BME

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AN ACT III PUBLICATION
OCTOBER 1989
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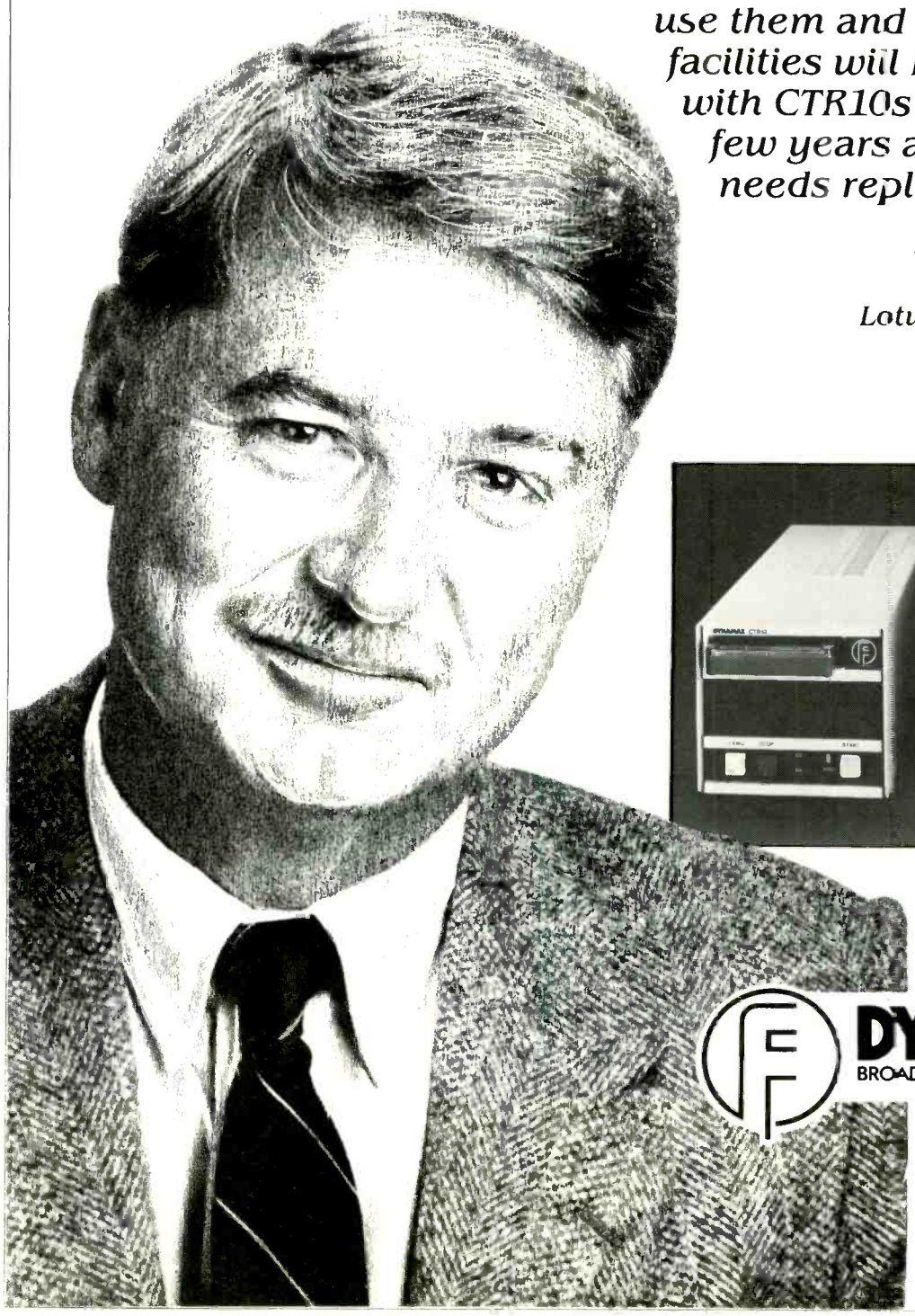

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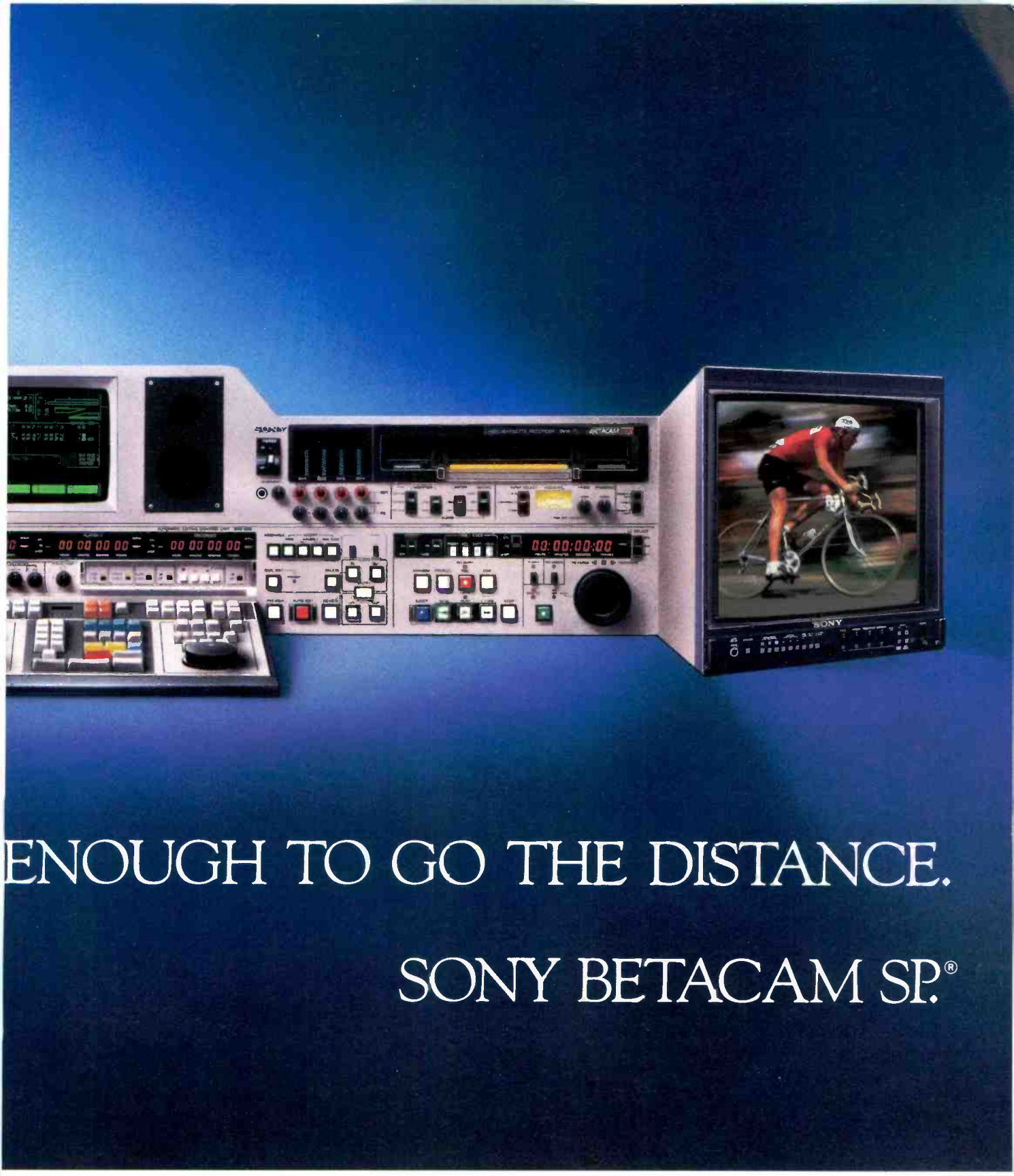

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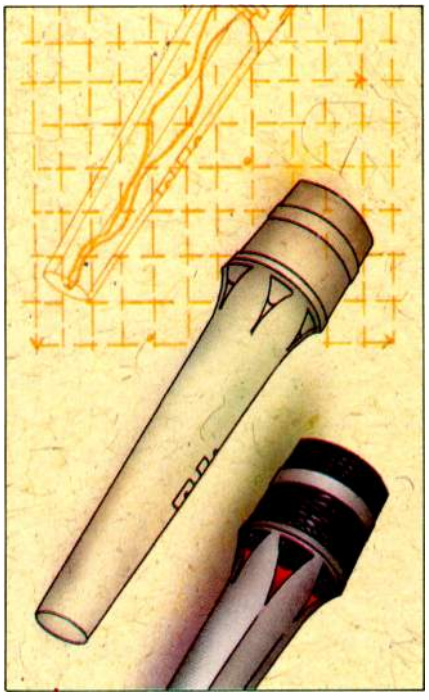
RF Engineers: Endangered Species?



35 *Special Supplement*

BME
FOR TECHNICAL AND ENGINEERING MANAGEMENT

OCTOBER 1989
VOL. 25, NO. 10

Features

PHASE TRAK 90™

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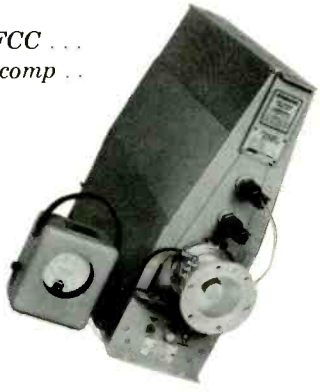

15 *Roy Stewart Named to New Post at FCC*

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VIEWPOINT

The importance of microphones and headphones belies their typically low purchase price.

When you open this month's *BME*, you'll find something new and different: a special pull-out supplement focusing on the latest technological trends and applications in microphones, intercoms and headphones. We've chosen this unusual format as the best way to bring you, our readers, a closeup look at what's happening in these critical areas of audio technology.

The importance of microphones and headphones belies their typically low purchase price. It may be easy to gloss over "small" items like microphones when specifying a multi-million dollar facility, but to do so is perilous. The ability of a microphone to reproduce sound cleanly and accurately is a critical link in any audio system. Similarly, both studio and field applications benefit from careful consideration of headphone design features.

This month's special supplement, therefore, brings you a comprehensive look at developments in headphone technology, written by Dan Daley, an experienced audio writer and frequent contributor to *BME*'s sister publication *Mix*. In addition, *BME*'s audio editor, Skip Pizzi, offers a discussion of how careful microphone placement can optimize a stereo production, along with a look at the new generation of stereo field microphones.

Just as a signal distribution system ties a broadcast plant together, a well-designed intercom system keeps engineers, producers and talent operating in concert. Specifying a large-scale intercom system is a complex procedure, and omitting any important consideration may have disastrous results on the system's suitability for the application. Dan Daley has outlined the most important factors to take into consideration in designing an intercom system you won't regret.

We hope you'll find this special supplement a useful and edifying addition to *BME*'s usual coverage. In 1990, we hope to bring you several similar supplements on important areas of studio and remote technology. I welcome your comments, reactions and suggestions. ■

Eva J. Blinder

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UPDATE

Roy Stewart Named to New Position at FCC ... Varian Reorganizes ... Behr Joins Cubicomp ... ATSC Defines HDTV ... Philips Working on Simulcast HDTV

Roy Stewart Named Chief of Mass Media Bureau

Alfred Sykes, new chairman of the FCC, is wasting no time nominating members to his staff. One of the first of such assignments to be announced is the appointment of Roy Stewart as chief of the Mass Media Bureau. Stewart, a 25-year veteran of the FCC, was previously the chief of the Video Systems Division of the Mass Media Bureau. He assumes his new duties October 1.

Under the broad spectrum of its regulating authority for radio and television, one of the Mass Media Bureau's main responsibilities is the job of authorizing services—a task carried out primarily through the processing of applications. Although Stewart declined to speak specifically about any of his long-term goals for the Mass Media Bureau, one of his short-term goals is streamline the processing of applications.

"Particularly in the area of FM, we have a substantial backlog of applications despite the significant efforts of the staff in the FM branch," said Stewart. "By working with the staff and the lawyers who practice for the FCC, I will try to find ways to streamline our processing procedures to expedite our taking action on various types of applications."

The backlogged applications range from those seeking permission to start new FM radio stations to those stations that want to make alterations in their existing facilities.

Stewart, who started working for the FCC in 1965 in the television branch, was appointed chief of the Transfer Branch, which is in charge of the sale of radio and television stations, in 1974. Five years later, Stewart was made the chief of the Broadcast Bureau's Renewal and Transfer Division.

In 1982, following the reorganization of the Broadcast Bureau into the Mass Media Bureau, Stewart was made the chief of the new Mass Media Bureau, Video Services Division, where he remained until his recent appointment.

Stewart earned his Bachelor of Arts degree in 1960 from the University of Virginia and in 1963 earned a J.D. degree from New York's Cornell University Law School. ■

TIM GREJEK

Varian Reorganizes

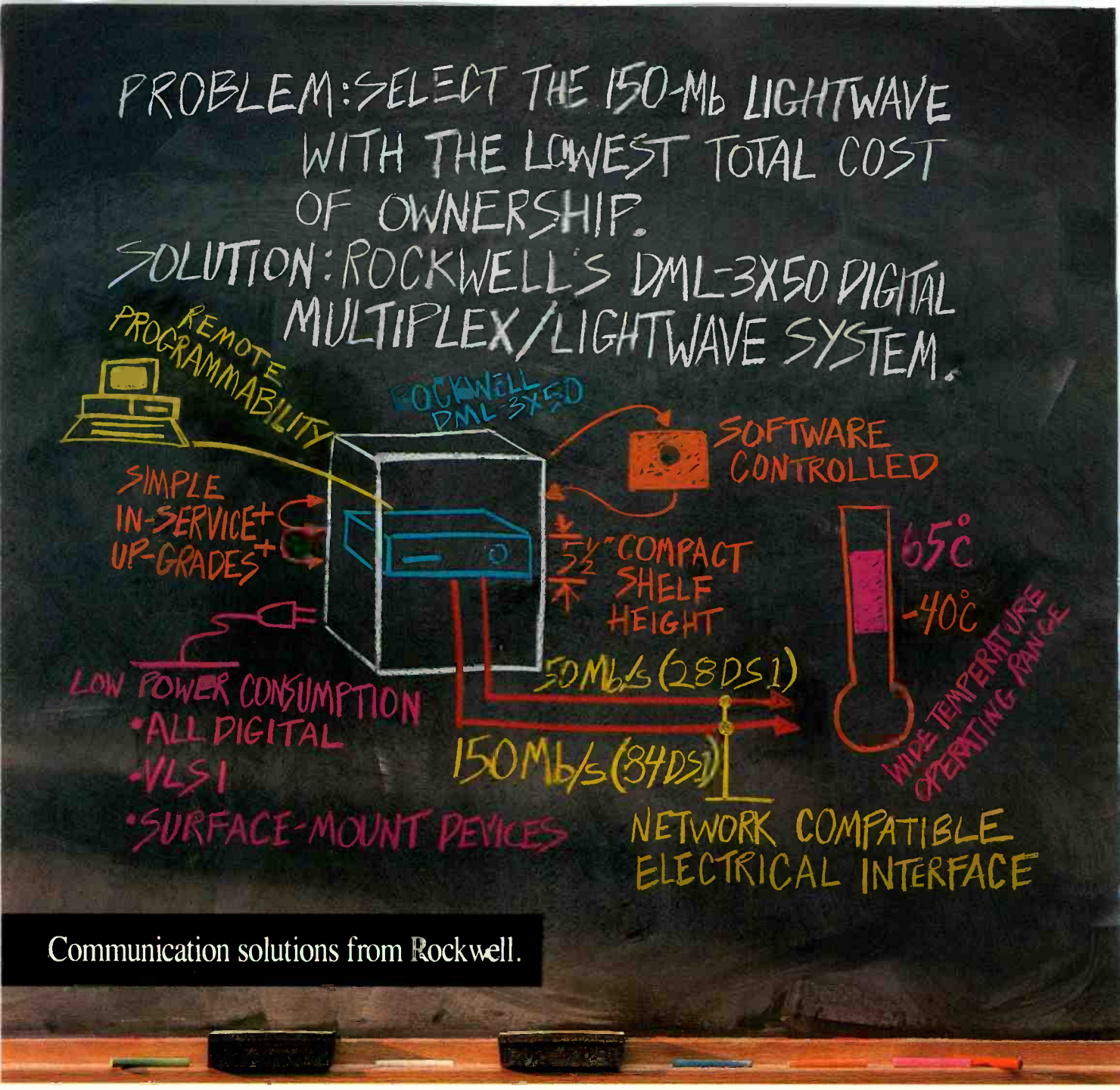
In a move expected to have little direct impact on the broadcast industry, Varian Associates, Inc. has announced a major realignment of its operations and management structure. According to the company, the change reflects a significant shift in its strategy. Varian will now focus on growth opportunities in semiconductor equipment, analytical instrumentation and medical products.

The organizational move will divide the company's four communications-oriented entities into two groups.

According to Laurie Alire, manager of corporate communications for Varian, the company is reshaping its organizational structure to group similar activities together primarily based on end use.

"This realignment has been done according to whether the specific group manufactures a system or a component that goes into the system," she said.

The newly formed Components Group will consist of the Microwave Power



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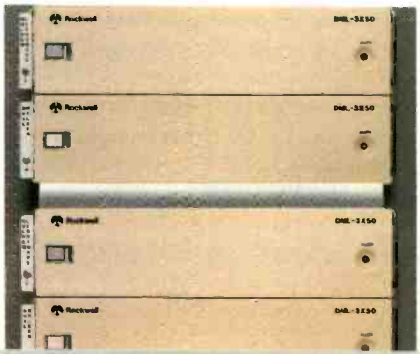

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Tube Division and Varian Eimac Division—each of which manufactures the tubes used in the transmitters built by Varian. The Equipment Group will consist of the Continental Electronics Division and Varian TVT Division—each of which manufactures radio and TV transmitters. ■

Philips Working on Simulcast HDTV

North American Philips has announced it is working on a simulcast HDTV system, in addition to its previously announced augmentation system. According to Peter Bingham, Philips' consumer electronics vice president, technology, the new system would use a separate self-contained 6 MHz channel to simulcast the HDTV signal. He said the system probably won't be ready for the start of testing by the Advanced TV Test Center, but could be submitted later in the test process.

Philips Labs president Mark Rochkind said he expects the system to be demonstrated soon, because it is based on technology developed while working on signal compression for the augmentation system.

Meanwhile, two other HDTV proponents, the Del Rey Group and the New York Institute of Technology, have apparently abandoned plans to participate in the ATTC testing program. Both said lack of funds prevented having hardware ready in time.

Del Rey president Richard Iredale said the group's second round of funding didn't arrive. The CBC, Cox, Tribune Broadcasting, and Westinghouse Broadcasting had contributed a total of $400,000, but more was needed for hardware, Iredale said.

NYIT cited the same reasons for its decision to drop out of the testing program at this time. As reported by *BME* in August, Dr. William Glenn left as head of the NYIT project several months ago. ■

Behr Joins Cubicomp

Allan J. Behr, an executive with more than 25 years' experience in the video and broadcast industries, has been named president and chief executive officer of Cubicomp Corp., the Hayward, CA-based manufacturer of 3D graphics and animation systems. Behr succeeds Peter Shaw, Cubicomp's board chairman.

Behr will direct Cubicomp's operations, including manufacturing, finance, sales, marketing, personnel and engineering. Shaw will concentrate on long-term and strategic company issues, according to a Cubicomp statement.

Until joining Cubicomp, Behr had been with Dynatech Corp. in a variety of capacities, most recently as a consultant on business planning and acquisitions. Previously, he was president of Quanta Corp., one of Dynatech's divisions.

Behr was associated with CMX Corp. for 10 years, where he eventually earned the posts of vice president, general manager and director. ■

ATSC Defines HDTV

Noting "considerable confusion" about the meanings of the various terms applied to advanced television systems, the Executive Committee of the Advanced Television Systems Committee has announced a series of official definitions. Here are their complete wordings:

IDTV, or *Improved Definition Television*, refers to improvements to NTSC television which remain within the general parameters of NTSC emission standards and, as such, would require little or no FCC action. Improvements may be made at the source and/or at the television receiver and may include improvements in encoding, filtering, ghost cancellation, and other parameters that may be transmitted and received as standard NTSC in a 4:3 aspect ratio.

EDTV, or *Extended Definition Television*, refers to a number of different improvements that modify NTSC emissions but that are NTSC receiver-compatible (as either standard 4:3 or "letter-box" format). These changes may include one or more of the following: wide aspect ratio, extended picture definition at a level less than twice the horizontal and vertical emitted resolution of standard NTSC, any applicable improvements of IDTV.

For purposes of identification, EDTV transmitted as 4:3 is referred to as EDTV, and when transmitted in a wider aspect ratio, as *EDTV-Wide*. If the EDTV transmission requires additional spectrum for augmentation beyond a standard NTSC channel, then it will be referred to as *EDTV-Augmented*.

HDTV, or *High Definition Television*, refers to television systems with approximately twice the horizontal and vertical emitted resolution of standard NTSC. HDTV systems are wide aspect ratio systems and may include applicable improvements from IDTV and EDTV. Terrestrial HDTV systems must be NTSC receiver-compatible. This may be achieved through simulcasting or through the use of an NTSC-compatible main channel accompanied by an augmentation channel.

The ATSC Executive Committee approved the definitions unanimously, although Zenith took exception to the specification of a wide aspect ratio for HDTV. ■

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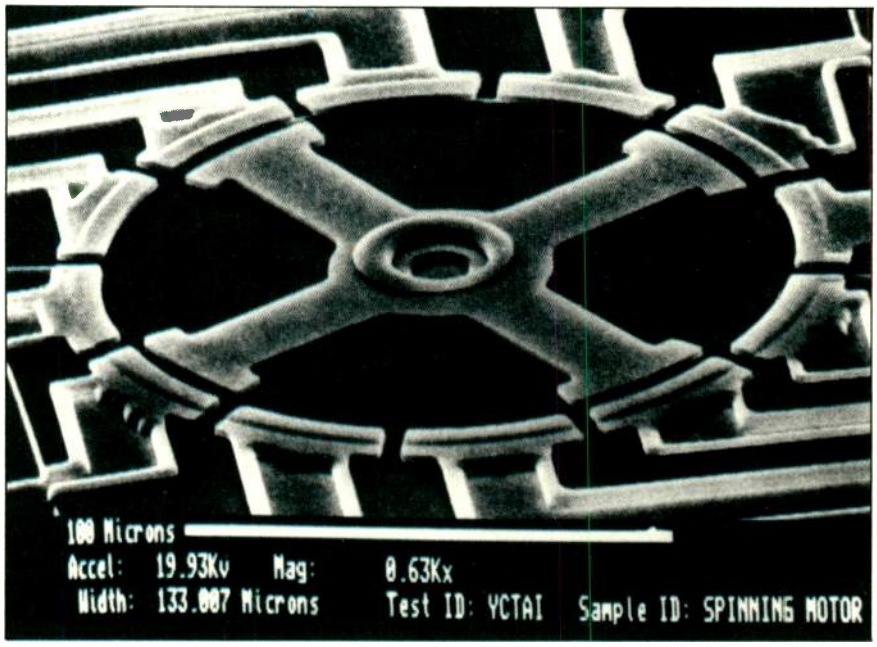
The Deafening Roar of Tiny Motors

By Robert Rivlin



This micromotor is just over 100 microns in diameter and is built on a silicon-chip base.

Taken by itself, the sound of one of the new class of microscopic motors under development at the University of California, Berkeley, MIT, Bell Labs and several other research centers wouldn't amount to much. Each is smaller than the thickness of a human hair. But taken together in the quantities being talked about by scientists, the tiny motors add up to a deafening roar. The rotor in the device has a diameter of 60 microns, whereas a human hair is 70–100 microns in diameter.

The Berkeley motor is only experimental at this point, but it does move when a static charge is applied—although not yet for prolonged periods of time. To produce a moving part free from its silicon base, scientists build structures on "sacrificial" layers on a special kind of glass that is etched away at the end of the manufacturing process. It is as if a structure were made of metal and ice, and then the ice melted away, leaving only the metal.

The motor being designed at Berkeley uses static electricity rather than the magnetic forces that usually drive motors. To produce rotation, a voltage is applied to the pronglike objects surrounding the rotor. As the voltage is moved around the prongs, the rotor spins, constantly changing the charge.

Besides the microscopic machines created at the U. of California, scientists have also created gears with teeth the size of blood cells as well as springs, cranks and tongs so small and light that they are prone to being accidentally inhaled. According to one scientist, the next largest device with the precise moving parts that characterize these as machines is at least 100 times larger.

The exact application for these tiny mechanisms is still open to the imagination. But many believe that mechanics is on the brink of the same kind of revolution that occurred in electronics with the development of tiny integrated circuits. Computers that used to fill entire rooms became small enough to put onto desktops.

"We'll have a whole new class of micromechanical systems," says Richard Muller, a professor of electrical engineering and co-director of the Berkeley Sensor and Actuator Center. "They will provoke a whole new line of products and a whole new category of capabilities."

A new report issued by the National Science Foundation lists dozens of applications to which the new tiny motors could be put: Tiny scissors and buzz saws could be used for delicate microsurgery; tiny machines could also travel down arteries, scraping away deposits of fat that lead to heart attacks and strokes.

Micromachines could also be used for exacting manufacturing tasks such as the alignment of lasers, light detectors and thin optical fibers used in fiberoptic communications. Instruments used on spacecraft to take measurements could become extremely small and light. There is also a tremendous potential for use in consumer electronic devices such as VCRs and cameras. It might also be

Micromachines could be used for the alignment of lasers and light detectors used in fiber-optic communications.

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possible to build a flat television in which the intensity of light at each point on the screen would be controlled by its own micromotor or microshutter.

To make the tiny devices, engineers are using techniques borrowed from the technology that creates IC circuits. Precise structures are created on silicon chips by depositing ultrathin layers of materials in some areas while etching away materials in others. The hope is that, one day, micromachines will be able to be produced as cheaply and uniformly as electronic chips are today.

According to George Hazelrig of the National Science Foundation, who heads research into micromechanics, "we can expect to be able to make motors for a 10th of a cent a piece or less. You can talk about applications with 100,000 or one million motors."

It is also possible to envision armies of gnat-sized robots that could perform some functions more cheaply and efficiently than one single large robot.

While tiny gears, turbines, motors and other moving parts are still experimental, non-moving parts fashioned with the same micromachining techniques have already found commercial applications as sensors. A tiny pressure sensor can be made, for example, by etching a thin diaphragm in the middle of a silicon chip. The diaphragm bends in response to pressure and circuits embedded in the silicon along the rim of the diaphragm record the movement of the central panel. Millions of these sensors are produced each year for measuring blood pressure and for detecting air intake pressure in automated automobile engines by Novasensor in Fremont, CA. Tiny accelerometers are also being developed for use in automobile air bag systems to sense the velocity of the car during a crash.

According to Hazelrig, German scientists have also made tiny nozzles that bend gas molecules through a sharp curvature. Since heavier gases will curve less easily, the nozzle is used to separate the lighter form of uranium—useful in nuclear reactors—from the heavier form.

The ultimate goal is to be able to combine the sensor, actuator and moving parts onto a single chip to allow the creation of a robot-on-a-chip that could sense its environment, determine how to react and then do it. Real-world applications for this model are still some time away and may never be fully realizable. One obstacle is that devices built on silicon chips are essentially two-dimensional, despite the moving parts; the "real world" is, of course, three-dimensional. There is also the further question of silicon's hardness. Some scientists say that the chips have the strength of some steels; but because motors have yet to be subjected to prolonged testing, their long-term durability remains questionable.

"The new field of micromechanics is likely to open up all sorts of possibilities."
—George Hazelrig

Working with microscopic machines will also introduce some entirely new design challenges because the physical forces at work on the microscopic level are not the same as those on a larger scale. "The prediction rules we have don't work well at the micro level," says Hazelrig. "We don't even know what the word 'friction' means when you get down to that scale. Air looks like molasses to these turbines.

"Who would ever have predicted that computers would be used in wristwatches?" Hazelrig concludes. "The new field of micromechanics is likely to open up all sorts of possibilities for applications that can only be imagined today." ■

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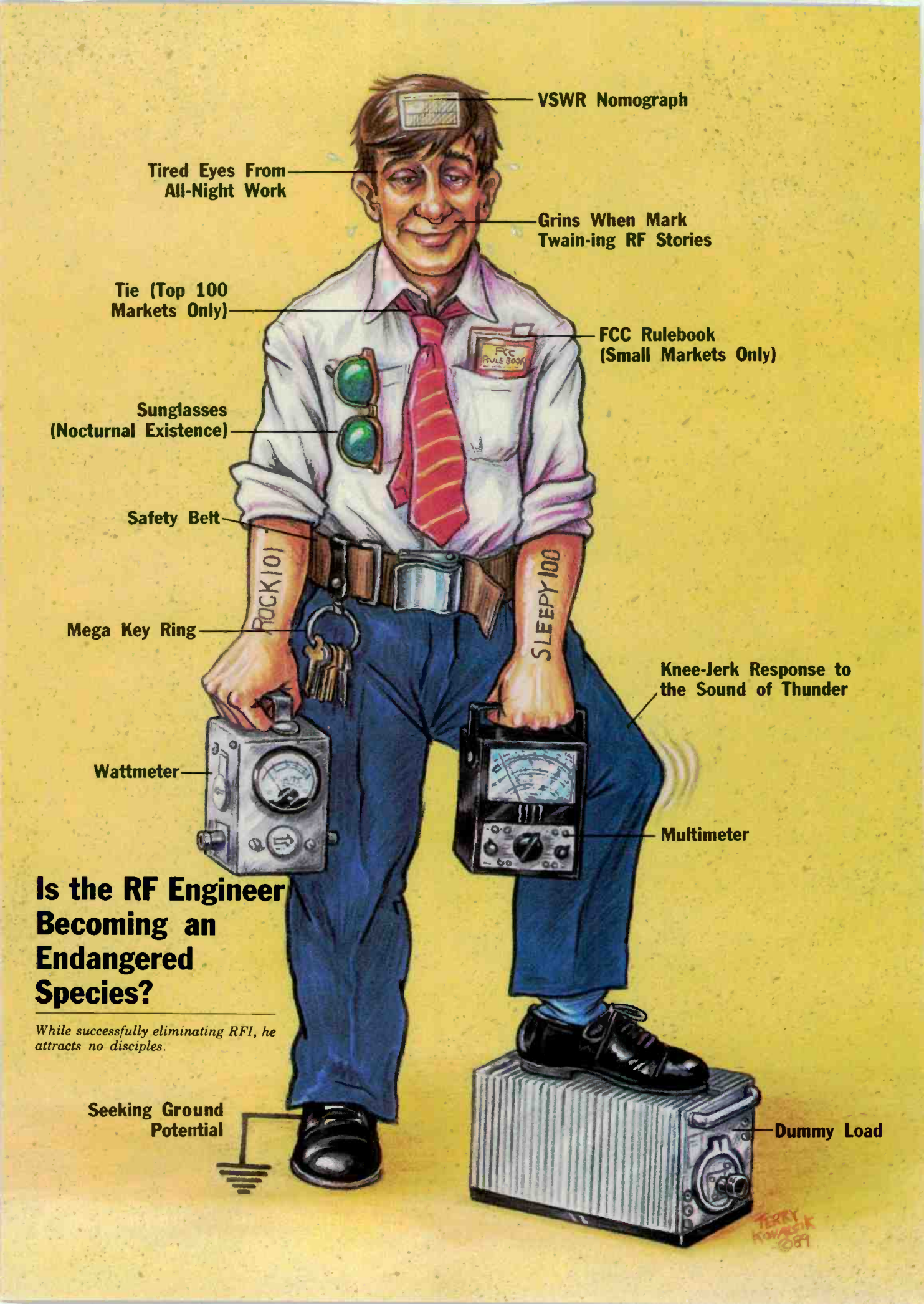
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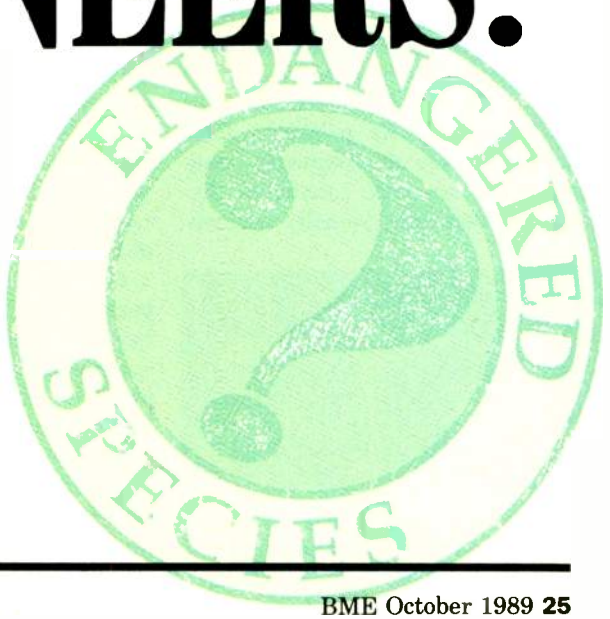
RF ENGINEERS:

Why is this challenging career failing to attract young engineers?

BY TIM McCARTNEY



The demand for specialized RF expertise is on the increase, but a simultaneous loss of interest in the field is radiating warnings. The result may be the endangerment of an engineering species broadcasting cannot afford to lose.

Economic and environmental considerations continue to encourage the concentration of multiple transmission systems at single sites, resulting in increased problems from the strong RF fields. Concerns about the impact of such energy upon the health of humans and animals are generating increasing pressure from the FCC; the EPA has also studied the matter, but its work has been placed on hold. In many localities, new ordinances have been proposed establishing ground radiation standards that may be based more on emotion than appropriate data. With a greater need developing for effective responses to all types of RF problems, engineers experienced in these areas are finding themselves in great demand.

Station managers readily concede that good local maintenance engineers are difficult to find. While usually tight-fisted on engineering expenses, GMs fully expect to spend more heavily on outside RF experts when problems exceed their local engineers' abilities.

Stories abound concerning the lack of interest in broadcast engineering as a career. Three years ago, a major-market station offering competitive wages spent over a year in search of an RF engineer, but failed to find a qualified candidate. About the same time, a retired military RF engineer was finally lured back to the field due to TV and FM translator problems in his small mountain community; upon retirement from the Navy seven years earlier, he had vowed never again to work in the RF field.

Many of today's most seasoned RF engineers are unwilling to relocate as they look at retirement in the next 10 to 15 years. Other problems, such as comparatively low wages, unconventional working hours, the dangers associated with site access, radiation exposure concerns and on-call requirements, may be contributing to the diminished interest in RF as a career. A poor understanding by some GMs of engineering only exacerbates employment and contractual relationships.

Worse, few electronics students view broadcast engineering as a viable career choice. For example, an electronics school in Boise sends its students to one of the leading local AM/FM radio stations each year. The station's chief engineer voices his concern that not one student over the last decade has expressed interest in pursuing broadcast engineering as a career.

Computers remain the specialty of choice among today's electronics school graduates. It can be argued, however, that greater challenges exist in the RF field than in the computer field. Such an assertion must note the satisfaction felt after a successful application of

ILLUSTRATION BY TERRY KOVALCIK

original solutions to a maze of interesting problems, under the gun of staying on the air. The know-how to accomplish such victories is not attained solely from two- or four-year degrees. Rather, it comes from thorough electronics knowledge enhanced by many years of RF field experience, plus a steady diet of RF engineers' stories and articles in the trade publications.

Experienced RF engineers often attribute a wide variety of seemingly unexplainable transmitter site phenomena to RFI. These theories can usually be proven simply by removing the nonfunctional equipment from the RF field. Upon closer examination, it is possible to pinpoint exactly where RF interferes in a given piece of equipment. A summary of problems with certain types of equipment noted at a high-RF mountain site in Boise exemplifies the kinds of challenges faced by RF engineers.

Spectrum Analyzers. RFI can result in a noise floor over which accurate readings become difficult on spectrum analyzers. With this equipment, as with FM monitors and frequency counters, even a direct connection to a transmitter's RF sample port is not adequate for proper operation. The problem lies with an excessive noise floor, making certain tests impossible.

FM Monitors. The impact of front-end overload or intermodulation from other strong RF sources frequently rules out the use of studio monitors in these locations. As a result, tests involving audio or frequency measurements cannot be conducted. Average FM receivers typically are inoperable as a result of front-end overload.

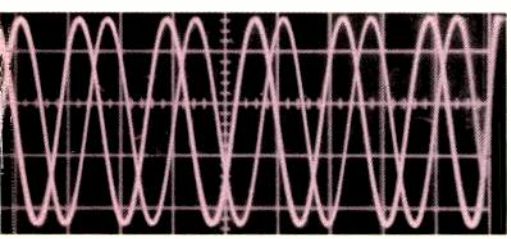


Figure 1. *Sine wave in high-RF field on oscilloscope, probably the result of improper triggering.*

Many of today's most seasoned RF engineers are unwilling to relocate as they look at retirement in the next 10 to 15 years.

Frequency Counters. Since only a few of the older counters constructed with a sturdy steel chassis will perform reliably on RF frequencies, most need to be used away from the transmitter site. However, frequencies up to 43 kHz performed properly on one inexpensive unit with a plastic frame when the audio oscillator was fed directly into the counter.

Oscilloscopes. Two problems were observed using a dual-trace, X-Y oscilloscope in the strong RF field: a high noise floor and difficulties with triggering. However, the unit was still able to perform to some degree.

With no test leads attached, the noise floor was 30 mV. When the test leads were attached but not terminated, the noise floor increased to 1 V. With a 600 ohm unbalanced termination, the noise floor further increased to a varying 1.2–2.2 V. This setup in a non-RF field resulted in a noise floor of only 20 mV.

After some experimenting, it was possible in the high RF field to see a clear 5 kHz sine wave on the oscilloscope when fed directly from an audio oscillator. However, simply adjusting the frequency control on either the oscillator or the oscilloscope resulted in an almost out-of-phase second signal "mirroring" of the first. (See Fig. 1.)

It may be that the output of an audio stage in the oscillator was acting as an antenna and feeding the RF signal through the oscilloscope's vertical amplifiers. If so, the solution would lie in careful triggering.

AM Noise Meters. The ability to tune an FM transmitter for minimum incidental noise is lost since most AM noise measurement devices fail to provide reliable readings amid high RFI. Since accurate readings require an RF sample before the transmitter's harmonic filter, AM noise measurement is not possible at any location other than the transmitter site.

Stereo Generators. In a very strong RF field, few stereo generators perform at all. The noise floor, dominated by low frequency rumbles, completely masks program material.

Audio Oscillator/Distortion Meter Sets. Test sets, such as those used for audio proof-of-performance checks, functioned to a limited extent in high RF fields. The ability to measure frequency response from 50 Hz to 20 kHz was unaffected when tested from the oscillator directly into the distortion meter. The same setup, however, showed THD ranging from 15 percent at 50 Hz, down to about seven percent for 100 Hz–5 kHz, and then up to 85 percent by 20 kHz. (See Fig. 2.)

Headphones. Since headphone cords can serve as antennas, their placement determines which signal may be presented to the earpiece. The audio heard can vary from any of the site's broadcast stations to swirling hums. Audio amplifiers are susceptible to many of the same problems as headphones, as well as low frequency noise.

TV Receivers. The displayed video can contain two stations' images, with the one tuned on the receiver usually the dominant picture. Considerable improvement can be made with the use of a monitor, but shadows and other visible noise remain likely. The audio is degraded by varying hums.

Multimeters. Some meters work fine in high-RF environments, while others are erratic and unreliable. A digital meter performs inconsistently

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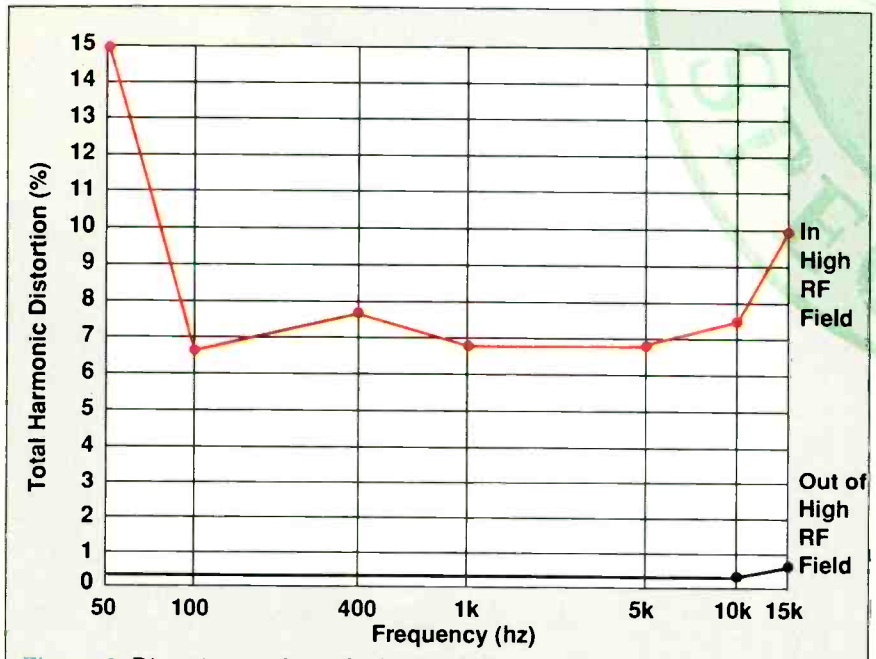


Figure 2. Distortion results in high-RF field using audio oscillator direction into audio analyzer.

in the resistance and dc V functions, and self-overloads in the ac V mode. One analog design works reliably on the ohmmeter and dc V functions. As for ac V, the meter hovers around the three-quarter mark on the meter with nothing attached to the leads. (See Fig. 3.) Such a limitation removes the important ability to verify ac voltages in a transmitter. Sometimes it is possible to take advantage of the RF shielding of the transmitter chassis in order to read 220 V, just over the noise floor of about 200 V.

Videocassette Recorders. The sensitive digital control circuitry of consumer VCRs renders them useless in high RF fields. Thus, simple operations such as power on/off fail to perform reliably.

Digital Converters. Pulse code modulators (PCM) respond to RF with digital glitches in the audio. In some cases, the front-panel display assists in advising of this problem by indicating signal dropout. At other times, audio is degraded on the high end of the frequency spectrum; an oscillator feeding a tone greater than 7 kHz into the PCM begins pulsating. This problem occurred at two different RF sites in Boise: the mountain site noted here as well as a satellite uplink farm shared by AT&T and BSU Radio.

Light Emitting Diodes. In high-RF fields, LEDs may light despite the absence of a supply voltage. Or, they may only flicker when such voltages are applied.

Fluorescent Lights. Such lighting may flash intermittently or remain lit despite the absence of a supply voltage.

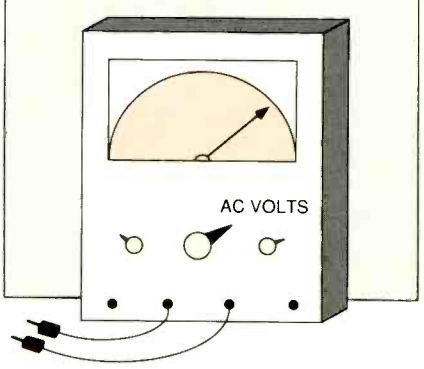
Of course, with RFI properly eliminated, most of this equipment can generally be resurrected to at least a marginal level of performance. Copper or aluminum screen is effective in shielding buildings and equipment racks. A proper choice for an equipment rack is the four-sided version (with a front door). At the high-RF site, it became clear that BSU Radio's equipment rack had the least amount of RF energy at the bottom; thus, that's where the most RF-sensitive gear was located. This included an exciter with self-contained audio amplifier and stereo generator modules. In addition, the last leg of the station's digital STL was located there: a TV receiver, PCM and interface amplifier.

After much trial and error, the system performed with minor audible noise. A few days later, however, the RF environment had changed sufficiently to render unacceptable performance from the same equipment in the same location. In response, copper screen was used to shield the front side of the rack. This netted only short-term results, since the screening itself served as an antenna in the absence of proper grounding.

At this point it seemed appropriate to contact the former tenant of this exact location in the building. Cary Harrison, KJOT-FM technical director, Boise, had moved his equipment to another building, in which aluminum wire screen mesh was installed on the inside of the building to shield out RF. This meant screening the walls and ceiling, bonding it all together, and uniting the entire shield to a common ground. The result was a 10 dB improvement in signal-to-noise ratio.

BSU Radio was trying to implement a digital STL amidst strong RF. All other stations at the site were using the more conventional 950 mHz composite STL systems, which are far more immune to RFI than their consumer equipment-based digital equivalents. So, better RF protection was clearly necessary.

Figure 3. In high-RF field, multimeter in ac volts position registers ¾-scale on all ranges with nothing attached to leads.



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Another experienced RF engineer, Clair Mineau of KTVB-TV, Boise, studied the BSU Radio setup and noticed several weak points. Since the coax used to connect the TV receiver to the PCM was consumer-grade, he recommended doing what the TV stations had already done with their RG 59: upgrade to a double-braided coax. Baseband video is easily affected by RF, which is exactly what was on this coax.

He also noted that the coax connector appeared as if a crimper had not been used. After a proper crimping, most of the RF problems disappeared.

In addition, he pointed out that the rear door was not grounded to the rest of the equipment rack. The two hinges served only to provide physical support while thick paint prevented any effective electrical connection to the rack. Fingerstock could be used to form an effective electrical connection between the door and the rack frame, as well as additional bonding to the main rack.

What about RF coming in the power lines? He discussed the filters and ferrite beads used by some manufacturers in equipment destined for RF environments. Generally, the designs serve as low-pass filters that eliminate anything above the 60 Hz ac power frequencies. Such a filter, typically located inside the chassis, is the first obstacle seen by the incoming ac power, before the power transformer. While gear so equipped often includes remote controls and STL receivers, these designs are not to be found in consumer items, such as the components used in digital STLs.

KIVI-TV, Boise, approached the RFI problem from the ground up during the design and construction of its transmitter building. Chief engineer Andrew Suk explains that some $40,000 in copper was installed about 15 years ago, including six-inch-wide extra-thick ground strap and ¼-inch copper mesh on all walls, floors and ceilings. With the tower, ground system and building all tied together, the building was well protected from RFI. So, most test equipment works well in the building.

In general, even the best engineering practices are under the tough scrutiny of unforgiving RF.

The most difficult problem arising from RF is that standard diagnosis techniques are ineffective. It is difficult to troubleshoot a problem when restrictions are imposed on monitoring a signal in conventional ways. For example, if strange sounds swirl around the audio noise floor, it may not be possible to hear the problem

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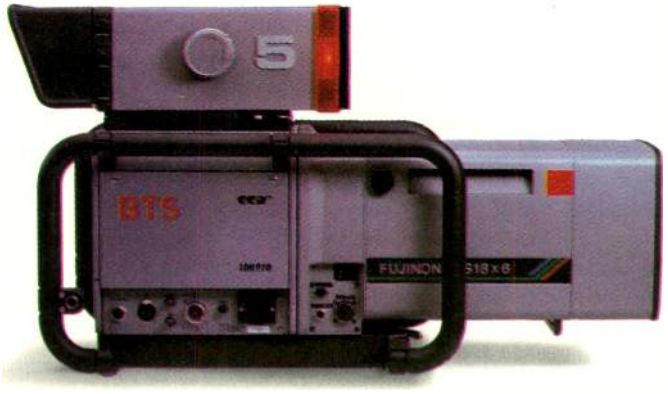

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reliably at the transmitter site. The inability of a monitor or set of headphones to function properly limits audio troubleshooting. So, reliance is placed upon someone at the studio to offer advice via telephone while various remedies are attempted.

On the other hand, some equipment will perform reliably even in a very strong RF field. Among these items are wattmeters, dummy loads and analog multimeters (ohmmeter and DC V functions). And, of course, the transmitter, STL, TSL and remote control are designed to work well in such environments.

Curiously enough, though, sensitive microprocessor options on some transmitters have caused problems in these situations.

A rule of thumb is that the more technologically advanced the item (*i.e.*, sophisticated ICs), the more care must be taken. Very fast surge protection/filtering, properly connected to adequate ground systems, is necessary to protect this calibre of circuitry.

Experienced RF engineers have learned that these problems are routine elements of their work. In response, a myriad of imaginative and original solutions have been developed. Most such approaches are stored only in these engineers' minds, partially because the wide variety of remedies is difficult to completely document on a regular basis.

Inevitably, a conflict will develop between the economic forces pulling many transmitters to a single site and safety concerns about ground radiation. One rather certain outcome of such a clash is the need for technical resolutions to a wide variety of RF-related problems. Expertise in this area will be in demand.

It is important that electronics students and broadcast engineers learn more about RF as a specialty. Then, despite the negative aspects of the work, the motivation factor may serve to attract the new generation of specialists. Younger RF engineers should work with the seasoned professionals in order not to miss the remaining learning opportunities.

Today's broadcasters should work to develop an RF engineering plan for the next decade. The industry cannot afford losses in its RF expertise, which would only further contribute to interference. As proven by AM radio's long-term interference-related problems, massive numbers of listeners can be lost permanently. ■

Tim McCartney is director of engineering, BSU Radio Network, Boise, ID.

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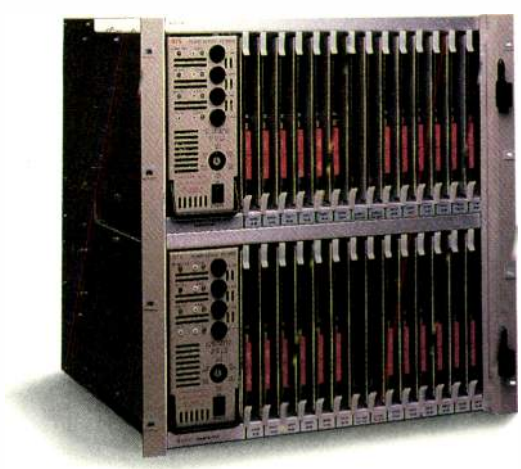

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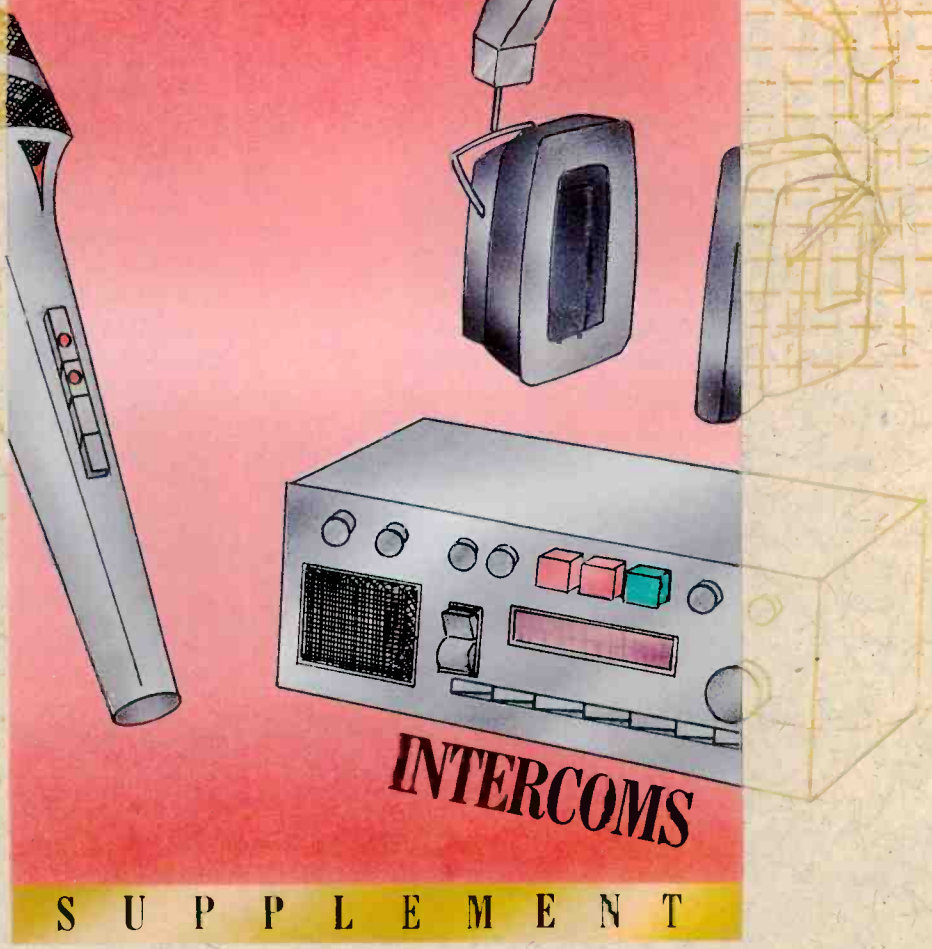

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MICROPHONES

Mic it Right for Great Sounding Stereo

It's no longer necessary for today's broadcasters to rely only on outside-produced programming for their stereo material. With a little knowledge and some specialized equipment, it's easy to produce any local program in stereo.

For stereo to be effective in broadcasting, two major criteria must be satisfied. First, the systems employed must not be substantially more cumbersome than monaural equivalents, and second, any stereo material must be mono-compatible. An exact definition of just what constitutes mono compatibility is elusive and varies among practitioners, but its ideal goal is that the mono listener hears everything the stereo listener does except for the stereo imaging. This requirement is deceptively simple. The many possibilities for error that exist in stereo recording can cause anomalies in the mono sum severe enough to create a substantially different program for the mono listeners.

Techniques

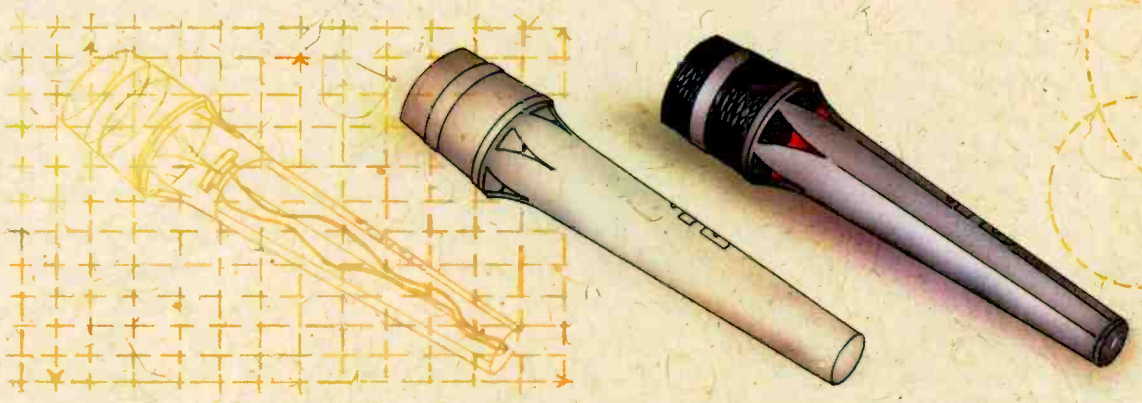
Stereo recording techniques can be broken into two broad categories. The first involves the use of many separate microphones, each of which is assigned a stereo "location" by the use of the panpot on its input of a recording console. Such a "panned-mono" stereo recording is how most commercially released recordings are made. Except for an occasional live music event, this approach is generally far too equipment- and time-intensive to be practical for the typical broadcast application. Therefore, the second category, which can be called "true stereo" recording, is of greater interest and usefulness to broadcasters.

True stereo (sometimes called "minimalist" microphone technique) employs a single pair—occasionally two or more pairs—of microphones to capture stereo audio, using the acoustical environment's own sound field to generate a stereo image, rather than artificially constructing it as in the panned-mono method. True stereo approaches come in two varieties: *spaced-mic* methods and *coincident* techniques.

A spaced-mic arrangement uses two microphones placed at some distance from each other (generally ranging from eight to 35 feet), with each mic discretely assigned to one channel of the stereo signal. The exact distance between microphones will vary, but the resulting recording is typically quite "spacious" sounding, with high amounts of separation and a heightened sense of ambience. Individual sound sources may seem to "wander" around in the stereo image, however.

"Panned-mono" stereo recording is how most commercially released recordings are made.

Coincident techniques are so called because they employ a pair of microphones located as close as possible to the same point in space. Although coincident miking will often exhibit less spaciousness than a spaced approach, its image *accuracy* and *stability* is greatly increased, making it especially appropriate for situations that require consistent recreation of exact directional information (such as stereo TV, where sonic and visual images must match, or orchestral recording for radio, where the various sections of the orchestra should be placed as they are on stage).



Coincident Styles

The coincident approach can be either of a discrete style (in which each of the two mics in a coincident pair feed one channel of the stereo recorder directly—the so-called "X-Y" technique), or a component method (in which center and side information is captured by two microphones and fed to a sum-and-difference matrix, which then extracts the left and right signals—referred to as mid-side or M-S miking). Although the X-Y approach is simple and can be useful, especially with two figure-eight microphones crossed at 90 degrees to each other (the so-called "Blumlein" pattern), the M-S approach is often preferred, and is well worth the extra step it requires due to its superior imaging and flexibility. Imaging is improved since the mid-mic, regardless of its polar pattern, is always oriented directly at the center of the image, with the information at the edges of the image picked up by the side mic (which is always a figure-eight pattern). This contrasts with the X-Y approach, which places a pair of directional mics necessarily off-axis to the center of the image, often losing focus as a result. The M-S technique also allows for adjustment of the S-mic's level in the sum-and-difference matrix, thus providing a convenient method of adjusting the stereo image width electronically.

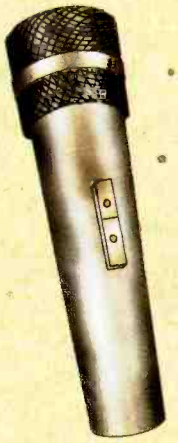
The M-S approach is often preferred, due to its superior imaging and flexibility.

The mid mic of an M-S pair can be of any pattern, with resultant stereo patterns changing accordingly. Furthermore, sum-and-difference matrixing can take place during recording or during post-production. Finally, M-S mono compatibility is also superior, since the S-mic output cancels out completely in the sum signal (it is out of polarity across the stereo channels when it leaves the sum-and-difference circuit), and the resulting mono signal is the output of the M-mic only.

Making Mono Work

In general, coincident methods ensure mono compatibility to a high degree. Spaced stereo miking may create interchannel phase errors, resulting in frequency-selective cancellation of the monaural sum signal. Depending on the program material and the spacing, this cancellation can be inconsequential, a minor annoyance, or a major problem; auditioning an A-B comparison of the stereo and mono signals is the only way to verify the magnitude of the problem. An X-Y oscilloscope display of the stereo signal is also quite useful here.

While any reasonably matched pair of microphones—of any polar pattern—may be used in spaced techniques, coincident applications require the use of directional microphones. Since both mics of a coincident pair occupy the same location, the only way any difference information can be derived is by using directional microphones oriented in different directions.



Omnis are also much less sensitive to wind noise, vibration, plosives and proximity effect.

Spaced microphones, on the other hand, are not constrained to use directional microphones. They can therefore use the often more natural-sounding omnidirectional microphones, benefiting from their smoother on- and off-axis frequency response, especially at lower frequencies. This can have a surprisingly profound effect on the overall sound quality of a stereo recording. Omnis are also much less sensitive to wind noise, vibration, plosives and proximity effect, and should therefore be considered when any of these problems are likely to be encountered.

Variations on a Theme

Variations on both the spaced and the coincident themes attempt to combine the strengths of each. Spaced pairs may be augmented by a third, center microphone, assigned to both channels, which solidifies the stereo image a bit and aids mono compatibility somewhat. It requires a more complex setup than a simple pair of microphones, usually involving a mixer. The three mics in this sort of array are typically all omnis, but needn't be. One variant flanks a center cardioid with two figure-eight mics; another hybrid approach currently in favor for orchestral recording uses a central M-S pair with spaced figure-eights on either side. Additionally, close and distant stereo pairs can be combined for "direct" and "ambient" sound from concert or sound effects recordings, with relative levels of the two pairs balanced on a mixer for the desired overall "perspective."

Continued on page 42

Stereo ENG Microphones

The increased need for stereophonic location audio has generated a new class of single-point stereo microphones designed for that purpose. Several manufacturers have recently introduced stereo microphones with features aimed at specific field recording needs.

One such mic, the AKG C522-ENG, is intended primarily for handheld reporter/producer use. It incorporates a pair of small-diaphragm cardioid microphone elements that operate in a fixed 90-degree X-Y configuration. As with any stereo mic, special attention must be paid to the lateral orientation of the microphone in order to insure that the stereo image is arranged in the proper plane (i.e., horizontally rather than vertically). For handheld use with the C522, the microphone should be kept in a fairly stable position as well (unlike a typical mono ENG mic) to prevent background image shifting. The mic is powered by phantom or an inboard rechargeable battery.

Other stereo ENG microphones are directed more toward the location recordist/engineer. The entrants here are the Neumann RSM-190i (recently upgraded to the RSM-191i), and the Sanken CMS 7 and CMS 9.

All are M-S designs, and the Neumann models employ an interference tube design for increased directionality of the mid capsule. All exhibit quality sufficient for remote music recording, where they have found favor as stereo spot microphones in classical music and opera recording, among other applications.

All except the CMS 9 allow control of pattern and M-S matrixing, either outboard, or in the case of the RSM-191i, on the microphone body itself. (The latter also replaces the RSM-190i's brass shell with aluminum for lighter boom weight.) The newer and less expensive CMS 9 features a fixed pattern (decoded M-S) stereo output only; on the others, M-S components may be decoded on site or recorded directly to tape for later matrixing. All powering is via outboard phantom supply.

With this new generation of stereo field microphones, field production and ENG have taken a major step closer to studio quality. ■

Incredible stereo. Great imaging. No trade-offs.

Until now, there have been only two choices for stereo microphones.

Mid side and X-Y mics gave good mono compatibility but produced wishy-washy imaging and sacrificed ambience. The second choice, near-coincident pairs, produced sharper imaging at the expense of poor mono compatibility and required awkward stands and field assembled parts.

Either way, low end has been weak and off-axis coloration lurked in the background.

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Full ambience without coloration, excellent sum to mono and an extraordinarily broad frequency response, SASS offers fantastic imaging with pinpoint localization for both music and non-music sources.

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MICROPHONES

Near-coincident techniques place a pair of directional microphones close, but not coincident, to each other (usually less than one foot apart) in such a way that some spaciousness is added without losing all of the stereo image accuracy and stability. Mono compatibility varies widely with each application for near-coincident approaches, as does stereo image stability.

Mono capability varies widely with each application for near-incident approaches.

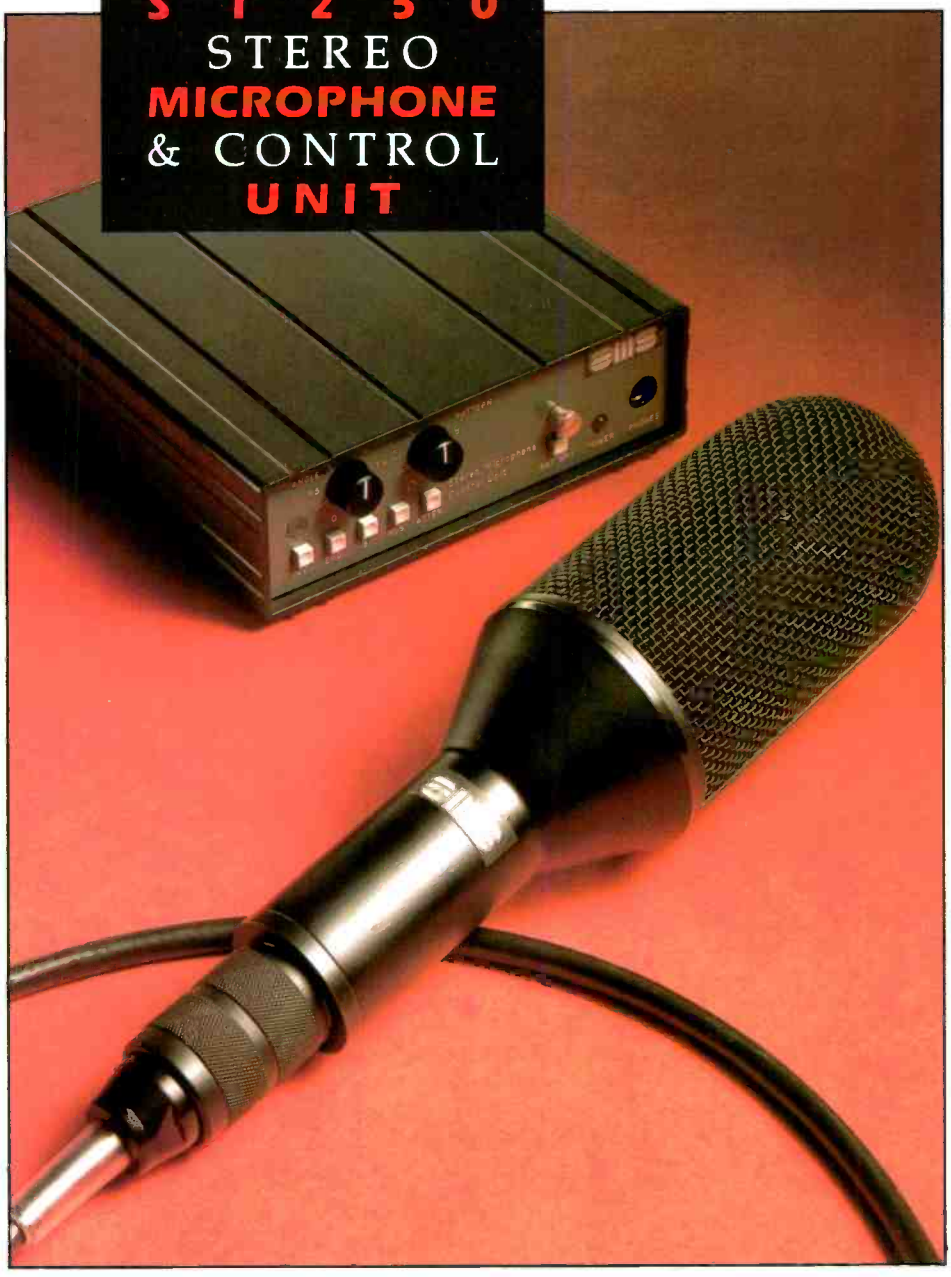
Finally, *binaural* techniques attempt to simulate the human hearing sense exactly by placing microphones in the ear canals of a dummy head. Such recordings are really only suitable for playback on headphones, where they can provide stunning realism. They are not nearly as successful on speaker playback and mono compatibility is often poor, although much research is currently underway on minimizing these problems by using digital signal processing.

Sounding Right

Although many in the industry are quite doctrinaire in favoring a particular approach—and the hard science does lean toward coincident systems—keeping an open mind (and ear) is recommended. The best advice is gained from one's own experience, since there are no real formulas; if it does the job simply and reliably, and sounds right in stereo *and* in mono, then it's the proper technique. Try it for yourself and see.—*Skip Pizzi*

ams

ST250 STEREO MICROPHONE & CONTROL UNIT



The AMS ST250 stereo microphone produces the most accurate stereo image of any microphone available and offers several unique and practical features that have only previously been available to owners of the AMS SoundField.

Surface mount component technology is employed to achieve a compact reliable unit with an uncompromised specification.

The flexibility of the ST250 exceeds the normal bounds for one microphone. Its ability to switch remotely from X-Y to M-S stereo formats, and from vertical to end-fire with total remote control over the effective capsule angle and polar patterns, allows this microphone to be used in almost any application for stereo or mono recording.

The integral self powering allows unrestricted use both in the studio and on location.

Using the AMS ST250, audio engineers and producers all over the world can now look forward to total control over the most accurate stereo recordings possible.

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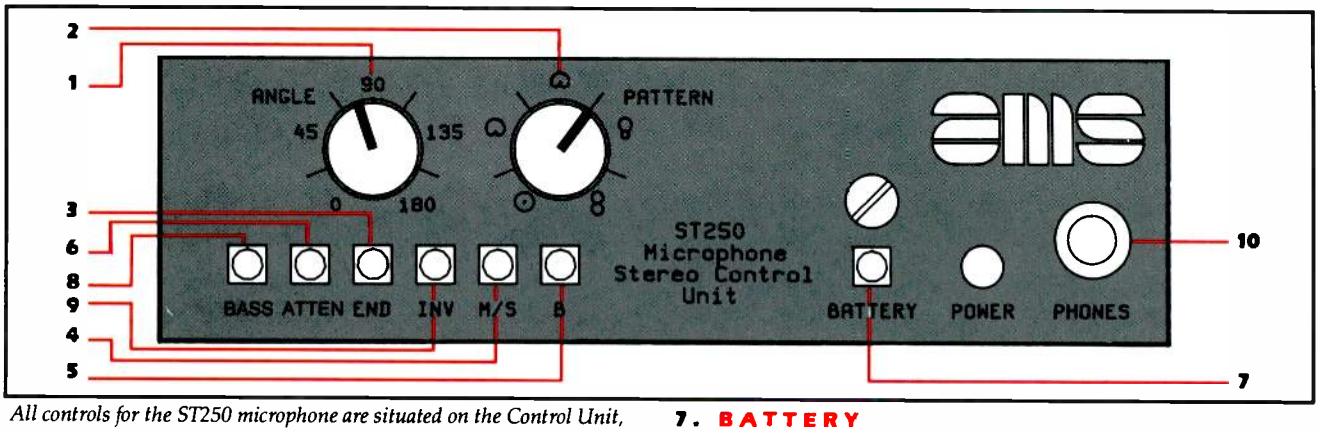
MAIN FEATURES

- Frequency response 20Hz – 20kHz
- Remotely controlled bass roll-off
- Truly coincident stereo signal up to 10kHz
- The most accurate polar patterns in the world
- Linear frequency response on and off axis
- Total remote control over the effective capsule angle and polar patterns
- Remotely switchable for vertical or end-fire use
- Remotely switchable X-Y, M-S format
- Extremely low noise performance
- Total mono compatibility
- Powered by mains (110 – 250V), phantom power or standard batteries
- Configurable for European or USA connector standards

AES BOOTH # 511

SMPTE BOOTH # 1214



All controls for the ST250 microphone are situated on the Control Unit, allowing total adjustment of the microphone after placement.

1. CAPSULE ANGLE

In the X-Y mode the effective angle between capsules can be adjusted from 0-180 degrees allowing the user to control the width of the stereo image. Mono can be achieved by setting this control to 0 degrees.

In the M-S mode the operation is the same but the control adjusts only the angle of the sides without affecting the centre "mono" image of the microphone, retaining complete compatibility in broadcast for the mono listener.

2. POLAR PATTERN

In the X-Y mode the polar patterns can be adjusted from omni through all the cardioid patterns to a figure of eight. If adjusted in conjunction with the angle control it allows the user to achieve any crossed pair response. e.g. 0-180 degree cardioids, crossed figure of eight, or just a mono cardioid etc.

In the M-S mode the polar pattern control adjusts only the centre response of the microphone and in conjunction with the angle control allows the user to manipulate the overall M-S response of the microphone to achieve the ultimate stereo image for the particular application.

3. END

This switches the ST250 for vertical or end-fire use. In end-fire mode the angle and polar pattern controls operate in the same way as for the vertical mode.

4. M-S

Switches the ST250 from the X-Y to M-S format. Can be used with the END switch control allowing the user to operate the ST250 in M-S or X-Y mode either in the end-fire or vertical state.

5. B

Allows the user to record a 'B format' four channel surround sound signal via the special ST-CB3 cable.

6. ATTEN

For use when recording very high signal levels. This button pads the input of the microphone to avoid distortion.

7. BATTERY

Switches batteries in circuit (housed in the control unit) for self powering. Using standard C cells, the expected operational life for the batteries is up to 40 hrs.

8. BASS

Rolls off the bass response of the microphone from 120Hz to reduce wind noise or low frequency ambient signals.

9. INVERT

As is normal with stereo microphones X-Y or M-S, if the microphone itself is physically positioned upside down, left and right outputs are effectively reversed. The INVert switch on the ST250 Control Unit allows the user to maintain a true configuration of the L-R channels by reversing the L-R channel outputs if depressed.

10. HEADPHONE MONITOR

Whether in X-Y or M-S mode you can monitor the output signal from the control unit in X-Y format. This is intended as a checking device and is only operational in the mains and battery mode.

ST250 MICROPHONE POSITIONING

Because this microphone can be switched from vertical to end-fire and also inverted it is important for the user to identify the positioning of the microphone relative to the stereo image. The AMS logo has been placed on the front of the microphone such that when used in the vertical or inverted position the white AMS logo should be directed towards the sound source. When used in the end-fire position the AMS logo signifies the underside of the microphone. Obviously if the microphone is physically inverted *and* the INVert button is depressed the identifying mark will then represent the top of the microphone.

STANDARD ITEMS:

Foam windshield
3 metre cable
Stand adapter
Field carrying case

OPTIONAL EXTRAS:

Field shoulder case for Control Unit
20 metre cable
100 metre cable with drum
ST-CB3 B Format cable
Shock mount
Rycote windshield, pistol grip & mount

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INTERCOMS

The Future on the Line

Formats come and formats go, but still the intercom links us all. And while the intercom concept, based originally on telephone technology, has been around as long as broadcasting has in one form or another, what has changed is the number and type of sources it must interface with—satellites, microwave, RF, telephone, and of course, the almost primeval land line.

Considering the costs and the complexity involved, however, the most important interface is not between stations or sources but between customer and manufacturer. A thorough understanding of the needs of the broadcaster is primary in designing and implementing a functional, practical intercom system.

Broadcasting's need for intercom systems spans the range of categories in this area, including the two-wire conference line, the four-wire matrix or point-to-point system and IFB systems. The increasing number of interface sources, as well as the current overall complexity of intercom technology, and their large relative costs—it's not unusual for budgets to exceed $100,000 for a large mobile unit—make precise planning critical.

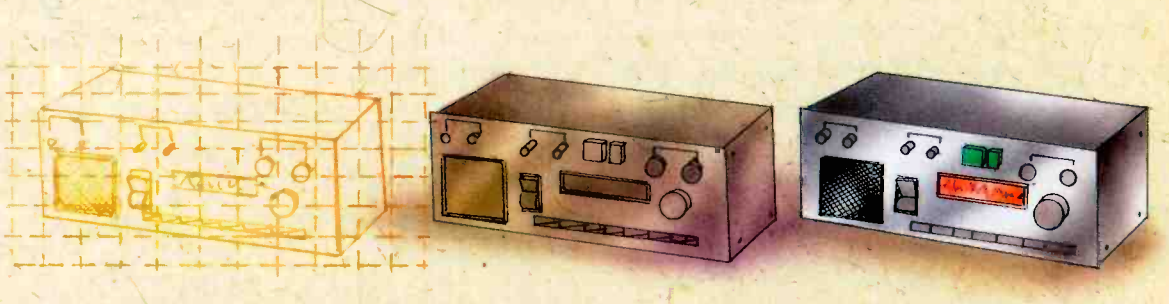
Television productions are usually oriented toward conference line operation and thus are best served by the two-wire approach, while post-production applications are served better by a four-wire matrix system. Depending upon the size of the overall operation, a combination of both systems could be necessary.

Critical Questions

The following list of design questions, prepared by Dave Brand of RTS Systems of Burbank, CA, provides an excellent overview of the paper evolution of an intercom system.

- Is the system primarily for production or post-production?
- Who are the operators (within the system) and who talks to whom? Are there any specific restrictions?
- For conference operation, how many simultaneous, private conversations need to be supported (determining the number of channels required)?
- Who needs headsets? Who needs speakers and microphones?
- Is communication oriented more toward continuous speaking, as in a live production situation, or toward momentary speaking, such as normally found in post-production situations? The first implies a conference line mode of operation; the second a matrix mode.
- What is the required form factor of each station—rackmount for headset, rackmount with speaker, beltpack, portable with speaker, console mount, wall mount or wall mount with speaker?
- Are there severe limitations at any operator position?
- What sort of interfaces with external systems are required?
- Are any stations at a remote location? If so, what are the means of interconnect?
- Are there any paging areas to be covered?
- Are there any areas of high ambient noise, requiring special headsets and microphones?
- What type of headsets are required?

After the basic design components have been specified and chosen, the next step is the IFB portion of the system. Used intensively in news and sports, the IFB is one-way and generally multichannel, and most systems provide tally signals when there is more than one control point. In most designs, the program audio is cut off for the duration of the announcement or cue. Questions in these systems designs include:



- How many talent stations must be provided for?
- How many operators need to access the IFB system?
- How many program inputs are required?-
- Do any of the outputs drive radio or satellite links?
- Do any of the outputs drive telephone or other outgoing types of lines?
- Do the control stations require their own mics or will the operator's intercom station microphone be shared?
- How does the talent talk back to the IFB control operator?
- Will there be any future expansion in the number of stations?
- What kind of earpieces or headphones are required for the talent?

Cameras generally have at least minimal intercom capability; four-wire compatibility is common in studio cameras, but a determination has to be made whether to match cameras to the intercom system or to bypass the camera intercom capability altogether and go with external beltpacks, using conductors in the camera cable circuitry. This last approach allows the camera intercom to interact easily with the rest of the operation. Internal intercom mods are possible, too, adding wiring to the camera head for an intercom interface. This method, however, doesn't work with triaxial cable cameras and can also increase the crosstalk factor between intercom and video signal. In some cases, the cameras themselves can also be modified to accept new circuit cards to make them compatible with an existing intercom system.

Working Together

When planning a purchase, one should keep in mind that there is a need to make sure that components from different manufacturers can work together. The three major areas to consider are termination impedance, line level and power system. For instance, while both RTS and Clear-Com use 200 ohm termination impedances, RTS combines its power onto the same line as the audio signal while Clear-Com uses a separate power line. RTS's duplex line runs five to eight dB hotter than that of Clear-Com's, although this difference can be overcome with an interface made by Clear-Com. Nevertheless, it underscores the importance of keeping a consistency between major components.

Wireless systems can range from simple, inexpensive Radio Shack components working in the 49 MHz range to the half-duplex walkie-talkie approach using a pair of frequencies. High-quality full duplex wireless systems, made by manufacturers like Swintek, Vega, HME and Clear-Com, are four-wire systems, and interfaces that include simple black boxes with a single-level matching connection, or interfaces with up to 18 DIP switches to connect to two-wire intercoms.

The hand signals in radio booths that gave way to telephone technology intercoms have finally approached the digital age. Some of the long-term analog audio improvements have included increased bandwidth and frequency response, and standardization of impedances. More recently, digital matrix control components have made complex systems easier to handle. Microprocessors and custom integrated circuits (CIC) are finding their way into intercom systems.

Digital Plus and Minus

Digital audio is immune to induced noise and crosstalk, making it particularly useful for portable applications. While digital systems don't have the bandwidth capability of current analog systems, the fidelity of an intercom signal is secondary to its clarity in most cases. According to Bob Tourkow, systems manager for Clear-Com, the company discovered in tests of its Matrix Plus fully digitalized audio intercom system that while digital audio loses extremely high frequencies above 5 kHz, that's the region in which most ambient background noise exists.

A digital matrix system runs on a single pair of wires digitally, or can carry either digital or analog signals over three-pair wiring. This capability vastly reduces the amount of wiring necessary for large-scale remote events requiring intercom capability, allowing a full-function master station to run on a single pair of wires. Implementing digital in a facility upgrade doesn't pose a major problem for a similar reason: Most in-place facilities have at least a single pair connecting all stations. Tourkow stressed that the cost of a digital audio intercom is comparable to that of an analog one when the amounts of wiring are included, and that its interface capabilities—including the ability to interface with and generate standard DTMF touchtone telephone signals—are wide-ranging.

The intercom aspect of broadcasting doesn't grow in leaps and bounds.

But the intercom aspect of broadcasting doesn't grow in leaps and bounds, technologically speaking. RTS's Brand explains that the market is small and extremely competitive. As a result, costs can't be amortized over a larger base and prices tend to stay high. This means that the newest technologies take a while to filter down to intercoms. But, he assures, new technology is improving intercom systems and will continue to do so in the future.

Eugene Johnson, sales engineer at Ward-Beck Systems Ltd. in Scarborough, ON, says that, ultimately, digital audio will become the norm in the intercom industry. "Digital control is already here," he says. "But you have to carefully evaluate the advantages at this point in terms of cost-effectiveness."

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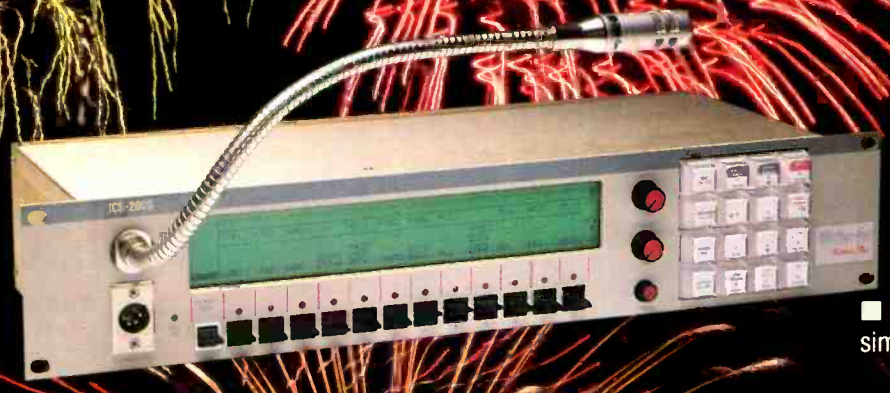

- 50 station point-to-point capacity plus IFB, ISO, and PL.
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INTERCOMS

Going Mobile

Mobile operators face perhaps the greatest array of possible interfaces—telephone, microwaves, satellites and more. Thus a wide interface capability is required.

"Having a clear idea of the flow of information is critical," warns Jay Adrick, executive vice president and general manager of Midwest Communications, the largest mobile unit supplier in the U.S. "Interfaces are critical and it can be very frustrating to have a million-dollar truck and an interface that doesn't work."

Adrick says he's seeing more and more point-to-point or single-channel systems lately, due to the increasingly specialized nature of intercom communications. And a growing number are matrix-based rather than party line-based, especially in the larger trucks.

While intercom systems for trucks can range in price between $15,000 for an ENG unit to over $100,000 for large trucks, Adrick estimates that customers should figure the intercom system to account for between four and seven percent of the overall truck cost.

Bob Robinson, John Crowe Productions' director of sales development, says combinations of wired and wireless systems are proliferating. And expansion capability is important, too. "Versatility is critical," he says.

Omar Sattah, marketing manager for McCurdy Radio Industries in Toronto, says that while features such as digital control and dynamic switching functions are important in truck systems, size is the true bottom line.

"Space is the premium resource of a truck," he says. "That and audio specifications. In trucks, as in studios, having to continuously listen to bad audio quality is a distinct disadvantage."

Intercom systems are growing in complexity to meet new broadcasting demands, and digital technology is becoming a part of that growth. But the bottom line is the interaction between customer and designer and builder that makes a system both effective and cost-effective. In the end, it's the human interface that is paramount.—*Dan Daley*

THE INTERCOM SOLUTION FROM McCurdy

Looking for an integrated communications system? Look to McCurdy for the affordable solution. McCurdy's advanced Digital Intercom Systems have set a new standard for programmability, flexibility, expandability and reliability. We offer you cost-effective solutions to your intercom needs, large or small.

Our affordable, high performance intercoms are integrated communication systems with the following superior capabilities:

- Point-to-Point communications
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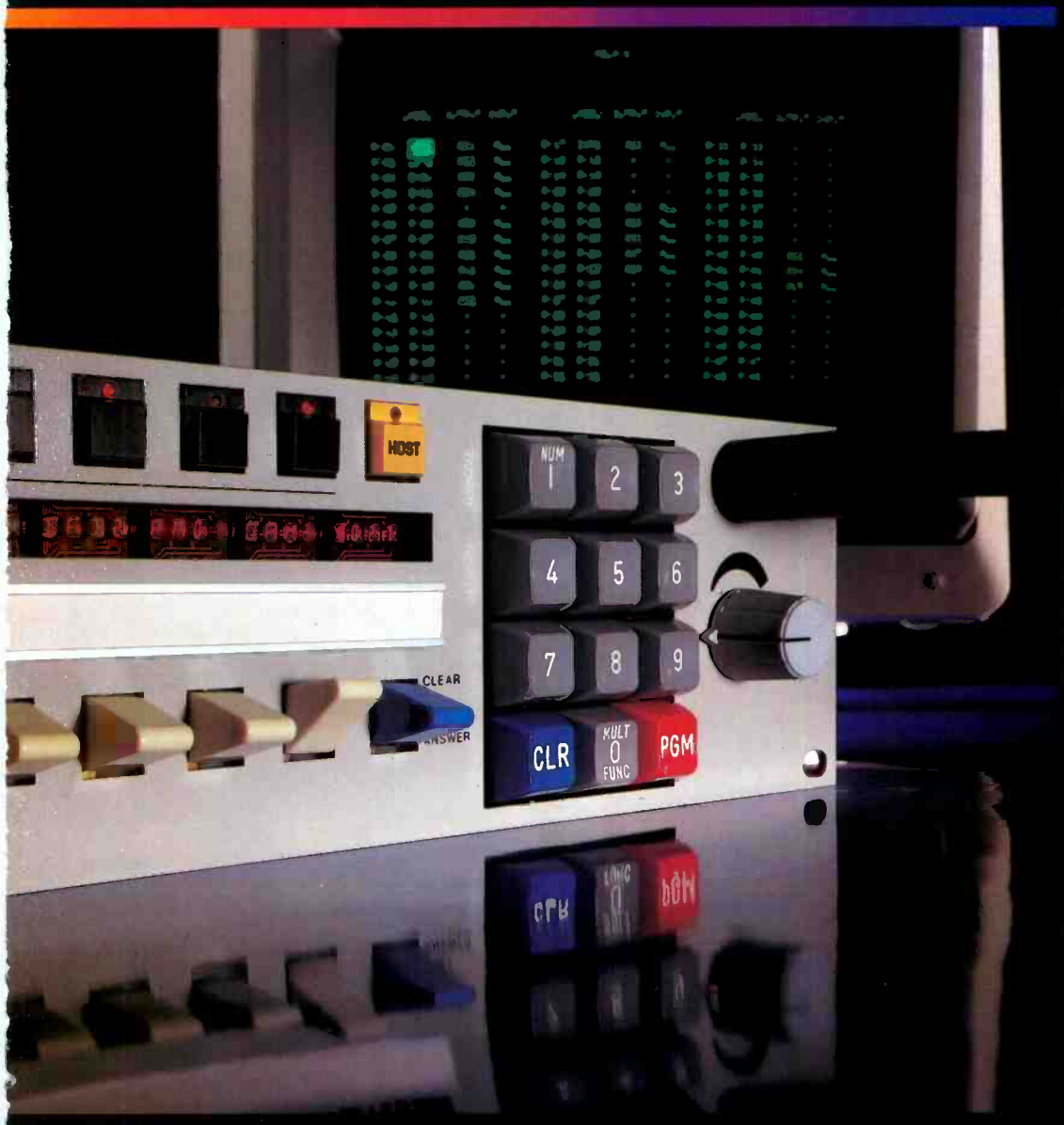
- Programmable IFB's (Program Interrupt)
- Programmable selective Group Calls
- 2-wire beltpack interface
- 2-way radio interface
- Telephone interface with auto answer
- Camera interface
- Camera ISO capability
- Relays for auxiliary equipment control.



Other features include:

- Ultra-reliable
- Instantaneous Cross-point Access Time
- Fastest system reconfiguration time
- Disk based storage system or EEPROM
- Completely modular and field expandable
- 3-pair telco wire between matrix and control panels
- Wide choice of control panels
- Bright, easy to read 4 character alpha-numeric displays
- Easy to program
- All keys universally programmable locally or at central terminal
- System configuration can be changed by user at any time
- Very compact: CS9500 50×50 matrix is only 3 RU (5¼") high

40 YEARS OF EXCELLENCE

McCurdy's intercom systems are in use around the world; they range in size from 10×10 to 400×400 systems.

As the premier intercom supplier for the 1988 Calgary and Seoul Olympic Games, McCurdy intercoms succeeded with flying colors!

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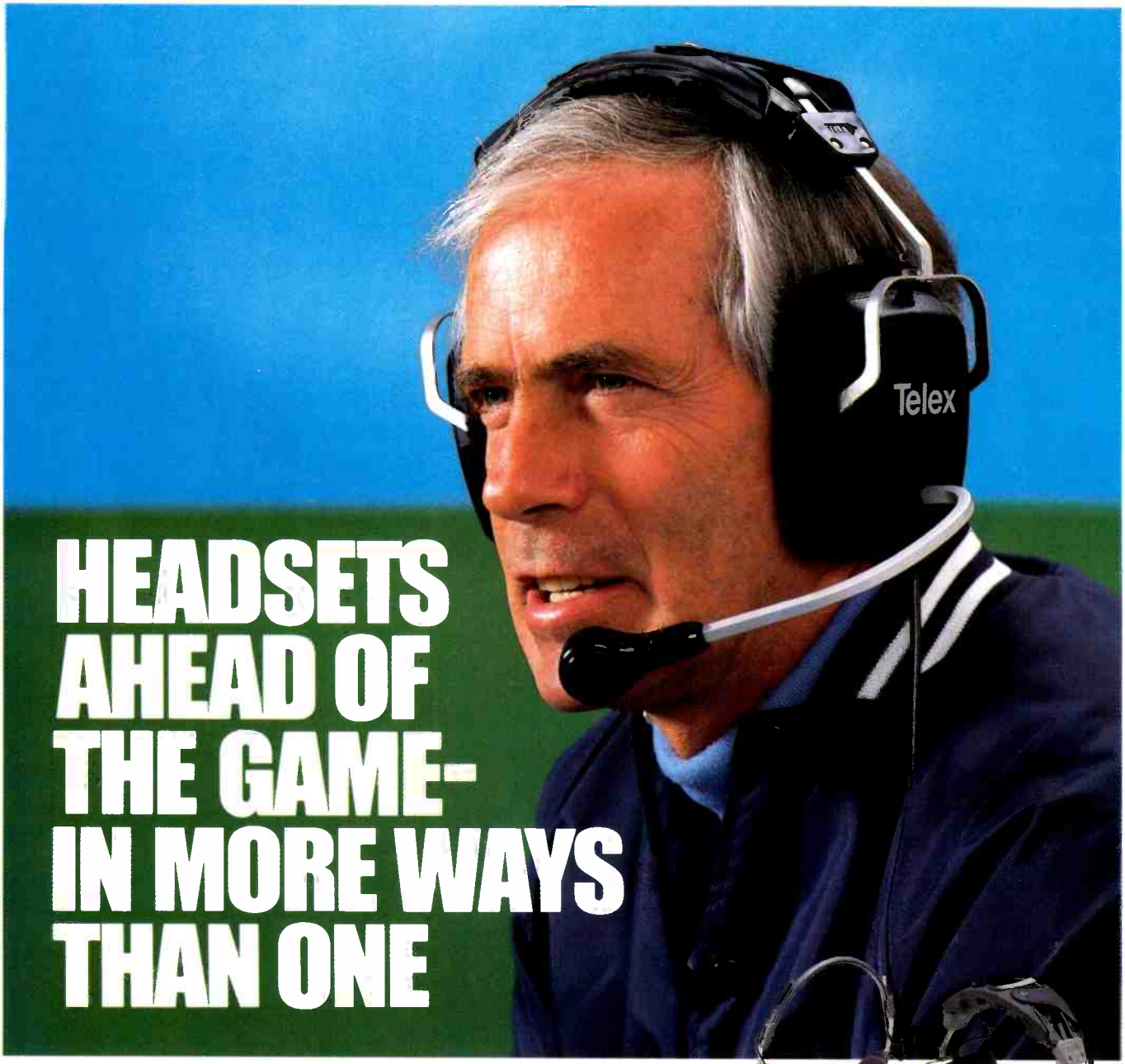

HEADSETS AHEAD OF THE GAME- IN MORE WAYS THAN ONE

For coaches and broadcasters alike— the pros pick Telex.

On the football field and in the broadcast booth high atop the stadium you'll find Telex Headsets are the choice of the pros. National Football league stadiums and major television networks use a variety of Telex Professional Headset models day-in and day-out.

Furthermore, thousands of colleges, high schools and local radio/television stations who have recognized the value of clean, clear, dependable communications are also using Telex. If you're not already using a Telex, we urge you to take a closer look next time you have a requirement.

A model for every purpose. Whether your need is communication, camera, sportscaster, studio announcing or inconspicuous on-camera listening, Telex has a model that will fit your requirements perfectly. No other headset manufacturer has the tremendous model variation Telex offers.

Lightweight, full cushion, single sided or dual, boom mic or monitor headsets are all fully described in the latest Telex Headset Catalog. Full specifications are included and the catalog is free. Call or write today: Telex Communications, Inc., 9600 Aldrich Avenue South, Minneapolis, Minnesota 55420.

TELEX®

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HEADPHONES

New Technology Makes for Better Choices

Headphones and headsets are on the front line daily in broadcast, and if they don't perform optimally, the rest of the production can suffer. Recent advances in the design and construction of headphones can have tremendous positive impact for users. The trend to new lightweight materials in the transducer elements and housings has reduced overall component weight considerably even as the transducer elements have increased in area size, enhancing the accuracy and resolution of the audio signal. Not an insignificant evolution in an area of audio that generally averages a unit cost of about $150.

It's that low cost that all too often results in the choice of headphones becoming an afterthought in many equipment budgets. Executives will rightly vet and fret the cost-effectiveness of big-ticket items in budgets, but leave the procurement of headphones—the piece of the puzzle that literally links an entire production chain of command on intercom systems—on the bottom of priority lists. Think about it: Headphones are often the final point at which the audio segment of a broadcast is monitored before it hits the ether.

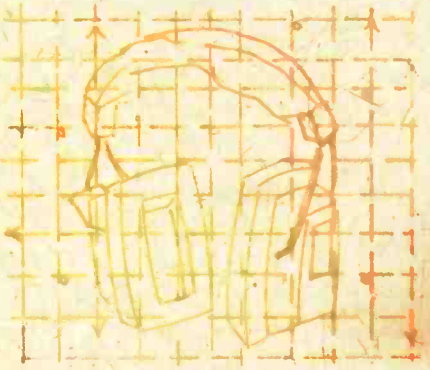
Types

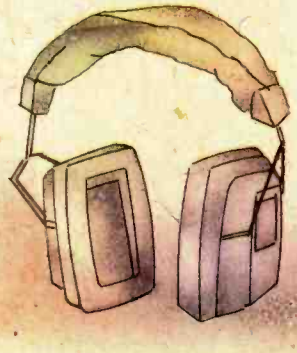
The user marketplace can be segmented roughly between in-studio and location applications, each category having a number of subdivisions; for instance, location work can be either short-duration ENG work or more sustained film production, sports events and extended event coverage; in-studio applications range from a single on-air personality in a booth to multicamera productions broadcasting live. Each application has its own requirements in terms of communications between personnel, and the headset is the common denominator. Headphone and headset variations include mono/dual (two sided/mono signal), single-sided, binaural (capable of handling two separate programs simultaneously), in-ear and stereo.

Outdoor work calls for extra-rugged construction, particularly in corrosive environments such as near salt water. Keeping environment in mind when purchasing is ultimately cost-effective. Materials vary, generally a combination of stainless steel and high-impact plastic, with muff padding ranging from simple foam to lambskin and fluid-filled rubber. The ability to repair headphones and headsets in the field is desirable, a feature common to all Telex headsets, according to Jeffrey Peters, sales manager for Telex's pro audio division.

In the studio, the choice between closed and open-air muffs should be dictated by the situation, although personal taste is an important element here, too. Open-air headsets are the most comfortable since the porous muffs are the lightest and can be worn for extended periods without being uncomfortable. Some radio broadcasters avoid open-air sets because of the possibility of feedback, while others feel that the leakage is insignificant at low monitoring levels; other users feel that closed headphones increase concentration on intercoms, especially non-matrixed intercoms. In these cases, individual situations will determine what's best, depending, for instance, on the level at which speakers are being monitored in the same room.

Users of closed headsets have always had the option of pushing one of the muffs up over one ear to monitor other sound sources (or just to give at least one ear a rest). Sennheiser offers a set, the HMD 410,





which allows one muff to flip back easily to get the same result.

Closed headsets have as a characteristic enhanced bass response, which manifests itself as boominess. Some manufacturers have changed designs to compensate for this, including placing the closed portion directly over the ear opening to minimize the area covered and reduce boominess. Closed sets, of course, have a higher outside noise attenuation factor. The synergism between the diaphragm and the muff is analogous to the relationship between a speaker and its enclosure, and the two should have a design consistency that optimizes compatibility.

Going Both Ways

Two-way headsets come with either dynamic or noise-canceling microphones, the latter being particularly useful in sports broadcasts, although some smaller stations with limited input capability will opt for the former and use the ambient crowd noise as part of the broadcast. Noise cancelling is accomplished by phase shifting and various methods of porting to obtain an optimal polar response. The mounting angle of the mic on its boom and the design of the mic element conspire to achieve a desired cardioid—or in some cases hyper-cardioid—response. Mics also require the ability to withstand high SPLs of up to 120 dB (ever hear John Madden when he's *really* excited?) as well as adequate windshielding to attenuate pops and wind noise. An example is the Beyer DT-109.

Two-way headsets have considerations above and beyond ergonomics and electronics. Cosmetics come into play here because they often wind up on camera. Mike Solomon, marketing manager at Beyer, says ABC requested a change of color from light gray to black because the latter looked better on the air. Solomon adds that immediately after the change, sales picked up considerably on that model.

New Materials

In terms of electronics, headphones have benefited tremendously from new materials that have improved accuracy and frequency response while making sets lighter, and thus easier to wear over long periods.

For instance, Beyer now uses a thin, plasticlike material it developed called Hostophan for its transducer element in headsets like the DT-7 Pro, which it claims produces better high- and low-frequency response. This exceptionally low-mass material has the effect also of producing faster transient response and its lightness means that more of it can be used, creating a larger transduction area that enhances reproduction accuracy.

Sennheiser employs both neodymium ferris or cobalt magnets, which are both lightweight and produce a stronger magnetic field at the driver coupling. The element can respond faster with the stronger force and intermodulation distortion is substantially reduced.

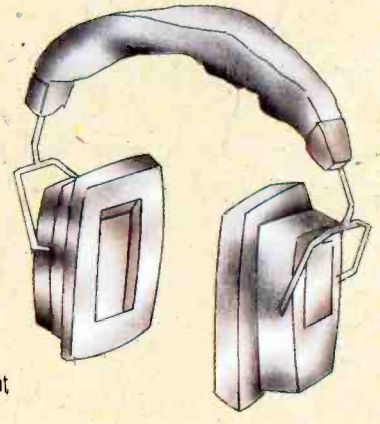
Impedances vary from a low of 72 ohms to a high of 600 ohms, and the choice is best dictated by the equipment the headset is interfacing with. Six hundred-ohm headphones are the consumer-level standard and interface with line-level signals, which covers a big portion of the equipment spectrum. But lower impedances can achieve better gain levels before distortion thresholds are reached. Intercoms generally operate at 200-ohm impedance.

There is no set standard for frequency response in this area, although the AES has discussed this in the past. Twenty Hz to 25 kHz is common for better sets, and some claim to push both those limits. A flat frequency response is preferable to a contoured one because although contoured responses can be less tiresome on the listener over long periods of time, they essentially distort the actual audio picture.

Choosing With Care

With the advent of stereo television and other sonic improvements to audio signal, headphone choices have grown in importance. The key to intelligent decision making is, according to Mike Solomon, to allocate management time to survey usage patterns at facilities and for just plain listening. Beyer loans clients headsets for up to 30 days for evaluation purposes. "Fidelity is more important in radio and television these days, and it's the same with headphones," he says. "The old sets just aren't good enough today."

Prices range from below $100 up to around $250; program type is good indicator of what sort—and what cost—is in order. And keep in mind that many headphones and headsets are sold barefoot: *i.e.*, without end connectors, unless specified by the customer.



The ultimate bottom line is personal sonic preferences, says Tony Tudisco, marketing vice president at Sennheiser: "While I think everyone would want some sort of standard, it's really hard to say what makes an ideal one. As with speakers, everyone's taste is different."—*Dan Daley*

Our "small revolution" is making big waves in shotgun microphone design!

Model 4071
Line+Gradient Condenser Microphone
(shown with AT8415 Shock Mount)

Model 4073
Line+Gradient Condenser Microphone

The Model AT4071 is just 15½" long, while the AT4073 is a mere 9". Yet, both 40-Series shotguns perform far "longer" than their actual size. Because inside these two new Audio-Technica studio condenser microphones is a revolutionary approach to shotgun design.

New Coaxial Tube Design

In effect, the ingenious coaxial interference tubes perform as though the microphones were half again as long. Our unique tube design goes far beyond the normal phase cancellation that occurs in a simple resistance-damped tube. There is actually a tube-within-a-tube, creating a separate, acoustically longer path for the lowest frequencies. Low frequency directivity (normally a simple function of tube length) is maintained, yet the microphone size is reduced to a far more practical length.

The Result: A Better Working Tool

This shorter length for a given acceptance angle has practical benefits in the studio and the field. It's easier to avoid shadows and to stay well out of the frame. Cancellation from the back is also impressive, making exact mike placement less critical. And the very light weight (far less than the others) will be appreciated by every user. As a bonus, the nested internal construction makes the 40-Series shotguns unusually resistant to accidental damage.

Clean Transformerless Output

Listen carefully to the 40-Series sound. The transformerless output insures fast, distortion-free response to transients. You'll hear crisp, natural dynamics over an extended frequency range, even under high SPL conditions. Output of 40-Series models is extremely high, for a very favorable signal-to-noise ratio. A built-in high-pass filter is included, of course.

Quiet in Every Way

The low noise of these new microphones is impressive. Self-noise is almost immeasurable. Equally important, the rejection of wind and handling noise is outstanding. Coupled with excellent sensitivity, the 40-Series design allows you to take full advantage of the finest digital and analog studio electronics.

Compatible and Competitively Priced

Finally, both can be powered from any 12-48V phantom power supply. They come complete with foam windscreen, stand clamp, and case. Yet, with all their advances and performance superiorities, the new A-T 40-Series microphones are priced competitively with the best known shotguns.

The significant performance advances of these new 40-Series microphones demand a trial in your most difficult environment. Heft them. Hear them. Compare them in every way. This bold new technology will change your expectations about shotgun performance!

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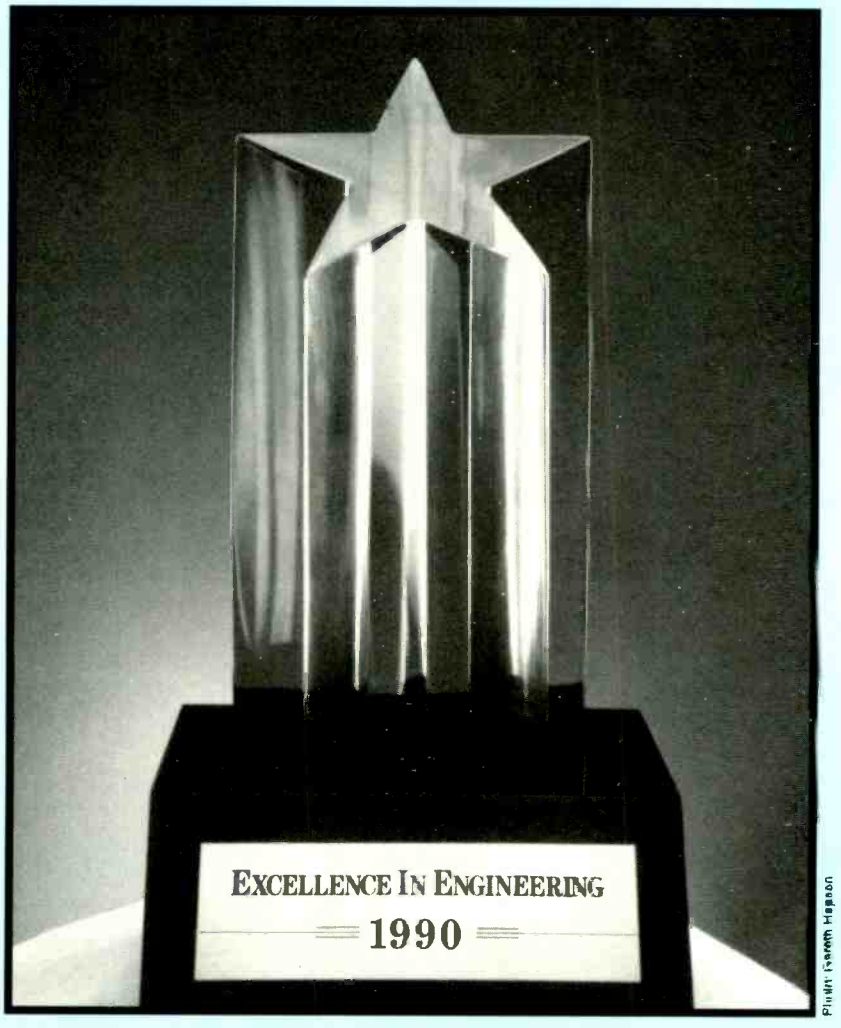
ANNOUNCING BME'S THIRD ANNUAL EXCELLENCE IN ENGINEERING AWARDS

NOMINATIONS ARE NOW BEING ACCEPTED



For the third consecutive year, BME magazine will present the Excellence in Engineering Awards, recognizing those organizations and individuals who have made significant contributions to the art of broadcast and teleproduction engineering.

Honorees may include stations or facilities that have demonstrated innovation in design or operation; industry groups that have spearheaded technological progress; or researchers who have furthered the science of broadcasting.

To nominate an organization or individual, or for more information, contact Eva J. Blinder, Editor, BME magazine, 401 Park Avenue South, New York, NY 10016, (212) 545-5100.

BME

Nominations must be received no later than October 30, 1989.
Award winners will be announced in the February, 1990 issue.

SMPTE

celebrates partnership of tradition and technology

Celebrating the 100th anniversary of the 35 mm film format and 50th anniversary of television, the 131st Convention and Equipment Exhibition of the Society of Motion Picture and Television Engineers promises an instructive look back along with an inspirational look forward. The 173 papers to be presented in 22 technical sessions will include several presentations on historical subjects, in addition to a large number on various aspects of the state of today's art.

While not much will be absolutely new on the exhibit floor, visitors will have a great opportunity to see the products that made last spring's NAB such a blockbuster. Given the pace of today's technological development, it's expected that NAB's new products will be significantly enhanced since their debuts. That, and a small but impressive array of new-for-SMPTE products, will help make this show a memorable one.

SMPTE TECHNICAL PROGRAM

Saturday Morning
Opening Session

Saturday Afternoon
Archival
Advanced Television I—
Transmission
Computer Interactive Video
and Graphics

Sunday Morning
Film Production
Advanced Television II—
Transmission/Production
Ancillary Services and
Distribution Systems

Sunday Afternoon
Film Production/Presentation
Advanced Television III—
Production Equipment
Quality Control and
Measurement

Monday Morning
Laboratory Technology
TV Production I—
Equipment
TV Post-Production

Monday Afternoon
Sound Technology I
TV Production II
Recording

Tuesday Morning
Film/Electronic Interface I
Encoding/Decoding and
Standards Conversion

Tuesday Afternoon
Film/Electronic Interface II
Automation and Robotics

Wednesday Morning
Digital Tutorial I
Television Sound Technology

Wednesday Afternoon
Digital Tutorial II

EXHIBIT HOURS

Saturday	2:30 p.m. - 6:00 p.m.
Sunday	10:00 a.m. - 6:00 p.m.
Monday	9:00 a.m. - 7:00 p.m.
Tuesday	9:00 a.m. - 5:00 p.m.

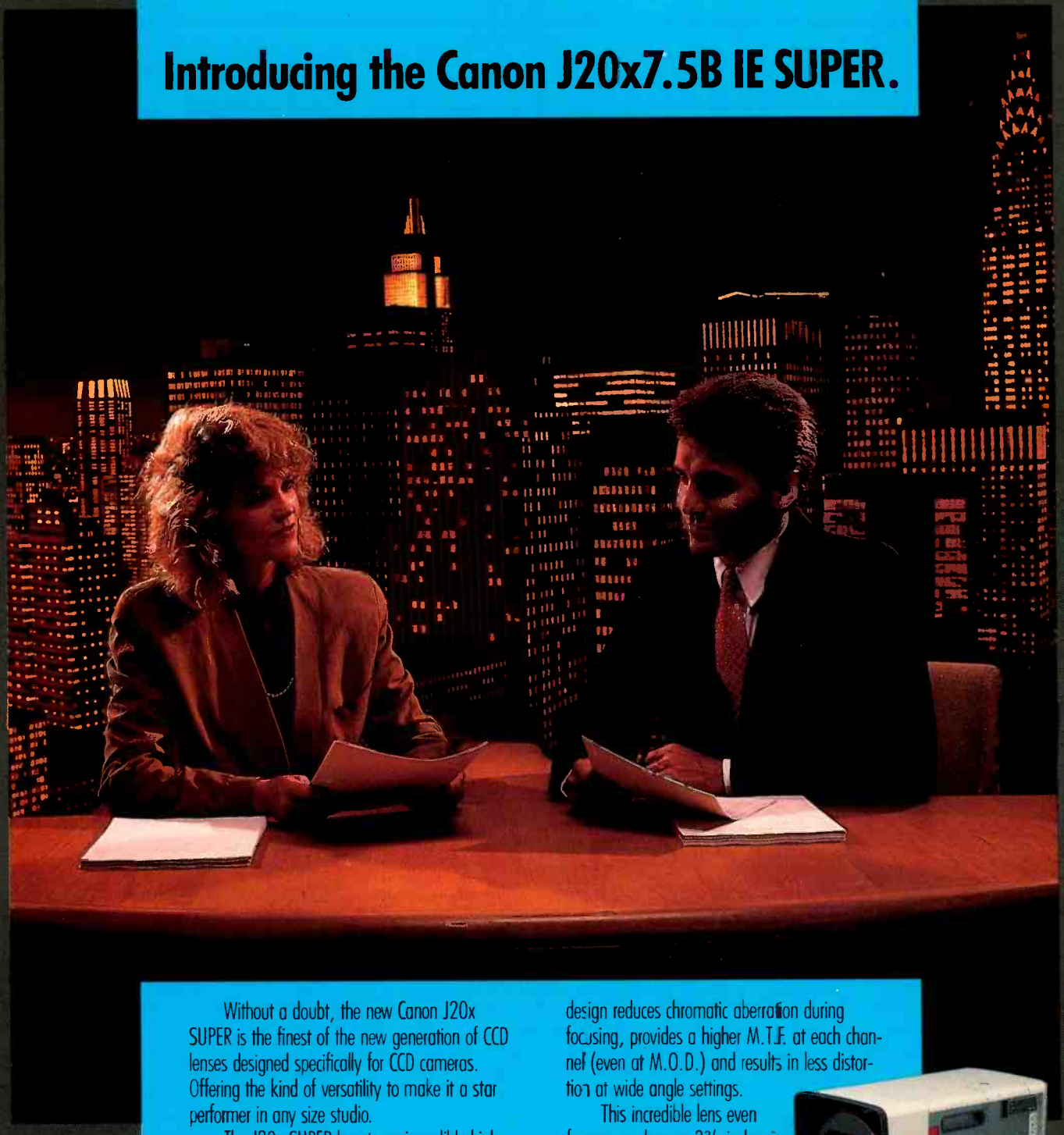
WHAT'S HOT ON THE EXHIBIT FLOOR

This month's SMPTE Convention will be a relatively quiet show equipmentwise; not surprising, since the industry is still recovering from the excitement of NAB '89. While visitors can expect brand-new product introductions to be down somewhat over previous years, a wealth of significant products introduced at NAB will make their SMPTE debuts. The following list of "must-see" highlights represents just a few of the many exciting developments at SMPTE 1989.

Post-Production
Random-access video editing, which got off to such a shaky start a few years ago, has come into its own. Of special note:

- Avid Technologies' Avid/1 Media Composer random-access editor, a big hit at NAB, uses a Macintosh II user interface.
- Editing Machines Corp.'s EMC^2,

Introducing the Canon J20x7.5B IE SUPER.



Without a doubt, the new Canon J20x SUPER is the finest of the new generation of CCD lenses designed specifically for CCD cameras. Offering the kind of versatility to make it a star performer in any size studio.

The J20x SUPER boasts an incredibly high and flat M.T.F. to provide greater contrast and excellent resolution, especially at the corners.

And as in all Canon CCD lenses, we've reduced both lateral and longitudinal chromatic aberration to virtually zero for each color channel. Bright and sharp, even at the longest focal lengths.

Plus, the J20x SUPER's internal focusing design reduces chromatic aberration during focusing, provides a higher M.T.F. at each channel (even at M.O.D.) and results in less distortion at wide angle settings.

This incredible lens even focuses as close as 3¾ inches in macro!

Simply stated, the new Canon J20x7.5B IE will perform flawlessly in a wide range of studio and field applications. But then again, you wouldn't expect anything less from a Canon broadcast lens.

Focal length: 7.5-150mm
(15-300mm w/2x extender)
Max. Relative Aperture:
1:1.5 through 118mm
1:1.9 at 150mm

See us at SMPTE Booth #1326

Canon

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Canon USA, Inc., New York Office: One Jericho Plaza, Jericho, NY 11753 (516) 933-6300. Dallas Office: 3200 Regent Blvd., Irving, TX 75063 (214) 830-9600. Chicago Office, 100 Park Blvd., Itasca, IL 60143 (312) 250-6200. West Coast Office: 123 Paularino Avenue East, Costa Mesa, CA 92626 (714) 979-6000. Canon Canada, Inc., 6390 Dixie Road, Mississauga, Ontario L5T1P7, Canada (416) 795-2012.

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SMPTE

also new at NAB, should repeat its crowd-stopping performance.

- Amtel Systems, famous for audio editors, will unveil the E-Pix random-access editor.
- Montage, a pioneer in this field, will show the latest version of its Picture Processor.
- Ampex Corp. will introduce version 3.0 software for the ACE 25 editor, along with an MIF serial/parallel interface box for control of Sony Type 5 VTRs. Also new is a networking system for the ESS 5 still store.
- Quanta Editing Products, formerly Calaway Engineering, will introduce the CE-25 two-machine cuts-only editor and CE-75 three-machine A/B roll editor.
- Videomedia will unveil V-LAN, a LAN-based post-production automation system.
- Adrienne Electronics will feature the new AEC-BOX-19 Sony/Ampex VTR serial protocol converter.
- In still stores, visit the Asaca/ShibaSoku booth for a look at the ADS-300 still store, which uses erasable optical disks.
- Look for developments in time code equipment from Adrienne Electronics, ADX Systems, Evertz Microsystems, Fast Forward Video and Skotel.
- Rank Cintel's Ursa film transfer system, making its industry debut, incorporates a host of features previously available only as third-party add-ons.

Graphics and Effects

For anyone who missed NAB, SMPTE will be the ideal opportunity to catch up on a host of significant advances in video graphics and digital effects.

- Sony's System G digital effects system, the talk of NAB, features such unique and innovative effects as real-time 3D manipulation of 2D images.
- Ampex's ADO 100 is more than just a low-cost version of the popular ADO; its extensive use of ASIC architecture has allowed Ampex to lower the cost dramatically with no sacrifice of image quality.
- Electrohome will feature its Jazz line of digital video efx equipment.
- Alta Group's SMPTE introduction in this area is the Pictoris/E digital efx system.
- In graphics system advances, look for ColorGraphics Systems to introduce a new 3D modeling and animation and 2D modeling package for the DP 4:2:2 digital graphics system.
- Dubner Computer Systems' latest introductions will be the GF-50 Graphics Factory and the 20-KW weather graphics system.
- Ampex will unveil a new keyframe animation package for the Alex character generator.
- Quanta Corp.'s latest character generator is the QCG-500, which features a preview buffer.
- VGS California will unveil its Electric Crayon 2D and 3D graphics and animation system and the 2.5D cel animation system.

Advanced Television

Three SMPTE technical sessions are devoted to advanced television, and the show floor will reflect the increasing importance of this field. In addition to the latest advances in production equipment from Sony Corp., Hitachi and Ikegami, new or recently introduced ATV/HDTV gear can be seen at the following booths:

- Adrienne Electronics Corp. will add a new HDTV routing switcher to its line, the 30 MHz AEC-2.
- Rebo Research, at its first SMPTE show, will display a line of HDTV production products including an HDTV downconverter, a fiberoptic remote camera control system and an HDTV framestore.
- Merlin Snell & Wilcox will show a multistandard HDTV downconverter, the ME 2001.
- A technology demo at the Canon booth will feature a Canon-built HDTV codec and VTR.
- An unusual entry from Nikon will be the HQ-1500C HDTV still frame camera.
- Also on the "don't miss" list: BTS's HDTV cameras; Eidophor's HDTV projection systems; HDTV lenses from Fujinon; HDTV routing switchers from Grass Valley; an HDTV keyer/mixer from Sierra Video.

Video Processing

The two hottest areas in processing, NTSC encoding/decoding equipment and standards conversion, will be the joint subjects of one of this year's technical sessions. In addition to the papers, here's what the exhibit floor will have to offer:

- Accom, one of the hottest new companies in this area, will introduce the D-Bridge 122 digital encoding system, which pairs with the D-Bridge 221 digital decoding system.
- Merlin Snell & Wilcox will intro the ME9900 four-field, four-line aperture standards converter.
- Watch for developments in NTSC encoding and decoding technologies from Central Dynamics, Broadcast Video Systems, Asaca/ShibaSoku.
- Magni Systems, best known for

SMPTE

T&M gear, will introduce the VGA Producer VGA-NTSC encoder.

- TBC technology continues hot. Check out: Ensemble Designs' TC400 TBC controller; I.DEN Videotronics' IVT-9Plus TBC; Nova Systems' 900S Super TBC with effects, plus the 710S wideband TBC and 502 EFP TBC;
- A variety of new and recently introduced matting devices will be on display, including Sierra Video Systems' CIK-2 chromakeyer and Videotek's new RGB chromakeyer. And don't miss Ultimatte's Memory Head, introduced last year.
- Alta Group will introduce the Pegasus, a combination production switcher/chromakeyer/downstream keyer.
- Intelvideo will feature the new Pre-Coder, described as an RGB pre-encoding corrector/enhancer/color detailer.
- Hotronic will add to its line of video delay lines and frame synchronizers.
- Asaca/ShibaSoku will introduce the TS30B6 sync generator.

Imaging

The maturing of video camera technology has resulted in plenty of top-quality cameras, but relatively few brand-new introductions. In addition to the HDTV cameras noted elsewhere, these developments are worthy of note:

- Panasonic's digital processing camera, still in prototype but advancing rapidly, may be the shape of things to come as the all-digital production system moves closer to reality.
- BTS's LDK-91 studio/field ENG camera, the hit of NAB, marks a significant advance in the application of CCD imaging technology.
- Hitachi will introduce the SK-F2 ENG camera.
- Ampex will introduce the CVR-300 single-piece Betacam camcorder and the CVC-70 CCD camera.
- Nikon will introduce several new still video cameras, including an HDTV model and a slide scanner.
- Lens leaders Canon, Fujinon and Schneider will feature the latest additions to their product lines. Also worthy of note in the lens area: Nikon, Century Precision Optics, Innovision Optics, and new lens filters from Tiffen Manufacturing.

Video Recording

While few brand-new products in this category are expected to be introduced at SMPTE, several important new recorders will make their SMPTE debuts.

- For starters, check out the latest advances in Panasonic's half-inch digital composite recorder. The skepticism that greeted this device at its introduction at last year's SMPTE faded dramatically at NAB, where working models were producing viewable color at shuttle speeds of up to 60x normal. The next step is a working model of the dockable recorder.
- Sony's D-2 portable recorder marked another significant advance in digital production; expect to see it again at SMPTE.
- Ampex will show its new 3.0 software for the VPR-300 D-2 VTR. Hitachi Denshi will also have the latest version of its digital VTR.
- For advances in tapeless recording technologies, visit the booths of Abekas and DSC/Chyron (disk recorders) and Sony and NEC America (RAM recorders).

Signal Distribution

Routing switchers and switcher automation continue to garner considerable attention. Some important SMPTE developments in this area include:

- Utah Scientific's most recent switching system is the AVS-2 routing switcher; Utah will also feature the new TAS-1 Total Automation System.
- New from Alamar Electronics USA will be the MC-2055 master control automation system and TD-Assistant production automation system.
- Amtel Systems will have a new routing switcher, the VA12.
- Asaca/ShibaSoku will add the new ASW-885 routing switcher.
- CDL will introduce its new SDS-2+ routing switchers.
- Visit Di-Tech to see the new Model 5856 routing switcher.
- Image Video will introduce a new master control switcher.
- Don't forget the established routing switcher and automation lines from BTS, CCI, Grass Valley Group, Hedco, Intergroup Technologies and Videotek.

Audio

Electronic audio editors and digital audio workstations have overcome some initial user suspicion and are gaining acceptance rapidly. Some of the most exciting audio news at SMPTE will be in these areas.

- Lexicon, a leader in the DAW field with its Opus system, will show a new version, the new Opus/E digital audio editing system.
- Cinedco, maker of the Ediflex video random-access editor, will show the new Audiflex digital audio editing

workstation.

- AMS Industries will have enhanced software for its AudioFile DAW, including the new TimeFlex time compression/expansion software.
- Soundmaster USA will feature its Soundmaster digital audio workstation.
- Adams-Smith will show enhancements to its lines of tape synchronizers and electronic audio editors.
- Neve will introduce the VP Series of post-production audio consoles, along with the Flying Faders console automation system.
- Tascam will unveil the new MSR 24 multitrack ATR and the MIDIizer ATR synchronizer.
- In intercoms, Clear-Com Systems will feature its new Matrix Plus digital point-to-point and party line intercom system.

Lighting, Power, Support

Three little words, but how much they say. It can be argued that these three categories form the bedrock of video production, and the generous number of new product introductions in these areas bear out that contention. In addition to advances in robotic camera systems from A.F. Associates, TSM, Vinten and Ultimatte, you'll find advances at the following booths:

- Vinten Broadcast will introduce a new camera pedestal, the Osprey.
- Frezzolini will have announcements in both lighting and camera support, as well as the new SC-2 and MC-2A computerized battery chargers.
- Miller Fluid Heads will introduce two new models, the 30 Series II and 50 Series II.
- O'Connor Engineering will add the Ultimate 1030 fluid head to its support line.
- Bencher will introduce the M3 Copy Outfit copystand.
- New from Preston Cinema Systems will be the Auto-Laser focus system.
- Cinema Products will feature several new products, including the Steadicam Pro Lite EFP; and the WRC-4 wireless lens control.
- Anton/Bauer's latest batteries include the Magnum 13, Magnum 14, Compac-Magnum 13 & 14 Logic Series.
- Perrott will have several new products, including the new Lite-2 lighting equip.; A/C P.S-1, Super 90 and PE 45 batteries; and 441/14 and 441/90 battery chargers.
- The Lightmaker Co. will show new solid-state HMI ballasts.
- In lamps, L.E. Nelson/Thorn-EMI will unveil new 575-12K W HMI lamps. Philips Lighting will show the new MSR575 Stage Studio/TV lamps.

Testing & Monitoring

As equipment gets more sophisticated, so does the gear required to test signals and monitor images. Several major advances in this arena will be on view at SMPTE:

- Magni Systems' Signal Creator is designed to be the last word in programmable test signal generators. Magni also will feature its line of HDTV test equipment.
- Tektronix, which also has a line of HDTV T&M gear, will introduce the WFM 300A component/composite waveform monitor. Also new will be a BTSC aural modulation monitor/decoder.
- Asaca will introduce new video monitors, the CM93A and CM95A, along with the VN30A1 color video noise meter.
- Conrac Display Products will introduce the Model 2660 professional monochrome monitor.
- New from ETI Systems is the M-SAT test & measurement switching system and software.
- For program production, Spectra Cine will feature the new SC-700 Series Cinemate photometer.
- Wohler Technologies will have the new AMP-2 stereo audio monitors for video production.

Computer Applications

The convergence of television and computer technology is one of the hottest trends facing the industry as it enters the new decade. In addition to PC-based graphics and editing products, several interesting product introductions will illustrate the increasing importance of the PC:

- The Commodore Amiga, with its excellent graphics and sound capabilities, is catching a lot of eyes. Omicron Video will introduce a new genlock system for the Amiga.
- Corvis Communications will feature a database tool designed for production management, the OSC/R.
- Gefen Systems/Sound Ideas will add the TrackWriter ADR software package to its line of video production software products.
- Video Logic Corp. will introduce the Log Producer video production/post-production software system.
- Don't forget to check out Comprehensive Video Supply's line of computer software packages for video production and post-production. ■

SMPTE EXHIBITORS

A.F. ASSOCIATES 109
Studio design & construction; mobile vehicle construction; production/postpro facility; technical/engineering consultants; robotic camera systems; standards converters.

AATON 304
Cine cameras

ABEKAS VIDEO SYSTEMS 112
Digital video efx; character generators; digital still stores; production switchers; digital disk recorders.

ACCOM 702
New: D-Bridge 122 digital encoding system.
D-Bridge 221 digital decoding system; DIE-125 digital image enhancer.

ACMADE INTERNATIONAL 650
Audio synchronizers.

ADAMS-SMITH 1309
New: Tape synchronizers, electronic audio editors.
Time code equip.; ATR synchronizers; electronic audio editors.

ADRIENNE ELECTRONICS CORP. 2038
New: AEC-2 30 MHz routing switcher; AEC-BOX-14 VITC/LTC translator; AEC-BOX-19 Sony/Ampex VTR serial protocol converter.
HDTV routing switchers; audio routing switchers; time code equip.

ADX SYSTEMS 2039
New: ADx-03 time code equip.
Technical & MC automation; time code equip.; tape synchronizers.

ALAMAR ELECTRONICS USA 1742
New: MC-2055 master control automation system and TD-Assistant production automation system.

ALEXANDER MFG. 2030
Batteries, chargers.

ALTA GROUP 520
New: Pegasus production switcher/chromakeyer/downstream keyer; Pictoris-E digital video efx.
Electronic still stores; frame synchronizers; TBCs; format converters.

AMERICAN SOCIETY OF CINEMATOGRAPHERS 1936

AMERICAN STUDIO EQUIPMENT 746
Lighting equip.; camera support equip.

AMPEX 130
New: ADO 100 digital efx system; keyframe animation package for Alex CG; CVR-300 single-piece camcorder; CVC-70 CCD camera; SMC-200 slow-mo controller; 3.0 software for VPR-300 D-2 VTR; networking system for ESS 5 still store; version 3.0 software for ACE 25 editor, plus MIF serial/parallel interface box for control of Sony Type 5 VTRs.
Electronic still stores; 2D graphics systems; production switchers; TBCs; digital VTRs; one-inch VTRs; half-inch VTRs; camcorders; ENG/EFP cameras; digital video efx; cart automation/MERPS; character generators; videotape editing systems.

AMS INDUSTRIES 1214
New: Enhanced software for AudioFile, including TimeFlex time compression/expansion software; ST250 stereo mic & control unit; machine control interfaces for TimeFlex.
Digital mixing consoles; Virtual Console System; stereo digital delay; audio delay for video; digital reverb; surround mic.

AMTEL SYSTEMS 1518
New: E-Pix random-access editor; VA12 routing switcher.
NTSC encoders/decoders; tape synchronizers; time code equip.; audio routing switchers; character generators.

ANGENIEUX CORP. 507
Lenses.

ANTON/BAUER 1134
New: Magnum 13, Magnum 14, Compac-Magnum 13 & 14 Logic Series batteries.
Power supplies & batteries; portable lighting & accessories.

ARRIFLEX CORP. 1116
Cine cameras; lenses; lighting equip.; camera support equip.

ASACA/SHIBASOKU CORP. 1525
New: ADS-300 still store; TG91E6/CM65B6 HDTV production equip.; CD10B/CC5B NTSC encoders/decoders; ASW-885 routing switcher; TS30B6 sync & pulse gens; CM93A/CM95A video monitors; VN30A1 color video noise meter.

AUDIO PRECISION 302
Audio test equip.

AUDIO SERVICES CORP. 404
Distributor of ATRs, audio processors, tape, mics, headphones, mixers and other audio equip.

AVID TECHNOLOGY 1449
New: Avid/1 Media Composer random-access editor.

B&B SYSTEMS 2116
Audio test equip.

B&S LEISTUNGSELEKTRONIK VERTRIEBS GMBH 1745

BARCO INDUSTRIES 1307
Video monitors.

BENCHER 250
New: M3 Copy Outfit copystand.
Camera support equip.; image capture, digital transfer stands.

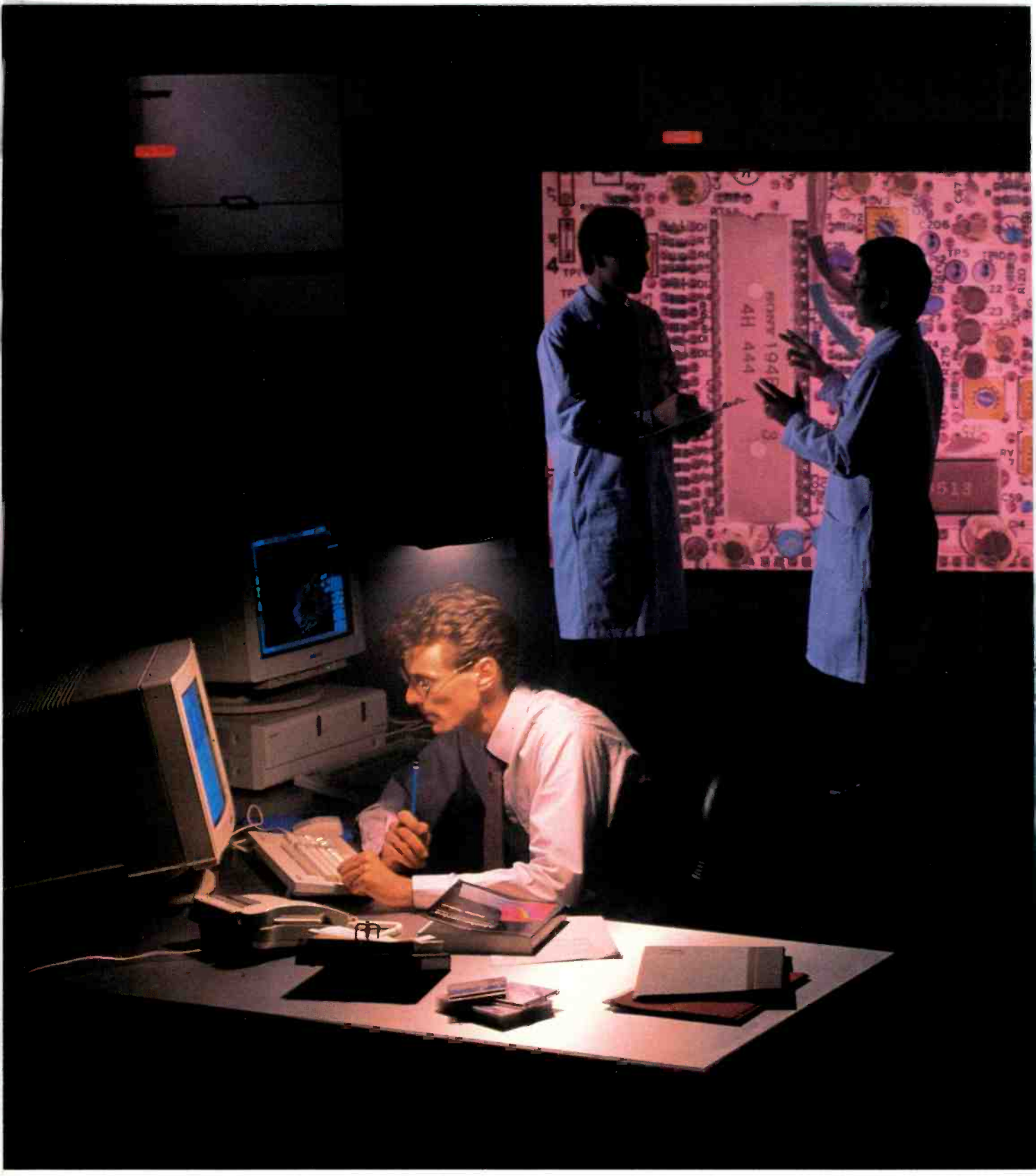
BHP, INC. 546
Videotape editors; random-access editors.

BIRNS & SAWYER 1112
Lenses; lens filters, accessories; lighting equip.; cine cameras; camera support equip.

BREMSON DATA SYSTEMS, MOTION PICTURE DIV. 548

BROADCAST VIDEO SYSTEMS 1201
New: Mini Box Series video delay lines; EN 350, EN 450 NTSC encoders/decoders; SA103, SA102 safe area generators.
Downstream keyers; clocks, timers.

THIS IS NOT THE MOST IMPORTANT ADVANCE IN BROADCAST OPERATIONS.



The key to successful station operation is more than hardware.

It's people. Sony people. Designers and engineers who understand the real problems of integrating a new system into your station.

When you invest in a multi-cassette system, it is vital to plan for the 1990s and beyond. It's the only way to meet current needs efficiently while retaining the flexibility to grow.

You need a manufacturer with a range of products and expertise covering the entire "on-air" operation. And with systems specialists to help you select and configure the right system for you.

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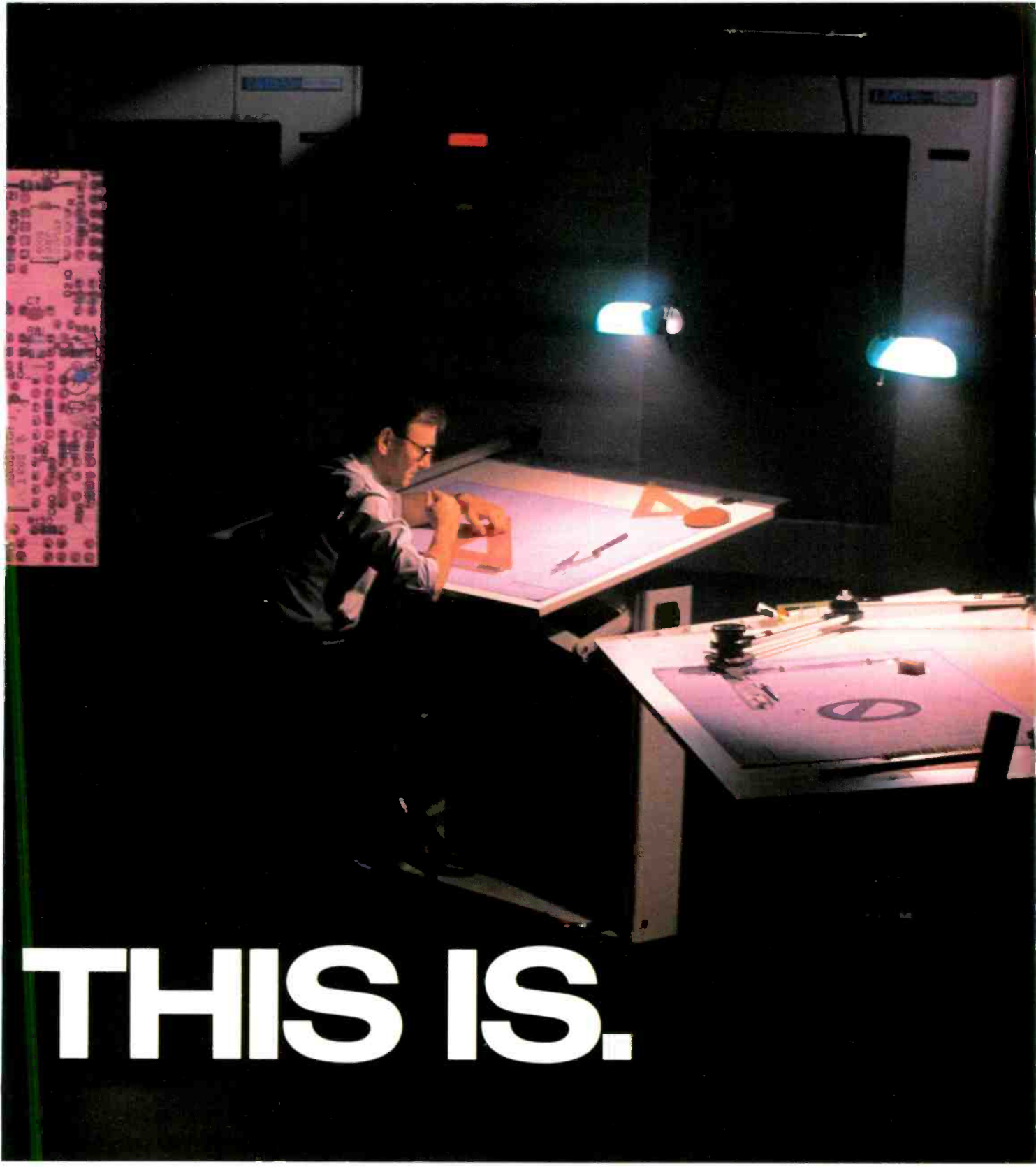

with the most complete line of Library Management System™ products available, is working toward a true network integrated system.

Sony offers you a choice. Formats, capacities and software. Analog or digital. For single- or multi-spot operation. Direct-to-air or compiling. All with Sony quality and reliability. And with the engineering resources, support, and service to protect your investment.

Check with the specialists in LMS. Contact your Sony Broadcast Sales Engineer. Or call (800) 635-SONY.

SONY®

BROADCAST PRODUCTS

SMPTE EXHIBITORS

BTS 116
Technical & MC automation; camcoders; studio cameras; ENG/EFP cameras; CCDs; color correctors; digital video efx; DAs; character generators; multisource editors; electronic still stores; frame synchronizers; 2D & 3D graphics, animation; HDTV cameras; lenses; lens filters, accessories; NTS C encoders/decoders; MC switchers; routing switchers; sync & pulse gens/procs; telecines; solid state video recorders; one-inch VTRs; digital VTRs; half-inch VTRs; weather graphics systems; audio preamps; audio routing switchers; hum eliminators; studio design & construction; mobile vehicle construction; financial services.

CAM-LOK 1646
Lighting equip.; electrical connectors, power devices.

CANON USA, OPTICS DIV. 1326
New: J55x9BIE field lens.
Lenses; lens accessories; camera support equip.; demonstration of Canon-built HDTV codec and VTR.

CARPEL VIDEO 1407
Videotape.

DWIGHT CAVENDISH 2130
Videocassette duplication equip.

CCI ELECTRONICS 253
MC switchers; switching automation; video routing switchers, DAs; sync & pulse gens/procs.

CEI TECHNOLOGY 1812

CENTRAL DYNAMICS LTD. 709
New: Stage*1 E-NTSC encoders/decoders; SDS-2+ routing switchers.
Production switchers; routing switchers; DAs.

CENTURY PRECISION OPTICS 505
New: lenses; lens filters, accessories.

CHAPMAN/LEONARD STUDIO EQUIPMENT 1150
Camera support equip.; mobile vehicle construction; mobile facilities rental.

CHRISTY'S EDITORIAL FILM SUPPLY 552
Flatbed film editors; video projectors; audio tape; transportation cases; financial services; sales & rentals of post-pro film equip.

ALFRED CHROSZIEL & OPTEX 852

CHYRON 852
Character generators; 2D graphics systems.

CINE 60 1340
Power supplies, batteries.

CINEDCO 1342
New: Audiflex digital audio editing workstation.
Random-access editors.

CINEMA PRODUCTS CORP. 1338
New: Steadicam Pro Lite EFP; SteadiMag camera magazine; WRC-4 wireless lens control; CP-16R 30fps conversion; CP Keycode reader; CP amplifier for Heden lens motors.
Camera stabilizing systems; cine cameras; fluid heads; teleprompters.

CINEMATOGRAPHY ELECTRONICS 1314
Cine cameras; frame synchronizers.

CINEMILLS CORP. 705
Lighting equip.

CLEAR-COM SYSTEMS 1942
New: Matrix Plus digital point-to-point and party line intercom system.
Audio monitor speakers; modular telco interface system.

COLORGRAPHICS SYSTEMS 520
New: 3D modeling & animation, 2D modeling package for DP 4:2:2 digital graphics system.
2D graphics systems; 3D modeling & animation; weather graphics systems; color correctors; character generators.

COMPREHENSIVE VIDEO SUPPLY 1020
Equipment distributor; video production & post-production software.

COMPUTER PROMPTING CORP. 504
Computer-based teleprompters.

CONRAC DISPLAY PRODS.
New: Model 2660 professional monochrome monitor.
Video monitors.

CONVERGENCE CORP. 907
Multisource editors; edit controllers.

CORPORATE COMMUNICATIONS CONSULTANTS 910
Color correctors.

CORVIS COMMUNICATIONS 1050
New: OSC/R production database management tool.

DEDOTEC USA 500
Lighting equip.

DELSYNCHRO 2135

DENECKE 601
Time code equip.

DESISTI LIGHTING/DESMAR 735
Lighting equip.

DEXTER VISION 1552

DI-TECH 909
New: Model 5856 routing switcher.
DAs; routing switchers; audio routing switchers.

DIGIDESIGN 1940
Digital audio workstations; electronic audio editors.

DIGITAL F/X 1138
Digital video efx; 2D graphics systems; integrated graphics & postpro systems.

DN LABORATORIES 2046
Battery packs & chargers; HMI lighting systems.

DOLBY LABORATORIES 922
Audio processing; noise reduction systems.

DUBNER COMPUTER SYSTEMS 144
New: GF-50 Graphics Factory; 20-KW weather graphics system.
Electronic still stores; 2D graphics systems; 3D modeling & animation; character generators.

DYNATECH CORP. 520
See: Alta Group, ColorGraphics Systems, Quanta Corp., Utah Scientific.

EASTMAN KODAK 124
Film stock; videotape.

ECHOLAB, INC. 1709
Production switchers.

EDITING MACHINES CORP. 252
Random-access videotape editors.

EIDOPHOR/GRETAG/SAIC 100
HDTV projection systems.

ENSEMBLE DESIGNS 1908
New: TC400 TBC controller.

ETI SYSTEMS 352
New: M-SAT test & measurement switching systems & software.

EVERTZ MICROSYSTEMS 248
New: Model 4105 time code generator.
Character generators; clocks, timers; time code equip.; ATR synchronizers.

FAROUDJA LABS 1616
Enhanced NTSC/ATV systems; NTSC encoders/decoders; video processing.

FAST FORWARD VIDEO 1840
New: P-1 portable SMPTE time code generator/reader.
Time code equip.

FGV PANTHER CORP. 1253
Camera support equip.; lighting equip.

FILM FACIT 1047

FILMLAB SYSTEMS INTL. 1401

FOR-A CORP. OF AMERICA 102
Digital video efx; character generators; video editors; NTSC encoders/decoders; production switchers; TBCs; time code equip.; audio mixers.

FOSTEX
Digital ATRs; two-track, multitrack studio ATRs; ATR synchronizers; headphones; mics; time code equip.; studio monitors.

FREZZOLINI ELECTRONICS 448
New: UPS-14PX camera support equip.; FL-400 lighting equip.; SC-2 and MC-2A computerized battery chargers.

FRIES ENGINEERING 805
Handheld camera stabilizer; lens filters.

FUJINON 924
ENG lenses; studio/field lenses; HDTV lenses; lens accessories.

GE LIGHTING 849
Lamps.

GEFEN SYSTEMS/SOUND IDEAS 2020
New: TrackWriter ADR software.
TrackPlanner cuesheet software; M&E Organizer production database software; BBC sound efx library; synchronizer software.

GEOCAM 402
Universal production matte box.

ALAN GORDON ENTERPRISES 1542
Camera support equip.; fax animation; power supplies, batteries; distributor of motion picture equip.; equip. rentals and repairs; transportation cases; distributor of mics, mic accessories, mixers, lighting equip.

GRAHAM-PATTEN SYSTEMS 1726
Production switchers; downstream keyers; post-pro audio mixers.

THE GRASS VALLEY GROUP 138
Digital video efx; DAs; character generators; edit controllers; multisource video editors; random-access editors; 2D graphics; 3D modeling & animation; HDTV production equip.; standards converters; production switchers; MC switchers; routing switchers; sync & pulse gens/procs; audio routing switchers; audio amps, preamps; audio mixers.

JAMES GRUNDER & ASSOCIATES 1716
Digital video efx; edit controllers; standards converters; TBCs; video scan converters.

HARRISON BY GLW 1607
Post-production audio mixers; console automation.

HEDCO 707
DAs; routing switchers; sync & pulse gens/procs; audio amps, preamps; audio routing switchers.

KARL HEITZ, INC. 452
Camera support equip.; lenses; mic fishpoles.

HI-TECH FURNISHINGS 1845
Studio furniture; studio design & construction; mobile vehicle construction.

HITACHI DENSHI AMERICA 516
New: SK-F2 ENG camera.
Studio cameras, ENG/EFP cameras; video monitors; digital VTRs; S-VHS VCRs; video projection systems.

HOLLYWOOD FILM CO. 406

HORITA 648
DAs; sync & pulse gens/procs; time code equip.

HOTRONIC 748
New: Video delay lines; frame synchronizers.
Digital video efx; TBCs.

HYBRID ARTS 1838
Audio heads, accessories.

I.DEN VIDEOTRONICS CORP. 1548
New: IVT-9Plus TBC.
DAs; frame synchronizers; transcoder/DA.

IKEGAMI ELECTRONICS 1330
Camcorders; field/studio cameras; ENG/EFP cameras; HDTV cameras, monitors; microwave for ENG; NTSC encoders/decoders; standards converters; video monitors; video projectors.

ILC TECHNOLOGY 1614
Lighting equip.

IMAGE VIDEO 502
New: Master control switcher.
Routing & MC switchers; audio routing switchers; studio automation equip.

INNOVISION OPTICS 950
New: Series 5000 lenses.
Lighting equip.; motion control tables.

INTEGRATED BROADCAST SYSTEMS LTD. 2042

INTEGRATED MEDIA SYSTEMS 1405
Digital audio workstations.

INTELVIDEO 2032
New: Pre-Coder RGB pre-encoding corrector/enhancer/color detailer; Video Flasher.
NTSC encoders/decoders.

INTERACTIVE MOTION CONTROL 917
Animation stands.

SMPTE EXHIBITORS

INTERGROUP TECHNOLOGIES 916
DAs; downstream keyers; production switchers; MC switchers; routing switchers.

ROY ISAIA EQUIP. BROKER/ EGRIPMENT 1604
Equipment distributor.

J&R FILM/GOLDBERG/ MOVIOLA 918
Film editors; multisource video editors; lighting equip.; tape synchronizers.

THE J-LAB CO. 1512
Standalone CCUs; safe title area gens; transcoders; Beta playback modification.

JAZZ SYSTEMS, ELECTROHOME 1302
Video monitors; digital video effects.

JEM-FAB CORP. 1408
Audio amps, preamps; audio rack monitors; studio furniture; RS-422 digital jackfields.

KEM ELEKTRONIK MECHANIK GMBH 900

LAIRD TELEMEDIA 604
Telecines; color correctors; DAs; character generators; NTSC encoders/decoders; routing switchers; video processing.

LEE AMERICA WEST 1252
Lighting equip.

LEITCH VIDEO 1720
DAs; clocks, timers; electronic still stores; frame synchronizers; sync & pulse gens/ procs; NTSC/PAL video proc amps; video test equip.; SCH monitors; audio DAs/test gens.

LEONETTI CO. 1912
Lighting equip.

LEXICON 1550
New: Opus/E Digital Audio Editing System.
Audio efx; audio time compression/expansion; audio delay synchronizers; digital audio workstations; reverb/special efx.

LIGHT SALES 1507
Lighting equip.

THE LIGHTMAKER CO. 2112
New: Solid state HMI ballasts.

LISTEC VIDEO CORP. 1712
Teleprompters; video monitors.

LOWEL-LIGHT MFG. 912
Lighting equip.

LTM CORP. OF AMERICA 509
Lighting equip.

M/A-COM MAC 904
ENG microwave; telco interface equip.; microwave communication equip.

MAG-ZON 1644
Audio tape, carts.

MAGNA-TECH ELECTRONIC CO. 148
Time code equip.

MAGNI SYSTEMS 106
New: Signal Creator test signal generator; VGA Producer VGA-NTSC encoder.
Video test equip.; HDTV test equip.

MATTHEWS STUDIO EQUIPMENT 1733
Camera support equip.; lighting equip.; remote motion control.

MCCURDY RADIO INDS. 1212
On-air consoles; intercoms; audio amps, preamps; audio routing switchers; audio test equip.; telco interface equip.

MERLIN 1818
Standards converters; technical & MC automation; cart automation/MERPS; audio test equip.; technical & engineering consultant.

MERLIN SNELL & WILCOX 1809
New: ME9900 family of four-field, four-line aperture standards converter, including the ME9930 PAL/SECAM/NTSC model and 9910 entry-level model; ME 2001 multistandard HDTV downconverter.
Standards converters; waveform monitors and vectorscopes.

MICROTIME 934
Digital video efx; frame synchronizers; 3D graphics systems; TBCs.

MICROWAVE RADIO CORP. 2120
ENG microwave.

MIDWEST COMMUNICATIONS CORP. 938
Equipment distributor; studio design & construction; mobile vehicle construction; color correctors; frame synchronizers; production switchers; routing switchers; sync & pulse gens/procs; TBCs.

MILLER FLUID HEADS 1016
New: Miller 30 Series II, 50 Series II fluid heads.

MITCHELL CAMERA CORP. 348
Cine cameras; camera support equip.

MITSUBISHI PROFESSIONAL ELECTRONICS DIV. 202
Video monitors; video projectors.

MONTAGE GROUP 1945
Random-access editing systems.

MSE VIDEO TAPE SERVICES 550
Videotape evaluation service; new videotape.

NAC, INC. 902
Cine cameras.

NEC AMERICA, BROADCAST EQUIPMENT DIV. 914
ENG/EFP cameras; digital video efx; solid state video recorders.

L.E. NELSON/ THORN-EMI SALES 201
New: 575-12K W HMI lamps.
Lighting equip.

NEMAL ELECTRONICS INTL. 848
Wire, cable; connectors, jackfields; tools.

NEVE 1317
New: VP postpro console series; Flying Faders console automation.
Audio consoles; digital ATRs.

NIKON 1142
New: QV-1000C, QV-1010 still video cameras; HQ-1500C HDTV still frame camera; LS-3500 35 mm still frame to tape converter.
ENG and HDTV lenses.

NORRIS FILM PRODUCTS 653
Camera support equip.; clocks, timers.

NOVA SYSTEMS 1312
New: 900S Super TBC with effects; 710S wideband TBC, 502 EFP TBC.
Frame synchronizers.

NURAD 1738
Microwave for ENG.

O'CONNOR ENGINEERING 320
New: Ultimate 1030 fluid head.
Camera support equip.; transportation cases.

ODETICS BROADCAST 1334
Cart automation/MERPS; news control terminal.

OKI ELECTRIC/SAECO INTL. 1924
Standards converters.

OMICRON VIDEO 801
New: Amiga computer genlock system.
HDTV production equip.; MC switchers; sync & pulse gens/procs; NTSC encoders/decoders.

OPTICAL DISC CORP. 1730
Videodisc recording system.

ORION RESEARCH 1453
On-air mixers; post-production consoles.

OSRAM CORP. 1724
Lighting equip.

PALTEX 907
Edit controllers; multisource video editors; tape erasers, degaussers.

PANASONIC BROADCAST SYSTEMS 312
New: Half-inch composite digital recorder; digital processing camera.
ENG/EFP cameras; camcorders; digital VTRs; ¾-, half-inch VTRs; cart automation/MERPS; TBCs; NTSC encoders/decoders.

PANASONIC COMMUNICATIONS & SYSTEMS CO. 312
New: AG-7450 dockable S-VHS deck; AG-A800 editing controller.
Camcorders; ENG/EFP cameras; CCDs; edit controllers; multisource video editors; production switchers; video monitors; solid state video recorders; half-inch VTRs; portable audio mixers; on-air mixers; post-production consoles.

PERROTT ENGINEERING LABS 1316
New: Lite-2 lighting equip.; A/C P.S-1, Super 90, PE 45 batteries; 441/14, 441/90 battery chargers.
Lens filters, accessories.

PETERSON INTL. ENT. LTD. 1400

PHILIPS LIGHTING CO. 1007
New: Stage Studio/TV lamps MSR575.

PHOTO ELECTRONICS CORP. 1412

PINNACLE SYSTEMS 309
Digital video efx; downstream keyers; electronic still stores; 2D graphics systems; 3D modeling & animation.

PRESTON CINEMA SYSTEMS 602
New: Auto-Laser focus system.
Camera zoom control, focus/aperture control, gyro-stabilized camera system.

PROFESSIONAL BUSINESS APPLICATIONS 920

QUAD EIGHT ELECTRONICS 920
Audio consoles.

QUANTA CORP. 520
New: QCG-500 character generator with preview buffer; CE-25 two-machine cuts-only editor; CE-75 three-machine A/B roll editor.
Character generators; video editing systems.

QUANTEL 1109
Harry digital video production suite; character generators; digital video efx; color correctors; electronic still stores; 2D graphics systems.

RANGERTONE 535
Equipment distributor; telecines; ATRs; ATR synchronizers.

RANK CINTEL 1125
New: Ursa film transfer system.
Telecines; color correctors; electronic still stores.

RANK TAYLOR HOBSON LTD. 1346
Cooke zoom lenses.

REBO RESEARCH 1906
HDTV downconverters; HDTV framestore; HDTV fiberoptic system.

RESEARCH TECHNOLOGY INTERNATIONAL/RTI 1417
Tape cleaners & evaluators; tape storage systems.

ROSCO LABORATORIES 1146
Color correctors; chromakeyers.

ROSS VIDEO 1305
Production switchers; downstream multikeyer.

RTS SYSTEMS 1933
Intercoms; audio amps, preamps; audio test equip.; headphones; mics.

SACHTLER CORP. OF AMERICA 930
Camera support equip.; lighting equip.

SCHNEIDER CORP. 1514
Lenses, lens filters.

SCHWEM TECHNOLOGY 1938
Image-stabilizing lenses.

SIERRA VIDEO SYSTEMS 1313
New: CIK-2 chromakeyer; CIK-1E-"E" downstream keyer; Delta format converters.
HDTV keyer/mixer; DAs.

SIGMA ELECTRONICS 1714
NTSC encoders/decoders; video test equip.; routing switchers, DAs; sync & pulse gens/procs; clocks, timers; audio routing switchers.

SKOTEL 1409
New: TCG-311 LTC generator/reader; TCG-313 LTC generator/reader/inserter; TCT-421 VITC to LTC translator.
Time code equip.

SOLID STATE LOGIC 306
Digital audio workstations; electronic audio editors; post-production consoles; console automation.

SONY BROADCAST PRODUCTS DIV. 530
New: System G digital video effects; portable D-2 VTR; BVW-300 one-piece camcorder; Sony still store; production switchers.
Studio cameras; camcorders; ENG cameras; digital VTRs; one-inch VTRs; half-inch VTRs; Library Management System; multisource video editors; monitors; HDTV production equip.; TBCs; standards converters;

Hitachi makes it easy.

THE TOUGHEST CHOICE IN PORTABLE S-VHS RECORDERS IS ALSO THE EASIEST. THE VL-S100.

Hitachi's VL-S100 is built to deliver years of rugged service. With a built-in Time Base Corrector and many advanced features, it also delivers a superb combination of performance, simplicity and value.

The VL-S100 makes error-free recording easy—with a special video head that provides a simultaneous playback picture during recording.

Flawless editing is simple, too. A flying erase head guarantees that insert and assemble edits are clean and transparent. The RS-422 serial protocol enables convenient connection to our VL-EC10 editing controller.

The VL-S100 gives you easy, jam-free operation. Thanks to its front-loading design it can be stacked or rack-mounted.

Learn more about the tough S-VHS recorder that makes your choice easy. Contact the Hitachi regional office nearest you.

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SMPTE EXHIBITORS

SONY COMMUNICATIONS PRODUCTS CO. 530
ENG/EFP cameras; camcorders; ¾-, half-inch VTRs; 8 mm VCRs; NTSC encoders/decoders; electronic still stores; VTR editor/controllers; video monitors; video projectors; on-air consoles; post-production consoles; mics, accessories; studio ATRs; field ATRs; Compact Disc equip.

SONY MAGNETIC PRODUCTS CO. 530
Videotape.

SOUNDMASTER USA 607
New: Soundmaster digital audio workstation, audio processor.
ATR synchronizers; electronic audio editors.

SPACECAM SYSTEMS 2034
Helicopter camera stabilizing systems.

SPECTRA CINE 400
New: SC-700 Series Cinemate photometer.
Spot meters, color temperature meters.

STEADI-FILM 942
Telecine accessories: high-speed lens, pin-registered film gate, notch guide, festival kit.

STEENBECK 1920
Flatbed film editors; telecines.

STRAND LIGHTING 1523
Dimming equip.; lighting control consoles; studio lighting fixtures.

TASCAM 1930
New: MSR 24 multitrack ATR; MIDIizer ATR synchronizer.
Portable mixers; on-air consoles; studio & field ATRs; digital ATRs; compact disc equip.; cassette decks.

TECCON ENTERPRISES LTD. 152

TECHNIFORM 2016

TECHNOLOGICAL CINEVIDEO SERVICES 2012

TEKTRONIX 1123
New: Alternate input (4.5 MHz board) to 751 BTSC aural modulation monitor/decoder; WFM 300A component/composite waveform monitor.
Video test equip.; frame synchronizers; HDTV test equip.; sync & pulse gens; TBCs.

TELCOM RESEARCH 1814
Time code equip.

TELEMETRICS 1347
Camera support equip.

TELEPAK SAN DIEGO 1504
Transportation cases.

TELESCRIPT 1706
Teleprompters; camera support equip.

TELMAK U.S.A. 1612
New: Y/C version of Amiga PC genlock.

TIFFEN MFG. CORP. 1915
New: Soft/FX, Pro-Mist lens filters.
Lens filters.

TROMPETER ELECTRONICS 1816
Telco interface equip.; wire, cable; connectors, jackfields; tools.

TRUEVISION 948
NTSC encoders/decoders.

TSM/TOTAL SPECTRUM MFG. 1130
Robotic camera systems.

ULTIMATTE CORP. 1102
New: Ultimatte Memory Head.
Chromakeyers.

UNIMEDIA 1004

UNIQUE BUSINESS SYSTEMS 1546
Software to manage rental business.

USHIO AMERICA 1647
Lamps.

UTAH SCIENTIFIC 520
New: AVS-2 routing switcher; TAS-1 Total Automation System.
MC switchers; routing switchers; audio routing switchers; technical & MC automation.

VEAM, DIV. LITTON SYSTEMS 2036
Fiberoptic systems; connectors; jackfields.

VEGA 300
RF mics; intercoms.

VGS CALIFORNIA 1349
New: Electric Crayon 2D graphics, 3D animation; 2.5D cel animation system; Nigel B studio furniture.

VGV, INC. 749

VICON INDUSTRIES 1610
Remote camera controls.

VIDEO DESIGN PRO 1910
Software for engineering design and cable documentation.

VIDEO LOGIC CORP. 1049
New: Log Producer video production/post-production software system.

VIDEOMEDIA 2125
New: V-LAN technical automation; VLC-32 video editing system.

VIDEOTEK 409
New: RGB chromakeyer; DM-14, DM-141s demodulators.
DAs; frame synchronizers; production switchers; routing switchers; sync & pulse gens/procs; video monitors; video test equip.; audio program monitors.

VINTEN BROADCAST 1538
New: Osprey camera pedestal.
Camera support equip.; robotic camera systems.

WEIRCLIFFE 907
Tape erasers, degaussers.

WESCAM 1447
Cine cameras; ENG/EFP cameras; camera support equip.

WHEATSTONE CORP. 752
On-air mixers; post-production consoles; audio routing switchers; DAs.

WIDE RANGE ELECTRONICS CORP. 1510
Tape degaussers; time code equip.

WINSTED CORP. 1642
Studio furniture; tape storage systems.

WOHLER TECHNOLOGIES 2124
New: AMP-2 stereo audio monitors for video program.
Stereo audio program monitors; audio phase indicators.

ZAXCOM VIDEO 549
Edit controllers.

WHY WTVH-TV'S BRUCE LEVY LOVES HIS EPO ROBOTIC CAMERA CONTROL SYSTEM.

For more than 20 years, WTVH-TV, the CBS affiliate in Syracuse, N.Y., has broadcast its news using EPO remote camera control systems. During that time, the systems have outlasted four sets of cameras—a clear testament to EPO's durability and reliability.

For most of those years, as Bruce Levy, the production chief at WTVH-TV, will tell you, the station was virtually alone among American broadcasters.

Now, of course, all that has changed. Americans are beginning to wake up to what their European brethren have known for some time—that **EPO Camera Control Systems can save them money. Lots of money!**

But even EPO Robotic Camera Systems don't last forever. Recently, when WTVH-TV's 20-year-old unit began to show some wear and tear, Bruce Levy confidently ordered three new ones from A.F. Associates, thereby continuing his and WTVH-TV's long association with the EPO systems.

If you would like to know more about Bruce Levy's favorite way to save money, call A.F. Associates. In the east: (201) 767-1201; in the west: (619) 277-0291.

THE RADAMEC EPO ROBOTIC CAMERA CONTROL SYSTEMS.
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A.F. ASSOCIATES INC.
ADVANCED SYSTEMS AND PRODUCTS FOR THE VIDEO INDUSTRY
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RADIO ENGINEERING

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New Modulation Monitor in Use At New York Radio Station

A seemingly ordinary event—the delivery of a modulation monitor to a New York City radio station—could well signal a turning point for the radio industry.

Manufactured as a result of the deregulated FM radio modulation peak specification orphaned by the FCC in 1983, this new modulation monitor may signal a boon or bust for the radio industry—depending, of course, on which side of the fence you sit on.

Simply put, this new modulation monitor, dubbed the Mod Minder by its inventor, Eric Small, president of Modulation Sciences, Inc., "lets radio stations reduce processing or increase their loudness, or a little of both."

More specifically, the device applies an algorithm which more accurately measures the peaks according to the old FCC standard—one millisecond. The post-1983 standard dictated that the peak flash indicator had to respond in 10 cycles of 10 kHz, for a signal with 100 percent modulation. Standard modulation monitors, in keeping with this post-1983 standard, determine that a variety of signals can be peaks—even if they are shorter than one millisecond.

This is significant, according to Jim Stagnitto, director of engineering for WNSR, the first station to purchase the Mod Minder, when considered in conjunction with overshoots—very short duration peaks caused by either the subcarrier or some artifacts—that sometimes occur.

"These overshoots don't affect your loudness, they just make the peak flasher go off," he said. "This will rob you of loudness because you are measuring extremely short duration peaks that really don't take up much of the bandwidth. The Mod Minder, on the other hand, ignores these short duration peaks."

Once you eliminate this overshoot, according to Stagnitto, stations that don't heavily process will gain about 1.5 dB of loudness because now they can turn up the volume.

"WNSR, which doesn't heavily process the audio, sounds just as loud as all the other rock stations on the dial that do heavily process," said Stagnitto. "The main benefit of the Mod Minder is that the broadcaster can remain competitively loud without heavy processing."

However, the situation isn't quite that simple. Some companies that manufacture audio processors are calling foul. Bob Orban, president of the Orban Division of AKG Acoustics, is concerned about what this new standard will do to the integrity of radio. "Modulation Sciences is telling everyone that they can turn up the volume if they buy the Mod Minder," said Orban. "This was done without any concern for the effect on interference that might result. There is not enough research on how this will affect different types of radios with varying IF bandwidths. The radios with narrow bandwidths are more likely to distort under the circumstances."

Orban concedes that it may be possible that some type of weighted peak algorithm might be appropriate to measure modulation but he believes this determination should be made by an official body.

"This is a matter for an industry committee to take up for long study, not for one manufacturer to unilaterally bring out a product," he said.

Eric Small, on the other hand, believes resistance to his product stems from economic concerns.

"We're changing the rules of the game," he said. "Anytime you change the rules the people who depend on the current rules are threatened by it," he said. "We're establishing a new standard and I think ultimately everyone will fall into line behind it. The Mod Minder takes away the incentive to over-process. The very heavy processing so common in radio arises from the necessity to make the signal look good on a modulation monitor. If you have a monitor that doesn't care if you have some dynamic range and you're letting a few peaks through you're going to change the way people use processors. Eventually, it will result in a new generation of much more benign processors. This, I think, will benefit, not harm, radio." ■

NAB Objects to City-of-License Changes

Saying that the FCC's new rule permitting FM and TV stations to change their city of license without comparative challenge does not "ensure that licensees do not merely abandon their local communities to seek enhanced financial opportunities in well-served urban areas," the National Association of Broadcasters has filed a petition of reconsideration. *(For more on the new rule, see "Spectrum," BME, August 1989.)*

The NAB argues that the FCC's procedures are not adequate to ensure migration of stations from rural to urban communities. It recommends that the FCC should require that a licensee serve its community of license for a specified period before it is permitted to change communities. ■

CONTROL ROOM AUDIO MONITORING DESIGN

How well operators hear what they're doing in control rooms is greatly affected by room design.

Control rooms are the ultimate source of most radio stations' programming, providing workplaces for continuity and creativity. In each and every case, operators rely on what they can hear to guide their actions. Yet, the sound they receive is often seriously degraded and changed from what is really coursing through the studio's circuits due to insufficient attention to the control room's monitor system. Even in well-appointed facilities, operators must often strain to hear the results of their work; their judgments may be tainted, and the product may suffer. At the very least, extended periods of work in such facilities can create considerable stress for these operators. Most importantly, though, it is the radio station's product—its air signal—that is under scrutiny here. What purveyor of any product desires to examine its quality with an imperfect or rose-colored instrument?

A number of factors have conspired to make the installation of quality monitoring systems so elusive. First, the industry's understanding of the phenomena involved, both in acoustics and psychoacoustics (the latter involving the study of human perception of sound), has only recently grown to its current level. Secondly, unlike video monitoring or any other audio component in the radio studio, the monitoring system's performance is greatly affected by the physical nature of the control room's construction and the speakers' placement within it. In fact, moving a speaker by a few inches can, in many cases, radically alter the quality of the sound as perceived by the operator.

It should come as no surprise, then, that the design of proper monitoring systems has of late evolved into a highly complex science, one that must be considered during the earliest stages of a facility's planning for best results. Retrofitting is possible and often problematic; a significant rebuild is usually required.

The monitoring system itself consists of three component parts: power amplifiers, speakers, and room design. High-quality and well-matched components should be selected in the first two areas, and proper installation procedures followed, according to an appropriate plan for the size of the room and its use. But the full monitoring *environment* also includes the ambient conditions of the room and these can be the most vexing and expensive of all to set right, especially in a retrofit situation.

First, in terms of power amplifiers, rugged, balanced input, high-power units should be selected. Rated outputs should be at least 100 W per channel RMS for use with most speaker systems. Often, even higher ratings are recommended. Such high power ensures adequate headroom, which in turn guarantees that plenty of volume can be delivered to the operator without clipping occurring in the amplifier. It is such *clipped*, high-level audio that blows speakers fastest. A speaker voice coil can tolerate undistorted peaks up to a much higher level than distorted ones due to the latters' higher duty cycle (from the "squared-off" waveform of a clipped signal) and the greater voice coil heating that results. Speakers should, of course, be adequately fuse-protected in any case. Be sure to provide adequate ventilation for amplifiers; this single factor will go far to ensure the amplifiers' long-term reliability.

The choice of speakers is largely a matter of taste, but a few hard factors can be considered. Professional audio speakers have traditionally placed reliability as their primary design criterion, often relegating pure sonic quality of reproduction to a lesser level. High-end consumer audio speakers have reversed this situation, leading some to prefer such speakers for professional applications. While this is not necessarily a bad idea, a speaker's reliability still must be seriously considered. You should also remember that consumer audio speaker models change almost as quickly as cars (the industry as a whole is quite volatile), making the availability of parts or more matched replacement or expan-

BY SKIP PIZZI

sion units potentially slim a few years down the road. In the area of overload protection, some top-of-the-line consumer speakers are well-equipped in this regard while others are not. Bear in mind, too, that this sonic quality differential has not gone unnoticed by the professional speaker manufacturers, and some quite good-sounding new speakers have been introduced in the pro market recently.

Try to obtain demo or rental units of speakers you are considering and audition them in your facility. You might even consider blind listening tests using your operators as subjects. Another important recommendation involves uniformity within your facility; whenever possible, install the same model amplifiers and speakers in all control rooms. Speaker placement and room design should also be similar throughout the plant.

A relatively new development in both the professional and consumer speaker industries combines the amplifier and speaker into a single unit. These "powered speakers" have the advantage of optimum matching of components, smaller total size, and perhaps somewhat lower costs than equivalent separate units, but may present difficulties in ventilation for soffit-mounted applications. The "non-modular" design also makes incremental upgrades more difficult and can present problems in interchangeability between rooms if not all studios are so equipped.

A good rule of thumb for speaker placement is to attempt to minimize the reflecting surfaces between the speaker and the listener. This provides a clear path for direct sound from the speaker to reach the listener's ear. The objective here is to reduce reflections that arrive at the listener within about 20 ms of the direct sound's arrival, thereby satisfying a psychoacoustical consideration known as the "Haas Effect." This phenomenon of human hearing tells us that reflections that arrive within the 20 ms window will "smear" the sound by confusing the ear, since it is unable to distinguish the reflection from the direct sound. Reflections arriving outside the 20 ms period are able to be detected as reflections and are essentially ignored by the hearing sense. Since sound travels at approximately one foot per millisecond, this means that if the area between the speakers and the listener is relatively nonreflective, and the nearest major reflective surfaces are at least 10 feet away from the listening position, the direct sound will arrive at the listener unaccompanied by significant early reflections, then take 10 ms to hit reflective surfaces, and 10 ms more to return to the listening position. This will satisfy the 20 ms Haas Effect criterion.

It has been further shown that the reflections arriving outside the 20 ms window are essential to natural-sounding reproduction, so the room should not be completely dead. But to enhance their effectiveness in terms of pleasant sound, flat response, and stereo image enhancement, their arrival at the listening position should not be all at once, but rather spread out evenly over a fairly wide period of time. This phenomenon is referred to as *diffuse* reflection (as opposed to the "all-at-once" *specular* reflection) and can be accomplished by proper room geometry, and appropriate surface treatment. Geometrically, the room design should insure that reflections from the speakers will not bounce off the side and rear walls in such a way that a majority of them will arrive back at the listening position all at once. Rear-wall diffusion can be enhanced by the installation of diffusing panels, which are currently commercially available from only one manufacturer, RPG Diffusor Systems of Largo, MD.

The two functions described above are the heart of the so-called "Live-End/Dead-End" (LEDE) control room design, which can provide greatly improved frequency response, power efficiency, stereo imaging and freedom from listener fatigue when compared with traditional designs. Power efficiency is improved even with a dead area around the speakers due to the reduction of comb-filtering, and the corresponding lessening of power required to "fill the nulls" and com-

KPLX/KLIS control room, Dallas, by Russ Berger of the Joiner-Rose Group.

pensate with monitor equalization. Such attempts of the past were ultimately in vain, anyway, since the real-time analysis (RTA) they required would only be valid at the exact location of the measuring microphone, and flat response would not be ensured anywhere else in the room.

LEDE-style rooms typically provide a wide listening area of flat response, although the optimum stereo image location is still fairly small. Nevertheless, the image at that position in an LEDE-style room is dramatically improved from the traditional control room, allowing even tiny panpot adjustments to be clearly audible and providing a remarkably strong and stable "phantom center."

(The term LEDE is the trademark of Synergetic Audio Concepts of Bedford, IN. To be called LEDE, a room design must be certified and licensed through this organization. Traditional control rooms can benefit incrementally from any approximation of the LEDE approach, even though they should not be officially referred to as LEDE without certification.)

What purveyor of any product desires to examine that product's quality with an imperfect or rose-colored instrument?

You will notice that the LEDE approach is exactly the opposite of the traditional style of control room design, in many cases, with the old live front and dead rear. This design was not randomly chosen in its day, but rather trickled down from theater design, which uses a live front to reinforce and direct sound occurring on the stage to the audience, and minimizes later arrivals, or "slap" echoes, with a dead rear. What went unrealized at that time was the fact that these criteria failed to apply when room size became small and when the sound source was the twin "point-sources" of a stereo reproduction system's speakers. This is one reason why retrofitting an older control room can be a rather involved process.

Another relatively difficult but worthwhile improvement involves the placement of speakers into proper

soffits. Such flush-mounting into a dead corner insures optimum coupling of the speaker to the room, thereby further enhancing efficiency, and fits well with the attempt to minimize early reflection energy. A further refinement of this process is the "Reflection-Free Zone" (RFZ) concept, originated by Dr. Peter D'Antonio of RPG Diffusor Systems. The RFZ approach defines the front walls and ceiling of a control room with oblique angles, such that ray-tracing from flush-mounted speakers directs all early reflections past the listening position and into a highly diffusive rear wall. This minimizes the need for absorbent material in the room and can provide a natural, flat response, given proper room dimensions.

The reduced need for monitor equalization means lower equipment cost, higher reliability in the monitor

Design of proper monitoring systems must be considered during the earliest stages of a facility's planning for best results.

system's accuracy over time (less unauthorized or "custom" tweaking), flatter response over a wider area, and often lower distortion as well. Now the choice of monitor speaker is even more important, however, since it defines the limits of the listening position's flatness in the middle and high frequencies. The low end is defined by the speaker's response *and* the coupling to the room. Speakers that are designed to provide fairly flat low frequency response in a free-field (i.e., non-soffit-mounted) application—the much more typical case—are often bass-heavy when mounted in a corner. This is the only remaining area where monitor equalization may be required; in this case, the equalization *is* valid for the majority of locations in the room, assuming the geometry is such that no major standing waves are present. Such soffit-mounting with proper equalization will generally extend the low frequency performance of a free-field design speaker.

The intricate world of control room

design has spawned a number of highly developed practitioners within whose province the state of the art has become even more highly refined. A sampling of their comments on problems most often encountered in assessment of existing radio control rooms they have encountered is most revealing.

Russ Berger, of the Dallas-based firm Joiner-Rose Group, contends that room size and building methods often create low-frequency monitoring problems.

"Usually, the volume of the room is not sufficient to support accurate monitoring of low-frequency energy below about 250 or 300 Hz," says Berger. "That's barely enough for the low end of the voice range, let alone music.

"Flimsy construction is another problem that can wreak havoc with the low end of the room," he continues. "Things go diaphragmatic, they burp sound back into the room later in time, and you wind up with this big smeared, swimmy low end that has no definition or direction."

"Usually, the volume of the room is not sufficient to support accurate monitoring of low frequency energy below about 250 or 300 Hz."
—Russ Berger

Berger has also found that piecemeal retrofits can make facility-wide problems difficult to solve. "The layout of physical plants often doesn't allow a smooth traffic flow or communication within the facility, and as a result, isolation problems can occur," he counsels.

"If you try and pack different sound-critical facilities next to each other, no matter what you do to a common wall, you're bound to run into some isolation problems. But between a control room and its studio, where program audio is the same, 25 or 30 dB should be enough, given the typical close microphone placements used by announcers."

Another well-known designer, Chips Davis, was one of the early developers of LEDE design. Now with the firm Paoletti-Lewitz Associates in San Francisco, he observes, "The most common problem I find in existing facilities is the mechanical noise.

Most people don't realize that when a building is first completed, it will be as mechanically quiet as it's ever going to be. It then degrades over the years. If mechanical problems that come up are neglected, and if changes to the facility are made haphazardly, rattle, rumble and vibration will result."

Davis has noticed some deficiencies in speaker placement even among recently built facilities.

"Many people think that near-field monitoring is a total panacea, and they ignore the reflections that can occur from shelving or the installation of equipment and racks right next to the speakers," he reveals. "A lot of the turnkey control room packages available today exhibit this problem."

Davis offers this helpful hint. "One way of finding out about what is happening right around the speaker is to place a mirror on any surface near the speaker. If you see the speaker in the mirror when you're sitting in the primary monitoring position, then you know that this surface is going to give you an unwanted reflection. A piece of fiberglass board or other absorbent material on that surface will help eliminate it."

"When a building is first completed, it will be as mechanically quiet as it's ever going to be. It then degrades over the years."
—Chips Davis

Whether you're planning a minor adjustment or a full facility from scratch, it's worth consulting an experienced radio studio designer like those quoted, or others such as Neil Muncy Associates of Toronto, ON, or Al D'Alessio of Northeastern Communications Consultants in New York. Acoustical design has developed into a highly specialized science, mostly outside the expertise of the typical broadcast engineer, but intimately involved with the success of facilities we are commissioned to build. It behooves us to improve our rooms and our awareness of acoustics by interfacing with these experts whenever necessary. ■

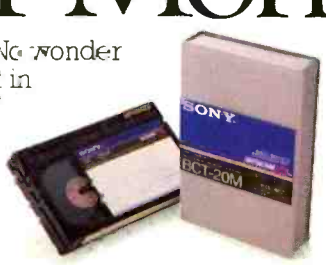
Pizzi is BME*'s audio editor.*

No jamming in Inner Mongolia.

Cassette jamming is one of the biggest problems production crews face. Unless they're shooting with Sony Videocassettes. No wonder the producers of a recent documentary shot in Inner Mongolia chose to tape with Sony BCT Series Betacam® cassettes.

The Sony cassettes didn't jam during the entire three weeks of taping, even when covering the nomadic people of Mongolia's grasslands, where temperatures vary from extremely hot to extremely cold.

Not that this surprises those of us at Sony Professional Videotape. After all, we've designed all our products around one basic premise: durability. To be frank, the demanding shooting conditions of Mongolia aren't as tough on our tape as we are.



BCT Betacam cassette for instance, combine a high-impact ABS anti-static cassette shel with a base film that's been given Sony's ultrafine carbon-black back coating. All of which ensures more uniform tape transport and superior winding characteristics. Among other things, this kind of runability helps keep Mongolians out of a jam.

No matter which Sony Professional Videotape you're working with, there's one thing you know for sure. Its greatest ability is durability. Whether it's Betacam, U-matic,® 1" or Digital tape. So take on the world. With Sony Videotape. In Inner Mongolia or in your own studio you need a tape that's tough as Sony. After all, there's no better way to prevent unwanted jam sessions.

SONY®
THE ONE AND ONLY.

New Products

BME's expanded coverage of the latest developments in new broadcast equipment.

Chicago Condenser Announces PCB-Free Capacitor Kits

Chicago Condenser Corp. has introduced a line of non-PCB capacitor kits for common broadcast transmitters. The kits are designed to avoid the dangers of fires or leaks in PCB-containing capacitors, as well as the stringent EPA reporting requirements for such equipment.
Reader Service #200

Clarity Offers Interface Upgrade

The Clarity XLV effects interface has been enhanced and upgraded to enable full automation of Lexicon 224XL, Lexicon 480L and AMS TMX-16 digital delay and reverbs. The new software automates all page and machine changes available in the Lexicon LARC controller.
Reader Service #201

SSE Unveils Compact C-Band Satellite Transceiver

SSE Technologies' ASAT 0406 compact C-band satellite transceiver is designed for SCPC or point-to-point applications. The unit includes a single 19-inch shelf for indoor electronics and outdoor units containing the RF transceiver, power supply and LNB. Monitor and control capability are based on a 16-bit microprocessor.
Reader Service #202

JVC Presents Tri-Deck VHS Duplicator

JVC has introduced its BR-7030U three-in-one Hi-Fi VHS duplicator. The unit features three individual VHS recording transports in a single cabinet occupying 12 to 15 standard rack units. The individual transports slide out of the main chassis from the front for maintenance. List price is $4995.
Reader Service #203

Monroe Presents Program Timer

Monroe Electronics' Series 3000 program timer uses state-of-the-art "Soft Key" front-panel switching and a self-prompting, two-line, 40-character LCD display. With 16 open collector outputs for on/off or momentary operation, the timer can be used in any application requiring a closure to ground or a change in logic level for activation or deactivation on a realtime basis. The timer has a 250-event minimum capacity, with realtime clock, seven-day programming and time display to one second resolution.
Reader Service #204

ANDREW

Andrew Expands Radiax Cable Line

Andrew has broadened its Radiax coax cable line with the addition of four cables: ¼-inch, ⅜-inch, 1¼-inch and 1⅝-inch. All sizes of Radiax cable can be ordered with a patented fire-retardant, halogen-free jacketing construction, UL-listed under Article 820 of the National Electrical Code.
Reader Service #205

ANTON/BAUER

Chromatics Intros 3D Graphics For CX2000 Platform

Chromatics' PHIGS BR (Programmer's Hierarchical Interactive Graphics Standard Basic Rendering) package allows its CX2000 platform to support hierarchical 3D applications such as object modeling, contouring simulation, solids modeling, animation and mapping. The package supports multiple light sources and performs 250,000 3D vectors per second with six-plane clip testing. List prices start at $8000.

Reader Service #206

Anton/Bauer Announces Magnum Battery

Anton/Bauer has introduced the Magnum 13 and Magnum 14 Logic series batteries. The batteries incorporate all the features of the Logic series including the IMPAC case, Hi Res ACS and MicroCode program module, but are the same size and weight as the company's Pro Pac 13 and 14 batteries.

Reader Service #208

Intelco Intros Variable Attenuator

Intelco's Model 220 single-mode precision variable attenuator features continuous attenuation to over 60 dB, linearity and repeatability to 0.04 dB, 10 factory- or user-set wavelength calibrations, insertion loss less than 3 dB, and full-function IEEE-488 GPIB circuitry for remote control and automated testing. List price is $6850.

Reader Service #209

LAZERUS

Lazerus Unveils Radiant Software

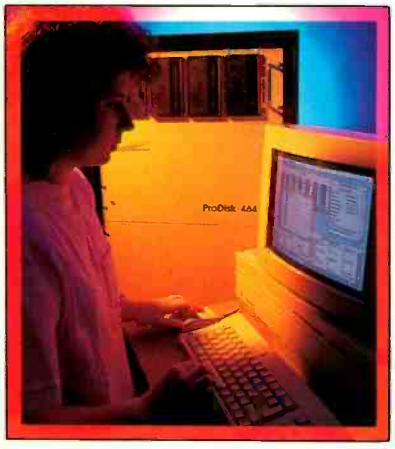
Lazerus' Radiant/PC software is designed to permit users to create and animate photorealistic imagery on PC/XT, 286/AT and 386 personal computers. Features include object-oriented software with a menu-driven interface and layout grid drafting aids; full 32-bit IEEE floating point database; and the ability to render at up to 4096 × 4096 at 24 bits/pixel resolution. List price is $3995 for 386 systems; $2995 for XT or AT systems.

Reader Service #207

Digital Dynamics Offers Disk Audio Recording System

Digital Dynamics' ProDisk-64 digital disk random-access audio recording and editing workstation features Winchester disk storage, plug compatibility with multitrack tape machines, 96 dB dynamic range and a 90 dB S/N. The system is compatible with SMPTE time code and MIDI. List prices start at $25,995.

Reader Service #210



DIGITAL DYNAMICS

Neutrik Offers ProFi Connectors

Neutrik's ProFi phono connectors are designed to eliminate grounding noise. They are constructed with a special ground shell that retracts into the connector body as the signal post is inserted into the phono jack. Two types of casings are available: nickel- or gold-plated.

Reader Service #211

B&K-Precision Presents Frequency Counter

B&K-Precision's Model 1804 frequency counter features measurement to 550 MHz, eight-digit LED display, low-pass filter, one-second and 0.1-second gates and an overflow indicator. Resolution is 10 Hz on prescale and 1 Hz for direct mode using the one-second gate, and 100 Hz prescale and 10 Hz direct using the 0.1-second gate. List price is $295.

Reader Service #212


HME

HME Presents Four-Channel Power Station

HM Electronics' RP755 four-channel power station features a matrix assignment panel that allows the operator to assign 12 stations or groups to one of the four independent intercom lines or two private lines. The unit provides power for up to 64 belt-pac headset stations with call light function or up to 200 without the call light function.
Reader Service #215

Panasonic Unveils High-Speed VHS Recorder

The AG-1730 VHS Hi-Fi recorder from Panasonic features an extremely fast tape transport mechanism, allowing the operator to go from stop to play mode in about two seconds and completely fast forward or rewind a T120 tape in approximately two minutes and 30 seconds. The unit also features 19-step and 21-step shuttle/jog dial control and a double fine slow function—variable from 1/5 to 1/30 normal speed. Audio dynamic range is 90 dB.
Reader Service #213

Harry Carter Rolls Out Car-Top Platform

The improved version of Harry Carter's car-top platform features fir wood and all aluminum fittings and castings; it is available with a chrome-steel ladder for rear or side access. Each platform is built to exact specifications or can be bought as a preassembled do-it-yourself kit.
Reader Service #214


HARRY CARTER

TEAM Systems Unveils Programmable Video Generator

TEAM Systems has introduced its Astro VG-819 programmable video generator. The unit offers independently programmable horizontal scan rate from 10 kHz to 130 kHz and dot clock (pixel frequency) from 5 MHz to 240 MHz, with an accuracy of ±0.1 percent. Analog, ECL and TTL outputs and GP-IB and RS-232 interfaces are provided. List price is $12,950.
Reader Service #216

Tascam DA-50 R-DAT Deck Now Samples at 44.1 kHz

In addition to sampling at the standard baud rates of 32 kHz and 48 kHz, Tascam's DA-50 R-DAT recorder now records at the rate of 44.1 kHz, permitting two-track mastering direct to compact discs without an additional interface.
Reader Service #217

Anritsu Offers Handheld Optical Loss Test Set

Anritsu's MS9020A optical loss test set uses either individual 1.3 μm and 1.55 μm sources or a switchable 1.3/1.55 μm LED module. The unit can measure CW light and has modulation frequencies of 270 Hz and 1 kHz to test single-mode fiber. The 32 dB dynamic range allows single-mode testing of cables up to 64 km long. Also available is the ML9002A power meter, designed for simple power measurements. List price of the MS9020A is $1040; list price of the ML9002A is $880.
Reader Service #218


ALLIED

Allied Offers Squeezeplay Radio Skimmer

Allied Broadcast Equipment's Squeezeplay unit incorporates custom IC circuitry into a radio-cassette player. The unit can be switched between skimming and normal operation and the user can select appropriate record and wait-time intervals. Squeezeplay is designed for use in skimming AM and FM radio stations.
Reader Service #219

Pomona Offers BNC Connector Adapter Kit

Pomona Electronics has introduced a selection of its most popular BNC connector adapter combinations in a carrying case, Model 5511. The kit consists of six variations of BNC male/female connector adapters. The case interior is fitted with a contoured foam liner to protect the adapters.
Reader Service #220

Thomson Announces 20 kW Tetrode

Thomson's TH 582 is a coaxial metal-ceramic tetrode, designed for trans-

mitters of peak-of-sync output power of 22 kW for video carrier only, or 10 kW combined video and audio carrier. The company claims high reliability for the TH 582—a tube has logged more than 22,000 hours of sound operation.
Reader Service #221

Video Communications Presents Business Automation

Video Communications has introduced an IBM PS/2- and AT-compatible version of its Sales, Traffic, Receivables software. The software is resident in a DOS environment. It also contains a "disk shadowing" feature, providing immediate duplication of information onto a second disk, which is automatically referenced should the original fail.
Reader Service #222

SENCORE

Sencore Intros Z-Meter Demonstrator

Sencore Electronics' DM115 provides "faulty components" that allow the user to learn how the company's Z-Meter tests indicate capacitor and inductor failures. The unit simulates good, shorted, and open capacitors and inductors, among other problems such as excessive value changes and a single shorted turn.
Reader Service #225

Computer Dynamics Announces RS-232 to RS-422 Adapter

Computer Dynamics' Opto-Adapt is an optically isolated, plug-in RS-232 to RS-422 adapter that permits RS-232 and RS-422 interface circuits to be connected bi-directionally, even between buildings, according to the company. The unit optically isolates the computer/peripheral from the serial cable, eliminating ground loop currents. List price is $120, with external power supply available at $10.
Reader Service #223

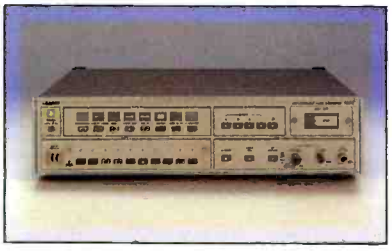
COMPUTER DYNAMICS

Panduit Announces Crimping Tool

Panduit's CT-100 crimping tool is designed to provide UL-approved and CSA-certified terminations on #26 to #10 AWG wire. The tool offers wire cutters, a wire strip length gauge, bolt cutters and color-coded crimp pockets for insulated terminals.
Reader Service #224

EEV Improves 30 mm TV Camera Tubes

EEV has added a patented integral variable light bias control to its XQ1410 TV 30 mm TV camera tube. The improvement is designed to reduce picture smear and enhance tube life. Individual controls allow separate adjustment to the light bias in each color channel.
Reader Service #226


LEADER

Leader Offers RGB Video Generator

Leader Instruments' Model 1602 high resolution RGB video generator can be set up to drive any RGB monitor or video system with requirements of up to 60 MHz dot clock frequency (pixel clock). The Model 1602 is designed to work with Leader's Models 1603A, 1604A, LVG-1603 and LVG-1604 using the same PROM format. List price is $4395.
Reader Service #228

Fluke Presents Frequency Counter

John Fluke Mfg.'s PM 6677 frequency counter has a frequency range to 2.3 GHz. The company offers a choice of five timebase oscillators for the unit, with the high-performance version offering stability up to 5×10^{-10}/24 h. Other features include a wideband, continuously variable input attenuator to ensure error-free triggering on the 120 MHz low-frequency input channel. List price is $1895.
Reader Service #227

The Faroudja **LINE DOUBLER**

Ahead of its time

The LD-1 Line Doubler accepts 525 line, 2:1 interlaced, 59.94 Hz video signals and converts them to 525 line progressive scan or 1050 line interlaced signals.

The motion detection techniques used in the LD-1 are considered by experts in the field as being the most advanced. Along with proprietary bandwidth expansion techniques* and patented detail processing, Faroudja Laboratories LD-1 delivers images that rival HDTV.**

35 mm Film Quality

The absence of visible scanning line structure, edge blurring or motion artifacts at the LD-1 outputs makes it an ideal companion for large screen TV displays. Its crystal clear, artifact free image delivers a "cinema-like" feeling from standard 525 line video sources.

SuperNTSC™

The Faroudja LD-1 Line Doubler, CTE-2 Encoder and CFD-N Decoder comprise the basic building blocks of the fully compatible SuperNTSC™ ATV system.

* Patent Pending
** Patent Numbers 4,030,121 and 4,262,304

FAROUDJALABORATORIES

Faroudja Laboratories Inc.
946 Benicia Avenue
Sunnyvale, California 94086
Telephone 408/245-1492
Telex 278559 MUHA UR
Fax 408/245-3363

Tektronix Premiers XD88 Graphics Workstations

Tektronix has introduced its XD88 line of graphics workstations. The standard system configuration includes 8 MB of RAM (expandable to 176 MB), 156 MB hard disk and 150 MB streamer tape. An independent 68020-based graphics engine fuels interactive redraw speeds of 450,000 2D vectors per second and 20,000 Gouraud-shaded triangles per second. The workstations are graphics-compatible with the company's 4300/4200 series. The line consists of the XD88/30, a 3D workstation, priced at $34,950; the XD88/20, a 2D workstation priced at $29,950; and the XD88/01, an applications processor that can host Tektronix terminals, priced at $24,950.

Reader Service #270

TEKTRONIX

Glenn Unveils Test Pattern

Designed for rapid setup and matching of color video cameras, Glenn Video's Quick-Test color video test pattern features computer-designed white and black bars surrounding a flesh-tone model and color bar chips. Quick-Test can be used to match subcarrier phase between two or more cameras without a vectorscope, by setting up a two-camera, split-screen wipe and varying the subcarrier phase of one camera relative to the other. List price is $19.95

Reader Service #229

New England Digital Offers MaxTrax

New England Digital's MaxTrax enhancement enables users of its Direct-to-Disk and PostPro recording/editing workstations to double the number of available recording tracks in their systems. The package consists of proprietary software and up to eight 16-bit, 100 kHz output voices for playback of the additional tracks.

Reader Service #230

Sony Unveils Still Video Recorder

Sony's MVR-5600 ProMavica high-band format still video recorder and player handles analog video signals at more than 500 lines horizontal resolution. The unit inputs and outputs NTSC composite, RGB analog and Y/R-Y/B-Y component video signals. The MVR-5600 is equipped with an RS-232C port and its TC Sync connector allows playback to be triggered by a 1 kHz tone signal from a tape recorder or other audio device. List price is $4195.

Reader Service #231

Rapid Systems Premiers Digital Timing Analyzer

Rapid Systems' R3600 digital timing analyzer features a 200 MHz sample rate. The unit features input probes guaranteed not to load a circuit with more than 1M ohm at 3 pF, enabling the display of a true waveform. Other features include 8K data buffers per channel, external clock to 50 MHz and list data in binary, ASCII or hex formats. List price is $2495.

Reader Service #232

Systemation Premiers Automated Weather Forecast System

In conjunction with WeatherBank, Systemation has developed CompuCast, an automated weather forecast system being offered as an option to Systemation's Informer interactive telephone system. CompuCast is designed to deliver a live-sounding weather forecast to a radio station by using digitally stored phrases that cover a range of weather possibilities.

Reader Service #233

BRYANT ELECTRIC

Bryant Electric Presents Quadplex Receptacles

Bryant Electric's Quadplex color-coded, four-outlet receptacles can be used with a portable nonmetallic box for temporary studio power applications requiring extension cords. Quadplex wall outlets can be used for flush mounting to one- and two-gang device boxes or four-inch square boxes. Ratings include 15 A and 20 A 125 V (15 A 347 V for Canadian applications).

Reader Service #234

You're burning the midnight oil... Final edit's due at 8 a.m.

Be glad you have a Prodigy—the new switcher with more brain-power in a smaller package.

Forget about old two mix/effect systems.

A reliable video switching and special effects system follows the new industry standard—multi-level effects with look-ahead preview. Much more than just another clone, Prodigy raises the standard—offering features no one else does, even on their most expensive systems. Prodigy includes stereo audio-follow-video, editor interface, effects memory and a programmable downstream keyer.

Have it *your* way.

Modify Prodigy to suit your style of operation and create memorable performances. Program up to 99 events into Prodigy's 68000 microcomputer, then preview the results instantly. Ten programmable sequences link 80 on-line memory registers, and ten learned operator transitions track your actions over time. With Videotek's exclusive Times Six Plus black burst generator, system timing is virtually automatic.

Who says the grass is greener?

Equally at home in the post-production facility, newsroom or studio—Prodigy rack-mounts in minutes and its software talks to a wide range of popular editing controllers.

Get your hands on a Prodigy and let the performance begin! For more information or the name of your nearest Prodigy dealer, call Videotek today.

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Circle 138 on Reader Service Card.

Interalia Announces Digital Phone Response

Interalia's Voice digital telephone response system can link two messages so they sound like one, according to the manufacturer. The unit is designed to permit broadcasters who sponsor telephone information lines to sell advertising spots on those lines. The unit is distributed by Allied Broadcast.

Reader Service #235

Delta Electronics Premiers Stereo Noise Generator

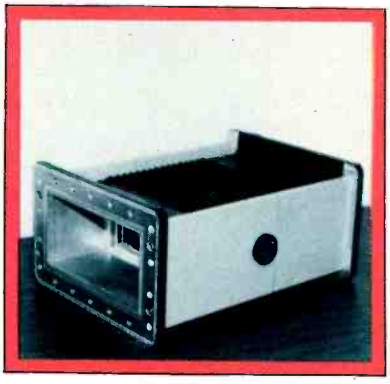
Delta Electronics' Model SNG-1 stereo noise generator offers switch-selectable white, pink and USASI noise spectra, in either continuous or pulsed output modes. An external gate feature permits control of left and right channel noise for a variety of alignment and troubleshooting tests. List price is $495.

Reader Service #236

MCI Unveils Articulated Waveguide

Micro Communications' articulated flex waveguide allows for single-axis movement in one plane, while providing solid support in the other two planes. The waveguide can be configured by the user for flexible movement in either the E or H plane axis. Various articulated sections are available to custom fit the desired configuration.

Reader Service #238

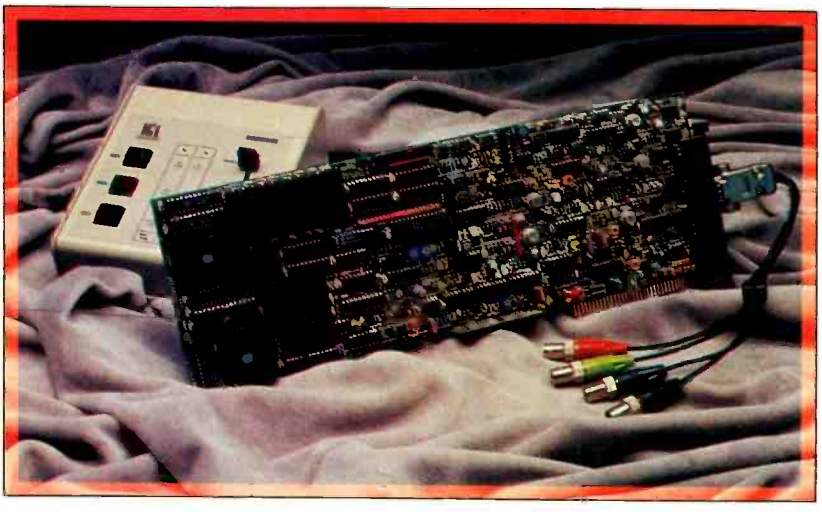


MCI

Magni Announces VGA Producer

Magni Systems' VGA Producer allows users of IBM-compatible PCs to produce professional-quality video from VGA graphics. The unit will encode VGA graphics composed in 640 × 480 resolution (or lower) into an NTSC or S-VHS video signal. Remote control unit gives the user control of effects including keying, border color fills, X-Y positioning and fades between video and graphics. List price is $1695.

Reader Service #237



MAGNI

AUDIOMETRICS

Audiometrics Intros Power Distribution/Lighting Units

Audiometrics' ac power distribution/lighting units are designed to eliminate power surges and voltage spikes and to receive clean, uninterrupted EMI/RFI noise-filtered power. Four models are available: Model PLM features two slide-out swivel lights and a standard digital voltmeter; model PDL features the swivel lights alone; model PDM features the voltmeter alone; and model PDO is the basic model without lights or meter. The units are distributed by Allied Broadcast.

Reader Service #239

AP Unveils Newsroom Software

The Associated Press has introduced AP NewsDesk, a software program for radio and TV newsrooms. The system runs on IBM-compatible PCs and scans any of AP's high-speed newswires, saving incoming stories to disk. The system has complete editing and rewrite functions. Other features include custom categories of information sorting, automatic printing, and a built-in atlas.

Reader Service #240

I-Den Presents IVT-12 Digital TBC

I-Den's IVT-12 digital time base corrector can be driven continuously for a minimum of 40 minutes by a portable battery. The unit features component, Y/C358, Y/C688 and composite video inputs. Other features include built-in full-frame memory, auto chroma control circuit, RS-170A sync generator (with black burst output), field/frame freeze capability and auto freeze capability.

Reader Service #241

GET A BUZZ FROM THE BEST OF BROADCASTING TECHNOLOGY!

Inter BEE '89

International Broadcast Equipment Exhibition

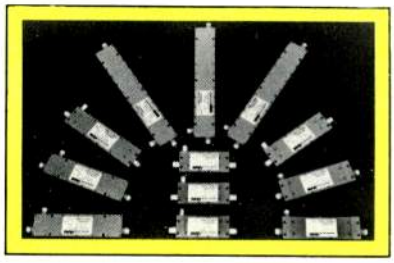
November 15~17, 1989
Convention Center Tokyo, Sunshine City, Tokyo, Japan

Engineers, managers, and manufacturers all come to the largest broadcast equipment exhibition held in Asia, recognizing that it is one of the world's leading shows. More than 24,000 visitors benefited last year, learning about the latest broadcast technologies and developing contacts with important companies and potential clients. Leading-edge technology is the highlight of the three-day exhibition, showcasing products and developments from around the world. Don't miss out by missing Inter BEE '89.

Japan Electronics Show Association

Tokyo Chamber of Commerce and Industry Bldg., 3-2-2, Marunouchi, Chiyoda-ku, Tokyo 100, Japan

Circle 156 on Reader Service Card.



BIRD

Bird Unveils Directional Couplers

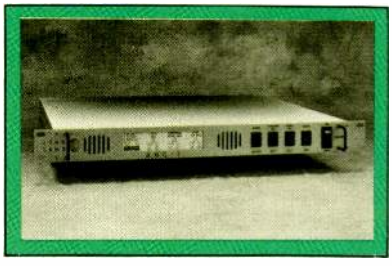
Bird Electronics has introduced a series of 12 coaxial directional couplers rated at 200 W that provide 10, 20 or 30 dB coupling over four frequency ranges from 125 MHz to 2 GHz. The 4728 Series couplers sample power flowing in one direction in 50 ohm systems while attenuating power flowing in the opposite direction—without disrupting transmission to the load. All models have an insertion loss of 0.25 dB maximum and a coupling accuracy of ±1.0 dB.

Reader Service #242

Cubicomp Intros Broadcast-Quality Animation from CAD Systems

Cubicomp's CADView is designed to permit users to prepare broadcast-quality animation from popular 3D CAD systems. The initial release includes an interface to 3D models from CADKEY modeling systems and contains the company's broadcast-quality video frame buffer and rendering and animation software. The system consists of an 80386 PC, RGB monitor, data tablet, CS/24 24-bit frame buffer, CADView software and True Color Paint. List price is $28,000.

Reader Service #243



LYON LAMB

GAM Presents Diffusion Material

The Great American Market has introduced a new line of GamColor diffusion material, including GamFrost, GamSpun, GamWhite and GamSilk in 20- × 24-inch sheets, 24-inch × 50-foot rolls and 48-inch × 25-foot rolls. The full range of colors totals 85. List prices are $4.50 per sheet, $85 per roll.

Reader Service #244

Maxell Intros Betacam SP Tape

Maxell has introduced a ½-inch videocassette specifically designed for use with Betacam SP machines. The new tape employs ultra-fine ceramic armor particles, designed to provide high output over a wide frequency range. Other features include a high binder system for stable tape transport in severe environments.

Reader Service #247

AMPEX

Ampex Premiers Betacam SP Camcorder

Ampex's CVR-300 Betacam SP camcorder weighs just over 15 pounds, including battery and cassette. The three CCD sensors in the camera section feature 670 lines of resolution and are bonded directly to the prism block to form a shock-resistant, permanently aligned system that never needs registration or adjustment. The unit accepts cassettes of up to 30 minutes in length. List price is $35,500.

Reader Service #245

Lyon Lamb Intros Sync Generator/Encoder

Lyon Lamb's ENC-7 color sync generator and encoder outputs both composite and component video from RGB sources with or without genlock. Possible outputs now include S-VHS component video, as well as composite sync, blanking, burst flag, subcarrier, horizontal drive and vertical drive. The unit supports all NTSC composite video formats as well as Betacam and MII component formats. List price is $4500.

Reader Service #246

Standard Communications Announces Satellite Receiver Interface

Standard Communications' SatCom Division has introduced its CRC810 remote control computer interface for its Agile Omni PRO satellite receiver. The option provides an RS-232C interface port that can operate at 300, 1200, 2400 and 4800 baud rates. The unit incorporates software that can control up to eight functions including transponder center frequencies; multiple antennas; video and antenna polarity; six IF bandwidths

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the card to play

Whether you're frustrated with maintaining your old master control slide chain, or tying up expensive equipment for those same few stills, the Leitch **PROM-SLIDE™** is what you've been waiting for.

This single compact card will ensure that your station ID, logo, standby message, or custom test signal is always available, with full color frame resolution, at the input of your switcher.

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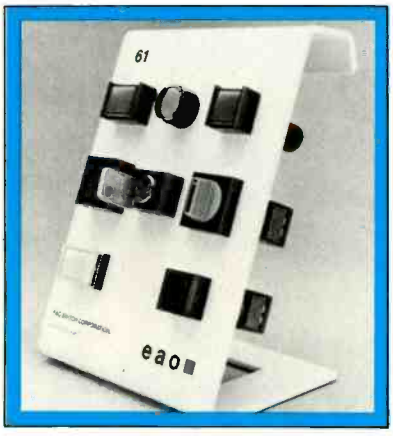
and audio subcarrier frequencies with three bandwidths; and switching between C and Ku bands, scan and various on/off cycles. List price is $249.
Reader Service #248

Video Graphic Systems Unveils PC for Harsh Applications

Video Graphic Systems has introduced a 19-inch rackmount 386 computer designed for use in harsh industrial applications. The unit features anti-vibration rubber mountings for the six disk drives, three positive pressure temperature-controlled fans and a hinged and latched front disk access door. Other features include 16 MB of 32-bit memory on the motherboard; two serial, one parallel and one game port; and floppy drive controller, 80287, 80387 and Weitek math coprocessor sockets on the motherboard.
Reader Service #249

Original Electric Offers OST Relay Series

Original Electric's OST slim line relay series is designed for tungsten load or high in-rush current applications, remote control TV receivers, monitor displays, CATV converters and audio equipment. The relays have a TV-5 125 V ac lamp load or 7 A @ 250 V ac/30 V dc contact rating. List price is $1.93 each in 1000-piece quantities.
Reader Service #250



EAO

EAO Presents Oil-, Watertight Switches

EAO's Series 61 oil- and watertight switching system features actuators made of chemical-resistant plastics that meet IP 65 requirements. Switch modules, with gold or silver contacts, are available with solder or Q/C terminals. Diode matrix units are available in the following configurations: three N.O. contacts; two N.O. contacts; and one N.O. contact. List prices start at $9.25.
Reader Service #251

SOLA

Siecor Premiers Field-Installable Fiberoptic Connector

Siecor's FC-PC single-mode fiberoptic connector can be field-installed and features a glass-in-ceramic ferrule design to allow a quick-curing UV adhesive to replace epoxies. Typical insertion loss of the device is 0.5 dB and return loss is under –35 dB. A connector tool kit is also available.

Reader Service #253

Sola Premiers Interface Kits

A new series of PC software interface kits from Sola allows two levels of communication between personal computers and regulating standby power sources or uninterruptible power systems. The first level gives operators the ability to monitor, on screen, the operating status of Sola power protection equipment; the second level allows interface-equipped computers to automatically save "work-in-progress" to hard disk after a power failure or low battery condition is sensed.

Reader Service #252

Hotronic Offers TBC/Frame Synchronizer

Hotronic's AF75 TBC/frame synchronizer facilitates time base correction for heterodyne VTRs. The unit includes frame sync with full-frame memory, constant H phase, 4x subcarrier sampling, eight-bit resolution, separate Y/C processing, 3 dB chroma noise reduction, full bandwidth freeze field/freeze frame and optional variable-speed strobe.

Reader Service #254

North Hills Premiers Video Isolation Transformers

North Hills Electronics' triple-channel video isolation transformers are designed to eliminate hum in RGB TV and data systems by providing 120 dB ground isolation at power line frequencies and 500 Vrms isolation between input and output and

ground. Model 1117UA has a bandwidth of 10 Hz to 5 MHz for NTSC and PAL compatibility; Model 1116UA has a bandwidth of 20 Hz to 25 MHz for HDTV and other high-resolution video applications. Insulated BNC connectors are standard. List prices are $275 for the 1117UA and $490 for the 1116UA.
Reader Service #255

Fuji Unveils Highband 8 mm Metal Videotape

Fuji's 8 mm MP Master metal videotape offers a horizontal resolution of more than 400 lines. The tape's FM luminosity signal falls in the range of 5.7 to 7.7 MHz, but is still compatible with conventional 8 mm systems. Other features include an increase of 1.5 dB in video and color S/N compared to other Fuji tapes when used with conventional 8 mm.
Reader Service #256

Connolly Offers Network Automation System

Connolly Systems has developed an enhanced version of its VTS-100 videotape sequencer system, which provides all the hardware and software needed to control up to eight VTRs and an audio-follow-video switcher. By adding the company's PSS-100 PC-based program library and scheduling system, the user has direct access to a tape library with full transmission details and scheduling and tape preview facilities.
Reader Service #257

VINTEN

Vinten Intros Osprey Pedestal

Vinten's Osprey studio camera pedestal features a total weight capacity of 120 pounds, self-pumping or externally-charged pneumatic upper stage, balance-assisted lower stage with a gas strut, total height range of 26 to 58 inches, and standard five-inch wheels with individual brakes and cable guards.
Reader Service #258

Sennheiser Intros Condenser Mic

Sennheiser's MKH 70 P48 shotgun condenser microphone uses a symmetrical push-pull transducer to virtually eliminate intermodulation distortion, according to the company. Other features include linear frequency response, equalization and padding switches and 48 V phantom powering.
Reader Service #259

Roscor Rolls Out Satellite News Vehicle

Roscor Corp. has introduced its Star Fleet 21 Mark II satellite news vehicle. The vehicle features the company's "RigidRak" design, which eliminates excess attenuation by mounting the antenna directly over the equipment racks, according to Roscor. Other features include dual con bays (one for audio/video, one for power), rivetless construction and lighted stairs.
Reader Service #260

TELEPAK

Telepak Presents T-Cam Case for Betacam

Telepak's T-Cam carrying case for the Sony Betacam is made of durable water- and stain-repellant nylon. The case includes interior pockets for tapes and accessories. Available colors are blue, black, burgundy and camouflage. Custom colors are also available.
Reader Service #261

CMX Announces Hard Disk For CMX 3600

CMX has introduced a 20 MB hard disk as standard equipment on its CMX 3600 large-scale editing system. The hard disk is also available for existing CMX 3600 systems, giving the operator a choice of hard disk, 3.5-inch or eight-inch floppy disks for storage, access, archive or backup.
Reader Service #262

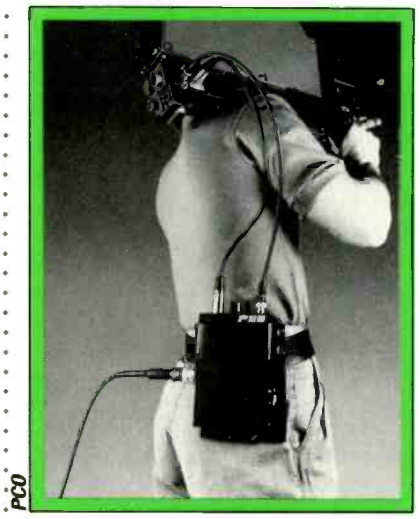
EECO Announces Audio Archive Line

EECO has introduced a line of audio archiving products including the ARC-50E encode system and the ARC-50D playback unit. The system uses a format in which a video signal is en-

coded with audio data (97.44 kB per frame), allowing a single side of a video laserdisc to store 5.262 gigabytes of audio information, equivalent to 150 hours of audio at a bandwidth of 3.5 kHz or 50 hours at a bandwidth of 11 kHz.
Reader Service #263

LaserMedia Premiers Power Supply for Xenon Lamps

LaserMedia's dc power supply for xenon short-arc lamps is designed around a MOSFET half-bridge PWM switching converter and can power lamps rated from 150 W to 500 W with operating voltage and current range of 10-20 V dc and 10-35 A dc respectively. The unit operates from either 100-130 V or 200-260 V ac at 50 or 60 Hz sources. Output current is regulated to 3 percent or better. List price is under $1000.
Reader Service #264



PCO Unveils Fiberoptic Field Transmission System

The PCO-5050 fiberoptic video/audio transmission system can be worn on a belt or attached to a portable camera. The system permits a camera to roam 500 meters to 1 km from its ENG/EFP vehicle without the problems associated with coax, says the manufacturer. Using analog FM, the PCO-5050 transmits NTSC video and stereo audio using a high-powered LED optical transmitter at 1300 nm over multimode fiber. List price, including housing, LED transmitter, unit holder/belt and power supply, is $4195.
Reader Service #265

Peerless Announces Speaker Mount

Peerless's Radial Cube speaker mount is made of tubular steel formed into a "cubic" frame. Other features include a 4- × 4-inch center opening for access to speaker wires, extension from wall of nine inches, and ability to handle loads up to 75 pounds.
Reader Service #266

THE PROFESSIONAL CD PLAYER FOR THE PROFESSIONAL CD PLAYER.

Like all professional CD players, the new Technics SL-P1300 is technologically advanced.

But you don't have to be a technical genius to operate it.

In fact, even if you haven't spent years in the studio, it will only take you a few minutes to figure it out.

You see, the SL-P1300 is ergonomically designed to give you greater control over playback than you've ever had before.

Perhaps that's because it's built like a recording console. Which means the disc well and all the other controls are right at your fingertips.

First, the control panel features a long stroke sliding pitch control. It's continuously variable with a range of ±8%. In addition, it lets you restore quartz lock accuracy at the touch of a button.

There's also our two-speed search dial with audible pause. Which makes finding your in point extremely easy.

Our professional CD player has other features professionals enjoy working with. Like one-touch memorization by time code, A-B repeat, and our exclusive rocker control search buttons. It's the digital equivalent of dragging your finger on the edge of a record.

A great deal of thinking also went into things like our balanced outputs (10 dBm nominal into 600 ohms). There's even a port for a wired remote. And separate power supplies for digital and analog circuits. Given this, it's not surprising that its S/N ratio is 112 dB.

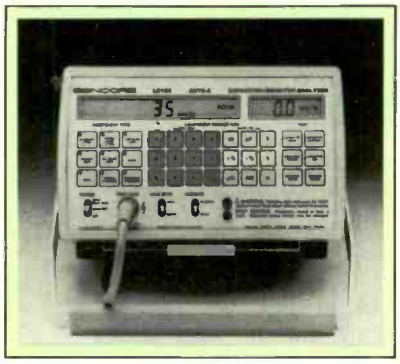
If you're a professional CD player, chances are you're ready to hear what our professional CD player can do.

Call your Technics representative. You'll find that our pro CD player isn't the only thing from Technics that's a pleasure to work with.

Technics
The science of sound

Circle 149 on Reader Service Card.

SENCORE



Sencore Intros Capacitor and Inductor Analyzer

Sencore Electronics' LC102 tests capacitor values from 1 pF to 20 farads by charging the capacitor through a precision resister and measuring its time constant, displaying the value on a digital LCD readout. The unit also dynamically tests inductors, in or out of circuit, from 1 microhenry to 20 henrys.

Reader Service #267

KINEMETRICS

Kinemetrics/Truetime Premiers 900 Series Time Code Generators

Kinemetrics has introduced three models in its 900 series of time code generators and translators. The microprocessor-based systems support microsecond resolution in parallel BCD, IEEE-488 and RS-232 interfaces. All feature full-sized LED time display, alphanumeric LCD display and keypad and full operation from the front panel. Options include synchronized generator, tape search, control bit insertion, RS-232 and IEEE-488 I/O ports, bandpass filtering, transformer coupling, 50 ohm drivers and custom configurations. List prices start at $2250.

Reader Service #268

Digital F/X Premiers 40 MB Storage for DF/X 200

Digital F/X has introduced a removable cartridge disk drive for its DF/X 200 and Composium integrated digital production system that utilizes removable 40 MB disk cartridges to provide unlimited data storage capability. The drive fits in a slot in the DF/X 200 chassis. Cartridges are available, formatted, from the manufacturer.

Reader Service #269

A Program for 40 Electronic Formulas

By Ronald F. Balonis

Broadcasting differs from most other high-tech businesses in that its technical knowledge doesn't go out of style or become instantly obsolete. Instead, technologies overlap, working side by side—the new with the old, and sometimes with the very old, too. For the experienced or inexperienced engineer, this creates a staggering amount of technical knowledge and information to absorb. But because this knowledge accumulates over the years as each technical innovation finds its place, it's generally taken for granted.

Although it is possible to know it all, with a PC it's not necessary, nor is it really desirable. Knowing lots of bits of information or formulas is not what intelligence or engineering skill or ability is all about: The bits of information and the formulas are only the means to the end, not the end in itself. It's what you do with what you have; it's the ability to find, to use, and to apply it. Let a PC remember the bits of information and do what it does best, precise and predictable formulaic thinking.

FORMULAS.BAS, this month's COMPUTE program, is designed to do that remembering. FORMULAS.BAS remembers 40 engineering formulas and does the formulaic thinking.

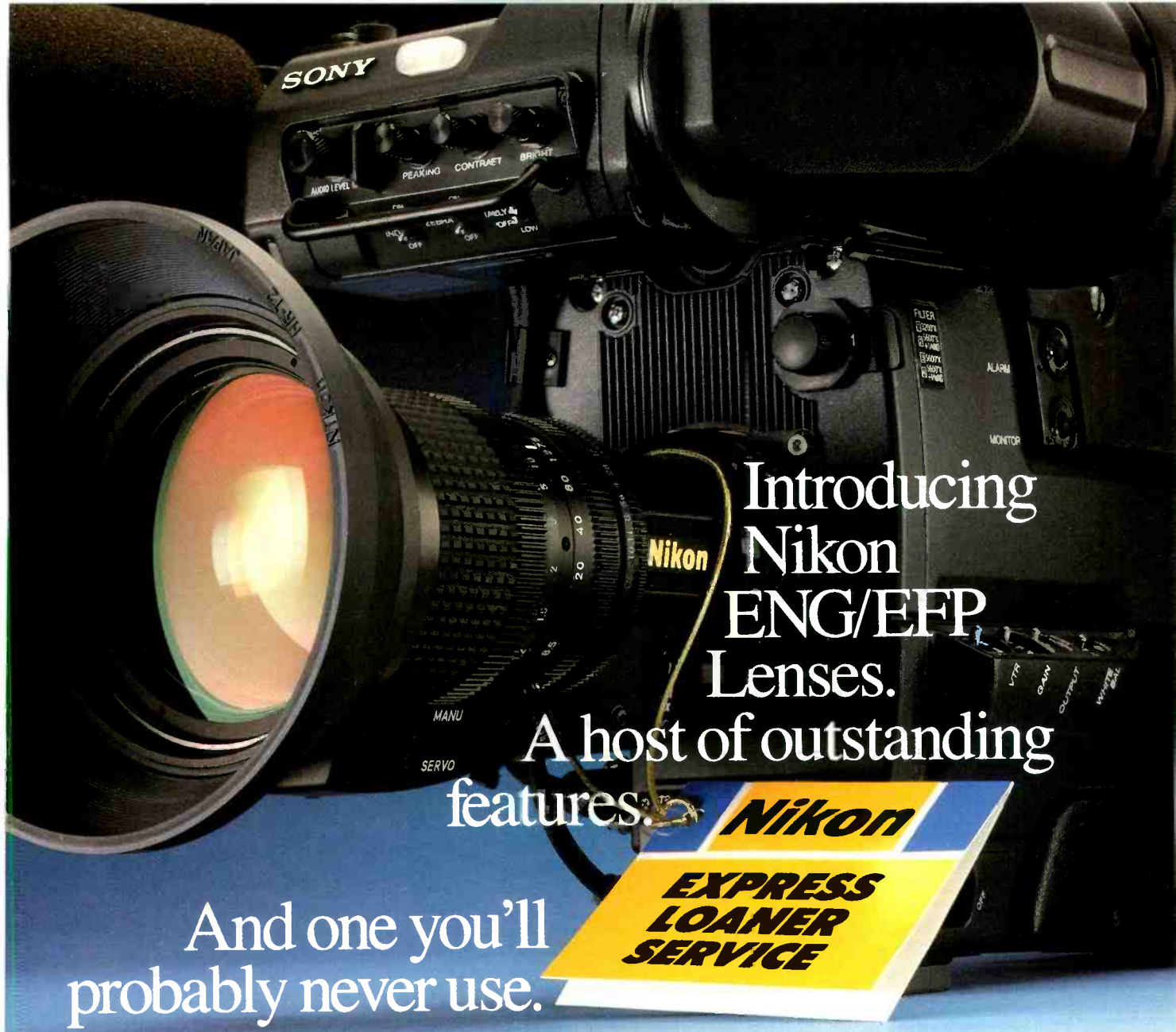
FORMULAS.BAS emulates, in BASIC, a Forth-like formula interpreter to "interpret" the built-in formula database in lines 700 to 750. Forth is a very powerful programming language, but a relatively obscure and esoteric one. It was developed about two decades ago and generally finds use in scientific and expert system-like control applications. The power of Forth comes from its design concept—it emulates one of the ways we think.

In its design, Forth uses a "stack" and "Reverse Polish" notation, and so does FORMULAS.BAS to evaluate the selected formula. With the Reverse Polish arithmetic notation, formulas are expressed in exactly the same order that you evaluate them. The stack is used to pass the variables and the "operands" to the functions. While our ordinary "infix" arithmetic notation is more readable, the "postfix" Reverse Polish one is, from a programming and computational aspect, more functionally elegant and simple.

FORMULAS.BAS may appear complex, but it really isn't (that much). It consists of five functional program modules. The first, in lines 100 to 170, displays the formulas and prompts for a selection and puts the formula in the string variable FRML$. The second module, from lines 180 to 240, parses and interprets the formula in FRML$. Lines 200 to 240 parse the formula (in FRML$) from left to right, first looking for a leading space and then a trailing space. Spaces delimit the opcodes, the math operands, functions, and variables in the postfix "coded" formula. As it finds each one, line 235 calls the Forth-like subroutines starting in a daisy-chain sequence at line 250 to evaluate it. The third module, lines 250 to 310, evaluates the operands, and the fourth module, lines 350 to 465, does the functions. The fifth, lines 500 to 750, forms the formula database.

```
FORMULAS.BAS   ++++ ELECTRONIC FORMULAS ++++
[ 1] : f(mHz)=300/Y(meters)              [ 2] : y(meters)=300/f(MHz)
[ 3] : Rt(par)=(R1R2)/(R1+R2)            [ 4] : Rt(ser)=R1+R2
[ 5] : Ct(ser)=(C1C2)/(C1+C2)            [ 6] : Ct(par)=C1+C2
[ 7] : E=I*R                             [ 8] : E=P/I
[ 9] : E=SQR(P*R)                        [10] : I=E/R
[11] : I=SQR(P/R)                        [12] : I=P/E
[13] : R=E/I                             [14] : R=P/(I*I)
[15] : R=E*E/P                           [16] : P=I*I*R
[17] : P=E*I                             [18] : P=E*E/R
[19] : f(Hz)=1/2PI*SQR(L*C)              [20] : f(kHz)=159.2/SQR(L*C)
[21] : Xc=1/2pi * f * C                  [22] : C=1/2pi * f * Xc
[23] : Xl=2pi * f * L                    [24] : L=Xl/2pi * f
[25] : dB=10log(P1/P2)                   [26] : dB=20log(E1/E2) (I1/I2)
[27] : Po=Pi(antilog(dB/10))             [28] : Pi=Po/(antilog(dB/10))
[29] : Eo=Ei(antilog(dB/20))             [30] : Ei=Eo/(antilog(dB/20)) (Io,Ii)
[31] : L(feet)=234/f(mHz) wave/4         [32] : L(feet)=468/f(mHz) wave/2
[33] : L(uH)=25330/f(kHz)^2*C(uf)        [34] : C(uf)=25330/f(kHz)^2*L(uH)
[35] : L(uH)=(Nr)^2/(9r+10l)  (in.)      [36] : N(turns)=sqr(L(9r+10l)/r (in.)
[37] : VSWR=1+sqr(Pr/Pf)/1-sqr(Pr/Pf)    [38] : FEET=DEGREES * 2.734/F(mHz)
[39] : P(out)=E * I * eff                [40] : eff(%)=P/E * I
[41] : KEYBOARD FORMULA                  [42] : EXIT

ENTER FORMULA # : ? 21


    ++++ ELECTRONIC FORMULAS ++++

[21] : Xc=1/2pi * f * C

f(Hz)     = .98E+6
C(fd)     = 500E-12

Xc(ohms) =  324.806  <A>GAIN ?
```

Figure 1. *Demo screen for FORMULAS.BAS*



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Nikon
ELECTRONIC IMAGING

Circle 151 on Reader Service Card.

```
0  'FORMULAS.BAS     +++ ELECTRONIC FORMULA INTERPRETER +++
5 'A FORTH-LIKE FORMULA INTERPRETER
10 'BY Ronald F. Balonis 3/19/85 7/12/88
50 RESTORE:CLEAR 1000:DIM STK(40),REG(40),FRML$(50),EQ$(50)
90 '
100 CLS:READ TLE$:PRINT "FORMULAS.BAS    ";TLE$:I=0
105 I=I+1:X=0:READ FRML$(I),EQ$(I):'------SHOW THE FORMULAS
110 IF INT(I/2)=I/2 THEN X=40:'------PRINT THEM 2 TO A LINE
115  PRINT TAB(X);USING"[##] : ";I;:PRINT FRML$(I);X$;
120  IF X=40 THEN PRINT:'-----------IF 2ND ONE, DO A CR/LF
125   IF FRML$(I)<>"EXIT" THEN 105:'-----IF THERE'S MORE
130    PRINT
135 '
150 INPUT "ENTER FORMULA # : ";X$:X=VAL(X$):PRINT
155  IF X<1 OR X>I THEN RUN 0:'---ILLEGAL # = ERROR, SO RUN
160   IF X=I THEN STOP:'-----OR SYSTEM
165    IF X<I-1 THEN 180:'----A FORMULA SELECTED
170     LINE INPUT "; ";EQ$(X):FRML$(X)=EQ$(X)+" "
175 '
180 CLS:PRINT TAB(5) TLE$:PRINT:'----PRINT SELECTED FORMULA
185  PRINT USING"[##] : ";X;:PRINT FRML$(X):PRINT
190  FRML$=EQ$(X):L=0:LO=LEN(FRML$)
195 SP=0:ER$=" <A>GAIN ":'----PARSE & INTERPRET THE FORMULA
200 IF SP<0 OR SP>39 THEN ER$=" ++STACK++":GOTO 300
205 L=L+1:IF L>LO THEN ER$=" ++ERROR++":GOTO 300:'-AN ERROR
210 B$=MID$(FRML$,L,1)
215 IF B$=" " THEN 205:'-------DELETE THE LEADING SPACES
220  A$=B$:'---------------FOUND THE START OF AN OPCODE
225  L=L+1:IF L>LO THEN GOSUB 250:GOTO 200:'--LOOP 4 MOR
230  B$=MID$(FRML$,L,1)
235  IF B$=" " THEN GOSUB 250:GOTO 200
240   A$=A$+B$:GOTO 225:'--AND LOOK FOR A TRAILING SPACE
245 '
250 I=INSTR("+-*/^0=",A$)+1:'--------MATH OPERANDS & ETC
255 ON I GOTO 350,260,265,270,275,280,285,290
260 SP=SP-1:STK(SP)=STK(SP)+STK(SP+1):RETURN:'          +
265 SP=SP-1:STK(SP)=STK(SP)-STK(SP+1):RETURN:'          -
270 SP=SP-1:STK(SP)=STK(SP)*STK(SP+1):RETURN:'          *
275 SP=SP-1:STK(SP)=STK(SP)/STK(SP+1):RETURN:'          /
280 SP=SP-1:STK(SP)=STK(SP)^STK(SP+1):RETURN:'          ^
285 SP=SP+1:STK(SP)=0:RETURN:'                          0
290 PRINT:PRINT RIGHT$(FRML$,LO-L);TAB(10);"= ";STK(SP);:'  =
300 PRINT ER$;:X$="":L=LO
305  INPUT X$:IF X$="A" THEN 180 ELSE RUN 0:'---RESTART AT THE TOP
340 '
350 IF LEN(A$)<>3 THEN 450:'-----MATH FUNCTIONS & FORTH OPERATIONS
355 I=INSTR("LOG SIN SQR TAN ATN COS EXP DUP STO RCL 2PI ",A$+" ")
360 IF I=0 THEN 450
365 ON I/4+1 GOTO 370,375,380,385,390,395,400,405,410,415,420
370 STK(SP)=LOG(STK(SP))/LOG(10):RETURN:'               LOG
375 STK(SP)=SIN(STK(SP)):RETURN:'                       SIN
380 STK(SP)=SQR(STK(SP)):RETURN:'                       SQR
385 STK(SP)=TAN(STK(SP)):RETURN:'                       TAN
390 STK(SP)=ATN(STK(SP)):RETURN:'                       ATN
395 STK(SP)=COS(STK(SP)):RETURN:'                       COS
400 STK(SP)=EXP(STK(SP)*LOG(10)):RETURN:'               EXP
405 SP=SP+1:STK(SP)=STK(SP-1):RETURN:'                  DUPlicate
410 SP=SP-1:REG(STK(SP+1))=STK(SP):RETURN:'             STOre
415 STK(SP)=REG(STK(SP)):RETURN    :'                   ReCaLl
420 SP=SP+1:STK(SP)=8*ATN(1):RETURN:'                   6.28
450 SP=SP+1:'------------ITS EITHER A VARIABLE OR A NUMBER
455 IF VAL(A$)=0 THEN PRINT A$;TAB(10);"= ";:LINE INPUT A$:'-ITS A VARIABLE
460  IF VAL(A$)=0 THEN ER$=" ++ERROR++":GOTO 300:'---------ZERO IS AN ERROR
465   STK(SP)=VAL(A$):RETURN
495 '
500 DATA "++++ ELECTRONIC FORMULAS ++++":'------ELECTRONIC FORMULA DATA BASE
510 DATA "f(mHz)=300/Y(meters)",                    "300 y(meters) / = f(mHz)"
515 DATA "y(meters)=300/f(MHz)",                    "300 f(MHz) / = y(meters)"
520 DATA "Rt(par)=(R1R2)/(R1+R2)","R1 1 STO R2 2 STO * 1 RCL 2 RCL + / = Rt"
525 DATA "Rt(ser)=R1+R2",                                    "R1 R2 + = Rt"
530 DATA "Ct(ser)=(C1C2)/(C1+C2)","C1 1 STO C2 2 STO * 1 RCL 2 RCL + / = Ct"
535 DATA "Ct(par)=C1+C2",                                    "C1 C2 + = Ct"
540 DATA "E=I*R",                          "I(amps) R(ohms) * = E(volts)"
545 DATA "E=P/I",                          "P(watts) I(amps) / = E(volts)"
550 DATA "E=SQR(P*R)",                  "P(watts) R(ohms) * SQR = E(volts)"
555 DATA "I=E/R",                          "E(volts) R(ohms) / = I(amps)"
560 DATA "I=SQR(P/R)",                  "P(watts) R(ohms) / SQR = I(amps)"
565 DATA "I=P/E",                          "P(watts) E(volts) / = I(amps)"
570 DATA "R=E/I",                          "E(volts) I(amps) / = R(ohms)"
575 DATA "R=P/(I*I)",                   "P(watts) I(amps) DUP * / = R(ohms)"
580 DATA "R=E*E/P",                    "E(volts) DUP * P(watts) / = R(ohms)"
585 DATA "P=I*I*R",                      "I(amps) 2 ^ R(ohms) * = P(watts)"
590 DATA "P=E*I",                          "E(volts) I(amps) * = P(watts)"
595 DATA "P=E*E/R",                    "E(volts) DUP * R(ohms) / = P(watts)"
600 DATA "f(Hz)=1/2PI*SQR(L*C)",        "1 C(Fd) L(H) * SQR 2PI * / = f(Hz)"
605 DATA "f(kHz)=159.2/SQR(L*C)",       "159.2 L(uH) C(uF) * SQR / = f(kHz)"
610 DATA "Xc=1/2pi * f * C",            "1 2PI f(Hz) C(fd) * * / = Xc(ohms)"
615 DATA "C=1/2pi * f * Xc",            "1 2PI f(Hz) Xc(ohms) * * / = C(fd)"
620 DATA "Xl=2pi * f * L",                          "2PI f(hz) L(H) * * = Xl"
625 DATA "L=Xl/2pi * f",                        "Xl(ohms) 2PI f(Hz) * / = L(H)"
630 DATA "dB=10log(P1/P2)",             "P1(watts) P2(watts) / LOG 10 * = dB"
635 DATA "dB=20log(E1/E2) (I1/I2)",     "E1(volts) E2(volts) / LOG 20 * = dB"
640 DATA "Po=Pi(antilog(dB/10))",                   "Pi dB 10 / EXP * = Po"
645 DATA "Pi=Po/(antilog(dB/10))",                  "Po dB 10 / EXP / = Pi"
650 DATA "Eo=Ei(antilog(dB/20))",                   "Ei dB 20 / EXP * = Eo"
655 DATA "Ei=Eo/(antilog(dB/20)) (Io,Ii)",          "Eo dB 20 / EXP / = Ei"
660 DATA "L(feet)=234/f(mHz) wave/4",               "234 f(mHz) / = L(feet)"
665 DATA "L(feet)=468/f(mHz) wave/2",               "468 f(mHz) / = L(feet)"
670 DATA "L(uH)=25330/f(kHz)^2*C(uf)",  "25330 f(kHz) 2 ^ C(uf) * / = L(uH)"
675 DATA "C(uf)=25330/f(kHz)^2*L(uH)",  "25330 f(kHz) 2 ^ L(uH) * / = C(uf)"
680 DATA "L(uH)=(Nr)^2/(9r+10l)  (in.)"
685 DATA   "N(trns) r(rad) 1 STO * DUP * 9 1 RCL * 10 1(lgth) * + / = L(uH)"
690 DATA "N(turns)=sqr(L(9r+10l)/r (in.)"
695 DATA "L(uH) 9 r(rad) 1 STO * 10 1(lgth) * + * 1 RCL 2 ^ / SQR = N(trns)"
700 DATA "VSWR=1+sqr(Pr/Pf)/1-sqr(Pr/Pf)"
705 DATA                "P(refl) P(fwd) / SQR 1 STO 1 + 1 1 RCL - / = VSWR"
710 DATA "FEET=DEGREES * 2.734/F(mHz)",         "DEG 2.734 * F(mhz) / = FEET"
715 DATA "P(out)=E * I * eff",   "E(volts) I(amps) eff(%) 100 / * * = Power"
720 DATA "eff(%)=P/E * I",      "P(out) E(volts) I(amps) * / 100 * = eff(%)"
725 DATA "KEYBOARD FORMULA","","EXIT",""
730 '
750 '-----------------THE END OF THE PROGRAM----------------------
```

Figure 2. *FORMULAS.BAS, a program that remembers 40 engineering formulas.*

The formula database consists of two DATA strings for each formula. The first DATA string is for display on the screen—it's the ordinary English "infix" notation for the formula.

The second DATA string for each formula is the program for solving the formula, using the math operands and functions, the variables and the Forth-like operations. The program sequence is in Reverse Polish "postfix" notation and a space delimits the opcodes—anything not an operand or a function is a variable, and variables prompt for an input value. The math operands are +, −, *, /, ^, 0 and =. The equal sign prints the TOP of the stack, preceded by the label following the equal sign in FRML$. The math functions are LOG, SIN, SQR, TAN, ATN, COS, EXP. The Forth-like stack operations are DUP to duplicate the TOP of the stack into TOP-1; STO to store TOP-1 into REGISTER (TOP); RCL to Recall REGISTER(TOP) into TOP of the stack; and 2PI puts 6.28 on the TOP of the stack.

The coding of each formula's program is in Reverse Polish postfix notation—the operands and functions follow the variables. The easy way to write a formula program is to write out exactly how you do it by hand. Even though you may read the formula in "infix" notation, you actually use "postfix" notation to solve it. Use [41] : KEYBOARD FORMULA to either write the program sequence for equations not on the list, or to replace some with your own.

The demo screen shows the sign-on formula selection screen and one example. Just select a number and enter the variables as it prompts for them. Enter A to do the same formula again, a null enter for a new selection or 42 to exit the program. Since the formulas are programmable, they can easily be changed by following the ones in the formula database, using [41] : KEYBOARD FORMULA to write the coded program sequence, then editing them into the database. ■

Balonis is chief engineer of WILK, Wilkes-Barre, PA. His Compute programs are available for download on A/V Sync, Atlanta, (404) 320-6202 and Broadcasters Computer Database, Houston, (713) 937-9097.

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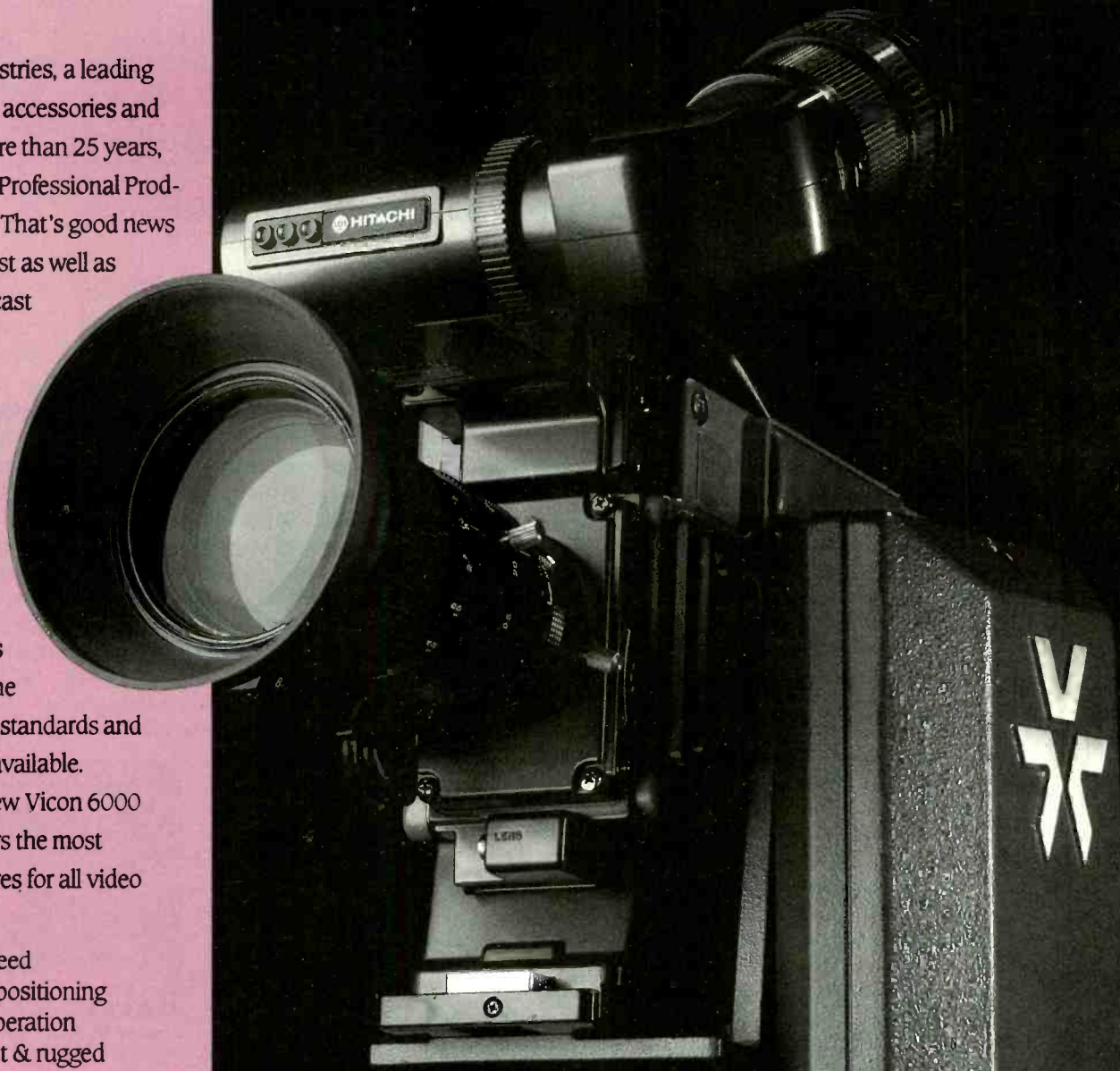

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FAA's EMI Concerns Threaten Application Interference

By Harry Cole

Over the last year or two, the FCC has opened a variety of opportunities for new and improved facilities of all sorts, especially in the FM service. While resultant overloading of the Commission's processes has resulted in long delays in some areas, we have generally been enthusiastic about the possibilities the FCC has offered the broadcast industry. Now, however, a stumbling block could preclude many of the improvements the FCC has so diligently sought to encourage. The stumbling block is *not* the Commission; rather, it is the Federal Aviation Administration and its zealous and (arguably) overprotective standards for electromagnetic interference (EMI).

The problem of EMI is not itself brand-new. In fact, at least one prominent aeronautical consultant who works regularly with broadcasters expressed concern about its likely impact on broadcast applications some four years ago. However, because of the nature of the concerns underlying the FAA's EMI policies, and because of the then-applicable FCC policies on upgrading, those expressions of concern went generally unheeded. What makes things worse now is that the FAA recently implemented a new computer program designed to screen for potential EMI problems. Initial reports indicate that that program is almost guaranteed to lead to the rejection of many, if not most, upgrade applications.

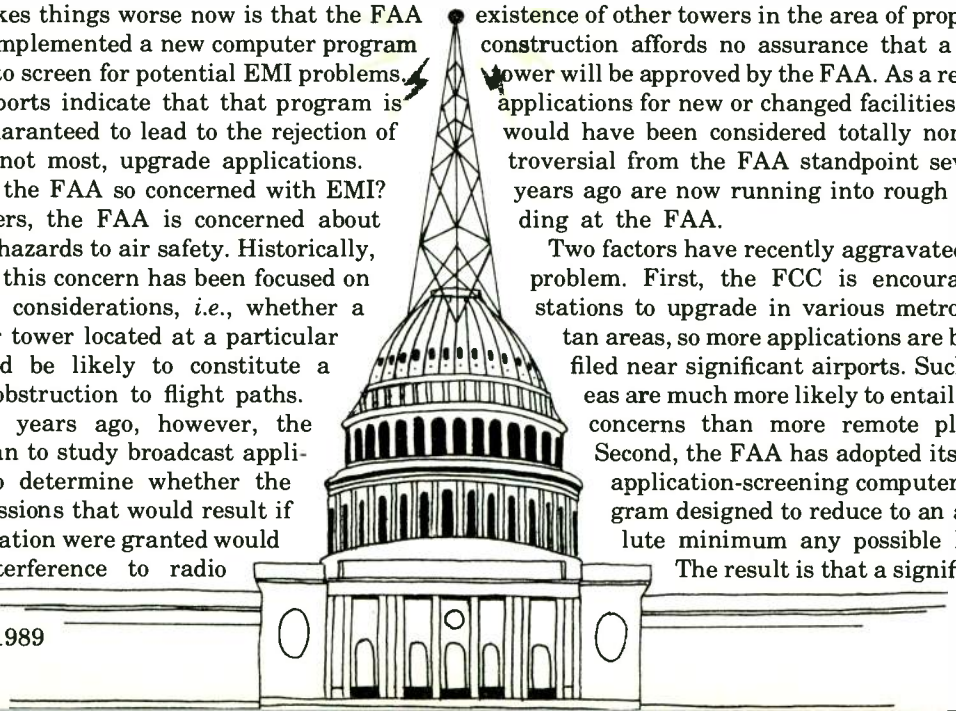
Why is the FAA so concerned with EMI? For openers, the FAA is concerned about potential hazards to air safety. Historically, of course, this concern has been focused on *structural* considerations, *i.e.*, whether a particular tower located at a particular site would be likely to constitute a *physical* obstruction to flight paths.

Several years ago, however, the FAA began to study broadcast applications to determine whether the radio emissions that would result if the application were granted would cause interference to radio equipment used for aeronautical communications or navigation. Not only do pilots and airports use radio for voice communications, but airplanes are equipped with sensitive radio equipment for navigational purposes and many airports utilize radio gear for such applications as instrument landing systems. The FAA is understandably and justifiably interested in assuring a minimum of harmful interference to all such radio operations since the safety of air travel hangs in the balance.

The trouble is that the FAA's screening for EMI sweeps very broadly, reaching areas that might otherwise have been thought to be geographically remote from any airport and, therefore, not likely to engender any air hazard problems. Instrument landing systems extend several miles beyond the areas that normally would be viewed as aeronautically sensitive if physical obstructions were the only consideration. Additionally, since EMI involves radio spectrum impact and not physical impact, the existence of other towers in the area of proposed construction affords no assurance that a new tower will be approved by the FAA. As a result, applications for new or changed facilities that would have been considered totally noncontroversial from the FAA standpoint several years ago are now running into rough sledding at the FAA.

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

Two factors have recently aggravated the problem. First, the FCC is encouraging stations to upgrade in various metropolitan areas, so more applications are being filed near significant airports. Such areas are much more likely to entail EMI concerns than more remote places. Second, the FAA has adopted its new application-screening computer program designed to reduce to an absolute minimum any possible EMI. The result is that a significant



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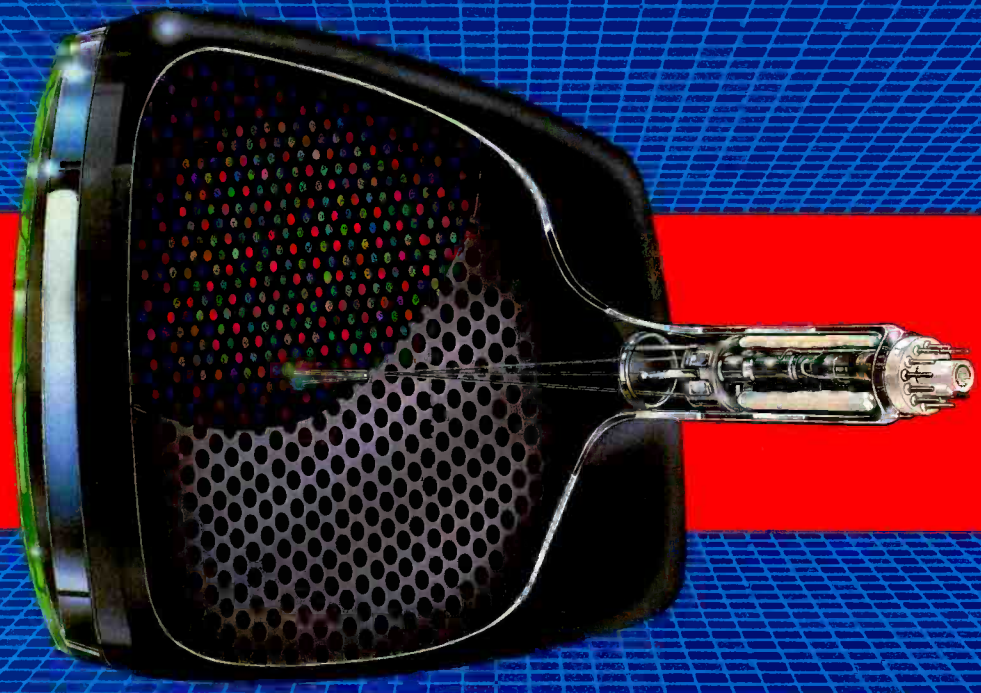

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number of applications have run amok of the FAA even though those applications are otherwise grantable.

A number of communications engineers who have reviewed the FAA's computer program believe that that program is vastly overprotective. That is, by virtue of various elements of the program, many broadcast applications will be deemed potential hazards to air navigation even though, in the real world, the risk of harmful interference is negligible. In other words, the FAA's goal of safe airways could be achieved *without* the rejection of many, if not most, applications.

Interestingly, when the FAA's concern about EMI was in its early stages several years ago, the FCC and the FAA worked out an informal way of dealing with it which did *not* include FAA issuance of determinations of hazard. Instead, as set forth in an exchange of letters between Mark Fowler, then chairman of the FCC, and Donald Engen, then administrator of the FAA, it was agreed that, in cases where the FAA was concerned about potential EMI, the FAA would so advise the FCC, and the FCC would grant the application subject to a condition that the licensee/permittee would be responsible for correcting any EMI that might be detected within one year of the commencement of operations. Further, if such EMI could not be corrected, the licensee/permittee would be required to cease operations. The informal FCC-FAA agreement provided that this condition would "self-destruct" after one year if no EMI occurred during that period.

Now, the FAA seems to be ignoring its own informal arrangement with the FCC and is instead issuing determinations of hazard that effectively prevent the FCC from granting construction permits.

This raises interesting questions concerning the relationship between the FCC and the FAA. As a matter of "turf," the FCC normally would be deemed to be the agency with the most expertise and authority relative to radio interference. Thus, it would make more sense for the FCC, rather than the FAA, to be the final arbiter of whether or not harmful interference may or will occur. On the other hand, the FAA is the agency charged with the responsibility of keeping air navigation safe for all of us. There are weaknesses in the FAA's position, of course. First, the informal FCC-FAA arrangement struck several years ago certainly seemed to accommodate both agencies' respective interests adequately, as far as the agencies were concerned; if so, what was the need for any change?

Secondly, while the FAA is justified in seeking to protect aeronautical radio use, it should be subject to reasonable limitations in that effort. For example, the easiest way to provide absolute assurance of such protection would be to preclude the use of the radio spectrum for any use except for aeronautical communications and navigation, which would prevent all broadcasting, private radio, business radio, amateur radio, etc. It would

New FAA procedures are almost guaranteed to lead to the rejection of many, if not most, upgrade applications.

appear that the appropriate course would be the adoption of *reasonable* standards that would govern the EMI analysis. Such standards should be adopted by the FCC, with input from the FAA.

What if the FAA declines to abide by the terms of the FCC-FAA arrangement? There is, unfortunately, not much you can do. The FAA's procedures do include mechanisms for appealing determinations of hazard. Those mechanisms, however, are normally slow and can require up to a year or two for resolution within the FAA, not counting any time for appeal. But following through with the FAA's appeals process is probably the best approach to take for the time being. The EMI problem is now being focused on by a number of broadcasters, consulting engineers and communications attorneys. It is likely that some or all of these groups (and possibly others) will press wherever possible (in the agencies, the Congress, and the courts) for changes in the FAA's position. By patiently pursuing appeals through the FAA's system, you will be maximizing the likelihood that you will be able to take advantage of any changes which might come from those efforts.

If you have any questions about any of this, contact your communications counsel. ■

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BUSINESS BRIEFS

Sony Corp. recently celebrated the sale of its 50,000th three-chip CCD camera worldwide. Sony's first production model three-chip camera was introduced at NAB '86. The company has also announced the sale of 10 Library Management Systems units to **CBS Inc.** . . . CBS has also agreed to purchase 12 transponders on two satellites owned by **Hughes Communications, Inc.**, Los Angeles. The satellites are scheduled to begin operations in mid-1993 . . . Initial shipment has begun on the downstream multikeyer introduced as an option for **Ross Video's** model 416 production switcher. The first unit was retrofitted to a model 416 in the field at a post-production house in Japan . . . **CMX** has loaned a CMX-6000 editing bay to UCLA Extension for use in filmmaking classes and in courses on editing techniques. The unit is housed at Extension's Westwood Village Center . . . **International Video Systems** has hired **B & B Systems**, Valencia, CA, to redesign and move IVE's post-production facility from Newbury Park to Van Nuys . . . Remember those startling images of Neptune we all saw back in August? Those pictures were the work of two **Lyon Lamb** RTC realtime scan converters at the Jet Propulsion Laboratories, which converted Sun workstation graphics into NTSC in real time.

Doug Di Giacomo, formerly Midwest regional sales manager for JVC Professional Products, has joined **Digital F/X**, Mountain View, CA, as Midwest regional manager . . . **Gentner Electronics**, Salt Lake City, has named Hugh R. Heinsohn director of corporate development. In addition, Gentner's chief operating officer, William V. Trowbridge, has assumed product management responsibilities from the company's director of marketing development . . . Robert E. Lambdon has been appointed national sales manager for **Microtime, Inc.**, Bloomfield, CT.

Cinema Products will host an intensive training course on its Steadicam camera stabilization system in Palm Desert, CA, December 3–9, 1989 . . . February 1–3, 1990 are the dates for the **1990 INFOCOMM International** show, at the Anaheim Convention Center in Anaheim, CA.

Broadcast Technology Partners, developer and licenser of the FMX system, has relocated its laboratory and technical operations to Bloomfield Hills, MI . . . **Utah Scientific** has moved to expanded quarters at 4750 Wiley Post Way, Salt Lake City, UT 84116; telephone (801) 575-3298.

Harris Corp., Melbourne, FL, has announced a major restructuring, including a fourth-quarter charge of $85 million, designed to allow greater focus on four core-business areas—advanced electronics systems, semiconductors, communications and office-equipment distribution.

Intelco Corp., Acton, MA, has released a pocket guide for its Model 160B laser loss set. The guide demonstrates two methods for testing attenuation end to end on installed fiberoptic systems . . . The **National Association of Broadcasters** has published its *Broadcaster's Property and Liability Insurance Buying Guide*, which reviews types of coverage available and provides guidance in evaluating coverage. ■

Producer-director Stephen Spielberg (right) and Steve Yuhas, vice president of Panasonic's Audio Video Systems Group, discuss the requirements for the Boy Scouts of America's new cinematography merit badge. The award is co-sponsored by Spielberg and Panasonic AVSG, which donated 50 AG-170 camcorders and 200 pieces of videotape for Scouts to fulfill the badge requirements.

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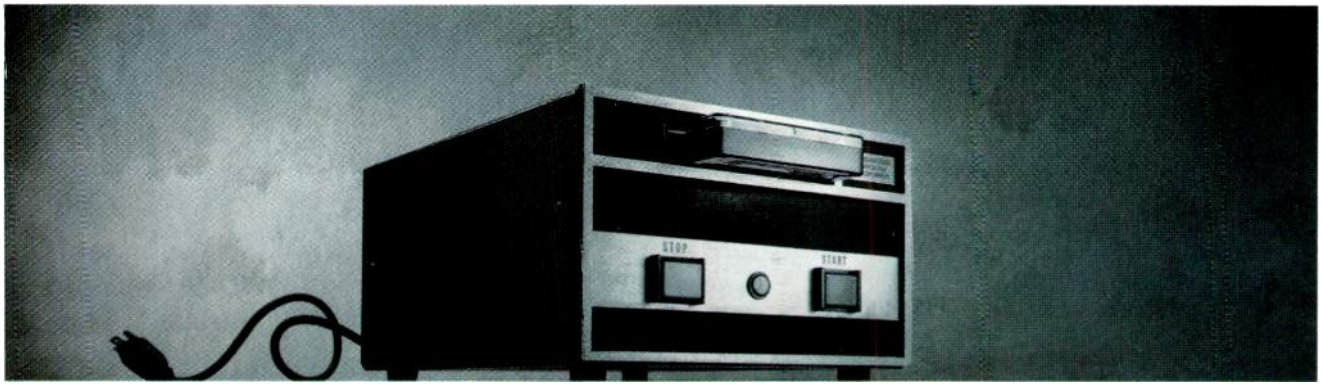

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