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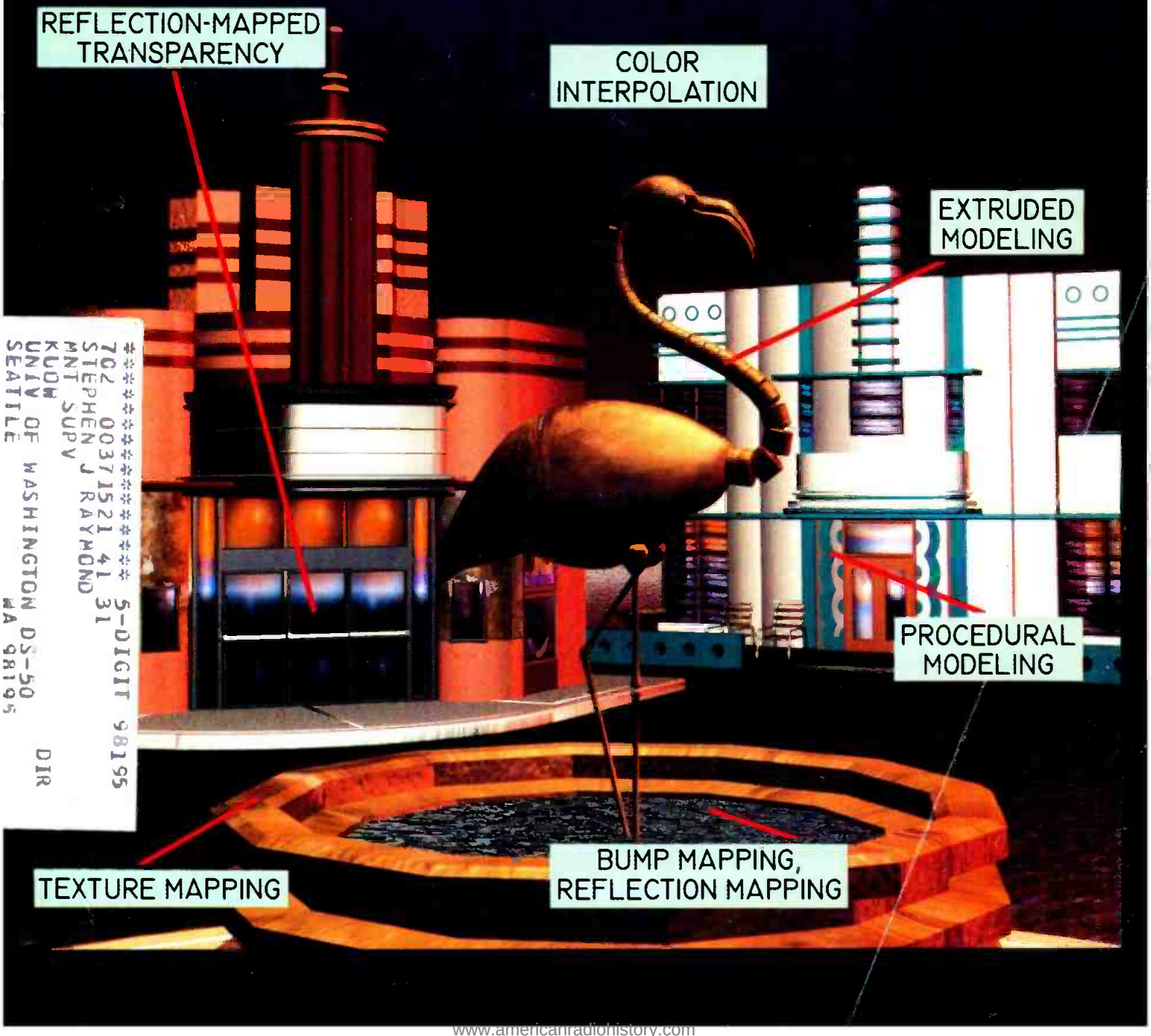
BROADCAST MANAGEMENT/ENGINEERING

Redefining Beta Splines:

p.30



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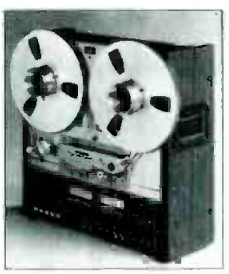

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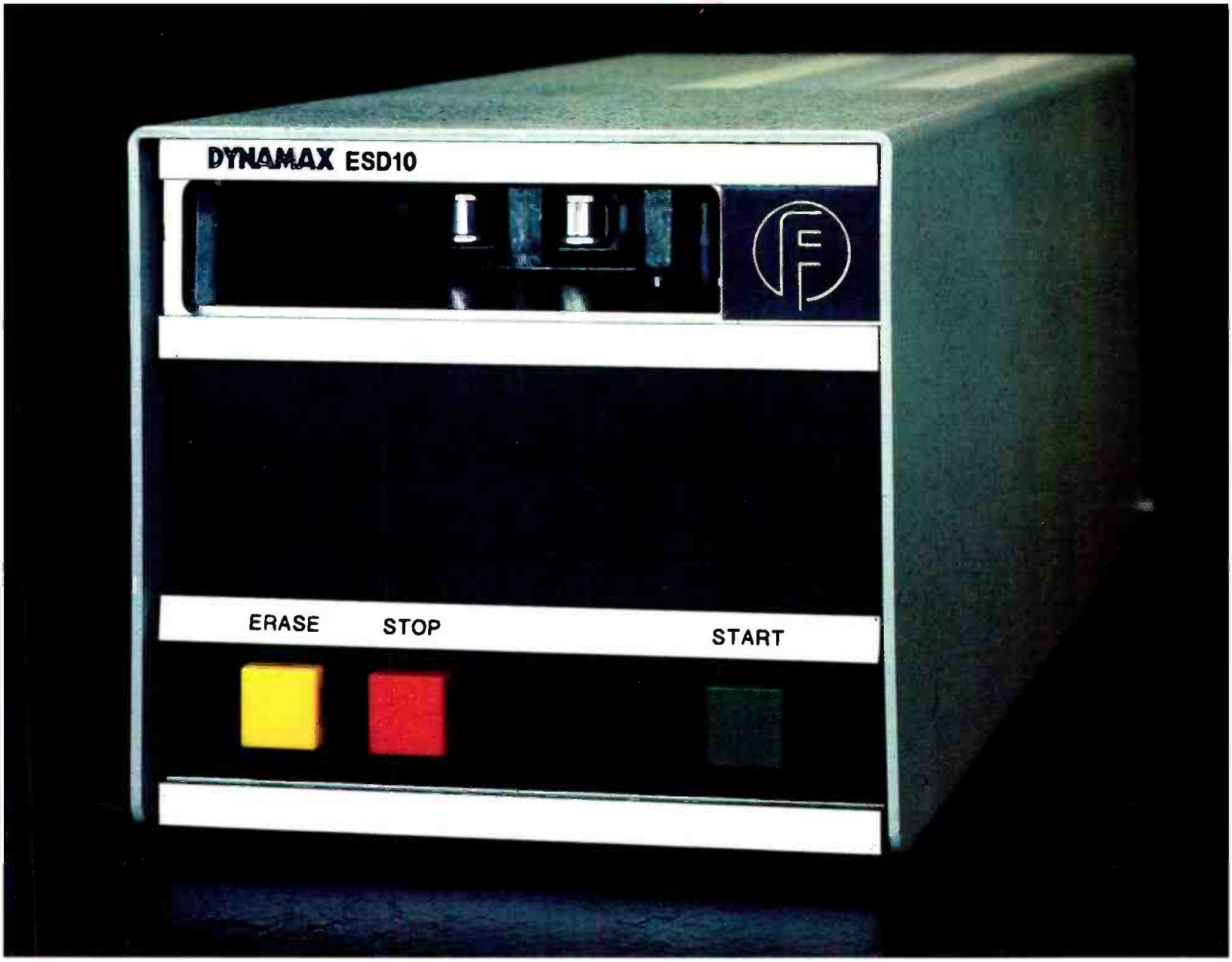

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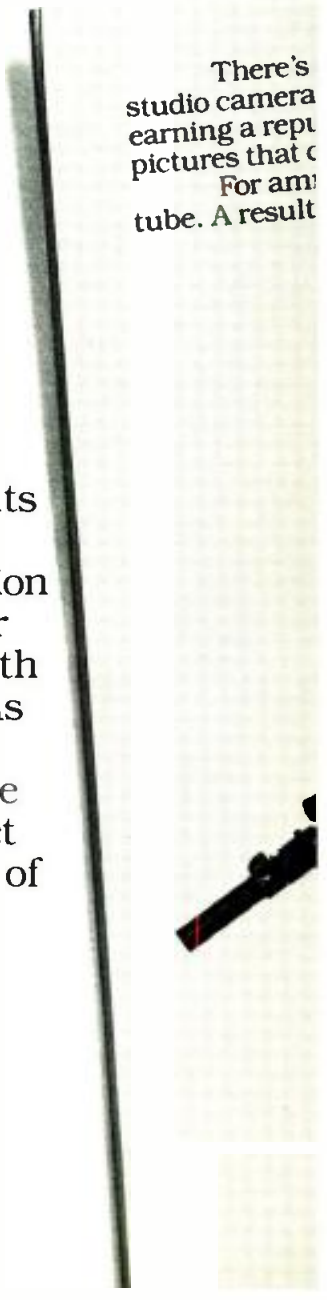

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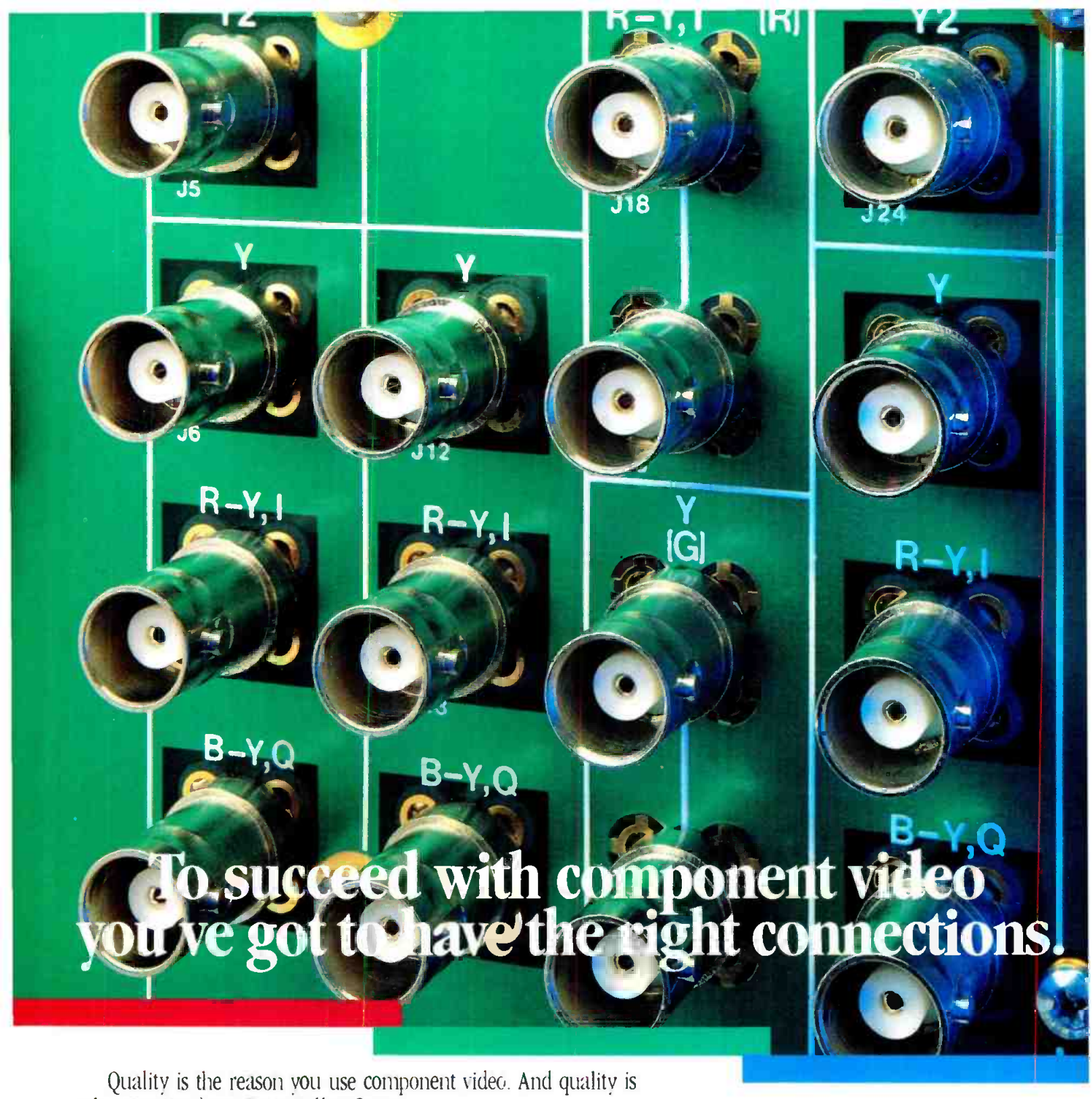

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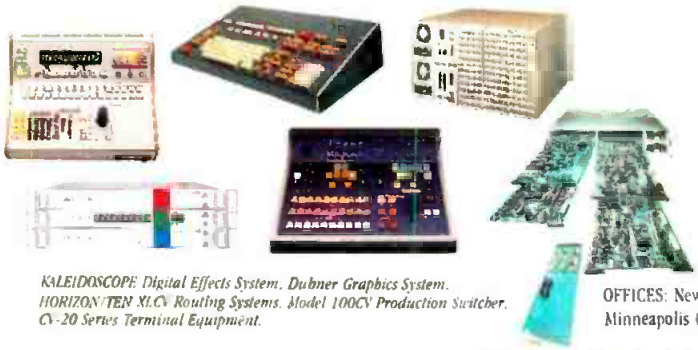

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Cover

Cliff Garbutt of Limelight Video in Miami created the cover image on the Cubicomp Vertigo 3D modeling and animation system using Cubicomp's latest software revision. The image was rendered as an 8000-line transparency at Image-Set in San Francisco.

The mic mixer you would have designed yourself–The Shure M267.

In the space of just two years, the Shure M267 has become one of the most well-known and widely used mixers in the broadcast industry. One look at it will tell you why.

The M267 gives you the improvements you've told us were most important. Every channel has a mic line level switch for maximum flexibility. There's also a built-in limiter to keep the M267 from overloading at critical moments. The unit contains a built-in battery pack that utilizes three standard 9-volt batteries. Simplex (phantom) power and a peak LED are standard, too.

The M267 oscillator provides a clean 1 kHz tone, and is located on the front of the unit for simple access. The headphone output is also on the front and includes a level control. IC design, along with active gain controls, provides greater headroom and quieter operation.

For location work or even studio post-production, the M267 carries on Shure's reputation for reliability and ruggedness.

For more information on Shure's complete line of mixers, call or write Shure Brothers, Inc., 222 Hartrey Avenue, Evanston, IL 60202, (312) 866-2553.

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Graphics for Engineers

"Nowhere is the trend towards engineering's involvement in purchasing production-type equipment more apparent than in graphics systems."

During the past several decades, there has been a continual evolution of the role played by engineering in equipment purchasing. In the industry's early days, when signal quality and questions of reliability were of tantamount importance, it was virtually impossible to think of buying equipment without involving the CE.

Then came the 1970s and the "production revolution." With equipment quality and reliability virtually assured and with an increasing emphasis being placed on equipment's features rather than its specs, the CE's role in purchasing became more advisory.

Now, in the 1980s, engineering has once again become the dominant force behind capital expenditures. Production people want to know what a piece of equipment will do; but each new box has to be integrated into a system and be capable of growing with the industry and the facility itself. Here only engineering can provide these insights.

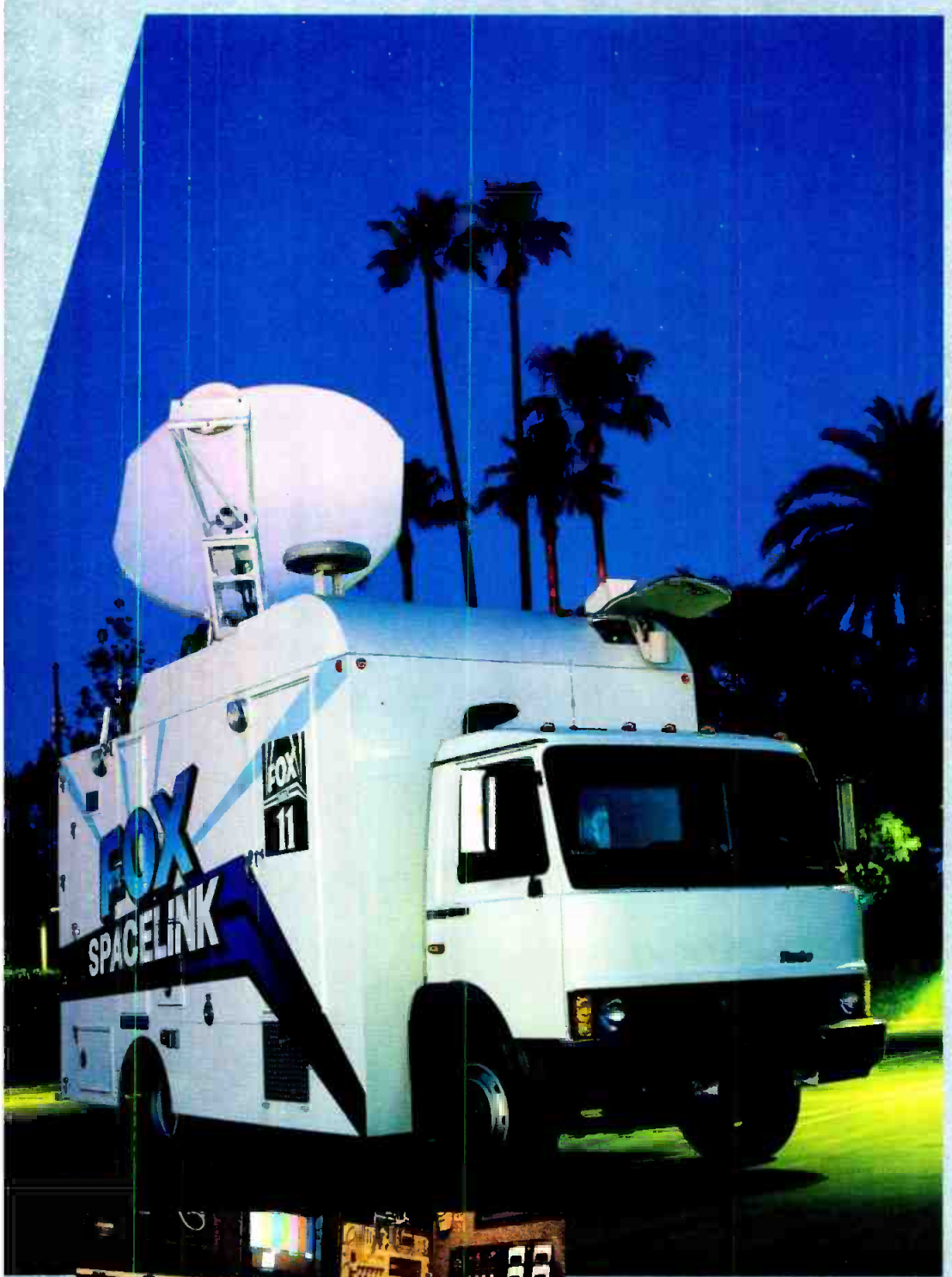
Nowhere is the trend towards engineering's involvement in purchasing production-type equipment more apparent than in graphics systems. Once thought to be purely within the domain of the news and art department(s), both 2D and 3D systems are beginning to be looked upon in the same way as cameras, production switchers, audio boards, and other elements within a station or a facility. Graphics must be understood, must be integrated, and must function within the overall scheme.

The problem, of course, is that although they are being asked some tough questions, many engineers don't know the difference between a beta spline and a bicubic patch—though both are essential to high-quality three-dimensional modeling and animation. For those bewildered by the technology and terminology of computer graphics, we offer "Redefining Beta Splines: A Computer Graphics Primer"—a basic introduction designed especially for engineers.

Robert Rivlin
Editor-in-Chief

the SOURCE

Midwest Links Fox Network to the World



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Bob Morse,
VP/General Manager KTTV

Steve Blue, KTTV News Director, continues:
"The *Spacelink* gives *Fox News* an advantage our competition can't top... Midwest was prompt with delivery and prompt with support."

Make Midwest the Source for all your mobile satellite communications needs. For more information on the S-23, contact your Midwest representative today.

KTTV VP/Director of Broadcast Operations, Steven H. Steinberg, sums it all up with this comment:
"This is the second S-23 that I have purchased from Midwest. It is not often I can say this, but in both cases, there were no problems."

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Steinberg Moves to Sony

In a move that has turned heads in the industry, Ampex veteran Charles A. Steinberg has resigned as chairman emeritus of Ampex Corp. and has accepted appointment as executive vice president of Sony Corp. of America, with responsibility for nonconsumer products. In his new position, Steinberg will oversee Sony Communications Products Co., including the broadcast, professional video, and professional audio divisions, and Sony Information Systems, which markets dictation systems, satellite communications products, video displays, and other nonbroadcast products.

Steinberg's 25-year carrer at Ampex started in product management and technical positions. He played a key role in the development of the videotape recorder, which shook the industry in 1957. Later, he became the head of the Audio/Visual Systems division, president of the company, and CEO and chairman of the board since October 1986. He became chairman emeritus on December 9 of last year. Ampex has so far announced no plans to elect a new chairman.

Steinberg will be based in Sony's national headquarters in Park Ridge, NJ.

Chyron Woos Aurora

Chyron Corporation has announced its intention to acquire the majority interest in Aurora Systems, the maker of videographics systems. The over all sum, to be delivered over the next five years, is undisclosed, but Aurora will receive $2.1 million as an immediate, long-term advance. Although some details have yet to be ironed out, Aurora will be able to gain access of Chyron's customer finance plan right away. Aurora's new affiliation with Chyron was announced shortly before NAB, and Aurora products appeared at Chyron Group booths.

This venture is no new exercise for Chyron, whose other subsidiaries, DSC and CMX, maintain their unique independence and identification. If this deal follows the same path, it will lead to eventual control—Chyron now owns 100 percent of DSC and 80 percent of CMX (with apparent plans to buy more). But since no stock had been exchanged with Aurora as of this writing, the relationship will be initially a financial one. Still, there is every indication that Aurora will be treated in much the same manner as the other companies under the Chyron umbrella. Comments W. Tom Beams, president of Aurora, "We will remain very clearly Aurora."

Chyron's Chairman of the Board and CEO, Alfred O.P. Leubert, agrees. "Autonomy is a good word," says Leubert. "They would depend on us for our financing and our backing, but they would have the right to select their own distributers. While the product lines serve, in many cases, the same customers, it doesn't necessarily mean, in our thinking, that the same salespeople should be selling all four product lines. The marketing people should come closer together because in some cases people will want to use our financing plan for a combination of our equipment."

The two companies' product lines are expected to remain intact, since Leubert sees them as serving different markets. "All this serves to fill the vacuum between the camera and the tube. Aurora adds to our technological base," he states. Beam puts it this way: "Our thrust is more in the high end, and heavily software-based systems where we develop particular capabilities for the graphic artist, as opposed to an art card replacement.

"We have been following Aurora for the last five years," says Leubert. "We have a lot of respect for the people. The growth of Aurora was only stymied by the lack of managing capability. They don't lack anything in products. When we can free up resources for them."

To prove this out, Beams is talking about several new products on the blackboard; a few had introductions at NAB. "We're taking advantage of the fact that technology marches on, but somebody has to do a lot of software development," he notes. "We really don't want to go off on a different tangent, but we have a lot of ideas about complimentary products. And [the freed-up finances] allows us to do that."

NBC Brings on 3D Transmission

Sometimes the May sweeps directly affect engineers. Marketing and programming people are currently talking about the ratings impact of broadcasting's first 3D transmission by ABC in conjunction with Coca-Cola—but what of the technical side of this breakthrough?

The 3D segment will take place during several minutes of *Moonlighting*'s season finale and during a 60-second Coke commercial to follow immediately afterward. The process, Nuoptix 3D, was developed by Terry Beard and, although it employs the old-fashioned glasses, it goes a step further in the technology because it eliminates the blurry effect usually experience by those not wearing the glasses. This, of course, is

a prime consideration for network broadcasters.

The process requires special production techniques and unusual telecine efforts and post-production.

NED Jumps into Radio

Fueled by the growing wave behind digital audio in broadcasting, New England Digital has made a frontal attack on the radio industry. NED and Columbine Systems have signed an agreement jointly to market the Synclavier and the Direct-To-Disk recorder. Installations were announced at KIIS-FM (the Gannett flagship radio station) in Los Angeles and WGCI-AM/FM (the Gannett affilitate radio station in Chicago).

Direct-To-Disk unit. (Insert) Nick Colleran, Alpha Audio; Brad Naples, NED; John Phelps, Full Sail; Murray Goldman, Columbine.

Columbine, a leader in business software for TV and radio stations, will begin drumming for NED among its customers in the U.S. and Canada. The systems have already been installed in hundreds of recording studio and post-production houses around the world.

Bradley J. Naples, NED president, exudes confidence in his mission. "Recent advances in hard disk storage technology and support software have opened up a broad new market. . .We will make a significant contribution to the advancement of on-air quality while also contributing to the automation of the broadcast industry." Naples asserts that the systems can, in the long run, save time and money for the production of on air-material and improve audio quality for broadcast facilities.

System fidelity surpasses even CD quality and the two gigabytes available on optical disk make possible sound effects and instrument files. It is possible to create, edit, and produce station IDs, commercials, and other station needs without any further equipment.

CBS to Transmit All Programming in Stereo

Just as one day "In Color" was frequently seen before a program, "In Stereo" has become the newest edition to the opening credits. And just as all programming eventually became color, the same is happening now with stereo. CBS president Thomas F. Leahy has announced that the network will broadcast stereo signal for all programming by Fall 1988. The original, case-by-case service was inaugurated in 1986.

The first program to be broadcast in stereo by CBS was the 1986 Grammy Awards. Since then, the service has been provided during the special broadcasts—especially those involving music, mini-series, and hit shows. The owned and operated stations were among the first to employ the service, and now that many stations already have the capability, they should be able to go happily forward to regular stereo transmission.

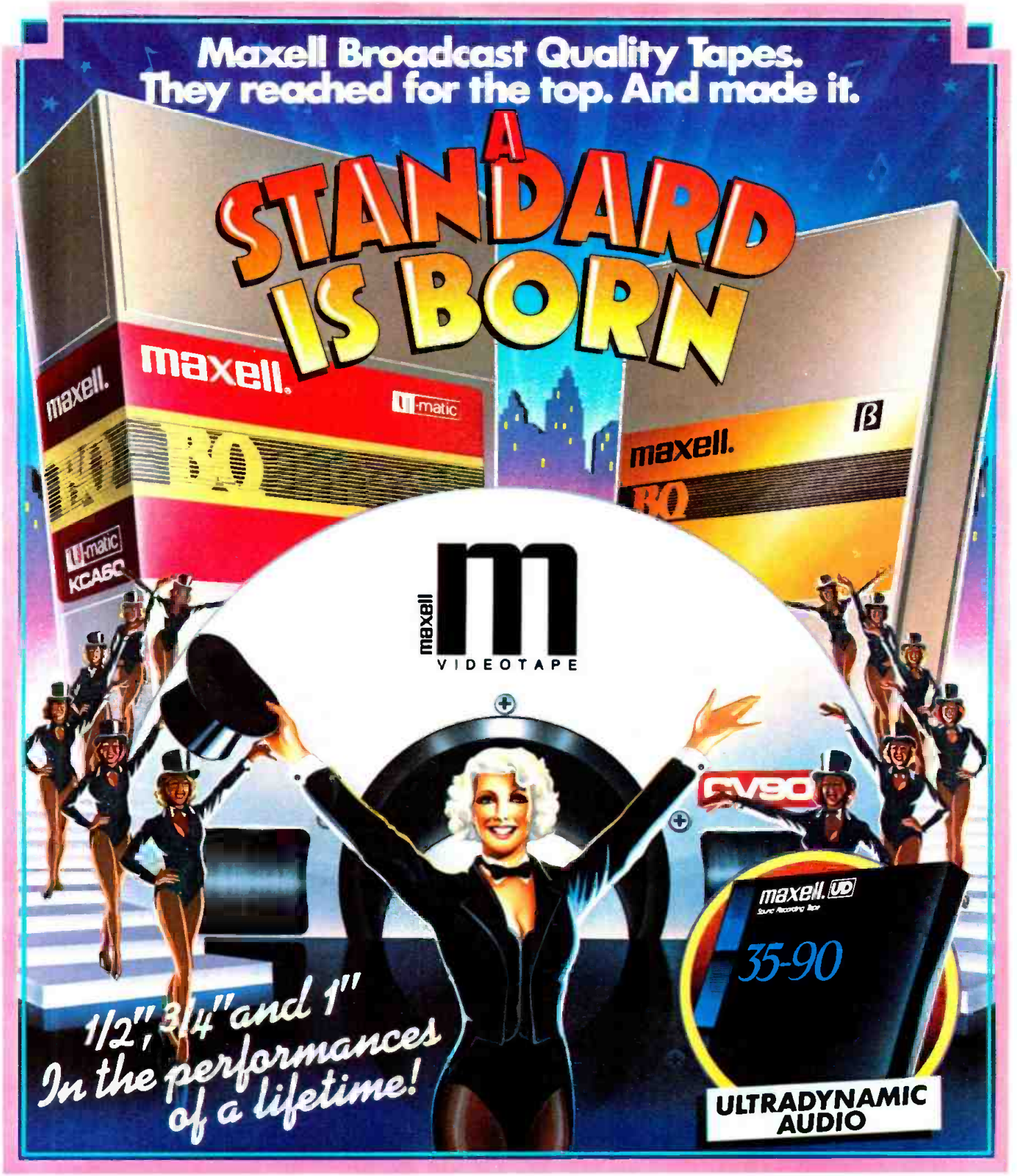
The cost of upgrading, at $15,000 and up, is not prohibitive for most markets. Affiliates have been cautious in acquiring the necessary exciters and other equipment to generate the second audio channel, though; 60 CBS stations had the capability at last count. At this juncture CBS will be able to boast about as many stereo-available markets as NBC does.

The upgrade involves transmission equipment, and of course adjustment of master control. No new staff should be necessary, but the new transmission will also have the effect of individual audio experts "feeling a little more important than they used to feeling," according to Rupert Stow of the CBS network.

Stow also says that the none of the affiliates are considering originating programs in stereo at the moment—local programing (such as news) rarely requires the added sound quality. To the 11 percent of the viewing (or listening) audience that currently have stereo sets, the shift to mono may be slightly disturbing, so as more consumers get capability, more affiliate will consider stereo production.

CBS Radio O&Os to Adopt FMX

By this summer, all 11 CBS-owned radio stations will be broadcasting in the new FMX system. As described in this space last month, FMX removes the FM noise penalty, and, as a result, provides significantly improved stereo seperation and virtually eliminates multipath distortions when the signal is received on an FMX receiver.



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To implement FMX, the station must replace its current stereo generator with an FMX generator at a cost of $3000 to $5000. With this move, consumer manufacturers, several of whom already have prototypes, will probably step up the schedule for rolling out compatible receivers.

The system has been tested at the network's Boston station, WODS. "We are impressed by how well the system works in improving reception, particularly in weak signal areas and automobiles," says Larry Conti, director of technical operations for CBS-owned radio stations.

Emil Torik, president of the licensing company, Broadcast Technology Partners, reports the additional CBS stations brings the number of stations currently transmitting in FMX to 16. Additional stations are located in Bridgeport, Hartford, and Stamford, CT; as well as Detroit and Las Vagas.

DAT's Progress

According to a number of observers, the first real stab at preventing the copying of digital audio tape (DAT) is all but dead in the water. A report funded jointly by opponents and proponents of the CBS Copycode system found the system not to comply with three basic criteria. The proposed Copycode system worked by cutting a "notch" in the upper mid-range frequencies of broadcast and recorded music. The National Bureau of Standards (NBS) found the system to sometimes fail to prevent recording, but leave a false positive signal, that it audibly distorts music, and that it could be easily bypassed.

It is no secret that any anti-taping message mandated by government will also probably give rise to a market of "descramblers." But perhaps the best method of copy protection will be adding messages to recordings that direct chips within the machine to turn off, rather than the recently rejected "notch" method. One system for added messages developed by Kahn Communications was discussed in this space last month.

The Home Recording Rights Coalition (HRRC) sees the NBS findings as a victory, but is still adamantly maintaining its original First Amendment stance. "In our view, Copycode would have been equally objectionable if it had worked as advertised," says HRRC chairman Thomas P. Friel. And now that the issue is essentially thrown back to warring parties and out of Congress, the HRRC is apprehensive. Still, Friel says, "We don't think any committee of Congress will ask us to, in effect, finance further R&D toward a goal that we find abhorrent."

NAB Dissatisfied with FCC Interference Rulings

It seems that there are more devices than ever that share the AM and FM bands. Although there was some relief after the CB fad died down, the use of interference sources such as personal computers, radio-operated toys, garage door openers, home security systems and wireless microphones are decidedly on the rise. The National Association of Broadcasters (NAB) has asked the Federal Communications Commission (FCC) to amend its rules on the subject.

NAB finds several essential problems with currently proposed rules. Regulatory Review Committee chairman Ray Lockhart says, "The changes that the FCC has proposed to remedy the problem are not adequate. What is needed is an outright prohibition." Rather than taking measures to promote more effective use of the spectrum, NAB is calling for elimination of allocated use of broadcast bands to nonlicenced entities altogether.

The "grandfather" section of the proposal is correct in its intention to ease the impact on manufacturers, say NAB officials. However, the 10-year period is excessive and should be shortened by 50 percent.

In addition, NAB informed the commission that the absence of complaints on the consumer side should not be an overriding consideration. According to a study on AM reception, consumers do not neccessarily think to complain to the FCC when they experience interefence. NAB maintains that the same can be said of FM and TV reception.

Fiber Optics and Radio Making Bedfellows

No one would have predicted the marriage that is taking place between radio and telephone technology. When on remote, radio broadcasters used to have two fairly unappetizing choices: High-priced satellite hookups and low-priced (and low-quality) terrestrial phone lines. Satellite and microwave transmissions are also affected by lightning, radio waves, and sunspots.

But since fiber optic service has become so prevalent, digital technology has allowed everything from call-in shows to sports events to get audio quality very close to satellite. The increased recognition of the quality possible with fiber-optics has paid off for fiber-optic systems providers. By combining industry-standard frequency gear and the digital transmission broadcasters are getting away with origination of on-air material at the price of a phone call.

Demonstrations of the technology were more than visible at NAB. US Sprint lines were used in conjuction with Comrex at two exibitor's booths. In addition, Sprint—not the usual NAB exhibitor—was out in force to promote the idea, even providing free long-distance phone service for show attendees.

At this junction, the greatest use of the technology has come from the sportscasting arena, a top user of remote for nonmusical events. KMBZ-AM, an NBC affiliate in Kasas City, MO, recently used the service to broadcast a four-hour program from the Royal's spring training camp in Florida. The whole event was reported using a Foncard (US Sprint's travel card) with the aid of one Comrex PTLX two-line transmitter at the sight of transmission and one RTLX receiver at the station.

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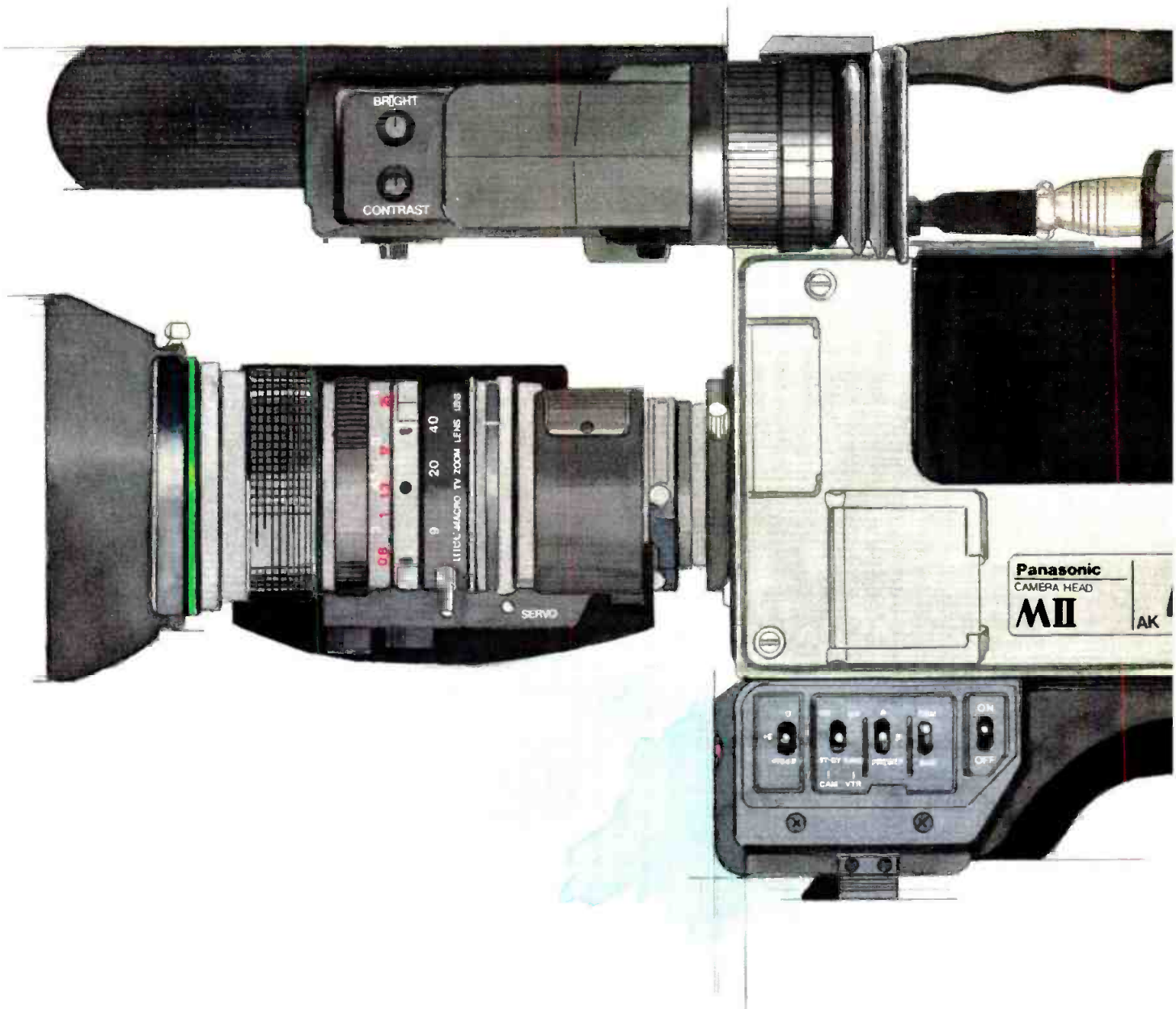

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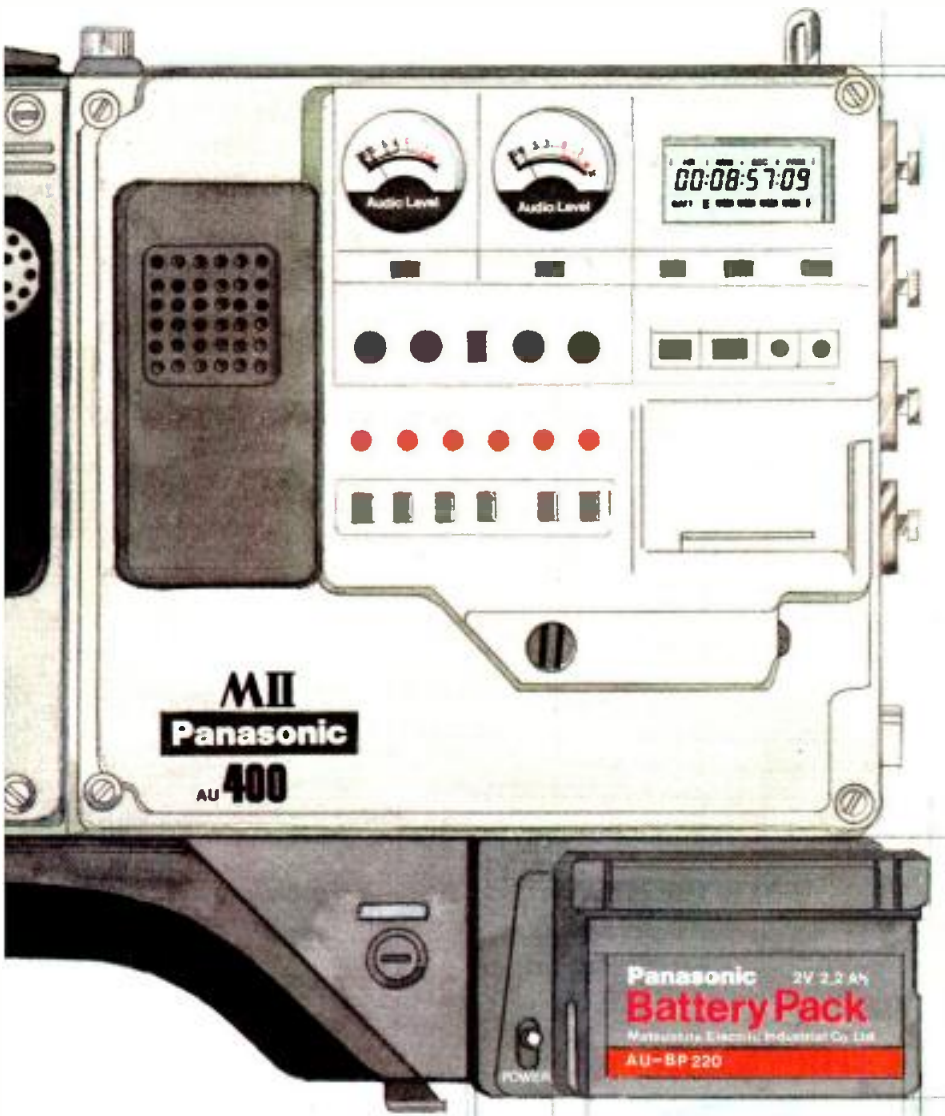

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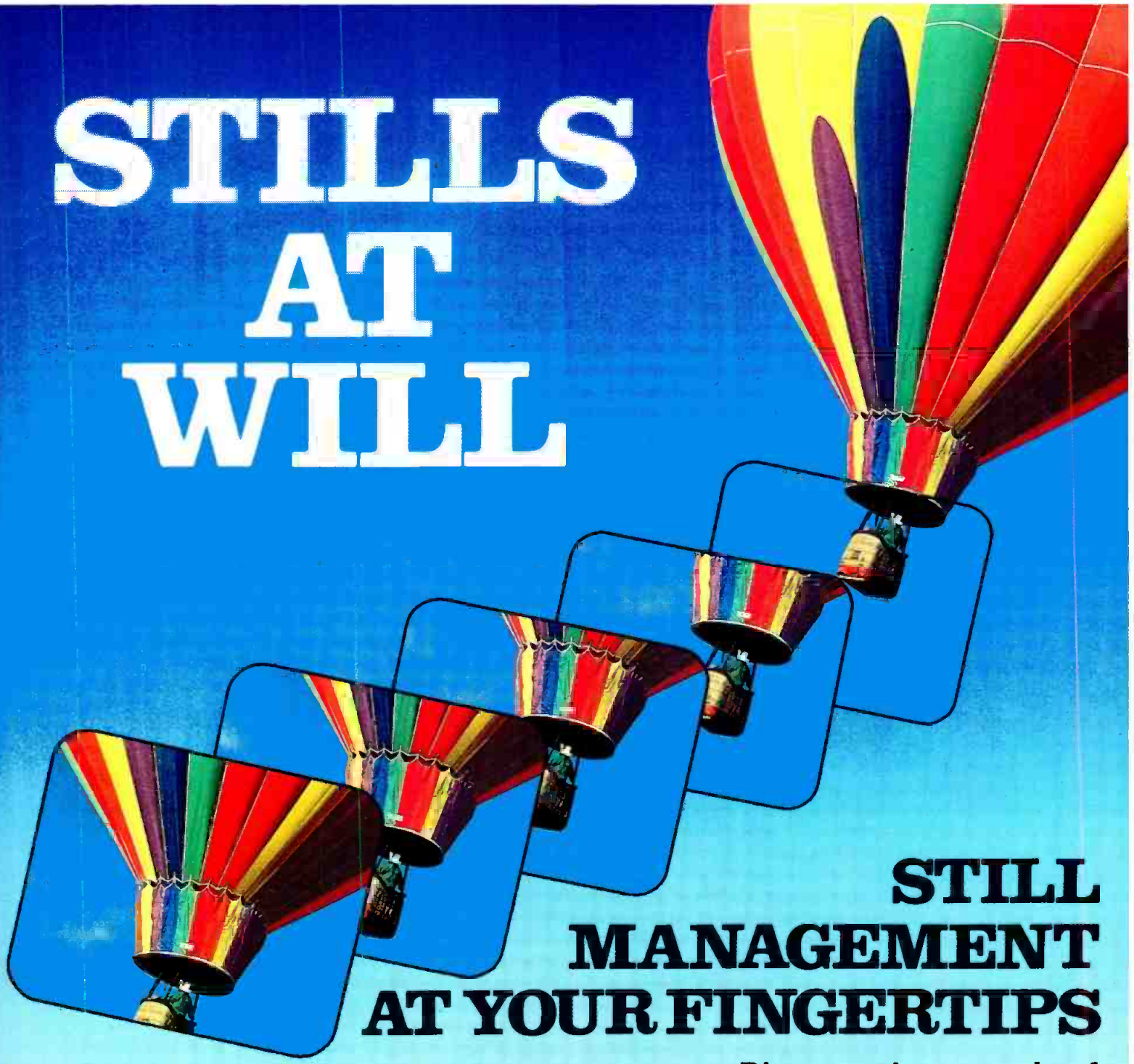
STILLS AT WILL



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FCC to Deregulate Equipment Sales...UHF Power Economies...ITS Engineering Program Set

For a long time, equipment manufacturers have been wondering why only the broadcasters were benefitting from the FCC's efforts to deregulate the industry. Now, however, it is their turn. Under a Notice of Proposed Rulemaking, the Commission will finally do away with type approval and type acceptance procedures. Instead, the Commission is proposing a verification program, in which no documentation needs to be filed and the Commission will grant no authorization.

Manufacturers themselves, or those responsible for marketing the products in the U.S., will be required to perform their own testing on equipment and to maintain records showing that the equipment conforms to FCC technical specs.

The Commission is proposing a verification program, in which no documentation needs to be filed and the Commission will grant no authorization.

Reactions to the proposal from both the manufacturers and station engineering have been mixed—as has been the case with most of the proposals for technical deregulation. On the one hand, manufacturers are delighted that the FCC is getting out of the business of watching over their new product development efforts. With the deregulation, they argue, the lengthy period of waiting for FCC type acceptance on new equipment will be removed, and products will find their way to market a lot sooner.

On the other hand, at least some station engineers are concerned that the removal of type acceptance testing by the Commission opens the door for unscrupulous manufacturers to put out products that don't conform exactly to accepted technical guidelines. There will, of course, be a complaint procedure against manufacturers of faulty equipment. But who will bear the burden of prooof? And, if a station is found guilty of FCC rule noncompliance because his equipment does not meet specs, who will pay the fine—station or manufacturer?

UHF Power Economies

Energy consumption is the albatross around the necks of UHF TV stations everywhere. It seems an insurmountable problem to balance the budget and get the needed power at the same time.

Darrell Burton, director of transmitters for Kentucky Educational TV (KET), has discovered a way to surmount the insurmountable. When he took over the reigns of this service in 1978, he immediately began wagging a war against the escalating energy consumption and power costs. Ten years later, even with longer programming hours and inflation, KET's power bill has shrunk—difficult to believe, but true.

He predicted $628,000 for the network's annual power bill. It now comes to $512,000. "I don't have any idea of how much the cost of electricity increased over that ten-year period," says Burton. "I would figure that had we not taken conservation measures, our 1987 power bill would have been close to a million dollars that year."

Yet, particular emphasis is placed on KET's transmission quality. On the air since 1968, KET operates 14 30 kW UHF-TV transmitters and one 60 kW transmitter out of the 15 stations across the state. In this way the entire population can pick up the programming, which ranges from cultural enrichment to event coverage.

"Had we not taken conservation measures, our 1987 power bill would have been close to a million dollars that year."—Darrell Burton, KET

As Burton notes, "With 15 stations, you can justify doing things that a one-station situation might not be able to. You can have more people and test-equipment flexibility."

One of the steps Burton initiated is the recent conversion of KET's transmitter in Elizabethtown from VA890H tubes to VA946S tubes in the visual socket. As a result the station has reported 75.6 percent peak of sync efficiency using the five-capacity integral tube at 30 kW output power. He says that prior to the conversion, it was more along the lines of $2100—and it was

$2700 per month before the installation of mod-anode pulsers several years ago.

This is not the end of his plans, though. In the near future, Burton plans to phase the five-capacity "S" tubes into all of his four-capacity RCA transmitters. "When you can get 10 percent more out of a klystron, it is worth the investment, and the payback is pretty quick," he explains. "There are ten more RCA 30 kW four-capacity tube transmitters that we plan to convert. When you factor the savings over that many transmitters, it's even more significant."

Using the actual primary current and operating hours, the local power company has projected a monthly cost of $999 for the station.

In addition, KET has installed an "S" tube at its station in Paducah. "I don't know what the station's exact before and after energy costs were," says Burton. "The key is that through all of our efficiency changes, we have not suffered technical quality to the viewer. That's the bottom line," stressed Burton. "Throughout anything we do, we don't compromise the quality.

ITS Engineering Program Set

The long-awaited debut of the combination ITS/NAPTE show and conference is right around the corner. From June 25 to 28, the Los Angeles Convention-Exhibition Center will be the scene of the production and post-production community's weekend in the sun. There will be a manufacturer's forum, and manager's institute, panel discussions on teleproduction issues, manufacturer's roundtables, and special interest sessions. The Monitor Awards will also be given at a gala at the Dorothy Chandler Pavilion on Monday, June 27.

There will be a good deal for the engineer at the show, not the least of which is a special engineering reception on Saturday June 25 sponsored by this publication. "Engineers will benefit just by interfacing with other engineers from around the world," says Bob Henderson of Windsor Video, the chairman of the conference and exhibition. There will be the ever-present demonstrations of new technology, such as HDTV. Then too, there is a plethora of seminars and meeting that will appeal to the engineer's curiosity.

Digital video effects, computer animation systems, audio for video, and video paint systems will all be discussed in manufacturer's forums. There should be something to appeal each day—audio storage discs, random access video, CCD cameras, film to video processing, character generation and manipulation.

Trends in Facility Design, and Digital Dilemma Parts I and II are examples of seminar that seem to be designed expressly for engineers. Says Henderson, "A lot of these things are structured for engineers, but are included so that people like myself, facility owners with some background will get a lot out of them."

New CE at Act III

Congratulations are in order for George Parnicza, who has been named corporate chief engineer for Act III Broadcasting, the Atlanta-based broadcast wing of Norman Lear's Act III Communications media corporation.

Parnicza will be responsible for the coordination of all engineering operations for the Act III broadcast group of television stations, including equipment purchase, maintenance scheduling, facility design and implementation, capital budgets, and staff training and recruitement. In addition, he will retain his title and duties as chief engineer of Act III station WVAH-TV, Charleston, WV.

WVAH-TV, incidentally, just recently completed a conversion from a UHF to a VHF station.

Other Act III stations include WNRW-TV, Winston-Salem, NC; WTAT-TV, Charleston, SC; and the company is awaiting FCC approval for the purchase of WZTV-TV, Nashville, TN.

The Act III publishing wing also publishes *Channels*, *Marketing and Media Decisions*, *Television Business International (TBI)*, *World Broadcast News*, *Corporate Video Decisions*, and *BME*, as well as other titles.

D2 Purchases for Facility Upgrade

Andrew McIntyre, chairman and CEO of AME, Inc., a full-service video post house in Burbank, CA, announced from the NAB floor his company's purchase of 50 Ampex VPR-300 D2 format digital tape recorders. The units will form the heart of a major upgrade and expansion of AME's facilities.

AME VP Robert Bajorek cited the VPR-300's quality and unique features, while McIntyre added, "I have been doing business with Ampex since the early days of videotape. It is encouraging to see that the company is continuing the tradition by providing advanced technology as well as a product that meets the reliability and operating efficiency requirements of a dynamic post-production facility like AME."

Totaling approximately $5 million, the units will form the heart of a major upgrade and expansion of AME's facilities.

According to Ampex, the VPR-300 D2 studio VTR is fully compatible with existing analog facilities and equipment, providing a minimum of 20 transparent generations of video.

Finally, a three-tube camera priced to take the chip off your shoulder.

If today's attractively priced chip cameras have put the exceptional quality of a tube camera out of reach, try shouldering an Ikegami ITC-735.

And, since the camera is also ideal for teleconferencing, with its optional 4-camera CCU, you may also consider putting it on a tripod.

Either way, the ITC-735 is the ideal camera for budget conscious professionals who demand a high performance ENG/EFP camera.

Saticon® IV tubes and newly designed low noise pre-amplifiers, offer excellent picture quality, while a high speed f/1.4 prism produces quality color reproduction, high sensitivity and excellent resolution.

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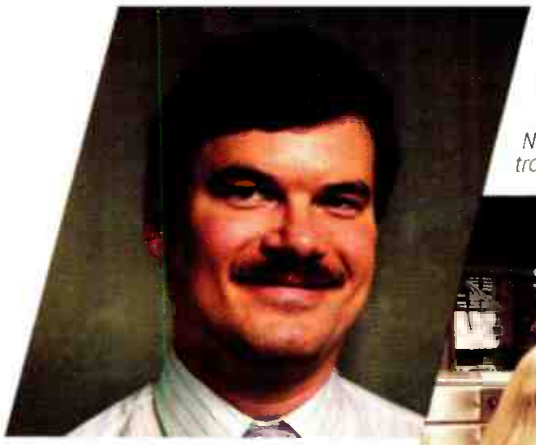
Hitachi Denshi



Ron Gaier. Chief Engineer. WHIO-AM-FM-Dayton. Ohio. Cox Broadcasting.

Newscaster Dawn Matthews on the Auditronics 212 in WHIO-AM news studio.

"Reliability makes Auditronics boards winners with us",

Jim Jones on the Auditronics 224 in WHIO production.

says WHIO AM-FM chief engineer Ron Gaier. "Our job in engineering is to keep the station on the air, so our three Auditronics consoles' record of zero failures makes me very happy."

"When we renovated three years ago, I insisted on enough input capacity so every signal source could have its own channel with no switching or patching. So we bought the 224 for production and on-air, and the 212 for news. This also gives us the flexibility to easily reconfigure the boards as our needs change."

"We got everything we wanted from Auditronics through our dealer Allied, including timely delivery which was critical to us then."

"Based on our trouble-free experience with the Auditronics 200 series thus far, I'd buy them again tomorrow."

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Desktop Supercomputers Depend on Chip Development

By Tim Wetmore

Will the raw computing power of a Cray supercomputer soon be sitting on top of the engineer's desk? "Eventually," promise some in the computer industry. "Never," answer other industry analysts.

The confusion arises quite naturally as a result of recent rapid advances at the mini-supercomputer and workstation level. These include improvements in processing techniques, hardware and software. As computer industry source Susan Bickford puts it, "Workstations are growing down while personal computers are growing up."

What separates different levels of computers is processing power, measured in Mflops (millions of floating point operations per second). The Cray supercomputer, for example, has a computational speed of 50 Mflops (it can also cost as much as $25 million). A 3D super-workstation, in contrast, runs at between 5 and 15 Mflops. Machines in this category, priced under $150,000, are available from such manufacturers as Stellar, Ardent, Silicon Graphics, and Apollo.

The thrust in technological development, of course, is to bring the processing power of the larger computers down in size and price. In addition to those companies already mentioned, Sun Microsystems in Mountain View, CA and Weitek Corp. in Sunnyvale are making impressive strides toward offering the user more chips for less change. Weitek's new XL-Series of coprocessor boards and its 1164 and 1165 chips may be leading the way for the supercomputing power to come to the desk top. Sun Microsystems has incorporated these new chips into its latest workstation usingits own SPARC (Scalable Processor ARChitecture) technology, providing mini-supercomputer power in a smaller, desktop package.

Billed by the company as the first supercomputing workstation, the Sun Microsystems 9/110 contains single in-line memory modules and a floating point processor.

Even more powerful will be the Weitek XL-8000 boards. Consisting of an integer processing unit

and a program sequencing unit, they are technically known as attached processors. The boards will be available for PC AT/Xenix machines, for PC AT machines operating under MS-DOS, and for the Sun, Apollo, and DEC MicroVAXen workstations.

Explains A.G.W. Cameron of the Harvard-Smithsonian Center for Astrophysics, "In addition to integer and floating point processors, the XL Series processors include a 32 element data register file and a 33 element program control stack. The floating point chips also have a 32 element floating point register file. These register files allow memory access to be reduced by maintaining variables and, where possible, passing parameters in registers rather than in RAM. The processors have a RISC (Reduced Instruction Set Computer) architecture." Such progress in processing techniques brings impressive speed.

Design shifts

What has made these advancements possible? For one thing, manufacturers are moving away from standardized processors. Until recently, the economical way to design chips was to build ones that would work fairly well for a broad range of applications, keeping the market as big as possible. A rethinking of that philosophy has opened up economically rewarding opportunities for those willing to attempt advanced development.

Richard Shaffer, the editor of *Technologic Computer Newsletter*, explains, "Market conditions have changed to the point where chip designers can now target specific markets and develop chips that will do a specific job better than anything else and still make a profit. There isn't the economic necessity for the broad-based chip anymore."

Also, some technological barriers are causing manufacturers to come up with new strategies. Microprocessor developments appear to be reaching a plateau that limits the amount of improvement that can be expected.

Shaffer maintains, "Processors have now run out of gas. When you need to speed them up you can do it in two ways: increase the clock rate, increase the bit width, or do both. They [designers] are now close to the limits in this kind of solution, having reached 32 bit processing as very common. Since 64 bit gives only a marginal performance increase (except for memory addressability in very special scientific computations) a new approach is being called for." And out of this internal pressure come the interesting solutions that are fueling the current excitement over "desktop supercomputers." One important trend is a greater use of multiprocessor machines and parallel processors tied together; itself the result, to an extent; of new bus architectures.

***"Market conditions have changed to where chip designers can now target specific markets and develop chips that will do a specific job. There isn't the necessity for the broad-based chip anymore."—Richard Schaffer,* Technologic Computer Newsletter**

Industry drivers

Converging technologies are also forcing changes. For example, gate arrays can be made to work fast enough to act as processing elements. Beyond this, market competition can be expected to drive down the prices of the smaller "supercomputers" and make the technology available to applications beyond special research interests.

In addition, user-driven influences are helping to make desktop supercomputers a reality. Frequently, scientists and engineers now spend more time waiting when time-sharing on a Cray, for example, than they would actually spend on computing time. The new computers are intended to provide this level of processing power to single users, eliminating the wasteful waits.

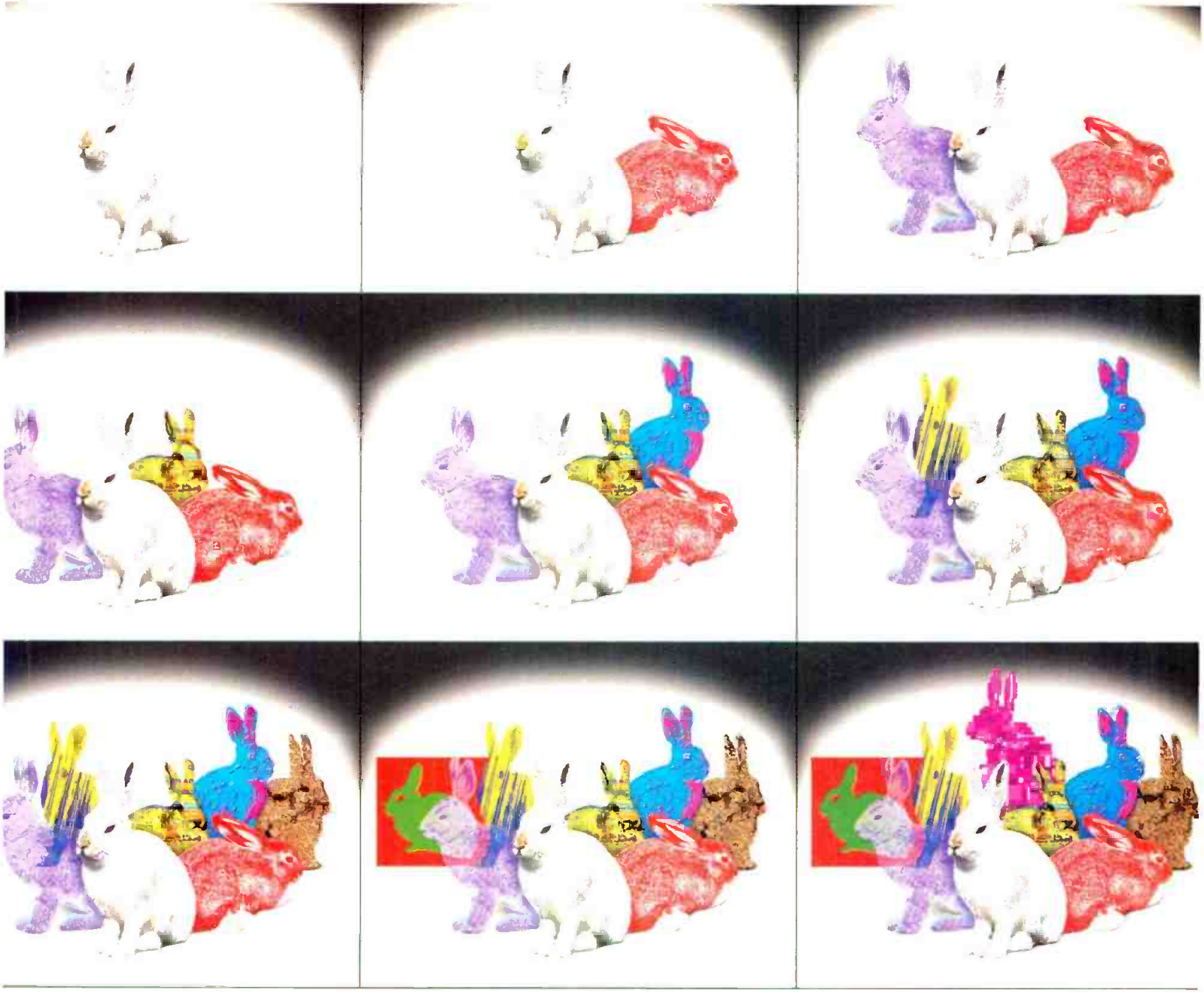
At the same time, users of PCs are seeking advanced processing power, while resisting the difficulties of learning UNIX, a requirement so far for the larger workstations. To tap this large market, desktop supercomputers will need to incorporate some of the PC's ease of user interface.

Since power users frequently consider MS-DOS inefficient, many prefer UNIX. UNIX, however, has the disadvantage of being difficult to learn, more appropriate for computer jocks than the standard user who merely wants speed and power. So, to tap that broader market, suppliers will have to find way of bringing UNIX efficiency to DOS users. NeXT Computers, Steve Jobs' startup company, is attempting to do just that. He is currently developing a UNIX system with a "shell" designed to make it more user-friendly, and will offer it first as an academic workstation.

This kind of development may provide the connection needed to bring supercomputing power to the desktop of the a wider range of users, who nevertheless may need to do some rapid processing of large amounts of data. Accelerating the speed of scientific discoveries in data processing will ultimately lead to developments in other areas. It is expected to affect the television business most directly in graphics, leading ultimately to real time computer movies.

In fact, Henry Fuchs, a researcher at the University of North Carolina, has developed the Pixel Planes Machine, a series of parallel processors tied together for graphics manipulation that will do just that: real-time computer movies. The system is still experimental, but it illustrates one direction in which supercomputing could take us.

Rest assured, ladies and gentlemen, that time is fast arriving. Start your engines. The race is on!



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REDEFINING

A 3D GRAPHICS PRIMER

With an onslaught of affordable 3D modeling and animation systems, the computer graphics revolution that has engulfed television over the past few years has gained a firm foothold in TV stations. The new systems utilize recent advances in computer processing and software to make life easier for the artist and designer, who no longer needs to be versed in programming and computer technology.

Beneath this user-friendly veneer, however, lurks a morass of technical and engineering processes that few end users, especially at the station level, are familiar with. But no engineer can properly evaluate an impending graphics system purchase without a basic understanding of the terms and processes involved.

Points and coordinates

Although computer graphics as we know it dates only from the late 1950s, the mathematics it rests on was described by Rene Descartes in the eighteenth century. A graphics system describes objects in terms of points that fall along Cartesian coordinates, the familiar x, y, and z axes. Since two-dimensional graphics uses only the x (horizontal) and y (vertical) axes, a three-dimensional object can be only suggested. The addition of the z axis allows the computer to add the dimension of depth. The points of the three-dimensional object are defined in relation to each other, so that the object can be rotated or sized and viewed from any angle.

Raster graphics, the most common form for television applications, is based on discrete units of data. The basic two-dimensional unit in discrete systems is the pixel; in three-dimensional discrete graphics systems, the basic unit of measurement is the voxel, a unit of volume.

The earliest types of computer graphics systems, such as Ivan Sutherland's Sketchpad, developed in the 1960s, used vector displays because the memory requirements of raster-based displays were far beyond the capabilities of then-available computers. Raster graphics provide much greater display detail, however, and are found in modern full-featured animation and modeling systems.

Detailed descriptions

In general, the pixel is the smallest unit that can be described in a raster-based graphics system. The pixel is only one factor limiting the resolution of the system. The number of pixels an image contains is its spacial resolution.

Intensity resolution (also called dynamic range or pixel depth) is measured by the number of bits the graphics database uses to de-

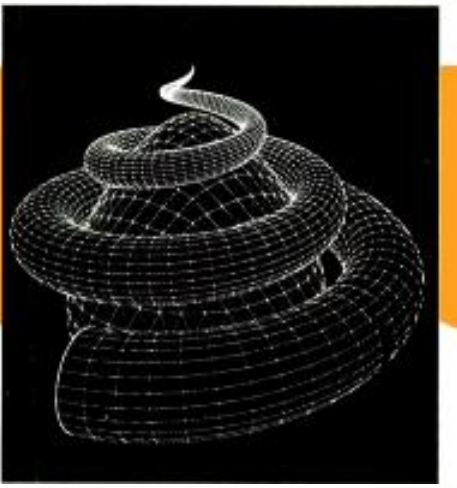
GRAPHICS GLOSSARY

Algorithm: *A rule or procedure for solving a mathematical problem that frequently involves the repetition of an operation.*

Aliasing: *Display artifacts caused by representing continuously variable information in the form of discrete pixels. See Jaggies.*

Antialiasing: *A technique for disguising the effects of aliasing by averaging the color values of the background and the line that is aliased.*

BETA SPLINES



Sophisticated, affordable 3D modeling and animation systems have changed the face of television. But many engineers still don't know a bicubic patch from a B-spline.

BY EVA J. BLINDER

scribe each pixel. The greater the number of bits that is used to describe each pixel, the greater the control over luminance and/or color intensity. At eight bits per pixel, for example, each pixel can have any of 256 values; "full color" paint, with 16.7 million colors, is achieved with 24-bit processing allowing 256 levels each of R, G, and B.

Discrete images have an inherent disadvantage in resolution over continuous images, since their boundaries move in steps rather than flowing without interruption. The higher the spacial resolution of the system, the more the image will resemble continuous data. A familiar problem encountered in raster graphics is aliasing, a loss of detail caused by the discrete nature of the data.

Spacial aliasing is often experienced as a "stairstep" effect in a diagonal line. Antialiasing schemes mask this effect by averaging the values of the pixels that form the line with those of the background. In this way, the "jaggies" are blurred, giving a more realistic effect at the expense of some softening of resolution.

Temporal aliasing can occur in an animated sequence when the individual frames move too slowly, creating a visible flicker. This is usually not a serious problem with the standard NTSC frame rate of 30 frames (60 fields) per second. Nevertheless, some users involved in very high-end graphics prefer to operate at 60 frames per second for even smoother, and hence more realistic, movement.

Object databases

An object database for 3D modeling and animation must be structured hierarchically, with each point and plane defined in relationship to all others. At its

Bit mapping: *A technique for creating a graphics display by describing it in terms of pixels. (See Raster Graphics)*

Jaggies: *A colloquial term for one of the most common results of aliasing, jagged or stairstepped edges on diagonal lines.*

Pixel: *(for Picture Element) A discrete unit of picture information, the smallest unit of raster graphics.*

Pixel depth: *The number of bits used by the computer to describe each pixel; a measure of intensity resolution.*

Raster graphics: *Graphics based on a raster display, in which the electron beam of the CRT scans each line in turn, illuminating only those points (pixels) where information is found.*

Vector graphics: *Graphics based on a vector display, in which the electron beam traces the actual lines of an image.*

Voxel: *A discrete unit of volume.*

MODELING GLOSSARY

B-spline modeling: *A method of defining a continuous curve by recording a series of control points, each with two associated control vectors: one representing the angle of the curve as it approaches the control point, and the other representing the curve's angle as it continues past the point.*

Extrusion: *A method of creating a three-dimensional model from a two-dimensional shape by adding thickness.*

Fractals: *A class of shapes that exist in fractal or non-integer dimensions, created by fractal geometry, which applies recursive subdivision to a basic form while introducing a random factor at each subdivision.*

Fresnel effect: *The tendency of certain surfaces to absorb light rather than reflecting it, which must be accounted for in modeling.*

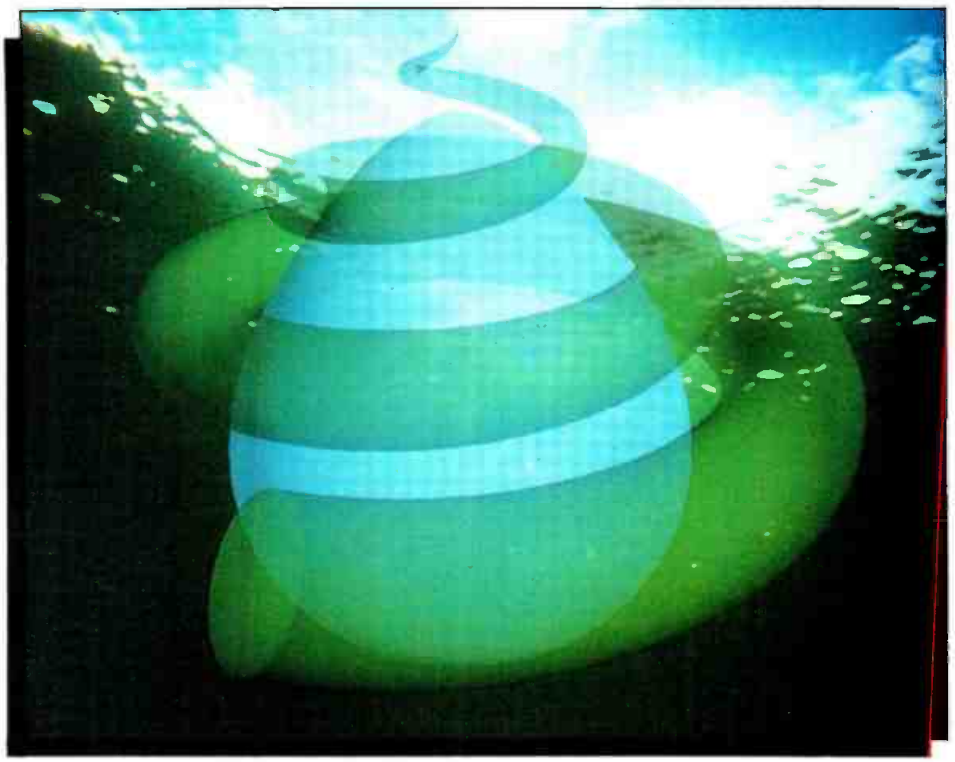
IMAGE INFORMATION

The graphics that illustrate this story were produced by Symbolics Corp. and represent a variety of 3D modeling techniques, performed on the graphics database on the previous page.

Shown on the first page of this article, a parametric projection, with square grid maintained by specifying a scale factor for the ratio of length to circumference in the spiral.

On this page, reflectance mapping of two color ramps, each a variation of colors selected from the background image. Following page: opacity control using the thin-wall model.

Next page: Both egg and spiral are rendered using a reflectance map; the egg is also bump mapped. Opacity control of the spiral is by the thick-wall (variable) model. Last page: combination of bump-mapped image with reflectance map. The bump map scale factor is negative, causing an apparent etching of the surface.



most basic, such a hierarchical database permits the object to be sized or rotated without being deformed.

In addition, the database stores information about the relationship of objects, or parts of objects, to each other. This sort of information is essential for producing realistic animation in which, for example, a hand must move when the arm moves, but can itself move independently of the arm. It also permits one object in a scene to be moved without affecting other parts of the scene. This kind of hierarchical movement is sometimes called parenting.

Many 3D modeling systems, especially those designed for CAD work, display an object first as a wire-frame model, an open structure with all angles visible. Early 3D systems, those based on vector displays, were unable to show a model in any other way. Although

ANIMATION GLOSSARY

Graftals: *A class of shapes created by graftal geometry, which recursively subdivides a basic form in a manner similar to fractal geometry, but without the randomness characteristic of fractals.*

Hidden line and hidden surface removal: *The process of removing those lines or faces of an object that are hidden by the parts of the object that face the viewer.*

Normal: *The orientation of a surface; that is, the direction the surface faces.*

Parametric surface patches: *Objects, used to define a three-dimensional object, that are created with a limited number of control points that define the surface's shape and curve, with remaining points determined computationally. Also known as* bicubic patches.

Polygonal rendering: *A basic modeling technique that defines polygonal surfaces defined by vertex points and filled in with color or gray-scale shading.*

Procedural modeling: *Modeling based on a series of instructions that defines the elements of a scene and the rules for combining them.*

Visible surface algorithm: *A modeling method that describes solid objects with filled-in surfaces; characteristic of raster-based systems.*

Wireframe modeling: *A method of model construction that produces objects defined by a network of straight lines, characteristic of vector-based systems.*

Hierarchical database: *A graphics database that defines the parts of a scene in relationship to each other such that movement of one part is dependent on or independent of movement of another part.*

In-betweening: *Computerized interpolation between key frames of an animation sequence.*

Light sourcing: *The definition of one or more source of illumination for a scene.*

Motion blur: *Deformation of an object along the longitudinal axis of movement, designed to give motion.*

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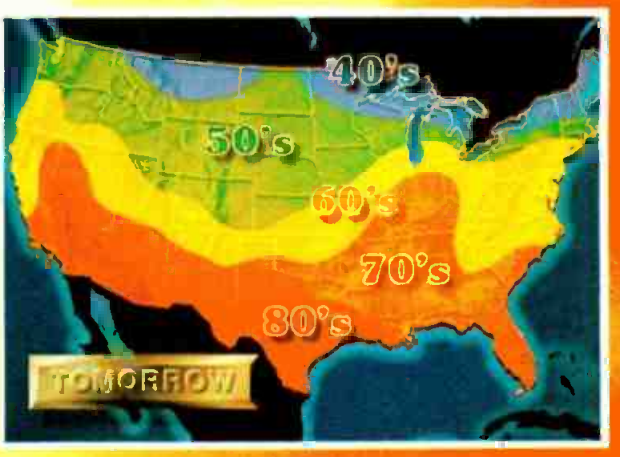

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it is possible to simulate a solid model with a vector display by "filling in" the surfaces with many closely spaced lines, this is impractical for animation uses and limits the realism of the model. Solid modeling relies on hidden-line removal and visible surface algorithms to create a model that appears solid.

Fractals and graftals

Extremely complex models, especially those designed to simulate such natural features as mountains or clouds, are difficult to recreate realistically because of their irregularity and element of randomness. One solution to this problem is fractal geometry, developed in 1975 by Benoit Mandelbrot. Fractal geometry takes a basic shape, such as a triangle, and subdivides it recursively according to a formula that includes a random element. Because each new point that is defined by the algorithm is related to an already existing point, the result is a scene of ever-increasing complexity—one that can be englarged without losing detail. The degree of randomness can be controlled by the user, but beyond that, creation is largely automatic.

The disadvantage of fractals is the large amount of computer power they require. A more recent development, graftals, resemble fractals in their recursiveness, but do not require randomness. Graftals are often used to create such images as trees, with a main trunk dividing into a branch that divides into a branch that divides into yet another branch, and so on. Graftals usually go through fewer recursive subdivisions than fractals, making them less expensive to compute.

Objects with indefinite boundaries, such as clouds or fire, are often defined as particle systems, which are made up of random particles with varying properties, including lifespan and direction of movement. The particle system as a whole is defined according to density and the rate at which new particles are created.

A complex scene, especially one containing fractals or other randomly generated images, may contain hundreds of thousands of individual polygons, each with its own surface and light-reflecting properties and with its own position in the scene's hierarchy.

Other methods of model-building have been developed that take advantage of the computer's computational power to create a basic element with curved edges rather than straight lines. The bicubic patch is a parallelogram with curved sides, generated by adding a curve parameter to the patch coordinates. The patch can then be subdivided recursively until it is

RENDERING GLOSSARY

Bump mapping: *A technique for creating a surface texture on a three-dimensional objects by wrapping a two-dimensional matrix of normals onto its surface. The matrix may or may not be random.*

Gouraud shading: *A smooth shading algorithm, developed by Henri Gouraud, that averages the light-reflectance values of the polygons that make up a model, creating the illusion of a smoothly curving surface.*

Phong shading: *A smooth shading algorithm, developed by Phong Bui-Tuong, that incorporates diffuse reflection and specular reflection to create a smoothly curving surface with light-reflecting highlights.*

Ray tracing: *A method for tracing the path of light rays from their source to the viewer's eye as they reflect from and/or pass through the objects that make up a scene.*

Reflectance mapping: *An algorithm for causing the surface of an object to display a realistically distorted reflection of the background scene.*

Rendering: *The process of creating finished output from a software scene description.*

Smooth shading: *The process of smoothing the polygonal edges of a model to make it appear realistically three-dimensional. See also Gouraud shading and Phong shading.*

Texture mapping: *An algorithm for "wrapping" a two-dimensional pattern or texture around the surface of a three-dimensional objects so that the pattern curves and distorts realistically.*

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no larger than a pixel without losing its characteristic shape. Bicubic patches fit together smoothly, forming a more pleasing surface than a mesh of polygons.

In a similar vein, a model can be constructed using B-spline curves. Developed in the early 1980s, B-spline modeling defines a curve as a series of x,y coordinates. For each coordinate, two control vectors are defined, one representing the angle of the curve as it approaches the control point, the other representing the angle as the line moves on. This makes it easy to develop even complex curves, which can then be used to describe the edges of a bicubic patch.

Shedding light

Light sources are defined within the graphics database just like solid models, but their properties differ in several respects. Like objects, light sources have a position defined on the x,y,z coordinates of the scene. A light can be located at infinity, or within the frame or just out of its range. It can vary in brightness or intensity and in color. An omnidirectional light radiates in all directions from its origin, while a spotlight is directional.

How the lights—whether bright or dim, diffuse or focused—react with the surface of objects in a scene is a more complex matter. At the most basic level, reflectance is determined by the angle between the surface normal and the light beam, along with the angle between the normal and the viewer. These are known as the angle of incidence and the angle of view, respectively. A matte surface, with low luster, will reflect light evenly, without highlights. (How much of the light is reflected depends on the surface's light-absorbing properties, another factor the database must establish.) A highly reflective surface, on the other hand, may reflect light in specular fashion; that is, in the direction of the angle of reflection. This creates a highlight.

Smooth shading

Models built of polygons will naturally have flat surfaces and sharp edges. If the desired object is curved, such as a sphere, polygonal modeling falls short of the goal. The first step toward creating a realistic curved surface out of polygons is to increase the number of polygons so that the faces are as small as possible.

Smooth shading algorithms enable polygons to be formed into smoothly curving surfaces. The first, Gouraud shading, was developed by Henri Gouraud at the University of Utah in 1971. Also known as intensity interpolation, Gouraud shading is based on the lighting rules described above. Instead of defining one value for each polygon based on its surface normal and angle of incidence, however, Gouraud shading averages the shading values of adjacent polygons to create a smooth transition from one to the next. Pixel values are blended into each other across the surface of the object for a realistic change in intensity as the object curves or slants away from the light source.

Objects shaded according to Gouraud's model are uniformly smooth and matte. Another University of Utah researcher, working a few years later, developed a smooth shading model that would allow specular reflections and highlights. Phong shading, developed by Phong Bui-Tuong, accounts for the mirror-like properties of some curved objects, with a bright highlight concentrated at the surface normal, fading away into more diffuse reflections. Phong shading is widely used because of its realism.

Mapping

While smooth shading can create objects that react to light in realistic ways, by itself it cannot create surfaces that are patterned

Many 3D modeling systems, especially those designed for CAD work, display an object first as a wire-frame model, an open structure with all angles visible.

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or textured.

Yet another University of Utah scientist, Jim Blinn, developed a technique called texture mapping that uses bicubic patches to represent textures. The four coordinate points that define the bicubic patch are used to construct for normals for each pixel, allowing the programmer to compute the precise tilt of each pixel in a scene. By altering or "perturbating" all the normals in a scene according to an equation, the surface can be given a texture. A similar process is used to map a two-dimensional pattern onto a three-dimensional model, allowing the pattern to distort realistically as it curves along the surface.

A procedure known as reflectance mapping allows an object to reflect other objects in the scene. Reflectance maps can be created in two ways. The first calculates a spherical projection of the environment looking out from the center of the object to be reflectance mapped. The projection thus created is then mapped back onto the object. While this method can create a very accurate map, it is also very costly in computer time. To be completely accurate, furthermore, a separate map would have to be constructed for each object in the scene, and, if the scene is animated and the object moves, a new reflectance map created for each frame.

A more economical method is to build six planar projections from the center of the object, one each looking up, down, left, right, forward and back. These projections are then merged into a single two-dimensional reflection map, their edges disguised with computer-generated blur. The resultant plane is then mapped onto the object's surface so that the object appears to reflect the environment. Only one map is used, even if the object moves. Unless the application is an unusually critical one, this is the method that is generally used.

Ray tracing

A sophisticated way of dealing with the interactions between objects and light sources is ray tracing. As its name implies, ray tracing involves following the path of light rays from their source until they reach the viewer's eye. Depending upon the properties of the objects they encounter, the rays may be absorbed or reflected; some of them may pass through a transparent or translucent object. Rays that reflect or bounce off an object will hit other objects before they reach the eye.

Ray tracing involves following the path of light rays from their source until they reach the viewers eye.

A great advantage of ray tracing is its ability to create shadows automatically and with great realism, and to simulate the actual properties of translucent objects. Its great disadvantage is the amount of computer real estate it eats up. It is one of the most time-consuming processes of computer graphics, and for this reason is often avoided. The most commonly used ray-tracing algorithm traces the rays "backwards," that is, from the eye to the light source, thereby conserving computer power since many fewer rays reach the eye than are transmitted from the source. The process is still extremely costly, however. For those jobs where ray-tracing is necessary, it is possible to ray-trace only part of a scene, making it economically more feasible.

The actual rendering process for a 3D animation applies the necessary algorithms to the data the user has entered to form a finished, viewable image. It is here where raw computing power makes itself felt most clearly. Rendering speed is one of the hardest graphics system capabilities to evaluate accurately.

In general, faster and more powerful hardware will render a given scene faster. High-end graphics systems often dedicate a separate computer to rendering alone, leaving the main system free for modeling. But the complexity of the scene is an equally important factor. The number of polygons in a scene, the number of light sources, the kind of shading, and the presence or absence of such costly techniques as ray tracing will greatly affect rendering speed. In evaluating manufacturers' claims, it is important to compare apples to apples. **BM/E**

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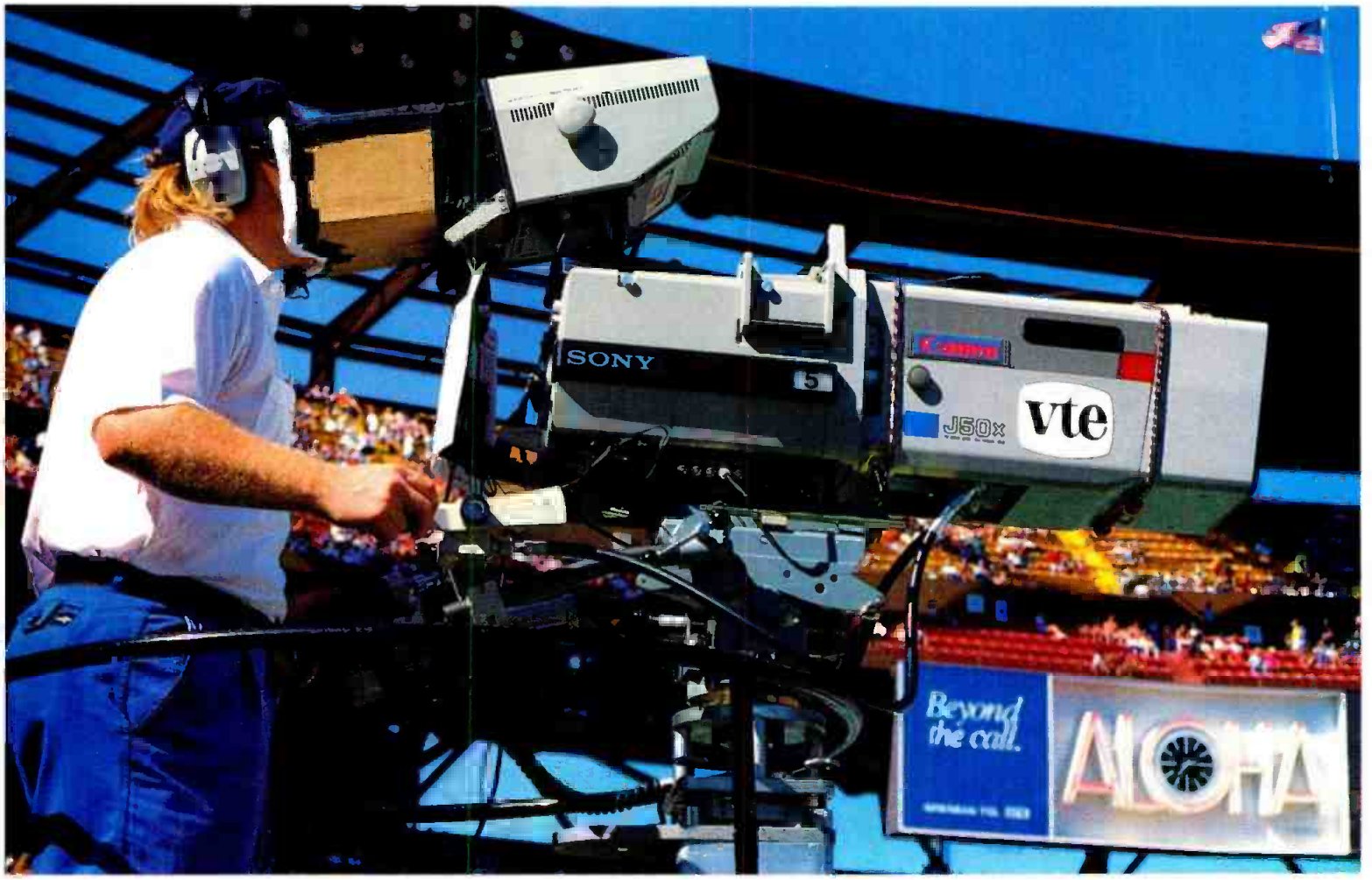

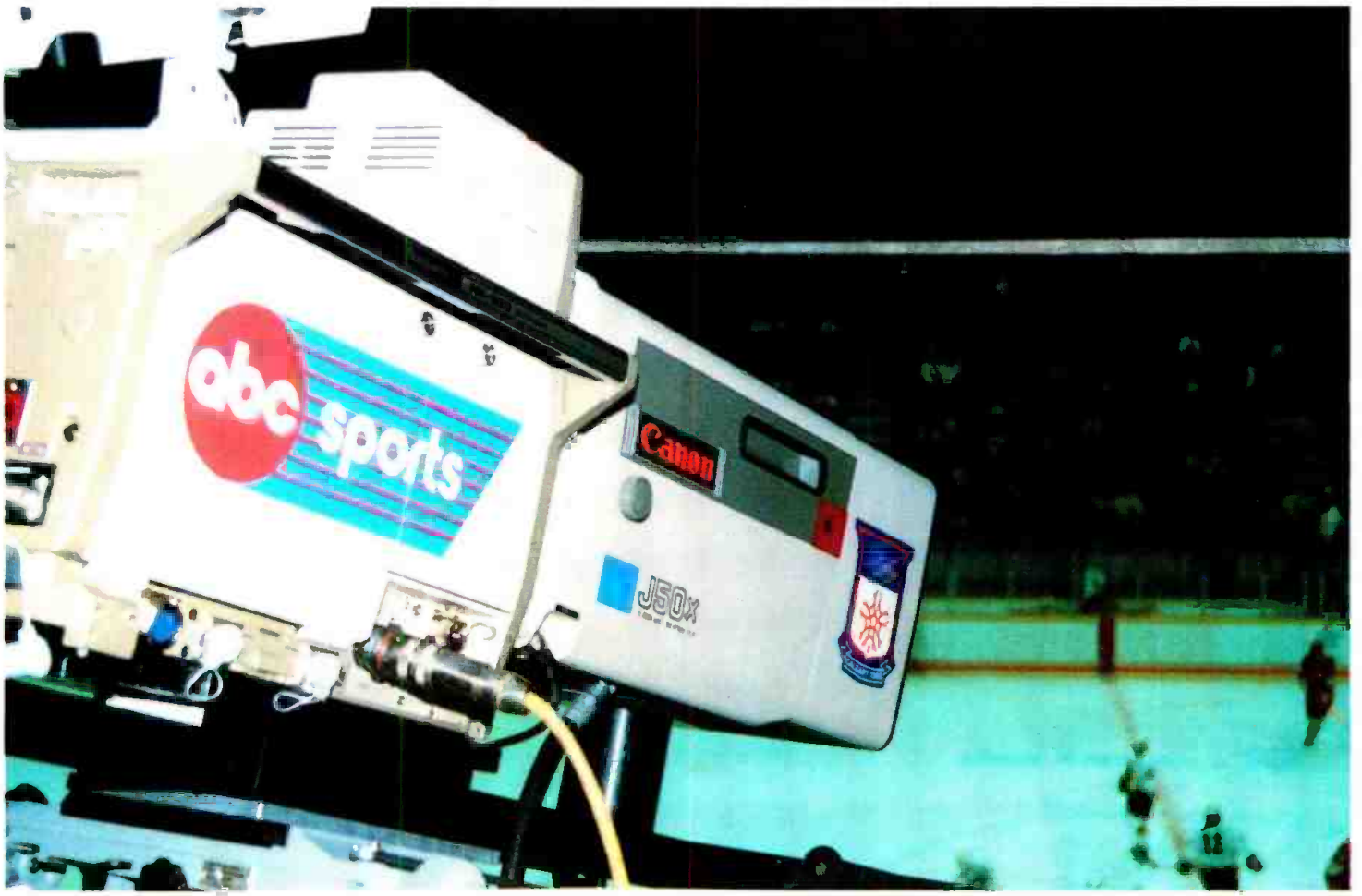

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DISK 'n' DAT

The format battle of the century is looming between compact disks and R-DAT.

BY BETH JACQUES

It won't be the first time that market forces have refereed two competing formats. But the forthcoming introduction of rotating-head digital audio tape recorders (R-DAT) into a market already experiencing the woes and pleasures of digital audio via CD players may signal the start of fight of the century in the audio world.

At first, the format decision looks easy. R-DAT provides a host of application features, and it can be record; CD is currently playback only, and recordable CD technology still lies in the future. ("The eraseable medium erases itself," Ernie de los Santos, national marketing manager for Sony's pro audio division, confesses.)

Sony for one, is optimistic that American radio stations will want it both ways. The CD will replace the turntable in on-air studios, according to de los Santos; R-DAT will replace the function of the standard NAB cart (a transition that will take several years because current carts are reliable, inexpensive, durable, and, of course, ubiquitous). Some, however, feel that the formats cannot coexist and that one will come to dominate. At this point, CD has the numbers on its die. Industry sources report that there is now at least one CD player in use at nearly every radio station in the U.S.—a user base of about players.

CD problems

On the other hand, there are a number of problems starting to emerge among those stations that have switched to CDs. "You can't go back to analog," says Steve Davis, chief engineer of KMOD/KAKC Tulsa, OK, a man who has culled market leadership for three years by putting 92 percent of his station's programming direct to air from CD. "We've established quality. Listeners demand digital now—it shows up in the ratings."

KMOD has had, however, some

"murderous" on-air embarassments due to skips and downtime—embarassments due, Davis feels, to operator error and sloppiness in handling the CDs (they are not, as was thought in the beginning, able to handle surface scratches very well).

Davis's solution will be to begin using the new Denon CD-Cart system immediately—one of the new breed of cart decks developed for the professional market, which is able to hold up to six CDs at once thereby minimizing the amount of potentially dangerous operator handling.

Even the greatest of CD enthusiasts, however, see the potential for R-DAT recorders. "We have to have quality and we have to have reliability," Davis says. "If these CD Cart players won't solve our problem, we'll go to R-DAT no matter what." And though not every radio engineer is as adamant about staying digital as Davis, R-DAT's future in the radio station appears to be solid.

What is R-DAT?

R-DAT is one of two new digital audio tape recorder formats originally developed by Japanese manufacturers for the consumer audio market—a high-quality replacement for standard audio cassettes (the other format is a longitudinally recorded cassette scheme). It employs the same technology as used in consumer video recorders—a rotating head that lays down two tracks of 16-bit digital audio on metal particle cassettes, approximately the size of a pack of cigarettes, with sound quality at least as as good as CDs. Decks are extremely small and can be carried around in the field.

Thus R-DAT, because it is a recordable medium with extremely high quality, is seen as a natural format for professional use at radio and TV stations. Indeed, Sony claims that several of its PCM-2500 R-DAT professional machines (priced between $5,000 and $6,500 depending on configuration) are currently in use, and Panasonic introduced its SV Series of recorders at NAB last month. The line includes the rack-mounted SV-350, priced at $2,950, and the SV-250 portable priced at $3,495.

Most useful as an ENG or field acquisition tool, according to Steve Woolley, director of sales and marketing for Panasonic's Audio/Video Systems Group, R-DAT's other initial applications include in-house production, on-air delivery, and the transfer of LP or CD material for archiving.

And some radio stations are champing at the bit to make R-DAT standard. "If the record companies hadn't complained so publicly, they never would have put the idea in peoples' heads," fumes Rick Cruz, chief engineer of WQIO-FM, Mt. Vernon, OH, the first station inthe country to go direct to air with R-DAT. "We

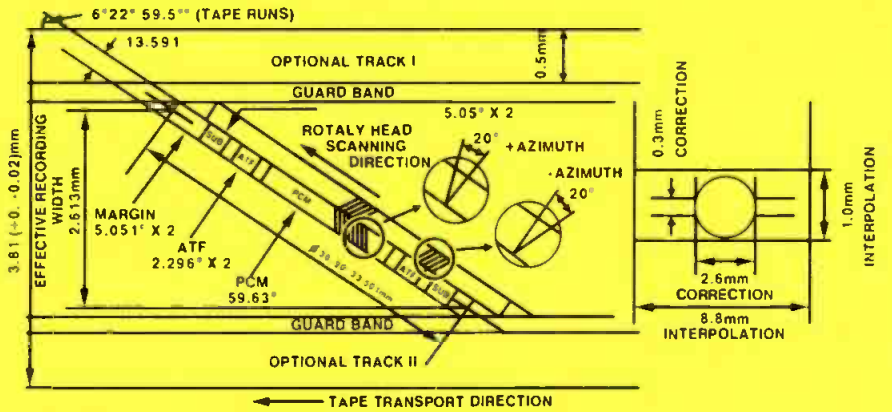


FIGURE 1: R-DAT FORMAT SPECS.

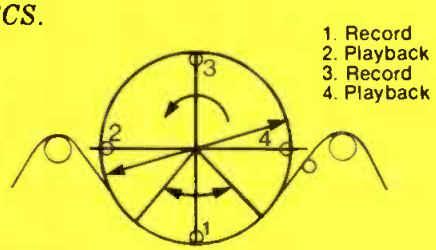


FIGURE 2: R-DAT HEAD POSITIONS.

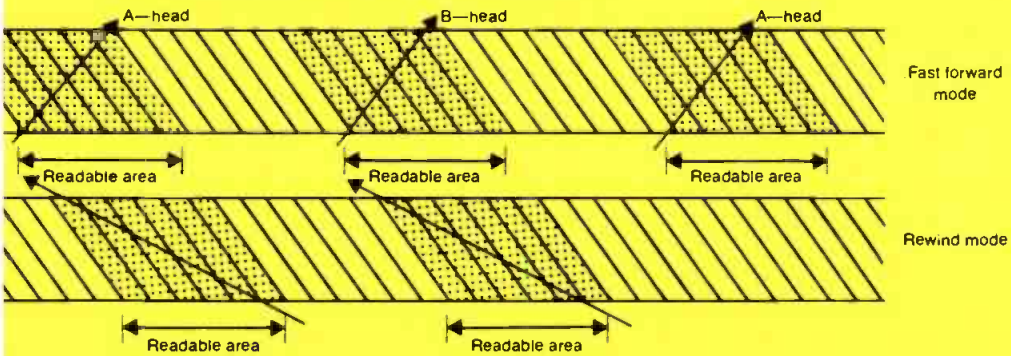


FIGURE 3: R-DAT SEARCH MODES.

love this technology," he insists. "What can we do to help it get accepted?"

Cruz runs two Sony ES-1000s in production and two direct to air; a fifth machine is kept for back-up. WQIO immediately transfers all the hits on "one-hit CDs" to DAT to preserve generation and keep the long-player from taking up space in the on-air category. "We also transfer our classic cuts from LP if no CD source is available so we avoid cue burn and pops and skips," he added.

Cruz also uses R-DAT to downlink satellite feeds of syndicated programs such as ABC Watermark's "Reelin' in the Years," to transfer classic album cuts for broadcast, and to record station-sponsored artist concerts directly through the mix board. He cites the lack of generation loss in downlinking, production, and transfer from CD for broadcast as particularly important.

"If you need multiple passes, digital tape is cheap and transports are becoming less expensive, so you can easily run off multiple digital master copies," says Woolley. "You will see R-DAT widely accepted when we consider its application as an alternative technology." For Woolley, this means using R-DAT as a high-performance field acquisition unit, bringing samples back, dumping into a digital workstation, and doing manipulation there.

Woolley envisions R-DAT tape as a low-cost, high-quality disposable medium for broadcast but the high-performance originating medium of choice for stations of the future using computer-controlled library systems.

"We need to examine the job that needs to be done and then consider alternative technologies rather than forcing parallels with existing technologies such as razor blade editing."

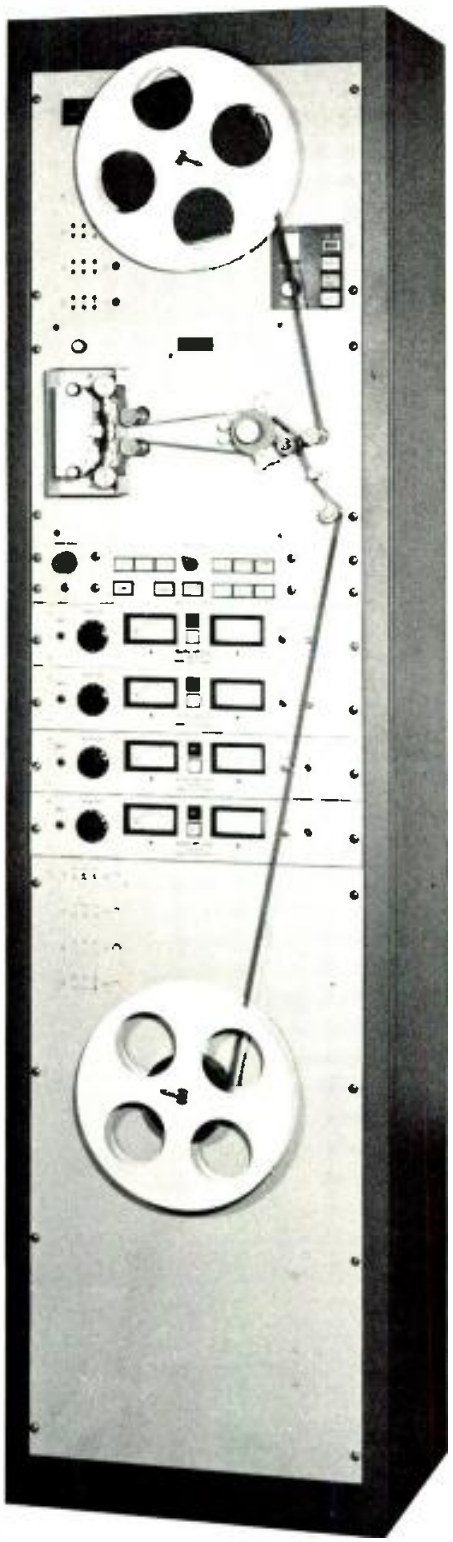
Legal and technical concerns

Despite its advantages, however, R-DAT is plagued by problems that range from legal to technical. On the legal front, full-scale format introduction has been stalled pending congressional legislation over copyright protection. The format's ability to generate digital master-quality copies threatens intellectual property rights, according to the Recording Industry Association of America (RIAA), which has threatened to sue any manufacturer who brings out mass-market machines without some form of copyright protection.

There are problems on the technical front, too. R-DAT can't be edited or synchronized yet. The lack of an R-DAT edit function doesn't bother either WCIO, which uses R-DAT to assemble programming and manipulate simple production, or KMOD. "As a rule, radio production engineers aren't very familiar with computer editing," says Davis. "It's going to be a job to wean them away from razor blades." His position is that R-DAT's immediate advantages outweigh a production editing learning curve.

A more serious problem may be wear. According to one source, test engineers are reporting faulty error correction in R-DAT tapes that exceed 200 plays.

Not everyone agrees that there is a problem with wear. "If DAT tape deterioration at a couple of hundred plays is true, I'd like to hear about it," says Jim Ringwood of Maxell, which launched its line of R-DAT tape at the NAB. "Our engineering department hasn't reported anything like that." Maxell has just concluded contact with some 3000 possible R-DAT duplicators, and Ringwood stresses that no one in what can be considered a bellweather target group raised that particular issue.



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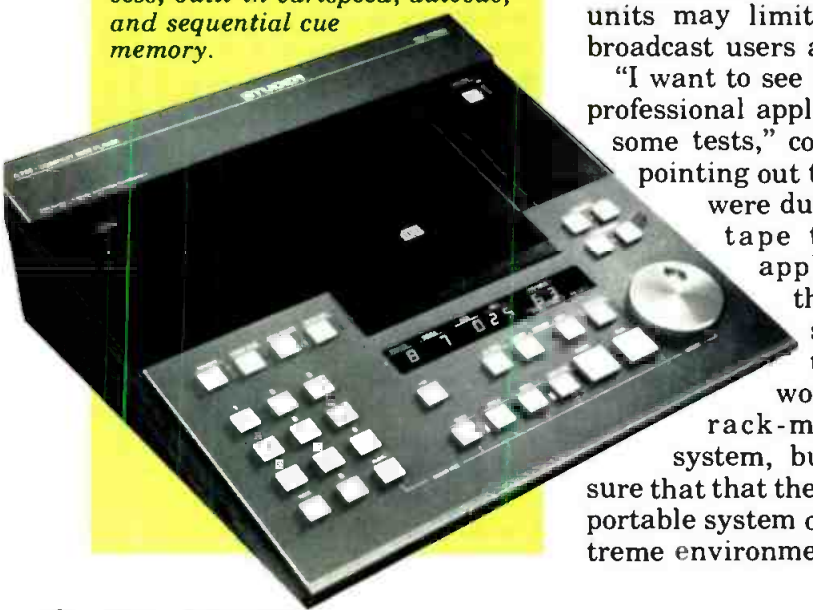
Sony's PCM-2500 DAT recorder uses double-encoded RSC error Lcorrection.

Denon's DN-950F CD-Cart uses CDs mounted in plastic cartridges to minimize handling.

Weighing under 3.2 pounds with battery pack, Panasonic's SV-250 portable R-DAT recorder costs $3495. Studer's new A730 (below) delivers frame-accurate access, built-in varispeed, autocue, and sequential cue memory.



Cruz says WCIO hasn't run into wear problems on either tape or machine: "We have about 20 two-hour DAT programs on Sony tape. Each cut has been played at least 150 times and they are error-free. We've done terrible things to them, too; we've stepped on them, and I ran one through a washing machine accidentally and dried it out. The material was there."

Professional users are also concerned with oxidation of metal tape in conjunction with exposure to air and moisture. Neutralizing agents are currently used to coat metal particles in the magnetic layer, but long-term storage may require added coatings to help stabilize the material.

"We've had no problems with Metafine metal particle audio tape in the last 10 years," points out Rich Collins, 3M's professional audio products manager. According to Collins Metafine demands a fixed head hardware format while R-DAT relies on helical scan heads.

3M reports no technical problems or concern with R-DAT tape wear and will have R-DAT available after the NAB. Full product launch will depend on how the market develops, Collins says, adding that a holding pattern for consumer players combined with the postponement of key portable units may limit the market to broadcast users and studios.

"I want to see R-DAT in use in professional applications and run some tests," continued Collins, pointing out that his concerns were durability vis a vis tape thickness and application rather than tape wear itself. "We know that R-DAT works fine in a rack-mounted studio system, but I need to be sure that that the same is true of a portable system on location in extreme environments—in a desert or on the street in the summer in New York."

"The issue isn't features or edit function so much as price. When R-DAT gets to $2,500 and CD records, then you'll see war."—Steve Davis, KMOD

R-DAT tape is two to three times thinner than videotape, he adds, and therefore environmental conditions and the tape handling capability of portable units need to be assessed. "There may well be no problem at all," he says, "but 3M needs to be sure before it goes to full launch."

Collins' other concern is the format's cue-up time compared to the spontaneous response of cart or CD. Some broadcasters may try to eliminate this by cueing the machines and leaving them in stop motion; as with videotape, however, this causes problems over time. Although Collins expects the problem will be solved, he feels that R-DAT mechanics and cue-up functions may preclude the format replacing NAB carts.

"DAT is tape, and it does wear," says Sony's de los Santos. "It's not clear how fast."

"I don't want to be an alarmist as far as metal tape for long-term storage is concerned," says Robert Herman, product manager of professional video products for 3M's magnetic media division, "but we just don't have the data to prove its viability one way or the other. All we have is accellerated aging testing—which indicates that properly manufactured metal particulate tapes have good short-term capacity—four to five years.

"Any time there is a new type of storage medium, all you can do is accelelerated aging tests for factors of high temperature and humidity and so forth, but you just never know if it will correlate in real life."

CD wear factor

At first it might seem that those not wanting to be subject to potential wear problems would automatically choose CDs. Engineering tests on CDs shows that they last at least five to 10 years.

On the other hand, practical experience in some cases is proving otherwise. "We've had a terrible wear problem with CDs," says Davis of KMOD. "They get scratched, damaged, pitted, fingerprinted. We have to replace them constantly."

"Broadcast is unforgiving. The days of the two-person studio with the engineer carefully handling the material are gone," says David Bowman, director of professional dealer products for Studer Revox. "The talent must be on-air and handle the material at the same time—often under intense pressure." Things get spilled, people smoke, fingernails slip, disks get dropped.

Bowman appreciates a good cart system. "They're great for broadcast and they also have a distinct advantage over CD when you consider the elemental nature of the broadcast day. For example, a CD may have lots of selections but a cart may have one item on it of almost any length. Some of this elemental nature is being addressed by the CD single.

"Typically, carts don't allow for damage to the material and they are idiot-proof.

"While the potential for on-air disaster is equal with each format—carts can jam and CDs can skip—one can resurrect a cart," Bowman says. "But when special care is taken and top-grade equipment is used, the sonic quality of the CD can't be matched."

Contributing to CD wear is the little-known fact that the label side of a CD is actually far more vulnerable to damage than the clear side, according to Studer's Dave Bowman. "People must be careful not to clean CDs in a circular motion because dropouts are caused by disrupting the laser as a function of time—i.e., a circumferential scratch," he said. "But they don't realize that if you scratch the other side—which is far more vulnerable because there's no protective surface—you take off the aluminium and there's nothing for the laser to reflect from." CDs with paper labels combat this problem, but not many are made that way, he says. CDs also have to be manufactured correctly, Bowman adds. "Some manufacturers try to ride the specs to get 70 to 80 minutes of time and put a 12-CD library on 10 disks," he says. "If you centerline all the specs, the most time you can get on a CD is slightly over 60 minutes. But you see them out there at 75 and 78 minutes. CD players work within spec and hardware manufacturers get blamed for the problems that result from stretching disks." Stretching specs affects tracking in particular.

FORM COMPARISON	CD	R-DAT
Function	Playback only	Record/playback
Maximum Play Length	60 minutes (On specification)	120 minutes
Maximum Record Time	N/A	120 minutes
Search Time	2-3 seconds (Random access)	40 seconds approx. (FF and REW)
Sampling Frequency	44.1kHz	32kHz (Digital input only) 44.1kHz (Playback only) 48kHz
Quantization	16 bit linear	16 bit linear (32k-LP and 32k-4CH modes: 12 bit)
Frequency Response	20Hz to 20kHZ plus/minus 0.1dB	2Hz to 22kHz at fs = 48kHz 2Hz to 20kHz at fs = 44.1kHz
Dynamic Range 1 2	96dB format potential; approx. 90 dB in application	96dB format potential; greater than 90dB (Emphasis ON at 1kHz)
Harmonic Distortion 1	Less than 0.006% (20Hz to 20kHz)	Less than 0.05% (THD at +4dB)
Digital/Analog Conversion	Quadruple oversampling, 16 bit	Quadruple oversampling, 16 bit

1 CD encoding and manufacturing specifcations conform to IEC 908 (1987) performmance specifications for each format can vary according to reference used by individual manufacturers.

2 Distortion, dynamic range, and signal-to-noise ratios can be affected by use of "dither" in recording and editing processes.

Questions of reliability

Besides wear, another issue of concern is the reliability of the respective format hardware. There simply isn't enough R-DAT equipment in the field to establish those parameters, according to Laura Tyson, sales engineer for professsional products for Denon.

Further, the technology is not quite mature, she adds, pointing out that editing and sync functions are limited by the rotary head scan design. Varispeed functions are also not available.

CD hardware is not without its reliability problems in the broadcast chain. There have been some problems reported with top-of-the-line pro CD units, however, the bulk of the difficulties stems from stations subjecting consumer CD players to the rigors of a 24-hour broadcast day. The problems compound over time.

"I don't want to beat on brands," says Davis of KMOD. "We've had every brand on the market in here and we're in our fourth replacement cycle."

Formerly an availability issue—there were few broadcast-standard CD units in development—the big trade-off in durability now is for price. Fully professional CD units, which offer features such as auto cue, time remaining indicator, and full-function hard-wired remote control, can fetch between $2,500 and $3,000. In comparison, a full-featured consumer CD, which offers some features useful in station production such as random programming, run around $1,000.

(By comparison, professional quality R-DAT decks are projected to cost in the $5,000 range.)

Typically a hard-driving station will use a broadcast CD for direct-to-air and a consumer model in production. Problems arise when the consumer models make it into the air-chain.

"The reality is that it's a reliability issue," says Studer's Bowman, which markets a Revox B226 and the Studer 727 and new Studer 730 CD units to the broadcast market. "You need to spend money to buy professional equipment to ensure that."

Broadcast quality is limited to the quality of the cart machine, Denon's Tyson points out. "You're only as good as the worst medium in the chain."

The Denon CD-Cart combines digital capability with durability and software longevity in a format that the company says is easily used because it is so similar to the standard NAB cart. Although other manufacturers feel the CD-Cart may skimp on some design elements and serviceability, it appears to be selling like hot cakes—which indicates real end-user need. Two-hundred units have shipped since the product's launch, and Denon, which is back-ordered, is putting on skates to supply heavy demand.

Digital advantages

Whether the industry decides to go for disk or DAT or some combination of the two, there seems little doubt at this point that digital will play a strong role in radio's future.

According to the engineers, there doesn't appear to be an audible difference between DAT or CD, but there is an audible difference between digital and analog sources in direct transmission. There's also an audible difference between material carted from either digital format and vinyl.

"Some people believe that reliability of CDs in the broadcast chain depends on carting them," Bowman said, adding that while excellent cart players—particularly models with Dolby noise reduction—are available, the current generation of professional CD players has been designed to maximize on-air reliability.

Nevertheless, some stations continue to believe carted CDs are easier to handle. And in terms of sound quality, with respect to noise, material carted from CD is better than if it were carted from vinyl despite the 15 kHz transmission limit on broadcast FM signals.

Although R-DAT's choice of sampling frequencies generate 22 to 24 kHz frequency response, seemingly an overkill given radio's 15 kHz limit, opinion has it that the better the source, the better the transmission. Theoretically inaudible, the extra bandwidth provides more margin for filters to eliminate phase problems.

WQIO, which puts eight pieces of processing equipment in the on-air chain, originally worked to ensure listeners heard differences between DAT, CD, and vinyl. The station has now corrected and balanced for situations such as high-end audio splash on DAT-originated material picked up on home audiophile hi-fi systems, and is now broadcasting a consistent signal orders of magnitude better than standard radio transmission.

"We started a fidelity war in the Columbus area," comments Cruz. "The 15 kHz limit didn't affect us because we used special equipment to correct and enhance the DAT." WCIO had to correct for analog hiss because the DAT transmission was so clean, he says.

KMOD is also involved in a "format war." The number one station in the Tulsa market, it's currently coaching its Oklahoma City sister station up against a rival claiming to broadcast 100 percent CD. KMOD's twin uses identical processing equipment but carts off vinyl for convenience.

"They know there's a difference in sound between us but they still want to cart," says Davis. "I tell them the only difference is digital. If you're carting off records, which are probably scratched and run down, you're immediately into second generation—and off an inferior source."

"Technology is driving improvements, concludes Denon's Tyson. Many stations buy subscription formats," she says, while classical repertoire stations still work from a deep library of vinyl.

The future

Given all the advantages and disadvantages of both digital formats, what is the prognosis?

Tyson estimates that it will take three years for CDs to be fully established in broadcast, and five years for acceptance of R-DAT, if ever.

Nor can one forget the bottom line. "The issue isn't features or edit function so much as price," says KMOD's Davis. At $5,000 an R-DAT is a pretty spendy item.

"When R-DAT gets to $2,500 and CD records, then you're going to see war," Davis says.

There's also the relationship between consumer acceptance of a format and software availability. CDs are so widely accepted that CD singles are a hot new item. R-DAT boasts a few prerecorded audiophile cassettes on the GRP label—but look for that to change fast as Sony's new high-speed Sprint duplication system, comes on line.

Finally, any delay in CD recording capability, stalling tactics affecting consumer marketing of R-DAT, or reliability problems in either format may ensure that the real high-performance battle in the broadcast arena forms up around digital consoles and crystalline or biological memory. "We're not really in the pro audio industry any more," Panasonic's Woolley points out. "It's the computer industry now." **BM/E**

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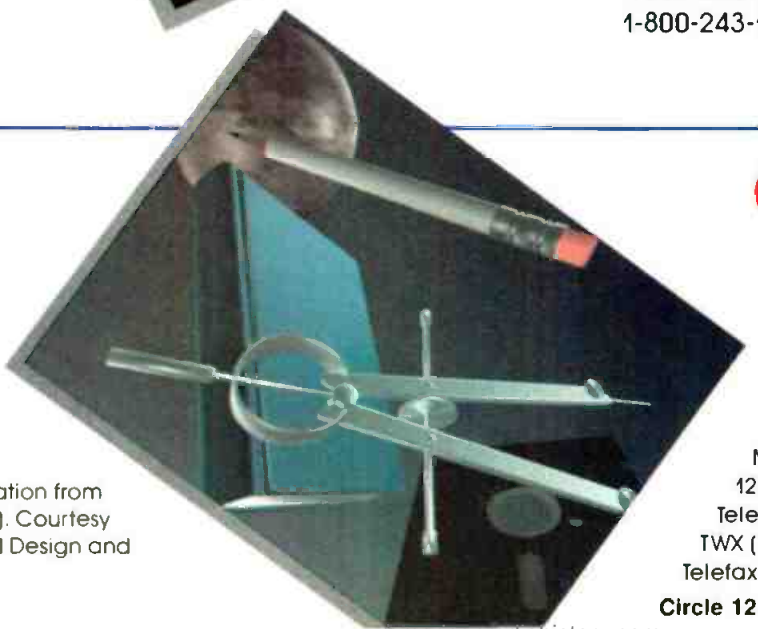

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*Based on a comparison of Panasonic edit machines

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Technological advances on several different fronts have sparked renewed interest in weather graphics systems.

The daily changing of the weather contrasts with—and gives rise to—the continuing, unchanging importance of weather reporting for television stations everywhere. Engineers faced with upgrading their stations' weather presentation facilities now have a broader than ever array of equipment to choose from, ranging from simple information databases to sophisticated graphics systems geared for weather reporting. Whatever a station's needs may be, there's a product to fit them.

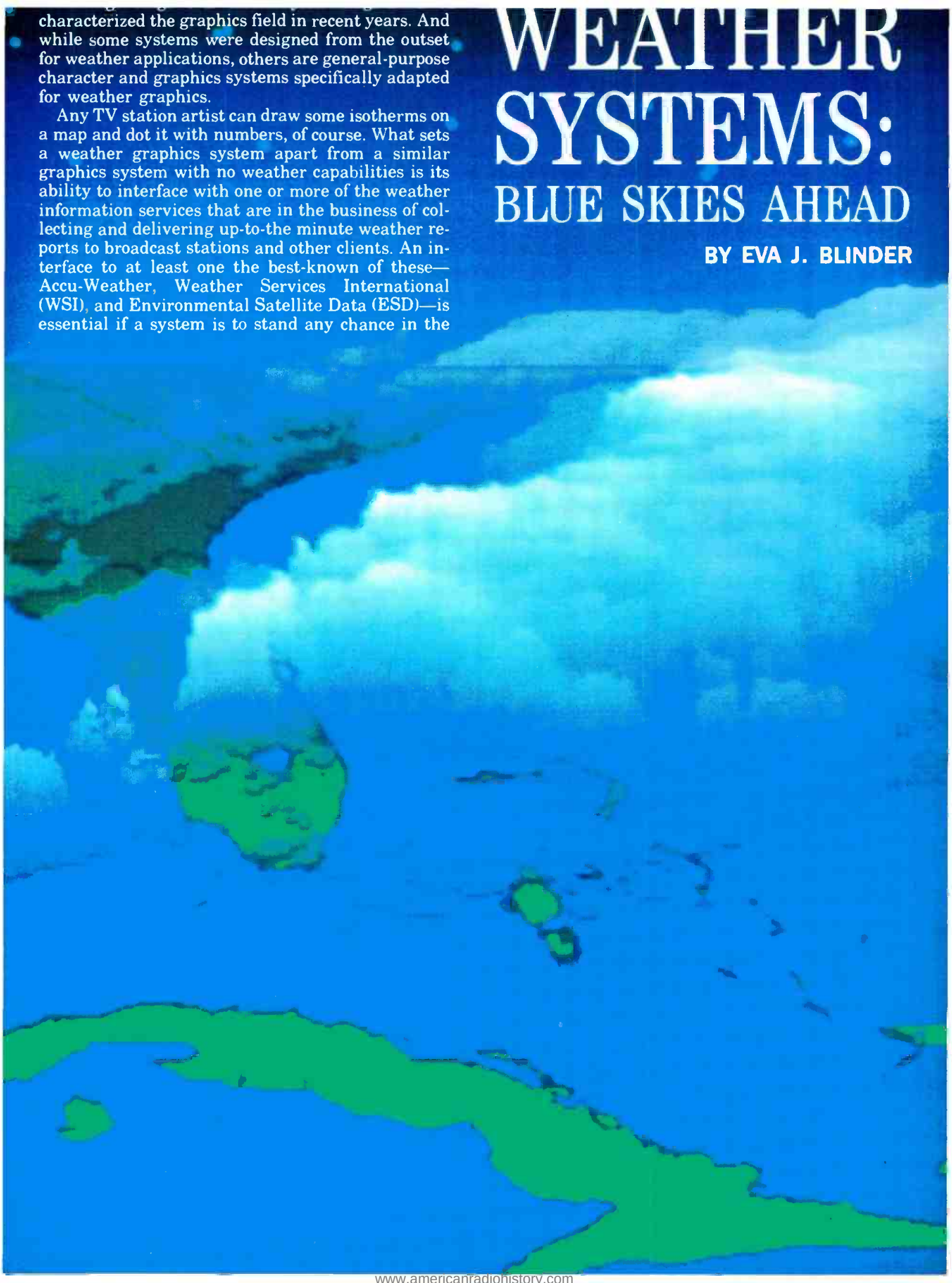
Weather packages fall into three broad categories: weather graphics creation systems, based either on paint and animation systems or on high-end character generators and equipped with the facilities needed to create weather displays; weather radar systems, often capable of full-color display; and weather graphics and information databases. The first two catagories, especially, overlap quite a bit,

WEATHER SYSTEMS: BLUE SKIES AHEAD

BY EVA J. BLINDER

characterized the graphics field in recent years. And while some systems were designed from the outset for weather applications, others are general-purpose character and graphics systems specifically adapted for weather graphics.

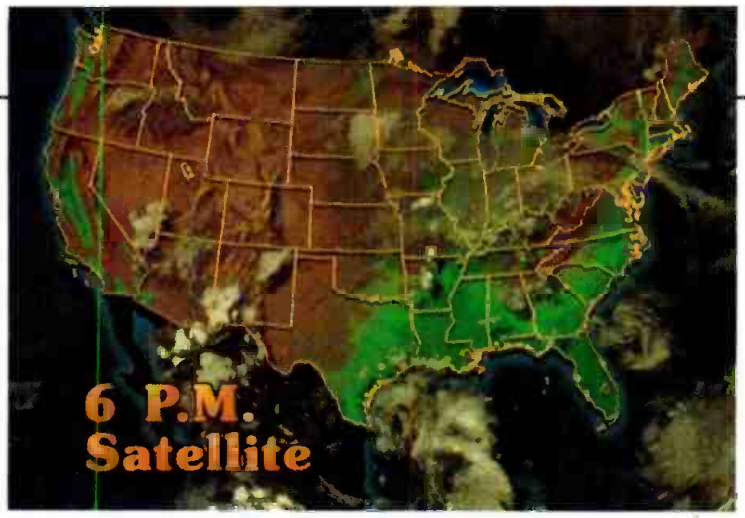
Any TV station artist can draw some isotherms on a map and dot it with numbers, of course. What sets a weather graphics system apart from a similar graphics system with no weather capabilities is its ability to interface with one or more of the weather information services that are in the business of collecting and delivering up-to-the minute weather reports to broadcast stations and other clients. An interface to at least one the best-known of these—Accu-Weather, Weather Services International (WSI), and Environmental Satellite Data (ESD)—is essential if a system is to stand any chance in the



current market.

Graphics creation

One of the newest entrants in the weather graphics system arena comes from WeatherConnect, a Chicago-based company that made its broadcast-industry debut at last month's NAB show. WeatherConnect's WC-1000 is a turnkey, multitasking weather graphics workstation in a package that combines characteristics of a Macintosh and an IBM PC. The system processor is a 32-bit Motorola 68020, similar to that used in the Mac. Like the Mac also, the WC-1000 uses an icon-based graphical user interface, although the main input device is a Summa graphics tablet (a mouse is optional). It has a 68030 coprocessor for video and animation, 5 Mb of system memory, and an internal 3.5-inch floppy disk drive and 40 Mb hard disk.



ColorGraphics' LiveLine 5 adds full 2D art and animation capability to weather information.

The WC-1000 can download

WEATHER GOES DESKTOP

In weather graphics, it's not only the high-end systems that have benefitted from the development of computer technology. The recent introduction of personal computer-based weather graphics systems allows even broadcasters with small budgets to offer live, on-air weather reports.

PC-based weather graphics systems are not brand-new. For the past two years or so, Weather Central, the ColorGraphics subsidiary weather graphics service, has been offering daily newspapers a selection of on-line weather graphics created on the Macintosh. The service takes advantage of the Macintosh's popularity with newspapers by allowing Mac-equipped papers to download standard and custom graphics over the telephone.

According to Chuck Scholdt, of ColorGraphics, the graphics are available in black-and-white and (with the recent addition of two Macintosh IIs) color. Subscribers can access the graphics by dialing Weather Central directly or by calling the Weather Central electronic bulletin board on Knight-Ridder's PressLink electronic information system. As an option, subscribers can retrieve special custom graphics.

One company offering PC-based weather graphics for television stations is Associated Computer Services, which took space in the Commodore/Amiga booth at last month's NAB convention to demonstrate a new weather package that takes advantage of the high-resolution color graphics of the Amiga.

The weather software is part of a series called Station Manager designed as television productivity and management tools. According to ACS president Keith Masavage, the first modules in the series allow a broadcaster to select, download, enhance and air weather data and graphics from Accu-Weather.

Weather Link is a high-resolution communications package that automates the process of downloading graphics and information. It logs onto Accu-Weather automatically and then downloads the selected products according to a user-defined script file. (A station may define several different script files, each for a different situation or time of day.)

Weather Link does more than passively download graphics, however. According to Masavage, it employs special smoothing algorithms and techniques such as antialiasing and dithering to actually increase the resolution of the downloaded pictures.

Once downloaded and enhanced, the pictures can be fed into another ACS product—Deluxe Productions, a high-resolution animation package.

A third item is a Weather Graphics Map Generator. This is a surprisingly flexible map generation package that allows quick and easy creation of user-defined maps. Using the mouse, the user can select any portion of a U.S. or world map; the system will then automatically create a high-resolution map for the selected region, complete with latitude and longitude lines.

How much will this set you back? The prices are almost too low to be believed, especially in this high-ticket industry. The Weather Link software costs $295; Deluxe Productions is $195, and the Map Generator is a mere $145. (The company also plans to introduce a $295 Graphics Library, complete with premade maps and weather graphics images, and a $295 character generator.) Add to that the under-$1000 Amiga itself and a low-cost genlock unit (running anywhere from $500 to about $2000), and you've got a nifty, low-cost weather package.

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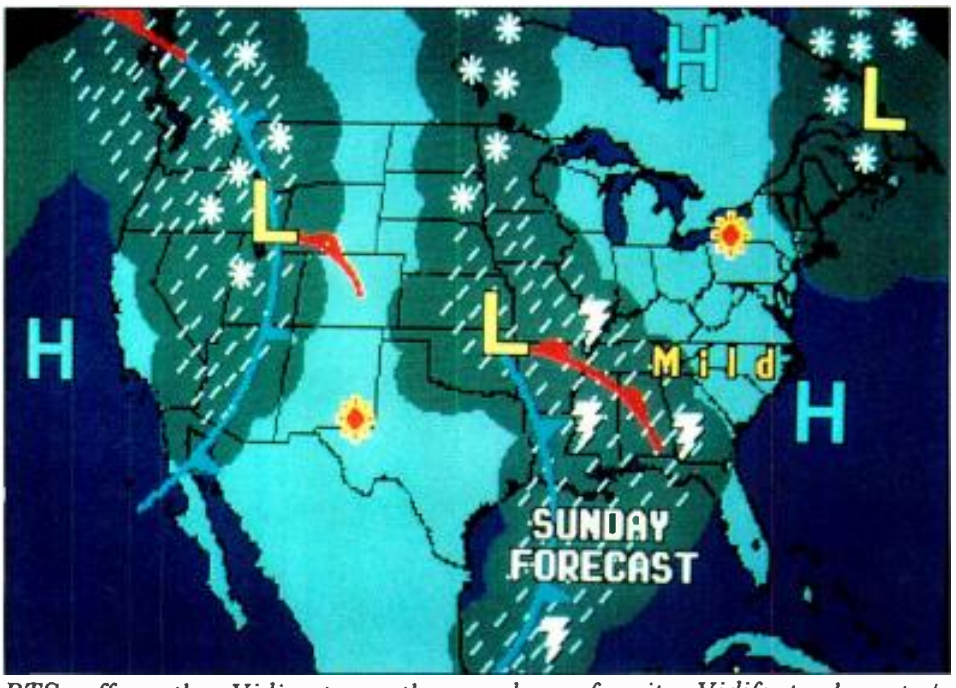
data, high-resolution satellite pictures and custom art from WSI, Accu-Weather, and Weather Bank (in whose booth the system will be demonstrated). Its multitasking capabilities allow a user to perform sequencing and manipulation of weather graphics while simultaneously receiving information.

Users can take further advantage of the system's multitasking capabilities by installing an optional "bridge card" that adds MS-DOS compatibility to the system, enabling it to run standard MS-DOS business software. An MS-DOS-compatible 5.25-inch floppy drive and 20-Mb hard card are also available.

Graphics capabilities include animatable text generation and a full paint package with a palette of 4096 colors that can be mixed and cycled. The full system sells for under $20,000.



BTS offers the Vidicast weather package for its Vidifont character/graphics system.

High end

The high end of weather art systems is probably best exemplified by the LiveLine, which ColorGraphics Systems has been producing for several years. Its latest incarnation is the LiveLine 5, with capabilities that rival any high-end paint system. The LiveLine 5 is a dedicated weather presention system, however, with interfaces to ESD, WSI, Weather Central and Accu-Weather. The system also works with the new satellite weather data delivery services, including ESD's Front End, WSI's ASTROgraphics, and Accu-Weather's Front Door. In addition, ColorGraphics offers an interface to Weather Central's dial-up eight-bit weather graphics.

Like its big sister, the ArtStar graphics system, LiveLine 5 offers 24-bit-per-pixel, full-color graphics capability, with 16.7 million displayable colors. Side-by-side with this capability is an eight-bits-per-pixel graphic system that offers ease and flexibility of use. The latest addition to the LiveLine 5 is an optional digital video mixer, called MXR, that uses an "alpha channel" to control the mix for advanced real-time animation. It allows such sophisticated effects as true dissolves between two 24-bit or two eight-bit images for glows, fades, dissolves and cutouts; animation of the full-color layers, including zooms, scrolls and opacity; transparent color-cycle movies; and "undo" editing capability in the LiveLine 5 paint program.

The hardware foundation of the LiveLine is a Motorola 68020 32-bit microprocessor, augmented with a 48 MHz bit slice arithmetic maximizer, 4 Mb of video memory, 2 Mb of system memory, a 190 Mb hard disk, two floppy disk drives, a cartridge tape drive, NTSC encoder, graphics tablet with stylus, and RGB/NTSC monitor.

Other paint and graphics system manufacturers recognize the importance of weather and offer weather packages as options. Dubner, for example, offers an optional weather system for its Texta 500 video graphics generator, a character-based system with full-color paint and 3D animation capabilities. The weather option allows the Texta 500 to receive satellite pictures, radar maps, temperature data and forecasts via modem from WSI, ESD, or Accu-Weather.

An even more powerful combination for high-quality weather graphics will soon be available from Dubner: the Graphics Factory, a modular, expandable graphics system unveiled at last month's NAB show. At press time the Graphics Factory weather package was still under development, but a company spokesperson said it was anticipated to produce images that look "just like photographs," with excellent resolution and full-color capability. Like the LiveLine, the Graphics Factory combines 24-bit and eight-bit capability. It operates internally in the D-1 digital component format, with RGB and NTSC outputs standard. (PAL and digital component outputs are available as options.)

Aurora Systems recently added greater weather graphics capability to its low-cost AU/75 graphics system, which now interfaces to Accu-Weather. (The system already interfaced to WSI, and an interface to ESD is planned for the future.) The interfaces are part of Aurora's Weather Package, a software option that automatically connects the 75 to various sports and weather databases and formats the extracted information graphically on the screen. Similar weather packages are available for Aurora's other paint and graphics systems, the AU/220 and AU/280. These systems offer a number of advan-

tages over the IBM PC/AT-based 75, including 3D modeling and full-color video input.

The popular Vidifont system, now manufactured by BTS, offers a configuration especially for weather reporting. The Vidicast, which interfaces directly with Accu-Weather, Weather Central, ESD and WSI, operates as an independent module of the Vidifont with up to two weather workstations. (Up to eight additional Vidifont users can create graphics while the Vidicast is in use.)

A useful feature of the Vidicast is "templating," by which the user can set up a "format page" for a frequently used weather chart. The format page defines one or more information "windows" into which downloaded weather information is inserted automatically. Of course, the process can be performed manually if preferred.

For many meteorologists, the bread and butter of local and regional forecasting are the National Weather Service images.

For more sophisticated manipulation of downloaded weather graphics, the Vidifont's GraphicStore paint and still store system may be utilized.

New dimensions

A fully integrated approach to weather information is offered by Kavouras. The Minneapolis-based company operates its own weather database, which includes satellite pictures, radar information (including Doppler radar), and atmosperic information. To display and manipulate this information, the company offers the Triton-X weather graphics system.

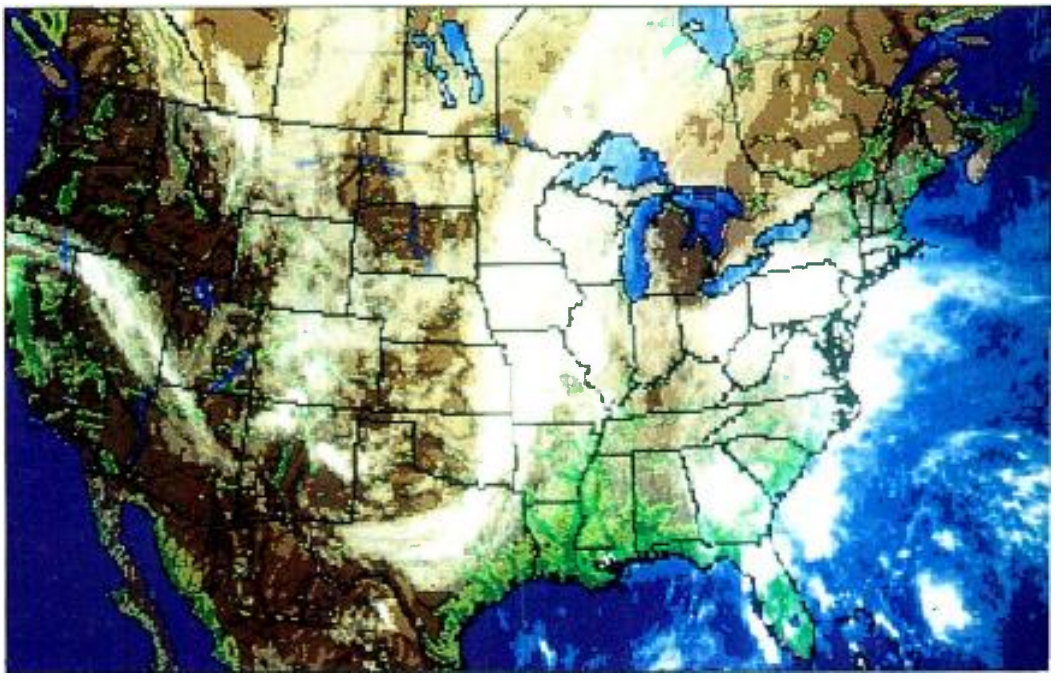
Kavouras's latest enhancement is an innovative product called 4 Dimension Satellite. Introduced at NAB '88, 4 Dimension Satellite is an animated display that combines data from several sources (surface and satellite) with computer-generated, extremely realistic clouds. The result is a weather map with a transparent, 3D cloud cover that closely matches the actual conditions. The graphics are created and transmitted every half-hour, so users can animate them to show the clouds forming and dissipating.

Kavouras customers will be able to receive 4 Dimension Satellite pictures on the Triton-X, a weather workstation that allows them to manipulate and animate the transmitted pictures. The Triton-X also interfaces with Kavouras's RADAC radar network, which scans National Weather Service S and C band radar sites and displays the images in color, and with the company's Triton Doppler radar, an advanced technology that detects motion in falling precipitation, allowing very accurate location of storms and wind systems with greatly reduced ground clutter.

Radiant radar

For many meteorologists, the bread and butter of local and regional forecasting is the radar images transmitted by the National Weather Service and National Oceanic Atmospheric Administration. Alden Electronics offers a dedicated radar display terminal, the C2000, which comes in several configurations. One of the newest is the C2000C weather radar composite unit, which offers the unique ability to process data from multiple NWS sites simultaneously and generate a composite color image.

The C2000C can composite up to 15 separate radar sites on a single monitor image. A multicolor map overlay background is standard, so images are ready to air. If desired, any one of the monitored radar sites may be viewed individually in the center of the picture. Other features include three display memories and nine quadrant sector zoom.



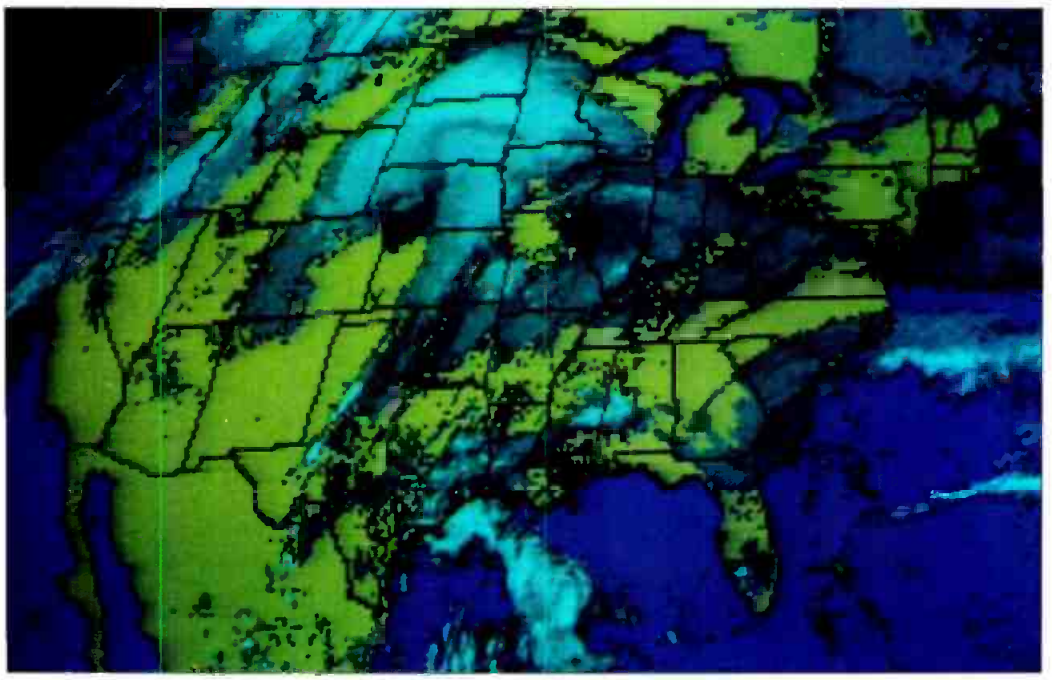
Weather service interfaces are available optionally for Aurora's videographics systems.

Alden's top-of-the-line unit is the C2000R color radar display, which numbers among its standard features a 16-picture memory, genlock, zoom, pan and scroll, concentric rings, sweep lines, and four-color backgrounds. The company's most recent addition is the C2000M, an economical, compact system with one-button operation.

Alden also offers its own weather graphics system, the C2000S, which can access the private weather databases.

Dialing for data

Where would the weather graphics systems be without the databases they draw on? Companies like WSI, ESD, Accu-Weather and Weather Central provide a wealth of weather information in all forms, from nearly raw numbers to finished graphics to professionally prepared forecasts. While they originally transmitted their products over telephone lines (and continue to do so for the majority of customers), satellite distribution has become increasingly common and popular.



Like other weather data and graphics sources, WSI now offers satellite delivery of products such as this GOES East satellite image.

The advent of satellite distribution has prompted some of the information services to get into the hardware business, at least to a limited extent. WSI, ESD and Accu-Weather are now all offering dedicated hardware that acts as the intermediary between the satellite and the weather graphics system.

ESD's offering, appropriately named the Front End, is an 80386-based microcomputer that processes satellite and radar imagery and transfers it to the host graphics system. Designed primarily to free up the main graphics system for other uses, the Front End has no graphics manipulation capabilities, although it can format and customize the data for an individual station's needs. Its main selling point is speed and efficiency in receiving data, resulting in time savings.

If a station with no weather graphics system wishes to access Express Weather, ESD will go one further with the optional Weather Graphix art and animation system. This is a basic graphics package for the Front End that allows the user to create customized, air-ready graphics.

In the same vein, Accu-Weather offers the Front Door 750, a device that receives the company's weather graphics and data via satellite, although alternatively it can access the information via telephone lines. The Front Door stores up to 250 images, displaying them on a monitor and allow them to be sorted and indexed.

Users without a weather graphics system who need a low-cost way to air weather graphics can try the Accu One, a $12,500 variation on the Front Door that adds limited graphics manipulation, but without paint capabilities.

WSI's satellite receive unit is ASTROgraphics, an 80286-based, turnkey system that interfaces with all the major weather graphics terminals. The system is designed to receive WSI's ASTRO-WX satellite-delivered weather graphics service, which includes on-air graphics, worldwide weather data and DIFAX weather facsimile maps. ASTROgraphics will simultaneously receive satellite transmission and transfer images to the graphics machine. It has a PREview option for viewing graphics before they are sent to the weather graphics systems. Another module, ASTROfax, has a VIEWfax option that lets the user store and view DIFAX maps on a monitor rather than automatically printing them out.

A new offering from WSI is FUTUREsat, a "synthetic" weather image that forecasts where the clouds will be in the next 12, 24, 36 and 48 hours. WSI creates the image using sophisticated computer models and NWS data.

Weather Central, the weather database and graphics service that is a division of ColorGraphics, recently introduced two new services: ultra-high resolution, eight-bit weather graphics with 256 displayable colors, antialiasing and multicolored fonts; and WeatherBase, a new dial-up database. WeatherBase offers access to Weather Central's standard or customized graphics at speeds of up to 9600 baud for lowered telephone costs. **BM/E**

For more information on products and companies mentioned in this story, please use the Reader Service Card:

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KARL RENWANZ

BY MICHAEL A. RIVLIN

Not two feet from Karl Renwanz's desk is a waveform monitor and routing switcher head that WNEV-TV, Boston's VP of operations and engineering punches up daily to make sure all is well. But Renwanz is more eager to talk about an often overlooked aspect of achieving excellence as engineering manager of the country's largest locally owned affiliate: management.

Having established a track record as one of the country's most far-sighted broadcast engineers—manufacturers vie with one another for the opportunity to develop new technologies that meet his specs and to have him critique their works-in-progress—Renwanz has delegated to his 70-person staff many of the day-to-day engineering details. "My job," he explains, "is not to look at my feet but to look ahead. If you look at your feet you walk into a lot of walls."

Growing up as a self-described "hick" in the backwoods of Oregon, in a tiny village more often than not ignored by mapmakers, Renwanz more than most carried from childhood a belief in the importance of hard work and a seriousness of purpose. In short, he's a man who's never been without a plan.

His family relocated to Central California, and it was there, when he spoke to some broadcasters at a local eigth grade "job fair" that his interest in broadcasting peaked. Later, while attending college, the opportunity to work at a radio station cropped up, and according to Renwanz, "that was it."

Renwanz, whose classic good looks and quiet intelligence are reminiscent of a younger Dick Cavett, abandoned his pursuit of a professional baseball career to work as a combo man in a small California radio station. "One day, when the ratings came in and the boss cut everyone's salaries in half, I decided that radio was not going to be the future," he recalls.

Instead, he applied for a job at KVIE-TV, Sacramento as someone who "knew nothing but would work real hard." He left 10 years later as the station's manager of operations and engineering to join WGBH, Boston as its director of engineering.

During his last three months at WGBH, Renwanz was loaned out to help a group of local businessmen seeking to acquire the license of Boston's former RKO station. When the long-neglected property became WNEV on May 22, 1982, Renwanz found a situation in which he could have the title of VP of operations and engineering, and which was ripe for managerial as well as technical innovation.

The VP of operations and engineering at WNEV-TV, Boston keeps the industry asking, "What'll they do next?" Here, his secrets are revealed.

Station revitalization

The well-known multimillion dollar WNEV revitalization supervised by Renwanz, which touched on virtually every area of station operation, resulted in a facility at the forefront of technology in just about every area.

One of the first major decisions Renwanz and the highly capitalized station in search of almost brand-new everything had to make was a new ENG/EFP tape format. This coincided with 1982's outstanding new technology—the introduction of half-inch component analog videotape formats. Renwanz's decision to adopt Panasonic's original M-format was the first major U.S. inroad for broadcast-quality half-inch videotape, and gained attention nationwide. And from the day the equipment arrived, Renwanz began to engage in the activity with which he's still absorbed: urging, prodding, and sometimes pushing manufacturers to extend product features and broadcast technology.

Renwanz performs daily scope check of signal quality.

With the new M-format hardware, Renwanz immediately saw the need for a component video switcher. "That would be the key, the heart of the system," he suggests. He imagined component edit suites in which one could do dissolves and effects in the component mode, and more elaborate effects with a Chyron character generator and the Harris Iris 2 still store they'd just acquired.

"I talked to the biggest switcher manufacturers in the world," Renwanz recalls. "I called one and said, 'I'd like to buy a SECAM switcher.' They laughed. They called a couple of weeks later and said, 'Look, it's a great idea, but it will never sell.' "

A talk Renwanz gave at the Fall 1982 SMPTE interested Jeff Smith, director of engineering for Shintron, and the broadcaster and manufacturer "co-conspired" to make the component switcher. Shintron's component switcher was shown at the 1983 NAB, and Renwanz took delivery of six shortly thereafter.

A component time-base corrector was the one element missing from the equation when Fortel showed Renwanz a prototype with component outputs. The manufacturer added component inputs at his request. "The marriage of all the hardware made real component editing possible."

The next manufacturers Renwanz prodded were those who made test equipment. "We couldn't use typical subcarrier measurements; it wouldn't mean anything in component," he explains. The engineer approached Tektronix, among others, just as the industry was starting to realize that the revolution that had taken place at a locally owned Boston affiliate was going to shake the industry.

Manufacturers have come to seek Renwanz out because of his reputation not only as a product innovator but also as a company maker. Larcan is an example. In 1983, following his CAV revolution, Renwanz turned his attention to more mundane concerns, like replacing a 21-year old transmitter. This time, the engineer had ideas about a new kind of exciter and found another up-and comer, Larcan, to carry them out.

"We sat down at a table in Canada and convinced them to meet some really difficult specs," recalls Renwanz. In addition to taking some of the credit for development of the still-popular exciter technology, Renwanz acknowledges the commercial impact of the project. "We feel our involvement certainly helped Larcan—they had a better handle on understanding the marketplace and we gave them that direct feedback."

Testing

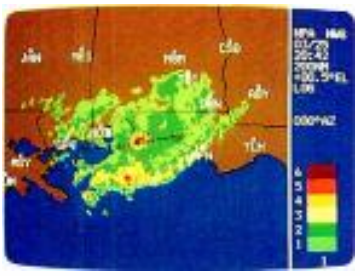
Renwanz's reputation as a critic of new technologies is due in large part to his diligence in providing thorough, accurate, objective product evaluations. It's a skill he and his staff have honed by testing the specs of every piece of equipment the station purchases, to make sure the hardware meets the manufacturer's specs.

"I think more television stations should take more interest in testing and evaluating hardware and not accepting what manufacturers send," Renwanz asserts. "If you know how good a product is when it comes in, and every parameter is measured and tested to meet or exceed the specifications that were agreed upon, then you push the manufacturer to always meet their spec."

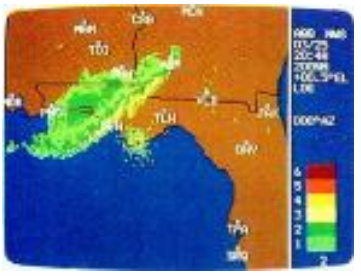
Renwanz cites the objectivity in his research as one reason he rejects CBS network engineering evaluations in favor of his own. "There are some very talented people in the networks' R&D departments, but sometimes the top of those organizations' decisions get mired in politics," he comments. " 'Well, so-and-so network has it. We don't want that. We want to have our own stamp on this particular device.' The one thing we don't have that they have are any political biases to deal with. You shouldn't buy gear because it says Sony or Ikegami. You make investment decisions based upon performance, and when you do that, you wipe politics out."

Renwanz is as enthusiastic about SP as he was about M-format. "Luminance and signal-to-noise ratio far exceed anything

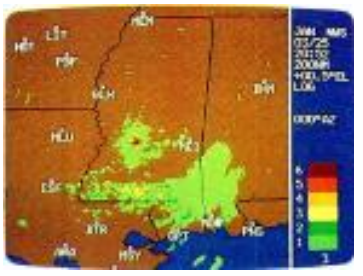
Four Radars



Pensacola, FL



Apalachicola, FL



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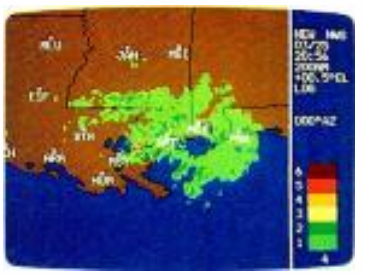

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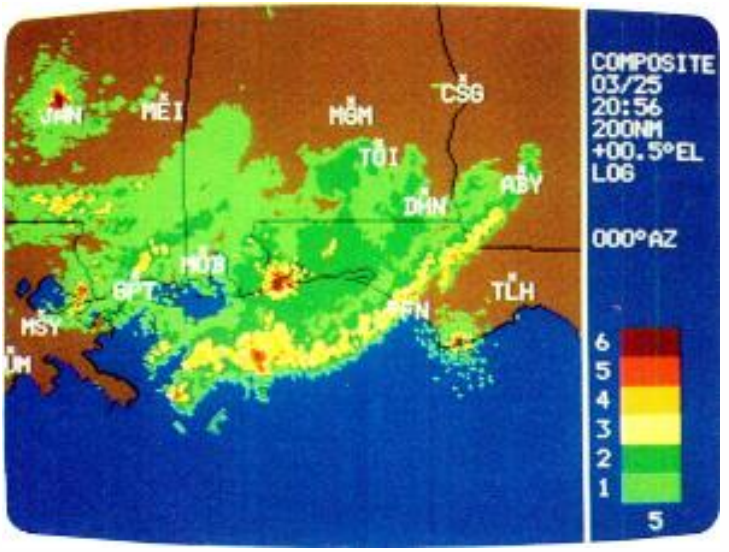

Individual radar displays can only show you part of the picture. This composited image, centered in Apalachicola, FL, combines echoes from four different radar sites and shows the true magnitude of the storm.

In One

When the real weather story is outside the range of conventional radar, you need Alden's new radar compositing feature.

Compositing combines the echoes from multiple radar sites and displays them on a single screen. You can specify the radar sites you want, or automatically gather echoes from all the sites in your region–up to 16 in some areas!

The result is a display that's dramatically different from conventional radar. Instead of simply showing the weather that's here, compositing adds the weather that's on its way.

In addition to compositing, Alden's Weather Radar System offers a full range of standard features, including zoom, time-lapse looping, customized backgrounds, and auto-dialer. Yet the cost is thousands less than other systems.

For more information on Alden's Weather Radar System, contact Alden Electronics, 46 Washington Street, Westborough, MA 01581 (617) 366-8851.

ALDEN ELECTRONICS

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else out there, and you can do it for 19 pounds," he notes. The format's 90-minute capability has allowed Renwanz to covert the bulk of his tape room to SP. Savings in tape costs were an important factor in his decision. "We're getting at least 10 passes on our SP field tape, which is far beyond anything we used to get with U-matic or M-format," he observes.

The five-year plan

With technology about to shake up broadcasting more violently than ever, those who can more accurately predict technology's future will be in great demand. Because he enjoys the confidence of numerous manufacturers who ask his advice and share with him plans for technologies far in the future, Renwanz can predict more accurately than most. All this knowledge has put him at the head of WNEV's budget process and in control of its five-year plan, and there is no more telling sign of Renwanz's status and power.

The station's five-year plan is a year-by-year projection both of specific budget items and a general philosophical direction for the station, written and influenced in large part by Renwanz. Throughout the year, as one manufacturer confides a secret or a co-development project advances another step, the plan is altered accordingly. "We're looking at the future, and we're plotting it out very carefully, and the direction is well-founded," Renwanz notes.

Rather than meekly submitting a yearly budget to the station's four-person capital committee, Renwanz is its chairman. And his own four-person management team—who monitor the needs of departments throughout the station—generates the vast majority of capital requests. "The lists are very short from other departments because they've learned to rely on us in a leadership role, not just a supportive one," he comments.

This year, for the first time, Renwanz brought the capital committed along with him to NAB, so he and his staff could look first hand at the two most challenging items in the current five-year plan: library automation and HDTV, which he terms "the ultimate challenge." The engineer has written HDTV into the plan beginning in 1992. How much money has he budgeted? "A lot."

"It's more important to nurture better people, because the technology is there to allow the job to be done right if you keep the people motivated."

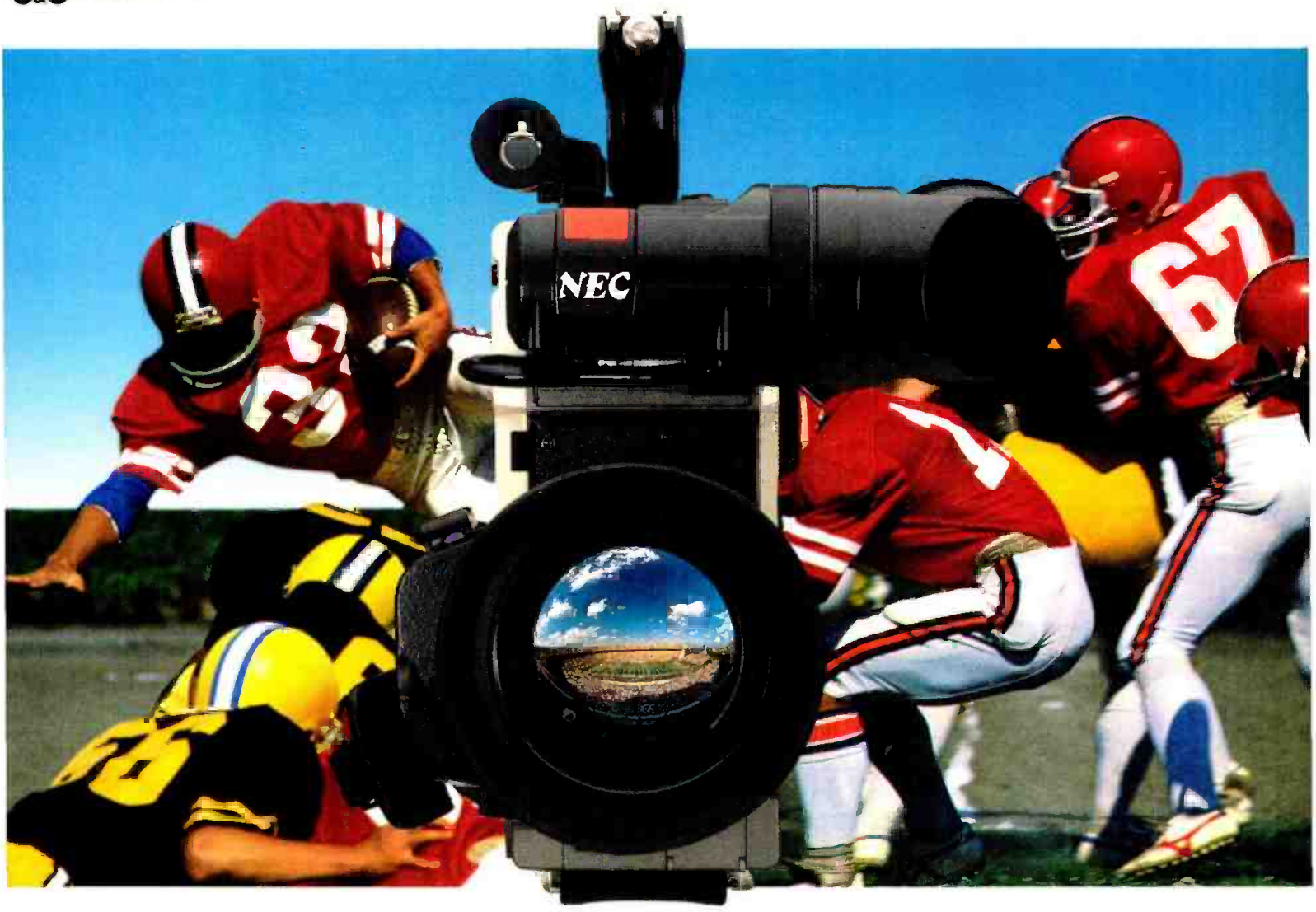
Like many in the industry, Renwanz acknowledges that it is WNEV's responsibility and intention to support the development of one or more HDTV systems, but it's a decision he's found difficult to make.

Another important issue confronting the broadcaster is station automation. Renwanz is keeping his own counsel on his long-term automation plans for both competitive and internal reasons. He does acknowledge that for several years WNEV has allied itself with one or more manufacturers developing automated camera control system technology, but declines to discuss the projects in detail.

Renwanz has also been working closely with three major cart manufacturers, each of whom showed prototypes at NAB. "Only a couple of library management systems are going to take television into the 1990s," he asserts. Those that do, he believes, must have the capacity to carry a couple of thousand programmed events, draw on a single library for an entire week, and offer great increases in reliability. "Makegoods are not fun to get involved with," he observes.

From the start of his career in radio in the 1960s, Renwanz has rejected the stereotype of the chief engineer as someone whose competency extended only as far as his screwdriver. That stereotype "meant you had to have the plastic screwdriver holder in your pocket, and you were commonly referred to as a screwdriver-wielding idiot, because although your ability to fix gear was great, your ability to deal with people and respond to the needs of the general manager and the needs of the

Renwanz, Brian Lay, engineering manager of production and technical services (left) and Art Murphy, technical crew chief, ENG/EFP evaluate final units of 25-piece Betacam system.



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NEC

company didn't always seem to be in line with the betterment of the company," he says. "That perception might have been incorrect, but chief engineers do carry a lot of baggage from the past, and the engineering manager of the 1990s has to shed that baggage."

At WNEV, Renwanz has replaced that image with one of a Renaissance man who wears a jacket and tie, and who understands not only the needs of his staff but also those of other of every department, and who prizes one skill above all others.

"The number one set of skills the head of engineering should have," he asserts, "is not engineering but management. It's more important to nurture better people, because the technology is there to allow the job to be done right if you keep the people motivated."

In fact, Renwanz, who's done a little bit of everything in his career (including a substantial amount of production and direction), advocates his background as ideal for anyone else in his position. "When someone has a problem I can help them solve it without talking about megahertz and gigahertz," he quips.

However, Renwanz has probably learned to speak like a manager not just because it allows him to do his job better, but because it allows the "Renaissance engineer" to get involved in something he really enjoys: programming and marketing. For every new show planned by the station, Renwanz joins his fellow department heads and WNEV president Seymour Yanoff for a day-long meeting in which the group examines every angle of the concept.

"All of us have input," explains Renwanz. "The news director may throw an idea on the table and say, 'Here's something I've been thinking of,' and from there he'll have eight people working the idea over from every angle possible. It means that in my role as engineering I'm not relegated to

only saying, 'This is how many cameras you need.' "

In fact, Renwanz's proudest achievement at the Boston station was overseeing development of the New England News Exchange, one of the most comprehensive news gathering networks owned by a single station in the country. The idea began in 1983 as a proposal for a community news bureau capable of providing thorough neighborhood coverage for viewers outside Boston's metro area. The half-million-dollar system, designed by Renwanz, includes bureaus in four locations with their own edit suites, seven ENG receive sites, and two-way communications capabilities extending through 100 miles of terrain, all steerable from WNEV.

"What we can do with NENE goes beyond normal ENG receive capability," says Renwanz proudly of the network, which now includes five television and seven radio stations. "The NENE delivers regional news to a local TV station."

Renwanz lives with his five children and wife, Sondra, (owner of Video Transfer, a duplication and standards conversion facility) in a house backing up to a 100-acre nature preserve, which provides some relief from the pressures of his job. Still, the broadcaster believes he's rapidly experiencing burn-out and plans to retire at 55. But he'd like to do so with the title of general manager, an ambition he doesn't mind appearing in print.

"Sy Yanoff knows very well that that's something I have in mind, and it really demonstrates how there are some examples in this world where you can tell your boss what you're really thinking and not get lynched for it," he grins. **BM/E**

About the author:
Michael Rivlin is a freelance writer and producer based in the New York Area.

Above and below, equipment and set for the New England News Exchange, Renwanz's "greatest accomplishment."

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☐ FM Stations
☐ Corporate/Institutional Facilities
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☐ Independent Teleproduction Facility
☐ Microwave, Relay Stations or Satellite Company
☐ Government
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5/88

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128	129	130	131	132	133	134	135	136	137	138	139	140	141
142	143	144	145	146	147	148	149	150	151	152	153	154	155
156	157	158	159	160	161	162	163	164	165	166	167	168	169
170	171	172	173	174	175	176	177	178	179	180	181	182	183
184	185	186	187	188	189	190	191	192	193	194	195	196	197
198	199	200	201	202	203	204	205	206	207	208	209	210	211
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226	227	228	229	230	231	232	233	234	235	236	237	238	239
240	241	242	243	244	245	246	247	248	249	250	251	252	253
254	255	256	257	258	259	260	261	262	263	264	265	266	267
268	269	270	271	272	273	274	275	276	277	278	279	280	281
282	283	284	285	286	287	288	289	290	291	292	293	294	295
296	297	298	299	300	301	302	303	304	305	306	307	308	309
310	311	312	313	314	315	316	317	318	319	320	321	322	323

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B. What is your purchasing authority?
1 ☐ Evaluate 2 ☐ Recommend 3 ☐ Specify

C. Purpose of this inquiry:
1 ☐ Current Project 2 ☐ Planned Project 3 ☐ General Information

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BM/E RAPID RESPONSE CARD

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C. Purpose of this inquiry:
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City _____ State _____ Zip _____

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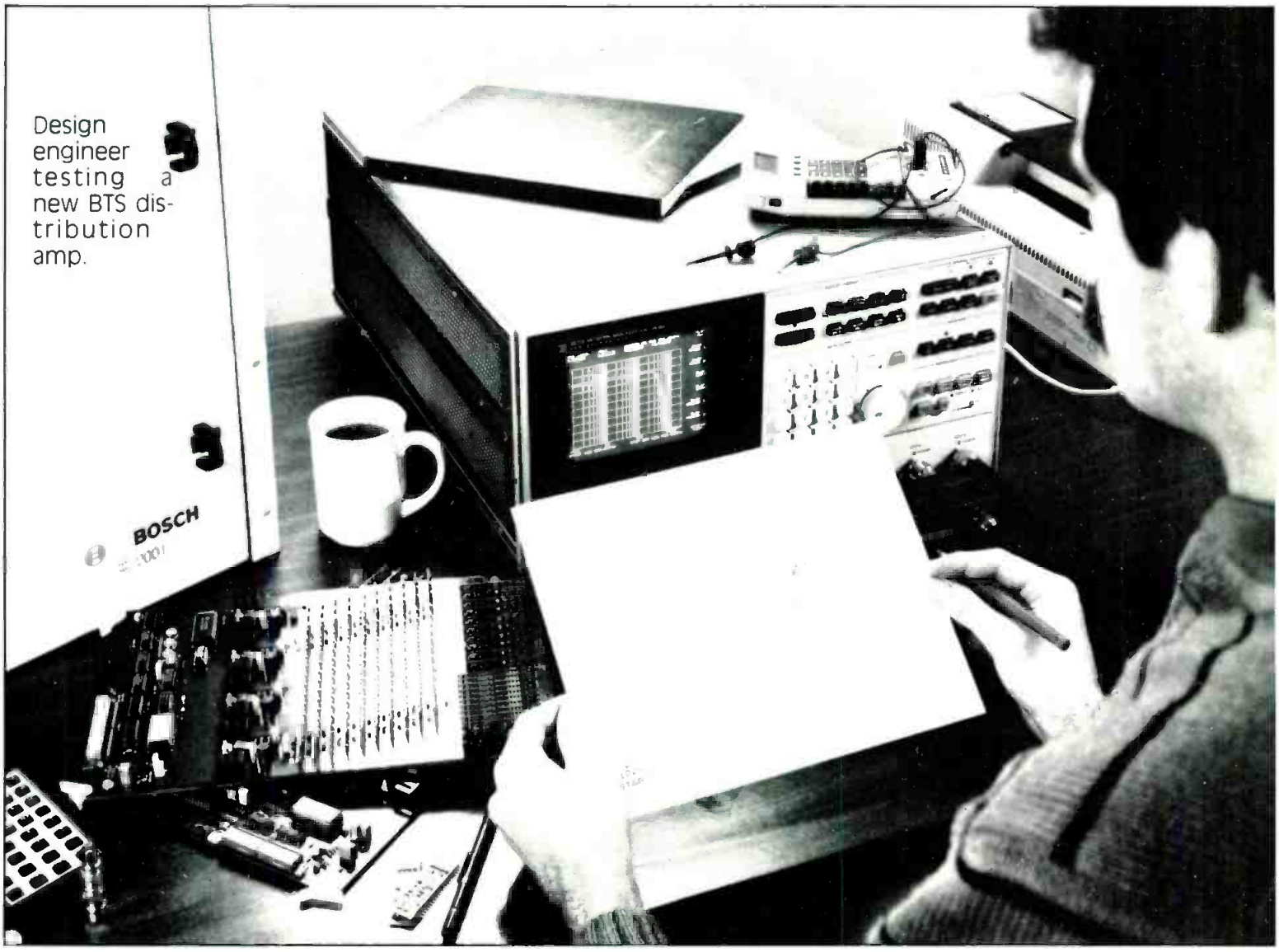

Design engineer testing a new BTS distribution amp.

THE CHANGING REQUIREMENTS FOR VIDEO DISTRIBUTION SWITCHING

What's the right bandwidth for tomorrow? And what technologies will provide the needed specifications?

BY DAVE BYTHEWAY

As signal distribution systems have evolved from patch panels to distribution amplifiers through present-day routing switchers, frequency response specifications have grown from the 10 MHz bandpass of the original TeleMation TVS/TAS-1000—perhaps the first modern routing switcher—to the 20, 30, 60, even 100 MHz switchers now being offered. The choices are numerous.

But why the variety? Do these performance levels represent the best that a particular manufacturer can manage on the way to the real target? Are they each someone's idea of the optimum performance versus cost balance for the next 15 years? Or were they each made to fit a particular niche as the best switcher for that application?

In the past, with a 4.2 MHz video channel allocation as the final (and only) distribution path, bandwidth had a natural boundary. Now, however, we have three three-wire component analog video schemes (RGB; Y, B-Y R-Y; and Y, P_b, P_r), we have multiplexed analog component, we have many and various HDTV proposals, and we have digital effects and graphics generators (to name a few). We don't know what the future holds for these ideas. We do know that they have different bandwidth requirements. Unfortunately, the higher the bandwidth needed, the more expensive and more limited in size the distribution switcher tends to be.

To begin with a familiar reference point, the bandwidth requirement for composite video is considered to be about 5 to 7.5

MHz. But for current equipment these numbers should be very flat, within about 0.1 dB down to 5 MHz and less than 0.5 dB down to 7 MHz. The requirement for component analog video is really very similar.

Multiplexed analog component (MAC) requires roughly twice the bandwidth needed for composite video—something like 10 to 15 MHz. The MAC bandwidth must also be very flat, under 0.2dB to -10 MHz. Looking to the future, the requirements increase. HDTV, at least in the pure 1125-line realm, will need to pass frequencies up to 30 MHz.

As for digital video, which is defined more in terms of bits per second or rise time rather than the equivalent bandwidth, the bandpass requirement is several times higher still. However, while research in video switching is being conducted, this article will be confined to issues in the analog domain.

Frequency response

First, how do switcher manufacturers specify frequency response of their products? If we see a spec like "30 MHz bandwidth" without the "*x* dB down" number, it doesn't tell us very much. It is true that the traditional measurement of bandwidth for electronics has been at the -3 dB point; so if we see a specification of "30 MHz bandwidth" without further elaboration we would just assume that the device passes frequencies up to where the amplitude has dropped by 3 dB. However, at frequencies that are of interest or of need, -3 dB by today's standards is unacceptable—that's a 30 percent drop in amplitude. A reasonably acceptable drop for composite video, as already mentioned, is 0.1 dB—about 1 percent.

Still there are other issues. It's not too difficult to build an amplifier that has a large bandwidth, and is quite flat for the important frequencies. But at what voltage level? If we decrease the input level, we can easily get an increase in the bandwidth. The trick comes in getting a sufficient output amplitude at an increased bandwidth. So in order to compare two amplifiers, we need to use the same input level. We prefer to use a full amplitude input—0.7 volt video and 0.3 volt sync. Others may use a lower level input as their reference figure.

This at first might look like an easy way to get a higher bandwidth number, but you can argue it both ways. You may say that reasonable pictures coming from a TV camera do not have 30 MHz, 100 IRE square waves, and base your specification on 0.2 or 0.3 volt video. On the other hand, you may be very concerned with a graphics device that will generate this kind of signal.

As for digital video, which is defined more in terms of bits per second or rise time rather than the equivalent bandwidth, the bandpass requirement is several times higher still.

As an additional means of comparison, manufacturers are moving to a "slew rate" specification, which is given in volts per microsecond. This tells us how fast the signal can change amplitude and still make it through the amplifier without distortion. Most people first encounter the term "slew rate" with op-amps, when, for example, they might find out than an op-amp will go to 10 MHz or much more before it hits unity gain. But its "full power bandwidth," or the frequency at which it can deliver a full amplitude signal, may only be 100 kHz—or less. It's simply a problem of how fast the output voltage can change. Slew rate is related to rise time, but it simply isn't the same as a rise time measurement.

Suppose we have a square wave test signal, such as that shown in Figure 1, being run into "Amplifier." The slew rate is shown by the slope of the vertical transitions.

Now we look at Amplifier B (Figure 2), which has a lower slew rate. At a low amplitude, maybe 50 percent or 25 percent of normal, the square wave may look great—the rise time is still short, so the frequency response is much the same as it was for Amplifier A.

Yet if we take the signal up to normal amplitude. (Figure 3), we see that Amplifier B is now "slew rate limited." Since the slew rate is constant, the signal can only increase by *y* volts in *x* microseconds. More rise time is needed to get to the full amplitude, and the waveform starts to lean over—it becomes distorted. We lose some of the higher frequency harmonics, and we see a decrease in bandwidth.

System size

Although slew rate and frequency response are basic performance benchmarks for routing switchers, we still have to consider system size. You may have a very high slew rate, but only within a 10 x 10 matrix. As a switcher gets bigger, generally the specifications will have to suffer. So the question to ask, "How good will the switcher function at the size I'm getting?" Unfortunately, the only way to answer this question precisely is to build the switcher first.

The exact effect of expansion depends on the design. In our case, each additional ten outputs requires another card cage, and the inputs must now all be looped to this cage. As this process continues, we add more and more coax, which gives us more cable losses, and so, less bandwidth. A similar thing occurs as we increase the number of inputs. Eventually, almost any switcher will require the addition of distribution amplifiers to maintain the bandwidth specification, which is why BTS and others have developed complimentary lines of wide band distribution amplifiers.

However, one of the differences between brands, is the point at which these DAs—with their ad-

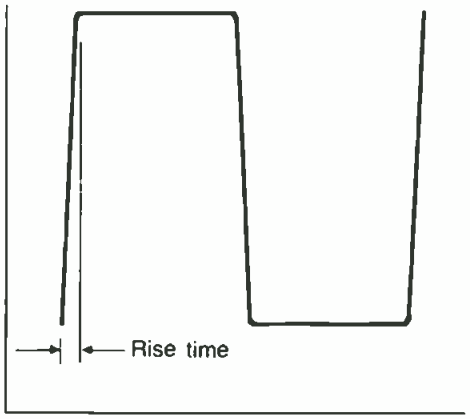

Figure 1: *"Amplifier A" slew rate.*

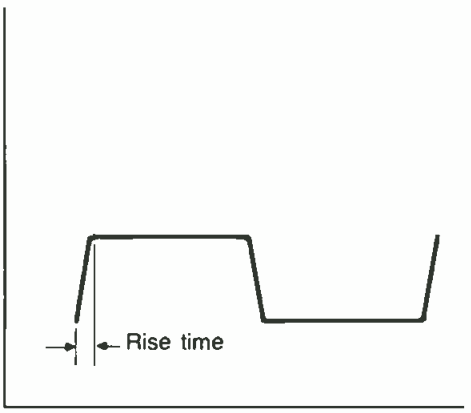

Figure 2: *"Amplifier B" at reduced amplitude*

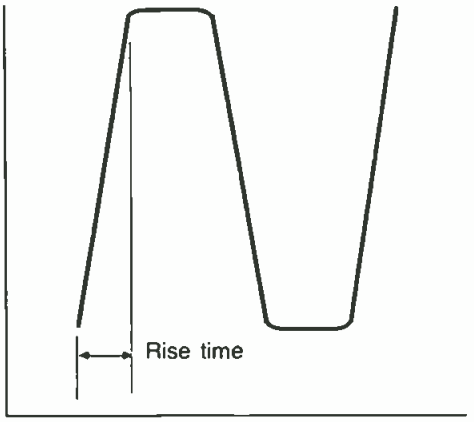

Figure 3: *"Amplifier B" at full amplitude.*

ditional cost—must start to appear.

It is possible to decrease the amount of cage-to-cage wiring by increasing the size of the basic building blocks, but this may force the customer to buy more switcher than he needs.

The switcher designer thus has to search for the best mix of performance, cost, and expandability, and hope that his finished product will fit the needs of the marketplace a good percentage of the time. Once these overall dimensions are settled, he can get to work on the more straightforward issue of electrical performance, and in particular, bandwidth.

Surface mount technology

In order to improve bandwidth performance, we've had to make the circuitry somewhat more complicated, and smaller. This led us to surface mount technology, which involves the use of smaller components that solder directly on the surface of the board. In other words, there are no leads in the usual sense. And therefore no leads penetrating through holes in the board. The surface mount parts can fit into about a quarter of the area of ordinary parts: for example, instead of putting resistor leads in on 0.4 inch centers, we can put them in on 0.2 inch centers. We use these surface mount components in our new switcher's building blocks—amplifier modules, crosspoint modules, and so on.

As an alternative approach, some manufacturers use hybrid circuits, these being a combination of discrete and integrated parts. For example, a hybrid might have miniature transistors and capacitors soldered on but have resistors printed on using resistive ink. While these are pretty much impossible to repair, they may offer the advantage of making the product a little less expensive. We have investigated hybrids, but we haven't found a lot of savings for our particular design.

Repairability is definitely an issue for surface mount also. We have changed surface mount parts using a traditional miniature soldering iron, but the recommended practice is to use a special workstation. The customer who wants to repair his own boards will need to put a little more investment into such tools. However, surface mount technology is becoming much more popular, showing up in consumer equipment, industrial equipment, and in ENG cameras. We are not the first to send surface mount parts into a television station.

Besides giving us room for more parts (and presumably better circuits) the principle benefit of surface mount technology is less stray capacitance and less inductance in the leads. By reducing the unwanted capacitance to ground, we preserve the high frequency parts of the signal and so maintain bandwidth.

Smaller circuitry can lead to crosstalk problems, but there's a couple of solutions available. One is shielding: we use the entire bottom layer of the multilayer board for this purpose. Another is layout: when you are looking at an amplifier in terms of stray capacitance, you try to make the amplifier itself smaller.

Utilizing the mother board

Another idea being pursued by some manufacturers, including BTS, is to treat the mother board bus as a transmission line. This provides consistent performance across the width of the board—as compared to the old design, in which bandwidth varied slightly at higher frequencies according to the position of the crosspoint board on the bus.

Besides improving consistency, the transmission line approach allows longer mother boards which, for our particular switcher design, is very significant. The longer the mother board, the more inputs that can be wired directly to each output decade amplifier card, and the better the bandwidth performance in large systems. **BME**

Author's note: *The author wishes to thank Marc Walker and Dave Quebbeman for their assistance in preparing this article.*

About the author:
Dave Bytheway is the project manager of and a design engineer for the TVS/TAS-2001 switcher. He joined BTS in 1984 as a consultant and became a full-time employee in 1986.

The Capacitor Color Code System

By Ronald F. Balonis

The same basic color code system used for resistors (see last month's PCs in Engineering column, "Resistor Color Code System," on p. 91) is also used for capacitors. However, with capacitors it's a little more complicated because there are more characteristics needed to identify a capacitor.

That makes the task of identifying color-coded capacitors more complex than for resistors. It also makes the program to do it a bit more complex.

The problem is that capacitors come in all shapes and sizes. Fortunately, the basic color code system is used only on mica-capacitors and relatively small paper and ceramic capacitors.

Capacitors are more complex to identify. The value of capacitance can range from as small as 1 picofarad (pFd) to 1000 microfarads (mFd). Depending on the frequency, capacitors exhibit resistance and inductance effects. Capacitors are subject to voltage breakdown. And, capacitance varies with temperature.

To keep the program relatively small, and to limit its complexity, a shortened capacitor code table is used. The program knows nothing about voltage breakdown and the temperature coefficients for extended range ceramic capacitors; for these you must refer to a capacitor code chart in an electronics reference text. For everything else, your PC and CAP.BAS can tell you all you need to know.

```
                    ---------------------------------------
                ---|        Capacitor Code systems         |---
                    ---------------------------------------
          ---------------- Paper ---------------
< 1 > =          [Dot] / [Dot][Dot][Dot]
< 2 > =    [SIL][Dot][Dot] / [Dot][Dot][Dot]
< 3 > = [Band][Band][Band][Band]  [Band][Band]
          ------------ Mica/Button ------------
< 4 > = [WHT/BLK][Dot][Dot] / [Dot][Dot][Dot]
< 5 > =        [Dot][Dot][Dot][Dot][Dot]
< 6 > =     [Dot][Dot][Dot][Dot][Dot][Dot]
          --------- Molded/Disc Ceramic --------
< 7 > =          [dot][dot][dot][dot][dot]
< 8 > =               [dot][dot][dot]
< 9 > =     [ Band ][band][band][band][band]
< 10 > =  [Band][Band][white Band][Band][Band]
          -------- TC Tubular Ceramic ----------
< 11 > =     [Dot][Dot][Dot][Dot]      [Dot]
< 12 > =        [End] [Dot][Dot][Dot][Dot]
< 13 > =     [End] [Dot][Dot][Dot][Dot][Dot]
          -------------- Tantalum --------------
< 14 > =     [ Band ] [Dot] [ Band ] [ Band ]
< 15 > =     QUIT
Select A Color Code System :? 12




                    ---------------------------------------
                ---|        Capacitor Code systems         |---
                    ---------------------------------------
                    -------- TC Tubular Ceramic ----------
                    ---------------------------------------
                ---|      [End] [Dot][Dot][Dot][Dot]       |---
                    ---------------------------------------

Enter the  5  colors.  READ LEFT to RIGHT.
Colors are: BLK/BRN/RED/ORG/YEL/GRN/BLU/VIO/GRY/WHT/GLD/SIL/PNK/

COLOR # 1  <XXX> :? WHT
COLOR # 2  <XXX> :? BRN
COLOR # 3  <XXX> :? GRN
COLOR # 4  <XXX> :? BRN
COLOR # 5  <XXX> :? BLK

Capacitance (mmfd) =  150
Tolerance  (+/-%)  = 20
Temp. Coef. (C)    = *CHECK A CAPACITOR TABLE*   <ENTER>?
```

Figure 1: *Demo screen for CAP.BAS.*

Capacitor characteristics

Like resistors, the marking conventions on capacitors are similar to a degree; there's an added program dimension to account for differences in color markings (bands, dots, or a combination of each), the sequence in which they must be read, and the type (paper, mica, molded/disc ceramic, tubular ceramic, and tantalum).

The capacitor color code system program, CAP.BAS, recognizes all of those types, followed by a subset of color code systems used for each. There are a total of 14 capacitor code systems to select from. This should cover most color coded capacitors found in broadcast equipment.

Like the RES.BAS program last month, CAP.BAS signs on the computer with a listing display of

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Circle 127 on Reader Service Card Page 67

```
0  'CAP.BAS ---Capacitor Code systems---
10 'By Ronald F. Balonis  2/6/88
15 '
20 DIM TBLE$(13,11),CODE$(15,2),BND(6)
25 I=0:II=0:J=0:K=0:CODE$="":KOLR$="":RESTORE
30 '-CAP TABLE-|PAPER|-MICA--|--CERAMIC--|TANT|
31 '         1/2 M   T   K   M   T   M   T    TC   M    E
32 DATA BLK, 0, 0,20, A, 0,20, 0,20,   0, 0, 10
33 DATA BRN, 1, 1, X, B, 1, 1, 1, 1,-033, 1,  X
34 DATA RED, 2, 2, X, C, 2, 2, 2, 2,-075, 2,  X
35 DATA ORG, 3, 3, X, D, 3, X, 3, 3,-150, X,  X
36 DATA YEL, 4, 4, X, E, 4, X, 4, X,-220, X,6.3
37 DATA GRN, 5, 5, 5, F, X, 5,-9, 5,-330, X, 16
38 DATA BLU, 6,-9, X, X, X, X,-9, X,-470, X, 20
39 DATA VIO, 7,-9, X, X, X, X,-9, X,-750, X,  X
40 DATA GRY, 8,-9, X, X, X, X,-2, X,   *,-2, 25
41 DATA WHT, 9,-9,10, X, X, X,-1,10,   *,-1,  3
42 DATA GLD,-9,-9, 5, X,-1,.5,-9, X,   X,-9,  X
43 DATA SIL,-9,-9,10, X,-2,10,-9, X,   X,-9,  X
44 DATA PNK,-9,-9,20, X,-9, X,-9, X,   X,-9, 35
50 FOR I=1 TO 13:'--LOAD THE CODE TABLE
51  READ A$: KOLR$=KOLR$+A$+"/"
52  FOR II=1 TO 11
53   READ B$:IF B$="X" THEN B$="**Error**"
54   TBLE$(I,II)=B$
55  NEXT II
56 NEXT I
60 DATA "         Capacitor Code systems         "
61 DATA "---------------- Paper ----------------" ,3
62 DATA "        [Dot] / [Dot][Dot][Dot]         " ,V1M2
63 DATA "  [SIL][Dot][Dot] / [Dot][Dot][Dot]     " ,12MTK
64 DATA "[Band][Band][Band][Band]  [Band][Band]" ,12MTVV
65 DATA "------------- Mica/Button ------------" ,3
66 DATA "[WHT/BLK][Dot][Dot] / [Dot][Dot][Dot] " ,12MTK
67 DATA "       [Dot][Dot][Dot][Dot][Dot]       " ,12MTK
68 DATA "   [Dot][Dot][Dot][Dot][Dot][Dot]      " ,123MTK
69 DATA "--------- Molded/Disc Ceramic --------" ,4
70 DATA "        [dot][dot][dot][dot][dot]       " ,X12MT
71 DATA "             [dot][dot][dot]           " ,12M
72 DATA "   [ Band ][band][band][band][band]     " ,X12MT
73 DATA " [Band][Band][white Band][Band][Band] " ,12MT
74 DATA "-------- TC Tubular Ceramic ----------" ,3
75 DATA "   [Dot][Dot][Dot][Dot]      [Dot]     " ,12MTV
76 DATA "      [End] [Dot][Dot][Dot][Dot]       " ,X12MT
77 DATA "   [End] [Dot][Dot][Dot][Dot][Dot]     " ,YZ12MT
78 DATA "-------------- Tantalum -------------" ,2
79 DATA "   [ Band ] [Dot] [ Band ] [ Band ]    " ,1M2E
80 DATA "   QUIT" ,0000
90 '
100 CLS:I=0:READ CODE$(0,0):GOSUB 600:'-SIGN PROGRAM ON
110 FOR I=1 TO 5:'----SHOW CAPACITOR CODE SYSTEMS
115  READ TYPE$:READ J:PRINT TAB(8) TYPE$
120  FOR II=1 TO J
125   K=K+1:READ CODE$(K,0),CODE$(K,1):CODE$(K,2)=TYPE$
130   PRINT"<";K;"> = ";CODE$(K,0)
135  NEXT II
140 NEXT I
150 '
200 PRINT"Select A Color Code System :";
205  INPUT J: IF J<1 OR J >K THEN RUN
210   IF J=K THEN STOP
215 '
220 CODE$=CODE$(J,1):TYPE$=CODE$(J,2)
225 KK=4:TC=9:E=7:C$="mmfd":M=2:T=3:'-ASSUME PAPER
230 IF INSTR(CODE$(J,2),"Mic") THEN M=5:T=6
235 IF INSTR(CODE$(J,2),"Cer") THEN M=7:T=8
240 IF INSTR(CODE$(J,2),"Tan") THEN M=10:E=11:C$="mfd "
245 '
250 CLS:I=0:GOSUB 600:PRINT TAB(25) CODE$(J,2)
260 I=J:GOSUB 600:PRINT:II=LEN(CODE$(J,1))
270 '
300 PRINT"Enter the ";II;" colors.  READ LEFT to RIGHT."
305 PRINT"Colors are: ";KOLR$:PRINT
350 FOR I=1 TO II
355  BEEP:BND$=""
360  PRINT "COLOR #";I;" <XXX> :";:INPUT BND$
365  IF BND$="" THEN RUN ELSE K=INSTR(KOLR$,BND$+"/")
370   IF K=0 THEN LOCATE 11+I,1:GOTO 355
375    BND(I)=INT(K/4)+1
380 NEXT I:PRINT
390 '
400 '-------------COMPUTE THE CAPACITOR
405 C=VAL(TBLE$(BND(INSTR(CODE$,"1")),1))*10
410 C=C+VAL(TBLE$(BND(INSTR(CODE$,"2")),1))
415 K=INSTR(CODE$,"3")
420 IF K>0 THEN C=C*10+VAL(TBLE$(BND(K),1))
425 C=C*10^VAL(TBLE$(BND(INSTR(CODE$,"M")),M))
430 PRINT "Capacitance (";C$;") = ";
435  IF C=<0 THEN PRINT  "**ERROR**"; ELSE PRINT C;
440 '
445 K=INSTR(CODE$,"T")
450  IF K=0 THEN 465 ELSE T$=TBLE$(BND(K),T)
455   PRINT:PRINT "Tolerance  (+/-%)  = ";T$;
460 '
465 IF INSTR(CODE$,"V")>0 THEN E$="*CHECK TABLE*":GOTO 480
470  K=INSTR(CODE$,"E")
475   IF K=0 THEN 490 ELSE E$=TBLE$(BND(K),E)
480    PRINT:PRINT "Working voltage    = ";E$;
485 '
490 K=INSTR(CODE$,"K")
495  IF K=0 THEN 510 ELSE K$=TBLE$(BND(K),KK)
500   PRINT:PRINT "Characteristic     = ";K$;
505 '
510 IF INSTR(CODE$,"YZ")>0 THEN TC$="*":GOTO 525
515  K=INSTR(CODE$,"X")
520   IF K=0 THEN 590 ELSE TC$=TBLE$(BND(K),TC)
525    IF TC$="*" THEN TC$="*CHECK A CAPACITOR TABLE*"
530     PRINT:PRINT "Temp. Coef. (C)    = ";TC$;
580 '
590 PRINT "   <ENTER>";:INPUT J:RUN:'-AND RESTART
595 '
600 '-----------------PRINT A CAPACITOR
605 PRINT TAB(20) "     ------------------------------------"
610 PRINT TAB(20) " ---|";CODE$(I,0);"|---"
615 PRINT TAB(20) "     ------------------------------------"
620 RETURN:'-------END OF PROGRAM
```

Figure 2: *CAP.BAS, a capacitor recognition program.*

the capacitor code systems it recognizes and prompts for the selection number. Select the one, according to the type, that looks like (or is closest to) the capacitor you have. The computer then displays its second screen, showing the selected capacitor code system and the three letter color words it accepts as input (see Figure 1). At that prompt, enter the colors one by one (use uppercase) reading the capacitor from left to right or clockwise.

If the capacitor code system and the colors for the capacitor are valid, it displays the capacitor's value, and other characteristics. If not, it displays **Error**, indicating that one of the colors was invalid for its position in the code sequence. Either a wrong color code system was selected, a wrong color read/entered, or perhaps it's just not a capacitor.

The program works by looking up the numerical values for each color band/dot in the sequence. It then calculates the value. CAP.BAS starts the same way as RES.BAS, by dimensioning the arrays and allocating the variables (see Figure 2). The capacitor code table is in lines 32 to 44 and the color codes systems in lines 61 to 79, as Data statements. Lines 50 to 55 load the Table array.

Lines 100 to 245 sign-on and prompt for a color code system selection, 1 to 15 to Quit. Lines 300 to 380 show the capacitor type and color code system selected, and it prompts for the colors. A null enter at any of the colors restarts the program. Finally, lines 400 to 530 form a calculation sieve.

The program makes prolific use of the "INSTR" text string function to make "decisions." In lines 230 to 240, it sets the values of M and T for indexing in the code table based on the type of capacitor. In each of the characteristic calculation routines it determines if the calculation is required by the color code system's sequence (CODE$). It is also used to index into the code table according to the code system's sequence, and then to calculate the capacitance.

Have a problem with the program, or just need some help with it? I'd like to know about the problems and will help if I can. I can be reached at WILK-AM, (717) 824-4666.

About the author:
Ronald Balonis is chief engineer at WILK-AM, Wilkes-Barre, PA.

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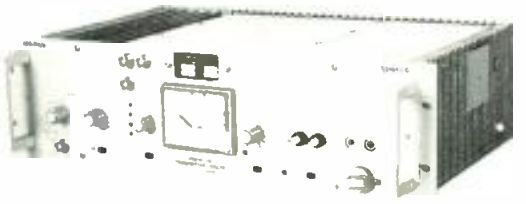

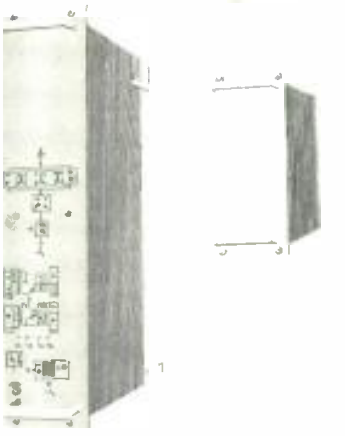

100W Transmitter/Exciter (model S3161C) (left)

- Exceeds 50,000 hours MTBF
- Broadband amplifier
- Mono/Stereo/SCA operation
- Integrated harmonic filter and directional coupler

The key to 500, 1000 and 1500W transmitters (500W amplifier) (centre)

- Redundant RF circuitry
- Separate dual rail electronically stabilized power supply
- Convection cooled

1.25kW Transmitter Amplifier with separate power supply (right)

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* Design patent pending

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New FM Channel Allocation Scheme

By Harry Cole, FCC Counsel

Just when you thought it was safe to calculate exactly what the coverage of your commercial FM station actually is—or, more importantly, might be upgraded to—the FCC is contemplating still more changes in the FM channel allotment process. While these changes may not be as sweeping as those effected in Docket No. 80-90, they could have a greater impact on many existing stations than did the Docket 80-90 changes.

The 80-90 revisions were primarily intended to create opportunities for new stations to be established; the proposals now under consideration are intended more to permit existing licensees to improve their facilities. Since these are the kind of changes that owners and general managers tend to be interested in, and since owners and managers are likely to consult their engineers for information and guidance, it's important to be up to speed on these on-going proceedings, and also their relationship to the FCC's overall system for allotting FM channels.

FM was a relative latecomer to the broadcast media: its first cousin, AM radio, had been around since before the 1920s.

At the risk of retelling a story that may already be well-known, let's start off with a quick history of the existing FM channel allotment scheme. As you probably already know, FM was a relative latecomer to the broadcast media: its first cousin, AM radio, had been around since before the 1920s. In fact, one major problem in the AM allocation scheme arose because the AM industry had initially sprouted up *without* any governmental regulation. When the government tried to instill order into the increasing chaos on the AM band, it was faced with a substantial number of existing stations that were reluctant to relinquish whatever they had already built up in the way of facilities and audience. The government's problems were complicated by the nature of AM propagation, which differs between daytime and nighttime. In any event, Congress ultimately established the FCC partly to straighten these issues out.

"Drop-in" system

In turn, the FCC ultimately adopted a "drop-in" system for authorizing AM service across the country. The system worked more or less as follows: the Commission set up a series of signal protection standards designed to assure existing stations that their signals would be safe from interference from new authorizations; when an applicant filed for a new station (or improvements to an existing station), it had to show that its proposal would "fit," that it could be "dropped in," *i.e.*, that it would satisfy the various protection standards given the distribution of AM stations at the time of the filing.

The drop-in system of allocation is cumbersome. It requires that each application be studied against the overall AM database, a time-consuming and difficult process. It also requires that each application be studied against pending applications, to make sure that no two applications are mutually exclusive with one another. It also prevents, or at least seriously complicates, the easy "window" system of inviting applicants for a given frequency (such as is now in effect for FM). And, because of all these factors, the turn-around time for processing AM applications has tended to be relatively long. In addition, the FCC's AM staff has to deal with complex considerations which are totally foreign to FM and TV allotments.

What do these AM issues have to do with FM? By the 1950s, when the notion of a viable FM broadcast industry began to take shape, the Commission had been thrashing around with the AM drop-in scheme for some 20 years, and it had learned some lessons. Not wanting to create a similarly cumbersome allocation system in the relatively new FM service, the Commission took the bull by the horns and set up an overall channel allotment system *before* the FM industry developed. Thus, when it came to developing standards, the FCC was writing on a clean sheet, as opposed to the situation that it confronted in the 1930s, where an already well-established AM industry had to be reckoned with.

By allotment only

The allotment system, which was adopted in the early 1960s, was based on the notion that the FCC, as opposed to the individual applicant, should decide where any particular FM frequency is to be used. Thus, the Commission established its Table of FM Allotments. That Table (which can be found at Section 73.202 of the Commission's rules) consists of an alphabetical listing of all states, with the listing for each state in turn containing an alphabetical listing of the communities within that state to which one or more FM channels have been assigned by the Commission. If you want to file for an FM authorization

in a particular community, you can do so only if there is a vacant channel listed for that community in the Table. If there is not, you have to file a petition for rule making seeking an amendment to the Table to reflect the addition of a channel to that community.

The decision as to whether or not to allot a particular channel to a particular community is governed primarily by a set of minimum mileage separation standards. Those separations are designed to assure that any new station operating with maximum permissible facilities on an allotted FM channel in a given community will cause no interference to any other station. This is accomplished by assuming, at the allotment stage, that any station operating on the channel to be allotted will be operating at maximum available facilities, and further that all stations already on the air are also operating at maximum. These are not necessarily valid assumptions, but they serve the purpose of keeping channels far enough from one another to eliminate the need for detailed examination of every application that gets filed for any channel.

Under a further refinement of this approach, most FM applicants have historically been precluded from proposing fancy directional antenna systems in order to "squeeze," "shoe-horn," or "drop-in" an application that would otherwise be inconsistent with the minimum mileage separations underlying the FM allotment system. While directionalization has been permitted in some cases involving stations on the air prior to the adoption of the original Table of Allotments (in a move akin to the accommodations accorded AM operators up and running before the FCC came into existence) and to noncommercial stations, it has been unavailable to the vast majority of commercial FM licensees and applicants.

The FCC's attitude has been that, in order for its system to function optimally, it is essential that the mileage separations be preserved. As a practical matter, the more individualized situations are created which do not fit neatly into the allotment scheme, the more complex becomes the task of adding more channels and authorizing more stations on those channels. Again, having learned certain lessons from its AM experience, the FCC has sought to avoid the pitfalls of that experience.

Mileage may vary

The Commission's practical considerations, however, have not been much consolation to existing stations who could improve their facilities but for the minimum mileage standards. Picture a station that could upgrade from Class A to Class C status without adversely affecting anyone else in real-world terms, perhaps because any co-channel or adjacent channel stations are operating with less than maximum facilities and, therefore provide virtually

no chance of harmful interference. Nevertheless, the FCC's analysis up to now has been to disregard a real-world approach and to look instead only at distance between transmitter sites: if that distance falls below the minimum for the separation of, say, co-channel Class A and Class C stations, the would-be upgrade's application fails.

This situation may change. In February the Commission proposed changes that could result in considerable upgrading opportunities for existing licensees. Under the proposal, applicants would be permitted to use directional antennas as well as lowered power and/or antenna height to reduce the distance separations.

The decision as to whether or not to allot a particular channel to a particular community is governed primarily by a set of minimum mileage separation standards.

In other words, the Commission may now be willing to consider applications (but *not* channel allotment proposals) on the basis of the extent of "protection" they offer, in real-world terms, to other stations. As a result notwithstanding the minimum mileage separations specified in the rules if an applicant could demonstrate that using a directional antenna to suppress its signal in a particular direction or reducing its power or antenna height to avoid interference to another station, it might be permitted to upgrade its facilities.

In connection with its proposal the FCC has also requested information concerning the present state of the art of FM directional antennas. Further, as might be expected when the Commission considers venturing into a generally unexplored area such as this, it has a number of questions relative to how such upgrade applications should be processed and whether only certain categories of upgrades should be accepted. Comments have been solicited on these questions, and you should feel free to contribute. A copy of the full Notice of Proposed Rule Making can be obtained from the Commission.

Upgrade opportunities

This potential for upgrading would certainly be a boon for many licensees, particularly those in areas where FM service is particularly congested, where adequately spaced transmitter sites are scarce and where upgrade opportunities have thus tended to be few and far between. Instead of having to find a properly spaced site, the licensee would, at least in theory, have only to find a combination of directionalized antenna system, power and antenna height which would satisfy the noninterference protection standards from its present site. Certainly this would open a number of opportunities. **BM/E**

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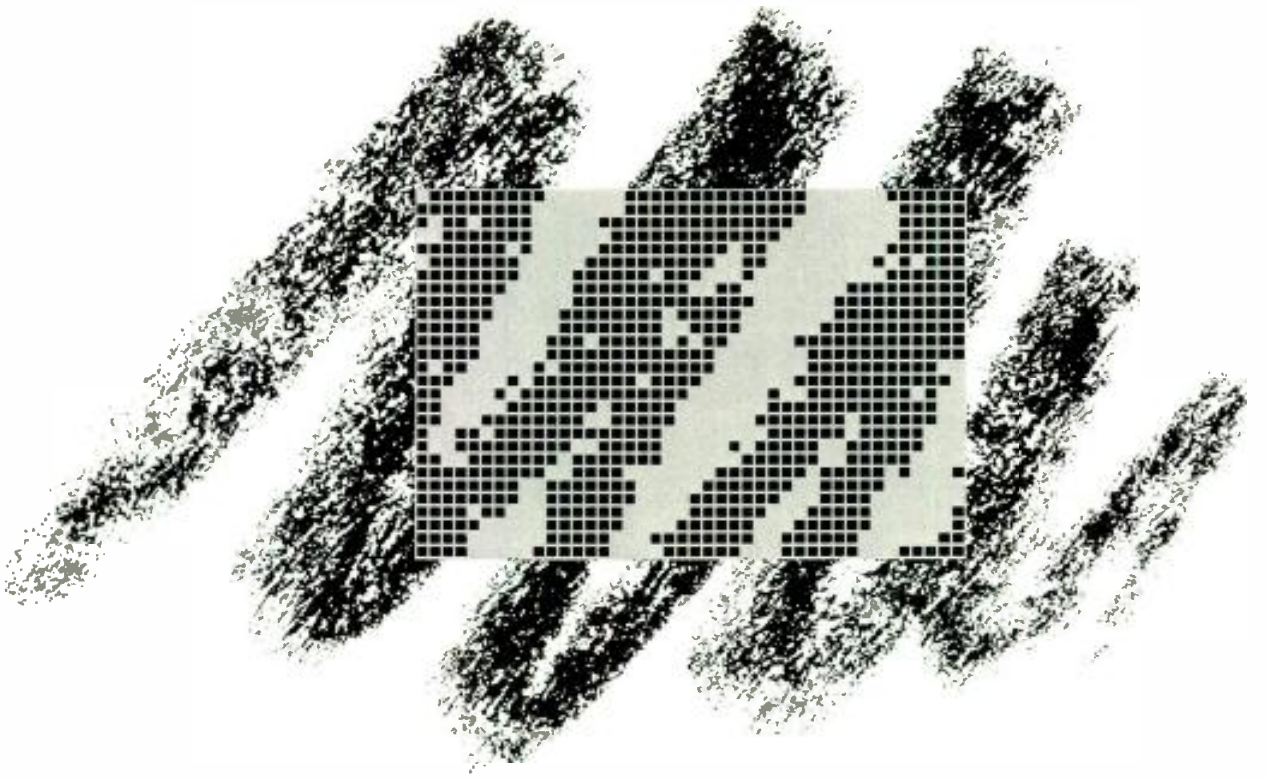

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SSL Launches Digital Console

Solid State Logic announced its all-encompassing digital production center, the 01. The system combines signal processing, storage, mixing, and editing in one compact system. It is now possible to go from conversions from analogue signals to end product in the digital domain, but in an environment that retains analog design. Yet, the electronics makes for better speed and accuracy. Billed as an edit suite in itself, it is complete with eight channel mixer, three stereo tape machines, synchronizer and edit controller, time code reader/generator, analogue to digital converters, and a sampling rate converter.

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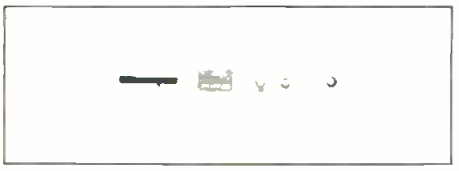


New Stereo Spatial Enhancer from Orban

Orban Associates announces the new model 222A stereo spacial enhancer. Intended primarily for radio broadcast, to add depth to a station's stereo image, the unit can be used in the final processing of stereo CD and cassette masters, as well. Patent-pending technology detects and enhances psychoacoustic directional cues present in all stereo material. Because it operates only on attack transients, the 22A does not increase sensitivity to vertical tracking distortion in disc playback, reverberation, and multipath distortion—all common problems with like equipment. Controls let the user determine the degree of processing. The suggested list is $995.

Circle #201 on Reader Service Card

Timeline Has Lynx Post-Pro System

The new Lynx Post Production System by Timeline combines a powerful, yet friendly, human interface with strong control of the machine. The goal was to simplify control of various machines, even in complex audio-for-video applications. On the keyboard are copious function keys for everything from system status to jog/shuttle.

Sequences are available through macros and a grouping function lets the user call on a set of machines in unison. The Supervisor, which is programmable through the keyboard or separate computer, uses a new ES bus serial communications protocol standard. Lynx time code modules are also employed as a chase synchronizer system—up to eight can be used.

Circle #202 on Reader Service Card

New Diaquest VTR Controller

The DQ-50P from Diaquest is a videographics interface for videotape recorders with parallel control ports. The board and software integrates PC-based or host computer 2D and 3D graphics systems for frame accurate animation sequences. The initial software release controls the Sony VO-5850 and the JVC CR-850U U-Matic recorders, but releases are planned for control of additional JVC machines (including MII) and the Panasonic AG-7500 for S-VHS. On board time code and sync generation cuts down on the need for peripherals.

Circle #203 on Reader Service Card

8-Track on Cassette from Tascam

Tascam has introduced and professional multitrack recorder for professionals. The Tascam 238 Syncaset doubles the previous number of tracks previously available. It has a plethora of attractive specs attached and is capable of hookup with other decks and even synchronization with video. A MIDiiZER will be released soon to allow easy integration. In addition, it features a serial connector for external computer control and an open architecture.

Rapid Systems Combines T&M

A PC-based test and measurement unit that combines spectrum analyzer and digital oscilloscope has been announced by Rapid Systems. It takes advantage of the move toward PC operation of equipment. The R350 is a turnkey, menu driven, two-channel FFT all-in-one product running for $3995. It has a host of advantages in display, buffer storage of data, and bandwidth.

Circle #211 on Reader Service Card

New Sensations from Solidyne

The Argentinean company Solidyne is exporting a new multiband audio processor. The 260 can improve the perceived sensation of loudness, presence, and quality in both music and speech. Oscar Bonello has developed the unit from his theory of adaptive processors. The open-ended architecture will appeal to radio broadcast, recording, and production engineers that appreciate the youth of this technology. The 260/Turbo-FME is a 22 stage (11 per channel) device for FM. The technique is achieved through expansion, compression, and finally splitting of the signal. One of the "tricks" of Mr. Bonello's theory is the process of clipping the peaks in each audio band.

Circle #212 on Reader Service Card

Super TBCs from Prime Image

In order to cope with the higher resolution possibilities presented by S-VHS, but remain compatible with ¾-inch, Prime Image has initiated a series of new time base correctors. The family of TBCs feed directly into the Y/C (S video) input to S-VHS VTRs and the new four-pin-input monitors. The models S TBC+, S TBC.Sync+ are available with and without digital effects. Prices range from $3990 to $8888.

Circle #213 on Reader Service Card

Delta Measures Splatter

With the NRSC bandwidth limitation proposal in the news in Washington, questions of measurement come into play. For AM

stations compliance is important, but not all have access to a spectrum analyzer. Delta Electronics has developed a splatter monitor to be featured at NAB. The monitor measures out-of-band emissions with a speaker to confirm the readings on the meter. Monaural stations can reduce incidental phase moducation (IPM) without purchasing an AM stereo moduation monitor. With the instrument, the enginner can ascertain whether splatter is caused by improperly adjusted processing, by measuring envelope, or Linterstage neutralization by measuring quadriture mode.
Circle #214 on Reader Service Card

New Headphone Distribution Amp from Stewart

A new four-channel headphone distribution amplifier that produces one watt per output regardless of the input has been debuted by Stewart. The HDA-4 is designed for professional applications, such as connection to the cue of a mixer. There are controls for all channels, stereo/mono switch, and front and rear inputs in a rackmount chassis.
Circle #215 on Reader Service Card

Schwem Makes Panning Easier

The new gyrozoom FP-1 pans at a rate of 30 degrees per second, a vast improvement over the six degrees of the previous model. Schwem's image stabilizer lens fits most ⅔-inch ENG cameras and cuts down on vibration. The lightweight lens goes zooms from 60 mm to 300 mm to subjects up to

1000 feet away.
Circle #216 on Reader Service Card

Microwave Filter has Variable Waveguide Attenuator

The Microwave Filter Co. has introduced model 6151, a variable wavelength attenuator. The device reduces signal levels from broadcast remote pickups and STL links to prevent overload in receivers. It attenuates from zero to 15 dB any frequency from 6.8 to 7.2 GHz and includes waveguide flanges. The price is $695.
Circle #217 on Reader Service Card

Celwave Protects for 900 MHz Trunking

Celwave has introduces a new bandpass filter designed to reduce signals outside the 900 MHz trunking receive band. It features an electro-mechanical construction and can be integrated into 900 MHz multicoupler systems. It can protect from high-level in-bands and from cellular base stations operating as high as 894 MHz.
Circle #218 on Reader Service Card

Mickey Gets an Update

A new program offering four additional features are now standard for new Mickey editing systems from Videomedia. Jog/shuttle to move tape by single frames, nonvolitile memory to maintain 50 events despite power loss, field upgrade options through easy compatiblity with IBM PCs, and software-assignable VTRs add flexibility to the existing system. Users that purchased their units after December 1, 1987, may have their units upgraded at no charge, others can get the software for $250.
Circle #219 on Reader Service Card

ICS Expands IEEE 4888

The IEEE 488 specification is the standard method of connecting T&M equipment to computers. Fourteen additional instruments and up to 20 meters of additional bus cable length can be added to a IEEE Bus system using the 4832C buffered IEEE 488 expander from ICS Electronics Corp. The device doubles the specifications due to low speed of older bus instruments and controllers and the adherence of newer equipment. The device is transparent to the program and has no address.
Circle #220 on Reader Service Card

Blonder-Tongue Earthstation Receiver

The new C-band/Ku-band CESR commercial earthstation receiver from Blonder-Tongue Laboratories is now available. Baseband video and audio outputs support the company's MAVM modulator or compatibles. There are two outputs for descrambler and one for unscrambled messages. The front panel includes meters, digital display, and a switch for selecting the preset 6.8 MHz or tuneable audio subcarrier.

Circle #221 on Reader Service Card

HP Enhances Synthesizer/Function Generator

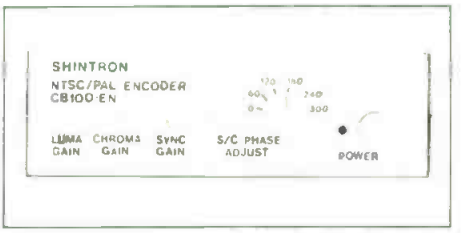
The Hewlett-Packard 3325A sythesizer/function generator is out in a new, enhanced version. It covers frequencies from dc to 21 MHz and offers modulation source, discrete sweep, and RS-232-C interface, as well as standard interface. The new model acheives or exceeds the 30,000-hour MTBF of its predecessor.

Circle #222 on Reader Service Card

"Two-in-One" SCA Generator from BTC

The newly-formed Broadcast Technology of Colorado is on-line with the model 1000 SCA generator. Features include simultaneous dual channels, making the device "two in one." Optional mute module, 2:1 compressor, and a very soft audio processor/limiter are available. List price is $375.

Circle #223 on Reader Service Card



New Shintron Candybox

The model CB 100-EN PAL encoder is the most recent addition to the Shintron Candybox line of broadcast, video, and computer accessories. Riding on the trend toward miniaturization, the manufacturer has made it possible to store three of these units in one rack tray. Unlike conventional encoders that require blanking, sync, subcarrier, and so forth, this device requires only system colorback to encode.

Circle #224 on Reader Service Card

Business Briefs

In news from the recent **NAB** show in Las Vegas, **Ampex** reported a record high for television equipment orders; nearly double the number taken on the NAB floor last year. Combined digital recorder orders totalled over 300 units for an estimated $30 million; 25+ orders were logged for the ACE 25 editor; and numerous orders "across the entire product line" were reported, according to George Merrick VP/GM—Video Systems Division.The NAB news mirrors a general "up" trend occurring in Redwood City as Ampex posted a 19 percent sales increase this year, with total sales reported at $619 million for fiscal 1987. President and CEO Max Mitchell pointed to market growth in all company divisions as well as to a 31 percent increase in international sales as being emblematic of the company's health. Ampex has recently been involved in turnkey installations overseas in Denmark, Kenya, and the Soviet Union. In **New Zealand**, for TVNZ, Ampex orchestrated an "over-the-weekend" move for the network to larger, better-equipped facilities.

In response to growing automation incompatibility problems, the **National Computer Graphics Association (NCGA)** and the **Society of Manufacturing Engineers (SMA)** held seminars and demonstrations at the recent NCGA show in Anaheim, CA. The general problem, according to the association, involves departments or functions within a company handled by independent, incompatible automation systems. The goal of both the system integration demonstrations and the Integrate '88 seminars was to show how industry standards could be used to exchange information and images between systems... Attendance figures on the NCGA show, incidentally, indicate that, at 36,000 registered attendees, it was the largest computer graphics show ever. A 30-minute, magazine-format video show report can be obtained by calling **EDR/Media**, (216) 751-7300.

In other organization news, the **Radio-Television News Directors Association (RTNDA)** has officially come out in oppostion to the recent recommendations of the National Transportation Safety Board (NTSB) to impede news coverage from aircraft. In comments to the FAA, RTNDA president Ernie Schultz reaffirmed his organization's interest in the safe operation of newsgathering aircraft, but rebuked the NTSB's recommendation's as being "too far-reaching." Schultz also announced the creation of an Aviation Safety Committee within the RTNDA to work on newsgathering aircraft safety issues.

Radio syndicator **Westwood One** has gone public with an offering of 2.5 million shares of common stock it was recently announced. Comprising 2 million shares of company stock and 500,000 shares from a selling shareholder, the offering is expecting to bring in proceeds for the company's planned acquisitions of radio stations and other complementary businesses.

Solid State Logic (SSL) has logged several recent sales: **HBO Studio Productions** has received delivery of a new SL-6000 E-Series console for its new audio post room...**Soundcastle Studios**, Los Angeles, has re-equipped its facility with an SL-4000 G-Series console, automated with the Total Recall package...**Todd-AO/Glen Glenn Sound** is adding two more SL-5000 M-Series consoles to its growing equipment arsenal...And **Encore Studios**, Burbank, CA, has just received delivery of a 56-input 600-E console to serve duty on both its music recording projects and on its growing number of commercial productions

Promotions this month: Walter Rice; new director of sales for **Continental Electronics**...And Richard S. Hadju has been named president and CEO of **Orion Research, Inc.**

Celebrations on both coasts were held by Fuji Photo Film USA recently to celebrate the success of ABC's coverage of the 1988 Winter Olympics in Calgary and Fuji's role as exclusive supplier of the network's videotape. Customers and Fuji employees at the Sporting Club in New York watched and cheered on American athletes during the games. Left to right: John Malaspina, manager of corporate purchasing, Cap Cities/ABC; Loretta Malspina; Tom Volpicella, Northeast district manager, Fuji; Charles Couture, director of corporate purchasing, Cap Cities/ABC.

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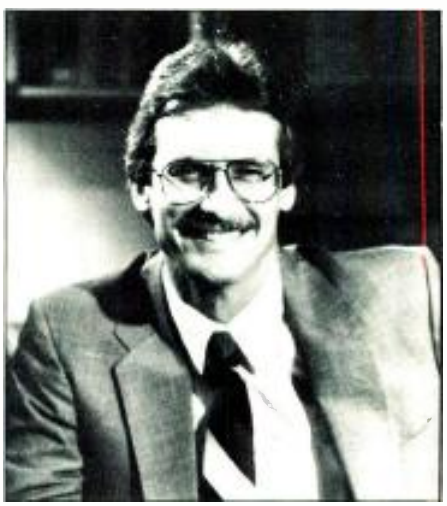
Job Opportunities

Image, Stereotypes, and the Broadcast Engineer

By Sim A. Kolliner



Just as we all project an image, we also have preconceived notions about others. Asked to describe, for instance, an accountant, one works from various kinds of information—some based on first-hand experience, some based on stereotype. Yet, while we laugh along with the rest of the crowd, we should be aware that we're sometimes the brunt of the jokes ourselves.

Broadcast engineers have a stereotype: the image of a nerd, complete with pocket protector, pens, and screwdrivers. According to the image, we wear cheap, wrinkled clothes, horn-rimmed glasses repaired with white adhesive tape, we don't bathe regularly, and we speak only "Engineerese."

Our business is made up of diverse characters. It's unfair that any one group should get saddled with an incorrect notion that they are not "regular" people.

Things change quickly in technology-related fields. The operational requirements in broadcast engineering have changed drastically in the last ten years. If there ever was a time that the engineering manager had his hand in the tool box or in some way doing anyone of the things that make up the stereotype, those days are long gone. Today, he or she is more likely to be found in a corporate situation concentrating on budgets, plans, and on managing personnel.

Even the title chief engineer is becoming obsolete. The term smacks too much of the kind of engineer who wears striped overalls, stokes a furnace, and blows the whistle on a train. Today the *engineering manager* is a department head, in charge of millions of dollars of equipment, large staffs, and makes decisions as important as any other department head in the business.

Perhaps many engineering professionals are not interested in climbing the corporate ladder. That's fine. But we still must be objective about the image that we project.

Several years ago, I was introducing myself to a new employee. When I said that I was the director of engineering, he said, "Really? You don't look like an engineer, you look like a salesman." Talk about double application of stereotyping! I didn't know whether to feel good that I didn't look like an engineer or bad that I looked like a salesman.

Reputation is the freeze frame, and image is the video. Reputation is the combination of actual projected image and people's perception of that image. I'd like to suggest that we all do a bit of self-analysis to find out what video people are seeing of us. We have to playback ourselves as the freeze frames are stored by the "perceivers."

Communicating an image

One of the most important aspects of image is communication. True professionals are capable of communicating in terms that fit the occasion. How well can you talk about technical issues in "layman's terms?"

We may not even be aware of all the ways we are being judged. The most educated and capable person can be shot down by the simplest things. One example is spelling and grammar.

Another large factor of image is appearance. True, the examples given at the beginning of this piece are ridiculous to those in the know. They are, unfortunately, indicative of the kind of battle we're up against.

Learning to "play the game" is no different than learning a new set of procedures for aligning a piece of equipment. We learn procedures to broaden our experience, capabilities, and value as an employee. Leaning how to project a professional image and change the stereotype will not only enhance our ability to make a living doing something we enjoy: The presentation of the professional image will eradicate the old prejudices and raise broadcast engineering to the level it so desperately deserves.

About the author:
Sim Kolliner is the director of engineering at WHIO-TV, Dayton, OH.

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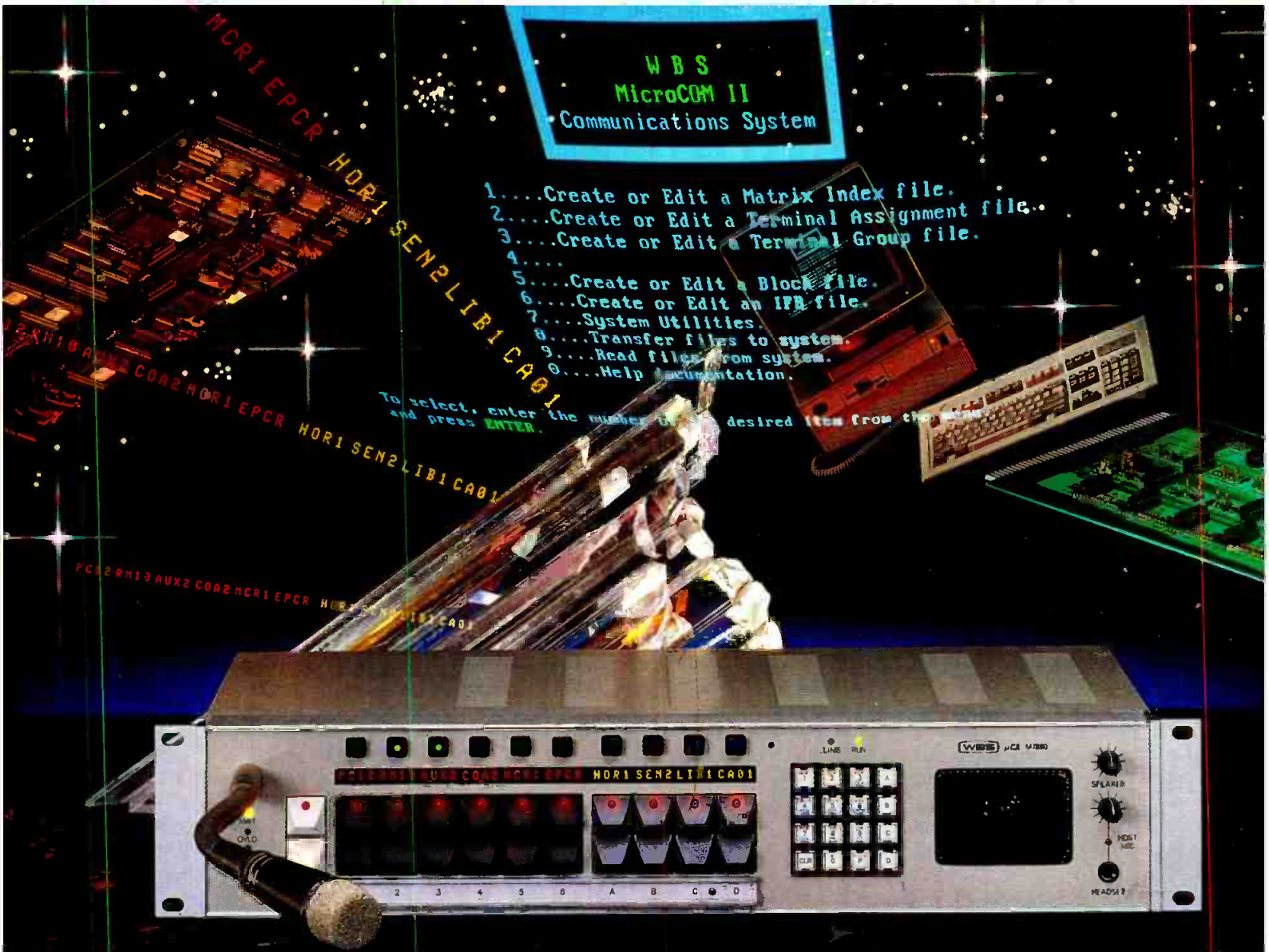

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