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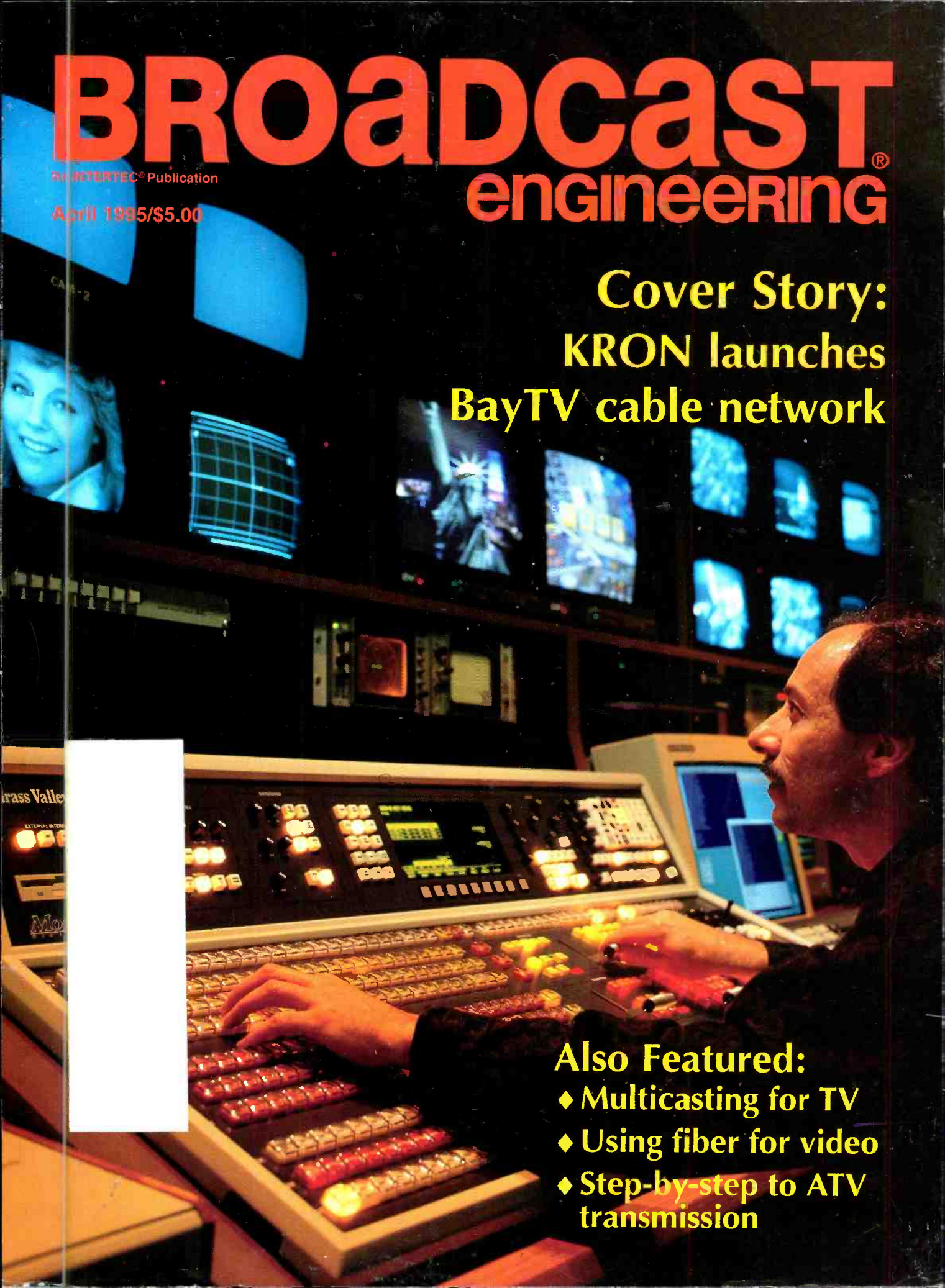

Cover Story: KRON launches BayTV cable network

Also Featured:

- Multicasting for TV
- Using fiber for video
- Step-by-step to ATV transmission

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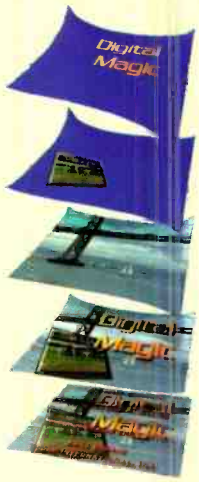

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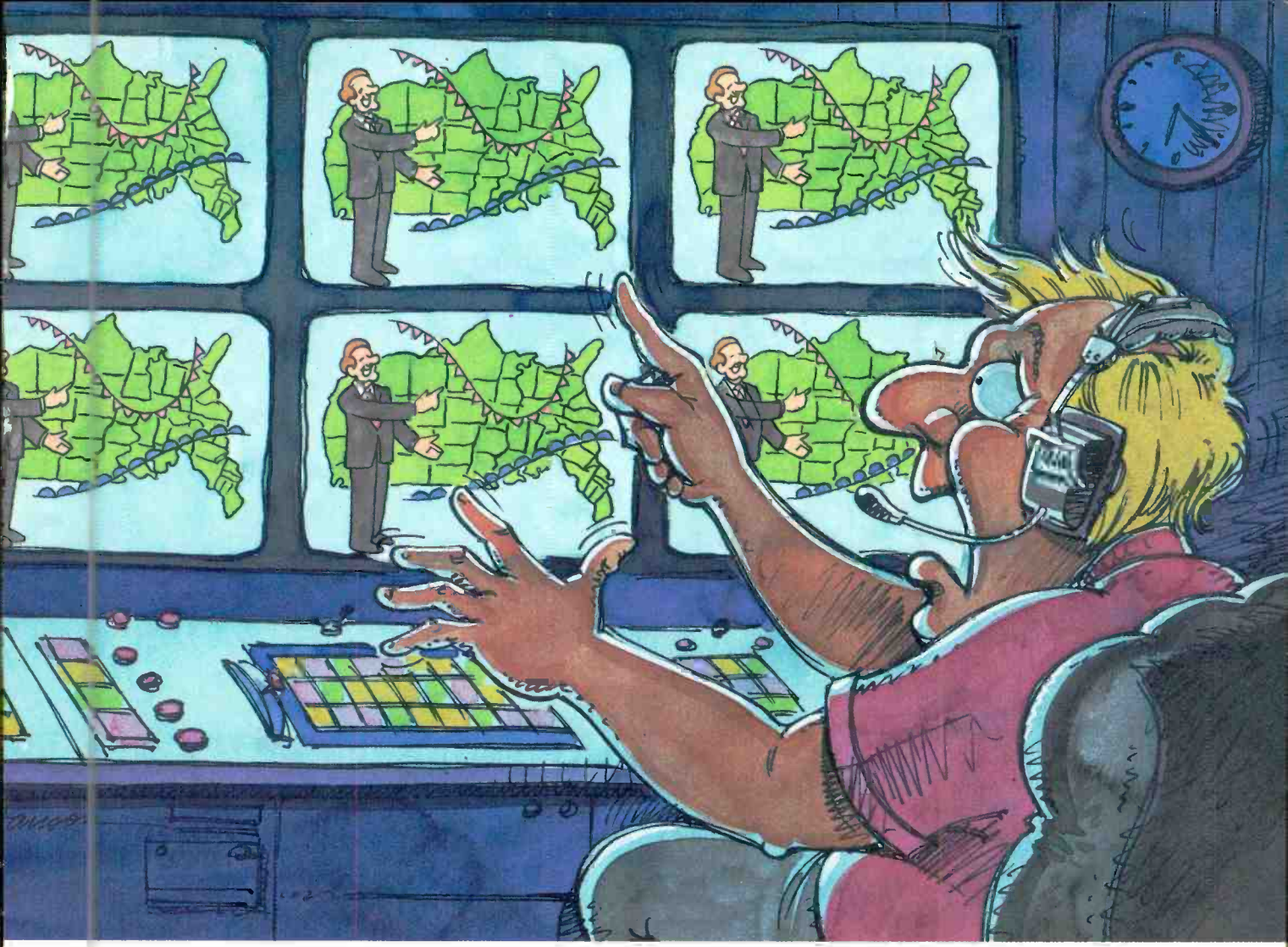

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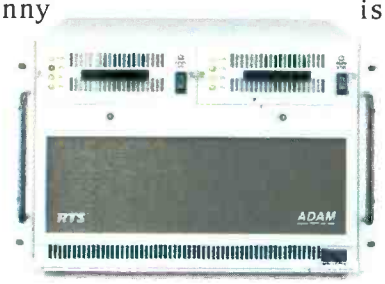

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ON THE COVER: Cover courtesy Grass Valley Group, GVG 4000 digital video production switcher.

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By Dawn Hightower, senior associate editor

Telcos to comply with FCC cable rules

According to NAB, when a telephone company offers video programming to subscribers, the Communications Act states that the telco is subject to cable regulations including must-carry, retransmission consent and program non-duplication rules.

On March 21, NAB filed comments regarding the FCC's proceeding to determine how its video dial-tone rules will be affected by court decisions allowing telephone companies to provide video services inside their service areas.

The Communications Act envisions only common carriers that exclusively provide transmission capacity and cable systems that offer video programming. Once telcos provide video programming, the language of the Act and a recent court decision make clear that they become cable operators subject to cable regulations.

NAB said this does not preclude the FCC from tailoring its regulations to the particular circumstances of a telco's proposal to provide video programing in conjunction with video dial-tone service.

According to NAB, because channel positioning and other rules developed for the cable model may not apply to the telephone company environment, new types of regulations dealing with menuing, navigation and software systems may have to be adopted. The commission needs to establish the principle that the core parts of its cable regulations apply fully to telephone companies that provide video programming.

NAB also agreed with the FCC's tentative conclusion that it would be constitutional to retain the prohibition on telephone companies' purchase of in-region cable systems that have no multichannel competitor.

The proposal maintains its pro-competitive nature by foreclosing phone companies' ability to buy out their primary video delivery competitors. However, it still ensures that phone companies would be able to build their video delivery systems, which could be either video dial-tone or traditional cable.

Panasonic introduces DVCPRO tape format

Panasonic's DVCPRO is the latest news on the professional format front. The DVCPRO systems record 4:1:1 component digital video using 5:1 intraframe compression that supports frame-accurate editing. The system uses cassettes that come in two professional sizes. One is about the size of 8mm videocassettes (one hour for camcorder) and the other size is a little bigger than a thin deck of cards (two hours for studio deck).

DVCPRO is semi-compatible with the upcoming consumer format. The format of 20 microns was agreed to by a consortium of companies. The consumer format, DVC, is to be released later this year.

The pro version adds a cue track and a control track as well. As a result, consumer DVC tapes will be able to be played on DVCPRO machines, but DVCPRO tapes will not be able to be played on consumer machines.

Along with the tape products, Panasonic is offering a digital optical disk recorder that can record up to 45 minutes of digitally compressed video and two channels of audio.

Panasonic plans to submit its DVCPRO standard to SMPTE.

McKinley directs NAB Employment Clearinghouse

Michael McKinley has been named director of NAB's Employment Clearinghouse. It is a free job-referral service for radio and TV stations. The Employment Clearinghouse is part of NAB's human resource development department. It is a diversity-oriented service that helps broadcast stations recruit minorities, women and others interested in a broadcasting career.

FCC clears phone firms' video plans

The FCC has taken major steps to allow telephone companies to compete against cable TV operators by delivering video programs to homes.

The FCC approved five applications by Chicago-based regional Bell Company Ameritech Corporation, to provide video service over phone lines to 1.3 million homes, businesses and institutions in parts of Illinois, Indiana, Michigan, Ohio and Wisconsin.

The commission wants to introduce competition into cable-delivered television, which traditionally has been operated as a monopoly. However, there are major questions about financing and the technical feasibility of the phone company's proposed service.

Ameritech plans to offer 390 channels of advanced TV services, such as 2-way, interactive shopping and banking, as well as movies that customers could order and view right away. Various video programmers would lease blocks of those channels to provide a variety of offerings.

The FCC rejected Ameritech's proposal to designate up to 13 channels, which would include retransmission of over-the-air broadcast and public channels as "common channels" that would be made available on a non-discriminatory basis to all programmers. Ameritech failed to explain how that concept would work.

The FCC imposed conditions on the company to guard against it improperly charging phone subscribers for the cost of building the video system. ■

Calendar of events

May 7-10
NCTA in Dallas (202-775-3629)

June 9-13
International Television Symposium in Montreux, Switzerland
(+41 21 963 32 20)

June 14-17
SCTE in Las Vegas
(215-363-6888)

June 15-17
INFOCOMM/ITVA in Dallas
(INFOCOMM -- 703-273-7200
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MACWORLD in Boston
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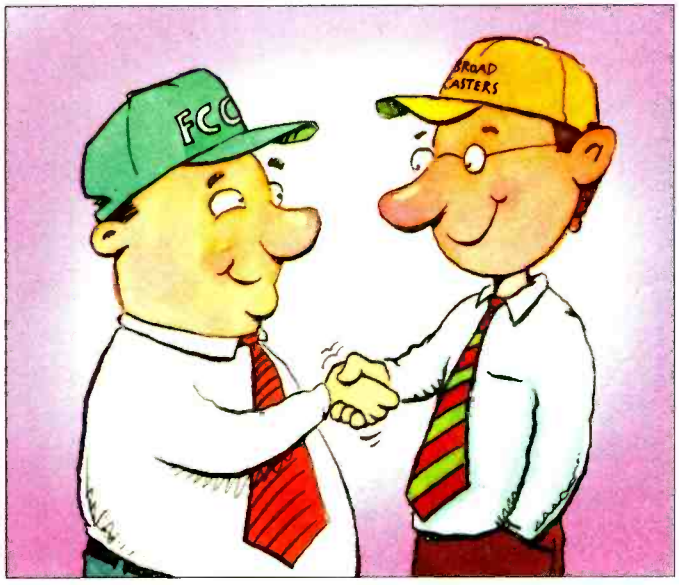
A win-win situation

The term deregulation usually elicits catcalls from the broadcast technical community. Engineers especially have visions (and sometimes real examples) of how deregulation has adversely affected the broadcast industry. Whether it was the loss of the First Class License, or the elimination of the previously required technical tests and parameters, less governmental regulation has sometimes carried with it some drawbacks. However, I've found one example of where that has not been the case. In fact, it's a perfect case of where less is more.

In an effort to help stations remain compliant with commission's rules, the FCC's Kansas City office and the Missouri Broadcasters Association (MBA) have developed a program that helps stations comply with the regulations while reducing their risk of an FCC inspection. The program allows stations to undergo an FCC-like inspection without the drawback of being fined if they fail. It works like this: Members of the MBA can, for a fee, arrange for a technical inspection of their radio or TV station by an independent engineering contractor. This individual works under contract for the MBA and is not affiliated with the FCC. Although he has received some instruction on how the FCC performs inspections, he carries no governmental authority to cite, fine or even notify the commission of his findings.



Upon paying the fee, the station is then inspected by the contract engineer. The results of the inspection are then shared with the station. Once the station passes, the FCC's office in Kansas City is notified that the station has passed the inspection. If the station fails the test, no one other than the station, the contract engineer and MBA know. If the infraction is minor, the station may be able to verify that the problem has been fixed and not have to undergo another inspection.

A station can take the test as many times as it's willing to pay for. It's only when the station passes that the FCC is notified of its passing grade.

So where's the advantage to the station?

The Kansas City EIC has agreed with the MBA that all stations passing the inspection will not be inspected by the commission for two years. This covers the regular surprise inspections typically conducted by field engineers. The exception would be where possible interference or complaints are evident. Otherwise, the station management and engineer can rest in confidence that not only are they operating in compliance with FCC rules, but that there will be no surprise visits by FCC inspectors for two full years. What peace of mind!

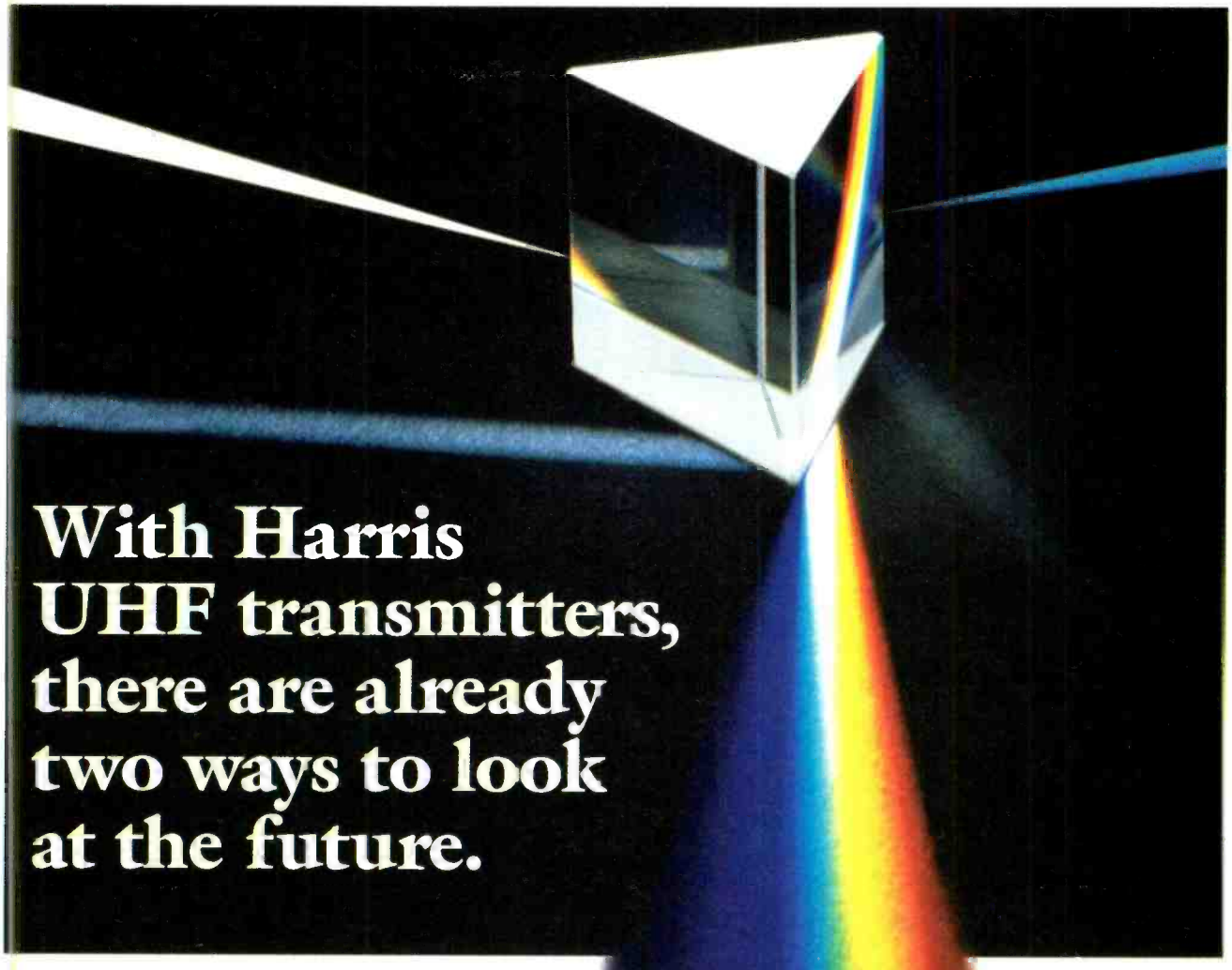
This cooperative arrangement should be lauded and emulated by all other state broadcast associations. It represents the best of governmental deregulation and industry cooperation. Everyone wins. First, the stations win by knowing they're in compliance with the rules. Second, they know they will not be inspected for two years. Third, the commission wins by knowing what stations have made the effort to ensure compliance and therefore don't need to be visited for two years. And finally, the public wins because stations police themselves, which helps ensure quality service.

I urge other state associations and the Society of Broadcast Engineers to contact their local FCC office and begin immediately setting up similar plans. Don't wait for that dreaded knock at the door, "I'm from the government and I'm here to help you." Help yourself, your station and your audience by participating in this excellent example of industry-government cooperation.

Brad Dick

Brad Dick, editor

Editor's note: If you would like more information on setting up a similar program in your area, contact the Kansas City FCC office: James Daily, EIC, at 816-333-3773.



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By Harry C. Martin and Andrew S. Kersting

Raid on 2GHz

In a January rulemaking, the FCC has proposed to reallocate 1,990MHz-2,025MHz from its current TV auxiliary use to the Mobile Satellite Service, which lost its spectrum to PCS in 1992. Currently, 1,990MHz-2,025MHz is used by TV stations primarily for ENG. The 1,990MHz-2,110MHz also is allocated to cable TV microwave relays (CARS) on a shared basis. To accommodate displaced broadcasters and cable operators, the FCC is proposing to relocate them to the 2,110MHz-2,145MHz band. Costs of the move would be assumed by the licensees who are required to move.

In a related action, the FCC has set aside 4,660MHz-4,685MHz, which previously was government-occupied spectrum for fixed and mobile services including broadcast ENG, STLs and ICRs. However, it's unclear whether the FCC's allocation is being earmarked for exclusive video use or will have to be shared with other services.

"Reinventing" the FCC

The FCC's response to Vice President Gore's mandate to federal agencies to "reinvent government" is in a report issued in February by the commission's special counsel, Mary Beth Richards. The first part of the report describes the agency's efforts over the past year to eliminate backlogs, improve processes and reduce regulatory burdens. More interesting, however, are the proposals for administrative and rulemaking actions that will streamline FCC operations:

- Simplify and clarify the criteria used in comparative hearings to choose among competing applicants for new broadcast facilities.
- Amend Part 74 with regard to the Instructional Television Fixed Service to create a window filing procedure.
- Streamline and consolidate the equipment authorization process, including shifting to electronic filing.
- Delete the requirement for TV receiver manufacturers to file an annual report of the UHF noise figures for their receivers.
- Delete the requirement for TV receivers manufactured after January 1995 to incorporate closed-caption compatibility for cable systems that use the Eidak encryption technology, which is never used.
- Relax the marketing and administrative rules related to equipment authorization.
- Remove restrictions on the use of frequencies above 40GHz and open up spectrum for licensed and unlicensed services.
- Authorize the use of electronic mail and electronic filing.
- Make the effective date for delegated authority items the release date to a public network like Internet.
- Delegate to the designated frequency coordinators authority to deal with Canada for frequency coordination.
- Simplify procedures for certification to the requirements of the 1988 Anti-Drug Abuse Act.
- Simplify or eliminate several filing requirements for microwave stations, including expansion of the types of station modifications that don't require FCC approval.

Proposals to Congress for changes in the Communications Act include the following:

- Modify the prohibition against the commission waiving the requirement for a broadcast construction permit. This proposal would give the agency flexibility to determine when permits are necessary and when construction can be undertaken without prior approval.
- Provide that a license authorization for a station silent for one year automatically cancels. This would save FCC resources, eliminate undue protection of non-operational stations, and allow operational stations greater flexibility in changing frequencies and upgrading facilities.
- Extend TV license terms from five to seven years. This would make the license terms for radio and TV identical and reduce costs for the TV industry and the commission.
- Legalize the broadcast or cablecast advertising anywhere in the United States of any lottery enterprise that is lawful where conducted.
- Simplify the broadcast license renewal process by establishing a 2-tiered process. First, the incumbent licensee's performance during the preceding license term would be compared only against statutory standards and not against any competing applications. Second, the renewal application would be automatically granted if the statutory standards are met or exceeded, or designated for hearing if the standards aren't met.
- Authorize the use of private, independent testing labs to test and certify radio equipment in order to ensure compliance with technical standards for radio-frequency (RF) emissions.
- Authorize the FCC to: a) retain fees above a certain sum sent to the treasury, b) amend fee categories, c) exchange the amounts of fees, and d) create new fees.

DATELINE: JUNE 1

On June 1, 1995, broadcast stations in the following states must file their annual ownership reports: Arizona, Washington DC, Idaho, Ohio, Oklahoma, Maryland, Minneapolis, Nevada, Texas, Utah, Virginia, West Virginia, New Mexico and Wyoming. May 31, 1995 is the deadline for filing annual employment reports (FCC Form 395-B).

ITFS processing revamped

As part of its "reinvention" initiative, in February, the FCC adopted rules to increase the efficiency of its processing of applications for new Instructional Television Fixed Service (ITFS) stations, major amendments to such applications, and major changes to existing stations. The rules will lower regulatory barriers to the deployment of wireless cable by facilitating rapid authorization of new and modified ITFS facilities. The specific changes involve adoption of a window filing procedure, which will allow it to accept, consider and dispose of ITFS applications in the most efficient and timely manner possible. The new window procedure will be enhanced by a proposed electronic filing and processing system. In addition, the commission will limit sales of unbuilt ITFS facilities to out-of-pocket expenses.

The FCC also adopted a number of technical rules designed to further streamline the ITFS window application filing system. It also incorporated into its rules the 20-mile (radius) "area of operation" standard to limit to four the number of channels a single operator may have in a community. ■

Harry C. Martin and Andrew S. Kersting are attorneys with Reddy, Begley, Martin & McCormick, Washington, DC. Respond via the *BE* FAXback line at 913-967-1905 or via e-mail to be@intertec.com.

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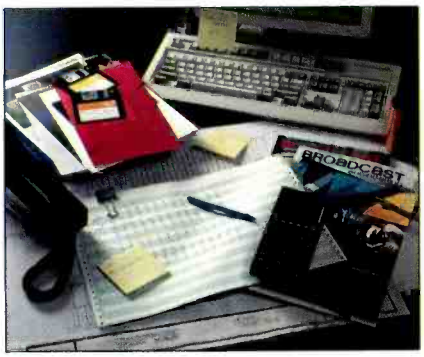
By Curtis Chan

Personal chemistry, part 2



Last month we looked at communication and how it's vital to your personal and professional success. This time we'll explore the nuances of negotiating the best possible job responsibilities, salary and benefits.

Unless you're a seasoned negotiator, chances are that at one time you may have "missed a step." These missed opportunities can add up, representing significant reductions in professional growth and financial compensation. The following guidelines will come in handy the next time you voluntarily or involuntarily enter a career crossroads.

Reviewing the rules

The first rule is that *winning isn't everything*. Intimidation and attack strategies have no value in an employment negotiation. The technique of one-upmanship can cost you the job. In an employment situation, you don't want to be overly aggressive. The way you handle yourself will set the tone for your long-term relationship. The best negotiators are low-key. They avoid potential irritations. You don't want to be argumentative or emotional nor cold and calculating. Being sincere and reasonable makes the best impression.

Next, *start when the employer is sold*. Never attempt to negotiate until the employer is sold on you. After the "sale," one technique is to *express some vulnerability*. This can be an effective weapon and is done by letting the employer know that accepting the job on the terms offered would cause personal difficulties. This plays to the employer's desire to make sure that you're happy, so you can devote your full energies to the job.

The negotiating process is one of effective communication. The next thing to remember is to *question, rather than demand*. The best negotiators persuade others through questions. This gives them the information they need to put themselves in control of the situation. It also gives the negotiator time to think, thus avoiding "laying all the cards on the table." Your goal is to let the company discover the validity of your request. Now it's time to know what to negotiate for.

Negotiating

Negotiate the job itself. The most important thing you can negotiate isn't money but the nature of the job. This is because the range in which you will negotiate compensation is determined by the nature of the job. Begin with a positive comment about the job or firm. Suggest that they might benefit by adding certain responsibilities. Share your thoughts on what might be added. Talk about areas of activity where the company could capitalize on your experience. Tell how you have made contributions in these areas.

Avoid money talk

Now that we've gotten past the responsibility stage, it's time to talk turkey. The most important thing to remember is *avoid discussing money*. In most cases, the first to discuss money loses because it gives the other person an advantage. If you cave in first, the employer will have an idea of your compensation range. Keep in mind that you don't have to answer the question, so be polite, avoid confrontation, arguments or abrupt, terse statements.

Your job is to seek as much responsibility as you think that you can manage, then negotiate compensation. At this point, if you haven't already done the research, you need to *find out the salary range*. Don't be surprised if the prospective employer, like you, evades the issue. Try the U-turn principle if this happens. Back away from confrontation by turning the discussion in another direction. Revisit the salary range that they have in mind at the next opportunity in the conversation.

After all of this, you still may find that the offer is too low for your consideration. The next step involves *what to do when the offer is too low*. It's important to avoid the urge to negotiate for a higher figure. Following are three ways to further your negotiation:

1. Raise the possibility of redefining the job.
2. Make a positive, 20- to 30-second statement about the company and the position. Rather than dealing with redefining the job, show vulnerability as previously mentioned. Suggest a specific dollar amount to be added to the base salary.
3. Use your enthusiasm as a negotiating technique. Even if you don't succeed, it may be possible to negotiate an early review.

Effective negotiators also *set goals* that blend optimism with realism. They *avoid accepting offers on the spot*. Rarely will you be forced to by an employer to make a decision at the time of the offer. It's also often wise to *negotiate a percentage increase*. Negotiating in percentages sometimes sounds better than haggling over equivalent monetary amounts approaching thousands of dollars.

Try to negotiate futures. There are many hidden company perks that can make up the difference in a low salary. Their value to you could well exceed a couple of percentage points in salary, unless you're making more than $100,000 per year. See box below for examples of company perks.

- Base salary and commissions
- Severance
- Bonus
- Memberships
- Profit sharing and/or pension plans
- Relocation allowance/interim living
- Medical and life insurance
- Stock option
- Vehicle use or compensation
- Bridge loans -- finance
- Charge cards and expense accounts
- Spouse employment assistance

In many cases, *employment contracts* are a legitimate tool in the final stages of negotiation, particularly for management positions. They needn't be complicated, so keep the contract simple and keep your lawyer behind the scenes. Basic requirements include the length of agreement, specific assignments, title, location, report structure, compensation and exit recourse. More involved contracts deal with minimum compensation, bonuses, deferred compensation, moving expenses, outplacement and post-employment medical insurance continuation (COBRA). For executives earning above $60,000, these contracts are important when dealing with companies that are financially troubled, candidates for acquisition, recently merged or acquired, family controlled, or where one individual dominates the environment. Executives should also consider termination agreements with minimum severance equaling six months, relocation expenses, insurance for up to 12 months and outplacement assistance.

Negotiating for job duties, salary and benefits can be complicated, if you choose to look at the process that way. It's actually more of a game with the obligatory set of rules, none of which are carved in stone. Like any game, practice makes perfect. Think through the negotiation session, visualizing a successful outcome. Repeat this process to develop an effective game plan that can lead to long-term career victories. ■

Curtis Chan is president of Chan and Associates, a marketing consulting service for audio, broadcast and post-production, Fullerton, CA. Respond via the *BE* FAXback line at 913-967-1905 or via e-mail to be@intertec.com.

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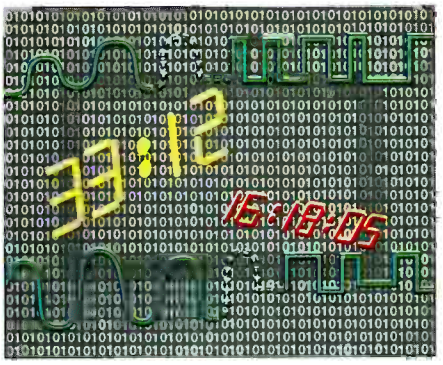
By Les Brown



Serial digital video

The first part of this discussion about serial digital video basics concluded with the thought that our comfortable composite video paradigm for broadcast might be about to change. That doesn't mean the transmission of component video will start in the immediate future, although ultimately, it may do just that and in digital form.

The analog composite system actually begins with component video.

The analog composite system actually begins with component video. Consider the camera: three pickup elements, one for each color component; red, green and blue. About the only time we think about these three individual elements is when thinking about chroma-keying. Even so, the camera output is composite. Graphics generation is similar and we are much more aware of the encoder because we have to pay for it separately.

Either way, video starts as component and must, at some point, be converted to composite to be transmitted. Despite the wider bandwidth of the color signals, they still must be transmitted through a system originally designed for black-and-white service. Because it's not possible to send three full-bandwidth signals of component video through a system designed for monochrome, they have to be squeezed into what's available. Don't like the term "squeezed?" How about "compressed" or perhaps "encoded?" Now the process starts to sound familiar. Unfortunately, to get the three channels of information down to one channel, tradeoffs must be made and we've seen them: artifacts like dot-crawl and moire.

The digital barrier

Let's look at some of the conversion processes that take place in the digital world. There is a tendency to substitute *format translation* for *encoding* and *decoding* when relating digital component to digital composite video.

It's tempting to think it is possible to multiply the 270Mb/s rate of serial component digital video by a magic number then divide it down to 143Mb/s and have instant serial composite digital video. It isn't so. That 270Mb/s datastream consists of three distinct components. The conversion process requires that the three components be encoded into a single signal then reduced to a 143Mb/s datastream.

To go the other way, 143Mb/s to 270Mb/s, the process is decoding. The processes are mathematical but not simple multiplication and division; the algorithms are complex and precise. Though they can automatically fine-tune according to picture content, there will still be imperfections, and minute as they may be, they're still there.

Because of those imperfections, it was understood from the beginning of color that avoiding encoding, or at least putting it off until the last possible moment, would result in better pictures. Still, nobody gave much thought to building an all-component facility. Economics dictated that the old monochrome infrastructure remain intact. Its one-signal-per-cable architecture supported direct substitution of a composite color device for a similar monochrome device. To go component meant triplicating the whole structure. In the component domain, whether RGB or Y, R-Y, B-Y, there are three signal paths that require three identical lengths of coax between each device. Distribution demands three amplifiers that are closely matched. Besides, encoders were built into or supplied with almost everything made for color television.

Encoding to a computer type may mean compressing the signal, not generating composite video from component video.

The economics were simple — better images could result by remaining in the component domain. But in order to transmit the signal, it had to be encoded to composite and the end result would be lesser-quality pictures. The solution turned out to be simple — do the encoding at each source device and avoid the triplication required by a component facility. The end result would be the same in terms of image quality.

There were islands within a station, notably graphics, where component design made sense, especially with component analog recorders. This same logic produced component installations away from the stations, especially in film-to-tape transfer and high-end commercial production and post facilities.

There is an important housekeeping matter to keep in mind when using the terms encoding and decoding. The video and computer industries have not yet (and may never) adopt a common meaning for these terms. Encoding to a computer type may mean compressing the signal, not generating composite video from component video.

Digital economics are different

As long as digital was exclusively parallel, it didn't make sense for broadcasters to use it except inside devices. The conversion cost and headaches of parallel cables were overwhelming obstacles. Established makers of production switchers identified a strong market in the post-production industry where analog component already had a foothold. Besides, component production was favored internationally because of the inherent editing problems of the 8-field sequence of PAL-related video. Start-up manufacturers saw it differently and risked introducing composite digital switchers with parallel digital and analog inputs and outputs.

When serial digital became economically available, it all changed. Once digital video was serial, component or composite, complicated parallel cables were not needed and only one coax path was required.

BNCs broke out like measles on the back of digital tape machines! Because analog or digital composite video (with the right choice of options) could be put into a composite digital production switcher and the output taken as serial digital, why couldn't it be recorded directly to digital composite tape without an intervening D to A step? It looked like broadcast was going composite digital from camera to just short of transmission! But remember — cameras and graphics devices are inherently component. Just as in the analog

world, in a composite digital approach the economic and picture-quality costs are paid at every source.

When quality is free, everyone wants it

Just as production switcher and digital effects manufacturers unleashed new composite switchers, we took a harder look at the advantages of serial component technology. Because serial digital video, component or composite, travels on a single coax path, the daunting triple-cost drawback of analog component was gone. Distribution cost was back under control; we no longer needed three DAs per signal or a multilayer router.

Component serial digital costs the same to distribute as composite — maybe even less because an encoder is not needed at every source device. Some of the savings are offset at the production switcher, but the price difference between digital component and composite switchers is small in comparison to the disparity in the analog world. The economic tie-breaker was now on the record/playback side. If the decision hinged only on the relative price of D-1 vs. D-2 or D-3 machines, composite would remain the probable winner.

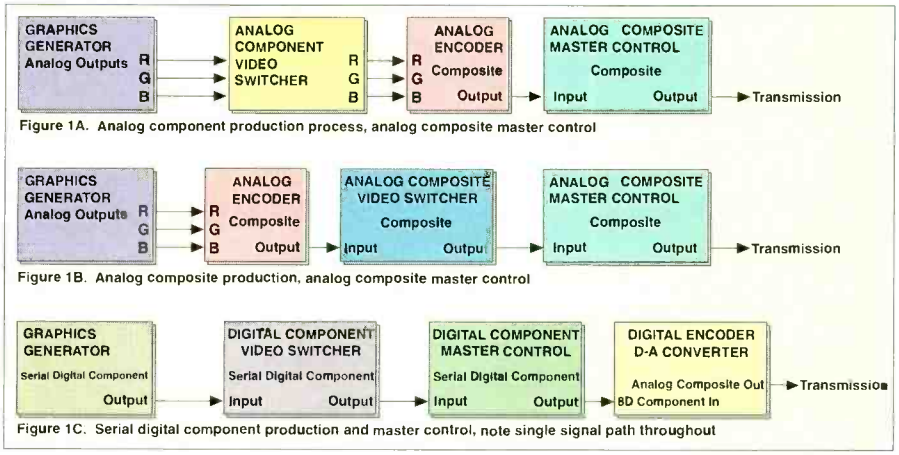


Figure 1. Pictured above are possible signal implementations. Figures 1A and 1B are analog hybrid systems. Figure 1C is a digital system that only encodes the signal to composite when necessary, prior to transmission. If serial digital transmission becomes a reality, the encode is simply removed from the signal path.

New recorders shift the balance

As broadcasters pondered the composite or component future, a flurry of new component tape machines was released. Digital Beta, DCT and D-5 are all tape formats, but their inputs/outputs comply with SMPTE 259M. Many of the machines also offer analog I/O, composite playback, and in the case of D-5, 360Mb/s record/playback. These new machines make the recording costs between composite and component comparable.

Even if the higher quality/lower maintenance attractions of digital were set aside and broadcasters went shopping for analog devices, it would be difficult to get the latest

effects or any sort of recording device that isn't at least internally digital. Because analog-to-digital and digital-to-analog conversion isn't free, and serial digital can use existing cabling, it makes sense to evolve toward digital. The tougher decision remains whether to go component or composite.

The component edge

When planning a new facility, the component design offers an impressive edge. Capital costs are not radically higher for component than for composite gear of similar design and construction quality. Also, systemization costs are almost identical. Integrating composite digital equipment from the previous facility (if there was one) would add conversion costs, but the quality of the encoders and decoders needed has increased in recent years while prices have plummeted.

The one place where the absolute best in encoding is required is just prior to transmission, and for now, a digital to analog conversion is still needed. This is typically available as an internal option for a quality encoder. A backup encoder is advisable because it's the bottleneck through which everything must pass before it hits the air.

With an existing facility, the economics are not so clear. A lot of equipment may not be replaced immediately. Some of it is probably already composite digital, at least internally. That makes a good argument for integrating a new composite digital production switcher and possibly digital master control as well.

When planning a new facility, component design offers an impressive edge.

With careful planning, much of the infrastructure, cabling, routing and distribution will remain usable providing for an orderly evolution to a component digital future.

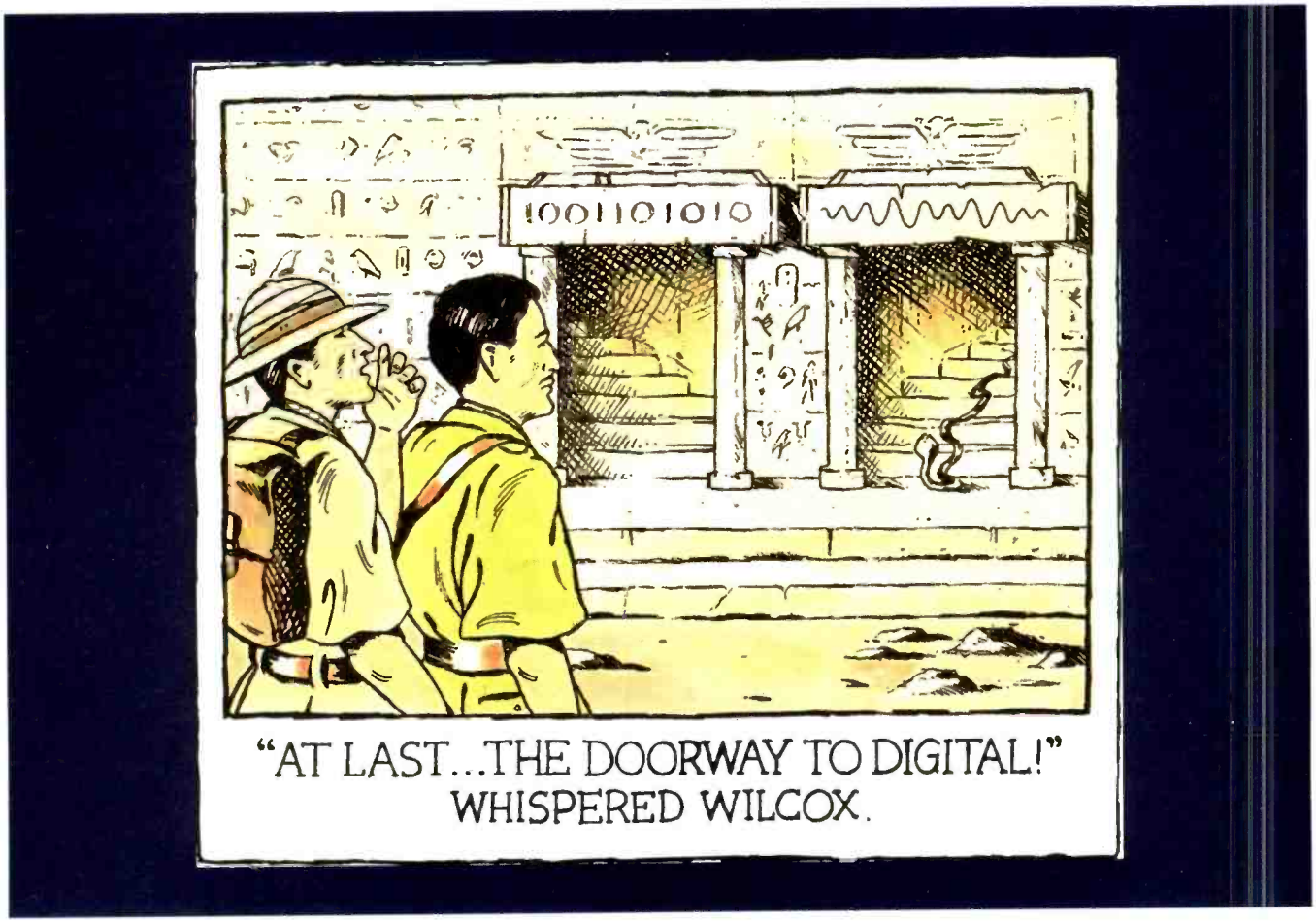
Looking ahead

Barring a major upset, the United States is headed for television featuring 16:9 aspect ratio pictures and component digital transmission. Though the longer term will bring high-definition transmission, a pair of near-term digital approaches to 16:9 are based on component digital implementations. One approach is to sample at 13.5MHz (270Mb/s serial) with rectangular pixels or 18MHz sampling rate (360Mb/s serial) with square pixels (and therefore somewhat better resolution).

The SMPTE 259M standard was recently amended to legitimize the 360Mb/s serial data rate. There isn't a lot of thought being given to a composite form of 16:9. The concept begins as component and would be transmitted as component, so why bother with a facility based on composite? This suggests that stations built or rebuilt on a component digital core capable of supporting 360Mb/s have a higher probability of moving seamlessly to next generation broadcast and post-production.

On the other hand, many of us felt secure when we had hedged against a high-definition future by building an analog 20MHz facility. It is certain, though, that the future is digital and most likely, serial digital. ■

Les Brown is president of Les Brown Associates, Grass Valley, CA. Respond via the *BE* FAXback line at 913-967-1905 or via e-mail to be@intertec.com.



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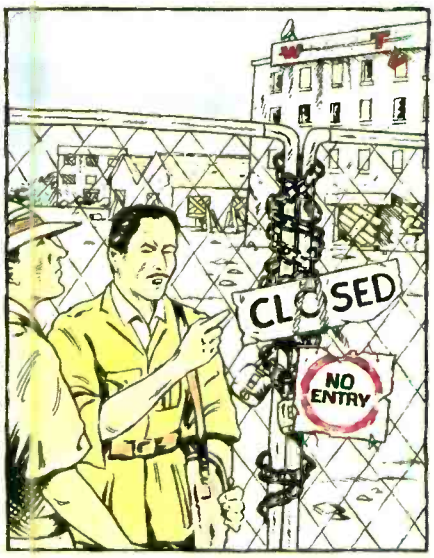

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By Bennett Liles

Cassette-based digital audio

There are many who will argue that tape-based audio recording and storage is becoming a bygone technology. In the big picture, they may have a point, but as long as tape storage costs remain at a fraction of disk-based systems' prices, tape formats will remain market strong.

Today, all the practical and cost-effective digital audiotape systems use cassette rather than open-reel formats.

Professional, cassette-based digital audio recording includes four different (helical-scan) formats — two 2-channel (stereo) systems and two 8-channel systems.

2-channel formats

The 2-channel systems are the DAT format (also known as R-DAT for rotary digital audiotape), and the NT (non-tracking) format.

DAT comes in many models from many manufacturers, while NT is available only in one deck from one manufacturer. (See "New Audio Recording Formats," February 1993.) DAT uses 4mm tape for uninterrupted recordings of two hours (longer recordings are possible using computer-back-up DAT tapes). DAT supports sampling rates of 32kHz, 44.1kHz and 48kHz, using 16-bit resolution. A half-speed option is available on some machines, allowing a doubling of recording time with 32kHz sampling and 12-bit resolution.

NT uses a tiny postage stamp-sized cassette in a unique 2-sided rotary head format, for up to 2-hour recordings (one hour on each side). It employs 32kHz sampling and non-linear 12-bit resolution (equivalent in S/N to 17-bit linear PCM) and offers extremely long battery life (seven hours or more on a single AA cell).

Multitrack formats

The 8-channel systems include the ADAT (Alesis Digital Audio Tape) format and the DTRS (Digital Tape Recording Standard) format. Both systems use commonly available videocassette tapes. ADAT uses S-VHS and DTRS uses Hi-8, but they run them at higher speeds than their standard video applications. Several tape manufacturers have introduced variations of these videocassette formats that are optimized for use in multitrack audio systems.

ADAT was developed by Alesis and also is supported by Fostex. DTRS was developed by Tascam and also is supported by Sony. Both systems support 44.1kHz and 48kHz sampling and use 16-bit resolution. (Third-party adapters allow higher resolutions at the expense of fewer tracks.) ADAT allows up to one hour of continuous recording, while Hi-8 can handle 108 minutes.

Today, all the practical digital audiotape systems use cassette rather than open-reel formats.

Most interesting is the ability of either system to "stack" multiple decks together for greater numbers of channels. By linking the machines, synchronized multitrack recordings can be produced in increments of eight channels up to 128 channels. For this reason, these systems are sometimes called *modular digital multitracks*.

More than audio

Most cassette-based digital audio format standards include auxiliary or *subcode* data for placing additional information on the tape. This data is used for marking cue points, for displaying timing information or for other identifying and setup headers.

The latter are useful on the ADAT and DTRS formats where operator setup and machine programming (such as autolocation times, crossfade times and pitch-shift settings) can be recorded on the tape. When playing back the tape, this data can automatically configure any compatible machine.

Some machines offer proprietary subcode features that are not universally recognized, however. In other cases, subcode data may not be transferred during digital copying, even when two identical machines are used.

For the broadcast market, a subcode feature that is often required is SMPTE time code. Because full SMPTE chase-lock capability is not always required, some units offer this only as an option.

Another type of data that is included in cassette-based digital audio recorders is the *Automatic Track Finding* (ATF) signal, which serves as an electronic guide to match playback tracking to record tracking.

Features

Like any rotary head recorder, cassette-based digital audio systems are not good at instant start up. Broadcasters who are used to fast-starting audio from open-reel or cart decks are often appalled at how standard DAT machines jump into the first audio and upcut the sound in a highly unpredictable manner. Recently, RAM buffers have been added to some DAT decks. This allows them to store a few seconds of audio data in RAM for instant-start playback, then seamlessly switch to tape once it's up to speed and synched.

Other features found on many cassette-based digital audio recorders (DAT, ADAT and DTRS formats) include video sync with programmable offsets, jam sync in selectable frame speeds, and film/video pull-up and pull-down with LTC or VITC reference. Some of the units have external synchronizing modules and some offer internal sync with optional cards. MIDI synchronization is also possible.

Many machines equipped with SMPTE time code can be interfaced to video editing controllers.

Portable DAT decks add even more features specifically for field work. These include tone and voice slating, selectable audio reference levels, powering options, voice and music filtering, variable compressor/limiter settings and even M-S stereo decoder monitoring. Some also offer true SMPTE time code (called *R-time* in DAT parlance), while others provide only *Absolute Time* (*A-time*), which counts hours, minutes and seconds from the head of the tape. Many non-SMPTE portable DATs can accept tapes that have been pre-striped with SMPTE time code. Alternatively, a DAT recorded with A-time data in the field can be post-striped with SMPTE time code on a SMPTE-capable studio deck.

Whether you need stereo or multitrack audio, in the field or in the studio, for pure audio or audio-for-video applications, chances are good that a cost-effective and versatile solution is available among today's cassette-based digital audio recording systems.

For more information on cassette-based digital audio recorders, circle (300) on Reply Card. See also "Recording & Playback Products," p. 58 of the BE Buyers Guide.

Liles is an audio engineer for Georgia Public TV, Atlanta. Respond via the *BE* FAXback line at 913-967-1905 or via e-mail to be@intertec.com.

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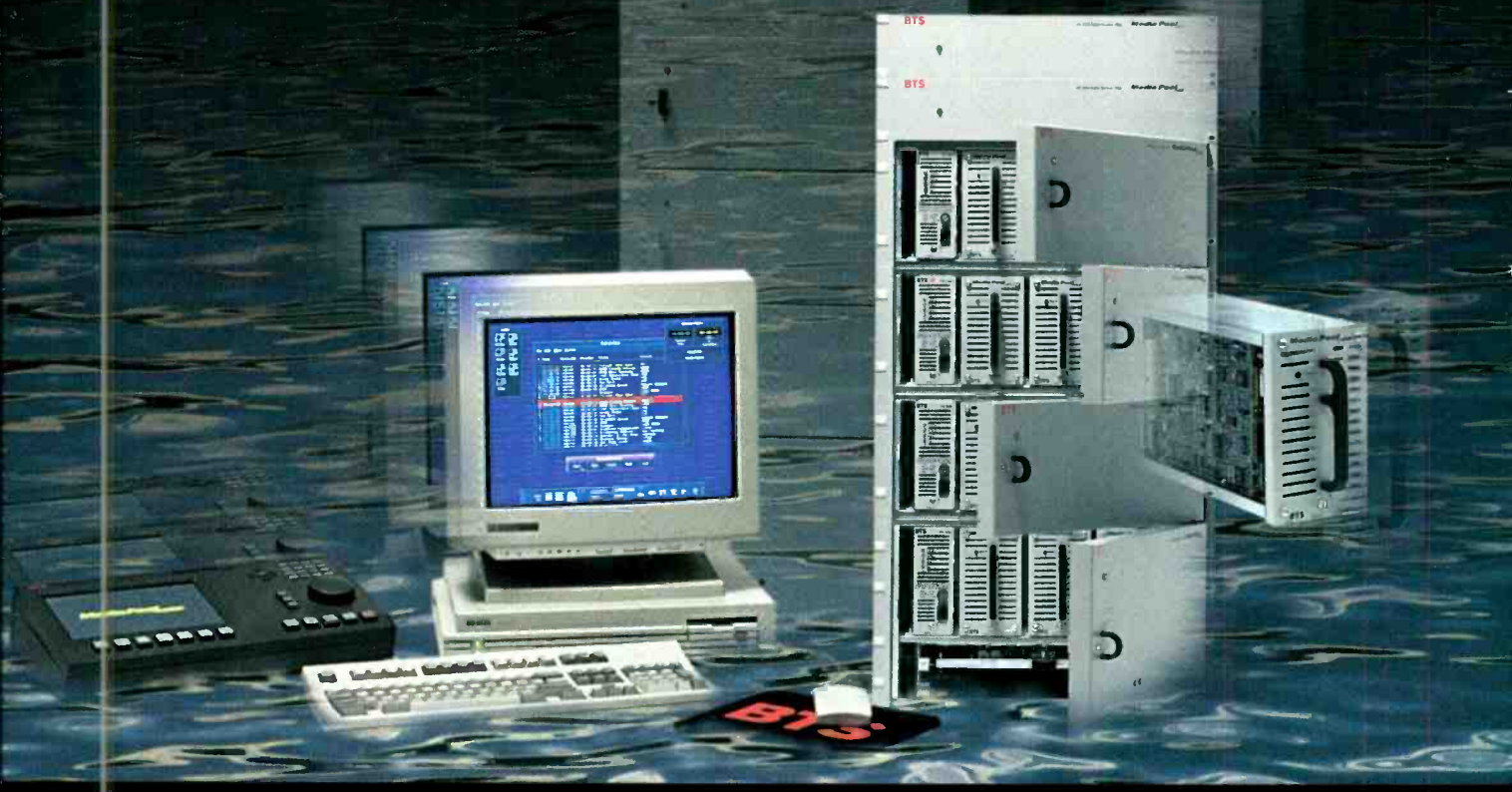

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By Marcos Sanchez

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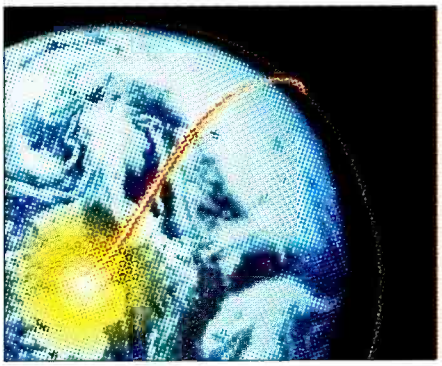

Everyday another company is putting its documents on the Internet World Wide Web (WWW). From government documents to highly technical product specifications, if you know where to look, you can probably satisfy your information needs. One of the Web's strengths is its rich document content, including graphics and hyperlinking. Users can quickly navigate the Web to other related documents with the click of a mouse. In response, software companies are meeting users' desires to access this content by offering a variety of products for surfing the Web.

Many of these products allow users to access the Web and various other Internet services seamlessly. Included in the usual offerings are: Transmission Control Protocol/Internet Protocol (TCP/IP) stacks, dial-up software, Web-browsing software, e-mail capabilities and even a selection of Internet access providers.

Once installed, some of these products even negotiate the complicated IP addressing transparently. All that is left for the user to do is enter his or her credit card information. Some of the products now available are: Spry Inc.'s *Internet in a Box*, Netcom's *NetCruiser*, Netscape Communication Corporation's *Netscape*, and FTP Software Inc.'s *Explore On Net*.

It is also worth noting that most of the major on-line services like America On-line, CompuServe, Prodigy et al, will be offering full Internet access. Additionally, IBM, Novell, Apple, and Microsoft have all announced that they will ship fully integrated Web browsers with their respective operating systems. When these browsers ship, consumers will be able to connect to the Internet and the Web transparently without the hassles of complicated configurations.

Seeking the info

After installing one of the many browsers available, users are faced with the task of finding the information they want. According to some of the latest estimates, the Web has upward of 10,000 servers around the world. What is missing is a set of universal white pages that describes the content and location of each of these servers. In lieu of such a resource, several Web sites have specialized in providing databases that contain thousands of other web sites and their locations.

Typically at these sites, users can expect to find some form of search engine that will allow them to perform key word searches. Once the query is performed, a list of sites appears with each site ranked by amount of times the key word was mentioned (hits) and a hyperlink so users can instantly access the site. Each hyperlink includes the server's Uniform Resource Locator (URL) address, which is the addressing that allows you to navigate to that site.

Some of the most helpful servers on the Web are:

Yahoo: a server out of Stanford University that has a comprehensive database (my first choice for information). URL - http://akebono.stanford.edu/yahoo

World Wide Web Virtual Library: URL - http://info.cern.ch/hypertext/Datasources/bySubject/overview.html

EINet Galaxy: URL - http://www.einet.net

University of Michigan Clearinghouse: URL - http://www.lib.umich.edu/chhome.html

Global Network Navigator by O'reilly and Associates: URL - http://www.gnn.com/gnn/wic/about.rescat.html

Planet Earth: URL - http://teal.nosc.mil/info.html

Using these servers as starting points for exploring the Web is the best way to find available information. The Web is growing everyday and these servers make a concerted effort to keep up with its growth. Whether searching for professional or personal enlightenment, the Web most likely has a server with the information you need.

Another form of information readily available on the Internet is Ezines, or e-mail magazines. One of the more popular styles of Ezine is the information retrieval service. *HeadsUp*, from Individual Inc., provides its users with a daily synopsis of industry events from several news sources including trade publications, wire services and newspapers. Included in your daily e-mail is a short 2-sentence synopsis of each news item in the category of your choice and a corresponding code. In order to receive full-text articles, users simply send one or all of the codes to HeadsUp and the full text is sent back to the user.

WEBster, an Internet-specific Ezine from Tabor Griffin Communications, offers a similar service available on a semi-monthly basis. *HeadsUp* can be reached at 800-414-1000, and a free trial subscription to *WEBster* can be obtained by sending an e-mail to 4free@webster.tgc.com. If you are interested in a slightly more complex service, Farcast Inc. offers an agent-based product for news retrieval. Users can set up agents called Droids to search and collect information from several wire and news services. The e-mail information is then sent to your mailbox several times throughout the day. To access more information on the service, send an e-mail to info@farcast.com with the subject hello.

Whichever method you use to connect to the Internet, be it e-mail or the World Wide Web, there is an abundance of information available. As the offerings mature and the market becomes less volatile, we should see a consolidation of many of the resources now up on the Internet. This should serve to ease access problems and create an environment that is substantially easier to navigate. ■

For more information on the Internet check out the following home pages –

Multicasting Backbone:
http://www.eit.com/techinfo/mbcre/

Internet Engineering Task Force (the Internet Standards Body):
http://www.ietf.cnri.reston.va.us/home.html

Motion Picture Engineering Group:
http://www.crs4.it/HTML/LUIGI/MPEG/mpegfaq.html

WWW Home Pages Broker:
http://www.town.hall.org/brokers/www-home-pages/query.html

Unofficial Internet Book List:
ftp://rtfm.mit.edu/pub/usenet/news.answers/internet-services/book-list

Marcos Sanchez is an account executive and professional WWW surfer at Niehaus Ryan Haller, San Francisco. Respond via the *BE* FAXback line at 913-967-1905 or via e-mail to be@intertec.com.

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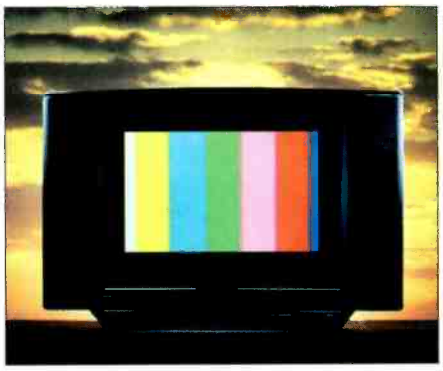
By Louis Libin

ATV: A look back



Editor's note: This month we begin a series of articles on ATV and how stations can begin planning for its implementation. NBC's director of technology, Louis Libin, will provide readers with his insightful look at how engineers can begin planning now for ATV transmission. Don't wait for your competition to act. Follow along as Libin leads you to your ATV future.

The ATV Broadcast Service is coming, and the FCC is planning to assign a new channel to each TV station. Most of the assignments will be in the UHF band. What is the basis for that assignment? What if you are assigned UHF Channel 68? Will your current viewing audience be able to receive the new signal? This series of articles will help you better understand the basis for your station's channel allocation, the predicted coverage for the new service, and for VHF engineers, some important fundamentals of UHF broadcasting.

Your new channel

We should expect that shortly, perhaps this year, the FCC will officially adopt a standard for a new advanced TV broadcast service (ATV). To begin the implementation phase, the FCC will assign each of the approximately 1,700 TV stations a new channel for ATV. This new channel will be paired with the current NTSC channel requiring stations to broadcast on two separate channels for a period of time.

Because most of the new ATV assignments will be in the UHF band, most VHF stations will have to build a UHF transmission facility. There will, however, be some VHF/VHF channel assignments.

The ATV digital solution

Station engineers may wonder what is the basis for the channel allocations. What if you are operating on Channel 4 now and you are assigned UHF Channel 68? Will your viewers tune up to Channel 68? Will your current viewing audience even be able to receive the new signal? These are only a few of the questions that might be asked about the new service. The last two may be answered simply. Even the first generation of ATV receivers is expected to have *smart* features that will let viewers select stations by network, for example *NBC*, or another service provider. With such features, the viewer doesn't care what channel the station actually broadcasts on. Once the desired *service* or *network* is selected, the TV receiver will tune to the correct frequency. In this example, if an ATV signal is available, the television would tune to the ATV programming on Channel 68. If no ATV signal is present, the receiver would tune to Channel 4 and would display the regular NTSC signal.

The often-believed poor UHF-reception problems will not be as prevalent with the new ATV service. Early tests have confirmed that the ATV transmitted signal can outperform NTSC transmission. In fact, the ATV system has proven that it can deliver HDTV-quality pictures into the fringe areas of NTSC and do so with lower transmitter power. In most cases, engineers should expect the ATV transmission to extend to the Grade B contour. This means that all most viewers will need is a good outside antenna or their regular cable service.

How did we get here?

Now that you better understand where we're going, how did we get to where we are today? In 1987, the FCC, at the request of broadcasters, initiated a rulemaking on advanced TV service and established a blue-ribbon group called the *Advisory Committee on Advanced Television Service* (ACATS). The committee's challenge was to investigate the technology and finally recommend a broadcast standard to the commission.

Over the past seven years, hundreds of companies and organizations have worked together to develop an amazing array of new technology. The ACATS process represents an impressive example of government and industry cooperation marked by many important accomplishments.

The first task for ACATS was to develop a competitive process by which proponents of systems would build prototype hardware that would then be thoroughly tested under laboratory and field conditions. This process sparked innovation and a truly entrepreneurial response. A total of 23 system proposals were submitted to ACATS in September 1988. Hardware for six systems was actually built and tested.

The digital dilemma

The FCC made several key spectrum decisions that also helped spark innovation. The commission decided in early 1990 that new ATV systems would share TV bands with existing services and would use 6MHz TV channels as presently defined. The commission also decided on a *simulcast* approach. This meant that the new HDTV signals would be broadcast on currently unused TV channels and that broadcasters would be temporarily assigned this second channel to accomplish the transition to HDTV.

Although the FCC had said in the spring of 1990 that it would determine whether all digital technology was feasible, most observers viewed it as at least 10 years in the future. However, that same year General Instrument (GI) became the first to announce an all-digital system. Later, all-digital systems were announced by MIT, the Philips-Thomson-Sarnoff consortium and by Zenith-AT&T. The path was now set for a digital ATV system.

The FCC and ACATS anticipated the need for interoperability of the standard with other media. Initially, the focus was on interoperability with cable television and satellite delivery; both being crucial to any broadcast standard. With the advent of all-digital systems, computer-friendly progressive (non-interlaced) scanning became increasingly important. ACATS formed a special subgroup that worked for two years to assure that interoperability would be maximized in the new HDTV standard.

In February 1992, the Advanced Television Systems Committee (ATSC) recommended that the new standard include a flexible, adaptive data allocation capability and that the audio be upgraded from stereo to surround sound.

Let the tests begin

Six systems (four of which were all-digital) underwent extensive testing in 1991 and 1992 at the Advanced Television Test Center (ATTC) in Alexandria, VA. Also participating in testing were Cable Television Laboratories (CableLabs) of Boulder, CO, which tested systems over a cable test bed at the ATTC, and the Advanced Television Evaluation Laboratory (ATEL) in Ottawa, Ontario, Canada.

Based on the test results, ACATS decided in February 1993 to limit further consideration to the four all-digital systems. This included two systems proposed by GI and MIT, one proposed by Zenith and AT&T, and one proposed by Sarnoff, Philips and Thomson. ACATS decided that, while all of the digital systems provided impressive results, no single system could then be proposed to the FCC as the U.S. HDTV standard.

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The Grand Alliance

Simultaneously, ACATS adopted a resolution encouraging the digital HDTV proponents to look for a way to merge the four remaining all-digital systems into a single system, hence the term *Grand Alliance*.

On May 24, 1993, the seven companies announced the successful formation of the Digital HDTV Grand Alliance. The Advisory Committee assigned its Technical Subgroup to evaluate the Grand Alliance proposal in detail. In October 1993, the Technical Subgroup approved most of the key system elements: video compression, transport, scanning formats and the audio subsystem. The final element, the modulation subsystem, was approved by the Technical Subgroup in February 1994.

In the summer of 1994, the transmission subsystem underwent six weeks of extensive broadcast and cable field tests at the Charlotte, NC, test facility. The tests proved that the Grand Alliance digital transmission technology will outperform today's analog transmission.

In January this year, the Broadcasters Caucus and the Association for Maximum Service Television (MSTV) submitted to the FCC their recommendation for a nationwide ATV channel assignment table. The table pairs a channel for ATV simulcast with every NTSC station. This filing was signed by 90 broadcast groups including the NAB and four networks. The assignment table is a fair plan that optimizes ATV service for all broadcasters with minimal impact to existing NTSC service areas.

Next step

So what should you do now? Begin by looking at the allocation table, which is available from the FCC under Docket MM87-268. It will tell you what channel you'll likely be assigned. Although the table hasn't yet been cast in stone, it will provide you with a good place to start.

Then begin looking at how you'll handle the RF system. Will you be able to mount an ATV antenna on your own tower? Will you need to replace your current NTSC antenna with a combination NTSC/ATV antenna? How about transmitter costs? Is there sufficient power available at the site.

The questions are relatively straightforward. For most stations, early adoption of ATV transmission will mean only a pass-through capability. Once the RF system is in place, you can then concentrate on building your studio ATV system. Future articles will address these issues. ■

Louis Libin is director of technology for the National Broadcasting Company, Inc. (NBC), New York, NY. Respond via the *BE* FAXback line at 913-967-1905 or via e-mail to be@intertec.com.

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FEATURE

TV station builds cabl

The Bottom Line:

The cracles of media predict doom. for single-channel TV operations. As a hedge against this, a San Francisco station has created a news channel that it feeds to area cable systems. The concept combines economies of scale with smart programming and innorative technology to create a cost-effective second service. $

Above photo. The BayT

By Judith Walcutt

e news network

KRON breaks new ground on the multicasting front.

er control room. Photos by Kathleen Bakula.

"Convergence" has run the gamut from buzz word to bugaboo in fairly short order, but up to now it's been more theory than practice. Yet broadcasters and cable operators are now seeking (and finding) ways to work together. The goal is a cooperative movement into a new frontier that demands more tightly focused program streams and clear niche-audience targets.

One good example of a broadcasting entity that's already positioned itself for multiple paths into consumer households is San Francisco's KRON. The station is already part of a diversified media corporation that includes *The Chronicle* newspaper and Chronicle Books. Now it has launched a 24-hour cable news/talk/information channel for the San Francisco area called BayTV.

In exchange for the station's retransmission consent, 30 cable systems throughout San Francisco and San Jose markets have given KRON a second-channel presence that the station is using for a highly local focus. This second channel reaches nine counties and, at last count, is wired to a million households. Within a year, it'll be up to 1.4 million households, achieving 98% penetration of the area's cable universe. But to achieve that, the station's engineering staff had to come up with innovative solutions to solve distribution problems caused by difficult terrain.

BayTV reaches nine counties and is wired to a million households.

A station within a station

BayTV is a mini-station within the larger broadcast station, operating with its own staff, studio and location equipment. Some resources are shared between the two operations allowing the cable channel to be launched without prohibitive capital investments.

The BayTV format has been likened to "radio with pictures" in that its style and content are more closely related to information/talk radio (with plenty of audience call-ins) than they are to either conventional network television or news-wheel radio. In the months since its July 1994 launch, a staff of approximately 60 handles a daily mix of seven live, locally produced programming hours plus round-the-clock, half-hourly news updates. The rest of the schedule is filled with pre-produced programs and taped replays.

Innovative program origination

The broadcast day starts with a 2-hour morning show hosted by a local character actor and radio personality. The program has a "Today Show" feel with a local spin. The second hour of the morning show is immediately replayed as the third hour of the morning show block.

Another locally originated program is a simulcast of a KNBR-AM sports-talk call-in show. With two cameras in the radio station's studio, BayTV provides a behind-the-scenes look at this top-rated sports-talk and humor program as it airs live on weekdays from noon to 2:00 p.m. The radio show host is also KRON-TV's sports director/anchor, which is one example of how the over-the-air station shares assets with the cable station. Other cost-effective sports programs on BayTV include a live feed of the San Francisco 49er's weekly press conference during football season.

Evening programs include a one-hour daily news show, a public affairs talk show and a Larry King-like call-in program. Again, some talent is borrowed from the KRON staff. Viewers are encouraged to interact via phone, fax and e-mail. Much of this programming is replayed throughout the night and next day.

Other programming includes re-wrapped excerpts from archived KRON documentaries, new shows that another subsidiary — KRON Video Enterprise — co-produces with The Discovery Channel, and a unique local home-shopping program.

Delivering the goods

BayTV's relatively spartan master control facility plays recorded programs on JVC industrial-grade S-VHS decks, and runs all commercial spots from an ASC virtual recorder. Of course, live programs are switched in directly from studios or remote sites, and a modest amount of special effects are available. Downstream of the master control switcher the program signal is

split through DAs and fed to three different systems that are variously used to reach the 30 cable head-ends served by BayTV. (See Figure 1.)

Most of the cable systems are fed via an Instructional Television Fixed Service (ITFS) channel in the 2.5GHz band, which BayTV leases from the Catholic Television Network (CTN). BayTV supplies these cable head-ends with receivers that allow them either to downconvert the ITFS signal directly into their distribution system at an intermediate frequency or to fully demodulate the signal and then remodulate it onto a cable channel. Most head-ends use the IF method, but the demodulation approach will allow a cable operator to add local insertions, an option that BayTV is currently exploring. (Cuing signals for the insertions will be carried on the VBI of KRON's main on-air channel.)

A conventional common carrier circuit is used to feed the BayTV signal from San Francisco to the ITFS hub site in Menlo Park, a distance of about 25 air miles to the south. From this site, the signal is beamed by microwave to ITFS transmitters on Mt. San Bruno and Mounment Peak. A microwave relay from the latter feeds another ITFS transmitter on Mt. Diablo, and an ITFS translator on Mt. Tamalpais repeats the signal to systems north of the bay. The AM video used on the ITFS system allows IF conversion at the receive sites, but video quality is slightly degraded when off-air repeating is used, as in the Mt. Tamalpais case.)

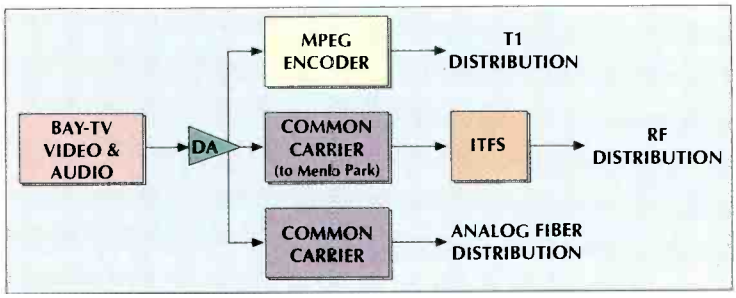

Figure 1. BayTV uses three different distribution technologies to get its signal to the 30 cable head-ends it feeds.

The cable system for the city of San Francisco proper is fed directly from KRON by an analog fiber-optic circuit leased from the phone company. This relatively short cross-town link to the head-end on Mt. Sutro may eventually be replaced by a digital video feed on fiber, but for now, its length permits analog transmission to be used without significant degradation.

The ITFS and analog fiber distribution take care of 25 head-ends. For the remaining five sites (Napa, Santa Rosa, Scotts Valley, Santa Cruz and Vallejo), distance, terrain and budget limits prevented the use of conventional distribution to these sites. KRON/BayTV engineers turned to a new technology: T1 circuits using data compression.

Although it seemed theoretically possible to send audio and video signals through a T1 line's 1.544Mb/s data rate by using MPEG-1 encoders set for a 160:1 compression, no one had actually done it be-

THE TALK OF THE TOWN

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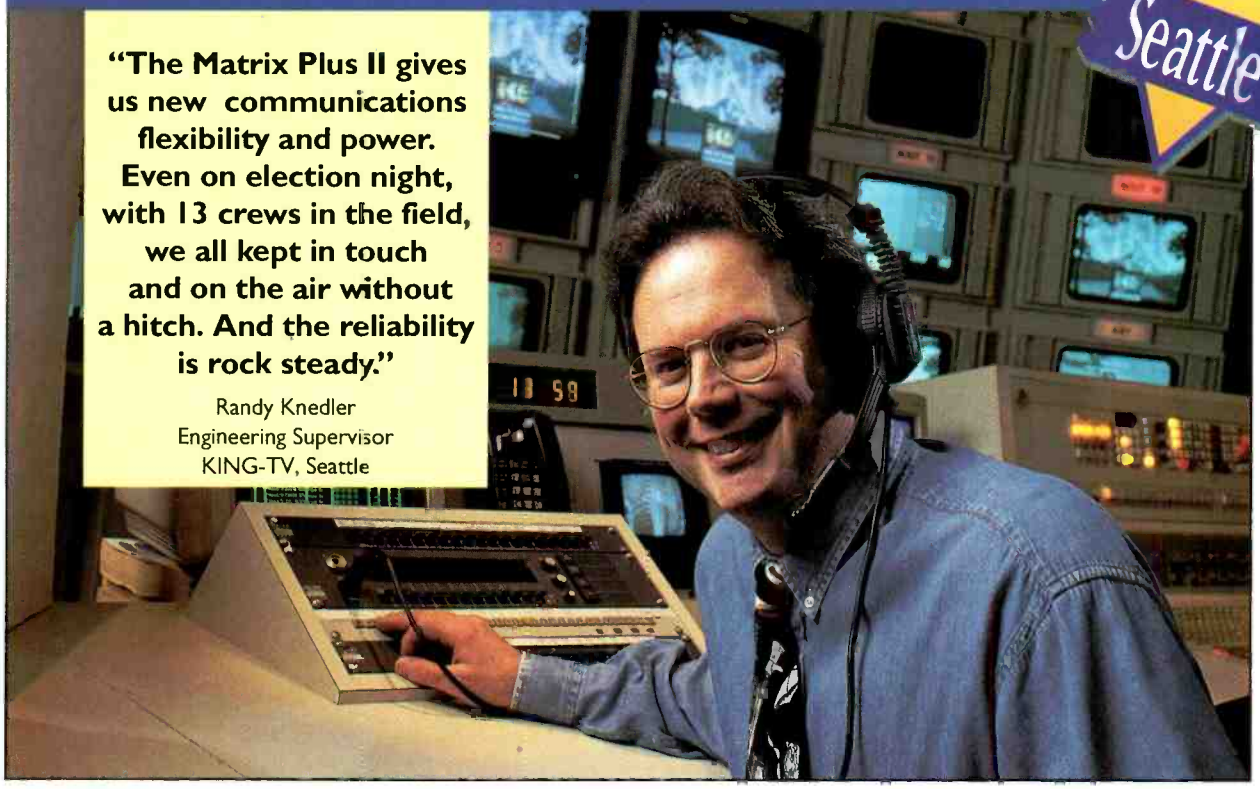

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fore — at least not for the type of application that BayTV intended. So this simple cable channel launch became an important "proof of concept" experiment in convergence, including all the necessary real-world players from the broadcast, cable and telco environments.

MPEG-1 on T1

As it turned out, the signal processing required for this distribution method was most cost effective using PC-based systems. The process is performed in two steps: first the MPEG-1 compression, then the T1 formatting.

In the BayTV facility, video and audio outputs from the master control DAs are fed to a 486/66 PC equipped with a *Prime-view* MPEG encoder board set from FutureTel of Sunnyvale, CA. This PC performs real-time MPEG-1 encoding of the signal, then outputs the MPEG packets to a 10Mb/s Ethernet LAN.

Also on the LAN are five 486/33 PCs, which receive the MPEG packets via their Ethernet adapters, and package them as a T1 transmission signal using another FutureTel board called *TeleMux*. A separate PC is required for feeding each of the five T1 lines to the head-ends. (See Figure 2.)

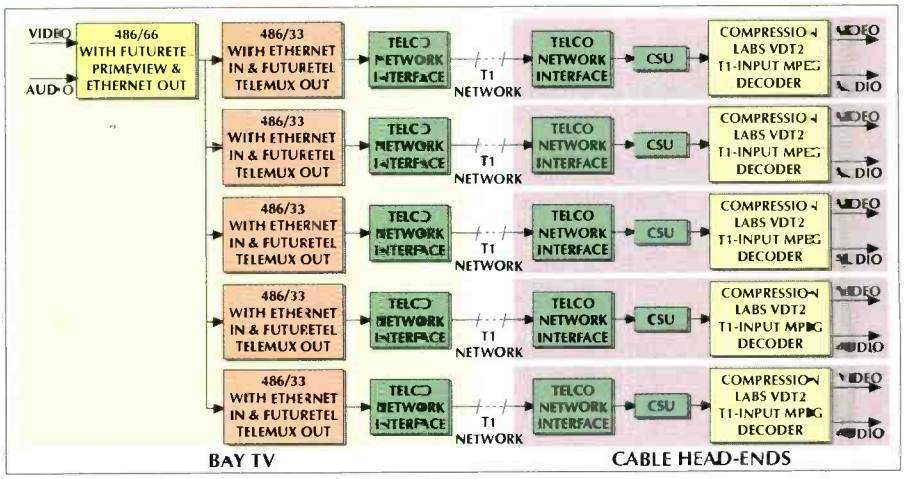

Figure 2. BayTV's PC-based T1 distribution system uses a 486/66 for MPEG-1 encoding, which feeds five 486/33s via Ethernet for T1 transmission to five cable head-ends. A dedicated T1/MPEG receiver/decoder at each head-end converts the signals back to VHS-quality video and CD-quality audio for transmission on a standard cable channel.

A sixth 486/33 with a TeleMux board stands by as a spare.

Each T1 signal then travels through the telco-provided *network interface* (NI) onto the T1 line. At the cable head-ends, another NI and a conventional T1 *customer service unit* (CSU) serve as terminal equipment. The data signal from the CSU goes to a Compression Labs, Inc. (CLI) VDT2 receiver, a set-top-type box that handles both T1 interfacing and MPEG decoding. (This unique product was originally designed as the customer end box for one of the telco video trials. CLI modified the units for this application.) Its VHS-quality analog video and CD-quality analog

audio outputs are then taken by the cable operator and modulated onto one of its system's channels.

The CSUs at the head-ends provide a return clock signal back to the BayTV computers via the T1 line (T1 circuits are inherently bidirectional). This is used by each TeleMux board as a clock reference.

Problems and solutions

The T1 distribution system was not without its early problems, including dropouts, video artifacts and audio-video sync problems. Determining the causes for these problems was a challenging but ultimately enlightening process.

T1 circuits are rarely pushed as hard as they are in this application. Seldom do the business phone systems that employ T1 circuits use its entire 1.544Mb/s. Furthermore, a T1 circuit is usually a multiplex of multiple separate communications paths, and the usage level of the circuit varies continuously. In this case, however, every bit of the T1 bandwidth is used for a single, wideband data channel, 24 hours a day. Therefore, any problems in the lines that were previously masked by infrequent or partial usage became clearly evident in the BayTV application.

BayTV control room section showing S-VHS record/playback decks and PC-based controllers.

It took considerable cooperation among the participants, including the manufacturers of the compression and the distribution equipment, to develop appropriate test procedures for isolating the problems. With only 45 days between bench prototype and final installation, these parties accomplished some remarkably elegant revisions that solved the initial problems. This included modifications to the Primeview board's MPEG system multiplexer to improve MPEG-to-T1 compatibility, which is not inherent.

A thornier problem involved the feeding of the same MPEG signal to different locations. The encoding computer runs at one clock rate, while each of the transmitting computers is referenced separately (because the T1 lines are not all locked to a common clock). To overcome these problems, the encoder software running on the 486/66 computer was revised to allow adjustment of its data rate.

Updated receivers have further improved the performance of the system by providing enhanced MPEG-1 video decoding quality, and by maintaining audio-video sync via recognition of the time-stamps that MPEG-1 encoders assign to each audio and video packet.

The current system is also *fault-resilient,* allowing it to automatically recover from many of the problems that it might encounter on the T1 network. This feature also permits nodes (i.e., receive sites) to be added or removed from the system without affecting any other active nodes — a helpful attribute during troubleshooting, testing or expansion of the distribution system.

BayTV newscasters provide live updates twice every hour.

Start-up costs and resources

BayTV cost around $4 million to launch, and its operating expenses are approximately $350,000 per month ($20-30,000 of that pays for distribution costs). This compares favorably with similar services in New York City (New York 1) and Chicago (Chicagoland TV), which both cost more than $10 million to establish. Of course, BayTV has the advantage of being housed in a major broadcast facility with studios in place and the occasional Betacam to spare. Though the plan ultimately is to be autonomous from the over-the-air resources, BayTV has benefited from having access to everything from the reporter talent pool in the studio to the microwave van on the street. (BayTV recently acquired an ENG van of its own.)

A detailed view of the T1 distribution system indicates that the MPEG-encoding PC platform costs about $16,000 while the T1-transmitting PCs cost about $3,000 each. The T1 lines are leased at an average of $1,000 each per month, which includes the $450 basic rate, plus distance charges that vary on each line.

Despite all the hardware/software modification required to get it up and running, the T1 system turns out to be a highly cost effective way to reach those difficult headends. This is true when compared to the only other available distribution alternative — via satellite — which was estimated to cost

around $250,000 a month plus uplink charges.

This cost effectiveness and increasing availability of hardware and service should make MPEG-1/T1 systems attractive to stations. The systems are typically used for backhaul applications, such as live election coverage or special sports events.

The cost effectiveness and availability of hardware and service should make MPEG-1/T1 systems attractive to stations.

One popular weekly feature that BayTV originates in its studio is a 10-minute cooking show.

Outlook

With BayTV still in its first year of operation, the investment is deeper than the visible return. After all, selling advertising on this channel isn't easy. A cable channel new to a block that Arbitron hasn't begun to notice will certainly take more than its first few months on the wire to book out. But management is optimistic, citing a list of approximately 40 charter advertisers. KRON predicts that BayTV will break even by the end of its second year.

More important, KRON managers feel that the experiment is worth pursuing for the trail that it blazes into the multicast future. Time will determine what delivery technology will prevail, but whatever the route, KRON has exploited its synergy in providing an early, alternative path into consumer households. ■

Judith Walcutt is CEO of Otherworld Media, Freeland, WA, a production company that develops program streams for alternate distribution technologies. Respond via the *BE* FAXback line at 913-967-1905 or via e-mail to be@intertec.com.

Editor's note: Thanks to Craig Porter, chief engineer and Roy Trumbull, assistant chief engineer at KRON, San Francisco, for their help in the preparation of this article. Thanks also to Franco Franca, vice president of marketing at FutureTel, Sunnyvale, CA.

For more information on MPEG/T1 transmission, circle (305) on Reply Card.

FEATURE

Using fiber for video

By Les Brown

Signals can travel a long way on a sliver of glass.

The Bottom Line:

As technology moves forward, the limits of coaxial cable become apparent. Copper wiring is appropriate for many applications, however, the size, bandwidth and long-distance capabilities of fiber optics make it ideal for wide-bandwidth long-distance applications. As the cost of fiber transmitters and receivers comes down, their use in a variety of broadcast and video applications will increase. $

Fiber-optic technology is relatively new. Despite widespread use by long-distance carriers, short-haul fiber solutions have only recently become cost effective. Today, fiber is being used by several industries to solve a variety of problems. Camera manufacturers are using fiber to connect camera heads to CCUs with a lightweight, wide-bandwidth medium resistant to electromagnetic and RF interference. In the computer industry, fiber is being used for high-speed, high-capacity network connections. For broadcast, fiber has been used for STLs where microwave systems are too expensive or simply not feasible.

Reasons for using fiber

The problem most commonly solved by fiber is high-quality transmission over long distances. Transmitting a signal across the city is a distance issue regardless of whether it's composite analog, component digital or digital data. If you don't own the right of way between the transmit and receive points, you're in the hands of a common carrier or bypass carrier that may impose bandwidth and access restrictions. In some localities it's possible to lease "dark fiber," which is a dedicated loop between two locations. Dark fibers are the optical equivalent of a telco "dry pair." Leasing dark fiber allows you to control the bandwidth and type of use. You also have to supply your own transmitters and receivers.

Even when you own the right of way, there are some considerations attached to the cost of using fiber. It's expensive to dig a trench for conduit, especially when there may be other ways to get from point to point. Look for existing paths between buildings as possible money-saving alternatives. Local regulations may let you run fiber through electrical conduits or even existing plumbing. A post house in London links two buildings with fiber snaked through the sewer pipes! Though it's not good practice to allow water into the optical fiber package, it's not as devastating as water penetration on coax. During the Lake Placid Winter Olympics in 1980, both fiber and coax were installed in conduit under a roadway. During construction the conduit became flooded with water. The coax became useless, but the fiber continued to work properly.

Distance problems with copper are also related to signal type. Analog composite video demands equalization to compensate for the effects of coaxial cable, but EQ amps capable of dealing with the effects of several thousand feet of coax are easily available at reasonable prices. Not so with serial digital video where distance is critical. Although 143Mb/s composite digital video normally performs well at or a little beyond 300 meters (1,000 feet), it's usually not recoverable beyond 350 meters (1,150 feet). For component serial digital at 360Mb/s or even 270Mb/s, distance is even more critical. Some have reported reliability problems at half that distance. Baseband HDTV, with its 1.2Gb/s requirements, may be challenged at as little as 50 meters (160 feet).

Space and weight are interrelated problems that are becoming serious in existing facilities. As stations find it necessary to increase the number of video feeds, those used-to-be-large cable trays become too small for even a few more runs of 8281. Removing unused cables, inevitably those at the bottom of the tray, is often cost prohibitive. Fiber can offer an efficient solution to adding multiple feeds in crowded trays and racks. Even using an individually jacketed fiber per signal represents a space/weight saving. The real savings comes when a multifiber cable is installed. There is then plenty of room for growth.

Another reason to move to fiber is environmental.

Continued on page 36

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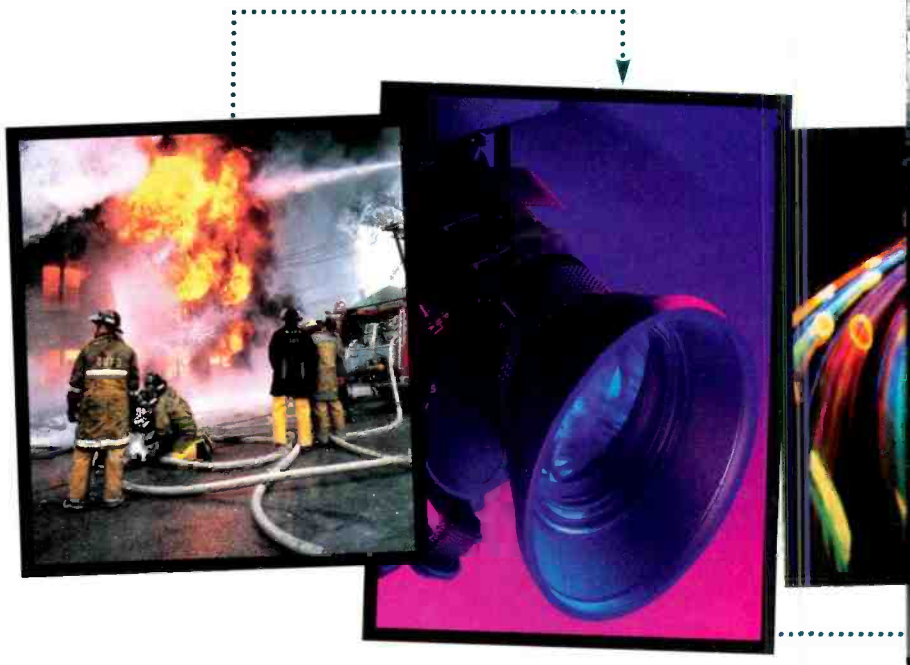

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Continued from page 32

Copper is now considered a hazardous waste and you can't just chuck old coax in the landfill. Another serious environmental concern comes from the sky — lightning loves copper. Facilities in areas where lightning is prevalent have moved to fiber for outdoor links regardless of distance. The cost of replacing damaged equipment far outweighs the initial cost of fiber transmitters and receivers. Tower installations are especially prone to lightning damage. It's relatively easy to run fiber from the studio or transmitter to a platform on the tower for microwave receivers or transmitters thereby eliminating most, if not all, of the coax on the tower. For more information, see "Using Fiber for Satellite Systems," *BE*, May 1994.

Fiber basics

Let's look at some basic theory. Shine a light into a tube with a totally reflective inner surface (typically glass with an exceptionally pure core and a cladding of intentionally less purity) and it'll come out the other end even when the tube is bent around corners. For practical results, however, the light source needs to be focused into the tube and must be capable of more than just shining at constant intensity. At the far end, the light has to be focused onto a receiving element that converts the light to an electrical signal. For in-depth information on fiber basics, see "Building Fiber-Optic Transmission Systems," Parts 1-3, *BE*, November 1991 through January 1992.

LEDs were the only practical light source in the early years of fiber-optics development. They cost up to $600 each and left transmitter manufacturers with the problem of arranging their own coupling to optical fiber. It demanded tedious hand work and the yield was typically not high. Now they're down to as little as 14 cents each including a fiber pigtail that makes building them into transmitters relatively easy. The low-cost units are fine for low-speed data but video demands better. Fortunately, even today's highest grades cost only a few dollars each.

LEDs aren't tightly focused and work best with multimode fiber. In multimode fiber, light travels multiple paths from end to end reflecting off the inner surfaces of the glass strand. Receivers "see" multiple versions of the same signal and have a difficult task restoring the original. Multimode fiber also rapidly attenuates the limited light "launched" from an LED. Although LED-based systems are relatively inexpensive, distance potential is limited.

Lasers offer extremely tight focus and a higher intensity than LEDs. In recent years, their cost has fallen dramatically. Because of their tight focus, lasers make practical a different type of fiber called "single-mode" through which light travels a predominantly linear path. Light isn't constantly bouncing off the interior walls of the fiber so more of it reaches the far end coherently. The reconstruction task is less complex and more reliable. Single-mode fiber used to cost significantly more than multimode, but the difference has narrowed as its production has increased.

Lasers have an additional advantage over LEDs when used in digital applications. Turn-on/turn-off times are much faster. A reasonably priced laser capable of dealing with today's 143Mb/s-360Mb/s video data rates is typically suitable for use in the gigabit range as well. Remember that it's the laser itself, not necessarily the equipment in which it's installed.

Laser or LED, the industry is converging on a single wavelength; 1,310nm (nanometers). Other wavelengths that have proven practical are 850nm and 1,550nm. Various proprietary systems are based on their use and they offer an attractive alternative for carrying multiple signals on a single fiber through "wavelength division multiplexing (WDM)." WDM couples several transmitters, each launching a different wavelength into a common fiber. Though the method is effective for

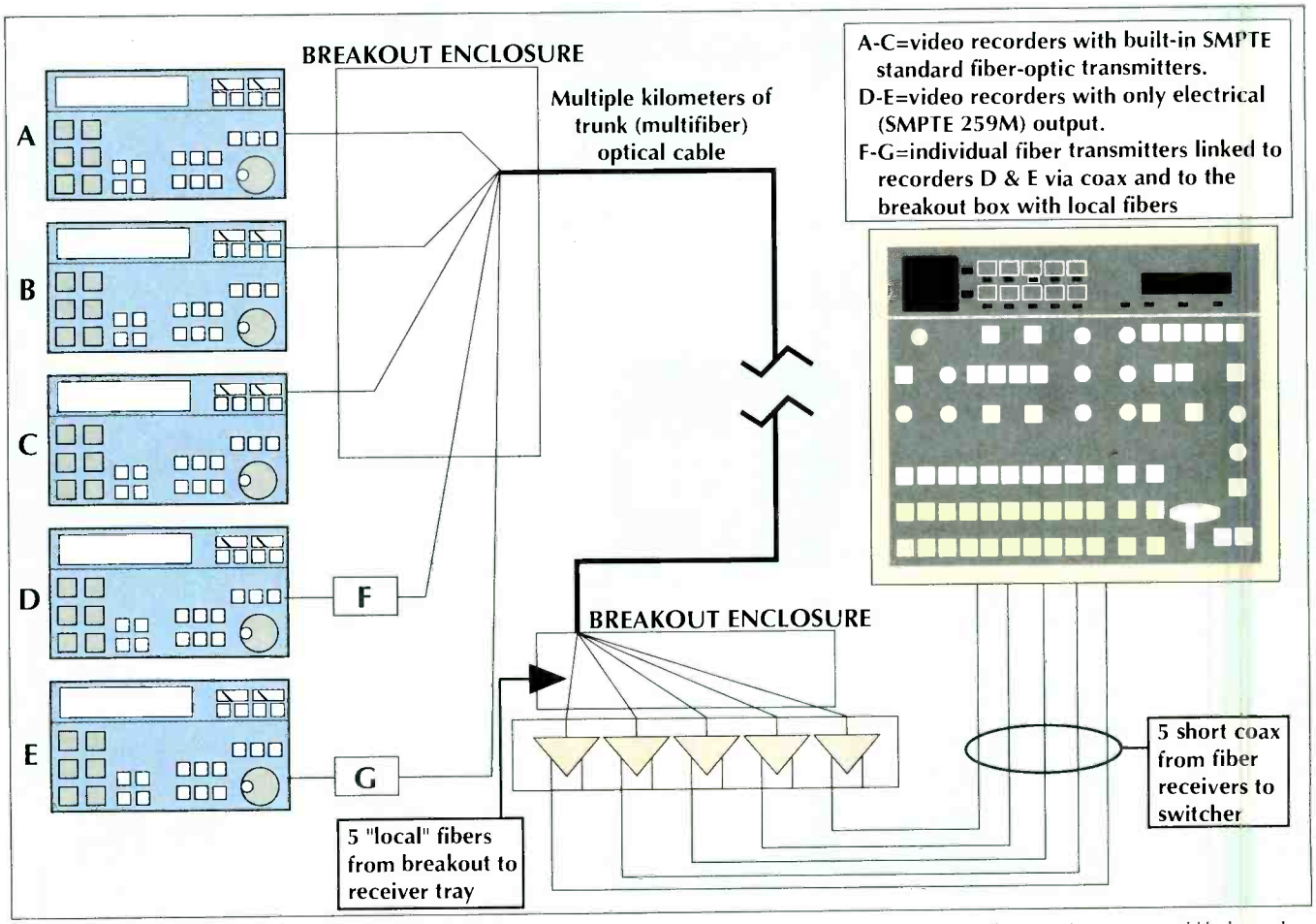
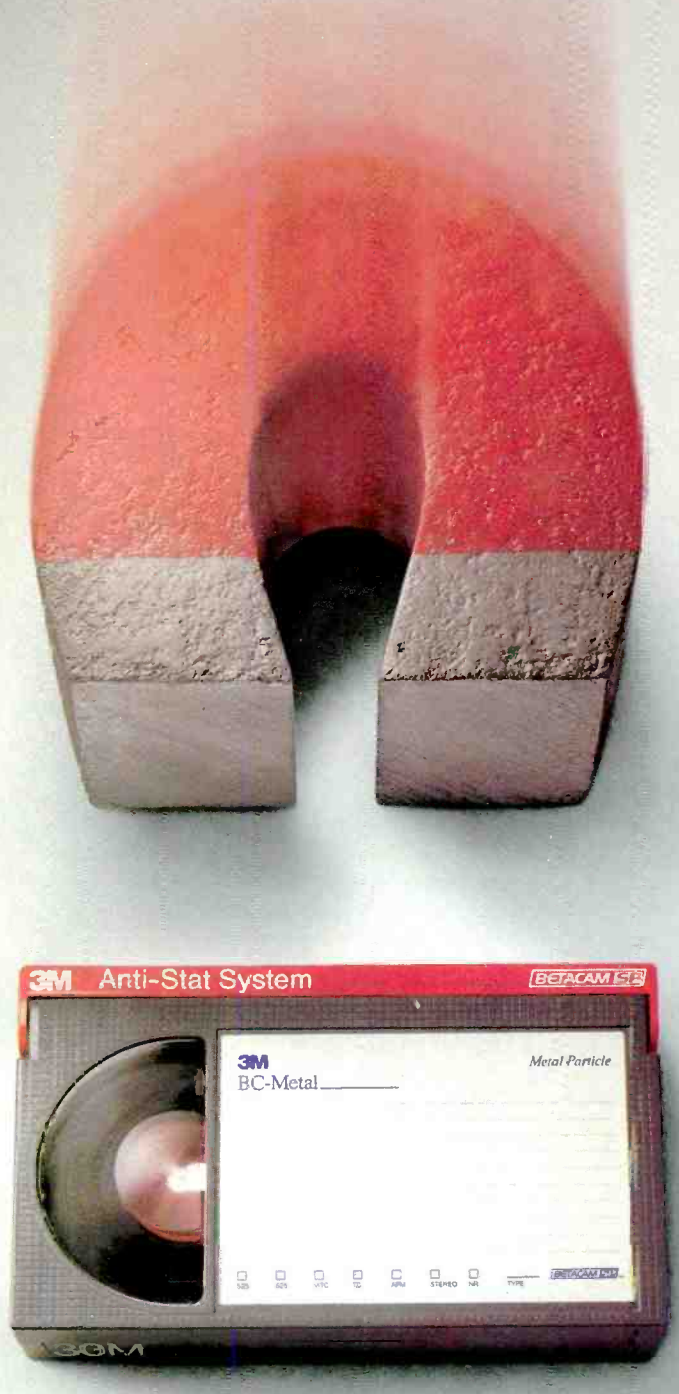


Figure 1. One use of fiber within a facility would be long-distance runs between equipment rooms and edit suites and control rooms. Equipment could be located on the ground floor with control rooms located several floors above. Fiber-optic interconnections would limit losses due to the distances involved.



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moderate distances the optical losses of the combining and splitting devices required make it less useful for longer runs. Be aware that test equipment may not be frequency selective and could cause an erroneous reading when measuring fibers with more than one wavelength in use.

Another consideration for fiber-optic use is that fiber does not necessarily imply digital. Fiber is well-suited for digital transmission, however, it is also capable of handling analog signals. Analog systems that modulate two or more audio channels onto a video signal are available. The combined signals are then modulated onto individual channels that are combined onto a single fiber. These systems perform well for transmitting analog signals over distances up to 15 miles without the need for additional amplifiers.

One signal or many?

For facilities, practical fiber applications usually means one signal per fiber. This is usually because the signal is going from point to point and no other signal is going between the same two points. In these applications, one signal is used to refer to video plus one or more audio channels properly multiplexed before transmission. In analog applications, costs and technical impacts may be such that it's less costly to treat the audio separately. In digital there's some possibility that audio is already multiplexed with the video and, if it isn't, it's clean and relatively inexpensive to accomplish.

For multiple signals over the same fiber, an alternative to WDM is Time Division Multiplexing (TDM). A number of manufacturers offer products that digitize analog video, compress and packetize it for transmission over a single fiber to a receiver of matching design. Synchronous TDM allows each channel to be independent. This allows individual channels to be added or removed as needed without affecting the other channels. Synchronous TDM has several advantages when used for digital data applications in a network architecture. These systems typically deal with audio separately from the video and multiplex it into the single datastream, avoiding the need to first get audio onto the video. It's effective when video is being distributed for viewing but arguments can be made that the effects of compression have negative effects when further production work is intended.

Standards are on the way

The industry has adopted standards for interfaces and connectorization. There's more work to be done but the day will come when we'll be able to dial up video circuits at various levels of compression according to intended use.

Studio standards are pending at this writing and may have been adopted before you read this. Two SMPTE Working Groups are tackling the task. One for true high-definition television, the other for today's common formats. Their work should be announced shortly.

High definition, with its gigabit requirements, will demand the use of lasers and single-mode fiber. The immediate impact will come from the work of The SMPTE Working Group dedicated to an optical fiber standard for serial digital signals in the range of 100Mb/s to 400Mb/s. There's already a standard in place for electrical transmission of serial digital video in this range, SMPTE 259M. Its proposed optical transmission counterpart allows manufacturers and users considerable latitude while maintaining compatibility. The optical standard, like its electrical counterpart, is unidirectional.

The proposed wavelength is 1,310nm, already in common use. The standard permits the use of either multimode or single-mode fiber, recognizing that there is a sizable installed base of multimode fiber, some of which has never been used. This also supports use of LEDs, which are adequate at moderate distances. Lasers, however, are the preferred light source. The electrical/optical transfer function is elegantly simple; it corresponds directly to the SMPTE 259M electrical standard with

I didn't know Snell & Wilcox did that...

Logic "1" represented by maximum intensity and Logic "0" by minimum intensity.

The specified connector is the SC/PC type developed in 1984 by Nippon Telephone and Telegraph (NTT). The basic SC design supports mechanical coding that makes it impossible for a user to misconnect source and destination fibers. PC refers to preparation of the fiber for physical contact with the mating fiber.

In the studio environment, new products will likely focus on single-fiber packaging that looks much like RG-59 type coax, though perhaps a bit smaller. It's most suitable for point-to-point installation and easiest to terminate. For trunk runs the situation is more analogous to handling audio cabling. Multifiber cables can be run between major equipment areas where they may be broken out for runs to individual devices.

Multifiber cable costs much less than the equivalent number of individually jacketed fibers and takes up far less room in cableways. On the other hand, the individual fibers in the cable aren't sufficiently protected for exposed use. The breakout at each end should be done inside a protective enclosure with each individual fiber taken to an SC receptacle for connection to an individually jacketed run to its local destination or perhaps fused directly to the local fiber. Either way, the enclosure has to provide support for the fibers. It's much like a video version of the audio punch-down blocks used to break out multiconductor cables. If you have time and a little patience, you can get the job done with hand tools, but you may wish to invest in a fusion splicing setup or call in a contractor for the job.

What if the fiber breaks?

A major fear expressed by broadcasters considering installing fiber is "What if it breaks?" Fiber, like coax, doesn't just break by itself. Most breaks in the cable occur at connectors. Locating breaks in a long run of fiber is relatively straightforward. In fact, the technique was outlined by Harold Ennes in his earliest *Television Systems Maintenance* books in 1964.

Just like coax, time domain reflectometery works in fiber too. The measuring instrument is called an Optical Time Domain Reflectometer (OTDR). If you're planning to do a great deal with fiber it's a sound investment. Not just for finding breaks, but also for measuring losses and making sure everything's working well. Once a break is located, it must be repaired. The usual approach for coax is to install a connector on each broken end and insert a barrel. You can do the same with fiber using an SC connector on each broken end and a device called an adapter to function as the barrel.

Fiber's time has come

Costs are down and equipment is increasingly available. Standardization has made it practical for suppliers to seriously consider making fiber I/O options available or perhaps even standard. You won't see SC/PC connectors replacing BNCs on things like video recorders and monitors immediately, but it won't be long before they're alongside BNCs. If you don't think fiber is close, take a look at some of the professional audio equipment. Fiber I/O is becoming common on some digital recorders and players. Video products will soon follow.

As stations increasingly look for ways to convert to digital and build facilities for HDTV, fiber will increasingly become a solution to problems. Now's the time to learn how to use fiber. Don't wait until that new piece of gear arrives and you have to learn on-the-fly. Besides, with HDTV just around the corner, high-speed data transmission over fiber will be a matter of course. ■

Les Brown is the president of Les Brown Associates, Grass Valley, CA. Respond via the *BE* FAXback line at 913-967-1905 or via E-mail to be@intertec.com.

For more information on fiber-optic equipment, circle (306) on Reply Card. See also "Fiber-Optic Components" on p. 94 of the BE Buyers Guide.

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By Fred Stone and George Hopstetter

Automation for multicasting

Offering additional program streams allows viewers new opportunities for education and entertainment.

The Bottom Line:

Automation is playing an ever-increasing role in today's broadcast industry. As demands on personnel and budgets increase, automation provides a solution. When properly implemented, automation allows for increased productivity from station personnel. Automated multicasting allows for multiple program streams using shared resources and increases use of equipment and staff. $

Master control automation allows the various forms of information — audio, video and data — to be used in conjunction with broadcast and non-broadcast technologies. Whether non-commercial/educational or commercial, stations must deliver a variety of services to a variety of people with the highest degree of flexibility and control.

Greater Dayton Public Television (GDPT) is the community licensee of two public broadcast stations — WPTD, Channel 16 (Dayton) and WPTO, Channel 14 (Oxford). The stations' service area covers southwestern Ohio, southeastern Indiana and northern Kentucky with translators extending coverage into west-central Ohio. Each has a separate program schedule and originates from the WPTD/WPTO TeleCenter in downtown Dayton.

GDPT also operates four Instructional Television Fixed Service (ITFS) channels in partnership with two local colleges. The combination of broadcast and ITFS channels serves more than 300,000 students and 1,200 educational facilities in 24-plus counties. These services require automation and considerable switching capability to keep everything running smoothly. Automation allows a single operator to handle these multiple output streams.

Selection

In the case of GDPT, a multichannel routing/master control audio/video switching system with automation control was desired. The automation system needed to handle seven independent switching channels for two TV broadcast stations (WPTD and WPTO), four ITFS channels, and a general-purpose XY channel for recordings and feeds. To get the most from an automation system during the planning phase, consider the following:

- Discuss plans with station staff and management to get a precise description of the needs and requirements of the automation system.

- Talk with other stations about their automation, router and master control switching systems. This helps foster a better understanding of the needs automation can address.

- Consider a common switching matrix to consolidate router switching and multiple master control switchers. A consolidated system reduces the space needed for equipment and makes troubleshooting less cumbersome.

- Consider using the same manufacturer to provide the automation control system and the routing and master control switching to assure a more closely integrated system and responsible vendor. This also prevents shifting the blame for any potential problems from one manufacturer to another.

As the selection process moves forward, consider the various vendors carefully. Track records, warranty, parts availability and support need to be taken into account. In the end, we chose Utah routing and master control switchers along with the TAS Total Automation System all of which come from the Dynatech Video Group.

Routing switcher

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coming changes in the intra-Ohio intercity interconnection system and the increasing complexity of ITFS operations revealed a need for increased switching capabilities to handle the increased programming resources and destinations.

We selected a switching matrix of 60 x 60 for video and stereo audio and a matrix 30 inputs by 30 outputs for audio level 3. The first two audio channels are stereo, while the third audio channel is used for SAP/DVS (secondary audio program/descriptive video service) and time code.

In planning additional audio levels, consider the number of audio channels available on each VTR. GDPT's VTRs have either two or three. Thus, SAP and time code share a common level. Satellite receivers and VTRs are the primary input sources for level 3 while VTRs and the WPTD and WPTO STLs are the primary output destinations.

The routing switcher was designed with a totally modular building-block approach that supports analog, digital, and data matrices of any size to be combined under a single integrated control system. The analog video matrix supports composite or component wide-bandwidth analog video.

One of the master control stations used at GDPT. The routers and automation units are in the racks in the background.

The stereo audio switching matrix comprises two independent high-performance audio channels terminated at the rear panel

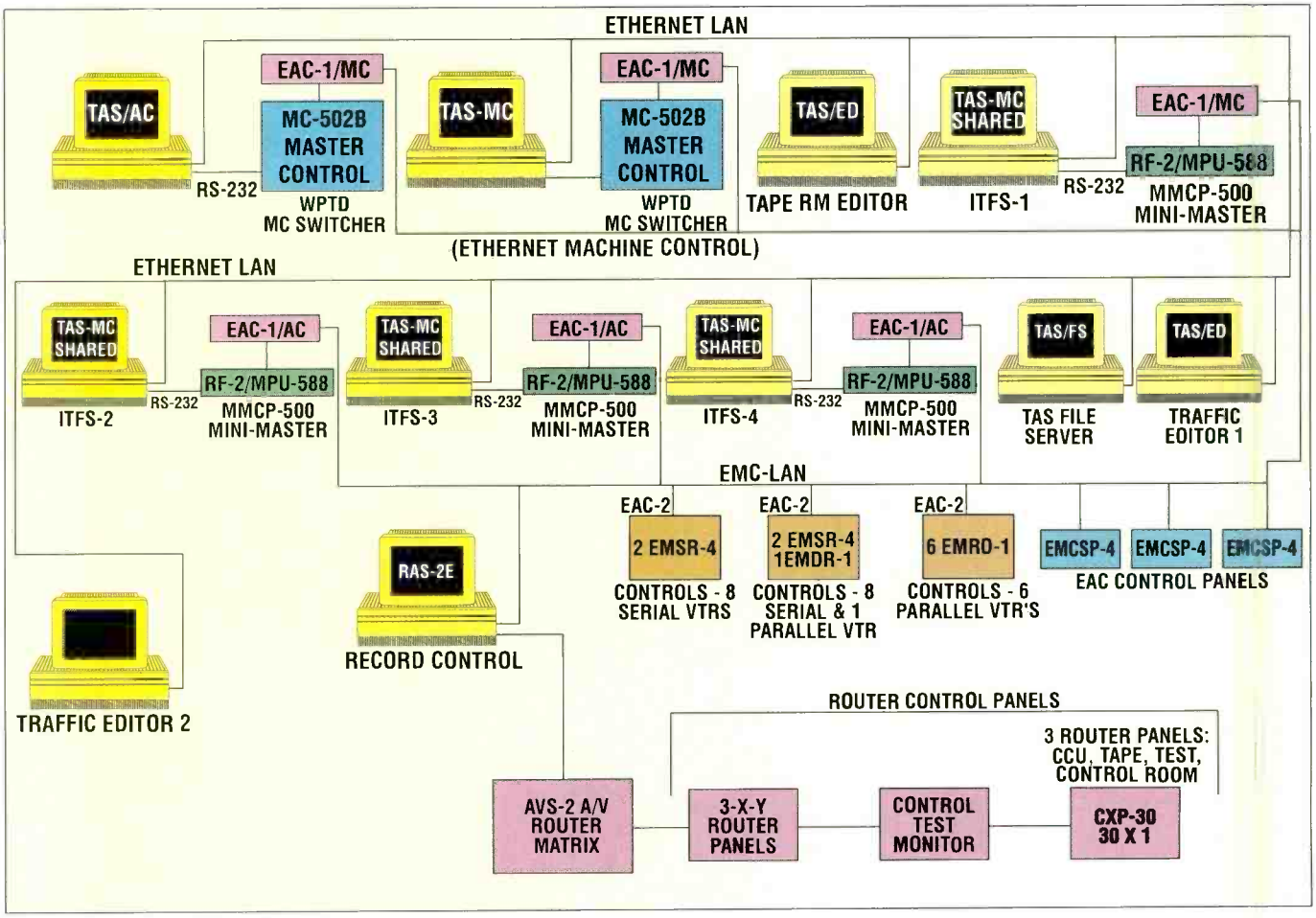
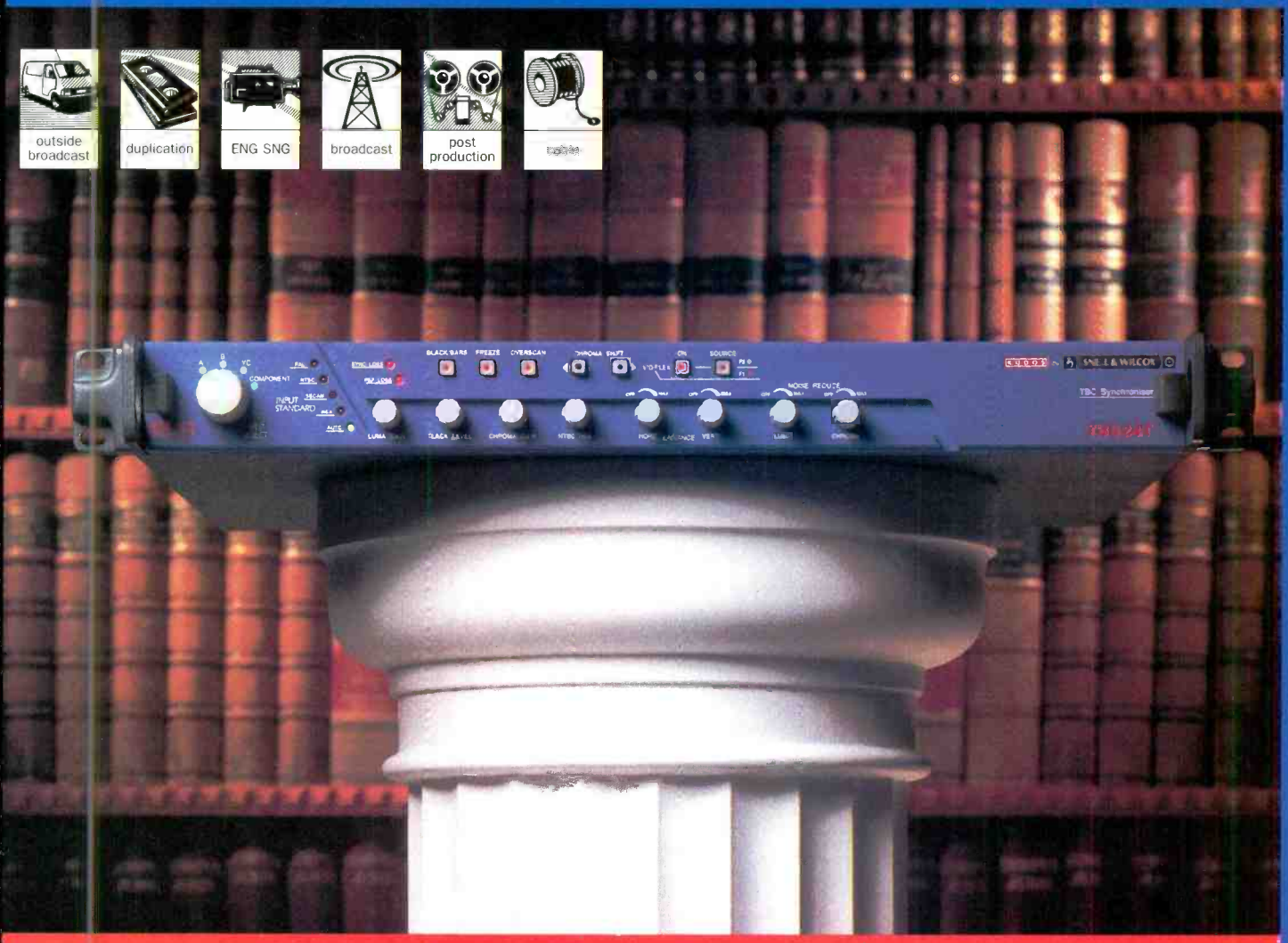


Figure 1. Block diagram of WPTD/WPTO-TV automation system. Allows fully automatic operation of four ITFS and two on-air TV channels, and one record channel.

'I sync, therefore I am'.



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via direct compression screw terminals. The audio inputs and outputs are balanced and set for unity gain at +4dBm terminated into 600Ω loads. The high-impedance bridging inputs have provisions for optional internal 600Ω termination on each input line.

The switching control system also provides an option for future upgrades to serial digital video, AES-EBU digital audio, and RS-232/422 data routing with the ability to achieve completely standards-independent operation for handling signals of any data rate up to 360Mb/s. When looking into router frames and upgradeability, consider the size and cost of the next step up and tailor the system to your needs. If you only need to add five inputs, a router that requires a 32-input frame may be cost prohibitive.

Master control switcher

When deciding which master control switcher to purchase, consider a built-in machine control interface to ensure reliable control of VTRs for accurate, timely preroll with minimal operator intervention. In the case of the TeleCenter, three buses were desired: program, preset and preview/key. Each of these levels handle video and stereo audio along with SAP audio and each uses a set of crosspoints in the router. Be aware when planning for several master control channels that the number of crosspoints required for program, preset, and preview/key outputs can eat up a significant portion of the router matrix.

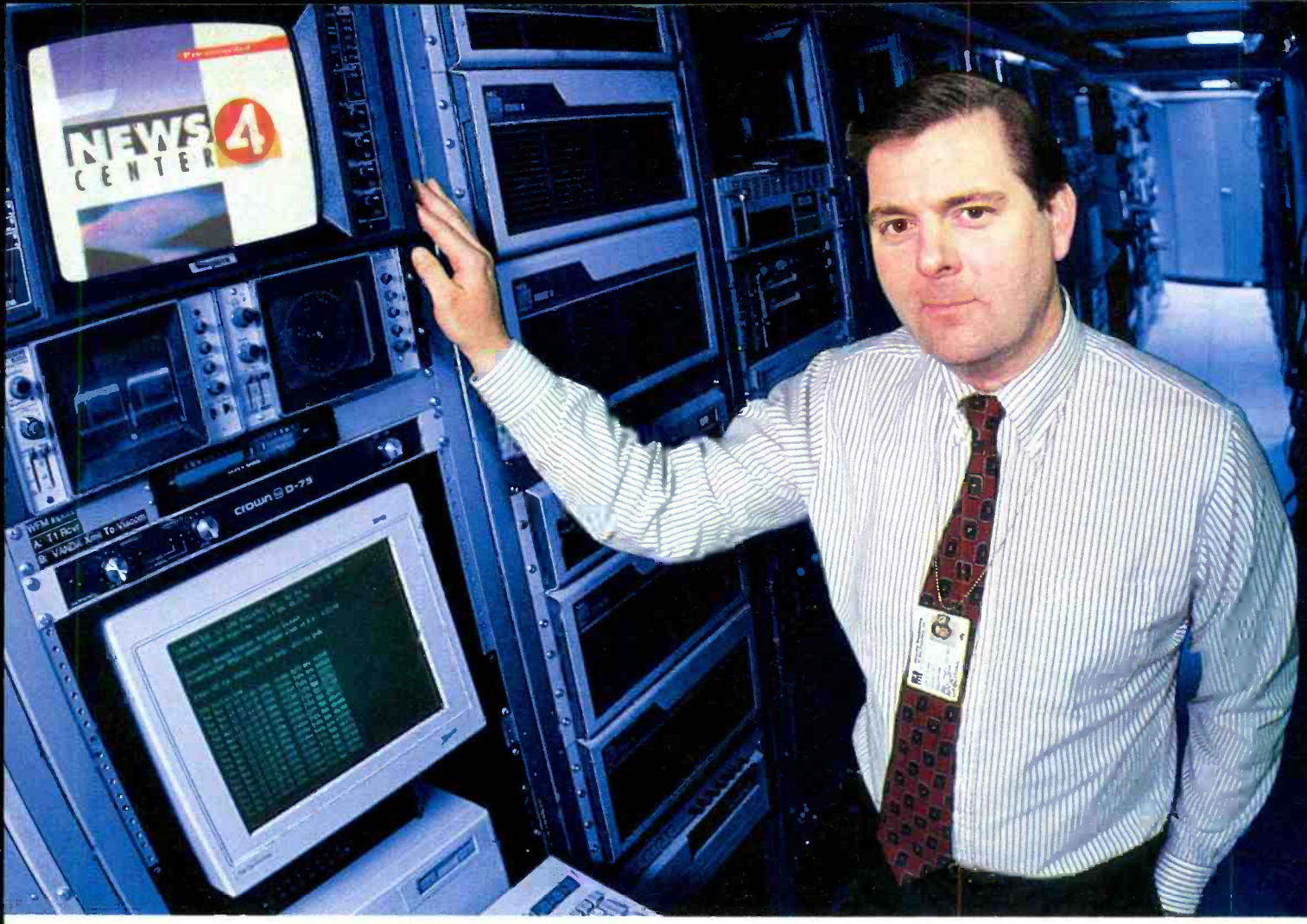
When looking into router frames and upgradeability, consider the size and cost of the next step up and tailor the system to your needs.

Backup systems are important, especially in master control automation. If something happens to the computer or software that is running the master control and the automation, what happens? Does the lone operator on the night shift go crazy trying to remedy the problem or does backup exist? Effective backup/redundant systems assure that master control does not have a single catastrophic failure point where the entire system can fail. This needs to be carefully investigated when considering automation systems. Determine if the computers used are off-the-shelf or if they contain proprietary parts or modifications. If you go the proprietary route, make sure spares are available in case of failure.

In our system, six computers are used for the two broadcast channels and the four ITFS channels. One computer terminal and one master control switcher panel for each of the broadcast channels is located at each end of the console in the master control room. The tape room houses five racks with four rack-mounted computers and four small master control switchers for the four ITFS stations.

A single rack-mounted pull-out space-saving keyboard is used along with a 6 x 1 switch to select the desired ITFS channel computer. This allows for quick review or editing of the program schedule on the single rack-mounted computer monitor. The switch eliminates the need for a separate keyboard and monitor for each of the four ITFS channels because five computers share the same terminal. This space-saving idea can be used in most applications that require multiple computer keyboards and monitors that clutter the desktop.

For complete flexibility, switching and machine control assignments can be made at the master control panel overriding the



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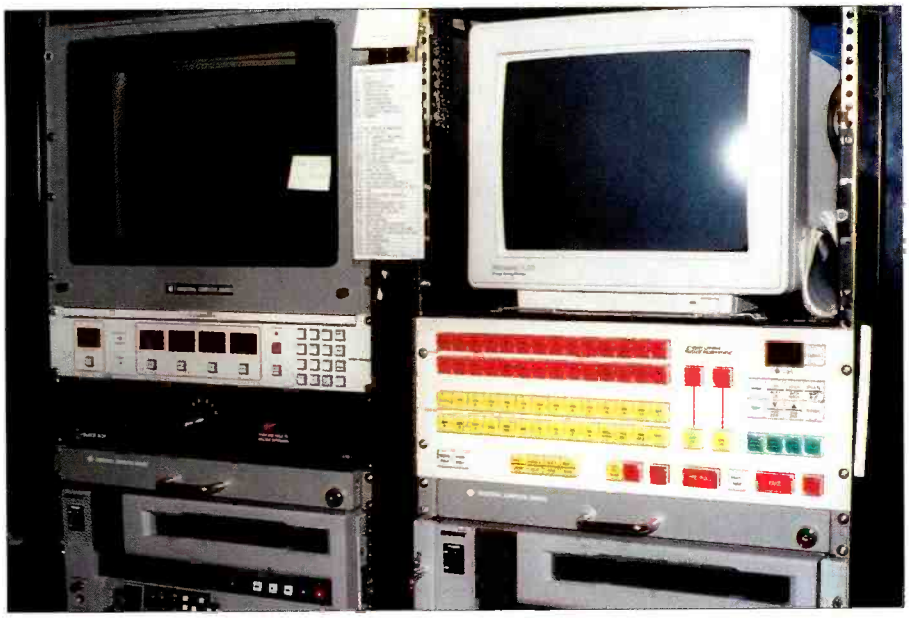


One the mini-master control switchers used for the ITFS channels.

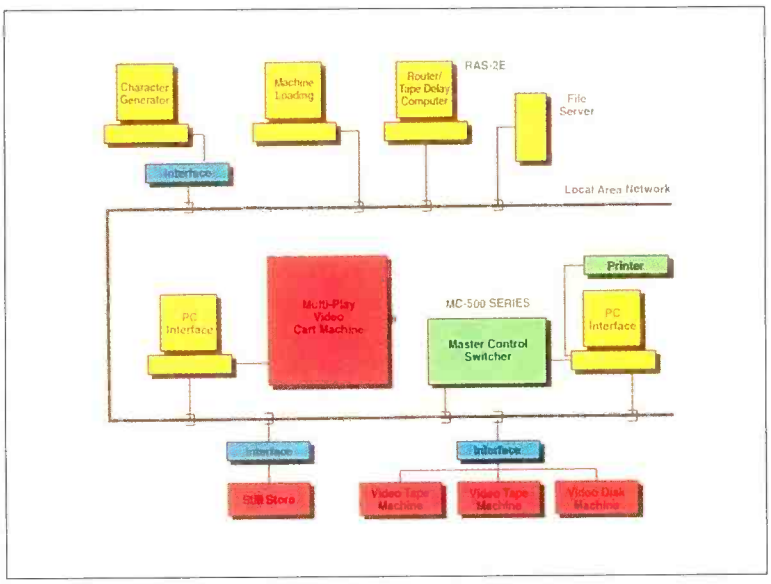
automation program. This provides the master control operator the opportunity to make last-minute spot or program changes. Event stacks are automatically updated to compensate for manual intervention, allowing for smooth transitions between manual and automatic switching. As-run logs keep track of all switching events including manual events.

Machine control

Machine control panels are another big consideration for automation. With machine control throughout a facility, such as in post-production, one person can load tapes on desired machines and be able to shuttle through the tapes and set cue points without the assistance of a tape operator. With an integrated machine control system, any machine can be controlled from any control point.

Machines can be controlled using various methods. One is a simple patching matrix that uses existing control panels for machine and TBC controls. These systems simply tie the RS-422 control lines to a common patch panel and machine control is achieved through normalled and manual patches. The next step up is the equivalent of a router matrix that connects control panels to equipment through crosspoints.

One of the more sophisticated approaches makes use of computer networking technology to allow integrated manual and automated machine control. Many of these systems have a common point where all machine remotes are tied into. Then, using an Ethernet LAN, dedicated panels and computers on the network can issue commands. These commands are received at the common point and directed to the appropriate unit. Many of these systems allow for serial control as well as GPI switching that can be used for parallel interfaces. Our system uses the Dynatech Ethernet Machine Control that allows for time-code-based cuing of material on serially controlled decks.



A portion of the LAN used to automate the GDPT facility.

Total automation system

In the selection of a total automation system, be positive that its distributive processing system assures that there will be no slowdown during multitasking operations, such as downloading information from the file server during breaks.

Cost, efficiency, improved accuracy and precision are all advantages of automation. However, automation does not necessarily mean a reduction in work force. In our case, it allowed for expanded services without increasing personnel. Operators are still needed to monitor broadcast quality and to intervene when a program ends early or runs longer than logged.

The number of operators and attending personnel depends on the number of channels and the degree of immediate control desired in the event of an unexpected situation. GDPT has expanded from one to six channels while still using just one master control operator. Production and engineering maintenance personnel are generally available to assist, but the system is designed as a one-person operation and it works well in that mode.

With automation, one operator can switch six channels even if the switches occur simultaneously. Station breaks generally occur on the half-hour and the hour for public television, and more frequently for commercial television. Without automation, one operator per channel could be required. The automation allows the operator to concentrate on delivering a quality product and a quality on-air signal to multiple channels simultaneously.

The as-run log records every switch action, which helps troubleshoot problems by pinpointing the source of the problem as the equipment, the schedule or the operator.

Automated documentation of what actually goes to air allows for the automation of program logs, billing cycles and other desired records. Files can be retained on disk, thus saving paper. Instead of distributing paper logs to various station personnel, staff members at networked PCs may access and review the schedules easily.

Ethernet and a Novell-based LAN network (see Figure 1) provide direct

Continued on page 52

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Multimedia Group

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Continued from page 48

The basic components needed for the TAS automation system include a PC-compatible computer, TAS software and a tape library system.

communication between traffic personnel and master control. From the programming manager's previously created block schedule, the traffic operators download prepared logs for each station's broadcast day into the main file server, which then appears on the respective channel and becomes the automation schedule. The master control operator previews the upcoming events and enters codes for the tape machine, satellite receiver or other programming source. With the time and sources properly input, the resulting automated switches are precise and clean.

Summary

For us, automation has allowed increased services without increased personnel. In addition, the reliability and repeatability of our daily operations has improved. Providing seven output streams in a reliable fashion is no easy task, but through careful planning and the right choice of automation systems, it has worked well. For the future, our plans are to automate as many of the daily tasks as possible. Hopefully, this will allow us to provide an increased level of services to our viewers. ■

Fred Stone is chief engineer and George Hopstetter is engineering supervisor for Greater Dayton Public Television, Dayton, OH. Respond via the *BE* FAXback line at 913-967-1905 or via e-mail to be@intertec.com.

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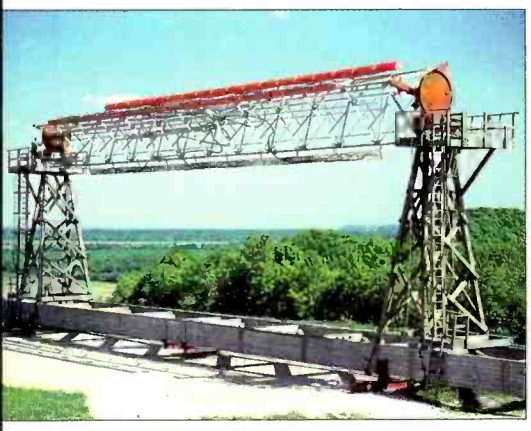
FEATURE

ATV transmission: Step-by-step

By William Zou and Matt Tietze



There are no cookie-cutter transition plans for ATV conversion.

The Bottom Line:

Adding an advanced TV (ATV) RF system to an existing TV facility will be difficult and complex. Each station will require a different design plan due to its location, the mechanical constraints of its tower, its new channel assignment, its ERP and its coverage. No single plan will satisfy even a small number of facilities, so every station will have to develop its own approach. $

Above photo: A multipurpose panel antenna undergoes acceptance tests in the manufacturer's test range. It has been designed for KOZK, Springfield, MO, where it will be used initially for NTSC only (Channel 21), then for combined NTSC/ATV simulcasting (Channels 21 and 66), and eventually for ATV only (Channel 66). (Photo courtesy of Harris Allied.)

After nine years of effort, the development of an advanced TV (ATV) standard has reached its final stage. A digital HDTV system created by the Grand Alliance (GA) will be tested this year. Based on the results of these tests, the FCC Advisory Committee on Advanced Television Service (ACATS) is expected to make a recommendation for the ATV standard to the commission in late 1995. The commission, therefore, could adopt an advanced TV system standard as early as 1996.

The conversion to ATV service will begin immediately after the standard is adopted. As the date for implementing the new service approaches, stations must prepare plans to ensure that future years' capital budgets can handle the ATV conversion process.

Converting an NTSC RF facility to an ATV facility involves technical and non-technical issues. The latter primarily involves regulatory and financial concerns. Technical decisions primarily involve the tower, transmitter, antenna and feedline. Many technical factors will drive each station's financial plans and trade-offs involving coverage, power level, cost and implementation schedule will have to be made.

Regulation, scheduling and licensing

The FCC has proposed an ATV implementation schedule based on an initial date when the final channel-allocation table and the final Report and Order have been released. After this date, stations may apply for ATV construction permits. As indicated by the FCC, the conversion will be a multistage process lasting 15 years. Once the standard is released, each eligible station will have three years to apply for a construction permit and six years to complete construction.

The ATV licensing process has not been formally defined by the FCC, but some preliminary decisions have been made (and other positions can be inferred). The application process will probably be the same as that currently used in that an ATV application will be treated as a new license rather than an extension or major modification of the current one. Requirements for economic, coverage and environmental analyses also should be similar.

A preliminary channel allotment/assignment table and the assumptions for its creation were released in the second Notice of Proposed Rulemaking issued in July 1992. More recently, broadcasters submitted their own channel allotment/assignment proposal to the FCC. The broadcasters' table was based on the following four goals: pairing the ATV channel with the NTSC channel, replicating NTSC coverage on the ATV channel, maximizing ATV coverage and minimizing interference to NTSC. A final decision on ATV channel allotment has yet to be made.

Implementation options and cost factors

Initial implementation scenarios for an ATV RF system can take either of two schemes called *minimal* and *transitional*. A minimal RF system is intended to get the station on the air quickly and inexpensively. This method relies on finding ATV antenna and transmission line space on the existing NTSC tower. The transitional scenario assumes that market acceptance of ATV will be quick and widespread. Therefore, major capital expenditures are made at the beginning of the implementation period rather than waiting until later.

In either case, coverage equivalent to the existing NTSC service is the goal. Implementation cost will vary based on the set of pre-existing conditions, the scenario chosen, and the coverage required.

Tower use and alliances

The most important part of defining a feasible ATV RF system implementation is finding a suitable location to mount the new ATV antenna and feedline. Many issues regarding selection of the best antenna location are technical, but economic and

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political issues will probably determine the final decision.

Significant technical and economic benefits come from using the current NTSC transmitter and antenna location. If the current site cannot be used, explore alternate sites near the existing location that can share a combined (NTSC + ATV) common antenna. If this is also not possible, construction of a new tower is the only remaining option.

The advantages of such a new site are obvious: total control of the structure, ability to choose tenants and partners, and the ability to design a multichannel site with anticipated growth and lease income. Unfortunately, the problems are almost as obvious: the total cost, locating a site, obtaining the numerous approvals and permits, and dealing with tenants.

Multichannel operation of a new site is also a possibility. Combining multiple ATV stations (and possibly relocating existing NTSC stations) in a new transmission facility could provide many options for optimum use of tower space.

Tower stress analysis

A tower stress analysis will determine whether the new ATV antenna and feedline can be loaded on the existing tower. The essential elements of this analysis include an appropriate design standard for specifying and calculating environmental loads (e.g., windloading and iceloading), and the definition of safety factors and allowable member capacities.

Based on the structural analysis, a cost estimate for all the necessary tower modifications can be prepared. It should include costs for engineering, materials, fabrication, galvanizing, shipping and installation.

System design

The main requirement of any ATV RF system design calls for the antenna and feedline combination to fit in the available aerodynamic envelope, while still providing the desired coverage (for *all* stations using the system, in the case of multichannel installations). This requirement will drive the proposal and selection of equipment. Proposals should provide several alternatives in each major component area. These areas include antenna, feedline, transmitter, filter and switching. For multichannel systems, an RF combiner is also required.

The choice of antenna type, size and performance is a complex problem.

• *Antennas:* The choice of antenna type, size and performance is a complex problem. Generally, broadcast transmitting antennas fall into one of three basic design varieties: dipoles, dipole panels and slot arrays. Dipole panel arrays and slot arrays are the two most common antenna types used at UHF frequencies. An ATV antenna can be mounted in different ways on an existing or new tower. Options include top-mounting, wrap-around, side-mounting and candelabra. Available tower space and coverage requirements will determine which mounting option is chosen.

• *Feedlines:* The feedline should carry the high-power RF signal up the tower from the inside RF equipment to the antenna input port with as little loss as possible. It must also fit within the available aerodynamic envelope on the tower. The performance of feedlines, therefore, must be examined with respect to windload, flange reflections, power handling and attenuation.

• *Transmitters:* An ATV transmitter is similar in many ways to an NTSC transmitter. The major difference is the use of a diplexer to combine visual and aural signals in NTSC, vs. a single amplifier for the ATV bitstream. This should make the conversion of existing NTSC backup transmitters to ATV a straightforward process. Currently, there are five types of high-power transmitters available and likely to be used for ATV operation at UHF frequencies. They include IOT or Klystrode, MSDC klystron, solid-state, tetrode and Hypervapor/tetrode. Each has its advantages and disadvantages.

The main requirement for any transmitter is that it amplify the desired signal to high power levels without adding distortion, noise, harmonics and out-of-band products. It appears that a good quality NTSC transmitter should make an acceptable ATV transmitter and that performance levels relating to amplitude and phase distortion, signal-to-noise ratio, intermodulation and harmonics will be similar.

• *Filters and switching:* The RF components between the transmitter output and the feedline provide filtering and switching of the high-power RF signal. The switching systems will be similar to those used for NTSC transmitters, in which various coax and

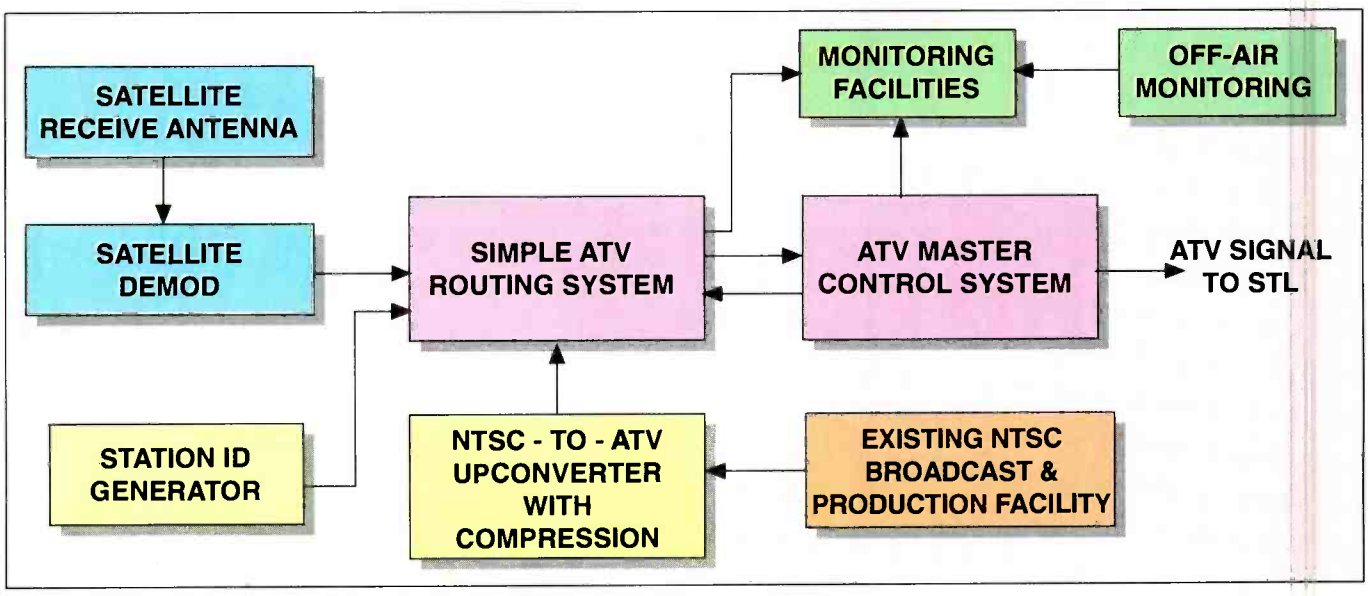

Figure 1. Basic block diagram of a "minimal scenario" for a station's ATV conversion.

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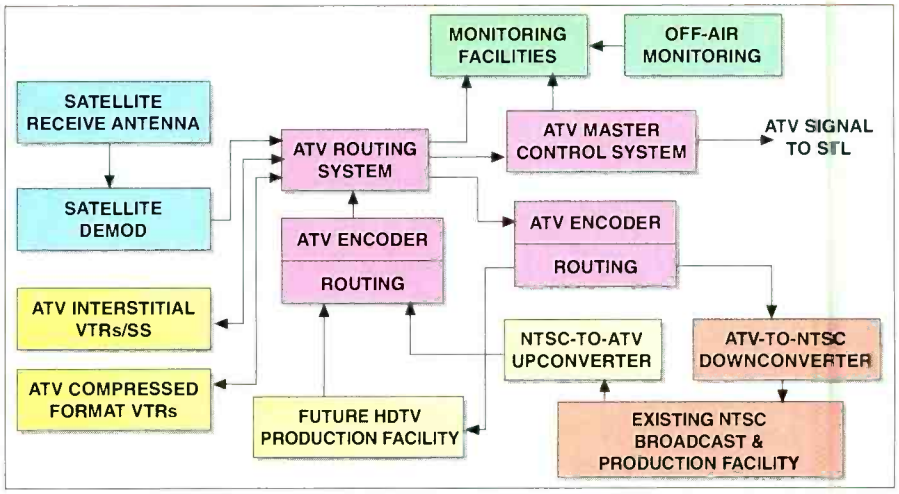

Figure 2. Basic block diagram of a "transitional scenario" for a station's ATV conversion. (Interstitial VTRs and still-stores at left are used for spots and other short-form programs, while compressed-format VTRs carry long-form programs.)

waveguide switches, switchless combiners and patch panels will be used to route the transmitter to the proper load or antenna. The performance specifications of these systems are not expected to change.

To prevent radiation of intermodulation products by the antenna, a bandpass filter is required. This new high-power filter must absorb or reflect the out-of-band products created by the transmitter.

• *Multichannel combiners:* A multichannel combiner is required to radiate two or more channels from a common antenna. The combiner must provide total isolation between the channels with as little additional insertion loss and VSWR as possible. It must also be stable and reliable in operation under varying environmental conditions.

Two basic types of multichannel combiners are available for use at UHF: *constant-impedance* and *star-point*. The performance characteristics of a combiner are assessed along the categories of power handling, channel spacing, isolation, insertion loss, group delay, channel capacity and expansion capability.

Installation considerations and costs

Following the preliminary selection of feasible ATV RF system alternatives, installation requirements of the system must be defined. Three major factors should be considered:

1) Space requirements of the ATV transmitter in the transmission facility's building.

2) The rigging of the tower for the required new equipment or modifications.

3) Worker safety during installation.

To thoroughly evaluate each ATV RF system alternative, a complete bill of materials including all costs must be prepared. The bill of materials should detail the type, size and where applicable, the manufacturer and model number. These cost estimates can be used for budget analysis of system proposals.

To thoroughly evaluate each ATV RF system alternative, a complete bill of materials must be prepared.

As the schedule for introduction of ATV service in the United States advances and the date for implementing the new service appears on the horizon, stations must prepare plans for their transition now to guarantee proper capitalization. This planning is absolutely necessary to ensure that over the next 10 to 15 years terrestrial TV broadcasting does not become a technological dinosaur. ■

William Zou is communications systems engineer and Matt Tietze is director of engineering at Public Broadcasting Service, Alexandria, VA. Respond via the *BE* FAXback line at 913-967-1905 or via e-mail to be@intertec.com.

Editor's note: The *ATV RF Feasibility Handbook* will soon be available from PBS. It is the first comprehensive reference book that covers the conversion of an existing NTSC broadcasting facility to ATV. Contact Matt Tietze at PBS for further information at 703-739-5481.

For more information on ATV transmission equipment, circle (304) on Reply Card. See also "Antennas, Other," "Transmitter Systems" and "Transmission Line, Waveguide," pp. 82-88 of the BE Buyers Guide.

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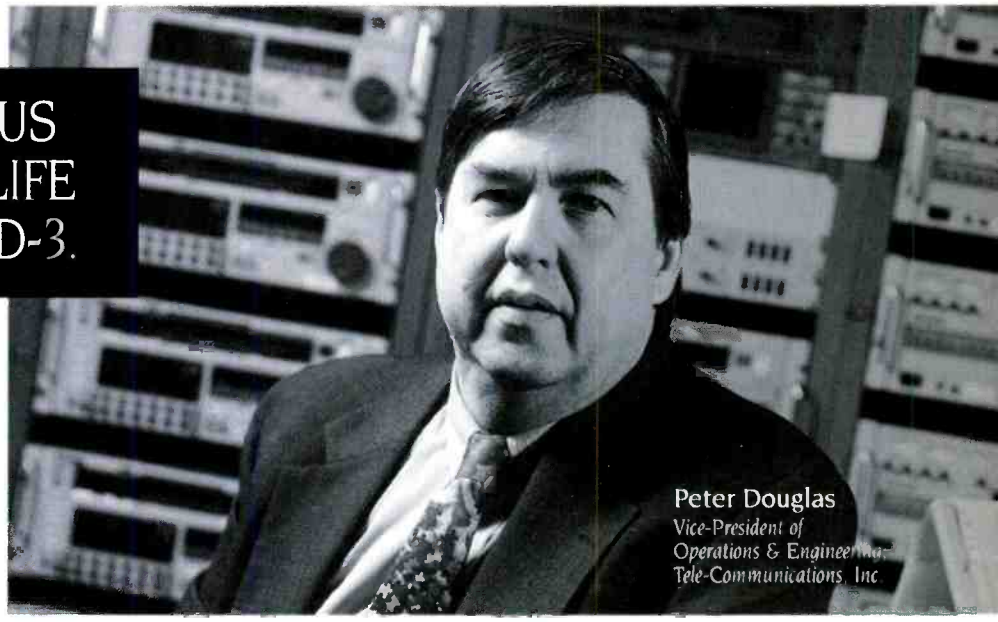

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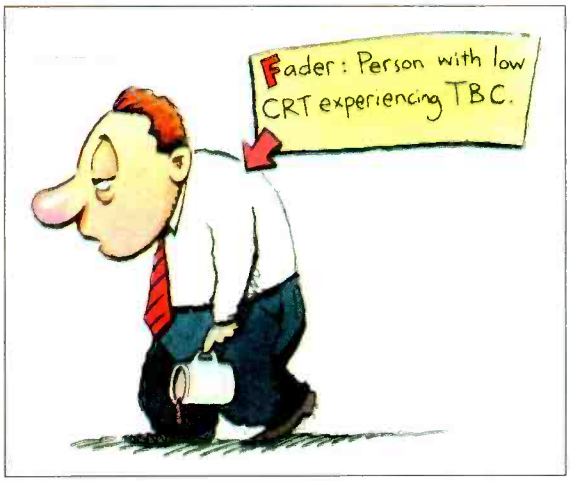
FEATURE

Technical Glossary

By John Moretti



You may not be communicating the meaning you thought you were.

The Bottom Line:

With a technology that is constantly changing, it is important to stay on top of the industry's jargon. Although many of the same basic terms are still being used in broadcasting, some new and surprising definitions have evolved over the years. This glossary of terms will update your vocabulary to ensure proper communication with your peers. $

"I claim not to have controlled events, but confess plainly that events have controlled me."
—Abraham Lincoln in a letter to A. G. Hodges

A lengthy tenure in broadcasting taught me two important lessons: Murphy prefers to drop in unannounced, and a sense of humor is cheaper than a therapist and easier to carry. Here is a collection of terms whose original definitions began to change about the same time reality crept up and tackled me from behind.

• *ATR.* Abrupt Termination Response — the result of STL (Sudden Total Loss) that often includes screaming, moaning, hair-pulling and long bursts of foul language.
• *Color correction.* The immediate and animated retraction of a statement that turns management or clientele pale green or bright red, such as "we've exceeded the budget" or "we can't make deadline."
• *CRT.* Caffeine Reaction Time — the time between ingestion of copious helpings of coffee and the restoration of mental activity.
• *Cuts-only.* One possible scenario for time spent working on inaccessible equipment. As opposed to "cuts, crush wounds and fractured limbs."
• *De-icer.* A device that keeps the transmitting equipment toasty warm when serviced regularly by a freezing engineer.
• *Detail correction.* A misleading term used by management or clientele that translates to a complete overhaul of the project — from shoot to final edit.
• *Direct box.* Slang for an emergency overnight or courier delivery of replacement parts for crucial equipment that has failed on an on-location shoot.
• *Dock.* v. (1) To impact a loading platform with a van or truck filled with expensive gear. n. (2) The loading platform that goes "crunch" when impacted by a van or truck filled with expensive gear.
• *EBS.* Engineer's Back Syndrome, also called "rack back" — a pathological condition, not unlike carpal tunnel syndrome, that is caused by the continuous removal and re-installation of rack-mounted gear.
• *Editing controller.* That which dictates the amount of quality time spent editing any given project. Examples would include "budget" and "time."
• *Fader.* An employee whose blood caffeine level has decreased to the point of ineffectiveness.
• *Fiber.* A sensible and reliable way to ensure gastrointestinal regularity during remote on-location work.
• *Heat exchanger.* A highly technological explanation used to deflect wrath away from the responsible party and toward innocent gear.
• *Level compensation.* A worthless title or position awarded an employee by management to try to compensate for an inadequate salary.
• *Pan head.* Slang for one who takes out frustration by pounding his or her head with Magnalite cookware. See "tilt head."
• *Profanity delay.* The time between a catastrophic technical snafu and the utterance of a linguistic unmentionable.
• *Prompting system.* Any of a variety of methods used to attract the immediate attention of someone committing a serious gaffe, such as parking a camera shot on the mayor's wife's chest, telling off-color jokes within the pickup range of a live mic, etc. See "signal enhancement."
• *Pulse delay.* The period of time between a technical director's implementation of a prompting system and the resumption of his or her heartbeat.
• *Signal enhancement.* Any means, including but not limited to wild gesturing and the lobbing of heavy projectiles, with which to increase the impact of an urgent message from a technical director

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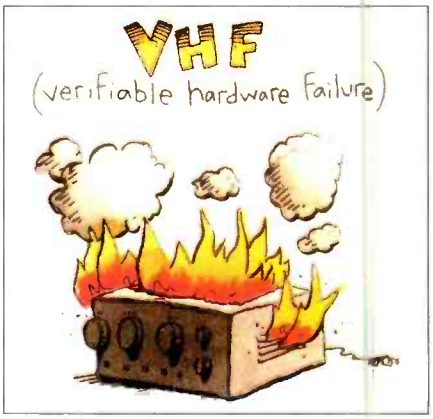
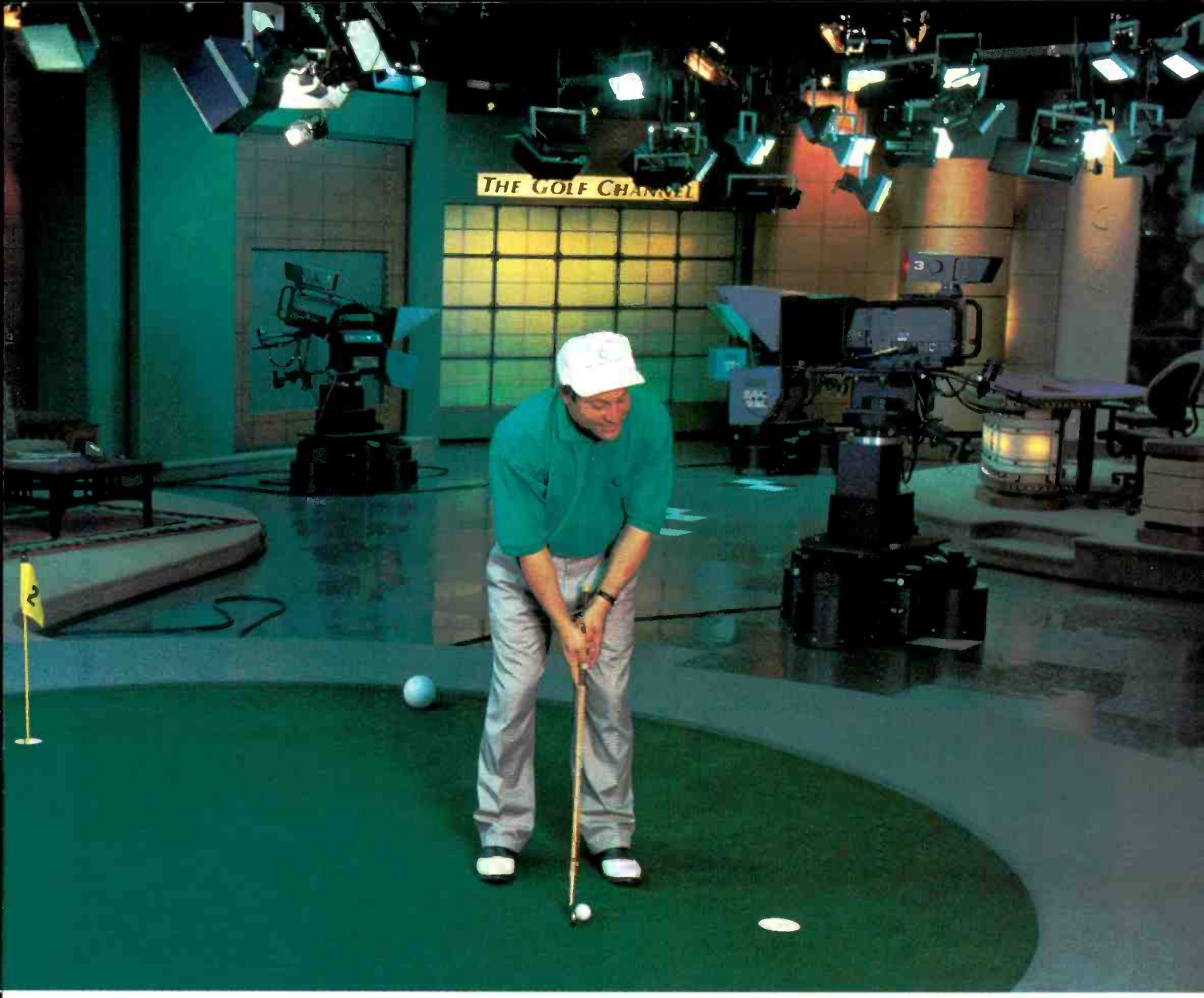


to a camera person or talent. See "prompting system."

- *Solid-state.* Descriptive of the body of an ENG videographer covering a tense all-night standoff in the middle of a blizzard.
- *STL.* Sudden Total Loss — the instantaneous and complete loss of any crucial data or signal at the worst possible moment.
- *TBC.* Total Brain Crash — a mysterious mental impairment that often occurs directly following an STL.
- *Test slide.* A sudden forceful application of the brakes of an ENG or EFP vehicle used to confirm that the gear has been properly secured.
- *Tilt head.* A slang term for the alignment of a pan head's skull along the vertical axis.
- *Time modification.* The traditional strategy of greatly exaggerating the amount of time needed to perform a given task, thus making one look like a hero when the job is completed earlier than expected.
- *Transmission line.* A stock excuse used by ENG crew members who are late because they stopped for coffee and doughnuts, "Sorry we're late. It was the transmission again."
- *UHF.* Unverifiable Hardware Failure — an equipment anomaly that one suspects — but cannot prove — is caused by a particular piece of hardware.
- *VHF.* Verifiable Hardware Failure — an equipment anomaly that can be traced to a piece of hardware that is either smoking or in flames.
- *Videodisc.* The slang name for a pathological spinal condition caused by hauling heavy ENG and EFP gear.
- *Zoom lens.* Slang for a contact lens sucked free of its host eyeball and sent hurtling toward the ground as a result of a videographer positioning himself or herself too close to the open door of a rapidly moving helicopter.

The editors of *BE* hope you enjoyed this lighthearted effort to provide some comic relief. April Fools!

John Moretti is a writer, producer and cartoonist based in Denver, CO. Respond via the *BE* FAXback line at 913-967-1905 or via e-mail to be@intertec.com.



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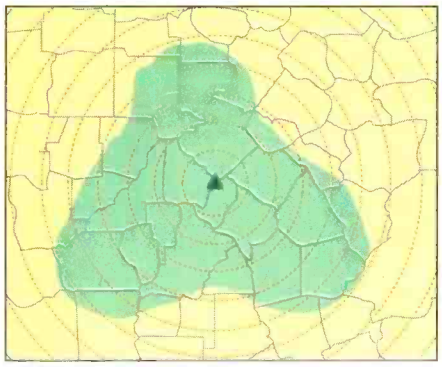
By Bob Leonard

Selection and maintenance of transmission lines



Picking the right transmission line for TV broadcasting used to be easy. You decided whether to go with waveguide or coax (rigid or semiflexible cable), then looked for a line with the right power rating and loss. Verification that the tower would support the added load was the last step. But now the spectre of HDTV has led many broadcast engineers to fear that the line they choose today might not be usable in a few years. They may need something different to make their station HDTV-ready.

The spectre of HDTV has led many to fear that the line they choose today might not be usable in a few years.

While it's true that there are more choices than ever for transmission line, the fundamentals of selection still apply, so rest assured. There are some special issues relating to HDTV that must be addressed, however. But first, consider the following review of the basics.

Transmission lines

Rigid coaxial line provides lower attenuation and VSWR than coaxial cable, so rigid line is preferred for lower-powered UHF-TV applications and others requiring good performance in these areas. Some broadcasters in rural areas select rigid line because a bullet hole in the line can be eliminated by replacement of a single section, while coaxial cable requires a splice or patch. On the downside, rigid line's installation is more difficult and it costs more. Several versions of rigid line are available: standard, expansion, bellows, hybrid and broadband.

Semiflexible coaxial cable is widely used for antenna feeds of VHF-TV and LPTV. Two types are available: foam dielectric and air dielectric. Foam dielectric cable needs no pressurization and is favored for systems using an unpressurized antenna. Air dielectric cable is used when the antenna requires pressurization or lower attenuation is needed than is possible for foam cable. Air dielectric cable is available in larger sizes than foam cable. For cables of the same size, air dielectric has higher-average power-handling capability.

Waveguide is the line of choice for high-powered applications for higher-frequency stations. When large rigid coaxial line won't work or where low attenuation is essential (such as in areas where electricity costs are high), waveguide does the job. Waveguide's only disadvantage is the substantial wind-loading it adds to a tower because of its larger size. There are three types of waveguide to choose from: rectangular, truncated and circular. Because the circumstances that dictate the selection of a waveguide transmission line are clear-cut, the remainder of this discussion will refer to coaxial types only.

Selection criteria

To pick the optimum transmission line, start with your requirements for cutoff frequency, power transmitted, loss (attenuation and efficiency) and VSWR. The cutoff frequency, given in manufacturers' catalogs, is the frequency above which undesirable modes of propagation are generated. Don't use any transmission line above its cutoff frequency.

Two power ratings are given by transmission line manufacturers: the *peak power rating* determined by voltage breakdown considerations and the *average power rating* determined by the maximum heating the line construction can safely withstand. Because single-station TV broadcasting is average-power limited, the peak power rating is usually ignored. But if you plan to combine several signals at your antenna when HDTV comes along, don't forget that equivalent peak power levels go up by the *square* of the number of channels. Make sure that you won't exceed either the peak or average power ratings of your line.

Average power

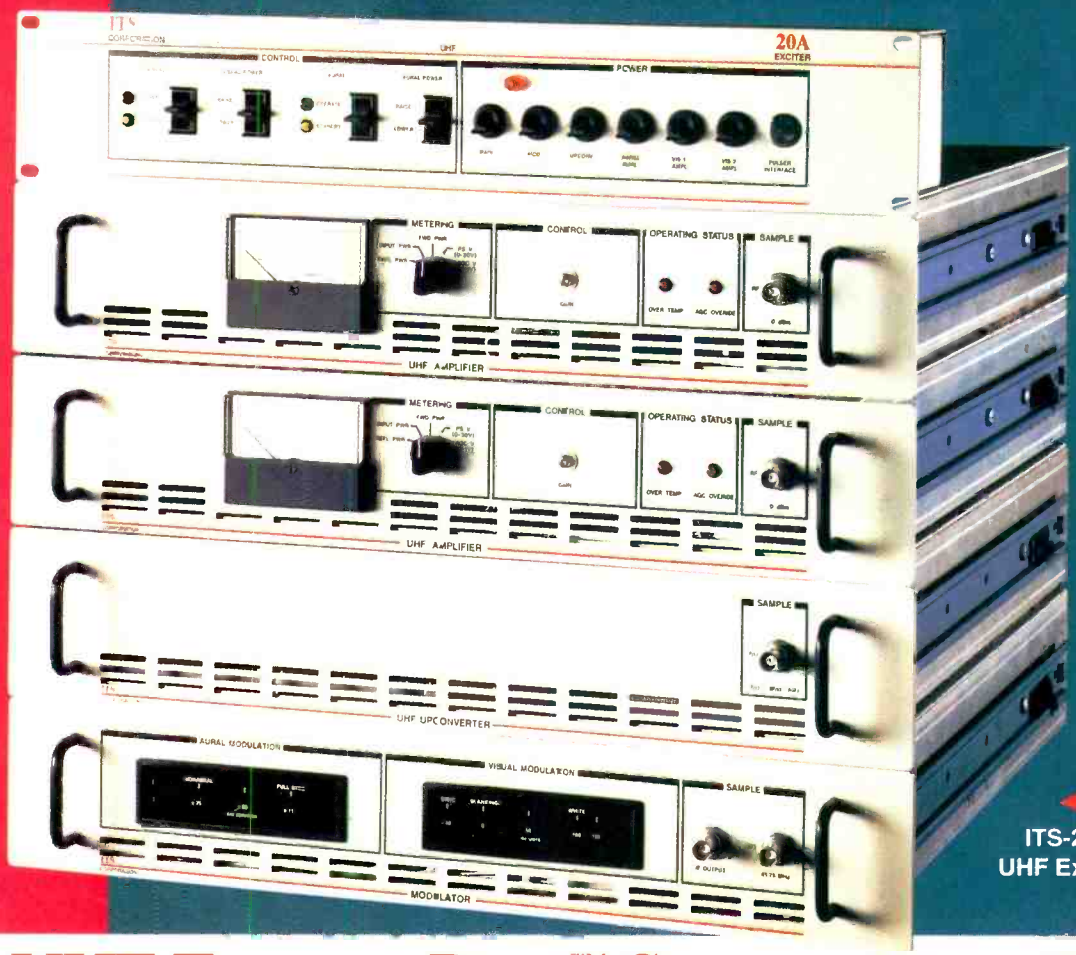
The average power rating of coaxial line depends on the maximum inner conductor temperature that permits safe long-term performance of the dielectric. It decreases with increasing frequency. Manufacturers' ratings for average power assume a VSWR of 1.0 and ambient temperature of 40°C, and they must be derated for actual ambient temperature and VSWR.

Use the following equation to calculate the average power that is applied to a transmission line:

$$P_{AVG} = 0.82\ P_{TV}$$

where P_{AVG} = average transmitter power (visual and aural)

This high-power UHF-TV transmission line uses circular waveguide.



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and Prv = TV peak sync power

The 0.82 factor is based on a totally black picture (60% peak TV power) plus aural signal (22% peak TV power). This provides an absolute maximum for average power level. A more practical factor is 0.7, based on 10% aural + 60% video.

After calculating your average power requirement, compare it to the candidate transmission lines' average power ratings. Be sure to adjust these ratings to your actual ambient temperature and VSWR conditions following the charts and formulas given in the manufacturer's catalog.

Attenuation

The attenuation of a transmission line is the ratio of input power to output power in decibels. The effect of connectors on loss is usually negligible and can be ignored.

Coaxial-line attenuation ratings are given for "standard operating conditions," which probably won't apply exactly to your situation. Performance will be affected by temperature and load VSWR. Manufacturers' catalogs usually provide a curve showing the variation of attenuation with ambient temperature. This effect is generally small, however. The VSWR of the antenna also raises the total transmission loss of the system, though this also is typically extremely small (if there is a good match between the line and the antenna). See the manufacturer's catalog for details.

Efficiency and VSWR

In selecting the right line for an application also consider *efficiency*, which is defined as the ratio of power delivered to the antenna vs. input power to the transmission line. (One manufacturer offers a software program to calculate efficiency for its products.)

Where VSWR is critical, rigid coaxial line or specially selected low VSWR cable can be ordered. To be sure of getting the best performance, let the manufacturer know the exact channel and/or bandwidth that will be used.

Rigid-line expansion compensation

When power is applied, the inner conductor of any coaxial line expands. With corrugated cable, the corrugations compress to accommodate this. But rigid line with no corrugations requires another method. This is generally done by allowing the inner conductor to slide over the inner connector or *bullet*. Eventually, enough metal will wear off to cause arc-over and line burnout.

One method to reduce this problem uses a contact that resembles a watchband spring to minimize galling of the inner conductor. Such lines are usually marketed as *expansion lines*. More recently, a *bellows line* has

heen patented that, while retaining the bullet, eliminates the sliding contact. Even newer is the *hybrid rigid line*, which combines a corrugated inner conductor with a rigid outer conductor. This uses a bolted connection and dispenses with the bullet completely.

Tower loads must be reviewed next. Every transmission line imposes a windload and a deadload on the tower, distributed uniformly between the antenna and the base of the tower. Use ANSI/EIA/TIA Standard 222-E to determine windloads and iceloads, and verify that your tower can withstand them with an ample margin of safety.

HDTV considerations

What about the additional channel required by HDTV? Will your new line accommodate it? With coaxial cable this is not a problem because cable is broadband. But with rigid line, the regular connectors along its length create standing waves that may cause high VSWR at frequencies other than the one originally specified. To address this difficulty, one manufacturer has introduced a new kind of rigid line offering broadband performance. This product creatively solves the frequency-specific problem by improving connector manufacturing tolerances and by mixing sections of slightly different lengths in a pseudo-random pattern. Unfortunately, this pattern must be calculated uniquely for each installation, which takes a toll on speed of repair because replacement sections must be custom ordered from the manufacturer.

It may not be necessary to have a wideband rigid line for NTSC/HDTV simulcast operations.

But it may not be necessary to have a wideband rigid line for NTSC/HDTV simulcast operations. For most HDTV applications, the second frequency will carry a low-power digital signal for which an auxiliary run of 3-, 4- or 5-inch air-dielectric cable may be quite sufficient. To determine which approach is right for your situation, consider the costs of rigid line, coaxial cable, antenna (panel/top mount/side mount) and multiplexer/demultiplexer, plus any tower modifications needed for the additional windload of a panel antenna and other additions.

Transmission line maintenance

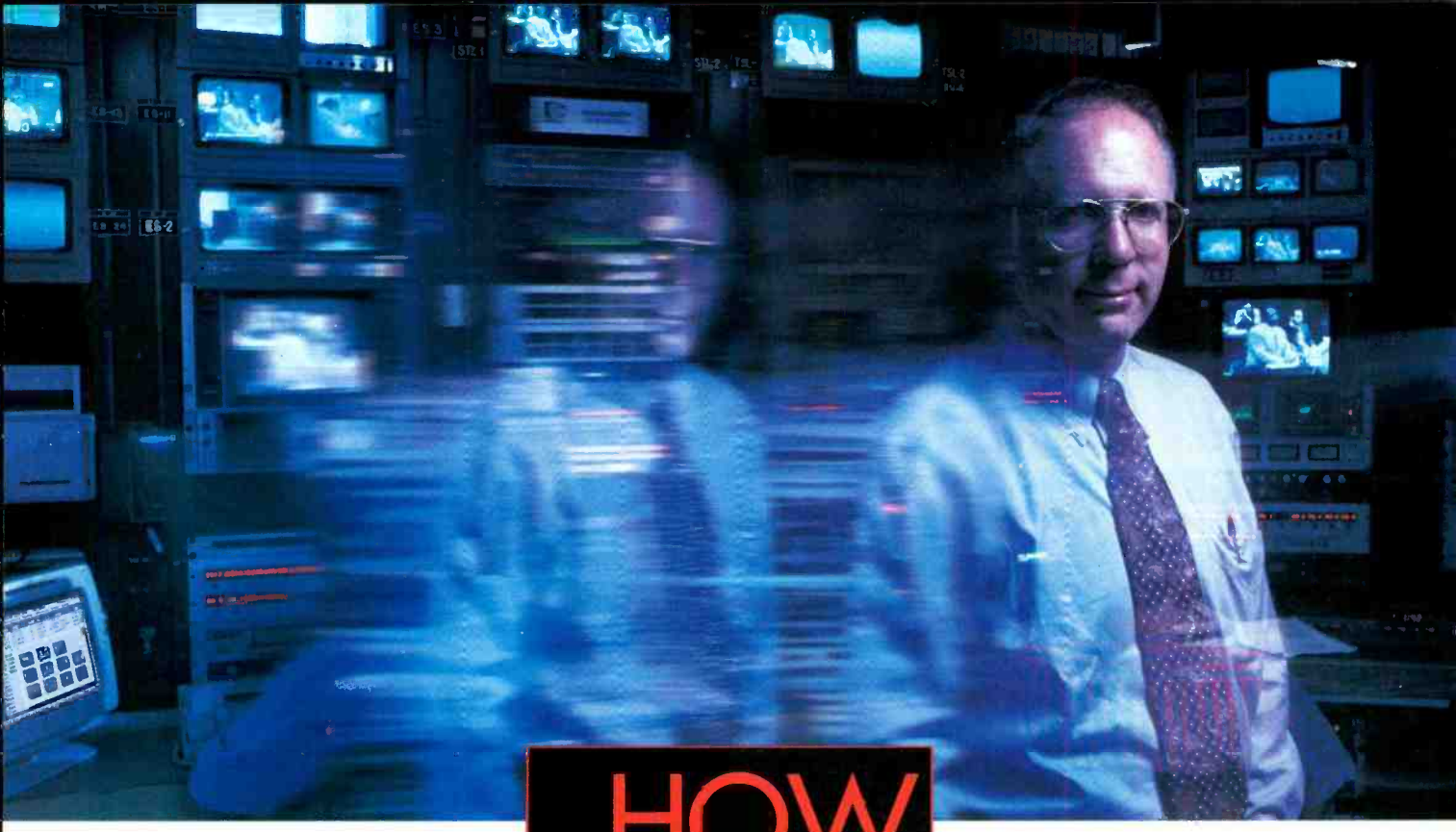
Neither rigid line nor coaxial cable requires much maintenance. If rigid line with sliding contacts (even expansion types) is used, it's good practice to replace the bullets every 10 years to avoid sudden failure. Hanger and flange bolts should be checked periodically. Inspect the line immediately for damage if a VSWR trip or low-pressure/excess run-time alarm occurs. With proper care, any transmission line system can be expected to give many years of service, even across the NTSC/HDTV transition period. ■

Bob Leonard is product manager, broadcast transmission line products, at Andrew Corporation, Orland Park, IL. Respond via the *BE* FAXback line at 913-967-1905 or via e-mail to be@intertec.com.

Editor's note: *E-CALC*, an MS-DOS program for transmission line efficiency calculation, is available free of charge from Andrew Corporation at 1-800-DIAL-4-RF, extension 2985.

For more information on transmission line, circle (302) on Reply Card. See also "Transmission Line, Waveguide," pp. 86-88 of the BE Buyers Guide.

Both rigid coaxial line and semiflexible coaxial cable are included in this transmission line installation at WGTV (Channel 29), Traverse City, MI.



HOW FAST CAN YOU DISKO?

IF you want to make the move from tape to disk, Ira Goldstone has a few quick words of advice:

Q: As Director of Engineering at Tribune Broadcasting, you're in the midst of updating your entire system. How do you deal with the pressure?

A: *Carefully.*

Q: Right. So did you choose the Louth ADC-100 automation system to bridge to disk or give you future flexibility?

A: *Yes.*

Q: Meaning you liked Louth's ability to control all types of different devices?

A: *Yes.*

Q: And you weren't worried about any problems with proprietary automation software or choosing any disk vendor you wanted?

A: *No.*

Q: So if you were to give advice on how to make the transition to disk, without worrying about where your station goes in the future, what would it be?

A: *Louth.*

Q: And what about the multi-casting environment?

A: *Louth.*

Q: Of course, you'd still need a media management and traffic interface system to tie it together. Any final words of advice?

A: *Louth.*

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By Jim Wulliman

SBE Certification Program marks 20th anniversary

The SBE provides many benefits and services to the broadcast industry and its related technologies, most of which benefit our members as well as their employers. The work of our volunteers in local and national Frequency Coordination, and the FCC Liaison Committee, which has earned its reputation for intelligent, farsighted filings in broadcast-related proceedings, are just two that come to mind.

Another SBE industry service is the Certification Program. This spring marks the 20th anniversary of the SBE Certification Program. The program was introduced to the broadcast industry at an Early Bird Workshop during the 1975 NAB Convention in Las Vegas. The meeting room was overflowing and the coffee wasn't even ready yet!

The Certification Program began as an idea for a proposal to the FCC that would have created an endorsement to the First Class License. This endorsement would have been required in order to be a broadcast station chief engineer. It had become apparent that the First Class License had been devalued by the "memory course" examinations. Many broadcast engineers felt that a higher standard of evaluation should be available, and such an initiative from the federal government did not seem likely.

Ben Wolfe, who was director of engineering at WTOP-TV in Washington, DC, at the time, had developed a set of exam questions for the proposed endorsement. When the FCC showed little interest in upgrading its exams, Wolfe and his friend John Wilner, who was director of engineering at New Jersey Public Television, asked the SBE if it wanted to develop the idea further. Many meetings and several years later the SBE Committee was ready to present its plan to the broadcast industry for what had by that time become the SBE Certification Program. It should be noted that this was quite some time before the FCC decided to eliminate the First Class License, which the committee considered to be an entry-level position. The Broadcast Technologist level was introduced later to replace the First Class License following its elimination by the FCC.

The SBE Certification Committee has been pleased to see how well the program has been received by the industry as the premiere method for evaluating and upgrading technical personnel. A quick glance at the technical job offerings in industry publications will reveal just how widespread the acceptance of SBE Certification has become. Many positions advertised require or prefer candidates who hold SBE Certification.

Of course, if the program is to continue to thrive, it must be responsive to changes in the industry. Thus, it was last year that SBE introduced a new Radio Operators Certification Handbook. In February of this year, a TV Operators Certification Handbook also was announced.

These handbooks are preparation for the respective Operator Certification examinations. They are written to train persons interested in obtaining entry-level operator positions in the industry. They also serve as training manuals for new employees at radio and TV stations. These new handbooks are proving to be popular, judging by the orders from individuals and stations. The SBE has also received inquiries from several junior colleges and technical institutes asking for information on how they can integrate these handbooks and the exams into their training courses. If the FCC eliminates the requirement for a Restricted Operator Permit as they have recently proposed, these new Operator levels of SBE Certification will become even more valuable to general managers and chief engineers in evaluating operators and applicants for operator positions.

The SBE looks forward to working with more chief engineers and general managers in incorporating these operator certifications into their employment programs. Mandating that new hires pass these operator certifications is a fair and realistic way to ensure a baseline of technical proficiency in operating broadcast facilities. (See the two tables at left for a rundown of the 1995 SBE Certification exam schedule and the different levels of SBE Certification. ■

1995 SBE CERTIFICATION EXAM SCHEDULE

EXAM DATES	LOCATION	APPLICATION DEADLINE
April 11	NAB Convention Las Vegas	February 28
June 9-19	Local Chapters	April 28
September 7	SBE Conference New Orleans	July 27
November 10-20	Local Chapters	September 29

SBE CERTIFICATION LEVELS

CERTIFICATION LEVEL	EXPERIENCE REQUIRED	EXAM/LICENSE/ APPLICATION
Broadcast Technologist	None	Exam or License
Broadcast Engineer Radio	Five Years*	Exam
Broadcast Engineer TV	Five Years*	Exam
Senior Broadcast Engineer Radio	Ten Years*	Exam
Senior Broadcast Engineer TV	Ten Years*	Exam
Professional Broadcast Engineer	Twenty Years	Application

* Bachelor's degree (4 years), associate degree (2 years) or related accredited education (up to 4 years) may be substituted. See the SBE *Program of Certification* folder for complete guidelines.

Jim Wulliman is a CPBE and director, SBE Certification Program. Respond via the *BE* FAXback line at 913-967-1905 or via e-mail to be@intertec.com.

Editor's note: For more information on the new Radio or Television Operator Certification Handbooks and the SBE Certification Program, call SBE Certification Secretary, Linda Godby, at the SBE National Office at 317-253-1640. Or you may write for information, addressing your correspondence to: SBE, 8445 Keystone Crossing, Suite 140, Indianapolis, IN, 46240. You may also fax your request to 317-253-0418.

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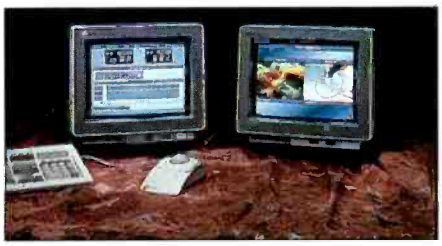
THIS BOOKLET PROVIDES THE AMPEX APPROACH TO REACHING THE GOAL OF "NO DROPOUTS."

By David Leathers

DVision Pro 2.2



Performance at a glance:

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- *Three selectable levels of compression*
- *24fps and 30fps operation*
- *Supports up to 21 SCSI devices*
- *Viewable video at up to 50x play speed*
- *S-video output*
- *Supports RS-422 control using a COM port and adapter cable*
- *File management and time-code capabilities*
- *Real-time digitization at lower resolutions*
- *EDLs to 1,000 events*

I recently had the pleasure of editing the music-action-adventure film *Klash*, directed by Bill Parker for Jamaican-based Kingston Pictures. The script called for several dynamic scenes that, at times, were intercut with parallel plot developments. The DVision Pro 2.2 system from DVision Systems, formerly TouchVision, was chosen for the non-linear editing portion of the project. Parker and I were familiar with DVision from previous projects, but had never tried it for a project this large. We had more than 23 hours of film and wanted to be able to see and access it all instantaneously. In addition, the project was to be finished on film, and using DVision for this was a first for me.

Film finishing

A number of considerations come into play when editing video for finishing on film. The first is that the system must be capable of reading in Evertz's Keylog or Timelogic's Flex files. These are computer lists generated when the film is telecined to videotape. These log files track the film camera rolls and edge-code numbers, the location sound rolls and their time code and the corresponding new SMPTE time-code numbers on the telecined videotape masters. This permits the actual editing to be carried out using the videotape time-code numbers.

After the DVision edit, an EDL is created. A function in the program accesses the Evertz or Flex files and converts the DVision file back to the film edge code and sound roll lists needed to conform the film elements into the final edited film.

Project considerations

This project required disk storage for more than 20 hours of video. Luckily, there was 24GB of drive space available. This meant that after compression about one hour of video (with mono uncompressed audio) needed to be stored onto each gigabyte of hard drive space. Some extra space was allowed for material that would be added later. The 300kB/s data rate of DVision's medium resolution was the most visually acceptable of the choices that fit the requirements.

After compression, about one hour of video (with mono uncompressed audio) needed to be stored onto each gigabyte of hard drive space.

Reliability was another key consideration. Many non-linear systems have the annoying problem of unpredictable, and sometimes frequent, computer lock-ups and crashes. I have never been quite able to develop a patient and accepting attitude about this. DVision provides a system that doesn't require a Zen approach to editing. When properly set up, it just doesn't crash. Amazing! (OK, it did crash once in 14 weeks, but I suspect a major pilot error was involved.) Generally speaking, within the editing functions of DVision Pro 2.2, we had no software problems. However, the system is not perfect because we did experience some bugs and glitches in some of the capture and utility programs.

Two other areas in which DVision excels are overall system price and speed. For a professional non-linear off-line system, it's inexpensive and extremely fast. It can access stored video in seconds and play it back at up to 50x normal play speed. DVision Pro is primarily an off-line system, although it can export digital media files in PC-compatible formats, including Video for Windows. It is not broadcast quality, and the system does not do 60fps video.

The system

DVision Pro 2.2 is a DOS-based program sold as a board-and-software set. It includes the DVision board and the Intel Action Media II DVI digitizing and display board. Our system consisted of a 486DX2/66 processor, 8MB of RAM, and a 240MB IDE hard drive. For video storage, we used two 3.5GB drives mounted internally, and three 3.5GB drives and a 9GB drive mounted externally. This provided approximately 23GB of usable drive space after formatting. The arrangement filled the single SCSI bus provided by the single controller card. However, DVision supports up to three SCSI controller cards allowing a total of 21 SCSI devices.

The Intel Action Media II card is an aging workhorse, but it has been the basis of DVision from the beginning. It has three sets of connections and audio and video are input via a multiconnector breakout cable. The cable is flimsy and ours tended to come unseated from its plug in the board. The video is output via a standard S-video connector. Audio for both of the system's speakers and output to tape comes from a single stereo mini-plug socket. The audio output is split with Y-connectors. A more durable array of connectors would be a nice improvement.

Getting the system properly configured for the best performance turned out to be tricky. DVision Pro, like other board-and-software packages, is built using off-the-shelf components from several manufacturers. The compatibility of these components changes as new versions are released. Frequently, the manuals and documentation do not reflect the current release of the components and incompatibilities exist. However, once the bugs are worked out, the system becomes rock solid. Having a knowledgeable systems integrator can be extremely helpful during this shakeout period.

A Betacam SP player, controlled with an RS-422 cable connected to a COM port, was used as the source machine. The video was in letterbox format with video time code and film edge-code numbers burned in the black borders. This was a precaution that allowed the edge-code numbers to be read from the off-line if necessary.

Digitizing

In a DVision session, the first step is to digitize and capture the video to the computer's hard drives and DVision allows for three levels of initial capture resolution. Depending on the amount of material needed, the available storage on the system and

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Scott Weber, Buena Vista Sound, Walt Disney Studios

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Tom Cusic, TM Century, Dallas, TX

"I think it's one of the most versatile I've ever used."— Roy Thomas Baker, Producer

In fact, all of these professionals asked one remarkably familiar question:

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the output resolution required, the user chooses low, medium or high resolution.

At low resolution, the data rate is 150kB/s, and up to two hours of video can be captured on each gigabyte of hard-disk space. At medium resolution, the data rate is 300kB/s, and about one hour of video can be stored per gigabyte. At high resolution, the data rate climbs to 650kB/s. In Super RTV recapture mode, the data rate reaches 1MB/s. In this mode, about 20 minutes of video can be stored per gigabyte.

As previously explained, we had decided to work at medium resolution. The process of digitizing the video in medium resolution takes place in real time. Both high-resolution and Super RTV modes require the system to pause for additional compression after the actual inputting has stopped. The digitized audio, which is captured at CD quality, can be captured in stereo or mono. In the editing program, up to six channels of audio can be edited and mixed independently.

The process of digitizing the video in medium resolution takes place in real time.

Given the amount of material, we wanted to keep everything in the easiest order we could work out. Also, because DVision defaults to displaying source files in the editing source displays based on the file number assigned during the digitizing process, it is most convenient to digitize the clips in scene order.

To do this, we used the script logs and telecine logs to input all of the clips relevant to each scene in order. We also chose to create separate files for each scene/source tape combination. DVision Pro 2.2 has a limited system of naming reels and files. Having experienced difficulties with this before, a separate log was maintained as Microsoft Excel file listing the scene, tape and file number of each digitized file.

The system is somewhat unforgiving if mistakes are made when assigning a reel number (before the capture). The only way to correct such an error is to exit the program and edit the file in the *text browser*. This is inconvenient and it is also undocumented in the manual. As the tapes were digitized, a visual index or source catalog of still frames was created by pressing the *enter* button. Scene and take numbers along with keyword descriptions were added to the index as well.

Editing

DVision Pro is set up for two monitors and the control monitor displays a time line with video, overlay and six audio channels. In addition, there are controls for the source and record (virtual) machines and pop-up menus for trims, mark, paste, special effects, undos, mix and EDL windows. The picture monitor displays side-by-side source and record monitor windows that fill the width of the screen. Both displays are well laid out and easy to work with. The

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time-code displays are large and easy to read, even after long hours of editing.

Most editing operations are done with a 3-button trackball. Clicking the right mouse button on the source window switches the display on the picture monitor to the source catalog. Clicking it again on a frame in the source catalog switches the picture screen back to the source/record monitor display and loads the selected frame into the source monitor. Pressing the left mouse button on either the source or record window puts that (virtual) machine in jog/play mode. The mouse cursor disappears and a speed indicator meter appears at the bottom of the picture. Using the trackball, you can roll forward or reverse from single frames to 2x play speed with audio and from 2x to 50x play speed without audio.

Finding source material is quick and easy. DVision can display 100 pages of its source catalog with 12 images on each page. Our source material was closer to 200 pages on the source catalog and could not all be displayed at once. This is where the scene numbers and keyword descriptions entered during the capture and logging functions came in handy. Typing a scene number or key word in a field at the top of the source catalog window instantly brought up all designated shots.

DVision EDLs are restricted to 1,000 events. We had to edit the file in sections, because ultimately there would be more edits than that in our final list. Although the system is extremely fast, it slows down as the EDL becomes larger. Once the EDL exceeds 700 to 800 edits, some operations became slow. I suspect more RAM would solve or seriously improve this performance.

Screen shot of the source catalog display. Scene and keyword fields can be used for search functions.

The edit mode is selected in the time-line window by clicking on the tracks to be edited and either selecting or de-selecting insert. With insert on, the incoming material replaces the existing material for the indicated track. With insert off, the existing tracks are pushed down the time line affecting the sync between tracks if you are not careful.

Marking in and out points for edits is done with the center trackball button. At this point, the editing methodology differs significantly from linear editing. Edit points are set by parking the source or record picture at the edit point and clicking the center button. Finding precise audio points using the digital audio scrub is simple and eliminates the need to create marks on the fly. Also, the system doesn't care whether you mark the in or out first. It's easy to back time an edit by selecting the out points first and then rolling back on the source or record window to locate and mark the in point. When the second edit point is marked, the edit is done. If you don't like it, you can undo and start over. The undo function reverses up to 20 events. The *trim* window displays the incoming shot on the source side of the picture monitor and the outgoing shot on the record side. Either side can be trimmed independently or heads and tails can be locked.

The simplicity and ease-of-use of DVision's

editing functions made it easy to try many different ideas. We could discuss ideas that would involve five or 10 edits and, if we were even remotely interested, could create the idea quickly.

Output

The first requirement of the project was to create a 5-minute promo. We did this in about three days and used the video EDL to assemble a Betacam SP to Betacam SP master on a linear system. The list produced on the DVision was almost perfect. However, there was some confusion regarding reel assignments that occurred when the actual reel numbers were converted to conform to DVision's 3-digit numbering system.

During the editing of the film, we had several occasions when we had to show the work in progress to various interested parties. We played EDLs back directly from the system through an S-video monitor. This was all we needed to communicate on the project's progress and to get the input we needed. Occasionally, we made viewing tapes by connecting an S-VHS deck directly to the DVision's output. A time-code reader/generator can be used to get time-code output from the DVision via a COM port connection.

The DVision Pro 2.2 system came through the project overall with flying colors. It is a lot of editing system for the money. Priced at $4,950, the system includes the software and the boards, including the Intel Action Media II board. You have to provide the computer system and peripherals, but it's still a great deal.

DVision Pro running on a laptop allows the system to be taken into the field for small projects.

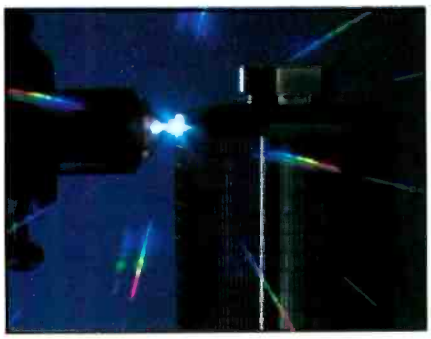
DVision has also been working on a new family of products. The new system will run on Windows NT and, eventually, Windows 95. The software will support a number of different video boards and compression algorithms. It will be sold as software only or in various turnkey configurations, including an integrated non-linear D-1 system built on a dual-Pentium platform. Eight to 24 or more tracks of DAT-quality audio will be available. Both 24-frame and 30-frame systems will be available, as well as a super system that includes all the options. ■

Editors note: The Digital Media Lab is an ongoing project of *Broadcast Engineering* and *Video Systems* magazines. Operated by David Leathers, president of Eye Square, the lab evaluates computer-based audio and video production systems for use in broadcast, recording, production and post-production applications. *Broadcast Engineering's* responsibility is to publish the results of such evaluations, positive or negative. No report should be considered an endorsement or disapproval by *Broadcast Engineering* magazine. Companies manufacturing such desktop-type equipment may request an evaluation of their product by contacting the editor of *Broadcast Engineering* magazine.

David Leathers is the president of Eye Square and director of *Broadcast Engineering* and *Video Systems* Digital Media Lab, Hollywood, CA. Respond via the *BE* FAXback line at 913-967-1905 or via e-mail to be@intertec.com.

For more information on DVision Systems, circle (303) on Reply Card.

By Randy Price



Wireless video transmission

Whenever a breaking news story hits, the power of television can be riveting. Stories like the highway chase of O.J. Simpson's white Bronco or the bombing of Baghdad during the Gulf War and plane crashes or major traffic accidents can grip a viewing audience like no other programming. In Milwaukee, research shows that breaking news ranks as one of the top three reasons TV viewers tune into a newscast. These facts alone should make it obvious that TV crews need all the help they can get to bring such live drama to their viewers. Fortunately, there is a new technology designed to make that process much easier...and quicker.

WTMJ-TV in Milwaukee has gained an edge over the competition by using new video-over-cellular technology from Ameritech Cellular Services and FoNet, Inc. Called FirstLook Video, the wireless technology enables the instant transmission of high-resolution, full-motion color video and audio over Ameritech's cellular network, all at a cost savings over traditional satellite techniques. Video-over-cellular technology has made a difference in how fast WTMJ-TV's crews can respond to breaking news stories.

The setup and use of the technology is straightforward. Photojournalists can typically learn the basic operation of the FirstLook Video system in a 90-minute training session.

How it works

Upon arriving on a news scene in one of WTMJ's eight news cars, a photojournalist shoots video with a standard Beta camera. After shooting, the photojournalist returns to the news car to complete the video-over-cellular transmission. The camera is connected to the FirstLook Video remote unit that consists of a computer with a built-in monitor, cellular phone and trackball. The frame rate (one to 30 frames per second) and the length of the video segment per transmission (normally 10 to 30 seconds with capability of several minutes) is selected from the screen menu. Using the trackball, a click on the send command causes the connector to dial the host unit at WTMJ-TV's news center. The remote unit also allows up to one hour of video/audio storage capacity (570MB). The video is transmitted over cellular networks, a process that takes about five to 10 minutes for a typical 30-second clip. Throughput ranges from 4,800b/s to 14,400b/s, with 20,000b/s possible at higher compression rates. The system is also capable of transmitting video over traditional dial-up land lines.

The FirstLook Video system uses a process called *macroplexing* to break down the video file (audio if included) into packets of data. FoNet's macroplexing technology uses intelligent chip logic to sort and send digital video/audio allotments over one to four lines simultaneously. The continual auditing of binary transfer information (baud rate and signal strength) maximizes transmissions over the most optimal lines through adaptive packet assembly schemes.

After transmission over the cellular network or land lines, data is received by a host unit consisting of modems and a color monitor at the station. The host unit reconfigures the packets of data into video frames and downloads the digital video files to a FirstLook Video player unit. The player feeds a scan converter, which converts the frames into standard NTSC video.

On average, WTMJ-TV uses the system from three to six times per week. On a given news story, FirstLook Video may be used about eight to 10 times in order to provide updates during a newscast.

The advantage of having such a portable system comes into play in a variety of breaking news situations where time or the

Continued on page 83

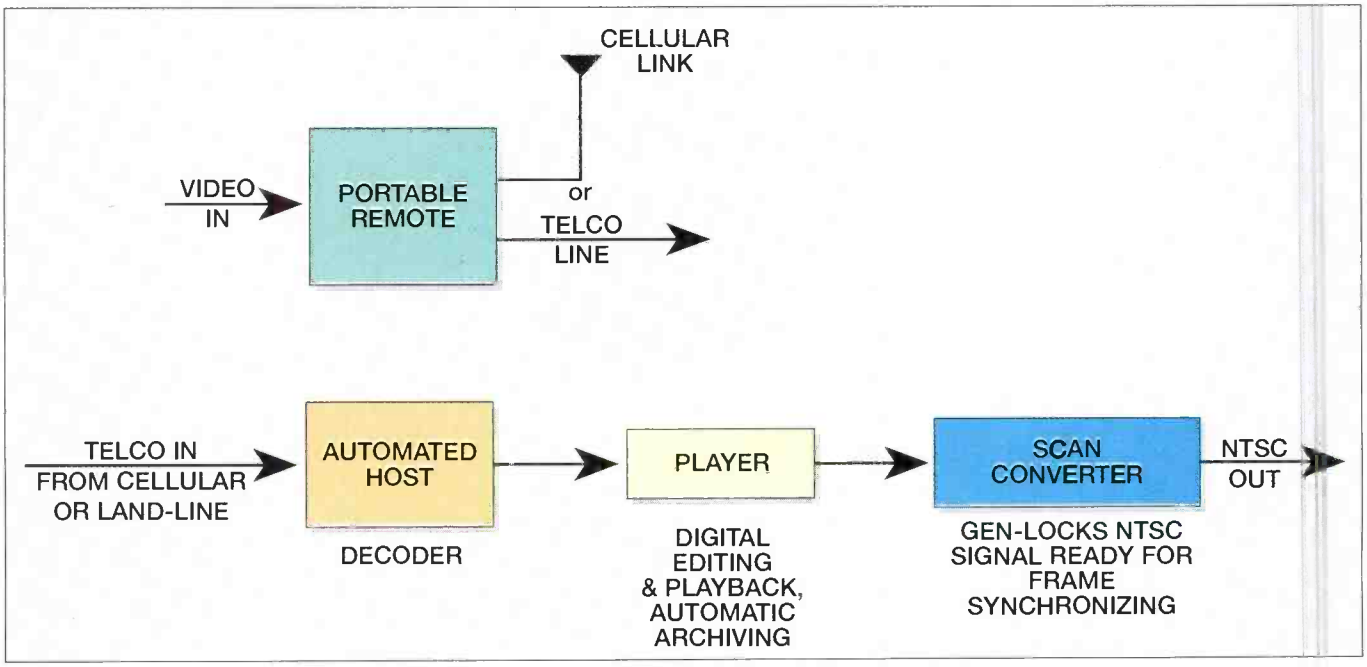


Figure 1. Basic block diagram of FirstLook Video transmission system.

Broadcast

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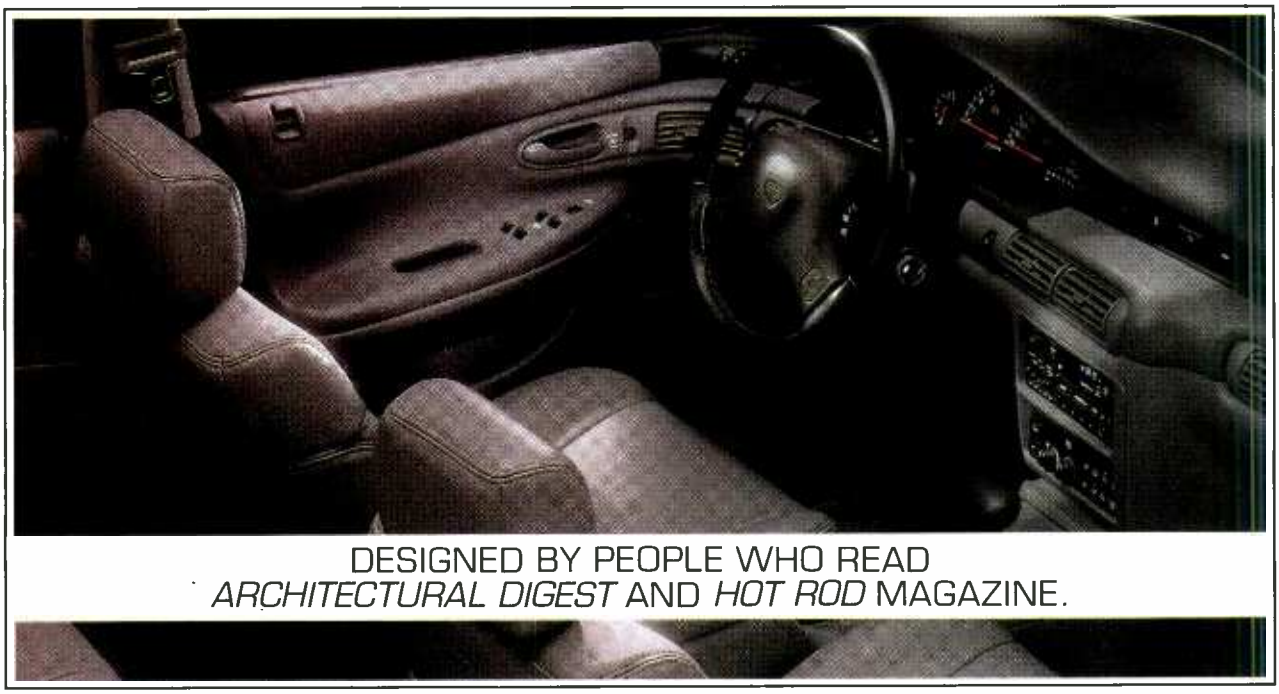

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ARCHITECTURAL DIGEST AND *HOT ROD* MAGAZINE.

EAGLE VISION TSi. It's interesting how an Eagle Vision TSi can be so elegant and refined yet at the same time be so brutally powerful. You can experience this paradox firsthand when you take The Eagle Test Drive. Only then can you appreciate the style, technology, and performance of Vision TSi.

A quiet, spacious cab-forward interior, available leather-trimmed seating, and available 120-watt Infinity Spatial Imaging sound system give no hint to the power of the 214 horsepower 24-valve engine lurking under the hood. Not to mention an optional performance suspension that would make any sports car envious. For added safety, there are even dual air bags† and four-wheel anti-lock disc brakes.

So take The Eagle Test Drive. Then pick up your own copy of an Eagle Vision TSi.

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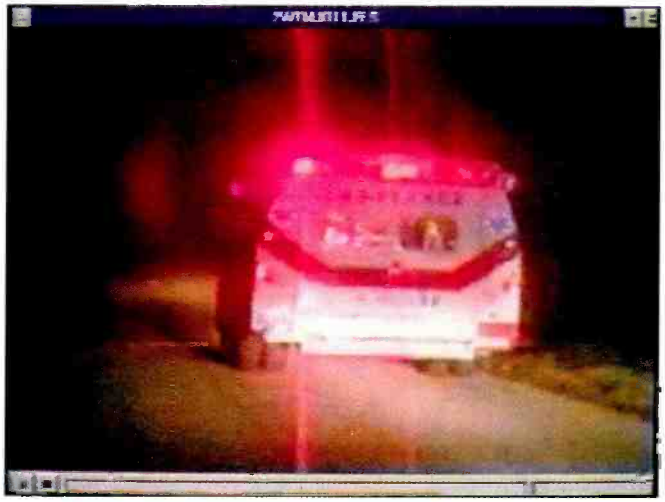
Continued from page 80

nature of the story are crucial. A breaking news story may take place at a location far from the city where it is not time or cost efficient to use an ENG or satellite truck. Crews using FirstLook Video during rush hour can provide footage of heavy traffic areas during morning newscasts even if they are stuck in traffic.

The new technology also affords news crews the ability to discretely transmit video, which can be important in hostage or domestic situations. Video can be fed even while driving from one location to the next, saving time and expanding the reach of a station's news coverage.



Playback of video received by cellular phone on the PC-based FirstLook player.

In reporting severe weather, WTMJ-TV has discovered another advantage of using FirstLook Video. Now, news crews can provide viewers with live video during heavy rain or high winds without risking the crew's safety or the loss of an ENG truck mast.

Viewers are told when the system is in use. Whenever a feed takes place via the cellular network, the Ameritech Cellular and FirstLook Video logo appear in the lower right corner of the TV screen.

Although the system currently used is not comparable to the picture quality provided by microwave or satellite trucks, the time and cost savings from the technology and the ability to quickly bring images of important breaking news to viewers often outweighs the aesthetics.

An upgrade of the system's capabilities to near broadcast quality is currently under way. The new upgradeable system employs firmware architecture that incorporates lossy compression algorithms with improved video resolution, while still allowing video to be sent over the narrow bandwidths associated with cellular phones. The FirstLook Video system upgrade package allows instant recording and playback of digital video and audio clips at 640 x 480 resolution as though they were from a traditional broadcast video source.

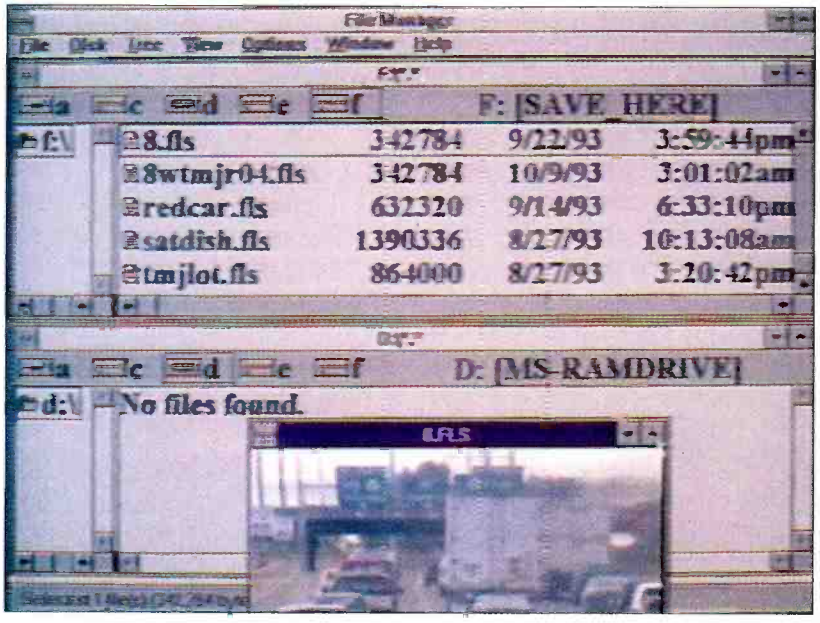
The FirstLook Video system has allowed WTMJ-TV to bring its viewers improved news coverage without the typical high cost associated with additional ENG trucks.

Competitive advantage

The FirstLook Video system is awarded to TV stations on a market-exclusive basis. Currently, WTMJ-TV, along with more than 30 TV stations across the country, are exclusive users of the technology. Such exclusivity gives these stations a competitive advantage. Because the information is quickly transmitted, possibilities for news crews, as well as sports and other applications, are endless.

FirstLook Video has expanded WTMJ-TV's remote video transmission capabilities by supplementing its ENG and satellite trucks. The system is portable, and news crews can transmit video and audio via the cellular network within minutes of arriving on a scene. ■

Randy Price is vice president of engineering, WTMJ-TV, Milwaukee, WI. Respond via the *BE* FAXback line at 913-967-1905 or via e-mail to be@intertec.com.



Screen display of FirstLook player showing archive list and viewing window.

INDUSTRY BRIEFS

BUSINESS

Canon sold a J55xSuper zoom field lens to Modular Video Systems (MVS), Seattle.

TouchVision Systems, Chicago, has changed its name to D-Vision Systems. Also, in an expansion program planned for this year, the company has reorganized its marketing force into six regions worldwide. The company is opening five new sales offices and has targeted creating professional partner agreements with 400 deals worldwide.

Leitch, Chesapeake, VA, has opened a new southeastern regional sales office in the Atlanta area, which will serve customers in Tennessee, Georgia, North Carolina, South Carolina, Alabama, Mississippi and Florida. Paul Hogan is the regional sales manager for this area; phone: 800-641-1277; fax: 404-640-6707.

Also, a new central regional sales office has been opened and will serve Iowa, Illinois, Indiana, Kentucky, Michigan, Minnesota, Nebraska, North Dakota, Ohio, South Dakota and Wisconsin. Steve Brant is the central regional sales manager; phone: 800-861-9440; fax: 317-861-9441.

Chyron, Melville, NY, has signed a memorandum of understanding to acquire all of the outstanding stock of Evolving Video Technologies, Arvada, CO. The acquisition is subject to completion of satisfactory due diligence and to negotiation and closing of a formal stock purchase agreement. The total purchase price is $3,750,000 payable in a combination of cash and Chyron securities over a 5-year period.

Also, Chyron entered into a sales and marketing alliance with The VIDEOFAX Company, New York. Chyron will be integrating its CODI and pc-Codi family of character generators with The VIDEOFAX Company's software products for video messaging, information display and visual communication applications.

Grass Valley Group (GVG), Grass Valley, CA, will more prominently feature the name of its corporate parent, Tektronix, Beaverton, OR, in its booth at NAB 95 to signal the growing importance Tektronix gives to the company's success in the growing video marketplace.

Also, GVG has announced the sale of three Model 4000 digital production switchers and five channels of Kaleidoscope digital effects systems for use in its new 260,000-square-foot facility in Littleton, CO.

PESA Switching Systems, Huntsville, AL, has been chosen by Science Applications International Corporation (SAIC), a subcontractor of Hewlett Packard to supply up to 1,500 routing switchers as part of a U.S. Navy contract for the Advanced Tactical Computer system. Hewlett Packard, the prime contractor of the job, was awarded an estimated $672 million contract to supply the U.S. Navy with computer hardware. PESA's portion of the contract is estimated at $22 million.

Vinten Group plc., UK, has purchased the entire share capital of Sachtler AG, Germany, for a total consideration of more than $1 million. Sachtler, remaining independently managed, will add to the Vinten Group in its ranges of film and broadcast camera support equipment and lighting equipment, including studio and portable lighting and a wide range of studio suspension equipment.

GEPCO International, Chicago, has supplied the Lyon's Group's post-production facility with audio and video cable. The Lyon's Group is the creator of Barney and producer of *Barney and Friends*.

Avid Technology, Tewksbury, MA, and Providence Journal Broadcasting have announced that NorthWest Cable News (NWCN), Seattle, and NBC-affiliate KHNL, Honolulu, will soon be operating the world's first tape-free newsrooms. Owned by Providence Journal, NWCN and KHNL will install Avid's disk-based server production system over the next few months and begin operating without tape from capture through transmission.

Also, Avid is shipping version 3.0 for its AudioVision and AudioStation digital audio workstations. The new version supports 16 channels of digital audio using the new Avid-designed audio processing hardware. It provides many new interface features and is compatible with the company's AvidNet/ATM high-speed networking solution.

Avid and Digidesign have announced that the merger of the two companies has been successfully completed. Stockholders from both companies voted to finalize the merger at special shareholders meetings. Digidesign will operate as a wholly-owned subsidiary of Avid.

Avid also announced the sale of its 1,000th Media Composer 1000 digital non-linear on-line editing system to Chrysler, Detroit, A second Avid NewsCutter editing system has been installed at KTVK, Phoenix, AZ.

Antenna Concepts, Diamond Springs, CA, has announced its affiliation with Micro-Tek Engineering. Micro-Tek is now providing engineering services to Antenna Concepts including some joint projects in UHF TV antennas.

Also, Antenna Concepts has further upgraded its standard feed system by incorporating DIN connectors for use in its power dividers and at inter-bay cables.

Turner Broadcasting is using the Sony Library Management System (LMS) to provide the foundation of its 24-hour broadcast operations.

Pixel Magic, a division of OCS/Freeze Frame, Los Angeles, has used its newly acquired Quantel Domino digital film opticals system to complete a record number of digital composites for the upcoming Warner Brothers film *Outbreak*. A total of over 150 composites were created on Domino within three weeks.

Quantel has announced the purchase of two edit boxes by Henninger Video to be installed at its facility in Arlington, VA.

Also, KWGN, Englewood, CO, has taken delivery of a Picturebox Twin and a Paintbox. Other recent Paintbox installations include: KARE-TV, Minneapolis; KOTV-TV, Tulsa, OK; Klint Reid Assoc., Chicago; Reuters, Washington; and WGBO, Chicago.

BUSINESS

James Brad Gilmer has been named director of advanced network operations for the Network Operations department of the Turner Entertainment Group, Atlanta.

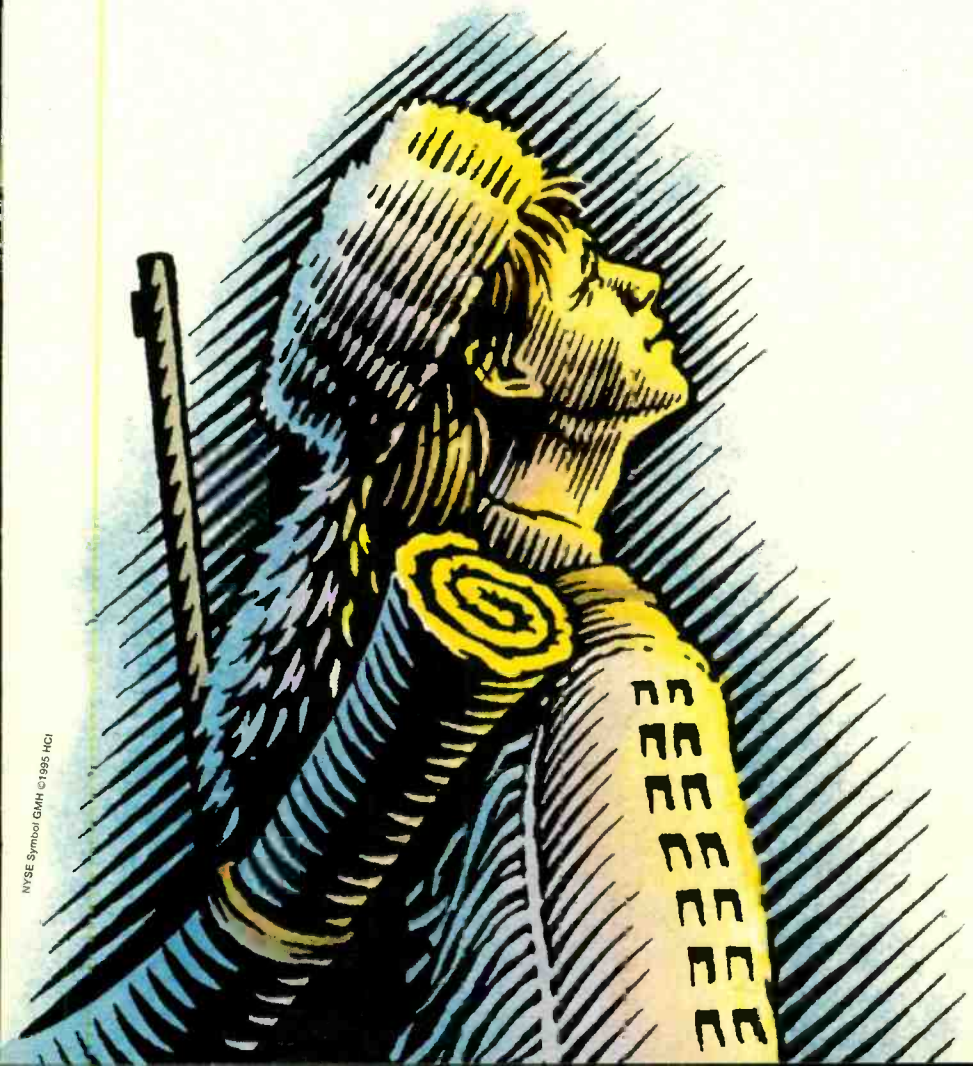
Paul Brennan has been named vice president of finance for the Grass Valley Group, Grass Valley, CA.

Ned Mountain has been named to the newly created position of vice president, broadcast television products for Wegener Communications, Duluth, GA.

ITS, McMurray, PA, has announced the following promotions:

- Phil Holmes to vice president and controller,
- Dave Neff to vice president of marketing and sales of the broadcast division,
- Ken Shultz to vice president of marketing and sales of the microwave systems division,
- Ron Ogrodowski to vice president of market development of the microwave systems division,
- Gregg Nissly to vice president of operations of the microwave systems division, and
- Ken Foutz to vice president of product developments and manufacturing of the broadcast systems division. ■

It takes a pioneer to invent the future.



What makes a pioneer different? Vision. Plus the ability and resources to act successfully on that vision.

HCI's determination to think years ahead of the curve has made us the world's largest commercial satellite operator.

Our fleet of GALAXY® and SBS satellites has set the pace for the future of today's broadcast, cable, radio and data transmission industries. HCI developed DIRECTV,® the first high-powered digital DBS system, and is now working with partners around the globe to establish regional direct-to-home systems.

We are a partner in AMSC, North America's first satellite mobile phone system, and are working with various partners to establish similar systems internationally. And in 1998, we will launch SPACEWAY,™ a broadband global network.

If telecommunications are vital to your company, chances are we're inventing your future right now.

HUGHES
COMMUNICATIONS

A unit of GM Hughes Electronics

Circle (63) on Reply Card

The future of TV.

Montreux

How do you see it?

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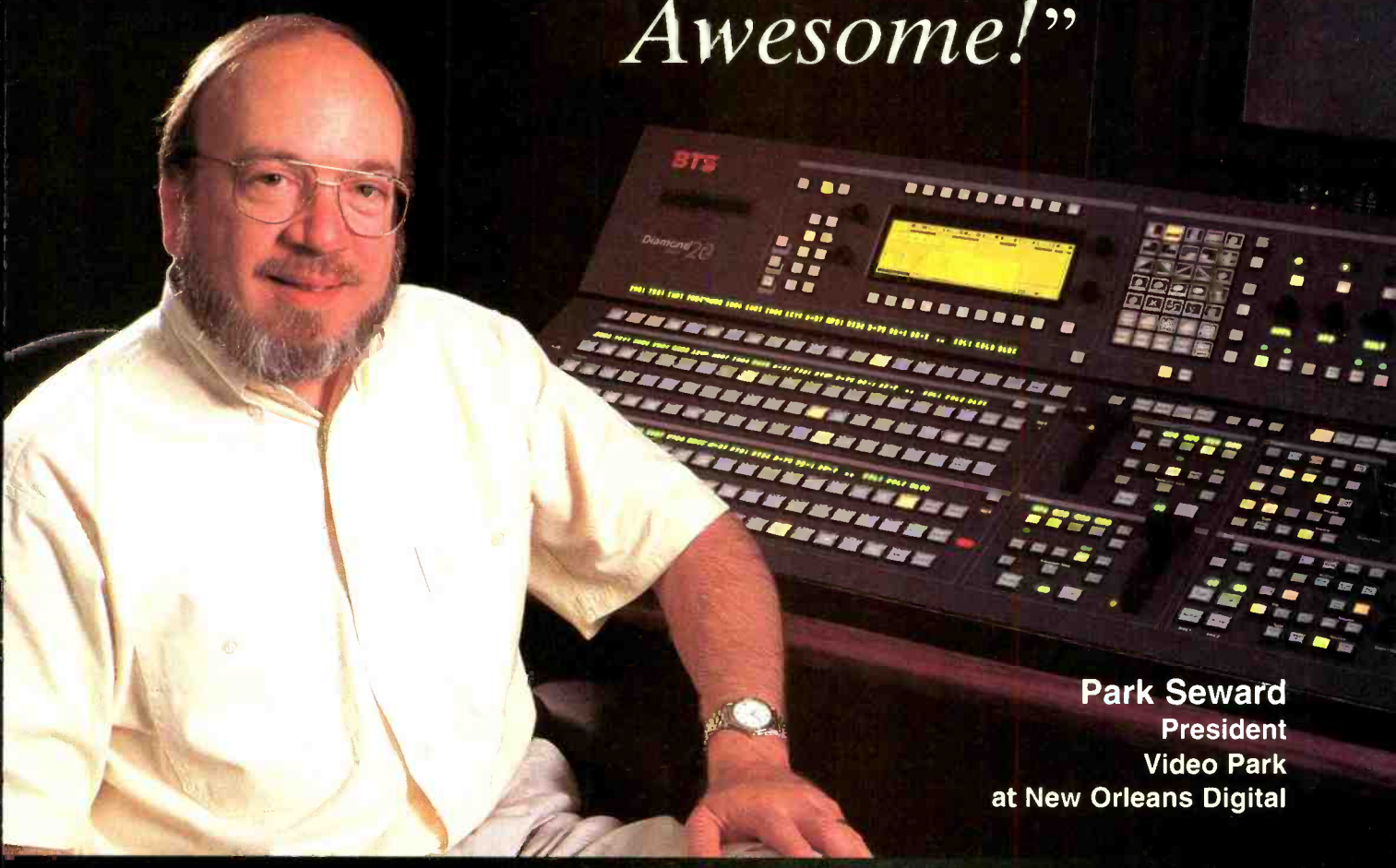
POST-PRODUCTION SWITCHER

"There's only one word for your Diamond-digital switcher: *Awesome!*"



Park Seward
President
Video Park
at New Orleans Digital

"I spent nine months looking for the right production switcher. Your Diamond-digital serial component switcher won hands down.

"In a market like ours, you've got to be flexible. In one session, you'll do simple dissolves and keys, then you'll do spots with heavy effects. You want to worry about your client, not your switcher

"The first thing that impressed me was the keying. It's flawless. And the keyer gives you up to eight parameters to fine-tune a chroma key.

"You offer color correction on every input, but you can also do global adjustments of several scenes on a single input, or all inputs at once. I don't know of another switcher that does that.

"Your extensive wipe capabilities are terrific, especially your ability to multiply pattern styles 5, 10 or 50 times instantly.

"And the board layout is completely intuitive.

"Technically, the Diamond is the most contemporary switcher on the market. Because it uses ASICs, its internal architecture is an engineer's delight. It's also 10-bit serial digital throughout.

"Its electronics rack is the smallest of any switcher in its class. Another bonus: It features 11 separate individually controllable AUX busses. And how's this for flexible: Instant switchability between 4:3 and 16:9, as well as 525 and 625.

"A switcher must be the most up to date when you buy it, and completely adaptable for any technology changes for the future.

"That's a perfect definition of my Diamond-digital: my switcher for today and tomorrow."

Shown: The BTS Diamond-digital DD 20. Photographed at Video Park at New Orleans Digital, New Orleans La., a full-service video post-production facility.

BTS

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Outside the U.S. and Canada, call (805) 584-4700

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NEW PRODUCTS

Battery charger
United States Broadcast

➤ The Power Plant: a master broadcast battery charger for all types of broadcast batteries including cellular, 2-way, walkie-talkie and other types of batteries; charges up to six batteries of any variety at the same time; displays the amount of charge in each battery through the use of a large LED ladder display on the front of the unit; standard features include elective discharge and a full analyzer station.

Circle (350) on Reply Card

Field-strength meter
Z Technology

➤ R-505 field-strength meter: a hand-held, battery-operated, fully synthesized RF field-strength meter that covers all frequencies from 3MHz to 1,000MHz with step sizes as fine as 2kHz; power measurement accuracy is guaranteed to within 2dB; instrument can measure input power levels from as low as 0.32uV up to 320mV; impedance is 50Ω; front-panel control is through a digitally encoded TUNE knob and separate large LCD displays for frequency and signal level readout; the unit will operate at least five hours on one battery charge; the meter can be remotely controlled via an RS-232 serial port; the R-505 includes an internal NiCad battery pack, weighs nine pounds and measures 3.5"H by 8.4"W by 8"D; product is shipped with a protective softcase and carrying strap, extendible antenna, waterproof user card guide, NiCad battery and an AC battery charger/power supply.

Circle (351) on Reply Card

Fluid head
Sachtler AG

➤ Video 90: a fluid head that combines advanced technology with a compact design; head weighs 31.7lb and can carry up to 198lb; head comes with the patented leak-proof, frictionless Sachtler fluid damping, reproductable at any payload and temperature (within range) and fully matched in pan and tilt; head features a new arrangement of positive horizontal and vertical brakes for freezing the picture on-air at the rear of the head; the extended range of the sliding balance plate (180mm/7.1") meets special studio requirements of teleprompting.

Circle (352) on Reply Card

Recordable CD media
HHB Communications

➤ 680Mb/74-minute recordable CD: discs employ a Phthalocyanine organic dye recording layer that is less susceptible to the effects of UV light; the discs are double-coated for further protection against scratches, fingerprints, and the effects of extreme temperature and humidity; compatible with all leading CD writers and capable of recording at 1X (153kB/s), 2X (307kB/s), 4X (614kB/s) and 6X (921kB/s) speeds.

Circle (353) on Reply Card

Time code and color black generator
Maddox Broadcast

➤ The Master: a self-contained time code and color black generator; designed to join four traditionally separate pieces of equipment into a 1U box; unit incorporates 12 output distribution amplifiers for both time code and color black signals; features a 7-segment LED display that can show either time code or user bits, selectable from the front panel; user bits can also be configured to display the date; this information is supplied by a real-time clock calendar chip that has a battery backup to maintain time- code accuracy in case of power failure.

Circle (369) on Reply Card

Tripod
Sachtler AG

➤ OB 2000: a heavy-duty tripod with integrated off-ground spreader and rotatable rubber feet; the integrated spreader clamps to a hand-crank column eliminating the need for a separate spreader; also features hinge locks that can be tightened and clamped to prevent unwanted movement between tripod legs and the base; besides the Video 90 pan-and-tilt head, the OB 2000 accepts all standard flat base mounts and hand-crank columns as well as Video Mitchell mounts without any adapter.

Circle (356) on Reply Card

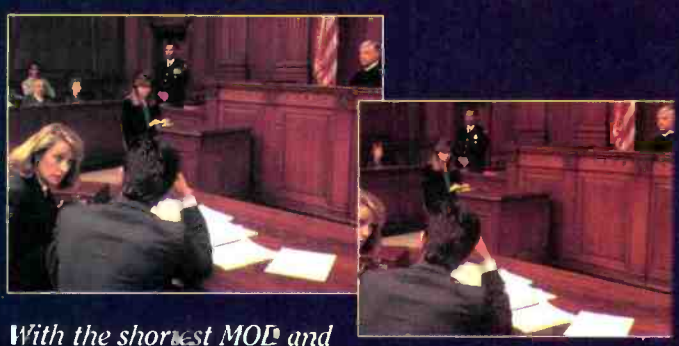
J15ax8B IRS

IFplus

Internal Focus

IFPLUS: WE'VE TAKEN A GREAT TECHNOLOGY AND MADE IT BETTER.

IFplus: The Future Is Now.
Having pioneered IF technology, Canon takes another step forward with IFplus, the latest breakthrough in Internal Focus that provides important features and benefits that meet the requirements of new wide screen formats. Now for the first time ever, you can shoot as close as .65m with a wide angle of 8mm (57.6°) using Canon's J15ax8B IRS lens. Enjoy higher resolution, higher MTF, reduced chromatic abberation and improved optical performance.



With the shortest MOD and widest angle of any standard lens, Canon's J15ax8B IRS lets you shoot in tight or restricted areas at the closest minimum object distance ever possible and capture more of the subject as compared (right, to conventional lenses. (For illustrative purposes only).

Unsurpassed Optical Quality.
Consistent with Canon's reputation for outstanding lens quality, the IFplus utilizes a new and improved glass, which is stronger by design and able to provide extremely low dispersion, while correcting chromatic aberrations. Wide angle images, with substantially reduced distortion, is just one benefit of this technology.

Meets The Demands of 16 : 9.
You can depend on Canon's IFplus technology to meet the challenges of new formats that require increased screen line density (Outstanding performance is also achieved in 4:3) Offering the highest MTF required, the J15ax8B IRS will meet and exceed your expectations.

Canon's J15ax8B IRS features:

- The shortest MOD in a standard ENG lens: 0.65m
- The longest focal range: 8-120mm
- The widest standard lens, with a wide angle of 8 mm (57.6°).

It all adds up to a lens you can rely on to let you get up close to the subject. We'd like to tell you more. Please call us at **1-800-321-4388.** *(In Canada, call 905-795-2012)*

Canon
The Number One Lens

Circle (73) on Reply Card

NEW PRODUCTS

TV transposer
Teko Telecom

➤ 5/10W modular V-UHF TV transposer: BLM-type transposer with 5/10W RF output power; designed to receive all TV channels in band I, III, IV and V (including channel C in band II) and transmit them in bands III VHF and IV/V UHF; the transposer is split into eight plug-in modules housed in a 19-inch 3SU subrack; each module can be replaced with an equal one without changing the overall technical characteristics; the equipment can use its built-in linearity pre-corrector along with an external (FU02) notch filter to operate at 10W output power; complies with CCIR B and G standards as well as NICAM-728 standards; features MF SAW filter and the ability to repeat any channels, even adjacent ones.

Circle (357) on Reply Card

Routing system
Dynatech Video Group

➤ Utah-300: routing system designed for efficiency and maintenance-free operation in medium to large routing switcher environments; developed with "Smart Architecture" featuring the ability to handle analog and digital signals in the same rack frame; an optional swap/sum module allows system to combine adjacent audio channels into one, creating a mono signal from a stereo input; system also features small wireless fans built into its frames providing efficient cooling of the matrix frames; the video frames can manage several different video signals, analog composite or component and serial digital; the audio frames manage both analog mono, stereo, and digital AES/EBU signals.

Circle (358) on Reply Card

Editing system/software
Grass Valley

➤ Sabre 4100S: a dynamic editing system; comes complete with CPU, monitor, and ergonomically designed keyboard with jogger, and device control engine providing real-time control of more than 30 devices.

➤ Sabre Edit version 1: offers many features available with Super Edit; also supports continuous preview and auto assembly of multiple program segments, simultaneous control of up to 21 source devices, virtually unlimited EDL and effects storage, and full resolution video windows on the workstation screen; the limited standard EDL structure gives way to an edit data base allowing any number of elements to be arranged on a time line.

Circle (359) on Reply Card

LAN cable tester
Wavetek

➤ LANTEK PRO XL: a fast, portable LAN cable tester for 100MHz networks; the tester features Dual NEXT technology that allows a test speed of 40 seconds and reduces the time required to test 2-way, near-end crosstalk; the 1-button autotest runs a complete test sequence including measurement of crosstalk at both ends of a cable; comprehensive testing includes line mapping, Dual NEXT, signal attenuation, DC loop resistance, mutual capacitance and cable length; the results of 500 tests can be automatically stored in the internal memory.

Circle (360) on Reply Card

Video furniture catalog
The Winsted Corporation

➤ 1995 Catalog: 132-page full-color catalog; includes complete information, specifications and pricing on Winsted's line of video cabinets, consoles, multimedia furniture, tape storage systems and accessories; catalog includes many new products including the Digital Desk series for multimedia editing and production, low-cost knock-down vertical racks, the new flip-down editor shelf, and a pull-out shelf for VTRs; catalog also features an expanded line of rack slide kits and the System/85 instant assembly consoles; information on Winsted's free design service and equipment layout software is also provided.

Circle (361) on Reply Card

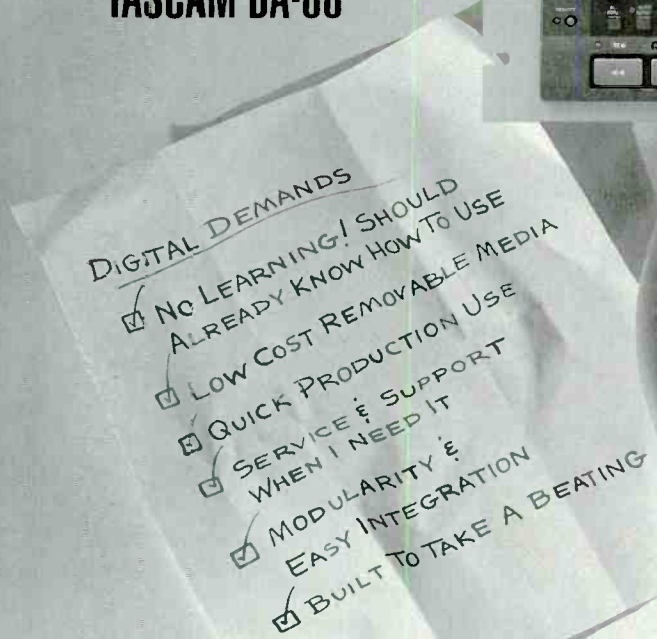
Some People Think That Radio Production People Are Too Demanding.

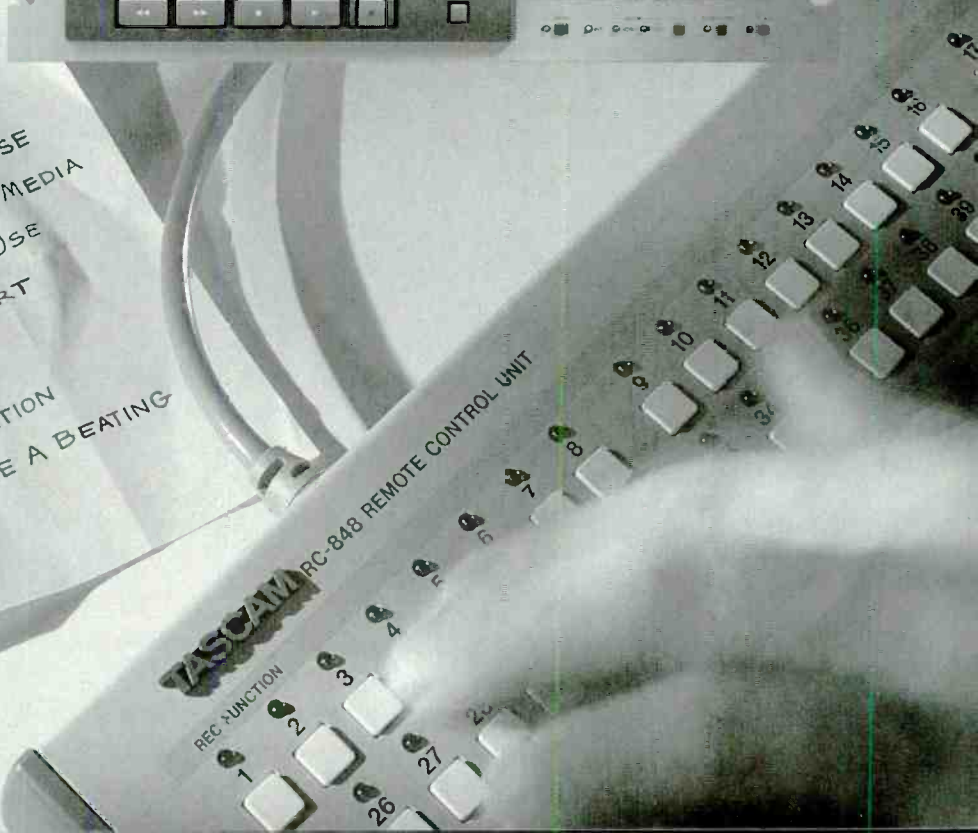
NOT TASCAM. Radio and broadcast production demands durable equipment that performs unrelentlessly twenty-four hours a day. That's why you'll find TASCAM equipment in practically every production facility in the country. And that goes for the TASCAM DA-88 modular digital multitrack, as well. It offers you incredible flexibility and a quicker production alternative to elaborate workstations, yet it costs less than a good cart machine. Bottom line is you get the benefits of digital and the ease of use of analog.

No matter how you look at it, the DA-88 is the smartest way to ease into digital production and it's the essential complement to any digital audio workstation. It gives you one hour and forty-eight minutes of crisp digital audio *(8-tracks)* on a low cost standard Hi8 video tape. Better yet. It works just like any other TASCAM deck — no learning curve. That means hassle free, quick production, especially on those smaller projects with crazy deadlines.

So if you're a demanding broadcast product on person, demand the best value in digital multitrack —

THE TASCAM DA-88





TASCAM®
Take advantage of our experience.

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NEW PRODUCTS

Fiber-optic hybrid connectors
Lemo

➤ Hybrid connector series: fiber-optic hybrid connector for TV camera applications; offers increased information carrying capacity due to a higher bandwidth; also offers resistance to external electrical interference including electromagnetics; connectors feature quick connect-disconnect self-latching system; the optical interfaces and electrical contacts are recessed inside the connector shell and the fibers remain protected from damage even when unmated.

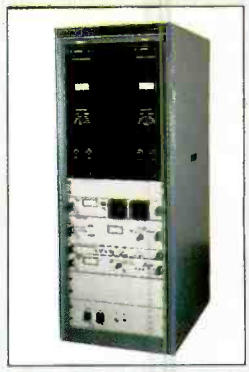
Circle (363) on Reply Card

Desktop video product
Grass Valley/ Data Translation

➤ VideoDesktop personal production suite: provides users with a complete range of features to create programs from start to finish on a single system; the system is based on technology developed by Data Translation for its Media 100 product and includes an Apple Power Macintosh 8100/100CPU, 20-inch monitor, and an 8.2GB hard disk array; options include a video monitor, monitor speakers, additional disk drives, and a tape backup system; the VideoDesktop personal production suite is the result of a collaborative effort between Grass Valley and Data Translation.

Circle (365) on Reply Card

Solid-state UHF TV transmitter
Acrodyne

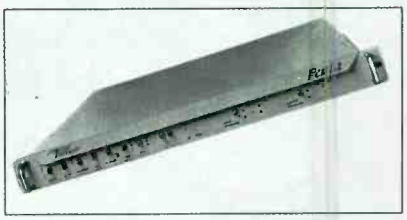


➤ Model TLU/1KE: a solid-state LPTV transmitter/TV translator designed around a higher-gain, double-power transistor; equipped with two 800W power amplifier modules hybrid combined conservatively and operating for 1,000W peak visual and 10% aural power output; features Acrodyne-built Type E exciter, a band-pass output filter, individual PA blowers, lightweight modules and an output circulator; the exciter features stereo or mono audio input, IF correction and an optional video input processor.

Circle (364) on Reply Card

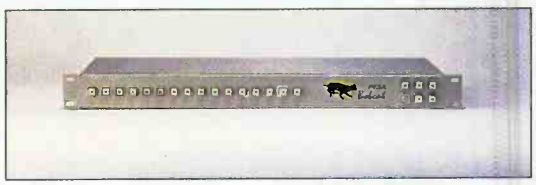
Standards converter
Prime Image

➤ Penta: a standards converter with a 5-field memory system (new technology uses method that adds a fifth field); judder anomalies are reduced 2-to-1 over other methods; system is contained in a 1U high rack-mountable unit powered by 15W; unit is fully controllable from the front panel and contains a full proc-amp; features include ultrastable freeze frame/field and variable-rate strobe; accepts signals in practically every known standard; built-in time-base corrector/synchronizer accommodates inputs and outputs in NTSC, PAL, PAL-M or PAL-N standards.



Circle (366) on Reply Card

Routing switcher
Pesa Switching Systems



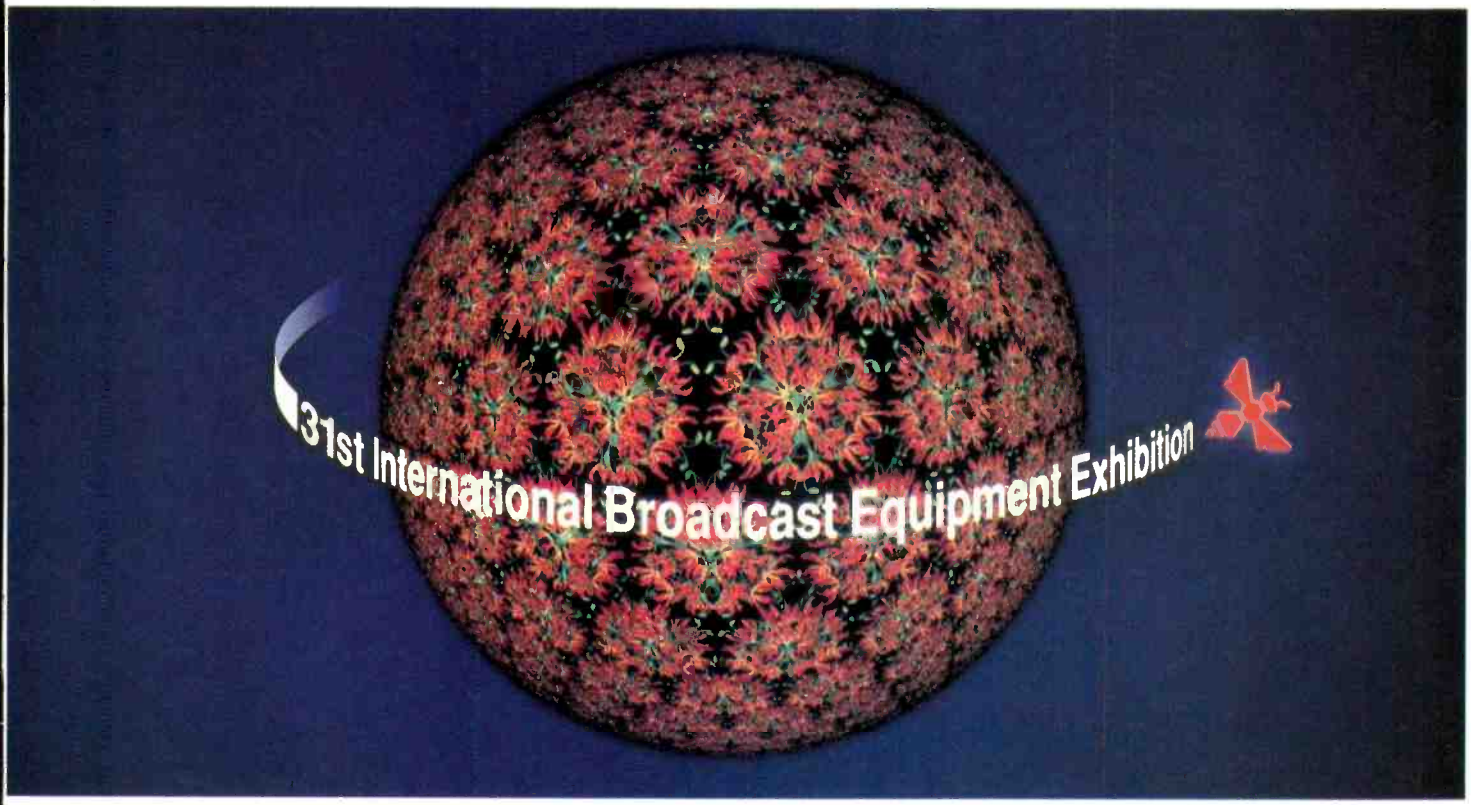
➤ Bobcat: a 250MHz routing switcher suitable for HDTV and graphics distribution applications; in addition to standard baseband or wideband analog video, the Bobcat can be supplied to route 270MB/s serial digital video with reclocking; two channels of analog or serial digital audio can also be included in the same 1RU chassis; offers 16 terminated video sources switchable to two destinations on a single level or alternately, two levels (Y-C) of eight terminated video sources to a single destination, plus two independent levels of audio; multiple units may be stacked to form RGB or RGBS configurations.

Circle (367) on Reply Card

31st International Broadcast Equipment Exhibition

Period: November 15–17, 1995 Place: Nippon Convention Center (Makuhari Messe)

DISPATCH OF INFORMATION FOR EXHIBITORS IN MARCH/CLOSING DATE FOR APPLICATION APRIL 20TH



Inter BEE '95

INTERNATIONAL BROADCAST EQUIPMENT EXHIBITION Inter BEE Nov.15-17'95

EXHIBITS ● audio equipment ● cameras and related equipment ● VCRs and related equipment ● video processing equipment ● transmitters and related equipment ● measuring apparatus ● transmission equipment ● link-up systems ● equipment for multiple broadcasting systems ● satellite bradcasting systems ● HDTV sets and related equipment ● etc.

See All You Can BEE

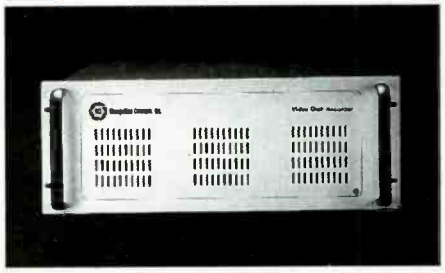
The 31st International Broadcast Equipment Exhibition (Inter BEE '95) is your chance to see the latest in broadcast, video, and audio technologies in action.
And there's more. As well as exhibits, Inter BEE '95 will feature symposiums, forums, and seminars hosted by some of the world's leading broadcasting, audio, and video software developers.
As the largest event of its kind in Asia and one of the world's top three, Inter BEE '95 will be a magnet for more than 450 manufacturers and around 25,000 visitors from around the world.
Inter BEE '95 will be held on November 15–17, 1995, at the Nippon Convention Center (Makuhari Messe).
So, make the trip to Inter BEE '95 to see all you can BEE.

For more information on Inter BEE '95, contact:

Circle (49) on Reply Card

Japan Electronics Show Association
Tokyo Chamber of Commerce and Industry Building, 3-2-2, Marunouchi, Chiyoda-ku, Tokyo 100, Japan Fax:81(3)3284-0165

Video disk recorder
Recognition Concepts Inc.



➤ VDR 6011K: a high-definition disk recorder that works with high-resolution video using existing 4:2:2 equipment; in 8:4:4 mode, the disk samples at twice the 4:2:2 rate yielding a horizontal resolution of 1,440 luminance pixels and 720 chrominance pixels; the number of lines remains at 487 or 576 depending on the 525 or 625 standard of operation; all commonly used resolutions, including 16:9, are more easily derived from images rendered or scanned at 8:4:4; a single VTR can be used to record or restore HD video at five HD frames per second; unit stores four minutes of HD and switches to 13 minutes of 8:4:4 or two independent 4:2:2 disks storing 13 minutes each.

Circle (368) on Reply Card

Compact digital routing system
Grass Valley

➤ Series 6000: a signal management system that can be configured in sizes from 16 x 4 to 32 x 32; system can be configured to accommodate serial digital or analog video as well as AES/EBU digital or analog audio signals; the serial digital video matrices are compatible with all standard data rates from 143Mb/s to 360Mb/s.

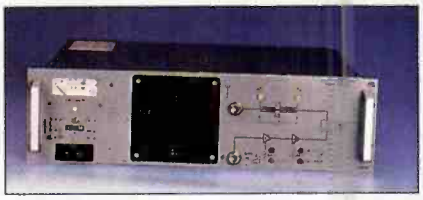
Circle (374) on Reply Card

Mobile studio
Morris Mobile Studios

➤ Mobile studio: a mobile, self-contained studio for on-location shoots; the hydraulic-lift vehicle features a 20'x20' studio that can be elevated from four to 16 feet above ground for panoramic views; the studio can be relocated within a 4-hour setup time; studio features studio-quality sound, multiple camera capability, full-light grid, patchbay at base of chassis, bathroom with fresh water supply and neutral density filters for various lighting conditions; the studio is pre-cabled with video, audio, telephone and computer lines.

Circle (372) on Reply Card.

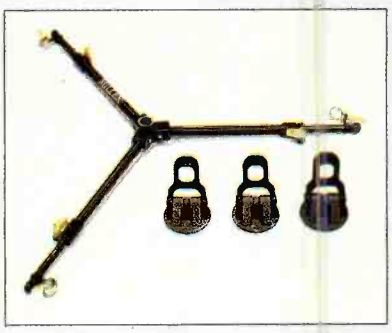
UHF TV amplifier
Teko Telecom



➤ L4AMP120: a 100W UHF TV amplifier; complies with CCIR B and G specifications; fully compatible with BLM transmitter and transposer drivers series; full solid-state equipment housed in a 19-inch 3SU rack.

Circle (373) on Reply Card

Tripod accessories
Miller Fluid Heads



➤ Above-ground spreaders and ground spreaders: available for all Miller ENG/EFP tripods; above-ground spreaders are lightweight and easy to attach; spreaders are designed to increase the torsional rigidity of the overall camera support system.

➤ Rubber feet: increased traction rubber feet developed for use with tripods using above-ground spreaders; the rubber feet feature a wider pad diameter and incorporate a low center-of-gravity tripod mounting point to enhance overall system strength.

Circle (354) on Reply Card

Routers
Digipath

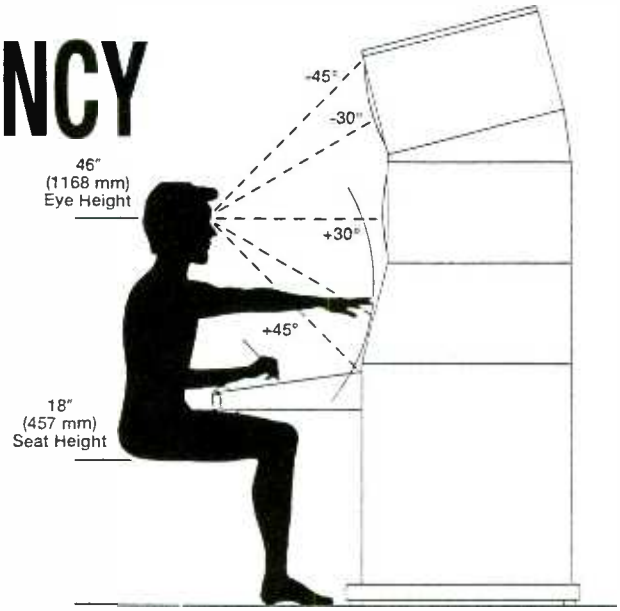
➤ Sahara 16x routers: 16 x 16 expandable routers featuring a plug-in modular design; each 1RU router can operate as a stand-alone unit or in conjunction with other Sahara 16x slave frames using the software-based control system; direct communication between the routers is facilitated through a ribbon cable connection that attaches to the parallel port on each unit; each model comes equipped with C-NET, RS-232 and RS-422 serial ports; standard control system features virtual matrix mapping, definable defaults, group and sequence switching, locks, and panel on-line diagnostics.

Circle (375) on Reply Card

COMFORT = EFFICIENCY

Winsted Consoles

are ergonomically designed for maximum operator comfort. Vision lines are direct, controls are easy to reach. With less strain on the operator's eyes, neck, back and arms, there's less fatigue. And that translates into greater operator productivity, a critical factor in any video or multimedia operation.



Modular Design

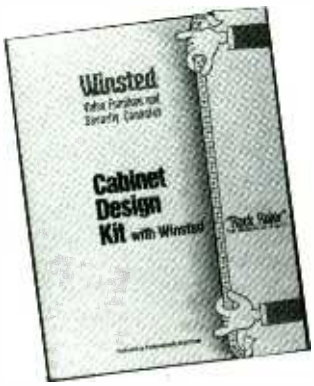
Winsted modular components are designed for maximum flexibility. You can design a console to meet your particular requirements. And you can easily add to or rearrange components as your needs change. All System/85 components are UL listed and designed for comfort and safety.

The complete video line

Winsted offers a full line of video furniture and support systems including desks, consoles, rack cabinets and modular components. And only Winsted offers a full range of special security features like locking pull-out drawers and shelves.

90% of all orders are shipped within 24 hours!

A complete line of video support furniture including desks, consoles, rack cabinets and modular components.



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Circle (50) on Reply Card

The GALLERY

HORITA

WG-50
Window Dub Inserter

- Makes burned-in SMPTE TC window dub copies
- Indicates drop-frame or non-drop-frame time code
- Also functions as play speed SMPTE time code reader
- Adjustments for horizontal and vertical size and position
- Dark mask or "see-thru" mask surrounds display
- Provides reshaped time code output for copying TC
- Displays time code or user bits • Display on/off
- Field 1/ field 2 indicator • Sharp characters
- Always frame accurate (on time)

$269

TG-50
Generator / Inserter

Combination time code generator and window dub inserter. It includes all features of WG-50 **PLUS–**

- Generates SMPTE time code in drop/non-drop-frame format
- Jamsync mode jams to time code input and outputs new TC
- Simple "on screen" preset of time code and user bits
- Run/stop operation using front panel momentary switch
- Selectable 30/60/90/120-second automatic generator back-time
- Make a window dub copy while recording TC on source tape

$349

BSG-50
Blackburst/Sync/Tone Generator

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

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

$269

CSG-50
Color Bar/Sync/ Tone Generator

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

$349

TSG-50
NTSC Test Signal Generator

The TSG-50 generates 12 video test signals suitable for setting up, aligning, and evaluating the performance of various video equipment found in a typical video editing system, such as video monitors, distribution amplifiers, VCRs, switchers, effects generators, TBCs, etc. In addition to the video signals, the TSG-50 also generates composite sync and, with a video DA such as the Horita VDA-50, becomes a high quality, multiple output, house sync generator.

- Fully RS-170A SC/H phased and always correct. No adjustments ever required
- Built-in timer automatically switches video output from color bar pattern to black after 30 or 60 seconds. Makes it easy to produce tape leaders of color bars followed by black.
- Video signals generated are in accordance with Industry standard EIA RS-170A video timing specification.
- Audio tone switches to silence and color bars change to black when using 30/60 second timer
- Convenient pattern selection - 12 position front panel switch.
- Includes crystal controlled, 1 KHz, 0dB audio tone output.
- Generates precise oscilloscope trigger output signal one H line before start of color field 1.
- Outputs: video, sync, ref frame, 1KHz, 0dB

$439

WE STOCK THE FULL LINE OF HORITA PRODUCTS INCLUDING:

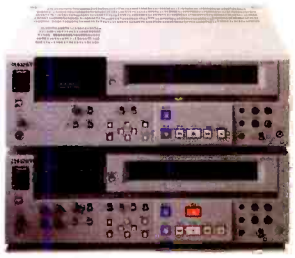
WG-50 – Window Dub Inserter
TG-50 – Generator/Inserter
TRG-50 – Generator/Inserter/Search Speed Reader
TRG-50PC – Has all of the above plus RS-232 control.
VG-50 –VITC Generator, LTC-VITC Translator
VLT-50 – VITC-To-LTC Translator
VLT-50PC – VITC-To-LTC Translator / RS-232 Control
RLT-50 – Hi8 (EVO-9800/9850)TC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

SONY

NEW! **SVP-5600 and SVO-5800**
S-VHS Player/ S-VHS Editing Recorder

SVP-5600 and SVO-5800 features:

- By combining the high resolution (400 horizontal lines) of S-VHS with high quality signal processing techniques like DNR, Digital Field DOC and Chroma Process improvement, they deliver the consistent picture quality so essential to editing. They also incorporate a wide video head gap and track width (58mm) for stable and faithful picture reproduction.
- Each has a built-in TBC plus an advanced Digital Noise Reducer (DNR) for both the chrominance and luminance signals to eliminate noise during playback. At the same time, a field memory incorporated in the noise reducer removes jitter to provide sharp, stable pictures. The field memory, also includes a Digital Field DOC (Dropout Compensator), which replaces signal dropout with information from the previous field.
- They also incorporate Chroma Process Improvement circuitry for excellent color picture quality in the playback mode. This advanced circuitry greatly improves the chroma bandwidth, thus enabling sharper and clearer color picture reproduction.



ADVANCED EDITING FUNCTIONS

- For frame accurate editing, both machines employ a sophisticated servo system, an improved quick response mechanism and built-in LTC/VITC time code capability. This makes them ideal for animation and computer graphic recording, where a frame-by-frame editing function is indispensable.
- They are equipped with industry standard RS-422 9-pin serial interface. The 9-pin connector carries edit commands and time code data between the VCR and the edit controller.
- When connected to an RS-422 equipped edit controller, the SVO-5800 functions as an editing recorder. It performs assemble and insert functions and also provided audio split editing capability of norman audio tracks 1 and 2. In the insert mode, video, audio and time code can be inserted independently, or in any combination.

FOUR CHANNEL AUDIO SYSTEM

- They each incorporate four-channels of high quality video. There are two channels with Hi-Fi (AFM) tracks and two with longitudinal (normal) tracks. The Hi-Fi tracks provide a wide frequency response from 20hz to 20khz and a superb dynamic range of 90db. The normal tracks incorporate Dolby B noise reduction for high quality sound reproduction. XLR connectors are used for the inputs and outputs for all four channels.

MULTIPLE INPUTS AND OUTPUTS

- Both machines employ composite and S-Video connectors. With optional SVBK-170 Component Output Board, they provide component signal output through BNC connectors. With the board, the VCRs can be integrated into Betacam SP editing systems.

USER FRIENDLY OPERATION

- They have a built-in character generator which superimposes characters on the "video monitor output" signal. This allows time code data, control track, menu setup and VCR function status to be shown on a monitor.
- For more efficient operation they have an on-screen setup menu which allows a variety of customized VCR mode operations. Programmed in the form of a layer structure, you simply go through the menu and initialize VCR operation.
- All parameters of the TBC, such as luminance level, chroma level, setup, hue, Y/C delay, sync phase and SC phase are easily controlled from the front panel, and can be remotely controlled from the optional UVR-60 TBC Remote Control. The UVR-60 also accesses field freeze function in the still mode and allows on/off control of the chroma and luminance noise reducer.
- Quick and smooth picture search can be performed by either using an RS-422 equipped edit controller or the optional SVRM-100 Remote Control Unit. Recognizable color pictures are provided at up to10x normal speed in forward or reverse.

REBATES: Buy an SVP-5600 or SVO-5800 Professional S-VHS VCR or UVW-1600, UVW-1800, Betacam SP VCR with:
• Sony PVE-500 A/B Roll Edit Controller and receive $500 instant rebate!
• Sony FXE-100 A/B Roll Edit Controller/SEG and receive $1000 instant rebate!
• Sony DFS-300 Switcher/SEG and receive $2000 instant rebate!

FXE-100 ALL-IN-ONE VIDEO EDITING SYSTEM

The new FXE-100 is an A/B roll editing system designed for quicker, easier video editing, and is well-suited for today's professional audio/visual communications. It is at once an edit controller which controls basic VCR functions, a special effects generator which cuts, mixes, wipes and composites the video sources with stunning effects; and an audio mixer with various fading and switching abilities. There is no longer a need to configure multiple devices for video editing. With either Hi-8 or S-VHS VCRs and the FXE-100, an ideal professional editing system can be easily configured.

- Switchable machine control of three RS-422 equipped VCRs or three RS-232 equipped VCRs. Basic VCR functions, such as play, stop, still, fast forward, rewind and record are controlled through these interfaces. Variable speed control is also possible for VCRs equipped with Dynamic Tracking.
- Accepts time code, control track (CTL), and 8mm time code as editing references. These can be set separately for each VCR.
- Performs assemble and insert editing (Video, Audio 1, Audio 2). The first EDIT mode, which allows you to record sufficient timecode for synchronization to a new tape is also featured.
- Features a split audio edit function which allows setting of audio and video in-points separately. This permits you to bring in the audio source before a visual transition.
- Store up to 99 scenes, including effects settings, in memory.
- Edit list data can be saved and downloaded to an IBM-compatible PC, allowing you to review or modify edit data at any time.
- The FXE-100 has two program busses, the A- and B-bus. Each bus provides Player 1, Player 2, Aux inputs and Background Color. Both composite and S-Video signals can be input.
- Taking advantage of the freeze function, two machine editing with effect transitions is realized by freezing the recorder OUT point picture. Also, by selecting the same video source in both A and B bus, wipe or mix In/Out of the digital effects is possible without picture transition. This "Self A Roll" function is another feature which allows effective two machine video editing.

SWITCHER AND SPECIAL EFFECTS GENERATOR

- Multiple wipe patterns, including picture scroll and slides, are programmed in. Wipe patterns are easily accessed, and transition rates can be set. Soft edges or a choice of 15 color borders can be added to most wipes and effects.
- Variety of mix effects, such as mosaic mix, black and white mix, posterization mix and picture-in-picture (PIP). Also fade to black and fade to white effects.
- Digital effects, such as mosaic, paint, pixel trail, multi-picture, monochrome, and zoom. Picture freeze function is also featured in frame or field mode.
- Because all the special effects can be set separately to the video sources of each bus, wipes or dissolves of the sources with the digital effects can be executed. It is also possible to combine multiple effects to create stunning images, such as wiping the multi-picture effect with the paint effect and dissolving color corrected picture with mosaic effects.

ADJUSTABLE TRANSITIONS

Transitions are done using the fade lever, or they can be automatically set. Transition time can be set from 0 to 999 frames. Transition can also be paused and reversed. Other parameters such as GPI timing, wipe selection and pre-roll time can be set.

CHROMA KEYER

The FXE-100 features chroma and luminance keyers to superimpose characters, figures, or video sources onto a background. Clip and gain levels can be adjusted to give clean and sharp key edges. Color correction is done via the joystick for both busses with memory to hold a favorite setting for storage and recall.

WIPE CONTROL

By moving the location stick, you can move the closed wipe patterns such as square, circle and heart, around the screen. This function also enables you to start the wipe transition from any desired position on the screen.

AUDIO MIXING

Audio-follow-video editing can be performed with the FXE-100. Two channels are assigned to each player VCR's input and one channel for the recorder VCR's input. Two channels of AUX inputs and a MIC input are available for mixing background music with voice-over. All audio input levels can be adjusted separately. Two Program output channels and one monitor channel are provided. A switch for -7.5dB and +4.0 dB is provided for flexibility in choosing input levels for VCRs with either RCA or XLR connectors.

USER FRIENDLY OPERATION

- All keys and buttons are logically grouped by function, and are color coded for quick identification and economy of keystrokes.
- Permits one monitor operation. No need for multiple monitors. Various editing data, such as edit mode and time code address of each VCR, can be monitored on the same screen.

VERSATILE SYSTEM INTEGRATION

- No need to configure multiple devices. By simply connecting three VCRs, a professional video editing system is formed.
- Two frame synchronizers allow perfectly synchronized wipes and dissolves without time base correctors.
- Equipped with two GPIs for control of external devices, such as character generators and audio mixers. Also has a GPI input, allowing it to be controlled from an external edit controller.
- Has four black burst outputs to distribute internally generated sync signal, synchronizing connected devices. There is no need for an external sync generator.

We are an authorized Service Center for Sony and Panasonic Industrial and Professional video equipment. Call (800) 963-2525. In NYC (212) 206-8861 (24 hour service available)

MAGNI

MM-400

- The MM-400 is a combination waveform and vector monitor especially configured for the cost-conscious producer. A low-cost alternative to CRT-based waveform monitoring the MM-400 produces a video picture of the input signal's waveform and displays it on any video monitor. It provides a simple, affordable and accurate way to set camera levels before a shoot, or to check time base correctors and color fidelity in editing. Problems like hue shift, smearing, muddy contrast and loss of detail are easily identified for correction.

FEATURES:

- Converts waveform or vector display information into a standard video signal which can be displayed on a video monitor or routed around a video facility, no need for additional expensive monitors. Switch between pictures and waveforms at the push of a button.
- Incorporates an advanced SC/H phase and color frame indicator that is a must for editing and post production. At a glance it tells you if a signal's subcarrier-to- horizontal phase is properly adjusted and if the signal's color frame matches the house black burst connected to the MM-400 external reference input.
- Works anywhere and with any analog video format—NTSC, PAL, Component or S-Video. It has automatic detection between NTSC and PAL formats.
- Three loop-through inputs can accept three composite signals or one component, or RGB signal.
- No complex displays or special test signals are required for component video monitoring.
- Interchannel timing and amplitude display make component analog monitoring easy. has color bar limit markings for Betacam, M-II and SMPTE formats.
- Waveform and vectorscope controls, including channel, sweep speed, position control, phase rotation are on easy-to-see dedicated pushbuttons.
- Besides instant toggling between picture and waveform, a mix mode combines waveform and picture displays for simultaneous viewing.
- The MM-400 can be readily used by even novice operators. It has easy-to- understand set-up menus for display color, interchannel timing, SC/H phase alarm.
- Usable in any video facility of any size for displaying signals. its low cost makes it affordable by the smallest studio, while its features and performance make it ideal for monitoring in high-end facilities as well.

LEADER

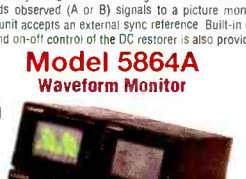
Model 5850C
Vectorscope

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

Model 5860C
Waveform Monitor

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

Model 5864A
Waveform Monitor



A fully portable waveform monitor for field use, the Model 5864A is a two-channel unit that provides 2H and 2V sweeps with MAG, FLAT and IRE response, and normal and X4 gain.

Model 5854
Vectorscope

2-channel portable vectorscope is ideal for field use and features A and B phase reference, fixed and variable gain. Both units shown with optional battery holder and NP-1 type battery.

ALL ITEMS ARE COMPLETE WITH ALL ACCESSORIES AS SUPPLIED BY MANUFACTURER

Preview

May...

• Building the Digital Facility

Don't miss this full-length feature story covering KHOU-TV, the country's first inaugural all-digital TV station. The article will cover source tape machines through routing and STL input.

• Graphics and Effects Systems

A look behind the front panel, where the architecture that is used in various systems determines system capability. A thorough review of the basic types of effects systems will be covered.

• Intercoms

The proper use of intercoms for remote trucks and in-studio applications will be reviewed. Matrix and dynamically assignable, computer-based systems will be featured.

• Wireless Microphones

Permanently installed wireless microphone systems are a boon to TV and live-performance facilities. The article will review techniques for effective installation and use of these systems.

June...

• NAB Review

BE reporters canvassed the entire NAB Convention for the latest hot products and technology. This multipart package includes thorough coverage of new products and demos from the show floor and back room peeks and important session reports. More than 15 engineers and reporters were on the job to bring you the best coverage in the industry.

• TV Pick Hits

This 20-product line-up highlights the hottest products on the show floor, as judged by our army of engineers and industry experts.

• Using Spectrum Analyzers

Sometimes there is only one right tool for the job. Such is the case with spectrum analyzers. Although engineers know of the device's importance, it is a complex and expensive instrument. The key to rapid troubleshooting is to know beforehand how the spectrum works and how it should be used.

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FOR SALE: G.E. Industrial Voltage Regulator. Model GEK-26035. In excellent condition. Recently overhauled by G.E. $3,500.00 plus shipping. Call Vic (818) 440-1147. Fax (310) 676-1033.

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Advertising rates in **Broadcast Engineering** Classified Section are 119^{00} per column inch, per insertion, with frequency discounts available. There is a one inch minimum and ten inches maximum.

Ads may also be purchased By-The-Word for $1.75 per word, per insertion. Initials and abbreviations count as full words. Minimum charge is $40 per insertion.

Blind box ads (replies sent to **Broadcast Engineering** for forwarding) are an additional 40^{00}. Reader Service Numbers are available for 50^{00} per insertion. Ads 4 inches or larger receive a Reader Service Number free.

Spot color, determined by **Broadcast Engineering**, is available at 95^{00} per insertion.

No agency discounts are allowed for classified advertising.

Call Renée Hambleton at 913-967-1732 to reserve your classified ad!

ATTENTION *BE* READERS

ATTENTION *BROADCAST ENGINEERING* READERS A former Editor of *BE* is looking for past issues of *Broadcast Engineering* to complete a collection of magazines. The following issues are needed: March 1984; July 1984; August 1984; June 1985. A finder's fee of $25.00 per issue will be paid for magazines that are complete and in good shape. Direct responses to: Jerry Whitaker, 2373 N.W. 185th Street, Suite 507, Hillsboro, OR 97124, or call 503-645-1221. Thanks for your help!

Looking for a job?
Have something to sell?
Have a professional service to offer?

Put Broadcast Engineering's Classifieds to work for you!

- BE's total readership of over 77,000*
- Low, low rates of only $1.75/word...

and

- 96% of all respondents have purchasing influence*

-means you get results for a very small investment

Call Renée Hambleton at 913-967-1732 or fax 913-967-1735 to place your classified ad in the next available issue.

*Harvey Research Organization-April 1994

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BETACAM™
WORLD'S MOST COMPLETE TRAINING CLASSES
'YOUR PLACE OR OURS'
LEARN FIELD TRICKS, SHORTCUTS, THEORY AND PRACTICE
LOTS OF 'HANDS ON'
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4475 GOLDEN FOOTHILL PKWY.
EL DORADO HILLS, CA 95762
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EQUIPMENT WANTED

WANTED: For RCA TM-21 color monitor flyback #214870 and power transformer #213987 or entire monitor. J. Ballard (212) 664-3033.

SMALL MARKET STATION looking for an ENG Microwave van. Turn key operational. Please write to: Dept. 758, Broadcast Engineering, 9800 Metcalf Overland Park, KS 66212-2215. We are ready to purchase.

TRAINING

FCC GENERAL CLASS LICENSE. Cassette recorded lessons for home study. Our 30th year preparing radio technicians for the license. Bob Johnson Telecommunications. Phone (310) 379-4461.

HELP WANTED

WE PLACE

(Technical Engineers-Post Production Editors & Colorists)

• All Levels, Locations, & Disciplines •

Employer Paid Fees
Guaranteed Confidential
15 Years Service

FAX and/or Mail your Resume to Mike Kelly

KEYSTONE INT'L, INC.
16 Laflin Road
Pittston, PA 18640

Fax 717-654-5765 • Phone 717-655-7143

SERVICES

Monitor Service Center

Varitek specializes in high resolution broadcast video monitors. Digital or analog. In all formats NTSC, PAL, SECAM.

We at Varitek have been providing quality service to our clients throughout United States since 1982.

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(800) 346-4380 Ext. (16)
VARITEK
415 W. Taft Ave., Orange, CA

Circle (102) on Reply Card

DIRECTOR
PRODUCTION AND TECHNICAL OPERATIONS

Highly experienced engineering director needed to oversee station's production operations and management of stages, production services, post production facilities, and field operations. Also, you'll enjoy managing technical operations related to broadcast systems engineering, on air operations, maintenance, transmitter and microwave systems. Must have working knowledge of FCC regs, degreed in electronics or equivalent television production and engineering, prior management experience with union negotiations, and computer literate with databases and CAD systems. Work flex hours and some weekends. Submit resume, with salary history to: KCET, HR/Tech Ops, 4401 Sunset Blvd., Los Angeles, CA 90027.

KCET
Equal Opportunity Employer
Celebrating Its 30 Year Anniversary

CLASSIFIED

HELP WANTED

MAINTENANCE ENGINEER Black Entertainment Television Inc. Ability to troubleshoot to the component level production switchers, digital video effects systems, routing switchers, vtr's character generators, cameras, editing systems and audio equipment. This will include system interfacing to computers and compatible components, equipment installation for studio and remote productions. Must be knowledgeable of system timing theory, broadcast specifications, and electronics course study. Ability to perform fiber switches and satellite downlink. Must have 3 years experience. BET, Corporate Human Resources, 1905-E 9th Street, N.E., Washington, D.C. 20018

ASSISTANT CHIEF ENGINEER Dominant CBS affiliate is seeking experienced engineer. Must have 3 to 5 years experience repairing video tape machines, cameras, computers and RF transmission equipment. FCC license preferred. Send resume to: Chief Engineer, KLFY-TV, P.O. Box 90665, Lafayette, LA 70506. (318) 981-4823. EOE.

ENGINEER Immediate opening for a transmitter/studio maintenance engineer. SBE or FCC license required with some component level expertise. To apply mail or fax resume and salary requirements to: Chief Engineer, WJHL-TV, 338 E. Main St., Johnson City, TN 37601 FAX (615) 434-4537.

PAXSON COMMUNICATIONS CORPORATION Currently accepting applications for Chief and Facility Engineers. We are a very dynamic, non-traditional, fast-growing network. Candidate must have experience with high power UHF transmitters, must be highly motivated, a self-starter and have good management skills. Minimum of 3 years experience required. All qualified persons send resumes and salary requirements to: Cathy Jones, Engineering Coordinator, Paxson Communications, 11300 4th Street North, Suite 318, St. Petersburg, FL 33716. No telephone calls please.

VIDEO OPERATIONS ENGINEER Fortune 100 Company seeks technical support for its Manhattan facility. Engineer must be able to trouble shoot systems problems and find workable solutions in an online situation. Engineer must also have studio camera set up and shading experience. Knowledge of all current tape formats, as well as Abekas DVEs, and Ampex/Grass Valley Switchers a must. Familiarity with open architecture environments preferred. Position is currently freelance with full time potential. Send resume to Dept. 757, Broadcast Engineering, 9800 Metcalf, Overland Park, KS 66212-2215.

MAINTENANCE ENGINEER: Immediate opening for Maintenance Engineer. Associate Degree in Electronics and 4-6 years experience TV Maintenance. FCC General Class license required–SBE certification desirable. Individual must be energetic, self-starter with experience in component level troubleshooting and maintenance of a wide variety audio, video and RF equipment. U-Matic maintenance required, Beta experience a plus, computer skills beneficial. Must also share in driving/operating KU band SNG truck (chauffeurs license required). Some weekends and nights required, and occasional master control operating shift. Minorities and women encouraged to apply. Send resume listing references, salary requirements and any manufactures technical schools to: Chief Engineer, KOMU-TV, 5550 Hwy. 63, South Columbia, MO 65201. An EEO, Affirmative Action Employer.

AN EQUAL OPPORTUNITY AM/FM, in the beautiful Rocky Mts., has great opportunity for enthusiastic broadcast engineer, with three years minimum of experience in transmitter & studio maintenance. Computer experience a plus. AM Directional experience required. Send resume & references to: Dept. 756, Broadcast Engineering, 9800 Metcalf, Overland Park, KS 66212-2215.

Disney

VIDEO MAINTENANCE ENGINEER

The Disney MGM Studios at WALT DISNEY WORLD® Resort has an immediate opening for a qualified Video Maintenance Engineer. Candidate must have at least 10 years post production experience and a degree in Electronic Technology or related field. Must be familiar with all video tape formats and have a strong working knowledge of TCP/IP or NFS networks. Command in computer technology and digital video required. Qualified individuals will be familiar with all SEMPTE standards. Please send resume and salary history to the address below. Resumes must be formatted chronologically on white or light colored 8.5" x 11" paper in order to be entered into our resume tracking system.

Walt Disney World Co.
Salaried Staffing
Dept. LWBR50401
P.O. Box 10,090
Lake Buena Vista, FL 32830

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Walt Disney World Co.

The Walt Disney Company is an equal opportunity employer committed to a culturally diverse workforce

MAINTENANCE ENGINEER: Mid-South Post House has immediate opening for experienced assistant engineer. Digital and analogue equipment includes Sony switchers, editors, DMEs, D2, 1", Beta SP, monitors, ADO, Delta CG, Rank Cintel, Composium, Avid, etc. Mac and PC computer skills very helpful. Minimum 3-5 years experience required. Some night and weekend work required. Must have good people skills and be a self starter. Competitive salary and benefits. This is a good opportunity for a motivated individual with a clear vision and professional goals. Please submit cover letter, resume and salary requirements to: Erv Vanags, Elite Post, 1025 16th Ave. S, Suite 302, Nashville, TN 37212.

CONTRACT/FULL TIME (New York Metro Area) We are looking for individuals with a technical background in A/V Systems design & operations to join our talented and aggressive engineering team. Responsibilities will include floorplans, rack layouts, overall system design and integration. Projects include large scale analog and digital broadcast as well as performance venue facilities. Autocad preferred, MS Word/Excel a plus. Some customer interface and travel necessary. Resumes to The Systems Group, 66 Willow Avenue, Hoboken, NJ 07030.

SONY

Sony Broadcast Business and Professional Group has several opportunities for Broadcast Professionals in the following areas.

Field Engineers
Engineering Specialists
Depot Engineers

(San Jose and Cypress, CA; Chicago, IL; Teaneck, NJ; Norcross, GA; and Irving, TX)

We have openings for Engineers with a background in installation, maintenance, repair and troubleshooting of audio, video and telecommunications equipment. An AA degree in Electronics or equivalent and 3+ years' broadcast experience are necessary. Customer interface and travel will vary, depending on position. Must be willing to relocate.

Send your resume and salary requirements, along with locations you are interested in to Catherine Borders at the address or fax number listed below.

Sr. Video Systems Design Engineers

Full-time and Contract/Temporary

We're looking for very seasoned Engineers to start immediately and work on designing large scale digital audio and video facilities. Candidates must be strong in system level engineering design, technical problem solving, team building and communications. Responsibilities will include the design of floor plans, equipment rack elevation layouts, and detailed signal flow construction diagrams. Fluency in Microsoft Excel for Windows is required; AutoCad, MS Word and MS Access software knowledge a plus. The ability to work with minimal supervision and training will also be key.

These contract positions require 5+ years' professional experience in the design, operation, maintenance and testing of large scale state-of-the-art analog and serial digital audio and video production, as well as broadcast facilities.

Contract/temporary positions require full-time presence at Sony's facilities located in San Jose, CA. Some travel will be required during installation and testing of facilities after designs have been completed. **Resumes should be sent to Christine Young at the address or fax number listed below.**

Send responses to: Sony Electronics, Inc., 3300 Zanker Road, MS: SJ-2C2, San Jose, CA 95134; FAX (408) 955-5163.

We are proud to be an EEO/AA employer M/F/D/V. Women and minorities are encouraged to apply. Also, we maintain a drug free workplace and perform pre-employment substance abuse testing.

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Shinjuku-ku, Tokyo 162, Japan
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BROADCAST ENGINEERING is edited for corporate management, engineers/technicians and other management personnel at commercial and public TV stations, post-production and recording studios, broadcast networks, cable, telephone and satellite production centers and networks. Qualified persons include consulting engineers and dealer/distributors of broadcast equipment.

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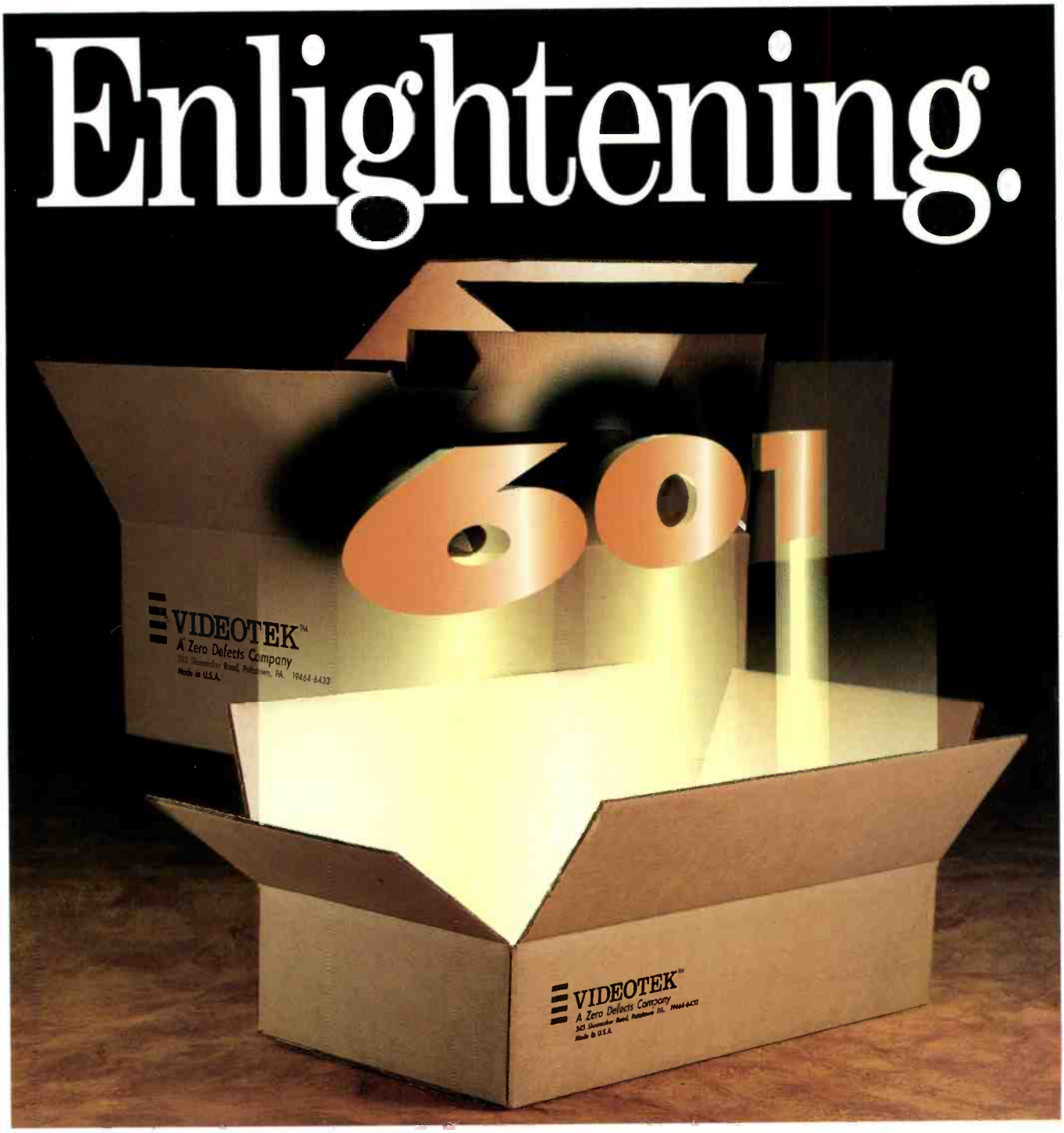
Enlightening.



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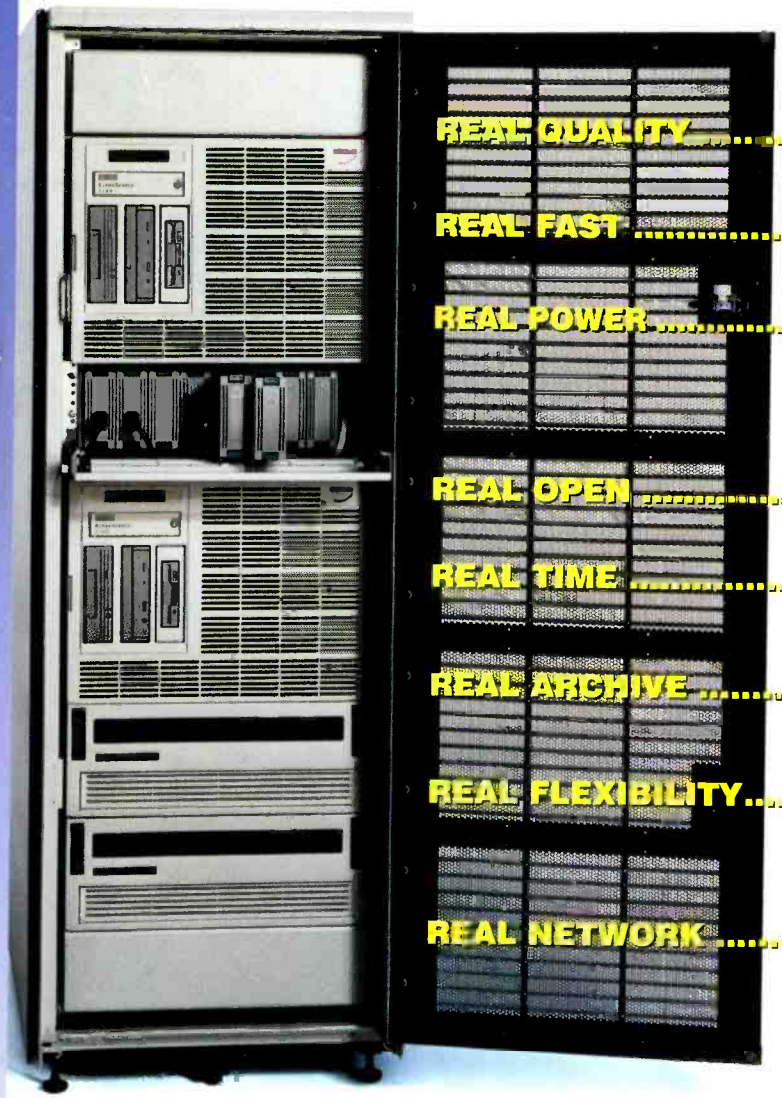

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