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BROADCAST ENGINEERING®

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THIS MONTH...

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DEPARTMENTS:

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COLUMNS:

ON THE COVER: *Raleigh, NC* — Three TV stations and two FM stations taking advantage of the latest technology in ice protection and the economies afforded by a multistation tower site, the latest WRAZ-TV designed by the architectural firm Architektur. Photography by Jim Sink, ArTech. Cover design by Stephanie Masterson.

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What? It's not written down?

I recently attempted to follow up on a story that appeared in the Friday, May 31 issue of *USA Today* when I reached a "Whitewater-Watergate." The newspaper's short story mentioned that Microsoft chairman Bill Gates had met with FCC chairman Reed Hundt. The meeting concerned the software industry's position on ATV. The event was apparently coordinated by the Business Software Alliance.

Following up on the story, I hoped to learn just exactly what the software industry's position was on ATV. I talked with Dianne Smiroldo, director of public affairs for the Business Software Alliance. Not only would she not discuss what Gates might have said to Hundt, but she also refused to say what the association was trying to accomplish with the series of meetings that also included key members of Congress. It seems those meetings were part of the alliance's plan to lobby policymakers on the future of ATV.

When I asked about the association's position on ATV, I was told, "It's not for public consumption."

Okay, I asked, could she tell me what the software industry's position on ATV was or where I might get a copy of it? Her response, "It's not written down."

What? It's not written down? Let me get this straight. The computer industry wants to affect the outcome of the FCC's decision on HDTV and ATV. Computer industry moguls are meeting with the FCC chairman and congressional leaders in "private" meetings, and yet no position papers exist on what those technical aspects are? I'll just bet!

Now I don't subscribe to the theory that there's evil hiding under every rock, not even in Washington. But when major industry figures begin lobbying the FCC and Congress and their positions "are not for public consumption" or "not written down," I begin to wonder. You should wonder too.

I'll be the first to admit that I've given the NAB a tough time when I think it has let the broadcast industry down. But when it comes to ATV, the association has done a pretty good job of expressing its viewpoint and supporting the industry's needs. At least the NAB didn't try any sleight of hand tricks under the guise of "it's not written down."

Hey, I think I know what happened. I'll bet there was an official computer industry position paper on broadcasting and ATV, and Gates probably wrote it. Unfortunately, he accidentally erased it when his mouse skipped and he clicked on *disk format* instead of *document format*.

He should have used the keyboard!

Brad Dick

Brad Dick, editor

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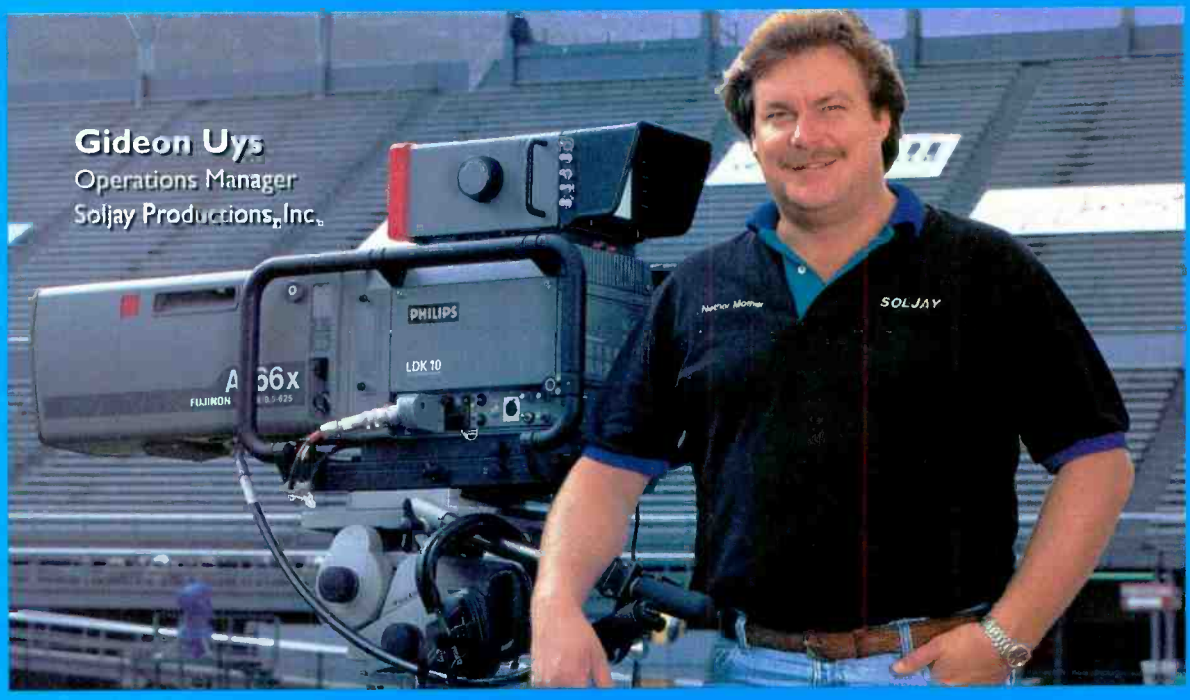

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June's editorial on ISDN service providers

Hello Mr. Dick,

After reading your ISDN article in May's issue, I thought I could offer some advice. I use both CompuServe and Netcom, but for Internet access I really never use CIS. Netcom's Internet gateway is much faster than CIS's, thus more rewarding. They now have unlimited access for $19.95 a month at 28.8kb/s. Then again, so is AT&T.

Hope that helps your "waiting to connect" woes.

Bill Bennett
Atlanta, GA

Thanks Bill. I'm still waiting and waiting....BD

More on the mouse

Brad,

I began reading your diatribe on the mouse first with amusement and then concern. There are a couple of things I feel compelled to comment on. First of all, you mentioned how you would like to be able to use the keyboard for your editing. I agree with you that this would be nice, but I disagree with your assessment of who/what is to blame. Instead of blaming the mouse inventor, you should be directing your scorn at the programmers at Microsoft who are responsible for such poor implementation. An immediate solution I could suggest for you would be to get a Mac!

Moving beyond, if you want, in my humble opinion, an ideal example of integrating keyboard and mouse, look at an Avid Media Composer (Mac implementation). Ours came with custom-colored and labeled keys that make nearly every edit control available via the keyboard, but at the same time allowing those who desire to use the mouse.

And, I almost forgot, I got a great kick about your comment that the keyboard was so fast. If you did any research on the origins of the current keyboard, you would know that it was designed to slow input clerks down. The efficient ones went so fast that the mechanical mechanisms couldn't keep up or jammed.

Dwayne Sandall
S Squared Design Group

Dwayne. Yep, that's my problem too. The keyboard keys keep getting jammed together as they strike the screen. Now if I could just get that white-out off the CRT....BD

"WHAT DO YOU MEAN—YOU DON'T FORECAST POLITICAL WINDS?!!"

In response to the Interactive column

Editor:

I heartily agree that while the Internet is a fantastic resource, one of the challenges is the lack of a "road map."

Broadcast Engineering *readers may be interested to know that there is an industry resource called INFOSEARCH. INFOSEARCH maintains a comprehensive hypertext directory of broadcast-related sites on the WWW. As a service to the industry, any bonafide broadcast-related company that has a WWW site can get linked to the INFOSEARCH site at no charge.*

To make things even easier, there is an online sign-up form. The URL for the INFOSEARCH site is http://www.xmission.com/~insearch.

Regards,
INFOSEARCH

Brad,

I've heard of Internet forums that are dedicated to broadcast issues, technical and otherwise. Do you know where I can find them? Are they news groups, Telnet?

Ed Elser
solder@rci.ripco.com

Readers: Let Ed know your favorite locations. BD

Response to editorial on being robbed in Amsterdam

Dear Brad,

Having read of your sad experience in one of Amsterdam's hotels, I wanted to share my experience with you. One time, I lost my wallet just as I was about to pay my restaurant bill. The people in the restaurant wouldn't believe that I lost my wallet.

I had to leave my wife and kids there as a deposit to assure the owner that I would return to settle the bill.

Leopoldo G. Bacusmo
Philippines

Leopoldo, I know some guys who would have left the restaurant without the wife and kids and never returned. BD

Send your thoughts to the editor at CompuServe 74672,3124 or fax to 913-967-1905.

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Circle (12) on Action Card

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By Dawn Hightower, senior associate editor

SBE offers professional liability insurance

The SBE is now offering its members group rates on professional liability (errors and omissions) insurance. Contract engineers and others who do not always work as employees when providing broadcast engineering services will find this coverage extremely valuable. The program is called PROinsure and is administered by MIMS International, Ltd. of Towson, MD. The Employers Reinsurance Corporation underwrites the coverage and it is tailored specifically for broadcast engineers.

Up to now, professional liability insurance was not available or was too expensive for most broadcast engineers. For more information and a no-obligation quote, call Debbie Zarzecki at (800) 899-1399.

BroadBand and DiviCom demo MPEG-2 transmission

BroadBand Technologies and DiviCom have announced an enhancement in the transmission of MPEG-2-encoded ATM signal-based, live digital video. The two companies successfully transmitted MPEG-2, ATM signals via BroadBand's second-generation Fiber Loop Access (FLX*f*) 2500 system and DiviCom encoders and set-tops. This transmission represents the culmination of efforts that began in 1994 to provide consumers with access to low-cost, high-speed digital video on a platform that is compatible with industry standards. The cost-effective, easily deployed BroadBand-DiviCom solution brings switched digital broadband to consumers by using existing twisted pair phone lines to reach homes and existing coax wiring inside homes.

NAB urges FCC to pre-empt zoning on outdoor antennas

The NAB has urged the FCC to follow Congress' directive in the 1996 Telecom Act and pre-empt all private and nonfederal government restrictions that impair a viewer's ability to use an outdoor antenna to receive over-the-air television.

A goal of local TV broadcasters and the regulatory agencies is to ensure that the audience is able to receive the signals. However, the actions of nonfederal government officials and private organizations often have thwarted this goal and have impaired full participation of the viewing audience in receiving free over-the-air television.

According to NAB comments, from Section 207 of the Telecom Act, all private restrictions that impair outdoor TV antennas installation and use must fall. Homeowners associations' restrictive covenants may no longer be allowed to prohibit or otherwise impair outdoor TV antenna use.

NAB asked the FCC to adopt a pre-emption rule that applies to all local zoning ordinances, rules, covenants and private restrictions that impair installations and/or use of outdoor TV antennas.

SCTE's Cable-Tec Expo '96 a success

SCTE's Cable-Tec Expo '96 at the Opryland Hotel Convention Center in Nashville, TN, June 10-13, drew 7,200 attendees and exhibitors. This was a 6% increase in attendance over last year.

The Expo kicked off with the annual engineering conference, which consisted of a full day of technical and management papers and panel discussions. The keynote address was given by NCTA president and CEO Decker Anstrom, which followed the annual awards luncheon where Alan Babcock was awarded SCTE Member of the Year, along with many other awards presented.

More than 325 companies displayed products and services. A technical training center was set up on the exhibit floor that allowed companies to offer formal presentations of their products and related technologies. Technical papers and materials that were presented during the engineering conference have been collected in the Cable-Tec Expo '96 Proceedings. For ordering information, contact SCTE national headquarters at (610) 363-6888.

FCC grants first experimental HDTV license

The FCC has granted the nation's first experimental high-definition television license to WRAL-TV, Channel 5, Raleigh, NC. The experimental station, with the call sign WRAL-HD, will operate on Channel 32. According to James F. Goodmon, president and chief executive officer of WRAL's parent company, Capitol Broadcasting Company, Inc., Capitol is building the station because HDTV is critical to the future of free television.

The engineering and technology staffs at the CBS TV network will serve as consultants. According to CBS spokesman Joseph A. Flaherty, senior vice president, technology, the network is fully supportive of the initiative in digital TV broadcasting and it will cooperate with WRAL-TV to ensure success of the experiment.

A Harris Sigma transmitter system will deliver the HDTV signal to a special Andrew UHF antenna. The antenna, mounted at the 1,750-foot level on Capitol's existing tower, will deliver 100kW of power to the Raleigh, Durham, Fayetteville and Chapel Hill areas. Capitol's HDTV project manager John L. Greene said Harris and Andrew were involved with the early Advanced Television (ATV) test facility in Charlotte. Harris has been involved in HDTV from the beginning when it built the test bed for the ATV test center in Alexandria, VA. Andrew beamed the first over-the-air demo of ATV to the 1993 NAB Convention.

Other applications for experimental licenses (including two in the Washington, DC area) have been filed with the FCC. ■

KNK sponsors MPEG seminar

KNK Seminars is sponsoring a two-day seminar on Aug. 22-23 in Santa Clara, CA. It will provide comprehensive analysis and design information on the MPEG-1 and MPEG-2 international standards, their applications and implementations. Descriptions of the standards, as well as trade-offs and implementation information, will be discussed. Topics include MPEG-1 and MPEG-2 video, audio and systems and their role in the storage and transmission standards and technologies for DVB, Digital Audio-Visual Council, HDTV, SMPTE, DVD, video-CD, digital storage medium-command and control and ATM and more.

The two-day seminar costs $1,095 per person and includes copies of the reference manuals. Preregistration is required. For more information, contact Kristine N, Kneib, KNK Seminars, La Jolla, CA; telephone (619) 459-8058.

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Circle (13) on Action Card

By Harry C. Martin

FCC announces office closings

In May, the FCC closed 12 high-frequency (HF) spectrum monitoring stations in Belfast, ME; Powder Springs, GA; Vero Beach, FL; San Juan, PR; Allegan, MI; Kingsville, TX; Grand Island, NE; Anchorage, AK; Douglas, AZ; Livermore, CA; Honolulu and Ferndale, WA.

The FCC district offices in Buffalo, NY; Norfolk, VA; Miami; Houston; Portland, OR; and Saint Paul (Maplewood), MN, also were closed.

Downsized professional staffs will remain in these nine locations affected by this action: Buffalo, Norfolk, Miami, Houston, Portland, Saint Paul, Anchorage, Honolulu and San Juan. Agents will be available in those locations to resolve enforcement and interference problems.

New renewal requirements

The Telecommunications Act, enacted by Congress in February, requires that TV stations begin including in their renewal applications a summary of all complaints received from the public regarding violent programming aired on their stations.

A supplement to FCC Form 303-S (the renewal application) is being sent to TV stations in their renewal packets and must be completed and filed with the FCC along with the renewal application. The summary of any complaints regarding violent programming must be attached.

LPTV and TV translator stations that are co-owned with primary full-service TV stations in the same state and broadcast the same signal as the primary station may file for license renewals in a single application along with the primary station.

DATELINE: OCT. 1

Commercial TV stations in the following states must file their annual ownership reports or report certifications on or before Oct. 1, 1996: Florida, Puerto Rico, Virginia, Iowa, Missouri, Alaska, Oregon, Hawaii and Washington. TV stations in Florida, Puerto Rico and the Virgin Islands must file their license renewal applications by Oct. 1, 1996.

A closer look at one-to-a-market waivers

The FCC's one-to-a-market rule, which has been in the news, due to the rapid consolidation in the broadcast industry, generally prohibits the ownership of a TV and a radio station in the same market. The commission looks favorably upon waiver requests that meet either of the following standards:

1. Those involving TV and radio combinations in the top 25 TV markets where there will be at least 30 separately owned broadcast stations after the proposed combination (determined by counting TV stations in the relevant ADI and radio stations in the relevant TV metro market); and
2. Those involving "failed" stations that have not operated for a substantial period of time (e.g., four months) or that are involved in bankruptcy proceedings.

Other one-to-a-market waiver requests are evaluated on a case-by-case basis. A public interest determination will be based upon the following criteria:

1. The public service benefits that will result from the joint operation of the facilities;
2. The types of facilities involved;
3. The number of media outlets owned by the applicant in the relevant market;
4. The financial difficulties (if any) of the stations involved; and
5. The nature of the relevant market in light of the level of competition and diversity after joint operation is implemented.

Because not all of the factors will be relevant in every case, the commission does not require that all five criteria be satisfied as a pre-condition to grant of a waiver.

An applicant requesting a waiver under the case-by-case standard must demonstrate that the proposed combination will result in substantial cost savings and enhanced program service benefits; the facilities involved are not "dominant" with respect to the other stations in the market; the applicant will own relatively few broadcast facilities in the market after the proposed sale; the station(s) sought to be acquired has suffered financial difficulties and may go dark if the proposed sale is not approved; and there are a substantial number of broadcast stations in the market after the proposed transaction.

Only a few one-to-a-market waiver requests have been denied. In an effort to speed up the process by which such requests are reviewed, the FCC has authorized its Mass Media Bureau to act on routine waiver requests in the top 100 TV markets. This should shorten the process from a year or more for contested waivers to six months, and possibly less, for uncontested requests. ■

Harry C. Martin is an attorney with Fletcher, Heald & Hildreth, P.L.C., Rosslyn, VA.

Persons in areas previously served by HF monitoring stations or district offices that have been closed and who need to contact an FCC facility may do so by calling one of the remaining district offices. FCC forms or other documents are available from the commission's Forms Distribution Center at 800-418-3676. Following is a list of continuing CIB service facilities for locations where FCC offices have been closed:

- ☎ **ALLEGAN, MI — contact Detroit office (810) 471-5924**
- ☎ **ANCHORAGE, AK — contact Seattle office (206) 821-9037**
- ☎ **BELFAST, ME — contact Boston office (617) 770-4023**
- ☎ **DOUGLAS, AZ — contact San Diego office (619) 467-0549**
- ☎ **FERNDALE, WA — contact Seattle office (206) 821-9037**
- ☎ **GRAND ISLAND, NE — contact Kansas City office (816) 353-3773**
- ☎ **HONOLULU, HI — contact San Francisco office (510) 732-9046**
- ☎ **HOUSTON, TX — contact Dallas office (214) 235-3369**
- ☎ **KINGSVILLE, TX — contact Dallas office (214) 235-3369**
- ☎ **LIVERMORE, CA — contact San Francisco office (510) 732-9046**
- ☎ **MIAMI, FL — contact Tampa office (813) 348-1508**
- ☎ **NORFOLK, VA — contact Kansas City office (816) 353-3773**
- ☎ **PORTLAND, OR — contact Seattle office (206) 821-9037**
- ☎ **POWDER SPRINGS, GA — contact Atlanta office (770) 279-4621**
- ☎ **SAN JUAN, PR — contact Tampa office (813) 348-1508**
- ☎ **ST PAUL, MN — contact Chicago office (847) 298- 5401**
- ☎ **VERO BEACH, FL — contact Tampa office ((813) 348-1508**

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Circle (14) on Action Card

EAS update

Some recent clarifications

By Leonard Charles

The clock ticks as the Jan. 1, 1997 EAS implementation deadline nears. Feedback from manufacturers after NAB 96 indicates that attendees came to look, touch and become educated on EAS equipment options and operation, but few came to buy. There were even those attendees convinced that the deadline would be pushed back once more.

Another delay on the deadline is highly unlikely. The lack of available equipment would be the only reason for further delay, and manufacturers seem confident that they can meet the equipment demand.

Meanwhile, some official revelations and clarifications came out of NAB 96 that bear mention as the industry prepares to meet the EAS deadline.

Preparing to meet the EAS deadline

The FCC will expedite the addition of local event codes to the EAS rules. Rather than follow its established procedure of waiting until local areas submit specific additional code requests, the FCC, working with FEMA and the NWS, will determine an all-inclusive list and then amend it into the rules. The process should be completed by this fall. Don't put off the purchase of EAS equipment pending the release of this list, because equipment manufacturers have assured the SBE EAS Committee that the new list can be added to their devices once the rules are amended — even to equipment already delivered.

As a state or local area, you may suggest custom codes or local emergency events to be covered in this list by contacting the FCC EAS office at 202-418-1220. The chances of adding further codes after the rules are amended will be nearly impossible. The SBE suggests list of local codes, which are published in its *EAS Primer*. This list is being reviewed by the three agencies for possible inclusion in the rules.

Another clarification that surfaced at NAB involves the high-frequency (HF or "shortwave") broadcasters in the United States and its territories. International broadcasters are mentioned only once in the new rules, in paragraph 11.54(b)(9). Many questions have been raised by HF broadcasters and the FCC has responded with the following clarifications:

- HF broadcasters must install an FCC-certified EAS decoder.
- They must monitor the two sources listed in their state plan.
- They must cease broadcasting immediately upon receipt of a national EAS message containing the event code EAN, then wait for the EAT (termination) code to resume broadcasting. This can be done in the automatic mode.
- They are not required to have an EAS encoder, because they do not need to activate the EAS.
- They do not need to participate in the required monthly test (RMT) or the required weekly test (RWT).
- They should record the receipt of any tests to show that their equipment is working.
- They may share EAS equipment with co-owned and co-located stations, even if those stations are not HF broadcasters.

The SBE EAS Committee will post new, updated or clarified EAS information as it becomes available in the SBE web site at sbe.org. You may also E-mail the committee chair if you have questions. The address is lcharles@wisctv.com or simply click on the chairman's name under the EAS heading on the SBE web site. ■

Leonard Charles is an engineer at WISC-TV, Madison, WI, and chairman of the SBE EAS Committee.

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Vicky Braden
General Manager, Senior Editor

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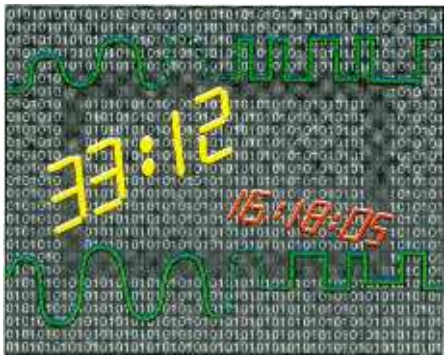
Circle (6) on Action Card

By Steve Epstein, technical editor



Integrating servers for post applications

Thinking about moving your current tape- or disk-based editing to some form of centralized server system? Slowly, but surely, you are becoming convinced that computers aren't all that bad and that disk drives and RAM storage, although costlier than tape, do have some advantages. Besides, parts and maintenance costs on your aging tape machines are increasing. Now is the time to begin the investigation into server-based production systems to determine if they meet your needs. Many factors must be considered, and despite the major cash outlay required, actual cost may be one of the easiest things to get a real handle on.

Servers are more than just big bit buckets

Successfully implementing server technology requires much more than selecting and installing the hardware and software involved. Before beginning the selection process, evaluate your facility and the nature of activities you intend to support. Examine the reasons and goals associated with implementing server technology.

Carefully define the goals associated with moving your production capabilities to a server environment. Are you trying to reduce tape/transport costs? Should the server provide transparent support for a collaborative production process? Do you want facility-wide access to high-quality digital video without generation loss? Is the server going to replace or complement the existing system? If you intend to complement existing equipment, how will the interface be implemented? These are all questions without right or wrong answers. Reasons for moving to a server-based system may include any or all of the above and possibly additional ones unique to your facility.

Once you understand what you expect the server to do, look carefully at potential candidates. Carefully review what's included in each manufacturer's server. How much is "off-the-shelf" technology that may make maintenance and future enhancements less expensive? What about application software? Many server vendors supply a basic file/operating system and expect you to develop custom applications. If this is the case, do you have the in-house expertise to develop the necessary software or will you have to contract the work to outside developers — and can you afford it? It might be easier and better in the long run to negotiate with the server vendor to include the necessary development services as part of the overall contract.

Flexibility and scalability issues

Moving to a server-based system is a long-term proposition. You need to consider how the server will meet your needs today, as well as how (if) it will meet the requirements two to four years down the road. A server-based system likely represents the single largest investment that you've made since your facility's doors were opened; protecting it is crucial. Even the most cost-effective proprietary solution can be a long-term disaster if it blocks expansion or access to next year's "latest and greatest" technology.

Carefully consider the number of users (simultaneous streams) you need to support now and in the future. What are the factors that influence facility expansion and how well does the manufacturer's expansion path sync with these factors? Be aware that this is much more than a technical issue; involve creative and business staff to ascertain that everyone sees the same vision of the future.

How expandable is the platform that you are considering? What are the true upper limits in terms of bandwidth, I/O, storage capacity and number of users? What documented benchmarks can the manufacturer offer regarding the impact of multiple users on system throughput? Are there plateaus that can only be conquered through investment in additional system resources? What about plateaus that have not been conquered — what is the upgrade path once the system is maxed out? Can you buy another server and network them together or do you have to start over?

How open is the server architecture? Most likely, your creative staff will have one or two "must have" software tools that are proprietary. Can they be successfully interfaced with the server? Is it possible for the staff to easily develop and implement "plug-in" effects within the server architecture?

Asset storage and management

The term "asset" refers to the information

Moving to a server-based environment does not mean you can get rid of all those racks. Considerable rack-mount hardware may be needed, based on your facility's requirements. (Photos courtesy of Avid.)

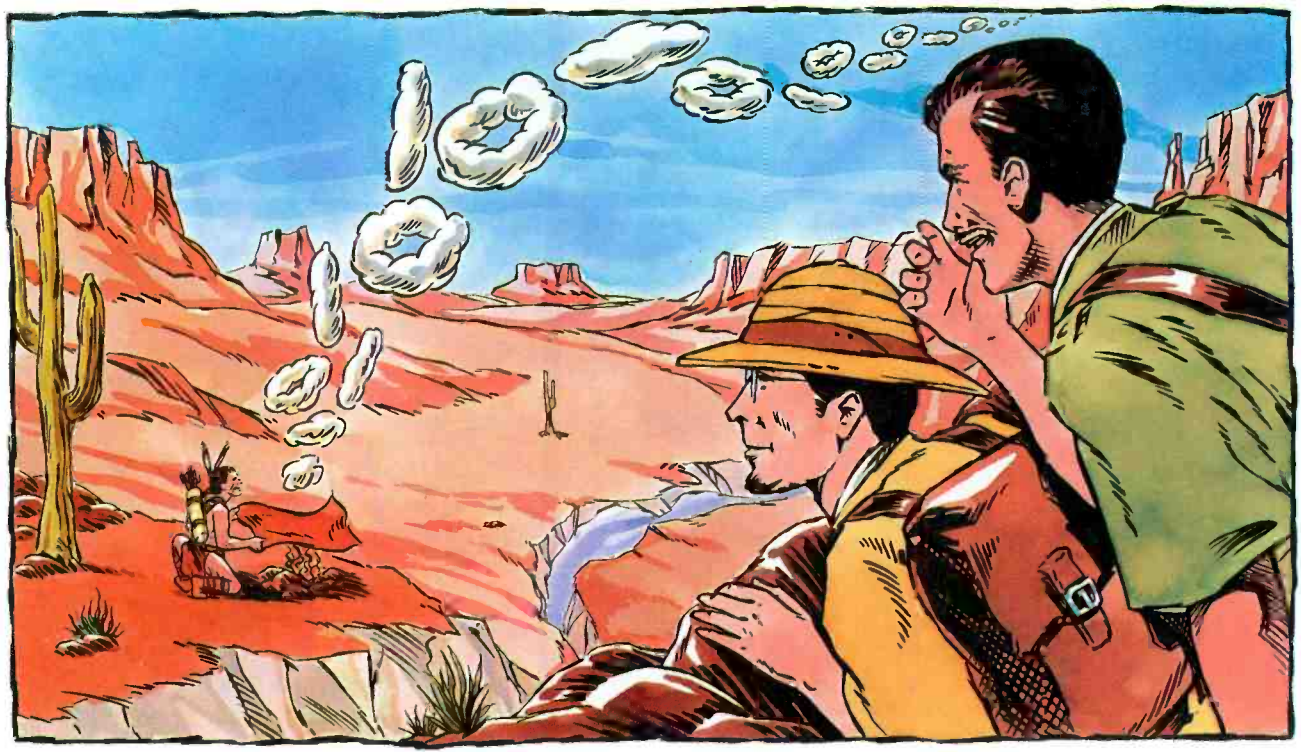
(clips, mattes, audio, backgrounds, etc.) that is used to build projects. In a tape-based environment, selling the client an additional reel of tape is relatively simple. The client can see it, and if desired, take it home or back to the office. But how do you convince clients that they need to buy (or possibly more accurately — rent) an extra 5GB or 10GB of storage on the server?

Modeling storage is a complex exercise. Assets may need to be stored in several different forms including compressed and uncompressed. Equipping each workstation with an SDI interface and providing video I/O at all locations might be desirable, but is also expensive. In most instances, it is more cost effective to limit video I/O to a few (dedicated) workstations.

Consider the issue of hierarchical storage, on-line vs. near-line vs. off-line storage and its impact on cost and throughput. Look at the various RAID levels and even portable drives. The RAID buzz word is a catchall for a wide range of features. Spend the necessary time evaluating the various options and their pros and cons within your work environment. (For more information, see "RAID Storage Technology," August 1995.)

To be effective, servers need both horsepower and access to large amounts of storage.

Manufacturers or resellers that are unwilling to take the time to review options with you are probably not the vendors you want to supply server technology — regardless of how attractive the price and promises. One



NAB exhibitor was showing a system that held seven drives. With 9GB drives installed, each unit held 63GB and the units could be chained together for a maximum of 1.5TB of hot swappable, portable storage.

While we are on the subject of storage, consider backup requirements. Data backup is critical to your operations. Adapters exist that allow D-1 and D-5 video decks to be used as data recorders. Look carefully at the resources required to maintain up-to-date backups of all critical data.

For asset management, look at the available options for access and control of assets stored on the server. Carefully determine if the server solution will require your creative staff to serve as system administrators. If so, you will be hindering the artists you seek to empower. If this is the case, be ready for resistance to change on a level unlike anything you have experienced.

What tools are available to access or browse stored assets? Given a choice, creative types will almost always opt for visual search engines over database lookups. Does the manufacturer have such a solution or can it recommend a third-party solution? How will the search engine impact system performance?

Other factors

After considering these factors, many of the major questions will be answered or at least be out in the open. Other factors to consider include I/O capabilities, cost/performance trade-offs and work-flow issues. I/O capabilities should include options in the computer and video arenas. In the computer arena, look at networking capabilities, including high-speed Ethernet, ATM and FDDI interfaces. In the video world, SDI and the number of simultaneous streams might need to be considered. Cost/performance trade-offs are going to be influenced by your budget, profit margin and local factors, including the amount of work available and how much competition exists for the work. It doesn't do any good to complete an eight-hour job in four hours if you can't bill it at a higher rate or your facility sits idle because there is no other work available.

Equipping each workstation with an SDI interface and providing video I/O at all locations might be desirable, but is also expensive.

Some of the work-flow issues that must be considered include the finite number of resources available for server I/O. If only one D-1 deck is available, it can't be used for dubbing into the system at the same time as your scheduled backup. Facility management software is available to assist in scheduling, however, a basic understanding of the work flow can eliminate many of the problems before they develop.

Finally, implementing a server involves more than buying a system and doing the installation. Understanding the fundamental changes involved before you commit is essential to making the transition successful. ■

Acknowledgment: Special thanks to Rich Schmeltz, managing director of the Digital Service Bureau, Tele-TV Systems, Reston, VA, for his help with this article.

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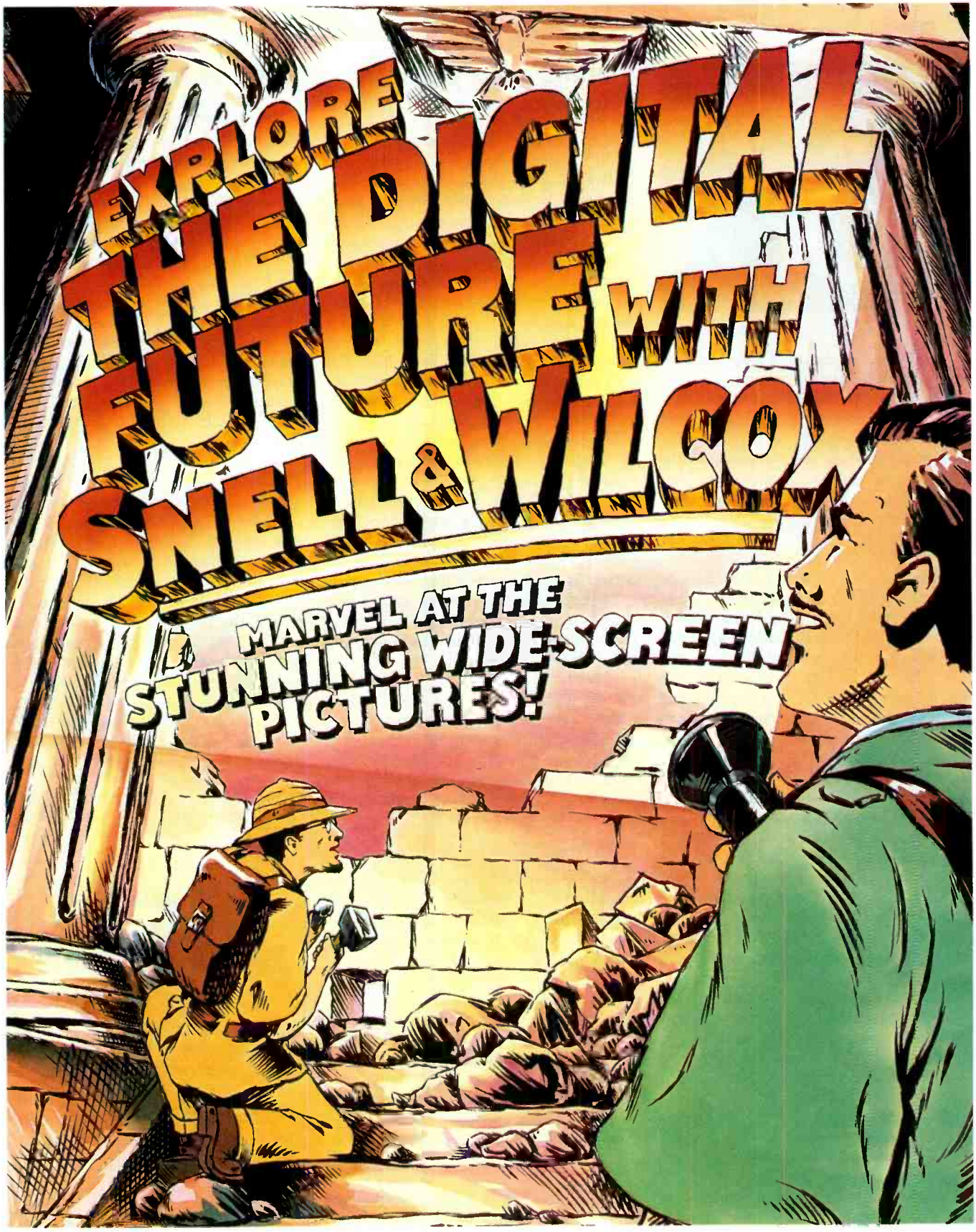

SNELL & WILCOX

Engineering with Vision

Circle (7) on Action Card

By Curtis Chan

Getting your purchase requisition through

The passage of the 1996 Telecommunications Act and the convergence of computing and video technologies has its merits. However, the convergence and forward progress is not without its perils. During the upcoming years, many stations will be absorbed into a larger collective as the limit on the number of stations that can be owned disappears.

The alliance age

Welcome to the new age of alliances, buyouts and acquisitions where the bureaucracy who makes the final purchasing decisions among many stations, affiliates, O&Os and networks just got a little heavier.

Whether the facility is in a broadcast group, expanding O&O network or part of an entertainment conglomerate, nowadays the chief engineer must muddle through an endless maze of personalities if he or she dares to tread on the holy ground of computer equipment acquisitions.

From the corporate gurus that spawned acronyms like CEO, CFO, CAO and COO now comes the CIO (chief information officer) and his or her henchman, VP of MIS, director of information systems, and manager and chief bottle washer of computer information systems. . . all with good intentions about saving costs and raising profits.

One of the major issues confronting technical personnel and corporate technical management is the simultaneous arrival of the personal PC/Mac and the corporate layer (corporate computer management). They are trying to control technical acquisitions, because many of them feel that all computer-based purchases fall within their domain, and not with the station's chief engineer or technical personnel.

This could cause segregated communication ties between the computer management and the engineering departments. There will be plenty of corporate chess as technical managers try to maneuver and evade the corporate gauntlet.

Imagine the shock value in the purchasing department when a computer requisition appears with these comments: virtual studio computing equipment — 4-pipe SGI ONYX with 1GB of RAM running Discrete Logic's Flame and third-party software, two 21-inch monitors, Challenge RAID server, Ultimatte-8 and two motion-control heads. Needless to say, knowing CPR would become a rigid requirement.

That is not to say that zero-based budgeting and thinking is bad, but the imposition of corporate bureaucracy should be carefully considered. . . especially in light of a station's technical-savvy personnel who understand the reasoning behind the equipment purchase. This is especially true if the new computer manager doesn't have a clue as to what the equipment is and why it's needed.

Similarly, TV station management must also be guarded against superfluous purchases on computer equipment that is technically overkill for the application. So what can you do to help the new computer management department understand your technical needs and requirements for the station when it comes to computing technology?

Justifying purchases

If the new computer department personnel is in the same building, invite them over to see your operation. Explain to them from a laymen's standpoint why the purchase is necessary and how it will impact positively on the station's bottom line.

- *Reason No. 1.*

The CIO may be more apt to swing your way if he or she understands what it is that you want to purchase, why it's needed and what kind of return the station would see over a specific time period.

- *Reason No. 2.*

Perform your own due diligence and find out who the new players are, what their hot buttons are and what approach you need to use with them. The reality is that converting one of them into an advocate would go a long way in seeing your equipment request being processed promptly.

- *Reason No. 3.*

Keep your computer department advocates in the communications loop early on, as well as throughout your equipment purchase analysis process, so that they feel that they had a part in the decision-making process. This can alleviate any concerns or questions about your purchase request. Remember, you tend to want to push something through if you feel that you had a part in the making. Pride goes a long way.

- *Reason No. 4.*

Justify in writing or verbally why the equipment is needed and substantiate it with a simple financial pro forma to help justify the cash outlay.

In reality, numerous programs can be obtained for quickly analyzing the return on investment (ROI) on a proposed product or system. Doing so will not only help to quantify your request, but senior management will see you as responsible and concerned about the company's bottom line.

- *Reason No. 5.*

Make change an ally. Change is not only necessary, it's inevitable. When change occurs, neutralize the risks, find the opportunities, make sure they come true and publicize them.

Also, be heard in the right circles, because having the perception of influence also means being in the right circle, gaining recognition for your achievements and making sure that the right people know of your accomplishments. This will help grease the wheels for your next round of purchases, because people in authority tend to trust people with a consistent track record. ■

Curtis Chan is president of Chan & Associates, a marketing consulting service for audio, broadcast and post-production, Fullerton, CA.

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Circle (8) on Action Card

By Terry Skelton

Handling multichannel audio

In TV audio, "surround sound" has become common. Many homes are equipped to receive it, most movies and many commercials are mixed in it, and if your broadcast facility is stereo-capable, (Multichannel Television Sound [MTS]-equipped), you're at least passing it through. If you are doing stereo origination, then you are probably creating surround sound, if only by accident.

This is all possible because today's surround sound is an analog, backward-compatible 4-2-4 matrix system. That means that four channels of audio are encoded onto two by the sum-and-difference and quadrature techniques referred to as *Dolby Surround.*

The encoded 2-channel signal can pass through any reasonably high-fidelity stereo transmission path or storage medium, including the MTS TV audio system. The end user can hear the signal through monaural or stereo reproduction or if a surround-sound matrix decoder is available, the four original audio channels can be recovered with reasonable faithfulness.

Original surround-sound decoders did a marginal job recreating the original four channels, but most of today's decoders are equipped with *steering logic*, which uses proprietary techniques to provide more accurate extraction of the four input channels from the 2-channel transmission or storage medium. This kind of adaptive decoder is generally marketed under the *Dolby Pro Logic* trademark. Most of these newer decoders can also derive a subwoofer feed from the audio signal, for extending low-frequency reproduction.

The convention for use of these four channels in television and film-audio surround-sound mixing is: left, center and right channels are placed in an arc in front of the viewer, with the center speaker placed as close as possible to the center of the screen. The fourth channel — the "surround" channel — is fed to two or more speakers placed symmetrically on either side or slightly behind the viewer. (See Figure 1.) Dialog is usually directed to only the center channel, while music and ambiance/audience sound is fed in stereo to the left and right channels. The surround channel is driven sparingly, typically with reverberation or ambient effects, plus the occasional discrete sound effect that is intended to be localized "off-stage."

This basic system (*Dolby Stereo)* has been in use on optical soundtracks in the motion picture industry for years. It's not a perfect system, however, and mixing for surround is ideally performed by monitoring through a decoder to hear how it will sound to the surround-equipped end user.

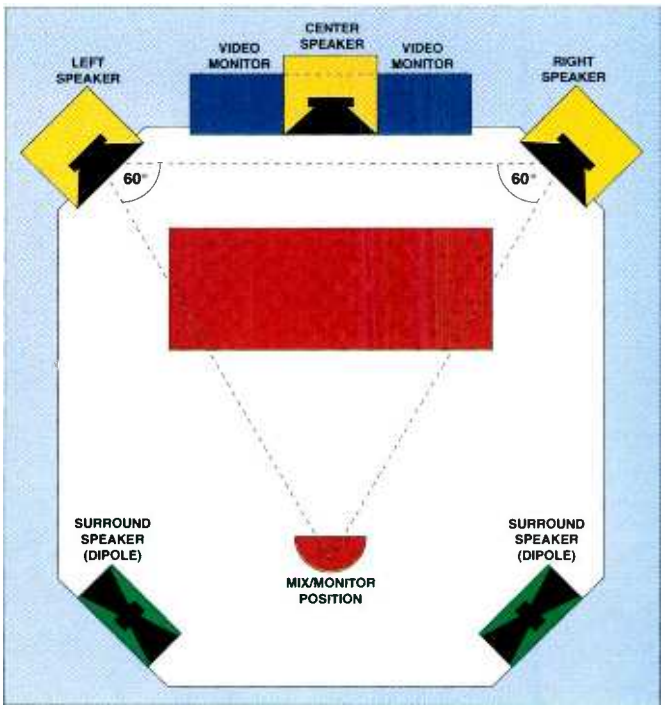


Figure 1. A suggested control room plan for surround-sound monitoring.

Monitoring surround sound

A properly setup surround-sound monitor system is critical for the production and master control room. This should consist of three high-quality matched speakers in an L, C, R configuration in front of the operator, and either dipole or conventional speakers located on either side of the operator, placed about six feet above the floor. Monitor controls should allow the operator to easily switch to a mono sum signal from only the center speaker and stereo from only the left and right speakers, in order to frequently evaluate 2-channel stereo and mono compatibility of the audio program.

You should also be able to activate only one speaker at a time in the surround mode for troubleshooting. The speakers should be fed from a high-quality decoder that also provides a subwoofer output. If your main speakers aren't flat to 20Hz, then a subwoofer is recommended.

Surround-sound programs

With care, any stereo console can be used to produce good stereo and surround. Any audio source that is phase-matched between left and right channels, such as mono or coincident-stereo microphone signals, is going to be directed to the front speakers.

Moving a stereo mic pair apart from a coincident position will develop surround information, as will the mixing of multiple coincident pairs and the exaggeration of S-levels in M-S microphone setups. You have to do this by trial and error while looking at an X-Y oscilloscope and listening to the decoder.

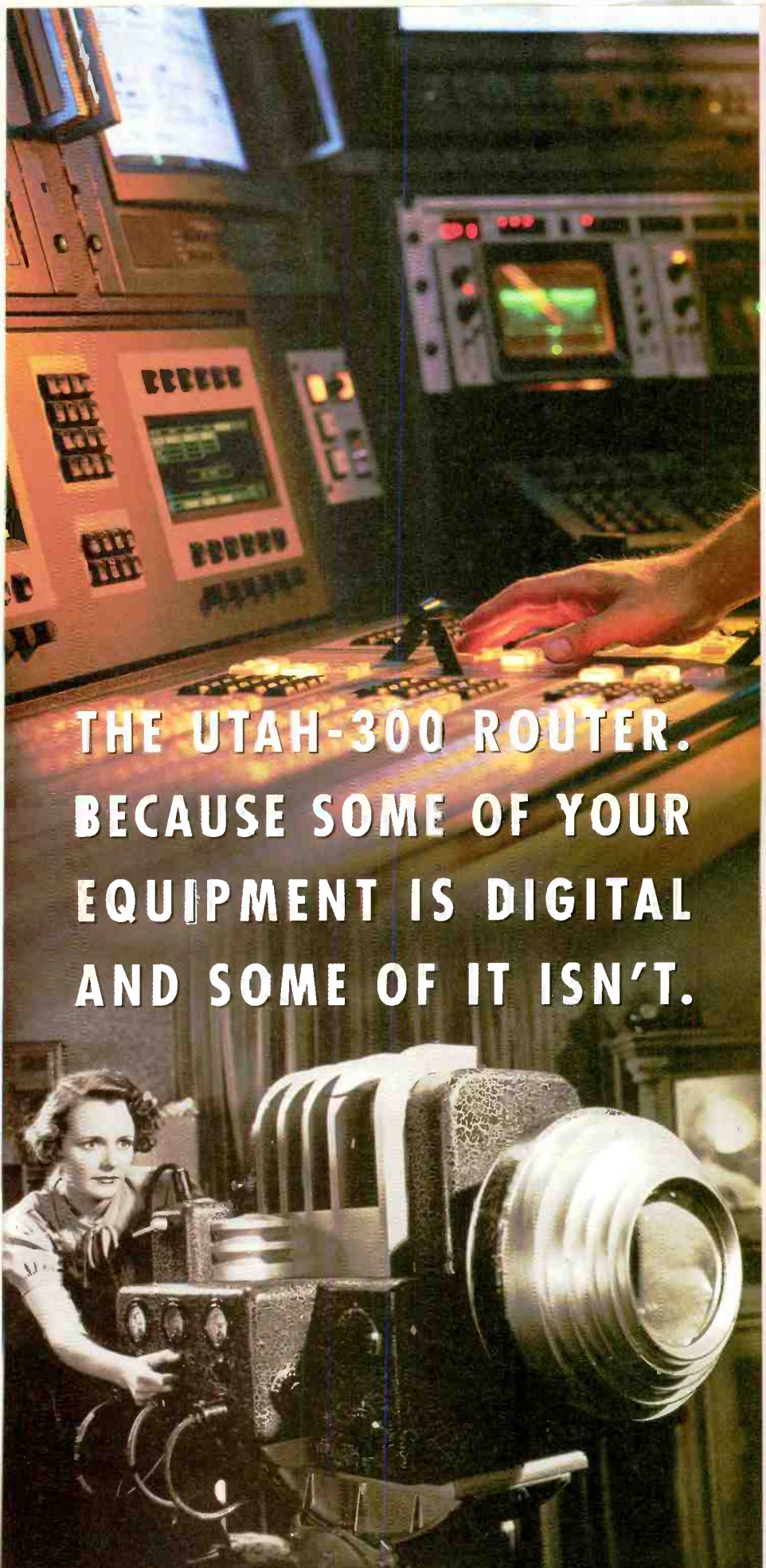
Stereo music or stereo effects from CDs will often contain some L/R phase differences and, therefore, some part of that material will be sent to the surround speakers. You don't have much control over that, except to make it mono during post-production.

Phase differences caused by delay and reverb devices can also be used to create surround effects. Be careful not to distract with too much surround audio. The surround matrix's phasing arrangement dictates that any audio directed exclusively to the surround channel will not be heard by mono listeners.

Alternatively, you can install a surround-sound encoder and feed it from four mix buses on your console. This will give you more control over where you want to place the audio. You must still monitor through the decoder in order to get the surround mix right — and continue to check for stereo and mono compatibility.

On the horizon is ATV with its 5.1 channels of *discrete* (non-matrixed) digital sound, using another Dolby system called AC-3 or *Dolby Digital.* (See "Audio for Widescreen," February 1996.) Installing matrix surround in your facility can improve your audio, for mono, stereo and surround listeners. ■

Terry Skelton is an audio consultant and trainer based in Bucks County, PA.



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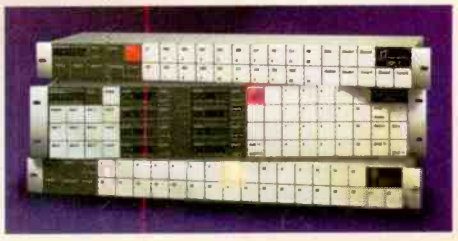

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Circle (15) on Action Card

By Steven M. Blumenfeld and Mark Dillon

Is our world splintering or coming together?

Remember those pictures of a '40s family cozied 'round that big mahogany radio? Whether listening to the stock market crash or a baseball game, everyone in the house was hearing the same thing at the same time in the same place. Socially, '50s and '60s television was radio with pictures — thus, watching the Kennedy assassination or Ed Sullivan, everyone in the house watched the same thing at the same time. Not any more. Our individual media contact is more personalized and spread out across time and place. In many ways, our world seems to be splintering, with broadcast media becoming more and more like the electronic equivalent of the railroads.

The location we choose is our first interaction with media — and depending upon where we go, things will get more, or less, interactive. There are four household venues for information and entertainment, each dominated by a specific media type:

1. The TV room (linear television);
2. The home office (personal computer);
3. The kids' video game room (video game console); and
4. On the road (wireless devices).

TV room

Occupancy: 2 or more
Distribution: Broadcast/ cable TV/ satellite
Interactive level: Low

Though the headcount is lower, television is still a social event that presumes more than just one person is in front of the screen. If you have any doubt about how much of a social event this is, just recall all of those remote-control jokes. (The gravity of this humor has been ignored by the evangelists of interactive television.) The interactive options available at home today (pause, step frame, slow motion) with discs and tape are seldom used — except when the phone rings or the refrigerator calls.

As long as more than one person is involved, interactivity in the TV room will be restricted mostly to decisions about which linear program to watch, not interactive shopping, banking or getting stock market quotes. Video on demand (VOD) is no more interactive than VHS tape — just slicker.

Home office

Occupancy: 1
Distribution: CD-ROMs and on-line services
Interactive level: High

It's not just for spreadsheets any more. The multipurpose multimedia home PC is perhaps the greatest threat to TV viewership. PC owners spend lots of time doing the things that interactive TV proponents say will happen with ITV — financial planning, shopping and games. In reality, these are individual activities that require confidentiality, high-resolution images, complex text and X-Y input devices that are not practical in front of a television. They are accomplished faster and easier on a computer.

On-line services provide a communications capability beyond what television can offer and different from the telephone. E-mail, bulletin boards and chat rooms have created whole new behavior patterns for many Americans. And in a turning of the tables, which should frighten John Malone and every other centralized broadcaster, such activities cause the user of content to simultaneously become the creator of content. (It is estimated that 60% of the on-line traffic is in this kind of E-mail-chat content.)

Video game room

Occupancy: 1 to 2
Distribution: Game cartridges, CD-ROMs, on-line services
Interactive level: Extremely high

The fact that video games are increasingly realistic and media-intensive is specifically the reason why they do not belong in the TV room. Do you want the combat sound effects of a modern video game pumped through your 100W per channel surround sound 35-inch television? Not if you're a parent. (If you're single and living alone, maybe.)

Games require either a game console and an old 15- to 21-inch television or a PC. The difference here is not so much the physical location, but the demographics. Between 3:00 p.m. and 8:00 p.m., the PC may be operated by 14 year olds and considered the game room. After 8:00 p.m. it becomes the domain of adults and reverts to its home office status.

Today, most games are distributed on read-only media, although multiplayer games have already come on-line. Like other on-line activities, the user now becomes the content developer. This is not limited to playing games, but creating them. Many CD-ROM games have "game editors" that allow a player to create new levels, characters or weapons.

On the road

Occupancy: 1
Distribution: Modem, cellular networks and pager systems
Interactive level: High

Beepers and pagers have increasing attractiveness as personalized broadcast media. Sports scores, stock market quotes and even the UV index are now available from a pager that's built into your watch. Information that you could only find in the newspaper or television on a delayed basis is now instantaneously available on your wrist. (Dick Tracy, are you listening?)

The first entity to fully comprehend the opportunity of these multiple media and take advantage of them (instead of perceiving them as a threat) was ESPN. Besides operating one of the most successful cable TV services, ESPN licenses video games and CD-ROMs. ESPN's web site is the most popular in the world, and now you can get instant sports scores with its pager service. Eventually, ESPN may embed Internet data into the broadcast signal to provide TV viewers with more in-depth and real-time information about the broadcast product.

The social nature of the venues for information and entertainment have a tremendous technological and economic impact on those of us in the business of distributing products into the American household. With so many options, the viability of any one media is largely based on how well it competes with another media for eyeball time (a.k.a. mindspace). Television is competing with computer games and the Internet. You decide — which ones are growing and which ones are shrinking? ■

Steven Blumenfeld is vice president of technology and studio operations, and Mark Dillon is vice president, on-line services, with GTE, Carlsbad, CA.

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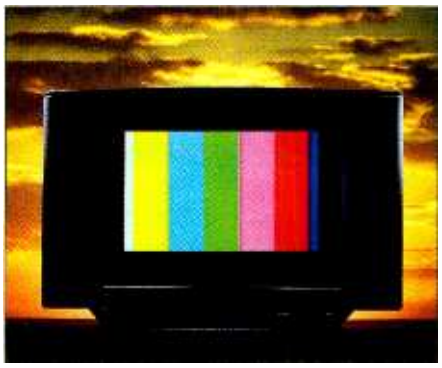
Circle (18) on Action Card

By Louis Libin

The genesis of the DTV channel assignments



The first FCC action on the digital second channel for DTV (digital television or high-definition television) was on advanced TV policy. The second action was the unanimous commission recommendation of the advanced TV transmission standard. Now the FCC is working on the third action and will soon submit for public comment a Notice of Proposed Rulemaking on the channel allotments and assignments.

The allocation of a second channel will allow every TV station to introduce a DTV broadcast service while maintaining its current NTSC broadcast service. In the future, the FCC plans to withdraw the current NTSC licenses so that stations will be required to broadcast only the DTV service. When the DTV broadcast service is introduced, the relative advantages of stations could change. The FCC has announced the intention to allocate *only* UHF channels for DTV. All channels will be equally accessible on the DTV receiver and most DTV channels should have coverage comparable to their NTSC population coverage.

The channel assignment table

By now, you have seen at least one proposed, specific DTV channel assignment table. Generally, the first column in these tables provides each existing VHF and UHF TV station with a DTV channel specifically paired with the NTSC so that it will best match the existing population coverage and service area contours. This approach is known as the "pairing" approach. Without the pairing approach, there is little chance that a station will obtain a DTV assignment that is technically suited to cover its existing service area.

A more random assignment approach would create substantially more interference to NTSC service and could exaggerate existing coverage disparities among stations. At first, the FCC was reluctant to adopt the pairing approach because it feared broadcaster in-fighting. In January 1995, more than 100 broadcasting organizations under the auspices of the Broadcasters Caucus and MSTV together filed comments proposing a channel assignment plan. Since then, industry responses have been muted. The majority of broadcasters agreed that the Caucus plan was substantially better than the original assignment plan of random community pools of channels based on geographical spacing. The FCC is expected to issue its own allotment/assignment table this summer for public comment.

The new FCC channel assignment table

The newly released FCC channel assignments will be analyzed carefully for their NTSC paired station replication. One of the primary driving forces behind the FCC DTV assignments is spectrum reclamation, the "giving back" of the previously reserved broadcasters' spectrum for auction and use by another service. The FCC proposal may reclaim 138MHz of spectrum nationwide. This translates into 23 channels, each 6MHz wide.

The FCC claims that there is no substantial increase in interference in spite of the spectrum reclamation. The plan may call for the upper UHF spectrum to be reclaimed, as well as the VHF spectrum Channels 2-6. A number of issues still remain open:

1. The differences in propagation between VHF and UHF have not been fully explored to determine exact replication. There are those who claim that UHF broadcasting is only reliable as a line-of-site service. On the other hand, recent experiments have shown that UHF signals can be captured many miles past the radio horizon. In addition, a higher tower pushes the signal further and raising the amount of transmitted energy often breaks through the radio horizon, even at the higher frequencies. Bear in mind that UHF technology is dramatically improving.

The new mode of thought is since all DTV is new, there will be no UHF stigma. Typically, VHF reception indoors with no outdoor antenna is poor. The noise level is high because of all of the appliances and electrical equipment in and out of the typical home. For outdoor reception, VHF will still outperform UHF; but with maximum facilities and good transmitting equipment and with a good, clean signal from studios, UHF comes close. If the industry pushes for minimum receiver specifications for DTV reception, DTV will have good service reliability.

2. Adjacent-channel issues must still be resolved prior to full station implementation. Only full power adjacent-channel testing will tell us for sure how well the system can withstand the various adjacent-channel operations scenarios. For example, do stations have to be exactly co-located or is nearby co-location sufficient for interference-free operation?

3. The cornerstone of the Broadcasters Caucus/MSTV assignment plan has always been the replication of existing population served and the service area. The exact replication figures will have to be studied as the digital service is rolled out. The differences posed by the channel numbers, your new assignment vs. your market competitors, can, in most cases, be mitigated by new technologies and your own facility implementation.

4. There must be a mechanism for facility changes built into the system. Some stations may desire a move, a minor modification in power or even a change in their assigned channel number. The Caucus model recognizes the need for fine-tuning the plan on a local basis to accommodate stations that cannot co-locate or ones that wish to move their facilities or desire any other facility changes. Even channel changes between stations are possible if the result is not additional interference to another station. It is understood that in congested markets, these station changes become more complicated, because they would, by necessity, involve other stations changing channels, as well. In all likelihood, an industry committee will be formed to develop guidelines for pre- and post-adoption facility changes.

How to react?

It is vitally important that in your comments to the FCC, you, as a broadcaster agree with the basic allotment/assignment principles adopted by the commission. Should the FCC plan not be wholly embraced by the broadcasters at large, the entire DTV allotment/assignment process could be knocked off track and broadcasters could find themselves in an auction process. ■

	NTSC	DTV	POPULATION SERVED (000s)			SERVICE AREA		
STATION	Ch#	Ch#	NTSC	NEW IX*	DTV	NTSC	NEW IX*	DTV
WWW	11	23	2,410	0.0%	2,417	44,450	1.0%	45,468

An example of a comparative analysis needed for each new Assignment Table.
** Note: New IX is new percentage interference into the existing NTSC population or service area contour.*

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New directions in transmitter design

Like everything else in television today, the future is digital.

The technical challenges facing transmitter design engineers over the decades since television became commonplace have not changed significantly. Those challenges — not insignificant by any stretch of the imagination — focused on higher power, higher operating frequencies, reduced transmission artifacts and greater overall efficiency. These design goals, however, often work against one another. For example, higher operating frequency can usually be achieved only at the expense of maximum available power, and improvements in transmission band flatness are usually at the expense of operating efficiency, for a given active device.

All of the accomplishments that have been made over the years to improve these parameters have dealt with the same basic waveform within the same basic bandwidth (the changes from monochrome to color notwithstanding). We are poised now, however, on the brink of a technology change that will forever alter the way TV stations do business. I am speaking, of course, about digital HDTV. Broadcasters can argue over likely timetables for implementation of HDTV or multicasting or whatever happens to finally emerge as the practical application of the Grand Alliance system. The fact, however, remains that this change will occur. That being the case, we will examine some of the fundamentals of digital transmission and how those principles dictate the hardware that we will be shopping for in the coming years.

The Bottom Line:

The FCC has approved the Grand Alliance system, and although timetables still must be set, ATV is now official. Broadcasters who have put off making plans until the FCC decided must now act. New transmitters will be required for the new channels in almost every case. As always, choosing a transmitter is a decision with long-term consequences. Making the correct choice can be critical to future success. An understanding of the technology involved can make this difficult decision easier, and in the long run, easier to live with. $

It is important to understand that digital transmission systems for the near-term future include much more than just HDTV. Applications for the TV industry include satellite relay, STL and microwave point-to-point. The benefits of digital systems over analog are well-documented, and any number of techniques may be used to accomplish a given task. It is important, therefore, to have some familiarity with the basic digital coding techniques in use today.

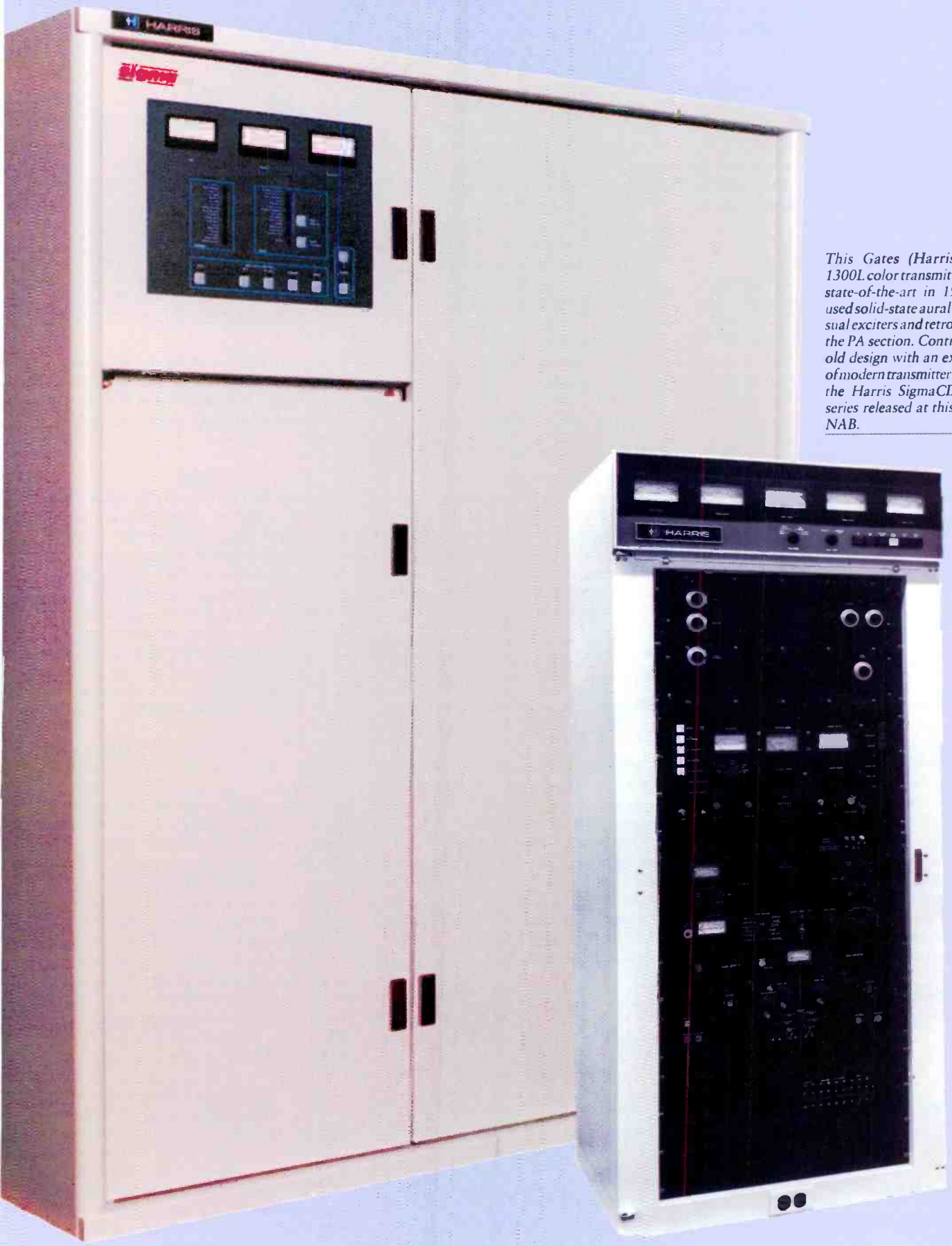
In a vacuum

Conventional logic dictates that a digital system is — by definition — a solid-state system, to the exclusion of vacuum tubes. With regard to logic, control, signal generation and signal-processing circuits, the conventional logic is quite correct. With regard to high-power transmission equipment, however, I would be willing to argue the point. MOSFETs are proportional switches. Tetrodes are proportional switches. Klystrons are proportional switches. There is nothing intrinsically digital about an amplifying semiconductor device. MOSFETs were used in analog transmitters long before digital transmission equipment was practical.

Having said that, it is certainly true that semiconductors enjoy a long list of attributes that are desirable by station owners and operators, including:

- Low voltage operation, which reduces the chances of arcing and provides certain benefits from the standpoint of power supply design.
- Graceful degradation capability through redundant design, as required to achieve the

By Jerry Whitaker



This Gates (Harris) BT-1300L color transmitter was state-of-the-art in 1977. It used solid-state aural and visual exciters and retrodes for the PA section. Contrast the old design with an example of modern transmitter design, the Harris SigmaCD ATV series released at this year's NAB.

desired operating power.
- Simplified cooling requirements.
- Semiconductors lend themselves to more efficient circuit configurations, albeit at the expense of system complexity.

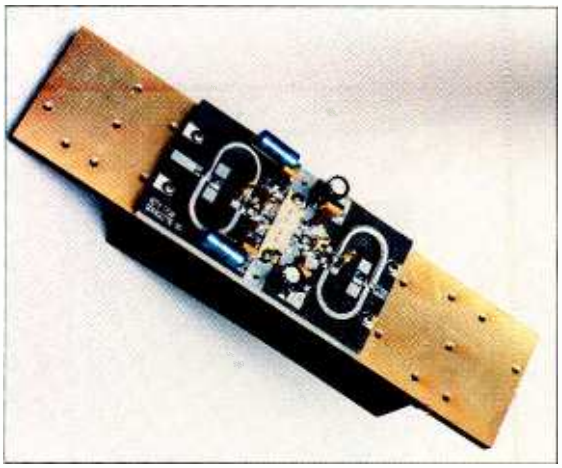
The purpose of this article is not to debate the relative benefits of tubes vs. transistors. That topic has been addressed in great detail in the past. Suffice it to say, however, that a discussion of digital transmission and the devices required to achieve that transmission at high frequencies and power levels are two different subjects.

Digital modulation

Digital modulation is necessary before digital data can be transmitted through a channel, be it a satellite link or HDTV. Modulation is the process of varying some attribute of a carrier waveform as a function of the input intelligence to be transmitted. Attributes that can be varied include amplitude, frequency and phase. In the case of digital modulation, the message sequence is a stream of digits, typically of binary value. In the simplest case, parameter variation is on a symbol-by-symbol basis; no memory is involved. Carrier parameters that can be varied under this scenario include the following:
- Amplitude, resulting in amplitude-shift keying (ASK);
- Frequency, resulting in frequency-shift keying (FSK);
- Phase, resulting in phase-shift keying (PSK.)

So-called higher-order modulation schemes impose memory over several symbol periods. Such modulation techniques can be classified as binary or M-ary, depending on whether one of two possible signals or M > 2 signals per signaling interval can be sent. Binary signaling may be defined as any signaling scheme where the number of possible signals sent during any given signaling interval is two. M-ary signaling, on the other hand, is a signaling system where the number of possible signals sent during any given signaling interval is M. For the case of M-ary modulation when the source digits are binary, it is clear that several bits must be grouped to make up an M-ary word.

Another classification for digital modulation is coherent vs. noncoherent, depending upon whether a reference carrier at the receiver coherent with the received carrier is required for demodulation (the coherent case) or not (the noncoherent case). In situations where it is difficult to maintain phase stability, for example in channels subject to fading, it is useful to employ a modulation scheme that does not require the acquisition of a reference signal at the receiver, which is phase coherent with the received carrier. ASK and FSK are two modulation techniques that lend themselves well to noncoherent detection. Receivers for detection of ASK and FSK noncoherently are shown in Figure 1. There is one other binary modulation technique that is — in a sense — noncoherent: differentially coherent PSK (DPSK). With DPSK, the phase of the preceding bit interval is used as a reference for the current bit interval. This technique depends on the channel being sufficiently stable so that phase changes resulting from channel perturbations from a given bit interval to the succeeding one are inconsequential. It also depends on there being a known phase relationship from one bit interval to the next. This requirement is ensured by differentially encoding the bits before phase modulation at the transmitter. Differential encoding is illustrated in Table 1. An arbitrary reference bit is chosen to start the process. In the table, a "1" has been chosen. For each bit of the encoded sequence, the present bit is used as the reference for the following bit in the sequence. A "1" in the message sequence is encoded as a transition from the state of the reference bit to the opposite state in the encoded message sequence. A "1" is encoded as no change of state. Using these rules, it can be seen that the encoded sequence shown in the table results.



A 500W amplifier module based on silicon carbide. Westinghouse showed an ATV transmitter based on these products at NAB 96.

Message sequence		1	0	0	1	1	1	0
Encoded sequence	1	1	0	1	1	1	1	0
Transmitted phase radians	0	0	π	0	0	0	0	π

Table 1. Example of the differential encoding process.

QPSK

Consider the case of an MPSK signal where M = 4, commonly referred to as quadriphase-shift keying (QPSK) This common modulation technique uses four signals in the signal set distinguished by four phases 90° apart. For the case of an MASK signal where M = 4, a quadrature-amplitude-shift keying (QASK) condition results. With QASK, the phase and amplitude of the carrier take on a set of values in one-to-one correspondence with the digital data to be transmitted.

Several variations of QPSK have been developed to meet specific operational requirements. One such scheme is referred to as offset QPSK (OQPSK). This format is produced by allowing only ±90° phase changes in a QPSK format. Furthermore, the phase changes can take place at multiples of a half-symbol interval or a bit period. The reason for limiting phase changes to ±90° is to prevent the large envelope deviations that occur when QPSK is filtered to limit sidelobe power, and then the regrowth of the sidelobes after amplitude limiting is used to produce a constant-envelope signal. This condition is often encountered in satellite systems where, because of power efficiency considerations, hard limiting repeaters are used.

Another modulation technique closely related to QPSK and OQPSK is minimum shift keying (MSK). MSK is produced from OQPSK by weighting the in-phase and quadrature components of the baseband OQPSK signal with half-sinusoids. The phase changes linearly over a bit interval. As with OQPSK, the goal of MSK is to produce

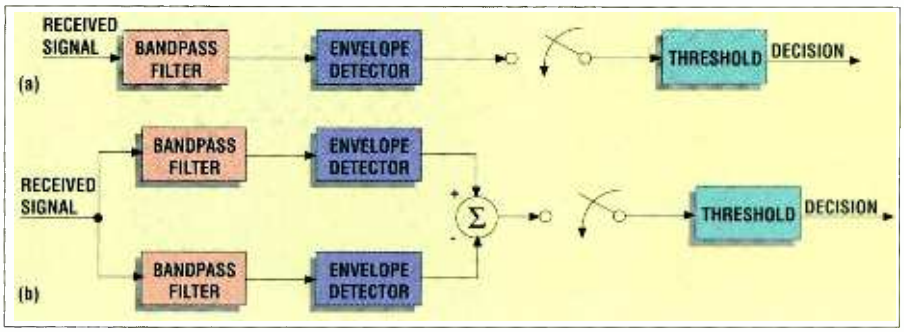


Figure 1. Block diagrams of receivers for noncoherent detection of binary signals: (a) ASK, (b) FSK.

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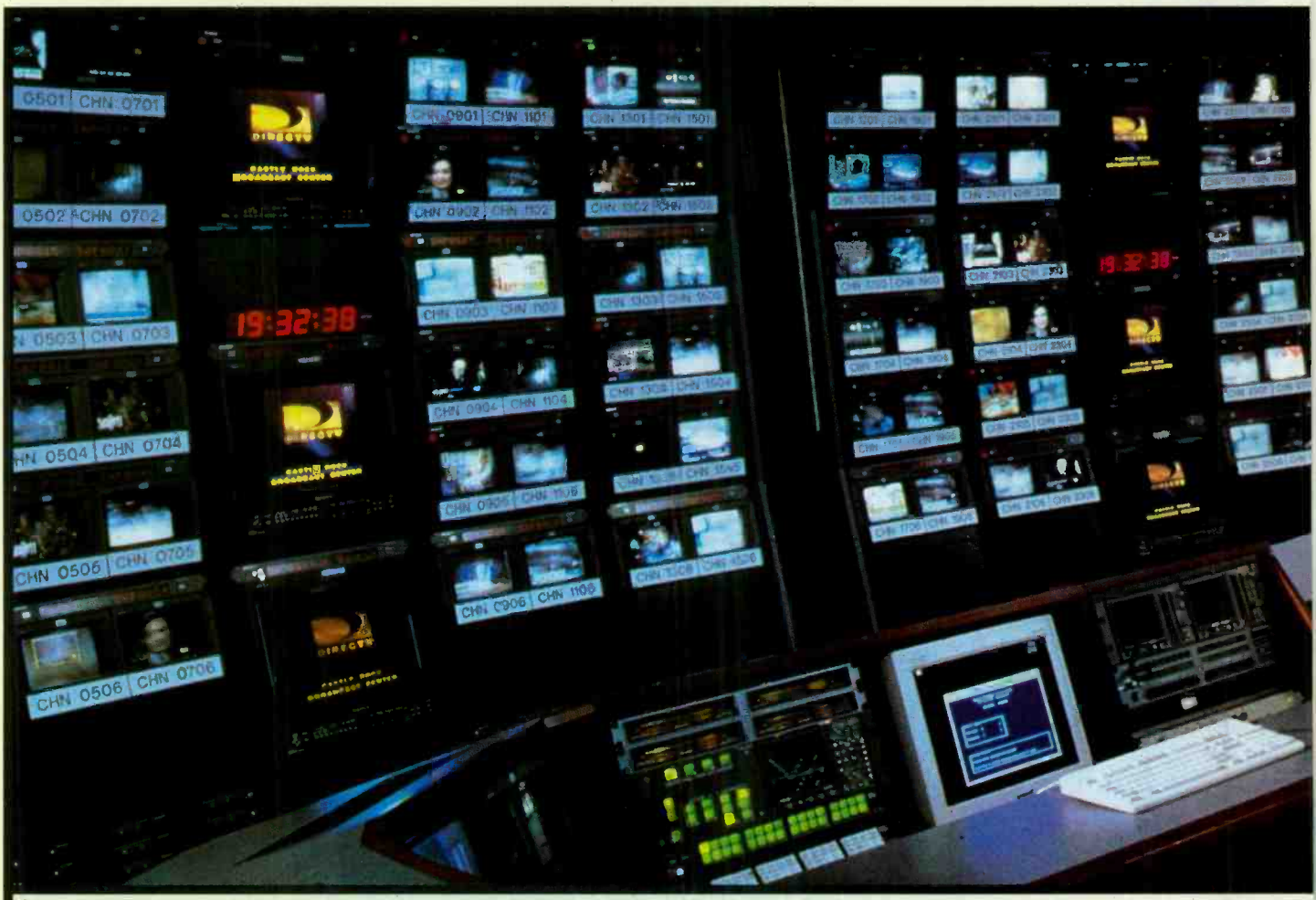

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a modulated signal with a spectrum of reduced sidelobe power, and one that behaves well when filtered and limited. Many different forms of MSK have been proposed and investigated over the years.

A modulation scheme related to 8-PSK is $\pi/4$-differential QPSK ($\pi/4$-DQPSK). This technique is essentially an 8-PSK format with differential encoding where, from a given phase state, only specified phase shifts of $\pm \pi/4$ or $\pm 3\pi/4$ are allowed.

Continuous phase modulation (CPM) comprises a host of modulation schemes. These formats employ continuous phase trajectories over one or more symbols to get from one phase to the next in response in input changes. CPM schemes are employed in an attempt to simultaneously improve power and bandwidth efficiency.

Signal analysis

The ideal choice of a modulation technique depends on many factors. Two of the most basic are the bandwidth efficiency and power efficiency. These parameters are defined as follows:

- Bandwidth efficiency is the ratio of the bit rate to the bandwidth occupied for a digital modulation scheme. Technically, it is dimensionless, but for convenience is usually given with the dimensions of bits/second/hertz.

- Power efficiency is the energy-per-bit over the noise power spectral density (E_b/N_o) required to provide a given probability of bit error for a digital modulation scheme.

Computation of these parameters is beyond the scope of this article. Interested readers are directed to Ziemer 1996 for a detailed discussion of performance parameters.

Error correction coding

Digital modulation schemes in their basic form have dependency between signaling elements over only one signaling division. There are advantages, however, to providing memory over several signaling elements from the standpoint of error correction. Historically,

By Dane E. Ericksen, P.E., CSRE, CSTE

A review of IOT performance

The pros and cons of IOTs.

Above photo: Air-cooled digital IOT next to a 20kW/ 2kW air-cooled IOT system.

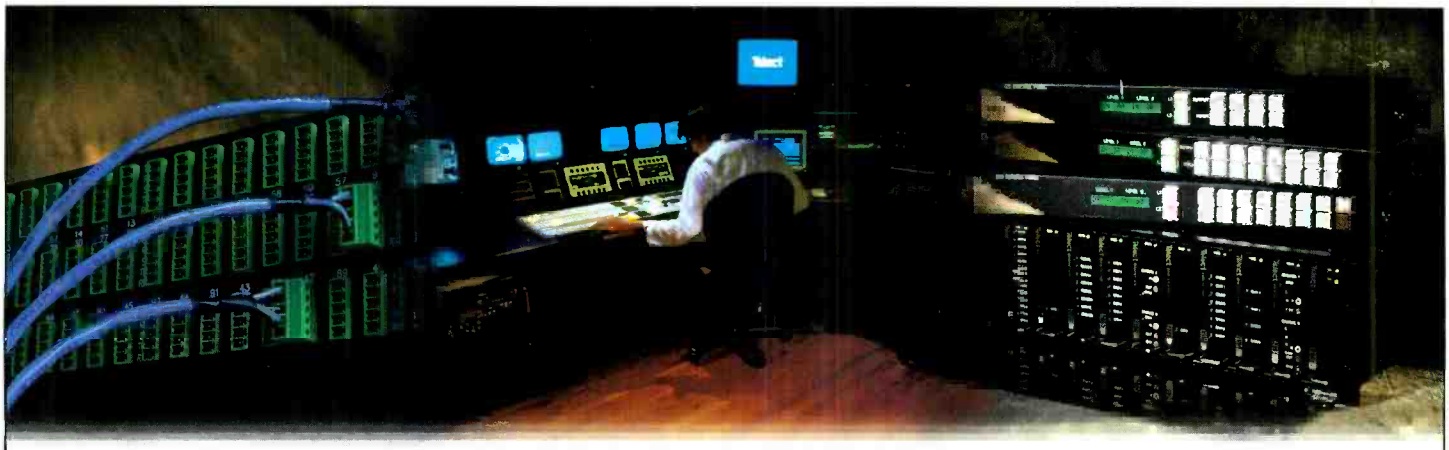
The Bottom Line:

UHF TV stations, as well as all broadcasters, are under constant pressure to operate their transmitting facility as efficiently as possible. With the adoption of a rulemaking by the FCC on May 9, advanced television (ATV) operations using the Grand Alliance system are now close enough for broadcasters to consider building their second-channel ATV facility. This article will review the performance of inductive output tubes (IOTs) and address some of the tube's advantages and disadvantages. $

The IOT has been around for about five years. It was first developed as a means of gaining better efficiency than was available from klystrons. The IOT uses a control grid to improve the tube efficiency while still maintaining the high power-handling capability and long tube life benefits of klystrons. Modern-day IOTs have gone through several design iterations and can be considered a mature and proven design, with a track record to provide reliable estimates of tube life and operating costs. Several important aspects of the modern-day IOT, such as the EEV model IOT7360, will now be explored.

Power consumption

Overall power consumption for a modern-day common-mode UHF transmitter is typically 1.35W WITH prime input power per watt of peak visual sync, with 10% aural power and a 50% average picture level. Thus, for a typical 2-IOT 60kW peak visual NTSC common-mode UHF transmitter, the



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the first way this was accomplished was to encode data by adding redundant symbols for error correction, and then use the encoded symbol stream to modulate the carrier. The ratio of information symbols to total encoded symbols is referred to as the code rate. At the receiver, demodulation is accomplished followed by decoding.

The drawback to this approach is that redundant symbols are added, requiring a larger transmission bandwidth, assuming the same data throughput. However, the resulting signal is more immune to channel-induced errors resulting from — among other things — a marginal signal-to-noise ratio for the channel. The end result is a coding gain for the system, coding gain being defined as the ratio of the signal-to-noise ratios without and with coding.

There are two widely used coding methods:

1. *Block coding* is a scheme that encodes the information symbols block-by-block by adding a fixed number of error correction symbols to a fixed block length of information symbols.

2. *Convolutional coding* is a scheme that encodes a sliding window of information symbols by means of a shift register and two or more modulo-2 adders for the bits in the shift register that are sampled to produce the encoded output.

While an examination of these coding methods is beyond the scope of this article, it is important to note that coding used in conjunction with modulation always expands the required transmission bandwidth by the inverse of the code rate, assuming the overall bit rate is kept constant. In other words, the power efficiency goes up, but the bandwidth efficiency goes down with the use of a well-designed code. Certain techniques have been developed to overcome this limitation, including trellis-coded modulation (TCM), which is designed to simultaneously conserve power and bandwidth.

There is nothing intrinsically digital about an amplifying semiconductor device.

Toward the future

We have merely scratched the surface of digital transmission principles. Readers are encouraged to explore the subject in more detail as the era of digital HDTV transmission nears. As in analog modulation schemes, digital techniques are based on a few fundamental principles, as outlined here.

It is tempting to view a digital transmission system as a black box and ignore what really goes on inside the box. However, as you begin installing, integrating and maintaining such equipment, the black box approach shows its pitfalls rather quickly. Like everything else in electronics, the more you understand about the underlying technology, the easier it is to capitalize on that technology. ■

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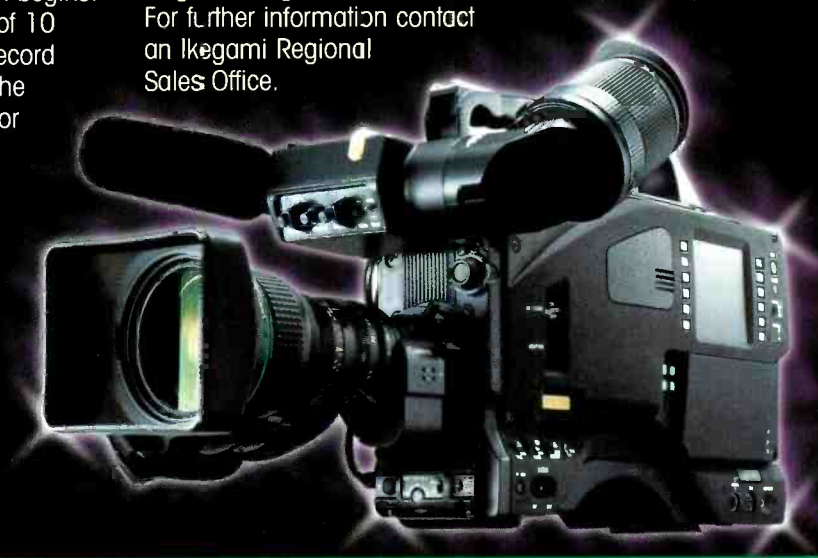

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prime input power requirement would be expected to be around 81kW. This is a far cry from 1960-vintage klystron transmitters, which typically would have required more than 200kW of prime input power to achieve this same peak visual output power.

Tube life

Expected Weibul tube life for an IOT is in excess of 35,000 hours. The Weibul life is the lifetime where one standard deviation ($1 - e^{-1}$), or 63%, of the devices will have failed. This is based on more than 300 IOT-equipped sockets with an estimated four million cumulative operating hours. Included in this universe of all EEV IOTs are 28 tubes with more than 20,000 hours; of these, 20 tubes have more than 25,000 hours; and of these, five tubes have more than 25,000 hours.

The average hours to failure excluding infant-mortality failures (failures of tubes with less than 1,000 hours of operating time) are now in excess of 21,000. If infant-mortality failures are excluded, the average life figure increases to almost 29,000 hours. Infant-mortality tube failures are, of course, handled under the manufacturer's warranty program and are replaced at no charge to the customer. Therefore, the higher average life figure that accrues when infant-mortality failures are excluded is a more realistic estimate of the tube life a customer can expect to actually obtain.

The success of the IOT is further indicated by the fact that more than 100 IOT-based transmitters are either being installed or contracted for. This is not to say that the IOT didn't have its teething problems. Early IOTs suffered from premature tube failures, but this problem was rectified in 1993 by a radical redesign of the cathode/grid structure. Early IOTs also had input cavity problems, but this has again been rectified by design changes. EEV has now almost completed its program to retrofit transmitters with early-style cavities at no cost to stations with the old-style tubes.

A sample of 231 60kW EEV IOTs manufactured after mid-1993 shows an average life of more than 42,000 hours including infant-mortality failures, and an average life of more than 58,000 hours excluding infant-mortality failures. For 40kW IOTs, again manufactured after mid-1993, but based on a smaller sample of 63 tubes, the average hours per failure and average hours per failure excluding infant-mortalities numbers are greater than 22,000 hours and greater than 42,000 hours, respectively. It is, therefore, conceivable that the average lifetime of IOTs will ultimately approach the 40,000- to 50,000-hour life of klystron tubes.

The average life of all EEV-manufactured IOTs, regardless of manufacturing date or power level and including infant-mortality failures, is in excess of 10,000 hours.

Cooling methods

IOTs can be air or liquid cooled. For liquid-cooled tubes, either pure water or a 50-50 mixture of water and glycol can be used. This gives flexibility to the transmitter manufacturer and to the TV station purchasing the transmitter.

Distortion products

High-powered tubes are nonlinear, and nonlinear devices generate distortion products. When the visual, chroma and aural signals are intentionally combined in a single tube (or pairs of tubes), the transmitter manufacturer is faced with the challenges of controlling out-of-band intermodulation products at 4.5MHz below the visual carrier and 9MHz above the visual carrier. The manufacturer is also faced with controlling in-band intermodulation products, such as the 920kHz chroma-aural beat and H sync spurs cross-modulating the aural signal.

Common-mode transmitters employing IOTs now have an established track record of being able to control these distortion products through the use of visual and aural correction circuits and high-powered band-pass filters. Indeed, some common-mode IOT-based transmitters have demonstrated performance characteristics rivaling that previously only attainable using diplexed transmitters. However, they have all the cost and efficiency advantages of not requiring a dedicated aural tube and cabinet, and do not need a large and expensive diplexer to combine the visual and aural signals.

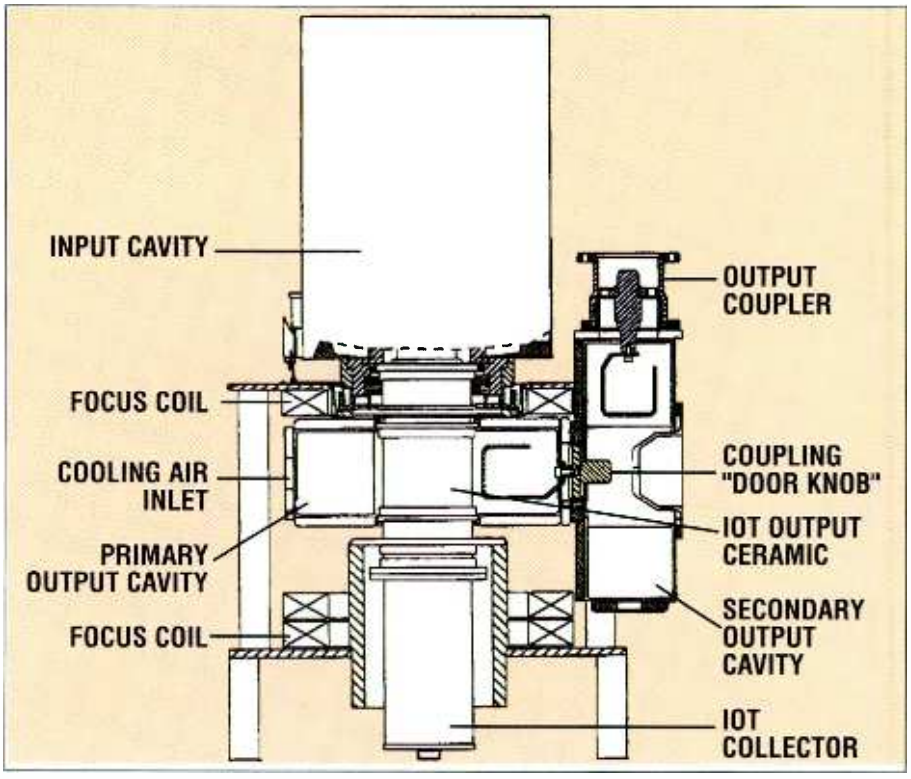
VSWR resilience

An IOT will typically deliver full performance for voltage standing wave ratios (VSWRs) of 1.1:1 or better, and will not sustain damage for VSWRs as poor as 1.5:1. This tolerance to less than optimum loads means that transmission line or antenna problems are less likely to cause tube damage than for other types of tubes that are more sensitive to poor line matches.

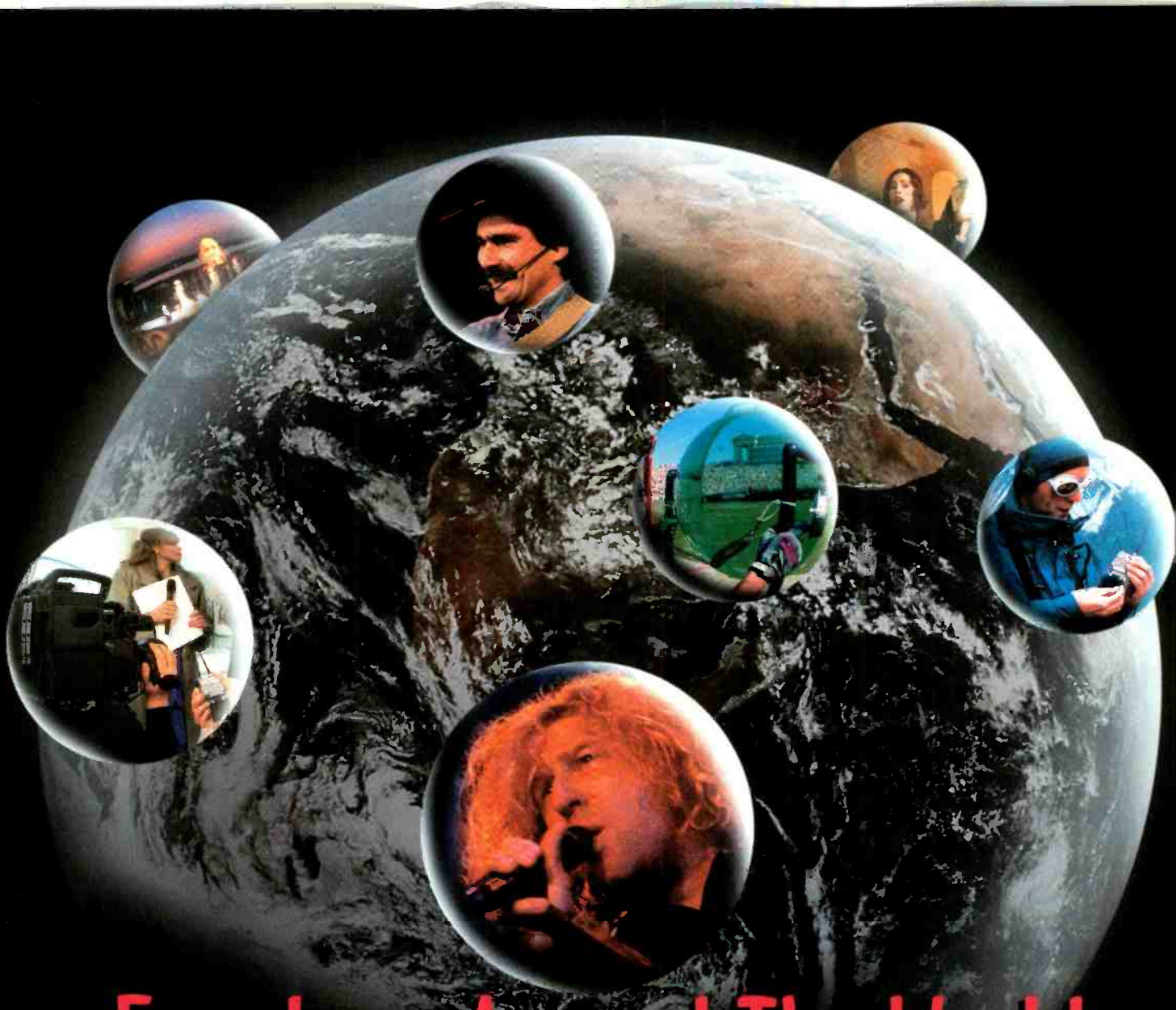
Maintenance issues

An advantage of IOTs over tetrodes or Diacrodes is that the IOT has a laser-cut graphite grid placed about 0.5mm from, and co-spherical with, the cathode. This grid need only be excited with a few hundred watts of input power. RF power extraction takes place some distance away in the output cavity. Thus, the two critical processes of a power tube, cathode action and beam modulation and RF power extraction, are physically separated.

By contrast, this is not the case for tetrodes or Diacrodes. The operating region of a UHF tetrode consists of a cylindrical cathode surrounded by a cylindrical grid, closed at one end, which in turn is surrounded by a second cylindrical grid, also closed at one end. The Diacrode internal construction is



Cross-section view of IOT tube.



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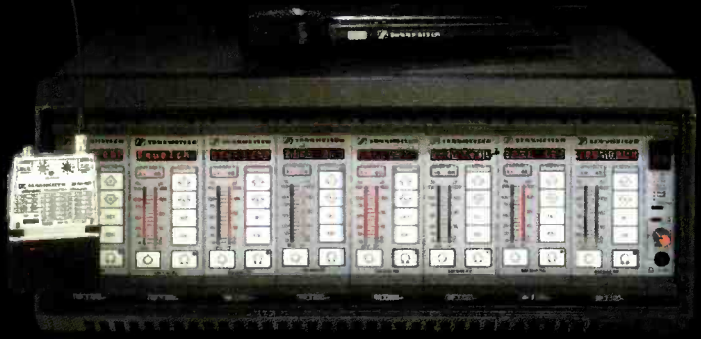

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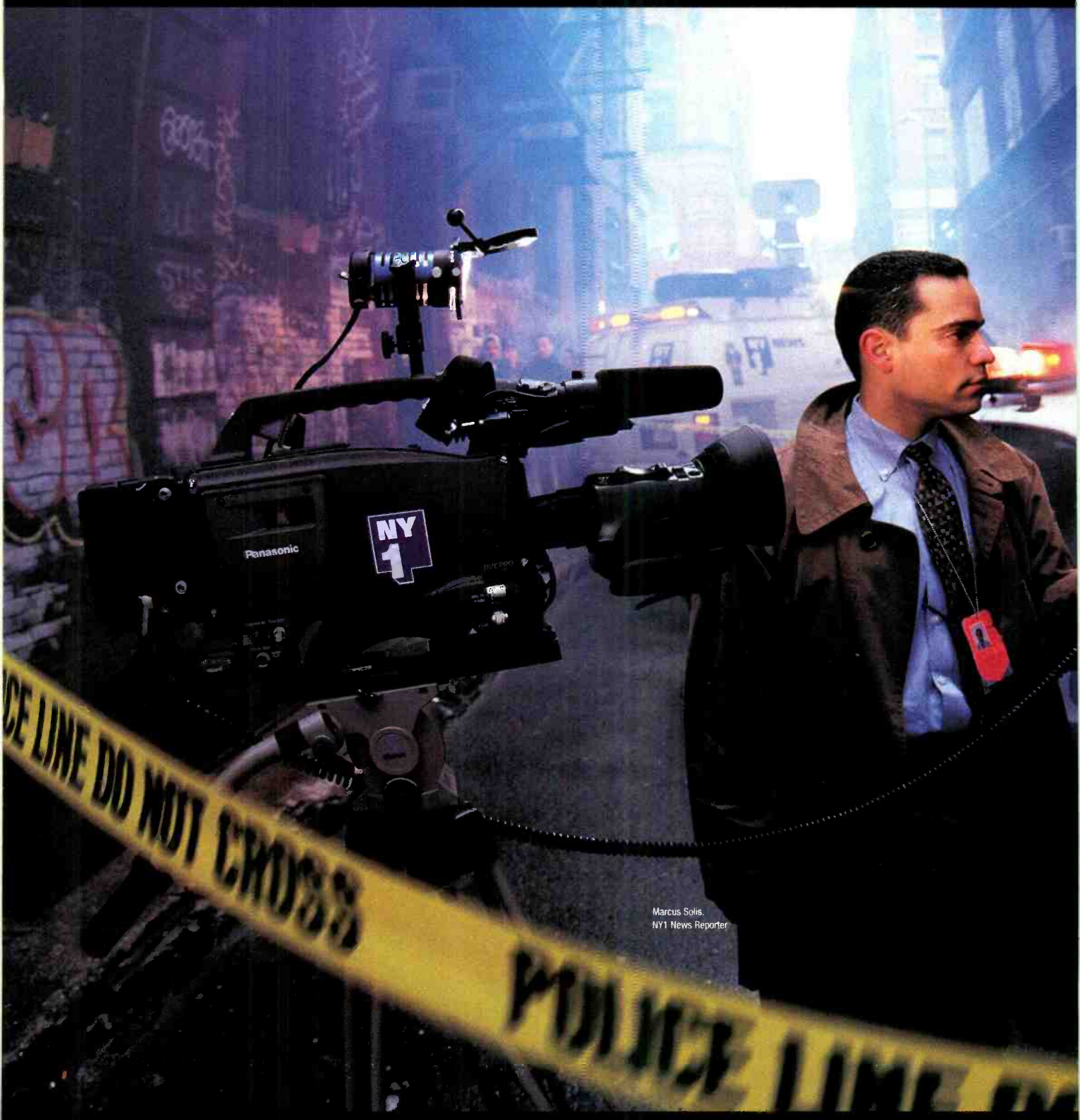



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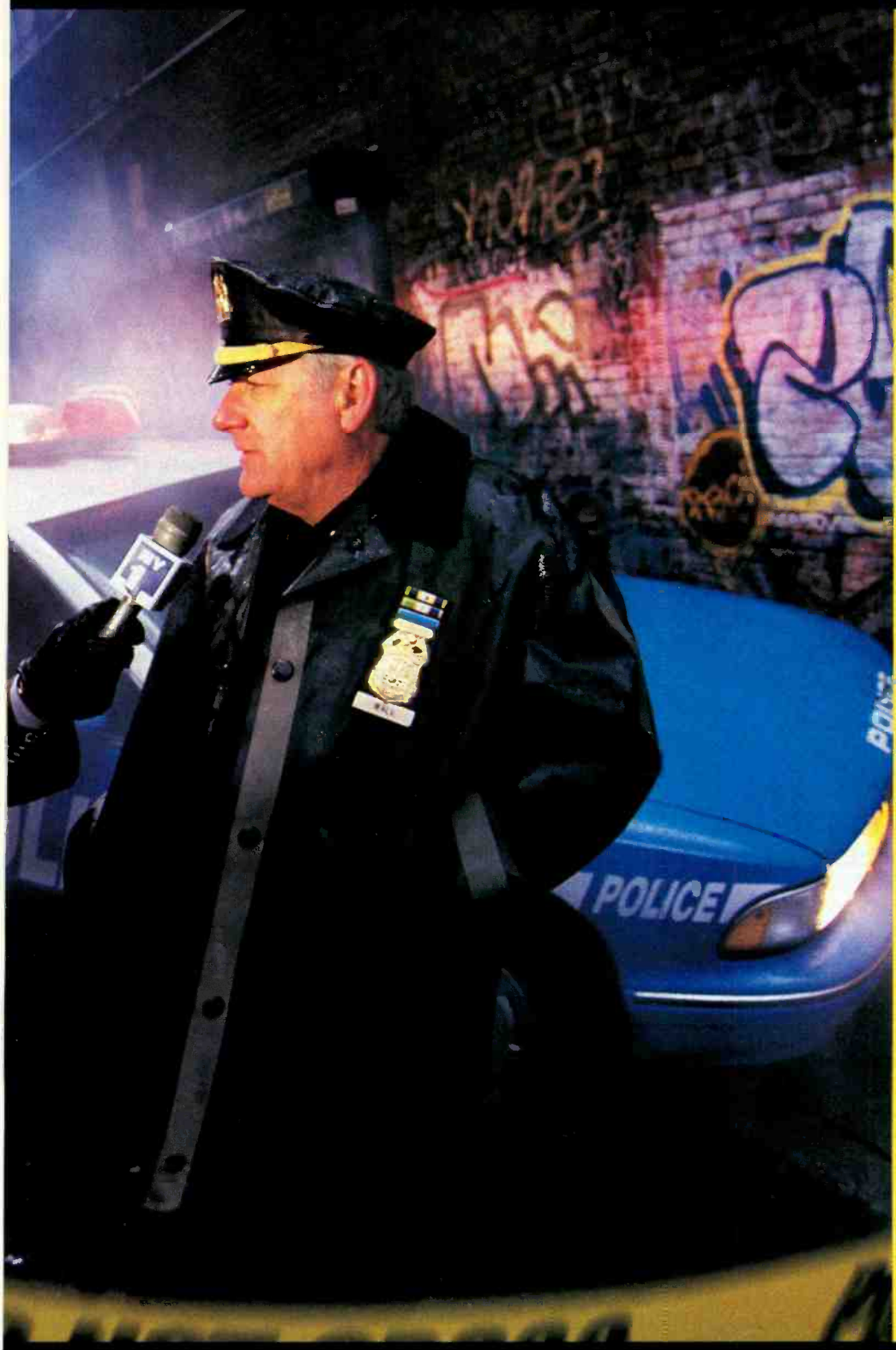

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even more complex. The separation between the grids and cathode must be maintained at around 0.5mm everywhere in order to preserve acceptable characteristics at UHF. Thus, cathode action, modulation and RF power extraction all take place in the same relatively small volume. As a consequence, high reactive currents flow in the anode-to-screen grid capacitance and heat up the screen grid and its support. Thermal and electrical stresses are consequently higher than in the IOT.

A consequence of the UHF tetrode and Diacrode construction is that the screen grid must be water cooled at the 40kW to 60kW peak visual power levels considered here. Lower-powered UHF tetrodes with air-cooled screen grids have not been able to demonstrate long lives. Due to high thermal and electrical stresses, tetrodes tend to fail suddenly, whereas natural IOT end-of-life is expected to emulate TV klystron end-of-life characteristics, where loss of cathode emission causes a gradual loss of output power, thus providing plenty of warning for planned maintenance.

IOT disadvantages

To be balanced, one must also address some IOT disadvantages in comparison to a tetrode or Diacrode. First, plate voltages are much higher. A tetrode or Diacrode is happy with plate voltages of less than 10kV, whereas an IOT needs a beam supply voltage of 28kV to 33kV. For conventional power supplies, this means more stored energy that must be dissipated if the high voltage must be momentarily interrupted to quench an internal tube arc. This was not necessary for klystrons, which the IOT was designed to replace, because the vacuum volume of a klystron was sufficiently large to not be degraded by gases released during a high energy discharge. However, for the smaller vacuum volume of an IOT, a high energy discharge can significantly degrade the tube's vacuum, at least on a short-term basis, and the tube manufacturer, therefore, requires a protective circuit.

A tetrode or Diacrode has no need of a brute-force "crowbar" switch to extinguish internal arcs that might occur. This is due to the smaller stored energy in a 10kV power supply as compared to a 30kV power supply. A Diacrode costs approximately $29,000 and only one is needed for a 60kW transmitter, compared to approximately $38,000 each for IOTs, and two such tubes are needed to achieve 60kW. Finally, although the life of an IOT can be expected to be double that of a tetrode or Diacrode, when the time comes to change an IOT, it will require between one and two man-hours, compared to probably less than half a man-hour for a tetrode or Diacrode.

Operating costs

Of course, tube cost per se is largely irrelevant when attempting to determine the overall cost over a 20-year lifetime. What counts is the total calculus of tube cost, tube life and overall transmitter efficiency. Assuming a 20-hours-per-day operating schedule and a conservative 30,000-hour tube life, over a 20-year period the IOT tube cost can be projected at $380k and the power cost at $1,064k (at nine cents per kilowatt-hour), for a total cost of $1,444k or about $7.29 per hour for power and about $9.89 per hour for total cost (power + tube capitalization). Thus, power costs rather than tube costs is the most significant factor.

50kW/5kW IOT system (left), and a 30kW/3kW air-cooled IOT system on the right.

Redundancy advantage of a two-tube transmitter

There is one consideration that is hard to put a dollar value on — the inherent redundancy of a two-tube IOT common-mode transmitter compared to a single-tube common-mode transmitter. For the case of a 60kW two-tube IOT transmitter, loss of one tube causes power to be reduced to a still respectable 30kW. For a single-tube Diacrode transmitter, loss of the tube means reducing power to the 2.5kW available from the driver stage. Or, in other words, the differences in a short-term "hit" caused by a tube failure is 3dB vs. 14dB. Whether this is a critical factor depends on whether the TV station already has an auxiliary (standby) transmitter and the appropriate plumbing to switch to that standby transmitter or whether the station, for whatever reasons, must make do with just a single transmitter.

In that regard, a related issue is tube warm-up time. Although tube replacement time for a tetrode or Diacrode is shorter than for an IOT, a new tetrode or Diacrode needs blackheat filament voltage applied at least 10 minutes prior to other voltages, and then the full filament voltage must be gradually and linearly ramped up over a three-minute period, for a total warm-up time of 13 minutes. By comparison, IOTs and their related crowbar thyratrons have a five-minute warm-up time.

ATV conversion advantage of a two-tube transmitter

A two-tube 60kW IOT common-mode transmitter has the potential advantage over a single-tube 60kW Diacrode common-mode transmitter in that with two tubes, the TV station has the option to temporarily create two transmitters: one tube transmitting conventional NTSC, and the other tube transmitting Grand Alliance ATV. Furthermore, at the end of the ATV conversion period, when the NTSC channel must be returned to the FCC, a two-tube transmitter again has the potential to either be restored to a higher-power ATV transmitter, or, more likely, to be converted to a main and alternate-main two-ATV transmitter configuration.

Summary

Whether IOTs or other high-powered UHF RF generators, such as tetrodes, Diacrodes, or even emerging-technology high-temperature Silicon-Carbide solid-state final RF stages, represent the best overall choice for an individual TV station will have to remain a case-by-case evaluation of the pros and cons of each of these technologies. Nevertheless, it is clear that the IOT will have a well-established place for high-powered UHF TV transmitters for many years to come. ■

Dane E. Ericksen is with Hammett & Edison, Inc., Consulting Engineers, San Francisco.

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By Thomas G. Crowder, AIA, NCARB

Maximizing vertical real estate

ATV conversion will require some major changes at the transmitter site.

The Bottom Line:

The need to add a second (ATV) transmission facility will cause many stations to outgrow their current tower and/or transmitter building. Yet, construction of new towers is not looked upon with great favor in many communities. The efficiency of multi-use towers will, therefore, become more valuable. Broadcasters can exploit this efficiency to new extremes using some innovative transmission facility designs. Excess capacity can also be included for additional future revenue from leasing. $

The need to maximize "vertical real estate" has never been as important as it is now with broadcasters beginning to plan for the transition from NTSC to ATV. Central to the decision process is the broadcast tower and whether it will support additional loads imposed by a new transmission line and antenna(s) for ATV, new design and government standards and insurance factors.

For the duration of the simulcast period, existing towers will need to support at least two signals or broadcasters will have to look elsewhere to either construct a new single or co-op (multistation) transmitter site or evaluate leasing options. As this change occurs, many larger broadcasting companies and vertical real-estate developers will be looking at providing new multistation towers and facilities.

Adding to your present tower

Adding a new antenna and transmission line to an existing tower first requires a structural analysis to determine if the existing tower can support the additional equipment loads. Armed with the results of this analysis, a broadcaster can make decisions on future directions, generally by choosing from one of the following three options:

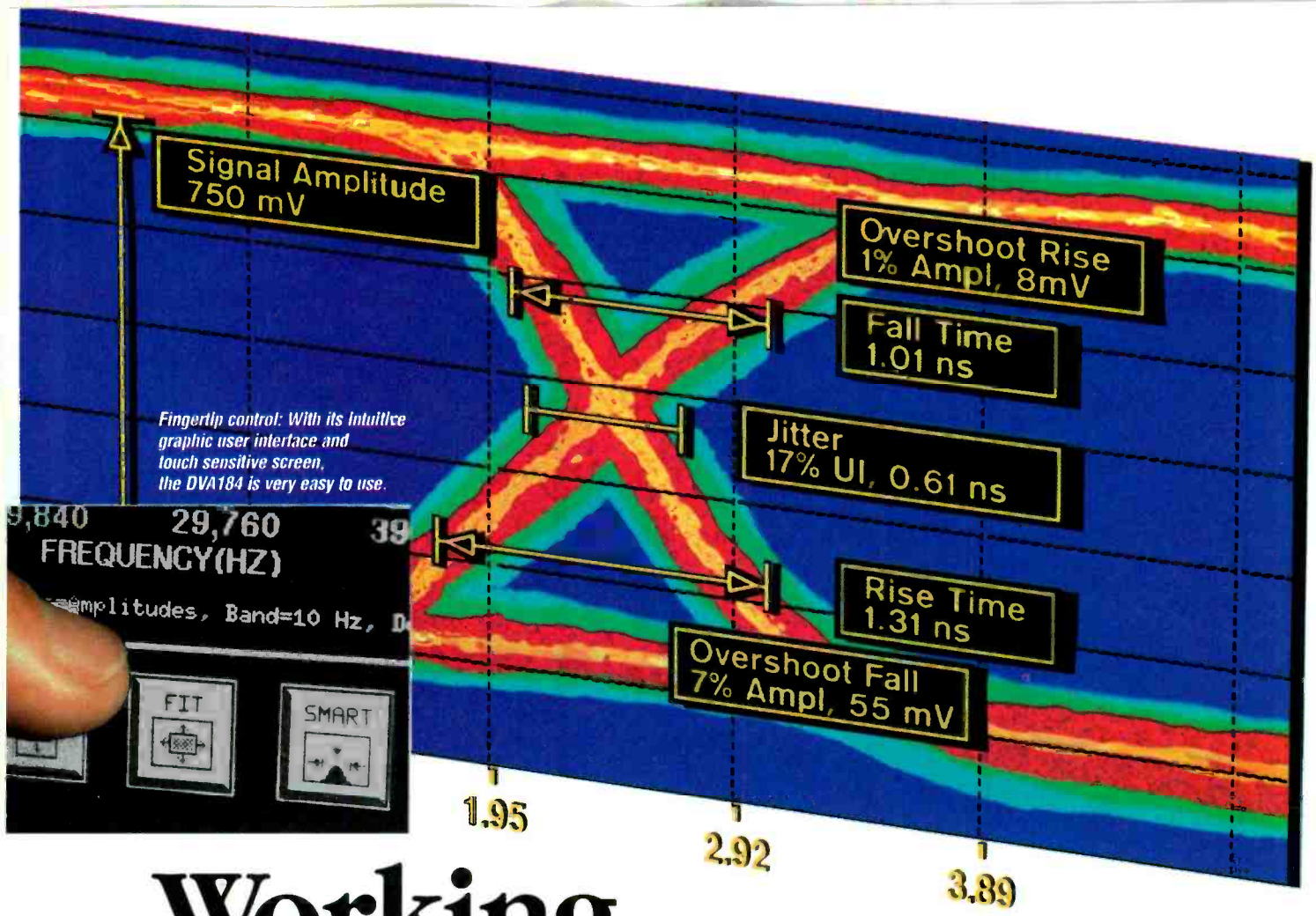
- Option 1: The tower's structural capacity will support the new ATV transmission line(s) and antenna(s), allowing installation to proceed. In this situation, little or no alteration will be required to the existing tower.

- Option 2: One or more of the tower components will be overstressed by the new transmission hardware, so the tower must be reinforced to accept the additional equipment loads. In this situation, structural modifications are necessary, requiring additional time and expense before installation of the additional ATV transmission line(s) and antenna(s) can proceed.

- Option 3: Addition of new ATV transmission line(s) and antenna(s) will compromise the structural integrity of the tower to a point that necessary reinforcement would be cost-prohibitive or beyond good engineering judgment. In this situation the only possibility is to construct or lease a new transmitter site.

Regardless of which option you will be faced with, the cost associated with this change causes all broadcasters to look toward maximizing their vertical real-estate assets. The advent of cellular telephony and personal communication systems (PCS) has caused many municipalities nationwide to tighten their zoning restrictions, and in some cases, to deny

Above photo: The Auburn transmitter site near Raleigh, NC. (Photo by Jim Sink, Artech, Raleigh, NC.)



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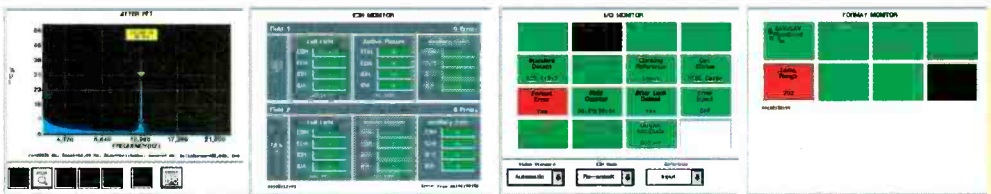

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erection of new cellular telephone and two-way radio communications towers.

With this in mind, even if your present tower can accommodate the new ATV transmission line(s) and antenna(s), how can you further maximize your tower's earning potential? How can you further increase your tower's earning potential after the simulcasting period has ended? Whether you'll be adding ATV to your present tower or a new site, try to provide the capacity for future tenant expansion and rental income during your analysis and design processes.

Your present transmitter facility

After evaluating your present tower's capacity for expansion, you should turn your view toward your present transmitter building. Should you find that your present tower is capable of supporting your existing NTSC and new ATV transmission line(s) and antenna(s), a UHF station will then face the additional question of whether to simulcast both signals at reduced power on its present transmitter or invest in a new ATV transmitter to simulcast both signals at full power.

If you decide to simulcast through your present UHF transmitter, you must analyze the feasibility of adding a new diplexer or RF unit within your existing facility. More than likely, space is already at a premium, and this may require you to expand your present facility.

If market share and coverage issues drive your decision to simulcast at full power, or you are presently a VHF station, you're even more likely to require a transmitter building expansion or new facility to accommodate the new transmitter. Of course, if your tower analysis proves it necessary to construct a new tower, these issues are moot — you will have to build a new tower and transmitter building or arrange to lease equivalent space from another party.

Why multistation sites?

What makes a multistation site advantageous? The first answer is a minimizing of your capital investment. Whether building a co-op facility with other broadcasters in your market or leasing from a vertical real-estate developer, your initial investment will be dramatically reduced along with future maintenance costs.

The resistance to new communications towers concurrent with the growing demand for new wireless communications services from consumers makes multistation sites even more attractive. Besides sharing the cost of the site's most expensive components — land and the tower structure — many other amenities can be shared, in use and cost. Examples include access drives, emergency generators, storm water systems, water/waste infrastructure, power to the site and ice protection.

Revisiting an early multistation site

One example of a successful multistation site is the Auburn transmitter, located just southeast of Raleigh, NC. (See "Building an Award-Winning Transmitter Site," March 1993.) This project was a collaborative effort of Capitol Broadcasting Company (WRAL-TV and WRAL-FM) and Durham Life Broadcasting (WPFT-TV and WQDR-FM), after both owners' 2,000-foot towers collapsed during an ice storm on Dec. 10, 1989. With two of the three 32 ADI network affiliates serving eastern North Carolina off the air, both companies scrambled to make temporary arrangements to resume broadcasting.

Once that was accomplished, the companies wanted to get back to full power as soon as possible. By combining their financial resources, both operations aligned to form the Auburn Tower Partnership. Still shaken by the recent collapse of their towers, a 723-ton, 12-foot-face triangular "supertower" was designed, from which both companies would broadcast their TV and FM stations, along with the provision for future additional capacity.

At their new site, one VHF station (WRAL), one UHF station (WPTF) and two FM stations (WRAL-FM and WQDR-FM) are all housed in a single building, with all four stations sharing a common ice bridge. In addition, two-way radio equipment rental spaces were constructed under the ice bridge between the building and the tower. With their combined resources, these two broadcasters were able to construct one of the world's heaviest towers and a revolutionary, low-maintenance building at less cost and in less time than if they had chose to construct separate facilities.

In revisiting the site today, the rental spaces are fully occupied (one tenant is a low-power TV station). The Durham Life Broadcasting stations, WPTF-TV (now WRDC-TV) and WQDR-FM have been sold, and their transmitters remain on site. At the base of the tower, a small telecommunications building has been added for a major cellular and two-way radio tenant. Capitol Broadcasting Company, under an LMA, has added a second UHF station, WRAZ (Channel 50). A new building was added to house WRAZ's transmitter. The new facility runs perpendicular to the existing building, yet 80% of the new station's transmission line runs protected under the existing roof's ice-protection system and ice bridge.

Out of an icy tragedy came the cooperation and entrepreneurial vision of two market competitors. The product of this effort, the Auburn transmitter site, has paid (and will continue to pay) many dividends to the partnership. Regarding the site's potential future, Capitol Broadcasting recently announced that it will soon inaugurate WRAL-HD, which may well be the first station in the country to broadcast high-definition television to its viewers.

An innovative design

With more than eight years of research, including the Auburn Transmitter site, the design firm ARCHITEKTUR of Raleigh, NC, produced and copyrighted an innovative design for transmitter sites. By clustering the transmitter buildings around the base of the tower, this plan accommodates one, two or three broadcast companies' transmitters on one combined ice bridge. (See Figure 1.) Tower capacity allowing, up to three of these triplex facilities can be sited at the base of one tower. This new design is economical and fast to construct, yet takes advantage of the designer's earlier innovations in the use of steel ice protection. (See "Transmission Technolo-

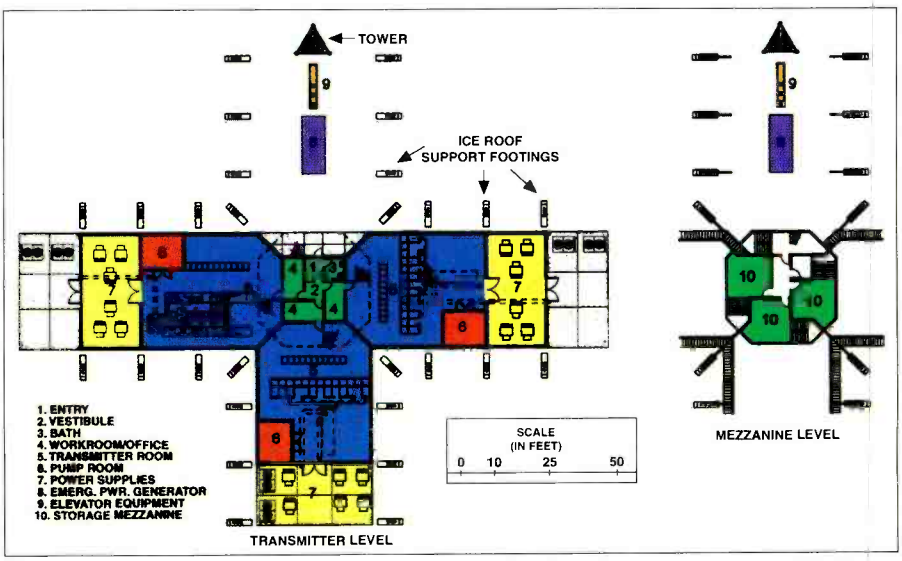

Figure 1. Floor plan of prototypical multistation transmitter building. (Design and drawing © 1994 Thomas G. Crowder, AIA, ARCHITEKTUR.)

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gy," January 1996.)

In this design, the ice bridge is an integral part of the building structure. For the first three to five bays from the tower face, all three broadcasters share the same ice bridge and its associated cost. Much like in a multitenant office building, common areas and utilities, such as toilet facilities (located in a common vestibule on the ground level) and its associated expenses for water and discharge of sewer are all shared by the co-op. To further enhance earning potential, broadcasters and vertical real-estate developers can provide two-way and telecommunications rental equipment spaces in the building, as well as on the tower.

As a way to convenience broadcasters in constructing new single or multistation sites, Kline Towers of Columbia, SC, and ARCHITEKTUR announced at NAB 96 that they have joined forces to help provide broadcasters a turnkey transmitter-site solution. This arrangement can potentially provide sites complete with tower, antennas, transmission lines and transmitter buildings, all with multistation capabilities that provide reduced coordination, time and cost. With the inevitable onslaught of ATV conversion in the near future, this prototypical facility design and site-delivery package can help ease the delays and cost associated with coordinating multiple designers and vendors for construction of their new sites.

The road ahead

In the post simulcast period, many stations may have NTSC transmission facilities (towers and transmitter buildings) to dispose of. With the new telecommunications legislation, FM-radio station groups are potential buyers, especially for VHF sites where shorter transmission lines exist. Cellular, PCS and advanced two-way radio companies also will become attractive tenants or potential buyers.

Most broadcast companies have not been faced with building transmitter sites in the recent past. Many existing sites have been in operation for 30 years or more. As ATV conversion and its associated costs come closer to reality, broadcasters must address the many options at hand. Potential earnings for broadcasters from their present towers and new multistation sites are options that can help ease this transition. New designs can also reduce overall capital investment and future maintenance costs at ATV transmission facilities. As these options are researched, the maximizing of vertical real-estate values will be a required element in broadcasters' absorption of the ATV conversion's financial impact.

Thomas G. Crowder, AIA, NCARB, is the principal in charge of design at ARCHITEKTUR, an architectural, planning and interiors firm in Raleigh, NC, which concentrates on broadcast facilities.

By Steve Epstein, technical editor

New acquisition formats

Tape Wars II.

The Bottom Line:

Nearly across-the-board support from manufacturers for the DV format, combined with Sony's decision to build VHS decks, had consumers and professionals hoping that tape format wars were over for good. Once again, however, Sony and Panasonic (Matsushita) have come out with similar, but incompatible, formats. Unfortunately, it appears that the tape format wars are back. Buyers are forced to choose between competing formats. They are also faced with the likelihood of having to buy machines in each format so they can play back out-of-house tapes. $

Many of us remember the battle between the giants: Sony with Betamax, and Panasonic and JVC with VHS. Channels for tape rental and purchase in the early '70s were just being developed. VCRs cost "bleeding-edge" consumers $600-$1,200 each. Few consumers at the time had the money to buy more than one. On the shelves of the video retailer, the consumer found two choices — VHS and Betamax; each had its strengths. Betamax had better technical specifications, but VHS offered longer playing times and more features. In the end, VHS won in the U.S. market. The Betamax machines were shipped south of the border and sold dirt cheap in the Mexican and South American markets.

Having lost the battle for consumers, Sony turned toward professional video where Betacam(SP) has found almost universal acceptance. Panasonic's M and M-II formats found success difficult on the professional battlefield. The M format never really made it off the ground, although M-II continues its struggle as small pockets of resistance in an ever-widening Betacam world.

Sony said it would never manufacture VHS decks, but about five years ago, the company changed its mind, based on VHS's popularity and the size of the consumer markets. For the last three years, work has been under way on the DV format. At present, more than 50 manufacturers are involved, and the first DV models are finding their way to consumers. It is possible that consumers looking to buy digital video equipment may not have to choose between competing formats, but professionals will not be so lucky. Here is a look at what's available for field acquisition in today's professional video markets.

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(* Pre-read is only available on the BR-D85)

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The Panasonic AJ-D700 camcorder is one of several units available that allows DVCPRO recording in the field.

DV and its variants

In professional video circles, tape format skirmishes are about as routine as NAB. Every year there is another NAB, and it seems that every year someone announces a new tape format. This year was no exception.

Starting with DV, the consumer digital video format, numerous manufacturers offered products based on the latest round of DV specifications. Models shown ranged from inexpensive consumer units to professional versions.

For those unfamiliar with DV, it offers digital recording on 6.35mm (1/4-inch) metal evaporated tape. Cassette shells come in three sizes — a small cassette (up to 60 minutes), a medium shell, not currently supported in consumer DV and a large shell that allows up to 270 minutes of recording time. The video signal is recorded in a 4:1:1 scheme that provides a 5.75MHz bandwidth for luminance. Intraframe DCT compression is used to reduce the 4:1:1 data to 20% of its original size. The compressed digital data is then recorded on tape using a 10μm track pitch. Two 16-bit/48kHz or four 12-bit/32kHz channels are available for recording digital audio. For professionals, camcorders and dockable decks are available.

DV in its original form offers at least one interesting feature. The smallest cassette is the size of a matchbox. JVC's MiniDV camcorder is small enough to fit in a shirt pocket. A camcorder this size capable of producing high-quality digital images could revolutionize news gathering. Because this small camcorder is the first of its kind, it is likely that in the next year or two even smaller and lighter units will be available. This will make field acquisition easier, and in some situations, possible under a variety of conditions.

A variation on DV, DVCPRO was introduced last year by Panasonic. This year, camcorders and studio editors were available for purchase from several vendors. Panasonic has been given the SMPTE D-7 designation to begin DVCPRO standardization around the medium and large cassette shells and 6.35mm metal particle tape. DVCPRO uses an 18μm track pitch, which reduces playing time to 123 minutes for the large shell and 63 minutes for the medium shell.

At NAB, a lower-cost recorder/player and 4x fast transfer unit were shown. For acquisition, camcorders are available from several manufacturers. Coming soon from Panasonic is a laptop editor that allows for simple cuts-only editing in the field. (For more information, see "Special Report: DVCPRO," May 1996.) DVCPRO decks can play back (depending on model) DV and DVCAM tapes.

Another variation of the DV format is DVCAM from Sony, introduced at NAB 96. DVCAM makes use of a 15μm track pitch, which allows 180 minutes of record time on the large cassettes and 40 minutes on the small cassettes. DVCAM uses metal evaporated tapes, which can be played back in some Sony DV consumer decks. Unique to Sony's tapes is a memory chip that stores time-code numbers for later edit sessions. High-speed upload/download at 4x play speed is also offered on some DVCAM models. Camcorders and dockable units will be available later this year. At present, Sony decks will not play back DVCPRO tapes, and there have been no announcements concerning future compatibility. DVCAM, although it has applications in broadcast and news gathering, is not Sony's primary format for the task. For professional news-gathering applications, Sony developed BetacamSX.

IEEE 1394 "FireWire" interfaces are among the features included in many of the units that subscribe to DV or its variations. Although few are available, the major manufacturers have expressed their intention to include the interfaces in future products. FireWire interface cards for computers will also be available in the near future.

The Sony DNV-5 is a dockable recorder that can be used to make BetacamSX or Standard Betacam (SP) recordings.

Is digital necessary?

All the hoopla over the DV format and its variants, combined with the computer industry's new-found fondness for digital video, have made it easy to miss improvements in current analog formats. S-VHS continues to thrive, and it's no surprise when you consider that some professional three-chip cameras are selling for less than $5,000. Analog equipment is firmly entrenched in facilities nationwide. It will be several years before many of these facilities move to digital. Improvements in circuit design and signal processing have benefited not only digital, but analog devices, as well.

Several new models of S-VHS equipment were introduced at NAB, adding considerable flexibility to the format. JVC pioneered the VHS in the '70s and since then has brought several major improvements to the format. The first major improvement was S-VHS in the mid-'80s. S-VHS increased the luminance bandwidth to 5MHz, and with the help of external Y/C (S-video) connections, managed to avoid many of the problems associated with composite video.

Several years ago, another improvement was the addition of control track time code. Control track time code allows tapes to be recorded in existing recorders and post striped if necessary — without tying up an audio track. Finally, JVC took the format digital with the introduction of Digital-S.

Digital-S decks are backward compatible with S-VHS. Facilities that have tape libraries of S-VHS tapes can move to Digital-S when appropriate, without having to maintain older S-VHS equipment indefinitely. Be aware that

The MiniDV camcorder from JVC is small enough to fit in a shirt pocket and can be used for digital recordings in a variety of locations.

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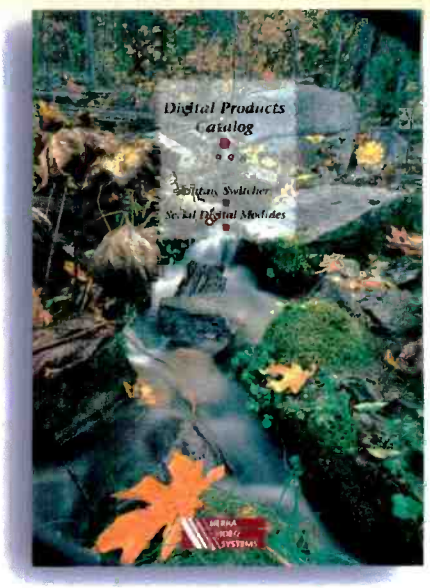

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current versions of Digital-S cannot playback standard VHS recordings. If your library includes VHS, you will have to maintain a machine for that format or bump the VHS recordings to another format. Digital-S uses 1/2-inch metal particle tape to make 4:2:2 component recordings. DCT-based intraframe compression at a compression ratio of 3.3:1 is used to provide a data rate of 50Mb/s and a recording time of 104 minutes on a VHS-sized cassette. Two 16-bit/48kHz individually editable audio channels are available on current equipment, with two more available within the format. Dockable recorders are available for field acquisition.

The Avid/Ikegami CamCutter is one of only a few units offering digital disk recording in the field.

Additional offerings

Another "new" format is BetacamSX from Sony. Dockable recorders and camcorders are available. BetacamSX is somewhat compatible with BetacamSP in that both formats use the same cassette shells and tape formulations. BetacamSX models can play back BetacamSP recordings, but the SX format is a digital format that records compressed video at 18Mb/s conforming to the MPEG-2 4:2:2 profile at main level. Sony feels that the recording and compression scheme used in BetaSX fits neatly into future broadcast transmission schemes. An SX high-speed feeder unit allows SX recordings to be uploaded at 4x play speed.

Along the lines of digital recording on a Betacam-compatible format, Sony also introduced a field recorder for Digital Betacam, the DVW-250. Panasonic added a new camcorder with full playback to its D-3 product line and Avid/Ikegami showed its new and improved versions of the CamCutter, still the only disk-based camera/recorder designed for field use.

With all this variety, how do you make an equipment choice? Numerous factors are involved, including budget, overall quality level, current equipment complement and features. Today, few U.S. facilities have the luxury of starting from scratch, and most have the problem of dealing with archive footage stored on a variety of formats.

Analog formats, like Betacam and S-VHS, offer the capability to move to digital without having to support additional machines solely for the purpose of archival retrieval. In the digital realm, only D-5 offers backward compatibility to an earlier format (D-3). Playing back older footage, although it is important, in most cases will not be a primary factor. Unless your existing decks are ready for the dumpster, they should provide some level of service for several years, during which time the demand for playback will diminish. Additionally, facilities exist that maintain machines in most formats. Tapes can be sent out of house and dubbed to whatever format is necessary.

Primary factors for choosing a new format must be based on your current and future needs rather than historical reasons. What direction do you intend to go in the next five to 10 years, and how will the new format fit into that? How will the acquisition format fit into plans for studio equipment? Several formats are excellent for acquisition, but mediocre for studio work. Others are the opposite, great for the studio, but useless in the field. Do you want to support two separate formats or are you willing to compromise on a single format that performs adequately for field and studio use?

Although this article covers acquisition, once acquired, footage must be edited into a final product. Look carefully at how you intend to do your editing. Converting signals causes degradation. Some conversions can be relatively clean, while others are not. The goal is to choose the format that offers the best quality cost-effectively at the end of the process. Whatever you do, choose carefully — you may have to live with your decision for many years. ■

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By John D. Weigand

Networking your newsroom, part 1

Networked computers in newsroom environments can make it easier to handle routine newsdays, as well as those days that are not routine.

The Bottom Line:

As computer equipment provides increased horsepower for less, computers are finding their way into a variety of settings. With more computers on desktops, networking is a logical step. However, making the interconnection is only the beginning. Hardware and software must be carefully integrated to provide a complete, workable solution that includes the tools needed to get the job done quickly, efficiently and cost-effectively. $

Newsroom automation and network systems are in a major transition. Technically, moving video can exist in a newsroom reporter's workstation. However, network servers will need to be bigger and faster to accommodate the new wave of technology here and on the horizon. To handle moving-video workstations, the typical newsroom of the future will need the equivalent of Pentium Pro series systems. The newsroom network system itself is likely to become a switched system rather than the traditional shared system. Quickly being outclassed is the 486-based server networked to terminals and 286- or 386-based workstations through a 10Base2 thinnet LAN.

Newer systems may include a video server, a newsroom server and an archive server connecting workstations through a network switch. The addition of video adds the requirement for high-bandwidth steady-stream data. Adding video will overload traditional network systems, requiring the purchase and installation of computer networks sufficient to accommodate increasing needs. To get it to the workstations, the video must be stored on a medium accessible by the server — on hard disk or on digital tape (for archive).

Video may be brought to the workstation through various means. Network speed may be increased by going to a 100Base system, an ATM system or the video can go through the IEEE 1394 serial bus, commonly known as "FireWire." As

Above photo: CNN Headline News recently installed an Avid networked newsroom system at its headquarters in Atlanta. (Photo courtesy of Avid.)

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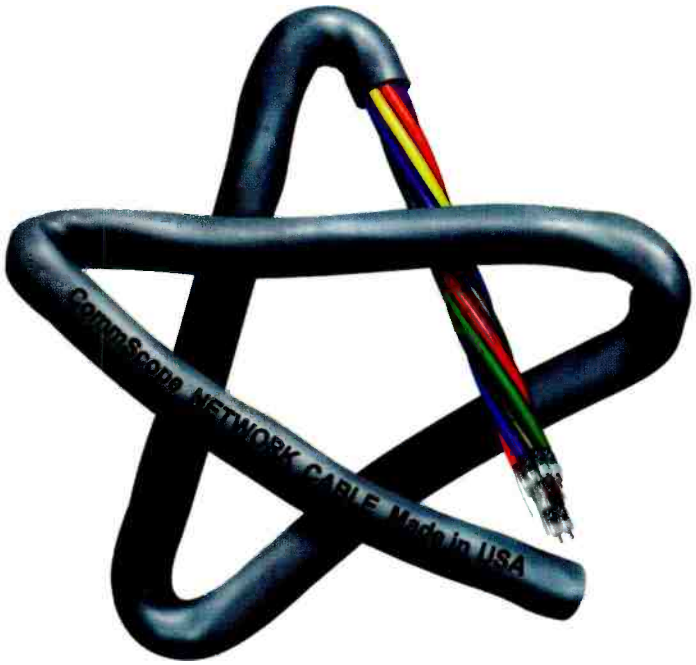

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an alternative, low-resolution video samples may be sent to the workstation where an edit decision list can be made and sent back to the server for editing and assembling of the news story. Low-resolution images can be sent over a 10BaseT network, the Ethernet standard, which costs less than the high-speed networks.

Basic networking

To fully comprehend the concept of networking you need to understand some of the basics. A variety of network formats include 10Base systems, 100Base systems, FireWire (IEEE 1394) and ATM. Data communication protocols are defined by the Open System Interconnection (OSI) reference model, which is used by ANSI and IEEE. (For more information on the OSI model see the "Troubleshooting" column, April 1994.)

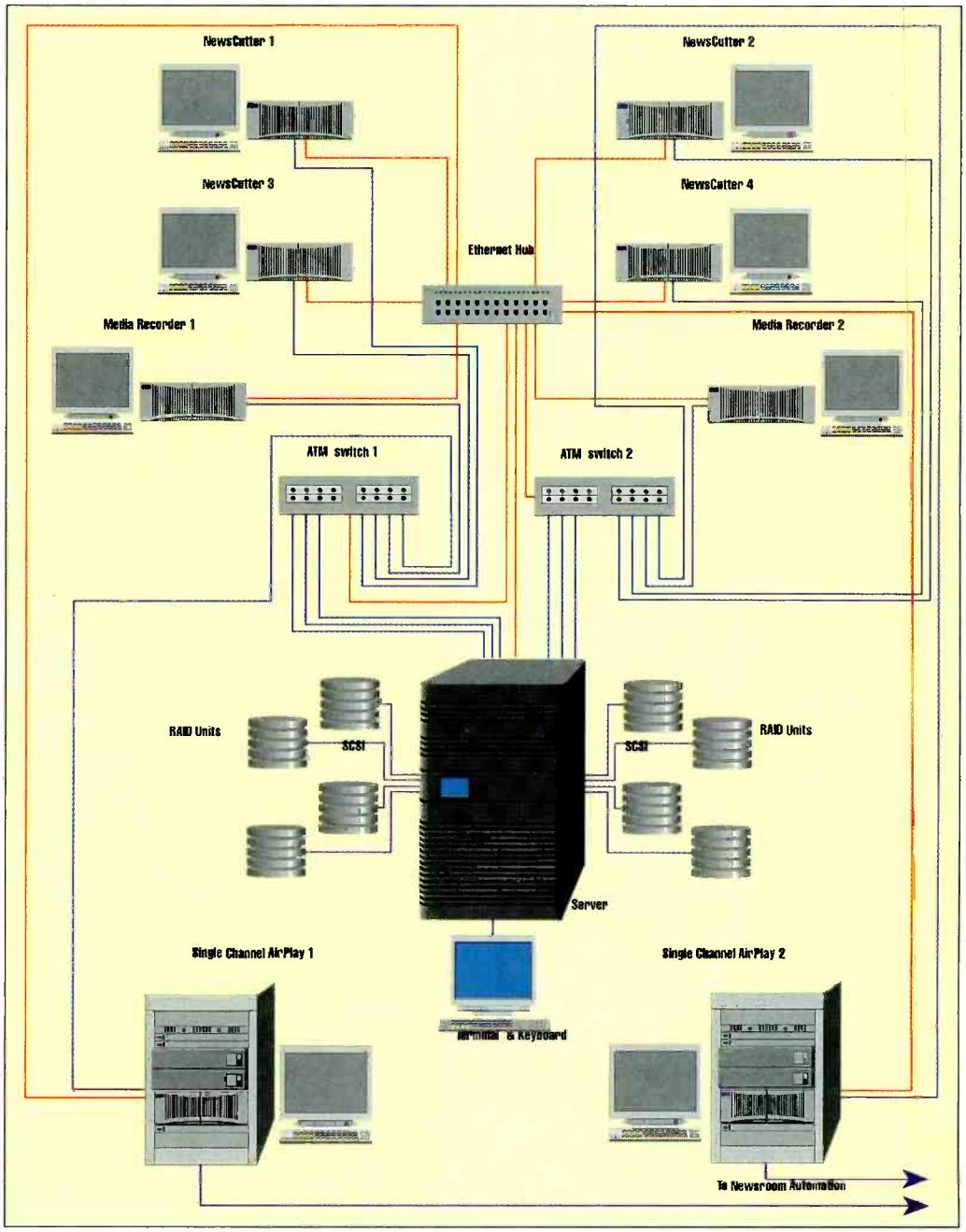
The 10Base5 system is also called "thicknet." This system was part of the original Ethernet IEEE 802.3 standard. The 10Base5 system uses RG-8 or RG-11 and can have up to 100 workstations (nodes) per segment. The 10Base5 system is connected to workstations through a network interface card (NIC). A DB-15 connector attaches an attachment unit interface (AUI) to a media attachment unit (MAU). This network can reach 2,500 meters and can consist of four repeaters and five segments, each 500 meters long. This is commonly known as the 4/5 rule (four repeaters, five segments).

10Base2 is known as the "thinnet" system. This system uses RG-58, which is less expensive, thinner and more manageable than coax for 10Base5 systems. The AUI and MAU are built into the thinnet NIC. Only 30 workstations can be connected per segment. Maximum segment length is 185 meters with expansion to four repeaters/five segments.

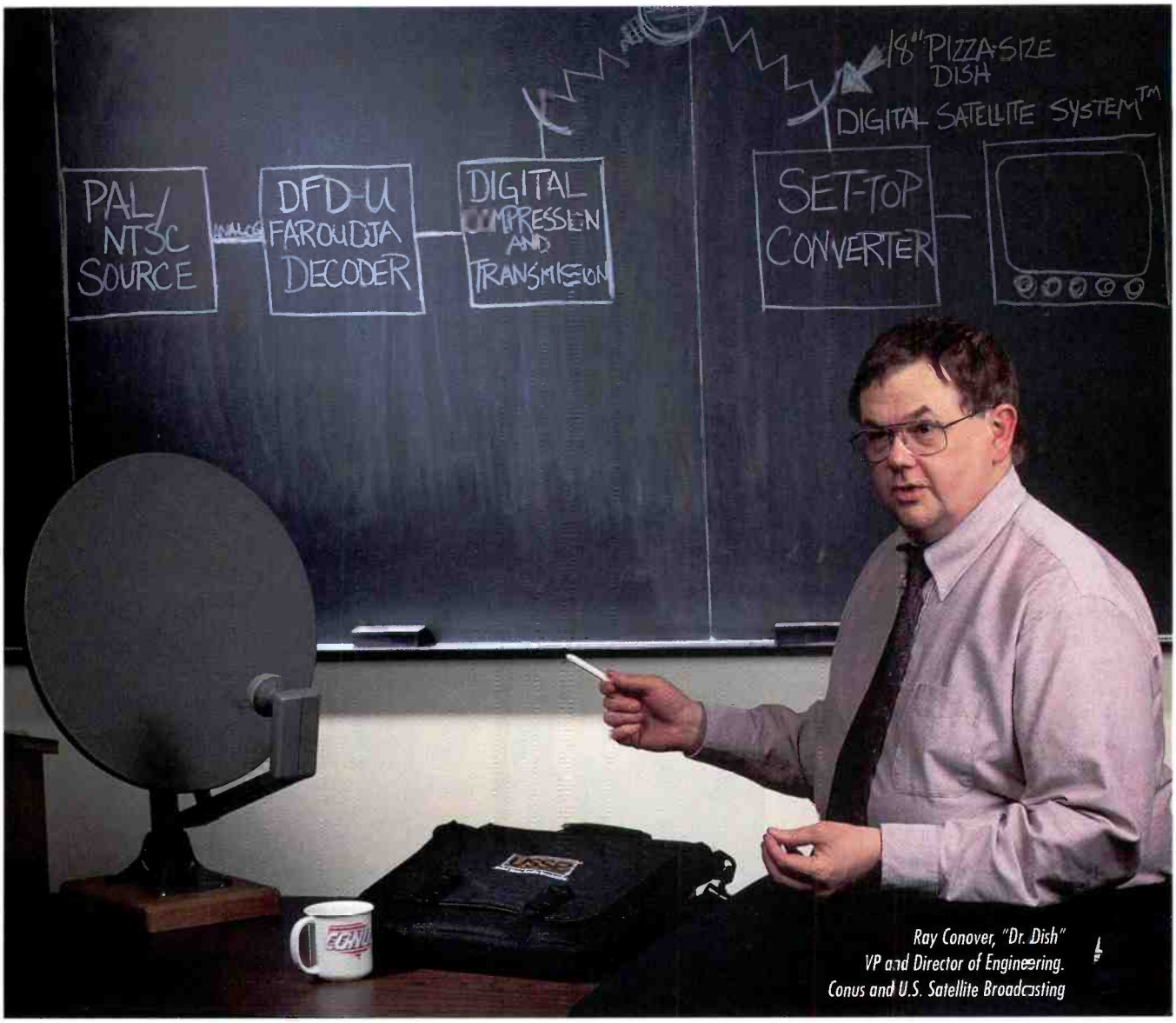
10BaseT systems use two pairs of unshielded twisted pair (UTP), one pair for transmit and the other for receive, along with an 8-pin RJ-45 modular plug at each end of the cable. Manchester encoding with predistortion provides reliable transmission. Link integrity is maintained by a heartbeat pulse every 16 milliseconds. Typically, there is an LED at the hub and NIC ends assisting system troubleshooting. Maximum segment length is 100 meters and the 4/5 rule applies.

The 10BaseF system is fiber Ethernet based on Fiber Optical InterRepeater Link (FOIRL), using duplex. There are four different fiber specifications. These are 10BaseFP, 10BaseF, FIORL and 10BaseFL. 10BaseFP specifies passive star configuration. 10BaseF is used for backbones or repeaters, and the MAU is integrated into the repeater as it is in the 10BaseFP. The 10BaseF does not allow nodes and is strictly a backbone or repeater system. FIORL allows for Ethernet nodes. 10BaseFL is based on the FIORL standard and is backward compatible; it is only used to link repeaters and requires MAU receivers.

In March of 1995, 100Mb/s standards were established for high-speed networks. The standard was established by IEEE and is known as IEEE standard 802.3u. There are three 100Mb/s standards — 100BaseTX, 100BaseFX and 100BaseT4. 100BaseTX uses two pairs of category five UTP wires or two pairs of type 1 shielded twisted pair (STP) wires. One pair of either type of these wires transmits data while the other pair receives data. The maximum



Newsroom servers can be connected in a variety of configurations. Shown here is a switched ATM network combined with a standard Ethernet network. Media is moved over the high-bandwidth ATM network, while control and housekeeping are handled by the Ethernet connections.



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segment length is 100 meters. 100BaseFX is fast Ethernet used in fiber-optic cabling, suitable for high-speed backbones and extended distances. Maximum segment length is 10,000 meters with single-mode fiber and 2,000 meters with multiload fiber. 100-T4 is fast Ethernet for UTP voice-grade wiring. The maximum length is 100 meters.

FireWire, the IEEE 1394 high-performance serial bus, has a speed of 200Mb/s, and is expected to go to 400Mb/s by 1997. Asynchronous transfer mode (ATM) incorporates the features of telephone switching networks and packet-based data networks. This system uses fixed-length 53-byte cell switching to transmit data, voice and video. It provides dedicated bandwidth necessary for video transmission. FireWire uses a thin serial cable with Nintendo-game-type connectors, while 100BaseTX and 100BaseT4 use RJ-45 8-pin connectors. 100BaseFX (fiber) uses ST connectors.

The cables and connectors used are important because choosing the incorrect cable/connector may cause you to spend more money than needed when upgrading your newsroom computer network system in the future. If your existing newsroom network system is wired with category five wiring, for example, you may be able to save the expense of replacing existing wiring.

With all of the above in mind, it is now time to build your newsroom computer network system. The question is, "Where do you begin?" The-answer is, "At the beginning."

System planning and design

The first part of developing a newsroom computer system is to determine what the system needs to do. For the most part, the list would include such items as story editing, copy timing, wire services, rundowns, assignments, E-mail, database archive search and automation interfaces to studio equipment. The news department must determine what must be accomplished at the journalists' workstations. Do they want to simply write scripts and perform video editing or do they want to complete a ready-to-air product? The journalist of the future will more than likely want to sit at some sort of divided screen that will enable writing and timing of copy to go along with the video images.

Ethernet sends data in bursts and was not designed to handle the high bandwidths and constant rate streams required by video. Low-resolution images can be sent over 10Base systems and be seen at the workstation, but not ready-to-air video. Switched and fast Ethernet can usually handle video for broadcast and allow it to be seen at the journalist's workstation.

ATM's switchable broadband protocol will likely be capable of handling the job of the future. ATM standards have not been set; therefore, interoperability is a problem. ATM hardware, up until now, has been too expensive for networking. However, prices seem to be coming down quickly and ATM 25Mb/s interface cards can be purchased for about $99 each.

ATM has two de facto standards: 25Mb/s and 155Mb/s. Higher speeds are promised for the future. The higher the speed, the better the video. ATM promises smooth-moving images combined with understandable dialogue at networked workstations which, if delivered as promised, will eliminate many of the problems now associated with newsroom workstations that offer moving video that may appear jerky and stilted, and audio that is somewhat disjointed and unintelligible. ATM proponents claim to be better positioned than Ethernet because the much higher data rates can deliver voice and video more effectively.

Video is a time-critical application (in computer networking terms) and typically requires large bandwidths and a constant datastream. Because of this, a switched system is used. This ensures that the video from the server to the workstation is continuous. If the video is on a shared network, then network overloading could render the system useless. Continuous, constant-rate datastreams are difficult, if not impossible, to guarantee on shared networks.

If you're installing a computer networking system now that doesn't have video, you should carefully consider purchasing network interface cards that are 10/100Mb/s 32-bit cards. These cards will work with video and most likely can be reused for future upgrades. Make sure the NICs have RJ-45 connectors and BNC connectors offering you added flexibility in future expansion. This way you can disconnect coax and move to category five wiring if needed. Buy the most advanced computer station that you can afford or make sure you can upgrade the computers you are buying. In other words, think about how you can upgrade the system that you are installing today.

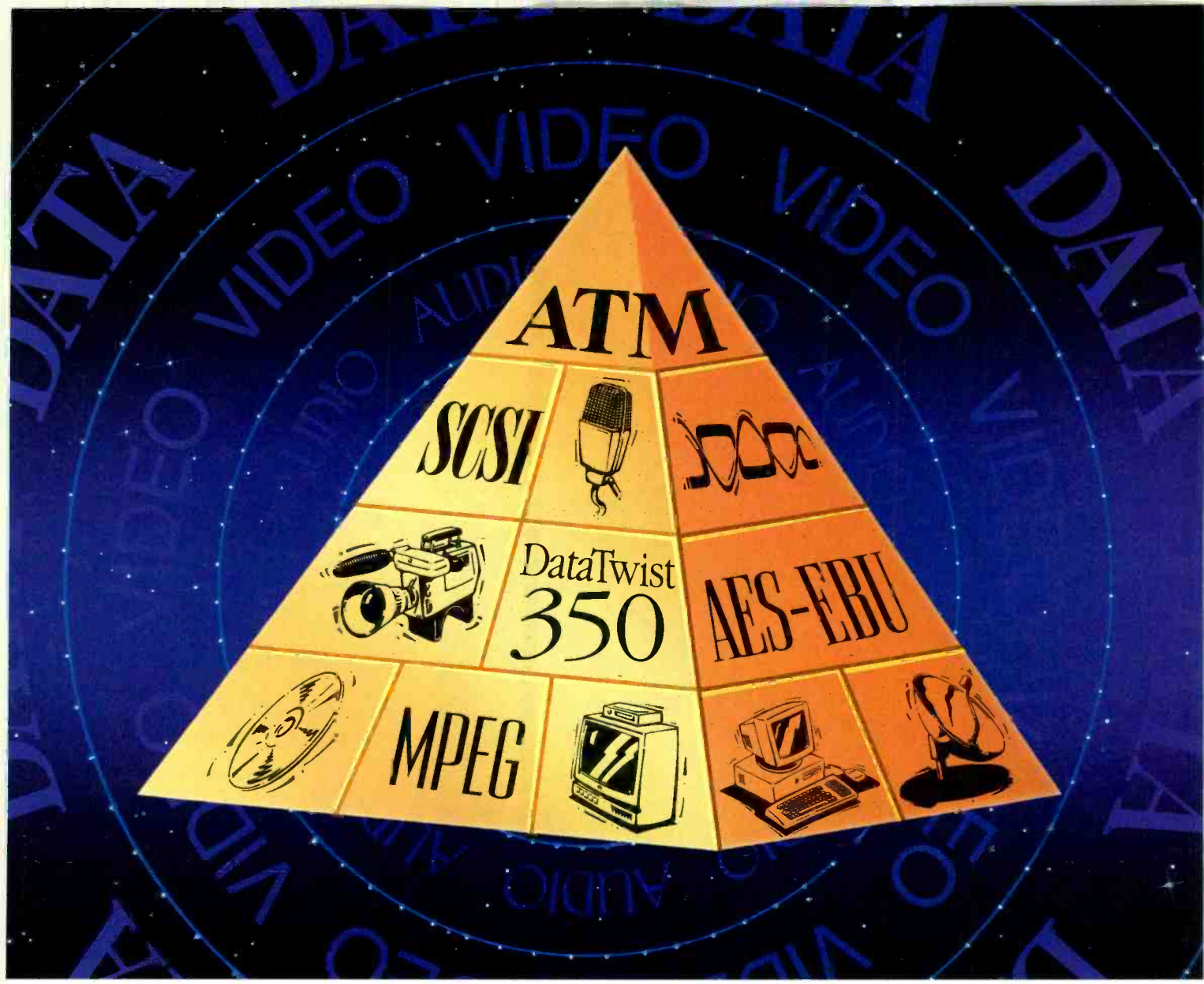
In any event, it is a good idea to plan into your budgets replacement or upgrading of personal computers in your system every one to two years. What is fast today will be slow and obsolete tomorrow. The convenience you receive will outweigh the costs. At today's prices, the most it can cost you is $3,000 to $4,000 a station, and that is relatively cheap in comparison to what you purchased for the same dollar value yesterday.

Powerful client editing and playback workstations are possible with today's networked systems. (Photo courtesy of Avid.)

If you are starting from the floor up, build a computer floor. Install all the cabling you will need now and in the foreseeable future. Plan for growth options. Each broadcast facility should look at its facility in relation to what is cost-effective, what serves news production and what is revenue-producing. Plan an adequately sized room for all the equipment that you will need. If you end up shoving servers underneath counter tops, rather than planning for proper positioning, over time and expansion you are liable to end up with a disaster.

Wiring and future upgradeability

Technology will be moving faster. Sony and Oracle have collaborated, and the workstation recommended by Sony/Oracle includes four PCI slots for ATM. Therefore, if you are putting in a Sony/Oracle system,



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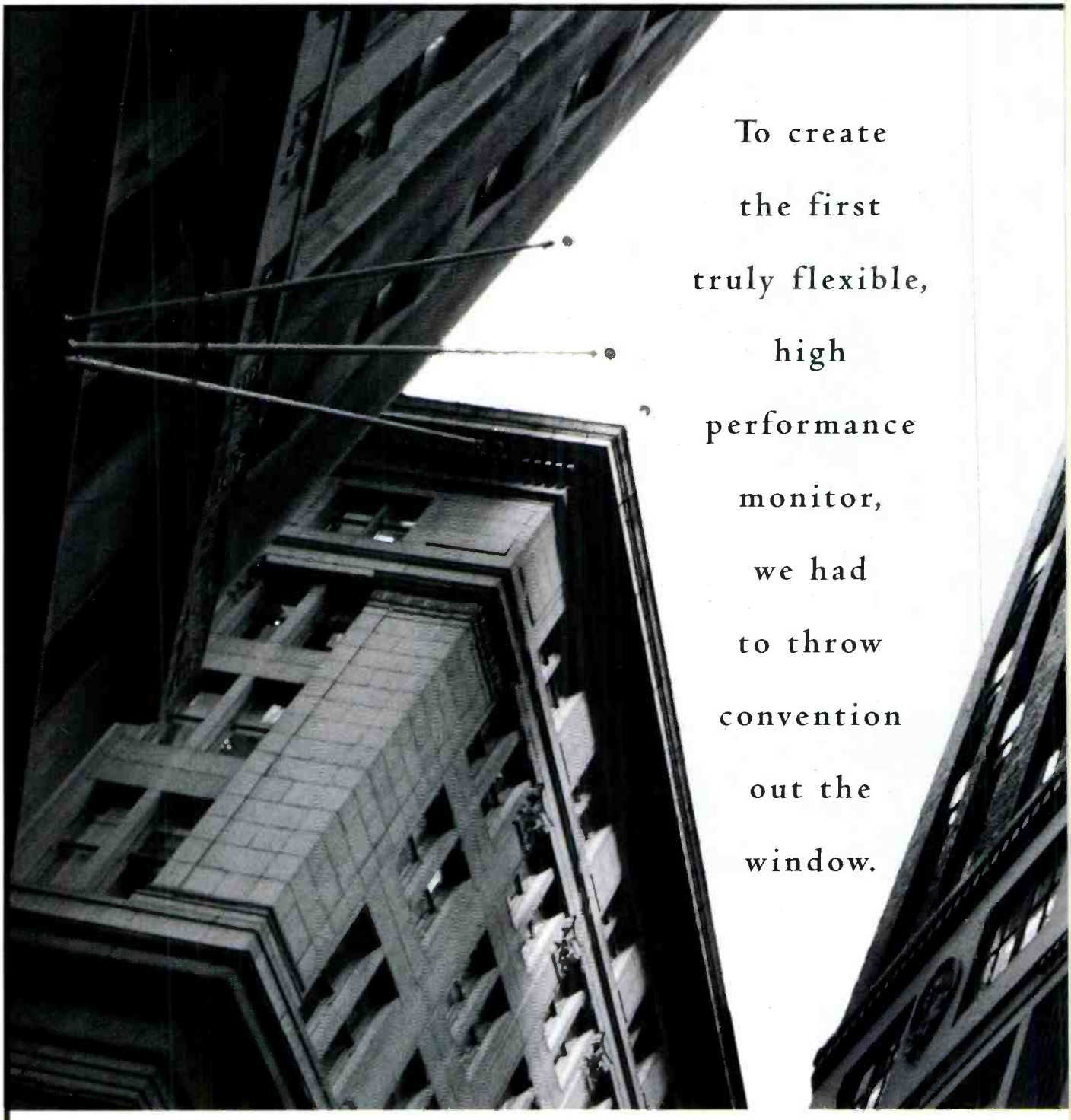

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composite to component. The new and improved CRT delivers performance that's even superior to our own previous high resolution monitors. New standard features include: auto white balance compatibility using industry standard color analyzers, VITC reader, safe area display, closed caption, an internal test pattern generator and on-screen EDH for the display of digital signal error codes. New options include an IC memory card which can store and transfer monitor set-up and configuration information. Call 1-800-472-SONY, ext. BVM for information on the new standard in monitor technology, and get ready to throw convention out the window.

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plan accordingly.

For now, your best choice is to install category five wire. Specify a system that uses category five so you can easily move to ATM or other advanced systems of the future. As always, some want to be different; in this arena, it is FireWire. It uses a different standard with different connectors and a different kind of cable. Sony's DV-CAM uses a modified version of FireWire and the Sony half of the Sony/Oracle newsroom network system is using FireWire while Oracle is using traditional category five wire and connectors.

Taken at face value, it would appear there is a contradiction between what will be the wire of the future. However, upon closer examination exactly the opposite may be true. There is some indication and argument that ATM and FireWire may be able to work in combination. It is argued that from the server you can connect to an ATM switch, have a long segment of ATM to another switch, go to an ATM/FireWire bridge, and then go to such devices as PCs and video servers. It is believed the packet structure of ATM and FireWire is similar enough to allow bridging. This may be why Sony and Oracle are working in concert using ATM (over category five cabling) and FireWire.

When budgeting for your newsroom network system, no matter what you do, you need to plan on upgrading.

When budgeting for your newsroom network system, no matter what you do, you need to plan on upgrading. Your PCs will more than likely need replacement every 18 to 24 months. You need to buy the biggest Pentium PC or equivalent and the most RAM you can afford. Make sure there is plenty of expansion capability to handle future upgrades. Overbuild, rather than underbuild, your computer floor. Provide too much space for expansion of servers rather than not enough, and maybe, just maybe, you will have exactly the right amount of space.

With the majority of the technical bases covered, next month we will take a closer look at some of the current products available for networking newsrooms. ■

John D. Weigand is director of engineering for Tribune Station KTTY, San Diego, and owner/operator of BEC consulting services, JDW Enterprises, serving the United States and China.

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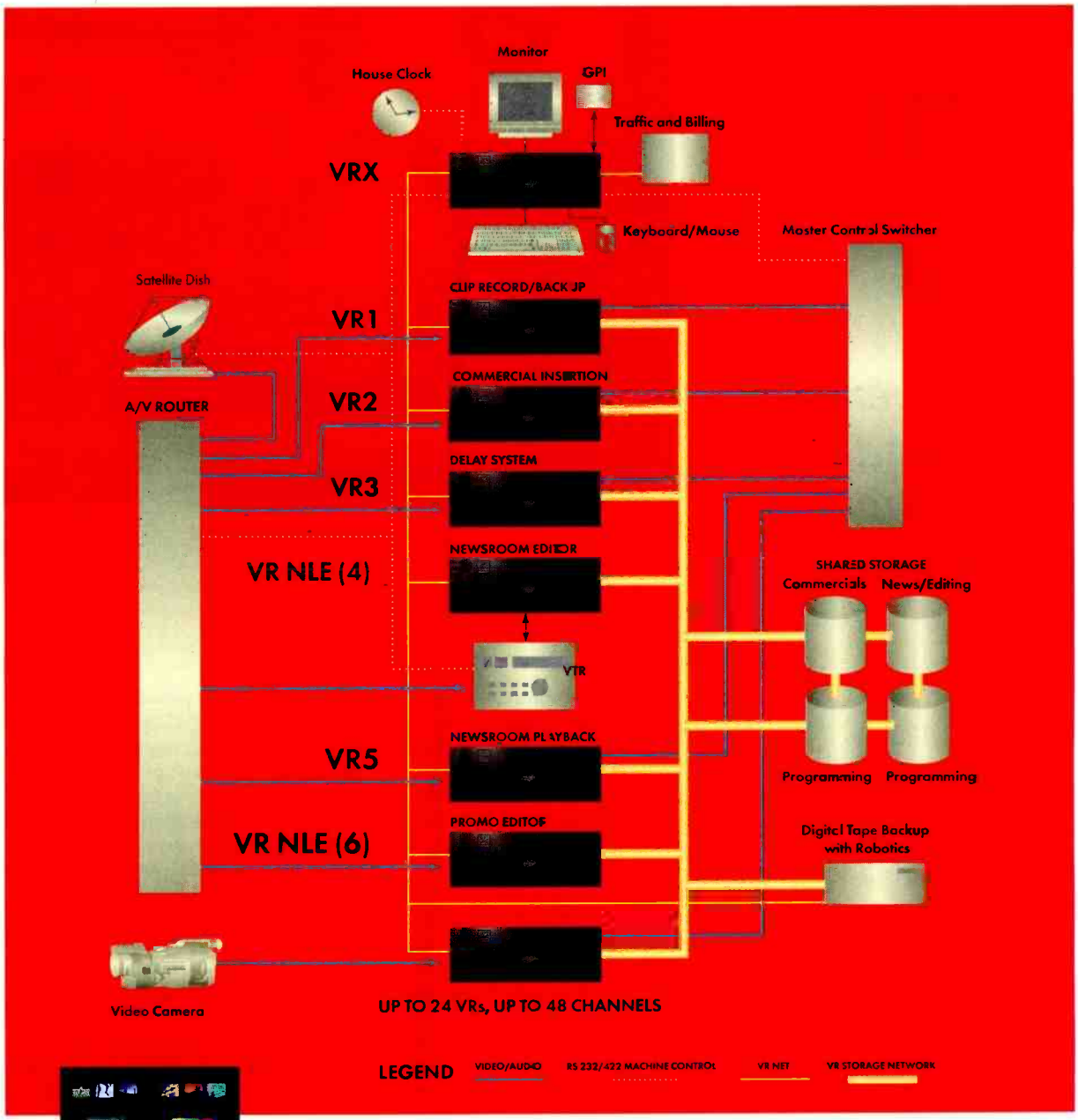

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By Charles Waltner

Dollars from data

Data delivery offers broadcasters new revenue opportunities.

The Bottom Line:

Advances in data delivery technology offer broadcasters new revenue possibilities. But ancillary data services are laden with technological and marketing questions. Recognizing the dangers of wandering too far from their expertise, broadcasters' best option is in using data services to augment their current video delivery and gaining revenue through value-added advertising and content. $

The digital revolution is inspiring cable operators to get into telephony and telephone companies to get into cable television. Cellular services are becoming Internet providers and computer companies are even becoming involved in entertainment content. But when it comes to providing data services, many broadcasters might be best off staying right where they are.

As broadcasters watch competition from direct mail, the Internet, satellite and cable television erode their advertising revenue, they are hoping for new avenues to profits. One of the most bandied about has been data broadcasting. Data broadcasting uses auxiliary elements of a TV signal to provide real-time delivery of stock quotes, news, sports, weather and advertising messages. Some data broadcasting technology has been available for a decade or more and now, with the ascent of computers, exciting new applications, such as auxiliary channels on HDTV, are cropping up.

But many questions about these technologies remain. The fortitude of many are yet unproved, while marketing issues pose daunting challenges. Many data services are already provided by numerous sources, such as via pagers, satellite and terrestrial telecom lines. Most significantly, it isn't clear how much money broadcasters could make from becoming involved in such services. "If I could find some data services in my DMA that would be in demand, I would do it," said Jack Clifford, president of the Providence Journal Broadcasting Corporation. Clifford noted that he has yet to find any that appeared lucrative.

But broadcasters can't afford to turn their backs on this technology. It promises a means to transition from traditional television to interactive, digital television. Some data broadcasting technologies are now being developed that will allow TV stations to transmit Internet web pages with video to personal computers.

Data broadcasting pros and cons

Regardless of what technologies broadcasters use to deliver data, much of the issues are the same. These emerging technologies are promising, but it seems on every front there are equally promising technologies from other telecommunications sectors. Paging, cellular, satellite, terrestrial Internet links, FM radio subcarriers and even cable television are all alternatives to delivering data via broadcast TV signals. But data delivery via broadcast signals does have some advantages. It doesn't tie up phone lines, such as the case with terrestrial Internet access, and it can also provide information in real-time. Pager systems, for example, cannot match data broadcasting in this regard. Pager data typically has a minute or two delay. And for such professionals as currency traders or stock managers, a two-minute delay of time-sensitive data is too long. This has helped make data broad-

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Steve Davis '96

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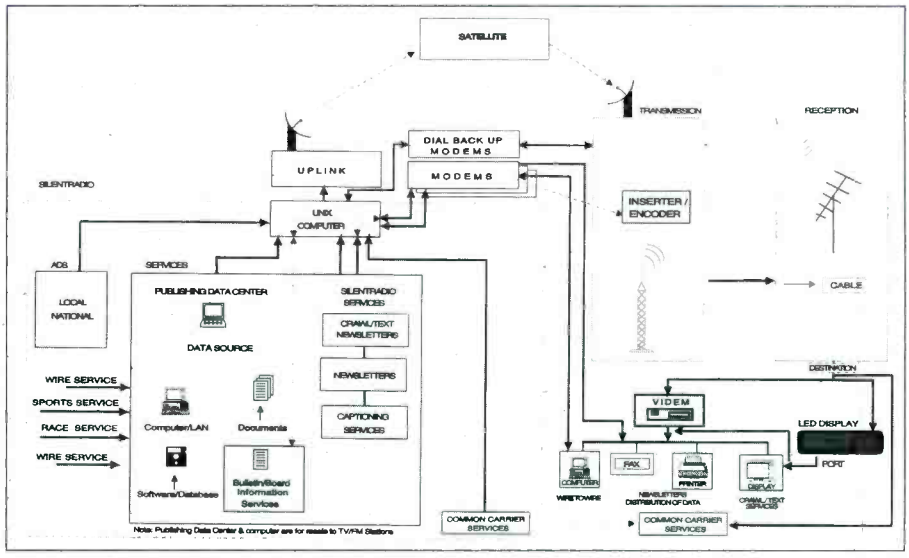
Data broadcasting, however, is held back by its limitations of only working one way. It can deliver data, but the cornerstone of the information age — interactivity — is not available through these systems.

Unlike the Internet, users of data broadcasting services cannot respond directly to the information that they receive. But some analysts, such as Walter Miao of International Data Corporation, said that broadcasters can find ways around this impasse by partnering with phone companies or other telecom operations that can run signals back out of the home or workplace.

The current technology for data broadcasting places data in the vertical blanking interval (VBI) in a TV picture. Decoders receive the signal and strip the video portion out to deliver just data. It has proven dependable for stationary receivers equipped with powerful antennas. But as Marc Batten, director of technology development at VBI Data Broadcasting, pointed out, the reception of the TV signal must be top-notch for the over-the-air data delivery to work. Because the VBI only occupies fewer than 10 lines out of the more than 500 lines in a broadcast signal, any static, ghosting or other flaws in a TV picture would likely compromise the integrity of the data carried in the VBI. And this limitation makes data broadcasting wholly ineffective as a delivery vehicle for mobile receivers.

Top: A Reebok enclosure using a Silent Radio Display. Bottom: Hibernia Savings Bank enclosure also using the Silent Radio display.

For these reasons, many data broadcasting companies have turned to cable companies for stationary delivery and to satellites and FM subcarrier technology for mobile delivery of data services. All these limitations chip away at the potential for TV stations to make money providing data delivery. Nevertheless, revenue opportunities are available from data broadcasting.



A diagram of Silent Radio's proprietary data network system that is used for information delivery. The network consists of more than 40 TV stations that use spare capacity on existing TV broadcast and cable systems to deliver real-time data.

Current VBI operators are bullish on the market and are scrambling to find new ways to apply the technology. "Data broadcasting as an industry is just getting started," said Ken Swenson, the CFO of WavePhore, which is one of two companies developing a second generation of data broadcasting technology. George Robinson, a partner in Towey & Associates, estimates the industry is growing at 20% or faster.

Silent Radio, a company that has been delivering data via VBI for 12 years, is regularly adding new clients and services. It just announced a new spin on data broadcasting: a service that will allow text messages to be broadcast to consumers via the four closed-captioning text channels available to TV stations. The bulk of Silent Radio's revenues come from providing news, sports and weather updates to LED message boards at airports and retail locations. The company estimates its data is viewed by 10 million individuals.

Like many VBI companies, Silent Radio leases the VBI segment from local broadcasters. Neil Kohrn, CEO of Silent Radio, said the leases vary depending on the location and the importance of the market the station delivers. A station delivering three million people in Los Angeles would be more valuable than a station delivering 200,000 consumers in Nashville, TN. The monthly fee Silent Radio pays broadcasters for access to their VBI ranges from $500 to $5,000.

Intercast casts hope for interactive TV

The technology and market for data and electronic information services is moving so rapidly that it is difficult to predict the revenue potential of data broadcasting two years from now. A case in point is Intercast technology. The Intel Corporation, with a host of content, cable industry and other partners, hopes it has found the missing link between conventional television and the fully digital interactive television that has so painfully flopped in such tests as Time Warner's Full-Service Network in Orlando, FL. "It's really moving data broadcasting to the consumer market," said WavePhore's Swenson.

Intel, which created the technology, heads a broad consortium for Intercast. Content partners include NBC, Viacom, Turner, QVC and WGBH-TV. Most PC computer makers are involved, including Gateway 2000 and Packard-Bell. Intel is also teaming up with many cable operators, such as Time Warner and TCI, to deliver the technology.

Intercast allows broadcasters to insert information into the VBI signal, which is coded in HTML, the programming language of the World Wide Web. If NBC's Tom Brokaw is doing a report on Bosnia, for example, the network could also broadcast a host of web-like pages with detailed multimedia information on, say, the history and culture of the region. The video portion of the signal would help frame the additional information and put it into context. Proponents of Intercast view it as a broadcaster's best bet to tapping into the momentum of the Internet.

Intercast is launching this month in the top 20 TV markets. Mariah Scott, director of the Intercast Group at Intel Corporation, emphasized that the technology would be a slow roll-out as it ironed out details with cable companies and broadcasters to carry the data on their VBIs.

Scott viewed Intercast as a value-added service for broadcasters. Theoretically, it would allow consumers to watch television on their computers with multimedia capability. This content addition could well jus-

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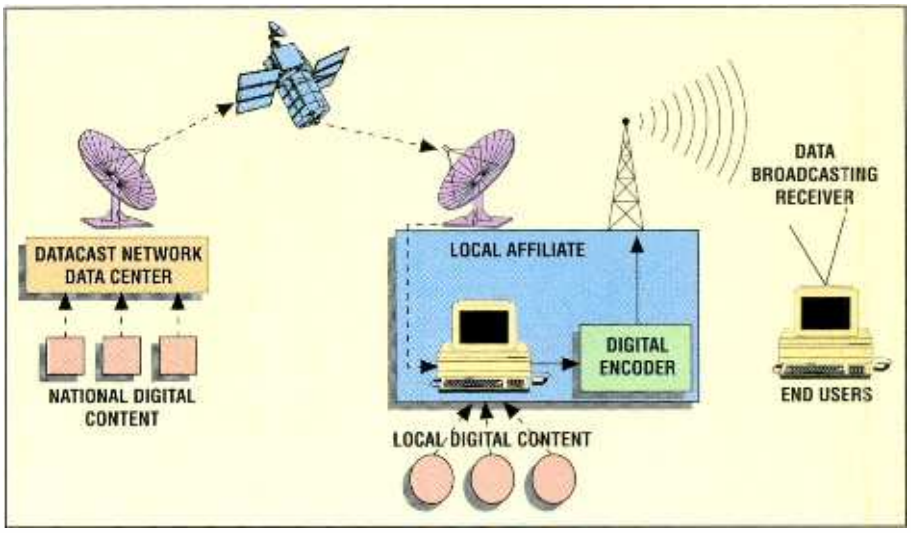

The Datacast network system transmits digital data in the vestigial sideband of existing NTSC TV channels.

tify the $5,000 investment broadcasters would need to make to run Intercast content. Scott noted that recent surveys indicated that many consumers with computers are using on-line services and surfing the Internet during prime-time TV hours. If Intercast could draw a portion of those people back to television, that could be more valuable than any ancillary revenue.

Scott also viewed advertising as the most viable option for local broadcasters to make money from the service. Companies would pay extra to have web pages attached to their traditional linear video ads. Or, possibly, companies could pay to have their web page "ads" inserted with a program, such as a car dealership web page during the broadcast of the Indianapolis 500.

VSB: Bigger but not necessarily better

Broadcasters will also have a chance to make money in a year or two with a new technology similar to VBI, but with greater bandwidth, making it suitable for faster transmission and richer content.

Two technologies are currently in development that tap the vestigial sideband (VSB) portion of the TV signals. John Abel, president of Datacast Partners, one of two companies developing VSB technology, said his company's version of VSB transmission offers several improvements over the VBI. Most importantly, VSB would provide much greater bandwidth than VBI. At best, VBI services run at about 28.8kb/s; Datacast's Digideck technology promises to deliver content at up to 525kb/s.

Abel views multimedia delivered via his system as the modern version of direct mail. As with Intercast, companies could attach multimedia web pages to any program and target specific audiences in a format other than linear video commercials. Abel said VSB will be most effectively harnessed by broadcasters to provide value-added multimedia content coupled with traditional video, which is delivered to a computer. The equipment for stations to transmit VSB content would run $50,000 to $80,000, Abel estimated.

VSB technology, however, is still a few years away. Besides Digideck, there is also WavePhore, another company with a slightly different technological approach to delivering VSB. Swenson said his company's technology, which he calls "TVT1/4" (indicating it delivers data at one-fourth the speed of a T1 line), could allow broadcasters to reap revenues from leasing access to their VSB signal to third-party operators or benefit by collecting a percentage of revenues such services might generate.

Abel views multimedia delivered via his system as the modern version of direct mail.

Broadcasters could also implement such services on their own. Swenson would not go into detail about what type of consumer services his company would offer over VSB, but said that the revenue potential for broadcasters could be in the "multimillion" dollar range.

Although this technology is proving feasible in the labs and promising as a method for delivering data and multimedia, it is in the same position as VBI systems. Competition already exists on many fronts, not to mention the recently auctioned personal communication systems, which are dedicated to servicing just such needs that VBI and VSB address. ■

Charles Waltner is a technology writer based in Seattle, covering new media technology.

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NAB ties in with CE and computer trends

By Marjorie Costello

By now, most of you have digested the NAB. Along with the buds and NAB, spring also brings a profusion of other trade shows, conferences, announcements and the usual consumer electronics line showings. Many of the trends and announcements from outside the broadcast industry pick up on themes orchestrated at NAB 96. This column will highlight what the consumer electronics, cable and computer industries have been serving to provide you with more food for thought on the web, DV-based recording and HDTV.

The web's new affiliations

Until this year, NAB show talk about a "web" or a "net" translated into references to ABC, CBS or NBC. But at this year's NAB, TV station and production pros were preoccupied with the World Wide Web and the Internet. The dynamic duo of cyberspace were prominently featured at NAB's booths and seminars. Popular video editing systems and desktop video software packages were transformed into "web creation tools" and "Internet enabling technologies."

At the same time as stations are affiliating with the web and video's most experienced production operations add site creation services, consumer electronics, cable and computer powers are readying new Internet-related products and services.

Above photo: Genius Theatre currently features a master unit control center for controlling a range of technologies through one remote control. The Genius Theatre II features a series of storage cubes resembling a mini-tower CPU housing a DVD-ROM/DVD player, a 28.8 modem, an Internet-accessing hardware unit and room for at least one other device.

The PC/TV (or is it the TV/PC?)

Gateway 2000 shipped the first PC/TV, called Destination, this past May. Destination links a 31-inch data-grade tube with a Pentium PC equipped with a TV tuner on a PCI card, a telephony modem, hard disk and floppy drives and a 6x CD-ROM drive. Destination is geared toward on-line cruising and CD-ROM playback, but can also provide a big-screen experience for viewing TV programs. Consumers can use Destination for running other applications, such as word processing and personal finance programs. Also available with a Harman surround sound system, Destination is priced from $3,500 to $4,700.

Thomson Consumer Electronics (RCA) showed a second-generation prototype for Genius Theatre this past spring. Designed for web browsing and CD-ROM playback, the RCA product — which the company prefers to call a TV/PC — is slated to launch next year in the $5,000 price range.

Genius Theatre features a master unit control center for controlling a range of technologies through one remote control. The technologies demonstrated in Genius Theatre II included a conventional TV picture displayed on a 36-inch TV/PC monitor. GT II also features a series of storage cubes resembling a mini-tower CPU housing a DVD-ROM/DVD player, a 28.8 modem, an Internet-accessing hardware unit and room for at least one other device.

Genius Theatre will include a special version of the StarSight interactive electronic programming guide designed to function in what amounts to a video version of Windows. (By the way, Thomson's parent company in France now owns 20% of StarSight.) Genius Theatre's StarSight implementation will let a TV viewer automatically link from a TV show to a related web site. And, the navigation guide enables easy access to any of the built-in devices, and in some cases, coordinates their operation.

In fact, RCA is touting the interactive electronic programming guide as the killer app for entertainment management, which the company predicts will become more important in the 21st century than information management. Thomson and other TV makers have made it clear they do not plan to surrender one inch of TV territory in the home to the computer industry. Declared

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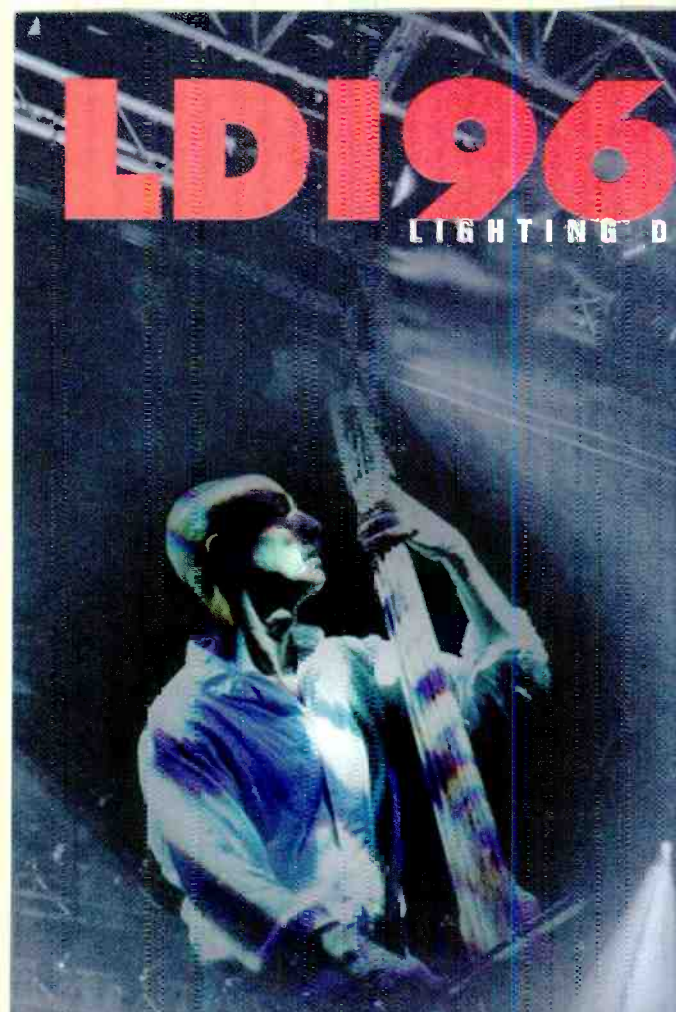

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Thomson executive VP Joseph Clayton, the living room is the "province of the consumer electronics industry."

Microsoft takes on the TV task

But that won't stop Gateway and Microsoft from trying to move in on the room where consumers watch television. At the WinHEC 96 (Windows Hardware Engineering Conference) held in San Jose at the beginning of April, Microsoft chairman and CEO Bill Gates unveiled the Simply Interactive PC (SIPC) framework of hardware technologies for Windows-based PCs. According to Gates, SIPC will make the PC platform the center of entertainment, communications and productivity for the home and office, providing the ease of use and convenience of a consumer appliance.

And, if there was question as to Microsoft's new battle plan, Gates predicted: "As the PC becomes a central device for entertainment and communications, it will be placed with these consumer devices in the family room." Gates also promised that even an inexperienced consumer would be able to sit down at an SIPC system and immediately complete such tasks as playing a game, watching a movie or TV program, browsing the World Wide Web, connecting to a stereo or VCR, listening to voice mail or writing E-mail.

However, it remains to be seen if a company that describes TV watching as a "task" can be successful marketing products to a mainstream audience. And, it has always been amusing to hear Gateway explain, during demos of Destination's TV feature, that it was "launching the TV application."

Broadcast-enabled PC

This past spring, Microsoft also demonstrated the broadcast-enabled PC with DirecTv at the SkyFORUM conference for the direct-to-home satellite industry. Microsoft, now a DSS licensee, is working on the development of this new type of PC with DirecTv, the major power behind DSS.

The PC will include a board containing the integrated receiver/descrambler (IRD) components found in DSS set-top boxes and could be connected to a large VGA monitor. Microsoft is developing specifications that would integrate the DSS decoder into Windows 95.

From demonstrations, it appears that consumers who buy this special PC will only be able to access select web sites and other data provided by DirecTv's content partners. However, they will be able to watch DSS's entertainment fare on the computer monitor.

DirecTv predicts data delivery by the end of 1997, with the DSS decoder boards and software bundled in high-end PCs selling for about $3,000. Microsoft promises the required "broadcast extensions" to Windows 95 by the end of 1996.

It will be interesting to see how Sony figures into the future of the broadcast-enabled PC, since the company and other TV makers are reportedly working with Microsoft to develop on-screen interfaces that can operate with a range of satellite and PC systems. In addition, Sony — which is currently marketing DSS home systems — is slated to make a major move into home computing later this year when it rolls out a home PC line.

At the same time as stations are affiliating with the web and video's most experienced production operations add site creation services, consumer electronics, cable and computer powers are readying new Internet-related products and services.

Web-browsing TV from household names

While we await word on Sony's plans, other TV set companies have already announced their Internet intentions. In May, Zenith said it will be selling televisions with built-in web browsing by the end of 1996. Incorporating Internet appliance technology developed by Silicon Valley startup, Diba Inc., Zenith plans a line of NetVision televisions with built-in 28.8kb/s telephony models and Ethernet ports for connection to cable modems. Slated to arrive in time for the Christmas selling season, NetVision televisions will start at less than $1,000.

This past April at the Magnavox line showing, Philips Consumer Electronics said it would be introducing Multimedia Access Terminal (MAT). MAT includes two products, both add-on boxes designed to connect with standard televisions or monitors. MAT-Internet, expected by the end of 1996 and priced between $300 and $400, provides web access and E-mail capabilities. MAT-CE, slated for the first quarter of 1997 in the $1,000 to $2,000 range, adds connectivity with consumer electronics devices including VCRs, DVD players, audio gear (with AC-3), videophones and home security devices.

An indication of the pressure many CE companies (and executives) are under to become web friendly was expressed by Philips senior vice president Edward A. Volkwein. He noted that with the computer industry moving into the living room, "there was a rush" to get to market and "stake a claim to the digital age."

Back in early spring, Mitsubishi threw its hat in the Internet ring by announcing plans to introduce a television in 1997 that can access the Internet. Nicknamed "PC Lite" by Mitsubishi, to distinguish its entry from what the company views as Gateway's "PC Heavy" approach, the models will focus on web browsing. The televisions will not incorporate hard-disk drive storage or a CD-ROM, which is also what appears to be the case with MAT-Internet and NetVision.

Available in some of the company's over 30-inch models and set to be sold under the Diamond Web name, Mitsubishi estimates the web-browsing capability will add $300 to $500 to the price of one of its larger-screen models. Jack Osborn, president of Mitsubishi's Audio/Video Division, even went so far as to predict, "I don't think there'll be an over 30-inch TV sold in the next few years that won't have some type of PC Lite, Internet-browsing technology built-in."

Game systems get web ready

Also getting into the web access business are the video-game console companies. Internet add-ons and game systems with built-in web-browsing capabilities were introduced in May at the Electronic Entertainment Expo in Los Angeles.

This fall, Sega will ship an Internet peripheral called Net Link, which when combined with a Sega Saturn game system, will cost less than $400. The system is likely to be among the lowest-priced consumer Internet access device available.

In September, Bandai will launch the $599 Pippin in the United States — based on Apple's Mac technology — which promises easy and low cost access to the web. Pippin is now arriving in Japan. And Sony's PlayStation is only a modem away from offering web access.

Cable gets caught in the web

And the TV set is not the only device that CE companies are developing for web access. At the National Cable Television Association show in Los Angeles this past May, Sony took the wraps off its long-awaited interactive digital home terminal.

With this terminal, featuring an Intel

The GALLERY

486DX4/75MHz processor, consumers can browse, retrieve and download current Internet services. The terminal includes full PC connectivity and PC application compatibility.

Also at NCTA, Zenith, a leader in cable modems, joined forces with U.S. Robotics to debut an enhanced cable modem system the companies claim will make it possible for one-way cable systems to deliver data, such as Internet services, at significantly faster rates. Zenith also announced that it was working with Microsoft to increase the speed limit for Internet data delivery via cable modem. And Mitsubishi — through a division different from the one promising a television with built-in web browser — was at NCTA demonstrating a web-browsing set-top box.

And Microsoft, in another collaboration, linked up with Motorola, a Zenith competitor in the cable modem business. The software company will develop applications, software and tools that take advantage of Motorola's CyberSUFR cable modem.

Microsoft's technology includes servers and software for cable systems and home PC use of the company's Internet Explorer browser.

LANcity Corporation, Andover, MA, had developed the LANcity Personal Cable TV modem (LPC), which provides users of a home computer and any cable TV system in any country with two-way, 10 million-bit-per-second connectivity city-wide across 200 miles for $595 per desktop. According to LANcity president and CEO Rouzbeh Yassini, "LPC is the first cable TV modem ever developed to operate over any commercial cable TV channel, extending the same power of corporate business networks to today's 500 million worldwide home cable TV subscribers.

The LANcity Personal Cable (LPC) TV modem enables home offices to access corporate offices, on-line services and the Internet at fast speeds, long distances and low costs.

Converging on a new show

To further bring home (literally and figuratively) the Internet's growing importance to the consumer electronics and computer industries, a new trade show focusing on technologies at the convergence is planned by two former arch rivals. CES and COMDEX are joining forces to co-locate their spring trade shows starting in 1997 in Atlanta. And they are adding a third show, one called Interactive Content World, to be held at the same time. (Remember when the NAB and the Grateful Dead co-located at the Atlanta's Georgia World Congress back in 1990?)

Among the products prominently mentioned as the focus of Interactive Content World are the PC/TV and the so-called Internet appliance. After marching on Atlanta from June 2-5 in 1997, the show threesome will move to Chicago for the next 10 years.

The DV dilemma

At NAB 96, another format war broke out between Sony and Panasonic, but this battle is spilling over into the consumer video

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world. The companies were promoting mutually incompatible technically enhanced pro versions based on DV, the consumer digital video format agreed to by more than 50 companies, including Sony and Panasonic. At NAB, Sony introduced DVCAM, which when it starts arriving later this year, will compete with Panasonic's DVCPRO, introduced at NAB 1995 and already in use.

Although these systems are aimed at professionals, the models' pro features will make them appealing to prosumers and desktop video producers. However, the two iterations on DV offer different degrees of compatibility with consumer gear, a situation likely to lead to confusion not only among consumers, but among pros as well, since they are also buying DV consumer camcorders.

Among the companies selling consumer DV camcorders are Sony, Panasonic, JVC, Sharp and RCA. However, there were no DV decks introduced at the spring line showings. The consumer electronics and motion picture industries are currently working together to resolve copyright issues, stemming from the digital cloning capabilities of the new format. When that agreement receives a congressional seal of approval, CE companies will probably start introducing DV decks.

Sony introduced the DVCAM at NAB 96.

However, if you happen to live in Europe, by now you should be able to buy the PAL or SECAM versions of Sony's DHR-1000. The DV consumer deck has only been demonstrated by Sony in the United States.

Compatibility clarification

As for DVCAM and DVCPRO, both systems include models that can play consumer DV recordings, but DVCPRO recordings are not compatible with consumer DV machines, which use a 10µ track pitch. DVCAM is able to achieve a higher degree of compatibility with consumer gear than DVCPRO by using a 15µ track pitch, instead of DVCPRO's 18µ approach.

As a result, DVCAM tapes will play on Sony's upcoming DV consumer decks, but not necessarily on DV VCRs offered by other CE companies in the future. To provide that compatibility, consumer DV decks will have to increase tape running speed when sensing a DVCAM recording. Since this adds cost — and is not required by the DV standard — it remains to be seen how many consumer decks will offer this feature when DV decks finally arrive.

To confuse things even further, DVCAM recordings will not play on Sony Digital Handycams nor on other DV consumer camcorders that have been introduced.

To play consumer DV recordings on DVCPRO gear, the tape must first be placed in an adapter, not required with DVCAM. Panasonic said that future industrial DVCPRO machines and the company's upcoming DVCPRO laptop editor would be able to play consumer DV tapes, again with the special adapter. Consumer DV playback, also with the adapter, is offered by some, but not all, of Panasonic's initial DVCPRO models.

According to Sony — currently the only company in a position to make the evaluation since DVCAM is not yet available — there is no interchange between DVCPRO and DVCAM.

Making life easier for some at NAB was JVC. While focusing on its low-cost pro digital system, Digital-S — which records on VHS-size cassettes — JVC also said it would market a pro DV dockable camcorder and deck, totally based on the consumer recording format.

DV cassette confusion

Another aspect of DV causing confusion relates to the cassettes designed to work with each of the new pro DV systems and the consumer models. The DV standard calls for two cassette sizes, one about the size of a DAT cassette, with the other similar to an audiocassette box. Metal-evaporated tape was also specified for the format.

While Sony is adhering to both specs for DVCAM, last year, Panasonic introduced a third cassette, about the size of an 8mm videocassette. Since Panasonic was concerned about tape cost issues, especially among its broadcast customers, the company went with the less-expensive metal-particle tape for DVCPRO.

As a result, DVCPRO customers won't be able to record on consumer DV cassettes. On the other hand, in a pinch, DVCAM users will be able to shoot on DV minicassettes picked up at a local retail outlet.

To fully exploit DVCAM's ClipLink clip selection feature, professionals will have to buy DVCAM cassettes. Through a special memory chip featured in the new DVCAM line of cassettes — with four times the memory of the chip in Sony's DV consumer cassettes — up to 198 video clips can be stored while shooting. However, Sony said its consumer DV minicassettes with memory could be used with ClipLink, but storage would be limited to 45 clips.

One DV-related tape introduction at NAB had nothing to do with

the new consumer-inspired format, although it also managed to create some confusion. Quantegy, which now owns the rights to market Ampex brand tape, kicked off the new Quantegy brand name by introducing one of the most out-of-sync tape names ever. Dubbing the new line, the DV Series, the new Quantegy line is geared for the Ampex DCT digital post-production system, which is unrelated to and incompatible with DV, DVCAM and DVCPRO. DCT, among other differences, uses tape that is 19mm wide, while DV's tape is 6mm.

FireWire to the rescue

One DV area that Sony and Panasonic agreed on at NAB is the importance of FireWire. Originally conceived for consumers, FireWire (a.k.a. IEEE 1394) has migrated upward for professional use. Panasonic and Sony are supporting the high-speed serial digital transfer system in DVCPRO and DVCAM models. In the consumer area, Sony remains the only company offering FireWire, featured in the company's Digital Handycam line. And Sony consumer digital camcorders are currently the only consumer models featuring digital inputs and outputs. FireWire was also promoted at NAB by Apple and Truevision, among others.

Adaptec, a leader in computer input/output hardware and software, is one of the companies spearheading the move to FireWire. During a private, off-site meeting with Adaptec at NAB, the company predicted the first FireWire add-on PCI cards will be available for sale by the end of 1996 with the technology incorporated in computers next year.

Some in the professional industry are calling FireWire a short-haul desktop digital transfer protocol, in contrast to SMPTE 259M, the digital transfer protocol used by most broadcast VTRs. Although SMPTE 259M is designed for moving information over longer distances, including throughout a video facility, as new chips are developed for FireWire, this protocol's reach is likely to expand, literally and figuratively. This prediction was not confined to discussions with Adaptec, since it was also offered by some of Sony's broadcast marketing executives.

During the past few months, FireWire has also added some fire power drawn from the computer industry. Microsoft announced that it will support IEEE 1394 in all future releases of Microsoft Windows, and SIPC will also incorporate FireWire. Apple, which invented FireWire, is promising to build it into products starting next year. Computer companies Compaq, IBM and Texas Instruments also said they will support the high-speed digital data transfer protocol in their upcoming PC platform models.

To add fuel to the FireWire fire, Sony and Microsoft have signed an agreement to develop open device driver interfaces and controllers for IEEE 1394. Sony's DHR-1000 decks, along with its current Handycam digital camcorders, support FireWire. And other companies have been mentioning FireWire at line showings and trade shows in connection with future TV/PCs, web-browsing televisions, camcorders and web-browsing game systems.

Are you ready for HDTV?

The big HDTV news occurred after NAB on May 9 when the Federal Communications Commission formally recommended the Grand Alliance's system as the new digital TV standard for the United States. The FCC's proposal paves the way for broadcasters to offer digital HDTV or split the channel into five standard definition digital channels.

The FCC, as part of its rulemaking process, has given interested parties the opportunity to respond with comments. Already voicing objections are the Hollywood creative community and the computer industry.

What's bothering industry people in Hollywood and computers is the FCC's decision not to mandate progressive scanning, which delivers superior pictures and is more compatible with computers, especially important to the Internet-crazed crowd. Instead, either interlaced or progressive scanning can be used. Interlaced is preferred by broadcasters and set makers to get HDTV off the ground because production equipment and consumer sets for this scanning scheme are less expensive to manufacture.

Major motion picture directors and cinematographers are also calling for a 2:1 aspect ratio, instead of 16:9, claiming their ratio is closer to the one commonly used today in movie production and projection. The creative community wants to make sure that as much of the original film frame as possible makes it onto the TV screen.

Consumer electronics companies, however, are anxious, and in one case, ready to build and market HDTV equipment. At its May line showing, Grand Alliance member Zenith debuted the company's first HDTV product, the HD-ready PRO900 video projector.

The front-screen model is compatible with the Grand Alliance digital HD system (which incorporates key Zenith technology) and provides 1,280x720 progressive and 1,920x1,080 interlace pictures. The PRO900 projects 60- to 240-inch diagonal pictures, in either the 4:3 or 16:9 aspect ratios. Initial customers presumably will be commercial accounts and rich consumers getting ready for HDTV.

At Thomson's spring line rollout, held on the eve of the announcement, executive vice president Joseph Clayton said that assuming the FCC gave the GA the green light on the 9th, Thomson would have HDTV sets ready by 1998, although some models, presumably PTVs, could be ready in 1997. Thomson's HDTV support was shared by Philips, another Grand Alliance member, at its line showing. Company executives are specifically mentioning HDTV as a key area of importance in future marketing efforts.

To bring our theme full circle, you can find the FCC's digital TV standard announcement along with related background and technical information on the web. The address is http://www.fcc.gov. ■

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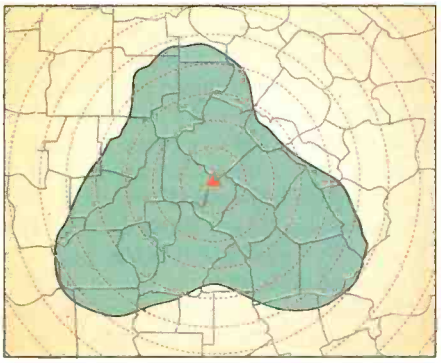
By Don Markley



Extending the life of VHF transmitters

With the somewhat imminent arrival of ATV (HDTV), most, if not all, VHF stations will be changing to UHF channels. The need exists, however, to keep the VHF systems operable, and it will continue to exist until such time as the NTSC channels finally disappear from use. That means a lot of semi-old and old physical facilities need to be treated with a significant amount of TLC to keep them operating for up to 15 years depending upon which set of rumors about the advent of ATV is currently considered the most viable.

Antennas and transmission line

With regard to the antenna systems and the transmission line, many VHF stations use batwing (superturnstyle) antennas. Those antennas, with their semiflexible exterior feedlines, will probably have to be reharnessed at least one more time during the next 15 years. On the positive side, one more time should be enough. When the VHF system ceases to exist, used VHF antennas will have about as much value as a bucket of warm spit.

The vast majority of transmission lines for VHF stations use either dual three-inch feedlines or a single six-inch line. Some of those lines are getting a bit long in the tooth. As a result, the sliding interconductors or "bullets" are becoming significantly worn. This results in an accumulation of debris on the anchor insulators that will eventually lead to one of two problems.

First, the connector will turn up as a result of increased resistance, due to erosion of the conducting material, accompanied by an increase in heating. Or second, the line will arc over at the anchor insulators as a result of the accumulation of debris on the Teflon material. In either case, as the lines grow old, the probability of failure increases rapidly, much as it does with old engineers.

For transmission lines, at least 15 years of additional life can be obtained by either replacing the interconductors with new conductors and connections or by at least replacing all of the bullets and O-rings. If there is no significant damage to the lines, this will bring them fairly well back to the original specifications.

A significant argument can be made for replacing the inners in total with some of the newer-type conductors and connectors that do not use sliding surfaces to accommodate expansion. The lines will then be good not only until the demise of NTSC television, but still will be usable in the UHF market for years to come.

Eliminating the sliding interconductors means the elimination of wear to the connectors and of debris on the anchor insulators, which results from the wear on the conductors. Although this costs a little more than replacing the old bullets with new ones, the used value of the line will be significantly better.

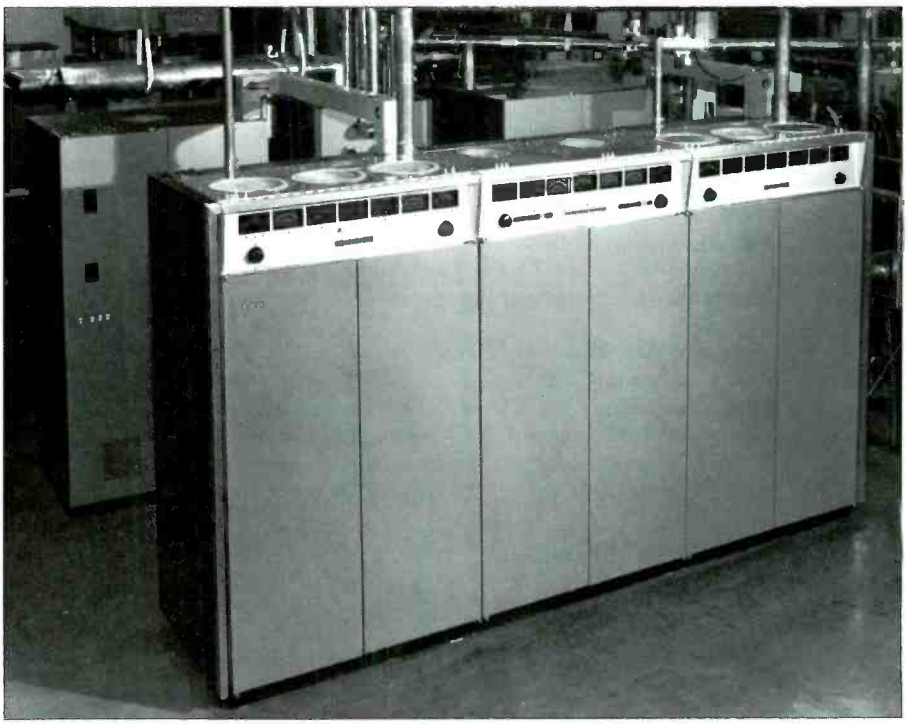
No discussion has been made of the tower itself. The same maintenance techniques that have kept the station's tower standing up until now need to be continued. Your favorite tower crew needs to come in annually to check guy-wire tensions, repair the lighting system as needed and do the standard annual examination that you have been doing every year up until now. There is a problem that may arise if you attempt to install the new ATV antenna and line on the same tower. This particular action has been discussed in previous articles and must be considered only after a structural engineer goes over your system thoroughly and grants his approval accompanied by the approval of your insurance carrier.

Replace or refurbish?

That leaves the transmitter. If your station is going to be going to a UHF channel, there really is no sense in attempting to buy a new VHF transmitter that can handle ATV. More than enough equipment will be sitting around for the few VHF stations that use VHF channels for their ATV operation.

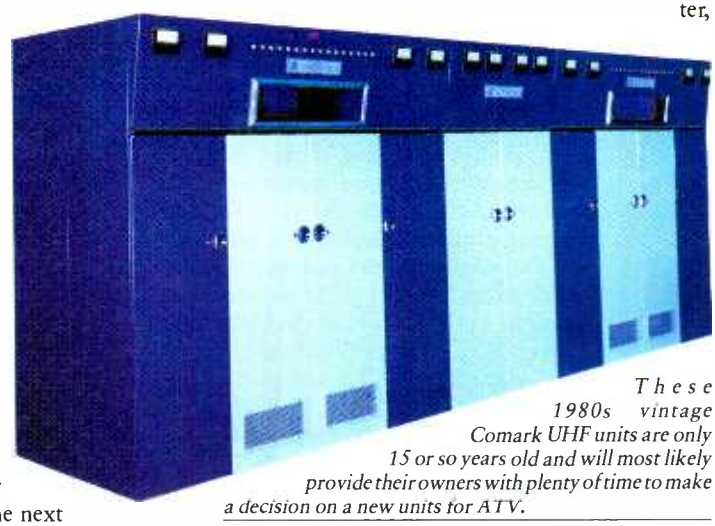
VHF stations will fall into one of two categories. Under Category A, your equipment is fairly new and in good operating condition. That being the case, there should be no difficulty in extending its life for another 15 years. Before that time period is over, you may reach the point where the amount of care required to keep the facility in operation becomes excessive. However, you can pay for a great deal of technician time for much less than it would cost to replace the VHF transmitter with a new unit when the period of need is small. Category B includes all of those transmitters that are marginal to bad at the present time. This is where the real work comes in.

If the transmitter needs to be replaced, it



RCA manufactured the FH Series in both VHF and UHF models. Many of these transmitters will soon be 25 years old. Owners will have to decide if their units will make it another 15 years. (Photo courtesy of Comark.)

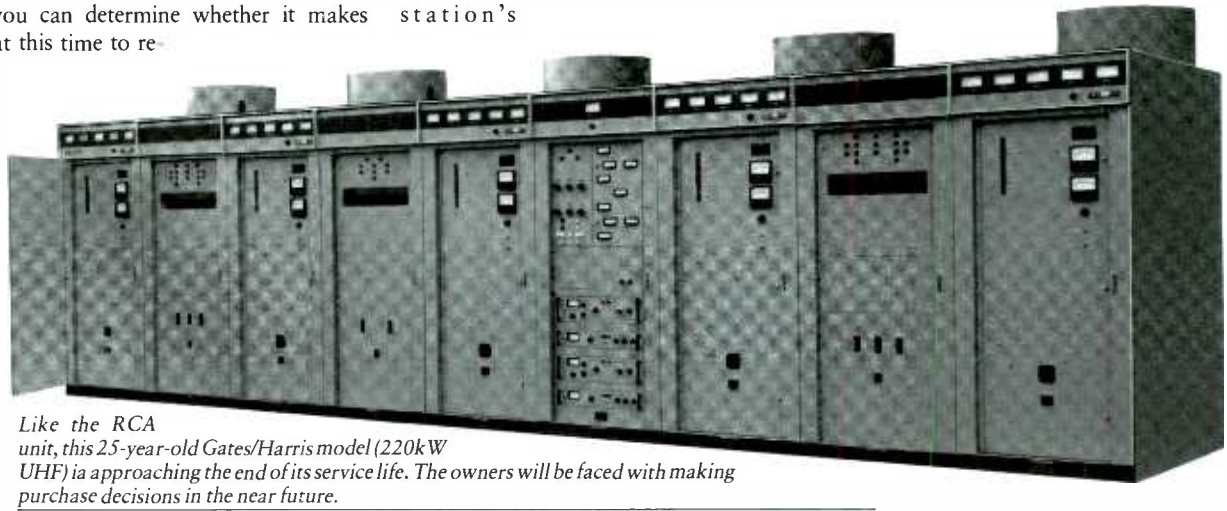
may be a poor investment to attempt to rebuild it enough to last for another 15 years. Remember, this kind of engineering decision is not really brain surgery. Working with the manufacturer or the parts supplier for your brand of transmitter, you need to sit down and make a list. On that list, you need to identify all of the major components that will need to be replaced over the next 15 years based on past experience with the transmitter. Include the cost of refurbishing cavities and sockets as needed and the cost for tubes that you will need over the next 15-year period. Also, look at the expected power consumption over the next 15 years and the cost for that power based upon your existing rates. Compare that to the cost of a new transmitter and the power that would be necessary to operate the new transmitter over that same 15-year period. You need to add a little something for the old transmitter to cover the technical maintenance that will be necessary. This will include the number of hours of overtime that the staff will collect for getting the 'old girl' back into operation at 3:00 in the morning on many a night. From that, you can determine whether it makes sense at this time to replace the transmitter or to repair, modify or beef up as necessary to extend its life expectancy.



These 1980s vintage Comark UHF units are only 15 or so years old and will most likely provide their owners with plenty of time to make a decision on a new units for ATV.

There is one small additional consideration when deciding whether to trade or repair. It primarily concerns the cost to the station for off-air time and the amount of hassle for the engineering staff to keep the old girl in operation. You might also give some thought to stock-piling a few of the more critical components. Parts for VHF transmitters are going to become more difficult to obtain as the transmitters are phased out of use. Ten years from now, it may be difficult to get that new tube socket for the PA. It would be extremely embarrassing to have to buy a new transmitter with only five years to go.

For the transmitters that are in moderate-to-good shape, the solution is simple. Those units need to be maintained in accordance with good engineering practice. That is, keep them clean, keep the filters changed, keep the units properly adjusted so excessive heat build-up does not occur because of mistuning and keep the hardware in good operating order. These are actions that the station's staff should have been taking over the years and would have to take on a new transmitter or on the old one under any circumstances. If your transmitter is less than 15 years old, there should be no worry about extending its life for another 15 years.



Like the RCA unit, this 25-year-old Gates/Harris model (220kW UHF) ia approaching the end of its service life. The owners will be faced with making purchase decisions in the near future.

A little extra TLC

Although the station may have planned on replacing the transmitter at 20- to 25-year intervals, a little extra maintenance is reasonable when compared with replacing a transmitter for a five- to 10-year life cycle.

If you are stretching the life of a transmitter, it wouldn't hurt to put a little more effort into that maintenance right now. Start by replacing all damaged fingerstock while such material is still obtainable. If the tube sockets are starting to show a significant amount of wear, replace them now. The same goes for water pumps and air blowers. Either replace them now so that you will be done with this work for the next 15 years or get a spare unit on hand ready to install. Doing this before the units actually fail allows you to shop around and find a source of blowers and pumps that may be more reasonably priced than you would be able to do if the front office was screaming at you and the station was off the air.

If you have old auxiliary transmitters, get them into good operating order and keep them there. As your main transmitter becomes older, the need for that auxiliary transmitter will become more frequent and more significant.

A transmitter that is in reasonably good shape now should last for another 15 years with an appropriate increase in the amount of TLC provided. However, now is a good time to be making that decision as to whether the anticipated life will be stretched or whether the old transmitter should be replaced within the next couple of years. ■

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READER FEEDBACK

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Internet: be@intertec.com
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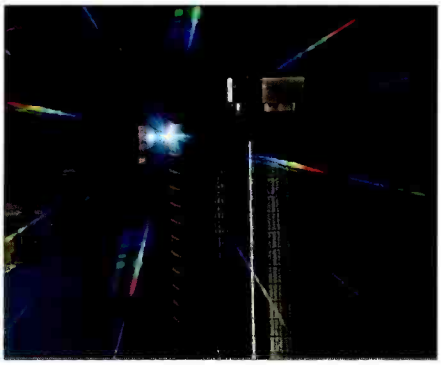
By Steven Alan Levine

Multistream digital video



Imagine having two digital video sources that share a single file on the storage system and can play back from different points in the stream. Add to that four channels of digital audio, which can be routed or synced with either video stream. This is multistream and there are many uses for this, especially when the sources are stored digitally. With delayed broadcasts, it's necessary to record an incoming satellite feed while playing the program in the future. This can be done with tape machines and is explained in "New Recording Technology," December 1995.

Compression standards

The acceptance of nonlinear editing and the widespread use of Motion JPEG as a production coding standard has sparked interest in digital disk-based video. Since the concept of digitizing, compressing, storing and retrieving video on a digital disk was accepted, new applications have appeared. Seeing compressed video looking better than ever at this year's NAB has confirmed what many believed would happen — D-1 quality from compressed video is possible, usable and affordable.

Hardware standards

PCI is the key technology making this possible. It is a bus standard that has gained a foothold in the desktop PC arena. PCI has the potential to bring PCs up to professional video requirements. In addition, Windows NT has matured in the digital video age. Advanced multimedia controls and facilities being incorporated into Windows, such as Open DML (Digital Media Library) and Active Movie, have excited video manufacturers who are hoping to deliver solutions to the broadcast and production communities.

An additional standard that is emerging on the hardware side is the Movie-II bus, developed by Matrox Electronic Systems of Canada. (The Movie-II bus is an outgrowth of Matrox's earlier Movie-I bus of which Rapid Tech was an original adopter.)

With the rapid evolution of these standards and technologies, it was inevitable that cost-effective digital multistream technologies would emerge this year. The ever-decreasing cost of memory, SCSI disk drives and PCI computers, coupled with advancements in the Motion JPEG techniques resulted in a product such as the Multistream Xpress (MSX). Taking advantage of the PCI motherboards, ultraSCSI and fibre-channel devices, MSX from Rapid Tech, synergizes these advancements into a reasonably priced package that occupies a single PCI slot.

Some of the problems

To properly implement a multistream system, it's necessary to have a common store where clip-based files are kept. A RAID device on Windows NT provides this feature. Using off-the-shelf hard drives and controllers, it is possible to achieve reliable throughput for digital media streams on a standard Pentium-based system. The multistream hardware must be capable of delivering one or more media streams to the output and the Movie-II bus independently. This allows for monitoring of streams that are being fed to Movie-II bus devices.

This requires that the individual streams be controlled without interaction with each other. They must be in perfect sync in order to guarantee frame accuracy for editing. MSX accomplishes this by a single master video timing controller on the board. This clock generator can provide master sync to the Movie-II bus and the MSX video circuits, as well. The MSX can also be genlocked to an external sync source.

The analog daughtercard and the main board of the Multistream Xpress.

One of the most difficult tasks to accomplish in previous codec systems was synchronization of the video, RS-422 and audio processes together. These devices were spread throughout a computer bus, causing lag times and the inability to keep everything in sync. This was seen as skipped frames, bad lip sync and other uncontrollable playback anomalies. With MSX's integrated, single board design and the powerful on-board RISC processor, this problem has been solved.

Transfer rates

Another problem that has plagued codec boards is the inability to transfer blocks of compressed video in bursts to a SCSI device over the computer's bus. With ISA and EISA, this was a bottleneck for allowing clean, uninterrupted video and audio streams to record and playback. Often times, the host processor and EISA bus limited direct memory access transfers to around 5MB/s to 6MB/s. PCI offers the most promise and many manufacturers have already moved their designs there. It also allows the possibility of deploying the board on the MAC and PC platforms.

The MSX takes advantage of the PCI bus master DMA and the PCI 2.1-compliant controller chips. Benchmarks show upward of 24MB/s sustained with four low-cost Seagate Barracuda 2.1GB RAID 0-inch drives that are striped by Windows NT. The 9GB Seagate Barracuda drives should allow performance increases with two or more drives striped together. Overall video quality is a complex function of drive latency, bus speed and application overhead. If any of these functions are poor, performance suffers. A good rule of thumb for data rate vs. quality for Motion JPEG is 5MB/s to 6MB/s for each channel of Beta SP video and 10MB/s to 13MB/s D-1 when losslessly compressed.

Practical examples

The Vistor-II multistream digital disk recorder is an example of a product that is based on the MSX. One application is a broadcast program delay and spot insertion unit. Its primary function is receiving satellite programs prior to the appointed time of the local broadcast, holding them until an indeterminate time in the future and then playing them back. The challenge comes when the total time of the program is greater than the delay time and it must start playing back while it is still recording the original.

The ideal configuration is a variable digital delay whose time is linearly proportional to the amount of disk storage installed. With the Vistor's dual stream capability, a record-while-play operation is used to facilitate the program delay. In addition to delaying incoming programs, the same unit may be used for dual-channel spot inser-

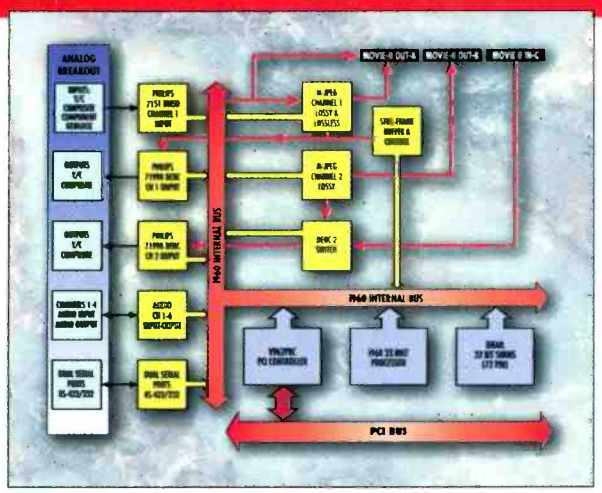
tion. The Vistor-II, while being RS-422 controllable, can also display a Windows-NT user interface so master control may observe or intervene during operation. Another aspect of the multistream capability is that spots may be dubbed in while the second channel is on the air. There is no need for take-down or clean-up times with this auxiliary channel standing by. Because the DDR is an open Windows NT system, reconciliation of aired spots can be done over the local area network connected directly to the DDR.

Production cache

A second area where the Vistor-II is used is in production playback. When the device is used as a 'server' or cache for video clips and stills, it can be instructed to call up these elements on short notice. If a device, such as the Pinnacle Genie, a PCI Movie-II effects board, is connected to the MSX, then it's possible to sequence real-time A/B rolls with effects from multiple streams of digital video. Using an RS-422 interface to the effects-equipped Vistor, it may be possible to edit effects on short notice and perform them with a single 'go' command, drawing from random-access video clip libraries stored on disk. Using familiar devices to set up and initiate these events, professional-looking transitions and 3-D effects may be combined with pristine digital video coming from one rack-mount box.

Nonlinear editing

With the functionality of a multistream DDR on a card, it is understood that the same device can be employed in a nonlinear editing system. If the Genie effects processor is combined with the MSX and Premiere' or In:Sync's Speed Razor, for example, a fully nonlinear A/B roll editing system with real-time effects can be inexpensively put together. With integral dual RS-422 interfaces on the MSX, external VTRs can be controlled for unattended dubbing to disk. With multistream capability, a long dubbing operation may take place in the background while other preparatory editing tasks or one-channel edits are run. With the multitasking of NT and the MSX multichannel capabilities, there is no down time due to critical operations. In digital nonlinear editing, the most time-consuming operation is rendering of effects. With real-time effects directly coupled to the 2-channel video engine, there is no waiting to see the effect, and the need for previews is gone. The editor can watch the A, B and C side rolling to get the feel of the transition. The linear suite is capable of this only after all channels are cued.



A diagram of the Multistream Xpress (MSX), an integrated risc-controlled PCI plug-in solution for desktop video.

Lossless compression

The MSX uses the Zoran 016'/050' chipset for Motion JPEG compression. With this combo, it's easy to produce lossless compressed video. Lossless refers to a mathematical measurement that states that nothing is removed from the original stream that cannot be 100% reproduced in the decompressed file.

To verify this, it requires a digital image that has never been through an analog circuit, to be coded with the lossless system under test. Then the image is decoded back to a digital raster. This file is mathematically compared to the original uncompressed image and they should be identical. JPEG compression performs lossless compression on every image, but it generally combines that technique with lossy ones to get more image reduction. Today, most uncompressed DDRs use D-1 data rates to achieve the same result that the MSX can with about half the storage.

With the advancements in disk-drive technology and plug-and-play PCI hardware, the nonlinear editing user will find it less of a chore to put together a powerful system. What used to cost several tens of thousands of dollars, now may be purchased at around $15,000 to $25,000 for a full-blown editing system. For the established post-production or broadcast facility hoping to expand on its investment in traditional equipment, the multistream DDRs, such as the Vistor-II, will make the transition a more smooth one as the tapeless world of the future rapidly approaches. ■

Steven Levine is president of Rapid Tech Advanced Digital Media, Buffalo, NY.

By Craig Strom

Euphonix CS2000B mixing console

Performance at a glance:

- Large, digitally controlled, analog mixing console
- High-quality audio performance
- Extremely flexible and versatile operation
- Intuitive "traditional" console design
- Snapshot automation of all console parameters
- Immediate, quiet recall of snapshot settings

When the time comes to buy a new audio console, the question that comes to mind first is, "Should we buy digital or analog?" Although this is certainly one issue, there are many others, and some are much more important than the digital vs. analog question. In news, functionality wins out over sonic integrity every time. Perhaps it is possible to have the best of both worlds. The Euphonix CS2000B is a digitally controlled analog console. This system is comprised of an (almost) traditional analog audio path and a powerful, compact and fast digital control surface.

In mid-1994, WFLD-TV, the Fox-owned-and-operated station in Chicago, was given the opportunity to replace the audio console in its main control room. By the end of the year, Euphonix had been chosen as the supplier. In September of 1995, the new console was on the air. The decision to replace an older, undersized console with a Euphonix board was based on the need to do a first-rate job on recently expanded news and sports programming. The CS2000B met those needs and has since demonstrated the power of its unique architecture.

In and out in a day

Euphonix has made installation and interfacing practically effortless. A field engineer, whose job is to assist with installation and verify proper operation, is "shipped" with every board. Had the station been ready, the board would have been installed within 14 hours of delivery. As it was, there was a great deal of cabling to do and several versions of new software that caused a delay. (This board was serial number 1 in the new broadcast line.)

Signal I/O is made entirely through bantam patchbays made specifically for Euphonix. These patchbays interface to the board and the real world via high-density Elco connectors. Euphonix provides the interconnection from the console to the patchbays. Elco connectors are more common in the recording industry than broadcast, but they proved easy to install and quite robust. The only exception to the above pattern is the time-code input. Time code is fed directly into the processing tower via an XLR. Apparently, this was done to keep time code and audio as far apart as possible.

Euphonix has made numerous accommodations on the console for the broadcast environment. Also, many new features were created simply by reassigning functions from their existing recording studio console design. For example, the 24 outputs used in recording studios to send buses to 24-track recorders have been modified for use by broadcasters as mix-minus sends. Several new features include active fader speaker muting, tally lights, GPIs for tape machine starts (tied to fader logic), electronic scribble strips, redundant power supplies, expanded (32 stereo) external monitor inputs and external router control (available with software version 2.6). With all of these new features, the board fits comfortably into a broadcast control-room environment.

Planning and preparation are the keys to a quality system. Detailed operational and I/O documentation preceded the board to WFLD. Understanding the architecture of the board was critical to properly designing a new audio control room that could maximize the unique features of the CS2000B. It seemed that a logical extension to the snapshot recall feature of the board was to have the ability to recall input routing for mics and line level sources with each snapshot. The snapshots are like e-mems on a video switcher: one or two keystrokes can recall one of 50 snapshots in each title (recall time is less than one frame and can be done live).

All of the inputs to the WFLD board come through either a Euphonix 48x48 mic router (the CUBE) or the main house router. This configuration allows a complete recall of all settings on the board between consecutive live shows — everything from dynamics setup and EQ profiles to IFB configuration and source mapping. Every level and switch position (except for monitors) is also recalled. It is possible to make MIDI program changes as part of a snapshot. All of the shows done at WFLD can now be produced without ever changing a patch cord.

The Euphonix CS2000B in the audio control room at WFLD-TV, Chicago.

Operational fortitude

System operation is similar to a traditional console, with a few notable differences. The first change most people observe is the double row of faders on each channel strip. Each strip offers six inputs: M1, M2, L1-L4. They can be assigned in any combination to either (or both) faders. The faders can be operated in any of several modes (stereo, mono, stereo-reverse, etc.) and assigned to either of two main output buses. The M1 and M2 inputs can handle levels from mic to line; L1 through L4 are fixed at +4dBu. Faders may also be assigned to aux sends, direct outs or three utility outputs known as "Outs 1-3." Most of these can be pre- or post-fader. This gives each channel strip significantly more capability than a traditional console, although it stops somewhat short of two channels in one, particularly in terms of EQ or dynamics on the strip.

The audio people at the station have found this configuration to be immensely valuable. With a little thought about source assignment, the board fits 56 faders into what traditionally

would be only 28. All channel strips are identical. This means channel setups can easily be copied from one strip to another. Similarly, individual sections (called "blocks"), such as auxiliary bus assignments, can also be copied. This can speed the process of making new snapshots.

The center section of the console is called the *digital studio controller* (DSC). It can actually be located anywhere on the mainframe, as can the channel strips (in groups of four). Unlike many traditional consoles, the layout of the CS2000B can be easily changed or expanded after installation to suit changing needs. The DSC is the key to fast operation in a live environment. Except for the pots, all functions on the channel strips can also be controlled from the DSC and master section. This type of assignable surface is becoming more common, and the Euphonix implementation is effective and powerful.

All rotary controls on the DSC are shaft encoders. Most of its push buttons are of the large, illuminated (and patented), industrial-strength variety. The organization and layout of the DSC is practical and adaptive. Its indicators and controls change function based on the current task. A healthy number of controls remain unassigned in anticipation of future software releases. Although this may seem unorthodox, WFLD's operators had little trouble adjusting to it.

The console uses a DOS-based computer to load system software, store setup information and control an LCD screen on the DSC. If the computer dies, the graphics screen goes dark and new setups cannot be loaded, but the system is otherwise unaffected. This was an important purchasing issue — some other automated consoles passed operational data through a PC. If the PC locked up, so did your show. The PC is, however, at the heart of the CS2000B's ability to store and recall setup information.

The digital control system is built to be extremely reliable. Distributed processing serves its purpose in the CS2000B for reliability and speed. Processors are scattered everywhere through the system, which ensures that if a subsystem does crash, it will not take down the whole system. In a real-time system such as this, speed is of the essence. When you lift a fader, you expect the level to change without delay. To date, every control acts as if mechanically connected to its function.

The control system has proved to be well-designed, reliable and effective. All of the intelligence is in the mixing surface. Processors send commands to the audio tower where they are decoded and applied to the analog processing circuitry. As a result, if the mixing desk is shut down, the tower continues to pass audio. If a power failure occurs, the control system takes a minute or two to reboot. The tower, however, comes back on about one second after power restoration in the same state as when it shut down.

Throw the book at them

Full documentation is provided with the console, and hardware documentation is particularly extensive. Schematics for almost every circuit in the system are included. The notable exceptions are several proprietary circuit designs, which are drawn as black boxes.

Like many software-controlled systems, the software documentation lags behind the latest release of code. This is not a serious hindrance to board operation, because software releases are evolutionary rather than revolutionary. Each release builds on the features of the previous release. While new manuals always seem to be in the works, each release of software is accompanied by detailed release notes. Euphonix actually releases a list of known bugs, as well as bug fixes in the current release. The development team at Euphonix is also capable and responsive.

The result of all this nontraditional architecture is a flexible console. Is there room for improvement? Sure, and this architecture will allow all of the new enhancements to be retrofitted to consoles already in the field. To date, Euphonix is still shipping new software to all of its customers without those annoying "annual software maintenance agreements." When the decision to buy a console leads to a traditional board, you expect to have essentially the same console in five to 10 years as the one you bought today. You expect to have a substantially improved board in five years. If someone can think of a better way to do something, chances are good it will show up in the next software release for the CS2000B. ■

Craig Strom is assistant chief engineer at WFLD-TV, Chicago.

Editor's note: Field reports are an exclusive *Broadcast Engineering* feature for broadcasters. Each report is prepared by well-qualified staff at a broadcast, production or consulting company.

These reports are performed by the industry, for the industry. Manufacturer's support is limited to providing loan equipment, and to aiding the author if requested.

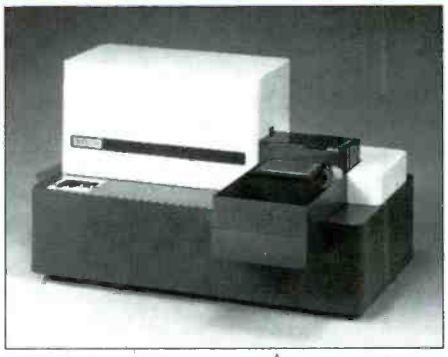
It is the responsibility of *Broadcast Engineering* to publish the results of any device tested, positive or negative. No report should be considered an endorsement or disapproval by *Broadcast Engineering* magazine.

NEW PRODUCTS

3-D graphics workstations
Intergraph Computer Systems

• TDZ-310, TDZ-410 & TDZ-610: the TDZs incorporate Intergraph's new RealiZm 3-D graphics to achieve 1.2 million lit, Z-buffered, Gouraud-shaded, 50-pixel 3-D triangles/s; RealiZm includes RenderGL, a new Intergraph-developed library of graphics extensions that work with the OpenGL graphics library; the new generation of TDZ workstations deliver real-time, interactive 3-D graphics with no compromise in performance, texture quality, display resolution or picture color depth.

Intergraph, Huntsville AL, 35894; 800-763-0242 or 205-730-5441; fax 205-730-9478; http://www.intergrpah.com/ics
Circle (350) on Action Card



Conveyor degausser
Research Technology International (RTI)

• Pulsar: a conveyor degausser featuring unique pivoting coil pulse discharge technology; it operates on standard 117V AC and uses five amps to quickly and completely erase any metal or oxide videotape format up to 1650 Oe in one pass.

RTI, 4700 Chase, Lincolnwood, IL 60646-1689; 800-323-7520 or 847-677-3000; fax 800-784-6733 or 847-677-1311; Internet: Email:Pulsar@RTI-US.com
Circle (351) on Action Card

High-end RAID solution
MicroNet Technology

• DataDock 7000: a high-end RAID 0/1/3/5 solution that complements the DataDock family of products; the DataDock 7000 drive modules lock into a seven-bay, innovatively engineered chassis that is available in tower or 19-inch rack mount configurations; DataDock 7000 is an ideal extension for existing high-end DataDock users, as well as users who require flexible, reliable and high-performance RAID solutions with transfer rates up to 40MB/s for critical server applications, such as video and the Internet.

MicroNet Technology, 80 Technology, Irvine, CA 92718; 714-453-6100; fax 714-453-6101; http://www.micronet.com
Circle (353) on Action Card

Compression solutions
Snell & Wilcox

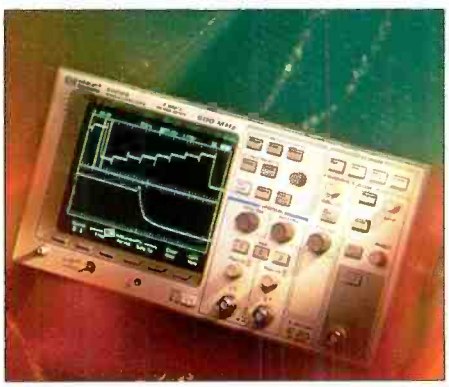
• Range of compression solutions: products for interface technology linking the past, through the present to the future; the products focus on compression, digitization, conversion, DVE and HDTV; some of the products include the Prefix compression pre-processing range, the MSA100 MPEG-2 transport stream analyzer and the MSP100 MPEG-2 transport stream player; the Kudos NRS50 noise-reduction system accepts all analog composite and component formats as inputs and provides all analog composite and component formats as outputs with an additional output of 4:2:2 SDI.

Snell and Wilcox, 6 Old Lodge Place, St. Margaret's, Twickenham TW1 1RQ, UK, +44 (0) 181 607 9455; fax +44 (0) 181 607 9466
Circle (359) on Action Card

TV channel splitter
Micro Communications Inc. (MCI)

• TV channel splitter: a device that allows two UHF channels to be separated to feed individual antennas; any two UHF channels can be uncoupled provided that there are at least three channels separating them; resonant-loop technology is incorporated into the design making the device insensitive to the elements.

Micro Communications, 438 Kelley Ave., Manchester, NH 03108-4365; 603-624-4351; 603-624-04822
Circle (356) on Action Card



Oscilloscope
Hewlett-Packard

• HP 54616B: a high-performance two-channel digital storage oscilloscope that features a combination of power and performance specifications, including 2Gsa/s and 500MHz bandwidth, to boost productivity; other features include 1ns digital peak detect at all sweep speeds, 5K memory depth and 50Ω input capability to ensure accurate high-speed measurements.

Hewlett Packard, Direct Marketing Organization, P.O. Box 58059, MS51L-SJ, Santa Clara, CA 95051-8059; 800-452-4844 (ext. 1454); http://www.tmo.hp.com
Circle (357) on Action Card

Disk-based broadcast systems
ASC Audio Video Corporation

• VR-300: addition to the ASC Virtual Recorder line; the VR-300 features two channels of video, for simultaneous recording and playback or dual playback, and four channels of audio; by choosing your own compression rates, you can precisely control the system's channel and storage capabilities

ASC Audio Video Corporation, 3816 Burbank Blvd., Burbank, CA 91505; 818-843-7004; fax 818-842-8945
Circle (358) on Action Card

Auto-nulling telephone interface
Clear-Com Intercom Systems

• TEL-1000: a microprocessor-based telephone interface that introduces a state-of-the-art solution to the problem of interconnecting a standard analog dial-up telephone line to a Clear-Com, Matrix Plus, RTS or any four-wire intercom system; features include automatic hybrid-nulling, auto-answer, auto-disconnect, auto-gain control and remote-control functions; when used in the auto-answer and auto-disconnect modes, it provides unattended dial-in operation.

Clear-Com Intercom Systems, 945 Camelia St., Berkeley, CA 94710-1484; 510-527-6666; fax 510-527-6699
Circle (361) on Action Card

Disk arrays for Windows
FWB Inc.

• SledgeHammer: a broad range of high-performance disk array storage subsystems featuring architecture that is extremely versatile and easy to customize; SledgeHammers are complete plug-and-play disk array subsystems that range in capacity from 2 to 17.4GB.

FWB, 1555 Adams Dr., Menlo Park, CA 94025; 415-325-4392.
Circle (362) on Action Card

Fiber-optic triax interface
Telecast Fiber Systems

• Cobra: a fiber-optic camera "snake" system designed to extend or replace triaxial cable in remote teleproduction; it interconnects Sony and Ikegami triax-equipped cameras to their base stations using ultralightweight fiber-optic cable; the system allows the operator to locate cameras more than 50,000 feet away from their base stations, with no repeaters or equalizing.

Telecast Fiber Systems, 102 Grove St, Worchester, MA 01605; 508-754-4858; fax 508-752-1520
Circle (354) on Action Card

Post-production system
Pinnacle Systems

• GeniePlus: a complete set of professional-quality, real-time 3-D digital effects, switching, character generation, paint and still storage available on a single PCI board; the system integrates easily into most linear desktop editing environments and features such effects as single-pass page turns, warps, ripples, spheres with lighting, trails, shadows and borders; multiple layers can also be created in a single pass.

Pinnacle Systems Inc., 870 W. Maude Ave., Sunnyvale, CA 94086; 408-720-9669; fax 408-720-9674
Circle (360) on Action Card

Component video in sync with Xpon
Prime Image

• Xpon: a time base corrector/synchronizer with component capability for both input and output offered in a plug-in circuit board for the AT bus of any PC; the Xpon allows the mixing of component and composite sources for multi-input switcher effects; Xpon is available in NTSC, PAL or PAL-M.

Prime Image, 19943 Via Escuela, Saratoga, CA 95070; 408-867-6519; fax 408-926-7294
Circle (352) on Action Card

Digital desk
The Winsted Corporation

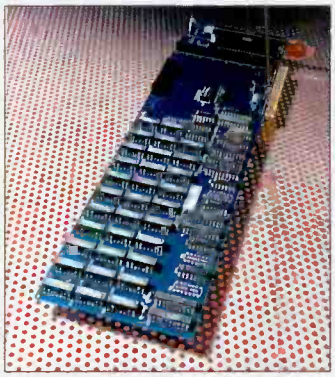
• Model E4697: an extra-sturdy 94-inch (W) desk with a large, wrap-around 30-inch (D) desktop and 18-inch (D) adjustable riser, both in black granite laminate; it is big enough to hold most multimedia systems; there is black contour trim on both the desktop, riser top and vertical rack with an available color accent trim insert to match your electronics.

The Winsted Corporation, 10901 Hampshire Ave. So., Minneapolis, MN 55438-2385; 800-447-2257 or 612-944-9050; fax 612-944-1546
Circle (363) on Action Card

PC-compatible relay card
Sealevel Systems

• REL-32: a PC-compatible relay card that provides 32 reed relays; it can be used for PC-based control of equipment, such as satellite antenna control systems and video/audio studio automation; the REL-32 can also be used to integrate unattended status monitoring equipment and fall-back network switching circuits.

Sealevel Systems, PO Box 830, Liberty, SC 29657; 864-843-4343; fax 864-843-3067
Circle (364) on Action Card



MMDS transmitters
Acrodyne Industries

• MMDS/ITFS series: new line for MMDS/ITFS that includes power levels of 10W, 20W, 50W and 100W peak visual output with 10% aural; the series is designed for complete compatibility with all formats, all amplifiers are broadband class A linear including the aural side; a single RF output connector providing combined visual and aural is used for the 10W and 20W models while the higher power transmitters make use of an external diplexer.

Acrodyne, 516 Township Line Rd., Blue Bell, PA 19422; 800-523-2596 or 215-542-7000; fax 215-540-5837
Circle (380) on Action Card

Expanded feature package for Ensemble Gold
Editing Technologies Corporation (ETC)

• Enhanced Ensemble Gold: a nonlinear series of editing systems that now feature infinite video layering for compositing and effects through multiple video channel control; Ensemble Gold eliminates the need for pre-digitizing and pre-selecting of scenes and footage.

ETC, 1192 Challenger Court, Moorpark, CA 93021; 805-529-7074; fax 805-529-6744
Circle (370) on Action Card

UHF TV klystron tubes
Communications & Power Industries (CPI)

• VKP 7983, VKP 7982 & VKP 7981: three wideband external cavity UHF TV klystron tubes; the four-cavity tubes cover the standard UHF frequency bands in a single tube, have air-cooled bodies and cathodes and water- or vapor-cooled collectors; each model includes an annular control electrode (ACE) for improved efficiency and uses electromagnetic focusing.

CPI, 45 River Dr., Georgetown , Ontario, Canada L76 2J4; 800-267-5387 or 905-877-0161; fax 905-873-7416
Circle (366) on Action Card

Telephone handset interface
JK Audio

• RemoteMix: a telephone handset interface that replaces the handset of your telephone with a mini broadcast console; RemoteMix is perfect for those times when you need to do a remote broadcast and the only phone available is a digital PBX or Key telephone — replace the handset with RemoteMix, choose a dial line and dial from the telephone.

JK Audio, 2701 N. 45th Rd., Sandwich,IL 60548; 815-786-2929; fax 815-786-8502
Circle (368) on Action Card

Broadcast video servers
Hewlett-Packard

• Digital broadcast video servers: servers that provide a complete digital storage and playback solution and deliver approximately twice the performance of the current platform — with up to six channels and up to 50 hours of video quality in a single package; the system is expandable and upgradeable and includes such features as full networking capabilities, a fault-tolerant architecture, industry-standard MPEG-2 video compression and an open platform for leading-edge application development.

Hewlett-Packard, Direct Marketing Organization, P.O. Box 58059, MS51L-SJ, Santa Clara, CA 95051-8059; 800-452-4844 (ext. 1454); http://www.tmo.hp.com
Circle (382) on Action Card

Character generator
Videonics

• PowerScript: a stand-alone or computer networkable device designed for all video post-production, multimedia and professional video graphy applications; PowerScript supports PostScript and uses digital video technology to produce fully anti-aliased characters, animation and graphics with 17.5ns effective pixel resolution.

Videonics, 1370 Dell Ave., Campbell, CA 95008-6604; 800-338-3348 or 408-866-8300; fax 408-866-4859; http://www.videonics.com/ ,info@videonics, com
Circle (367) on Action Card

Portable color LCD digital video scope
Hitachi Denshi America, Ltd.

• VC-5431: a portable color LCD digital video oscilloscope that provides measurements for video and signal applications in one compact unit; it combines an active-matrix color LCD, 50MHz, 30MS/s/Ch, deep 2kW memory, timed data acquisition, GO/NO-GO testing oscilloscope together with vectorscope, waveform monitor and a full-color monitor.

Hitachi, 371 Van Ness Way, Ste. 120, Torrance, CA 900501; 310-328-6116; fax 310-328-6552
Circle (384) on Action Card

Portable mixer
JK Audio

• RemoteMix C+: a portable mixer for remote broadcasts; this battery-powered telephone/mixer has two balanced XLR microphone inputs, RCA jacks for tape send and receive, and a headphone jack; it also has the standard telephone features, such as a DTMF keypad, ringer with on/off switch, a handset jack and an adjustable hybrid null circuit; you can plug into a regular RJ-11 wall jack or a fax/modem adapter connected to your cellular telephone.

JK Audio, 2701 N. 45th Rd., Sandwich,IL 60548; 815-786-2929; fax 815-786-8502
Circle (381) on Action Card

UHF TV klystron rebuilding program extended to IOTs
EEV Inc.

• EEV has extended its UHF TV klystron rebuilding program to its complete range of UHF TV inductive output tubes (IOTs); the features of the current program will be available to users of IOT-equipped transmitters; rebuilt IOTs will be available ex-stock from EEV; to take advantage of the program, you will be required to return your old IOT, which will then enter the rebuild program.

EEV, 4 Westchester Plaza, P.O. Box 482, Elmsford, NY 10523; 914-592-6050; fax 914-682-8922
Circle (369) on Action Card

Broadcast enterprise-management solution
Odetics

• Spectrum: system designed to provide total automation of multichannel spot insertion and program on-air presentation; Spectrum will increase the lifespan for on-air presentation equipment and improve the on-air look and reliability by using a digital-disk cache and a centralized spot tape archive.

Odetics, 1515 S. Manchester Ave., Anaheim, CA 92802; 714-774-5000; 714-780-7857
Circle (385) on Action Card

INDUSTRY BRIEFS

BUSINESS

Panasonic, Secaucus, NJ, announced that New York 1, Time Warner's all-news cable station, has selected Panasonic's DVCPRO 1/4-inch component digital video format to convert its operations to a fully digital news facility. New York 1's purchase includes 38 AJ-D750 DVCPRO VTRs, 22 AJ-D700 DVCPRO camcorders and 20 handheld AG-EZ1U DV camcorders.

Panasonic also announced a strategic alliance with Avid Technology, Inc., Tewksbury, MA, that included Panasonic's support of the industry-standard Open Media Framework file format, as well as Avid's endorsement of DVCPRO as an excellent format for digital news-gathering field acquisition for use with existing Avid systems.

StreamLogic Corporation, Chatsworth, CA, announced commencement of operations under its new company name. The genesis of the new company is the recent sale of the Micropolis name and internal disk drive assets to Singapore Technologies, Singapore. Built upon two former divisions of Micropolis Corporation, StreamLogic's products are sold to OEMs and system integrators and through distribution channels worldwide. StreamLogic's headquarters are located at 21329 Nordhoff St., Chatsworth, CA 91311; telephone 818-701-8400; fax 818-701-8410; E-mail http://www.streamlogic.com.

BTS Broadcast Television Systems Company, Simi Valley, CA, announced that it has become Philips Broadcast Television Systems Company. The transition is part of the company's plan to broaden its involvement in professional television.

Vela Research, Clearwater, FL, announced that it has been selected by Digital Equipment Corporatin, Maynard, MA, to provide video compression/decompression technology for its Mediaplex ad insertion and near video-on-demand systems. Silicon Graphics is also using Vela Research's MPEG-2 video compression/decompression technology for its ad insertion and video-on-demand systems.

In addition, NBC chose Vela Research to provide video compression technology for it high-speed data communications video trial.

Canon USA, Lake Success, NY, announced that with the purchase of six DIGI-SUPER 70 lenses, LIN Productions, Arlington, TX, owns the largest compliment of 70x lenses dedicated to baseball coverage.

Pinnacle Systems, Sunnyvale, CA, announced widespread industry support for its Genie 3-D video effects technology. Companies employing Genie include Adobe, Avid, Data Translation, Matrox and Play, Inc.

Also, Pinnacle completed the purchase of the Video Director software package from Gold Disk, Inc., Santa Clara, CA.

Prime Image's, Saratoga, CA, line of digital video processing products will now be represented in all states west of the Mississippi River by Progressive Marketing Products, Brea, CA.

The karden group, headquartered in Apollo Beach, CA, has been selected as the manufacturer's representative for Prime Image products in the southeastern United States and Puerto Rico.

YES Productions, New Orleans, LA, is employing 66X9.5 and 20X8 lenses by Fujinon, Inc., Wayne, NJ. YES used its new lenses in its coverage of the SEC basketball tournament.

Hitachi, Woodbury, NY, announced that WLIG-TV, Melville, NY, is on the air with three of its Z-2000 digital cameras. The cameras are being used in the studio for live news and talk-show programming.

Chyron Corporation and BVR Technologies Ltd. announced that the Challenge Fund, an investment fund based in Israel, entered into an agreement to make a cash investment in RT-SET Ltd., Herzelia, Israel, in exchange for approximately 11.7% equity interest.

Telemetrics, Inc., Mahwah, NJ, signed a worldwide OEM agreement with Hitachi to supply the TM-9250 Triax control system. The TM-9250 will be marketed with Hitachi ENG cameras for applications that demand full-featured studio operation and long cable runs.

Sullivan Broadcast Station WZTV-TV, Nashville, TN, purchased a Panasonic DVCPRO Smart-Cart automated record/playback system and 11 DVCPRO AJ-D750 studio VTRs.

ABC placed a substantial order for a complement of Tekniche Genesis 6000 digital interface products, including serial digital component decoders, frame synchronizers, audio delay, audio-analog-to-digital and audio-digital-to-analog converters, to be installed at its New York facility.

DIGITAL PROCESSING SYSTEMS INC.

PVR-2500 Digital Video Recorder

The PVR-2500 offers powerful features for awesome animation, morphing and rotoscoping 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 SCSI-2 interface that connects up to seven dedicated hard drives. Because the SCSI controller is integrated with the PVR-2500, video data never has to move over the PCI bus during playback. This avoids the bottlenecks found in systems which use the computer's hard drive for video storage.
- Designed to run under Windows NT 3.51 on computers employing Pentium, DEC ALPHA or MIPS processors. Perception's software utilizes NT 3.51's native support for multitasking and multiple processors, allowing use with-in the most powerful computers.
- Perception's multi-format virtual file system ensures complete integration with your existing Windows NT applications. Any acquired video or computer generated Perception video clips appear simultaneously in many different file formats including TARGA, SGI, BMP and TIFF. Also compatible with new NT versions of Lightwave 3D, 3D Studio, TDPAS 5.1, SoftImage and Elastic Reality.
- Video output section utilizes 10-bit 2x oversampled encoding and provides broadcast quality CCIR-601 (720 x480) resolution. Its dynamic range is in excess of D1 scaling so that images are brighter, have more color and greater spatial resolution. Outputs component, composite and S-Video via the included breakout cables.
- Use with any 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 perform real-time interpolation of 30 fps video to 24 fps film rates or vica versa.
- VCR-like controls on the Perception's GUI simplifies the task of batch digitizing and recording. In this mode, it reads SMPTE time code from the source deck.
- Drivers for Windows 3.1 are supplied as well, so third party editing software like Adobe Premier can be used. In fact, the PVR-2500 bundled with the AD-2500 capture card, a sound card, editing software and one or more SCSI hard drives becomes a non-linear editor of unparalled performance at an unbeatable price.

AD-2500 CAPTURE CARD

- The optional AD-2500 is a video capture daughtercard, that transforms the Perception into a digital video recorder. It has component, composite and S-Video inputs for real-time recording, and storage capacity is limited only by the size and number of your hard drives. Captured video can also be exported as sequential RGB files for rotoscoping and other compositing applications.
- The AD-2500 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.

TRUEVISION TARGA1000/2000

PCI-based Digital Video Capture Boards for Windows

The TARGA 1000 and 2000 is an easy and affordable way to transform your computer into a powerful digital editing system. Along with their high-speed PCI interface, both the TARGA 1000/2000 incorporate all the functions you need to create spectacular multimedia content. They support NTSC and PAL video standards and let you capture, edit and playback full-motion, full-resolution digital video with fully sychronized CD or DAT quality audio. Designed for high performance IBM compatibles, their advanced architecture provides incredible processing speed for video and audio effects, titling and compositing capabilities.

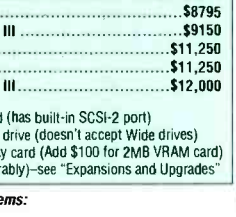
- Allows recording and playback of video directly to/from hard drive at full motion, full frame rates (50 fields/sec - PAL, 60 fields/sec-NTSC). Video is stored and played back at the highest resolution for each format (768 x 576 x 24 bit - PAL, 640 x 480 x 24 bit - NTSC). Compression can be adjusted on the fly to optimize for image quality and/or minimum storage space.
- Genlock using separate sync input for working in professional video suites
- Equipped with composite and S-video inputs and outputs. Also available with component input/output (TARGA 1000 PRO)
- The audio is digitized at 16-bit resolution (at 44.1KHz or 48KHz sampling rates), yielding professional quality stereo sound. Since all audio and video processing is done by on-board DSPs, you are assured of perfectly synchronized sound and images.
- Optimized to work with Winsows NT-based software (Adobe Premiere 4.2, in:sync Speed-Razor MACH III)

TARGA 2000 Additional Features:

- Equipped with composite and S-video inputs/outputs Also available with component input/output (TARGA 2000 PRO).
- Accelerated Windows 3.11 and Windows NT display drivers offer integrated, true-color (24-bit), non-interlaced desktop up to 1152 x 870 pixels.
- Provides a large work area for displaying video, as well as editing application controls. Any part of the display (or even the whole image) can be recorded to tape (video-out-of-a-window).
- View your desktop and video-in-a-window on your non-interlaced high resolution desktop display while the processed video is output at NTSC or PAL resolutions to a video monitor and/or a VCR.

Turnkey TARGA 1000/2000 and PVR-2500 Perception Systems:

• Video capture board (specify) • 220-watt, 6-bay midtower case • PCI motherboard with 256K pipelined burst cache • Pentium 133 MHz processor • Diamond Stealth64 Video 2MB VRAM PCI display card • 32MB of EDO (Extended Data Out) RAM • Quantum 1.28GB IDE system drive • Seagate (Barracuda) 4.2GB SCSI-2 FAST/Wide hard drive • Adaptec AHA-2940UW FAST/Wide SCSI-2 controller card • 3.5" floppy drive • Teac CD-56e 6X EIDE internal CD-ROM drive • Altec-Lansing 300.1 three-piece deluxe speaker system • Princeton Ultra 17+high resolution 17-inch multiscan monitor • Focus 2001A keyboard • Microsoft MS mouse • MS-DOS 6.22 and Windows 3.11 or Windows NT 3.51 operating system software.



*PVR-2500/AD-2500 Windows System with Adobe Premiere 4.0a	$7295
*PVR-2500/AD-2500 Windows NT System with In:sync Speed-Razor MACH III	$8495
TARGA 1000 Windows System with Adobe Premiere 4.0a	$7795
TARGA 1000 PRO Windows System with Adobe Premiere 4.0a	$8295
TARGA 1000 Windows NT System with in:sync Speed-Razor MACH III	$8795
TARGA 1000 PRO Windows NT System with in:sync Speed-Razor MACH III	$9150
TARGA 2000 Windows NT System with AVID Real Impact	$11,250
TARGA 2000 Windows NT System with in:sync Speed-Razor MACH III	$11,250
TARGA 2000 PRO Windows NT System with in:sync Speed-Razor MACH III	$12,000

*PVR-2500 System Notes: 1) Does not include Adaptec SCSI-2 controller card (has built-in SCSI-2 port)
2) Includes Seagate Barracuda 4.2GB Narrow hard drive (doesn't accept Wide drives)
3) Includes Stealth64 Video 2MB DRAM PCI display card (Add $100 for 2MB VRAM card)
4) Requires sound card (DSP-equipped card preferably)–see "Expansions and Upgrades"

Expansions and Upgrades for all Systems:

Substitutions

Full Tower Case (10-bay)	add 100.00	Super Tower Case (12-bay)	add 200.00
Pentium 150 MHz processor	add 150.00	166 MHz processor	add 400.00
Seagate Elite 9.1GB Narrow drive (for PVR-2500)	add1000.00	Seagate Elite 9.1GB Wide drive	add 1000.00
Matrox Millenium 4MB VRAM PCI Display Card	add 250.00	Matrox Millenium 8MB VRAM PCI Display Card	add 400.00
MAG Innovision MXP-17F 17" multiscan monitor	add 225.00	MAG MXP-21F 21-Inch multiscan monitor	add 1100.00
Altec Lansing ACS-500 three-piece surround sound stereo system			add 140.00

Add-Ons

APC Smart Ups 650 power backup	349.00	Conner 4GB QIC/ Wide tape backup IDE/SCSI	439.00
Ensoniq SoundScape Elite DSP-equipped 16-bit audio card (for PVR-2500 systems only)			199.00
MediaTrix Audio Trix Pro DSP-equipped 16-bit audio card (for PVR-2500 systems only)			279.00
Elastic Reality for Windows/Windows NT (includes Transjammer-30 transitions)			349.00
Transjammer Vol 1 (with 100 transitions)			89.00

in:sync SPEED RAZOR MACH III

Digital Video Editor for Windows NT

The ultimate digital video editing software, Speed-Razor MACH III allows you to edit full screen, 60 fields per second, CCIR 601 broadcast-quality video. Designed for the DPS PAR DR-2100/ Perception PVR-2500 and Truevision's TARGA 1000/2000 video capture cards. Speed-Razor MACH III is the fastest and most powerful tool for editing and compositing video clips, animations, stills, music and sound effects. Experience straight cut editing in real time and effects which fly on the fastest machines out there: Alpha,Intel, MIPs-based and PowerPC-based workstations, making this the fastest, most flexible software you've ever seen. Running under Windows NT, it offers three times faster than Windows 3.1 on the same machine and up to ten faster when used on Alpha-based systems.

Speed-Razor features infinite video, audio, transition and effects tracks and comes with Razor Blades—transitions and effects to enhance your production. There are preset tumbles, fades and wipes which you can easily customize and save as new presets. In addition, there are special image effects which are unquestionably the highest quality of any system—analog or digital. Speed-Razor sports anti-aliased 3D DVEs, an infinite channel chroma keyer and an excellent character generator. Use the effects or transitions which come with the package, layer them to create new ones, make your own grayscale bitmaps to use as transitions, or use third party plug-in effects—the flexibility is yours.

EDITING FEATURES:

- Real-time straight cut editing (this does NOT require a new file to be made and requires less space onthe hard drive to edit)
- The only video editor with the ability to cut to the field
- Work in Thumbnail or Final Output resolution mode (you set the resolution for each)

COMPOSITING:

- Infinite number of layers of video clips, still and animations can be composited together
- Handles any resolution from Betacam (720 X 480) up to Omnimax film (4000 X 4000)
- Video clips can be combined using an alpha channel, key color transparency, still or traviling mattes

FILE FORMATS:

- Reads and writes ANI files (created by DPS' PAR), PVD files (Perception), DVM files (TARGA 1000 and 2000) and sequences of TARGA files
- Convert files between any of the following formats: ANI, PVD, DVM, AVI, BMP, TGA, FLC, FLI, WAV
- Project-based Library for organizing your work

There are two user definable resolution modes (thumbnail and final) to facilitate editing. The thumbnail mode allows you to use Speed Razor in the field on a laptop computer then transfer the project file back at the edit suite and automatically recapture and re-render the entire project at final resolution. Speed-Razor also features RS-422 control and even does batch capture (new batch capture module allows you to automate video capture via SMPTE time code), so digitizing video and audio is simple and painless. In fact, with the innovative "Virtual Editing" function you can actually edit your project, complete with effects and transitions—before you've digitized a single frame of video.

AUDIO:

- Handles audio up to DAT (48 kHz) quality
- Infinite number of audio tracks for multi-layer audio mixing

EFFECTS:

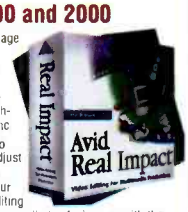
- Blur (circular, gaussian, fast), tint, brightness adjustment, chroma key, crop, displacement, emboss, freeze frame, glass texture, greyscale, invert, loop, matte, pixelate, repeat fields, scale, transparency, strobe, turn red/green/blue
- 3D DVE (translates and/or rotates an image in three dimensions on the X, Y and Z axis)
- Sets a color channel to an assignable value)
- Titles (full blown CG using any Windows font in any color with automatic drop shadow)
- Sub-pixel rendering for incredibly smooth motion
- Effects can be applied to infinite sources

TRANSITIONS:

- Includes over 100 grayscale image transitions, crossfades, luminance fades, fade to/from black, fade to/from white, push, twirl, twist in/out tumbles, flip, turn, scale (zoom)
- Transitions can be applied between infinite inputs.

Real Impact

Windows NT-based Video Editor for TARGA 1000 and 2000



With the introduction of Real Impact, Avid provides Windows users with the same professional image quality, intuitive cut/copy/paste editing, and instant random access capabilities that have won 2 Emmy awards—for thousands of dollars less than outsourcing an average video. Designed exclusively for Truevision's TARGA 2000, Real Impact lets you create professional-quality video with audio, graphics, animations, special effects and titles—with the speed, flexibility and creative freedom you need. Create sales, training and product videos right on your PC quickly and easily—without compromising quality. Produce video in 24-bit color, with CD-quality sound and perfect lip sync

Easy to Use: A true 32-bit application (Windows NT 3.51), Real Impact's intuitive interface and extensive on-line help get you productive right away. It's powerful editing features let you work with video, audio, graphics, animations and titles with the simplicity of cut, copy and paste.

Video Capture: Digitize video and audio—without dropping a frame. Your video is full-screen, full-motion, 60 fields-per-second and your audio in sync. With its Dial-a-Quality image feature, Real Impact allows you to adjust image quality for differing system, storage and delivery requirements.

Create a Storyboard: Extensive media management with built-in media library and database let you easily find the video and audio clips that you want. Instant access makes previewing edits simple and immediate. And, with timeline editing, you just click and drag to experiment with different cuts, rearrange clips and assemble your story. There are 32 levels of undo/redo.

Add Graphics, Titles and Special Effects: Create and seamlessly incorporate audio, graphics and animations into your video using popular Windows-based applications. Real Impact supports AVI video files, WAV audio files, FLC animation files as well as BMP, JPEG, PCX, TGA and TIFF graphics files.

Add Audio: Polish your audio with music and narration. Adjust pan and volume in real time. Simultaneous playback of four audio tracks makes audio editing quick and easy. View your four audio tracks in sync with the video immediately, no waiting for tracks to compile.

Digital Media Interchange: Compatible with the Open Media Framework (OMF) Interchange, a file format for the seamless integration of digital data among applications and across platforms. Through OMF, you can import video and audio files from other OMF-compatible applications like Avid's Media Composer.

Output to Tape, CD-ROM or Over a Network: Gives complete control over video distribution. There's no long rendering process, creating professional quality tape is a snap. Embedding video in multimedia presentations for distribution on disk or CD-ROM is as simple as the click of a mouse. Supports third-party MPEG tools to create MPEG files for network distribution.

Avid's Support Advantage: Real Impact is backed by Avid's world-class customer service. Toll-free telephone support and bulletin board service are just some of the benefits.

FEATURES:

Video

- Real-time JPEG compression / decompression and playback at 60 fields per second
- Supports RS-422 control protocol and SMPTE time code.
- Edit two tracks of video for layered effects.

Audio

- Edit up to four tracks of 44.1 KHz, 16-bit CD-quality audio.
- Real-time pan and volume adjustments, digital audio scrub.
- Waveform for precise audio editing.

Import/Export

- AVI video files, WAV audio files, FLC animation files.
- OMF Interchange files.
- BMP, JPEG, PCX, TGA and TIFF graphics files.

Special Effects

- Filter effects with previews and adjustable parameters.
- Transition effects include wipes, dissolves, zooms, pushes and squeezes.
- Layered effects include picture-in-picture, luminance and chroma key.

Integrated Title Generator

- 32-bit processing (24-bit color and 8-bit alpha channel).
- Support for TrueType fonts and international character sets.
- Drop shadows, transparency and color blends.
- NTSC and PAL-safe color palettes.

Media Management

- Media library for organizing digital clips.
- Database with search capabilities.
- Customized views for easy clip access and retrieval.

A note about our turnkey systems:

In addition to the systems listed on this page, we can further customize any system to fit particular needs. We carry a large variety of 2X and 4X CD-ROM recorders (HP SureStore 4020i, Sony Spressa, FWB Hammer CD-Rs), RAID subsystems (ATTO, FWB) and portable storage devices (Iomega, Syquest) to name a few. Tell us what you need and our salespeople will custom design a system for you. And if you happen to be in NewYork, please come and . . .

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INDUSTRY BRIEFS

The Walters-Storyk Design Group, Highland, NY, completed a redesign of the production facilities, including the addition of a soundstage, for Video Arts Studios, Fargo, NY.

Otari Corporation, Foster City, CA, secured the worldwide rights to the PicMix trademark from TG Systems, Inc., New York, NY.

The Video Systems Division of Matsushita Electrical Industrial Co. Ltd., Osaka, Japan, announced an agreement with Truevision, Indianapolis, whereby the two companies will jointly develop a DVCPRO-compatible version of the TARGA 2000 RTX.

Solid State Logic, New York, announced the sale of two Axiom digital production systems to be installed as part of Microsoft Studio's new teleproduction facility in Redmond, WA.

The Hewlett-Packard Company, Santa Clara, CA; Tektronix, Inc., Beaverton, OR; Avid Technology, Tewksbury, MA, and Panasonic announced their intent to work together to support Fibre Channel as a networking standard for broadcast and post-production industries.

Broadcast Video Systems, Toronto, Canada, sold 43 digital and analog linear keyers for use at the Summer Olympics in Atlanta.

Netter Digital Entertainment, Inc., North Hollywood, CA, reached a definitive merger agreement with Videssence, Inc., Burlingame, CA. Under terms of the agreement, Videssence will become a wholly-owned subsidiary of Netter Digital.

Videonics, Inc., Campbell, CA, announced that it has acquired all assets of KUB Systems, Foster City, CA.

PEOPLE

Clarification: Willie Scullion joined Sony Broadcast & Professional Europe, Hampshire, UK, as deputy managing director, not deputy marketing manager, as was reported in the May issue of *BE*.

Richard Rudman was named director of broadcast operations and engineering for the four CBS Radio stations in Los Angeles. He will oversee operations at KNX/KCBS-FM and KFWB/KTWV-FM.

Roger Henderson was appointed executive vice president of Chyron, Melville, NY.
Chyron also announced that Roi Agneta was named executive vice president.

Charles Peabody joined Acrodyne as international sales manager of the Blue Bell, PA, facility.

Chris Loberg was appointed vice president of sales and marketing for Texscan MSI, Salt Lake City.

Craig D. Zamzow joined Dielectric Communications, Raymond, ME, as vice president of sales and marketing.

Philip Hill was appointed research and development director for Questech, Berkshire, England.

Brian Brown was named vice president of worldwide sales and marketing for Harris Corporation's Broadcast Division, Quincy, IL.

John Falcone was named vice president of marketing/sales for the United States by Sennheiser Electronic Corporation, Old Lyme, CT.

James Conley was promoted to director of engineering at Communications Engineering, Inc., Newington, VA.

George Maier was appointed vice president of marketing for Artel Video Systems, Inc., Marlborough, MA.

Tim Schaeffer was appointed director of sales and marketing for the Otari Corporation, Foster City, CA.

Michael Guess joined Odetics Broadcast, Anaheim, CA as director of marketing. ■

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BECK BROADCAST PRODUCTS

TBC-RMT (TBC Remote Control Unit) Remote control of up to 3 TBC's. For use with internal TBC's on BVW, DVW, PVW, UVW, and BVH Beta machines or any machine using Sony BVR-50 controller. Purchased with 1, 2, or 3 modules. With 3 modules. **$960**

SCR-4X8 (Serial Machine Control Router) Input/Output: Twelve rear mounted DB9-F connectors (four controllers, eight devices). EIA RS-422 send and receive. Controls: Twelve lighted push-buttons for channel assignment. **$980**

SCP-10 (Serial 422 Patch Panel) 10x10 passive non-normalling serial data patch panel. Two rack units high. Legend strips and 10 patch cords included. **$350**

VU2-P (VU/Peak Meter with Phase Indicator) Simultaneous peak and VU display. Solid state phase indication. Highly readable LED arrays. Adjustable headphone output. Hi-impedance looping inputs. **$890**

SPK-2 (Two Channel Audio Monitor) Two channel audio confidence monitoring. Accepts both balanced and unbalanced inputs. Five switchable listening modes. Headphone output with speaker mute. **$650**

LM 2+2 (Audio Level Matcher) Provides a complete interface between an unbalanced audio device and a balanced environment. Two channels of balanced to unbalanced conversion complement two channels of unbalanced to balanced. Independent gain trims. **$212**

LM VCA (Audio Level Matcher w/Remote Gain) Two channels of independent voltage controlled gain with gain trims. Balanced or unbalanced inputs and outputs. 100 dB range with 0 to +5V control. True logarithmic response. Used for remote gain riding, remote monitor gain. **$255**

STG (Stereo Tone Generator) With simultaneous, unbalanced and balanced outputs, digital precision and crystal controlled accuracy. Provides a source of digitally generated 400 Hz and 1kHz tone for any consumer or professional input. **$305**

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MAINTENANCE TECHNICIAN/PERMANENT Part-time. Minimum two years experience in studio and transmitter equipment maintenance required. Must be self-starter. Ability to prioritize repairs and to troubleshoot analog and digital circuits to the component level required. Resumes to Director of Station Operations, WJAR, 23 Kenney Drive, Cranston, RI 02903. No phone calls. An Equal Opportunity Employer.

MAINTENANCE ENGINEER Midwest's largest infomercial production company has immediate opening for Maintenance Engineer for the dub and post facility. Experience with 1"/Beta SP/ 3/4"/ VHS and EFP equipment is necessary. Knowledge of studio equipment with emphasis on Beta and 3/4" tape formats required. Fax resume to C. McBeth at (515) 472-6043.

DIRECTOR OF ENGINEERING This is the opportunity to work for a progressive company that embraces new technology. RAMAR Communications owns & operates 3 TV and 2 radio stations in Lubbock and 2 TV stations in Albuquerque. RAMAR is seeking a motivated professional with proven ability in supervising an engineering staff & multiple projects. Position specifications: 7+ years combined broadcast experience TV & Radio; EE or EET degree preferred; Studio & RF experience; SBE certification and/or General Class (formerly FCC First Class) license preferred. This position requires project management, good written & verbal skills, and experience in budget preparation. Send resume to: RAMAR Communications, Inc., Position: Dir. of Engineering, POB 3757, Lubbock, TX 79452. (EOE)

WETA-TV/FM, Washington, DC, seeks an Engineering Manager to join the team responsible for management and supervision of the division's television production staff and technical facility. Station is getting ready to build ATV/HDTV facility. Responsibilities include: immediate oversight and quality control of the technical side of productions; hands-on supervision of technical and operational matters; direct supervision of satellites and circuits for production activity; and front-line manager and supervisor on remote productions. Qualifications include: BS degree in relevant field or equivalent, 7 yrs. exp. in a national, network-level TV production operation, including 5 years at a managerial or supervisory level. Thorough knowledge of current and conventional audio/video signal transmission technology applications, broadcast and production technologies, experience with the Washington, DC news-gathering environment and general FCC Radio Telephone license. Salary $49,000 to $62,000. Send resume and cover letter to WETA, Human Resources Dept./EM, P.O. Box 2626, Washington, DC 20013. EOE/D/M/F/V. WETA JOB INFORMATION LINE - 703-998-2738.

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CHRISTIAN TELEVISION NETWORK seeking qualified Chief Broadcast Engineer with experience in Transmitter and RF system. Production and Transmitting video systems, and Component level repair of all electronic equipment involved in TV production and broadcasting. The Network is seeking individuals who are goal oriented, quality minded and self-motivated. If you meet our criteria and share our vision and purpose, send your resume to: Tri-State Christian TV-Employment, P.O. Box 1010, Marion, IL 62959. An Equal Opportunity Employer.

UHF BROADCAST ENGINEER Religious television network. Duties include transmitter maintenance, trouble shooting and repair for master control, video tape and audio production systems. Needs to have knowledge of microwave and translator. FCC or SBE certifications preferred. Traveling is required. Only resumes with salary requirements will be considered. Forward to Chief of Staff, PO Box 81521, Mobile, AL 36689, E-Mail: Sbox @ Pipeline.com, or fax (334) 633-2174. Equal Opportunity Employer.

MAINTENANCE ENGINEER: Dynamic, Fast growing subsidiary of VIACOM INTERNATIONAL is currently looking for a Maintenance Engineer to assist in the maintenance of our tape duplication department. Qualified candidates must have at least 2 years experience working with broadcast tape systems. Must be capable of troubleshooting to component level. Degrees welcomed but not necessary to qualified individual. Resumes to: Joseph E. Ashton, Engineering Manager, VIACOM/MGS SERVICES, INC., 619 West 54th Street, New York, NY 10019 or call (212) 765-4500.

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BROADCAST AND AUDIO/VIDEO TECHNICIAN The National Technology Transfer Center (NTTC) at Wheeling Jesuit College is expanding its operation in television production and telecommunications. This position will join the technical staff of the Classroom of the Future (COTF) forming a new production team. This position requires taking directions well, working as a team member, and under the pressure of deadlines. Computer literacy is required. Responsible for providing technical support and maintenance for the television production and broadcasting facility. Responsibilities include master control operation; camera operation; editing; all aspects of audio and video production; lighting, etc. Responsible for operating, maintaining, and trouble-shooting audio/video systems. Detailed position description may be found in the staff section of the COTF home page (http://www.cotf.edu/staff). To apply submit a letter of application, resume, three references, and transcripts to: Susan Tate, Director of Human Resources, Wheeling Jesuit College, 316 Washington Avenue, Wheeling, WV 26003. A review of applicants will begin on July 26, 1996.

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VIDEO ENGINEER High-end corporate video communications facility has immediate opening for senior level engineer. Minimum 10 years experience with component-level troubleshooting and operations skills on three-suite, post-production facility, EFP equipment and computer systems. Please mail or fax resume to Video Engineer, Phillips Petroleum Company, C-25 Phillips Building, Bartlesville, OK 74004, FAX 918-662-1119. No employment agency referrals. An equal opportunity employer.

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By Paul McGoldrick

New compression chips

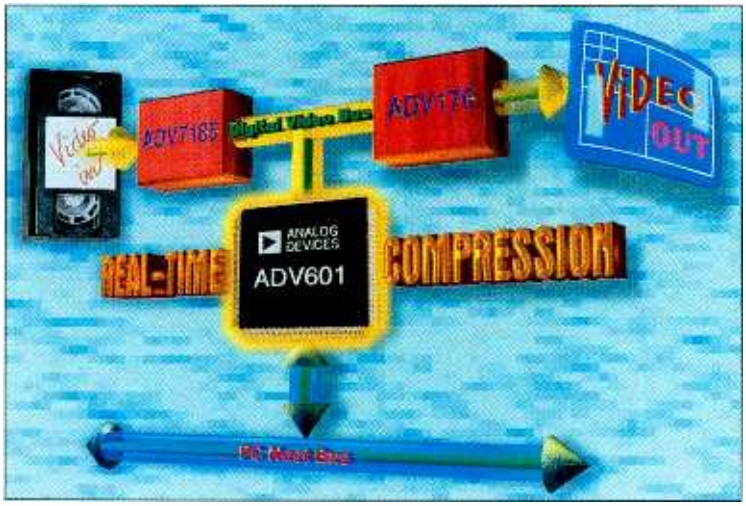
Me and my big mouth. In the June column talking about compression systems, I said, ". . . we are a conservative industry, and having taken so long to find DCT, we are going to be living with it for quite a while. You will see, however, an increasing number of uses for wavelet and fractal techniques in video applications more specialized than our small information section." Now I have to pat myself on the back and kick myself at the same time because the wavelet breakthrough has, I believe, happened.

Wavelet compression

In June, Quadrant International (QI) showed its new VideoWave at the spring Comdex in Chicago (a much more civilized affair than the monster fall show in Las Vegas). This is a PCI-based nonlinear video editor selling for $499. No, this has not become a product column; the key to the unit is the compression chip that it is using. This is a video codec IC using wavelet compression. It is the first wavelet implementation on silicon and originates from Analog Devices. It allows compression and decompression of 10-bit CCIR-601 signals from visually lossless down to 350:1.

The QI product is for the mass market with VHS video capture, editing, playback hardware and software. The expectation of all the analysts involved in multimedia seems to be an agreement that desktop video production will be as pervasive as desktop publishing, but the implications for the professional field are massive. The ability to record 25 minutes of VHS quality on 1GB of hard disk is significant (even more so, if somebody would define exactly what VHS quality is). From a professional viewpoint, however, there is now a viable, editable alternative to MPEG and JPEG. We will, without a doubt, see the QI system producing pictures on-air, but it will be the future developments that will be the most interesting.

Wavelets offer the major advantages of being totally scalable, symmetrical and error-tolerant. The scalability is key: compression can be chosen for the transmission environment and can be varied "on-the-fly" as needed. If material is archived, there is less concern about the final transmission standard because it can be transmission-compressed differently as progress takes us to new standards. Editing can be on-the-fly too, and the error tolerance is inherent because the compression is based on the whole image, not just arbitrary blocks chosen for convenience. Loss of data does not result in the loss of a block, and reconstruction is an easy mathematical process.



The first wavelet-based IC, Analog Devices' ADV601 provides low cost, high-quality real-time video encoding and playback for PC-based capture and editing.

Motion-detection characteristics in wavelets are also stunning and simple compared to DCT compression solutions. The mathematical needs of an effective motion-detection unit can be seen in the cost of the higher-end standards converters. But the mathematics of wavelets has always been daunting to the majority, and the reliance has been on a number of small research groups, mostly university-based, to try out various algorithms. Decisions, such as one by the FBI to use wavelet technology to store and compare fingerprints, should be seen as a by-product of the research. Recently, the ability to "what if" has been greatly simplified with a wonderful tools package for wavelets from The Math Works as a supplementary package to its MATHLAB software. The package is a great bridge between development/analysis and implementation.

The biggest message with wavelets in this first silicon implementation is in the cost. The Analog Devices' chip, the ADV601, uses about the same silicon area for compression as it does for decompression. Volume pricing on the chip is less than $40 and included on the chip is SRAM to minimize the external component count. Compare that to the cost of an MPEG-2 coder marked by numbers in the double digits of thousands of dollars.

One large semiconductor manufacturer worked for a long time on a silicon solution for wavelets and refused to join the MPEG society. Bowing to market pressures, the company, however, finally joined. The only comment by the VP responsible for the video group after being shown the Analog Devices' data was, "Damn."

Is this the end of JPEG, MPEG-1, MPEG-2 and the yet-to-come MPEG-Xs? Hardly. The momentum of the current compression standards is going to keep them going for at least another 10 years. But price differences are going to create some interesting equipment choices for users. Is the Analog Devices' chip using the best possible wavelet algorithm? I don't know; others will certainly tell us. If we take the common multipliers of our industry, the QI VideoWave could be an RGB machine for $1,000, D-1 for $2,000. Not at all disinteresting numbers for a nonlinear editor.

Disagree? Agree? Let me know at 74672.3124@compuserve.com. ■

Paul McGoldrick is a freelance writer and consultant based on the West Coast.

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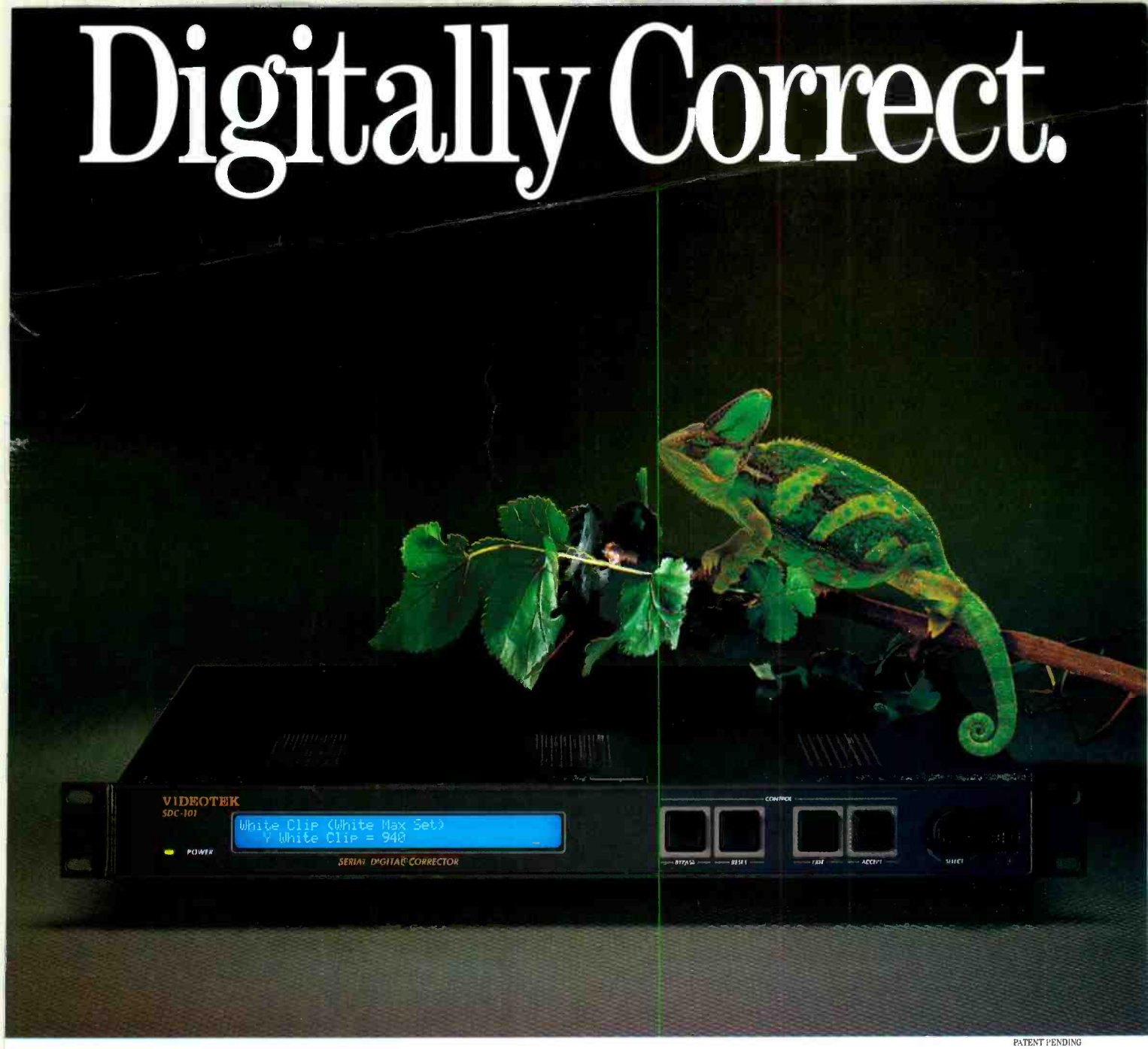

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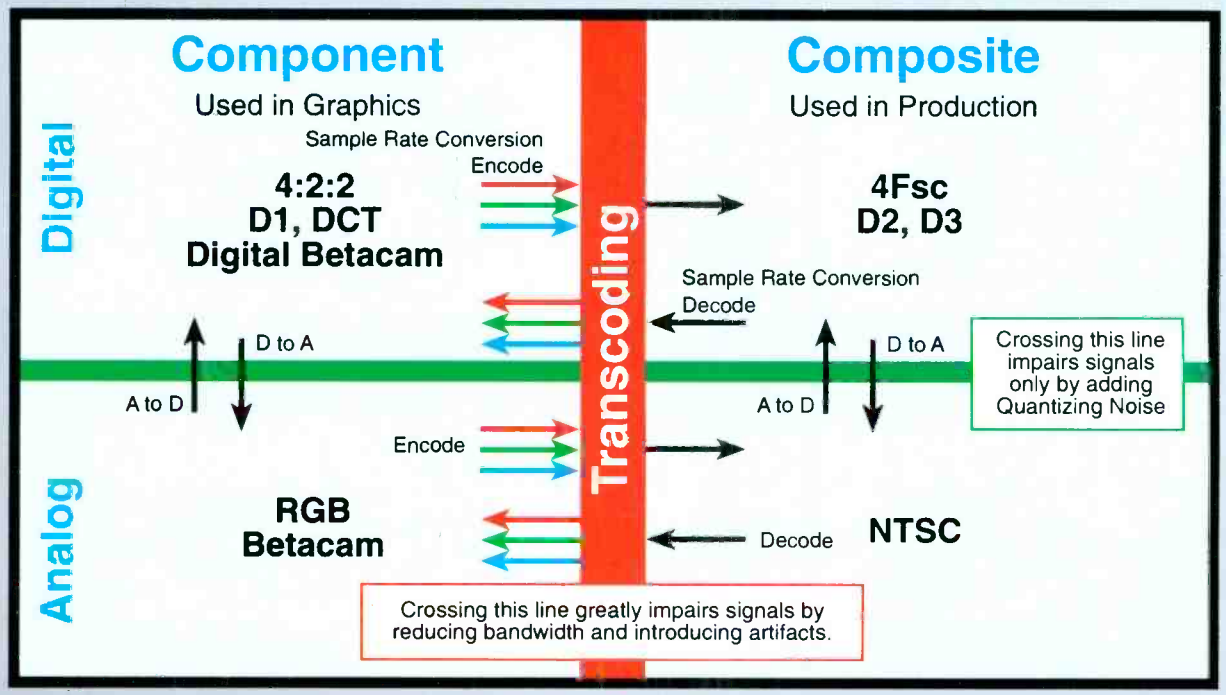

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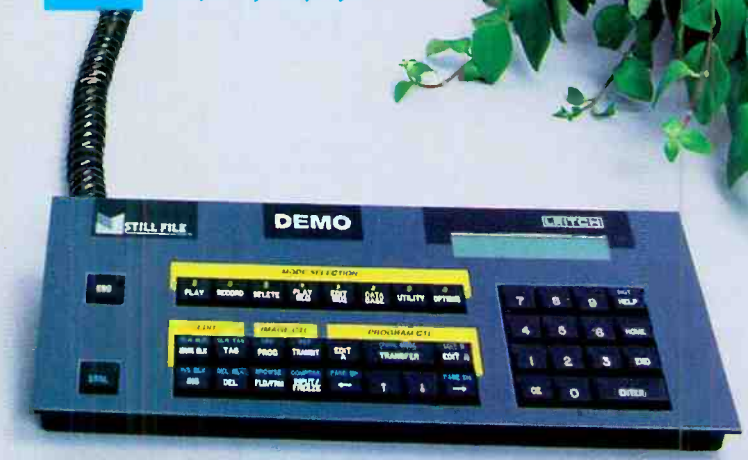

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