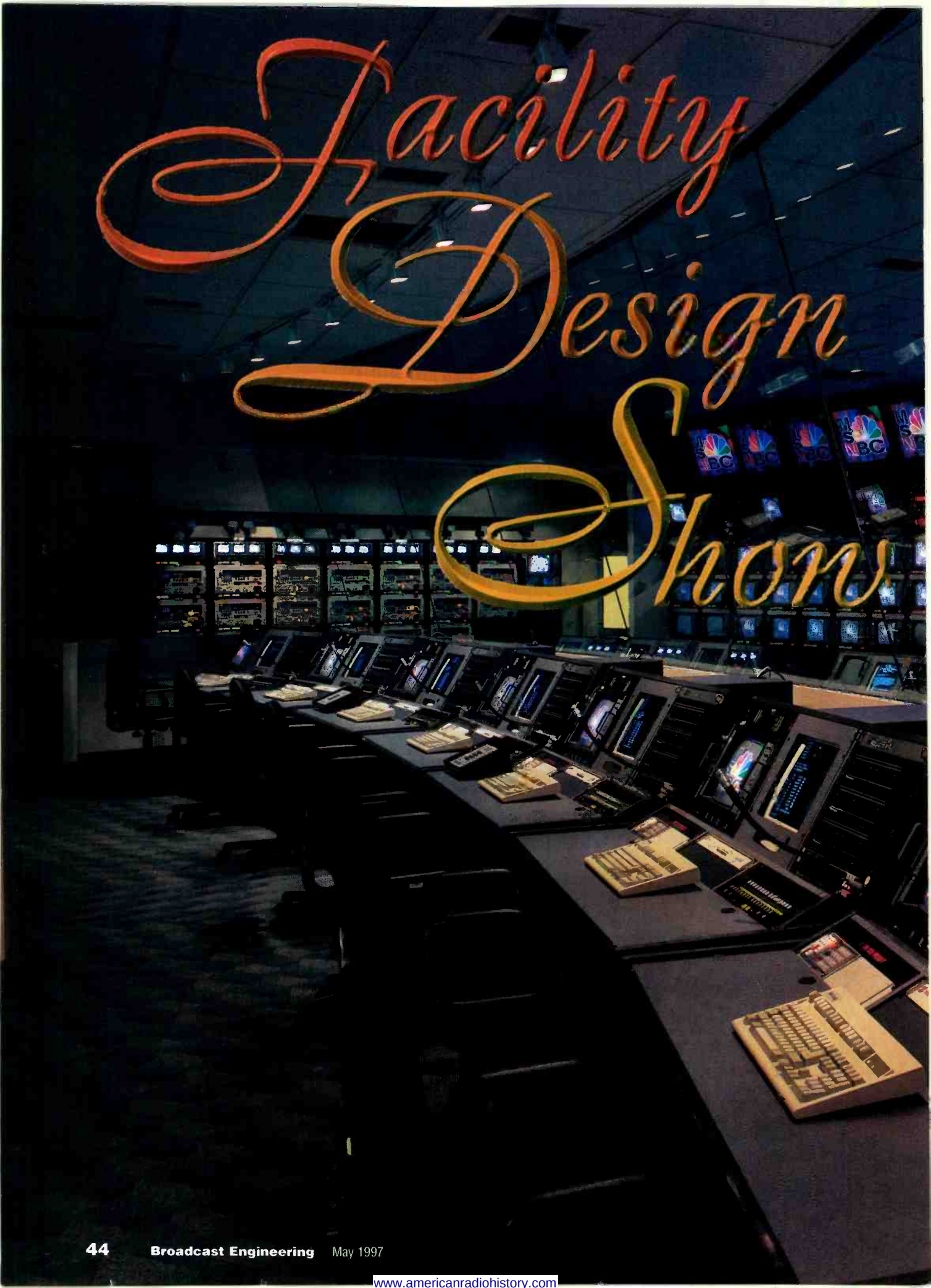

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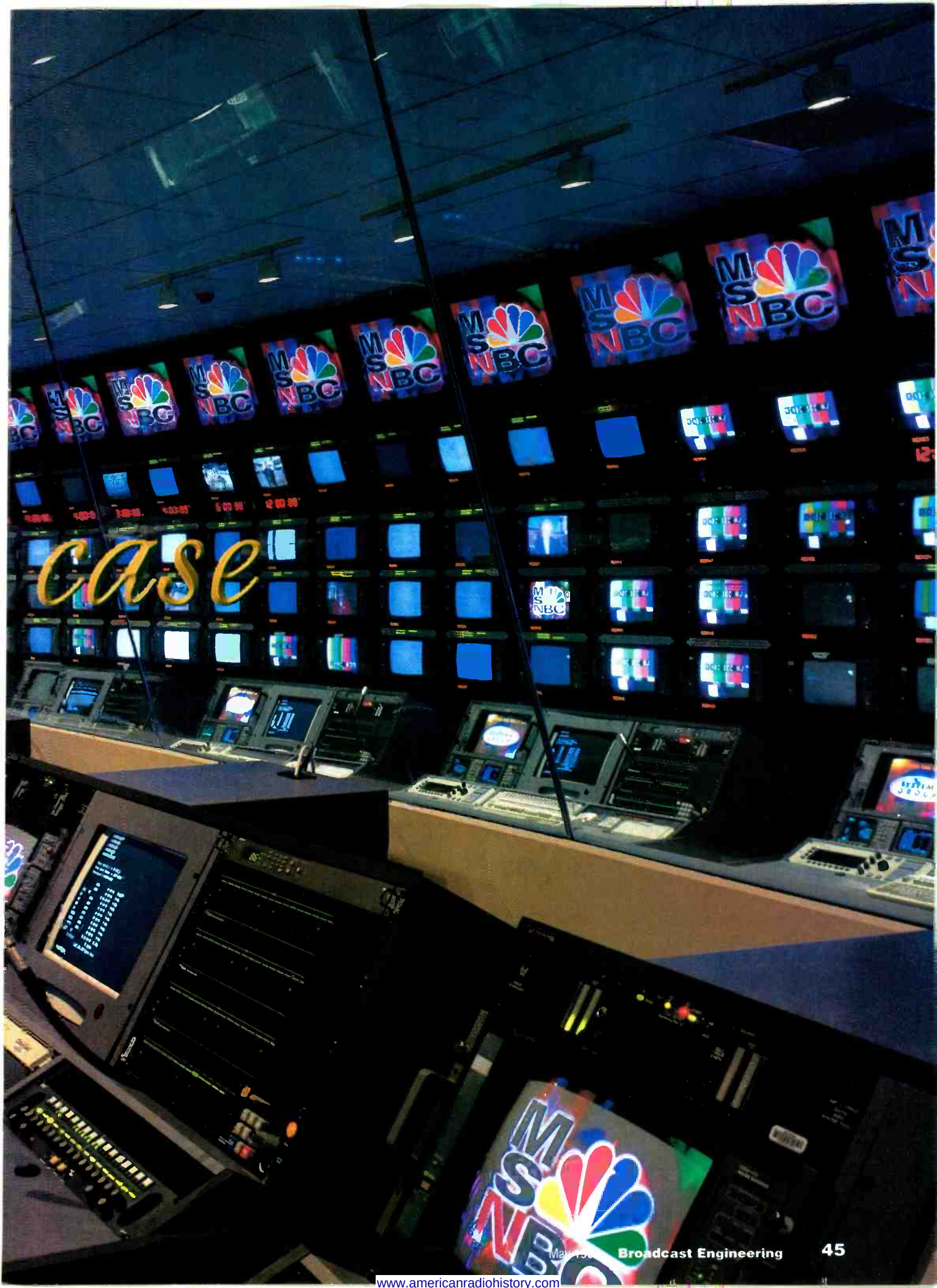

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SYSTEMS INTEGRATION

Building MSNBC

News-gathering for the 21st century.

By Bud Rigley

THE BOTTOM LINE:
MSNBC, the 24-hour cable news channel, combines the worldwide news-gathering ability of NBC News with Microsoft's software development and Internet capabilities. The partnership is one example of the convergence of leading-edge technologies in the cable and computer industries. By the time you read this, MSNBC will have just moved into its new facility. $

The first order of business for MSNBC was a search for a suitable facility. The prerequisites for such a technically demanding project were specific. In conceiving the facility, there were three goals:

1. To allow for the integration of new and emerging technologies for enhanced speed and production capabilities.
2. To find new and creative synergies between cable and Internet products.
3. To provide the infrastructure for MSNBC's future expansion.

The site had to be in close proximity to NBC's Network News headquarters in Manhattan. Because of the timing of multiple on-air assignments for NBC talent, proximity had to be combined with quick and easy access to the facility.

Despite considerable experience building facilities in traditional office

Photo: Wide angle view of the set and main production studio at the MSNBC facility in Secaucus, NJ.

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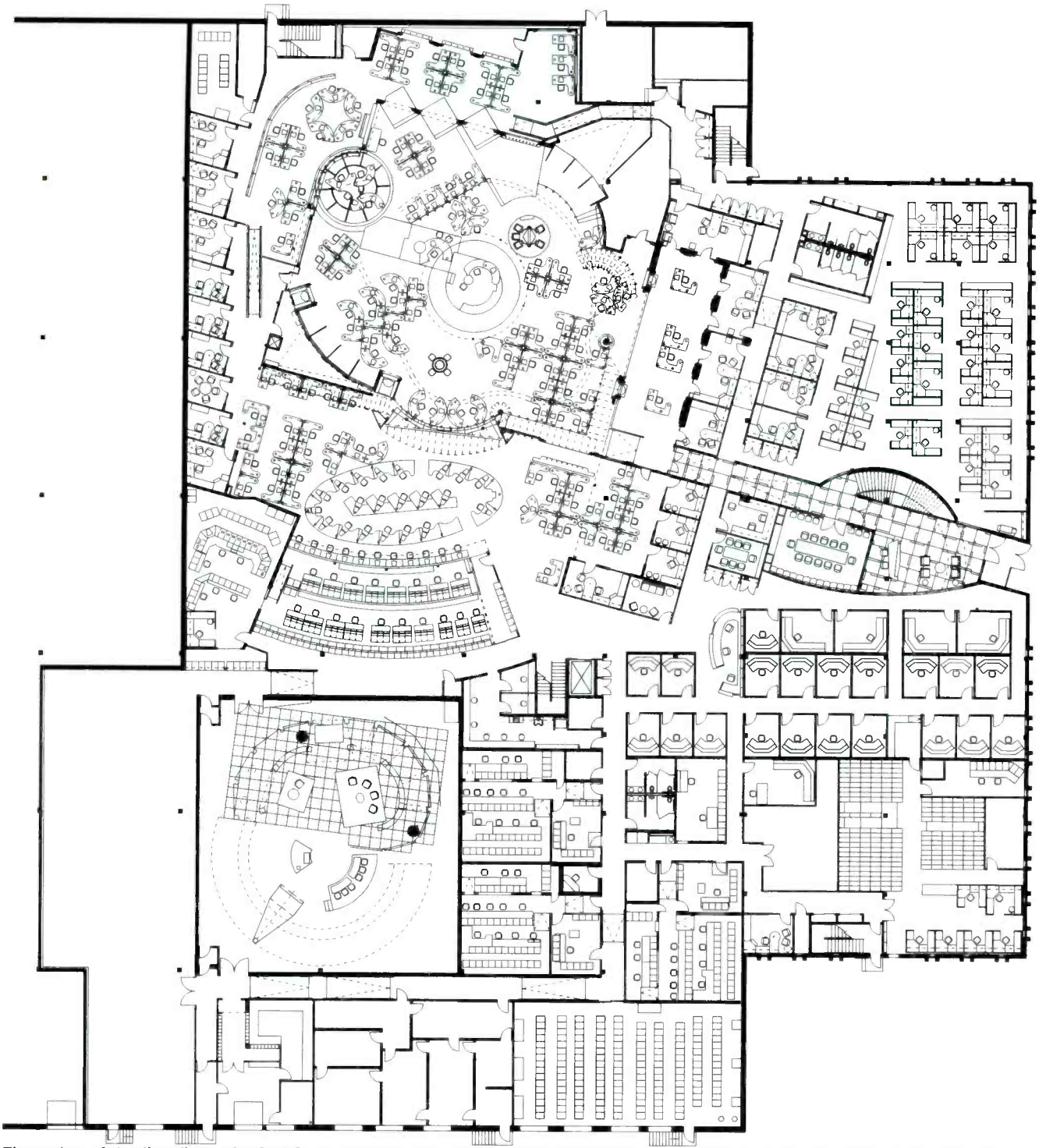
Building MSNBC

buildings, Randel Falco, NBC's president of broadcast and network operations, decided early on to use a warehouse instead. The need for traditional production studios, combined with an on-air newsroom, accommodating more than 200 employees required a floor plan in excess of 100,000 square feet, with the flexibility for expansion.

Because the on-air newsroom was also a complete TV studio, high ceilings and wide column spacing were also required. Warehouses could easily accommodate these but generally are located in less than desirable areas.

An additional challenge was the site's suitability for an extensive satellite antenna farm, with requirements that included adequate space, good reception and isolation from outside frequency interference. Finally, the site needed 4,000 amps of reliable electric service and close proximity to fiber loops.

From more than 100 sites, 40 Hartz Way in Secaucus, NJ, was chosen. The location had the ceilings and wide column spacing that were desired, great proximity to New York and a pleasant, industrial park-type surrounding. NBC



Floor plan of the first floor of MSNBC. Equipment racks and power conditioner are near the bottom, the main production studio is just above. The acquisition control room and news studio are near the top.

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From the dominating force in low-light cameras comes a digital duo that rules.

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● By utilizing JVC's next generation Super LoLux technology, the KY-D29 can shoot at 0.35 lux with minimal noise. This is the lowest level ever achieved by a camera — a level of darkness where the KY-D29 can see far better than the naked eye. ● And for optimum flexibility, JVC offers a complete line of studio accessories, including Triax.

You can now acquire the highest quality raw footage, and do so affordably, by mating the KY-D29 with JVC's Digital-S BR-D40 dockable recorder. ● Incomparable acquisition quality is made possible by the key features of Digital-S: 4:2:2 8-bit component processing and an extremely mild 3.3:1 compression ratio, yielding a data rate of 50 Mbps. ● And, when you begin editing with the absolute best raw footage, you're ensured of outstanding picture quality right down to your final edit.

So, whether you're in the field or the studio, broadcast, cable, corporate, education or event videography, only the digital duo of the KY-D29 and the BR-D40 can provide this striking level of performance and affordability. ● For more information, visit our web site at www.jvcpro.com or call 1-800-JVC-5825 and mention Product Code 1910.

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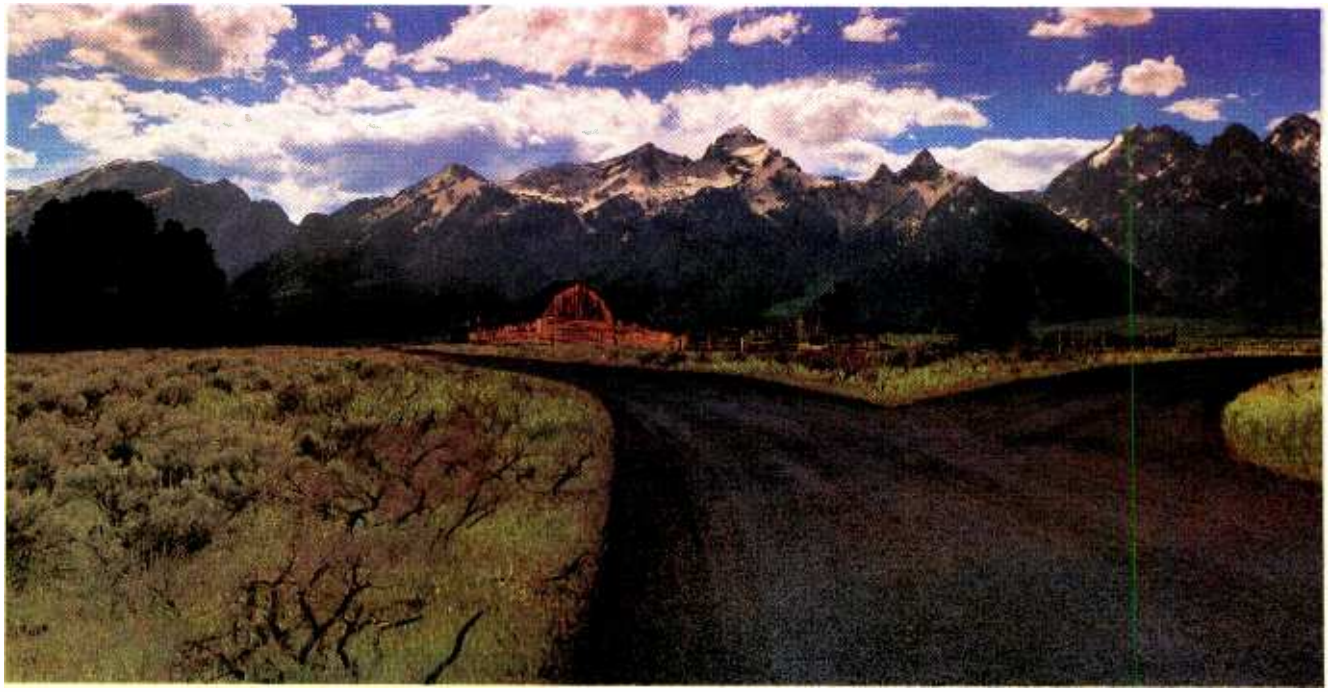
Your company will take either one road or the



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Plus, with the VideoStore System's open protocol, even third party automation vendors can use any control platform to operate the VideoStore System. In other words, you get the flexibility that you want, that you require, and that is so necessary to integrate the automation software package that's best for your station.

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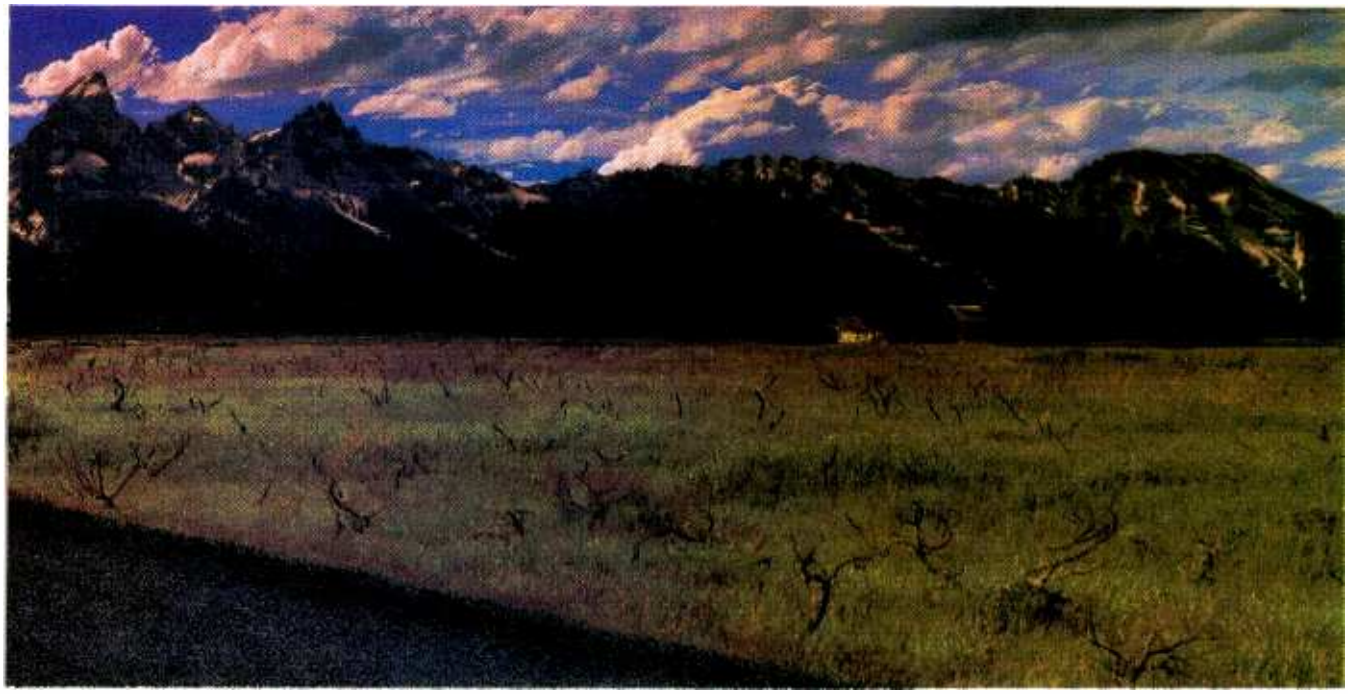
other. Which explains why we've taken both.



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took possession of the building in May, 1996.

NBC contracted with the team that helped to build the "Windows on the World" *Today Show* studio to help design the space: The Phillips Janson Group Architects, P.C.s Broadcast Division, headed by principal Dennis Janson and project director James Lee, and Edwards and Zuck MEP engineers led by Arthur Metzler. NBC's internal architectural management team included Stan Walczak, John DeSoto and Buddy Young, with real estate negotiations by Frank Lazzaro, Frank Marrano and Michael Sherlock.

One of the two production control rooms currently installed. Provisions exist for a third control room if needed.

On-air newsroom is core of facility

The MSNBC newsroom is not only the network's primary visual hallmark, but it's also the daily workplace for most of the news staff. The set was designed by the Production Design Group Limited's Eric Ulfers and James Fenhagen. The newsroom was envisioned as being loaded with technology: robotics cameras designed by Edge & Co. hanging from the ceiling, moving set pieces and four video projectors provide an edge to an already exciting environment.

For effective operation, the newsroom had to be surrounded by its technical support spaces to allow ease of communication among the varied staff. Immediately adjacent to the newsroom is the satellite operations and acquisition center. Edit and control rooms radiate out from this core. Production studios are positioned out of the main flow of daily operations, close to the loading docks for ease of set movement.

Outside the building's southern wall was the ideal location for the satellite antennas. This dictated placement of the generators, which would backup the entire facility, on the north side of the building. The electrical core and equipment room were then located nearby to minimize cable runs.

The requirements of the technical spaces left only a small portion of the first floor for key administrative staff office space. To accommodate the rest of the program requirements, an additional 16,000 square feet was added to the second floor that now comprises an extensive graphics suite, a complete cafeteria, a health and fitness area and additional mechanical spaces. This brought the entire interior project space to approximately 115,000 square feet.

There are many challenging design issues in converting a warehouse into a broadcast facility. The main physical challenge was making the newsroom column-free. The structural engineering firm M.G. McLaren P.C. was retained for this task. Three 120-foot roof-mounted trusses now carry the load of the six columns that were removed from the newsroom area. The ceiling/roof system was then literally hung from the trusses. Because the trusses are 15 feet high, they were placed above the roof to avoid any interruption of an otherwise clean, 24-foot ceiling height.

The new trusses were designed to accommodate the additional loads imposed on the newsroom roof structure for lighting grids, scenic elements, ductwork and robotics camera tracks. Additional structural modifications provided for a 500-ton roof-mounted chiller plant above the main mechanical room and the removal of one additional column in the larger production studio.

Project schedule

For scheduling purposes, MSNBC's goal was to complete the facility by April 7 — just 11 months from possession. NBC's project team led by Mel Weidner, VP, technical operations MSNBC, and Larry Thaler, NBC's director of news studios and project director for this facility, set an aggressive completion schedule.

Typically, NBC uses 'design-build' schedules, designing architecture while the construction is already in progress to speed the completion of the facility. Because of the complexity of the newsroom, we created a new process, 'design-build-dress.' The scenery, which is applied directly to the architecture, was designed and built simultaneously with the rest of the facility. It was fast, but difficult. A single mistake in one area could ripple through seven or eight other designs.

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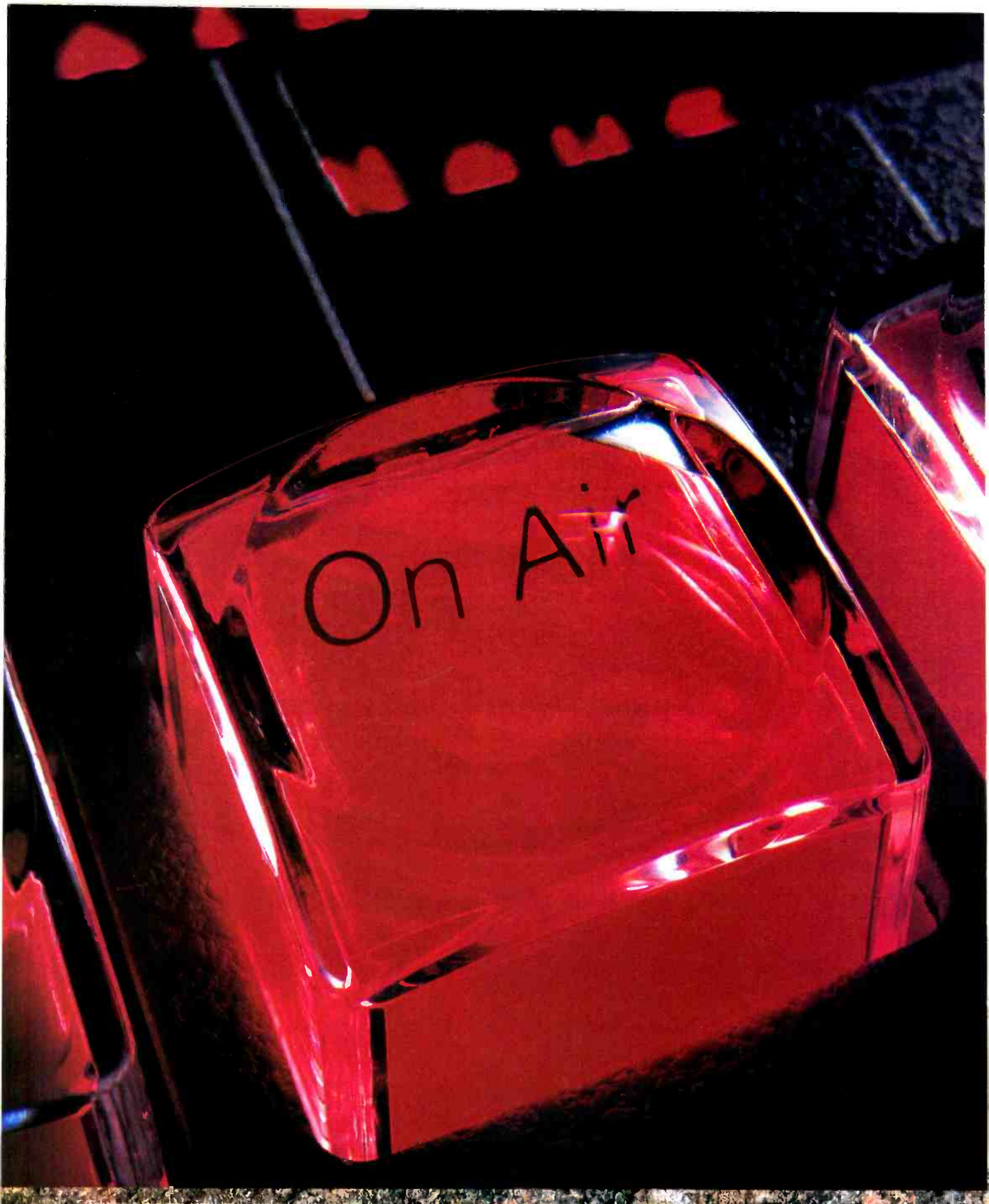

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cesses, NBC began its electronic systems design and retained The Systems Group (TSG), Hoboken, NJ, to manage all phases of the technical systems design and integration. Duties were split among TSG's three partners as follows: Scott Griffin directed all engineering, design and documentation efforts; Chris Mehos was responsible for technical project management and construction coordination and Alan Rudolph directed all project planning and project management tasks regarding equipment, materials and subcontractors.

As a first step, technical teams were created each tasked with design, documentation and implementation in each of seven operational areas:

- architectural support;
- core systems;
- production systems;
- satellite operations and news acquisition;
- graphics and editing systems;
- master control; and
- custom systems and set electronics.

Each team was directed by an NBC engineering manager assigned to coordinate each area and formulate the operational philosophy with MSNBC operations. Each corresponding TSG team consisted of a systems engineer and a systems technician tasked with the duties of design, documentation and installation. Coordination meetings were held daily.

Systems formats, new technologies, proven methods, operational requirements, ease of operation and designing for the future were all discussed and evaluated. As design decisions were finalized, implementation began immediately. Consistency and coordination throughout this rapid design process was critical. With a facility this large and complex, tight controls over the various design teams were crucial to remaining on schedule and ensuring clean hand-offs between the various systems facility-wide.

Once design decisions were clear, TSG moved rapidly to the document and build-to stage. In the early documentation stage, large cable cut lists were generated and subcontracted out to cable manufacturers allowing TSG to get a leap on fabrication. The majority of systems design and documentation, over 350 drawings, was completed in eight weeks.

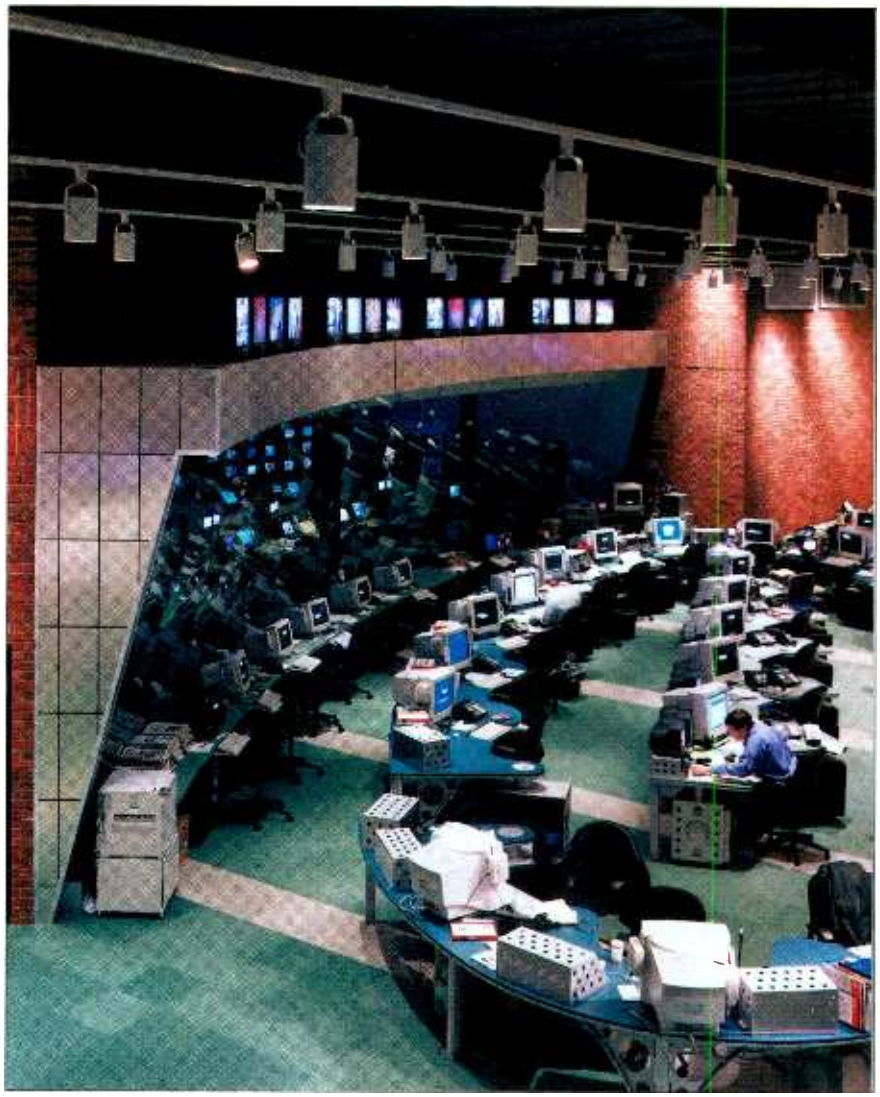
A logistics and coordination team was set up, dedicated solely to equipment configuration and selection, as well as equipment and materials handling, inventory, tracking and shipping. NBC's corporate sourcing department, headed by Craig Glaser, was responsible for all equipment procurement and TSG purchased all system materials, including cabling, connectors, racks and consoles.

Scheduling, logistics and planning were critical. The project included more than 2,500 line items of equipment, 370 equipment racks, more than 85 combined operational consoles and monitor walls, more than 2.6 million feet of audio, video, MATV, intercom/LAN, control and triax cabling and more than 675 combined facility jackfields. All systems prefabrication occurred at TSG's facility.

Technical systems

Basic systems concepts were discussed between the NBC and TSG design teams. One of the early decisions was making the facility serial component digital video with four channels of AES/EBU audio (non-embedded). For compatibility with NBC's existing news archives, the tape format selected was analog Betacam with outboard Tekniche 601 to YUV D/A and A/D conversion.

Four Tektronix/GVG 7000 routers were defined to support the operation. A 256x256 core router integrates all of the operational areas, a 128x128 ac-



The view from the mezzanine of a portion of the newsroom/studio areas.

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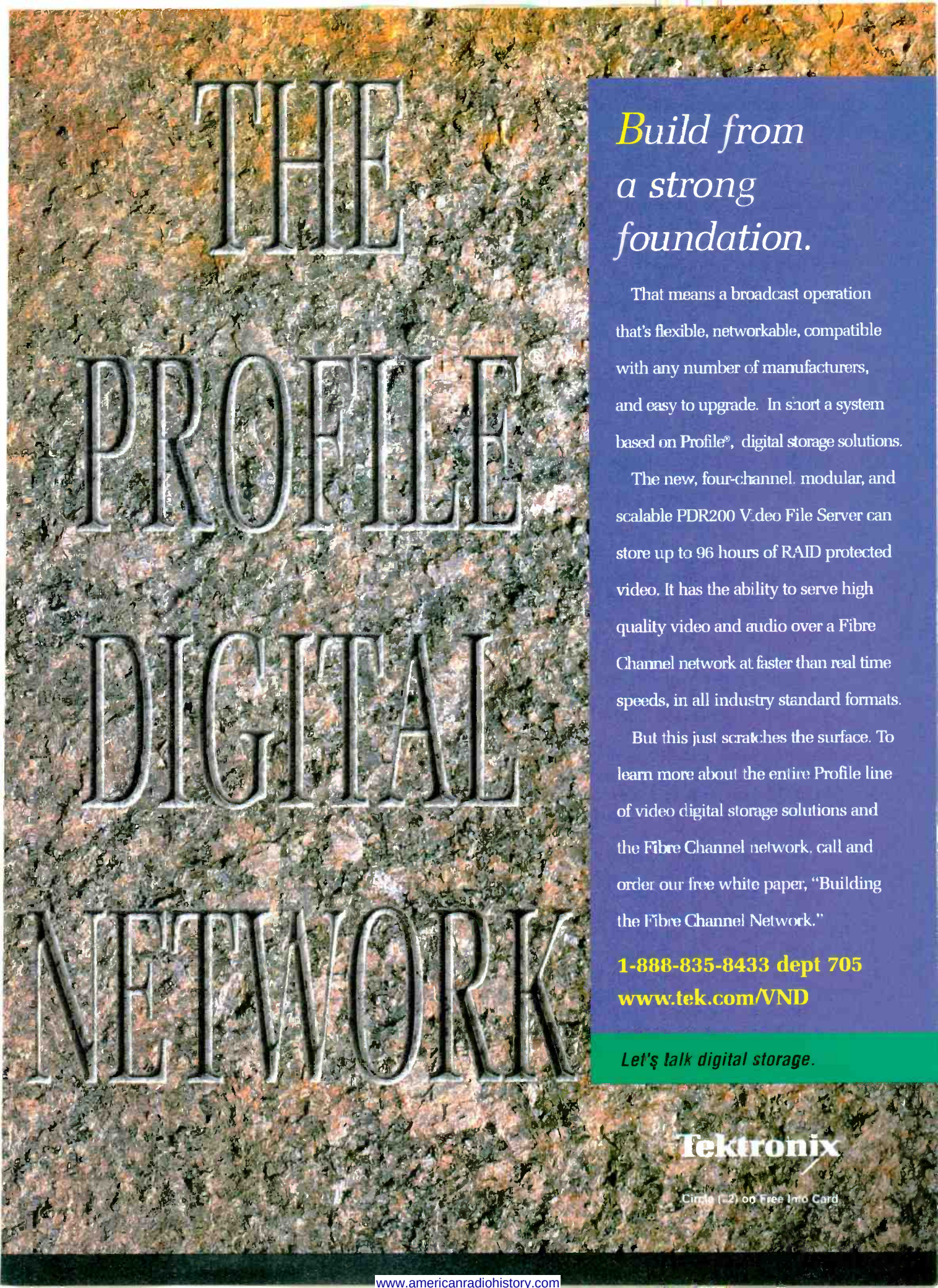

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quisition router to process the 86 simultaneous remotes, a 64x64 graphics router supports an expansive production capability and a 64x64 Interactive router provides real-time connection to the interactive component of the facility. All routers are linked through a common control system and include active trunking between frames.

The incoming feed capabilities are impressive. Seven satellite dishes feed 54 receivers and ultimately 84 Leitch Digibus frame syncs where signals are remotely adjusted to facility standard. Digital outputs are delivered to the acquisition router, which feeds 24 VTRs, a disk-based server and trunks to the control and edit rooms. McCurdy has provided the automation for this system, which enables each of eight acquisition operators and eight satellite operations managers to preschedule and record in-bound material, much the way commercials can be scheduled in a typical master control operation.

The end result of 10 months of long days and hard work is a state-of-the-art production facility unlike any other.

The acquisition process, typically a multiperson operation, has been streamlined by giving all the responsibilities and controls to each of the operators. This serial process has been converted to parallel, speeding throughput. By adding frame syncs to every receiver, we've reduced one major scheduling component, again speeding throughput. All inbound remotes feed one of two in-house MATV systems totaling almost 200 channels.

Two production control rooms support a studio, as well as the newsroom. Each control room contains a GVG 4000 digital production switcher, six Sony CCUs, a 96-input Neve Libra audio console, a Scitex DVEous DVE, Quantel Picturebox, Chyron MAX! and 15 dedicated router buses. Along with the traditional operator positions found in most broadcast applications, the interactive element is represented by a web browser control position. This position allows on-line media to be used as an element for production. The key location in the control room underscores its importance. The facility has space for a third identical control room and a second production studio.

Post-production is supported by nine analog cuts rooms, three Quantel Editbox non-linear rooms, seven Avid non-linear rooms, two on-line edit rooms with GVG 2200 switchers and an SSL Sceneria room. Each room is self-contained and ties to the core facilities via reference, intercom and router I/O. The graphics suite contains six Quantel Paintboxes, one Picturebox, two Hal systems, two Chyron INFiNiT!s and WSI.

Communications for the facility are provided by RTS with a 448x448 single intercom system. This intercom is tied via T-1 data lines into NBC's network of trunk intercoms. MSNBC will also be the first operation to use RTS's virtual communications panel, which works on a PC desktop. MSNBC's connection between NBC and Microsoft is tailor-made for a virtual panel of this type.

The final days

As the wiring was completed, testing began. This immediately became a team effort between TSG's project engineers and MSNBC's maintenance staff. Having the maintenance staff actively participate in the systems test not only speeds the process, but familiarizes all engineers with the systems.

The end result of 10 months of long days and hard work is a state-of-the-art production facility unlike any other. A high-quality flexible infrastructure and cutting-edge technology combine to provide MSNBC's production community with tools to bring the viewer the news first, while adding a unique value through its interactive component. ■

Bud Rigley is director of sales and marketing with The Systems Group, Hoboken, NJ.

MSNBC PROJECT TEAM

NBC project team: Mel Weidner, vice president, technical operations, MSNBC; Larry Thaler, director of news studios and project director; Chris Lizza, director, engineering, MSNBC
Project managers: Ron Schiller, Frank Rasor, Ken Fuller, Bob Streeter, Chris Dee, Randy Boutin
Broadcast systems integrator: The Systems Group, Hoboken, NJ
Architect: The Phillips Janson Group, New York City
Mechanical systems engineers: Edwards and Zuck, New York City
Structural engineers: M.G. McLaren, P.C., West Nyack, NY
Acoustical consultant: Robert A. Hansen Associates, New York City
Newsroom set design: Production Design Group, Ltd., New York City
Interactive systems integrator: Synergistic Technologies, Pittsburgh, PA

EQUIPMENT LIST

The project included more than 2,500 line items of equipment, 370 equipment racks, more than 85 combined operational consoles and monitor walls, more than 2.6 million feet of audio, video, MATV, intercom/LAN, control and triax cabling, and more than 675 combined facility jackfields.

- Four Tektronix/GVG 7000 routers
- Seven satellite dishes
- 54 satellite receivers
- 84 Leitch Digibus frame syncs
- 120 Sony BVW-75s
- Tektronix Profile commercial playback system
- McCurdy automation system
- Two production control rooms each contain: GVG 4000 production switchers, six Sony CCUs, a 96-input Neve Libra audio console, a Scitex DVEous DVE, a Quantel Picturebox and a Chyron MAX!
- Nine analog cuts rooms
- Three Quantel Editbox non-linear rooms
- Seven Avid non-linear rooms
- Two on-line edit rooms with GVG 2200 switchers
- One SSL Sceneria audio post suite
- The graphics suite contains six Quantel Paintboxes, one Picturebox, two Hal systems, two Chyron INFiNiT!s and WSI
- RTS 448x448 intercom system

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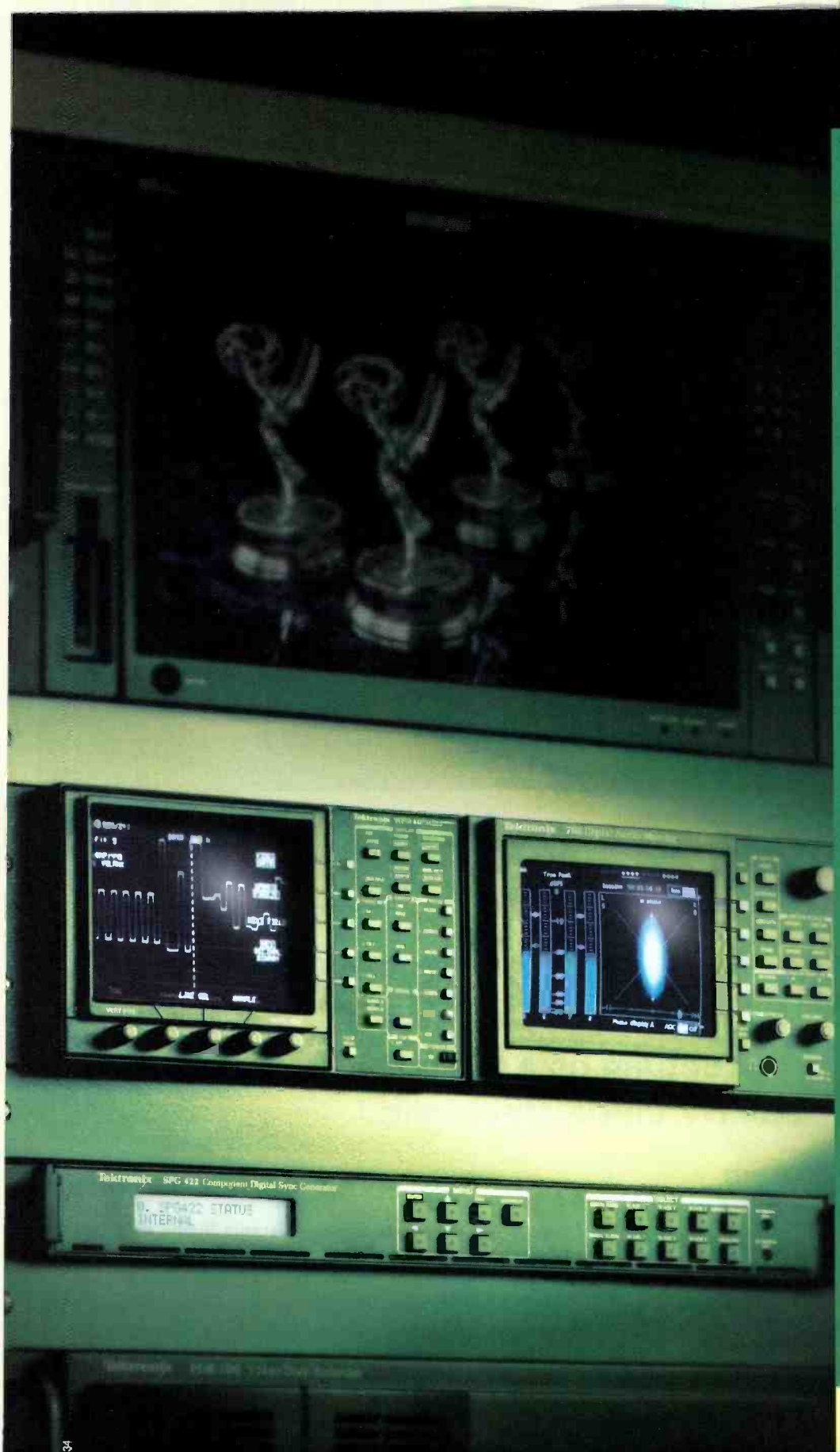

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SYSTEMS INTEGRATION

GPTV goes digital and multichannel

Betting on a winner.

By Linda Mastaglio

THE BOTTOM LINE:
Georgia Public Broadcasting is ready to unveil the first fully digital public broadcast TV and radio network in America. Located in an area that is fast becoming the "Telecommunications Center of the Southeast," the facility begins broadcasting in August. $

Thanks to proceeds from the Georgia State Lottery, Georgia Public Broadcasting (GPB) is preparing to move into its new broadcasting complex. GPB is one of the largest PBS organizations in the United States. The new facility will serve as headquarters for Georgia Public Television, which includes a nine-station public TV network, a 12-station radio network and a statewide distance learning center. In addition, completely digital video and audio production capabilities will attract corporate and individual producers, providing an additional revenue stream through facility and production service usage fees. It will provide the nation's first all-digital public broadcasting network, as well as America's first fully digital radio network.

The broadcasting agency began 30 years ago with one TV station. The existing,

Photo: New Georgia Public Broadcasting complex will house a nine-station public TV network and a 12-station radio network. (Inset) The 240,000-square-foot facility will be one of the largest facilities of its kind in the Southeast.

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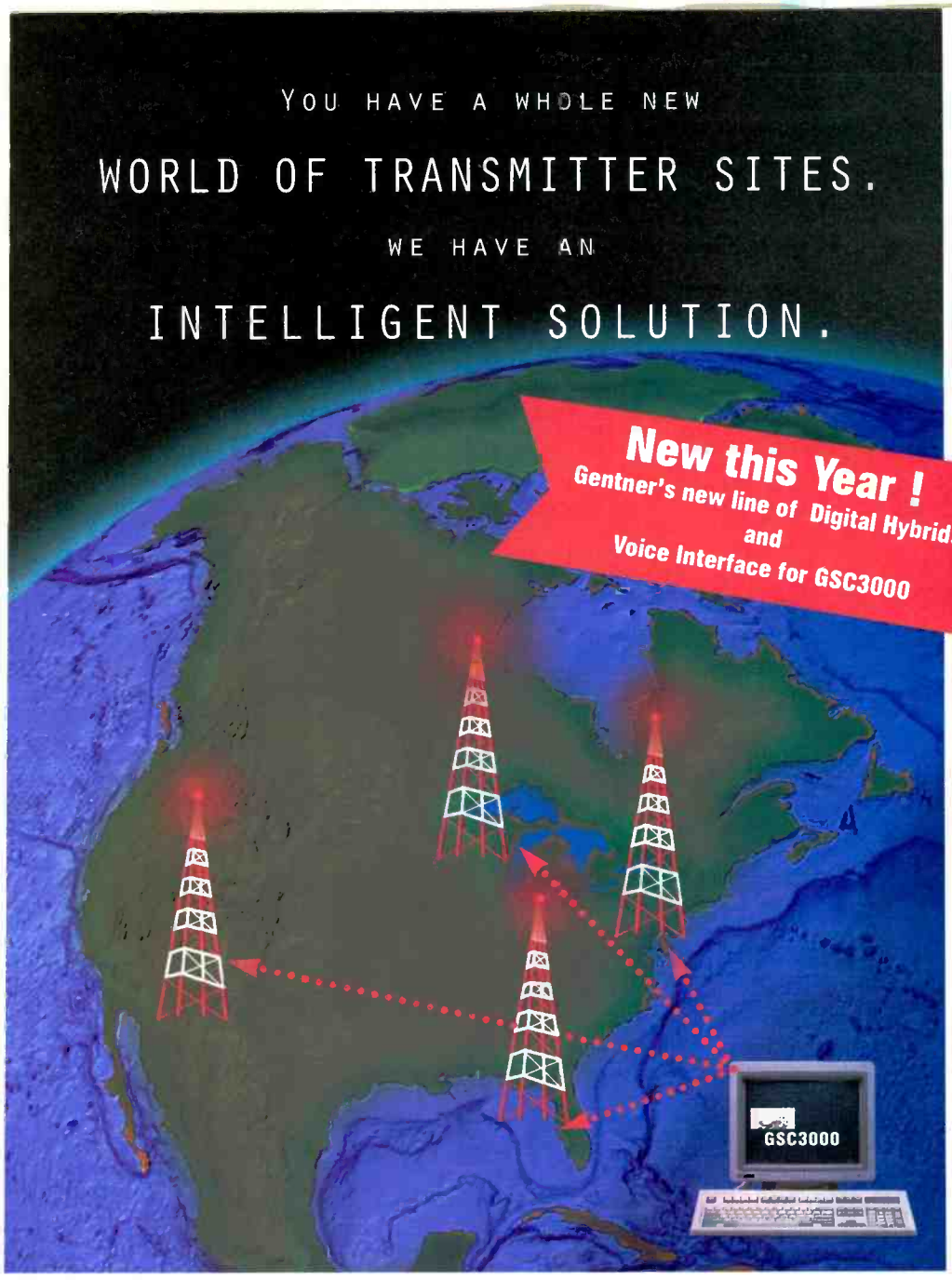

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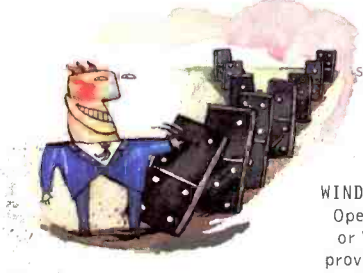

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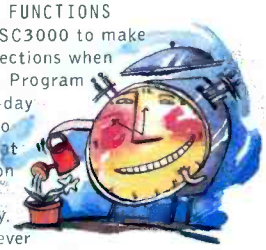

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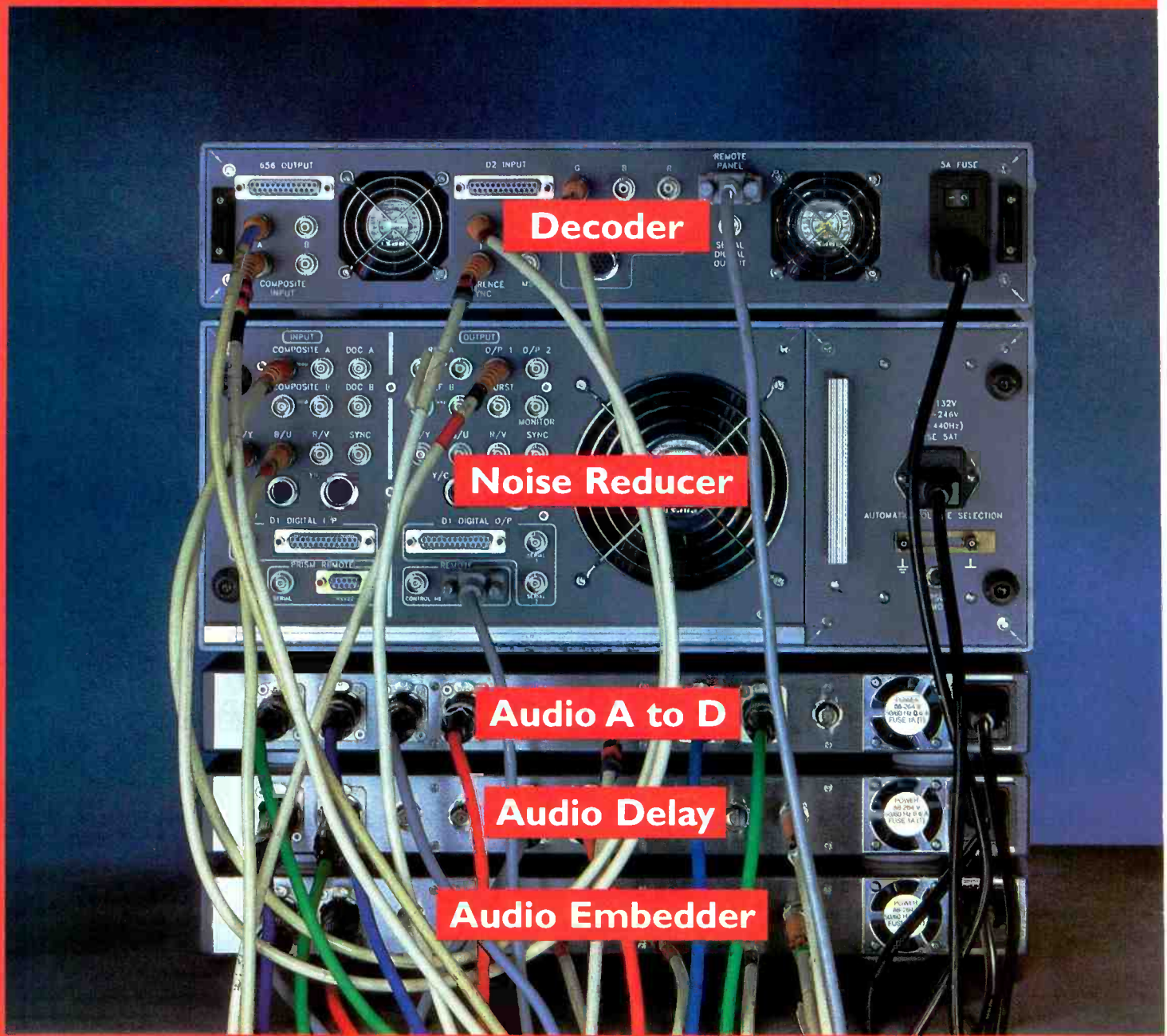

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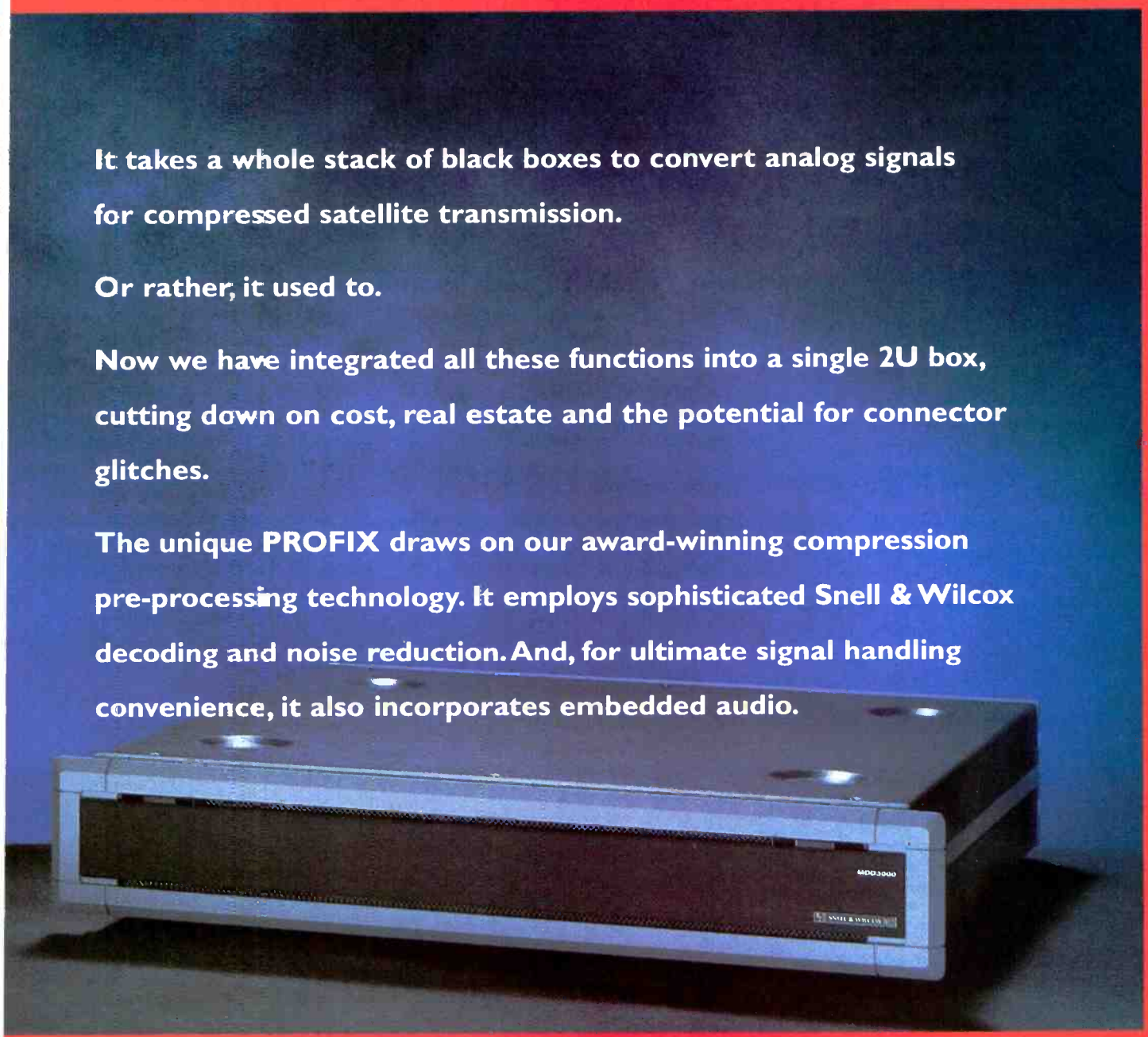

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GPTV goes digital and multichannel

age-worn facility was built in the late 1960s and became physically inadequate to support the multiple stations that today comprise complete TV and radio networks. In addition, the burgeoning staff outgrew the building and overflowed into two on-site trailers.

GPB management responded to the challenge by planning a facility that would not only solve its space and infrastructure problems, but would be one of the premier broadcasting production facilities in the nation. It is one of the largest facilities of its kind in the Southeast and offers high-definition capabilities and multicasting. It was designed by Rees Associates, Inc., a Dallas-based architecture, interiors and facilities planning firm that has designed more than 150 broadcast production facilities worldwide. GPB broke ground in 1995. Staff will begin moving into the new facility this month, with broadcast operations commencing in August.

The facility is a 240,000-square-foot building. It is adjoined to an 800-vehicle parking garage and the 165,000-square-foot Georgia Center for Advanced Telecommunications Technology. The campus is located on a four-acre site just outside of downtown Atlanta. The total budget for facilities and equipment is approximately $45 million.

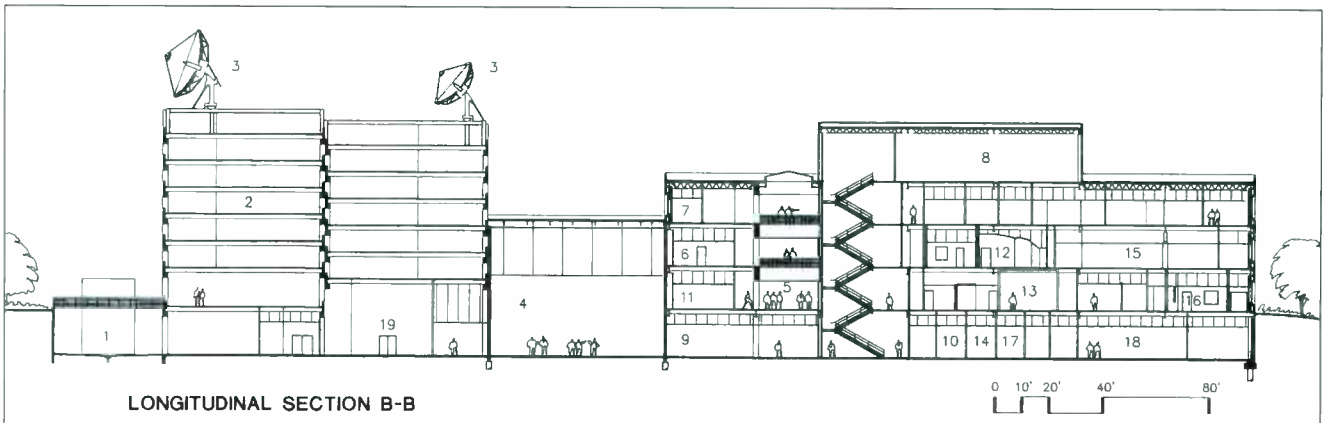
Nearly 70,000 square feet of the building was constructed beneath the parking deck.

The overall project master plan required the building to fit on 1.6 acres—allowing for just 70,400 square feet. Because facility needs dictated more than three times the available space, the building rises four stories, plus a basement. In addition, the architects worked closely with the master planner to define space in the lower levels of the parking garage to house several remote TV vehicles and to add needed building space. As a result, 69,000 square feet of the building was constructed beneath the parking deck.

Making a grand entrance

Georgia Public Broadcasting anticipates up to 300 visitors daily. As a result, GPB wanted a distinctive entry that would clearly point visitors to the public areas. The result is a dramatic, three-story, glass-encased atrium that crosses the building's east-west axis. The 5,500-square-foot atrium is designed as a multipurpose, community-use space. It not only serves as a break-out room for studio audiences, but will also provide an ideal layout for public and private receptions, art exhibits and special events.

The building exterior is composed of



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GPTV goes digital and multichannel

gray precast concrete that is accented by lighter gray concrete strips running lengthwise across the structure. As visitors approach the facility, white concrete pillars provide a dramatic visual identity that frames the atrium area.

The ultimate studios

The facility contains three major production studios ranging in size from 5,400 square feet to 2,400 square feet. The largest studio can accommodate a theater audience of 250 people. The theater seating is fully retractable, fitting tightly to one wall when the entire studio space is required for major performances, such as live theater or orchestral concerts.

"The studios have Super Flat floors," explains Ralph Blackman, AIA, the project director for Rees Associates. Super Flat floors are primarily found in PBS studios and the technology is used to ensure that cameras will not roll from a stationary position. "The technology involves determining the flatness and levelness of the floor surface," explains Blackman. "Typically, a 2'x2' grid is chalked onto the floor and a laser scan determines whether the surface is concave or convex. This level of precision assures that we have a surface that is virtually flawless."

Creating dead air

All studios, edit suites and post-production suites required complete acoustic isolation. This was accomplished by providing concrete masonry walls that are grout filled and isolated from the slab by one- to two-inch neoprene pads. This allows the walls to 'float,' assuring that no structure-borne vibration can penetrate the room. In addition, sound isolation flooring was constructed using eight-inch concrete slabs that rest on neoprene pucks and are undergirded with two layers of plywood. Between each of the pucks is a filling of fiberglass insulation.

Sound isolation ceilings were placed in all studios and are composed of three layers of taped and bedded drywall on a metal suspension system. Above the drywall are six-inch acoustical batts. A dead air space above each ceiling serves to dampen and isolate sound.

GPB broke ground in 1995 and will begin moving into the facility this month.

The HVAC system must provide maximum cooling to offset the significant level of heat that is generated by quartz lighting and large electrical loads. This requires the movement of 300 to 400 cubic feet of air per minute. To counter the potential noise that this motion could generate, the air is moved through extra-large ductwork at minimal speeds.

Mounting dishes

The facility's multiple satellite dishes, ranging in size from 4m to 6.1m, are mounted on top of the six-story parking deck. This location offered a particular design challenge, because the potential is great for dish vibration in a cast-in-place parking structure. To assure that satellite dishes would not lose signal, Rees Associates designed steel framing systems to anchor the dishes. The framing allows for no less than one degree of inflection.

Production precision

According to Al Korn, GPB's director of engineering, it was a planning priority to "diligently assure that, once video and audio were produced in digital format, all processes would be digital so transcoding would be kept to a minimum." The TV, radio and education services are integrated into one network. Programs will be produced in digital format in nine studios, six of which will have interactive capability to allow viewer participation. All tape will be digital, using a Panasonic DVCPRO digital serial component system with AES/EBU distribution systems. Broadcast animation will be served by a Louth automation system, which provides recording and playback capability.

The facility will incorporate Tektronix PDR 100 video servers and Philips Media Pool 30-hour disks for production recording and play back. The master control room will use Leitch SDV processing equipment and a Philips digital and analog routing system. The two production control rooms will incorporate an Abekas DVEOUS digital video effects system, Chyron MAX! graphic systems, Philips DD-30, 32-input digital production switchers, Pinnacle FlashFile Turbo still-store systems and an Enco digital audio storage system. Camera equipment will include six Philips LDK-10 digital output cameras and two LDK-10P portable digital units.

Multichannel broadcasting

"When the facility goes on-line, GPB will broadcast four channels full time and anticipates expanding to seven channels within a year," explained Korn. The system is designed to accommodate a potential of 16 total channels. An MCPC Digicipher II digital encoder will provide multichannel transmission and download to 2,200 antennas in statewide and interstate locations. The teleport system will include two Vertex 6.1m Ku-band uplink systems, two Vertix 4.5m C/Ku-band downlink sys-

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GPTV goes digital and multichannel

tems, Comtech 3.8m C/Ku downlinks, Scientific Atlanta Ku-band digital upconverters and Norsat Ku- and C-band LNBs. Two existing Harris transportable satellite uplink units will also be incorporated, one of which will be designated for the Georgia emergency broadcasting system.

Planning for the future

The facility's entire technical core is located on the lowest level of the facility and placed on computer access flooring for ease in switching out technical equipment and for running cabling to accommodate emerging and future technologies. In addition, the facility was designed with minimal ceilings to allow for ease in pulling cable at any time throughout the entire facility.

Caring for the community

GPB has historically shown great support to its local community. Evidence of its consideration is the integration of Radio Reading Services for the Blind. This is the only program of its kind that is located in a broadcast facility that is not state funded. Volunteers, located in a 2,200-square-foot studio, are scheduled throughout the day to read newspapers and other materials. Their readings are taped and aired over a 24-hour period on all of GPB's radio stations.

Changing the face of public broadcasting

GPB's progressive program to fully digitize its program production is a step toward bringing public broadcasting to a new level of sophistication and evolution. The foresight and vision provided by the GPB management team will serve as a model for other PBS stations and networks and will serve the residents of Georgia by offering exceptional quality in audio and video production and transmission. GPB's goal is to be a full-service information and program provider, capable of taking a project from initial concept through program production, distribution and transmission. The new state-of-the-art facility is the stepping stone leading the company to its vision. ■

Linda Mastaglio is the owner of Thoughts, Words & Images, a communications consulting firm in Irving, TX.

THE DESIGN TEAM

Client: Georgia Public Telecommunications Commission; Werner Rogers, executive director; Frank Bugg, deputy director; Al Korn, director of engineering
Architects: Rees Associates, Inc., and CGLS+ Associates· Ralph S. Blackman, AIA, project director; Kimberly Schnell, RID, interior design; Chris Johnston, project coordinator; David Lanier, AIA, architect
Broadcast systems integration: Harris Broadcast; JayAdrick, product line director
Mechanical and electrical engineers: Hibble, Peters and Dawson, Inc.
Structural engineers: Brittingham Associates
Civil engineers: Bailey Engineering
Acoustics: Russ Berger Design Group, Inc.
Contractor: Beers Construction
Project development: Cushman Wakefield
Client representative: Seefried Properties, Inc.

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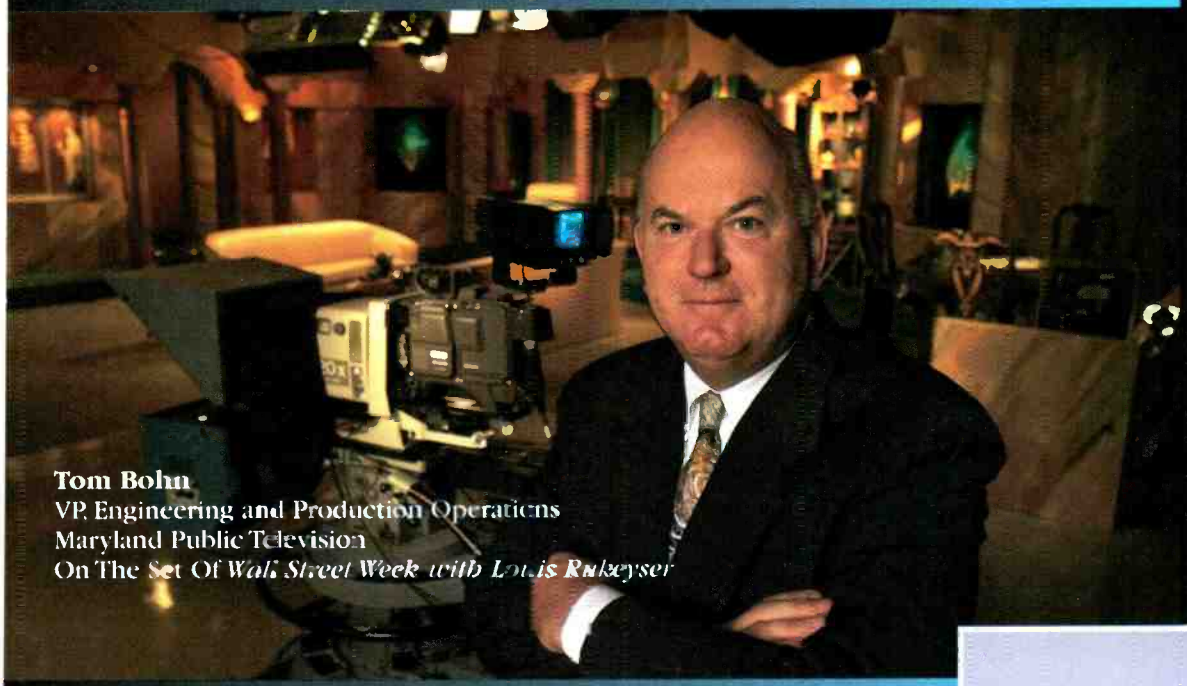
"Today, TV Stations Have To Be Future-Proof."



Tom Bohn
VP, Engineering and Production Operations
Maryland Public Television
On The Set Of *Wall Street Week with Louis Rukeyser*

Hitachi Digital Cameras Help Maryland Public Television "Stay Ahead Of The Curve."

Tom Bohn feels the change from 4:3 analog to 16:9 digital technology "will be a revolution every bit as big as black-and-white to color. And since we don't know what the standards will ultimately be, we must start to future-proof now."

As he invests in new technology, Bohn looks for upgradeability on each piece of equipment. That's one reason he purchased eight Hitachi digital cameras. The SK-2000 Series has four built-in upgrade paths, from the single LSI processor, and A/D converter, to the newest CCD block technology.

"As the fourth largest producer of PBS shows, MPT creates programs with very long shelf lives–which makes 16:9 digital capability crucial. So we needed a camera that was digital from the head all the way through the CCU. I personally visited all the factories and trade shows, and I found Hitachi to be two years ahead of the competition.

"Today, we use Hitachi digital cameras for all our studio productions. We're very pleased–we believe this is the best purchase for MPT today and well into the next century."

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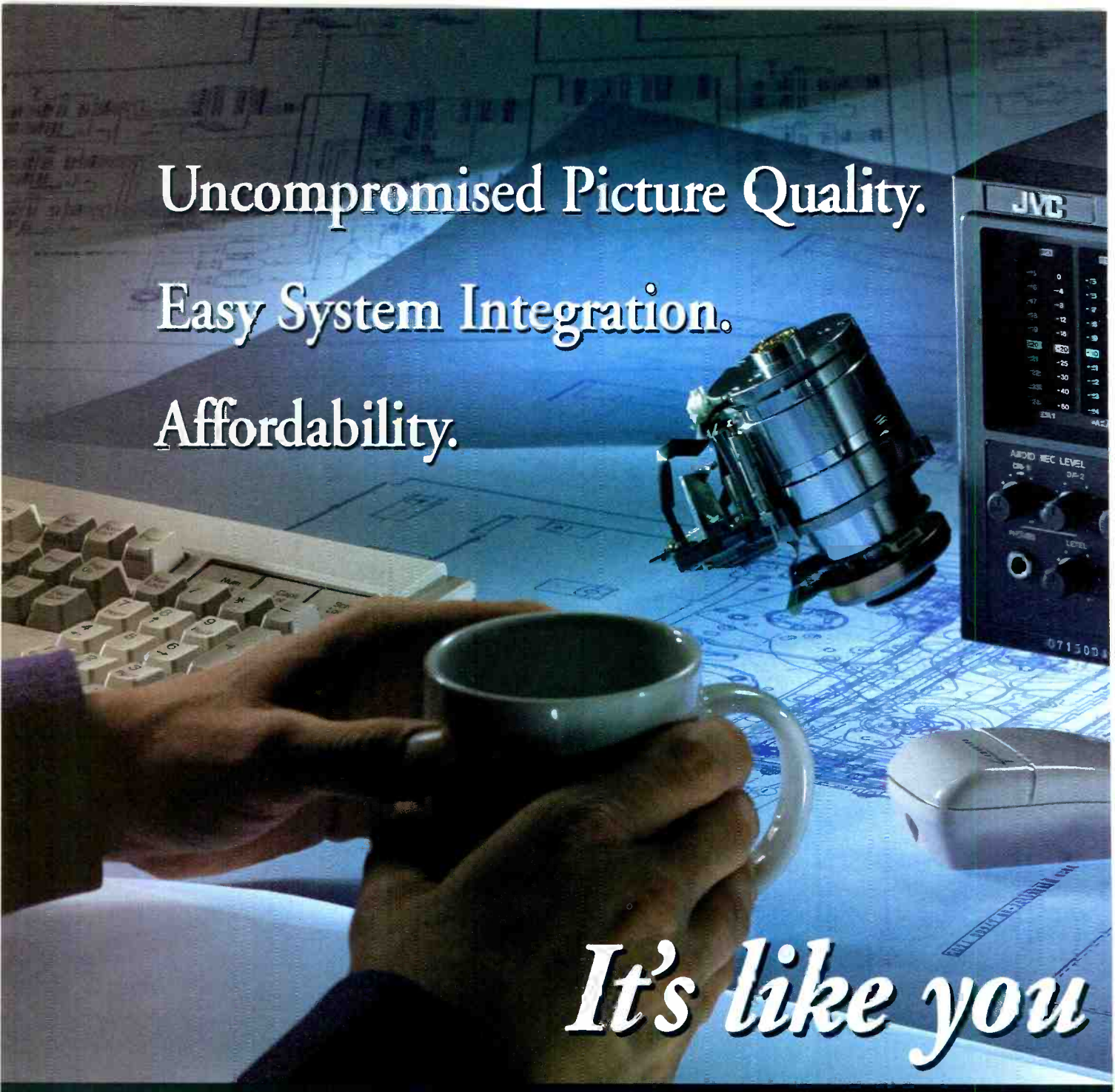

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designed it yourself.

tantly, it retains the quality of your original footage, generation after generation, ensuring phenomenal results. As if that weren't enough, pre-read also allows you to perform complex layering effects and A/B roll editing with only two VTR's instead of three. And, by incorporating both analog and digital inputs and outputs, Digital-S delivers the optimum performance level in either the digital or the analog environment with virtually no degradation.

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Digital-S from JVC. Your dream system brought to life. The Digital-S system includes the BR-D85 Editing Recorder with pre-read and digital I/O, the BR-D80 Editing Recorder, and the BR-D50 Player.

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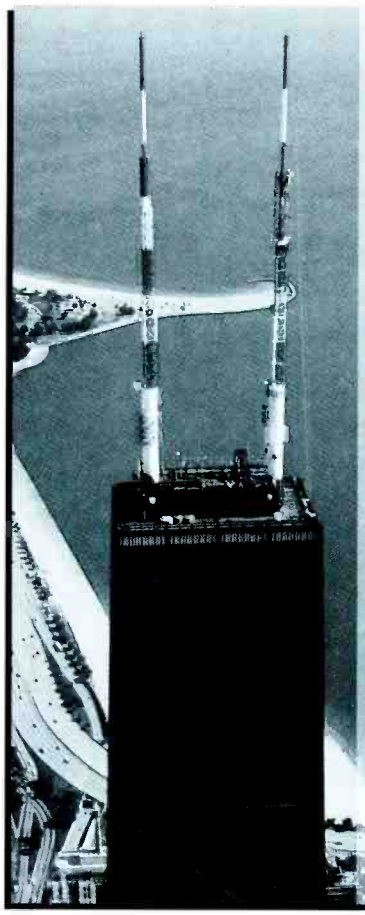

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GPTV goes digital and multichannel

EQUIPMENT

Master control room:
- Chyron Maxine! graphics systems
- Leitch SDV processing equipment
- Philips Saturn master control switchers
- Philips serial digital and analog routing
- Tektronix test and signal monitors

Master control technical core:
- Nvision AES/EBU converters & distribution systems
- Philips Jupiter file server
- Philips Media Pool
- Pinnacle still-store system
- Philips Venus video switching systems

Production control rooms:
- Abekas DVEOUS digital video effects systems
- Chyron MAX! graphics systems
- Enco Systems digital audio storage system
- Philips DD-30, 32-input digital production switchers
- Pinnacle FlashFile Turbo still-store systems
- Zaxcom ARRIA AES digital audio consoles

Post-production technical core:
- Philips digital and analog distribution system
- Nvision AES/EBU converters and distribution system
- Philips DVCPRO tape decks
- Philips serial digital video routing system, AES/EBU switching system and 64-port RS-422 switching system

Electronic graphics:
- Accom RTD 4224 digital disk recorders
- Chyron INFiNiT! graphics system
- Discrete Logic FLINT 4.0 graphics workstation, SGI Indigo2
- Philips DVCPRO tape deck
- Pinnacle FlashGrafix Composer still-store system
- Softimage 3-D compositing and paint system, SGI Indigo2

Audio sweetening/edit rooms:
- Enco Systems Pentium audio workstation
- Philips DVCPRO tape deck
- Studer Dyaxis PostTrio audio console

Teleport system:
- Comtech 3.8m C/Ku downlinks
- Harris transportable satellite uplink units
- Norsat Ku- and C-band LNBs
- Scientific Atlanta Ku-band digital upconverters
- Vertex 4.5m C/Ku-band downlink systems
- Vertex 6.1m Ku-band uplink systems

Radio technical core:
- Enco Systems digital audio network file server
- Nvision digital audio routing
- Nvision AES/EBU digital distribution system, A/D-D/A converters
- Philips VENUS stereo audio switching system

Radio production control:
- Auditronics 900-series audio console
- Enco Systems digital audio delivery system
- Orban DSE7000 digital audio workstation

Radio talk control/news control:
- Enco Systems digital audio delivery system
- Harris DRC-1000 audio console
- Otari DTR-8 RDATs
- Studer D-732 CD players

Radio edit rooms:
- Electro-Voice RE-20 microphone
- Enco Systems digital audio delivery system
- Mackie 12-input audio mixer
- Panasonic RDAT

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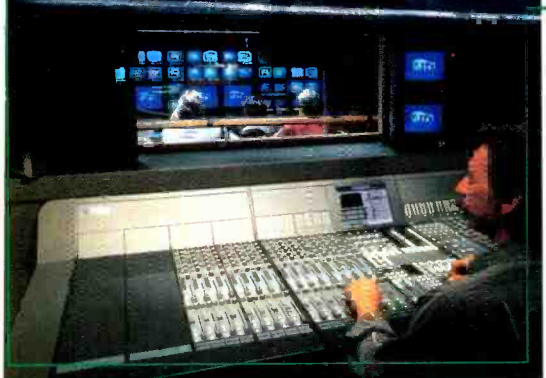
CBS
USA

equipped two new remote units with CS2000 systems to broadcast live sports and entertainment programs.

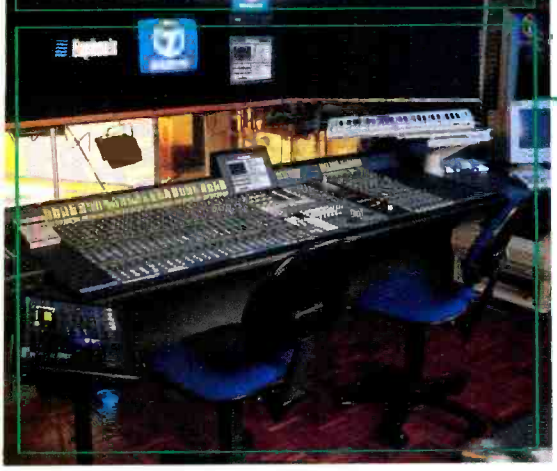


Lin Productions
USA

provide exclusive live remote broadcast for a major league baseball team, and other independent broadcast projects.

CCTV
China

uses Euphonix consoles in five studios across China for music recording and live broadcasting.



Channel 7
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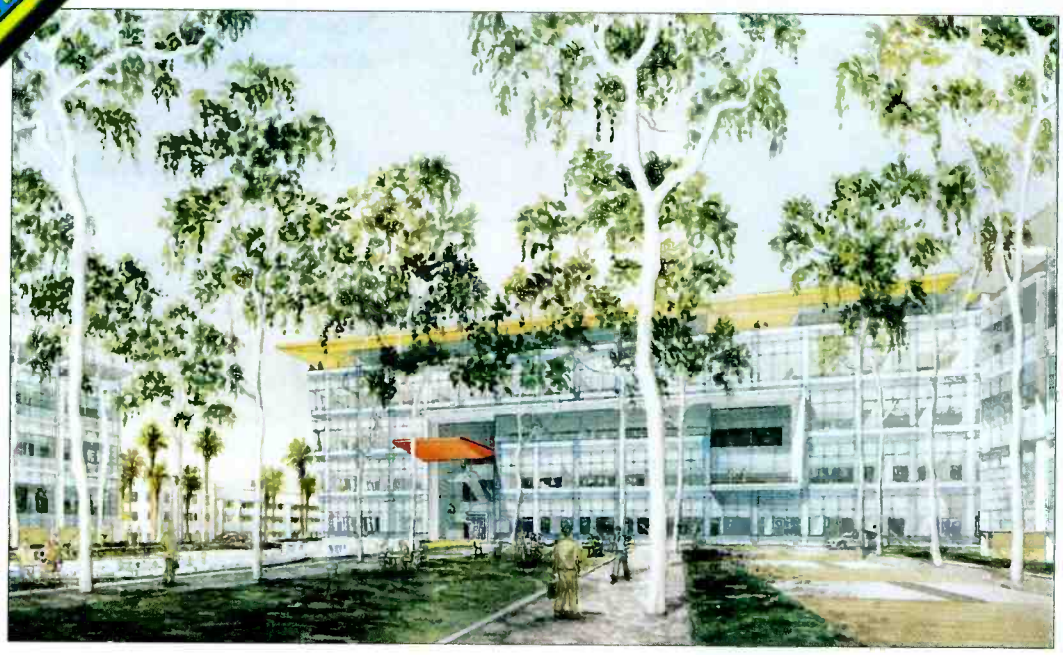
SYSTEMS INTEGRATION



The Fox Broadcasting Center

The Fox Broadcasting Center shows how nothing has to be sacrificed for speed with the right teamwork.

By John Aalto and Jim Schoedler

THE BOTTOM LINE:
Broadcast engineering projects today are designed not so much to last as they are designed to change. Durability is no longer about rigidity and immutability, but about flexibility and adaptability. Next January, when Fox Broadcasting inaugurates its new broadcast operations center, it will be the most advanced facility of its type. It will achieve that distinction by dint of the thought and energy that has gone into its choice of advanced technologies. It will retain that distinction by the force of its vision. $

Fox, in its relatively brief broadcast network history, has changed the face of the industry. It became the fourth network just when everyone said the first three were on the brink of extinction. Now there are six competitive commercial networks. Whenever Rupert Murdoch announces the "next thing Fox will do," the cynics no longer wonder "if" he can do it, but rather "how" he will do it.

From our vantage point, as the broadcast engineering design and integration firm that Fox has selected to work on its new Fox Broadcast Center (FBC), the Fox approach involves a bold vision; a penchant for detail and a deep conviction that the "process" must incorporate the same ideals as the outcome.

The new Fox Broadcast Center is designed to accomplish a number

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The Fox Broadcasting Center

of objectives: to consolidate various Fox operations from around Los Angeles onto the campus of the historic Twentieth Century Fox Studios; to provide facilities for new Fox operations; and to establish a community of enterprises that will enliven and stimulate the fundamental creative energies on which these enterprises depend.

A Fibre Channel core

The FBC will be the first large-scale implementation of Fibre Channel, the high-speed, high-performance interconnect standard backed by an increasing number of manufacturers. The design calls for a distributed architecture of Tektronix PDR-200 digital servers for on-line recording and playback supported by Ampex DST recorders to meet nearline requirements operating over Fibre Channel.

Video, audio, control and communications signals are all encoded into a single data structure with unique frame headers. Each device connected to the system has a Fibre Channel encoder/decoder that can send or receive data. When a particular buffer detects a frame header addressed to it, it then reads the data in the following packet and performs the actions called for. As a result, a great many devices, even ones requiring differing protocols, can be interfaced to the same physical medium whether it's fiber or copper.

Although Fibre Channel is hardware intensive, it greatly simplifies cabling and connector requirements. The use of a consistent encoding technique makes the bandwidth of the medium the only overall limiting factor for the bandwidth of the I/O. These characteristics make Fibre Channel highly adaptable to new technologies.

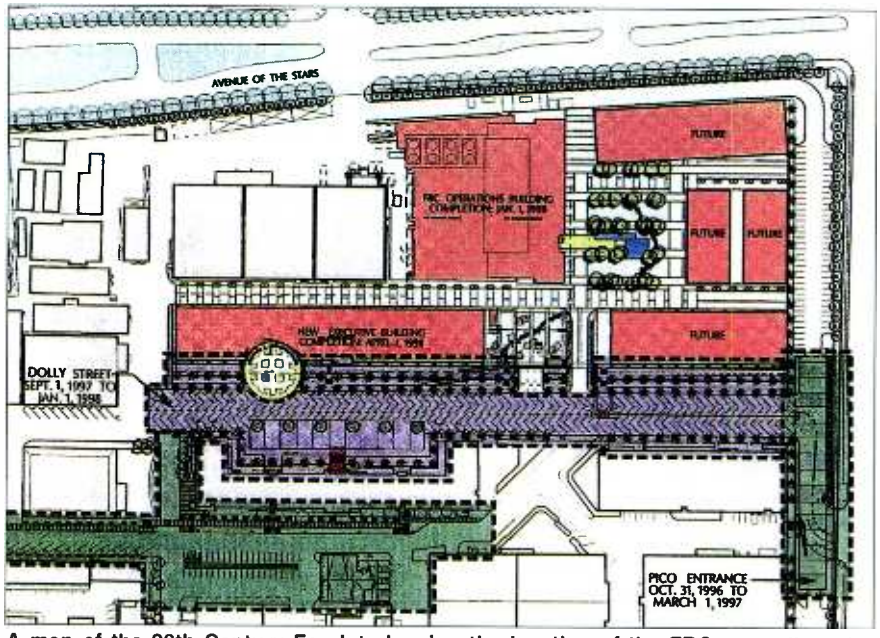
The FBC will initially use 16 to 20 Grass Valley M2100 digital master control switchers. On-air playout from the facility will be under the control of Louth automation using new software modules and techniques.

Logistics management

One of the keys to success in large fast-track projects is getting the long lead time items ordered early and making sure the sufficient quantities of the commodity-type items are on hand when construction begins. With many manufacturers adopting just-in-time manufacturing strategies, ahead-of-time ordering practices are necessary.

One of the first procedures used here is a quantity estimate for the commodity products like jacks, connectors, DAs, DA frames and so on. About the time we have the functional design work done, we start estimating how many of those items will actually be used. Throughout the project, we monitor the inventory and re-order as necessary. These items fall largely into the facility in Glendale, CA. Pre-building is a major opportunity for advancing the schedule. Sometimes, entire systems can be pre-built, tested, disassembled and shipped to the site. In other instances, key equipment or components may not arrive until late in the cycle so only some aspects of the systems, such as racks, jackfields, DAs and frames are built up, tested and shipped to the site for installation.

Cabling at the site begins as soon as it is clean and safe enough to lay cable without worrying about it being damaged by continuing construction work. Next, the pre-built systems are put into place and other installation begins as equipment arrives.



A map of the 20th Century Fox lot showing the location of the FBC, as well as the other buildings that are part of the overall renovation.

"for want of a nail..." category.

At the point that the bill of materials is approved, we start managing the procurement process. In this case, Fox does the purchasing, so we work with them and maintain an up-to-date spreadsheet on items that have been ordered, delivery schedules and progress of the project.

Pre-building and site management

Another key technique employed for the Fox project is pre-building. Because the site is a new building, access to the site for installation of subsystems is not always possible due to ongoing construction. Early on, we identify those systems that we can pre-build — layout, assemble, wire and test — at our

Overseeing the pre-build phase is an installation supervisor and an assistant project manager. As the action moves to the site, a site engineer operates as the representative of engineering and project management, interpreting drawings and operating as the interface to the client, our own installation teams and other project teams.

Testing and cut-over

Testing the installed systems is also an important part of the job. In the FBC case, testing and subcontracting some of the "copper testing" is being handled by another firm. "Copper testing" assures that all the cables have continuity and are terminated correctly.

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MiniDisc

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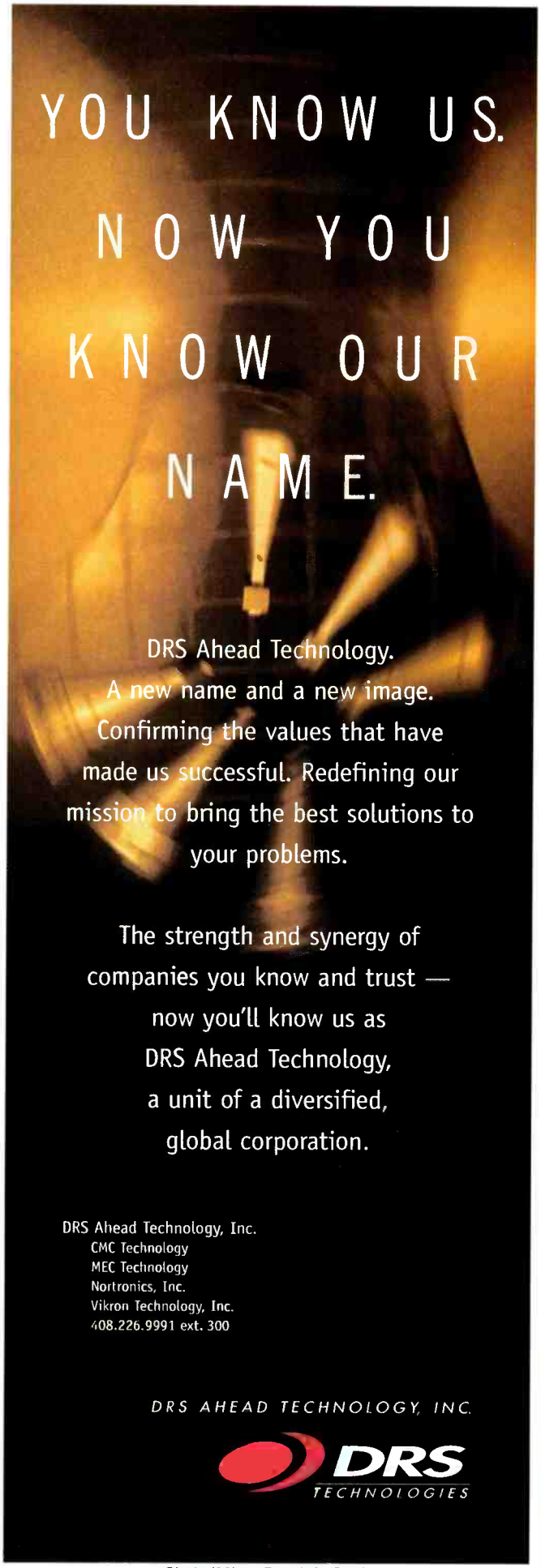

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The Fox Broadcasting Center

Commissioning is another part of the testing process that demonstrates to the client that the system is functioning properly and performing as designed. This is often a shared responsibility with the equipment manufacturer. As the system integrator, we develop a test plan. The plan spells out what is to be tested, how it will be tested, what equipment will be used to perform the tests, what the anticipated results will be and who will participate in the testing.

Once testing is successfully concluded, the client (typically) runs a month-long training and rehearsal period. During this period, Fox will shadow the operations of its existing on-air facilities from the new FBC facility. If all goes well, the actual on-air operations will be cut-over to the new facility in stages. It is anticipated that the first cut-over will be network operations for Prime Time, then children's programming followed by post-production, Sports Net and finally, NFL Sports.

The project scope

By late January 1998, every aspect of the new FBC will be built, tested, tried and operating. The original project was to design some 80 unique technical spaces in an eight-month period and, in an overlapping eight-month period, implement those designs. The FBC will require some 55,000 unique cables. As a point of comparison, a typical TV station might only require 10,000 to 15,000 unique cables.

Despite the fast track and the short time frame, when completed, the Fox Broadcast Center may well be the crowning achievement in a seven-year project to restore the historic Twentieth Century Fox Studios complex in Los Angeles.

The project has already won recognition and praise from local civic and architectural communities. The pre-existing sound stages and other buildings have had their famous stucco facades restored. The new buildings reflect that heritage in varying degrees through the use of stucco, glass and polished steel to echo the modern deco style of the famous Twentieth Century Fox logo. The FBC, with its predominantly glass and polished steel facade and advanced technology contents, demonstrates how technology, art and business can fashion a new era from the past, present and future. ■

John Aalto is vice president and Jim Schoedler is project director with National TeleConsultants, Glendale, CA.

THE DESIGN TEAM

Architect: HLW International, Michael J. White
Systems Integrator: National TeleConsultants; John Aalto, vice president and Jim Schoedler, project director
Key Fox personnel: Andy Setos, senior vice president, broadcast operations; Hal Reynolds, coordinating consultant

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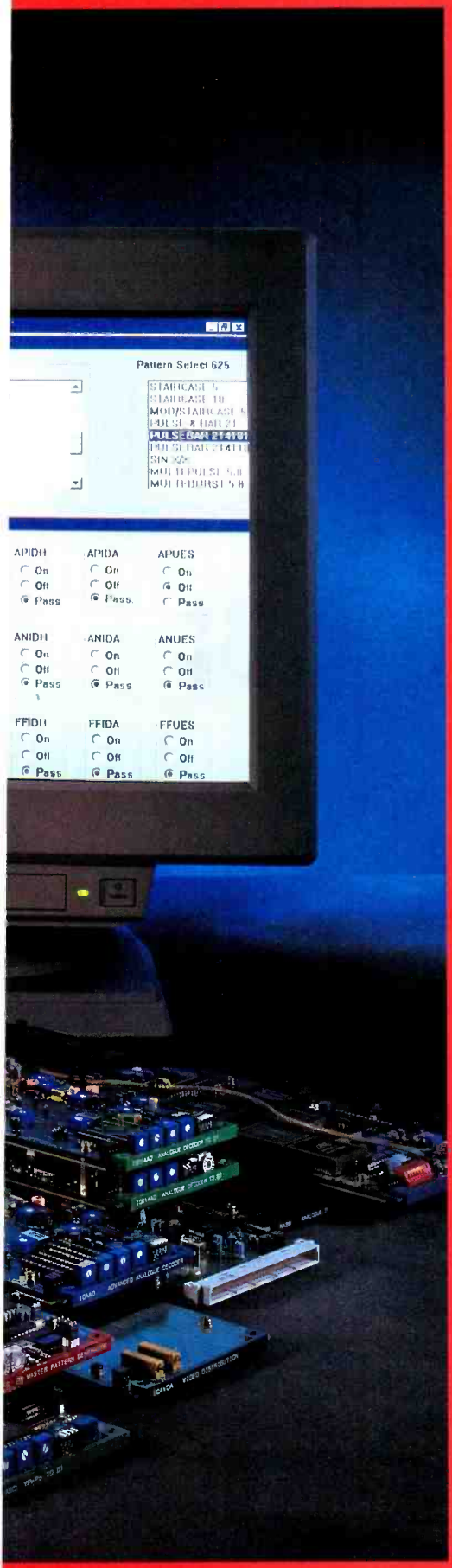

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SYSTEMS INTEGRATION

Digital archives: Speer Communications

Building the world's largest digital vault.

By Al Evans

THE BOTTOM LINE:
As stations face millions in costs to install digital transmission equipment, re-examining how studio operations are handled may be especially timely. Although the current model calls for every TV station to have huge video servers on site, there is an alternative. And, while off-site storage of a station's resources may raise many questions, it also offers as many advantages, not the least of which may be cost savings. $

From the perspective of a station owner, general manager or director of engineering, the 155,000-square-foot Speer WorldWide digital transmission and vaulting facility in Nashville appears to function just like the ideal digital library management system they might install in their own facility sometime in the near future, only much bigger. Operationally, Speer has designed an integrated network of digital and analog transmission systems that deliver content playback to any station just as reliably as if the station had its own equally complex system. The real differences are that the advanced systems required for digital near-line and on-line storage, retrieval, manipulation and transmission are already installed and operating at Speer. The cost of the hardware and software development is on Speer's books instead of the station's, and the top-notch broadcast, digital and software engineering people needed are on someone elses' payroll instead of the station's. And, the

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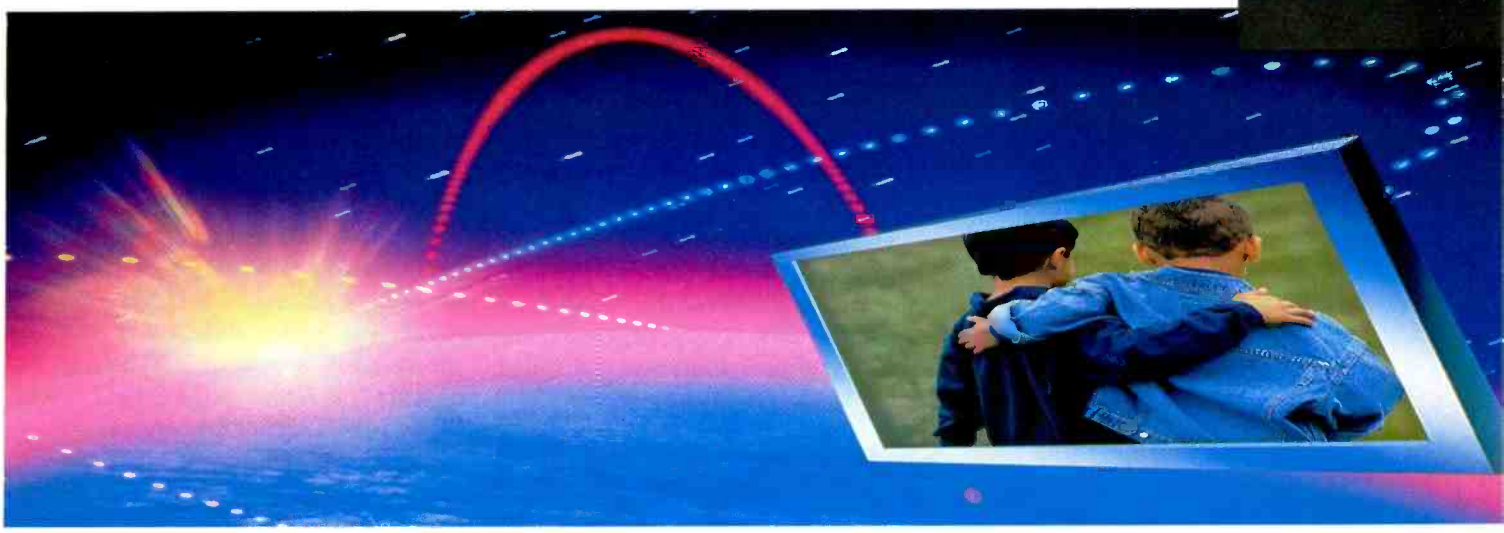
The second in a series of DTV updates from Comark.



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Digital archives: Speer Communications

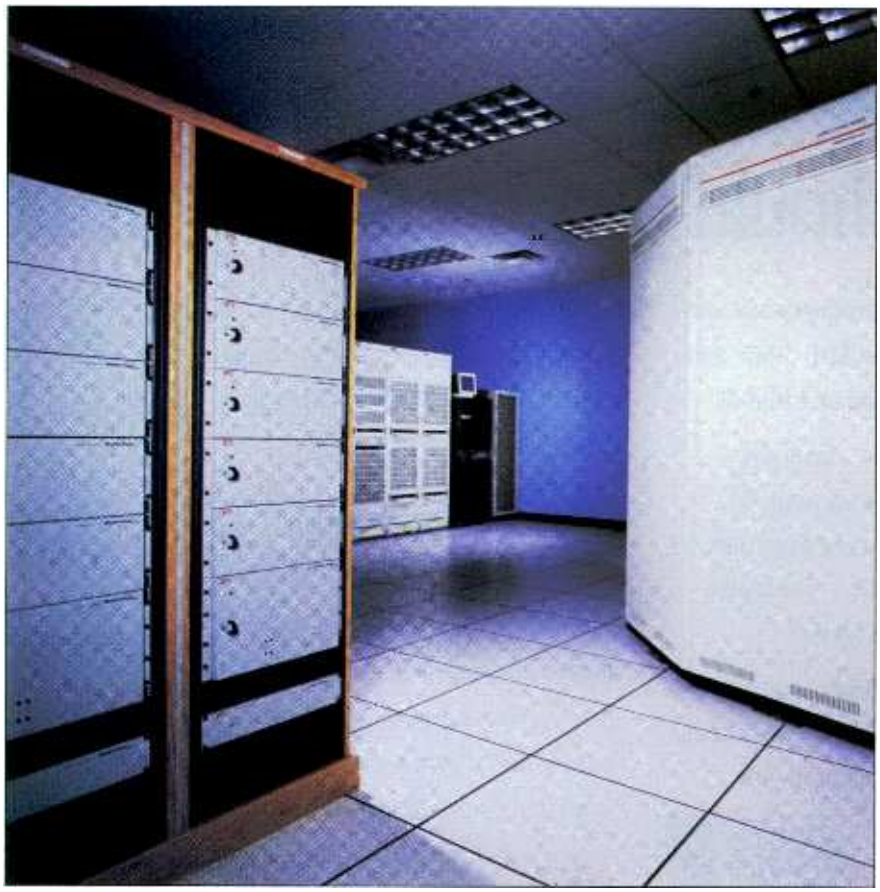
physical facility is, in fact, in Nashville and not down the hall.

It's this last point, the location of the facility (hundreds, maybe thousands, of miles from the local broadcaster's facility) that causes some broadcasters to flinch. But hold on. Digital technology, like any good innovation, offers at least as many solutions as it presents problems. Properly implemented, a digital approach like that used here should actually be more secure and less failure-prone than a locally housed archive. Let's see why.

An advantage of digital is that it's possible to make an exact duplicate of a stored program every time. In fact, as long as the process goes from one digital storage device to another, and stays in the digital domain, every copy ought to be indistinguishable from the original.

Because exact duplicates are possible, one can be stored in Nashville while the other is stored locally, greatly reducing the risk of catastrophe. The exact duplicate of each day's broadcast can be digitally fed to a station in real-time or as a compressed transmission, as close to air time as the local station wants.

The materials sent to the station fit perfectly with the schedule because the station prepares the schedule as normal with the Nashville center acting as a terminal to its own individual traffic system. All of the house IDs and contract information remain intact and controlled by the station.



In the Speer facility, a seven-channel and an eight-channel Media Pool store content required for real-time playback.

Tactically, a station will transfer as much of the long- and short-term inventory as practical to the central storage facility in Nashville. Here it is digitized and stored at a level of security unavailable at the local level. All files are automatically backed up. Extensive automatic fire-protection systems and electronic security measures physically protect the archives. Sophisticated software firewalls and a fingerprint-specific network access key make certain only individuals authorized by the station can access the files through the network.

A huge bit bucket

From the standpoint of archive storage, the local broadcaster gains a number of advantages. First, all the inventory is stored digitally for near-line access on StorageTek Powder Horn media vaults. The facility currently operates two such vaults, each with the capacity to store more than 50,000 hours of Motion-JPEG files at 8:1 compression. Alternate compression levels can be used at the client's discretion.

Digital technology, like any good innovation, offers at least as many solutions as it presents problems.

Anything housed in the vaults is automatically backed-up. The current near-line facility will ultimately house eight vaults, providing more than 200,000 hours of storage. The Powder Horn media vaults record data on 50GB tapes and can play video real-time at compression levels of 4:1 or higher.

The facility is wired for serial digital distribution at data rates sufficient to support component digital video at a CCIR-601-quality level. A Philips wideband serial digital Venus router interconnects all the video and audio devices in the facility. An on-line database keeps track of the current location and characteristics of all stored elements. If a schedule calls for a specific story or commercial, the system determines whether it is already stored on-line or whether a duplicate will have to be made from the distribution master stored in near-line.

The near-line digital vaults are connected through the router to on-line Philips Media Pool video servers and a DEC Alphastudio, which handles the commercial insertions. We are currently operating an eight-channel Media Pool and a seven-channel Me-

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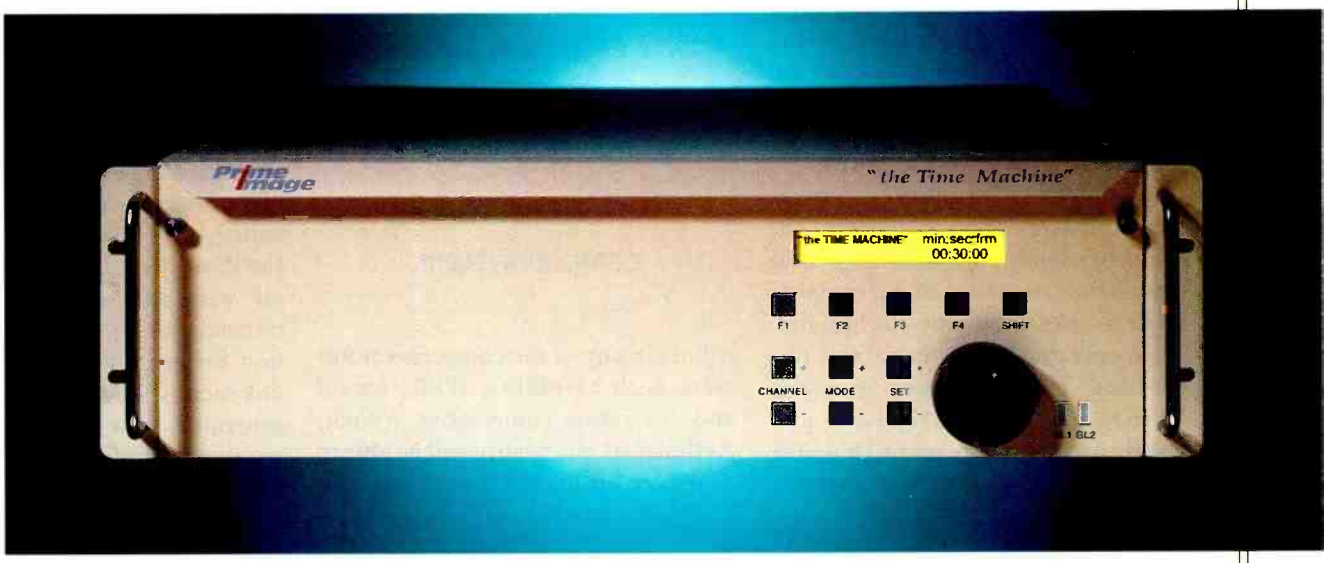

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The Time Machine is capable of changing time without changing the pitch (frequency) of the video or audio programming. The Time Machine consists of a main frame which houses the memory and all of the electronics necessary for control of the video and audio-Time Machine storage. A maximum of 30 seconds of video and two channels of time reduction audio is available.

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Digital archives: Speer Communications

dia Pool. The content required for real-time playback is stored on the Media Pools. Content for transmission is played back from the multichannel Media Pools via a dedicated Philips BTS digital Saturn master control switcher controlled by Philips Alamar automation. The facility has three fully equipped master control positions with provisions for adding several more.

Transmission and redundancy

Two OC-192 fiber gateways provide almost instant access to content. The lower-bandwidth applications can be met through a variety of terrestrial or satellite links. Currently, the Speer facility operates four C-band and two Ku-band uplinks, as well as several TVROs. The site is designed to ultimately accommodate up to 18 uplink antennas. A 474-foot tower supports 39 microwave links.

The facility is already capable of switching between 4:3 and 16:9 aspect ratios. The system is prepared to distribute in any of the compression formats, such as MPEG, JPEG, fractal and any future compression format. As designed, the facility will be able to distribute up to 20 network feeds simultaneously over the air, via satellite or by fiber. Speer Communications is already building a sister facility to the Nashville facility, in Las Vegas and another such installation is on the drawing boards for Europe. Ultimately, each facility will be joined by a global digital satellite network.

> Speer has designed an integrated network of digital and analog transmission systems that deliver content playback to any station just as reliably as if the station had its own equally complex system.

Custom network monitoring software constantly monitors data traffic at local and remote sites, and will automatically initiate the switch to a backup system the moment it detects any trouble. If a station has a local server, it can designate either the local server or the one in Nashville as the primary or backup.

The Speer teleport has access to the entire U.S. domestic and European satellites' arcs. The transmitters operate with one-for-one protection for transmission and one-for-five protection for maintenance. The entire uplink facility is on a UPS, backed up by generators that can meet the power requirements of the facility for up three days without refueling.

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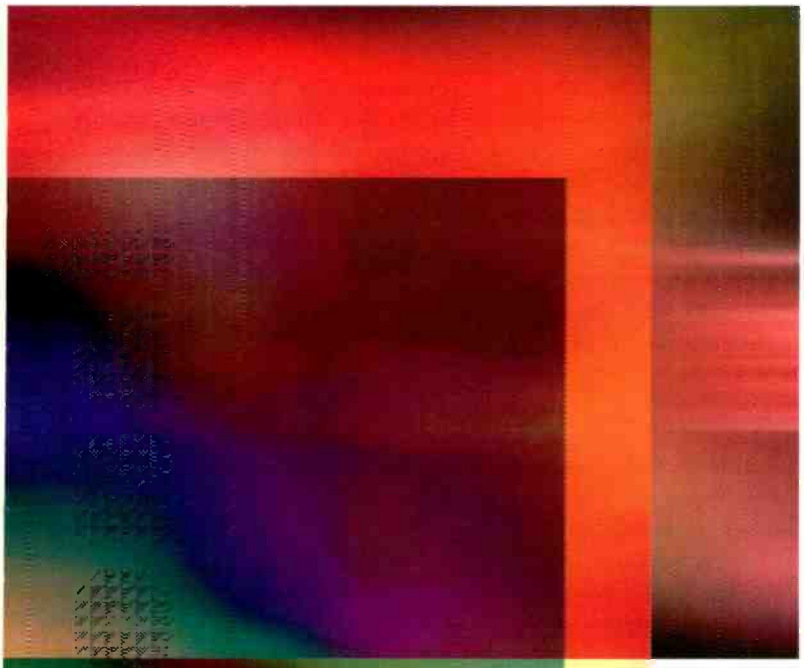

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Digital archives: Speer Communications

Operating options

The facility also runs the complete master control operations for WNAB TV, Nashville, a WB affiliate, and MOR Music Television, a 24-hour satellite programming and Internet transactional service being delivered to about 12 million homes in North and South America. Both are Speer Communications companies. The Media Pool meets the complete playback requirements for these two program streams.

Although both of these organizations rely totally on the system for on-air operations, most remote clients will, initially, continue to rely on their own master control facilities for actual on-air operation. Most stations will use their own local server to buffer the schedule by daypart.

Stations will transfer their archives to the storage system where they will be digitized and stored near-line. Speer's computers will become terminals to the station's traffic system and are compatible with any of the traffic and billing systems commonly in use. As the day's schedule is built, the software will determine the location of the requisitioned media and transfer it as appropriate between near-line and on-line storage.

Once all the appropriate elements are stored on-line, it's ready to be transmitted to the client. How and when it's transmitted is determined largely by the station based on its own technical resources. Transmission can be in digital or analog formats.

Content can be sent to the station in real-time or faster than real-time depending on the type of compression used. Once MPEG-2 compression becomes more popular and stations have MPEG servers, a full-day's content, or even several day's content, could be sent in a matter of a few hours. Compressed transmission would allow a station to take advantage of the overnight period when satellite rates are lowest. And, of course, as long as the station is operating its own server, only new elements need be transmitted.

On the other hand, if a station does not have a server, and needs to play back its schedule in serial form for significant blocks of time, the system can stream back those dayparts ready to air, complete with local commercials and network breaks. The station only needs to handle its local news and network rejoins.

Asset management

The Speer facility is fully integrated with the Philips Venus routing system with the co-located resources of Speer Professional Video Services International (SPVSI). The Media Pool multichannel video servers make any archive potentially available in real-time to any of the production and post-production resources of SPVSI. Discreet Logic's Flint, running on a Silicon Graphics Indigo2 system, provides users with a powerful range of tools for buffing and updating the look of archives and incorporating them with new elements using the powerful compositing software.

> In reality, stations and even large content owners like studios and syndicated program distributors, are not likely to begin by converting all of their existing archives to digital storage.

Post-production resources include CMX Aegis editing, as well as Avid off-line editing and the Zaxcom DMX-1000 digital audio mixer. Production control rooms include Abekas A-83, 32-input digital switchers and A-57 digital effects with Super Warp and the Video Combiner, Chyron MAX graphics and a Pinnacle Flashfile still-store. Audio production is supported by a Wheatstone TV-600 audio production console. The production control rooms command any of the four studios, which are equipped with the latest lighting equipment and Philips BTS LDK-10P CCD cameras mounted on TSM robotic bases.

An open systems approach

In reality, stations and even large content owners like studios and syndicated program distributors, are not likely to begin by converting all of their existing archives to digital storage. Indeed, most content will move to digital as it's called for by current program needs. Over time, however, more and more of these resources will be converted to digital, and in a sort of natural selection, the most valuable and most frequently used assets will be converted first.

Once digital TV broadcasting is fully implemented, however, new content will be digital from the beginning, so digital archives will build quickly. This means broadcasters must begin dealing with the issues of how they will store and manage these future assets, as well. Speer has adopted an open architecture approach so that clients are free to choose whatever hardware they want and update it as warranted without worrying about incurring unexpected archive storage or retrieval costs due to obsolete or proprietary technology.

At a time when broadcasters are faced with potentially huge investments in digital transmission equipment, it seems a natural evolution to seek some way to use the same technology to restructure the business and strike a new posture. The traditional notion that each and every station needs to have a self-contained storage system that seals all activities in a closed environment needs to be re-examined. Success for broadcasters in the age of DTV will depend on what new content, new viewer services and expanded news operations they can handle, not on what they spend for vast new digital archive and playback infrastructures, which viewers will never see and never care about. ■

Al Evans is executive vice president, chief operating officer and chief technology officer of Speer WorldWide Inc.

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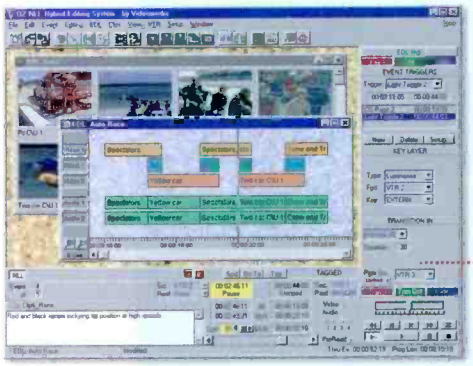
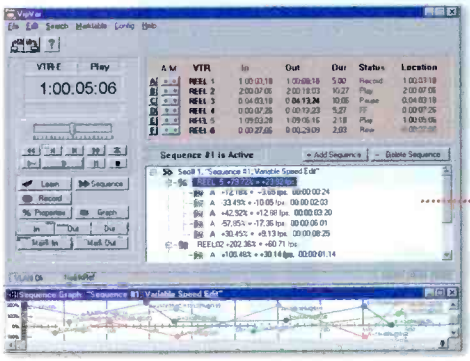
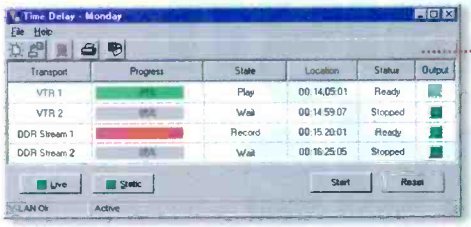


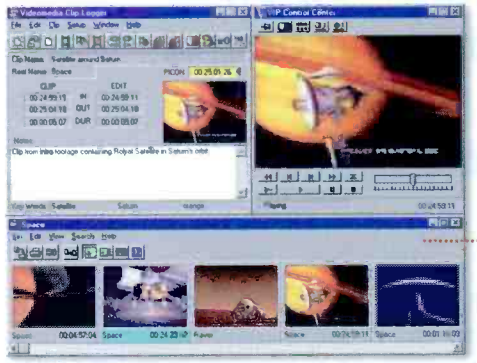
Nonlinear/Linear Video Editing



Variable Speed Control



Network Delay



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SYSTEMS INTEGRATION

The how-to in facility design and upgrade

The clock is ticking and the countdown is on to make sure your facilities can handle your operating needs now and in the future.

By Kenric B. Stone

THE BOTTOM LINE:

Now is the time to evaluate the impact of upcoming changes in technology on your facilities. Many stations will require some modification or upgrade to electrical, mechanical or auxiliary support systems. Advance planning will help head off a crisis or support-system failure, and will save significant dollars in the long run. If your facility is more than 30 years old, your support systems may be beyond their useful life. DTV brings a new thought process to planning a facility; the picture is larger with different ratios and the studios and control rooms will also need to be larger. The industry is undergoing significant change, and chances are your facilities will need to change as well. $

For the first time since the advent of color broadcasting nearly 40 years ago, TV stations must evaluate how well their facilities will be able to support a major change in technology — in this case, the transition to digital technology. Whether your station will require renovation, expansion or the construction of a new facility, the planning issues will be similar. Following are the key planning steps for a successful project.

Photo: A leading network incorporates advanced technology imagery into the design of its broadcast facility. (Munhwa Broadcasting Corporation, Seoul, South Korea.)

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The how-to in facility design and upgrade

Site planning is an important part of the overall facility design, especially when new facilities are added to an existing site. (WSB-TV Channel 2, Cox Broadcasting, Atlanta.)

Define operating requirements and review operating philosophy

The first step is to define your station's operational requirements and the operating revenues that will be required to support the capital investment.

Operating philosophies are unique to individual stations. You and your architect/planning team need to discuss your station's operating philosophy and long-range goals with respect to changes in technology and equipment.

This first step in the planning process allows you to assess the relationship between operating philosophy and facility requirements, separating the wants from the needs and establishing priorities.

Set a budget and timetable

Budget is one of the most important criteria in defining the scope of the project. If the budget is understood by everyone from the outset of the planning effort, decisions can be made and direction set in balance with the budget. The planning team needs to know your scheduling requirements from the beginning because this will affect the range of alternatives that can be considered. A new facility on a grass-roots site often requires approval through a lengthy community planning process that may also affect the project schedule.

Define technical equipment and systems requirements

An analysis of technical equipment and systems needs to be conducted concurrently with the preparation of an architectural program. Because technical equipment and systems form the core of the operations, their requirements establish the basis for the overall building plan. An overall master plan for technical equipment and systems must be developed that reflects your strategy. It should address the impact of second-channel digital, as well as the requirements of your planned technology infrastructure.

Once you have established a technology master plan, then equipment and systems that can be reused (at least temporarily) can be identified. The plan can then identify new equipment requirements.

Develop a facility requirements program

A broadcast facility is one of the most complex facilities to plan and design. There is no single facility layout or plan that will work equally well for every station. The best plan is one developed

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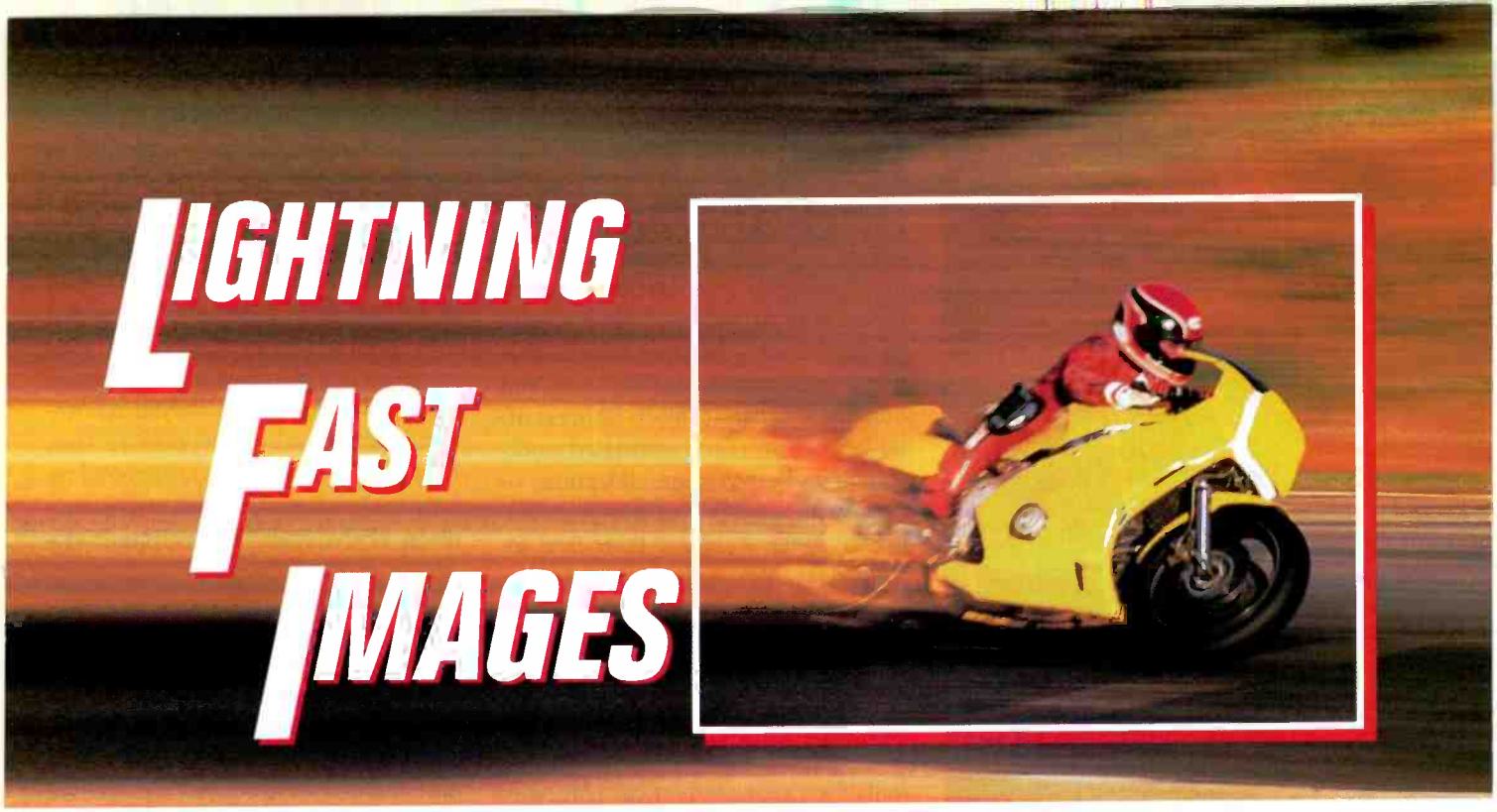

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The how-to in facility design and upgrade

in response to your station's specific needs. This process begins with a facility requirements program, which documents your current staffing levels and building areas and projects future staffing requirements and associated workstation and office space allocations — usually at move-in and five years following move-in. It also takes into account near-term and long-term requirements for technical operations, production and other support spaces.

Adjacency planning

Identifying required space and necessary equipment is just part of the formula for a successful facility plan; success comes with getting it all in the right place. This is where understanding your station's operating objectives comes in. It's beneficial to have an architect/planner who understands the broadcast business and the impact that coming technologies will have on all aspects of your operation.

Adjacency requirements need to be defined for each of the three main components of the facility — technical, production and administrative. Next, a layout needs to be prepared that accommodates these requirements, as well as adjacency requirements for the individual functional areas within each of these main components. Good adjacency planning results in optimum operating efficiencies, ease in expansion and in many cases, smaller and less costly facilities.

The probable life span of a new facility or a major renovation is about 30 years. Planning must provide the flexibility to accommodate future technical requirements, as well as internal growth.

Don't underestimate building-support systems requirements

The transition to digital technology brings equipment that is compact, lighter, uses less power and produces less heat than ever before; however, the reality is that more and more technical equipment is needed to provide the capabilities required to respond to increasingly complex presentation formats. These high-density installations require building systems that deliver enhanced power and cooling.

Many stations are operating in facilities that are at least 30 years old. At that age, electrical and HVAC systems are at or beyond their useful life. Those that have been upgraded or replaced were probably not planned to accommodate today's demands. In planning renovations, expansions or new construction, many factors need to be considered related to electrical, communications, auxiliary, HVAC and fire protection systems.

Electrical: If your service entrance and distribution systems are more than 10 years old, plan on major upgrades. Remember, that one of the least-expensive aspects of an electrical system is capacity. In designing main switch gear and distribution systems, provide excess capacity over your present or calculated move-in load. Make sure provisions are made to easily expand the main switch gear. This includes physical space, the means to bring the gear in, and the ability to get it in operation with minimum downtime or service interruption.

New equipment using switching-power supply technology can create excessive currents through the building feeder neutrals that can be dangerous to the building electrical infrastructure. In order to safely and effectively operate this equipment, a new breed of electrical service system (panel boards, transformers, switch gear, etc.) must be designed and installed. Special isolation transformers in the technical core can have a significant impact on structural and space requirements. This can be particularly challenging in existing facilities that are being renovated or expanded. Your architect/engineer will need to assess the capability of your facility to accept this equipment.

Make sure that critical systems are redundant, but design for redundancy in all systems wherever possible. Many times, this can be accomplished without adding much cost. Have your architect/engineer run the numbers and you will be surprised at how inexpensive redundancy is, especially in new facilities. Carefully evaluate requirements for standby power and uninterruptible power supply (UPS) systems.

In technical areas, correctly designed

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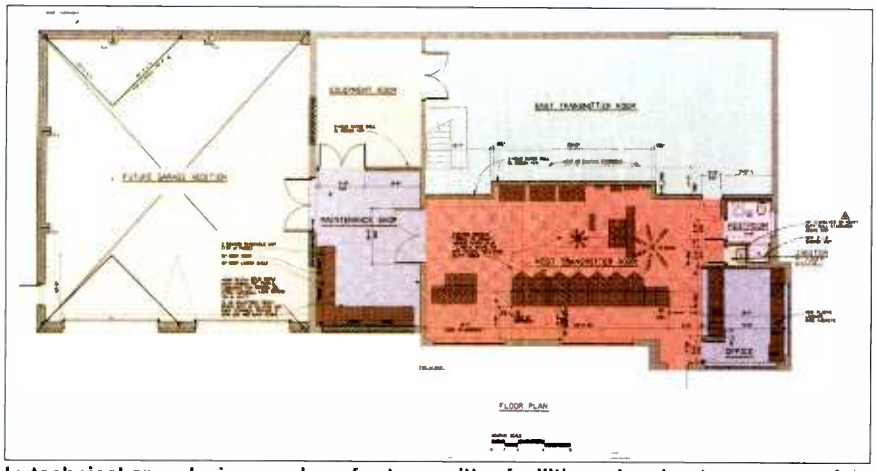
The how-to in facility design and upgrade

grounding and bonding systems are essential to reliable operations, especially in locations prone to electrical storms.

Communications: Communications is the backbone of the station. This includes satellite, microwave, fiber, cable and telecommunications systems. Most existing operations are overrun with wiring and cable. Develop a cable management plan. In renovation and expansion projects, plans need to be developed to allow interfacing between new and old systems. Never underestimate the requirement for cable trays and management systems. Plan for space to install new cabling while keeping the old cabling in place.

Auxiliary: Auxiliary systems include video distribution, fire alarm, security systems, technical clock systems, broadcast panels, intercom and IFB. At a minimum, put in conduit to accommodate future installations. Adding these systems later, without conduit in place, can be a costly and challenging undertaking.



In technical area design, such as for transmitter facilities, planning to accommodate additional and/or replacement equipment is required. (WTHR Channel 13, Dispatch Broadcast Group, Indianapolis.)

HVAC: Like electrical, if your HVAC systems are at least 10 years old, anticipate major work. If they are direct-expansion type, they probably already require a lot of service and are at the end of their useful life. If they are chilled-water-based, you are in better shape, unless they are more than 20 years old. In either case, remember that use of freon refrigerant is being phased out. The cost to modify older systems to use ozone-friendly refrigerant may make replacement a more reasonable option, especially when the lower operating costs of new energy-efficient systems are also considered.

In planning new systems or upgrades, calculate loads and include provisions for added capacity. Consider installing redundant or backup systems to serve strategic areas. If your cooling demand is large enough, chilled-water-based systems provide flexibility in expansion, respond easily to load diversity and are significantly more economical in operation; however, the initial cost is higher. Systems must be specified to maintain humidity control, provide good filtration and operate within desired noise levels, especially in studios.

Fire protection: Fire protection systems are a necessary evil. Designed primarily to protect the structure in the event of a fire, they can be devastating to equipment. Use dry-type or pre-action-type systems in technical areas whenever possible. The cost will be slightly higher, but you will feel more secure. Although halon fire suppressions are no longer available, there are new, but more expensive, substitute products. Using sprinklers in a dry-type or pre-action-type system should meet your requirements most of the time.

Structural design considerations

Equipment loading is an important design consideration. Make sure that your facility planner and structural engineer understand the loads that you

Continued on page 129

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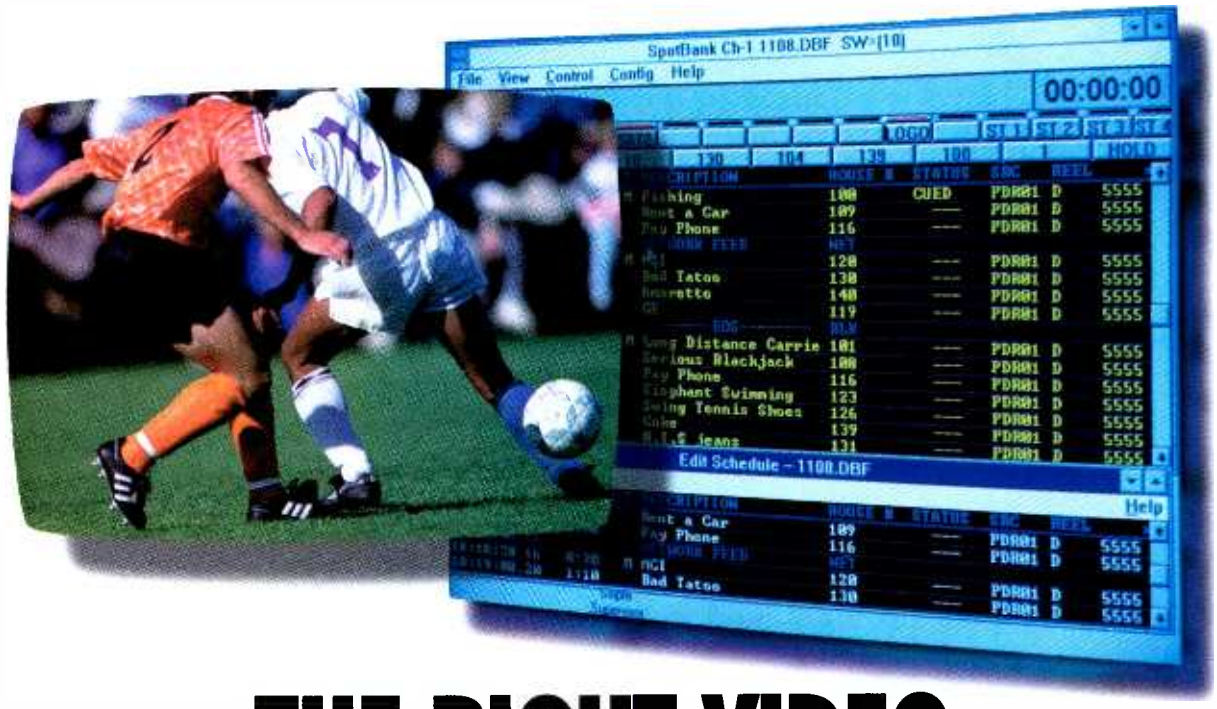

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SYSTEMS INTEGRATION

Videotape RECORDERS

Videotape recording is not dead, nor does it sleep.

By Kenneth Hunold

THE BOTTOM LINE:
In the rush toward the perceived "holy grail" of non-linear editing and video servers, you must not lose sight of the needs and realities of today's broadcasters. The last three NAB conventions have heard the proclamation "Tape is dead." However, during those same three NABs more than half a dozen new tape formats were introduced. Although reasonable people continue to disagree over the future of video recording, nearly everyone agrees it will be digital. $

For broadcasters, videotape is the most economical method of storing long-form programming. Even with the multitude of videotape formats in use today, tape is still the most common interchange format for the distribution of programming. Tape also offers an attractive means of archiving programs and commercials, with the lowest cost per unit of measure (hours, megabits, square foot, etc.) of any storage method. Lest you believe that this article will be completely anti-server, rest assured, it is not. Video server systems are ideal for multichannel systems, frequent playout of commercials and interstitial segments, program delay and editing. Hybrid tape-disk systems are popular today, and represent an appropriate use of both technologies.

Digital recording

The first commercially successful digital VTR was standardized by SMPTE as D-1. Strictly speaking, D-1 refers to the digital tape format (i.e., physical dimensions, track layout, channel coding, etc.) Unfortunately, the term is also commonly, although incorrectly, used to describe the type of digital video signal that the recorder processes. A D-1 recorder processes digital component video. This is a signal where the components, luma (Y), and the two color-difference components, red minus luma (R-Y) and blue minus luma (B-Y), are individually digitized.

Digitizing refers to the sampling and quantizing of the video (or audio) signal. The video signal is sampled according to the ITU-R (formerly CCIR) Recommendation 601 that specifies, among many other things, that the luma signal should be sampled at 13.5MHz, and the color-difference signals should be sampled at 6.75MHz.

Photo: Sony's HDW-500 is part of its HDCAM format, which offers high-definition video and audio recording on a ½-inch cassette.

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Chroma signals are sampled at half the luma sample rate because the human visual system cannot discriminate color changes as well as it can changes in brightness. ITU-R Rec. 601 has also been called 4:2:2 sampling. This notation dates to when multiples of the color subcarrier were being suggested as sampling rates. As such, 525-line systems would use 14.3MHz as the luma sample rate (four times 3.58) and 625-line systems would use 17.7MHz (four times 4.43). Thankfully, the CCIR recommended an international sampling rate of 13.5MHz for both systems, but the 4:2:2 nomenclature lives on.

Digital-S, from JVC, is the only format currently in production that is based on the DV consumer format and using 4:2:2 sampling methods.

In D-1 VTRs, video is sampled according to ITU-R Rec. 601, and then quantized to eight-bit values. Error correcting codes are inserted to detect and correct recording and playback data errors, and the data is recorded onto 19mm (3/4-inch) oxide tape. Four digital audio channels are included, which are sampled at 48kHz and quantized to 16 bits. Separate cue audio, time-code and control tracks are also included.

The second digital recording format standardized by SMPTE was a composite digital format and designated, appropriately, D-2. Again, the D-2 designation refers to the tape format and not the video signal format. The unique part of the composite digital signal is that the entire composite signal is sampled, including sync, color subcarrier and color burst. The NTSC signal is sampled at four times the color subcarrier frequency or 14.3MHz and the samples are quantized to eight-bit values. Four digital audio channels are included, with analog audio sampled at 48kHz and quantized to 20 bits.

The next two digital formats were D-3 and D-5. D-4 was omitted, most likely because the number four is considered unlucky in Japan. D-3 and D-5 are 1/2-inch tape formats. The smaller tape size and associated transport allowed for digital camcorder development. D-3 is a composite digital format sampled at 4fsc and quantized to eight-bit values, four digital audio channels are included. D-5 is a component digital format with video sampling per ITU-R Rec. 601. A unique feature of the D-5 format is that it allows video samples to be quantized to 10-bit values.

D-3 and D-5 VTRs allow for some limited compatibility between formats. With the proper options, a D-5 VTR can play back a D-3 format tape and could

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Videotape recorders

provide either a composite or component digital signal. A D-3 VTR cannot, however, play back D-5 format tape. This "backward compatibility" concept has been applied by many other manufacturers to various product lines.

Compressed digital videotape formats

For this category, we will ignore the fact that NTSC encoding is actually a type of compression. Many of the new tape formats that have been introduced in recent years use data compression or

Panasonic is adapting its high-end D-5 recorder for use in HD applications. The AJ-D2000 recorder uses 4:1 intraframe compression for eight- or 10-bit HD digital recording on 1/2-inch metal particle tape.

bit-rate reduction. Digital Betacam uses a DCT-based compression algorithm with a compression rate of approximately 2:1, allowing 10-bit component digital signals to be recorded on 1/2-inch metal particle tape. Four audio channels are included. Both camcorders and stand-alone portable recorders are available. A properly optioned Digital Betacam can play back Betacam-format tapes. These digital VTRs cannot, however make analog recordings.

The consumer video industry recently agreed on a digital home VCR standard. Originally known as DVC, this 6mm (1/4-inch) tape format has been renamed DV. The reason we will discuss a consumer format here is that DV forms the base for several professional extensions made by the broadcast manufacturers. Also, who can say that consumer video will never be used at their station?

The DV format accomplishes an initial data reduction by subsampling the two color-difference components (R-Y and B-Y) at one-quarter the luma rate. This type of sampling has been dubbed 4:1:1 sampling as 13.5MHz is still used for luma sampling. This 4:1:1 subsampled video is quantized to eight bits per sample and applied to an intraframe compression system. Intraframe means that all the compression is based on the current frame, as if it were a still image. Treating each frame as a unit simplifies the editing process. The subsampled video data is compressed approximately 5:1 to a data rate of about 25Mb/s.

The consumer DV format allows for either two channels of audio sampled at 48kHz and quantized to 16 bits or four channels sampled at 32kHz and quantized to 12 bits. The consumer format can record 60 minutes of video and audio on a tape much smaller than an audio cassette. The tiny size of the tape and transport allows for a complete camcorder with dimensions only slightly larger than a standard VHS cassette. Even the most finicky chief engineer or director would be impressed by the video quality of this system.

As mentioned, several products have been developed that offer enhancements and/or modifications to the consumer DV format. The DVCPRO format increases the distance between the helical tracks and adds an analog control track to increase the durability and reduce editing lock-up time of the system. To do this, and also to add an analog cue track, requires the use of metal particle tape instead of the metal evaporated tape used in the consumer format. Because of the increased track pitch, the tape speed is almost doubled. A larger cassette is used to increase play time. Consumer DV recordings can be played back using a mechanical adapter (similar to the type used to play VHS-C tapes in standard VHS players).

The DVCPRO format is currently being considered for standardization by SMPTE as D-7. At NAB, a new 50Mb/s version of DVCPRO was announced that uses 4:2:2 sampling and increases the number of audio channels to four.

Another professional extension to the DV format is DVCAM. The track pitch (distance between tracks) is increased, but metal evaporated tape is retained from the consumer format. This means there is no separate control track or cue track. Time-code information is extracted from the insert and track information (ITI) portions of the track, which is common to all DV formats. Camcorders and dockable VTRs are being developed , in addition to desktop and rack-mount editing VCRs. 4:1:1 sampled eight-bit video with two- or four-channel audio is available.

Although not technically an enhancement of the consumer DV format, Digital-S does use the DV compression algorithm. The video is sampled according to ITU-R Rec. 601 (full 4:2:2 sampling) and is less compressed than the other DV extensions (approximately 3.3:1), resulting in a higher data rate (about 50Mb/s). Digital-S uses 1/2-inch metal particle tape in a shell similar to S-VHS. This allows a control track and cue audio track to be added to aid in editing. Even though the Digital-S format includes space for four audio tracks,

This D-6 recorder from Philips offers uncompressed high-definition recording on a D-1-sized cassette.

current machines only use two. At NAB, it was announced that new machines will allow access to all four audio channels. Digital-S is currently being considered for standardization by SMPTE as D-9.

Along with Digital Betacam, another compressed digital VTR format for the Beta family is called Betacam SX. This format uses a higher compression ratio (lower data rate) than the Digital Betacam line, and is unique in that it uses

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MPEG-2 compression.

Although a thorough discussion of MPEG (Moving Picture Experts Group) compression is beyond the scope of this article, this brief explanation should be helpful. MPEG is often described as a "tool kit" with many choices of algorithm "profiles" and resolution "levels." Betacam SX uses the "4:2:2" profile and "main" level. The 4:2:2 profile retains the full chroma resolution of the ITU-R 601 recommendation and applies DCT-based compression to the data samples.

The resultant video data rate is about 18Mb/s. MPEG describes three picture frame types — I, P and B — that are used to increase compression efficiency. I frames are intrafield compressed frames (as in the DV standard), P frames are predicted frames that compare the data in the current frame with the data in the previous frame and B frames are predicted frames that compare the data in the current frame with the data in the frame before and the frame after. Betacam SX uses an I, B, I, B,... frame structure to make the B frames easier to decode and thereby make the video easier to edit.

Current SX products feature four 16-bit audio channels and record on 1/2-inch metal particle tape. Time-code, analog cue and control tracks are also provided. One SX product is a hybrid recorder that combines a tape and disk drive into a single unit. Tape data can be transferred to the internal disk drive where non-linear-style editing can be performed. Once edited, the information can be played back from the disk or dubbed back to tape for later playback or archive.

The future

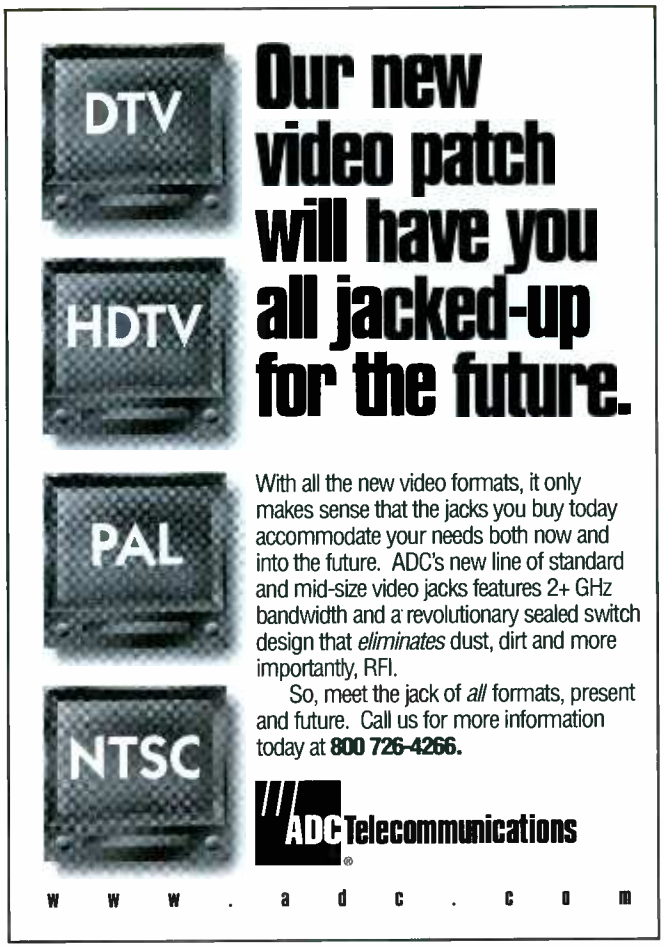
High-definition television will require a new generation of recording and/or compression technologies to store the increased amounts of video and audio data.

The first digital VTR capable of recording full-bandwidth, uncompressed HDTV was the Sony HDD-1000, an open-reel recorder that used one-inch tape (similar to the one-inch C format recorder). The data rate is approximately 1.2Gb/s. A frame of video is recorded over many adjacent tracks, and tape speed is just over 30 inches/sec. It can also record eight digital audio channels and an analog cue track.

Another full bit-rate HDTV recorder is available, and has been standardized by SMPTE as D-6. D-6 is a cassette-based VTR using 19mm (3/4-inch) metal particle tape, similar in size to D-1. Significant features of this format include multiple standard HD recording, 1,125/60 and 1,250/50 (Europe), and the ability to handle 1,080 active lines.

HDCAM has been developed to support a new HDTV camcorder. The camcorder and the companion editing recorder/player use a combination of subsampling and compression to allow HDTV recording on 1/2-inch metal particle tape. In the camcorder, the data coming from the camera is arranged in a 1,920-pixel by 1,035-line array structure. The VTR sub samples this video to 1,440 samples per line. This 1,920:1,440 (4:3) subsampling can be represented by changing the familiar 4:2:2 shorthand to 3:1:1. This subsampled video can be compressed to fit on a 1/2-inch videotape. Even though the camcorder and VTR are based on the Digital

Continued on page 128



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SYSTEMS INTEGRATION

Selecting an AUDIO CONSOLE

Digital or analog? The decision is getting harder.

By Skip Pizzi, technical editor

THE BOTTOM LINE:
New offerings at new price points are making digital audio mixers more attractive. This competition has moved analog mixer manufacturers to improve their products' quality, flexibility and cost-effectiveness, along with the addition of digital control on some designs. Selecting a mixer has, thereby, become a more complex process than ever, requiring precise understanding of mixer features and application needs. $

As digital evolution has progressed in the broadcast and post-production industries, the mixing console has represented analog audio's last stand. Recently, however, digital mixers have made significant inroads at both ends of the pricing spectrum.

At the high end, pioneers in this area like Sony and AMS Neve continue to excel with their post- and music-production digital boards, joined by more broadcast-specific products from Graham-Patten Systems, Studer, Zaxcom and more recently, Calrec. At more modest price points, Yamaha is moving into its third generation of digital mixing, with new competition coming from Mackie Designs.

A number of digital audio mixers primarily targeted toward the radio industry may also be useful for some production or on-air applications in television. These include products from Wheatstone, Auditronics, Pacific Research & Engineering, Logitek and Fidelipac.

Overall, the middle class of audio mixers for television seems to remain a safe haven for analog technology, but many of the more sophisticated units in this area have already succumbed to the lure of digital in their *control* circuitry. The hybrid that results is a *digitally controlled analog* (DCA) console, the style currently preferred by such manufacturers as Euphonix and Solid State Logic, joined by other offerings from some of the fully digital mixer manufacturers mentioned earlier.

Meanwhile, the inroads made by digital and DCA mixers have caused analog mixer manufacturers like Otari, Soundcraft, Ward-Beck Systems, TASCAM and

Photo: This post room at Novastar Digital Sound Services in Los Angeles offers surround mixing on two Yamaha 02R digital mixers.

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Panasonic/Ramsa to press their product lines toward better quality and value. As a result, many new products offer extremely low cost and high specs.

Integration

For studio applications, an important new trend in digital mixing hardware is its incorporation with storage systems. A number of high-end digital audio workstations (DAWs) — such as those from Solid State Logic, Studer Editech and AMS Neve — include fully digital mixers in hardware form as an integral (or, in some cases, optional) part of their audio storage, editing and production architectures.

This movement also has a low-end component, populated by companies like J.L. Cooper and more recently, Mackie Designs, that supplies hardware peripherals for use as mixing control surfaces with various DAW software systems. A few lower-priced DAWs using dedicated (i.e., non-PC or Mac-based) platforms also include integrated or optional digital mixing hardware, such as those from Roland.

Of course, in the workstation world, the option exists to forego the audio mixer and produce a finished mix entirely on the screen using the DAW software's "virtual" mixing desk (or "cartoon console"). Yet, while most users are happy to replace the physical vestiges of audio *editing* — like tape and razor blades — with their virtual counterparts in the DAW, many still prefer a tactile hardware approach when it comes to *mixing* on workstations.

The reasons behind this are made abundantly clear the first time anyone tries to do a simple crossfade (let alone a complex, real-time, multifader mix) using a virtual mixing process: How many controls can you manipulate at once using a mouse, touchscreen or QWERTY keyboard? Generally, only one, making even that simple crossfade a non-real-time or two-step process (or perhaps a selection from a set of pre-set crossfades from a menu, in which none may be exactly right for the current need). The limit to control manipulation with a "real" mixer is typically set by the number of faders or fingers, whichever is fewer — a far more powerful and ergonomic arrangement.

Benefits of digital mixing

It is well-known that digital audio technology has had more to offer to storage and transmission systems than to routing and mixing systems. In the last few years, however, 20-bit analog-to-digital converters have become commonplace, with 24-bit conversion on the horizon. Digital signal processing (DSP) power has also increased, such that adequate manipulation of these higher-resolution audio samples is now possible, as well — typically with 32-bit DSP. These developments have metamorphosed digital audio mixers from the exotic to the mainstream.

At La Chapelle studios in Belgium, a Euphonix CS2000 provides digital control of analog audio signals.

Note that these higher processing resolutions are required so that operations can be performed on audio samples of a given resolution without loss of those samples' resolution in the process. For example, a 20dB attenuation applied to a 16-bit input sample will produce an output sample of less than 16-bit resolution unless the operation is undertaken in a processing domain of greater-than-16-bit resolution. This was the primary source of weakness in earlier generations of digital consoles. They were largely unsuccessful as products because they cost more than their analog counterparts and exhibited more noise and distortion due to the loss of resolution in the digital signals passing through them.

Today's higher-resolution processors have essentially solved the dynamic range problem, although a cost increment above analog equivalents remains for some digital mixers. Yet, the sonic qualities of today's best digital mixers still do not exceed state-of-the-art analog consoles. Instead, the real attraction of a digital console is its elimination of the "analog island" that a traditional mixer represents in many facilities, where digital devices predominate at all other points. Allowing the complete audio path to remain in the digital domain via AES3 interconnections while still retaining the ability to fully manipulate the signal is — and will remain — a digital mixer's primary value.

A secondary benefit of digital mixers — which also applies to some digitally controlled analog consoles — is the *assignability* of the work surface. Many of these units provide one or two hardware controllers for audio processing functions that can be assigned to any input or output, thereby reducing the size and clutter of a large-capacity console. For example, a 96x64 mixer may have only two equalizer modules, two dynamics modules and one reverb/delay module. (Of course, most of the mixer's electronics are housed in separate rack-mount panels, but these can be placed wherever it's convenient, often at some distance from the console.) Once the processor settings are made for the selected channel, they are stored, and the control panel is then free for assignment to another channel.

The advent of digital mixers at this relatively late point in the digital audio transition also provides another serendipity. If all or most of the devices that the digital mixer connects with are also already digital, the need for analog-to-digital and digital-to-analog converters is reduced or eliminated, thereby greatly reducing the potential cost of the mixer. (These converters are among the most-expensive circuits in the console.) The fully digital I/O interface also minimizes the vagaries of interconnec-

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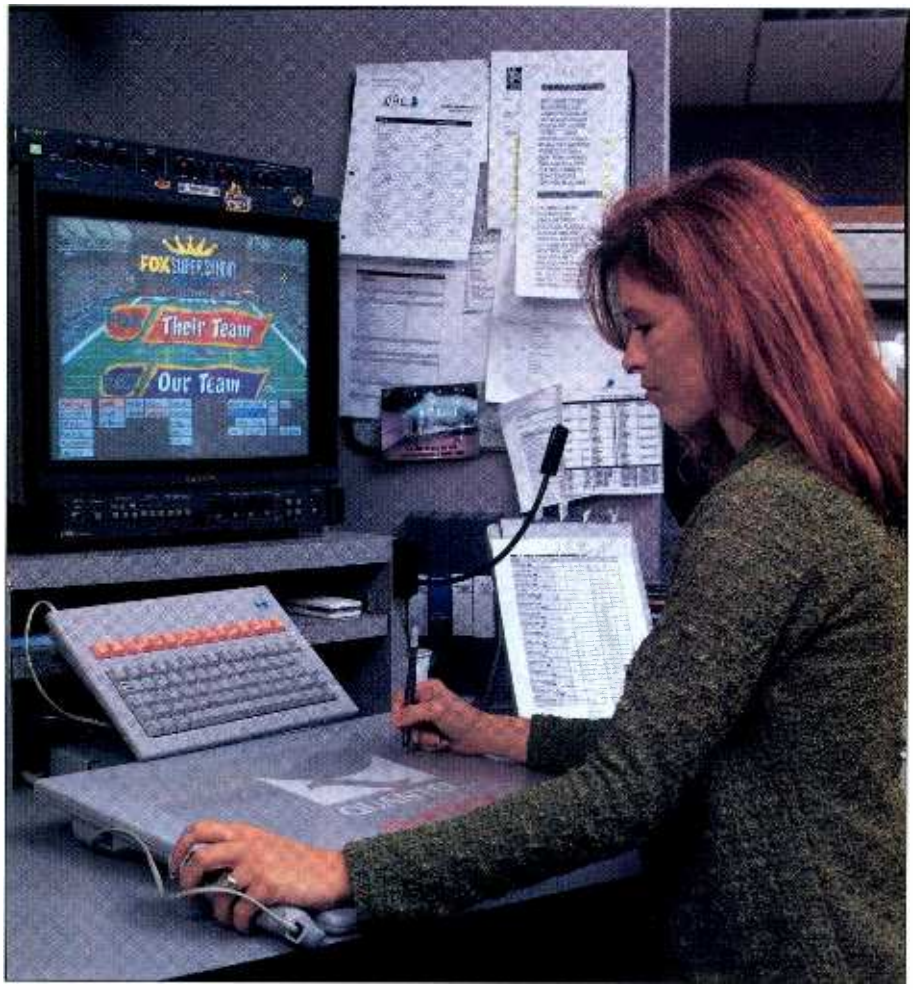

Still-store TECHNOLOGY

THE BOTTOM LINE:
Judging by the wide variety of graphics packages now in existence, the creation and handling of TV stills is easy. It is not. Professional TV broadcasting demands the same high standards of performance from the stills system as from the remainder of the production chain. The still-store must be accurate, reliable and perform as needed 24 hours a day, seven days a week. $

Don't underestimate the necessity of your still-store system.

By Jon Shaw

Stills are one of those areas of television that can look deceptively easy. But consider for a moment the level of scrutiny each still receives. While any frame of video will only be visible for a thirtieth of a second, a still, as likely as not, will be on air for at least 100 times as long. Consider also the type of information that that frame is likely to be used to convey. It could be detailed and critical information — a chart in a news bulletin, a map, a diagram or a close-up of some highly significant moment. Or it might be a station ID, a rundown of upcoming programs, a sting, a bumper or some other application with direct impact on the look, image and reputation of the station. Anything that is going to be scrutinized as carefully, for so long, must be good.

Photo: Still-stores can be used in a variety of live settings including sports and news.

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And if the still-store is to meet the demands of live television, it will also have to work to the same rules as all the other images used in the profession — it will have to be available at a moment's notice. Although the computer user has learned to accept it, the TV viewer is not used to seeing a little egg timer rotating quietly in the corner of his screen while a new image is being loaded. By the same token, neither is the producer used to being asked to wait while the picture source drags the relevant picture onto his screen. He is used to a steady flow of 30 new frames every second of every minute of every day.

No surprises

For television, a precise sequence of images needs to be available shot-by-shot on a next-frame basis. Achieving this level of performance in an environment in which any mistake, any failure, is immediately seen by millions of people, demands a system of the utmost reliability. No TV station can contemplate the number of software bugs and hardware crashes that seem to characterize the commercial computer industry. In other words, the only way to be certain that the program director is not faced with any unpleasant surprises is to make sure that everything is designed and built for the one dedicated purpose.

Stills systems are rarely used on their own. Operating within the TV environment they will, de facto, be required to include ITU-R 601 inputs and outputs. Increasingly, with the growing automation of TV stations, they will also be required to accept control inputs from station management and automation systems.

Fast changing

But TV environments require more than just digital video ports. Particularly in news and current affairs, where stills systems are likely to be used, every system must be so quick and so easy to use that its operation becomes second nature. As the news program goes to air, so the stills system must be able to keep pace, not just with every story as it progresses up the running order, but also with every change in the running order, every new shot inserted, every shot dropped as the news of the day changes. And as satellite feeds and electronic newsrooms appear in more stations, so the rate at which the news itself, and consequently the programs that report the news, will have to change just to stay in touch.

To match this ever-increasing speed, not only will the stills systems have to be fast, so will the means the operator uses to control them. While, in the less-pressured atmosphere of the graphics suite the various combinations of a mouse, a keyboard and a menu provide an adequate solution, it is well accepted that dedicated controls are faster. With two separate aspects to the business of the still-store — stack creation and play to air — there are two distinct needs for control.

Search speeds

The process of preparing stacks for transmission usually involves the operator in some sort of search for existing material. The more material there is available, the more likely it is that suitable stills can be found from store. However, the larger the store, the more complex can be the search.

If, as the stills library grows, it is not to fall into chaos, it will require two things: first a sophisticated database and second a powerful search engine. Although the database will be all but invisible to the operator, the search facilities will not. Make them too complex and time will be wasted filling in the necessary information. Make them too simple and they won't achieve the necessary accuracy.

To be effective the search engine must allow multiple search criteria, and preferably, enable search parameters to be added or dropped independently as the search develops. It must also enable the results of a search to be presented and selected pictorially, either as a combination of images and data or as multiple images on a page. Search speeds would certainly be improved if the images brought up by the search engine were stored as reduced-size thumbnails, rather than created from the original at the time of the search.

Except where the number of stills is small, and the workload of the store is minimal, it's unlikely that a single search station will be sufficient. However, because browsing isn't particularly time-critical, nor is the data-content of text

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Still-store technology

or thumbnail images particularly large, this is a task that can be handled by conventional network computers.

Computer networks already well-established in business environments, can also be used to pass images between graphics stations. Because the data content of images is large, and there tends to be little commonality between image data formats, such networks can be relatively slow, many taking seconds to transfer a complete TV image. However, with careful design, transfer rates can be improved considerably when working between systems that have the same data structure.

Presentation

Taking a wider view, it's obvious there is more to the use of stills than merely switching the video feed to a new full-frame still. While the dramatic effects of the pop promo might not be appropriate to the more serious business of news and current affairs, some form of image manipulation would be useful, particularly if it could be achieved without involving another system, a DVE for example.

The ability to size and position a shot prior to putting it to air is probably the most useful option a stills system could include. Full-frame, over-the-shoulder and lower thirds can then all be created and stored, giving complete confidence they can play to air exactly as required. Just as in editing, where transitions other than cuts can add extra interest, so stills presentation can be enhanced with a range of dynamic effects, such as pushes, wipes, slides and dissolves. As with the ability to size and position a still, so the option of simple transitions, which can be set up and rehearsed within the stills systems itself, can add considerably to its flexibility, while maintaining the independence of the system.

Use of keys

Having moved firmly into the business not just of storing fixed still images, but of manipulating them dynamically, it seems logical to ask whether it might be possible to overlay one image on the next and so build a montage. The answer is, of course, yes. Conventionally, this would require a considerable array of facilities including a downstream keyer (DSK) and two sets of independent outputs from the still-store.

The creation of a montage, where one layer only partially obscures another, requires a separate piece of information — a key — to define which parts of the second image should replace the original. Handling keys usually requires the extra facilities of a DSK, but building this into the still-store has the advantage of keeping the pressure off other capital equipment. However, because the keyer would be working directly with its own sources, it might also offer other benefits.

For example, it might be possible to find a way to dissolve from one cutout to another over a live background with just one external DSK rather than two DSKs and two banks of the production switcher.

Such close integration would also mean that storing keys with their respective fills would become a relatively trivial matter and might also make it easier to ensure that the key edges remain clean and anti-aliased — no matter how the images were manipulated.

Captions and cutouts

One significant use for the keyer is in the addition of captions to the on-air feed. They could, of course, be included in the still as part of the origination process, but live keys remain considerably more flexible. The addition of a library of typefaces to a stills system that already included sizing, positioning and key facilities would offer huge benefits.

Many of the stills generated in a graphics suite start as full-frame images from which the desired objects have been cut. Simply removing the graphic from its original background — a head-and-shoulders, a flag or some particular

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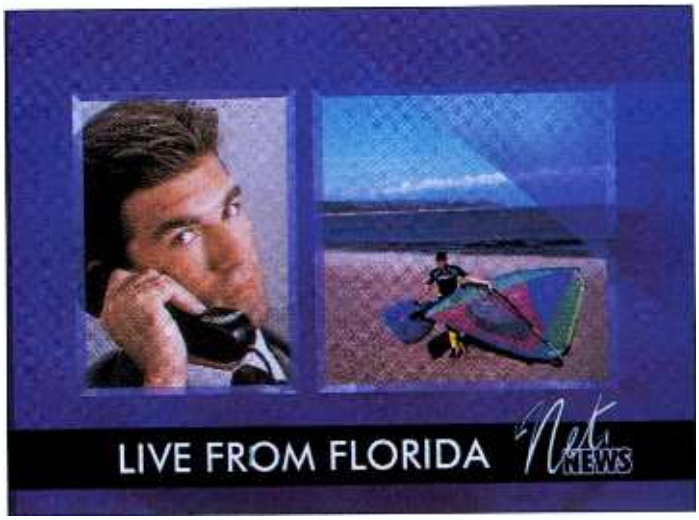
object — can give the resulting cutout considerable extra impact. Keying the cutout over another background, perhaps with its own identity, can enhance the message of the original material or give it a treatment that is in keeping with the preferred style of the program.

It is an unfortunate fact of life that to look their best cutouts need far more treatment than a quick whiz-round with the electronic equivalent of a scalpel. Fine detail, such as hair, transparent elements and reflective surfaces, each may well require a little cosmetic help if they are not to look false, forced or unreal. The ability to soften edges, to add or remove a highlight, to match colors and to blend objects into their backgrounds, are all tools that the graphic artist would normally expect to have to handle. Because such tools are considered essential in the graphics suite, they also make considerable sense within a dedicated stills system.



With cut-and-paste graphics capability, a still-store can be used to composite new stills quickly and easily.

Frame grabs

Surrounded as it is by moving images, the stills system remains constrained to frozen images as the source of its working material. Because it is highly likely that relevant source material will be found within the program stream itself, the ability to grab a frame from a live video feed has obvious advantages. And as a video frame comprises two distinct fields, which can differ considerably where they include rapid motion, a frame-grab facility should include some means of dealing with the resulting motion dither.

Clearly, the concept of a stills system has expanded from a mere store to a complete production package, and its effectiveness as a complete and fully integrated system has expanded enormously. So too have the needs for it to work in a more distributed manner and to integrate with other creative tools.

Networks

The inclusion of network capabilities in a stills system opens the door to a number of possibilities that include local database searches and file exchange within the TV station, and even, given the appropriate lines, remote searches and file transfer to other, more distant, users. On a more immediate level a network can also enable stack preparation to be separated from decisions on content. Because a stack may be no more than a numbered list of stills, it is possible to create the list of numbers before the stills are identified, effectively leaving identified spaces in the list into which the appropriate stills can be posted as they become available. With the play-out system satisfied that it has the appropriate number and sequence of stills, the files need only be transferred into the stack moments before each is due on air, adding precious minutes to the time available to find or create those stills.

Networks also provide an effective way to add extra storage, both permanent and removable, to the system. With multiple storage devices available on one system, it is easy to develop a sophisticated mix of local and remote storage, with backups recorded onto physically separate drives, to add capacity and integrity to the still-store.

The use to which stills systems are put probably depends as much on the history of the particular station as on the market it is trying to serve. Although some might be content with a system that is little more than an electronic means of storing slides, others will insist on equipment that can handle the full spectrum of stills preparation and on-air functions within the deadline-driven confines of a transmission environment. ■

Jon Shaw is product manager, transmission systems, for Quantel, Newbury, Berkshire, England.

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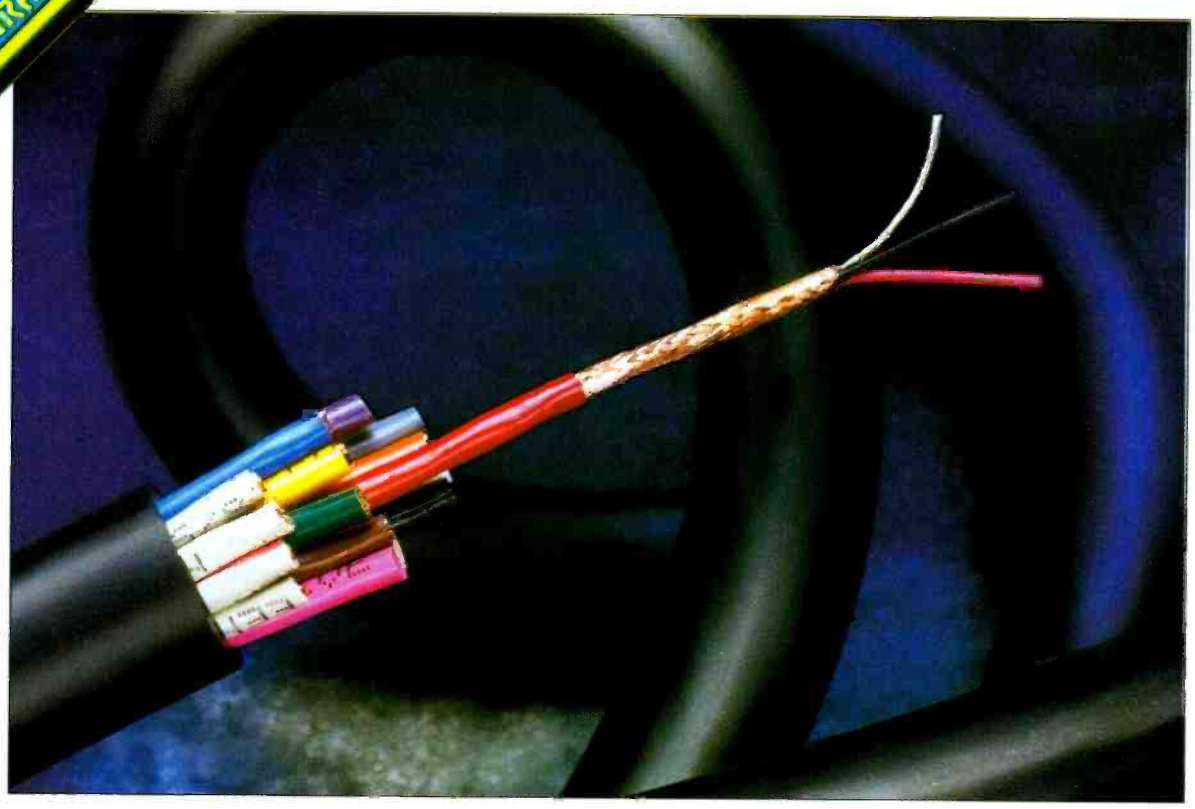
SYSTEMS INTEGRATION



The importance of CABLE SHIELDING

THE BOTTOM LINE:
EMI and RF interference have a negative impact on broadcast cable performance and reliability. Effective shielding can protect cables from signal ingress or egress, as well as triboelectric or other mechanical noise. New shielding technologies and advanced cable testing procedures are the keys to finding the right shielding solution for each application. $

Cable is key to proper wiring in a facility.

By Marty Van Der Burgt

There is, perhaps, no other industry that values reliable cable performance as highly as broadcasting, for the failure of broadcast cable often produces immediate, far-reaching and embarrassing results. From outdoor newsgathering, to studios and control rooms, to post-production, the broadcast industry faces critical challenges from EMI/RF interference. Since broadcast systems were launched, system engineers have been in perennial pursuit of shielding that would effectively ensure signal integrity, prevent downtime, maintain sound and picture quality — and provide a high level of confidence in audio and video transmissions.

Photo: Belden Brilliance AudioFLEX snake cable features French braid, double spiral (double serve) bare copper shield tied together by one braided strand.

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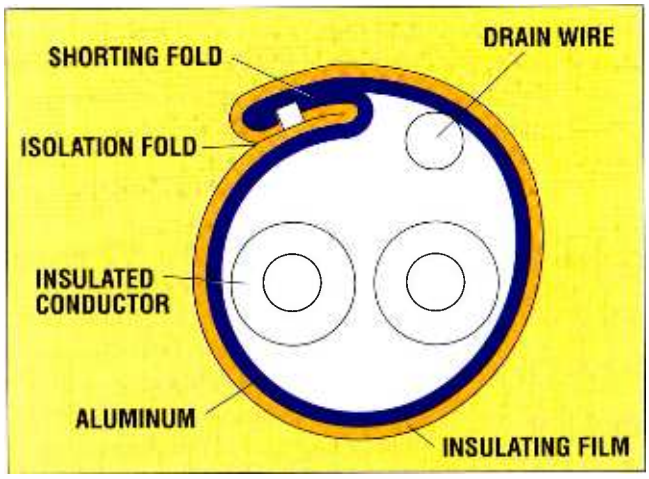
Cable shielding has proved to be an effective strategy for dealing with problems of signal ingress and egress caused by electromagnetic interference (EMI). And, today, with the FCC's Cumulative Leakage Index (CLI) standard, maximizing cable shielding effectiveness is even more critical.

Signal problems

EMI was first recognized in the early 1960s as interference problems broadened to encompass the entire electromagnetic spectrum. Prior to that time, most interference problems were experienced with radio signals, and hence, were referred to as radio frequency interference (RFI). Today, EMI refers to electromagnetic interference in its broadest sense. Thus, within the non-ionizing portion of the electromagnetic spectrum, all emitters, receptors and frequency bands are part of the EMI definition.



The Z-fold, an enhanced shorting fold construction, improves high-frequency performance by maintaining metal-to-metal contact.

For this reason, such diverse problems as interference from ground loops, common impedance paths, direct magnetic/electric field coupling (AC hum), electrostatic discharge (ESD), power-line conducted emissions or radiated emissions from all sources fall under the umbrella category of EMI.

In broadcasting, there are mechanically induced noise interference problems, as well. Triboelectric noise is generated by movement in the cable's components, resulting in a static or piezoelectric effect. Mechanically induced noise is a critical and frequent concern in the use of guitar cords, microphone cables and other cables that may be flexed while in use.

Fortunately, EMI/RFI and noise problems can be solved with the right cable shielding solution. Let's take a closer look at how cable shielding works and the different types available on the market for various applications.

Shielding solutions

A cable shield is placed between the core or components of a cable and the outer jacket or over individual components within a cable to contain the RF signal or keep out unwanted interference. Cable shielding is offered in a wide range of designs and configurations. Each type of shielding has its own distinct advantages and disadvantages that

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The importance of cable shielding

need to be considered when selecting the best and most cost-effective option for a given application. Shields available on the market today include:

• **Braid shields:** Braid shields provide superior structural integrity while maintaining good flexibility and flex life. These shields are ideal for minimizing low-frequency interference and have lower DC resistance than foil. Braid shields are effective in audio, as well as RF ranges. Generally, the higher the percentage of braid coverage, the more effective the shield.

A relatively new development in cable shielding technology, especially suited to audio and RD cable applications, is an ultraflexible double spiral shield.

• **Foil shields:** Foil shields consist of aluminum foil, typically laminated to a polyester or polypropylene film. Foil shields provide 100% cable or component coverage, improving protection against radiated emission and ingress at audio and radio frequencies.
Because of their small size, foil shields are commonly used to shield individual pairs of multipair cables to reduce crosstalk.

Foil shields may also be bonded to a coaxial cable insulation or cable jacket with a layer of adhesive, allowing for faster, easier and more reliable termination.
Foil shields have less weight, bulk and cost less than braid shields and are generally more effective at higher frequencies. Foil shields are also more flexible than braid, but have a shorter flex life. Drain wires are generally used with foil shields to ease termination and ground electrostatic discharges.

The shorting fold construction technique in foil shield design helps improve high-frequency performance by maintaining metal-to-metal contact, thereby increasing the foil shield's range of effectiveness to higher frequencies. This is achieved by folding one edge of the shield tape back upon itself. Thus, when the tape is wrapped around the cable, there will be metal-to-metal contact along the seam or edges of the shield tape, better approximating the performance of a seamless tube. Without the shorting fold, a slot is created through which signals can leak and cause interference.

• **Combination foil/braid shields:** Combination shields consist of more than one layer of shielding and provide maximum shield efficiency across the frequency spectrum. The combination foil/braid shield combines the advantages of 100% foil coverage with the strength, flexibility and low DC resistance of a braid. Typical braid coverages range from 60% to 95%. Other combination shields available include various braid/braid, foil/braid/foil and foil/braid/foil/braid designs.

• **Double spiral shields:** A relatively new development in cable shielding technology, especially suited to audio and RF cable applications, is an ultraflexible double spiral shield. This design consists of dual spirals of bare or tinned copper conductors, with the two spirals tied together by one weave.

The double spiral shield construction provides longer flex life than standard spiral shields and greater flexibility than conventional braid shields. It produces a much lower level (up to 50% less) of microphonic and triboelectric noise than either spiral or conventional braid shields. In addition, because it's not fully woven, the double spiral shield is easier to terminate than a standard braid. It also provides for lower DC loop resistance than a single spiral, resulting in improved performance.

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Testing methods

Securing reliable and comprehensive test data is the surest and most effective way to select cable shielding that will protect against the kind of interference anticipated. Several questions need to be asked: What kind of interference is anticipated? What frequency range? Is ingress or egress the primary concern? Is triboelectric or other mechanical noise likely to occur?

The transfer impedance test is the most widely accepted non-relative or absolute measure of a shield's performance. It is used to evaluate cable shield performance against ESD and radiated emissions coupling at a frequency range of DC to 1,000MHz. This testing method is recommended by the International Electrotechnical Commission, as well as the military.

The evolution of broadcast technology, and its resulting regulations, has created a growing need for more sophisticated cable shielding and reliable testing methods.

The transfer impedance value is dependent upon the sample cable's shield construction. The lower the transfer impedance value, the more effective the shielding. Theoretically, the absolute interference level of a cable can be determined using the transfer impedance value. Typically, measured in a triaxial fixture, the transfer impedance takes into effect the relationship between the signal-carrying region of a coax cable and the surrounding detector. The shield separates these two regions. Therefore, the transfer impedance test is a true measure of the shield effectiveness of the cable.

Another method is the absorbing clamp. The absorbing clamp is an accurate, portable testing device that is effective at detecting radiation directionally, as well as locally. It has a great capacity for electromagnetic compatibility cable measurements in the frequency range of 30 to 1,000MHz. It is also non-destructive to the sample.

The test fixture clamps over the shielded sample cable and inductively detects signal leakage. The radiation values are then compared to those of an unshielded sample of the same length. Shielding effectiveness is defined as the difference between the two values.

The GTEM cell is a rectangular transmission line segment that operates in the Gigahertz Transverse Electromagnetic Mode (GTEM). Cables, cable/connector assemblies and/or electronic devices are placed inside the chamber. The item under test can be subjected to a known field intensity provided by powering the cell or, alternately, the cell can be used as a detector to measure radiation emitted by the cable or device inside the cell. Frequency range covered by this method is DC to 1GHz.

Flex testing is another effective method. Shield performance during the life of the cable is an important consideration, especially in field or stage cables. Flex testing is performed on these cables because vibration, sway, continuous movement or coiling and uncoiling can cause degradation of shield performance over a prolonged period of time. Testing before and after flexing may be of value for cables used in these applications.

Cable technology has become increasingly more complex since EMI problems were first discovered. The evolution of broadcast technology, and its resulting regulations, has created a growing need for more sophisticated cable shielding and reliable testing methods. For these reasons, it's more critical than ever for system designers to evaluate, right from the outset, the conditions of each application in order to specify the most appropriate shielding option. ■

Martin J. Van Der Burgt is a senior product development engineer with Belden Wire & Cable Company, Richmond, IN.

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SYSTEMS INTEGRATION

Special Report: CABLE TV – AN INDUSTRY IN METAMORPHOSIS

By Dr. Joseph Schatz

The year is 2050. The scene is the 50th anniversary of the TelCat Corporation. Chairman Roger Thurgood is addressing the press while standing under a re-creation of the corporate symbol, a blue-and-white butterfly taking flight. He is describing TelCat's corporate lineage and is pointing to logos on the side walls. "In the year 2000, a number of cable TV and phone companies merged to form what is today the world's second largest multimedia communications and internetworking company. We have grown dramatically and today our revenues exceed $175 billion. . ." "Excuse me," shouts a reporter from the audience, "what is a cable TV company? Weren't they the predecessors of Multimedia Producers International?"

Today, cable television (CATV) produces entertainment content and distributes communication signals. Not surprisingly, these companies are beset by a number of structural and competitive problems that are more related to those found in the communications industry than the entertainment industry. To survive, they must address these issues head on. Most likely, they will either evolve into communications companies or entertainment content brokers.

In the past two decades, the face of the entertainment content and communication industries has changed dramatically. Customers have become more sophisticated and demand higher quality and a greater array of services. In particular, if the quality of service is not met, they often seek the help and intervention of governmental agencies. The most recent example of this phenomenon is the response of the state judicial systems to the service problems of America Online.

Technology has also advanced and empowered the forma-

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tion of many new and competing companies. The range of entertainment and communication services has also expanded. Customers have responded by splitting their disposable income between a large number of competing services rather than supporting the few that previously existed.

New services have stretched the capability of the CATV companies' service delivery systems and, in some cases, have made them inappropriate. Finally, and most importantly, to the CATV corporate headquarters, Wall Street has become much more intrusive into its strategic direction, valuation and daily operation.

As these conditions evolved over the last two decades, CATV companies have in many instances focused on the production of entertainment and content and not on their traditional roots of technical service delivery. Thus, many were not ready to deal with these competitive challenges.

In the near future, cable companies will have to choose whether they will be communications companies or entertainment content brokers.

In the area of customer service, CATV companies have long been benchmarked against the service provided by the Regional Bell Operating Companies (RBOCs) and other telephone companies. Almost universally, customer surveys indicate that CATV subscribers are unhappy with the quality of service provided by their suppliers. The connection or installation of new service is often late not by hours, but by days.

Furthermore, when a cable subscriber has a problem with reception, the quality of a connection or billing, they often have major difficulties getting their problem resolved. The quality of service provided is also not high. In large part, this is due to aging infrastructure. Many of these problems have been addressed by telephone companies that have already invested heavily in network modernization, customer facing and customer care systems and advanced billing systems. Government reaction to the dissatisfaction of CATV customers with these conditions was illustrated in the early 1990s when Congress regulated CATV rates.

Advanced technologies have empowered many new services. One of the most important of these technologies is the direct broadcast satellites that beam high-quality programming directly to a customer's location, thereby eliminating many service problems.

The traditional telephone companies are also beginning to provide entertainment services. Almost every RBOC has announced plans to provide interactive video services or is actively buying cable franchises. The most visible company in this regard is Ameritech, which has purchased a number of cable franchises in its Midwestern franchise area.

Finally, the broadcast industry is also entering the fray with new technologies, such as Multipoint Multichannel Distribution Service (MMDS) and Local Multipoint Distribution Service (LMDS), which hold the promise of providing high-quality digital cable-like signals to each subscriber's premises over the airways.

In terms of infrastructure, the coaxial cable networks that were originally put in place by CATV companies are old. Because of lack of maintenance and heavy churn associated with moving subscribers, these current networks are not capable of providing the kind of high-quality services CATV companies need to stay competitive.

Furthermore, the billing and operational support systems are not suited to supporting this new competitive environment. For example, a billing system designed to provide a bill that reflected a fixed monthly fee and limited pay-per-view service is not suitable for more advanced services, such as impulse pay-per-view, telephone services, PCS wireless services and Internet connectivity.

Finally, existing craft people who normally maintain the older systems do not have the skills for operating newer systems. Soldering irons are being replaced by epoxy glues, analog meters by digital test sets and lightly trained craft people by advanced digital network technicians.

The result is that CATV companies have a large revenue stream that is vulnerable to competing technologies and companies. This situation comes at a time when they may be ill-prepared to cope with many of the above issues.

The response

To increase revenue opportunities, the CATV industry has started to introduce new entertainment services. These are epitomized by the services provided by TCI's Head-End-in-the-Sky (HITS). Using HITS, a subscriber not only is provided analog television and many digital TV channels, but also access to more advanced services, such as impulse pay-per-view, pay-per-day and digital music. Continental Cablevision and Time Warner are introducing similar type services to their subscribers.

CATV companies are also planning to provide advanced communication and information services. These services include high-speed interconnectivity through such programs as @Home, RoadRunner and Highway-1, as well as shopping services, such as Time Warner's DreamShop upscale mall web site.

Telephone companies are entering the entertainment business. CATV companies are entering the telephone business. Cox, Comcast and TCI entered the wireless Personal Communications Services (PCS) marketplace in consortium with Sprint (Sprint Spectrum). Finally, the most traditional response to lagging revenues is to increase rates. The government rate regulation of the last several years has been recently lifted and many of the companies have aggressively increased their basic rates and fees for advanced services.

To support new services, as well as reduce the operational costs associated with their aging infrastructure, all cable companies are undertaking an aggressive program to update their in-place cable facility and replace it with

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advanced hybrid fiber coax technology that will support a frequency spectrum of at least 750MHz.

These upgrades permit the delivery of advanced pay-per-view services, high-speed data connectivity services and, in some areas, even telephone service. They are also installing advanced billing and operational support systems; recognizing that these systems not only reduce the cost of providing service, but also provide a competitive advantage. Billing systems, such as Cable Data's IntelliCable product and TCI's SummiTrack, provide competitive direct and regular methods for maintaining contact with each subscriber.

CATV companies are also hiring from the retailing and airlines industries where quality customer service systems have been in place for years. Companies are also engaging in aggressive skills upgrade programs. These programs include retraining installers and technicians who already work for the company, as well as hiring new staff that are capable of dealing with an infrastructure that is heavily software-defined and digitally focused.

Finally, the whole industry is going through an image-rebuilding phase. Promotions have been introduced, special buying incentives are being offered, and the public image and representation of the CATV companies are being changed. The face of the CATV company is changing from that of an unresponsive giant represented in the movie *The Cable Guy* to one that is concerned with subscribers and interested in providing them with high-quality, on-time service.

The dilemma

Unfortunately, a number of these initiatives are facing major obstacles. Price increases have forced consumers to look at the quality of service, as well as the choices and consider alternatives. Many subscribers have switched to the direct broadcast satellite competitors, despite the fact that these competitors cannot provide local programming and local channels. A large number of subscribers view the responsiveness of these satellite carriers, coupled with the high quality of the digital signals, to be far superior to anything they can get from their local CATV franchise operator.

The costs associated with upgrading in-place infrastructure are high, more than $1,000 per household passed, and must be born by the cash flow generated by current business, as well as by issuing debt. The need to retrain and hire new staff with the skill levels necessary to deal with satellite systems, high-speed fiber optics, software-controlled networks and Internet connectivity increase operational costs further.

These increased costs coupled with loss in market share have caused Wall Street to downgrade CATV company bond ratings. For example, TCI is no longer considered an investment-grade security. These barriers make it even more difficult for CATV companies to acquire the capital required to meet the competitive challenges. Some CATV companies are selling their assets to obtain the cash to invest in their core content delivery business rather than entertainment production.

CATV is changing from an unresponsive giant to one that is concerned with subscribers and interested in providing them with high-quality, one-time service.

The CATV industry's move into the communication and information services business has also resulted in another investment challenge. In both of these industries, quality and service is paramount, particularly in the provision of telephone services. The benchmarks in these industries for quality and responsiveness are much higher than might logically be anticipated for the cable industry. However, as the cable conglomerates enter these arenas, they are being held to standards that were originally set by the RBOCs and AT&T over the last 75 years. This industry standard increases the investment in new infrastructure, customer facing systems and trained technicians.

The final dilemma faced is one of focus, culture and personality — being an entertainment content company is a different organization than a communication and information delivery company. The former focus was on producing content: movies, music, TV programming and the artistic rendition of web sites. Typical examples of companies in this class include Turner Broadcasting, Fox and Columbia Pictures.

Communication and information delivery companies focus on the transmission and routing of signals. Typical services provided include telephoning, Internet access and video-on-demand (VOD). These are provided by the RBOCs, the cable operating divisions of TCI and Time Warner, BBN and AT&T.

Entertainment companies must be artistically creative, have the ability to deal with a continually changing business environment and to structure novel business alliances. On the other hand, communications and information delivery companies depend heavily on technology, must know how to use it to facilitate the provision of high-quality customer service, and have the critical mass and financial muscle (also known as staying power) to provide them over the long haul. Cable companies may have to choose between entertainment and content or communication and information delivery because companies in one of these segments have traditionally not been successful in the other.

What the future will hold

"The only thing that is sure is that the future is unsure." The market demand for new entertainment, communication and information services will continue to skyrocket. Our society and its industries have proved, particularly over the past few years, to have the capability in technology and innovation to supply what is required. An example is the on-line services information industry. Fifteen years ago, consumer use of the Internet was hardly even thought of. Today, we have a large

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number of Internet access providers who are satisfying the demand for a service that was not even conceived of then.

New information and communication services will also require a different and more flexible communication bandwidth delivered to the home. Currently, there are two communication and information pipes coming into each household. A pair of copper wires provide telephone service and a coaxial cable provides video and broadband entertainment services. In the future, it is highly likely that these two communication mediums will be merged. Either there will be a fiber-optic cable entering the home, a coaxial cable or a pair of copper wires making use of advanced digital technology, such as asymmetric digital subscriber line (ADSL). Whichever of these technologies is used, it is clear that they are expensive — at least $1,000 per household passed. The future winners in the information and communication industry must have deep pockets and easy access to capital markets.

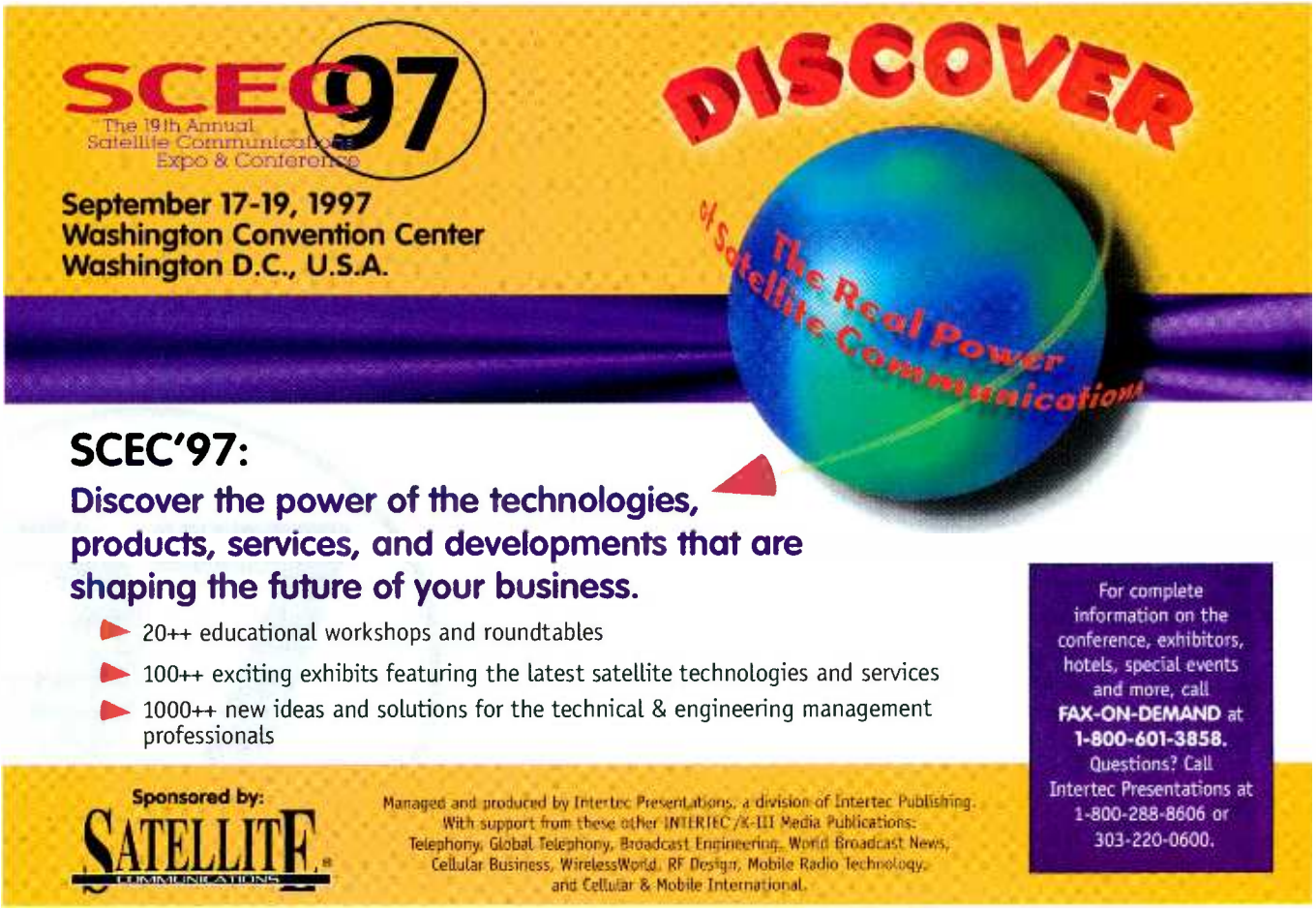
In addition to this financial muscle, successful players must also be able to spot new market needs early, quickly respond with new services, and have the infrastructure to operate and maintain the advanced technologies, such as hybrid fiber coaxial cable, switched digital video, ADSL and wireless cable.

The future winners in the information and communication industry must have deep pockets and access to capital.

The challenge CATV companies must meet to survive is focus. They must either take on the characteristics of a communications company or become entertainment and information brokers. In the process of choosing one of these paths, the communications portion of CATV companies will probably be acquired. This trend has already started. US West has bought Continental Cablevision in the United States, and in the United Kingdom, Cable and Wireless has just bought a number of CATV companies, including the holdings of NYNEX, Bell Cablemedia and Videotran.

The future clearly will not be like the past or even the future as the competitive environment continues to evolve. Technology has become highly flexible and customer expectations have increased dramatically. The competitive terrain is changing so quickly that the industry and the players will be significantly different 10 years, five years or even one year from now. In 2050 when the TelCat Corporation celebrates its 50th anniversary, Roger Thurgood will be standing over an empire that is much different from the one that exists today. ■

Joseph Schatz is vice president of Telecommunications Engineering Services for Logica, Inc.



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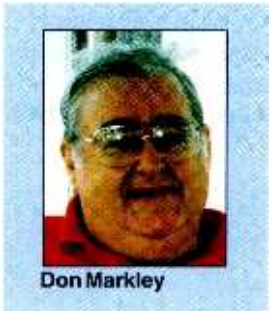
By Don Markley

Transmission line measurements

Trying to check out transmission lines poses one major problem. Unless you can climb or have a rigger available, your work is all done on the ground at the input end. This is like trying to determine how long a road is by standing at one end and gazing down it as it disappears over the horizon. Luckily, new technology has been developed to address this problem.


Don Markley

TDRs

The first was time domain reflectometry (TDR), which works by applying a pulse or a step of voltage to the input end of the transmission line. The idea is that any change in the impedance of the line, as from a dent in either the inner or outer conductor, for example, will cause a change in impedance. The larger the impedance change, the greater the percentage of the applied signal that will be reflected. The ultimate is either an open or short circuit for which all of the signal is reflected. Because the TDR is a DC device, the phase will only be shown by the sign of the reflection. An open or an increase in the line impedance will appear as a positive reflection, while a short or decrease in impedance will be a negative reflection.

The TDR can be invaluable for problems in the cable. An accurate measurement of the time required for the signal to travel to the discontinuity and back to the source, combined with the velocity of propagation, allows the distance to the problem to be calculated. Problems on cables can be determined to within a foot or two. However, TDRs aren't the total fix-it device because two small problems exist. First, TDRs aren't much help in identifying problems that are frequency sensitive. For example, antennas will look like either an open or short, which means that the TDR cannot tell you if the antenna is shot. Also, they cannot be used for troubleshooting waveguide systems.

The second area where TDRs fail is in identifying gradual problems. An example is an air dielectric line that has a slight slope and is filled with water. The distance from the inner conductor to the outer wall or the water surface will change slowly. This tends to look like a smooth transition to the TDR and there won't be any indication of the problem. The only thing that gives this problem away is that the other end of the cable won't be visible. The line will appear to be infinitely long and in good shape. Unfortunately, you may only realize this after you've told your boss that everything is great.

Vector network analyzers

The tool du jour for transmission line and antenna work is the vector network analyzer, which is an RF device that applies stepped frequencies to the transmission line and antenna system. The magnitude and phase of the returned signal is measured and analyzed by a microprocessor. The output can be shown as magnitude and/or phase of the return loss (difference between the forward and reflected signals), VSWR, Smith Chart plot, polar plot, input resistance, input reactance and input impedance. Any of these provide much of the same basic information, just in different output forms.

By recording the magnitude and phase of the returned signal over a wide range of frequencies, a mathematical operation called the Inverse Fourier Transform can be used to convert this information into the time domain. You can determine the distance along the line to irregularities and how bad those problems are. You can look at a system and determine if your problem is in the line or the antenna and then correct the problem at that point without ruining the rest of the system. This may seem a bit like being able to tell how long the road is by measuring the bumps, but it works well. Because only RF signals are used in the process, it also works on waveguide systems. Unfortunately, these devices are expensive. A complete system that includes calibration loads, cables, adapters, hardware and a plotter will run from $30,000 to $50,000, so it's essentially limited to manufacturers, groups or consultants.

Finally, stations should purchase a DC bridge. Those devices measure DC resistance down to a milliohm or so. Because most TV and FM antennas look like a short to DC, measuring the DC resistance will give a good indication of the condition of sliding inner connectors, whether they're bullets or "watchband" springs. By checking once or twice a year and recording the readings, the CE can tell when or if things start changing. A quick service call at that point can prevent the expense and off-the-air time of the burnout that will soon occur. ■

Don Markley is president of D. L. Markley and Associates, Peoria, IL.

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new products

By Deanna Rood

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Panasonic, One Panasonic Way, Secaucus, NJ 07094; 800-524-0864
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Pluto Technologies, 2511 55th St., Boulder, CO 80301; 303-402-9000; 303-541-9343; www.plutotech.com
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Quantel

Quantel has opened its application-specific hardware to external programmers; software developers writing in the Java language will be able to write applications for the entire family of Quantel products; Java on Quantel will allow developers to combine their creative ideas with access to the world's fastest and most powerful hardware platforms for still and moving images; no changes in hardware will be required and the Java applications will run seamlessly alongside the Quantel feature set; the intuitive Quantel user interface will remain completely intact, as the Java space will be represented simply by an extra menu box from which you can scroll through the Java applications in the system.

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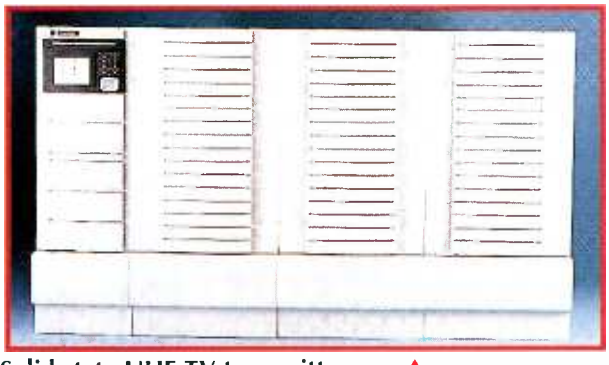
Test and measurement solution
Snell & Wilcox

•MSA100: an MPEG-2 waveform monitor/vectorscope for MPEG-2 encoders and bitstreams that solves the problems of analyzing the compressed digital transport stream and assessing whether the coding device is delivering a valid and compliant MPEG-2 transport stream; the compact rack-mounted unit is designed to work with any level, any profile MPEG-2 and performs detailed monitoring, recording and analysis of MPEG-2 transport stream information in real time.

Snell & Wilcox, Durford Mill, Petersfield, Hampshire GU31 5AZ, U.K., +44 (0) 1730 821188; fax +44 (0) 1730 821199; www.snellwilcox.com
Circle (261) on Free Info Card



Solid-state UHF TV transmitters
Harris

• Diamond series: a line of UHF transmitters that brings the advantages of Motorola LDMOS solid-state technology to broadcasters; the transmitters are available in NTSC and PAL models and are designed for easy upgrade to digital transmission; the Diamond series transmitters use the Motorola RF LDMOS transistor, a device that offers higher gain that minimizes the number of RF stages, higher efficiency for reduced power consumption, better intermodulation distortion and better thermal properties than other transistors that have been used in broadcast transmitters.

Harris, 3200 Wismann Ln., Quincy, IL 62305-4290; 217-221-7627; fax 217-222-0581; www.broadcast.harris.com
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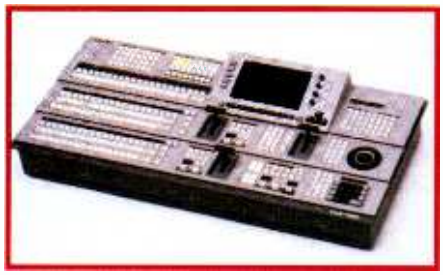
www.americanradiohistory.com

Digital production switcher
Sony Electronics



• DVS-7200: a two-mix/effects digital post-production switcher designed for migration to DTV, with optional dual-downstream keyer; designed specifically for post-production applications, the compact control panel can be configured with an integrated DME control module, keyframe/time-line control module and a 32-button instant recall shot box; it can store and recall up to 99 snapshot memories; featuring multi-aspect ratio, the DVS-7200 meets 4:3 and 16:9 aspect ratio production requirements.

Sony, Sony Dr., Park Ridge, NJ 07656; 800-SONY-022 or 201-930-7834; fax 201-358-4058
Circle (251) on Free Info Card

Editing recorder and feeder/player
JVC Professional

• BR-D750U editing recorder and BR-D350U feeder/player: these two products bring the high-end performance of the Digital-S format to a broad spectrum of users by providing high-quality 4:2:2 component digital performance at a low cost; both models are scheduled for delivery in August.

JVC, 41 Slater Dr., Elmwood Park, NJ 07407; 800-582-5825; fax 201-523-2077; www.jvcpro.com
Circle (268) on Free Info Card

DVCPRO50 for high-end production
Panasonic

• AJ-D950 (photo) & AJ-D900W: for higher video-quality performance and improved chroma resolution for high-end acquisition and post-production, Panasonic has unveiled the AJ-D950 studio editing VCR and the AJ-D900W 16:9/4:3 EFP camcorder; the AJ-D950 dual-standard studio VTR offers compatibility between the 25Mb/s 4:1:1 and the 50Mb/s 4:2:2 DVCPRO signal structures and is switchable between 525 (NTSC) and 625 (PAL); the VTR also provides RS-422, RS-232C, parallel remote control and an SDI interface; the AJ-D900W DVCPRO camcorder features three 2/3-inch (520,000 pixels in 16:9 and 400,000 pixels in 4:3 aspect ratios) M-FIT CCDs, 30 minutes of recording, 10-bit digital processing, a signal-to-noise ratio of 62dB and minimum illumination of 2 lux; both products will be available in the first quarter of 1998.

Panasonic, One Panasonic Way, Secaucus, NJ 07094; 800-524-0864
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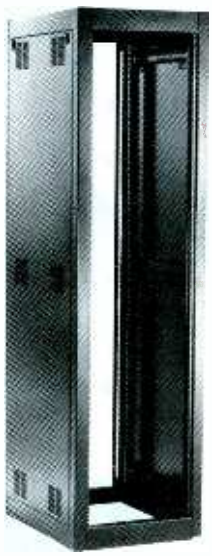
Heavy-duty racks
Winsted



• VRx series: a line of heavy-duty vertical racks designed for top-of-the-line performance; the racks have front and rear rack rails that adjust front to back to accommodate electronics of any depth; the rails are tapped (10-32) for equipment mounting and meet EIA standards; both the top and bottom of the rack are open for cable management and venting; other features include independent lift-off side panels, large corner uprights for cable management, conduit knock-outs top and bottom, two grounding lugs and mounting holes in the top for eye-bolts.

Winsted, 10901 Hampshire Ave. South, Minneapolis, MN 55438-2385; 612-944-9050; fax 612-944-1546; www.winsted.com; racks@winsted.com
Circle (273) on Free Info Card

Computer-to-broadcast bridge
Snell & Wilcox

• Transphix: a computer-to-broadcast converter that transfers computer-generated animations and other moving images to video at a quality level previously available only with dedicated systems attached to high-end workstations; Transphix accepts all popular computer video outputs automatically sensing the input standard; it features 4X zoom with pan and tilt, in addition to a freeze function that allows you to maintain an output image while using the computer for another purpose; the standard Transphix produces analog composite signals to full broadcast specification in PAL/NTSC/PAL-M and PAL-N, as well as a Y/C output for best results with SVHS recorders.

Snell & Wilcox, Durford Mill, Petersfield, Hampshire GU31 5AZ, U.K., +44 (0) 1730 821188; fax +44 (0) 1730 821199; www.snellwilcox.com
Circle (262) on Free Info Card

Disk-based broadcast system
ASC Audio Video Corporation

• VR300: an advanced disk-based broadcast system that uses FibreDrive technology to enable multiple servers to have instant, simultaneous, random access to all Fibre Channel RAID storage; access to every server is achieved at 1,066Mb/s (sustained rate of 720Mb/s), and up to 24 streams of video can be manipulated at once; the need to transfer and transport data files is eliminated and RAIDsoft software does away with controller hardware thereby removing the vulnerable, single-point failure that is inherent to many server systems; offset data striping distributes data among the drives.

ASC, 3816 Burbank Blvd., Burbank, CA 91505; 818-843-7004; fax 818-842-8945
Circle (270) on Free Info Card

www.americanradiohistory.com

New version of Chyron's Liberty

Chyron

• Liberty version 6.0: version 6.0 for the Liberty paint and animation software for Silicon Graphics platforms provides superior performance and enhanced interface to IMAGESTOR!; using Silicon Graphics Impact and Octane models, real-time performance has been achieved for many critical painting and color correction operations; using Silicon Graphics' Impact, 02 and Octane workstations, Liberty now has direct digital video input and output and real-time video display with correct 3:4 aspect ratio; the new version also allows you to preview warping effects in real-time by using the texture memory of the workstations.

Chyron, 5 Hub Dr., Melville, NY 11747; 516-845-2026; fax 516-845-3895; sales@chyron.com; www.chyron.com

Circle (269) on Free Info Card

Digital non-linear finishing system

Scitex

• StrataSphere: a platform for broadcast-quality, real-time program finishing system that is the only non-linear editing system featuring real-time dual-stream video with full-motion alpha channels; the alpha channels provide StrataSphere with the equivalent of four real-time channels of video and the system offers non-destructive compositing of up to 50 layers of video in a single generation while maintaining full key signal integrity.

Scitex, 101 Galveston Dr., Redwood City, CA 94063; 415-369-5111; fax 415-369-4777

Circle (271) on Free Info Card

Multiformat onscreen monitor

Videotek

• VTM-200: this multiformat onscreen monitor offers a new way to monitor and measure video signals with a display that provides quad-split output on an SVGA monitor, and optionally, a composite analog or serial digital monitor; this unique display provides high-quality video pictures, waveform monitor and vector displays, plus an audio level display with IEC 268 ballistics; the VTM-200 features four video inputs, two composite analog (NTSC or PAL independently) and two serial digital input (525 or 625 independently), plus four analog stereo inputs and optionally, four AES/EBU stereo pairs.

Videotek, 243 Shoemaker Rd., Pottstown, PA 19464-6433; 610-327-2292; fax 610-327-9295

Circle (272) on Free Info Card

High-resolution video monitor

Toshiba

• CM1900A: the Imaging Systems Division of Toshiba America Information Systems has added this affordable 19-inch color monitor with audio to its product line; the monitor incorporates some of the latest technology, such as a glass comb filter, to ensure more than 400 lines of horizontal resolution and lifelike color reproduction; with BNC and S-video (Y/C separated) inputs, the CM1900A can be integrated with a variety of imaging devices; the BNC video output provides loop-through capabilities, and an onscreen function display makes adjustments quick and easy.

Toshiba, 9740 Irvine Blvd., Irvine, CA 92713; 800-550-8674; www.toshiba.com.taisisd

Circle (277) on Free Info Card

Profile PDR family expands

Tektronix

• Profile PDR200: a two- or four-channel, highly configurable, network-ready video file server with increased storage capacity, higher internal bandwidth and digital audio; compared to the PDR100, the PDR200 features larger 9GB Ultra-SCSI disk drives, 24-bit AES/EBU digital or analog audio, 30MB/s internal bandwidth, increased external storage and RAID data protection options; the PDR200 also has the ability to share digitally compressed video over a Fibre Channel network and is designed for MPEG upgradability; it can be configured with a wide range of options.

Tektronix Video and Networking Division, P.O. Box 500, Beaverton, OR 97077; 800-547-8949; fax 503-627-7275; tekxpress@vnd.tek.com; www.tek.com/vnd

Circle (267) on Free Info Card

Video server

Philips BTS

• Media Pool XL: the XL series offers all the power, features, scalability and applications of the Media Pool MPS system at a reduced price; supporting all Media Pool applications, including DiskCart, Stream, Splash and Archive Manager, the XL can easily be integrated into a broadcast facility's automation system or edit controllers via standard industry protocols; the three models in the series include the XL-2100 two-channel system, the XL-3100 three-channel system and the XL-4100 four-channel system.

Philips BTS, 94 West Cochran St., Simi Valley, CA 93065; 805-584-4700; fax 805-584-4750

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industry briefs

BUSINESS

Canon USA, Englewood Cliffs, NJ, and CBS, New York, have reached an agreement that will make Canon the official lens supplier to CBS and its 14 owned TV stations.

Under the agreement, Canon will supply CBS with hundreds of IF+ broadcast-quality H15Ax6BIRS1/2-inch lenses for use with its Panasonic AJ-D700 DVCPRO camcorders. The H15Ax will become the standard ENG lens for the CBS stations.

The purchase represents the largest single sale of ENG broadcast lenses in history.

In further news from CBS, Harris Corporation, Quincy, IL, has entered into an agreement to provide analog and digital TV transmitter equipment for the 14 CBS-owned TV stations. The exclusive master purchase agreement also allows CBS-affiliated stations to participate.

MountainGate, Reno, NV, announced an agreement with Gefen Systems, Woodland Hills, CA, by which Gefen will use MountainGate's CentraVision Fibre Channel network and storage systems for its new sound effects library systems. The CentraVision system will replace CD changers, providing instant access to all sound effects in a library and providing shared access by multiple users.

The BBC has purchased one of the world's largest audio routers as part of an order for a 1,600x1,400 mono MADI audio router from Pro-Bel, Reading, UK. It will be used in the new bi-media news facility at Television Centre in London.

Belden Wire & Cable Company, Richmond, IN, has been selected by CBS to become its exclusive supplier of wire and cable products for a wide range of CBS operations. Product lines expected to be included in the agreement are Belden audio, video, data and multimedia cables.

Artel Video Systems, Marlborough, MA, has acquired the assets of Utah Scientific, Salt Lake City. The terms of the agreement haven't been disclosed, but Utah Scientific will operate as a division within the Artel organization.

Tektronix, Inc., Beaverton, OR, has acquired a 10% holding in the UK-based AVS Graphics Limited. The minority acquisition of AVS Graphics, which does business as OmniBus Systems, by Tektronix comes after three years of close cooperation between the companies during a series of TV station installations.

Avid Technology, Tewksbury, MA, has selected the 7000 series of Fibre Channel disk arrays manufactured by Ciprico, Inc., Plymouth, MN, for use in its MediaServer product line.

Additionally, 24 of Avid's Media Composer 4000 disk-based editing and finishing systems have been leased by Westinghouse/CBS for use in its new entertainment and information network, CBS Eye On People.

PEOPLE

Dwight Duke has been appointed president of transmission businesses for Scientific-Atlanta, Norcross, GA.

Also from Scientific-Atlanta, Perry Tanner has been named president of the Satellite Television Networks Division.

Dr. Benjamin A. Pontano has been elected president of COMSAT Laboratories, Clarksburg, MD. ■

Videotaperecorders

Continued from page 103

Betacam form factor, Digital Betacam tapes will not play in these machines.

Compression adapters have also been developed to allow HDTV and other formats to be recorded on a standard D-5 VTR. One adapter compresses the 1.2Gb/s 1,125/60 signal by a ratio of about 4:1 to allow it to be recorded on a D-5 VTR. The D-5 VTR is used primarily as a "bit bucket," and the output of the adapter is formatted so the data can be transferred using the D-5's 360Mb/s interface connection. Four channels of audio are also preserved in the conversion. Other adapters have been developed to allow progressively scanned 525- and 720-line images to be recorded on a D-5 VTR using a similar "bit bucket" approach. The 525P system is currently being used in Japan, and the 720P system is being developed for TV applications.

A version of the DVCPRO 50 (50Mb/s) VTR is being developed for the 525P system also. The doubling of the data rate from 25Mb/s to 50Mb/s and the addition of another DV compression system should allow for a fairly straightforward upgrade to a progressively scanned 4:1:1 sampled video format.

Videotape recording continues to evolve as the video production industry evolves. Other storage media will continue to be developed to serve the needs of certain applications. Hybrid storage systems now exist that exploit the benefits of these different storage media. Understanding the technology of videotape recording will help broadcasters make intelligent, informed nd responsible decisions about the future of video and audio storage in their facilities. ■

Kenneth Hunold is an audio/video project engineer at the ABC Engineering Laboratory in New York.

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The how-to in facility design and upgrade

Continued from page 98

will be placing in equipment rooms. If you are planning a renovation, consider load issues early to ensure that structural modifications are feasible, especially on upper floors. In addition, be aware that robotic cameras have little tolerance for floors with imperfections. Superflat floors must be specified and designed to ensure proper operations in the studio. Structural separation and isolation of studios and technical-support areas from adjacent functional spaces is critical for maintaining optimum acoustical conditions.

Architectural planning and design

Architecturally, facility design must address image, functionality, ergonomics, equipment requirements and sound isolation, along with code compliance and construction cost. A successful plan recognizes the interrelationships among these considerations and achieves a balance that ensures the priorities of each are satisfied. Several key architectural provisions are often not given enough attention when planning for the future.

First is providing adequate space, in the right location, for mechanical and electrical support equipment. Space requirements must be considered in detail from the beginning of the programming process. Next, is remembering the impact of multiple channels, digital and widescreen formats on the size of technical areas. Because the aspect ratios are significantly different, the monitor sizes, viewing angles and distances are different. This will affect the overall dimensions and layouts of rooms within technical areas, including control centers. The new format will also affect the size and dimensional ratios (height to width to depth) of studios.

Finally, an overall integrated solution must be achieved that will serve the station for the life span of the facility. The interrelationship between the broadcast technical systems and the space that houses them has a significant impact on functionality, flexibility and adaptability, as well as ergonomic issues.

As technology and equipment evolves, so will the requirements of the facility and its support systems. Architectural planning and design must be undertaken with a thorough appreciation of the impact of changes in technology on the overall facility. A successful design ensures an efficient and effective long-term balance between broadcast technical systems and all other facility components.

The planning process provides the opportunity to develop many alternatives. Explore and evaluate as many options as you can. The final solution is frequently developed as a spin-off of an alternative that may not work well overall, but contains one really good idea. Start the planning process as early as you can so that you have plenty of time. Remember, it is much less expensive to make changes on paper than with concrete and steel. ■

Kenric B. Stone is manager of business development for the broadcasting, communications and entertainment industries for The Austin Company, and is based in Irvine, CA.

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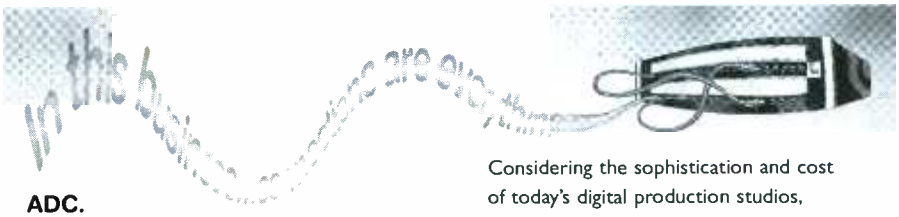

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System 20 ENG #339—Miller 20 Head, 649 2-Stage Aluminum, On Ground Spreader
System 25 #500—Miller 25 Head, 611 Lightweight Tripod, On Ground Spreader
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Vision 12 Systems

Vision 12 systems include #3364-3 SD 12 dual fluid & lubricated friction drag pan/tilt head, single telescoping pan bar & clamp with 100mm ball base.

SD-12A System
- SD-12 pan and tilt head
- 3518-3 Single stage ENG tripod with 100mm bowl
- 3363-3 Lightweight calibrated floor spreader.

SD-12D System
- SD-12 pan and tilt head
- 3513-3 Two-stage ENG tripod with 100mm bowl
- 3314-3 Heavy-duty calibrated floor spreader

VIN-5ST and VIN-10ST

- Compact & lightweight, they maintain Vision performance and quality.
- Provide total stability and durability with payloads up to 33 lbs
- Ideal for the latest generation of dockable and one-piece camcorders.
- Compatible with all Vision accessories.

VIN-5ST includes Vision 5LF head, single stage toggle clamp tripod, spreader and soft case.
VIN-10ST includes Vision 10LF head, single stage toggle clamp tripod, spreader and soft case.

QUICK DIAL 72

JVC DIGITAL S BR-D80/BR-D85
Digital Editing Recorder / Digital Editing Recorder with Pre-Read

Affordable, broadcast quality digital video is here. Digital-S reproduces images that not only are superior to any analog or digital 4:1:1 format but rival even the highest priced digital systems. It combines the robustness and reliability of a 1/2-inch format with 4:2:2 component processing and very mild compression to achieve and sustain excellent quality through multi-generation dubbing.

Broadcast Quality Digital Video

- 4:2:2 digital component processing adds richness and warmth unobtainable with lesser systems. Plus, only 4:2:2 stands up to the rigors of sophisticated chroma-keying, multi-generational editing, special effects, blue-screen compositing, matting, ATV up/down conversion, and multiple transconversion between compression systems.
- Mild 3.3.1 compression reproduces the finest colored details while minimizing artifacts. Digital S pumps out horizontal resolution of 540 TV lines. S/N ratio is 55dB.
- Audio is recorded by 2-channel, 16-bit PCM signals with a sampling frequency of 48kHz. PCM audio channels can be edited independently.
- Standard analog inputs/outputs provide outstanding performance for most applications. When virtually perfect dubs are required, the BR-D85 offers a serial digital interface. The one true digital video standard today, SMPTE 259M permits long cable runs and is used for direct connection to digital switchers, disk-based recorders and digital tape recorders. (Optional with the BR-D80).

Robust 1/2-Inch Format

- They achieve super-high image quality using a robust, 1/2-inch metal particle cassette tape. The cassette housing has a dust-proof structure to increases tape life as well as your images. 1/2-inch format also offers an extra wide track-width of 20 microns for improved stability and reliability.
- Has powerful error correction circuitry that not only replaces data in the unlikely event of a tape dropout but continues to play back a picture even with a clogged head.

Digital Editing

- Equipped with variable slow motion which can be accessed by standard editing commands. Smooth and noiseless, the image quality of slow motion is equal to regular playback and is available within a range of ±1/3X.
- Longitudinal tracks include two auxiliary audio (cue) tracks and a control track for tracking purposes. Cue tracks provide easy location of edit points which can be heard at any tape speed.
- Because of its linear control track, Digital-S has a short lock-up time which eliminates long pre-rolls. This feature achieves a stable picture faster, saving precious editing time.
- Auxiliary video (sub-code) area stores two selectable uncompressed lines of video. Suitable for recording closed caption or other information located in the vertical blanking interval.

PRE-READ EDITING (BR-D85 Only) Previously an exclusive feature of very high-end digital systems, video pre-read enables the recorder to first play back the digital signal on the tape, before recording a new signal in its place. Operable with either digital or analog signals, pre-read lets you perform layering and A/B roll editing with only two VCRs, instead of three.

QUICK DIAL 74

GY-X2B 3-CCD S-VHS Camcorder

- Newly designed three 1/2" CCD image sensors deliver 750 lines of horizontal resolution and superb signal-to-noise ratio of 62dB
- Micro-lens technology provides exceptional sensitivity of F8.0 at 2000 lux and LOLUX mode lets you shoot with almost no light! Shoot superb footage with excellent color balance at a mere 1.5 lux
- Variable Scan allows flicker-free shooting of a computer screen
- Full Time Auto White circuit lets you move from incandescent to fluorescent to outdoor lighting without changing white balance or the filter wheel.
- Quick Record Mode - when turned on the camera is set to the auto iris even if lens is set at manual. Also activates Automatic Level Control and Extended Electronic Iris which provides both variable gain and variable shutter. Shoot continuously from dark room to bright outdoors without having to adjust gain, iris or ND filter.
- Dual output system allows camera output to be connected directly to an external recorder

KY-27C 3-CCD Color Video Camera

- New 2/3-inch broadcast-quality 380,000 pixel CCDs with advanced electronics deliver resolution of 800 horizontal lines and reduced smear.
- High sensitivity of F9.0 at 2000 lux allows a truly usable minimum illumination of 1 lux with JVC's exclusive LoLux dual pixel readout sampling technique.
- LoLux mode allows shooting scenes that were previously impossible due to insufficient lighting. CCDs are maximized for low light sensitivity equivalent to an electronic gain of 24dB, then the dual pixel readout system is added which provides an additional 6dB. Together they provide +30dB without the noise and picture degradation normally associated with this much gain.
- Signal-to-Noise ratio of 63dB assures virtually "noise free" images.
- Auto knee circuitry extends a scene's light to dark dynamic range reproduction by up to five times without overexposure.
- Has large 1.5-inch viewfinder with 600 lines of resolution and SMPTE color bars. Status system provides audio levels, accumulated or remaining recording time, VTR operation, battery voltage and camera setup. Zebra pattern indication and safety zones with a center marker are also provided.
- Variable scan function enables a precise shutter speed from 1/60.2 to 1/196.7 of a second in 256 increments to be set, matching a computers scan rate. Almost any computer display can be clearly recorded.
- Camera head allows direct input of genlock signal and timing adjustment. A wide range optional remote controls, RS-232 interface, multicore and triax CCU's are available.
- Docks directly to the JVC BR-S422U, BR-S411UB and BR-S420CU professional S-VHS recorders. Optional adapters for docking to Hi-8 and Betacam SP are also available.

Panasonic
Broadcast & Television Systems

AG-DP800H
UPERCAM

S-VHS 3-CCD Digital Signal Processing Camcorder

- Three high-density 380,000 pixel CCDs with half-pitch pixel offset achieves over 750 lines of horizontal resolution, a S/N ratio of 60dB and remarkable sensitivity of f8 at 2000 lux. Additionally the Frame Interline Transfer (FIT) CCDs minimize vertical smear, so you maintain impressive picture quality even in very bright illumination.
- Digital Signal Processing circuitry provides four valuable benefits
  1) Consistently reliable up-to-spec performance
  2) Fine adjustment of a wide range of parameters.
  3) Memory storage and instant recall of specific settings.
  4) More flexible and higher quality image processing, as well as easier maintenance
- Six Scene File modes. There are two user modes for custom digital parameter settings including Horizontal Detail, Vertical Detail, Chroma and Dark Detail, and Color Correction. The four preset modes are normal, fluorescent, special and sparkling.
- In addition to regular AGC (Automatic Gain Control), Supercam has a Super High Gain mode. At F1.4 this enables shooting under illumination as low as 2 lux while retaining detail and color balance.
- Synchro Scan function allows flicker-free shooting of computer monitors. Electronic shutter increments can be set variably from 1/61 seconds to 1/253 of a second.
- Built-in internal time code generator lets you record with SMPTE LTC/VITC (Longitudinal/Vertical Interval) time code.
- Two hi-fi stereo audio channels with a dynamic range of 80 dB, as well as two linear audio channels with Dolby NR. Normal/Hi-Fi recording is selectable. Uses XLR connectors to further ensure high-quality sound.
- Has a 26-pin connector on the back that outputs a composite or component video signal. This enables convenient backup recordings using an additional VCR equipped with a 26 or 14-pin connector.
- Phantom power can be supplied to an optional microphone. Power can be switched off to prevent battery drain when not in use.

DP-800H "LS" Package:
- DP-800H Supercam 3-CCD camera head with 1.5" electronic viewfinder and Anton Bauer Gold Mount battery
- Fujinon S14x7.5 BRM 14:1 servo zoom lens
- CC-S800 soft carrying case
- WV-QT700 tripod mounting plate

DP-800H "XL" Package:
- DP-800H Supercam 3-CCD camera head with 1.5" electronic viewfinder and Anton Bauer Gold Mount battery
- Fujinon S14x7.5 BRM 14:1 servo zoom lens
- CC-H800 Thermodyne hard shell carrying case
- WV-QT700 tripod mounting plate
- Two Anton Bauer Digital Trimpack 14 batteries
- Anton Bauer 2-position quick charger

QUICK DIAL 72

sachtler
VIDEO 14/100 FLUID HEAD

- Sachtler Touch and Go System
- Integrated sliding battery plate
- Strengthened dynamic counterbalance in 2 steps
- Frictionless leak proof fluid damping with three levels of drag
- Vibrationless vertical and horizontal brakes
- Built in bubble for horizontal leveling

HOT POD TRIPOD SERIES

Especially developed for use in ENG, the Hot Pod tripod is the fastest in the world. The central locking system is activated on all three legs at the same time, while the pneumatic center column easily makes it possible to have the lens at a height of over 7 feet. The elevation force of the center column is factory set and doesn't require any setup. When moving to another location it can be carried by its handle located at the center of gravity.

ENG TWO-STAGE TRIPOD SERIES

Sachtler two-stage tripods have an enlarged height range (lower bottom and higher top position) so they are more universal. Legs can be locked in seconds with Sachtler's quick clamping. There are also heavy duty versions for extra stability. The heavy duty aluminum has a 20mm diameter tube vs. 16mm and the heavy duty carbon fiber has a 24mm diameter tube vs. 22mm. All heavy duty two-stage tripods have a folding tripod handle.

NEW! Sachtler CADDY systems

Now Sachtler quality is available to low budget users. The price of a CADDY system includes the new 7-step dampened CADDY fluid head, ultra-light but rugged carbon fiber tripod, lightweight spreader and either a soft bag or cover. The CADDY fluid head features an adjustable pan arm, 7 step adjustment for quick counter balance and the self-locking Sachtler Touch and Go System.

CAD 01 Single-Stage ENG Carbon Fiber System:
- CADDY Fluid Head • ENG Single-Stage Carbon Fiber Tripod
- SP 100 Lightweight Spreader • Transport Cover 100

CAD 2A 2-Stage ENG Carbon Fiber System:
- CADDY Fluid Head • ENG 2-Stage Carbon Fiber Tripod
- SP 100 Lightweight Spreader • Soft padded ENG Bag

Libec MATTHEWS
P100 Portable Pneumatic Pedestal

The P100 is a small size pedestal that offers great flexibility without taking up too much space. Featuring an advanced air pressure system, the P100 smoothly handles loads up to 66lbs., easily accomodating professional cameras used in a studio. Ideal for CATV, small studios, event and wedding video as well as all kinds of industrial and institutional applications.

Air Pressure System:
- Air pump attached to the main body frame allows air to be pumped into a column anywhere and anytime – even while a camera is mounted on the pedestal. This allows you to check and adjust the air pressure while using the pedestal and avoid over-filling of air.
- Air pressure can be gradually adjusted by discharging air through a bleed valve when too much air has been pumped into the column. There is also a relief valve that automatically lets air out when air pressure inside the column exceeds the uniform value, bringing it below the uniform value.
- Large double wheel 5" casters allow the P100 to move smoothly and quickly. Wheels and caster axiles are easily fixed by the double stopper system.
- A track lock mechanism locks the wheels of the pedestal so that it only moves in a desired position.
- Cable guards prevent the casters from rolling over and becoming tangled in camera cables when the tripod is moved around in a studio.
- Large steering wheel affords greater ease in handling when shifting columns up and down or when moving the pedestal.
- Maximum and minimum height is 31" to 61". By attaching the optional LA-100 Low Angle Adapter to the dolly for shooting at low angles. (Height from the ground to mount is only 10").
- The column and dolly can be quickly disassembled for convenient transport. The column weighs 18 lbs. and the dolly 16 lbs.

H80 Professional Fluid Head

A premium fluid head, the H80 incorporates a patented drag control system that provides the smoothest pan and tilt available.
- Unlike conventional drag systems that have click stops at predetermined points, Libec's Continuous Drag Control System provides infinite control of drag tension allowing smooth, rapid movements as well as very slow movements.
- Continuous Counter Balance Control System provides optimum camera balance with tilt angles of + 90° or -90°.
- Designed to withstand the most demanding environments, the H80 is fully operational even in temperatures as low as -22°F.
- H80 supports up to 37 lbs. and has a 100mm claw-ball to simplify camera leveling.

H70 Professional Fluid Head

The H70's patented counter balance mechanism supports various operating configurations including stand-alone cameras, camcorders and studio cameras with large viewfinders. Perfect balance can be obtained with settings from 0 to 3, depending on camera weight (from 15 to 33 lbs.) and tilt angle.
- Sliding balance plate features a locking mechanism and allow a total of 4" (100mm) of travel for camera balance. Has a 100mm claw ball.

www.americanradiohistory.com

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PHOTO - VIDEO - PRO AUDIO

QUICK DIAL 74

NRG

POWER VEST SYSTEM

The Power Vest combines the comfort and convenience of a photo-journalist style vest with the power of NRG's highest capacity power belt. Available in two styles, the **Field** model is designed for use in a field production environment, while the **Event** model is for shooting events where style is everything. The Field model is ruggedly constructed from black high density weatherized ballistic nylon and has an open-cut style that makes it comfortable to wear in a variety of climates. Also has a highly adjustable design to fit almost any physical proportion.

- Internal and external pockets for blank tapes and accessories, a clear insert window for a press pass or business card, D-rings for cables and microphones, and an integral padded camera rest on the right shoulder.
- Cleverly concealed inside the vest is your choice of 12-volt 86 watt hour or 13.2-volt 95 watt hour nicad cell packs.
- A control box on the front features dual power outputs (dual cigarette, dual XLR or mixed).
- 7-stage "fuel-guage", charge status indication and auto-reset short/overload protection.

The **Event** model is very similiar to the **Field** except in place of rugged fabric and pockets it features shoulder to sternum black satin tux fabric. Worn under a suit coat, the **Event** model is indistinguishable from a formal dress vest and it still retains interior and low exterior pockets. Both vests include 300-series charger (12 hrs.) and can be used with the optional Intelliquick Fast Charger (2 hrs.).

POWER CAN SERIES

For powering single or multiple pieces of 12v DC equipment for extended periods of time, nothing beats the power and convenience of NRG's Power-Can Series. It integrates an ultra-high capacity, high-discharge-capable UPS type lead acid power cell, a world-wide fast charger, and computer-controlled monitoring system with display—in a single, rugged package. Connect up to four pieces of equipment simultaneously. From a midnight emergency scene to a wedding reception in the park, the Power-Can delivers ample power for extended running time.

- Recharge in 8-10 hours by simply plugging the Power-Can into any source of AC power (90-250v AC)
- LCD display shows discharge/charge status, voltage etc.
- An optional "Power Dolly" allows the Power-Can to be rolled for easy transport.
- Available in 18, 28 and 40 amp versions, each Power-Can has either four cigarette lighter connectors, four 4-pin XLR connec-

HORITA

BSG-50
Blackburst/Sync/Tone Generator

The BSG-50 provides an economical means for generating the most common RS-170A video timing signals used to operate various video switchers, effects generators, TBCs, VCRs, cameras and video edit controllers.

- 6 BNC video/pulse outputs
- Now available: 6 blackburst, 4 sync, 2 subcarrier
- Each sync output individually settable for composite sync, composite blanking, H-drive, or V-drive.
- Separate buffer for each output–maximum signal isolation
- 1KHz, 0dB sinewave audio tone output, locked to video
- Outputs can easily be configured to meet specific user and equipment needs..... **$269**

CSG-50
Color Bar/Sync/ Tone Generator

- Generates full/SMPTE color bars, blackburst and composite sync signals.
- Built-in timer can automatically switch video output from color bars to color black after 30 or 60 seconds. Easy and convenient for producing tape leaders and striping tapes with color bars and black.
- Front panel selection of full-field or SMPTE color bar patterns or colorblack (blackburst) video output.
- Includes crystal-controlled, 1KHz, 0dB audio tone output.
- Outputs: video, sync, ref frame, 1 KHz, 0dB
- Audio tone switches to silence and color bars change to black when using 30/60 second timer
- Fully RS-170A SC/H phased and always correct. No adjustment required..... **$349**

WE STOCK THE FULL LINE OF HORITA PRODUCTS INCLUDING:

WG-50 -	Window Dub Inserter
TG-50 -	Generator/Inserter
TRG-50 -	Generator/Inserter/Search Speed Reader
TRG-50PC -	Has all of the above plus RS-232 control.
VG-50 -	VITC Generator, LTC-VITC Translator
VLT-50 -	VITC-To-LTC Translator
VLT-50PC -	VITC-To-LTC Translator / RS-232 Control
RLT-50 -	Hi8 (EVO-9800/9850)TC to LTC Translator
TSG-50 -	NTSC Test Signal Generator
SCT-50 -	Serial Control Titler "Industrial" CG, Time-Date Stamp, Time Code Captioning
SAG-50 -	Safe Area, Convergence Pattern and Oscilloscope Line Trigger and Generator

QUICK DIAL 74

Canon

IF+ Series 1/2-inch and 2/3-inch Zoom Lenses

Canon's IF+ family of lenses are engineered to meet the needs of the next generation of broadcasting while meeting the standards of today. Besides having the widest wide angle lens available, the IF+ lens series have wider angles at shorter M.O.D. (Minimum Object Distance), provide higher MTF performance and incorporate Hi-UD glass for reduced chromatic aberration. In addition to superb optics they're all designed with Canon's "Ergonomic Grip" for fatigue-free shooting over an extended time. IF+ lenses are your assurance of unsurpassed quality and performance for today and tomorrow.

J15ax8B

A next generation internal focusing lens with the shortest MDD and widest angle of any standard lens, the J15aX8B IRS/IAS is a standard ENG lens that lets you shoot in tight or restricted areas at the closest mimimum object distance ever possible and capture more of the subject. It incorporates all the great features of IF+lenses including a built-in 2X extender, high MTF performance, Hi-UD glass, square lens hood and Canon's "Ergonomic Grip"

J20ax8B IRS/IAS

Excellent for ENG, sports and production, the J20aX8B IRS/IAS lets you squeeze in shots from 8mm and still take you all the way out to 320mm with its built-in extender. Incorporates all IF+ features, plus is the only lens (besides the J9aX5.2B IRS/IAS) with aVari-Polar lens hood, enabling rotation of attached filters.

anton bauer

Logic Series DIGITAL Gold Mount Batteries

The Logic Series DIGITAL batteries are acknowledged to be the most advanced in the rechargeable battery industry. In addition to the comprehensive sensors integral to all Logic Series batteries, each DIGITAL battery has a built-in microprocessor that communicates directly with Anton/Bauer InterActive chargers, creating significant new benchmarks for reliability, performance, and life. They also complete the communications network between battery, charger and camera. With the network in place, DIGITAL batteries deliver the feature most requested by cameramen: a reliable and accurate indication of remaining battery power.

DIGITAL PRO PACS

The Digital Pro Pac is the ultimate professional video battery and is recommended for all applications. The premium heavy duty Digital Pro Pac cell is designed to deliver long life and high performance even under high current loads and adverse conditions. The size and weight of the Digital Pro Pac creates perfect shoulder balance with all cameras/camcorders.

- **DIGITAL PRO PAC 14 LOGIC SERIES NICAD BATTERY** 14.4v 60 Watt Hours. 5 1/8 lbs. Run time: 2 hours @ 27 watts, 3 hrs. @ 18 watts
- **DIGITAL PRO PAC 13 LOGIC SERIES NICAD BATTERY** 13.2v 55 Watt Hours. 4 3/4 lbs. Run time: 2 hours @ 25 watts, 3 hours @ 17 watts

GOLD MOUNT BATTERIES

Logic Series Gold Mount batteries are identical to the respective DIGITAL versions with respect to size, weight, capacity, IMPAC case construction, and application. They are similarly equipped with micro-code logic circuits and comprehensive ACS sensors. They do not include DIGITAL microprocessor features such as the integral diagnostic program "Fuel Computer". LCD/LED display and InterActive viewfinder fuel gauge circuit.

- **PRO PAC 14 NICAD BATTERY** (14.4v 60 Watt Hours)
- **PRO PAC 13 NICAD BATTERY** (13.2 v 55 Watt Hours)
- **TRIMPAC 14 NICAD BATTERY** (14.4v 40 Watt Hours)
- **TRIMPAC 13 NICAD BATTERY** (13.2 v 36 Watt Hours)
- **cDMPAC 14 NICAD BATTERY** (14.4v 40 Watt Hours)
- **COMPAC 13 NICAD BATTERY** (13.2v 36 Watt Hours)

InterActive 2000 Power/Chargers

A new generation of portable power systems, the InterActive 2000 Power/Charger series was designed from the ground up to offer unprecedented flexibility and economic expansion capabilities. Fully compatible with all current and future Gold Mount batteries, the InterActive 2000 Power/Chargers deliver all the advancements and proven reliability of interactive charging plus the ability to power a camera from AC mains. They also offer a unique, totally modular design that allows economical expansion to meet future needs. Starting with a base model, upgrades can be easily added at any time. With an unparalled combination of value and features, the InterActive 2000 Power/Charger system redefines the standard of power for video applications.

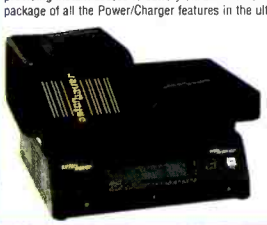
Standard Features on all InterActive 2000 Power/Chargers

- Two or four position models each with the full complement of InterActive technologies (see previous page) including: Automatic balance and rejuvenation, Lifesaver Maintenance, Gold battery safety and Power Loss Memory modes
- They have a slim, lightweight design for easy portability. The 2702 and 2401 Quad Power/Chargers fit easily in a notebook computer carrying case and the 2701 and 2401 Dual Power/Chargers weigh just 2.3 pounds. Plus, they include power supplies, so you can leave your AC supply behind!
- Built in regulated DC power supply output powers cameras from AC mains worldwide. Wide range (90-260 volts AC, 50/60 Hz) input automatically adapts to any worldwide source.
- Standard serial output for printer and PC interface.
- Two power choices for optimized performance and economy
- LCD automatically displays critical battery and charger data.
- Expanded communications with Digital Batteries and new charging protocols improve charge times and performance.
- Modular design allows addition or upgrades after purchase:
  - A charge position expansion port allows the addition of expansion charge modules to increase charge capability to four, six or eight batteries, including NP and BP-90 types.
  - Optional Diagnostic/discharge module featuring automatic calibration of digital batteries is available for each model. (standard on Quad 2702)
  - Power supply upgrade allows 40 Watt (2400 series) to be upgraded to 70 Watt (2700 series) capability.

QUAD 2702/2401
Four-Position Power/Chargers

The 2401 and 2702 are the lightest (and slimmest) full featured four position chargers ever available. Designed for the rigors of professional use, they can fast charge four Gold Mount batteries and can be expanded to charge up to eight. They also power any camera/camcorders from any AC main, all in a package the size of a notebook computer and weighing a mere 4 lbs (1.8 kg.)! The 40 watt (upgradeable to 70 watts) 2401 will charge ProPac batteries in two hours and TrimPac batteries in one hour. Add the Diagnostic/Discharge module and the QUAD 2401 becomes an all purpose power and test system with its standard LCD providing instant access to battery status. The 70 watt QUAD 2702 bundles the complete package of all the Power/Charger features in the ultimate professional power system.

Dual 2702/2401
Two-Position Power/Chargers



The DUAL 2701 (70 watt) and 2401 (40 watt) are sleek, rugged and economical two position Power/Chargers that have all the features of Anton/Bauer InterActive 2000 technology including DC camera output and an LCD display that shows the status of each battery as well as the internal battery data communicated from Digital Batteries. The high performance DUAL 2701 will charge any Gold Mount battery in one hour, the DUAL 2401 charges ProPac batteries in two hours and Trimpacs in one. Their compact, lightweight package design makes them the ultimate travel Power/Chargers. They can also be upgraded with the Diagnostic/Discharge Module and/or with the Expansion Charge Modules to charge up to six batteries of any type.

PROFESSIONAL VIDEO TAPE

QUICK DIAL 71

FUJI

Professional Grade VHS

PG-30	2.29	PG-60	2.49	PG-120	2.69

Superior Grade Double Coated VHS

SG-30	3.39	SG-60	3.99	SG-120	4.49

H471S S-VHS Double Coated

ST-30	6.99	ST-60	7.49	ST-120	7.99

M221 Hi 8 Double Coated

Metal Particles				Metal Evaporated			
P630HMP	4.99			E630HME	8.39		
P660HMP	6.49			E660HME	10.49		
P6120HMP	8.49			E6120HME	13.99		

M321SP Metal Betacam (Box)

05S	17.95	10S	18.49
20S	19.95	30S	22.95
60L	31.95	90L	49.95

DVCPRO

12M (Medium)	7.59	23M	9.19
33M	11.99	63M	20.49
64L (Large)	21.59	94L	32.49
123L			42.19

maxell

P/I PLUS Expitaxial VHS

T-30 Plus	1.69	T-60 Plus	1.99	T-90 Plus	2.09
T-120 Plus	2.19	T-160 Plus			2.69

HGX-PLUS Expitaxial VHS (Box)

HGXT-60 Plus	2.69	HGXT-120 Plus	2.99
HGXT-160 Plus			3.99

BQ Broadcast Quality Expitaxial VHS (Box)

T-30 BQ	5.49	T-60 BQ	6.19	T-120 BQ	7.39

BQ Certified Professional S-VHS (In Box)

ST-31 BQ	7.19	ST-62 BQ			8.09
ST-126 BQ	8.39	ST-182 BQ			14.99

Betacam SP

B5MSP	15.75	B10MSP	17.75	B20MSP	19.75
B30MSP	20.50	B60MLSP	29.75	B90MLSP	46.49

Panasonic

Mini DV Tape

AY DVM-30	9.95	AY DVM-60	11.99

DVCPRO

AJ-P12M (Medium)	10.99	AJ-P23M	12.99
AJ-P33M	15.99	AJ-P63M	29.99
AJ-P64L (Large)	29.99	AJ-P94L	49.95
AJ-P123L			64.95

SONY

Hi-8 Professional Metal Video Cassettes

P6-30 HMPX	4.59	P6-30 HMEX	7.99
P6-60 HMPX	6.59	P6-60 HMEX	11.49
P6-120HMPX	8.89	P6-120HMEX	15.49

Hi-8 Metal Evaporated Editor (HMEAD)

E6-30 HMEAD	10.49	E6-60 HMEAD	14.89
E6-120 HMEAD			20.19

PR Series Professional Grade VHS

T-30PR	2.39	T-60PR	2.59	T-120PR	2.79

PM Series Premier Grade Professional VHS

T-30PM	3.49	T-60PM	3.99	T-120PM	4.79

BA Series Premier Hi-Grade Broadcast VHS (In Box)

T-30BA	3.59	T-60BA	3.99	T-120BA	4.79

MQ Master Quality S-VHS (In Box)

MQST-60	7.49	MQST-120	8.39

BRS 3/4" U-matic Broadcast Standard (In Box)

KCS-10 BRS (mini)	8.29	KCS-20 BRS (mini)	8.99
KCA-10 BRS	8.19	KCA-20 BRS	8.69
KCA-30 BRS	9.69	KCA-60 BRS	13.39

XBR 3/4" U-matic Broadcast Master (In Box)

KCS-10 XBR (mini)	8.79	KCS-20 XBR (mini)	10.19
KCA-10 XBR	9.29	KCA-20 XBR	10.69
KCA-30 XBR	11.99	KCA-60 XBR	15.69

KSP 3/4" U-matic SP Broadcast (In Box)

KSP-S10 (mini)	9.59	KSP-S20 (mini)	11.09
KSP-10	10.09	KSP-20	11.59
KSP-30	12.99	KSP-60	16.99

BCT Metal Betacam SP Broadcast Master (Box)

BCT-5M (small)	14.99	BCT-10M (small)	15.99
BCT-20M (small)	17.99	BCT-30M (small)	18.99
BCT-30ML	21.49	BCT-60ML	27.99
BCT-90ML			41.99

BCT Metal Professional Series

UVW-30MLA	18.95	UVW-60MLA	25.50
UVW-90MLA			39.95

Mini DV Tape

DVM-30ME	15.99	DVM-60ME	19.95

PVD Series Professional DVCAM Tape

PDVM-12ME (Mini)	24.50	PDVM-22ME (Mini)	26.95
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QUICK DIAL 731

DIGITAL PROCESSING SYSTEMS INC.

PVR-2500 'Perception' Digital Video Recorder

The Heart of an Advanced Digital Audio/Video Workstation

The PVR-2500 offers powerful features for awesome animation, morphing and roto-scoping capabilities. With features like 720 x 480 resolution, 10-bit 2x oversampled video encoding, better than D1 scaling, component and S-Video outputs, multi-processor support and integrated FAST SCSI-2 controller, it empowers your computer to rival the finest professional production studios.

- The PVR-2500 is a full-length PCI card with a FAST SCSI-2 controller which connects to one or up to seven dedicated hard drives. Because the SCSI controller is integrated with the PVR-2500, video data never has to go over the PCI bus during playback. This avoids the bottlenecks found in systems which use the computer's hard drive for video storage.
- Perception gets animations out of your computer fast and easy. Its exclusive multi-format virtual file system ensures complete integration with your Windows NT applications. Any acquired video or computer generated Perception video clips appear simultaneously in many different file formats including TARGA, SGI, BMP and IFF. Perception is compatible with Lightwave 3D, Autodesk 3D Studio Max, Crystal Graphics TOPAS 5.1 PRO, Microsoft SoftImage, Elastic Reality and others.
- Runs under Windows NT 3.5 on computers with Pentium, DEC Alpha or MIPS processors. Perception's software utilizes NT's native support for multitasking and multiple processors, allowing use with the most powerful computers.
- Perception performs real-time interpolation of 30 fps video to 24 fps film rates or vica versa. This means that it is also at home on the Hollywood movie set as well.
- Video output section utilizes 10-bit 2x oversampled encoding and provides broadcast quality CCIR-601 (720 x 480) resolution. Dynamic range is in excess of D1 scaling so images are brighter, have more color and greater spatial resolution than ever before. Component, composite and S-Video outputs are provided via the included breakout cables.
- Also control BVU protocol VCRs for video acquisition. VCR-like controls on the Perception's GUI simplifies the task of batch digitizing and recording. In this mode, the PVR-2500 can read SMPTE time code from the source deck.
- Can be used with any Windows NT compatible sound card while synchronization of audio and video is maintained by the PVR software. Captured audio is stored on the computer's system hard drive, not on the dedicated drives. This approach provides maximum flexibility for manipulating audio and video during editing.
- Can be used with third party editing software such as Adobe Premier or in:sync Speed Razor MACH III. In fact, a system equipped with the PVR-2500, AD-2500 capture card, a sound card, editing software & one or more SCSI drives becomes a non- linear editor of unparalled performance – at an unbeatable price.

AD-2500 Component Video Capture Card

Coupled with the AD-2500 live video capture daughter card, the PVR-2500 becomes a broadcast-quality digital disk recorder. It delivers unsurpassed picture quality and storage capacity is limited only by the size/number of attached SCSI hard drives.

- Has component, composite and S-Video inputs for real-time recording. Captured video can also be exported as sequential RGB files for rotoscoping and other compositing applications.
- Incorporates a sophisticated automatic entropy prediction circuit that analyzes the content of incoming video and dynamically calculates the optimum amount of compression on a field-by-field basis—even during real-time recording. You also have complete manual control over compression level/quality settings.

FX-2500 Perception Effects Accelerator

The FX-2500 significantly reduces the time required to render complex non-linear transitions. Although it doesn't deliver real-time transitions, it significantly improves the productivity of non-linear editing systems by dramatically speeding up the rendering time for many effects and transitions.

- A stand-alone PVR-2500 provides real-time cuts between video clips, but other transitions such as dissolves and wipes, substantial delay can occur. A 30 frame dissolve can take minutes to render, even with the fastest PC, because the host CPU processes source frames on a pixel-by-pixel basis. The Perception FX reduces the waiting to time to under 10 seconds.

DAR-2500 Digital A4V Recorder

Featuring comprehensive audio post-production capabilities, the A4V (Audio for Video) board provides perfect video/audio synchronization when used with the PVR-2500. A full-length PCI card, the A4V's input and output connections are made via the supplied breakout cables while digital audio is stored on the system hard drive. And to ensure compatibility with third-party audio editing software, it plays and records standard uncompressed WAV files. It can also be controlled directly by video editing software like in:sync's Speed Razor Mach III.

- Non-linear, non-destructive audio editing. No waiting for edits to compile.
- True audio scrub.
- Simultaneous record/playback. Play up to three stereo tracks while recording one stereo track.
- Mix four stereo source tracks down to two output channels in real-time.
- Four-band Parametric EQ for each channel (assignable by stereo pair).
- Real-time reverb and compressor/limiter. Additional effects can be easily added via software upgrades.
- Built-in LTC/ VITC time code generator/reader/inserter lets you create window dubs with time code information superimposed over composite or S-video signals.
- Unlimited audio editing capabilities with third party software.

Scitex

SPHEREOUS Professional Video Editing Software for Macintosh

Working in conjunction with the Apple PowerMac 9500 and Truevision's TARGA 2000 RTX board, SphereDUS provides two simultaneous channels of CCIR 601 high resolution video, key-frameable effects control and four channels of stereo audio. An editors dream, dual streams of video eliminate waiting for transitions to render and enable a still alpha channnel to be superImposed without rendering. Who says the pros get to have all the fun? Now, sophisticated, realtime video editing capabilities are yours thanks to the industry-rocking punch of SphereOUS.

- Variable video compression ratios as low as 3:1 (user-selectable up to 18:1) translates into excellent picture quality. PlusSphereOUS offers extremely clean input and output (CCIR 601, 720 x 486 pixel NTSC; 720 x 576 pixel PAL) electronic video paths, with results that are virtually indistinguishable from the original source.
- Two simultaneous streams of broadcast-quality video allow special effects to take immediate shape on your monitor. InstantFX. Realtime. All the Time. InstantFX means your fingers fly across the keyboard, and as soon as you enter an idea POW! there it is on the screen. Want to modify something? Another POW! The minute you think of it, there it is moving from concept to reality in the blink of an eye. SphereOUS fully leverages the dual realtime video stream capability of the TARGA 2000 RTX.
- Realtime audio mixing with four CD-quality, stereo audio tracks - as well as independent channel gain, pan, and phase invert for maximum realtime flexibility. And remember - all audio effects are keyframable, inviting you to customize to your heart's content.
- SphereOUS' QuickTime-native Motion JPEG file format can be freely exchanged with compatible applications, enabling you to work with a variety of third-party animation and effects programs to create precisely the look you want.

DveousFX and AdvancedFX Options

The DveousFX is an optional full-length PCI board which adds 3D space manipulation to the existing 2D digital effects of the TARGA 2000RTX– providing real-time effects capabilities far and above what is possible with the RTX alone. This option allows you to rotate an image - with perspective - on an X, Y, and Z axis. You can also play with an extensive array of wipe patterns such as diamonds and hearts, and experiment with capabilities like soft edges, borders, drop shadows, blurs, and pattern repeat and rotation. There's even a luminance keyer on the overlay track with variable softness and position drop shadow.

- Wipe patterns include: Clock, heart, diamond, circle, box, left-right, center-split, 2-V point, square, triangle, pentagon, hexagon, 5- 6- 10-point stars, envelope, snowflake, hyper-hexagon, rounded hexagon, ellipse.
- Timecode support • Batch digitizing
- Unlimited custom effects creation capability
- Realtime video transitions: dissolves, wipes, pushes, zooms
- Realtime video special effects: crop, 2D DVE (size, position, X/Y 'rotation')
- Powerful Keyframer Control palette provides keyframe control of multiple layers of video.

For maximum impact, the AdvancedFX mezzanine board takes you a step further with the addition of a pallete of unique warps including page turns, rolls, ripples and spheres. The board also adds chroma keying, lighting and color correction controls that make you the master of features like luma and chroma gain, hue rotate, black level, and posterization. Dual color light source can be positioned in 3D space with a choice of bar, flood or spotlight effect to produce extremely realistic highlights and shadows. These can interact with page turns and ripples to pack your production with a realistic punch. With SurfaceFX, you can even add surface textures for a completely new dimension.

- Warp shapes include: Cylinders, rolls, wave, barrel, circle, bowtie, helix, twist, wrap, ripple, zigzag, paper fold, lace, interlace, split, shred, pipe organ, burst, flare, quad page turn, quad page roll, lens, swirl, rings, melt, qaud page split and multi-picture.
- AIFF/CD audio file import and export
- Tools for organizing and managing source material
- PICT file import/export
- CMX compatible EDL output/input
- Control panel operation: Audio Sliders (record and playback) Mode switches (Loop, Preview), VU Meters, VTR Controls

SphereOUS Control Panel

The optional SphereOUS Control Panel is ergonomically designed with jog knob, four faders for control of stereo audio level, master volume, mute, marks, and forward and rewind.

QUICK DIAL 731

FAST The Art of Digital Video

Video Machine

Video Machine is an edit controller for A/B roll, A/X roll and audio/ video split editing. It controls any VCR with Control-L or Panasonic 5-pin edit protocol. With optional interface it provides RS-232/RS-422 machine control as well. Controls 3 VCRs with no other hardware. It also features EDL export, alpha wipes, test pattern generator, Editing Panel, and more than 400 digital effects.

- Bundled VM-Studio software uses a graphical timeline interface for editing. You can work with all available material at the same time, and all objects in the timeline can be edited and moved to any position, any time.
- During previews and recording uses time code (VITC, RC Control Track) to accurately cue the VCRs to the in/out points of individual clips. Graphics, titles, and effects are automatically inserted at the point specified.
- Over 400 digital video effects (dissolves, wipes, tumbles, flips, picture-in-picture, fly-ins, fly-outs, zoom etc). With the DVE Editor, create an unlimited number of 2D effects. All effects are performed in real time.
- Supports composite and S-Video signals in PAL and NTSC. Up to six video inputs (two of which are controllable) can be connected, and any two can be assigned to the two video channels. Video standards can be mixed in real time.
- Two integrated frame synchronizers eliminate the need for TBCs (Time Base Correctors). Also provides two 32-bit framestores and a built-in background color generator.
- VM-Titler lets you create titles, logos and graphics in Windows application such as Corel DRAW or Photoshop. Use any font, size and color. Graphics produced in standard word processing or graphics applications are imported via the VM-Titler software module. Scanned pictures or images can even be imported from Photo CDs. Titles and graphics can be manipulated with any of the effects available. Functions such as scroll and crawl titling are off and running within a matter of seconds. Has complex filters for anti-flickering, scaling etc. Produces text without "stair-stepped" effects.

VIDEO MACHINE + DPR = HYBRID EDITING

Linear and Non-Linear Editing in a Single System for Maximum Flexibility

Video Machine with DPR (Digital Player/Recorder) is the only system which offers real-time mixing of analog and digital sources. Video Machine with DPR integrates two complete editing systems under one interface, thus ensuring the optimum balance of cost, performance, training, and maintenance. It executes both tape- and hard disk-based edits effortlessly, and it's simply a matter of preference whether you work in analog or digital, or both — all on the same system. Only the FAST hybrid system gives you the best of both worlds. Instead of being stuck with an inflexible system, you can select your method to suit your circumstances. For example, viewing and logging your tape footage can be tedious enough without having to face the next step. But imagine instructing the system to copy selected scenes onto the hard disk, while you take a coffee break. When you come back, you're ready to enjoy the creative freedom of non-linear. And once the creative decisions are made, you can either have the system perform the on-line edit for you, from tape or hard disk, or you can choose to go with an EDL export. No other system gives you this much flexibility.

DPR (Digital Player/Recorder:

- With DPR Video Machine becomes a state-of-the-art digital editing system. In addition DPR executes effects and transitions in real time. True M-JPEG compression enables every frame or field to be accessed individually.
- Compresses and decompresses video (software-selectable) from 200:1 to 2:1. At 2:1 DPR delivers broadcast, on-line quality allowing for mastering directly from the hard disk.
- Video Machine system treats the DPR just like any other "normal" video source. The DPR is enabled by a single mouse-click in the VM-Studio software. The edit suite instantly converts to nonlinear and allows you for example, to execute an offline edit in real time. A second click changes the editing suite back to analog. You can now edit the project using tape source material from your VCRs. Whether working on- or off-line, linear or non-linear—all four editing modes are available on one complete system.
- Integrated digital eight-channel mixer allows audio to be edited in real time in standard WAVE format. The audio is synced to video and recorded in full 16-bit, 48 kHz sampling. It is easy to split the digital audio and video signals, and the waveform display helps to precisely position edits. All eight online tracks can be monitored simultaneously.
- DPR is an ideal solution for animation. It offers broadcast quality while reducing recording time to a fraction of what is required with single-frame capable VCRs. Scene logging and batch digitizing are also automatically integrated via the connection of the edit control functions of Video Machine.
- Video Machine is based on an open architecture design and is almost infinitely expandable as far as storage. Up to 29 hard disks can be daisy-chained directly to the DPR. Using 9 GB drives, up to 260 GB is available on the system - enough for 15 hours of 5:1 or 300 hours of 100:1 video.

OPTIONAL ACCESSORIES:

Video Machine is designed to interface perfectly with traditional broadcast equipment. These rack-mountable accessories integrate Video Machine into a professional video studio environment.

Studio Control (SC) :
Connects video, audio, sync, machine control and TC cables from VCRs to Video Machine. With built-in LTC reader/generator, additional preview outputs, balanced XLR audio and reference in/out, the SC Box offers a simple way to interface with studio equipment.

YUV Interface:
19-inch terminal box connects to the internal YUV board. Enhanced analog bandwidth, 2X oversampling and a balanced signal filter guarantee excellent quality. Included calibration software lets you adjust volume and timing. Digital signal passes directly without generation loss.

GPI Box :
The GPI box provides control of external DAT recorders, CD players, video mixers and effect generators. As a master, Video Machine can sync control of up to four devices with pulse signals and has tally support for live cameras. In slave mode, Video Machine serves as the player for titles, graphics and digital video effects.

Jog/Shuttle Wheel:
An alternative to the mouse and keyboard, the physical Jog/Shuttle wheel offers a bette "feel" for the edit and during preview.

ANTEX ELECTRONICS

StudioCard

4-Channel Digital Audio Card for Windows

The next generation in digital audio for the desktop, StudioCard is a premium-quality digital audio adapter with advanced features, studio-quality specs and professional connections. Unmatched in quality, flexibility and expandability, it features 4 tracks of audio sound and real-time digital mixing capability,making it the ideal board for musicians who want digital multitracking and mixing on their PC, or producers looking for a versatile board for post-production digital audio editing and uncompromised audio quality. StudioCard is Windows 95' plug and play compatible plus includes drivers for Windows NT as well.

- Key to StudioCard's amazing sound is the marriage of a low noise analog I/O section and high quality A/D and D/A converters. A PCI-based 32-bit memory mapped board, it delivers less than 0.003% total harmonic distortion and 92dB dynamic range. Plus, a PLL-based sample clock generator that can be locked to an assortment of clock sources.
- Incorporates a programmable 32-bit 40 MHz DSP and pro connections like 4 independent balanced analog I/Ds (+4dBu or -10 dBV) and AES/EBU or S/PDIF digital I/O. It also offers a MIDI port with deep buffers and time stamping. No matter which type of equipment you have StudioCard will integrate into standard studio environments.
- Compatible with film, video or MIDI, StudioCard offers synchronization via SMPTE, MTC, word and pixel clocks, and composite video. Plus, the StudioCard not only reads SMPTE timecode, but generates it as well.
- Unique to the Antex design is StudioCard's multiple adapter capability. This means you can install multiple StudioCards in a single computer for up to 16-track recording. Start with one StudioCard today - add more StudioCards tomorrow. Also included is an on-board SPx expansion connector for plugging in optional daughtercards for compression or enhanced DSP operations.

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QUICK DIAL 72

nova SYSTEMS, INC.

StudioFrame Modular Video Processing System

The Nova StudioFrame Series is a modular, flexible, digital/analog signal processing system. It is designed to efficiently and effectively combine a wide variety of individual function (or processor) boards such as A-D and D-A converters, video signal encoders and decoders, audio and video distribution amplifiers and frame synchronizers into more complex function groups, all in one equipment mainframe. The scalable nature of the StudioFrame design allows it to be easily reconfigured and/or upgraded as today's video standards and requirements continue to evolve. The system is based on two rackmount frame models (the SF-3 and SF-1) allowing up to thirteen front loading processor boards and thirteen rear mounted passive interface cards to be accommodated in a single chassis. Both the StudioFrame SF-1 and SF-3 chassis are designed to meet the most stringent broadcast requirements. The SF-3 is a thirteen slot, 3RU chassis while the SF-1 is a 4 slot, 1RU chassis. All studio cards as well as the two chassis' are backed by a two year warranty on parts and labor with guaranteed 24-hour turnaround service. The units are ruggedly constructed to endure studio rackmount, production van and DB (Outside Broadcast) mobile applications. A universal power supply operates at either 110 or 240 VAC, 50/60 cycle. DC operation is optionally available as is a redundant supply with automatic switchover. Dual exhaust fans maintain proper airflow and cooling. "Hot swappable" front card loading allows power-on removal/insertion of individual processing modules without disturbing others in the system. All cabling can remain in place while you service" any module. An intelligent "centerplane" provides power, sync, timing and data distribution, facilitating expansion to more complex, more cost-effective signal processing functions.

NovaASD/NovaSDA

Analog to Serial Digital & Serial Digital to Analog Converters

Components of the Nova StudioFrame series, the NovaASD and the NovaSDA incorporate the latest digital video processing techniques for high speed A-D and D-A signal conversion. They are designed to meet the most stringent broadcast requirements and their "hot swappable" front card loadling facilitates servicing without disturbing other cards in the system. The NovaASD is ideal for for interfacing analog signals with digital video formats and the NovaSDA for interfacing serial digital signals with existing analog video systems as well as for signal monitoring applications.

SDA-1 Serial Digital Component to Analog Component Converter
- SMPTE 259M 4:2:2: Serial Digital Component (D1) input,
- Equalized and reclocked serial digital component output
- Analog component video (Y, R-Y, B-Y/YUV), RGB or RGB/S outputs
- 10-bit D/A converters
- Output level control
- NTSC and PAL compatible

SDA-2 Serial Digital Component to Composite and S-Video Converter
- SMPTE 259M 4:2:2: Serial Digital Component (D1) input,
- Equalized and reclocked serial digital component output
- Dual composite & dual S-Video outputs
- Color bar output selectable
- 10-bit D/A converters
- Output level control
- NTSC and PAL compatible

SDA-3 Serial Digital Composite to Analog Video Converter
- SMPTE 259M Serial Digital Composite (D2,D3) input,
- Equalized and reclocked serial digital composite output
- Four analog composite video outputs
- Color bar output selectable • 10-bit D/A converters

ASD-1 Analog Component to Serial Digital Component Converter
- Analog component video (Y, R-Y, B-Y/YUV), RGB or RGB/S input
- Dual SMPTE 259M 4:2:2 Serial Digital Component (D1) outputs
- 10-bit D/A converters
- Picture positioning control
- NTSC and PAL compatible

ASD-2 Analog Composite and S-Video to Serial Digital Component Converter
- Analog composite and S-Video input
- Dual SMPTE 259M 4:2:2 Serial Digital Component (D1) outputs
- 10-bit D/A converters
- NTSC and PAL compatible

ASD-3 Analog Composite to Serial Digital Composite Converter
- Analog composite video input
- Dual SMPTE 259M 4:2:2 Serial Digital Composite (D2/D3) outputs
- 10-bit D/A converters
- Input gain adjustment

NovaMNR Median Noise Reducer

The NovaMNR is a StudioFrame card that eliminates impulse and transmission noise, cleans up satellite, microwave and fiber feeds and fills in CODEC and time-based corrected videotape drop-outs. It features full bandwidth, uncompressed 10-bit digital processing for ultimate video transparency as well as analog composite inputs and outputs.

- Eliminates "sparklies", those black and white dots that sometimes appear on remote video feeds. The NovaMNR incorporates a proprietary adaptive three-dimensional median filter that analyzes pixels from several fields of video and replaces the impulse noise with uncontaminated, clean video.
- Universal drop-out compensation replaces missing video information, whether it is from a time-base-corrected VCR source or the decoded output of a CODEC feed. The NovaMNR effectively fills in drop-outs with replacement video from the surrounding pixels and previous video field.
- Control's are accessible locally or remotely. A three position threshold switch (off/low/high) adjusts system noise sensitivity while a bypass/operate switch is also included. Both switches are remoteable via RJ-11 jack.
- Also available in PAL and PAL-M versions.

NC-8 RGB/Component to Composite/S-Video Encoder

The NC-8 processor module is a 10-bit digital encoder that converts analog RGB or component video input sources into Y/C and composite video. Designed to facilitate multi-format interface requirements, the module incorporates the latest digital video processing techniques along with luminance and chrominance pre-comb filtering to assure the highest quality encoding. A frame of memory is utilized to provide an effective zero insertion delay.

- 10-bit processing, 8-bit D/A conversion
- Zero insertion delay, frame of memory
- Two composite and one S-video output.
- Analog RGB (Sync on Green or all three), RGB/Sync and YUV (Betacam) inputs. Also available with looping inputs.
- Variable luminance notch filter
- Y and C pre-comb filtering for maximum encoding performance
- Remote serial control
- Output level control
- Color bar output selectable
- Designed to meet the most stringent broadcast requirements.
- "Hot swappable" front card loading facilitates servicing without disturbing other cards.
- Available in PAL and PAL-M versions

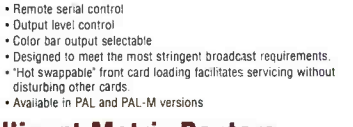
NovaRouter Intelligent Matrix Routers

NovaRouter is a series of serially controlled audio and video matrix routing switchers. These intelligent routers are available in 8x8, 16x16 and 32x32 matrices. They are capable of up to five switching levels to support unlimited combinations of Stereo Audio, Composite Video, Y/C Video, Component Video (Beta or MII), RGB/S and VGA Graphics. Audio follow video or breakaway routing is controlled by very intuitive computer software or optional XY control panels.

The computer software and VGA display provides quick visualization of all crosspoints and facilitates routing operations. An unlimited number of switching configurations may be stored and recalled at the click of a mouse. User defined labels for all sources and destinations provide positive identification of the matrix status. One computer can control several NovaRouter Systems for multiple studio or large presentation system applications.

The optional, easy to use, XY control panels provide routing functions for basic systems without the use of a computer interface. All video, audio and audio follow video switching functions are controlled by source select and destination select switches. Changing and verifying the matrix configuration is simple and clear. The XY controls may be front panel mounted or are available as a remote control unit.

Broadcast quality audio and video processing and microprocessor control ensure superior quality and performance. Yet, the simplicity and modular configurations of NovaRouters™ make them economical for broadcast, production, cable TV, graphics, presentation, teleconference and educational applications.



- 8x8, 16x16 and 32x32 switching matrices
- Stereo audio, composite video, Y/C, component video, RGB/S and VGA
- Up to five (5) levels of switching
- Audio follow video and audio break-away
- Serial control via intuitive computer software or optional XY control units
- Computer VGA monitor display provides quick visualization of all crosspoints
- Easy single "click" mouse switching control
- User labeling of sources and destinations
- Store system configurations in memories
- Multiple locations can be controlled from one computer
- Push-button XY control options, front panel mount or remote control units
- Audio and video modules provide easy system upgrade

VIDEONICS

POWER script™

Animated Postscript Character and Graphics Generator

QUICK DIAL 74

The most advanced character generator ever designed for video production, multimedia and industrial applications, PowerScript delivers the huge range of titles and graphics supported by PostScript display technology, plus animation, effects, transparency and color keying. It features two GPI inputs, anti-aliased, 17.5 ns (nanosecond) pixel resolution and 4:2:2 broadcast-quality video. It also offers high-speed RISC processing to provide real-time Level 2 PostScript imaging and fast rendering—even with the most complex images. The PowerScript works stand-alone or with a computer, has a built-in TBC, offers a powerful and intuitive interface, and is suitable for the desktop or can be rackmounted.

Powerful Character Generator
- Choose from 35 built-in fonts or download PostScript fonts from your PC. PowerScript's high-speed RISC processor provides real-time PostScript imaging.
- Characters can be rotated at any angle, scaled to any size, stretched horizontally or vertically.
- Styles include variable bold and italic, underline and shadow (drop shadow, variable displacement and opacity). Each character can be adjusted separately.
- Text can be positioned anywhere on the screen or automatically centered, vertically or horizontally. Left, right, top, bottom and center justification is also provided.
- Characters are automatically kerned, using the font's standard kerning information. Spacing is highly flexible with variable word and letter spacing and line spacing (leading).

Intuitive User Interface
- Built-in real-time object-based drawing tool and text editor—no computer or software required. Design can be done ahead of time and displayed later, or can be done on the fly.
- Supplied keyboard and mouse are used with easy on-screen menus to place and modify graphics and text.
- Change fonts, colors, and other characters instantly.

Transparency and Colors
- Characters can be made transparent (0-100%) over video, other characters and graphics with 64 levels of transparency.
- Opaque characters can use over 4,000,000 colors , transparent characters can use over 8,000.
- Different colors can be used for fill and outline (variable width) as well as each letter and each graphic.

Roll, Scrawl, Animation, Effects
- Variable speed roll, crawl and push (slide) in all directions.
- Every text object, graphic and logo can be animated. Complex animations include having elements follow paths, bounce, etc.
- Elements can change outline and/or fill color, transparency, position as they move and results are displayed in real time.
- Move individual characters in different directions; make colors change; flash words; make letters and words bounce; spin a letter across the screen. Use fades and wipes to transition between titles and video or between two pages of titles.

Backgrounds and Graphics
- Titles can be placed on solid color, patterned or graduated backgrounds, or they can be genlocked to incoming video.
- Lines, squares, rectangles, ovals and circles can be created and placed anywhere on the screen. Each graphic object can use a different color, transparency, rotation, size, fill and outline.

Imported Logos and Graphics
- Accepts most PostScript or PCX format graphics without modification. Imported images can be any size and can be scaled, skewed, and rotated when placed on screen.Transparency and anti-aliasing can be defined when graphic is generated.

Expansion Capabilities

Although PowerScript operates on its own, you can still add peripherals and connect to a computer or network. Two PC-card slots allow the addition of non-volatile flash-RAM and Ethernet cards. RS-232 port allows connection to desktop computers for added storage and downloading of fonts or graphics from a PC.

QUICK DIAL 72

LEADER

Manufacturing test and measurement equipment for over 40 years, Leader Instruments is the standard which others are measured against for reliability, performance, and most important—cost effectiveness. Before a product is brought to market, an exceptional degree of energy and effort go into its design. Prototypes are built and tested to withstand environmental and other factors far exceeding actual operating conditions. These include high humidity, extremes of heat, cold, shock and vibration. Manufacturing quality is built in every step of the way and only the finest parts are used. At each production run, subassemblies are separately tested before they are integrated into the finished product, then each product is tested again. This is why less than half of 1% of all Leader products are ever returned for warranty repair or adjustment.

5860C WAVEFORM MONITOR

A two-Input waveform monitor, the 5860C features 1H, 1V, 2H, 2V, 1 s/div and 2V mag time bases as well as vertical amplifier response choices of flat, IRE (low pass), chroma and DIF-STEP. The latter facilitates easy checks of luminance linearity using the staircase signal. A PIX MON output jack feeds observed (A or B) signals to a picture monitor, and the unit accepts an external sync reference. Built-in calibrator and on-off control of the DC restorer is also provided.

5850C VECTORSCOPE

The Ideal companion for the 5860C Waveform Monitor, the 5850C adds simultaneous side-by-side waveform and vector monitoring. Featured is an electronically-generated vector scale that precludes the need for fussy centering adjustments and eases phase adjustments from relatively long viewing distances. Provision is made for selecting the phase reference from either A or B inputs or a separate external timing reference.

5100 4-Channel Component / Composite WAVEFORM

The 5100 handles three channels of component signals, plus a fourth channel for composite signals, in mixed component / composite facilities. Features are overlaid and parade waveform displays, component vector displays, and automatic bow-tie or "shark fin" displays for timing checks. Menu-driven options select format (525/60, 625/50, and 1125/60 HDTV), full line-select, vector calibration, preset front-panel setups and more. On-screen readout of scan rates, line-select, preset numbers, trigger source, cursor time and volts.

5870 Waveform/Vectorscope w/SCH and Line Select

A two-channel Waveform/Vector monitor, the microprocessor-run 5870 permits overlaid waveform and vector displays, as well as overlaid A and B inputs for precision amplitude and timing/phase matching. Use of decoded R-Y allows relatively high-resolution DG and DP measurements. The 5870 adds a precision SCH measurement with on-screen numerical readout of error with an analog display of SCH error over field and line times. Full-raster line select is also featured with on-screen readout of selected lines, a strobe on the PIX MON output signal to highlight the selected line, and presets for up to nine lines for routine checks.

5872A Combination Waveform/Vectorscope

Models 5872A offers all the operating advantages of the 5870, except for the following. SCH is deleted from the 5872A (line select retained), making it ideal for satellite work.

5864A Waveform Monitor

A two-input waveform monitor that offers full monitoring facilities for cameras, VCRs and video transmission links. The 5864A offers front panel selection of A or B inputs, the choice of 2H or 2V display with sweep magnification, and flat frequency response or the insertion of an IRE filter. In addition, a switchable gain boost of X4 magnifies setup to 30 IRE units, and a dashed graticule line at 30 units on screen facilitates easy setting of master pedestal. Intensity and focus are fixed and automatic for optimum display. Supplied with an instruction manual and DC power cable.

5854 Vectorscope

A dual channel compact vectorscope, the 5854 provides precision checkout of camera encoders and camera balance, as well as the means for precise genlock adjustments for two or more video sources. Front panel controls choose between A and B inputs for display and between A and B for decoder reference. Gain is fixed or variable, with front panel controls for gain and phase adjustments. A gain boost of 5X facilitates precise camera balance adjustments in the field. Supplied with a DC power cable.

Designed for EFP and ENG (electronic field production and electronic news gathering) operations, they feature compact size, light weight and 12 V DC power operation. Thus full monitoring facilities can be carried into the field and powered from NP-1 batteries, battery belts and vehicle power. Careful thought has been given to the reduction of operating controls to facilitate the maximum in monitoring options with the operating simplicity demanded in field work.

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Continued from page 38

and applications.

The Grand Alliance system was designed to work well with the different format selections. The MPEG-2 syntax from the Moving Picture Experts Group (MPEG) is used, and the MPEG-2 tool kit supports most of the compression algorithms used by the system proponents. The video encoder supports the 1,080-line interlaced and the 720-line progressive formats. It was also designed for bidirectional-frame (B-frame) prediction, wide motion-estimation ranges, field and frame motion vectors, and adaptive field and frame DCT coding. The Grand Alliance system also supports forward analysis with localized quantization-level control and automatic film detection for high picture quality.

The PC Theatre, recently unveiled by Compaq Computer Corporation and Thomson Consumer Electronics' RCA brand, combines a fully featured computer with a large-screen television.

Broadcasters beware

You should be wary of the "bill of goods" being sold to broadcasters. Even the innocent-looking December agreement has the potential to be used as an entry by the computer industry bringing incompatible viewing services. This agreement opened the door for access to our audiences by additional content providers and producers. Should the computer manufacturers be successful in their campaign, it will impact both receiver design and allow the computer industry to build new desktop computers and laptop computers optimized for their content.

On this issue, broadcasters must remain united; no one outside the technical TV industry should control their destiny. ■

Louis Libin is a broadcast/FCC consultant based in New York.

Selecting an audio console

Continued from page 105

tion and interference, providing a consistent, clean and quiet signal path throughout a facility.

A further physical bonus that comes with any digital audio device (but which pays off with greater impact on a large mixer) is the reduction in cabling that the AES3 interface provides. Grouping a stereo pair (or two independent mono inputs) on a single wire can add up to a savings of many hundreds of feet of cable and dozens of connectors when installing a digital mixer.

Synchronization

The primary downside of the digital mixer involves its requirement for synchronization. (Video professionals will find this less disturbing than audio engineers because of its similarity to traditional analog video.) All sources that connect to a digital mixer's inputs must be locked to the same sampling rate, and the bitstreams must also be in phase (i.e., the first bit of each sample on each input aligned in time with one another). To accomplish this, a common *digital audio reference signal* (DARS) — typically an *AES11* signal — is sent to all source devices.

> For studio applications, an important new trend in digital mixing hardware is its incorporation with storage systems.

Where this is not possible (due to the source having no reference input or being at a remote location, for example), the digital signal can be *reclocked* via a sample-rate converter (SRC) that is locked to the house reference. (Again, video engineers will recognize a similarity in concept to the video time base corrector.) The same applies for interfacing digital signals of differing sample rates, such as the digital output of a CD player at 44.1kHz feeding the input of a digital mixer operating at 48kHz. In this case, the SRC works a bit harder, using buffers to change the signal's sampling rate instead of simply realigning existing samples.

When a digital audio mixer is used in an audio-for-video environment, the facility's DARS generator itself must be referenced to house video black. For pure audio applications, the DARS generator should be locked to any central source, typically the AES3 output of the digital mixer.

Multichannel audio, digital video and other developments in the TV industry will continue to challenge broadcasters and production facilities. The new class of sophisticated audio mixers will only become increasingly more comfortable and valuable in this environment. ■

FOR MORE information
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See also "Audio Mixers - Studio," p.12 of the *BE Buyers Guide.*

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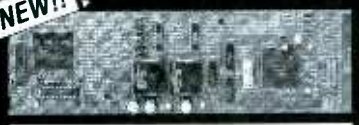

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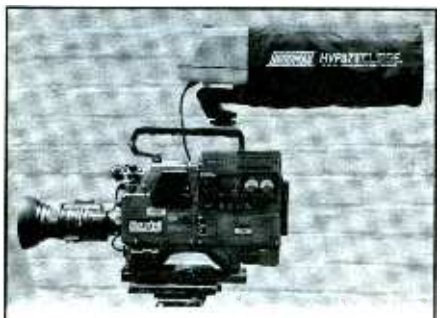

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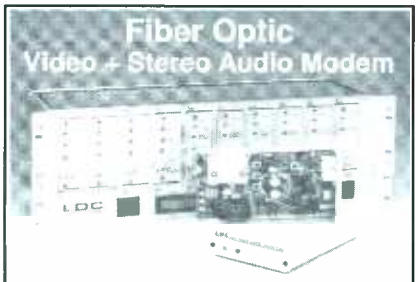

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DIRECTOR OF OPERATIONS NBC6 (WCNC-TV), a subsidiary of A.H. Belo Corporation and a growing station located in sunny Charlotte, NC, is currently recruiting for a Director of Operations to manage the station's studio operations, technical maintenance, building facilities, and information systems. We are looking for a hands on, highly motivated, proven leader with a minimum of 10 years news intensive experience in a large market broadcast environment. Microwave, transmitter, building and information systems planning and management knowledge is essential. Broadcast operations and capital budget experience is also necessary. This position will also provide a technical and operational liaison with the NBC News Channel. A 4 year degree in Engineering, Business or Communications is preferred. A minimum of a two year technical school with a preference for an ASEE or BSEE is required. Qualified applicants need to send your resume and salary history to: (NO PHONE CALLS, PLEASE) NBC6, Human Resources Department, Re: 97-9, 1001 Wood Ridge Center Drive, Charlotte, NC 28217. EOE/M/F/V/H

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WTMJ-TV, MILWAUKEE has an immediate opening for a broadcast engineer. Candidate must have solid background in electronics, experience with broadcast analog and digital studio and transmitter equipment and strong computer skills. A minimum of five years experience as a broadcast maintenance engineer in a television station environment required. SBE certification a plus. Send or Fax resumes to Randy Price, VP Engineering, Journal Broadcast Group Inc., 720 E. Capitol Drive, Milwaukee, Wisconsin 53212. FAX 414-967-5540. EOE

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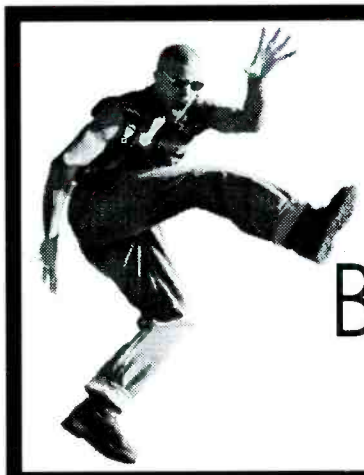

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Drug and background check will be required for employment. Successful applicants needing an accommodation for the interview should inform manager at time of contact. Send resume with salary requirements to: **TCI National Digital Television Center**, Attn: Office 105, 4100 E. Dry Creek Rd., Littleton, CO 80122, fax 303-486-3891. EOE.

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TELEVISION STUDIO MAINTENANCE ENGINEER KSTP TV is looking for someone to perform first line and final diagnosis and repair of Studio Television Equipment problems. Minimum of four years experience in the repair and maintenance of Television Studio Broadcast Equipment. Experience in the assembly, setup, and troubleshooting of MS-DOS and/or Macintosh personal computers. Completion of a college or technical institute course of studies in Television Technologies or another related technical area or equivalent experience. Submit resumes to: Human Resources, KSTP TV Job #30-97, 3415 University Ave., St. Paul, MN 55114. Please include Job #. No Telephone Calls Please. AN EQUAL OPPORTUNITY EMPLOYER.

SAN DIEGO'S PUBLIC BROADCAST STATION KPBS, seeks a TV studio maintenance engineer for new state-of-the-art production and broadcast technical plant currently under construction. Candidate should be service-oriented, self-starter, skilled and experienced in all aspects of television engineering including installation and maintenance of studio equipment, both analog and digital. High degree of computer literacy and proficiency in microprocessor and digital communications technologies is desired. Two years of maintenance experience in broadcast or high end production environment required. Salary commensurate with experience, knowledge and skills. Salary range: $2840 - $3757 per month. Applications and full position description are available: San Diego State University, Personnel Services, 3rd Floor Administration Building, 5500 Campanile Drive, San Diego, CA 92182-1625. Specify job: KPBS - Equipment Technician II. Recruitment closes on Friday, May 30, 1997. SDSU is an equal opportunity employer and does not discriminate against persons on the basis of race, religion, national origin, sexual orientation, gender, marital status, age or disability.

UPLINK ENGINEER TCI's Broadcast Satellite Uplink Center is growing from 275 uplinked services to 400. We need technicians to construct and operate this state of the art facility. Several positions available with responsibilities and compensation dependent on qualifications. Experience with digital video, computer based control systems, RF and broadcast operations desired. DBE, SCTE certification preferred. Drug and background check will be required for employment. Send resume with salary requirements to: TCI National Digital Television Center, Attn: Office 105, 4100 E. Dry Creek Rd., Littleton, CO 80122, or fax to 303-486-3891. EOE.

CHIEF ENGINEER: Dominant Gulf Coast affiliate seeks a chief engineer who can lead us into the digital future. The successful candidate will have excellent technical and leadership skills plus a thorough knowledge of broadcast equipment, including RF transmission systems. Requirements are an FCC license, college or technical degree (or equivalent experience), plus at least 10 years broadcast engineering experience. Send letter, resume, references and salary requirements to Veronica Bilbo, EEO Officer, KPLC-TV, P.O. Box 1490, Lake Charles, LA 70602. EOE.

BENCH ENGINEERS/TECHNICIANS needed in Albuquerque and Burbank. Need 2 years video experience and be familiar with systems. Bench and Video engineers needed in Dallas. Bench engineer needs 1-2 years video experience, Video engineer needs at least 3 years video experience and must be willing to travel. Salary DOE. Benefits package. Send resumes to 200 Union Bower Court, Ste. 220, Irving, TX 75061.

TELEVISION CHIEF ENGINEER Growing NBC affiliate seeks qualified "hands on" engineer to assume the role of Chief Engineer. Requirements include: FCC General license, experience with UHF transmitter, studio equipment, and video tape maintenance. Excellent opportunity with growing, aggressive station. EOE. Resumes to David Boyer, WICD, 250 S. Country Fair Dr., Champaign, IL 61821.

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By Paul McGoldrick

Watch your back, the Europeans are coming!

There are at least two acronyms that have many broadcast engineers bewildered: *DVB* and *DAVIC*. Both are intertwined for reasons that will become obvious. This month, I will deal with DVB.

DVB

The Digital Video Broadcasting (DVB) project was a fall-out in Europe of the failure of the multiplexed-analog component (MAC) systems in the satellite arena. As each MAC system developed, it was technically superseded almost immediately. The political noise drowned out even the most sensible engineering voices. By 1993, it was clear that the future of broadcasting in Europe was digital, either terrestrial, direct-to-home (DTH) satellite or cable.


Paul McGoldrick

The more than 200 constituents of the project are different from most engineering standards groups. DVB doesn't consider itself a standards body, but a clearinghouse for technical solutions. These solutions are then passed on to a standards body for ratification. All the specifications have been developed around core market needs, creating new industries. The emphasis has been on multiple-channel service, not HDTV. However, HDTV can be carried on the DVB multiplex; which was demonstrated at the 1996 IBC.

Broadcast containers

The core of the DVB systems is that any of the media available can be thought of as containers in which a flexible mix of MPEG-2 audio, video and other data can be poured. The common architecture of the MPEG-2 transport stream holds them all together; they all use a common Service Information (SI) system that gives details of the transmission system and the services being carried. All the systems use a common Reed-Solomon (RS) forward error correction (FEC) technique, where, if needed, a common punctured convolutional code can be employed.

When the project started, the most urgent market need was to formalize systems for satellite and cable, where the technology was less disparate than the terrestrial systems, and where legislative oversight was less intrusive. A common standard for satellite, DVB-S was finalized in less than six months, and in 1994 and 1995, the system was tested and characterized. A similar time pattern was followed for the cable system, DVB-C, which was important for users in Northern Europe.

In Southern Europe, many satellite master antenna TV (SMATV) systems allow a single antenna for apartment blocks rather than the town or city-wide cable system. DVB-CS was completed in 1994 allowing a mix of the satellite and cable systems for such SMATV arrangements. Following this, the terrestrial systems were developed as DVB-T and finalized at the end of 1995. The solutions for terrestrial were the most complex, taking into account the single-frequency complications of each country and interpreting the results of a number of pan-European development programs, including HD-DIVINE, SPECTRE and dTTb. The results allow dual-modes with two possible types of receiver.

MDS is gaining importance in Europe and the DVB specifications are well under way to give a system similar to cable for under 10GHz and similar to satellite for the over 10GHz frequencies. (MDS in Europe is allowed on 2.5GHz, 28GHz and 40.5-42.5GHz.) Other solutions developed have been the service information system (DVB-SI), a teletext transport system (DVB-Text) and a conditional access common interface (DVB-CI) to allow access modules to be connected to a receiver or other units needing access to a multiplex level signal.

Want to know more about any aspect of the DVB project? Give us a holler. ■

Paul McGoldrick is a free-lance writer and consultant based on the West Coast.

Conditional access

The conditional access (CA) requirement is complex. Proponents say that a set of common piracy laws is needed that will allow any CA breach to be treated in a similar manner. In the meantime, the DVB project allows providers who need CA to provide it in one of two ways known as *Simulcrypt* and *Multicrypt*.

Simulcrypt allows a provider (No. 1) to expand coverage beyond the one where he has provided receivers with access to subscribers. He cuts a deal with another provider (No. 2)—with his own CA access system—to provide No. 2's CA messages on No. 1's transmissions. While it lasts, all of No. 2's subscribers can also demultiplex No. 1's programs. This could be used in either a promotion or as a permanent expansion of service without added receiver expenses.

Multicrypt receivers have a standardized physical and logical interface port on the multiplex level. A PCMCIA card, distributed by the provider, can systemize the CA so the receivers become universal. The arrangement is such that PCMCIA card slots can be daisy-chained for multiplex provider access. ■

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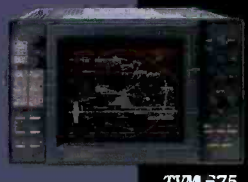
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