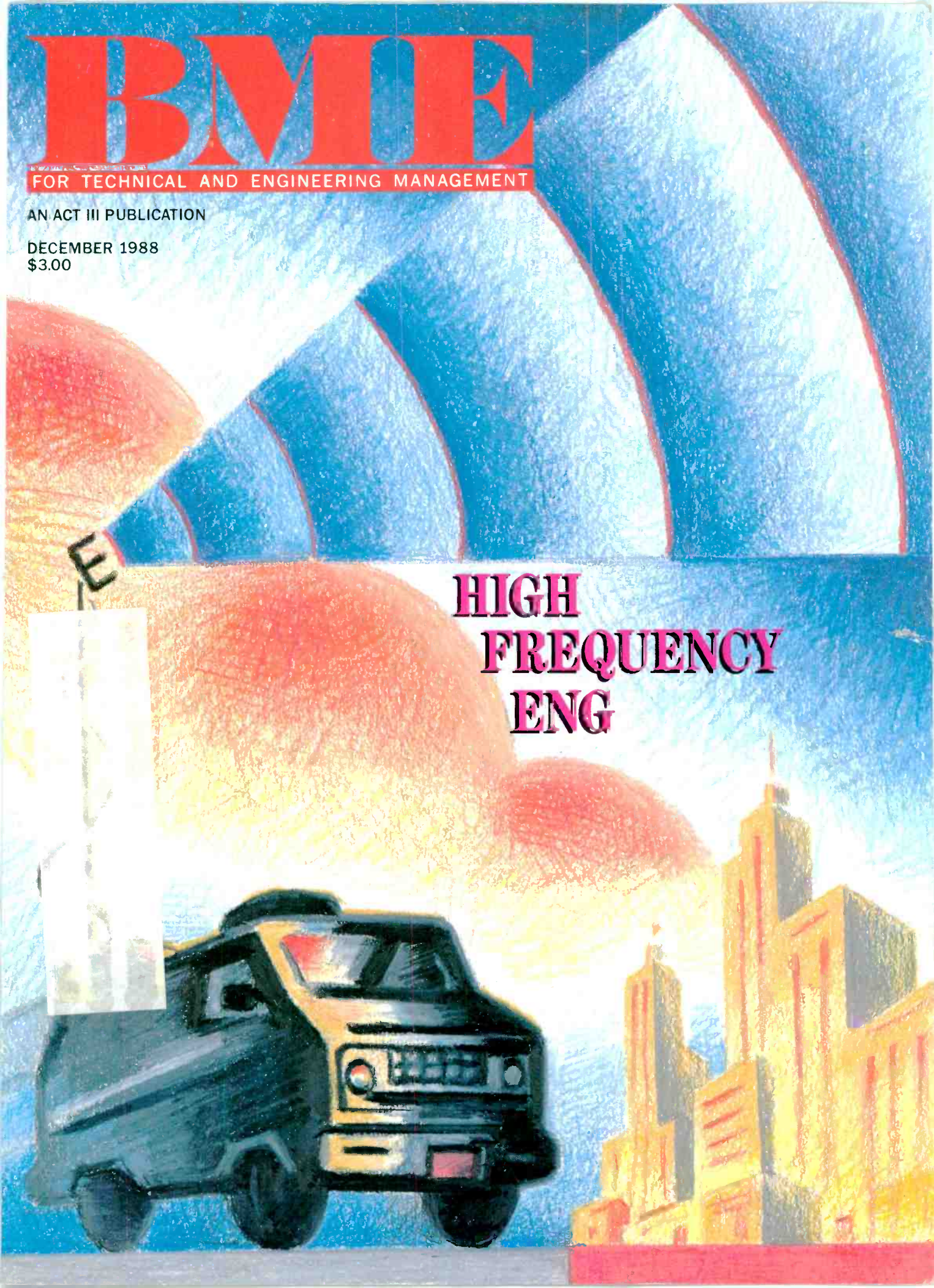
BME

FOR TECHNICAL AND ENGINEERING MANAGEMENT

AN ACT III PUBLICATION

DECEMBER 1988
$3.00



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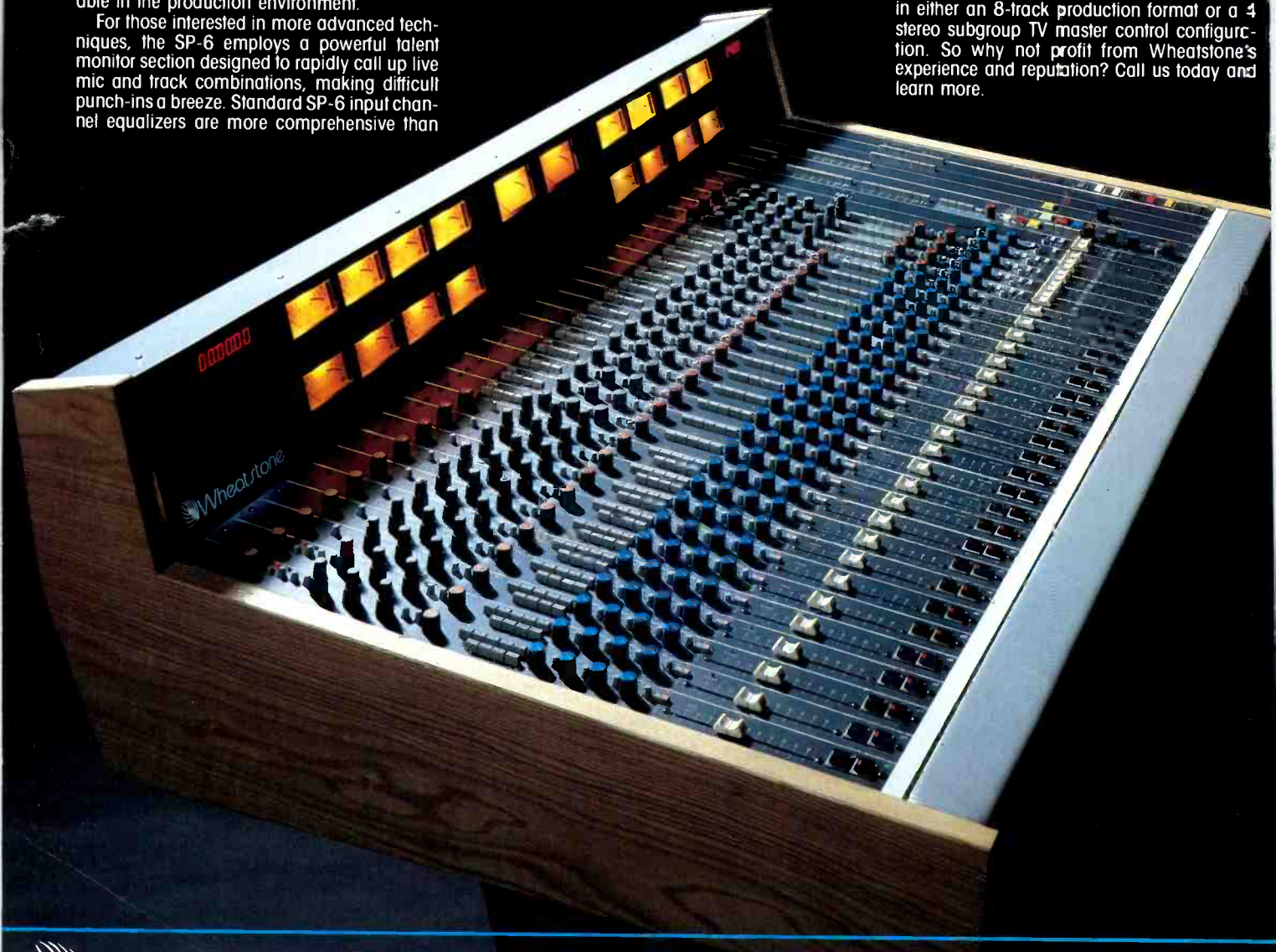

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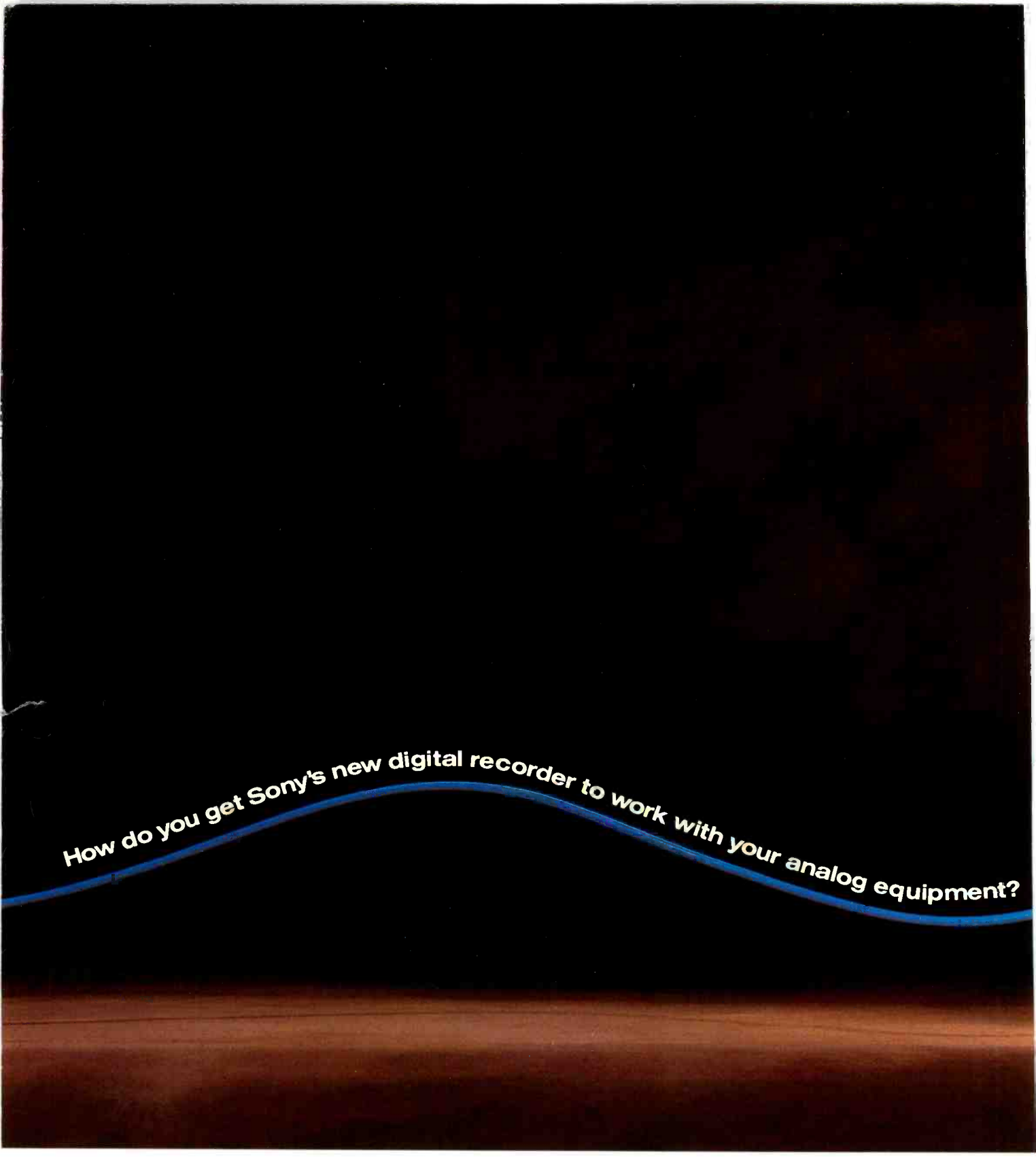

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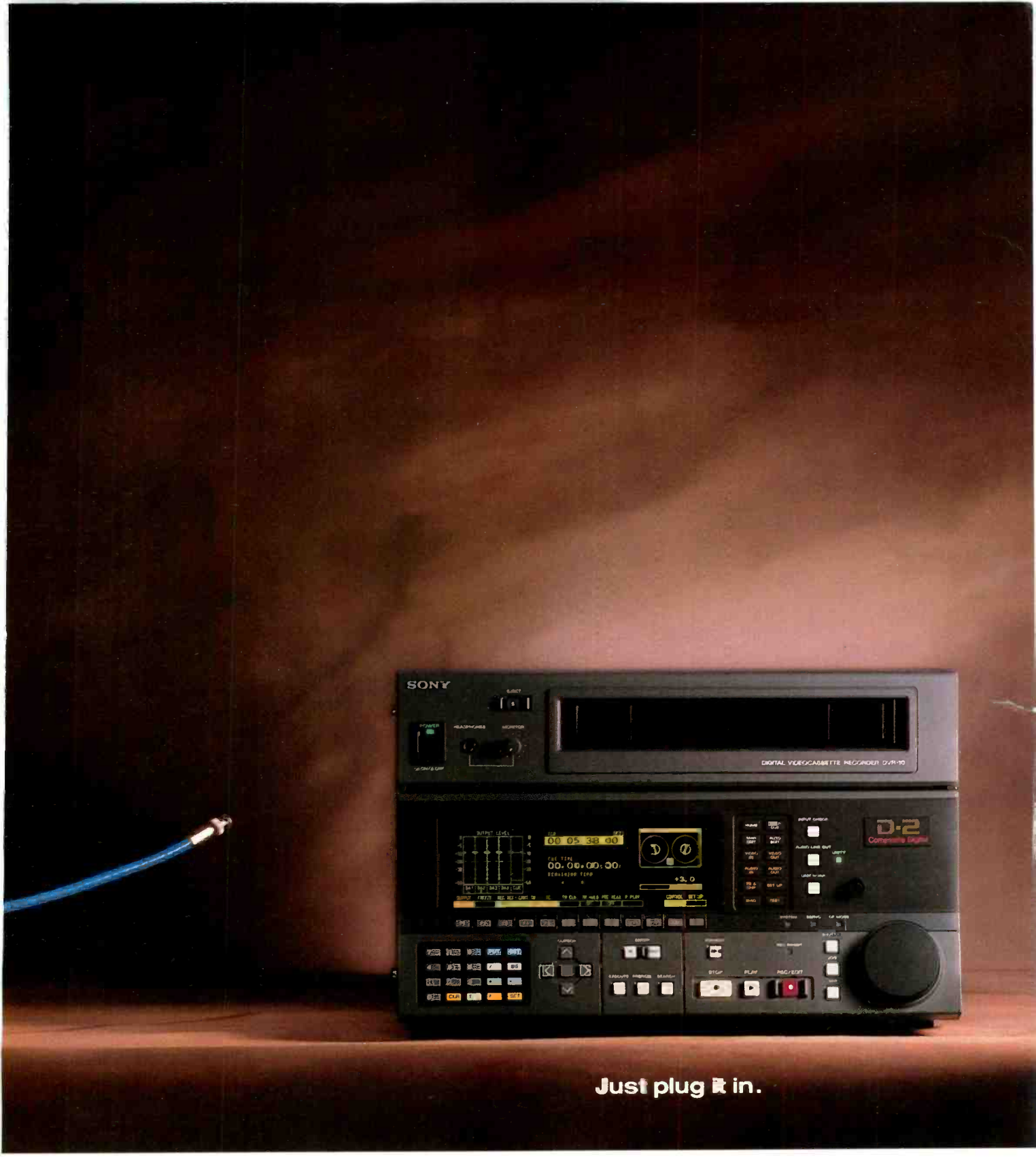

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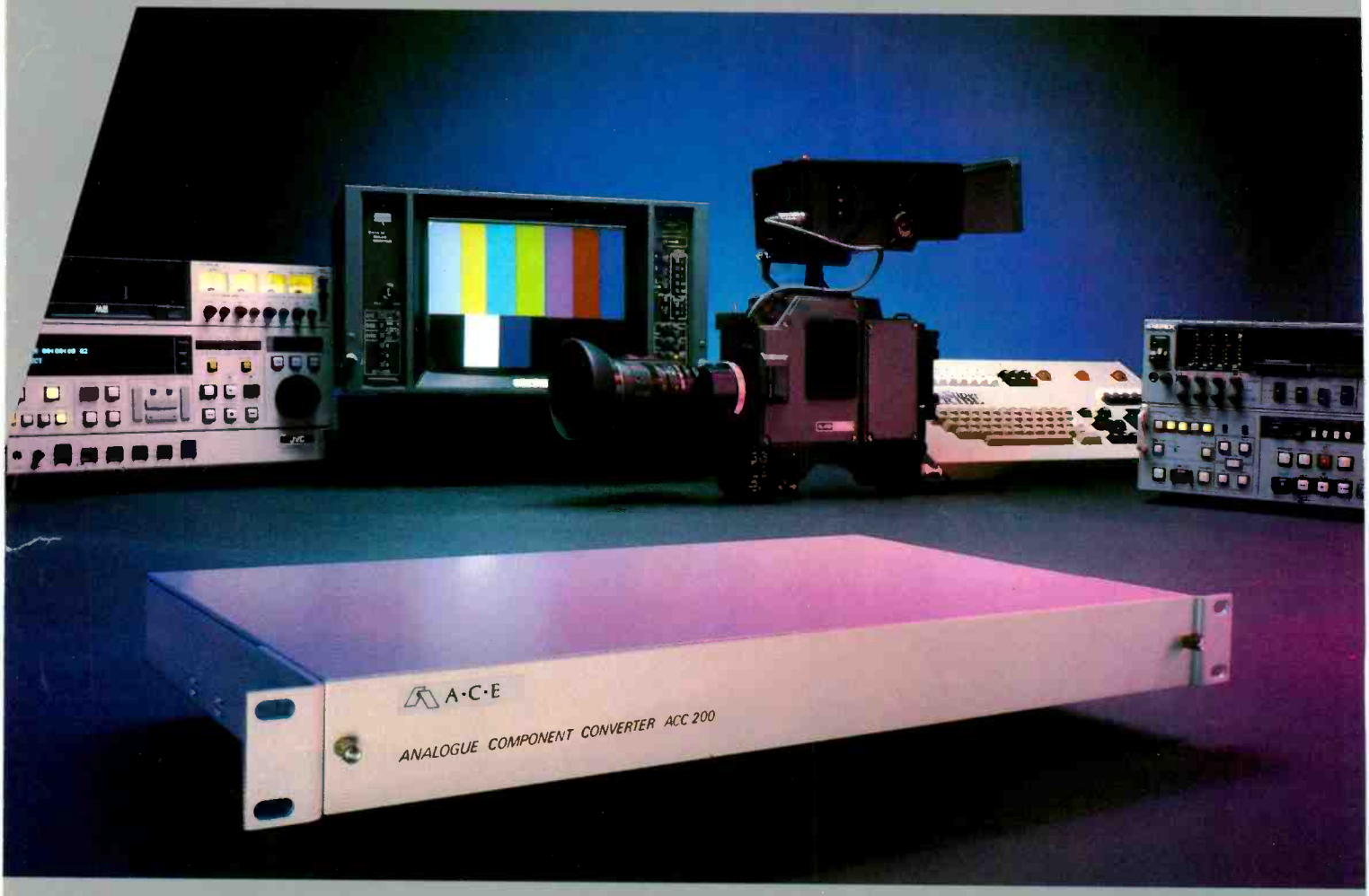

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DECEMBER 1988
VOL. 24, NO. 12

On the cover:
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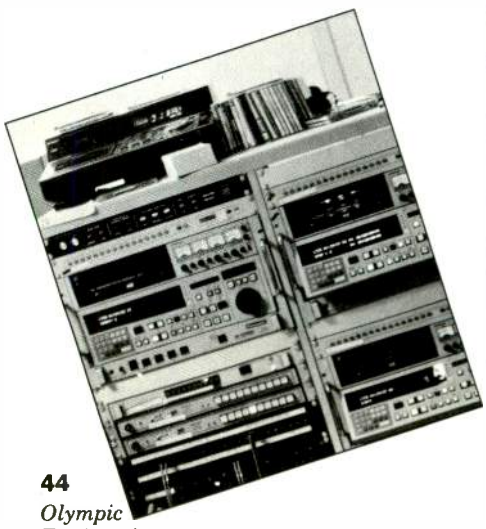
Illustration by
David Flaherty



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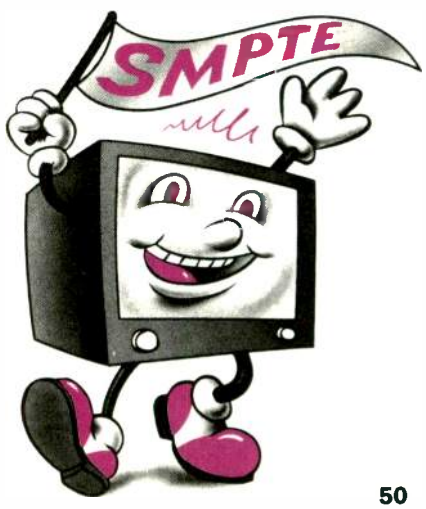
Olympic Engineering



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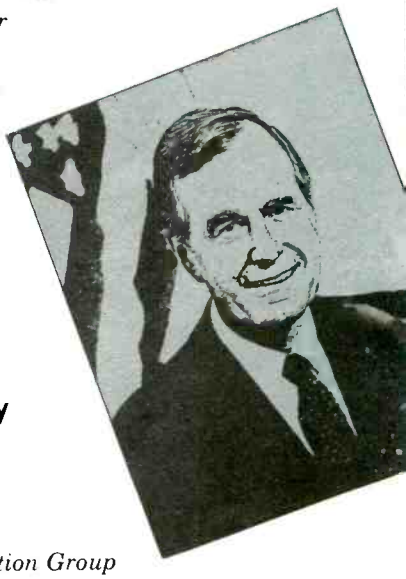

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VIEWPOINT

The engineering issues that broadcasters face are technically complex and complicated by political and economic considerations.

This month marks the close of a year of growth and change, for *BME* as well as for the broadcast industry at large. The plethora of engineering issues that broadcasters face as 1989 looms large are not only technically complex, but complicated also by a raft of political and economic considerations that are often at odds with each other and with engineering excellence.

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Gatherings such as October's annual convention of the Society of Motion Picture and Television Engineers provide a forum for competing interests and ideas to battle it out before the most interested parties of all—broadcast engineers. For this reason we have, for the first time, moved our review of the SMPTE convention up an entire month to the December issue. The developments in such crucial areas as HDTV, electronic graphics and digital audio are too important to wait until January. Whether you attended the show or not, we hope our analysis of SMPTE will prove thought-provoking and useful.

For this issue's editorial focus, we've chosen ENG—specifically, the changes in regulation and technology that are now affecting ENG microwave, the heartbeat of station news operations. California-based freelance writer Hal Rubin has contributed a thoughtful and thorough rundown of the advantages and possible pitfalls of the newly available high-frequency microwave bands. Another Californian, KABC-TV chief engineer Steve Pair, has shared his suggestions for dealing with the all-too-common problem of sync buzz in ENG microwave environments.

The recent Olympics provided the arena for the first large-scale field trial of Matsushita's MII component analog videotape format. As freelance writer Richard Baum describes, anyone who was waiting for the MII runner to stumble was disappointed. Baum, who observed NBC's Olympic efforts in Seoul last summer, has given us a first-hand account of how NBC's "universal format" interfaced with one-inch Type C and D-1 component digital at the International Broadcast Center.

Last but emphatically not least, *BME*'s contributing editor, Skip Pizzi, has dissected the NCMO, or numerically controlled modulated oscillator, a newly developed technology that enables the digital definition of any RF waveform. If accepted, the NCMO could revolutionize radio transmission technology. Remember, you read it here first! ■

Eva J. Blinder

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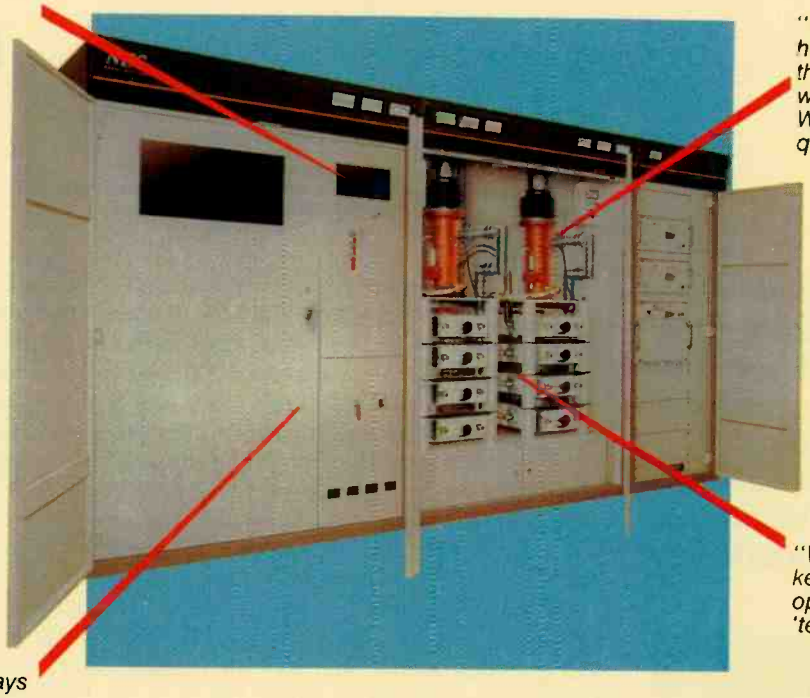

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Karl E. Paulsen, Chief Engine
KTZZ-
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FEEDBACK

NRSC Re-Emphasis

In regard to the NRSC pre-emphasis standard, and in particluar to the article by Stanley Salek in the September *BME* ("NRSC Update," p. 74): the pre-emphasis used with that standard does definitely not, and cannot "...reduce **adjacent**-channel interference..." [emphasis added]. Since AM radio stations are spaced at 10 kHz intervals, no more than 5 kHz can be transmitted without clashing with the 5 kHz energy from the adjacent channel. By use of a narrow bandpass in the receiver, say 3 kHz, it's generally possible to receive adjacent stations if the undesired station isn't using pre-emphasis; with NRSC pre-emphasis, the only way to pick out adjacent stations is with a demodulator that picks out only the sideband on the side not affected by the adjacent station, and that takes a type of receiver not generally available to the public.

What the NRSC mask (not the pre-emphasis curve) does is to remove components more than 10 kHz away from the carrier, thus improving **alternate**-channel (20 kHz separated), or further, reception. That's a good thing, but not the same thing.

What the NRSC pre-emphasis does is increase the apparent frequency response of AM on a receiver with limited bandwidth, normally including a "presense hump" between about 2.7 and 3.5 kHz; creates an overly bright sound on high-fidelity receivers (and crystal sets); and decreses the overall loudness on most receivers. Since in a pre-emphasized signal, more energy is generated further from the carrier, antenna systems with a high "Q" absorb or reflect this energy before it is ever radiated, and splatter in unintended directions increases with directional arrays. In either case, the apparent loudness of the signal is decreased still further.

What is really needed to take advantage of all this is a receiver that allows automatic bandwidth control based on signal strength, switchable de-emphasis, stereo decoding (all types), and selection of upper- or lower-sideband only reception when required to reduce adjacent channel interference. Adding these things, and extending the upper end of the dial to 1700 kHz, could be done on a hi-fi system for less than an additional ten bucks at retail. A broadband noise subtracter would be nice to remove atmospheric and electrical noises. "Boom boxes," car radios, and walkmen could have a few of these features, too.

When home (and car) listeners get improved "radio," it will be apparent how good AM can sound, even at a great distance to the station, and also how crummy some of the stations still are. Until such receiver become available, and at reasonable prices, stereo, the NRSC standards, and all the discussion in the world is downright silly. When the receivers become available, such talk of the advantages of pre-emphasis, the mask, and relative merits of AM stereo systems will merely be counterproductive.

James Reiger, PE/PTBW
Kitchen Productions
Salt Lake City, UT

Stan Salek replys:
Mr. Reiger's statement that the NRSC pre-emphasis standard can do nothing to reduce adjacent-channel interference is not quite true. In fact, before the audio pre-emphasis standard was adopted by the committee, many stations were enjoying much more than the prescribed 10 dB at 10kHz boost. The assumption Reiger seems to imply is that stations were not employing audio pre-emphasis at all before the NRSC standard was finalized. Although the intent of the pre-emphasis standard is to encourage compatibility in a new generation of AM receivers, stations that reduce transmitted pre-emphasis by installing equipment to comply with the NRSC audio standard would indeed reduce first-adjacent channel interference.

Hundreds of stations now using the NRSC audio standard have hailed it as a positive step forward, even on today's radios. By employing NRSC transmission standards, AM broadcasters are doing their part to meet receiver manufacturers at least half-way.

Do you have an questions, comments, or criticisms concerning what you read in BME*? Any bulletins or issues you want to open up to other engineering management readers? Our letter column, Feedback, is your forum. Write to: Feedback, BME Magazine, 295 Madison Avenue, 19th Floor, New York, NY 10017.*

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UPDATE

R-DAT: Time for a Standards War?...Aphex Excites TV...Bush May Face FCC Problems...NAB Says It's Been a Very Good Year

R-DAT: Time for a Standards War?

Matsushita Electric Industries Corporation, NHK and Sony Corporation have developed a time code standard for R-DAT. Called "STC" (Subcode Time Code), the format was proposed to the AES on November 4 in Los Angeles.

Supporting any move "toward the most-universal standard possible," Steve Woolley, sales and marketing director for Panasonic/RAMSA, says he's "excited" that pro-DAT is moving toward accepted standards. RAMSA markets a portable DAT recorder.

While the standard proposed by the three giant corporations is not manufacturer-specific, it is incompatible with the SMPTE-based system incorporated in the Fostex D-20 R-DAT unit. Available now and widely praised throughout the same convention, the Fostex unit is a four-head system which works by digitizing SMPTE time code and recording it in subcode data.

Prior attempts to conform R-DAT with SMPTE time code include Sony's PCM 2000, which was fed input as time code for subsequent longitudinal recording. Both Fostex and the backers of the new proposal have been exploring expanded broadcast applications for the tape-based digital audio format, concentrating especially on film and video sound acquisition and post-production.

In an industry where the development of new and often-incompatible technologies has as much to do with blocking as with the spirit of pure scientific inquiry, calls for incompatible standards is one good way of sidelining the ref during bloodshed in the end zone.

"We applaud any attempt to develop an international solution that's based on technical merit," stressed Mark Damon Cohen, vice president of sales and marketing for Fostex. "If the IEC decides on a standard that has true technical advantages as opposed simply to political ones, we'd be happy to consider it."

Four-head Fostex D-20 R-DAT. Here today.

Sony portable PCM 2000. Already gone?

The Matsushita/NHK/Sony proposal acts, in effect, as a "time code translator," enabling conversion of work between SMPTE (29.97 Hz), EBU (25 Hz) and time code used in film. In development for several months, the proposal specifies converting time code data into time of day data and recording it within the DAT subcode. It is thus machine and time code-independent, and transparent to international broadcast video standards including NTSC and PAL. Because DAT tapes will be exchanged and distributed worldwide, a DAT time code format should be independent of any specific video standard, the developers say.

The proposal was designed to record and playback time code information from a DAT tape, from asynchronous (nonlocked) time code frame frequency, and from DAT frequency. The proposal—which is expected to be adopted by the AES before the end of the year—also specifies time code display and output.

Aphex Excites TV

Best known for its recording studio processing equipment such as the Aural Exciter, Aphex is now in hot demand, first from radio broadcasters engaged in increasingly complex "processing wars," and now from television broadcasters concerned about stereo transmission. When CBS-TV began transmitting network programming in stereo October 18, coincidentally timed with SMPTE, an Aphex Dominator 703 peak limiter was included in the air-chain.

Peak limiters like the Dominator, which includes pre- and de-emphasis, are designed to provide "sonically invisible" gain control and accurate phase response in the pass band. These parameters enable stereo television transmis-

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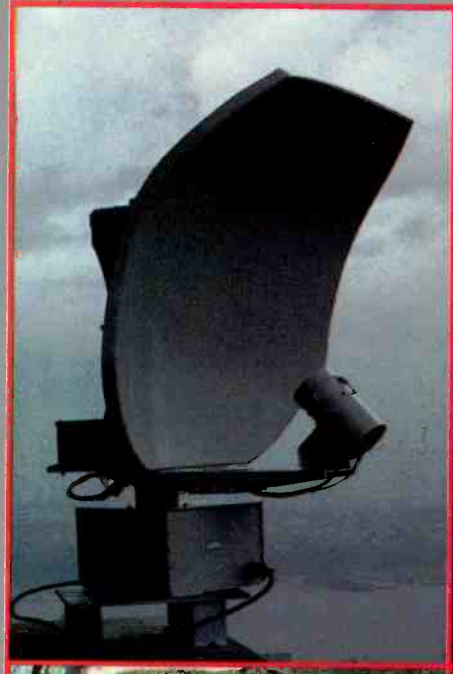

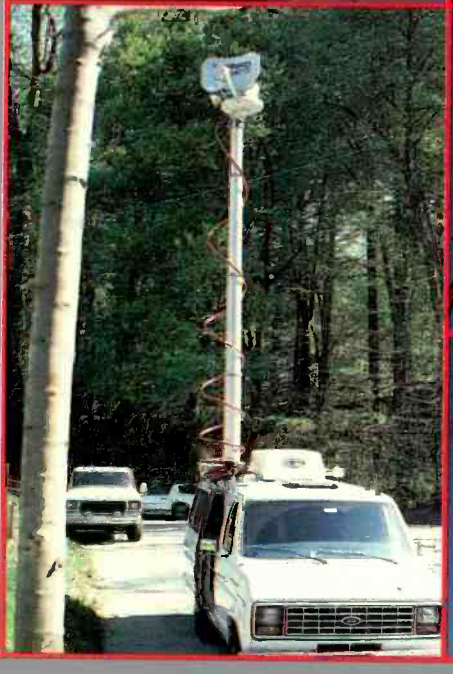

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sion with wide dynamic range but no sibilance, plus a solid stage for stereo imaging. A consistent and solid stereo image is especially important in transmission for surround sound programming.

At this point it is not clear which shows CBS is transmitting in "real stereo" and which in "pseudo-stereo," if any. The fact that the network chose to incorporate sophisticated audio processing and worked closely with the

TV: the final frontier for Aphex's Caesar?

supplier—Aphex president Marvin Caesar personally advised on the first transmission using the unit—nevertheless indicates CBS is paying close attention to high-end audio parameters.

As U.S. networks and stations become more involved in broadcasting forms of stereo audio as well as surround sound, the industry looks to increased interest in audio signal processing from television quarters. Several manufacturers of consumer equipment already market devices for home use which implement the Dolby Surround system used by most theaters. This system provides a real audio center image and a rear channel surround, as opposed to conventional stereo's phantom center with no surround element.

The issue of signal processing remains an ongoing subject of discussion between networks and affiliates, however, since many stations prefer to do their own. Putting already-processed audio up on a satellite—unless it's a noisy system—may simply duplicate effort. "It doesn't matter whether a network does it or the whether a station does it," cautions one industry expert. " The key is that whoever does it must do it carefully."

"There's more to stereo TV than just a second Audimax, and television engineers are now finding this out," stressed another signal processing industry engineer.

Technological developments such as HDTV won't inhibit the expansion of audio signal processing, Aphex's Caesar claims. He predicts that sound for HDTV will remain analog because of bandwidth constraints. He also says that increased demands for quality will necessitate transmission with limiting, and with on-going supervision of the processing and transmission processes. "HDTV sound will stay analog because digital audio eats bandwidth," Caesar explains. "It's also expensive."

Telco Casts a Shadow

There is growing evidence that the telco industry may not be satisfied with the role of carrier, and that it is taking an increasing interest in the content of what it transmits.

Speaking before the MST (Association of Maximum Service Telecasters) Conference last September, NAB President Edward Fritts said, "Telco entry into HDTV poses a double threat to broadcasters by offering both a new delivery mechanism, fiber optic cable, and improved HDTV pictures. As yet, telcos have not been given the go-ahead for video delivery, but phone industry representatives have made it clear they would like to. According to trade publications this week, one regional Bell holding company expects that video delivery and enhanced information services to the home will account for 65 percent of its total revenues by the year 2000."

Bush May Face FCC Problems

This past spring, at NAB '88 in Las Vegas, ex-broadcaster Ronald Reagan became the first president of the United States to deliver his message over High-Definition television. Reagan equated the event to other presidential media firsts—first presidential radio, television, and color television addresses—not only giving an Executive Branch nod to the new medium, but also communicating a distinctly personal pro-broadcast attitude.

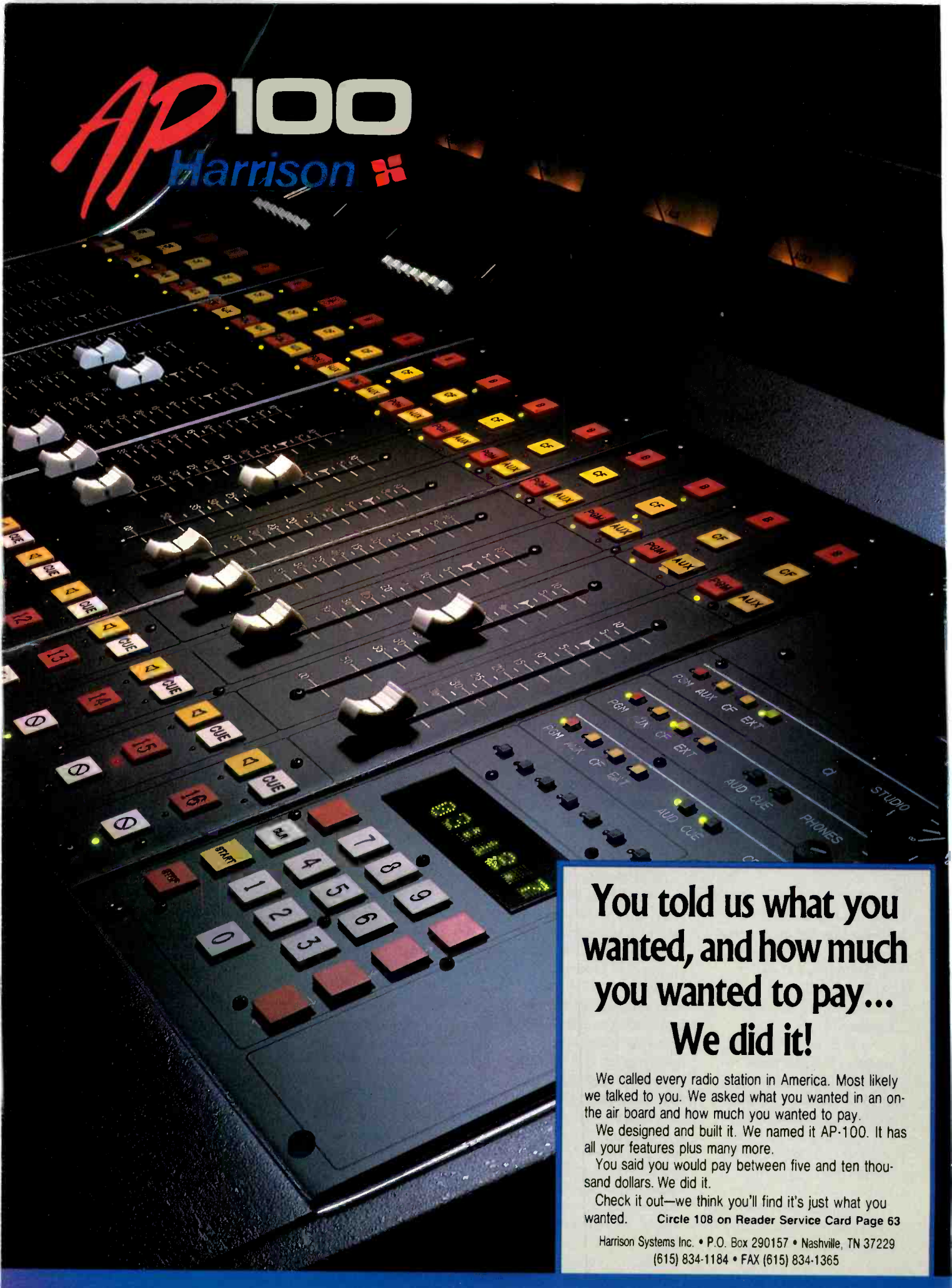
According to Washington nabobs, however, the votes may still be out on President-Elect George Bush's view of broadcasting, in general, and the FCC, in particular.

Case in point: ATV.

Even though the FCC has made one ruling on the implementation of HDTV, further decisions are needed to spell out the Commission's full intentions. Under Reagan, broadcasters could have expected subsequent rulings to give the widest possible latitude to the marketplace (with the possible danger of a nondecision decison a la AM stereo).

The President-Elect, like his predecessor, believes in the power of the marketplace to drive regulation. But Bush also brings his reputation as a practical man into the mix. Observers predict he will support the creation of necessary standards if their timing is appropriate.

Another topic that will come before the FCC in the next four years is the FM translator proposal al-



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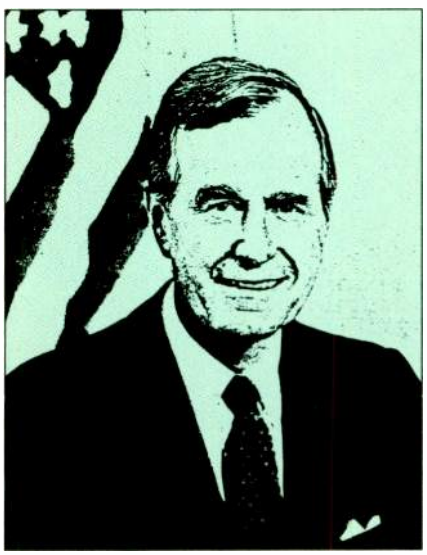
lowing operators to broadcast their own material along with programming received from other stations. Industry organizations have opposed this plan, pointing both to the proposal's tendency to create unnecessary competition and its likelihood to cause future interference problems. There is little support for the proposal, yet it is unclear what position Bush will ultimately take.

Controversy over the Fairness Doctrine should provide a harsher test for the next administration. This Doctrine, which arose from section 315 of the Communications Act, requires broadcasters to provide coverage of controversial issues of public importance. The FCC determined that the doctrine was a violation of the First Amendment and contrary to the public interest. Congress, however, supports the Fairness Doctrine. Bush's expected opposition to the doctrine, and the anticipated Congressional reaction, could set a decidedly tumultuous tone for the broadcast industry for the next four years of the Bush administration.



Bush: Bullish on broadcasters?

The President-Elect will face yet another FCC controversy when he confronts the demand for limitations on station swapping. Here again the question of free enterprise versus limiting regulation is at issue. The present administration believes the FCC should not impose a requirement on how long a station must be owned before it can be sold, while Congress, in general, favors a return to the three-year holding period or some similar requirement. Once again, Bush is expected to support President Reagan's existing policy.

Industry pundits and hillwatchers alike are predicting that the FCC will become even more strongly conservative over the next four years. Normally governed by one chairman and four commissioners, the current body has only two commissioners in place at the moment. With the rumored resignation of FCC Chairman Dennis Patrick the three, possibly Bush-appointed, new members will impact the direction of broadcasting for some time to come.

NAB Says It's Been a Very Good Year

In what's described as a very visible year for broadcasters, the NAB cites the passage in 1988 of many items of legislation which it considers favorable to industry interests.

Leading the list of NAB-driven changes were modifications to bills allowing home satellite dish owners to receive satellite-transmitted broadcast signals and changes affecting the copyright status of program material which could be colorized. Modification to trademark reform legislation affecting broadcast advertising and editorial content was also championed by the NAB.

Of specific interest to television broadcasters in the southeast, no further funding will be appropriated for TV Marti, which will broadcast programming into Cuba from a balloon tethered in the Florida Keys, until the contentious project has been fully authorized by Congress. Viewed by the NAB as a possible source of broadcast interference and a political justification for retaliatory action such as jamming, pilot work for the TV Marti project is scheduled to begin this spring.

The NAB also points with pride to an unprecedented amount of broadcast-related activity from the FCC. In addition to speedy rulemakings which address adoption of the NRSC-1 and NRSC-2 pre- and de-emphasis curves to improve AM radio, the FCC is also considering plans to improve FM via creation of a new class (Class 3) and consideration of requests to up power to 6 kW from Class A FMers. Consideration of such pesky pop-ups as FM translators are also on the books; on the downside, the FCC appears to be less than responsive to considerations of acceptable interference level, protected contours and multiple ownership of properties in a market. This could lead to "Wild Wild West"-type applications of directional antennas and power boosts, among other things. Complicated by an oversupply of properties in a market fueled by relaxation of cross-ownership, feared-for results include "AM-ization" of the FM band.

The regulatory story of the year for TV broadcasters, of course, was the FCC's September rulemaking mandating compatibility with NTSC for any HDTV or advanced television system entering the American market. Some 18 transmission and production standards are currently under test and consideration. Along those lines, discrete application of Association influence at the FCC helped delay a ruling to reallocate UHF spectrum to land mobile services. ■

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CROSSTALK
AN ENGINEERING MANAGEMENT JOURNAL

Much Ado About Production...Good Engineering in a Small Package

Much Ado About Production

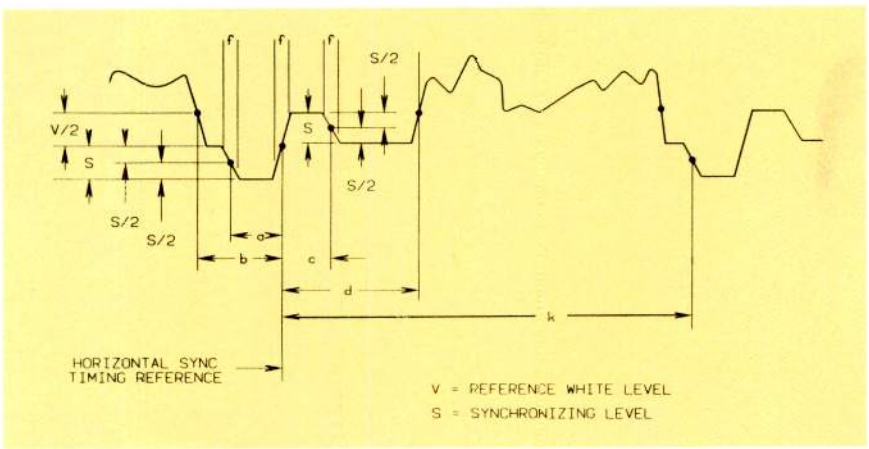
While some segments of the television and production industry are forging ahead with 1125-line HDTV, others are less quick to adopt the NHK-developed system. The debate intensified at October's SMPTE convention as NBC proposed an NTSC-compatible, 59.94 Hz production system.

The NBC announcement came the first day of the show at a press conference at which Mike Sherlock, NBC's president of operations and technical services, asserted that 1050/59.94 will match U.S. needs more closely than a 60 Hz system.

"NBC and a number of other organizations now realize that a world [HDTV] standard is not likely to happen," Sherlock stated in a reference to the European Eureka consortium's advocacy of a 1250-line, 60 Hz standard for Europe. The Eureka countries, Sherlock said, are attempting to define an HDTV system that is best for Europe; why shouldn't the U.S. do the same?

The NBC proposal, which has been formally submitted to the SMPTE for consideration, actually consists of three production standards: 1050/59.94 2:1 interlace, 525/59.94 1:1 progressive scan, and, for the future, 1050/59.94 1:1 progressive.

NBC's action generated much comment, both favorable and unfavorable. The network released a list of organizations endorsing "the concept of this additional production standard," including Capital Cities/ABC, Zenith, Thomson Consumer Electronics, North American Philips, the Center for Advanced Television Studies, Faroudja Labs and Tribune Broadcasting. The Association of Maximum Service Telecasters, in a separate statement, also "welcomed" the NBC announcement.



Horizontal sync waveform of NBC's proposed 525-line progressive scan and 1050-line interlaced 59.94 Hz HDTV systems.

Quick condemnation followed from the Del Ray Group, which called the NBC proposal "inadequate, premature and self-serving." In a statement issued after the show, Del Ray founder Richard Iredale said, "The NBC announcement has created more confusion on the HDTV scene...We are greaatly concerned that adoption of a 1050-line format for production would put program producers in this country at a serious disadvantage in marketing their products abroad. A 1050-line format employs only about 970 active scanning lines, below the 1000-line figure often quoted as being the minimum acceptable quality for an HDTV production format." Del Ray has proposed an NTSC-compatible transmission format, HD-NTSC, as well as a production format compatible with 1125/50.

Besides compatibility, one of Sherlock's stated goals for the proposed production system is economy. He flatly stated that NBC would buy no HDTV production equipment until it cost no more ("not one dollar") than comparable NTSC equipment. Steve Bonica, NBC's vice president of engineering, added, "This set of standards represents transition scenarios which allow the user to develop his business...in logical steps, making each of those steps something that is easily affordable."

According to Bonica, a production VTR for 59.94 Hz HDTV is presently being built.

Good Engineering in a Small Package

When Marc Sophos founded radio station WDFH, Dobbs Ferry, NY in 1968, it was a typical 100 mW AM run by a 10-year-old. A portable record player was the sole piece of studio equipment; the tiny transmitter ran on 110 V ac or dc and gave Sophos and his partners a 50-50 chace of getting a shock whenever they picked up a microphone.

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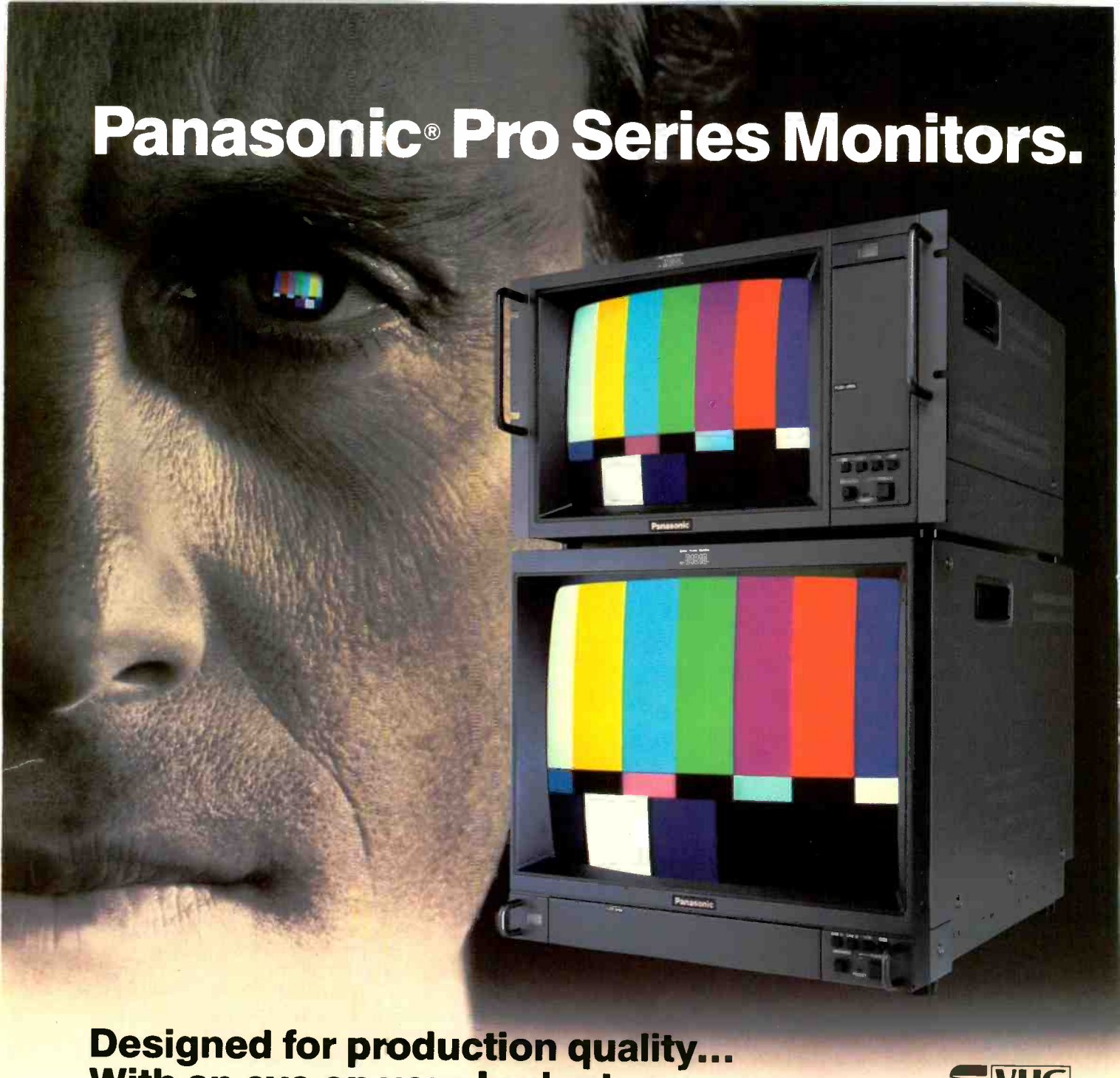

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The signal reached all the way to the house next door (and even around the block on a good day).

Twenty years later, Sophos is still operating WDFH out of the house he grew up in. Although the operation is still small, it's grown tremendously in both size and technical sophistication. The station now has three studios, one of them located in Sophos's bedroom. And it reaches an estimated 9000 homes in southwestern Westchester County over the local cable system.

Sophos exemplifies the ingenuity and determination that makes radio so special. WDFH's expansion began in the 1970s when, after touring local radio stations, he began building his own consoles and upgrading new equipment. The used Bogen B-62 turntables he installed in 1978, for example, had such a slow startup time (around 12 seconds) that the WDFH crew became adept at slip-cuing, which caused the turntables to slow considerably, and then pushing the platter at 33 rpm to get the record on the air at the right speed.

When the town awarded its cable franchise in 1980, Sophos immediately contacted the cable company's management, and in early 1982 signed an agreement allowing WDFH to provide background audio for one of the system's data channels. The station installed an 8 kc loop to the cable headend and signed on in March, taking its signal beyond the block for the first time ever.

Although WDFH operates 18 hours a day, the volunteer staff hasn't yet quit their day jobs. Staff constraints led Sophos to one of his most interesting innovations: a station automation system controlled by a Commodore 64 personal computer, running software written by Marvin Holverstott, CE of WALK-AM/FM in Patchogue, NY. The station airs 29:30 segments of recorded music and DJ commentary from three Teac X-2000R reel-to-reel decks; each segment is followed by a weather forcast or promo on cassette.

Each 10.5-inch reel (running at 3.75 ips) holds 12 half-hour segments, each followed by a 25 Hz tone. The leading edge generates an EOM that is sent to the computer and steps it to the next event, and the trailing edge stops the machine, leaving it cued up to the beginning of the next segment. The system has a fade circuit and a dual silence sensor that gives "absolute protection" from failure, Sophos states. He adds that the system has been "almost completely trouble-free" since it went on-air in October. Most evening programming is live, aired directly from records and CDs.

What's next for WDFH? Perhaps 24-hour operation, if the staff succeeds in its attempts to get local stereo shops to donate a fourth X-2000R. Upgraded audio is definitely in the cards; Sophos says he's planning to upgrade the rebuilt RCA BC-7A consoles with new electronics that will also allow mix-minus for telephone use. Some of the equipment is old, some is new, all is well-maintained. Anyone who doubts that you can do a lot with a little should take a good look at WDFH. ■

In 1968, WDFH was a typical 100 mW AM run by a 10-year-old.

Studio One, located in Sophos' bedroom, has an RCA BC-7A console modified for stereo, plus Technics turntables.

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AI: Building a Better Brain?

By James A. Ackerley

Few prospects inflame the imagination as does the possible creation of superhuman artificial intelligence. To be masters over omniscient, possibly omnipotent slaves is at once a fearful and irresistible temptation. Artificial intelligence could be the key to all the difficulties of human existence.

Some benefits of artificial intelligence (AI) may be far away, but certain industries are reaping rewards right now. Over the last two years, there has been a great revival of interest in AI, with progress reported in all areas: expert systems, symbol processing and neural networks. Of these, only expert systems are being used in industry. The question is not whether the broadcast industry will be affected by expert systems, but when we will get them and how we will use them.

The first expert system, called Mycin, was written at Stanford in the mid 1970s by Edward Shortliffe. Information received from doctors on the diagnosis and treatment of certain infectious diseases was encoded in the form of some 500 rules and stored in memory. The program then asked questions about the particular patient and, based on the answers and the rules stored in memory, supplied a diagnosis and a recommended treatment. In one test, Mycin was credited with being correct in 65 percent of the cases diagnosed—comparing very favorably to a control group of human doctors.

There quickly followed Emycin, for "empty Mycin," which was the shell of the Mycin program without the medical knowledge. The idea was for the user to create his own expert system by supplying expert knowledge, in the form of rules, from his own field. Today, two major computer makers, IBM and Digital Equipment Corporation (DEC), market a line of AI programs including a variety of shells.

Underwriters at Fireman's Fund Insurance Companies are using one of the first commercial IBM expert systems, named Underwriter's Workbench, to identify best-risk drivers. The system was created using IBM's Expert Systems Environment to encode the experience, knowledge, and logical approach of skilled underwriters.

David Griffin, vice president of underwriting for personal insurance, comments, "Two years ago, our automobile policyholder group barely met minimum standards for the type of driver we wanted to cover, and our operation was unprofitable. In less than a year, the IBM expert system has enabled us to identify the policies we want to write and made a major contribution to improvements in the division's loss ratio."

Another recent development in the field of expert systems is the microExplorer. This system consists of the Apple Macintosh II computer, a Texas Instruments add-on board and the Texas Instruments Explorer operating system. The add-on board con-

Designed for widespread deployment of expert systems and other AI applications, the Texas Instruments microExplorer system is symbolic processing power in a small package.

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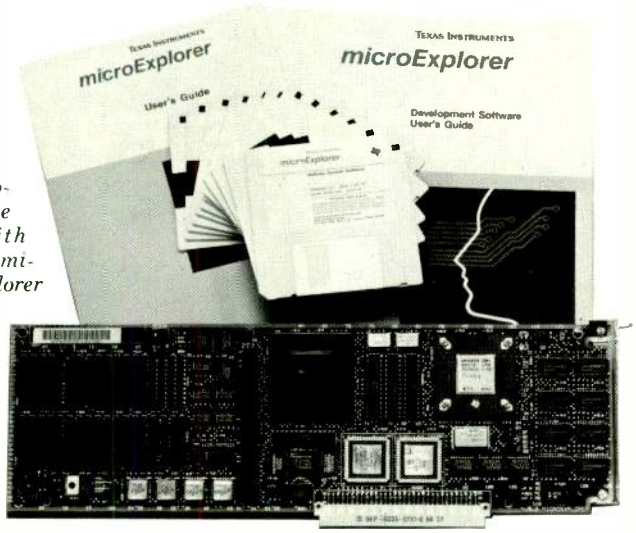

At the heart of the microExplorer system are the coprocessor board with Texas Instruments' Lisp microprocessor and the Explorer software. The coprocessor supports up to 12 Mbytes of memory.

sists of a Lisp coprocessor and additional memory. Tempest Products Incorporated (TPI) will market the system to the various government intelligence agencies for use with one of a number of software packages including an expert systems shell, Knowledge Engineering Environment (KEE), from IntelliCorp. TPI has already obtained the necessary government certification to allow the system to be used in this application.

According to William B. Brucato, vice president of TPI's Systems Integration, "The Tempest microExplorer will provide the capability to support the command, control, communications and intelligence community with the power of artificial intelligence at an affordable cost not available until now."

Not only does DEC market shells for creating expert systems, they also use expert systems. Because of a large and expanding product line and many options, it is necessary for DEC to check orders for configuration consistency. XCON was created to perform this task while ensuring prompt delivery of the correct configuration. In the course of time other functions—were added. The value of XCON expanded far beyond its original scope until it is today both the first and the most valuable of DEC's expert systems, according to the company.

Although expert systems are, at present, the most practical form of AI, they are not actually thinking systems. Real thinking is not merely following rules, however numerous. Real thinking involves going down a road for the first time without signposts and having the capacity to learn from experience. There are two ways to attempt this. One is to use the computer as a symbol processor with the intention of duplicating the results of human thought. The other is to model the machine on the brain itself through the creation of so-called neural networks. Surprisingly, after years of relative neglect, each of these approaches is now the center of intense interest and activity.

On its second attempt to solve a particular problem, Soar demonstrated its learning ability by reducing the number of steps required from 1731 to seven.

Soar (State Operator, And Result) is a new symbol-processing, general-purpose program for solving problems. It was developed by AI pioneer Allen Newell of Carnegie Mellon University and two former students, John E. Laird of Michigan and Paul S. Rosenbloom of USC. Back in 1957, Newell and his colleague, Herbert Simon, developed a program known as the General Problem Solver (GPS). Using general reasoning techniques, the GPS could actually solve simple problems. It never advanced beyond this stage, however, because it could never acquire an expert's knowledge.

Soar overcomes this limitation by going to work on an intermediate problem when it reaches an impasse. When it solves the intermediate problem, it encodes the result as a new condition-action rule or "chunk." In this way, it develops its own set of expert rules. In one experiment, Soar was tested with the expert system, XCON. On its second attempt to solve a particular configuration problem, Soar demonstrated its learning ability by reducing the number of steps required from 1731 to seven.

Newell explains, "There are today artificial intelligence systems, of which Soar is a good example, which are capable of learning from their own experiences. These systems show one way that expert systems will evolve beyond their present capabilities, namely, that they will be able to improve their performance as they work."

No person has ever synthesized a human brain cell, or neuron, but computers have been programmed to simulate them. Last July, 1600 people attended the second annual International Conference on Neural Networks, sponsored by the San Diego chapter of the Institute of Electrical and Electronic Engineers. Despite this great interest in the subject, progress remains slow. While the brain contains about 100 billion neurons, a supercomputer can simulate only about 1000 at one time. Nevertheless, only neural networks have shown promise at such tasks as recognizing speech and handwritten characters and in learning by example.

The immediate outlook is for rapid increases in the proliferation of expert systems. The resulting more intensive and more effective use of computers will affect all of us. The long-range outlook, possibly within our lifetimes, is a world where our mechanical slaves are smarter than we are. In this world the stream of scientific advances will become a tidal wave. ■

Ackerley is BME's technical editor.

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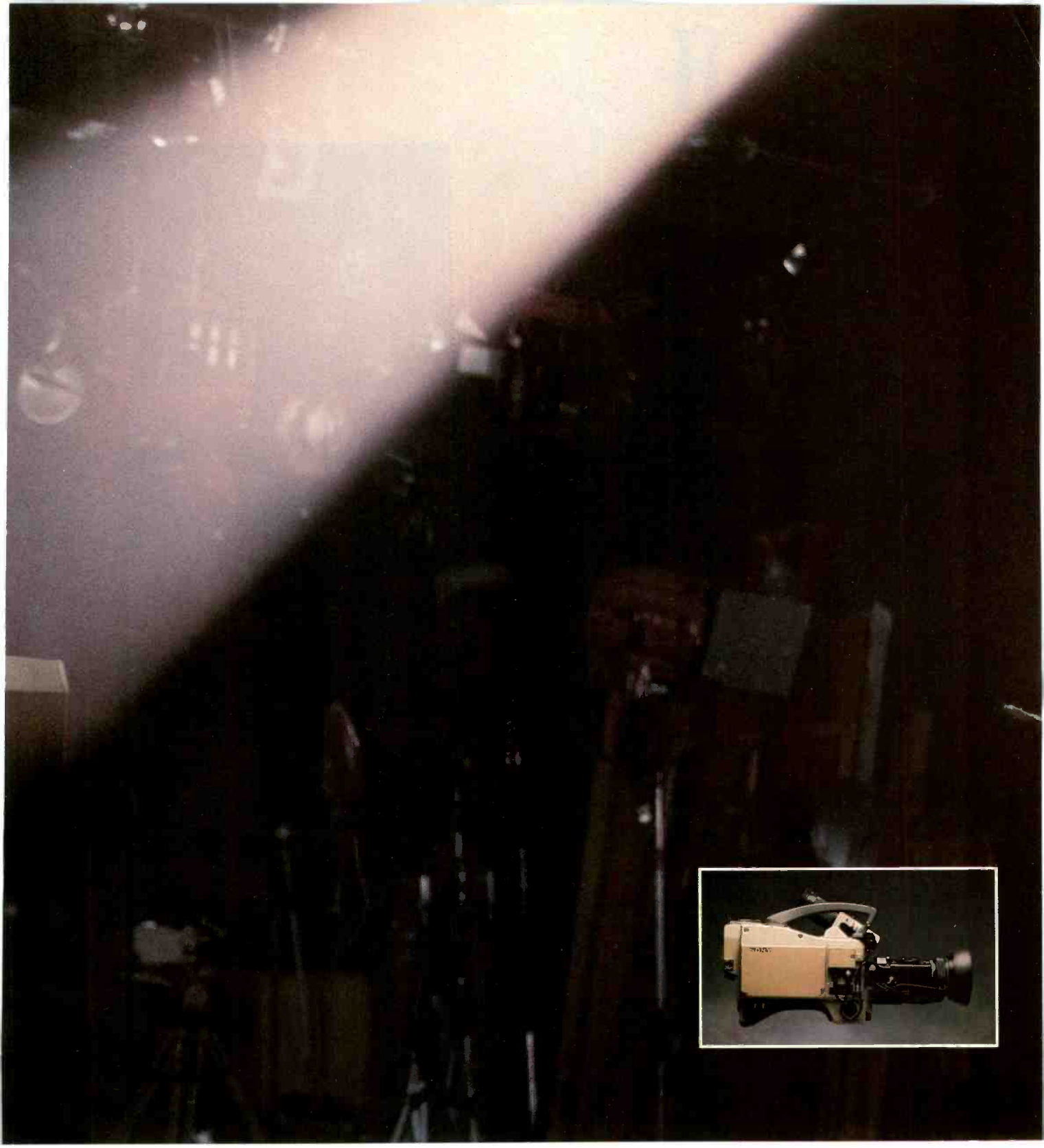

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BROADCAST PRODUCTS

HIGH-FREQUENCY ENG

BY HAL RUBIN

Fender-bending gridlocks are not limited to the nation's highways. The conventional ENG microwave bands are becoming so congested, at least in the larger markets, that some television broadcasters are looking to the higher frequencies for relief.

Manufacturers of TV equipment and broadcasters who are the end users are assessing the technical and operational tradeoffs that go along with moving up the spectrum. They are equally concerned about staying in the forefront of a rapidly evolving technology and figuring out the long-term effects of recent FCC rulings under General Docket No. 82-334 that became law on April 1, 1987.

Docket 82-334 has opened up a number of new opportunities for broadcasters and private users alike. The 6.4 to 6.5 GHz band, for example, formerly reserved for common carrier use, is now available for all mobile ENG users. At the same time, broadcasters must now share the 2 and 7 GHz bands, formerly their exclusive purview, with cable companies. The FCC has anticipated increased crowding in these and the 13 GHz band by instituting minimum path requirements for these frequencies, scheduled to go into effect in 1992.

With the traditional ENG microwave bands growing more and more crowded, broadcasters are seeking elbow room in the new, higher frequencies.

Nurad's Silhouette microwave antennas are widely used for ENG applications (opposite). Microwave Radio's 2/7/13 GHz central receive system.

The ultra-high frequencies recently opened up by 82-334 have yet to gain widespread acceptance for two reasons: unfamiliarity with and concern over technical limitations. One supplier of 40 GHz ENG microwave gear is Microwave Radio Corp. of Lowell, MA. The company was formed in 1986 with the purchase of the portable product line from M/A-COM.

While featuring its 23 and 40 GHz lines, Microwave Radio still produces products in the 2, 2.5, 6.5, 7, 12, 13, and 18 GHz frequencies. According to Microwave Radio's Eric McCulley, "The rule of thumb is that the higher the frequency for an equal distance, the greater the attenuation. A user has to realize the limitations of the frequency band he is working in." With rain or sleet, the additional attenuation per mile or per unit distance is much greater at the higher frequencies.

McCulley suggests that 40 GHz equipment should be used with two standard gain horn antennas (a 15 dB and a 25 dB horn). He asserts, "By staying within a mile of the transmitter and receiver you're going to be safe—even in rain or snow."

He said he believes CBS was the network that actually gave 40 GHz its start about four years ago. The network has bought 20 of those systems from McCulley's company. NBC has two and has ordered a third. CNN owns three.

Broadcast Microwave Services, Inc., of San Diego, which has been making 13 and 18 GHz equipment, added a 40 GHz line about six months ago. NBC used their 18 and 40 GHz self-contained portable tripod and tower-mounted packages at the recent Olympics.

"TV stations use the 40 GHz system because that is the only frequency band they can operate in without interference," asserts Jeff Harding, director of marketing for BMS. "Picture the Superbowl. You have 50 newstrucks, all with 2 gig microwaves. Then you have another 50 people walking around inside the stadium shooting to the top of the stadium and down to the trucks. You run out of room.

"That's where either 18 or 40 gigs can be an extremely helpful frequency band, especially in large cities where there are many interference problems."

Harding says the higher frequencies are attractive to large users such as the networks and ESPN because wherever they are operating, they can avoid congestion. TV broadcasters are also moving into the higher frequencies because excessive crowding at 7 and 13 GHz would blow intercity users off the air, he adds.

He notes that 40 GHz is attractive for stadium applications because the antennas are very narrow and multipath problems can be eliminated. At the same time, the antenna's laser-like beam width can be a problem. Even a slight jarring of the antenna will cause a signal loss.

Another problem, Harding notes, is that the 40 GHz system has an extremely limited distance capability—ordinarily about one mile, he says. The attainable distance depends on the kind of antenna used. He suggests that users rely on 2, 7, or 13 GHz wherever feasible because much longer shots are possible.

Broadcast Microwave is not aggressively selling the 40 GHz product, Harding says. "It doesn't make a lot of sense to buy a 40 GHz other than to complement an already existing ENG system at the higher frequencies."

Other manufacturers are skeptical about the prospects for widespread 40 GHz use. Harris Farinon, San Carlos, CA, currently manufactures 2, 2.5, 6, and 12 GHz microwave equipment for ENG use. The 6 GHz unit is for the company's thriving overseas trade, particularly Switzerland and Australia. Their domestic market is largely concentrated in 2 and 2.5 GHz.

"In the last few years better than 90 percent of the domestic market has been in 2 and 2.5 GHz equipment," he states. Fields adds that rain affects all frequencies above 10 GHz. "Even on a two-foot dish antenna and 13 GHz, the beam width is only one degree," he explains. "When you have people working who don't know east from west, it's pretty hard to get the antenna pointed right."

According to his calculations, a two-inch/hour rain will cause the loss of 3.3 dB per mile. With a 10-mile path, that will totally wipe out the signal. Fields considers snow to be a lesser problem than rain. A very dry snow causes less problem than a wet snow, he says.

RF Technology, South Norwalk, CT, makes 1.7 to 15.6 GHz ENG

McCulley: "The rule of thumb is that the higher the frequency for an equal distance, the greater the attenuation. A user has to realize his limitations."

equipment. ABC and CBS are among the users, according to Patrick Bradbury, vice president of sales and marketing. Although his company does not currently make equipment in the 23 and 40 GHz range, they may do so in the future, he reports.

Some of the company's 2 and 2.5 GHz equipment transmits signals from in-car cameras in racing cars. During the recent Americas Cup Race in San Diego, their on-boat microwave systems were used. Their 2.5 GHz equipment was in service at the Winter Olympics.

Bradbury says that some broadcasters avoid the 2.5 GHz frequency because they fear interference from the industrial users that share the band.

"But if you run a test, you'll find no interference occurs in 80 percent of the locations at 2.5 GHz, and it avoids interferring with local 2 GHz ENG television," he insists.

Ikegami Electronics, of Maywood, NJ, manufactures a series of ENG portable microwave transmitters and receivers in the 2, 7, and 13 GHz range.

The PP-80, available in 2 or 7 GHz, is a portable microwave link that features one touch of the channel selection and remote control terminal for airborne operations. The unit has a variety of uses, ranging from the standard application through the RX to TX control.

The PP-70-13, a portable mini microwave link, is a 13 GHz unit designed for cable-free transmission of television and audio systems, especially as a window link for ENG. This model enables a microwave link to be set up readily between the event site and an OB van.

The company's portable units were used extensively at the Winter Olympics and at the Indianapolis 500, according to company spokesman Robert Estony. He notes that long hauls aren't involved in the coverage of most special sports events.

Nurad, of Baltimore, MD, offers three complete lines of ENG transmitters and receivers in the 2, 2.5, 6.5, 7, and 13 GHz bands that serve for window links and other portable microwave operations. The company also makes a 23 GHz unit, but not for ENG use. (The 23 GHz band is not authorized for ENG applications.)

Nurad offers complete microwave units for ENG that include central receive systems with frequency-agile receivers and digital remote controls;

A microwave-equipped helicopter (shown here with Nurad equipment) can relay signals from a remote site back to the receiver.

remote transmitter systems with mast-mounted power amplifiers and frequency-agile transmitters; heliocopter systems and automatic tracking systems; and portable systems.

About the 40 GHz range, J. Stephen Neuberth, vice president, comments, "That might be an emerging frequency band, but at the current time we have not developed any product for that area."

According to Neuberth, changes in FCC rules related to 7 and 6.5 GHz have stimulated renewed interest in those frequencies. He said 13 GHz is used predominantly for portable operations, as opposed to having a central ENG receive antenna, and the same goes for 40 GHz.

"The 40 GHz unit is more tripod-to-tripod, rather than from a van to a tower or building where the central system may be," Neuberth adds.

Jim Stenberg, a design engineer at Micro Communications, Inc., Manchester, NH, says his company developed some ENG equipment and did a lot of antennas in the 12 GHz range before selling that line.

"There's no special reasons why our company hasn't moved into the 23 and 40 GHz lines," Stenberg says. "It's just something we've never pursued. We did some initial research into the lower frequencies when ENG was first becoming popular, but we never got into the higher regions."

Users of high-frequency ENG microwave equipment generally accept the manufacturer's technical specs and operational recommendations. Drawing on their own experience in the field, television broadcasting engineers provide pertinent footnotes.

Television and network engineers vary in their reactions to the attenuation problem. Dan Klos, RF engineer for CBS in New York, reports that his company has been using the higher frequencies for about four years.

With a 40 dB dish and a 25 dB horn, he has reliably gotten three miles out of a 40 GHz unit in rainy weather. For anything past that distance, a different frequency is called for, he says.

"In the 40 GHz frequency you have to be able to tune them up correctly. You don't dial them up like you do a 7 or 13 GHz," he advises.

Klos believes stations in the larger cities will end up going to the higher frequencies, especially at events that attract numerous broadcasters. He also stresses that from an engineer's standpoint, when dealing with longer ranges, aiming of the antenna becomes very critical. The operators have to be well trained to do that job.

"But once a unit is up and fired, it works very reliably," he states.

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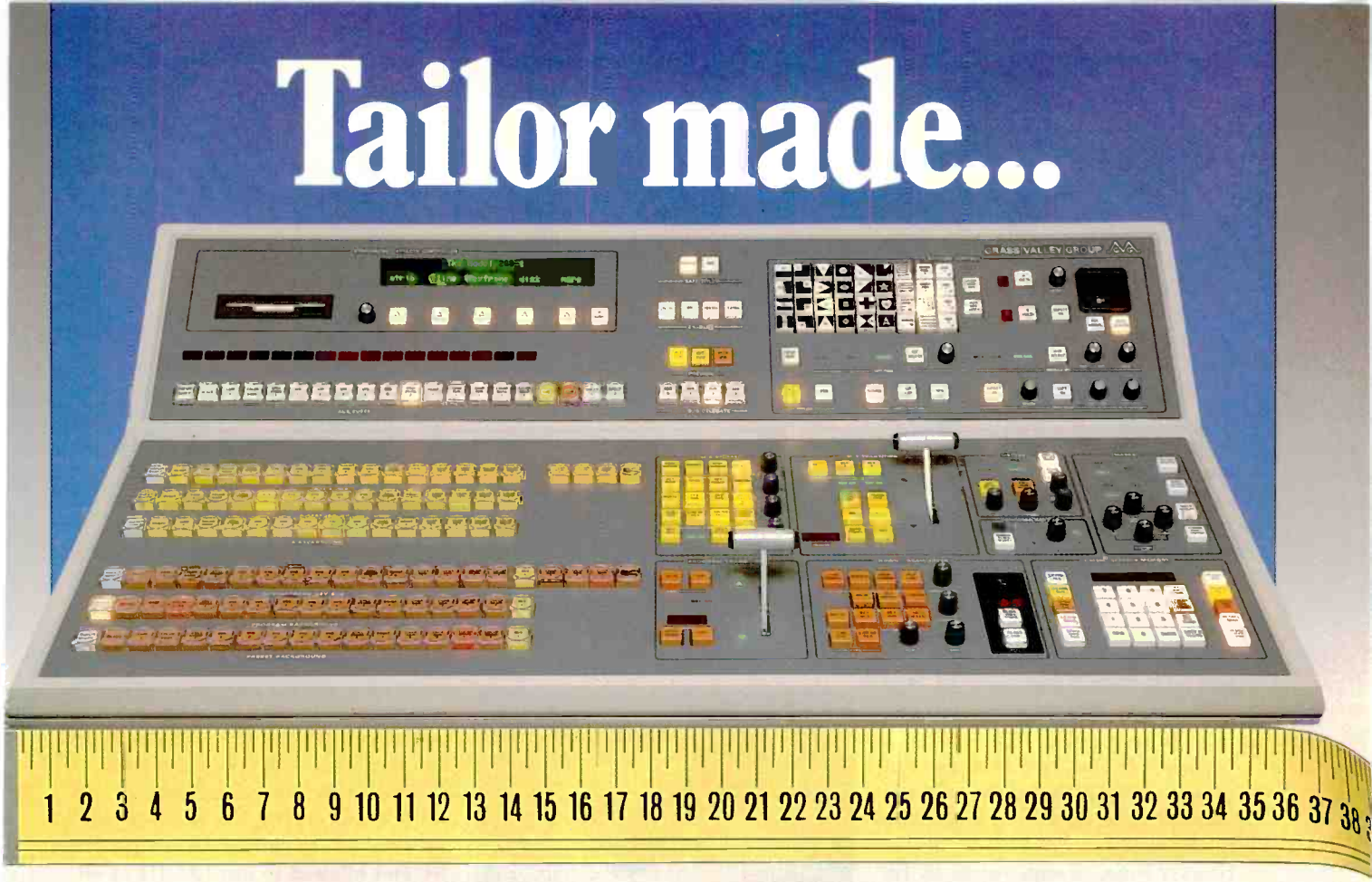

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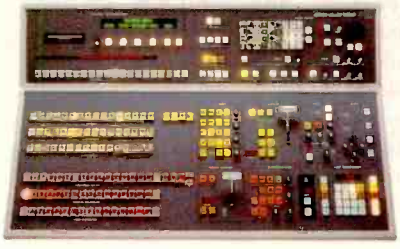
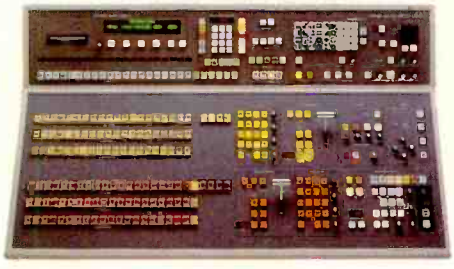


Model 200-1



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At the 1988 political conventions, CBS used 2 GHz units on the convention floor and 13 and 7 GHz units outdoors, Klos recalls. The CBS news division has six 40 GHz units and the network has an equal number, all of which are made by Microwave Radio Corp.

Ed Johnson, chief enginer of KGO-TV, Ch. 7 in San Francisco, and the Northern California frequency coordinator, adds that above the 7, 11, and 13 GHz range the equipment becomes subject to rain fade.

"To counter that you want to keep your path length short," he advises. "A longer path should be broken up into two hops."

Howard Fine, an engineer at KCBS in Los Angeles and database administrator for the Southern California Frequency Coordinating Committee, reports his station has no problem with weather.

"You just have to be aligned better, that's all. If the unit is properly engineered, weather shouldn't be a problem."

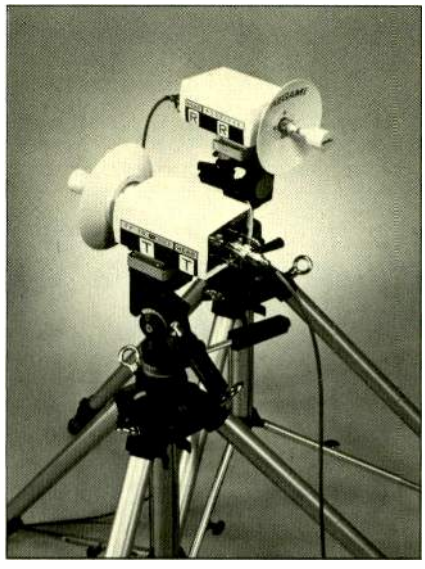
Robin Critchell and Ray Mascho are engineers at the same CBS station in Los Angeles. Critchell says that even fog will attenuate the signal quite noticeably at 13 GHz and over, and a couple of miles is the longest functionally practical path to run.

According to Critchell, 40 GHz doesn't have the signal margins that are available in the lower frequencies. He says that's not a factor except where the moisture content in the air is high. He notes, "In New Orleans during the political convention, the humidity was trying to be higher than 100 percent. We never lost anything because of that, but we had to realign a couple of paths and put on larger antennas."

Johnson says that KGO uses 13 GHz in what they call a "shoebox transmitter," which enables them to avoid laying cable. They just put it on a tripod in the building window and shoot down to the truck on the street. The truck raises its mast and uses 2 GHz to come back to the studio.

In San Francisco, 13 GHz would not work very well as a truck frequency because it is too directional to get around buildings and other obstructions, Johnson says. Channel 4 in that city has some 7 GHz trucks and some that are 2/7 GHZ combinations.

Even 7 GHz tends to become very directional, according to Johnson. He has encountered many sites in San Francisco where a 2 GHz signal will get out and a 7 GHz signal won't. The higher the frequency, the harder it is to get out of certain locations. A line-of-sight clear shot is needed.



Ikegami's PP-70 13 GHz ENG links, perfect for ENG use, are small enough to be hand-held.

At times the engineers will aim the truck antenna not toward the receiver, but toward a building that bounces the signal toward the receiving site. "That can be done at 2 GHz but not at at 13 or 11 GHz," Johnson says.

Critchell notes that KCBS in Los Angeles does not own any 23 or 40 GHz microwave equipment, but staff engineers provide assistance in network RF operations around the country. He likens the higher frequency gear to the 2 GHz operations of 25 to 30 years ago, because there are no synthesized oscillators.

"It's free-running, AFC controlled stuff that's a little harder to use. The point-to-point range is significantly limited. One advantage is that it doesn't exhibit the multipath characteristics often found in the lower frequencies."

For the types of applications KCBS encounters, 13 GHz units are usually sufficient, despite the congestion in Los Angeles, Critchell comments.

While they were assisting a network team during the political convention in Atlanta, the engineers weren't allowed to use 13 GHz at all. In New Orleans, 7 GHz was forbidden, so they had to rely heavily on 40 GHz.

"So far, the latter frequency is typically limited to significant major events. But an operation that already has the equipment would use it as a matter of course. That way they wouldn't have to worry about bothering somebody down the street."

The advantages he cites include the light weight of the transmitter, low power drain, and small size. He sees no good reason why 23 and 40 GHz should not have promising futures, particularly for broadcasters in major cities.

Mascho adds that from a general standpoint, 23 and 40 GHz are just an extension of 7 and 13 GHz. The same characteristics apply, only much quicker.

"You start to destabilize more rapidly and the pointing of the antenna is more critical," he notes.

He believes that it takes a very good RF engineer to know when and where to makes use of high frequency equipment. He cautions, "Certain procedures that work for us may not work for anyone else, and vice versa." ■

Rubin is a freelance writer based in Auburn, CA, who writes frequently on technical subjects.

3/4

THE PROFESSIONAL VIDEO MAGAZINE FROM SONY

MADISON AVENUE APPLAUDS SP PERFORMANCE

If you think clients in general are hard to please, just try being Arthur Williams. Williams is president and one of the editors at Editing Concepts, a leading post-production house in mid-town Manhattan. Most of his clients are large, world-famous ad agencies. Which means that Editing Concepts doesn't just have to do great work for their clients. They also have to please their clients' clients. That's why Arthur Williams says he bought a Sony U-Matic SP™ system for off-line editing of commercials.

Williams' clients demand a cutting-edge facility "that can service them quickly. So they can keep up with the demands of *their* clients." He bought the equipment on the advice of an industry colleague, who called the U-Matic system "user-friendly and simple to operate." Williams says that the system is

continued on page 2

AT COLUMBIA PRESBYTERIAN U-MATICS ARE ALWAYS ON CALL

At Columbia Presbyterian Medical Center in New York City, U-Matic® technology is an integral part of surgery.

Many procedures are taped. The video workhorses at the medical center are Sony U-Matic recorder/players. And a new BVE-900 was recently added for editing, along with a new special effects generator.

"This gives us the latest capabilities," says Jeff Szmulewicz, video production manager in the Audio/Visual Service. "Yet it is still fully compatible with the existing equipment."

All of the operating rooms in the medical center are wired for video. In the Neurological Institute, cameras are mounted on the microscopes that guide neurosurgical procedures—to see and record what the surgeons see. Other surgeons wear "headlamp" cameras.

And all of the diagnostic imaging systems in the medical center—ultrasound, nuclear magnetic resonance and CAT scanners, for exam-

continued on back page

AT J.C. PENNEY, THE STYLE IS "MIX 'N' MATCH" U-MATIC

J.C. Penney is one of the most innovative users of video in retailing. Last year, the company upgraded its Sony U-Matic 3/4" technology to the higher resolution U-Matic SP™ products.

"We needed compatibility," says chief engineer Tony Delsol. "We have a huge library of 3/4" tapes that we still use in a lot of ways.

"Of course, you only get the higher resolution with an SP-made tape played on an SP machine. But any combination of tape and player gives us at least the same picture quality we've always gotten from U-Matic recorders."

Several times a week, the giant retailer stages a five-hour "buying network broadcast" complete with anchor desk, on which merchandisers display their samples to buyers. Each program is transmitted by satellite to 300 Penney stores across the U.S. for live viewing. At the same time, the program is recorded for later viewing on tape at hundreds of smaller stores.

"Ease of use is as important to us as compatibility," Mr. Delsol continues. "SP has really been a boon to the non-technicians who have to operate these systems. The U-Matic equipment has been so simple to work with that everything has been wonderfully smooth."

What does the future hold for video at Penney?

"We're putting together an editing suite based on U-Matics," Mr. Delsol responds. "We'll be doing SP-quality work on tapes for training, and for broadcast mastering."

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much more. "With SP, we can do things we could only do previously on one-inch. We can make second- and even third-generation tapes without degradation—for a client who wants it all done yesterday. With SP, we can do it all under one roof. Finally."

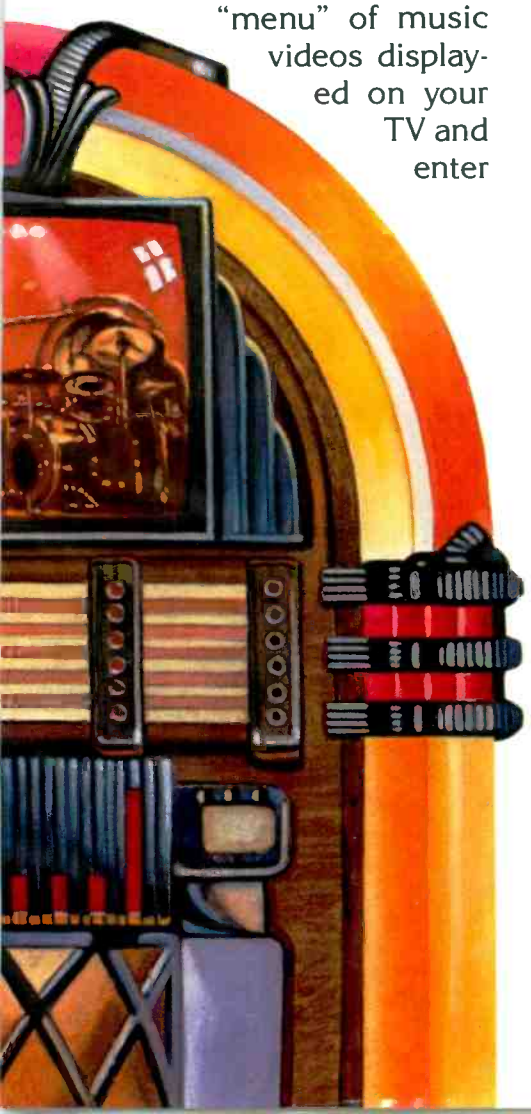
Nelson Leonard is Editing Concepts' off-line editor. Working on a commercial for a leading fabric softener company "there were two or three instances where scenes needed to be cut in reverse action and slowed down. The Sony U-Matic editor with the Dynamic Tracking™ feature lets us accomplish this easily and with perfect quality. So the agency was able to show the client a cut that was much closer to the final on-line version."

In Editing Concepts' business, quality is everything. SP allows them to meet their clients' demands for sophisticated editing techniques with endless revisions—without sacrificing quality. "There's always more than one way of seeing a concept," Williams says. Then with a grin he adds, "But it's always *after* the commercial is shot that ideas change."

"PLAY IT AGAIN, SONY."
THE VIDEO JUKEBOX IS BORN

Devotees of the jukebox, take heart. With a little help from U-Matic® technology, it's coming back on cable TV.

If you live near one of the fully automated cable television stations operated by Video Jukebox of Miami—well, you don't exactly drop a quarter in the slot. Instead, you dial a 976 phone number (like the weather announcements). You make your choice from a "menu" of music videos displayed on your TV and enter three digits through the key pad of your touch-tone phone.



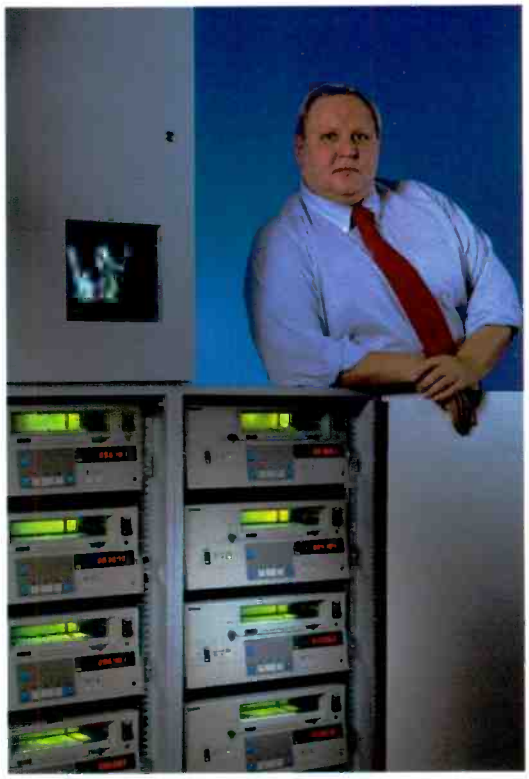
The menu drops away, and there's your favorite performer: on screen and in stereo. Later, you'll be billed for the play by your local telephone company. The phone company then relays payment to the Jukebox Network, which in turn splits the revenue with the cable operator.

When you make your selection, a computer at the station converts your three digits to a frame code "address" that's transmitted to a Sony VP-7000 Video Cassette Player. The VP-7000 accepts this digital code through an RS-232C computer interface, and responds by driving at high speed to the starting frame of the video you have selected.

"The computer generates graphics, programs the menus in and out, and directs the Sony VP-7000 to run commercials between play selections," explains Video Jukebox President Steve Peters. "The combination of the computer and U-Matic frame code capabilities is a potent one in creating this new enterprise.

"And obviously, the public likes it. Right now we have ten stations between Miami and Ft. Worth. We're about to open four more stations. And by 1990, we'll have over 100."

At Video Jukebox, U-Matic VTRs are key to it all. "Our VP-7000s work so well with the computer," Mr. Peters adds, "that we can run the stations completely automated. We visit them once a week or so just to load new tapes. And U-Matic VTRs are so reliable, we've been able to reduce our routine maintenance from once every 90 to every 120 days.



Mr. Steve Peters, President
The Jukebox Network.

"And finally," Mr. Peters says, "there's U-Matic VTR stereo. That capability is essential with music videos."

U-MATICS ON CALL *continued*

ple—are fitted with cameras and recorders.

"Our video equipment must be available 24 hours a day," Mr. Szmulewicz adds. "It runs non-stop. A lot of the units have been on the job for eight years. And they are still going strong."

The medical center makes recordings for legal, educational, and professional purposes. To create instructional videos, they edit much of this material into lecture, graphic and other footage. And the service works with biotechnology companies to make industrial videos.

Some of the editing is quite sophisticated. They have used split screens to provide a before-and-after view of a transplanted heart and three-way splits to show an organ before, during, and after a procedure.

Mr. Szmulewicz notes: "Our Sony U-Matic VTRs work as hard as the medical staff. They've always been there when we needed them. And so has Sony. We couldn't have asked for better service."

U-MATIC AND YOU

These days, you can do more than ever with U-Matic® equipment. Because Sony's doing more than ever to enhance the format.

Consider the BKU-901A Time Base Corrector, used with the BVU-900 U-Matic SP™ Player and BVU-950 U-Matic SP Recorder/Player. As recently as two years ago, it was a separate rack-mounted unit. Today, it's digital—a single plug-in board made of integrated circuits.

More importantly, it makes possible the new BKU-902 Digital Noise Reducer, also a plug-in board, which gets rid of as much as 6 dB of noise across the entire video bandwidth. The DNR has enough memory to store an entire frame or field in digital form. And it uses a memory-based technique to identify and eliminate the noise in the video.

Stay tuned to this setting for more tips.

TRANSMISSIONS FROM THE FUTURE

They say good things come in small packages. And if the future shapes up the way we at Sony anticipate, even better things will come in even smaller packages.

One day, devices like time base correctors and noise reducers (see above) may be reduced to just one or two integrated circuits. And if the past is any indication, they will also work better, cost less and be even more reliable.

Digital technology is one key to the future. A possibility that has Sony engineers excited is computerized self-diagnostics. Another is digital special effects. A third is improved, computerized machine control. And large-scale integration of digital circuits will increase reliability and reduce machine size, cost and weight.

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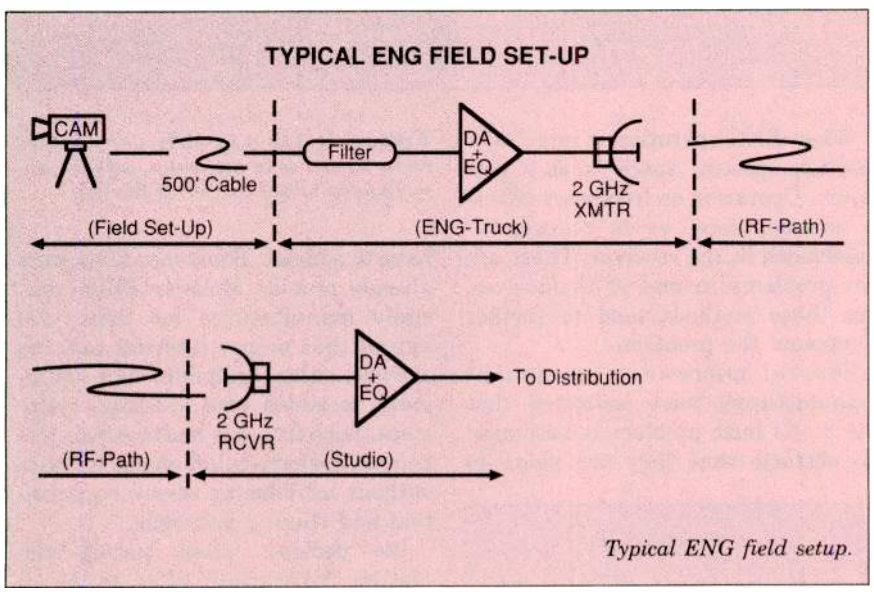
PROFESSIONAL VIDEO

CURING SYNC BUZZ

A problem most commonly described as "sync buzz" has plagued some users of ENG microwave equipment. This problem exhibits itself as an annoying buzz or whine in the audio when video with a high APL, or video generators that have identifiers, are routed to the input of a microwave transmitter. This problem is further exacerbated by the fact that audio subcarriers are sometimes placed around the 4.84 MHz region, which is right on the edge of the video passband.



Typical ENG field setup.

The annoying problem of sync buzz can wreak havoc with ENG microwave operations. One station describes a possible solution.

BY STEVEN C. PAIR

Video level control is obviously very critical to the above situation, but many ENG vans do not have the ability to closely monitor and control the video levels being fed to the microwave transmitter. Most ENG vehicles are not equipped with an overabundance of video processing gear, so the overall job rests with the operator. Not all operators are engineers, and some of them do not have a technical inclination. As a result, they can be familiar with the terms "luminance" or "APL," but have no real concept of the effect of each.

Operational procedures can cause severe problems also. Many times the ENG vehicle is left unattended after the path is established, which results in the output of the camera being fed directly into the transmitter without any monitoring of the levels. This situation is most critical as it appears to be a convention that most news stories are shot with the subject matter having direct sunlight or bright sky as the background. It is understandable that the camera operator, therefore, bypasses the auto-iris function of the lens and manually opens up the iris so as to see the subject. The result: more than 50 percent of the picture information is sent into the clippers, which might be set anywhere between 104 and 112 IRE units, and a black level that is nonexistent. Such shooting should properly have close observation and proper signal processing.

SYNC BUZZ

Most ENG vehicles are not equipped with an overabundance of video processing gear.

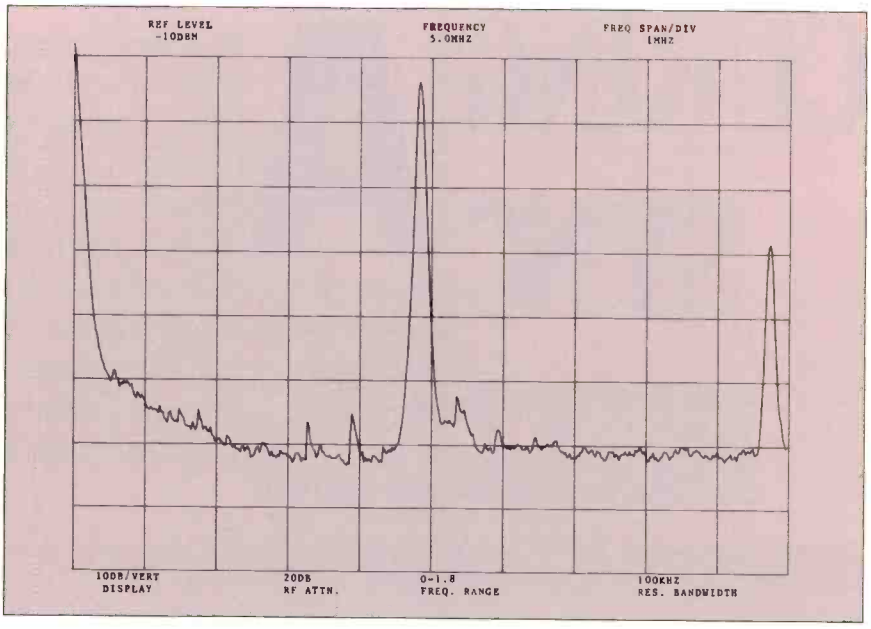


Figure 1: *The 4.83 MHz unmodulated audio carrier is in the center, with the unmodulated visual carrier at the left.*

When ENG operation is in a major market, spectral space is at a premium. Operation on frequency offsets is commonplace, as is reduced IF bandwidth in the receiver. These are not problems in and of themselves, but these methods tend to further compound the problem.

Several microwave equipment manufacturers have indicated that the audio buzz problem is becoming an obstacle that they are going to have to address. Some manufacturers already provide Matthey filters specially manufactured for them. All agreed that proper filtering was the answer, either built into new equipment or added onto existing equipment. Such filtering has to supply the necessary sharp cutoff characteristics without introducing severe equalization and ringing problems.

We decided, after testing the Matthey "Brickwall" filter, to install the MBW.420 B filters, which have virtually eliminated our audio buzz problem without video perturbations. When we tested the filters in a generator-to-filter-to-scope bench setup, some ringing was evident in color bars. In a practical field situation, however, with the video processed via a normal microwave link and viewed on the scope, we observed very little ringing. When active video is used as the source, no apparent degradation is viewed.

The effectiveness of the "Brickwall" filter is clearly shown in Figures 1, 2

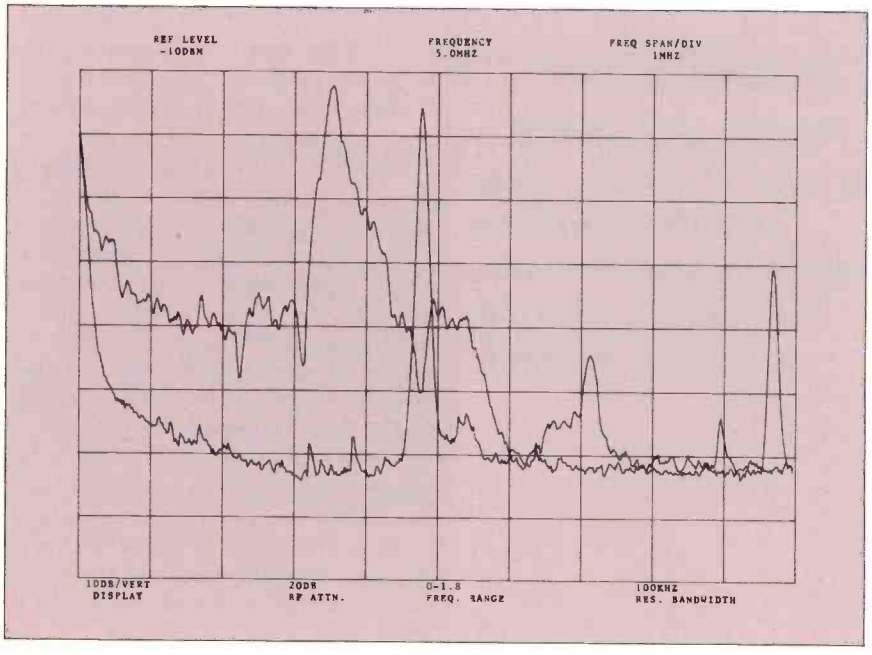


Figure 2: *By modulating the visual carrier, the effective noise floor of the audio carrier is increased by 25-30 dB.*

"Brickwall" filter installed in ENG equipment.

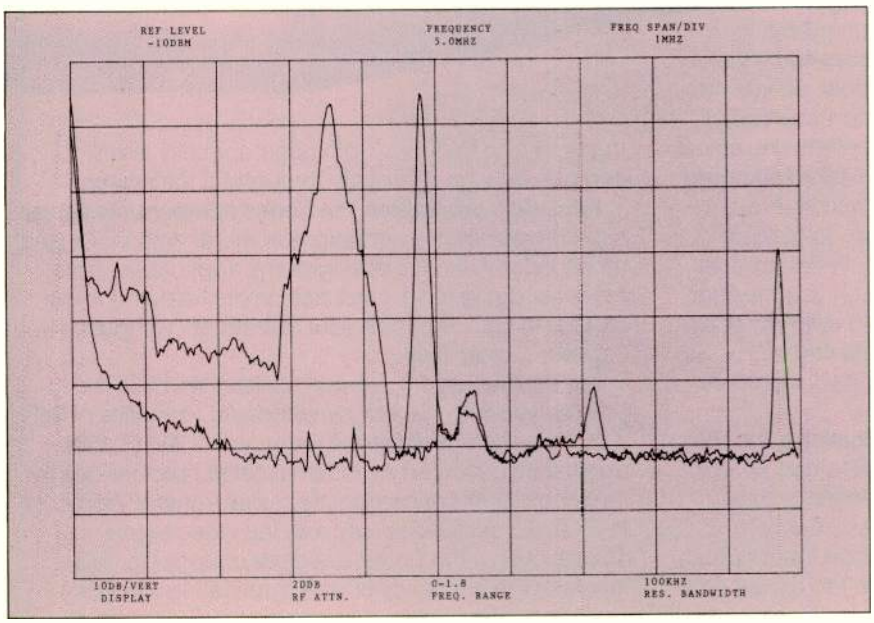
and 3. Figure 1 shows the 4.83 MHz unmodulated audio carrier in the center, with the unmodulated visual carrier at the left. Figure 2 shows the effect of modulating the visual carrier; the effective noise floor of the audio carrier is increased by 25-30 dB. In Figure 3, the filter has been installed and the noise floor is returned to its original level. This practically eliminates all video-on-sound effects.

Since the filter introduces approximately one-third of a volt drop in overall video level, we decided to modify our amplifer tray to accommodate the filter as well as the audio/video amplifiers. This proved to be the best option as there was a minimum amount of wiring and the filter was provided with a secured location (Figure 4). Had the newer zero loss version of the filter been available, we would have chosen that in preference.

We have had the Matthey MBW.420 B filters installed since February 1987 and have not experienced any audio problems on our ENG microwave links since. ■

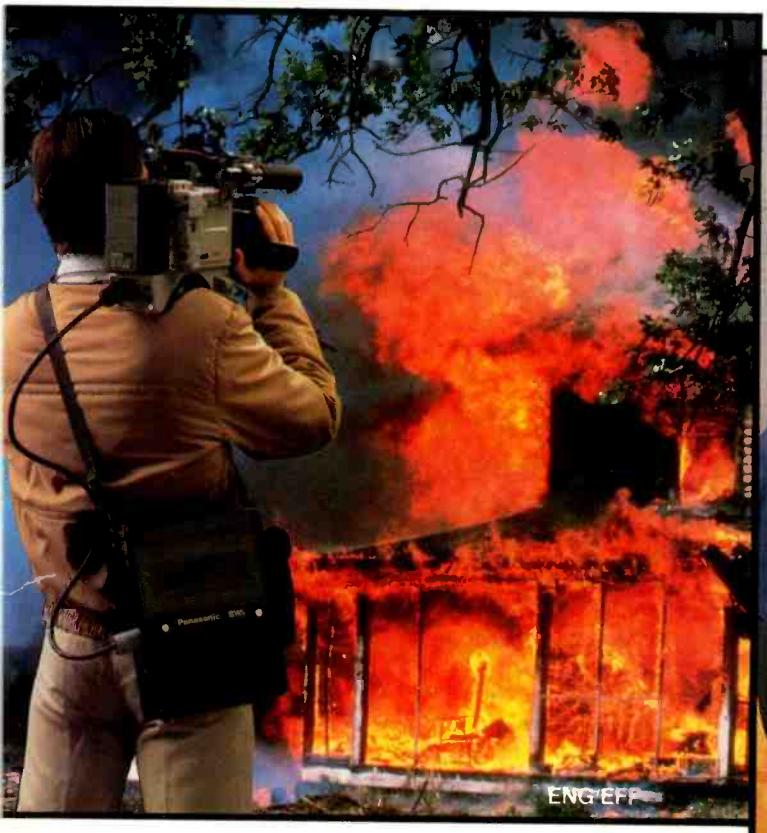
Pair is engineering supervisor of KABC-TV, Hollywood, CA.

Figure 3: *Installation of the filter returns the noise floor to its original level, practically eliminating all video-on-sound effects.*



Several microwave equipment manufacturers have indicated that the audio buzz problem is becoming an obstacle.

Get a sharper image...



The SVHS format behind the Panasonic® Pro Series will change the way you look at half-inch recording systems. Because it delivers over 400 lines of horizontal resolution. At an affordable cost. So you can get a sharper image even as you sharpen your pencil.

In the field, the Panasonic Pro Series offers you a host of benefits existing formats fall short on. Like two hours of recording time on a single cassette with Hi-Fi audio capability. In a highly portable package. To capture more action and sound on fewer tapes. Which means you'll have less to carry in the field and on your budget. And the Pro Series easily interfaces with a variety of existing component or composite cameras and VCRs. So you can easily integrate the Pro Series in your present field operations.

For editing and post-production applications, the Pro Series takes full advantage of the SVHS format as well. With easy to use features and high performance capabilities. Such as digital framing servo circuitry to provide highly stable edits. And time code input/output facilities for frame accurate editing. The Pro Series editing VCR also features 7-pin dub capability to maintain component signal integrity throughout the system.

For studio production, Pro Series components are designed with flexible operations in mind. With VCRs and monitors outfitted for total systems application. And cameras designed for use both in the field and in the studio. To help minimize your investment without limiting your capabilities.

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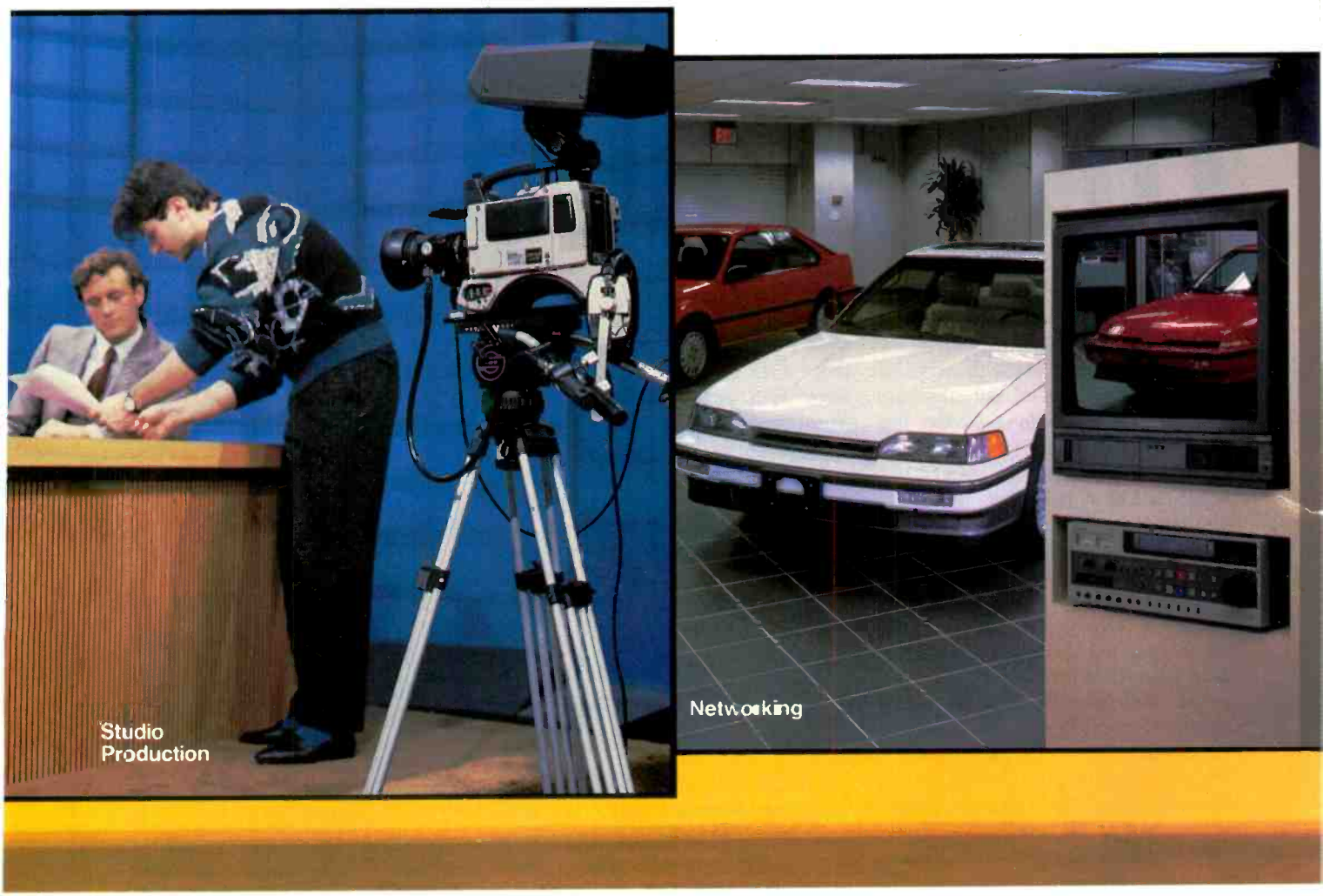
even as you sharpen your pencil.



Whether it be a small or large operation.

For video network applications, the Pro Series produces high quality images on both large projection systems and small screen monitors. With features like auto repeat playback for unsupervised presentations. And the system is upwardly compatible with standard VHS. So you can continue to use your existing library of recordings without any type of conversion.

Pro Series VCRs also incorporate a number of features designed for network automation. Such as video sensor recording. So you can transmit video programs to your network locations during off-peak hours. And save on both transmission and personnel cost. You can even interface Pro Series VCRs with computers for interactive training programs.

So whether you're looking for high performance field recording, post-production, studio, duplication or networking systems. The Panasonic Pro Series can sharpen your image while you sharpen your pencil.

For more information, call Panasonic Industrial Company at 1-800-553-7222. Or contact your local Panasonic Professional/Industrial Video dealer.

S-VHS

Panasonic

Professional/Industrial Video

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THE INTERFORMAT OLYMPICS

While much has been made of the financial risks attendant to such TV spectaculars, of the prestige issues, and of the strategic considerations on the big network scheduling boards, there is another aspect to mounting an Olympic telecast that will have an enduring impact on the industry long after the hullabaloo around "1988 Olympic Games: The TV Show" has died down.

For its exercise, NBC selected a number of technologies and practices that might send chills down the spine of the casual observer. But NBC is no casual observer. The network has drilled relentlessly over the past several years, and as Scott Rader, NBC's director of production services for the Olympics, noted, "NBC Sports wasn't exactly new at all this."

Three years ago, when NBC announced its intention to adopt the MII videotape recording format for all its network videotape recording applications, there were a lot of skeptics. Many remain skeptical, but not the hundreds of engineers, technicians, operators, and production people who put together the Olympic broadcast.

To NBC staff engineer Steve Mahrer, with the network's Technical Development team, the recognition of MII's broadcast character comes as no surprise. Mahrer was a member of the NBC team that carefully translated their broadcast experiences into design criteria for the MII system. The MII system, notes Mahrer, was at the beginning and continues to be a broadcaster's brainchild. "Panasonic wasn't the only maker we went to, but they were the only ones willing to work with us to develop the kind of [recording system] we needed," he says.

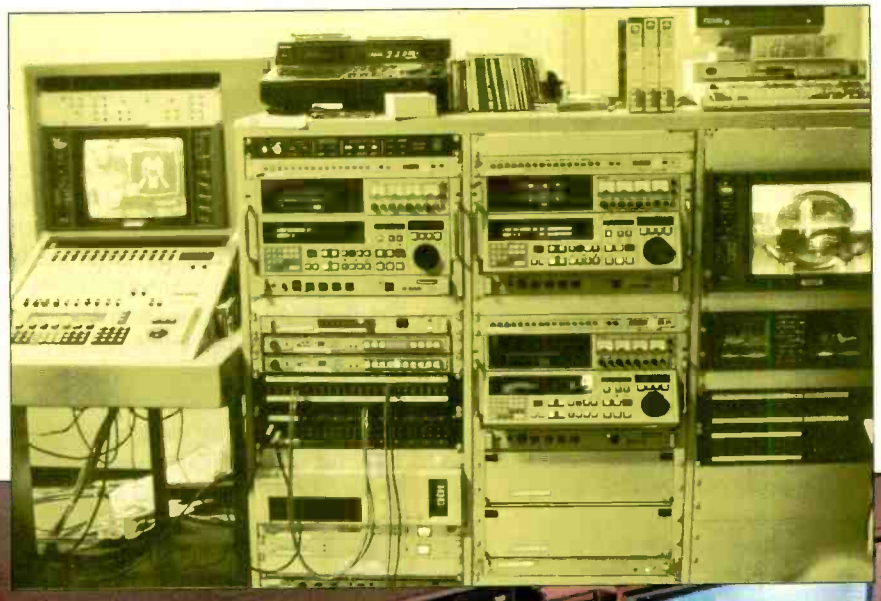
The plant that NBC constructed in its 55,000 square feet of space at Seoul's International Broadcast Center was the network's third largest production facility in the world—right behind Burbank and New York.

Kadenza permitted NBC to demonstrate convincingly that MII could coexist not only with NTSC, but also with CCIR 601 component digital images.

To the outside observer, the plant seemed to be the culmination of nearly every television engineering achievement of the recent past. For one thing, the entire plant was stereo, which made this Olympics "the first all-stereo Olympics," according to Charlie Jablonski, who was responsible for all Olympics-related engineering for NBC. But if a stereo studio turned out to be a little more complex than expected, the integration of so many other facets and so much new technology went more smoothly than

BY RICHARD BAUM

The Summer Games proved a grueling field laboratory for the interface of MII video with D-1, Type C, and other formats.



Integration of a variety of formats was vital at the Seoul Games. Above, the NBC VTR edit room at the IBC. Featured in the inset, the MII graphics interface racks.

NBC selected a number of technologies and practices that might send chills down the spine of the casual observer.

might have been reasonably anticipated. Said Jablonski, "We pulled it off, and pulled it off quite well."

NBC's Seoul graphics suite was central to the on-air look of the broadcasts. "With the graphics suite," noted Jablonski, "we probably have the single largest component graphics operation in the world." The graphics suite was in and of itself a new technology bonanza. "The Quantel Sports Cypher was new, and even the [Grass Valley Group] Kaleidoscope was new—but that worked out very well," noted Jablonski. One key to "working out well" lay in yet another new piece of technology, the GVG Kadenza.

The Kadenza, which has been described as a digital production switcher despite GVG's designation of it as the DPP-1 "digital picture processor," was used to compose pictures from multiple sources, combining the output of the graphics suites with other pictures generated from the venues, studios, or edit suites. Kadenza permitted NBC to demonstrate convincingly that its MII format could coexist not only with NTSC, but also with CCIR 601 component digital images, and still look as good as images from any of the other videotape recording formats.

The Kadenza unit that NBC used was a prototype system that had never previously operated outside of Grass Valley Group's own development laboratory.

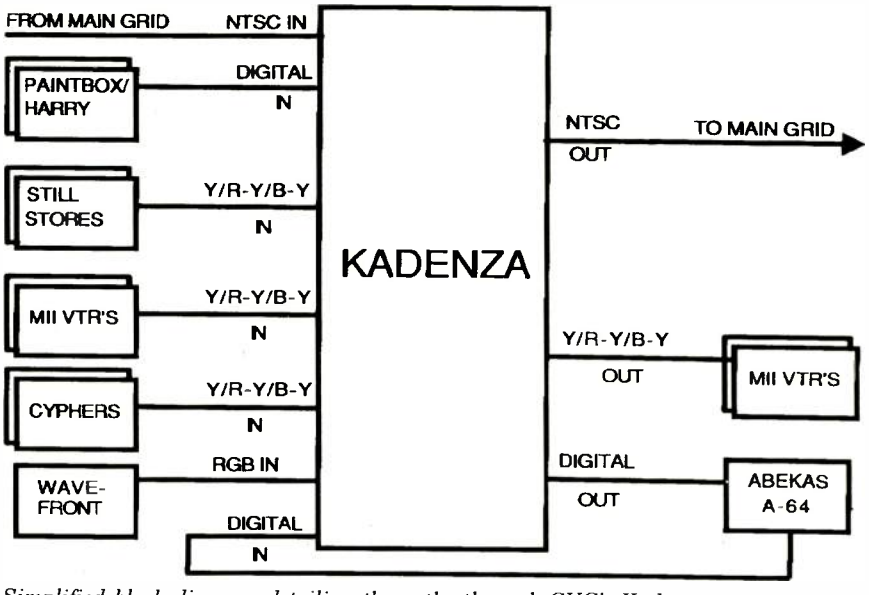
To a great extent, Kadenza allowed NBC to select video formats based on which one was best for each application. Thus, the network could use MII for all tape recording applications, RGB for the Quantel Paintboxes, and 4:2:2 from the A64, and still be assured of an effective means of combining them. The Kadenza was set up to take YUV from the tape machines, the Cypher graphics generators and Paintboxes, and 4:2:2 digital from the Abekas A64. Two channels of house NTSC from the master routing switcher came into the mix through the local Horizon router after being converted to YUV by high-quality Faroudja decoders. Internally, then, the Kadenza could manipulate all of its inputs in 10-bit, 4:2:2 digital using four Kadenza effects channels plus one channel of Kaleidoscope. Outputs from the Kadenza were normally in YUV for the MII machines, 4:2:2 back to the A64, and in NTSC for monitoring and to the master grid.

The entire NBC production design was conceptual and designed to elicit from each person a creative contribution, according to Rader. The technical structure was as much about creativity as it as about engineering. Rader explained, "Basically, we planned to go with large edit rooms and small edit rooms. The rooms were allocated according to daypart—morning, afternoon, prime time and late night. Each daypart had its own producers, directors, production assistants, engineering staff, editors, and so on."

The four large edit rooms, conceived as way stations on the image path from venue to viewer, were composite video edit suites. Each room had seven MII AU-660PE VCRs. The edit controllers were Grass Valley Group Model 51s, and each suite had its own GVG 300 production switcher and Quantel Sports Cypher, along with Ward-Beck audio consoles.

There were two "rings" of Kaleidoscope digital effects channels, with three control panels. Large edit rooms 1 and 2 and control room A had controllers for one ring of effects units, with large edit rooms 3 and 4 and control room B on the other ring.

These four edit rooms were not intended simply for off-line editing. Two outputs of each room (switcher Program and Preset bases) reentered the master routing switcher through NBC's unique Zero Studio Delay system, allowing video to be in time with other plant sources. Each of the large



Simplified block diagram detailing the paths through GVG's Kadenza.

We built the machine that brought home the gold.

The 1988 Summer Olympics.

Recorded, edited and aired on

Panasonic MII equipment.

MII Panasonic
Broadcast Systems Company

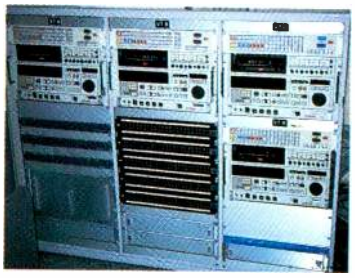
Tested in one of the toughest arenas on earth, Panasonic MII helped set new standards in broadcast quality.

Panasonic MII equipment helped NBC get over the hurdles of broadcasting the world's largest sports event in history. With more venues. More events. And better quality video and audio than ever before attempted.

From the ease with which an army of free-lance technicians was trained on MII...to the reliability it displayed under the pressure of 180 hours of intensive programming...MII equipment became one of the cornerstones of NBC's third largest facility—right behind New York and Burbank—and their first all-stereo facility.

Between the 4 large composite edit suites and the 11 small component suites, NBC utilized up to 100 Panasonic MII machines. Machines that the free-lancers found "to be user-friendly, reliable and responsive. It enabled us to maintain a high-caliber on-air look." *Jack Slomnicki, broadcast technician.*

With the grueling pressure of making it quickly to air with a combination of archival footage, live events, graphics, maps and animation, NBC's Olympic team found that MII's "primary advantage was the ability to make last-minute decisions on which segments to run. A 1-inch format would have required more machines to do the same job." *Neil Flagg, lead technical director, International Broadcasting Center.*



And the pressure was eased by the fact that "these machines proved to be reliable workhorses while providing excellent audio and video recording quality." *John Wesley Nash, broadcast engineer.* And also helped NBC set a new track record that could stand for years to come.

In addition, the host Korean broadcast network (KBS) as well as broadcast networks from Japan (NHK), Austria (ORF), and the Netherlands (NOS) utilized the MII advantage in their coverage of the games. All told over 300 machines brought home the gold.

Panasonic
MII
Official Video Equipment Of
The 1988 Olympic Games

Title 36 United States Code Section 380

MII Panasonic
Broadcast Systems Company

The small edit rooms were designed to keep the video in component form throughout the editing stage.

edit suites could operate as a control room using the edit controller to cue and roll tape machines.

Six of the seven AU-660s could be fed from the master routing switcher, allowing them to make recordings of incoming feeds, independent of other activity within the room. Two local 10x1 routers also connected the rooms to the master router and through them, any two of the seven VCRs could feed out of the room independent of the other activities in the suite.

The massive 3M master routing switcher integrated just about every piece of video production gear into an overall facility design, with everything connected to everything else. "When we designed the rooms, we had four things in mind: recording, quick turnaround of edited material, live-to-tape, back up to air," Rader recalled. "These rooms could bring in any venue, only needing to insert graphics. All the studio had to do was punch up a room."

The 11 small edit suites were designed to operate entirely in the component domain in order to minimize the number of times recordings would have to be encoded into NTSC. All recording, both in the field and in the broadcast center, was on MII machines, though the recorders aboard the trailers NBC leased were mostly Type C units, and were sometimes used to record video at venues for either simultaneous or delayed transmission back to the IBC. Nevertheless, once video arrived at the IBC, it was recorded on one or more of the approximately 150 Panasonic AU-660s at the NBC center.

(NBC also had, at the center, a few Type C recorders and a couple of U-matics for playback of archive materials, but all production recording and post-production was done on the Panasonic units. To provide for playback of tapes that might come in from other sources, NBC also maintained a couple of Sony BVW machines.)

The grist for the small edit rooms, however, was strictly component signals and the rooms were designed to keep the video in component form throughout the editing stage. The switcher employed in the rooms, for instance, was the Grass Valley Group Model 100CV component video production switcher. Editing control, as in the larger edit rooms, was through the GVG Model 51 editor, and the audio console was a Graham Patten Model 616. Four Panasonic AU-660 PE videotape recorders made up the VCR complement.

Grid outputs from the master router system were provided to each of the three playback VCRs in each of the small edit rooms, which permitted them record any of the video signals from the venues or from elsewhere inside the plant. Naturally, the Panasonic recorders converted any of the incoming NTSC signals to component and any of the inputs to the switcher that did not go through the recorders were converted to component by Grass Valley encoders.

As Jablonski put it: "I knew MII was not risk-free, but it had to appear to be risk-free to the people who implemented it. You can't make them think they are working harder than they have to." For many of the editors who staffed the small edit suites, this was their first encounter with all-component editing.

The principal adjustment that the staff of the small edit suites had to make to working in component was the absence of luminance level adjustments on the output of the MII machines, and the extremely quick ballistics of the AU-660s.

The color correction problems only arose when for some reason (generally attributable to improper camera setup in the field) luminance levels would get a little hot. In contrast to the composite environments with which the operators were a little more familiar, in component they could not correct the problem simply by turning down the levels at the encoder. Levels in component systems are preset, and so, setup has to be correct. If for some reason colorimetry is incorrect, then a component color corrector is needed to solve the problem.

Panasonic's Bill Bakonyi, who provided a lot of the videotape recorder training, noted that some of the editors who were accustomed to toggling the fast forward and rewind controls rather than using the jog control had trouble reacting to the extremely fast ballistics that moved the tapes to 32 times normal speed within a second. There was some discussion of possibly making a software adjustment to the machines to have their ballistics mimic those of say, a BVH-2000 or VPR-3, but with a little time to adjust to the speed of the machines, the editors found they preferred the new quickness.

NBC's Rader seemed extremely satisfied with the way the small all-component edit rooms came together. "There was a lot to do," Rader said of the period leading up to the Olympics. "A lot of time was spent developing a new technology [MII], and that didn't leave much [time] left over" to test out the various systems.

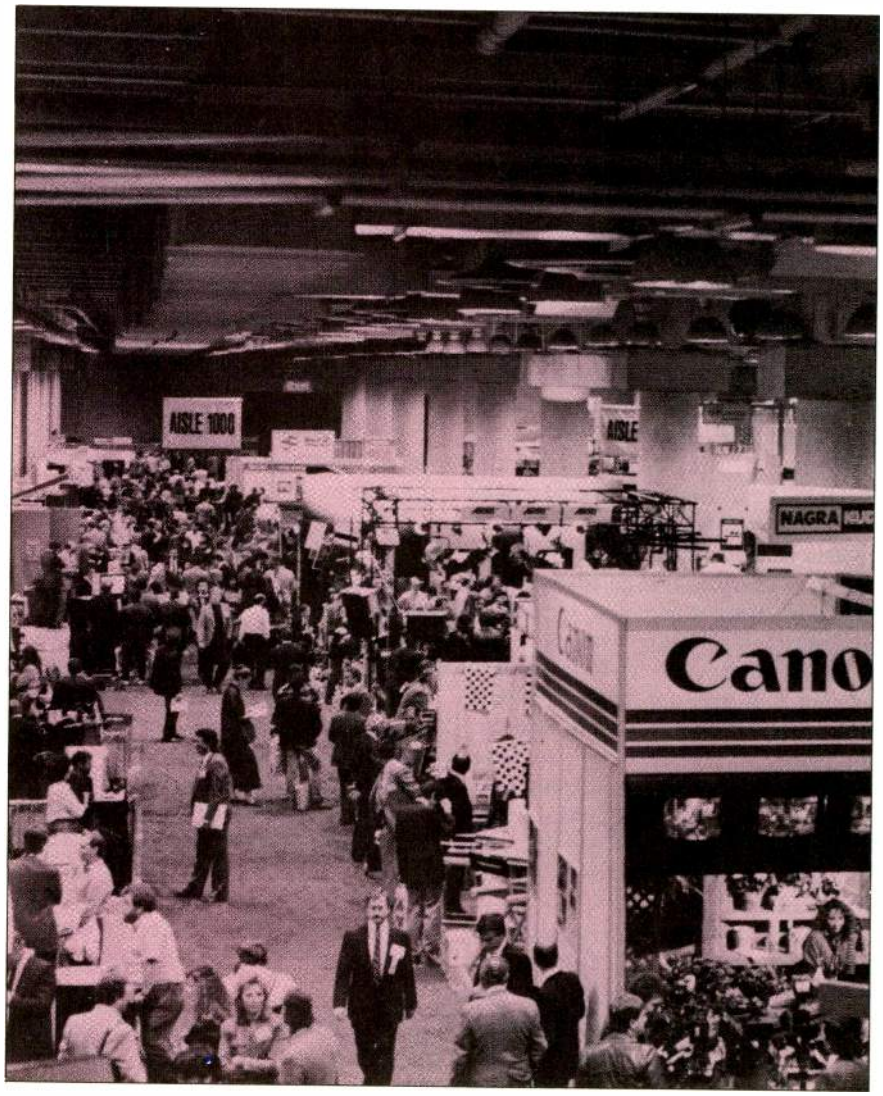
Whatever network faces the task of broadcasting the 1992 Olympics in Barcelona, they'll have a tough act to follow. It's hard to imagine a performance that can match the 1988 Games for degree of difficulty and excellence of technical execution. ■

Richard Baum is a New York-based freelance writer who specializes in video and broadcasting.

STAFF REPORT

THE ONE HUNDRED THIRTIETH SMPTE CONVENTION:

THE STANDARDIZATION STAKES INTENSIFY



The more than 15,000 attendees who gathered at New York City's Jacob K. Javits Convention Center in October for the 130th Convention and Equipment Exhibit of the Society of Motion Picture and Television Engineers came at what may prove to be a watershed time in television history. The political and engineering battles over the technology of the decade, HDTV, reached a new pitch.

Meanwhile, the pace of technological change in the industry as a whole is challenging the SMPTE standardization process as never before.

"Technology is galloping, standardization is crawling," asserted keynote speaker William Connolly of Sony Corp., addressing the opening session Saturday morning. Due to the "drastically shortened" design cycles for new equipment, he continued, "We are approaching the real possibility of seeing a product go from R&D into the marketplace and into obsolescence while we're still talking about adopting a standard...the guidance system is failing. The stress signs are appearing just at a time when the explosion in technology makes orderly standards more important than ever."

That explosion in technology was well in evidence at SMPTE, with significant developments in areas such as character generation, audio, postproduction and cameras. Here is *BME*'s analysis of the chief trends. ■

Controversy and Growth in ATV

ADVANCED TELEVISION

Without a doubt, advanced television was the technology of the moment at October's SMPTE convention. The eventual choice of HDTV transmission and production systems puts so much at risk for so many segments of the industry—over-the-air broadcasters, cable operators, teleproduction, program producers, receiver manufacturers—that no one is willing to stand by and accept whatever system may come down the pipeline.

Perhaps the most talked-about development at the show was NBC's proposal, announced by Mike Sherlock, president of NBC operations and technical services, at a Saturday morning press conference, of a 1050-line, 59.94 Hz HDTV production standard.

The paper NBC submitted to the SMPTE actually detailed three proposed ANSI standards for HDTV production: a 1050-line, 59.94 Hz, 2:1 interlace standard; a 525-line, 59.94 Hz, 1:1 progressive scan standard; and a 1050-line, 59.94 Hz progressive scan standard. (See this month's Crosstalk for more discussion of the controversial NBC proposal.)

With the industry gearing up to start full-scale testing of HDTV transmission systems, developments on the transmission side are coming fast and furious. Researchers at the David Sarnoff Research Center, whose two-level Advanced Compatible Television transmission system has received much attention, introduced yet a third level, ACTV-E (for "entry-level" ACTV). While Sarnoff representatives did not describe ACTV-E in detail, they did note that it lacks ACTV-1's "helper signal," the system's fourth component, which transmits additional vertical-temporal luminance detail.

A paper from North American Philips described various approaches to HDTV augmentation channels in that company's HDNTSC proposal, not to be confused with the Del Ray Group's HD-NTSC. Richard Iredale of Del Ray offered a status report on HD-NTSC, which is supported by Cox Enterprises and Tribune Broadcasting. A paper from Sony describewd the HDD-1000 digital VTR for 1125/60 HDTV. Y, R-Y, and B-Y components are separately and linearly quantized to eight bits/sample, yielding a 56 dB S/N ratio. Production Services, Inc., of Tucson, described the application of its Genesys technology to HDTV. Genesys combines "fundamentally new" carrier signal modulation, A/D conversion, bit compression and detection and will, the company asserts, allow an additional 3 MHz of information and four digitally converted audio signals to be added to the conventional NTSC signal.

While production equipment for the 1125/60 standard has been available for some time now, other pieces of the HDTV puzzle have been slow in coming. SMPTE '88 showed a few significant developments on the hardware side. BTS, for example, was showing an HDTV version of its routing switcher, the TAS/TVS 2001. First seen at NAB, this wideband system has already been installed at WGBH in Boston. It is designed to fit into HDTV systems of any size from 10x10 to 200x200, and its control systems are fully compatible with the 2000 routing switcher family.

Toko America, which specializes in signal processing for HDTV, introduced an HDTV multi-frame synchronizer and image storage system, the MFS-64H. Designed to fit into the 1125/60 environment, the MFS-64H can digitize and delay up to 30 frames, expandable to 90, and is suited to computer graphics and animation applications, the company says. Another new product from Toko was the VT-500, an $85,000 HDTV framestore for research, animation and broadcast.

Since the world is still largely low-def, standards conversion expert Merlin Snell and Wilcox introduced the ME 2001, a downconverter that accepts 1125/60 video and outputs NTSC, PAL, SECAM, PAL-M and PAL-N. The company says the product is "ready for" the proposed 1250/50 European HDTV standard.

In the improved NTSC camp, CDL demonstrated its new E-NTSC codecs, now known as Stage*1. The hallmark of this system is a new multidimensional filtering technique based on research conducted at Montreal's Bell-Northern Labs. The Stage*1 encoder without the two-dimensional filter is $7900; shipping, on a 90-day schedule, should commence within the month. The 2D filter can be added on a single card.

An interesting development in the nonbroadcast realm was High-Resolution Sciences' "chroma crawl-free" video technology, designed for cable systems but not currently suitable for over-the-air broadcast. A company spokesman said no receiver modifications were necessary.

CGs Catch Fire

GRAPHICS

Is there a CG operator out there who hasn't thrilled to instructions "Get it up there good, fast and cheap"? Until SMPTE '88, the printable response was usually: "Pick two and call me."

In graphics and effects, the hot news is that character generators are suddenly sexy. Formerly, CGs were either quick, dirty and cheap, or state-of-the-art and equally pricey boxes generating foundry-based type and

Museum of Art-quality. Revolutionized by computer graphics technology and buoyed by reports that some 80 percent of commerical TV stations recently surveyed by the NAB (September 1988) now use character generators and graphics technology in broadcast news, the market is responding fast.

At SMPTE, new units from the likes of Aston and Quanta and—significantly—new market entries from Ampex and Abekas promise all the old capabilities plus new functionalities—at a price that won't make one's heart stop.

Both the Aston Caption character generator and Quanta's Orion and Delta get economy-minded stations on the air fast with easily accessible, easily manipulable and attractive graphics. First announced at NAB, the Caption is essentially a single-channel version of the Aston 4. New effects including deal, stack, multirow twist and transparent backgrounds were introduced at SMPTE. Over 60 of the $27,500 Captions are currently in use, Aston says.

Initial shipments of Quanta's Delta—priced at $39,995—and the mid-range Orion began in September to a mixture of international and U.S. clients. A year in development and based on different hardware, the first Orion and Delta shipments were configured for up to eight languages. Status-driven, the keyboard-addressable Orion uses 16 levels of antialiasing, 256 levels of transparency and 16 million colors. The Delta is an antialiased, freeform text generator with real-time operation; an unlimited number of multilevel planes can each be rotated 360 degrees.

Ampex and Abekas are both new to the character generation market, but both have the marketing clout to be major contenders. Ampex in particular can wield serious turnkey muscle and can call on corporate resources, a synergy which in fact enabled the development of the Alex CG from technological "bits and pieces" the company had on hand. Priced between $23,500 and $39,500 for "mid to high end" broadcast and post-production applications, Alex boasts 256 levels of transparency and antialiasing of characters and symbols. It's said to be unique because it can perform almost limitless manipulation and animation of characters and symbols; characters and symbols can, for instance, be animated in real time along any arbitrarily defined motion path.

First introduced at SMPTE in 1987, the Abekas A72 is scheduled to ship in January 1989, the company says. More font attributes including soft shadows, soft characters and character aspect were introduced here for the CCIR 601-compatible digital CG. Priced at $35,000 for a single channel model and $45,000 for dual, the Abekas A72 offers on-line instant sizing, even on the fly. All fonts and colors are on-line; by combining the A72's variable roll and crawl speeds with an interpolated frame store, the unit can create animation which looks very similar to digital effects.

Another industry trend is integration of production and/or post-production systems, which Quantel epitomizes by linking everything including the sink to Harry (HarrySuite). While its U.S.-debut compact (read "price competitive") character generator Cypher Sprint, the little brother of fast digital graphics box Cypher Sport, doesn't make that particular link, it does download from Cypher Sport and displays pictures transferred from Paintbox. The multichannel 4:4:4:4 Sprint also generates and composes captions independently; it's intended for news, sports and election coverage.

TRUE VISION: TRUE GRIT

Open up an IBM PC and you may find a Targa video capture and display board. It was designed and made by Truevision, a feisty leveraged buyout from AT&T's former Bell Labs. Out on its own with frame grabbers/buffers and imaging software for PC-based imaging, Truevision was a debut hit at SMPTE with its TrueVista series of coprocessor-based videographics adapters.

Delivering a broadcast quality signal from an IBM PC or—new—an Apple Macintosh, the TrueVista boards incorporate a TI34010 32-bit graphics coprocessor and carry between 1 and 4 Mbytes of on-board video memory. Prices run from $2995 to $5995, plus a temporary memory surcharge. Color, capture and display resolution are programmable and the series is NTSC and PAL-compatible. Both the Targa and the Vista series are modular, and Truevision has developed a bus for the Vista that can support, among other things, an array processor. One more thing. These folks definitely love their job.

Just Slightly Ahead of its Time

DIGITAL AUDIO

Digital audio workstations applied to video editing—in theory, as Robin Williams would say, what a concept. In fact, as evidenced at SMPTE, the equipment is not quite there, and it doesn't come cheap. Equally important, anyone who says it's a snap to get smart on these

systems majored in a whole lot more than new math: the new technocracy of computer-literate audio for video operators will be sought-after birds commanding a high price.

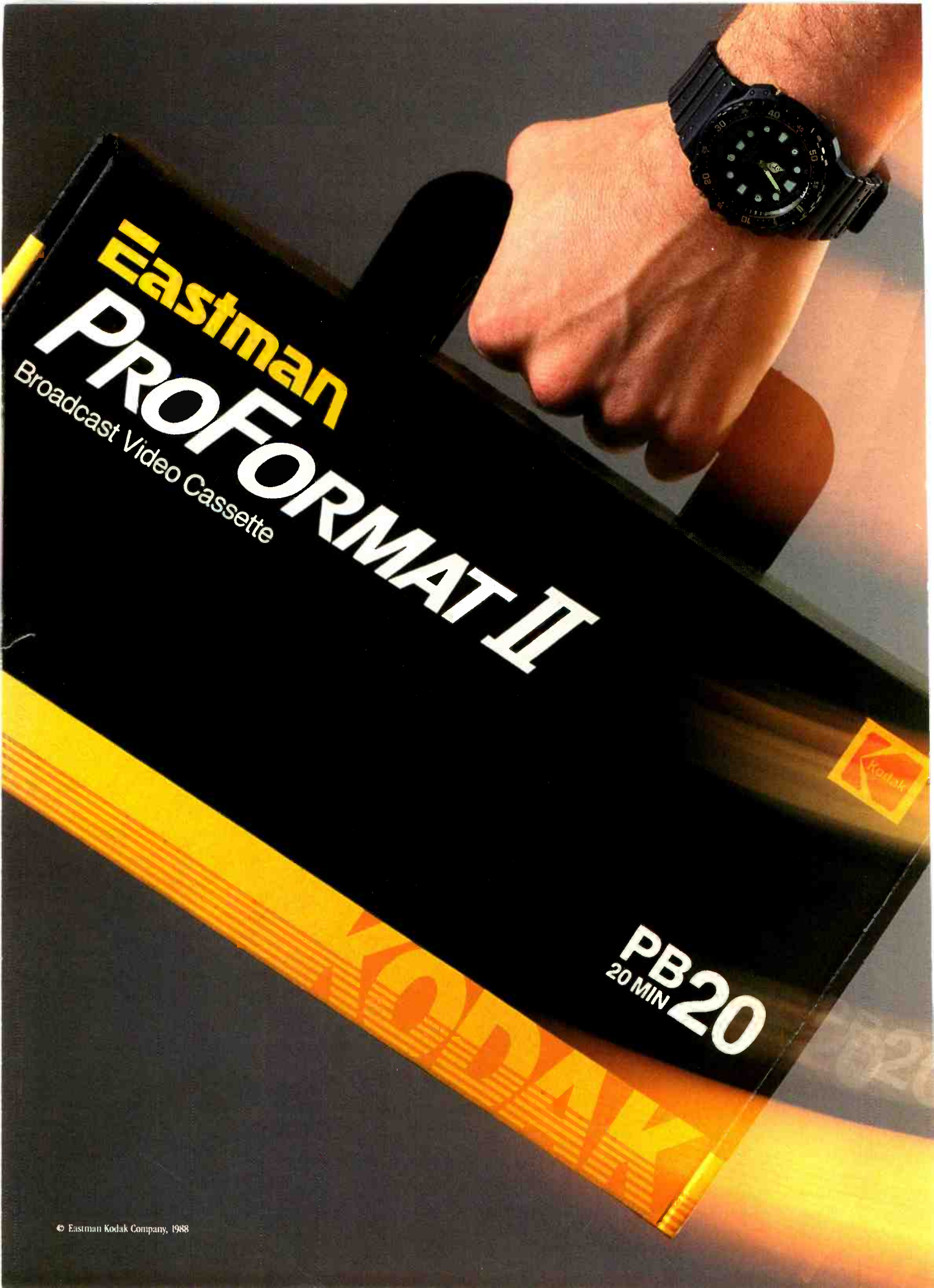
Nevertheless, digital technologies are filtering into editing, on-air and production modalties for broadcast television and radio applications. At one time it appeared that stations would "go digital" in one fell swoop, scooping the mortgage pool and putting in a Super Synclavier with the alacrity of Murdock's *London Times* switching to computer editing. Another school of thought argues the incremental apporach: a signal processor here, a digital workstation there, some fiberoptic cabling, on-air CD, touchscreen newsroom automation—and boom, whole station automation and digital through the STL.

Bolstered on one hand by the "systems integrators"—spearheaded at SMPTE by Quantel and Harry-Sound—and on the other by a host of companies which are making analog audio jump through digital hoops, the balance appears to be tipping toward the evolutionaries.

The SMPTE debuts of the Lexicon Opus 1 and SSL 01 Digital Production Center were the most visible contenders in the digital audio production ring, despite strong showings from New England Digital, Fairlight and a two-day "guest appearance" from Waveframe dispensing information from a truck parked across from the convention center. NED is targeting the film and video post industries heavily with its 96-voice new Synclavier system (a production and development deal was inked with Lucasfilm and announced at the AES in Los Angeles just two weeks later).

The Lexicon Opus 1 is a hard disk-based system that incorporates the functions of a digital multitrack recorder, a digital audio editor and a digital mixer in an environment easily grasped by anyone used to working with "reels" of sound. Primarily directed to the film and video post-pro market and capable of locking to audio and video recorders and film dubbers as well as generating time code and digital word clocks, the elegant Opus 1 workstation is also intended for multitrack music editing, CD preparation and radio work—particularly radio drama, which can be edit-intensive. Twelve of systems, which range in price from $150,000 to $225,000, are in the field, with deliveries quoted at 90 days.

The firstborn from the recent Quantel/SSL alignment under the UEI Group bowed at SMPTE as production versions of the SSL 01 system



EASY COME, EASY GO.

Our new PRO FORMAT II Production Pack makes carrying tapes for your Betacam system remarkably easy. Because each pack contains 10 high-quality broadcast cassettes in one, convenient case.

And with our quality assurance program for EASTMAN Products, you can be confident each cassette delivers the performance and dependability you need.

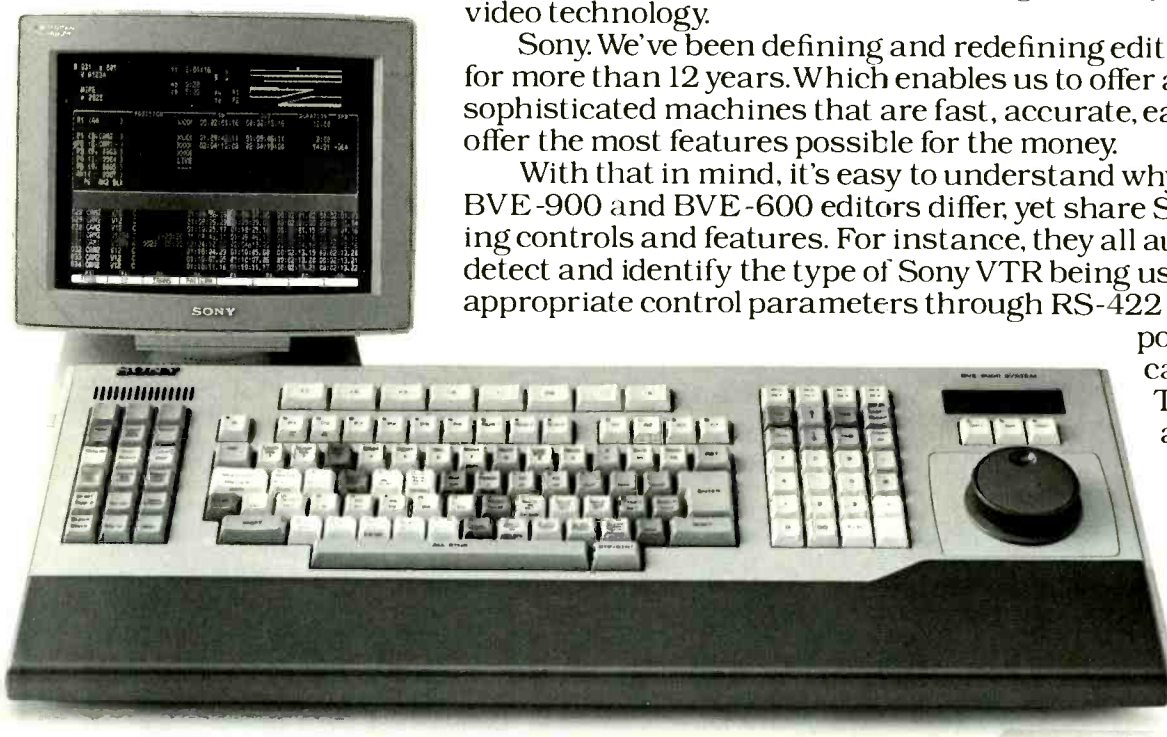
An outside log on the production pack also makes it easy to label, store, and retrieve tapes. Which means it's not only great for coming and going, but great for keeping track of what you did there, too.

Eastman
Professional Video Tape

Kodak

Why Sony cutting edge o

BVE-9000



One company has consistently managed to stay at the forefront of video technology.

Sony. We've been defining and redefining editing control units for more than 12 years. Which enables us to offer a wide range of sophisticated machines that are fast, accurate, easy-to-use and offer the most features possible for the money.

With that in mind, it's easy to understand why the BVE-9000, BVE-900 and BVE-600 editors differ, yet share Sony's key operating controls and features. For instance, they all automatically detect and identify the type of Sony VTR being used and set the appropriate control parameters through RS-422 serial control ports. Plus, they can read Control Track, Time Code and perform video/audio split edits. The list of features goes on and on, so by all means, read on.

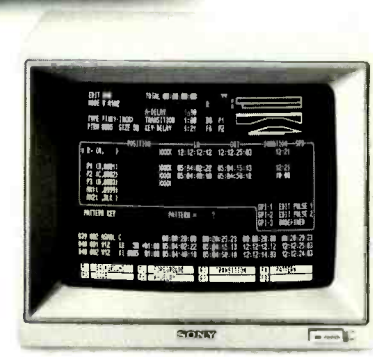
The BVE-9000. State-Of-The-Art That's Top-Of-The-Line.

The Sony BVE-9000 is one of the most flexible and powerful editing systems in the world. It's designed to save the most precious commodity of all: time.

Among its significant innovations are multi-edit preview and full assembly look ahead. This allows you to preview an entire sequence of up to 999 events, before actually having to record a single edit. And then, with the flick of a few key strokes, you can automatically record the entire program.

Of course, there are many other incredible features that help you control your entire editing facility. For one thing, the BVE-9000 can work with 28 separate devices. It also has an optional color menu display that's user friendly and programmable for layout and color.

What's more, our Dynamic Motion Control Learn-With-Create and



BVE-900

is on the f technology.

switcher Learn-With-Create features allow you to record a move without having to re-rehearse it. In addition, the temporary record assignment greatly speeds up multi-layering. And the most complete set of test diagnostics in the industry helps reduce system downtime. No wonder this top-of-the-line editing system can meet all your present and future needs.

The BVE-900. State-Of-The-Art Technology And State-Of-The-Art Economy.

The next best thing to editing on a BVE-9000 is editing on a BVE-900. It, too, is an easy-to-use system and economically offers technical advancements and expandability.

It controls up to four VTR's in any A/B roll edit. So you can perform sync roll and sync play. In addition, the BVE-900 gives you full control of video switchers and audio mixers, including fader selection and VCA control for split audio/video edits.

What's more, its easy-to-use menu driven display puts edit accessibility at your fingertips.

BVE-600

The BVE-600. State-Of-The-Art Technology Even More Economically.

The BVE-600 is our most economical unit. It allows you to control three VTRs (two players and one recorder). Which, depending on your needs, may be more than enough. You have the power to dissolve, wipe, or superimpose editing sequences, without the need for an external video switcher. Our optional built-in component/composite video switcher offers a selection of 10 wipe patterns. That, with our built-in MXP-29 Audio Mixer interface, make A/B roll editing a reality.

Of all the benefits of using Sony editing control units, perhaps the greatest is that they form an easy-to-use system. Which means you can connect them to Sony VTRs, switchers, audio mixers and video monitors. All of which are serviced by Sony.

For more information about Sony's entire line of editors, write to: Sony Information Center, P.O. Box 6185, Union, NJ 07083. Then you'll be able to see even better why Sony is on the cutting edge of technology.

SONY

Broadcast Products
Sony Communications Products Company

allows up to seven sources on the screen at one time and permits any one key to have more than one source. A dual chroma keyer with key shadow makes very transparent chroma keys. The unit comes in 12 and 24 input versions.

Another small but powerful system is the Prodigy from Videotex. The unit features an effects transition (ET) system that puts 100 events, 80 transitions, 10 instant replays, and 10 sequences on line with battery back-up to protect their contents. Instant replay allows Prodigy to learn the operator's actions against a real time clock, and programmed sequences allow repeatability without setting up the effect in real time.

CCDs Get a Foot in the Studio Door

CAMERAS AND RECORDERS

The big news in cameras at October's SMPTE convention was the first round of what may become an invasion of the studio market by CCDs. For ENG use, CCD cameras have overcome initial skepticism and virtually supplanted tubes in new camera introductions and sales. While tubes still have the edge for high-end studio use, advances in CCD technology are coming so rapidly that solid state imaging may become the norm sooner than anyone had expected.

At SMPTE, one of the first glimmers of the impending CCD studio invasion was BTS's introduction of its LDK 900, a frame transfer CCD production camera with full facilities for studio use. Employing the same CCD frame transfer sensors as the LDK 90

and weighing just under 40 pounds for the basic camera head, the LDK 900 features full studio functionality, including mono-knob control of iris and master black levels, individual RGB color painting controls, color temperature selection, gain control, gamma 1 and 2, knee function, contour selection and black stretch on/off. Outputs of the base station include full bandwidth composite RGB, component signals, and monitoring signals. The LDK 90 ENG camera is doing well, the company reports; BTS recently sold eight LDK 90 models to CCR Video to tape shows scheduled for the delayed fall season.

Another CCD camera that is attempting to cross the line into studio use is NEC's new EP-3, which the company has positioned for high-end EFP and studio applications. This unit features a completely new high resolution, interline-frame transfer CCD chip and advanced shutter technology. It has all the features needed for camcorder, standalone VTRs, multicore EFP, studio, and triax configurations. The camera and a complete line of accessories for use with triax and multicore remote control units are available for immediate delivery. The price is $40,000.

The camera is also available in a scaled-down version for ENG applications, the SP-30. This camera features 700 lines of resolution, an S/N ratio of 60 dB, and a sensitivity of f 6.2 at 2000 lux. Also available for immediate delivery, the price is $25,000.

While CCD cameras may have only a foot in the door of the studio market, they remain well entrenched in the ENG/EFP market. The trend in ENG/EFP cameras is definitely to smaller size, lighter weight, and reduced power draw. A good example is the new HL-55 from Ikegami, which weighs just 6.8 pounds and draws only 14 W. This frame interline transfer CCD camera, in harmony with Ikegami's Unicam concept, shares the same accessories used by the HL-95D tube camera. It features 700 lines of resolution and an S/N ratio of 62 dB, and is available in standalone and camcorder configurations.

Also in this category is the three-chip SK-F1 portable, introduced by Hitachi as the world's smallest dockable broadcast camera. A member of the Hitachi's Computacam family, the SK-F1 offers 700 lines of resolution and an S/N ratio of 60 dB. An advanced frame interline transfer CCD eliminates the problem of vertical smear. Other important features found in the camera include electronic variable speed shutter, auto knee and knee aperture, masking and flare compensation.The camera is available in camcorder, standalone, and EFP configurations. Delivery will begin in February or March.

Another very small—and very unusual—CCD camera is the Sony BVW-200, which integrates camera and recorder into a single body weighing just over 15 pounds fully loaded. At the core of this unit is the cost-effective 510 interline transfer chip. An ideal ENG imager, it features high-sensitivity, minimal lag and high-resistance to image burn-in as well as quick start-up. The company reports enthusiastic industry acceptance of this revolutionary concept since its NAB introduction, with sales passing the 70-unit mark in less than two months. This camera, which is also marketed by Ampex as the CVR-200, provides 550 lines of resolution and records up to 30 minutes on a single cassette. Delivery takes from 45 to 60 days and the price is $25,000.

Another unusual CCD camera, this one from Panasonic, is still in prototype form and does not as yet have a model number. The distinctive thing about this camera, which the company expects to be ready for April's NAB convention, is that while the output is analog, the processing is digital. An engineering model of the Panasonic digital camera was shown to reporters at NAB '88, and this was its first showing to the industry at large. According to the company, the camera will feature 650 lines of resolution, an S/N ratio of 60 dB, and an iris setting of f/5.6 at 2000 lux. ■

NEW PRODUCTS FROM SMPTE

BME's roundup of SMPTE product introductions brings you the hottest audio and video technology.

Use the Reader Service Card bound into this issue to get more information on these products directly from the manufacturers.

ABEKAS PREVIEWS A84 DIGITAL SWITCHER

Designed for component digital post production, the Abekas A84 is a 12-input, CCIR 601 compatible digital switcher, which Abekas says will be the most powerful post production switcher available. Incorporating Adaptive Sub-Pixel Intelligent Keying (ASPIK), the keyers free key edges from stair-stepping. Up-sampling is also incorporated in key processing. The unit will be shown in the U.S. in early 1989 and at the NAB.

Reader Service #201

ACCOM DEMONSTRATES 125 ENHANCER

First shown at the 1988 NAB, Accom's 125 digital image enhancer is a component-digital noise and film grain reduction system. It obtains noise reduction and aperture compensation while maintaining high video quality: its primary function is to remove random noise and film grain during film-to-tape and tape-to-tape transfer. The DIE 125 is component and all-digital 4:2:2. It uses separate luminance and chrominance processing and 10 bit internal accuracy in the luminance channel. Frame-recursive architecture provides up to 15 dB of noise and gain reduction. The DIE is available now.

Reader Service #202

NEW BATTERY FROM ALEXANDER

The Alexander model BP1A-11 features 11 cells, one more than the original Sony battery of this type. The eleventh cell allows engineers to use today's power-depleting video cameras and recorders for longer periods of time. Voltage for the new battery is rated at 13.75 with a 1.8 Ah capacity when fully charged.

Reader Service #203

ALTA ADDS DIGITAL EFX TO PICTORIS

New digital effects have been added to the Alta Pictoris video compression system previewed at the 1988 NAB. The Pictoris yields 450 lines of resolution from 5.5 MHz bandwidth. In addition to infinite compression, the Pictoris now features mosaic, vertical and horizontal inversion, posterization, negative video and dissolve. Designed both for live camera and remote work, the Pictoris uses component processing. It offers composite video capability and S-VHS/ED Beta (Y/C3.58) format compatibility. Suggested list price is $10,900. The Pictoris is available now.

Reader Service #204

ALAMAR PRESENTS REMOTE CONTROL PANEL

Alamar Electronics USA has announced the RCMP-5 remote machine control panel. With the addition of one to ten RCMP-5 panels, a full remote machine control network can be configured. VTRs, switchers, telecine chains, character generators, still store devices and general purpose interface contacts can all be remotely controlled utilizing this panel. The RCMP-5 remote panel communicates with the interfaced equipment via the industry standard ESbus.

Reader Service #205

AMEK EDIT SUITE INTERFACE BOWS

New from Amek/TAC is the ESM1000 serial and parallel interface for Amek BCII broadcast consoles. The interface enables console control from all ESAM-equipped edit systems.

Reader Service #206

AMPEX INTRODUCES CHARACTER GENERATOR

Alex, Ampex's first entry into the character generator market is targeted for mid- to high-end on-air broadcast and post-production applications. Features include characters and symbols animated in real time along any arbitrarily defined motion path, variable speed allowing smooth rolls and crawls to meet specific time requirements, automatic perspective, color changes as a function of time or overlapping, choice of over 16 million colors, mapping to follow the curve of a line, and real time "write-on" of signatures rather than left to right uncovering. Full antialiasing is maintained regardless of the effect, or combined effects, being performed.

Reader Service #207

AMPEX UNVEILS VPR-300 SERIES D-2 VTRS

Designed for high-quality production, post-production and broadcast applications, each unit of the new series is compatible with existing analog fa-

cilities and equipment and can be a plug for plug replacement for almost any composite analog VTR. The VPR-300 provides a minimum of 20 transparent generations, superior digital video and four channels of digital audio, simplified operation, and advanced self diagnostics. A lower cost version, the VPR-305, does not include AST automatic tracking capabilities, but may be field upgraded to full VPR-300 performance.
Reader Service #208

AMPEX MAGNETIC TAPE ANNOUNCES MP D-2

Ampex 319 D-2 composite digital videotape is now available in three cassette sizes, with maximum play times of 32, 90 and 208 minute respectively. It utilizes 1500 Oersted metal particle videotape, which enables greater bit packing density and slower play speeds, thus achieving longer play times than D1 tape formats. Ampex 319 is 13 micrometers thick. The cassette shell has been redesigned, but the company says the D-2 composite format is completely compatible with existing equipment.
Reader Service #209

ANGENIEUX MICRO-CONTROLLED LENS

A new microprocessor-controlled 20x8 f/1.3 studio lens from Angenieux allows for controlled focusing at any distance, as far up as the front element. Specifially designed for studio applications, the lens features a new accessory internal mechanical shutter with a speed of 1/250th of a second for slow-motion effects.
Reader Service #210

ANTON BAUER'S PROBING OPTION

The Probe programmed battery evaluator for the Lifesaver MP-4 and MP-8 microprocessor fast chargers is new from Anton Bauer. The computer-based unit is programmed to do diagnostic, calibration, and revitalization functions. These functions detect defects such as excessive self discharge, memory, separation failure, shorted cells, and reduced capacity. LCD displayed status results can be printed out via RS-232 port.
Reader Service #211

APHEX BOWS DISTRIBUTION AMP

The Aphex 120 audio distribution amplifier features one high impedance input and four low impedance outputs, each electronically servo-balanced. The unit uses transformerless circuits to develop flat frequency response that does not ring or overshoot, which enables distribution of SMPTE time code as well as audio. Each output has a dedicated amplifier and level control. The unit can be used as a stand-alone or rack-mounted. Suggested listprice of the 120 is $279.95.
Reader Service #212

ASTON REACHES FOR WALLET

The Aston Wallet is a 40 Mbyte picture still store which can be configured both with hard disk or removable disk. It uses two disks in the same format or one of each and provides RGB and YUV for digital capability. Targeted both at video production and the broadcast markets, the Wallet also provides full broadcast bandwidth. The Wallet is available now in a suggested list price range of $17,500 to $18,500.
Reader Service #213

AUDIO PRECISION SOUPS UP SYSTEM ONE

The "S" version of Audio Precision System One audio test set features a serial (RS-232) port in addition to the normal T&M features, thus allowing operation via remote PC (even laptops). Proprietary control software is being marketed by the company as well as a home-brew TV stereo proof package that provides MAIN-RSP, MAIN-THD, SUB-THD, and SEP-CHK testing.
Reader Service #214

AURORA HAS VIDEOGRAPHICS SYSTEM

Broadcasters use the AU/280 videographics system from Aurora to generate a variety of images and effects for news, advertising, and promotional sequences. Artists are also enabled to create everything from short opens, trailers and promotional clips to high resolution animated station IDs, complete with sophisticated 3-D effects. Model AU/280 also provides corporate and other private video and graphics producers with the tool to enhance the appearance and effectiveness of training, marketing, and communications videotapes. The principal feature of this and the other Aurora systems is ease of operation. Any image can be put on the screen by scanning, tracing, drawing or typing. It may then be moved, rotated, duplicated, modified, colored, outlined or animated using only a digitizing pen and an easy-to-understand graphic menu.
Reader Service #215

BARCO BOWS MONITORS WITH INTELLIGENCE

The Emmy-winning Barco CVS series monitors feature microprocessor control via screen panel, a remote cable-attached handset, or hard-wired multi-control console. Other features include auto setup and alignment, anti-drift biasing functions, and expansion slots for digital, composite, and other format inputs. Available models include the CVM-51 and 37 for high-end post and CVS-51 and 37 for broadcast applications.
Reader Service #216

BTS ANNOUNCES ROUTING SWITCHER

Model TVS/TAS-2001 is a new wideband audio and video distribution switcher from Broadcast Television Systems with a completely new 30 MHz bandwidth video section based on surface mount technology. Features include clamped video inputs, multilevel breakaway capability, redundant control card capability, power supply alarm indicators, coaxial party line or RS-422 control standard with SMPTE RS-422 computer control optional, dual video outputs and a 10 x 10 matrix arrangement. One 19 1/4-inch high x 19-inch wide rack mount chassis provides up to 160 inputs with 20 outputs or 70 inputs with 40 outputs. Additional chassis can be added as required. Delivery is 120 days.
Reader Service #217

BTS OFFERS FIRST STUDIO-STYLE CCD CAMERA

The LDK 900, the first frame transfer CCD with full studio facilities, is, at 40 pounds, the lightest full facility camera yet. The total system consists of a small camera head, base station, and operational control panel (OCP). OCP facilities include iris and black level mono-knob control, black and white matching, gamma, gain, color temperature and knee. The base station has outputs of composite, full bandwidth RGB and component signals, as well as picture and waveform monitoring signals.
Reader Service #218

CANON CCD LENS DEBUTS

A new lens for use with CCD cameras has been introduced by Canon. The J15x9.5B IRS dynamic broadcast zoom lens features a built-in 2x extender, 0.95m minimum object distance, high M.T.F., improved chromatic aberration, and decreased image distortion. Weighing in at 3.53 pounds without a hood, the lens come in two configurations: B3 and B4.
Reader Service #219

CDL ENHANCES NTSC

Stage*1 E-NTSC is a new line of NTSC codecs that incorporate multi-dimensional signal processing technology to deliver artifact-free images that are virtually indistinguishable from original RGB images, according to the company. Processing is entirely digital with 10-bit internal architecture, and digital I/O allows integration D-1 or D-2 equipment. An auxiliary channel provides for delay compensation for key or other video signals; analog outputs are NTSC or Y/C selectable. Options include genlock, analog input, ESbus interface and diagnostics.
Reader Service #220

CHYRON INTROS ACG

The ACG is a real-time character, graphics, animation and video effects system which uses an open-ended architecture based on a 20 Mbyte Winchester hard disk with an additional 3.5-inch floppy disk drive. The ACG is compatible with Scribe and Scribe Jr. It features automatic character kerning, 16.7 million color selections, variable character edges, automatic color ramping for graduated and shaded backgrounds and real-time animation. Optional features include logo compose and 2D video effects including flip, spin and rotate. Multiple speeds of roll, crawl and slow reveal plus custom animations including cel animation are also provided.
Reader Service #221

CMX INTRODUCES COMPLETE POST-PRODUCTION SYSTEM

Editing and switching capabilities combine in the new CMX 330S post-production system which evolved from the CMX 330A large scale computerized editor. With a built-in

audio/video switcher, the 330S offers full post-production capabilities with on-line and off-line editing, a controller with 3.5 inch disk drive interfaces for three serial VTRs, and a GPI for control of eight devices. The audio/video switcher provides cuts, dissolves, fade-to-black for A, B and C source machines, along with auxiliary and black inputs. A non-TBC mode allows for cuts and fade-to-black in the absence of time base correctors.
Reader Service #222

DP422 LAUNCH AND LIVELINE 5 UPGRADE

Colorgraphics announced 6.0 release software for the Liveline 5 weather graphics presentation system. A new compression algorithm enables expanded animation capabilities and faster display time. 6.0 software is standard as part of a Liveline 5 system. Also new and aimed at medium and high end facilities, the DP422 Digital Platform features multiple machine control architecture enabling control of digital devices such as the Sony DVR-1000 and the Abekas A64 and A60. It uses 4:4:4:4 internal processing with a 4:2:2 interface for key, thereby manipulating and maintaining work entirely in the digital domain. Image operations are automatically filtered to create antialiased edges; dissolves, fades, wipes and graphics elements are done in real time through a two-channel additive digital mix effects unit. Available now though backordered as of SMPTE, the DP422 has a suggested list price of $99,000.
Reader Service #223

COMPUTER PROMPTING SHOWS SOFTWARE

CPC-1000 computer prompting software, new from Computer Prompting, is designed to run from a modified laptop PC equipped with a third-party EGA card with a component output. The software is availabe in a simpler CGA version that does not require the modifiactions required with the EGA version.
Reader Service #224

CONRAC MICROMATCH MONITOR

The 6550 Micromatch monitor from Conrac features a key-lockable setup, preset memory defaults, and an in-line gun dot mask CRT. The 42-dot pitch unit optionally features a wireless Micromatch setup unit that stores monitor settings automatically by pressing the LCD sensor head to the "master" screen. Settings can then be invoked in other monitors from the data in the handheld unit. The monitors come in both 13- and 19-inch configurations.
Reader Service #225

DIGITAL F/X PRESENTS COMB FILTER DECODER

Model DF/X-2A NTSC is a new adaptive comb filter decoder which provides high quality NTSC decoding in a convenient one rack unit package. The DF/X-2A has been optimized for critical uses such as upstream decoding for component digital signal processing devices. The decoder exhibits low residual subcarrier with wide frequency response to both luminance and chrominance. Outputs are provided in both Betacam and RGB formats. Delivery will commence in January, 1989. the price is $4,900.
Reader Service #226

DSC MAKES A COLLAGE

The DSC Collage is a D-2 digital compositor for multichannel compositing of multi-layered effects and sophisticated program segments. It can composite directly to D-2 tape machines or disk recorders and can be upgraded to a tapeless production center with the company's DiSC real-time digital disk recorder. Collage uses a 12 bit video path; the basic DiSC system provides up to 212 second of record capacity and features simultaneous record and playback capability. A D-2 interface which digitizes composite analog inputs (3, 6 or 9) and contains D-A converters for three NTSC outputs (PGM, PVW and Key) is an optional standalone device. Digitally constructed sync and burst signals and VITC timecode can be inserted into the PGM output.
Reader Service #227

DUBNER BOWS NAME DROPPER II

Dubner's Name Dropper II affiliate/network ID system is set up for automatic insertion of local station IDs into network promotions and programs. Providing playback effects on ten screen sectors, Name Dropper II operates via a hidden code embedded in the vertical interval. This frees the audio channel, eliminating hum and interference, and permits a full color signal with graphics. Options include character generation, ID graphics packages and time and temperature displays. System options also include creation of custom logs allowing special effects and animation. Character generator capabilities and master control are front-panel accessible. External control is via two serial ports and GPI interface contacts.
Reader Service #228

EDITRON DEBUTS NEW SYNCHRONIZER

The newest multistandard synchronizer in the Editron line is the 100 System. Features include on-board software for 25 machines, internal timecode generator and monochrome sync pulse generator, programmable record in points, general purpose interface relays (GPIs), and offset calculation. The 100 will lock up to 3 machines to an input video reference, or synchronize up to 3 slaves to input timecode, pilot tone, biphase quadrature, or tacho pulse from a master. Delivery takes 6 to 8 weeks. Price with 2 interfaces is $10,000.
Reader Service #229

EMC OFFERS FIRST DIGITAL OFFLINE EDITING SYSTEM

EMC2 is a computer-based system for digital editing of audio and video. The system does not control tape decks, but works with all video and sound digitally. Source material is transferred from tape to a master optical disk where up to four hours of SMPTE/EBU timecoded video and audio is stored as low resolution color images and digitized audio. This will give editors the flexibility to change cuts near the beginning of a sequence without losing work done beyond the edit point. Price is $25,950.
Reader Service #230

EVENTIDE BOWS BROADCAST HARMONIZER

Billed as "the audio special effects department in one box", the H3000B Ultra-Harmonizer combines a digital reverb/effects processor and an automatic stereo time compressor/expander. Aimed at on-air broadcasters and production studios, the H3000B features 70 preset sounds which can be used immediately, stereo pitch shifting with full mono compatibility and MIDI control. The H3000B automatically calculates and adjusts pitch ratio; the unit provides 16 bit PCM sampling at 44.1 kHz. It is available now. Suggested list price is $2995.00.
Reader Service #231

NEW TIMECODE GENERATOR FROM EVERTZ

Camcorder from Evertz Microsystems squeezes the functions of a VITC/LTC generator into a package small enough to be mounted on most camcorders. The unit features full audio track availability, time code readability down to still frame, LTC jam-sync reader, built-in character inserter, pre-settable time and user bits, VITC line selection and remote start/stop from camera trigger. The price is $1500. Deliveries should start in January.
Reader Service #232

FAIRLIGHT UPGRADES SERIES III

The MFX control console and the Waveform Supervisor are new hardware/software upgrades for the Fairlight audio/post workstation. The MFX console integrates tape machines with Series III sequencers using dedicated transport controls enabling direct tape transport control and sound trigger while locked to any type of sync. Claimed to be three times faster than other hard disk-based systems, the Waveform Supervisor is based on a dedicated 68020 processor for disk operations and the new Hitachi 380 Mbyte ESDI (Extended Storage Device Interface) hard disk option. The disk plays back six tracks of digital audio at 44.1kHz and sustains bursts of up to 16 tracks using Fairlight's own new buffering scheme.
Reader Service #233

FGV PANTHER ADDS NEW JIB ARM

A new Super-Jib accessory for the FGV Panther crane doubles the Panther's column range geometry, along with the vertical drive speed, and thereby extends the drive elevation to 3 meters. The new accessory is lightweight, assembles to the Panther quickly and easily, and is ideal for both the open field and extremely tight places. The price is $13,950 for the new accessory and $57,000 for the basic unit.
Reader Service #234

FREZZI FAST CHARGER

The PAG Speedcharge 6000 microcomputer-controlled fast charger for nicad batteries, distributed in the U.S. Frezzolini, utilizes the battery's own cells as charge sensors. The unit determines the battery type connected and automatically analyzes battery attributes as it goes throught the charging cycle.

Reader Service #235

NEW TAPE FROM FUJI

Fuji has expanded its line of Beta metal oxide tapes for broadcast and field acquisition applications. Sixty- and 90-minute tape configurations are now available for Beta SP format, and the company has also announced plans to manufacture D-2 tape in early 1989, and consumer R-DAT tape (to be followed eventually with pro R-DAT).

Reader Service #236

FUJINON GOES TILT

In addition to new CCD lenses (including a new 8.5x5.5 wide angle), Fujinon has introduced a line of camera control equipment. Fujinon pan-and-tilt heads feature compact lightweight design and are available in three models: EPT-11 field head, EPT-12 studio head, and EPT-12P studio head/prompter. Three operating panels, the EOP-11, EOP-1A, and EOP-2 complement the line.

Reader Service #237

GRASS VALLEY BOWS 200-1 SWITCHER

Grass Valley showed the 200-1, a single mix-effects 20-input configuration of its model 200 video production switcher. Aimed at live and post-production applications, the 200-1 uses a program preset bus and features including extensive key and wipe facilities. Options include up to eight component chroma keyers, which generate a chrome key from component and RGB sources, a linear Borderline key edge generator, enhanced analog and matrix wipe patterns and four auxiliary buses. Three key levels—each capable of linear and luminance keying— and 20 analog wipe patterns are standard. Suggested list price is $30,000.

Reader Service #238

NEW GRASS VALLEY LINEAR KEYER

Grass Valley also introduced the DSI-101 linear keyer, which features a control panel styled on the Model 100 production switcher. The unit is designed for video post production applications which require high quality keys including linear keying for anti-aliased character generators and digital video effects units. Other features include additional keying for production switchers and the company's Borderline feature for border shadow. Unique features include the ability to program functions for individual requirements, such as selectable PAL and NTSC, programmable GPI and E-mem register stores. Suggested list price is $4995.

Reader Service #239

PAINT, COMPOSITION FOR HARRIS VWS

Paint, composition and titling software applications are now available for the 32-bit architecture Harris Vws video workstation. Harris Vws Paint offers true color and high resolution design capability for complex image manipulation. Features include multiple imaging, rotating, rescaling and cell animation as well as multiple brushes, including user-defined brushes. Composition features include image compression, magnification, bordering, rescaling and adjustable color and background design. Titling features automatic antialiasing, multiple fonts including italics, foreign language sumbols and kerning adjustment. The packages will be available in January 1989. Suggested list price for each begins at $2500.

Reader Service #240

NEW BROADCAST CONSOLE FROM HARRISON

Harrison Systems, Inc. has announced the introduction of a new on-air broadcast console, the AP-100 series. The new console has the features and price package specifically requested by a majority of radio station general managers and program directors. Among its features is a 12-input stereo configuration. The price is $8,900.

Reader Service #241

HITACHI INTRODUCES NEW D-2 RECORDER

Hitachi's new composite digital recorder, the VL-D500, will be ready for shipment in February, 1989. In addition to the characteristic benefits of digital processing, enhanced picture and sound quality with freedom from degradation during multigeneration copying, the unit incorporates major advances in digital processing circuitry. The VTR accepts small, medium, and large cassettes for a maximum recording time of 208 minutes. Optimized tape guiding provides 60X shuttle speed.

Reader Service #242

IKEGAMI DEBUTS CCD CAMERA

Model HC-230 is a compact, lightweight, camera for professional use. Three 1/2 inch pick-up devices with 360,000 pixels (NTSC) provide 580 TV lines and an S/N ratio of 58 dB. The camera can be operated with a VCR or with such systems as S-VHS and component type VCRs. An electronic shutter offers excellent resolution even when shooting moving objects and auto knee circuitry ensures well-balanced pictures. Price is $9,400.

Reader Service #243

NEW LIGHTWEIGHT CCD CAMERA FROM IKEGAMI

Ikegami Electronics' newest entry in the field of frame-interline-transfer CCD ENG cameras is model HL-55. Light weight, 6.8 lbs, and low power consumption, 14 W, are the main features, along with dynamic DTL and high sensitivity allowing gains up to +24 dB. Also featured are white shading correction, multi-speed electronic shutter, horizontal DTL, auto highlight compression and knee aperture correction. Available now for $28,000.

Reader Service #244

IMAGE VIDEO'S ROUTING SWITCHER

The Model 9600 high-density routing switcher from Image Video, Ltd., features +/- 1 degree timing of all inputs, constant total propagation delay, two sets of video outputs, +/- 1 degree timing of all outputs, a 40 MHz video bandwidth, and no external DAs are required. The 9600 utilizes a modular four-type building block design, and the unit can be configured for either video or dual audio applications.

Reader Service #245

INTERGROUP TECHNOLOGIES DEBUTS SWITCHER

Production switcher, series 9500, is a highly computerized switcher whose effects memory system, Reflex, holds over 200 events including every parameter which affects a different key and pattern modifiers for the various patterns. Two complete mix/effects systems provide maximum effects layering and allow up to seven sources on the screen at one time. Models 9512 and 9524 have, respectively, 12 and 24 inputs. Price is $28,500.

Reader Service #246

JVC HAS NEW CCD CAMERA

Camera system, model KY-20U, displays versatility as part of an S-VHS camcorder combination, or, with adapter, as part of an MII camcorder configuration, or, with large viewfinder and remote control unit, as part of a studio or mobile van configuration, or as part of a stand-alone configuration. Horizontal resolution is 530 lines and the S/N ratio is 58 dB. Multi-format output signals include RGB analog, MII (Y, R-Y, and B-Y) component, S-VHS (Y/C 358) and composite video signals. Price is $9,000.

Reader Service #247

KODAK UNVEILS VIDEO PROJECTOR

Operating with a VCR, laser disc player, Kodak Displaymaker video graphics system or computer, the 13-pound LC 500 will project an image 12 feet wide. Features include the ability to alternate between three sources, easily portable size, built-in speaker and lens cover, ease of operation and high quality images. Set-up time is under two minutes without assistance and requires only connecting to power and video sources, focusing and front panel tint, brightness, and audio level adjusting. Price is $3,495.

Reader Service #248

LEITCH PROVIDES D/A GO-BETWEENS

Leitch has introduced a new line of digital-to-analog decoders and distribution amps and accessories. The line includes the DAD-6000 CCIR-601 digital-to-analog decoder, the DDA-6000 CCIR-601 distribution amp, and the FR-600R digital-to-analog mounting frame.

Reader Service #249

LEXICON INTROS SOFTWARE OPTIONS FOR 2400

Software option 2.20 expands interface capability of the 2400 Audio Time Compressor Expander to include new menu-

selctable videotape machine choices. These include the Ampex VPR-6/VPR-80, Sony BVH-3000, Panasonic AU-660 and time code slave operation. Version 3.0 provides the same interfaces in V 2.2 plus DC servo capability to control the Panasonic AU-650 MII-format VCR. Suggested list price for upgrade to 2400 owners is $125 for V 2.2 and $250 for V 3.0.
Reader Service #250

MAGNI INTRODUCES HDTV SIGNAL GENERATOR

Model 2030 is a programmable signal generator capable of producing a wide range of HDTV test signals, either Magni library signals or user-designed custom signals, in conjunction with a personal computer. Three of the six outputs are generally dedicated to providing synchronizing information such as tri-level sync, H-blanking and V-blanking. Once loaded, these three channels retain their signals through non-volatile memory. The remaining three channels are usually dedicated to test signal outputs. Delivery is scheduled to begin in mid December. Price is $26,950.
Reader Service #251

MCCURDY INTROS DIGITAL INTERCOM SYSTEM

The CS9400+ digital intercom system from McCurdy features point-to-point communicatons, 80 dymanic party lines or two wire-type operation, 80 interrupted foldbacks, 48 relays, and 4-character alphanumeric displays. The unit is designed with a microprocessor control system, and instantaneous reconfiguration of the system setup is possible at any time from the system's dynamic control terminal.
Reader Service #252

DOWNCONVERSION FROM MERLIN SNELL & WILCOX

The essential link between HDTV and NTSC is now available from Merlin Snell and Wilcox. The ME2001 is an HDTV downconverter that accepts 1125/60 HDTV input and converts it to NTSC, PAL, NTSC4.43, SECAM, PAL-M or PAL-N for output. It will genlock in any of its output standards, and has freeze and fade controls and a built-in color bar generator. Dynamic pan and squeeze controls allow the user to compensate for the reduction in aspect ratio, while color balance, gain controls, and powerful aperture correction are provided to trim the picture and provide the exaggerated contours that may be necessary to optimize output appearance.
Reader Service #253

MICROTIME RINGS UP GENESIS ACT 3

Microtime's Genesis Act 3 digital video effects system offers three-axis rotation and perspective, plus fully programmable size and position, including infinite compression. Two times normal size expansion and the manipulation of live or frozen video are also featured. The unit can also select and program proportional borders with soft wedges between picture and border on a keyframe-by-keyframe basis. Genesis Act 3 is available now in PAL-B, PAL-M and NTSC formats. Suggested list price is under $30,000. A nominally-priced factory upgrade is available for Act 1 users.
Reader Service #254

MICROWAVE RADIO BOWS 23 GHZ EQUIPMENT

FCC Docket 82-334 has opened up ultra-high frequencies to broadcasters, and the Microwave Radio Corp. 23 GHz microwave Mini-Link is designed to help maximize this new spectrum. Designed for use with two standard-gain antennas, the unit provides safe transmission, even in rain and snow.
Reader Service #255

NEW ENG CCD CAMERA FROM NEC

Model SP-30 is a scaled down version of the EP-3. This camera features 700 lines of resolution, an S/N ratio of 60 dB, and a sensitivity of f 6.2 at 2000 lux. Also featured is a three position (0 dB, +9 dB, and +18 dB) gain switch. Available for immediate delivery at $25,000.
Reader Service #256

NIKON BROADCAST LENS

Nikon's broadcast lens line now includes the TV-Nikkoor S15x8.5B2 EAS-20, the S13x8.9B1, and the 13x9B CCD lens, which, uses Nikon's extra-low dispersion glass.
Reader Service #257

FRAME SYNC FROM NOVA

Nova has introduced the NovaSync frame synchronizer. The unit combines frame synchronization, auto default, video AGC, input switching, black source, color bars and a processing amplifier in a one rack-unit package. Retail price is $4490.
Reader Service #258

OKI'S LATEST CONVERTER

OKI has introduced the LT1210 digital converter. The unit offers four-way conversion of PAL, SECAM, NTSC 3.58 and NTSC 4.43 input. Features include a synchronizing signal generator, color bar generator and time base correction.
Reader Service #259

AUDIO-FOR-VIDEO OPTION FOR THE NEWSMAKER

The AFV/8+8 automated audio mixing package for video post option is a new offering for Orion's Newsmaker console. The console's standard features include ReMem setting recall functions and a standard plug-in ESAM/GPI serial editor interface. Features with the audio-for-video option include eight primary and eight secondary input sources, three stereo outputs, and a video-style sytem architecture.
Reader Service #260

PANASONIC INTRODUCES MII VTR

Model AU-660SE, an advanced, high performance MII studio VTR for production editing and on-air playback was introduced by Panasonic Broadcast Systems. Features include a 9-bit time base corrector with 32 Hp-p correction capability to reduce quantizing noise and provide a signal to noise ratio of better than 50 dB, color framing, controlled in a four-field sequence, to eliminate the H-shift at editing points, and 90 minutes of recording/playback together with a 20-minute cassette. Also standard is an adaptive edge comb filter for outstanding horizontal resolution in slow motion and still playback in the audio tracking mode. Additional features are audio split, variable memory, on-the-fly in the AT mode, preview, review, trim, go to, auto tag, retry, and discontinuous time code. Price is $35,500.
Reader Service #261

PERROTT UNVEILS CHARGER

The PE124 lightweight 4 HR dual charger unit from Perrott, specifically designed for use with third-pin technology, will simulatineousky charge two 14, 13, or 12 volt 4 AH nicad packs in about 4 hours. Each charger acts independently from the other and automatically cuts off at the completion of the charge cycle.
Reader Service #262

PINNACLE'S NEXT STEP IS 3D PRIZM

Prizm, a VLSI-based system offering Z-axis image manipulation of live video images with multiple layering of three-dimensional still images including perspective and rotation, is now available as an option for Pinnacle Systems 2000 and 3000 video workstations. Prizm is available in PAL and NTSC. It can also create combinations of effects including splits, blinds, transposition, multi-image montage and multi-freeze within an image in perspective, rotated or curved. It can also create or layer a still 3-D montage.
Reader Service #263

QUANTA LEAPS FOR DELTA

The Delta 1 antialiased character generator features free character placement, full-color digital compositing, unlimited color and 256 levels of transparency. Dual 720-pixel 32 bit frame buffers enable on-air page changes and updates during live events, while functions are selected via a pop-up window menu system. Ten languages and individual keyboard layouts are available. Delta hardware includes a programmable high-speed bit blitter, an additional video digital compositor, a downstream video linear keyer, 4 Mbyte of RAM, a hard disk and a floppy disk drive. The Delta 1 measures 10 by 17 inches and is rack-mountable. Available now, suggested list price including optional camera capture and full color RGB is approximately $39,995.
Reader Service #264

QUANTEL INTEGRATES ENCORE HUD AND HARRY

Quantel has integrated the control for Encore Head-Up Display and Harry under a single pen, tablet and menu control system called Harry Encore HUD. A single control station can now handle both editing and effects composition, preview and compositing. New features include real-time effects simulations, random access keyframe preview and final sequence composition within Harry via a single command.
Reader Service #265

RANK CINTEL LAUNCHES CCD TELECINE

Rank Cintel has announced the worlds most advanced CCD telecine, the ADS 2, featuring a new 135 linear array imaging sensor. The ADS 2 also provides a wide range of user-friendly facilities including electronic dirt and scratch concealment, multiplexed transfers and single switch 35mm-to-16mm operation. An unique electronic multiplexing option gives the user multiple film transports which can be interfaced to the master electronics cubicle to provide remarkable flexibility. Improved low light detection enhances the resolution of dense film detail and greater thermal stability ensures minimal black level drift. Another important option is the automatic color corrector which allows the telecine to operate virtually unattended.
Reader Service #266

SACHTLER'S SYSTEM

System 14 is a full camera suppot package for video camera applications. The pedestal features a pneumatic center column that can be locked into postition. The sturdy ENG tripod features a standard Sachtler 14 11 fluid head model with both S14 long and medium tripod legs.
Reader Service #267

SCHNEIDER BOWS NEW LENSES

New Schneider lenses, the 14.5x TV wide angle lens with x2 flip-in RE for 1/1/4-inch pickup tubes, including the BTS CDIC-6 one-inch, and the 14.5x wide angle lens with x2 flip-in RE and Diascope, have been introduced by Schneider.
Reader Service #268

SEEHORN TECHNOLOGIES BOWS PRE-PRO SYSTEM

Seehorn Technologies' MIDAS (Multimedia Interactive Database Access System) is a new pre-production system for film and video. Enabling budget planning, storyboarding, media cataloging, paper cut, first cut and final edit list in a single system, the system is based on an Apple Macintosh II as the central processing unit. MIDAS systems will be available in January 1989, at a suggested list price of $17,600 to $21,950, depending on options.
Reader Service #269

NO WIRES FOR SENNHEISER

The ENG 2003 UHF diversity wireless mic system has been introduced by Sennheiser. De signed for ENG/EFP applications, the system features highly-shielded metal transmitters, a strap-mounted mounted receiver antenna, and RF-shielded crystals. Operational range for the system is about 100 feet. These units were used by NBC during the recent Olympic Games in Seoul.
Reader Service #270

SIGMA HAS INTEGRATED GRAPHICS MODULE

Integrated Graphics Module IGM 2.0 makes it possible to integrate computer graphics cards into video systems, answering the problems, electrical and mechanical, associated with interconnecting frame buffers with cameras, VTRs, and production switchers. The unit decodes either NTSC or S-VHS into its RGB components and encodes RGB and sync from frame buffer into NTSC and S-VHS. In addition, the module provides the necessary sync generation, video position control and connector interfaces. Price is $3,695.
Reader Service #271

SKOTEL UNVEILS TIME CODE READER

Latest in the line of Skotel Corporation time code readers, model TCR-132 offers enhanced performance features in a more compact package. It is capable of reading either VITC or LTC time code over the full operational speed range from pause to forward and reverse shuttle. Either VITC or LTC may be selected. In AUTO, the unit will automatically switch from a source that is no longer valid to one that is. Time and user bit information may be displayed simultaneously with independent selection of position and other display attributes. The price is $1,800.
Reader Service #272

SONY SHOWS LIBRARY MANAGEMENT SYSTEM

The Library Management System (LMS) was the featured product at the Sony booth. Personnel from the company were on-hand to discuss recent installations of the automated cassette library product. Tokyo broadcaster ANB has configured a four-unit system, accessing up to 4000 cassettes. And interfaces with electronic dubbing sheets and bar code hardware were discussed.
Reader Service #273

SOUNDMASTER HAS NEW CAPABILITIES

New additions to the Soundmaster system for audio electronic editing and sound post production include the SHUTL remote shuttle control, a CMX download, a Shuttle Goto interface and an EBU/SMPTE bus interface. The shuttle knob can be used in both shuttle and jog modes, allowing control of video and many audio machines. Thirteen user programmable keys permit up to 79 automated keystrokes per key, a feature applicable to ADR.
Reader Service #274

SSL HARRYSOUND NOW AVAILABLE

Production versions of Solid State Logic's digital audio editing system first shown at NAB '88 are now available. Designed to extend the power of Harry, the video editing system manufactured by sister company Quantel, HarrySound is also available as a stand-alone unit. HarrySound mixes, edits and stores up to six digital audio channels with comprehensive splicing, crossfading time-offsetting and programmable gain-profiling. HarrySound's 330 Mbyte disk store holds 50 minutes of mono audio. Optional 690 MByte and 840 MByte disks are available. In/out include RGB monitor output, AES/EBU interface and SCSI interface for optional 8 mm tape archive drive and optical disk drive. HarrySound works via Harry-style controls.
Reader Service #275

TELECINE ENHANCEMENTS FROM STEADY-FILM

Two products to enhance the operation of the Rank Cintel MK III Telecine and one for the MK III-B Telecine have been introduced by the Steady-Film Corporation. A high speed lens for the MK III allows twice the light transmission of a standard lens. This improves the signal-to-noise ratio if the beam current is maintained or reduces burn and prolongs tube life if the beam current is reduced. Also for the MK III is a notch guide that greatly reduces interference caused by notched 35 mm film. An X-Y-Zoom printed circuit board for the MK III-B comes with a remote control panel and features a scan track.
Reader Service #276

STUDER REVOX SHOWS EIGHT-TRACK RECORDER

Directed at the half-inch video market, the Studer C278 eight-track quarter-inch audio tape recorder incorporates integral Dolby HX. In addition to autolocate and loop capability, the C278 generates its own time and date time code. Four-track and two-track versions plus a two-track/center track time code version are also available.
Reader Service #277

NEW VIDEODISC RECORDER FROM TEAC

TEAC has launched the mid-

range LV210A videodisc recorder, which retains most of the interactive features and external computer protocol of the LV200 12-inch two-sided desktop disc recorder. Priced at $17,995, the recorder does not provide long play CLV. A companion videodisc player model LV210P is priced at $4995. An RS232C interface is standard; an IEEE-488 is optional. A complete set of MSDOS drivers enables communication with most interactive authoring systems.
Reader Service #278

TEKTRONIX OFFERS WAVEFORM MONITOR/VECTORSCOPE

Video Measurement Set, model 1780R, by Tektronix is a new "top of the line" instrument at a very affordable price. Operators get all the advantages of separate, interactive waveform and vector monitors and the convenience of a single measurement package for multiple tasks. This wide bandwidth, multi-input analog measurement set is ideally suited for television production facilities and transmitter sites where critical measurements are made. Four video input channels accommodate composite and component formats. The fifth input is a standard Tektronix probe. Clearly marked controls, digital readouts, complete front panel presets, and pre-programmed measurement modes make for ease of operation. The touch screen lets an operator make selections quickly without going through any menus.
Reader Service #279

TELEMETRICS PRESENTS TRIAX CAMERA CONTROL SYSTEMS

Telemetrics triax connected camera control systems may be used with Sony, Hitachi, Ampex and BTS color cameras. Adapters for ENG/EFP and RECAM style cameras are available. These units provide all of the required system signals such as video, audio, genlock, controls and power for distances up to 5,000 feet on simple low-cost triax or coax cable. Use of these systems, especially for outside broadcasting, affords savings in set-up time and reliability of performance.
Reader Service #280

TELEX WIRELESS MICS

The new Telex FMR-25 series of wireless mics, which operate in the 165 to 185 MHz high-band frequency range, feature IF filters, allowing simultaneous multiple systems operation from one location. The two receivers offered in the series, the single-antenna FMR-25 and the true diversity FMR-25TD, are both smaller than the Telex FMR-50, have removable antennas, and feature a carrier indicator LED, a power-on LED, and a peak reading volume indicator.
Reader Service #281

TOKO FIELDS FRAME STORE FOR HDTV

Model VT-500 from Toko America is a new video frame store designed for digitizing and storing HDTV signals. It features RGB or Y, P_B, P_R 30 MHz signals for input/output, and a bipolar, tri-level sync signal (BTA S-001). External sync or sync separation from the Y or G channel can be employed. An interleaved, dual-port memory allows simultaneous display and computer access of the image data. Incoming video is digitized to eight bits/pixel for each of the three component signals at sampling rates of 74.25, 64.25 and 48.6 MHz.
Reader Service #282

TRUEVISION BOWS VIDI/O BOX

The VIDI/O Box is a standalone NTSC encoder/decoder which converts analog RGB to composite video or S-Video for half-inch Super VHS and ED Beta. VIDI/O also decodes composite video (NTSC) and S-Video (Y/C) to analog RGB components. The box includes a black burst generator, loop-through in all modes and subcarrier phase adjustment. Truevision, which specializes in PC-based videographics adapters including the TrueVista series of capture and display boards, exhibited at SMPTE for the first time. The VIDI/O Box is available immediately.
Reader Service #283

TSM ADDS X-Y BASE FOR SERVO PEDESTAL

A new robotic SP-200 X-Y base is now optional equipment with the Autocam SP-200 servo pedestal from Total Spectrum Manufacturing. Its unique servos and guidance system solve the problems of extremely accurate studio floor positioning and collision avoidance. Complete freedom to move about the studio floor is assured by the absence of rails or tracks and cumulative error in positioning is eliminated by a proprietary position sensing system. First deliveries are expected before the end of the year.
Reader Service #284

ULTIMATTE UNVEILS NEW COMPOSITING DEVICE

Shadows, transparencies, smoke, reflections, strands of hair, and blue wardrobe colors can be reproduced in the foreground of an Ultimatte-300 composite. This unit uses the same processing techniques as Newsmatte-2, but with controls designed for a production rather than broadcast environment. A fade control permits the foreground subject to fade in or out of the composite or to dissolve from the foreground to the background.
Reader Service #285

UTAH SCIENTIFIC ANNOUNCES TOTAL AUTOMATION SYSTEM

The Total Automation System (TAS) offers fully integrated broadcast automation from traffic system to on-air. TAS takes full advantage of today's "smart" machines and employs an open architecture allowing easy incorporation of improved versions of these machines as they become available. Based on a UNIX operating system running on redundant microcomputers, TAS provides great advantages in terms of processing speed and multitasked operation. The computers communicate with other devices in the system over a high-speed local area network. Color display terminals provide the human interface to the system, each terminal having its own dedicated functions. Shipments are now being made against a 6-month backlog of orders.
Reader Service #286

VIDEOMEDIA DEBUTS EDITING SYSTEM

The V-MAX series of editing systems represent the first truly modular approach to high-end editing and post production. V-MAX is based on Videomedia's V-LAN system which is used by many manufacturers of editing, animation, graphic systems and automation equipment as a new standard for machine control. V-MAX I and II, as well as MICKEY, may be upgraded to V-MAX III. Features include control of up to 32 devices of which 16 may be VTRs, animation, non-volatile 250-event ram, sync roll of as many as 4 VTRs in a single event, built-in video dissolve unit and built-in stereo audio-follow video mixer. Deliveries are expected to start before the end of the year.
Reader Service #287

VIDEOTEK ADDS LINE SELECT TO FRAME SYNCHRONIZER

Videotek, Inc. has added line select to the VDP-8000 Frame Store/Synchronizer which can now be programmed to view a single line of a particular field of video. Additionally, the VDP provides jitter free lockup of noisy feeds from satellite, microwave, ENG and remote broadcasts. Unique independent freeze field capability permits the storage of two different fields or one field without interruption of live video synchronizing. Price is $5,495.
Reader Service #288

VINTEN OFFERS NEW PEDESTAL

Vinten Equipment Inc. has expanded its line of camera accessories with the New Vision pedestal. Designed to complement the Vision 5 head, this pneumatic pedestal incorporates the main features of big television camera pedestals including the ability to take a "pull back and rise." Light weight, 26.5 lbs, makes it ideal for use with ENG/EFP cameras. First shipments are scheduled for the end of 1988.
Reader Service #289

RACK CABINETS FROM WINSTED

New from Winsted Corp. is the Model V8530/32 56-inch rack cabinet. Features include removable side panels for easy servicing, 16- and 26-inch depth options, and either punched or tapped rails.
Reader Service #290

ZAXCOM VIDEO HAS NEW INTERFACE UNIT

The DP800 Data Parrot allows an editor to perform keyboard functions, and thereby to control other devices, by providing an interface between the editor, the Data Parrot transmits a user-programmable data string, simulating keystrokes. Delivery takes 30 days. Price is $850.
Reader Service #291

JVC's S-VHS CAMCORDERS GIVE YOU FREEDOM OF CHOICE...

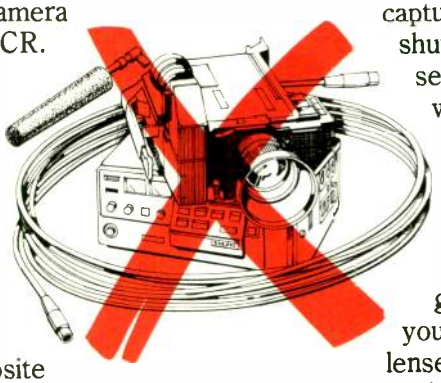
AND THE VERSATILITY TO CUSTOMIZE YOUR VIDEO SYSTEM

Discover the breathtaking performance of JVC's S-VHS camcorders, the most versatile, cost effective systems available to the video professional. They let you customize your video system to meet your needs, whether you're shooting on-site inspections in low light, sports in sunlight, or a medical team under the spotlight. They're the camcorders you've always hoped for.

The S-VHS format gives you separate Y/C signals, wider bandwidth, better signal-to-noise ratio, Hi-Fi audio, and more than 400 lines of horizontal resolution. In short, sharper, clearer images, without NTSC artifacts. S-VHS is one of the most powerful, economical formats ever developed. But that's what you'd expect from the company that developed S-VHS *and* VHS.

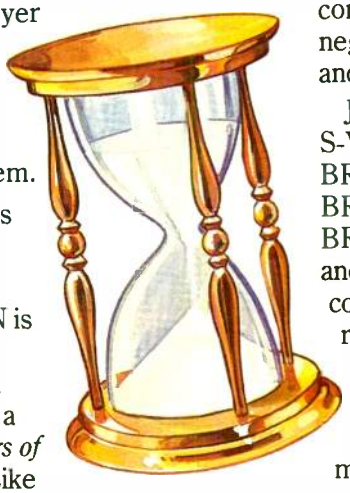
JVC's S-VHS camcorder story begins with the BR-S410UN recorder/player. Configure it the way you need it:

Combine the BR-S410UN with JVC's BY-10U single-CCD camera or 3-CCD KY-15U camera and it's a dockable VCR. You'll have true *one-piece camcorder convenience*, without the bother of separate components and webs of cable.



Combine the BR-S410UN with your existing composite camera or any color camera, and it's a portable VCR.

Or combine the BR-S410UN with JVC's RM-G410U editing controller and JVC's BR-S810U editing recorder/player and you have a complete, cuts-only editing system. The BR-S410UN is the *only* portable, dockable S-VHS recorder/player that can be used as a source in a cuts-only editing system.



Now that's versatility.

The BR-S410UN is packed with professional features for a full *two hours of recording*. Like audio level meters, audio controls for Hi-Fi and normal audio, and separate inputs and outputs for Hi-Fi and normal audio, a comprehensive warning and diagnostic system, an LCD counter, and an automatic edit function for clean assemble edits. And of course, JVC quality.

The BY-10U camera uses a 2/3-in. CCD for sharp image capture, a four-speed shutter, self-diagnostic warnings, three white-balance memory settings, external sync input for genlock, and your choice of lenses including 11X, and 16X, or a variety of C-mount lens without using an adaptor.

The KY-15U takes S-VHS to center stage. It features three 1/2" CCDs to capture the image with 360,000 pixels, a color matrix circuit, self diagnostics with character display, 2H vertical contour correction, flare correction, four-speed shutter, and negative/positive image reversal, and much more.

JVC has a complete line of S-VHS products, including the BR-S610U recorder/player, BR-S810U editing recorder/player, BR-S711U duplicator, RM-G410U and RM-G810U editing controllers, and S-VHS monitors ranging in size from 9 in. to the TM-200SU 20-in monitor.

JVC also has the accessories you need, including time-base correctors, multi-signal standard frame synchronizer, battery chargers, cables, view-finders and other camera accessories— everything required for the most demanding professional video applications.

Now that's freedom of choice.

And don't forget, JVC's S-VHS camcorders are a key element in Multi-Format Integration— the most *cost-effective* way to get the best from your existing video equipment.

For a complete set of product specifications, call JVC PROFESSIONAL PRODUCTS COMPANY at 1-800-JVC-5825. Ask for a product demonstration and experience the brilliant performance of S-VHS for yourself.

JVC's S-VHS camcorders. Linking your past, present, and future video technologies.

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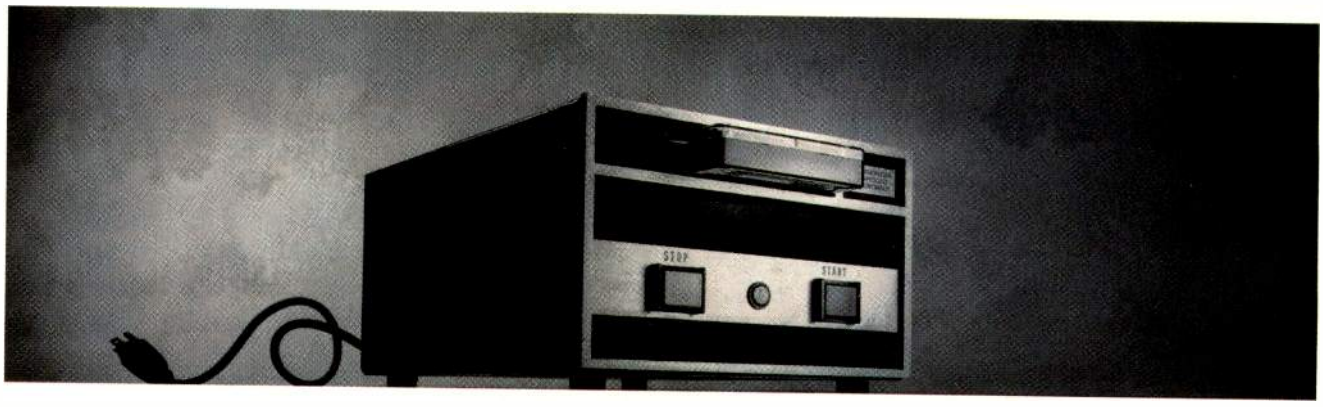
ALWAYS A STEP AHEAD... TO KEEP YOU A STEP AHEAD.

It's withstood nineteen years of raps, bops, swings and hits.



Reliability. It's what ITC audio cartridge machines are all about, even after years of pounding and playing. In fact, you'll find many of our original models still in use today. Like this one from KOMA-AM radio in Oklahoma City.

The reason is ITC cartridge machines have always been engineered to withstand heavy-duty use day in and day out. That includes today's latest models. It's reliability like this which has made ITC the undisputed leader in cartridge machines around the world.

And our reputation doesn't just end there. Engineers tell us ITC also offers the undeniably best support in the business. With toll-free technical consultations. Fast turn around on repairs and replacement parts. And our 2-year warranty on factory labor and all parts, including motors, heads and solenoids.

No wonder, then, more stations buy ITC machines than any other brand. And keep coming back for more.

There's an ITC cartridge machine for every need. Including the 99B Master Recorder with the patented ELSA cartridge preparation system. The DELTA Series, the most popular cartridge machine in the last five years. And the economical OMEGA Series offering affordable performance.

To find out more, call International Tapetronics, 3M Broadcasting and Related Products Department toll-free at 1-800-447-0414. (In Illinois and Alaska, call collect, 309-828-1381.)

Tell them you heard about it from a reliable source.

3M

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RADIO ENGINEERING

NUMBER FOUR SPECIAL SECTION DECEMBER 1988

AES Shows "Clear Migration to DSP"

The most important trend from the recent AES for radio broadcasters to note is a clear move toward digital signal processing (DSP). In addition to established industry manufacturers, a number of independent companies—notably Valley, which is already marketing its DDP Digital Dynamics Processor—are entering this area.

Most significant of all, two major manufacturers of OEM semiconductors, Motorola and Texas-based Crystal Semiconductor Corporation, mounted strong exhibitions supporting new high-bit DSP chips. These new semiconductors are expected to feature heavily in digital processor boards, system boards, link peripherals, A:D conversion and equipment similar to the digital stereo 10-band graphic equalizer featured in a Motorola application note.

The Motorola DSP56001 is a 56-bit general purpose DSP; it features 512 words of full-speed on-chip program RAM. The DSP56KCC-C is a new compiler with 24-bit accuracy. Crystal, which focuses on high-performance hybrid ICs which combine digital circuitry to enhance analog devices, emphasized a 16-bit stereo A:D converter for digital audio. The CS5326 also performs anti-aliasing filtering and sampling, using delta/sigma modulation to achieve oversampling at 64 X the output word rate. CTI Research, a sister company of dbx, also demonstrated a A:D conversion set (F410/D20C10/A1520) capable of 20-bit resolution.

In other news, digital audio system manufacturer New England Digital Corporation and Luscasfilm Ltd.'s Sprocket Systems Division entered a joint development agreement to produce film and video sound editing products. The two companies will develop hardware, software and communications protocols for the systems.

NED's Frank Sullivan (left) and Tom Kobayashi Lucasfilm, agree to take SoundDroid back to the future.

At the same time, New England Digital and Emmis Broadcasting Corporation have entered a similar agreement to refine NED's Post-Pro digital recording and editing system for radio broadcast use.

AES Product Picks

Two interesting new products include an audio time base corrector for stereo audio environments such as broadcast television, post production and Dolby Surround Sound for theater, and a digital multiplexer which can be adapted for studio installation.

The HoweTech ATC 35 Phase Chaser dynamically tracks changing timebase errors and provides accurate real-time correction. A proprietary circuit allows the device to discriminate between phase errors caused by interchannel time delays, which it fixes, and and the normal phase fluctuations which characterize stereo.

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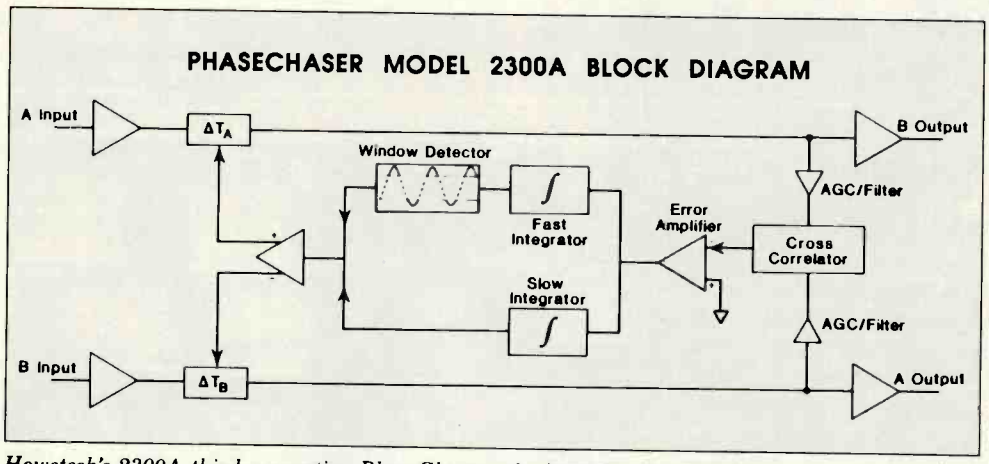

Howetech's 2300A third-generation PhaseChaser—the basis for the ATC 35 stereo audio time base corrector.

The unit can also be used with an oscilloscope as an analytic test instrument to display stereo information.

Monster Cable's Lightspeed multiplexer—available in January for $3900—enables more effective digital cabling. Up to 12 channels of audio can be linked via one fiber optic cable, both to tie studios as part of a permanent station design and to retain remote broadcast links in the digital domain.

NTIA Introduces SUM Spectrum Mapping

Executive branch communications policy-making agency National Telecommunications and Information Administration has developed a new approach to analyzing use of the radio spectrum. Called Spectrum Use Measurement (SUM), the procedure quantifies, measures and graphically displays how the radio spectrum is being used. The current standard technique for representing spectrum is to show locations and connectivity of terrestrial transmitters and receivers, which does not quantitatively indicate the effects of frequency assignments on the spectrum space which is used.

The SUM model performs interference calculations using data on existing systems from a frequency assignment file and accommodates mapping spectrum use in geographic areas.

NTIA applied SUM to two government fixed service bands and recommended that the SUM database approach be extended to other parts of the Federally managed spectrum. The NTIA further recommended the eventual application of SUM to various other radio services.

"The nature of spectrum use must be rendered understandable and visible for costs to be assessed, benefits to be understood and objective decisions to be made," said Charles Schott, deputy administrator for the agency.

At the same time, the NAB has requested the NTIA documentation for assessment as part of its ongoing program considering spectrum use, said Ralph Justus, director of Engineering, Regulatory and International Affairs for the Association. The NAB could not comment on the new procedure because it requires further investigation, Justus added. ■

Errata: FM Combiners

Please note the following updates to "An FM Combiner that Works" (*BME* October 1988): RF baseband response for the Gannett FM combiner system, Miami, FL is flat to plus/minus 200 kHz from center frequency; group delay is less than 50 ns for each station to plus/minus 150 kHz from center frequency. Flatness in the system, built by Shively Labs, is plus/minus 0.5 dB.

In the accompanying block diagram, cable connecting the four-patch panel to the dividing hybrid measures 9 3/16 inches.

SPARS Elects New Officers

The Society of Professional Audio Recording Services (SPARS) elected new officers and a board of directors during the AES Convention in Los Angeles on November 6. Bruce Merley, president of Clinton Recording Studios, New York City, was named president of the organization.

Other officers are David Porter, Music Annex, San Francisco, CA (treasurer) and Dick Trump, Triad Productions, Des Moines, IA (secretary).

Regional vice presidents include Howard Schwartz, Howard Schwartz Recording; Pete Caldwell, Doppler Recording; Dwight Cook, Cook Sound and Picture Works; and Tom Kobayashi, Sprocket Systems Division of Lucasfilms.

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Anywhere you find MTE sound equipment – that's practically everywhere in the world – you'll find Magna-Tech service readily available. Not only when you buy your equipment, but for as long as you own it. Our service engineers are on the road virtually every day of the year, calling on customers, checking on equipment, working with local service people.

With sales offices on six continents, we can provide the right post production equipment from a full line that includes magnetic film recorders and reproducers, telecine magnetic followers, video tape-film interlocks, electronic looping systems, dubbing systems, 16-and-35mm electronic projectors. Or, we can provide total facility engineering and consultation.

More awards have been won for theatrical and television films on MTE equipment than all others combined. We're ready to help you win some too.

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MTE

The Sound Heard Round the World®

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THE NCMO: AN RF MODULATION BREAKTHROUGH

The Numerically Controlled Modulated Oscillator (NCMO) is a newly available integrated controller that makes the digital definition of any RF waveform a practical and affordable reality.

BY SKIP PIZZI

At a recent NAB-sponsored workshop on digital technology, the participants' eyes were growing heavy and glazed as the afternoon wore on slowly towards the final presentation. It had been a full day of solid information, and most of the class had taken in about as much as they could in a single session. But, as the last speaker began, one by one the class perked up, inspired by the elegance and potential of what was being revealed to them.

The presenter was Robert J. Zavrel, Jr., of Digital RF Solutions Corp., names as yet unknown to most of the audience. What he spoke about was the NCMO, a new method of Direct Digital Synthesis (DDS) for generation of RF waveforms. To those in attendance, this brief presentation dashed the myths surrounding digital modulation and replaced them with impatience for availability of products utilizing the technology.

To understand how the system works, a review of basic oscillation is in order. Recall that any oscillation is the generation of a repetitive waveform which can be depicted as variation of amplitude (on the x-axis) over time (on the y-axis)—the familiar oscilloscope display—or, in a more theoretical form, as the motion around a circle. Each point on the circle corresponds to a point along the y-axis of the former display within one wavelength of the oscillation. Hence the term "phase circle," since each point on the circle represents a phase location along the oscillation's period.

The numeric oscillator breaks this phase circle into a finite number of discrete points. To control the oscillation, a counter is used to move along these points on the circle in one direction only, according to external instructions. Eventually the counter gets all the way around the circle and starts the cycle again. This counter is called a "phase accumulator." Its two control parameters are a clocking pulse, and a "jump size" value; the counter is told *when* to move along the circle by the clock, and *how far* to move—how many steps to go on the circle—by the jump size number. This is the heart of the DDS technique of digital oscillation, as it was developed in the early 1970s. In this form, hardware costs, power requirements and spurious productions were high.

As digital technology progressed, these problems have been reduced. Phase data from the phase accumulator is now fed to a ROM that has waveform coordinates burned into it. The phase accumulator tells the ROM "waveform map" where to go along the time (y) axis with 12- to 24-bit precision, and the ROM outputs the amplitude that corresponds to that phase location. As a result, the ROM acts as a "phase-to-amplitude converter."

This waveform information is typically sinusoidal, but it needn't be. Any periodic waveform can be contained in the ROM and generated by the NCMO's phase instructions. Or, the NCMO can direct a RAM, for generation of aperiodic waveforms. With sinusoidal waves, Nyquist rules apply—that is, the highest frequency that can be generated is one-half the clock frequency of the NCMO. With non-sinusoids, however, this upper frequency limit may be considerably lower, determined by the frequency domain resolution required by the chosen waveform's area of maximum curvature. For sinusoids, the ROM actually contains *cosine* data, since it is preferred to have amplitude errors occur at waveform peaks rather than at zero-crossings. (Amplitude errors are more likely at the edges of a map than at the center.) Although only 90 degrees of mapping is required for generating a sinusoid, most ROMs contain 180 degrees of cosine phase-to-amplitude conversion data, to further protect the zero-crossing integrity.

Modulation of the waveform in the frequency, amplitude or phase domains can be accomplished by numeric manipulations of this data,

which is finally presented to a digital-to-analog converter (DAC). The DAC's output is a modulated analog carrier, ready for the RF amplification stage of a conventional transmitter.

The NCMO approach improves on these contemporary DDS basics by integration of FM and PM modulation into the oscillator chip, improvements in ROM waveform mapping to further reduce spur problems and other anomalies (using waveform "predistortion"), all-CMOS design for low power requirements and high cost-effectiveness, and the use of high clock frequencies for easier and better image rejection.

As with any DDS system, carrier frequency is determined by numeric control of the phase accumulator's basic step size. On the NCMO, this is accomplished by a 24-bit tuning word applied to the oscillator's "tuning port." This means that the digital phase circle will have about 16.8 million steps, providing frequency domain resolution of about 0.5 Hz when a 10 MHz clock is used. Another identical port on the NCMO is used for up to 24 bits of FM data. Both of these then interact to control the actual step size. The tuning word remains the same as long as carrier frequency doesn't change, with the FM word adding or subtracting from the tuning word's step sizes as the modulating signal determines. For frequency-agile applications, the tuning word can change, but FM can continue unaffected. Frequency jumps can be made within two clock pulses, without any phase discontinuity or reset, and with minimal settling time. (Should higher frequency resolution be required, two phase accumulators can be cascaded, providing 48-bit resolution and step sizes in the nanohertz region.)

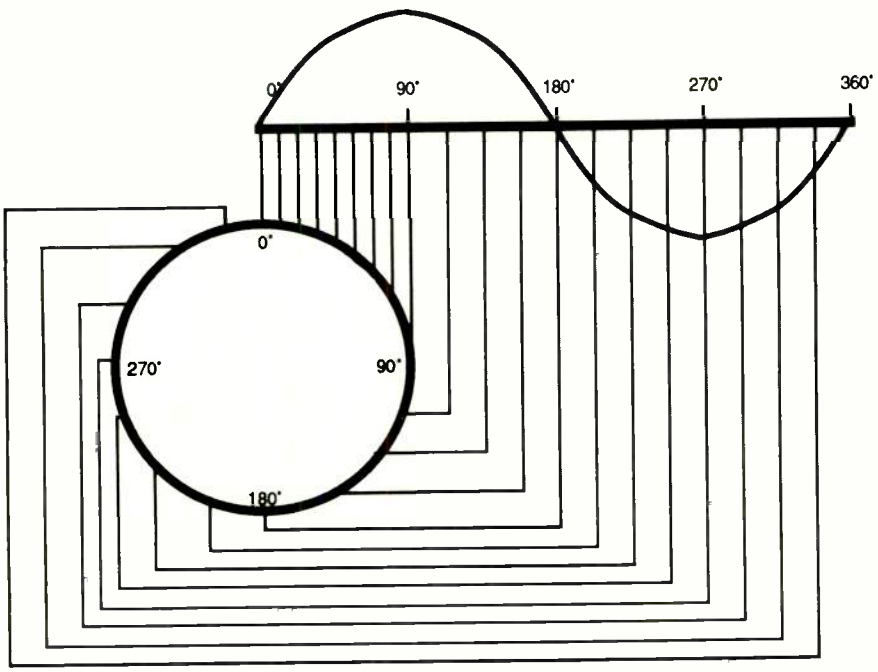
Up to 12 bits of phase modulation (4096 steps—0.9 degree step size) can be applied to the data output from the phase accumulator, but while still onboard the NCMO chip. This "time-domain" datastream is input to the waveform map, as described above. The "amplitude domain" data that comes out of the waveform map can then be modified through a digital multiplier which is controlled by 12 bits of AM information. Finally, the data is converted to an analog waveform—with proper filtering—and applied to the input of the first RF amplification stage of a transmitter.

With the NCMO it is therefore possible and in fact quite straightforward for the first time to provide simultaneous, digitally controlled FM, PM and AM to the same carrier, along with the ability for instantaneous and phase-continuous carrier frequency change.

So it's no surprise that the NCMO technology is of interest to the telecommunications and military/intelligence communities, where DDS in general has been a bit of a household word for the better part of a decade. The lower spurious response of the NCMO design is especially attractive to these users. "On July fourth, the U.S. Navy shot down an Iranian Airbus. On July fifth, we got a call from RCA saying 'We're thinking of upgrading our Aegis radar system to increase its resolution,' " Bob Zavrel recalls.

To broadcasters, however, this whole technology is new, and the NCMO's main attractions are its flexibility and cost. Zavrel contrasts conventional modulation to DDS techniques as "wiggling reactance versus adding hertz." Obviously, the latter can be designed with greater accuracy, stability and flexibility. Software rather than componentry controls the modulation. NCMO makes this possible economically for broadcasters, and with spurs around -80 dB. (Compared to earlier DDS designs showing -40 dB typically.) Technical implementation is much more realistic.

Zavrel is no newcomer to the broadcast world. He cut his teeth as chief engineer at KWAX-FM, Eugene, OR,

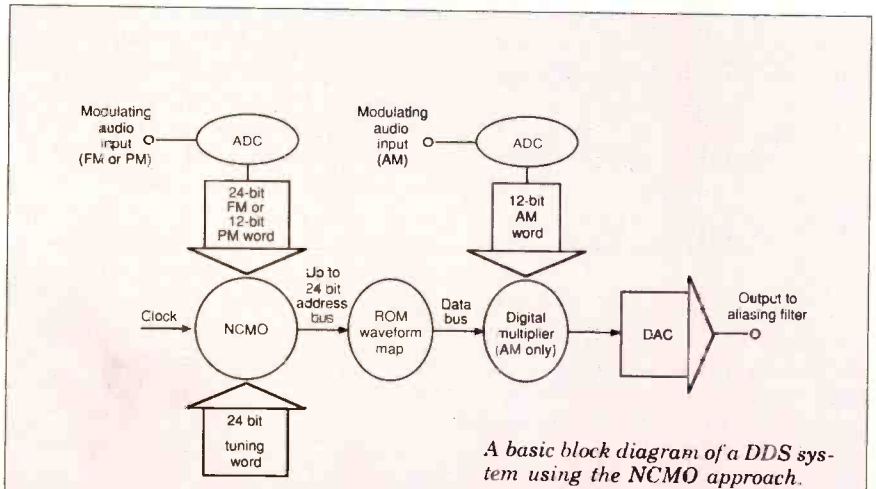


The "phase circle" compared to a linear time-axis display.

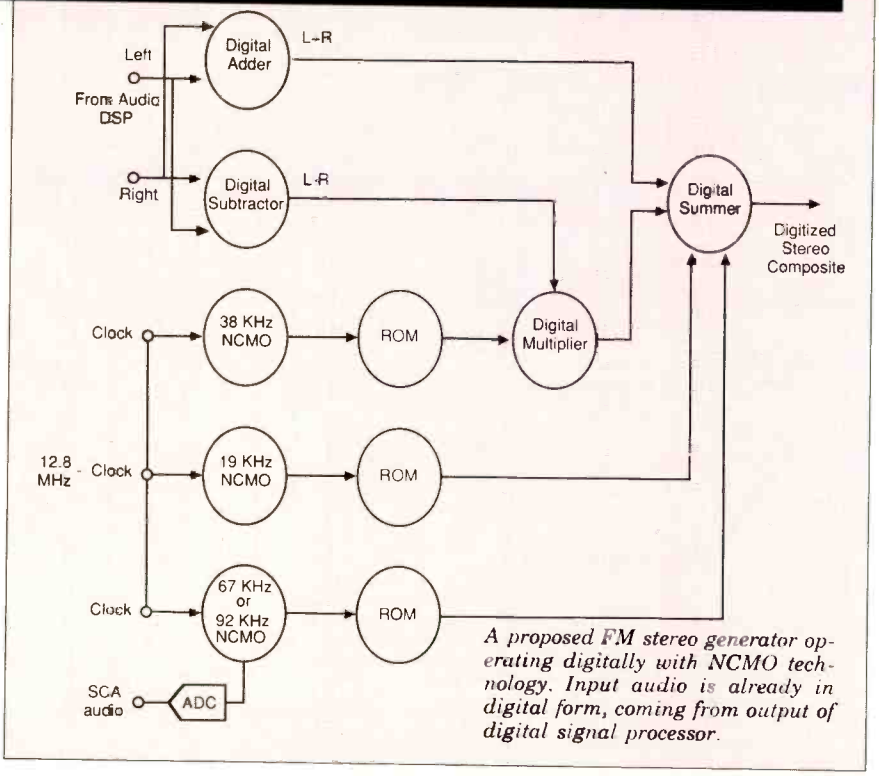
NCMO

a pioneering public radio station. He was on hand as KWAX became the first station to broadcast NPR programs received via satellite in 1979.

So it was only natural that after years away from broadcasting, immersed in what he calls "spook radio" work (CIA, NSA, etc.), he would suddenly begin to scribble on a napkin at lunch one day, quickly devising a complete FM stereo generator and FM exciter system based on the NCMO.



A basic block diagram of a DDS system using the NCMO approach.



A proposed FM stereo generator operating digitally with NCMO technology. Input audio is already in digital form, coming from output of digital signal processor.

Advantages for FM broadcasting with such a system would be evident in lower noise, especially AM synchronous noise, lower distortion and improved linearity for all subcarriers. Both RF and audio specs would improve, since all modulation (both FM for main carrier and SCAs, and AM for L-R subcarrier) is performed digitally. The digital multiplier used in the L-R subcarrier modulation is a four-quadrant type, which produces the required double-sideband, suppressed carrier AM signal.

Of special interest is the fact that this is an FM system that requires no peak limiting whatsoever in the transmission chain, since amplitude and frequency deviation maxima and minima are predetermined by the software and modulation words. "You can't overshoot a DAC," quips Zavrel. Of course, some audio processing might be applied ahead of the ADCs, or this too could be handled in the digital domain by a DSP (digital signal processor), another item that has recently popped its head over the horizon. In Zavrel's brave new word-world, audio would be digitized as early in the process as possible at the studio, and be filtered, preemphasized and processed digitally, then fed to the digital stereo generator and exciter at the station, sent to a digital STL and not return to analog until its hits the IF section of the transmitter.

Quadrature needs of broadcasters (AM stereo, FMX™) could also be satisfied by the NCMO. Here, a single NCMO feeds two ROM waveform maps, one containing cosine data, the other sine data. In this way, exact quadrature relationships are accurate to within less than one degree. (Alternatively, a single waveform map followed by a digital 90-degree phase-shifting circuit could be used.)

Contrasting the NCMO approach to AM broadcast modulation with the Harris DX series of digital AM transmitters provides some further insight into the future of these technologies.

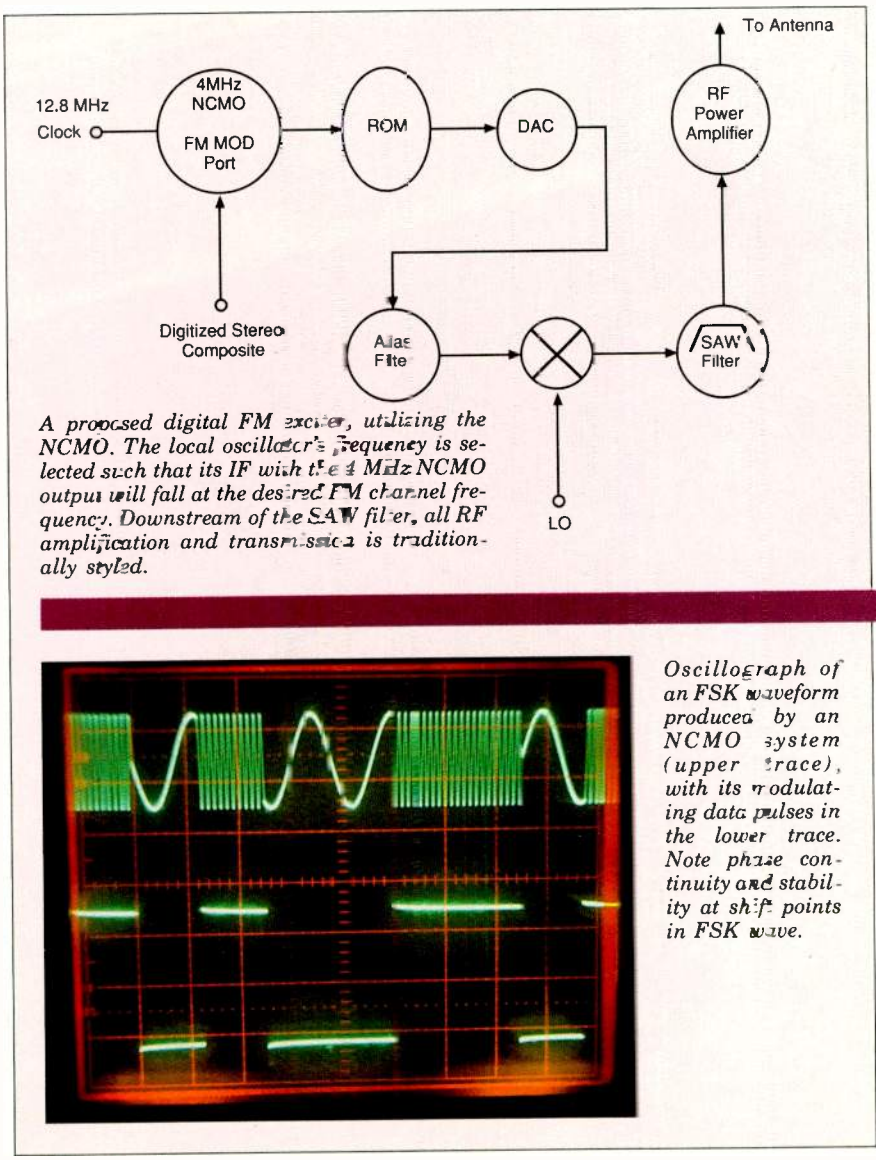
The equally elegant Harris method is a more "mechanical" digital design, in that it uses a digital final stage, switching many low power RF amplifiers on and off to create an analog AM broadcast signal. The NCMO uses digital techniques at the exciter, relying on conventional RF amplification thereafter. Both solve different problems associated with AM broadcast—Harris's high efficiency versus NCMO's high linearity and integral quadrature or simultaneous AM and PM for AM stereo—along with some improvements common to both in terms of low phase and amplitude noise. It also seems possible that the two techniques might be combined, with the NCMO's digital multiplier's filtered output directly controlling a Harris-styled digital RF stage.

FM applications for NCMO seem even more beneficial, and timely as well, as FM continues to compete with digital playback equipment in the listener's home and car. Although digital delivery over the air to the listener is the only way to truly match CD and DAT, this is still a long way off. Interim improvements to existing broadcast systems which implement the advances offered by digital techniques and yet remain compatible must first be made. This could be a boon for FM in the 1990s.

At present, the biggest limitations for NCMO applications are clock frequencies limited to 40 MHz or so, and the quality of available DACs. Spurious production is still a problem with current DACs, especially since most DAC manufacturers are of course concerned with DAC performance in the *amplitude* domain, but the *frequency* domain performance of the DAC is critical to its implementation in the NCMO system. Regarding clock frequencies, again DAC performance sets the limits. While NCMOs actually improve the phase noise of any clock with which they are used, the current limitation on frequency means that direct modulation of FM carriers is not yet possible. Nevertheless, with the proper choices of NCMO and local oscillator frequencies, an up-conversion mixer following the DAC can produce an IF at the desired FM channel, preserving the quality of the carrier in all domains. A SAW (Surface Acoustic Wave) filter with about a 500 kHz bandpass provides filtering and maintains good phase response across the baseband. For other applications, the NCMO can be used with a PLL multiplier to reach the desired frequency.

The exciting new technology of NCMO has been available in chip form for some time. Board level products of use to broadcasters are just now hitting the market, however, and products incorporating the NCMO are definitely ones to watch out for. For further information contact Digital RF Solutions in Santa Clara, CA. ■

Pizzi is BME's contributing editor.



A proposed digital FM exciter, utilizing the NCMO. The local oscillator's frequency is selected such that its IF with the 4 MHz NCMO output will fall at the desired FM channel frequency. Downstream of the SAW filter, all RF amplification and transmission is traditionally styled.

Oscillograph of an FSK waveform produced by an NCMO system (upper trace), with its modulating data pulses in the lower trace. Note phase continuity and stability at shift points in FSK wave.

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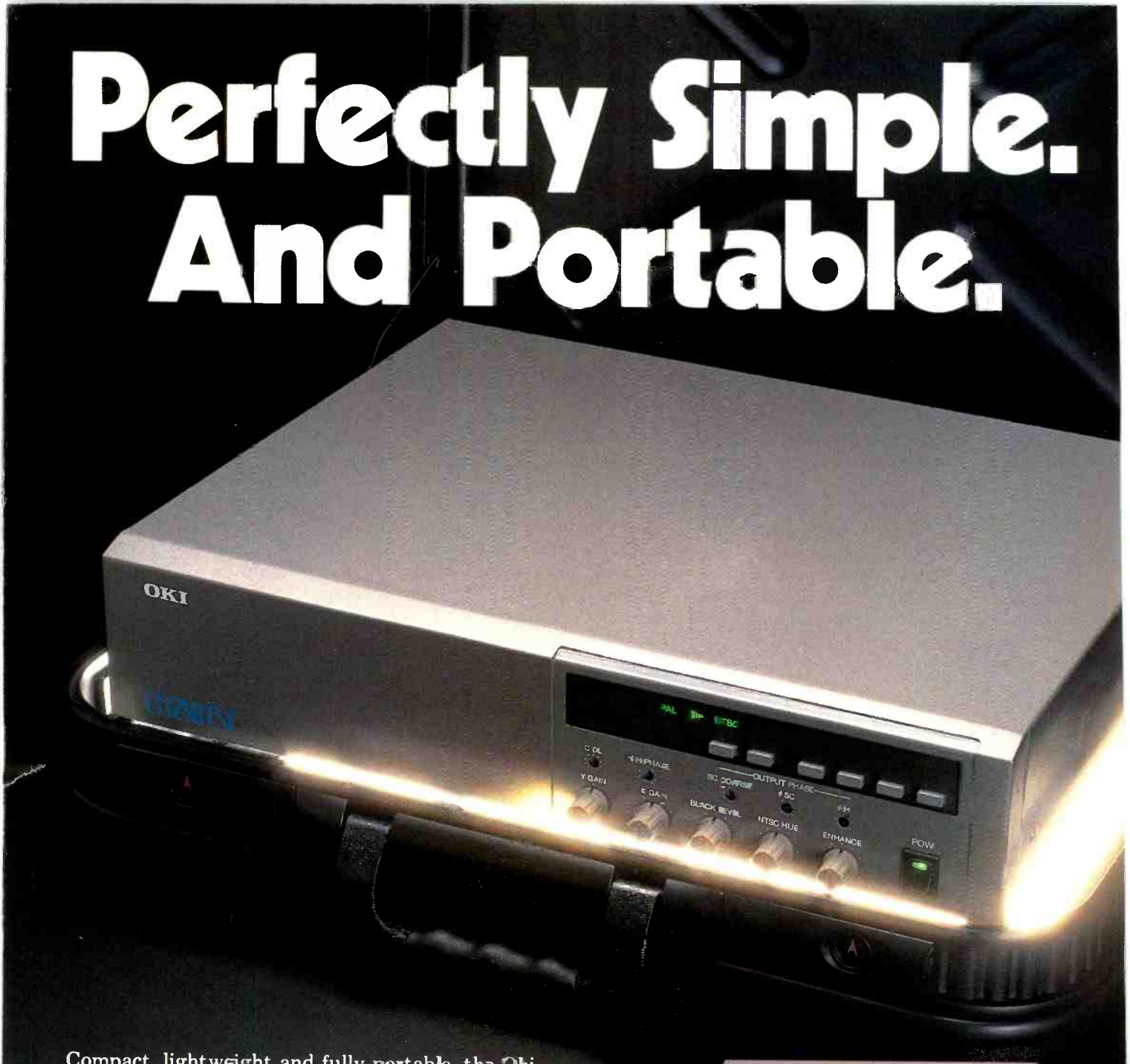

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PLEASE TOUCH

Noncommercial educational KSLU-FM is the first public radio station in the U.S. to install computerized control via touchscreen. They love it.

BY BETH JACQUES

Somehow it's fitting that the first track up on the live-assist tape deck when Hammond, LA's KSLU-FM went operational full-time with touchscreen-accessed computerized control was by the jazz group Special EFX.

Developed by Media Touch Systems, Inc., the Touchstone system in operation at KSLU since August 3, 1988, replaced a traditional radio control board with a computer-driven system. Announcers for the 3 kW Class A FMer now sit in front of a television monitor with all functions at their fingertips—literally—instead of operating the knobs, levers and dials of a traditional on-air broadcast console.

"The thing I remember most is all the wiring. And lots and lots of solder connections," said Ralph Hogan, KSLU's chief engineer. On the campus of Southeastern Louisiana University, the station uses many college students in addition to full-time staff. The station thus decided to combine state-of-the-art technology with its "tried and true" production studio equipment—including a Cetec Sparta board with Daven stepped attenuators—to provide tomorrow's radio operators and engineers internships with maybe-better-than-real-world, hands-on experience.

"Now people coming out of school will see both sides of the field," Hogan said. "Everything's going computerized, and computer access and that type of control system is becoming more prevalent in today's technology." KSLU was fortunate in being able to draw on CPB funding and use grant money for the purchase, he added. The total touchscreen system in use at KSLU cost some $50,000, although a station could save some $12,000 if it already had computers. Many options are available, so the cost of touchscreen computerized control is highly installation-specfic, Hogan stressed.

The system interfaces to any traffic system. This is useful, Hogan explained, because KSLU has its own Honeywell mainframe-based, in-house system developed by students. Media Touch wrote a custom interface that captures the KSLU program log generated by the mainframe computer and then downloads it into the network. Logs are programmed daily and appear on the touchscreen, as the computer simultaneously tracks events via the same screen. Every event or operation is logged as the touchscreen is tracked, which automatically generates a program log. The system can be updated or queried at any point, Hogan adds.

Announcers see seven horizontal rectangles on-screen, which list the next seven events as they come up. The event currently airing heads the list, highlighted in color. The next bar represents the next event; each event is brought to air by lightly touching the monitor screen image. The screen also displays announcement copy, or messages to the announcer—which are marked as received when the screen is touched to verify someone read it. Operators can reschedule, play and record all aired items via the screen because the system stores the whole day's log. Logs are permanently stored on floppy disk.

The Media Touch system can also handle a music library, Hogan says, although KSLU is not set up that way. Such a system can control random access into mass storage such as a CD player holding up to 100 compact disks, stacking up any cut to play through a database. Another treatment is to randomly access a sound effects library or jingles from a production console acting as an on-air console.

The KSLU system is based on a Novell 286 computer network, which links a file server and several remote stations. Two computers—Zenith Data Systems Z248 AT compatibles with hard disk drives—are located at the station, with a third at a permanent remote site in Hammond Square Mall, tied back through phone lines. KSLU broadcasts from the remote four hours daily, Monday through Friday, and the touchscreen allows the operator to control the entire master control area from the mall location.

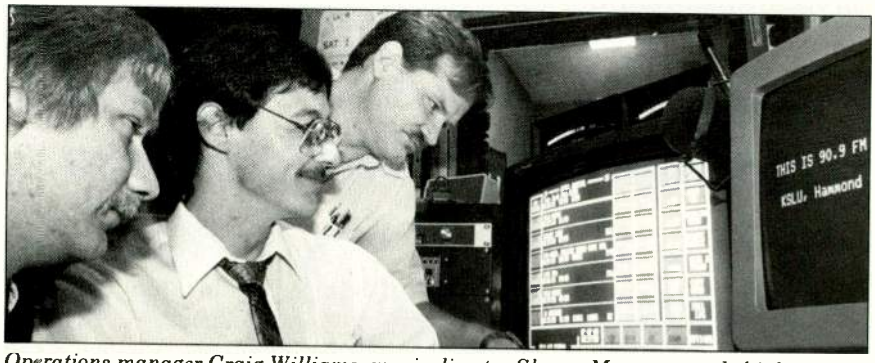
The linchpin of touchscreen operation is a digital interface to the computer, supplied by the system designer. Users with newer equipment access master control via an open collector to ground interface; stations like KSLU with older equipment use relays.

Hogan adds that KSLU is planning to add R-DAT equipment to the on-air control point in master control and in production. The station records programming off satellite and plans to replace a reel-to-reel deck with R-DAT to record off-satellite and play this programming back in the air

PLEASE TOUCH!

chain. This function will also interface with the touchscreen system. Media Touch is working on machine control to pick up actual points off R-DAT, Hogan says. Currently start-stops are relay control or opto-isolator, open collect or ground.

All 48 inputs to KSLU master control can be controlled via the touchscreen. In addition to the main studio, output from the production studio console comes in as input, along with the Hammond Square remote, one delay and one nondelay phone line, seven satellite demodulators, four analog reel-to-reel tape decks, a CD player, a turntable, three cart machines (two Broadcast Electronic Phase Trak 90s and one ITC Delta), 2 mics, EBS audio, National Weather Service, a Marti remote (which is often used for live programming including campus concerts and parish council meetings), an EBS tonegenerator for local tests orginating from KSLU and provisions for two R-DATS and a cassette deck. Satellite programming comes in either as mono input or paired for stereo by combining two mono demodulators. Managing and changing the stereo status can be controlled by the touchscreen, working with a Ramko routing switcher set up to provide information to the system's database.



Operations manager Craig Williams, music director Shawn Manguno and chief engineer Ralph Hogan (left to right) admire KSLU-FM's touchscreen automation system, the first in the south and the first-ever for public radio.

KSLU has also purchased a transmitter remote control, which it is working on interfacing through the touchscreen system. "The capability is there for full control," Hogan stated, adding that power can already be raised and lowered through the system. "The holdup is remote metering, since we don't know at the remote site what we do at the transmitter yet," he said. Once that software is worked out, KSLU plans to be a beta site, and certainly one of the first stations to use this capability. KSLU currently operates a CSI 3 kW transmitter at 2100 W. "We have fantastic tube life," Hogan quipped.

The station prepares only local news, although the system is capable of tying in to wire services and national services. The newsroom is set up as a non-on-air function, however, and although the touchscreen interface interacts, eager newshounds can't get operational control.

The good news for potential new users of touchscreen automation is that Hogan reports running into no major obstacles, either in installation or op-

eration, apart from an occasional wiring error in routing. He does caution that computers are very subject to power line disturbances, and so recommends putting an uninterruptable power supply (UPS) on every microcomputer. Hogan knows this from personal experience—Hammond loses power several times a month, allegedly due to bad load regulation. In addition to a UPS on every computer, the station has also installed a Control Concepts Islatron surge protector on the incoming power line feeding the whole plant. Changeover to emergency on master control happens automatically, retaining the operations screen, but KSLU is off the air for the 15 minutes it takes to crank up the emergency generator for the transmitter. The screen and data remain operational because of the uninterruptable automatic backup power supply. Money well spent, Hogan says, as the power company and the campus duke out who's to blame.

The good news: no major obstacles. But be prepared for 2000 feet of wiring. Radio's going computerized, but KSLU trainees get better-than-real-world experience.

Space precludes detailing the number and quality of touchscreen operation's feature, but Hogan calls them "just phenomenal."

"This is the tip of the iceberg as to what can be done," he says, adding that new computer software will help both production and engineering staff. "We're very fortunate to be on the leading edge," he concludes. ■

Jacques is BME's *senior editor.*

The Big Squeeze

By Ronald F. Balonis

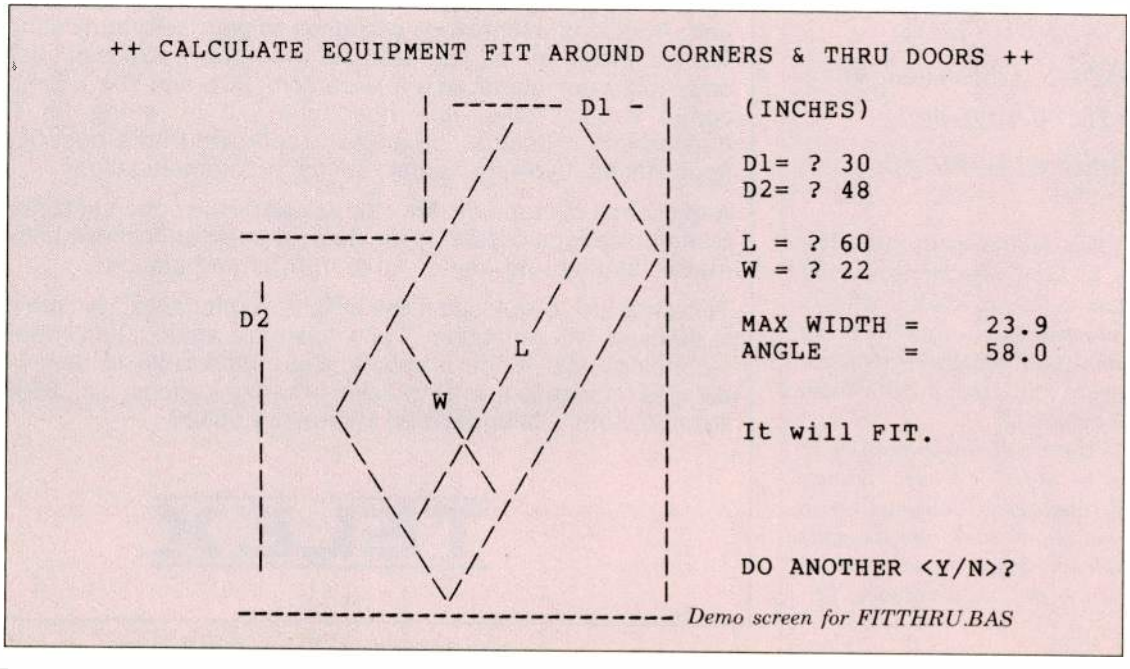
In this, the age of computers in broadcasting, to everyone who has been able to make the change, the First Class license is but a vague memory—the change from a job filled with detail and requiring a limited number of skills, to one still filled with detail, but now requiring an unlimited number of skills, new and old.

In the old days, possession of the First Class License represented the sum total of skills and proficiencies needed to be a radio engineer. Yet even then, as now, a license or a certificate of any sort does not guarantee the ability to use what it represents. In short, today's broadcast engineer needs to be able to handle anything from representing his staff in a board meeting to overseeing the details of a studio reconstruction or move.

In the old days, moving large cumbersome broadcast equipment could tax the best of engineers or professional movers. And moving usually entailed a lot of trial and error, grunts and groans, busted knuckles and profound sayings. But not anymore. A simple computer program can somewhat lessen the trial and error (and minimize the profound sayings) by enabling you to calculate, beforehand, if the equipment will fit through the halls, around the corners, and through the doors. So that's what this month's Compute program, FITTHRU.BAS, does. Providing the muscle, however, is still left to the ingenuity of the engineer.

In moving large equipment, it is its width that is the limiting dimension that determines if a given piece of equipment will fit around corners, and through doors of given dimensions. The width that will pass is a function of the length of the equipment and the width of the halls and the doors, and, the "will pass width" is always somewhat less than the smallest hall or door, varying as a function on the length of the equipment.

The problem can be solved mathematically using a trigonometric model to compute the "passing width" and equipment angle as it moves from one area to the other. The model consists of solving, as a function of the equipment pass angle, two right triangles representing the hall and/or door and the height of an oblique triangle repre-



Demo screen for FITTHRU.BAS

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senting the equipment.

It's a relatively simple straight forward applications program: Starting at Lines 100 through 120, they display its one and only screen which is stored as DATA statements in Lines 60 to 79. Then in Lines 200 to 270 it prompts for the input data in inches—D1, D2, L, and W. For all the prompts, data values less than zero or greater than BIG (biggest dimension allowed, set in Line 20) cause a data reprompt. At the D1 prompt, a zero or a null enter terminates the program. At the other prompts, a zero backs up the program to the first prompt.

Lines 325 and 330 code the actual trigonometric "moving equipment model" (formula); it determine the largest equipment width (WOK), given a length (L), and the hall or door dimensions of D1 and D2. Starting with the equipment in a horizontal position, the loop of Lines 320 and 350 increments its position one degree at a time until the smallest clearance width is reached—Line 340 detects it when the value of WW starts to increase. The loop then terminates and the results display. If it fits, Line 355 says YES or if it doesn't, Line 360 says NO, Line 365 displays the maximum equipment width, and Line 335 displays the equipment pass angle. Finally, Lines 375 to 390 prompt for another calculation or to quit.

FITTHRU.BAS is a simple-to-use basic application program: you just accurately measure (in inches) the dimensions of the equipment to be moved, the halls the equipment will be going through, and the doors it has to pass through in your facility. Then, key in the measurements to find out if the equipment will fit down the hall, around the corner, and through the door.

FITTHRU.BAS, was written in GWBASIC running on an IBM compatible. Other than the LOCATE statement (to position the cursor for printing at a location on the screen), the program code is near generic. ■

Balonis is chief engineer of WILK-AM, Wilkes-Barre, PA.

```
0    'FITTHRU.BAS + For Moving Equipment +
5 'By Ronald F. Balonis  2/19/86 & 8/20/88
10 'Based on 'Calculator Notes', Page 150
12 'in the June 8, 1978 issue of ELECTRONICS
15 '
20 RD=45/ATN(1):BIG=500:'--BIGGEST DIMENSION
50 TLE$="++ CALCULATE EQUIPMENT FIT AROUND CORNERS & THRU DOORS ++"
60 DATA "            | ------- D1 - |    (INCHES)"
61 DATA "            |    /    \    |"
62 DATA "            |   /      \   |    D1= "
63 DATA "            |  /        \  |    D2= "
64 DATA "            | /          / \ |"
65 DATA "------------/          /   \|    L = "
66 DATA "           /          /    /|    W = "
67 DATA " |        /          /    / |"
68 DATA "D2       /          /    /  |    MAX WIDTH ="
69 DATA " |      / \        L    /   |    ANGLE     ="
70 DATA " |     /   \      /    /    |"
71 DATA " |    /     W    /    /     |"
72 DATA " |    \      \  /    /      |    It will "
73 DATA " |     \     /\   /        |"
74 DATA " |      \   /  \ /         |"
75 DATA " |       \ /    /          |"
76 DATA " |        \    /           |"
77 DATA " |         \  /            |"
78 DATA "          \/              |"
79 DATA "--------------------------"
100 CLS:PRINT TAB(12);TLE$:PRINT
110 FOR I=1 TO 20
115  READ A$:PRINT TAB(20);A$
120 NEXT I
200 LOCATE 5,55:PRINT SPACE$(10):LOCATE 5,55
205 INPUT D1:IF D1=0 THEN STOP
210  IF D1<0 OR D1>BIG THEN 200
220 LOCATE 6,55:PRINT SPACE$(10):LOCATE 6,55
225 INPUT D2:IF D2=0 THEN 200
230  IF D2<0 OR D2>BIG THEN 220
240 LOCATE 8,55:PRINT SPACE$(10):LOCATE 8,55
245 INPUT L:IF L=0 THEN 200
250  IF L<0 OR L>BIG THEN 240
260 LOCATE 9,55:PRINT SPACE$(10):LOCATE 9,55
265 INPUT W:IF W=0 THEN 200
270  IF W<0 OR W>BIG THEN 260
295 '
300 '---USE A DUMB ITERATION LOOP TO FIND OUT
310 WOK=BIG*2:'--ALWAYS START TOO BIG
320 FOR I=0 TO 90 STEP 1:'- ONE DEG INCREMENTS
325  EQA=I/RD:SEQA=SIN(EQA):CEQA=COS(EQA)
330  WW=D1*SEQA+D2*CEQA-L*SEQA*CEQA
335  LOCATE 12,65:PRINT USING"###.#";I;
340  IF WW>WOK THEN I=90:'------ LOWEST
345  IF WW<WOK THEN WOK=WW:'---- LOWER
350 NEXT I:LOCATE 15,58:BEEP
355 IF WOK>=W THEN PRINT " FIT."
360 IF WOK< W THEN PRINT " NOT FIT!"
365  LOCATE 11,65:PRINT USING"###.#";WOK
370 '
375 LOCATE 20,51
380  INPUT "DO ANOTHER <Y/N>"; ANS$
385   IF ANS$="Y" OR ANS$="y" THEN RUN
390    STOP:'---END OF THE PROGRAM----
```

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AM: Stayin' Alive

By Harry Cole

As part of its continuing effort to keep the AM service alive, the Commission initiated four separate rulemaking proceedings in October. While there's no question that the FCC is trying to do what it can to assure the survival of AM radio, it's not at all clear that the limited steps it proposes to take are likely to have any substantial salutary effect, even if they're adopted.

In the first proceeding, the Commission proposed a number of modifications in its rules governing nighttime operations by Class II and III stations. In particular, the FCC believes that it may be a good idea to permit Class II-S and III-S stations to operate at night with a separate nighttime antenna system which would not be subject to the minimum power, city-grade coverage or minimum operating schedule requirements which currently apply to such operations. Also open for comment is the possibility of allowing full service Class II and III stations to reduce power voluntarily below minimum power of 250 watts.

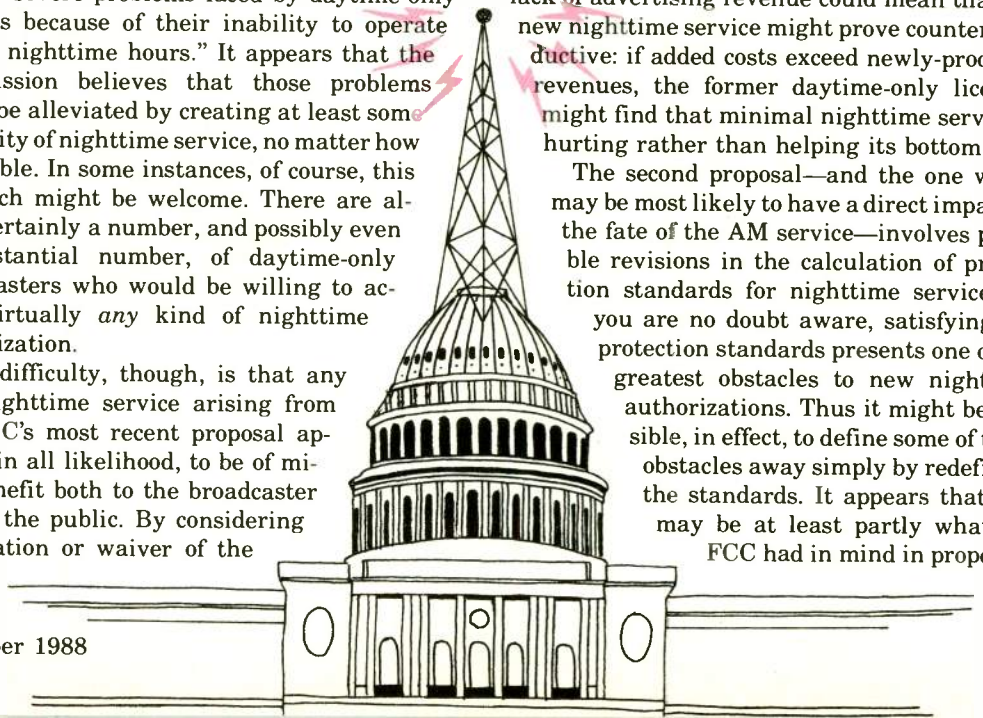
These proposals are, in the FCC's words, "part of (the Commission's) continuing efforts to alleviate the severe problems faced by daytime-only stations because of their inability to operate during nighttime hours." It appears that the Commission believes that those problems might be alleviated by creating at least some possiblity of nighttime service, no matter how negligible. In some instances, of course, this approach might be welcome. There are almost certainly a number, and possibly even a substantial number, of daytime-only broadcasters who would be willing to accept virtually *any* kind of nighttime authorization.

The difficulty, though, is that any new nighttime service arising from the FCC's most recent proposal appears, in all likelihood, to be of minor benefit both to the broadcaster and to the public. By considering elimination or waiver of the minimum power and city-grade cover rules, the FCC seems effectively to be taking the position that *any* nighttime service, no matter how limited, is a good thing. That may be a defensible position in certain respects. In real-life practical terms, however, it is not at all clear that anyone can be expected to benefit from such an approach. While a daytime-only licensee who never had a chance to sell time at night might think that any such chance would be worthwhile, this belief would be sorely tested if it turned out that the nighttime signal available for authorization were barely strong enough to reach the boundary of the station's transmitter site.

Cole is a partner in Bechtel, Borsari, Cole & Paxson, a Washington-DC-based law firm.

Even if the licensee were not disillusioned by such limitations, it's entirely possible—if not likely—that potential advertisers would recognize those shortcomings and be reluctant to pay substantial advertising rates for an insubstantial signal. Since operation at night entails much the same overhead expense as operation during the day, a lack of advertising revenue could mean that the new nighttime service might prove counter-productive: if added costs exceed newly-produced revenues, the former daytime-only licensee might find that minimal nighttime service is hurting rather than helping its bottom line.

The second proposal—and the one which may be most likely to have a direct impact on the fate of the AM service—involves possible revisions in the calculation of protection standards for nighttime service. As you are no doubt aware, satisfying the protection standards presents one of the greatest obstacles to new nighttime authorizations. Thus it might be possible, in effect, to define some of those obstacles away simply by redefining the standards. It appears that this may be at least partly what the FCC had in mind in proposing



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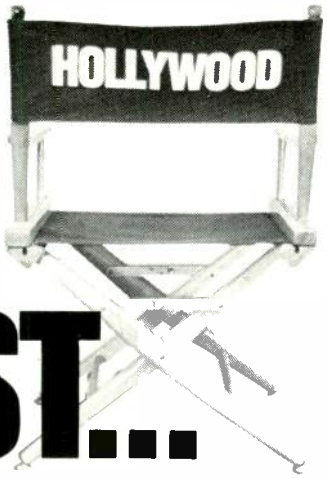

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modification of the rules governing the calculation of the nighttime RSS (root-sum-square) skywave interference level to the protected groundwave contours of Class II and Class III stations and the skywave service contour of Class I clear channel stations. (The Commission also indicated that it would be willing to consider whether adjacent channel skywave signals should be included in these calculations.)

This approach might hold some greater degree of promise for new nighttime service. Historically the Commission has designed its protection standards conservatively, to assure maximum protection to existing stations. That, of course, is why those standards have generally been so difficult to satisfy. Such protection has in many instances, however, proven unnecessary to ensure the provision of a listenable signal to the city of license and the surrounding areas.

The precise redefinition of the standards (or the calculations underlying those standards) has not yet been adopted, and it is therefore difficult to determine how effective this approach might ultimately prove to be.

The third and fourth proposals advanced by the Commission in October are less direct in their impact on AM service. These proposals involve merely the replacement of groundwave and skywave propagation curves with newly developed curves. The new skywave curves are based on "recent scientific analysis" which should provide a more accurate depiction of AM skywave service and interference relationships between AM stations.

Although the revision of these curves is important in a number of respects, it may be necessary to extend this approach significantly before it will produce maximum benefits for the AM service. While changing the propagation curves represents a major step, to have maximum effect it will probably be necessary to compare the data on which the old and new curves are based in order to derive a better idea of the precise nature of the real—as opposed to the theoretical—factors affecting AM interference. If new data are available which provide greater insight into the nature of the interference phenomena, it is possible that those data may provide a key to revising allocation standards in a way

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which could permit more meaningful nighttime service opportunities.

All these proposals can be viewed with both optimism and pessimism. On one hand, it's clear that the Commission is truly making an effort to do something about the AM service. Everyone now agrees that changes must be made, and the FCC is not shirking its proper role as the prime mover for such change.

On the other hand, the changes which the Commission has proposed thus far resemble, to an extent, a simple shifting of deck chairs on the Titanic. While the fate of the AM industry may not be quite so dire, the analogy is not inapt. Both because of its propagation characteristics and because of its historical and socio-political development, AM radio is nowadays akin to a large luxury liner in an era of faster craft.

It may be necessary to rethink AM altogether...and throw out all existing notions of how the spectrum is used.

The plight of AM broadcasters must invariably be viewed in the context of the marketplace. AM licensees are competing with FM licensees and other media outlets for advertising dollars. Whether an AM station operates full-time or daytime-only, with 50 kilowatts or 250 watts, it must obtain advertising revenues in order to survive. In order to obtain advertising revenues, it must be able to deliver to advertisers a particular audience. And in order to deliver an audience, it must have a signal which people will listen to.

Because of this, such approaches as changes in the governing curves or consideration of permitting minimally-powered nighttime operations are likely to be of marginal help, both in the short run and in the long run. Instead, it may be necessary to rethink the matter of AM radio altogether. Indeed, it might be preferable to throw out all existing notions of how the spectrum allocated to AM is now used and approach the matter as a *tabula rasa*, with an eye toward determining how it can now best be used. ■

BUSINESS BRIEFS

The **NAB** has announced the rosters for the association's 1988-1989 committees. Some pertinent engineering-related committees include the **Advanced Television Task Force**, Daniel E. Gold, president and CEO, Knight-Ridder Broadcasting, Inc., chairman; **AM Improvement Committee**, Art Suberbeille, president/GM, KANE-AM, New Iberia, LA, chairman; Daytimė Radio Broadcasters Committee, Bayard H. Walters, president, The Cromwell Group, chairman; **Engineering Advisory Committee**, Milford K. Smith, Jr., VP engineering, Greater Media, Inc., chairman; **FM Transmission Subcommittee**, John Marino, VP engineering, NewCity Communications, chairman; Engineering Conference Committee, T. Arthur Bone, VP engineering, Knight-Ridder Broadcasting, chairman; Local Carriage Task Force, Cullie T. Tarleton, senior VP and GM, WBTV, Charlotte, NC, chairman; **Radio Allocations Task Force**, Robert E. Fish, president, Federal Communications Corp., chairman; and the **FM Translator Subcommittee**, Denise A. Shoblom, VP and station manager, KFWJ/KBBC, Lake Havasu City, AZ, chairwoman.

Philips Laboratories and **Philips Consumer Electronics Co.**, both divisions of North American Philips Corp., have announced their support of the 1050-line/ 59.94 frame rate production standard for HDTV recently proposed by NBC at the SMPTE conference in New York. The standard, according to Dr. Mark M. Rochkind, president of Philips Laboratories, is consistent with the FCC's proposed guidelines in the U.S. and complements Philips' own HDS-NA advanced television system.

SMPTE has conferred its highest accolade, the status of honorary member, upon Kenjiro Takayanagi, supreme advisor of **JVC**. Takayanagi, an early television pioneer, began his research into visual broadcasting in 1924.

Ampex has announced the opening of a new two million dollar, 9600 square foot test center at its Opelika, AL, tape processing plant. The test facility incorporates eight separate labs for one-inch video, cassette video, audio, instrumentation, plastics, physicals, and microscopy studies. "This lab will be a vital part of our operation," says Gene Nyland, director of operations. "The lab's engineers are recording experts, ready to help Ampex provide customers with superior quality products and service." Other news out of Redwood City reports a milestone purchase, by WCVB-TV, Boston, of the **2000th Ampex ADO** system. The unit is WCVB's second ADO and forms part of a $750,000 purchase that also included two D-2 format VPR-300 VTRs, an ACR-225 D-2 automated cassette system, and an AVC Century switcher.

New for the Los Angeles-based Production Group is a full-bandwidth Alta Group Centaurus stillstore. Slated for duty on Production Group projects ranging from The People's Court *to* Sports Look *(done for ESPN), the Centaurus boasts storage of from 50 to 2500 stills. According to Production Group CE Dick Liebart, "Coupled with other features, such as the switcher and its special effects, we know we've found a highly versatile system. The Centaurus provides an excellent way to get sophisticated but inexpensive special effects."*

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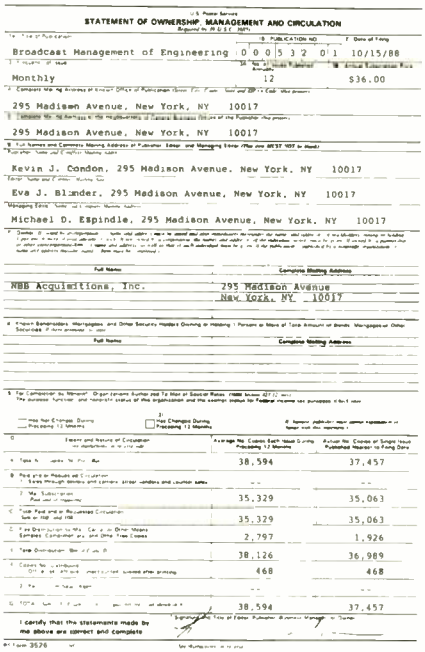

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AM: The New "Alternative"?

By Catherine Buckley

It all started when the younger generation wanted their own identity. "Alternative" music, plugged by record companies, began getting airplay on the "other" radio band, which had nothing to lose by experimenting. The FCC helped by ruling out simulcasting.

People had barely known the other band existed, but the unique, commercial-free programming drew them over. Potential ratings were being lost, however, as many radios could not receive the band. The huge response to station-conducted in-store promotions convinced manufacturers to produce radios with *both* bands and good-quality stereo.

It has taken 10 years, but now in the year 2004, these events have made AM the dominant band. Other factors included the FCC decision to maintain an equal number of AMs as FMs, better spacing on the AM dial, original programming on the new AM superstations—plus, of course, the digital AM signals, which are far superior to the antiquated FMs. The youth of the '90s, now prime target demos, listen only to AM, while old FM listeners are dying off. Hopefully, FM broadcasters will react before it's too late...

History may or may not repeat itself, but to undo the AM predicament, the industry has to address the issues that made it occur. The public has developed negative attitudes toward AM for two reasons: image and reality. The reality is that AM was vulnerable. The image festered, however, because AM allowed it. Where was AM when salespeople and manufacturers started pushing FM radios? How many times must I hear salesmen say that it is not technically possible for AM to sound as good as FM, or that AM stereo was invented only for car radios?

Although the FCC and AMers themselves must accept responsibilty for AM's plight, the worst damage done to the image of AM stations was the marketing done by FM stations. What can AM do about it? Unite and fight back, the way FM did. AM has a choice: continue to get anihilated, or produce a better mousetrap.

All AM stations, whatever their allocation, must compromise and lobby for mutually beneficial issues. Three areas must be addressed by AM:
***Engineering/FCC:** Listeners perceive the AM signal as "harsh," so process station audio to reflect consumers' impressions of high-fidelity sound. Mandatory strategies include NRSC and stereo AM transmission (pick a system) on all stations; minimize simulcasting (FCC); improve AM coverage and reduce crowding in rated markets; better regulation of interference.
***Manufacturing/Sales:** Manufacture shielded AM antennas that reduce man-made RF, and improve AM antennas in portable receivers. Mandatory strategies include AM stereo or continuous-tune on every radio; stereo pilot light; digital synthesis tuning and/or muting/quieting between stations; NRSC standard on receivers; lobbying to manufacturers and incentives for sales.
***Image/Programming:** Counter-attack using the tactics FM found successful. Consider a new acronym for AM (like a call-letter change). Target younger—more likely to buy new AM stereos.

If you AMers want to win, you have to act. Respond to the FCC calls for comments, talk to the NAB, and pin up your FM dartboards! ■

Buckley owns Light Sound Media, a Chicago-based consulting firm specializing in electronic media and audio/visual installation and production. She was project director for NAB's recent "Psychoacoustic Listening Study" and has worked in production and research at radio stations and as a TV station engineer.

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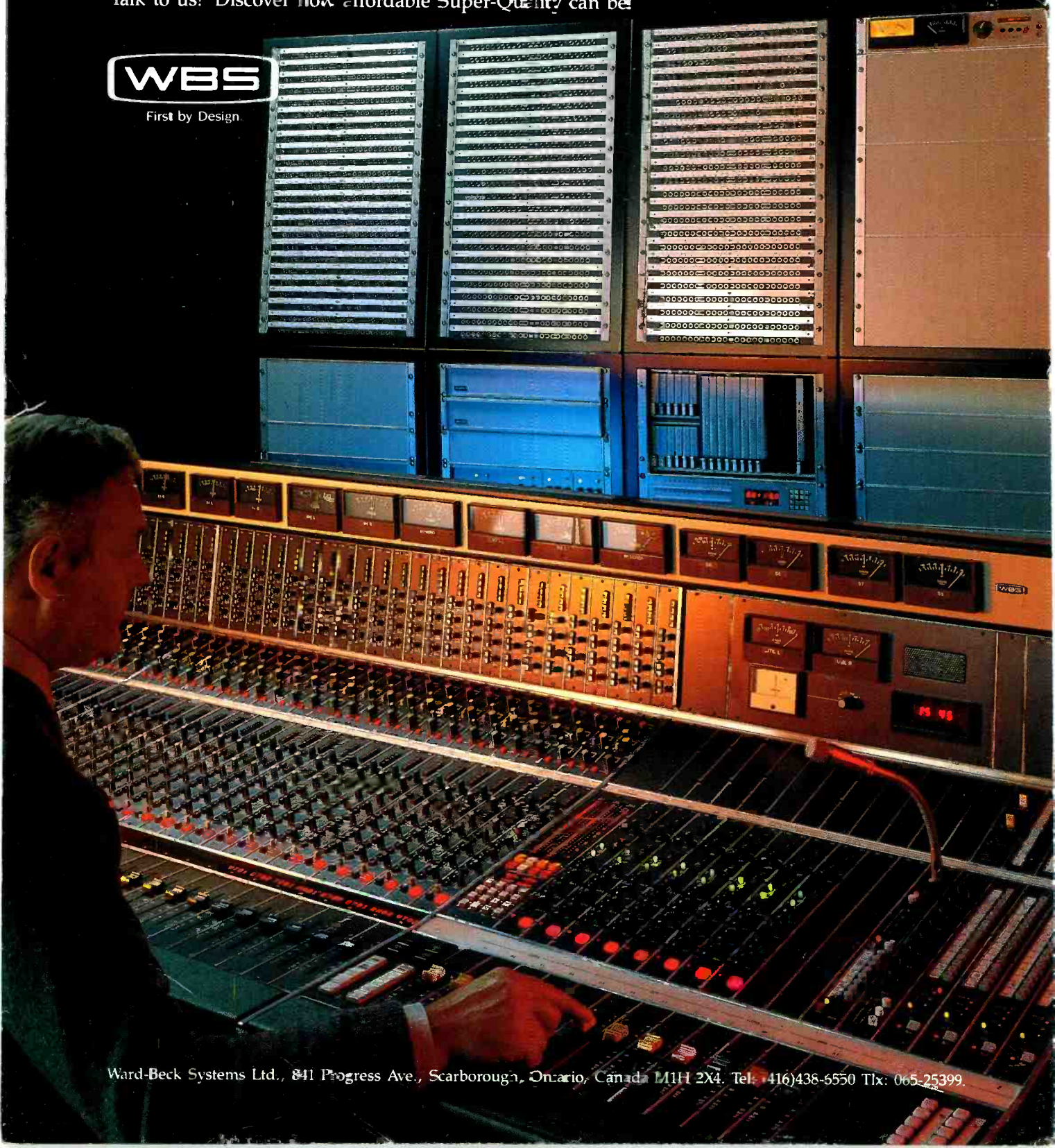

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