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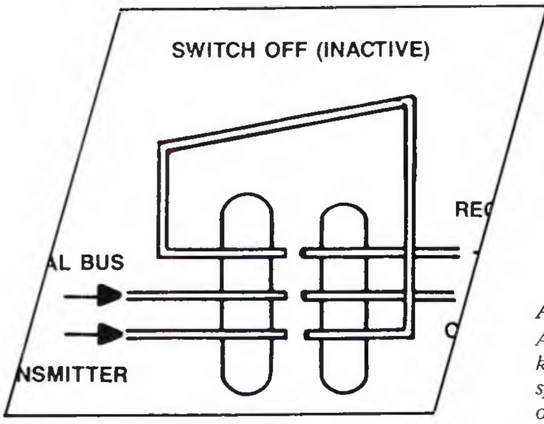

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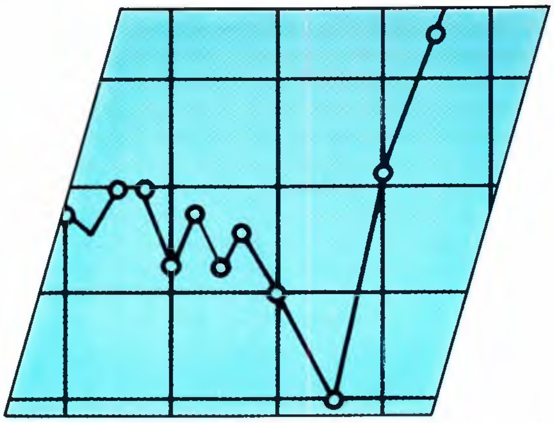

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AUDIO-VIDEO CONTROL SYSTEMS:

A broadcast facility is a complicated mix of technology. The key to an efficient operation is to make sure all of the systems within a given plant work together and talk to each other. This month, we look at the critical requirements for controlling audio and video signals within a broadcast facility.

OTHER FEATURES:

ON THE COVER

Computers have reshaped production and broadcast facilities, providing new solutions to old problems. Once viewed with skepticism by audio and video professionals, computers have become the central control point for many facilities. Shown is a computer-based video test-signal generating system. (Cover provided by Magni Systems, designed by David Henderson and photographed by Tracy Brown.)

DEPARTMENTS

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By Paula Janicke, staff editor

Merger ahead?

Chyron Corporation and Midwest Communications Corporation have authorized investment bankers to explore combining the two companies on a tax-free stock-by-stock basis.

Chyron Corporation, Melville, NY, designs, manufactures and markets Chyron, DSC, CMX and Aurora products. Midwest Communications Corporation, Edgewood, KY, is an independent distributor of products and systems to the video and broadcast industries. The combined company would have more than $200 million in annual revenues and a sales force of more than 250 persons. Currently, Midwest is Chyron's largest customer.

According to Alfred O.P. Leubert, chairman of the board, president and CEO of Chyron, the combination is a natural extension of Chyron's close relationship with Midwest. Both Leubert and David K. Barnes, president and CEO of Midwest, anticipate prompt finalization of the agreement.

Operational details of the planned combined company have yet to be finalized. Leubert, however, foresees both companies continuing to operate autonomously, with each drawing on the other's strengths.

Cable Labs joins forces with ATTC

Cable Television Laboratories, Boulder, CO, and the Advanced Television Test Center (ATTC) have announced an agreement to cooperatively test high-definition and other advanced TV systems. The agreement stipulates that Cable Labs, a research and development consortium of cable TV system operators, will pay the ATTC up to $2.5 million over a 3-year period for the use of its facilities and ATV test signals.

The ATTC, which has developed technology to generate test signals for the various ATV systems, will provide the signals to the various systems operating in a simulated over-the-air broadcast environment. Cable Labs will run these signals through a cable and fiber-optic test bed that approximates an actual cable system. These tests will be used to compile data about the effects of ATV systems that are connected directly to cable systems as well as the effects of cable retransmission of over-the-air broadcast signals.

SBE exam sessions set

Following are the dates scheduled for the 1989/1990 SBE certification exams and application deadlines:

- Oct. 7, coinciding with 1989 SBE convention. (Apply by Aug. 11.)
- Nov. 10-20. (Apply by Sep. 8.)
- March 31, coinciding with 1990 NAB convention. (Apply by Feb. 9.)
- June 8-18. (Apply by April 11.)

BROADCAST ENGINEERING

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Advertising offices listed on page 143.

INTERTEC PUBLISHING CORPORATION

FCC update

Class A FM power increased

By Harry C. Martin

The commission has increased the maximum effective radiated power for FM Class A from 3,000W to 6,000W. To qualify for the increased power, Class A stations must meet new separation requirements for Class A and all other FM classes. To maintain the current level of protection for existing stations, the commission refused to adopt an across-the-board 6kW increase.

In November, the commission will publish a list of approximately 500 existing Class A stations at locations that presently meet the new separation requirements. If the licensee of a listed station can increase power through simple technical means (by increased transmitter power), it will be allowed to do so on or after Dec. 1 of this year, as long as the public would not be subjected to RF radiation in excess of ANSI levels. These licensees must simply notify the commission when they begin operation with increased power and file an FCC Form 302 within 10 days of the increase. Licensees of other Class A stations, and those stations that do not meet ANSI standards, will be required to obtain a construction permit by filing an FCC Form 301 establishing compliance with all FCC rules.

If an existing Class A station does not meet the new separation requirements, it will be "grandfathered." Grandfathered stations will be permitted to relocate or make modifications under the previous power limit and separation requirements, or under technical conditions that present no greater potential for interference than the previous limit, such as through the use of a directional antenna.

Multiple ownership rule changes

The commission has affirmed its action in February 1989 relaxing the broadcast multiple ownership rules. At that time, the FCC decided to retain its one-to-a-market rule, but established a new waiver policy for common ownership of radio and TV stations in the same market.

Under the one-to-a-market waiver policy, the FCC will look with favor upon waiver applications involving radio and TV station combinations in the top 25 markets where at least 30 separately owned, operated and controlled broadcast licensees or "voices" will exist after the proposed combination.

The FCC also will look favorably upon waiver requests for proposed combinations involving at least one "failed" station (a station that has not been operating for a substantial period of time or that is involved in bankruptcy proceedings). For proposed combinations not meeting either of these criteria, a more rigorous case-by-case analysis would be made. The analysis would include consideration of the following factors: the types of facilities involved, the number of stations already owned by the applicant, the financial difficulties of the stations and the nature of diversity and competition in the market. However, no waiver application would be granted if the proposed combination would result in any one entity holding an attributable interest in more than one AM and one FM radio station within any single TV "metro" market.

The commission also decided to modify its previous statement barring waivers that involved combinations of a TV station and more than one radio station in the same service. It said a flat prohibition precluded the FCC from evaluating, on a case-by-case basis, combinations that could be demonstrated to be uniquely in the public interest. However, the FCC emphasized it did not foresee approving any combination involving a TV station and more than one radio station in the same service unless it could be demonstrated that the combination would provide unique public interest benefits.

Antenna lighting requirements enforced

The commission has fined a California station $8,000 for not lighting its tower. The station was fined an additional $1,000 for indicating in its station log that the lighting had been inspected and was functioning.

The commission again has warned licensees that it will continue close scrutiny of antenna towers to ensure that they are properly marked and lighted. Daily inspections are required to ensure that the lights are on and operating properly. If an outage occurs, the local FAA flight service station must be contacted immediately.

Station personnel must be fully aware of these requirements and make sure the proper inspections are being made. The commission is monitoring this matter carefully. Failure to comply could result in a substantial fine.

Sonrise to be investigated

In response to information indicating that its processes may have been abused by Sonrise Management Services, the commission has instituted an investigatory proceeding pursuant to section 403 of the Communications Act. Documents on file with the FCC indicate Sonrise may have sponsored more than 160 FM applications over the past several years, only a few of which ever have been granted.

The information before the commission raised serious questions as to whether Sonrise, its applicants and their attorneys, consultants and advisers engaged in a pattern of conduct constituting an abuse of the commission's processes and violations of the Criminal Code.

The commission concluded that, in view of the more than 160 applicants created by Sonrise, a single investigatory proceeding is warranted to consider whether such violations have occurred. The commission stated that it is appropriate for the Mass Media Bureau to develop a record that fully considers all aspects of Sonrise's activities concerning any and all applications that have been dismissed and that are no longer the subject of a pending or proposed hearing proceeding.

The commission directed that the presiding administrative law judge complete the investigation soon so that a final report can be promptly submitted by the chief, Mass Media Bureau, to the Criminal Division of the Department of Justice.

Martin is a partner with the legal firm of Reddy, Begley & Martin, Washington, DC.

Editor's note: For additional FCC information, !GO BPFORUM on CompuServe.

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Circle (7) on Reply Card

Exploring battlefield fiber

By Rick Lehtinen, TV technical editor

Fiber-optic signal systems have proved their worth in a variety of situations. One niche for which they were thoroughly touted, however, was rarely used; electronic news gathering (ENG). Fiber just wasn't tough enough, and the terminal gear was heavy.

Because of military requirements for non-jammable observation and communications systems, many government dollars have gone into perfecting fiber-optic equipment. The result; fiber-optic equipment that is both lightweight and reliable. The new fiber-optic gear is battle-rugged, and is sure to resist the destructive instincts of even the most aggressive ENG photographers.

***Figure 1.** Tele-operated platform pays out fiber as it wanders over nearly any terrain. A fiber remote-control cable sends signals back to the operator.*

Battlefield fiber has three broad uses. The first is FOG-M (fiber-optic-guided missile). These missiles are wire-guided. The projectile streams fiber out behind it as it flies. Signals from the bazooka-like launching device are transmitted up to the missile, allowing it to steer toward its target. The noise immunity of the fiber tether resists attempted jamming of the control information as it propagates up the tether.

A second battlefield fiber application is the aerial balloon or remotely piloted vehicle (drone). These devices float or fly near the front, and send back pictures of what lies ahead.

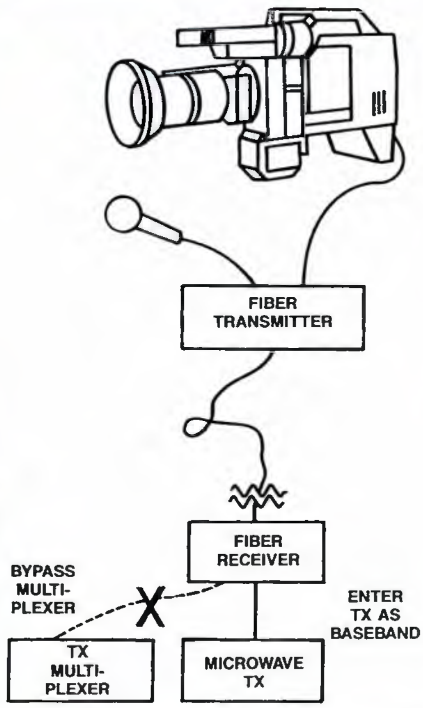

***Figure 2.** User-adjustable audio subcarrier frequencies on an advanced fiber-optic system allow video and audio signals to be transmitted in a baseband format from the camera into the station. This eliminates many conversion steps, greatly reducing noise degradation of the microwave signal.*

A more down-to-earth fiber application is the tactical multipurpose automated platform, or TMAP. (See Figure 1.) The 600-pound, diesel-electric platform is hinged in the middle for agility and surefootedness. It can negotiate almost any terrain. Observation cameras and laser range finders may be fixed to a remotely controlled pan and tilt head, and the device can be sent forward to stalk tanks or map minefields. It also can serve as an artillery spotter.

Of course, weaving through the woods and over rocks is hard on fiber. Apparently the fiber, developed by a division of Corning, is worthy of the challenge. The connectors are tough metal affairs about the size of a hunting knife handle. It's been said that if you were to connectorize the bumpers of two cars, the fibers and connectors could be used as a towrope. Tanks have danced on this stuff. If you knot the fiber and pull it tight, it will still operate. This sort of treatment would shut down most broadcast fibers right away.

Terminal gear

Of course, such tough fiber is of little use if the terminal gear on either end is too bulky for portability. The good news is, it's not. The company marketing the system to the video industry had the good sense to hire a designer familiar with broadcasting. This resulted in a series of portable, rugged systems, with the smallest unit nearly the size of an intercom beltpack. The subcarriers used to carry the audio from the camera end back to the receiver are user-adjustable to match the subcarriers used in the station microwaves. This means that at the ENG truck end, the fiber output can be plugged into the transmitter as a baseband signal, avoiding a stage of decoding and recoding. If another system was installed between the ENG receive point and the studio, the signal could be kept in baseband all the way home. (See Figure 2.) It would result in a tremendous improvement in signal-to-noise ratio for both the audio and video portion of the received ENG signals.

Acknowledgment: The author wishes to thank Jusse Russmisel, PCO, Chatsworth, CA, for his assistance in preparing this article.

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Circle (8) on Reply Card

Taking the measure of your station

By John Battison, P.E.

Bandwidth compliance, or *splatter control*, is now one of the hottest items on the FCC's agenda, and the means of checking it are limited. Can a selective receiver with a crystal filter be used to check bandwidth compliance? I don't think that such an instrumentation would be adequate to satisfy the requirements, because the time needed to set up the device and make the measurements would be excessive. I recommend an alternative approach.

What is splatter?

Just what is splatter? You won't find it in any technical dictionary yet, but a definition like this may soon appear: Splatter is the undesired portion of a station's output spectrum caused by modulation. Therefore, power-supply hum, sidebands and RF harmonics are not splatter, nor are co-channel and first-adjacent channel interference normally considered to be splatter. However, second- and higher-adjacent channel interference *is* splatter.

Engineering definitions depend partially upon engineering opinion as shaped by regulation. As most of us know, the presence of high-frequency audio components at the modulator input is the main cause of splatter. We're not going to discuss the problems associated with clipping and limiting. However, a typical source of splatter is inadequate clipper filtering.

Transmitting the higher-order transmission sidebands not only wastes power, because listeners cannot hear them, but these high audio frequencies also intermodulate in the transmitter and produce distortion in the audible, desired portion of the signal.

Incidental phase modulation (IPM) also can result in increased splatter. Phase modulation sideband pairs resulting from IPM also will affect envelope detectors, if they have been distorted by asymmetrical bandpass circuits. The tuned circuits convert some energy into AM sidebands, which adds distortion.

Battison, BE's consultant on antennas and radiation, owns John H. Battison and Associates, a consulting engineering company in Loudonville, OH, near Columbus.

Poor man's spectrum analyzer

To the best of my knowledge, there is only one manufacturer of splatter monitors, so I don't think that I'm showing any bias by discussing its use as a poor man's spectrum analyzer.

Most engineers probably think of the monitor as being rack-mounted and stationary. Delta makes a device known as an *active whip antenna* that disproves that idea. Because the monitor operates from 240Vac down to 12Vdc, it can be powered from a standard 12Vdc cigarette lighter.

An engineer equipped with such a monitor and whip antenna can visit the client and spend an hour checking the emission bandwidth to complete an emission report. Although NRSC-1 users are not required to develop such a report, other stations must complete some type of bandwidth measurement.

Monitoring splatter is also invaluable when, for example, an uncooperative station is overmodulating and transmitting an overly compressed signal that produces splatter. A quick check of the offender's signal gives management a big stick to wield if necessary. The process also shows both managers the advantage of having an engineer on the staff.

Assuming that you have NRSC-1 in use, how do you know that it is performing as designed? The splatter monitor will evaluate this for you (which should impress the manager and program director). They can see how their station compares with others and what the NRSC-1 filter really accomplished.

Performing mobile measurements is worth a reasonable extra fee for a contract engineer, or for a chief engineer who might own one and offer moonlight services. It certainly should not be included in the regular contract engineer service.

Delta has prepared a "Sideband Measurements" form, which is available from John Bisset along with a complete package of emission bandwidth material. Contact the company for additional information. Inclusion of a similar, properly prepared form in the maintenance log should ensure a safe visit from the FCC.

An extra benefit of monitoring splatter is that it provides a simple way to monitor IPM. Older transmitters with modulation problems or improperly adjusted audio feedback circuits often sound mushy, or have more blurred sound rather than clearly heard individual notes.

By using the "0kHz to 100kHz" measurement position, you can measure IPM and reduce it if necessary. First, make sure that the transmitter is tuned properly and modulation levels are set. New modulator tubes also are a good investment. Feed no more than 50% modulation into the transmitter (mono), and read incidental quadrature modulation IQM (this is almost the same as IPM at low modulation levels). It probably will indicate about −10 on the meter if the transmitter has not been optimized. Naturally, the lower the reading, the better the operation.

Adjust the tuning controls and plate neutralizing capacitor for minimum IQM. It often is possible to produce amazing results in this manner, especially in older, less precisely neutralized transmitters. A final reading of −25 or lower should offer a noticeable improvement in clarity.

Field applications

I recently had the opportunity to use a splatter monitor and active whip antenna. I drove to an area where the signal strength was high and installed the equipment in my car by plugging it into the cigarette lighter. I placed the antenna on the car roof and tuned in the station.

Following the manual's instructions, I measured my client's splatter. This particular station is using NRSC-1, and as expected, the monitor showed compliance. I then went to the station and connected the device into the modulation monitor feed.

After setting up the equipment, I measured IPM (IQM). It was a poor −9. Adjusting the transmitter neutralizing capacitor proved difficult. I had to open interlocks and go inside to adjust the knob, then close the back, fire up and make a measurement. Once I discovered which way to turn the capacitor, I quickly brought IPM down to −26. The improved clarity of the signal was quite noticeable, and my client was highly impressed.

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Circle (9) on Reply Card

Team goes to work in robotics center

By Elmer Smalling III

NASA's Goddard Space Flight Center has opened its robotics facility, where Goddard's robotics team will create, test and evaluate new robotic technologies to support the upcoming space station. The nucleus of this center will be the Flight Telerobotic Servicer (FTS), a robotic device that combines tele-operation (remote human manipulation) with autonomous capabilities for performing space station tasks.

The new facility contains a gantry robot, which is 40 feet wide, 60 feet long and 20 feet high, with six degrees of freedom. The robot is capable of lifting up to two tons of payload and applying 4,000 foot-pounds of torque. Suspended from one mast of the gantry will be a set of tele-operated industrial arms, which will be used as an FTS operational simulator. Another mast carries a grapple to emulate the space station's remote manipulator system, the SPDM (Special Purpose Dexterous Manipulator). It will be used primarily to transport payloads to and from the work site. (See Figure 1.)

Smalling, **BE**'s consultant on cable/satellite systems, is president of Jenel Systems and Design, Dallas.

The new Goddard facility also includes an operator workstation installed in a mockup of the space shuttle's flight deck. This simulator will permit manipulation of the robot, providing valuable information about the operation of FTS in the constrained environment of the shuttle.

The simulator uses computer-animated graphics to determine such things as the robotic assembly's reach capability and to provide collision-avoidance information. High-level robotic engineering, developed around the world, will go into the FTS project. This project will produce many beneficial spin-offs for the general public, and also will improve and advance the already state-of-the-art fields of artificial intelligence and knowledge-based systems technology.

Medical space bridge

In more down-to-earth matters, in May, dozens of medical-center physicians in Baltimore, Houston, Salt Lake City and Bethesda, MD, took part in satellite teleconferencing from 9 a.m. to 1 p.m. daily to discuss cases. What made it unique is that they were conferring with physicians and other medical personnel in Armenia (near the site of the great earthquake), Moscow and the city of Ufa (in the Ural Mountains, where a train gas explosion killed and injured hundreds).

Using the audio and video capabilities of satellite telecommunications, the physicians discussed difficult medical and surgical cases that involved plastic and reconstructive surgery, orthopedics, prosthetics, burn treatment, epidemiology and psychological treatment. The patients often were present at these conferences, along with their CT scans, X-rays and other relevant data. The physicians were able to learn a lot from viewing patients in addition to reading and interpreting their transmitted vital statistics. The project was named the "U.S./Soviet Space Bridge."

This sort of remote diagnosis could be used in areas of this country where sophisticated medical help is not available. In the early 1970s, a government project to remotely diagnose medical problems using TV pictures transmitted by satellite was unsuccessful because of picture-quality problems inherent with the low-cost color cameras then available. Exact tissue color is crucial in many diagnoses. Now that rugged, inexpensive TV color cameras and high-quality fiber-optic and satellite transmission systems provide true-to-life color, remote diagnosis is quite feasible.

Titan military launch

The Titan 34D launch vehicle proved itself once again with the launch on May 10 of two DSCS (Defense Satellite Communications Systems) satellites from Cape Canaveral. These satellites will be used for communications between the White House and military commanders around the world. When complete, the DCSC system will consist of four of these satellites spaced equidistantly around the globe in geosynchronous orbit.

The satellites are 3-axis, stabilized devices with attitude control provided by four inertial reaction wheels, 0.3- to 1-pound thrusters powered from a 600-plus-pound hydrazine reservoir, and Earth and sun sensors. The antenna system includes a 60-beam-forming network for exact spot coverage as well as for protection against jamming.

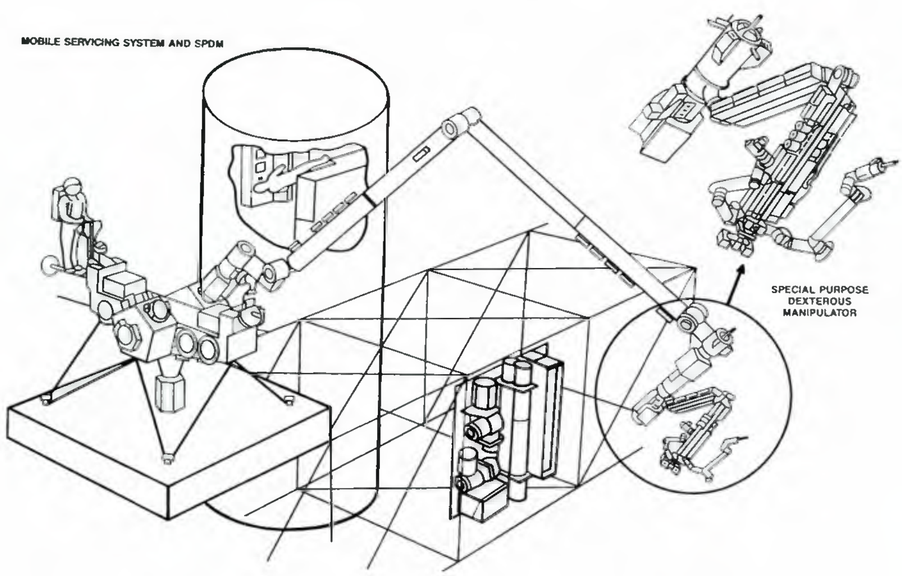

Figure 1. *Special-Purpose Dexterous Manipulator is shown deployed on a shuttlelike arm, a part of the Flight Telerobotic Servicer system.*

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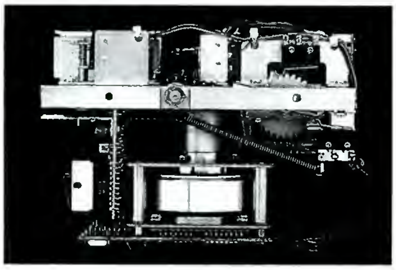

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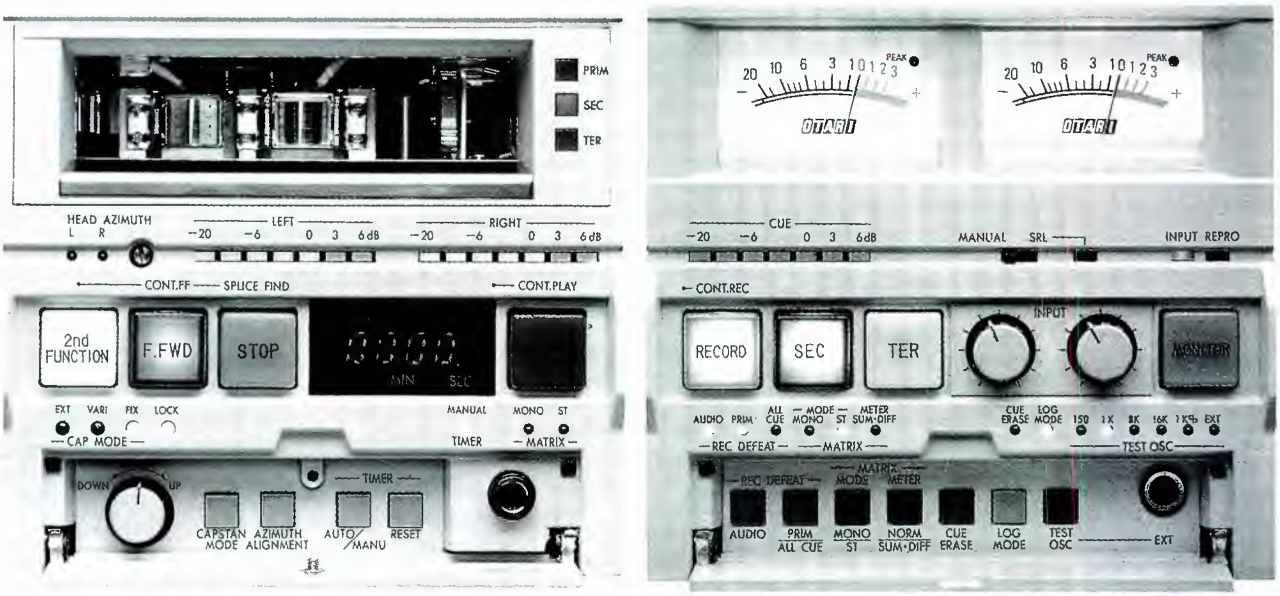

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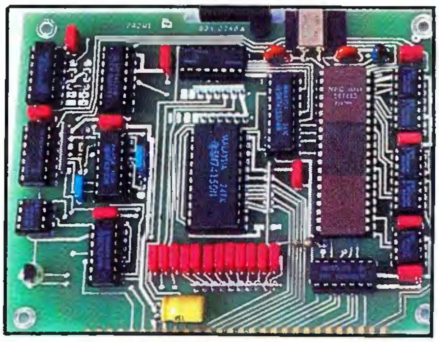
Using thermistors for time delay



By Gerry Kaufhold II

With some thermistor circuits, designers must make sure that current flow in the lead wires of a thermistor doesn't lead to self-heating, which would introduce errors in measuring and controlling temperature. A thermistor application also can use self-heating as an integral part of circuit operation. These circuits include time delays, surge suppression, overload protection and timing circuits.

For a thermistor with a negative temperature coefficient (NTC), the resistance decreases as the temperature increases. To use an NTC thermistor for timing, apply energy to the thermistor to make it self-heat. Be sure to choose a thermistor that exhibits the correct self-heating characteristics, and the mechanical design of the circuit must allow for the heat to be dissipated safely. The current-vs.-time relationship for self-heating is non-linear. To choose a thermistor, first define the circuit's electrical requirements, then refer to a chart of published values.

Time delays

For a time-delay circuit, apply a low-impedance voltage source to the thermistor circuit. Initially, the resistance of the thermistor is relatively great, about 10kΩ.

Kaufhold is a market development engineer for SGS-Thomson Microelectronics, Phoenix.

As current begins to flow in the circuit, the resistance converts electrical energy into heat. As the thermistor warms, its resistance decreases and current flow increases. This creates more heat, further reducing the resistance of the thermistor.

Usually, a differential amplifier with high input impedance is configured as a comparator and connected across the thermistor. When a threshold current level is reached, a control circuit energizes to accomplish the desired function. In the circuit of Figure 1, the initial voltage across the thermistor is approximately equal to the supply voltage, because the thermistor resistance swamps the effect of the voltage divider resistor. As the thermistor self-heats, the voltage across the thermistor decreases until the differential amplifier triggers a relay.

Automatic reset

The delay of this circuit is a function of thermistor temperature. If the thermistor is already heated, the delay period may be shortened. The full time delay may occur only on the first power-up sequence. For most applications, a time-delay is used to protect something. It may prevent the plate voltages from energizing before the filaments have adequately warmed, or it may limit inrush currents to power-supply capacitors to prevent surge currents from damaging cold tube filaments. To accomplish such tasks, the thermistor circuit must automatically cool down and reset, so that protection is provided on each power-up cycle. This requirement adds complexity to the simple time-delay circuit.

Thermistor time-delay circuits are reset automatically by latching the delayed device at the end of the time delay and removing power from the thermistor circuit to cool it. At power up, V+ is applied through the normally closed contacts of K1 to the top of the thermistor. (See Figure 1.) When cooled to ambient temperature, the thermistor is 10kΩ. As current begins to flow, the thermistor heats, charging capacitor C1 through a voltage divider composed of the thermistor, R1, and R-TD. R-TD obtains the desired time delay, which can range from a few seconds up to several minutes. During this time, ac current is flowing through the 10Ω, 2W resistor, slowly heating the filaments of tube V1 and charging capacitor C2. This illustrates the surge protection functions of the circuit.

When the voltage on C1 exceeds the voltage at test point 1 (TP1), the op-amp drives current through D1, energizing the relay coil. At this time, relay K2 pulls in, providing full current to the tube filament and capacitor C2. Relay K3 also pulls in, applying the high voltage. Diode D2 conducts through the coil of K1/K2 to keep it energized. Diode D1 blocks voltage from flowing back into the op-amp. As long as K1 is energized continuously, the thermistor has time to cool, resetting the circuit for the next power-up sequence.

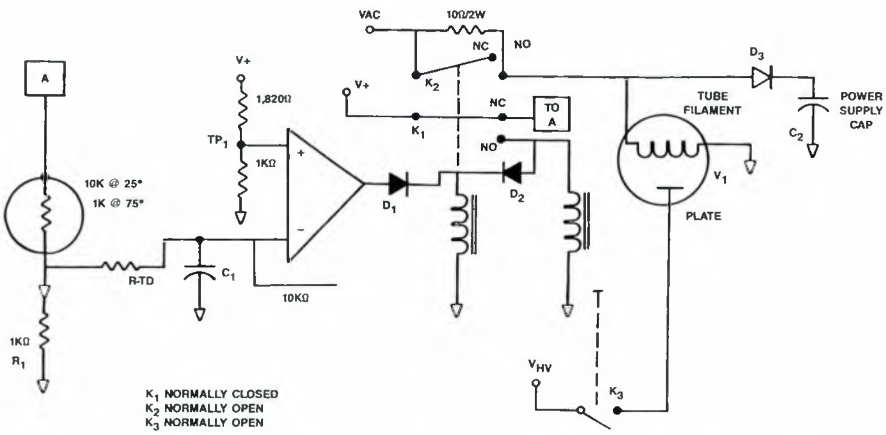


***Figure 1.** Self-heating properties of thermistors can be used to form time-delay circuits. In this example, the cathode is warmed before applying plate voltage and protects cold cathode from inrush current.*

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Part 4

Troubleshooting

CD troubleshooting

By Brad Dick, radio technical editor

Last month, we looked at several types of manufacturing defects that affect CD playback. Now let's examine how CDs may be damaged by users.

The cross section of a compact disc is shown in Figure 1. The transparent substrate (polycarbonate) forms most of the disc's 1.2mm thickness. Data is contained in the pits impressed in the top surface. The pit surface is coated with a 50nm-100nm-thick coating of metal, such as aluminum, silver or gold. Another acrylic layer 30μm thick protects the data layer. A disc label is printed on the protective surface.

User-caused damage

Two types of surface damage may affect a CD. The first occurs when the top acrylic is depressed into the aluminum coating. Because this protective coating is only 30μm thick, any depression on the acrylic layer can distort the metal (data) layer below. Even writing on the label side with a ball-point pen can destroy the data.

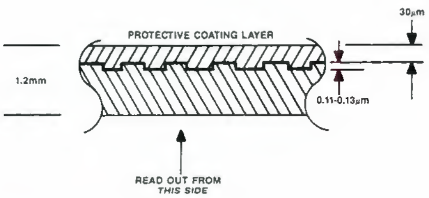
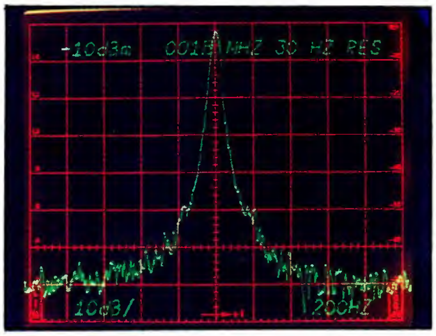


Figure 1. *Cross section of CD showing the relatively thin upper coating. This layer can be depressed into the aluminum data area easily by pressing with a ball-point pen or sharp object.*

The solvents from some permanent marker pens also have been known to penetrate the acrylic coating, exposing the aluminum to air. If this happens, relatively large portions of the aluminum coating (data) may be distorted, and repair is impossible.

The second major type of disc damage occurs as scratches to the playing side (bottom) of the CD. Although the polycarbonate used to make a CD appears rugged, even minute scratches can cause problems with playback.



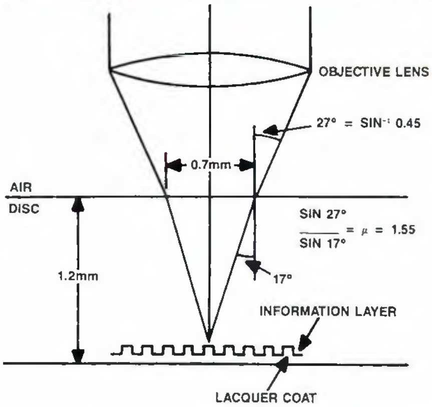


Figure 2. *The CD polycarbonate acts as a lens to focus the laser beam from 0.7mm down to 1.2μm at the disc's surface. The relatively large spot on the surface helps reduce the effect of the pickup to dirt and other surface defects.*

Figure 2 shows the normal laser path to the reflective coating on the disc. The objective lens of the CD laser pickup assembly has a numerical aperture (NA) of 0.45. This causes the beam to be inclined at a 27° angle to vertical. Refraction at the air/disc interface changes this angle to 17°. Once the beam hits the reflective surface, it has been reduced from 0.7mm to 1.2μm in size.

Physics of scratches

A scratch in the polycarbonate substrate does not affect the aluminum coating. However, it does affect both the shape and position of the laser beam on the disc and its return path.

Figure 3 illustrates what happens as the laser beam passes through a deep scratch. The refraction that occurs as the beam enters the polycarbonate remains relatively constant at 17°, but the difference is that the disc surface is no longer parallel to the data surface. This new angle causes the laser beam to shift its position on the data surface. Instead of reading track C, the laser may shift to track A, which produces the familiar skip or jump. The amount of skip depends upon how much the laser beam deflects from the correct angle.

The process repeats as the beam traverses up the outgoing side of the scratch. As the pickup moves up the right sidewall, it thinks it is on track D when it is actually reading track G. The scratch also may change the spot shape and beam intensity through diffraction. If the spot is elongated enough to illuminate more than one track, recovery of the audio may be impossible. The player will either mute or output noise.

Acknowledgment: Appreciation is expressed to Laura Tyson, sales engineer, Denon America; Martin Ledford, quality control manager, Denon Digital Industries; and Dave C. Bowman, director of professional products, Studer Revox, for their help with this column.

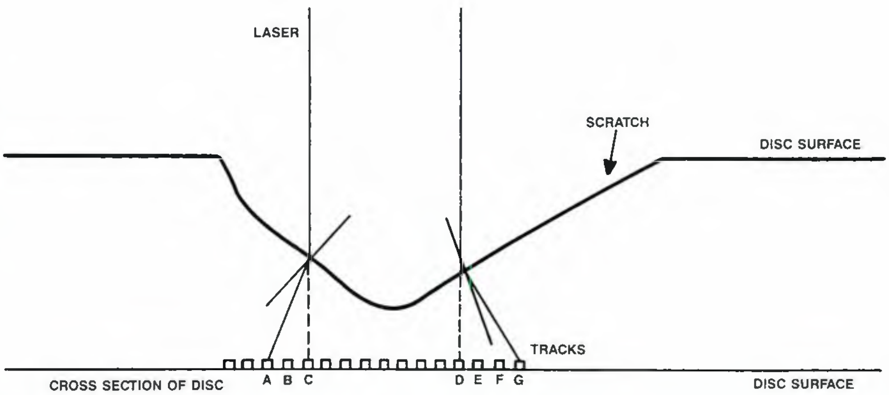


Figure 3. *A scratch located tangentially to the tracks alters the laser's intended focus point to some other area on the disc surface. Disc refraction, combined with the tilt of the disc surface, places the beam at locations A and G. The pickup expects the beam to be at locations C and D.*

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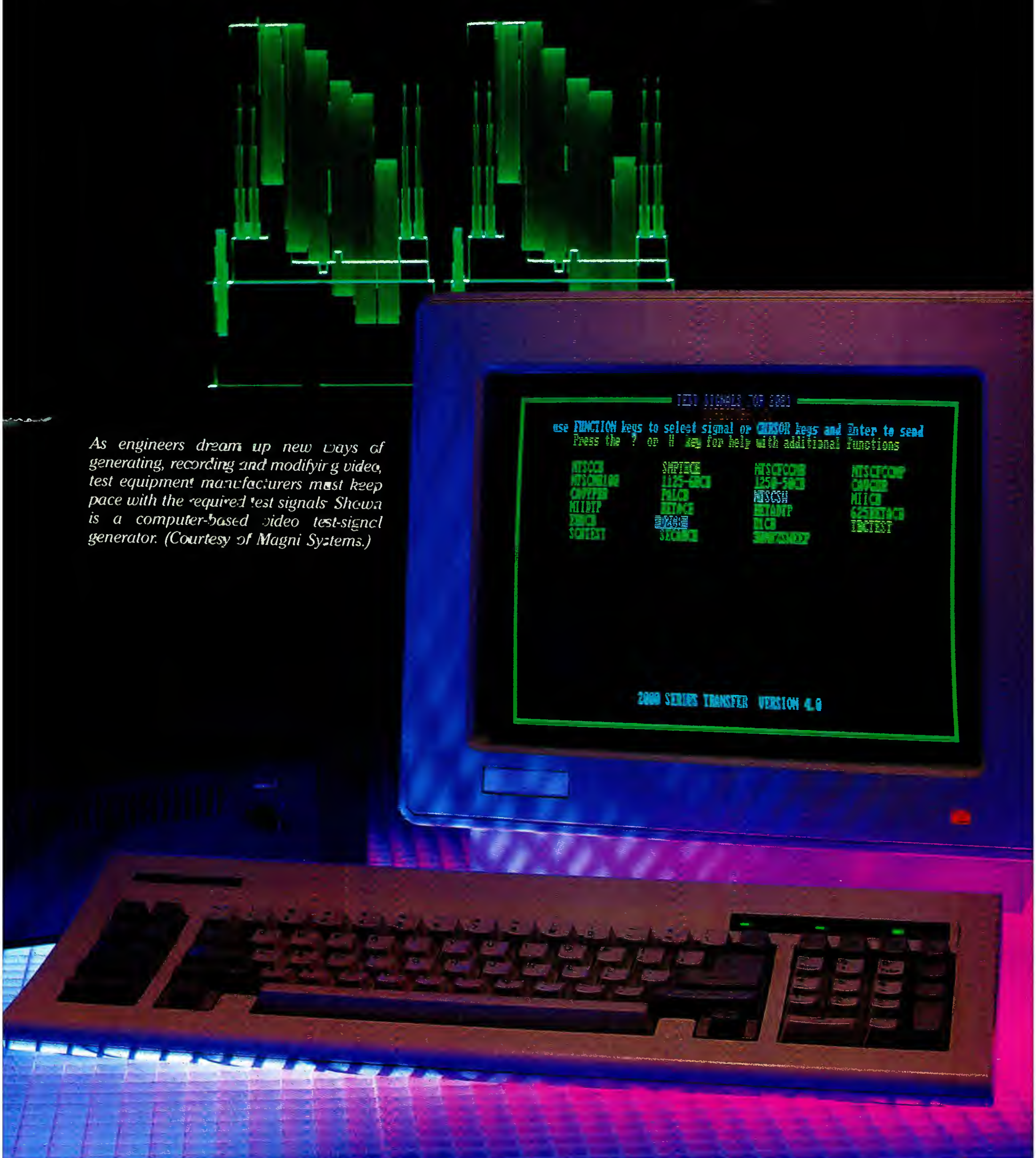
Audio-video control systems



As engineers dream up new ways of generating, recording and modifying video, test equipment manufacturers must keep pace with the required test signals. Shown is a computer-based video test-signal generator. (Courtesy of Magni Systems.)

Prescription for a healthy station? PCs and a high-fiber diet.

A station engineer, who at the time was busily engaged in the construction and relocation of a major TV and radio facility, was asked by management, "Is our new station done yet?" The engineer felt puzzled. On the floors around him were hundreds of thousands of dollars of state-of-the-art electronics, hundreds of miles of cabling and many rooms filled with test equipment, microwave gear, telephone systems, back-up power equipment, shops and archives. Back on the engineer's desk was a clipboard listing equipment due to arrive soon, and also items for the following year's capital budget. Considering this, the engineer felt compelled to respond that it was inappropriate to speak of the maze of interconnecting systems that made up the station as ever being "done," rather, the questioner might better inquire as to the new station's "health."

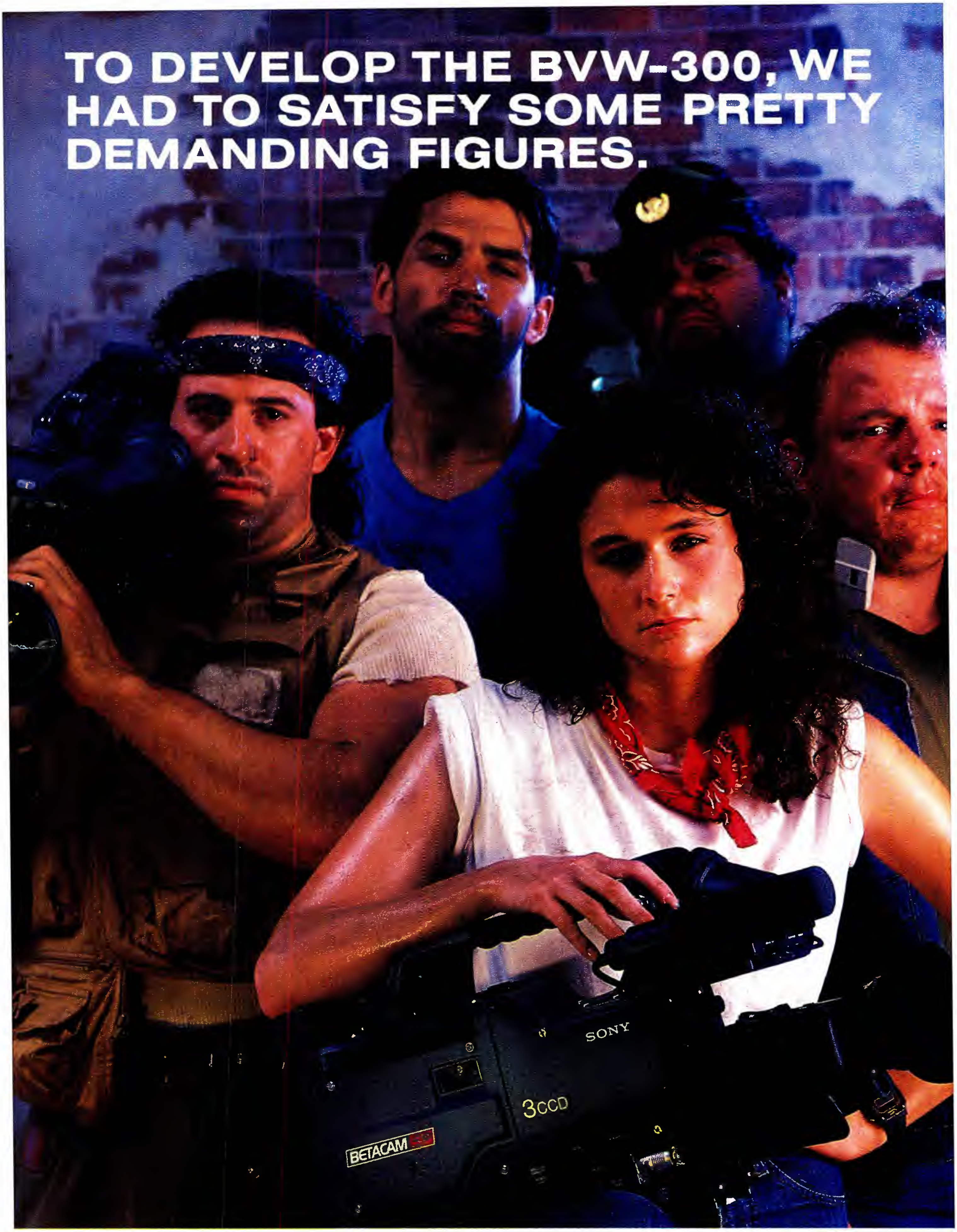
If information and entertainment are a station's lifeblood, and video and audio signals are the station's pulse, then the control systems that keep it all working together are the central nervous system. The key to an efficient operation is to make sure that all of the systems within a given plant work together and talk to each other. No one is better equipped to ensure this than the engineers who live with a station, who most likely built it, and who are in tune with it, over time developing a sixth sense about the conditions prevailing in the plant's electric arteries.

This month our coverage focuses on the audio-video control systems that govern a station's bodily functions. To start with, we will examine developments that may lead to an all-optical fiber-optic switcher. As fiber optics quickly become a tool for today, we need to be efficient in getting the signals where they have to go.

In the fast-paced world of today's broadcast engineer, computers are rapidly becoming important tools. In many cases, engineers see PCs as their electronic assistants. This month, we examine how to put the PC to work for your station.

As technology surges forward, it is vital that we keep our fingers squarely on the pulse of this industry. This month, as always, we strive to present useful information that will help you keep your facility healthy and fit.

Rick Lehtinen,
issue editor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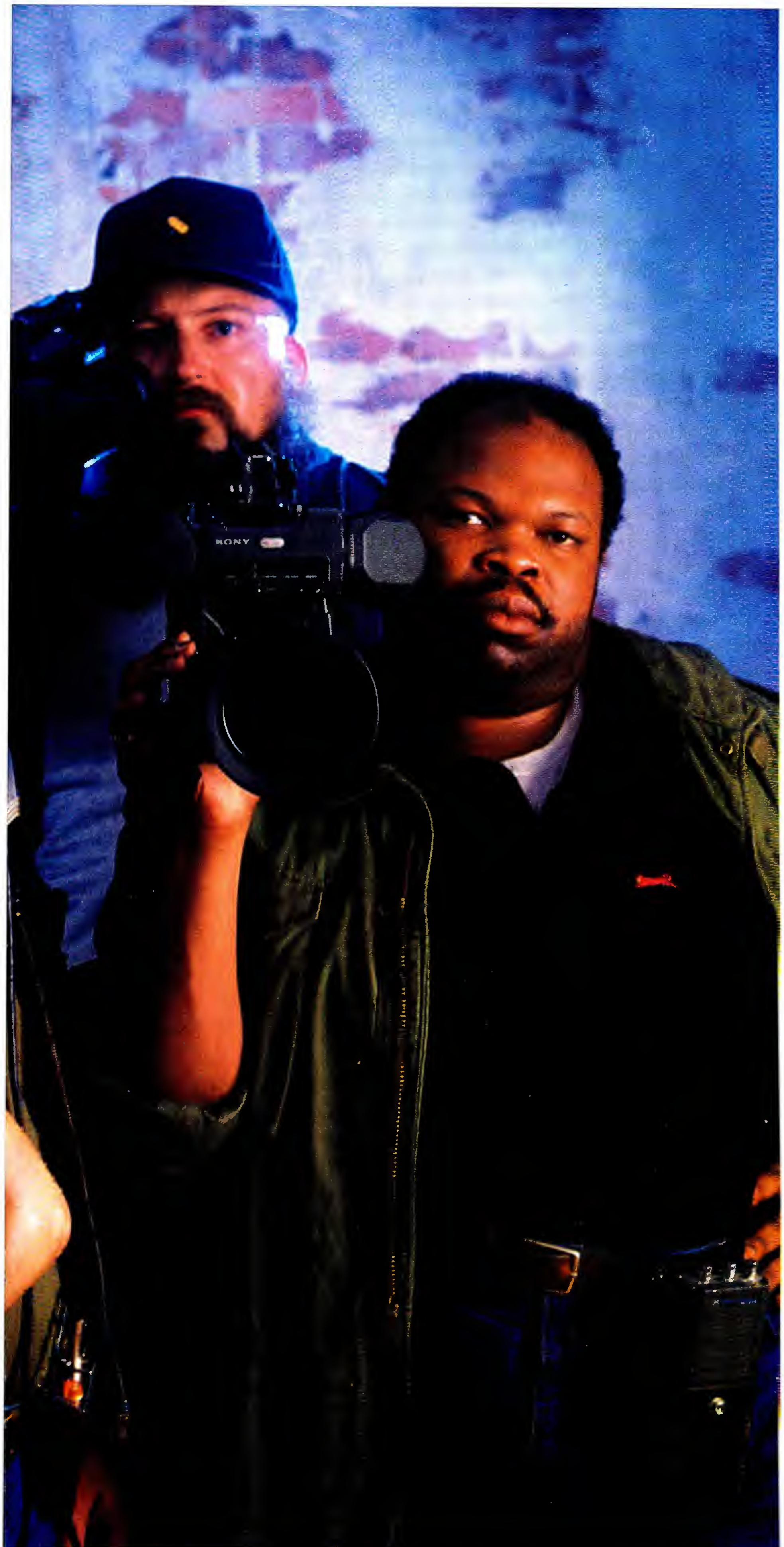

SONY

Switching fiber-optic signals

By Rick Lehtinen, TV technical editor

Fiber-optic routing switches direct light.

Most agree that fiber-optic cables are a good way to get a signal from point A to point B. Fiber doesn't roll off at high frequencies. It is impervious to RF interference and electromagnetic noise. Because fiber doesn't conduct, it doesn't have hum problems. About the only thing wrong with fiber is that it makes it difficult to switch signals — you generally have to go from light to electricity and back. But this won't be the case for long. This article explores advances in the rapidly growing field of fiber-optic technology.

Fiber's best where it's best

Because of the cost of getting a signal into and out of the "photon format," broadcasters today most often use fiber on long runs, on runs through areas where metallic cables would be susceptible to picking up noise, or in situations in which the bandwidth of the signal to be transmitted is greater than coaxial cable can handle well. In the equipment core of a well-engineered facility, where the wiring is electrically quiet and the cable runs are short, fiber optics probably wouldn't bring much benefit. In an era of high-definition (hence high-bandwidth) signals and digital VTRs, this situation could change quickly. Fiber-optic switching equipment is likely to increase in importance to broadcasters.

Advanced connectors

Actually, several methods can be used to switch a fiber today. The simplest is with two connectors and a barrel. (See Figure 1.) Advanced ceramics, keyed receptacles and ultratight precision lead to low insertion losses, usually less than 0.5dB for a mated pair. Furthermore, modern connectors can be hand-assembled in the field in minutes, not the hours it once may have taken. Of course, it is not a far step from connectors and barrels to using bulkhead mounted barrels to form a patch panel.

Splicing technology has come a long way, too. In addition to the tried-and-true fusion splice, which "arc welds" fibers together, a host of reliable, low-loss mechanical splices is available.

The trees and the stars above

An esoteric form of connection is the fiber-optic coupler. It is at the heart of many of the more advanced switchers. In a coupler, two or more fibers are fused carefully, then tapered and drawn. (See Figure 2.) When the light hits the taper, some of it leaves the fiber core and enters the fiber cladding. As the taper continues, the light eventually overlaps and re-enters the cores. The tapering process is discontinued when the desired amount of coupling is achieved, and the fibers are broken out individually once more. From two to 100 fibers can be coupled this way.

In a perfect coupler, whatever light goes in the input gets divided equally among the output legs, with no losses. In reality, there are some losses, but they can be held to about 0.5dB with good design. In a "star" coupler, the light on any input fiber is divided among all the output fibers. A "tree" coupler resembles a star, except

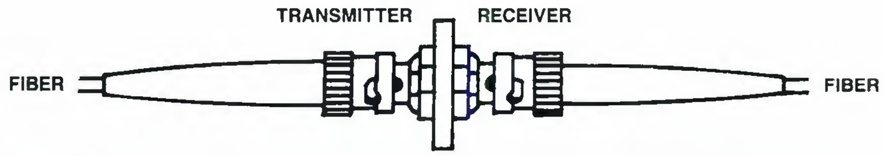
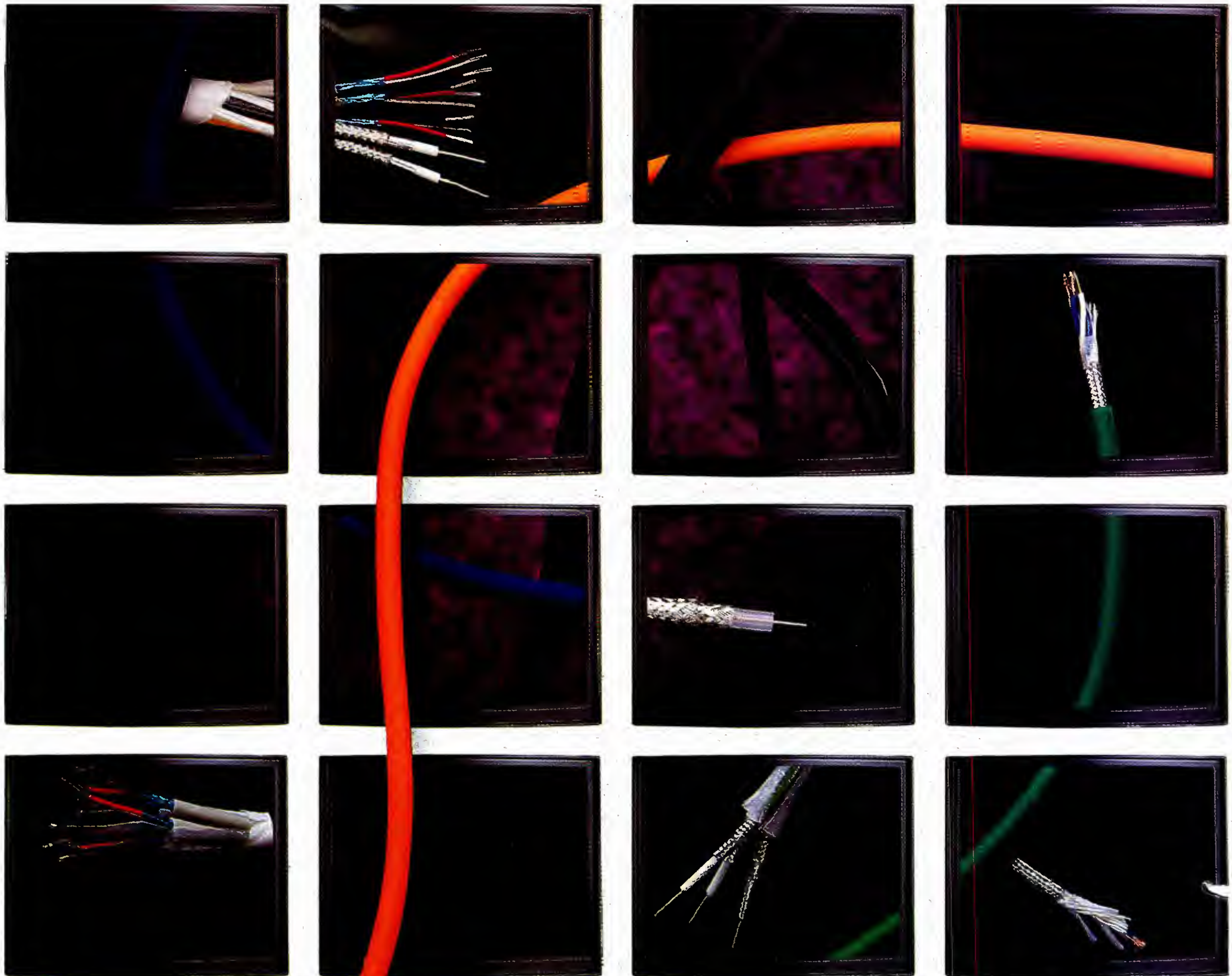


Figure 1. Two modern fiber-optic connectors joined in a barrel. A patch panel is created by mounting several barrels in a bulkhead panel.

Acknowledgment: The author wishes to express his appreciation to Kenneth Regnier, Comlux, Mountain View, CA; David Polinsky, DiCon Fiberoptics, Berkley, CA; Tony Diaz, Optivision, Palo Alto, CA; and Paul Kopera, Amphenol, Lisle, OH, for their assistance in the preparation of this article.



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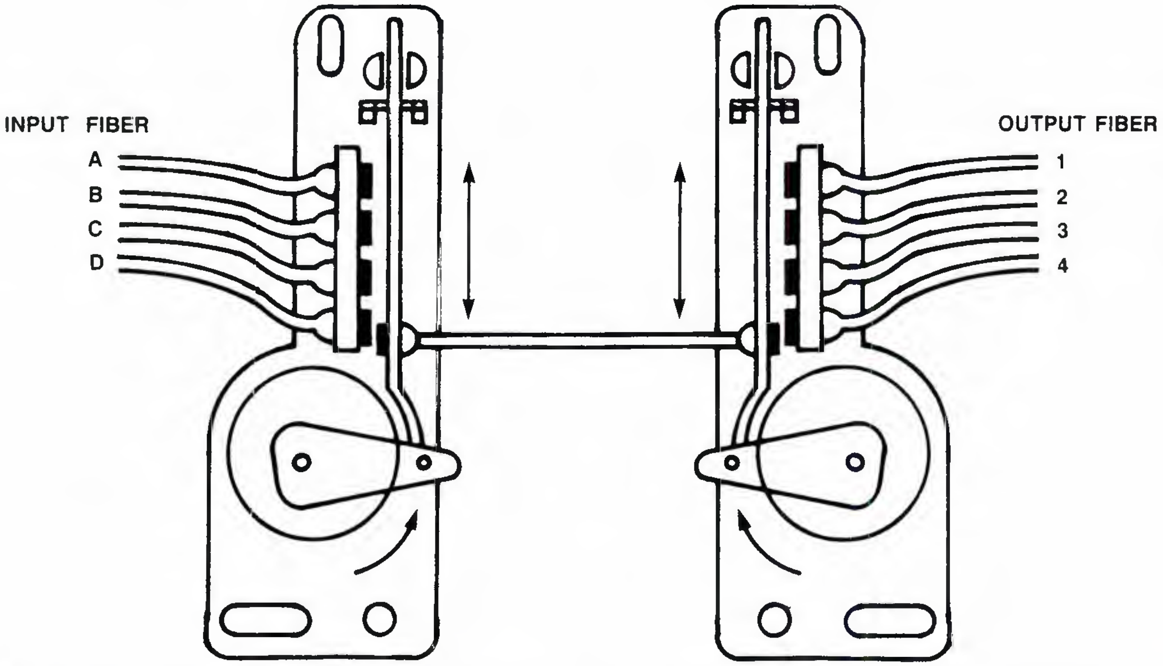

Figure 5. *Combining optical switches allows any one input fiber to connect to any one output fiber. This configuration, although feasible, wastes fiber capability because it "blocks" the unselected fibers and doesn't allow an input to be distributed to more than one output at a time.*

Continued on page 36

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Continued from page 32
treat a light beam differently depending on its strength. This means that optical devices could be self-switching. One such device, demonstrated recently by Bellcore, looks like little more than the fused portion of a 2-port star coupler. However, the little device has the ability to switch an input signal to one of two output ports based on the incoming signal's strength. Such devices could greatly simplify the design of future fiber-optic routing switchers.

Another new idea is that of the "soliton," a short burst of light. Currently, all fiber-optic systems have dispersion problems, which cause the pulses of light to spread out and eventually muddle together. The soliton, however, is so short it doesn't disperse. This "fundamental bit" of a light impulse could be the basis of future optical computers that think with light pulses, instead of electrons in silicon.

The limitless potential of light

There was a time when radio pioneers reflected on the vast range of frequencies "beyond 50MHz" and dreamed of the communications potential to be found there. Lightwave communicators have similar visions.

Just as certain microwave bands cut through rain and clouds better than others, certain light frequencies go through an optical fiber better than others. Common transmission "windows" are 1,500nm, 1,300nm, 1,050nm and 800nm. Each of these windows could be considered a frequency band, just as 2GHz and 6GHz are considered microwave frequency bands. Within each band there can exist many operating frequencies. There is nothing wrong with operating a fiber on several frequencies at once. One manufacturer offers a digital fiber-optic system that optically multiplexes four channels, spaced 30nm apart, into a single fiber operating at 800nm.

There also is nothing wrong with operating on more than one band at a time, such as 1,300nm and 1,500nm. Such wavelength division multiplexing (WDM) can effectively double the capacity of many fiber systems.

In the laboratories, however, research is focusing not merely on using many channels in a band, but also on locking down discrete "colors," or frequencies. Called a "coherent" system, this could increase the amount of traffic per band at least tenfold. And whatever capacity is achieved, it probably still could be doubled through WDM. But this is just the beginning.

It's about time

Gallium arsenide semiconductors have pushed up the speed limits on fiber. At this year's NAB, a manufacturer of a popular

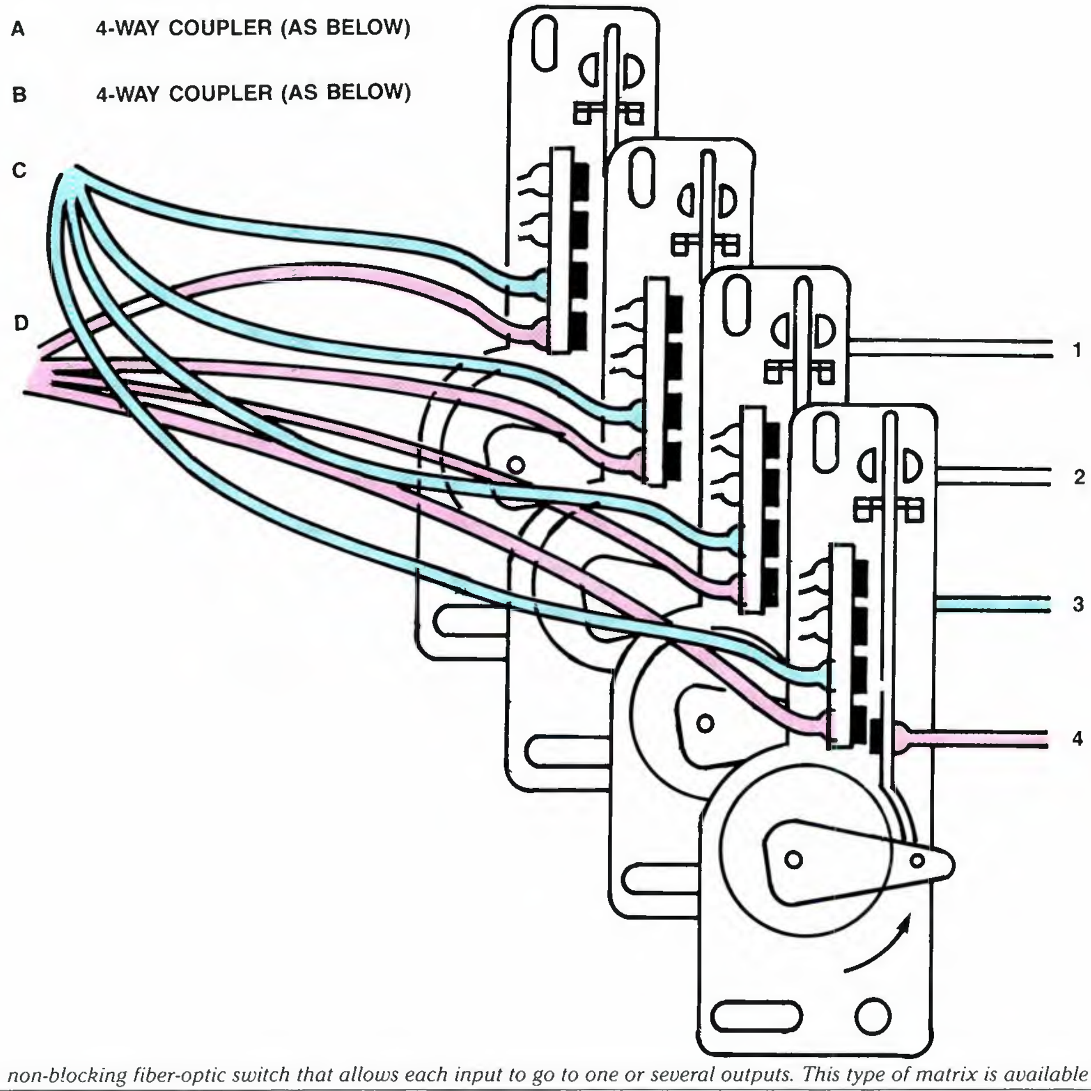

Figure 6. *A non-blocking fiber-optic switch that allows each input to go to one or several outputs. This type of matrix is available commercially.*

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140Mb/s digital fiber system introduced a 560Mb/s system. They achieved this by using a GaAs high-speed time division multiplexer (TDM) to sample four 140Mb/s video channels onto a single fiber-optic transmitter operating at 560Mb/s.

Courtesy of Bell Communications Research

Through non-linear optics techniques, this small piece of fiber can self-switch an input to one of two output paths, based on the power of the input pulse.

Already, advanced researchers are working with systems that can move data in the teens of gigabits per second. At these rates, researchers claim, the entire Encyclopaedia Britannica could be transmitted in well under a second. These speeds are much faster than the hardware available to drive them. Several laser transmitters have to be locked together and fired sequentially, gattling gun fashion. And even these incredible data rates can be multiplied using multiple frequencies per window and multiple windows simultaneously.

Will TV ever be the same?

Just as the capacity of fiber optics is expanding, researchers are working hard to shrink television's bandwidth requirements. To this end, they have come up with compression schemes, multiplexing systems, even proposals to get away from the real-time scanning basis of television, all with the intent of packing more television into a smaller spectrum.

What do these trends mean to telecasters? Two things. In the first place, by the time it is available, the routing switcher discussed at the beginning of this article might not be necessary. It probably could be replaced by a light-speed bus, with signals entering and exiting via multiplexers. Second, the capacity and production horsepower afforded by fiber optics is likely to outgrow our ability to deliver it over a single 6MHz-frequency channel. We are likely to see significant changes in the transmission side of television. For better or worse, like it or not, fiber optics will inevitably, irrevocably change the way we do business.

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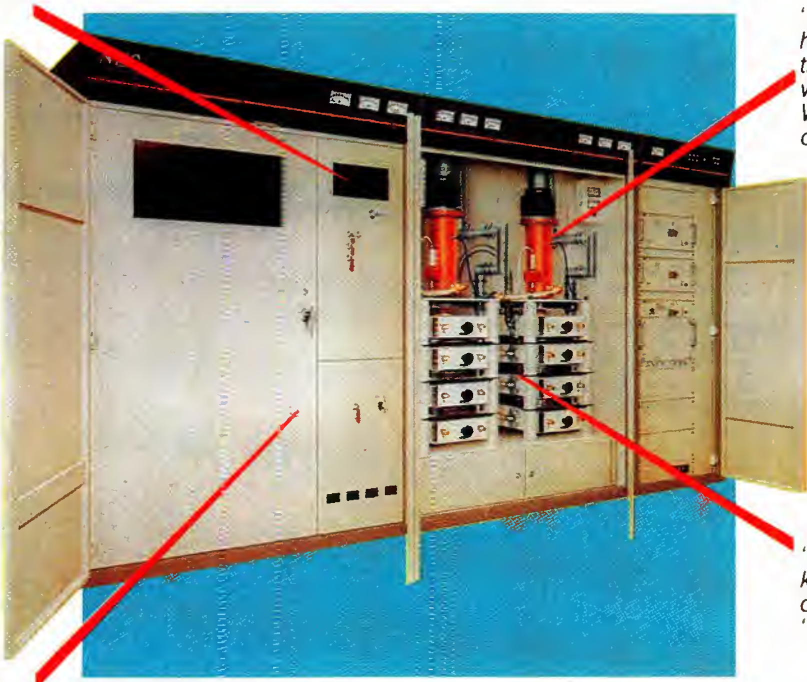

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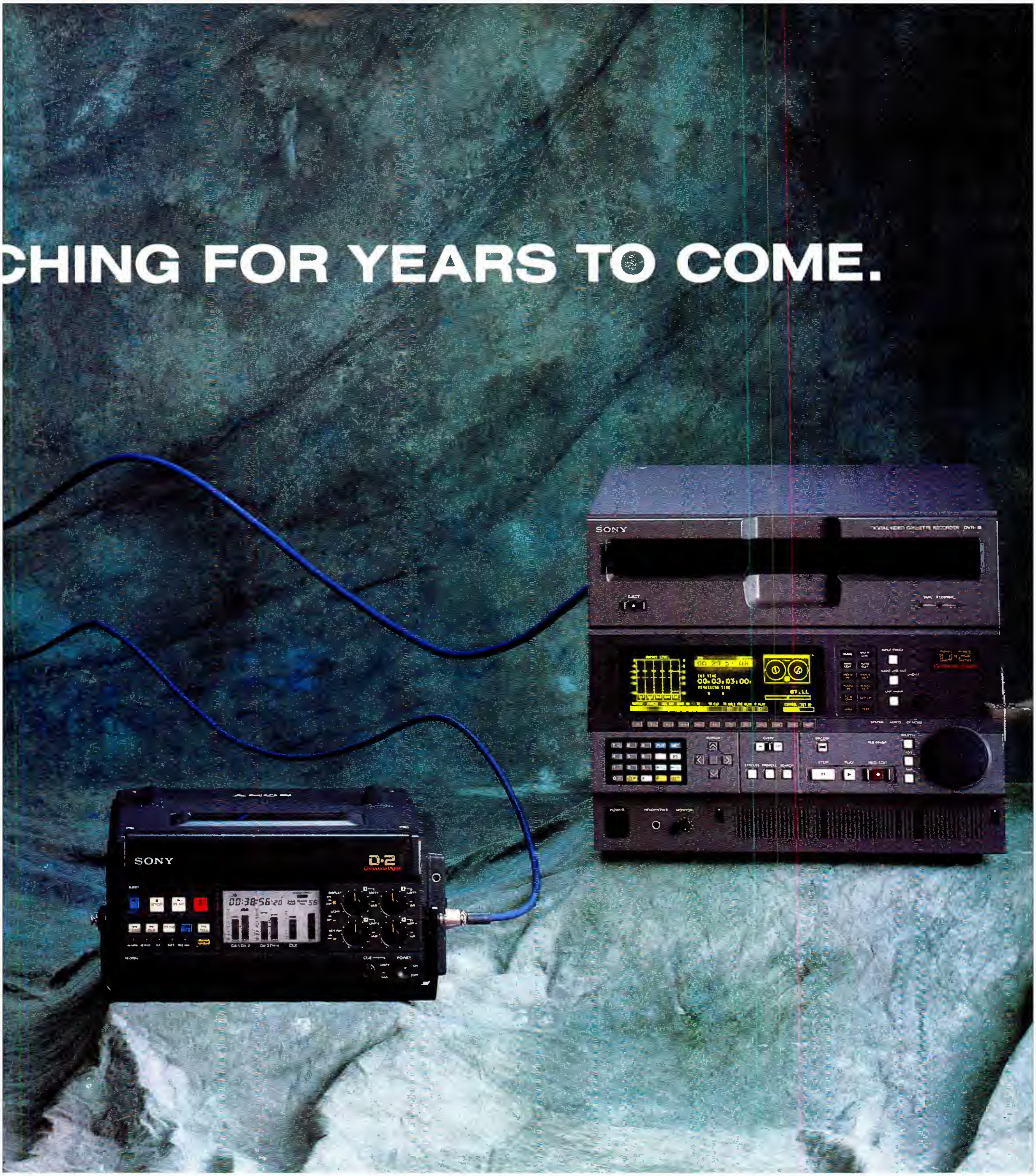

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Writing applications programs for a PC

By Ronald Balonis

Custom programs may be the BASIC answer to engineering problems.

Today's personal computer is the result of years of hardware and software technology. It's easy to use; you just tell it what to do. The key is to instruct the computer in a language it understands. Often, that instruction process requires that you create a custom program. At first, the process may seem difficult and complex, but once you're armed with some basic procedures (no pun intended), you'll find it isn't so formidable.

Electronic assistant

In the fast-paced world of today's broadcast engineer, computers are rapidly becoming important tools. In many cases, engineers see PCs as their electronic assistants. With a PC, obscure and esoteric technical minutia can be organized efficiently. Tasks ranging from word processing to complex and tedious mathematical calculations can be handled quickly and accurately. Today's PC provides expertise for the broadcast engineer.

Contrary to what some think, the real power of a computer is not in the hardware, but in its programs (software). This is the value of computer programming. A computer is not merely a mysterious machine or a fascinating toy. It is a tool that, through software, brings great power to the user.

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

Machine tools represent mechanical evolution. The computer represents cognitive evolution. The computer provides a way to store expertise in the form of applications programs.

Applications programs

An applications program is computer software that enables a computer to perform a task or solve a problem. It ultimately determines a PC's effectiveness, worth and utility.

Software falls into two general categories: pre-written and user-written. The first category includes a wide variety of products. These include word processing, electronic spreadsheets, database and utilities. The second type of program allows users to create custom applications. This may be necessary when your needs are not met by packaged programs.

There is a lot of application software from which to choose. It is relatively easy to find a program to perform such tasks as word processing, project management, graphics or database work. With these programs, all you have to do is load them and begin.

The second category of software is quite different. Once loaded, the program waits for instructions. It's up to you to use the program, much as you would a word processor, to tell the computer what to do. You must create a script or set of instructions for the computer to follow.

With a little expertise, you should be able to write your own programs. It's really not so different from writing operating instructions for equipment. If you're knowledgeable about application problems, you're halfway there. All you need to do is learn how to make the computer understand what you want. That's what computer programming is really about.

Programming

Programming is the process of creating step-by-step plans for a computer to follow. A program is a list of computer instructions telling the computer exactly what to do in solving a problem or performing a task.

Computer programming consists of three basic phases:

- Creating or finding an algorithm.
- Coding the algorithm into machine-ready code.
- Debugging and testing.

These steps must be completed and interactively used to develop any successful program.

Because of the sophisticated technology computers contain, programming is more similar to writing than to mathemat-

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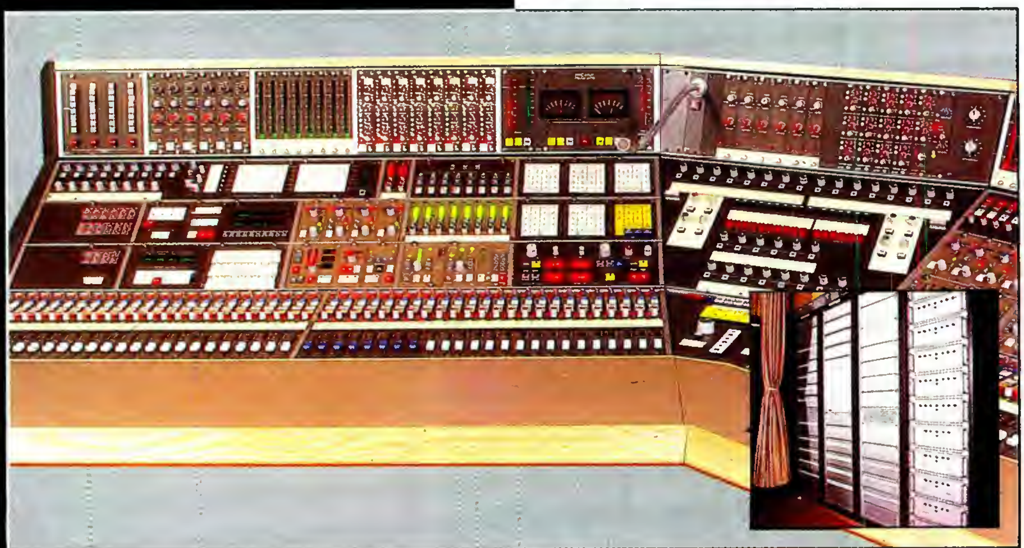

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ical computations. All programs must be planned and constructed carefully. Writing a program is a demanding task that doesn't allow you to assume anything. You must be explicit and avoid ambiguity, and you must write in a language the computer understands.

The process

Programming is more than just coding computer instructions; it is an algorithmic, problem-solving process. The first step in writing an applications program is to define the problem. Then you can begin to devise a solution. You must understand thoroughly what you want to do. You cannot ask the computer to know what you don't know. It has no built-in intelligence and no ability to reason. It only follows instructions.

Creating or finding algorithms is both art and science. It is an art because it requires some intuitive thinking. With time and practice, your proficiency improves. Programming also is a science because logical problem-solving methods are the tools you use to find and implement solutions.

You don't normally think of them this way, but algorithms are an integral part of the human thinking process. Much of what you do seemingly without thinking relies on built-in algorithms that were created internally when you first learned to do something. The primary difference between human instructions and computer instructions is that computer instructions must be contained in steps and procedures that can be coded into a computer programming language. The goal is to find a solution using an algorithm that can be coded to be computer-readable.

Just as practice makes your writing better or your thinking clearer, it also improves programming. There is no one perfect recipe or algorithm. Try to create programs that are simple and concise. Complexity is the enemy of good programs. The extra features — the bells and whistles — often cause frustration during development and use.

Making the computer program

The next step in the process is coding the algorithm into a machine-readable form: a computer program. Coding the algorithm into high-level computer language makes it possible to write the list of instructions (the program) in terms that can be understood by both human and machine.

The high-level language used in this example is BASIC (Beginner's All-Purpose Symbolic Instruction Code). Despite what some programmers say, BASIC has strong points for both the novice and the expert computer programmer.

- It is easily understandable.
- The commands and statements, presented in plain English, make it easy to learn and remember.
- The simple syntax is easy to type.
- Because it is interactive, coding and debugging is simplified.
- It is widely available for most computers.

Use the reference guide

To code computer programs proficiently, you must know the meaning and function of the BASIC program statements. Although it might be nice to know all the computer language instructions by heart, it's not absolutely necessary. If you don't know all the commands, or can't remember them, use the manual.

Refer to it as you would use a dictionary for any other language — to find out a statement's function, use and syntax. Most BASIC manuals provide examples so you can see how another programmer might use a function. Everyone uses the manual sometime, so don't be ashamed to keep it close by.

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Programming style

As you write the program, it's important that you keep it readable. Good programmers usually write with a certain style (appearance). This simply makes the code easier to read and understand. Sections of the program often are grouped and indented together so that they resemble paragraphs. The liberal use of remark and comment lines helps to define the code's functions and important variable names.

There is no single best way to write a program. Problem-solving requires creativity, but the structured nature of computers requires that specific procedures and methods be used to develop the program.

A structured programming technique can help prevent this human vs. machine conflict. The structure allows a program to meet the needs of both the programmer and the computer. Using these easy-to-follow rules helps programmers organize their thoughts and results in an efficient program.

The program must be built according to a top-down hierarchical structure. It should be modular and divided into logical parts. All variables must be initialized at the beginning of the beginning. Variable names should be as obvious as possible. Don't select a variable name such as "Blue" if "Blue" is actually the transmitter output power. You may remember what "Blue" means today, but you won't six months from now. Rely on standard abbreviations whenever possible. Modules must have only one entry and one exit point. Limit GO-TO statements to control structures, and limit the number of control structures (conditional, repetition or selection). Use comments, blank lines and blank spaces to document the program code. In short, keep it simple, and make it readable.

Debugging/testing

The last and most important step in developing an application program is debugging and testing it. No matter how elegant the algorithm, how clever the coding or how numerous the features, if the program doesn't work right, it's useless.

Debugging is the process of getting the program code to work right. Testing is the process of checking to verify that the program really does solve the problem or perform the task correctly.

Bugs are programming mistakes or errors. They come in two distinct varieties: logical ones related to the program's algorithm and syntax ones related to the coding of the algorithm. Both kinds of errors can show up as run-time errors. They may cause the program to crash or to display an error message. Subtle errors may produce incorrect operation or erroneous results.

```
  0 'PCBLABEL.BAS + Determine Size of PCB Warning Label ++
  5 'by Ronald F. Balonis 9/22/89
 10 '
 20 VOL=0:HGTH=0:WDTH=0:LGTH=0:WGHT$="":ANS$=""
 50 TLE$="++ Find the Size of the Required EPA PCB Label ++"
100 CLS:PRINT TAB(0) TLE$
105 PRINT
110 PRINT"Enter height, width and length in inches or 0 to quit"
115 PRINT
120 INPUT "Height: ";HGHT
125 IF HGHT <=0 THEN 240:'—STOP at the END
130 INPUT "Width: ";WDTH
135 IF WDTH <=0 THEN RUN 0
140 INPUT "Length: ";LGTH
145 IF LGTH <=0 THEN RUN 0
150 PRINT
160 VOL=HGHT*WDTH*LGTH:
165 IF VOL<1 OR VOL>9999 THEN RUN 0
170 PRINT "Volume = ";USING"####.# cu in";VOL
175 PRINT
180 INPUT "Is Weight Greater Than 9 pounds? <Y/N> ";WGHT$
185 PRINT
200 PRINT TAB(0) "**** ITEM REQUIRES a STD ";
210 IF VOL <= 200 AND WGHT$ <> "Y" THEN PRINT "1 x 2 ";
220 IF VOL > 200 OR WGHT$ = "Y" THEN PRINT "6 x 6 ";
225 PRINT "EPA PCB WARNING LABEL ****":PRINT
230 INPUT "DO ANOTHER <Y/N> ";ANS$
235 IF ANS$="Y" THEN RUN 0
240 STOP'—ELSE END THE PROGRAM—
```

Table 1. *This short program will help you determine the proper size of an EPA warning label for PCB capacitors.*

Efficient debugging requires the use of problem-solving techniques to isolate the bugs one by one. The same general techniques used for troubleshooting electronic hardware are applicable for electronic software.

Once you've discovered a bug, look for the cause. Common causes are typographical and syntax coding errors, grammatical rule violations or the misuse of statements and functions. Errors in problem definition or analysis also can develop.

Two other mistakes frequently occur. One is that you may have defined the problem incorrectly. In other words, the computer may be correctly solving the problem you defined, but that may not be the problem you really wanted worked. The other type of mistake is caused by an error in data entry. Did you mean to input 6kW, or was it supposed to be 7kW?

Two common BASIC debugging techniques are *dump* and *trace*. They can be used to check program flow, subroutine functioning and the computed variables. Use direct commands to test statements. Use print statements to show the contents of variables. When you have a problem, print the troublesome section of the program on paper. It's often easier to spot errors when you see them on paper.

Insert trace statements in the program such as STOP, PRINT a variable, PAUSE (input x) or BEEP to isolate the program error. Make a bug list. You may find that similar errors are repeated in other parts of the program.

Testing is the process of verifying that the program works as intended. Like all other aspects of programming, it's best approached by breaking up the process into three distinct phases.

In the first testing phase, typical data is used to verify the general working of the program, its subroutines and its computational structures. In the second phase, data with extremes — negative, zero, null and small and large values — are used to test for errors caused by atypical data. In the final testing phase, incorrect, incomplete or inappropriate data is used for checking the program's error-handling routines and capabilities.

Testing involves a critical look for abnormal operation and for objectionable errors. And, if the errors are serious, it means going back to an earlier programming step, such as problem definition, algorithm making or coding. You may have to rewrite the code to correct the error or abnormal operation.

Testing is an attempt to show that no bugs exist. Debugging is getting the program to work right by finding and correcting known bugs. They correspond to two common errors made in statistics: assuming that what is false is true, and assuming that what is true is false. Alone, neither procedure can guarantee no mistakes

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or a perfect program.

Example program

The applications program described here addresses the need to label PCB capacitors. For an engineer with a station having only a couple of PCB-filled items, the labeling process is mainly a regulatory nuisance. At a station with 40 or 50 PCB items, the problem is much larger. One important aspect of the labeling process is deciding which of two sizes of EPA-approved labels to use. This is where the computer can help.

The EPA regulations call for large PCB capacitors, those containing three pounds or more of dielectric fluid or a volume of 200 cubic inches or more, to be labeled with a standard 6″×6″ EPA warning label. Small PCB capacitors, those having a volume of less than 100 cubic inches or a volume of 100 to 200 cubic inches with less than nine pounds of dielectric fluid, require a standard 1″×2″ EPA warning label.

The first step in making an applications program is to develop a workable algorithm. This turns out to be easy because the manual method for finding the proper PCB label also should work in a computer program.

The manual algorithm (procedure) consists of three steps:

- Measure the capacitor and calculate its volume.
- Determine whether the item weighs more than nine pounds.
- Determine the correct label size by applying the decision rule from the EPA.

The rule is: *If the volume is less than or equal to 200 cubic inches, and the weight is less than nine pounds, then the item requires a 1″×2″ EPA warning label. If the volume is greater than 200 cubic inches or the weight is greater than nine pounds, then the item requires a 6″×6″ EPA warning label.*

With the algorithm defined, the next step is to write it into a workable program. Following structured programming concepts, the program should start with documentation and initialization of the variables. The actual BASIC program is shown in Table 1. Compare the program with the following description.

Program description

Line 0 is a remark statement, which lists the program name and briefly describes what it does. In BASIC, a remark or comment line is formed when an apostrophe or the word REM appears after the line number. The computer ignores everything on the line after that. Line 5 is a remark statement that tells who the programmer is and the program's date.

BASIC automatically initializes any variables. However, good programming technique suggests that variables be initialized at the top. Line 20 does this with abbreviated variable names. VOL will be used to store the item's volume based on height (HGHT), width (WDTH) and length (LGTH). String variable WGHT$ stores the yes/no answer to the question of whether the weight is greater than nine pounds. The string variable ANS$ will store the yes/no answer to repeat the calculation process. Line 50 initializes the string variable TLE$ to the program's title.

The program starts at line 100 by clearing the screen (CLS) and printing the title on the top line (PRINT TAB(0) TLE$). Line 105 puts a blank line on the screen using a null print statement PRINT. Lines 115, 150, 175 and 185 do the same.

Line 120 begins the first step in the algorithm, inputting the measurement data to calculate volume. Line 120 sets the value of HGHT to whatever number you enter. Line 125 uses a simple "if-then" test to determine whether that number is less than or equal to zero. If so, the program jumps to line 240 and stops.

Line 130 sets the value of WDTH to your input number. Line 135 tests to determine whether the number is less than or equal to zero. If so, the program jumps back to line 0 and begins again.

Line 140 sets LGTH to the input value. Line 145 performs the same test again. If the value is less than or equal to zero, the program begins again.

The volume is calculated in line 160, and VOL is set to that number. Line 165 then tests the variable VOL for an error in size. If VOL is greater than 9,999 or less than one, the program begins again. Line 170 displays the calculated volume.

The second step of the algorithm is coded in line 180 as a question to be answered with a yes (Y) or no (N). The response is stored in string variable WGHT$. The answer will be used in the third and final step of the algorithm.

The third step of the algorithm is coded in logical "if-then" statements in lines 210 to 230. Line 200 prints to the screen "**** ITEM REQUIRES a STD". Line 210 codes the EPA decision rules using a 2-level "if-then" statement for small PCB items that require a 1″×2″ EPA warning label. Line 220 codes the EPA decision rules for large PCB items that require a 6″×6″ EPA warning label. Line 225 prints to the screen "EPA PCB WARNING LABEL ****".

Line 230 asks "DO ANOTHER <Y/N>" and stores the answer in ANS$. The "if-then" statement in line 235 uses the contents of variable ANS$ to either restart the program (Y) or STOP it on any other answer.

Consider the value

This program points out an important fact about computers. They are extremely useful with repetitive tasks, in this case, calculating the required size label. If, on the other hand, you only needed to label a few capacitors, it would not be worth the effort to develop, debug and use such a program.

Before you take on that next task, ask yourself whether the computer could help. It may be that a computer can help you be more efficient. Perhaps it could help you develop information that would make your station more competitive. That would translate into profits.

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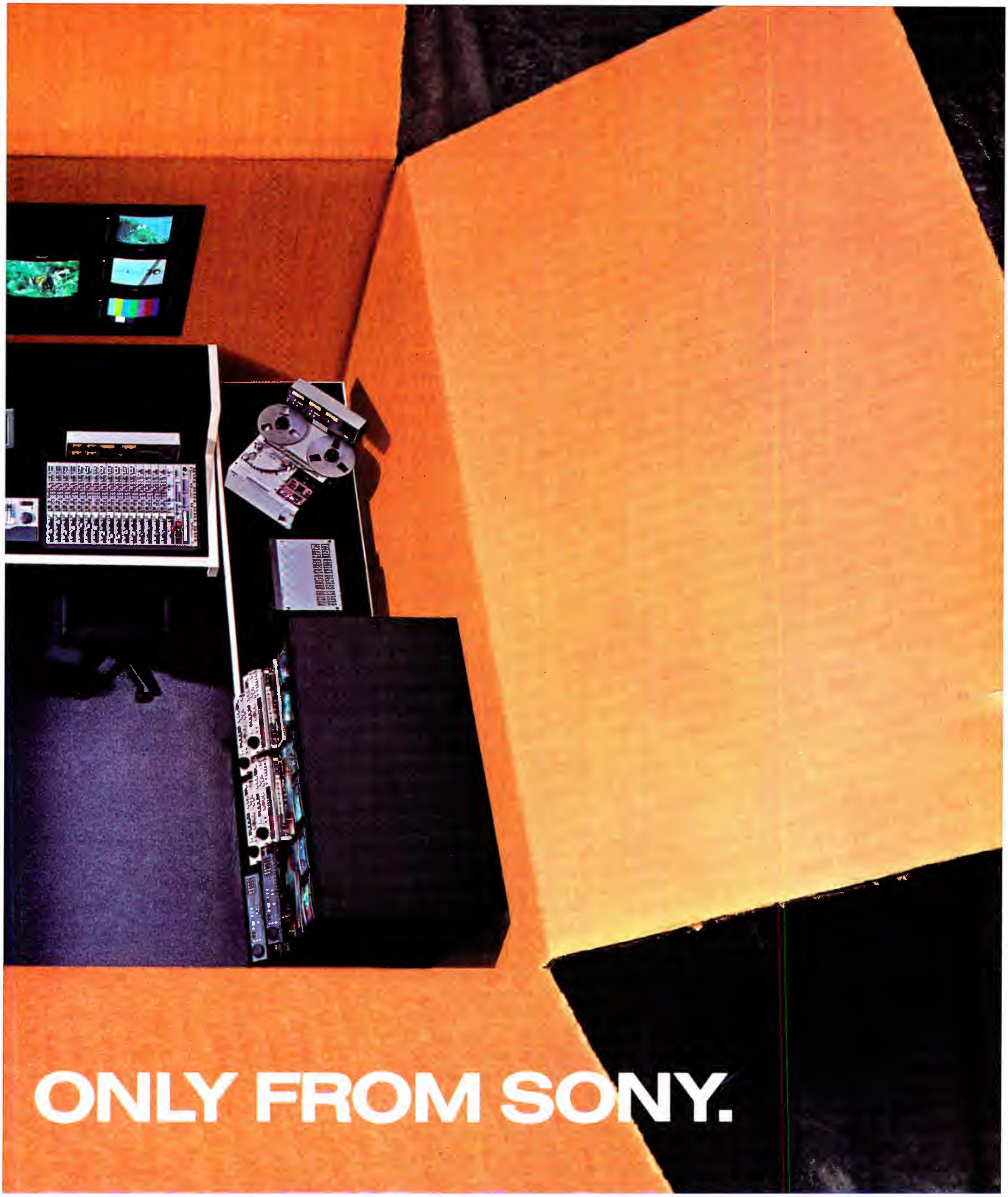

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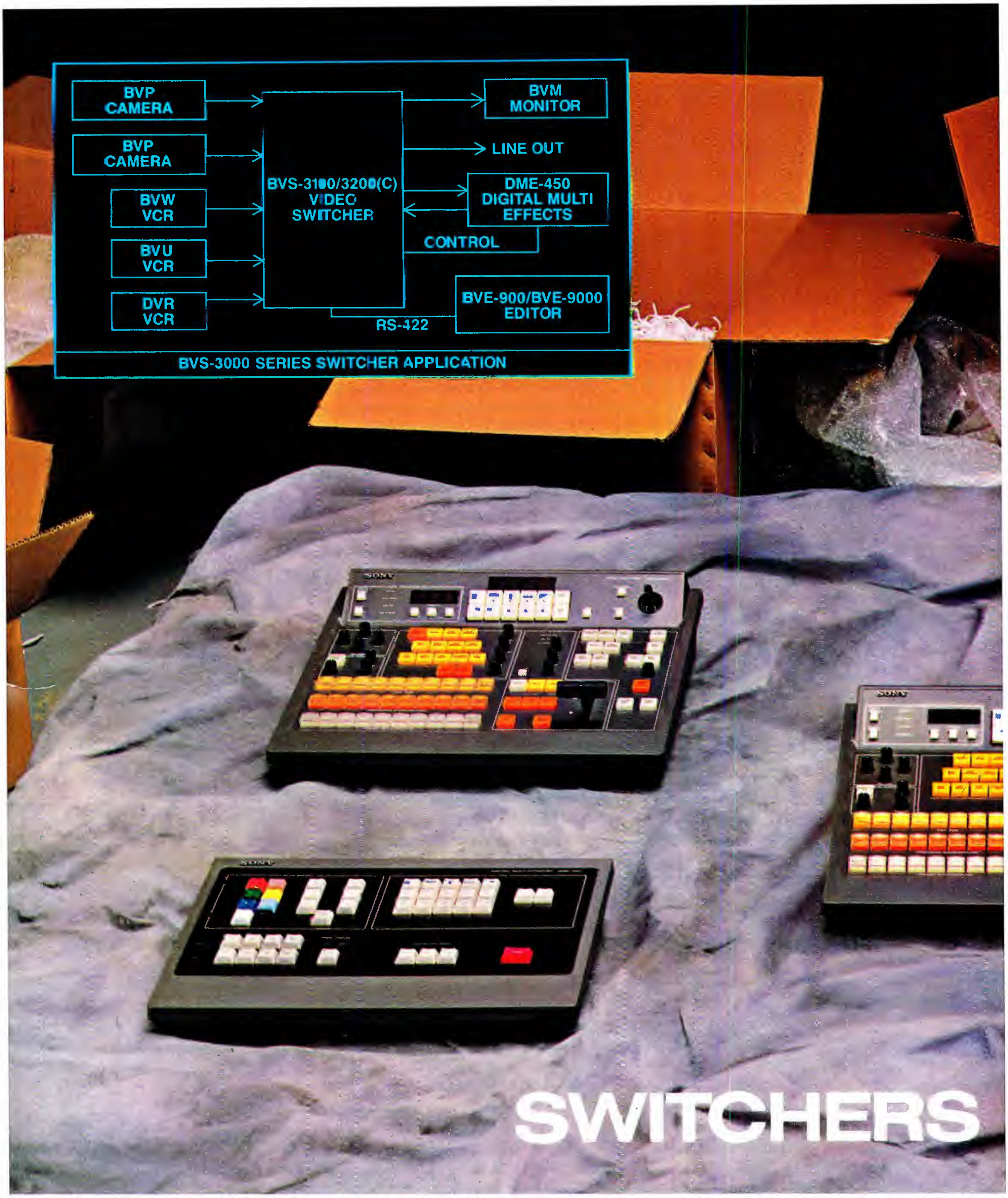

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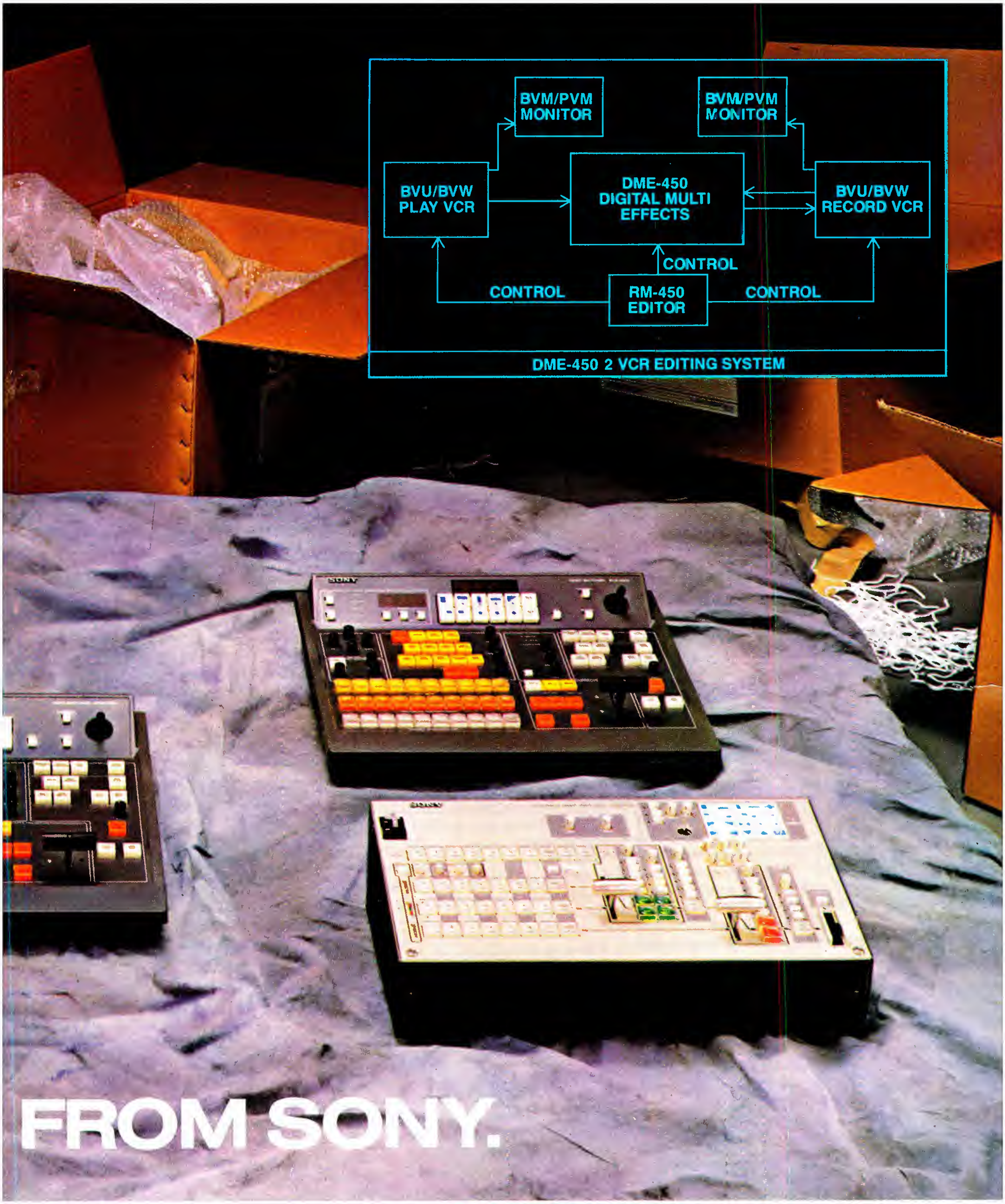

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The CCD scoreboard

By Rick Lehtinen,
TV technical editor

CCDs experience stellar growth in features and utility.

Charge-coupled devices, called CCDs, arrived on the camera scene a few years ago, and after a few false starts, they are firmly entrenched. CCDs have many inherent advantages. Solid-state image sensors are making more of our pictures than ever before. Also, recent product introductions may have paved the way for a return to the use of "stringers" in TV journalism, a concept that was used back when film was king.

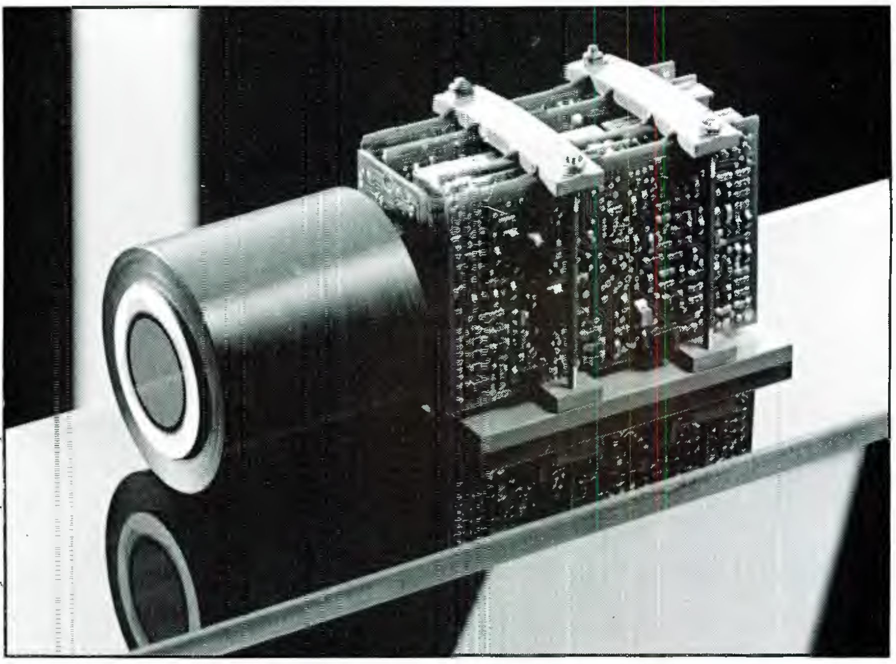
CCD pluses

CCDs took the ENG camera market by storm. The reasons were simple. They were clearly superior in terms of cost, size and weight. The chip cameras had no requirement for high voltage, greatly simplifying the power supplies. The CCD's scanning circuitry is digital, fabricated out of ICs, requiring none of the yokes or sweep circuits needed for tubes. CCD cameras have no filaments to heat, so they are ready for service instantly. Furthermore, CCD cameras are rugged, nearly impervious to mechanical shock and highly immune to the emissions of nearby walkie-talkies.

Aside from a few possible "smear" artifacts, chip cameras can work from near darkness up to strong backlight. If you have to hike or crawl or hang from a limb in the line of duty, it is comforting to know you won't irrevocably "burn in" an image on a tube face by letting a shot stray into the sun or a strong light. In short, CCD cameras are a great choice for ENG.

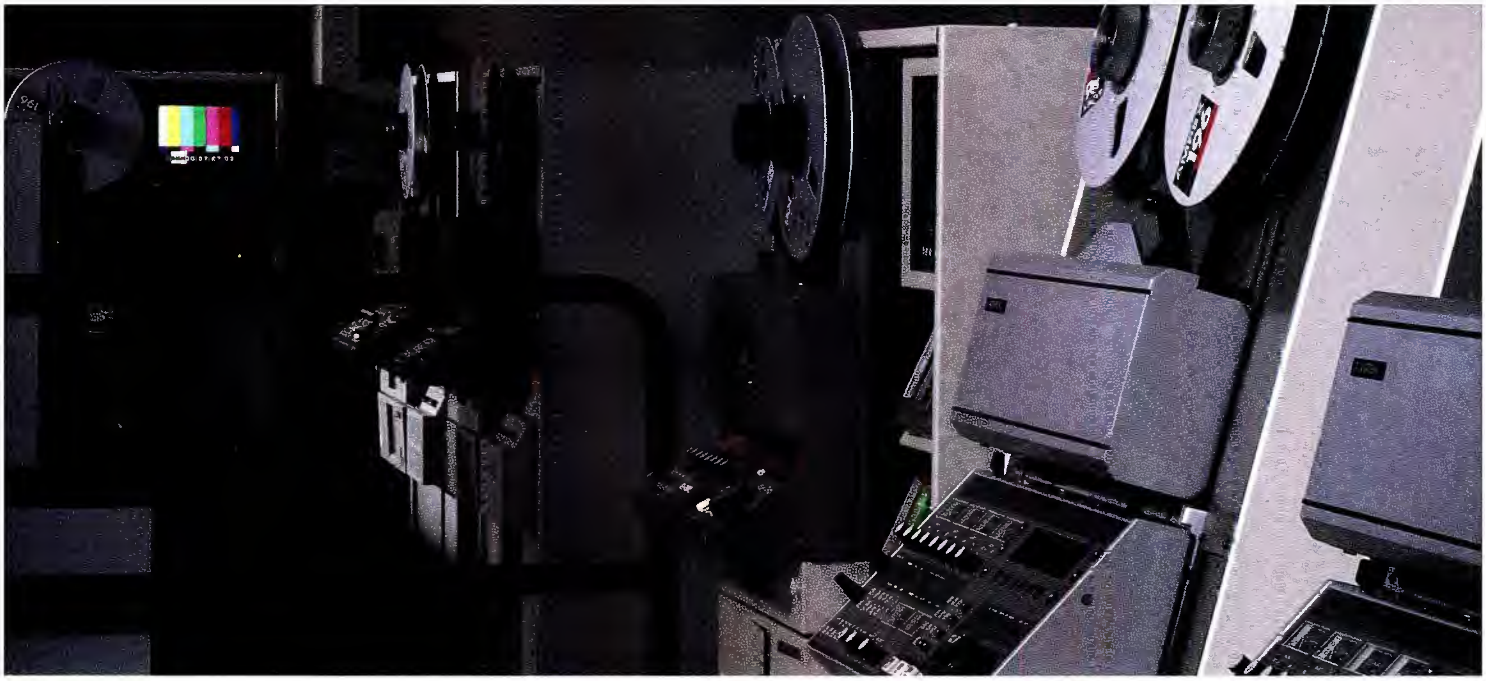
Other videographers also can reap the advantages of chip technology. Computer graphics system users quickly jumped on CCDs as the cameras of choice for scanning artwork into their systems. Although the image might not always have had quite as high a resolution as a 3-tube camera, and although the grid pattern on the CCD face sometimes caused aliasing with the image on the copystand, CCD cameras were adopted quickly because they never drifted out of registration.

CCD sensors possess inherently perfect geometry. This means that what is a circle on the copystand never looks oblong on the monitor. Also, registration is constant over the entire screen surface. Corner registration is not an issue with CCD cameras.



Courtesy of Philips Components

Intensified CCD image subassembly can see even in overcast starlight. A tapered fiber-optic bundle transfers the image from the intensifier tube at front onto the CCD array.



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We didn't spend five years pioneering the world's first D2 composite digital recorder just to win technology awards—selling D2 machines is one of our top priorities.

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"... business more than tripled this year using Type C..."

Bill Stokes,
Bill Stokes Associates

Ampex Zeus Advanced Video Processor

for the straight story about that equipment and its applications.

A case in point is the question we recently asked several of our customers who purchased Type C *after* we introduced D2.

"With the introduction of D2, why did you purchase Type C?"

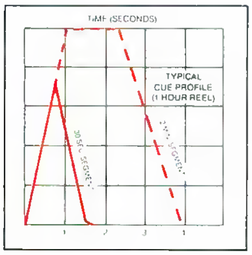
We think the answers we got may interest you if you're considering the purchase of *any* video machine.

Bill Stokes (*Bill Stokes Associates* in Dallas), came right to the point. "My business has more than tripled this year, and I'm using Ampex Type C machines. Is there any better reason to buy more? With the new TBC-7 or the Zeus processor they make perfect pictures. Besides, I like the service I get from Ampex."

Jerry McKinzie with *Cycle-Sat Communications Network* in Forest City, Iowa, (a satellite courier,

The VPR-80's Automatic Scan Tracking head and its erase head are both easily removed and replaced with only a screwdriver.

production, and post-production business), thinks it's important to be able to update easily as his business changes. "The hardware and software upgrades Ampex makes in their equipment allow me to keep my facility current, and to always give my customers the newest look. I like that, and my customers demand it."



The VPR-3's incomparable acceleration allows a 30 second segment to be re-cued and synchronously played in 2 seconds, using one hour reels.

Darrell Anderson, whose company *Anderson Video* in Los Angeles, recently purchased several

"...Type C business is readily available..."

Darrell Anderson, *Anderson Video*

VPR-3s, pointed out that the Zeus port allows interface with D2. Darrell believes that, "Type C and D2 will co-exist successfully in a well-managed facility. Type C business is readily available." We were gratified to hear that he, "bought the best Type C machine he could find."

Consider your purchase decision carefully. When the excitement of a new equipment introduction passes, and you've put the pros and cons down on paper, Type C may be exactly the right machine for your application. After all, it's still the world's broadcast interchange and distribution standard.

"...hardware and software upgrades keep my facility current..."

Jerry McKinzie,
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Breaking down barriers

Recent product improvements are "pushing back the envelope" on CCD performance.

- *Spectral response:*

Although CCDs already are star performers, designers know that certain frame-transfer CCD sensors exhibit a poor spectral response in the blue-to-ultraviolet wavelength. Although this might not be obvious to all users, it could affect the screen image. Furthermore, these frequencies might become increasingly important as research continues in lighting systems for chroma-keyers. One new lighting product, introduced at NAB 1989, uses specially treated fluorescent fixtures instead of hot incandescents.

Many cameras are especially sensitive to ultraviolet light. This means that UV scene reflections contribute to picture detail. The new lighting system is rich in UV, creating a lighting model that is said to be ideal for matte work. A CCD camera that is insensitive to this frequency may not be capable of optimum performance.

However, a new coating, developed in the United States and licensed to Thomson CSF, may solve the problem. The proprietary coating is applied directly to the front side of the silicon. The coating is temperature-insensitive and stable through time. The coating extends the response of CCDs up to 120nm. (See Figure 1.)

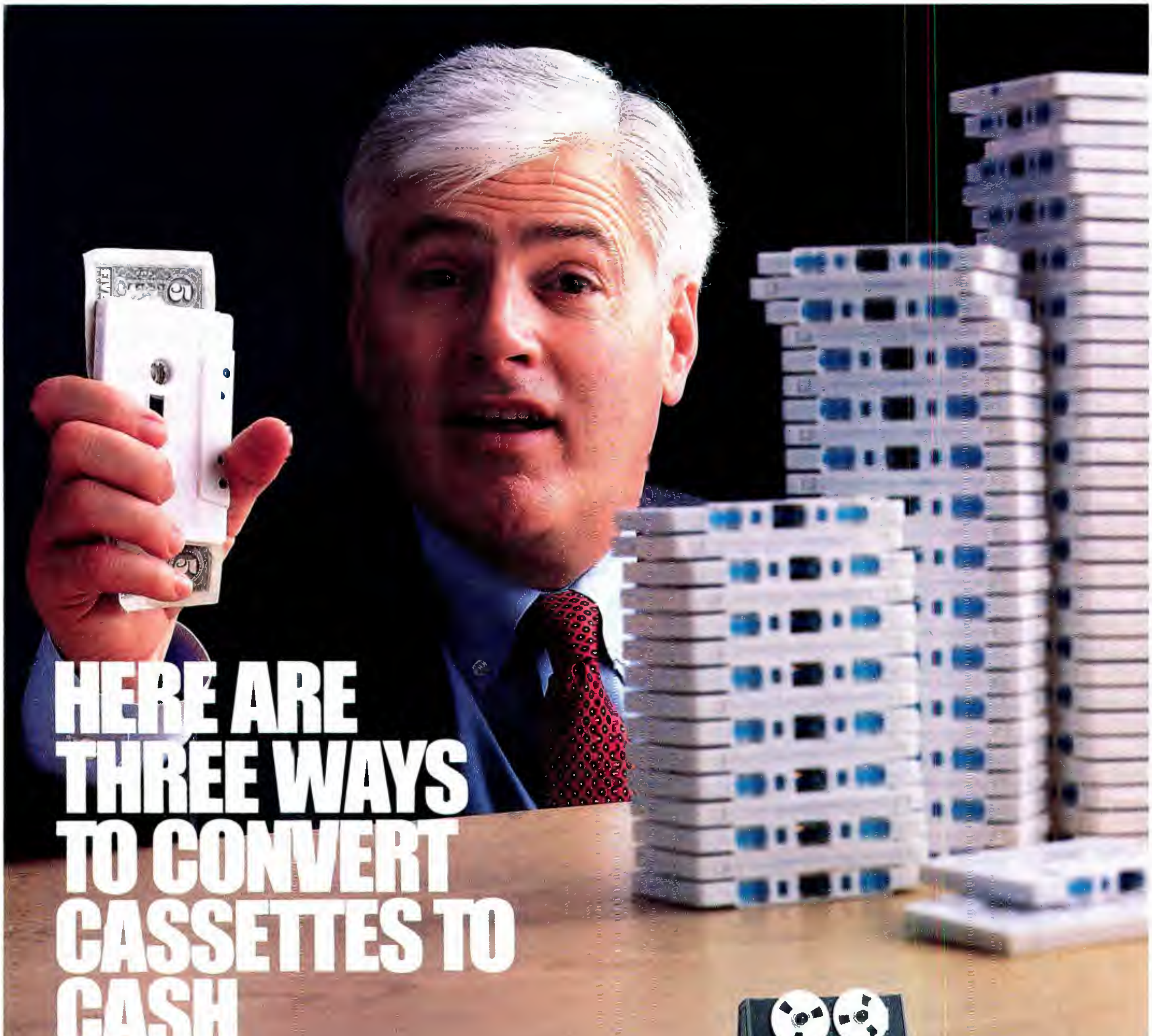
- *Low light sensitivity:*

Although CCD cameras generally are superior to tube cameras when it comes to working in low light, certain special setups, such as silicon-intensified target (SIT) cameras could do the job better. Philips components recently released an intensified CCD sensor system (shown in the photo) that is able to work right down to overcast starlight.

The sensor is available as a subassembly for incorporation into other manufacturers' products. The monochrome system is particularly suited for submarine, aerospace or other harsh, gloomy environments. Light entering the assembly is intensified by a special image-intensifier tube. The intensified image then is transferred to the CCD via a tapered fiber-optic bundle, which matches the image to the CCD face size.

- *Cost:*

Although they are popular in camcorders, CCDs have yet to make any real headway into the low end of the video market. Part of the reason for this is expense. The CCD circuitry in many of today's cameras may be too complex, hence needlessly expensive, for many operations such as video phones, door security systems, automotive rear-view systems and so on.



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Lenses: Is what you see what you get?

By Carl Bentz, technical and special projects editor

Lens manufacturers are working to make sure that what you see in the scene is what you see on the screen.

Designers of new TV equipment face the challenge to produce images that are closer and closer to reality. Every piece of equipment and every peripheral device can put its signature on the overall performance of the camera-to-receiver signal chain. What comes out can be no better than what goes in. The image quality on the home screen is a function of the image source, ultimately the TV camera. As a result, the entry point of pictures — the lens and pickup device — becomes a critical factor in the TV system.

Looking into the camera

Let's do some rough calculations. If the ⅔-inch (0.6667-inch) measurement of the optical format is the diagonal of the image on the pickup device, then the horizontal distance is 0.8 times the diagonal, or 0.53336 inches. The vertical distance is 0.6 times, or 0.40002 inches. For NTSC, divide the vertical dimension by the number of active video lines, which we will say excludes about 42 lines involved in the vertical blanking interval (525 − 42 = 483), to arrive at 0.000828 inches per scan line. A CCD with a pixel array of 610 × 492 (according to specifications released at NAB) drops down to an even narrower scan line of 0.000813 inches. (On later observation of the picture on a 27-inch-diagonal CRT, which is approximately 40 times larger than the ⅔-inch pickup device, the horizontal scan line becomes 0.03 inches in width. In comparison, a 0.31mm dot pitch — the distance between dot centers — on a high-resolution CRT is 0.0122 inches.)

CCDs have proved quite effective as camera pickup devices in numerous applications. The reality of a pixel-array structure with a finite number of light-sensitive locations and finite dimensions of those locations theoretically places a limitation on the CCD, but this does not mean that CCDs cannot produce high-quality images. Quite the contrary is true; cameras introduced at NAB '89 displayed resolutions surpassing a horizontal equivalent of 700TVL. However, when compared with tube-type pickup devices, CCD cameras still have some ground to gain.

For a ⅔-inch tube, there is no finite pixel-array structure. Although the target is, in essence, an array of photodiodes, the dimensions of the diodes are almost molecular. (The distance between centers of the photoconductive diodes is about 12 microns.) For tubes, possible resolution, ranging upward from 700 lines, has a great deal to do with the width of the scanning electron beam. Obviously, for smaller tubes, the beam diameter must be reduced to get the same kind of resolution that is obtained from larger-diameter devices. Still, to date, the lack of the "finite" array structure in the tube means a small advantage in tubes vs. CCDs, but indications are that CCD pixel sizes will continue to decrease.

Pickups and lens limits

The optical system of the camera has a role in determining whether you get (on screen) what you see (on scene). In most cases, the capability of the lens exceeds that of the camera upon which it is mounted, but new ingredients in the video recipe make some aspects of the lens-camera combination worthy of close scrutiny.

For example, beyond the concern of finite CCD pixels vs. "continuous" photosensitive material, control of pickup device placement and alignment requires attention. With tubes, there is a suggested orientation of the tube inside its deflection yoke for best possible results. The orientation is critical, but a degree of rotational tolerance is allowed. Freedom of the tube and yoke to move forward and backward achieve the best optical focus of the image on the faceplate in each color channel. Static and dynamic electrical focuses are among adjustments to be checked periodically on all tube-type cameras. Knowledgeable engineers and technicians can change and realign tubes with relative ease.

Adjustment is not the case in CCD designs. CCDs have predetermined, absolute alignments — horizontally, vertically, rota-

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aligned. Deviation from alignment produces image distortions, primarily laterally. To maintain the alignment, the structure holding the elements must be physically stable. It must not flex during movement of the different lens groupings, which rules out some lightweight materials. However, magnesium-steel and other space-age alloys can be cast into a honeycomb structure that does provide sufficient strength to prevent flexing with a reduced weight.

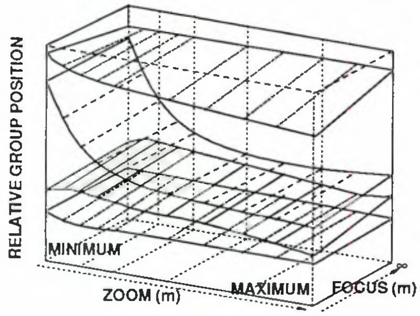


Figure 2. In standard zoom lenses the zoom and compensator groups move through mechanical cam-follower linkages. With microprocessor control, if zoom is altered, the other groups are optimumly positioned, according to data stored in a ROM. Similarly, if focus is changed, the remaining groups are repositioned as necessary.

What may not be apparent to many is the complexity of lens group position in relation to the zoom positioning. Figure 2 provides a view of the relative position of each group along the zoom range plotted against the relative focal length of the lens assembly. It is obviously a rather complicated relationship.

In the past, the typical solution to positioning of different lens groups has been to use a groove-follower arrangement. As the operator turns the focus and zoom rings, a system of threaded components inside the assembly forces a lens group to move. Alternatively, a zoom rocker switch energizes a motor to make the zoom and focus adjustments. A follower-cam attached to each group extends into a precision-machined groove. The cam may include a roller with bearings for easy tracking with a minimum of wear.

Inasmuch as the assembly is relatively sealed from the elements, abrasion resulting from the ingress of dirt is usually not a problem, unless the lens is exposed to extremely hostile conditions. If dirt does enter the mechanism, wear may result in sticky points along the zoom range, producing jerkiness in the zoom action.

By bringing microprocessors into the lens, new solutions have been found for controlling the accuracy of internal operation. In one application, small motors, one for each of the lens groups, control the optimum positioning of each group, based upon values stored in a PROM chip.

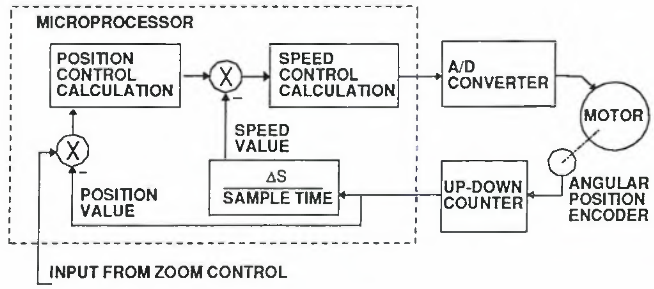


Figure 3. A motor control circuit for a microprocessor-controlled zoom lens.

Data in the PROM, determined during lens design, indicates exactly where each group should be, based upon operator-determined zoom and focus settings, and provides system diagnostics. When the camera is turned on, each motor calibrates itself by moving its group to a starting point, after which the microprocessor, in conjunction with angular encoders, determines the position. During operation, if zoom is changed or if focus is changed, the other three groups are adjusted accordingly to optimum positions. Figure 3 shows a block diagram of such a control system.

Today's lens systems provide other amenities to the camera operator. While the widely used mechanical lens assemblies use etched markings on the barrel and rings to indicate zoom and focus positions, some larger studio or OB lenses use a pointer moving along a scale to show the zoom position. The introduction of microprocessors offers other possibilities. For example, a multidigit LED array displays the zoom setting, or with the information in a digital form, the setting can be routed through the camera electronics to be displayed in the viewfinder, either as an effective lens length in alphanumerics or as a marker along a relative zoom position scale.

The mechanisms of zoom lenses allow some maintenance adjustments. In the smaller units, particularly for ENG, the adjustment is made by popping a protective cover off the adjustment screws. Some large studio and OB systems require that the housing be removed to reach the adjusting points. Others have arranged for all maintenance controls to be accessible through a small hinged opening.

The proper care of TV lens systems is important for continued high-quality imaging. Appropriate cleaning and adjustment, as outlined in a lens operation manual, typically will keep the unit in excellent operating condition. Abuse, rough handling and operation in hostile environments are precursors of problems. If the unit becomes damaged or suffers significant wear, it is wise to return the lens to the manufacturer for repairs, particularly if the damage or wear is internal. Attempts to make repairs could easily cause misalignment of the complex structure of optical elements and result in highly unsatisfactory performance.

As seen on the screen

Most of today's optical systems perform admirably. There is concern for the problems of chromatic aberration with CCD cameras, but manufacturers are taking steps to alleviate the error. The critical nature of aberration will become more important as we move toward higher resolution and high-definition imaging, simply because the individual pixel area of the pickup devices undoubtedly will become smaller. What we see in the scene usually will be well-represented by what we see on the screen, but manufacturers are searching for ways to keep ahead of the revolution in image-pickup quality.

Acknowledgment: Information for this article was provided by Canon, Fujinon and Schneider.

Designing an FM booster system

By Steve Broomell

An FM booster system might be a valuable addition to your station's technical portfolio, but it requires careful planning.

In 1987, the FCC issued new rules allowing FM broadcast stations to install and operate supplemental transmitters within their service areas. The purpose of the transmitters was to augment coverage areas that suffered from reception problems. Typical problems included multipath, weak signal strength caused by terrain, IM interference and receiver blanketing caused by other stations. These supplemental stations are classified as boosters and are licensed under Part 74, Subpart L.

These new boosters share several similarities with those previously covered by Part 74:

- They operate on the same frequency as the station they boost.
- They must be located inside the station's 60dBu (1mV/m) contour.
- They cannot degrade the original service of the station.
- They must carry the same programming and must be licensed to the primary station.

These new boosters differ from the classic booster in many ways:

- They may be operated as stand-alone transmitters, in that they can be fed programming by means other than direct off-air pickup.
- They may operate with as much as 20% of the power of the class of the primary station to which they are licensed.
- They may not extend the service area of the primary station. (In many cases this rule is actually more liberal than the 60dBu criterion.)
- If operated above 10W of transmitter power, they are governed by Part 73 technical standards.
- Booster antenna systems are not restricted by Part 73 criteria for FM directional antenna systems.

A station and its consultant should consider several factors before applying for a booster license. However, only technical considerations will be discussed here.

Broomell is manager, engineering services, Omega International, Irvine, CA.

The decision process

To decide whether a booster might be a valuable addition to your station's technical portfolio, answer these questions:

- Does the station suffer from the signal problems discussed?
- Do these problems justify a significant capital investment in its solution?
- Are the problems induced by factors that are not under the control of the licensee, such as terrain, location of other stations or inability to further improve the existing main transmitting plant?
- Is the station satisfied that such a booster will not enlarge its current coverage area to any significant extent?
- Does the station recognize that a booster will not be a total solution to any of these problems?

If you can answer "yes" to all these questions, a booster operating under the new Part 74 rules may be a wise investment for your station.

Implementation

As with any transmitter installation, study and engineering must be applied to the system design. In fact, greater engineering effort often is needed.

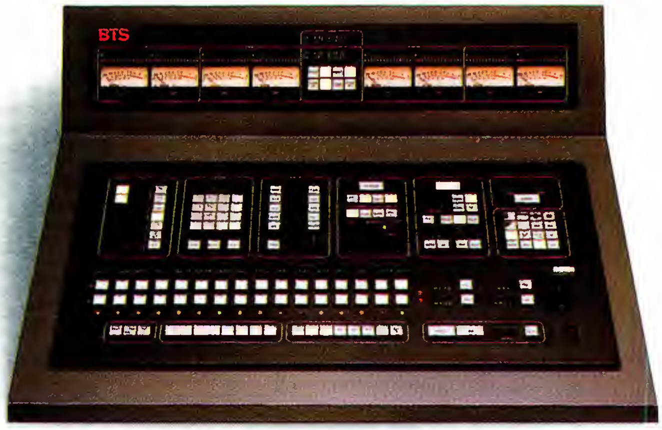
The first step is to quantify the specific coverage problem. Steps then can be taken to design a system to solve it. This process usually requires field-intensity measurements in the problem area(s).

Figure 1 shows the contour of a multipath and first-adjacent interference problem area. The contour was developed through field tests. Note that this is not simply a field-intensity contour. The map represents the perimeter of a specific area. Inside the contour, the service was poor, but no improvement was needed outside the contour.

At various points on the perimeter, field-intensity values are shown. Note that many of them are quite strong and, in some cases, they are above 60dBu. In other cases, the signal was too weak to be usable. Nonetheless, problems existed at all those points.

The solution was a synchronous repeater and a custom antenna system with carefully controlled vertical and horizontal patterning. The synchronous repeater

How to take control of a broadcast station.



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You simply pre-program the BTA-2300 Automation System to air all programs, station and commercial breaks exactly as you want, in real time. The Master Control Switcher accesses material from whatever sources you select: Betacarts, character generators, live feeds or satellite systems, for instance.

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(which will be described further), provides the best performance at high power when the signal ratio of the booster vs. the primary station is low.

The graph shown in Figure 2 is based on subjective listening tests. The subjective measurement is based on an average listener in a casual listening environment, such as a commuter drive in a normally quiet automobile. The lower, or 12dB, line represents the ratio below which the signal quality degrades noticeably. The upper, or 28dB, line is the ratio required for critical listening, such as classical music in a quiet home. Again, these ratios were arrived at subjectively by a limited number of people using a limited number of receivers.

These ratios are based on the use of an amplifying booster, such as the old 10W variety, or a synchronous repeater, locked in both frequency and phase to the primary station.

The same listening tests suggest that the ratios must be increased by at least 6dB to achieve the same results if the booster is not phase-locked. This is because of the presence of a discrete frequency heterodyne beat note or RF phase rotation at an audible rate.

This study resulted in a set of specifications for a client's booster system:

- A tailored, 3-dimensional antenna pattern providing a precise fit of the booster signal in the market cell.
- An effective radiated power providing a minimum of 12dB greater field from the booster than from the primary station.
- A booster transmitter that is phase-locked to the primary station signal to minimize the effects of mutual interference.

Construction

With the system described here, it was determined that an on-frequency amplifier at the booster site would be impractical. The required transmitter output of more than 200W into the specified antenna system would saturate the site. The resulting signal would be far too great to allow successful reception of the primary station. Such an on-frequency system would have become one large oscillator.

Even with much lower-powered, on-frequency amplifying boosters, it's usually difficult to maintain the required input-to-output isolation. In addition, maintenance of proper bandwidth is difficult because it is degraded by the inherent higher operating Q that accompanies regeneration.

For these reasons, a point several miles away was selected to receive the signal of the primary station. The signal is demodulated by a high-quality receiver and delivered as composite baseband to the input of a 950MHz intercity relay (ICR) transmitter. See Figure 3.

At the same location, a high Q passband cavity is used to ensure delivery of the primary station signal to the input of a downcounting system. The cavity severely attenuates signals from other stations.

The downcounter is a divide-by-N counter that produces a frequency within the subcarrier region of the ICR and is a submultiple of the primary station frequency. In this case, the primary station carrier was divided by 1,024 to generate a subcarrier of approximately 98.5kHz. Before the signal is applied to the ICR multiplexer input, it is highly filtered. This eliminates any harmonics that would cause out-of-band emission by the 950MHz transmitter.

Also, during the design phase, consideration was given to certain characteristics of the ICR equipment. Not all ICR equipment and exciters deviate in the same direction for a given polarity of audio input. The exciter used in this booster inverts the audio phase. In addition, because the output of the receiver at the relay

Continued on page 78

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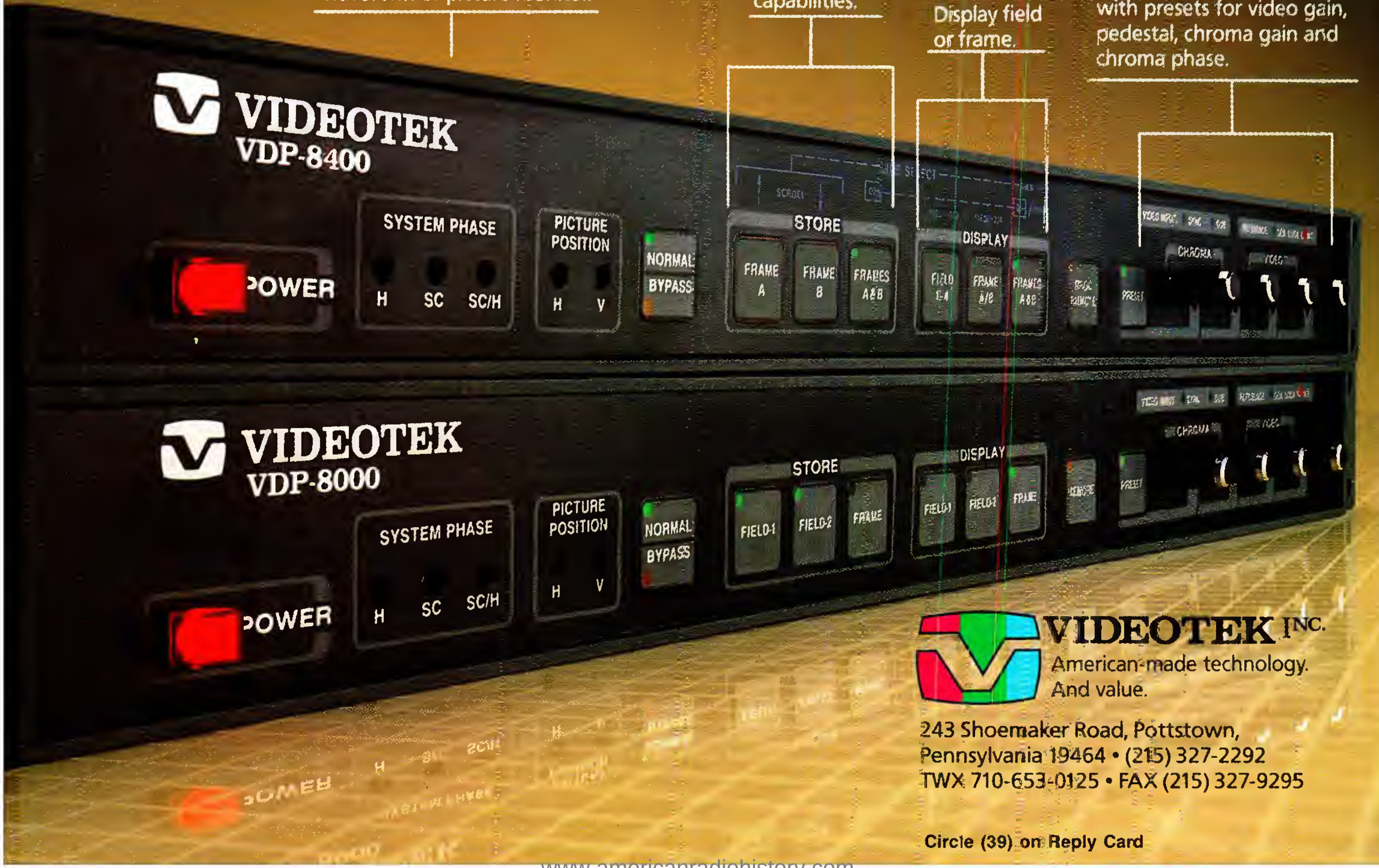

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When Panasonic set out to design Composite Digital recording systems, we had a big responsibility—to keep it small. Our customers have a right to expect their investment in 1/2-inch to be preserved. We know that a change in technology means more than a change in equipment; walls, racks, layouts, suites, vans and tape storage are all long-term investments that shouldn't have to be re-done every time there's a new chip on the block.

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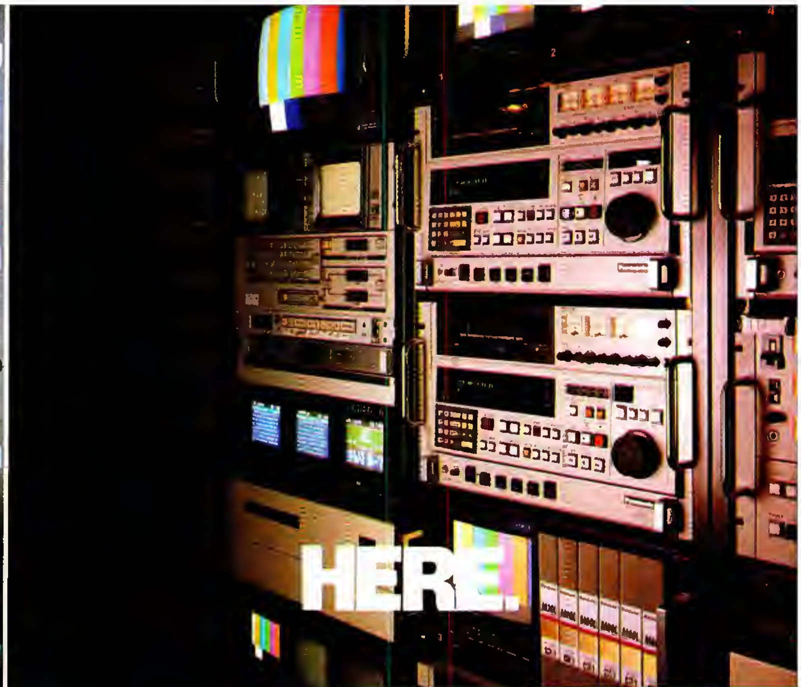
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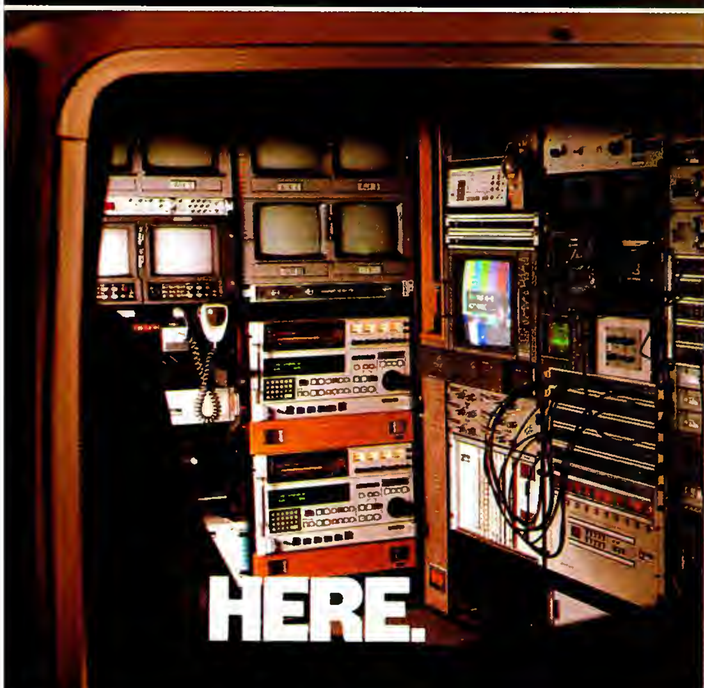
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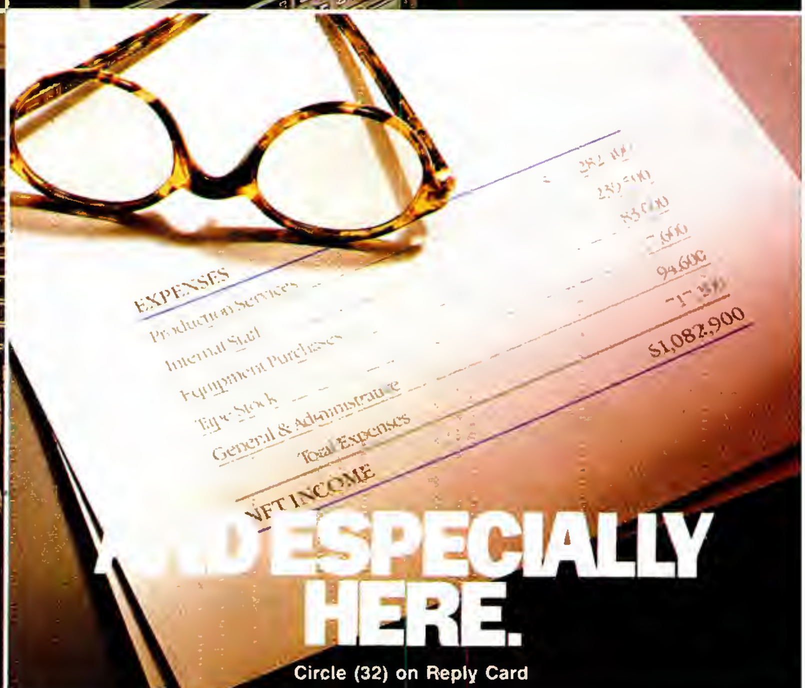
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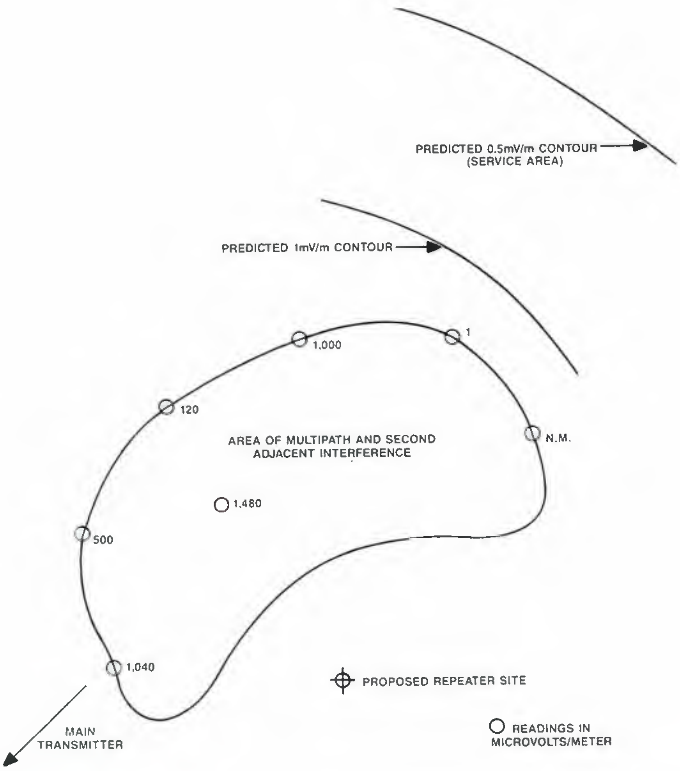

Figure 1. *Contour map developed with field-strength measurements and interference checks. Carefully construct this type of map as your first step.*

Continued from page 74

point was too low to drive the ICR transmitter, a phase-inverting distribution amplifier was installed between the receiver and the ICR transmitter.

Note that the design does not try to eliminate the phase-linear audio delays that are inherent in any booster system if the listener is not located equidistant from the two sources (in other words, where the mutual propagation time from the sources is equal). In this case, we are correcting for total phase reversal of the audio that would occur because of the booster. These inversions then would be detected as a phase error by a receiver's phase-locked loop circuitry.

This example system consists of a 950MHz signal modulated by composite audio baseband (with the appropriate phase) and a reference subcarrier. Both are transmitted to the booster site where they are demodulated by a standard ICR receiver. The composite baseband is delivered to the booster's input. The reference subcarrier is taken from the multiplexer output of the ICR receiver and directed to a phase-locked loop.

A downcounter, similar to the one at the relay point, is used to derive a frequency from the output of the booster. This sig-

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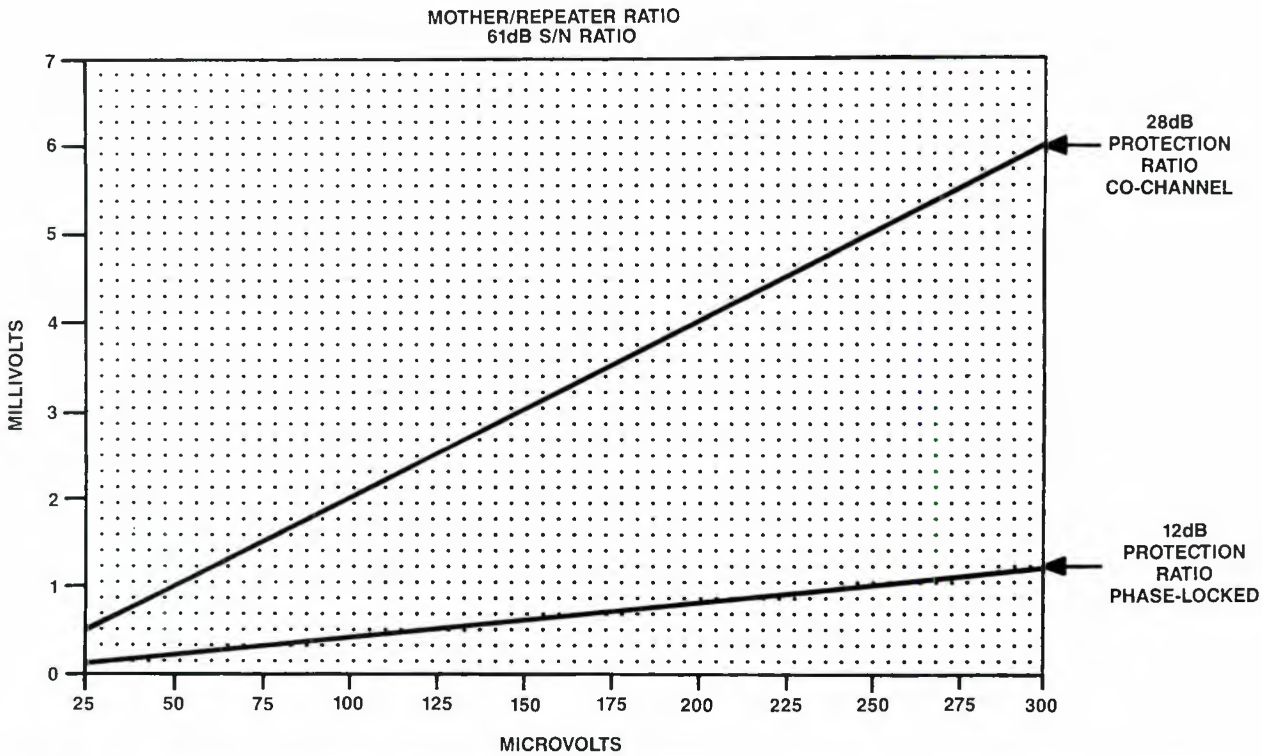

Figure 2. *The ratio in primary-to-booster signal strength determines the overall listening signal quality. A greater protection ratio is required for some types of programming.*

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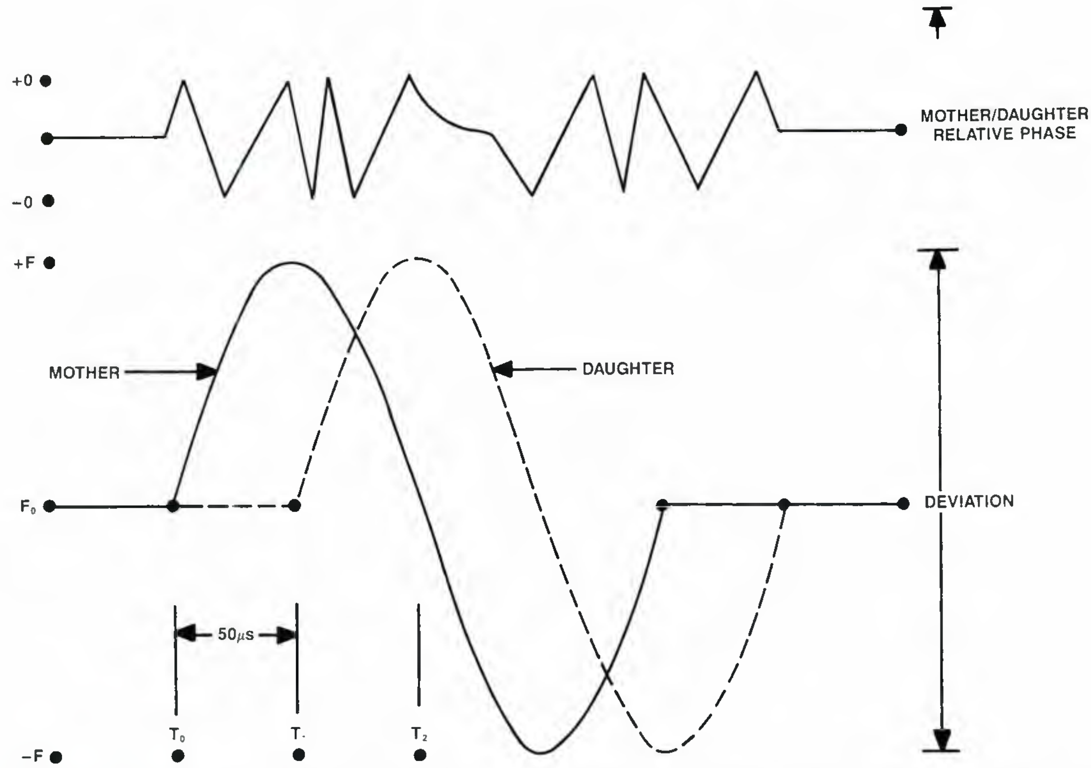

Figure 5. *The lower sine waves represent the primary and booster modulation signals. Time is marked as* T_0, T_1, T_2. *The propagation delay through the booster results in amplitude modulation within the receiver.*

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Modulation noise sets the practical limit on how close to equal the primary and booster may be in signal strength while still being listenable.

With single-tone modulation, this noise manifests itself as a second, single tone. With normal program material, containing components of many frequencies, the number of intermodulation products of these frequencies rapidly approaches infinity. The result approximates the sound of de-emphasized white noise.

To explain its cause, let's construct a model. An example situation is that of a receiver located in a station's service area where it receives equal-strength signals from both the primary station and the booster.

You can assume that the distance to the receiver from the primary station is less than the distance from the primary station to the booster. Also assume that no modulation is occurring and that the frequencies of the primary and the booster are the same and phase-locked.

The receiver will respond to the two signals as if they are the same and will recognize the vector sum as the signal strength. Under these conditions, no noise will be generated if the strength is adequate for receiver quieting.

Now, for the sake of example, apply a modulating signal of 5,000Hz at T_0 (see Figure 5). Assume that the propagation time through the booster to the receiver equals the first 90° of a 5,000Hz tone ($50\mu s$) and the propagation time to the receiver from the primary station is virtually nil.

During the first 90° of modulation, the primary station's frequency will deviate in a given direction while the booster's frequency will remain constant until T_1 (as perceived by the receiver).

During the next and succeeding 90° of modulation, the primary station will reverse its deviation direction. At the same time, the booster's frequency begins to deviate in the original direction taken by the primary station for 90° until T_2. Then the booster also reverses deviation direction.

Thus, the relative RF phase of the two signals will rotate, creating a large amount of apparent amplitude modulation. It will be impossible for the receiver's limiter and detector stages to mask this effect. The illustrated phase waveform in Figure 5 is only an example. The actual result is a function of the modulation index.

The various functions within the system also are non-linear. Therefore, with a multitude of modulating frequencies, all possible in-band IM products will be generated in the various receiver circuits. The result is modulation noise.

Antenna system

In light of this, an antenna system was designed for the station. The antenna creates the smallest possible area of equal signal strengths, as opposed to a system that would create the largest possible coverage area.

The antenna system's pattern, shown in Figure 6, is unusual, even as a directional array. It directs a deep null at the horizon while directing its maximum radiation at a slight depression angle into the market cell. Meanwhile, the horizontal radiation pattern rises in the vertical plane to the horizon as the azimuth becomes off-axis from the array maximum.

This 3-dimensional pattern was achieved through the use of two vertically stacked yagi antennas at a 4.06-wavelength spacing combined with a 7° mechanical beam tilt and skewed 60°.

Design carefully

Every booster system can be configured in several ways, and each market problem requires a different coverage pattern. Also keep in mind that the potential for causing more harm than good with a booster always exists. Fortunately, the potential for dramatic improvement also exists.

The key is to approach each installation as a unique engineering challenge. Consider all factors, and design each system from scratch. Begin the process from a market cost standpoint. Proceed through hardware selection, and end with an uncompromising antenna design. When it is completed, treat the system with the utmost care and maintain it diligently to ensure continued successful operation.

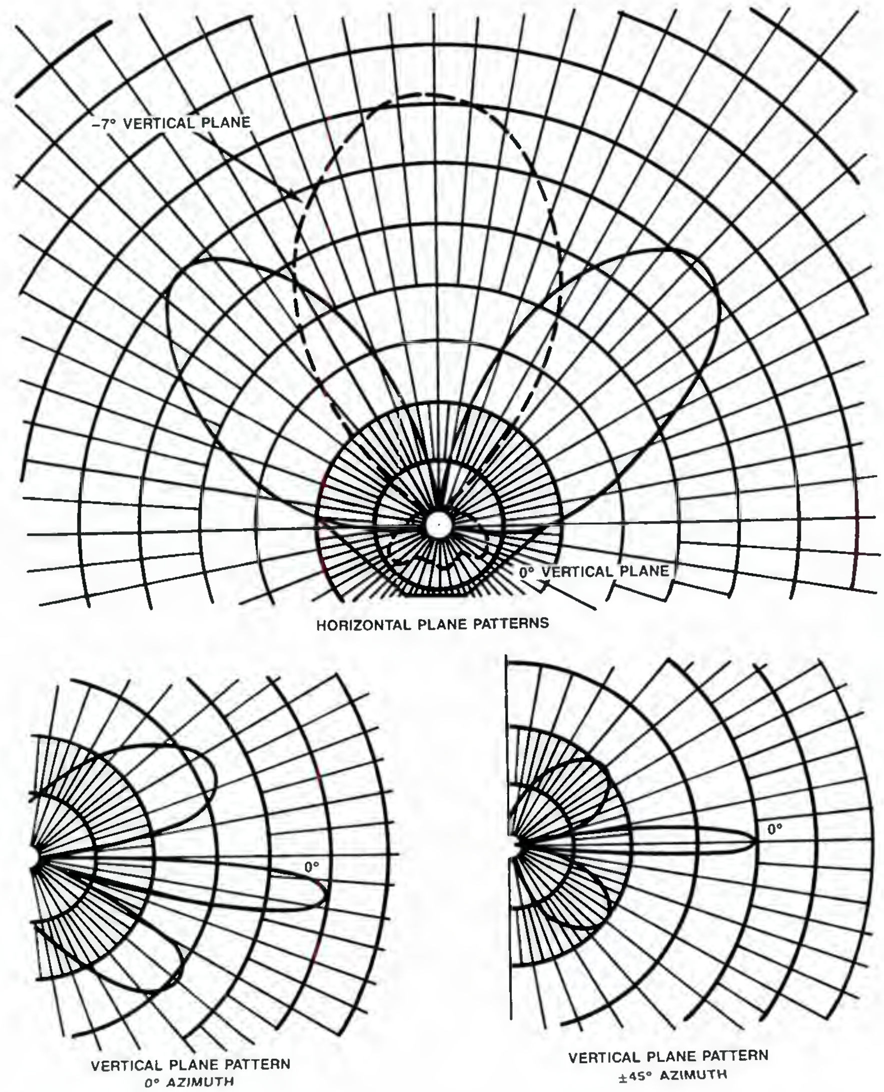

Figure 6. The example installation relies on a sophisticated transmitting antenna. The text describes the antenna's characteristics.

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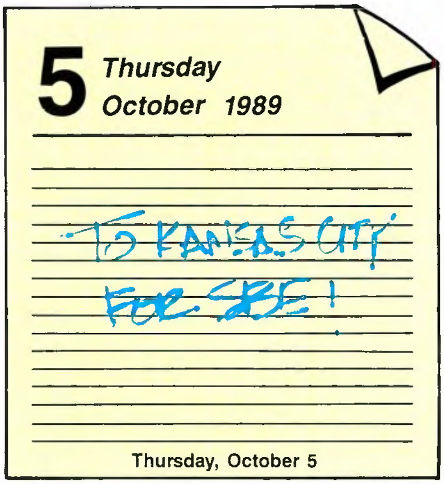

Don't miss the anniversary party

By Brad Dick, radio technical editor

Kansas City, MO, will play host to the 1989 SBE national convention Oct. 5-9. Coupled with the society's 25th anniversary, it promises to be a festive affair.

Come for the learning

Everyone knows that the SBE/**BE** seminars are first class, and this year's line-up is no exception. Attendees will be treated to lively, interesting and informative presentations by experts from across the nation, who will discuss a range of topics, from the latest technology to methods of extending the life of current equipment.

The presentations are keyed to meeting the needs of today's engineers. If you're involved in the technical operation or management of a station, you need to be at this convention. You'll learn more in the three days of sessions than you ever thought possible. You will leave Kansas City armed with practical, first-hand information to help make you a better engineer and your station more profitable. Come to K.C., and learn how to survive and prosper in the ever-changing world of broadcast engineering.

Every engineer wants to see the latest equipment, and manufacturers representing every type of hardware will be at the show. The booths will be staffed with technical people. If you want to talk technical, this is the place to do it.

Don't pass up the chance to have your questions answered by the people who really know how the equipment operates. This is a hands-on show, and you'll never have a better opportunity to try before you buy (a good reason to bring your boss). Admission to the exhibition floor is free, but advance registration is suggested.

Stay for the fun

Who said engineering conventions have to be boring? This year's convention is designed to be both fun and educational. Besides, we have something to celebrate.

SBE National Convention and Broadcast Engineering Conference

Wednesday, Oct. 4:	
• Ennes Engineering Workshops (all day)	
Thursday, Oct. 5:	
• 8 a.m.—9 a.m.	SBE national membership meeting
• 9 a.m.—12:30 p.m.	Morning Engineering Session: The Regulation Front
• 1:30 p.m.—6 p.m.	Afternoon Engineering Session: Broadcast Technology
• 6 p.m.—8 p.m.	Attendee reception in the exhibit hall
• 8 p.m.—10 p.m.	Night Owl Session: Audio Processing
Friday, Oct. 6:	
• 8 a.m.—10 a.m.	Morning Radio/TV Engineering Sessions
• 10 a.m.—3 p.m.	Exhibits
• 11 a.m.—1 p.m.	Lunch with exhibitors (receive an SBE lab coat)
• 3 p.m.—6 p.m.	Afternoon Radio/TV Engineering Sessions
• 6 p.m.—7 p.m.	Ham Reception
• 7 p.m.—9 p.m.	Night Owl Session: Engineer Licensing
Saturday, Oct. 7:	
• 8 a.m.—10 a.m.	Morning Radio/TV Engineering Sessions
• 10 a.m.—3 p.m.	Exhibits
• 3 p.m.—6 p.m.	Afternoon Radio/TV Engineering Sessions
• 6 p.m.—7 p.m.	SBE Reception
• 7 p.m.—9 p.m.	Dinner and State-of-the-Industry Address
• 9 p.m.—????	SBE 25th Anniversary Party
Sunday, Oct. 8:	
• 9 a.m.—10 a.m.	National Frequency Coordination Meeting
• 10 a.m.—noon	Engineering Safety Workshop
• Noon	Good-bye until next year!

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Schedule of Engineering Sessions

Oct. 5-8, 1989
Kansas City, MO

Thursday, Oct. 5

• Morning session: The Regulation Front
Session Coordinator: John Battison

7:30 a.m.	No-host continental breakfast
8 a.m. Paper #1.1	**Conference Opening and Welcome** • Jack McKain, SBE President • John Battison, Conference Chair *Keynote remarks to launch this year's convention, and the 25th anniversary celebration of SBE.*
8:30 a.m. Paper #1.2	**Telco: Friend or Foe?** • Daniel Collins, Bell Communications Research *An assessment of the future for cooperation — or competition — between broadcasters and the local Bell operating companies.*
9 a.m. Paper #1.3	**The State of the Broadcast Industry** • Wallace Johnson, Moffett, Larson and Johnson *Status report on how regulation is affecting the business of broadcasting.*
9:30 a.m. Paper #1.4	**NAB Looks Toward the Future** • Mike Rau, NAB *Summary of work being done by the National Association of Broadcasters on behalf of radio and TV stations.*
10 a.m. Paper #1.5	**Moving Toward 1999: Broadcasting in the Next Decade** • Jerry Whitaker, **Broadcast Engineering** magazine *A perspective on what the next 10 years may hold for radio and TV stations.*
10:30 a.m. Paper #1.6	**Communications Technology Roundtable** • Mike Rau, NAB • John Battison, SBE • Jack McKain, SBE • Wally Johnson, consultant *A free-for-all discussion of broadcasting today, and where it is likely to be heading tomorrow.*
Noon	End of Morning Session

Lunch Break (food served outside lecture hall)

• Afternoon Session: Broadcast Technology
Session Coordinator: Brad Dick, technical editor, ***Broadcast Engineering*** *magazine*

1 p.m. Paper #1.8	**Automation, Plain and Simple** • H. Stalnaker, V.P. of engineering, KEZQ-FM, Little Rock, AR *Case history of a station's experience with automation — what went right, and what went wrong.*
1:30 p.m. Paper #1.9	**Using PCs in Broadcasting** • Ben Evans, Evans Associates *How personal computers can improve productivity and reduce on-air errors at radio and TV stations.*
2 p.m. Paper #1.10	**Developing Computer-Aided DA Patterns on a PC** • Dave Matthews, C.E., WMNI-AM, Columbus, OH *How to let your PC take the work out of computing directional antenna patterns.*
2:30 p.m. Paper #1.11	**Complementing EBS with a Direct Warning System** • Troy Langhan, C.E., KQMJ-FM, Tulsa, OK *How one station improved the effectiveness of the emergency broadcast system in its service area.*
3 p.m. Paper #1.12	**Hardening Broadcast Facilities** • Dave Fitzsimmons, CCDR Architects *Maintaining architectural integrity in broadcast facilities can keep you on the air when disaster strikes.*

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do more. An optional positional focus control system and a zoom shot box allow you to customize the lens to specific broadcasting requirements. And like every Canon broadcast television lens, the J15X9.5B IRS provides years of dependable service thanks to superior optical and mechanical design and construction.

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3:30 p.m. Paper #1.13	**FCC Roundtable** • Coordinator: John Battison • Keith Larson, FCC • Robert Greenberg, FCC • John Sadler, FCC *Your opportunity to fire questions at the FCC, and get straight answers.*
5 p.m.	End of Afternoon Session
5 p.m.-6 p.m.	**SBE Membership Meeting**

******* 6 p.m.–8 p.m. — Attendee Reception in Exhibit Hall *******

• Night Owl Session: Audio Processing
Session Coordinator: Andy Laird, KDAY-AM, Los Angeles

8 p.m. Paper #1.13	**Audio-Processing Panel Discussion** • John Bisset, Delta Electronics • Other panel members to be selected *The always popular give-and-take session on what's good and what's bad about audio processing.*
10 p.m.	Close of session

Friday, Oct. 6

• Morning Radio Session: New Technology for Radio, Part 1
Session Coordinator: John Battison

7:30 a.m.	No-host continental breakfast
8 a.m. Paper #2.1	**Noise-Free Radio: A New Concept** • George Yazell, consultant *A new approach to AM broadcasting using FM.*
8:30 a.m. Paper #2.2	**FMX Status Report** • Tom Keller, Broadcast Technology Partners *An update on FMX and receiver blending.*
9 a.m. Paper #2.3	**AM and FM Boosters, Translators and Slave Stations** • Ralph Evans, consulting engineer *How to increase the coverage of your station, and stay within the FCC's rules.*
9:30 a.m. Paper #2.4	**The Status of NRSC-FM** • John Bissett, Delta Electronics *A report updating the work of the NRSC-FM subcommittee.*
10 a.m.	Close of session

• Morning Television Session: Advanced Television Systems
Session Coordinator: Ned Soseman, editor, ***Video Systems*** *magazine*

7:30 a.m.	No-host continental breakfast
8 a.m. Paper #2.5	**HDTV Status Report** • Ben Crutchfield, ATTC *The status of HDTV and ATV technologies, new products and new ideas.*
8:30 a.m. Paper #2.6	**Testing Advanced TV Systems** • Charles Rhodes, ATTC (tentative) *A report on how the competing ATV systems are being tested and compared.*
9 a.m. Paper #2.7	**HDTV Standards: Is There Any Hope?** • John Seazholtz, Bell Atlantic *A review of current proposed standards and standardization trends.*
9:30 a.m. Paper #2.8	**Competing With Cable and the Phone Company** • Steven Bonica, NBC *Observations on the role competitive organizations might take in the delivery of HDTV programming to the home.*
10 a.m.	Close of session

The Aphex Audiophile Air Chain

"FM radio has become a ratings war in which we are the casualties by being subjected to a poor excuse for clean, accurate music."
Thomas J. Koch, *The Audiophile-File*

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***** 10 a.m.–3 p.m. — Exhibit floor open *****
(Walk-around lunch and SBE lab coat with paid admission)

10 a.m.	Chapter Chairmen Meeting
11 a.m.	Meeting ends

• Afternoon Radio Session: New Technology for Radio, Part 2
*Session Coordinator: Brad Dick, technical editor, **BE** magazine*

3 p.m.
Paper #2.9
Solid-State Transmission Systems
• Bob Weirather, Harris Corporation
New approaches to the use of semiconductors in high-power radio transmitters.

3:30 p.m.
Paper #2.10
High-Fidelity 76kHz SCA
• Tim McCartney, D.E., KBSU-FM, Boise, ID
How to accomplish the improbable.

4 p.m.
Paper #2.11
Do You Know Where Your Signal is Going?
• Bob Richards, Dataworld
The ins and outs of station coverage.

4:30 p.m.
Paper #2.12
New FM Processing Methods
• Robert Greenberg, FCC
How the FCC plans to speed up the processing of FM applications.

5 p.m.
Paper #2.13
Stump the Experts
• Chairman: Mike Patton, Patton Circuit Systems
• Carl Lahm, P.E., consulting engineer
• Dave Chenowith, Continental Electronics
• Additional panelists to be selected
Let this panel of experts solve your toughest operating problems.

6 p.m. Close of session

• Afternoon Television Session: Digital Technology
*Session Coordinator: Rick Lehtinen, technical editor, **BE** magazine*

3 p.m.
Paper #2.14
Digital Recording Technology: An Overview
• Presenter to be named
The principles behind the D-1, D-2 and digital HDTV systems.

3:30 p.m.
Paper #2.15
Digital Graphics Systems
• Philip Malkin, Time Arts
How to use a local systems integrator to build your station's own computer graphics center from the ground up.

4 p.m.
Paper #2.16
Digital Format Conversion
• Christian Tremblay, Central Dynamics
Using current technology hardware to convert between digital formats.

4:30 p.m.
Paper #2.17
High-Speed Digital Communications
• Gerry Kaufhold, SGS-Thomson Microelectronics
How tomorrow's equipment will pick up the pace for digital data transmission.

5 p.m.
Paper #2.18
Finding the Teletext Niche
• Dave Webb, KSL-TV News
Teletext is here, but how can we use it?

5:30 p.m.
Paper #2.19
Using Super-Power Isolators in the Broadcast Plant
• James Stenberg, Micro Communications
How super-power isolators work, and the performance benefits they can provide.

6 p.m.	Close of session
6 p.m.-7 p.m.	Ham Radio Reception

• Night Owl Session: Engineer Licensing
Panel discussion coordinator: Chris Imlay

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Paper #2.20	• Bob Van Buhler, SBE • Dane Erickson, Hammett & Edison • Other panelists to be selected *A gloves-off look at the hot question of licensing broadcast engineers.*
9 p.m.	Close of session

Saturday, Oct. 7

• Morning Radio Session: Radio Transmission
Session Coordinator: Wayne Woollard, KDON-AM/FM

7:30 a.m.	No-host continental breakfast
8 a.m. Paper #3.1	**Transmission lines and waveguide** • Dane Ericksen, Hammett & Edison *Generating RF is only half the battle. You also have to get it to the antenna.*
8:30 a.m. Paper #3.2	**Dealing With Negative Towers** • Jerry Westberg, Westberg Consulting *Taking the negatives out of negative towers.*
9 a.m. Paper #3.3	**Optimum Bandwidth for FM Transmission** • Ed Anthony, Broadcast Electronics *How wide is wide enough?*
9:30 a.m. Paper #3.4	**Five- vs. Four-Pole Bandpass Filters for FM Combiners** • Bob Surette, Shively Labs *A new look at FM power combiners.*
10 a.m.	Close of session

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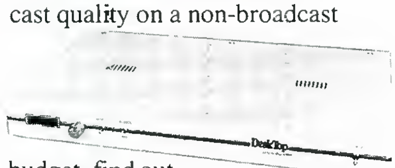

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- ***Morning Television Session: TV Transmission***
Session Coordinator: Ned Soseman, editor, ***VS*** *magazine*

7:30 a.m.	Cash continental breakfast
8 a.m. Paper #3.5	**Advanced Klystrode-Equipped Transmitters** • Nat Ostroff, Comark *A status report on Klystrode tube transmitter development.*
8:30 a.m. Paper #3.6	**MSDC Klystron Progress Report** • Earl McCune, Varian Associates *A status report on the multistage depressed collector klystron and its application in the field.*
9 a.m. Paper #3.7	**Using Tetrodes for High-Power UHF** • Dr. Timothy Hulick, Acrodyne *A report on the application of high-power UHF tetrodes in broadcast transmission equipment.*
9:30 a.m. Paper #3.8	**Maintaining Solid-State VHF Transmitters** • Gaylen Evans, Harris *New high-power semiconductor transmitters require a new approach to maintenance.*
10 a.m.	Close of session

******* 10 a.m.-3 p.m. — Exhibit floor open *******
(Lunch available for purchase on convention floor)

- ***Afternoon Radio Session: Radio Technology***
Session Coordinator: John Battison

3 p.m. Paper #3.9	**RENG and the Cellular Telephone** • Skip Pizzi, National Public Radio *Cellular telephones offer broadcasters a whole new world of opportunities.*

3:30 p.m. Paper #3.10	**Using Computers to Manipulate Audio** • John Statner, Compusonics *The demise of razor-blade editing.*
4 p.m. Paper #3.11	**Computer-Based Digital Audio** • Greg Dean, Computer Concepts *The inside track on computerized audio.*
4:30 p.m. Paper #3.12	**The Shape of Things to Come** • Brad Naples, New England Digital *A glimpse of the broadcast media in 1995.*
5 p.m. Paper #3.13	**Digital Signal Processing** • Richard Cabot, Audio Precision *New technology offers new ways to solve old problems.*

Plenty of music and conversation will be on tap at an attendee reception with the exhibitors on Thursday evening. On Friday, you'll be treated to lunch in the exhibit hall. Seminar attendees will receive a special SBE lab coat. You'll want one of the lab coats for use back at the station.

You only turn 25 once. And this is the year for the Society of Broadcast Engineers. The convention will mark the quarter-century point for the SBE, and the celebration may well be remembered for the next 25 years!

The festivities start with a reception for all members and their spouses. The informal gathering will provide an opportunity to renew acquaintances and catch up on the latest news in your market. The reception also will provide an opportunity to mingle with the pioneer members of SBE, the people who formed the society in 1964.

After the reception, join your colleagues, representatives from other professional organizations and our guest speaker for a formal dinner.

Following the official program, it's party time! Help the SBE mark 25 years of service to the broadcast industry, and have a good time, too. No anniversary party would be complete without presents. There will be something for everyone. Come and see what we have to mark the 25th birthday of the SBE. The grand prize will be a laptop computer. Winning is easy; just visit the various booths on the convention floor, and be present at the party. How can you miss?

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When was the last time you got a discount on taxi fares from the airport to your hotel? Well, SBE thought of that too. Special discounts are available for members who make advance reservations. Call 1-800-221-9165 before 5 p.m.

Kansas City offers something for everyone. Attend the SBE national convention and **Broadcast Engineering** Conference, and make it a family event.

Schedule continued on page 104

Auditronics 'because they work well and they're so easy to use"

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5:30 p.m. Paper #3.14	**Interfacing VHS Videocassettes for High-Quality Audio** • Wayne Woollard, C.E., KDON-AM/FM, Salinas, CA *Using consumer video equipment to solve audio problems.*
6 p.m.	Close of session

• Afternoon Television Session: Television Technology
Session Coordinator: Rick Lehtinen, technical editor, ***BE*** *magazine*

3 p.m. Paper #3.15	**Using Fiber Optics** • F. David Harris, Purdue University *Fiber-optic technology promises to revolutionize broadcasting in general, and television in particular.*
3:30 p.m. Paper #3.16	**New Approaches to Small-Format Video Recording** • Neil Neubert, JVC *Continued improvements in tape-recording technology offer users additional options for ENG work.*
4 p.m. Paper #3.17	**Future TV Transmission Technologies** • Rick Lehtinen, **BE** magazine *New digital technologies are appearing that could drastically alter the way we send signals.*
4:30 p.m. Paper #3.18	**LTPV Has Arrived** • Keith Larson, FCC *The status of low-power TV, and what the commission sees for the future.*
5 p.m. Paper #3.19	**Solutions for Unique TV Coverage Situations** • Thomas O'Flaherty, Andrew Corporation *Difficult coverage requirements demand a fresh approach to antenna design.*
5:30 p.m. Paper #3.20	**Designing a Candelabra Tower System for a Secondary Market** • Don Borchert, D.E., WIS-TV, Madison, WI *Designing an antenna/tower structure to meet some difficult requirements.*
6 p.m.	Close of session

******* 6 p.m.–9 p.m. — SBE reception/banquet with guest speaker *******
Followed by 25th anniversary SBE party at 9 p.m.

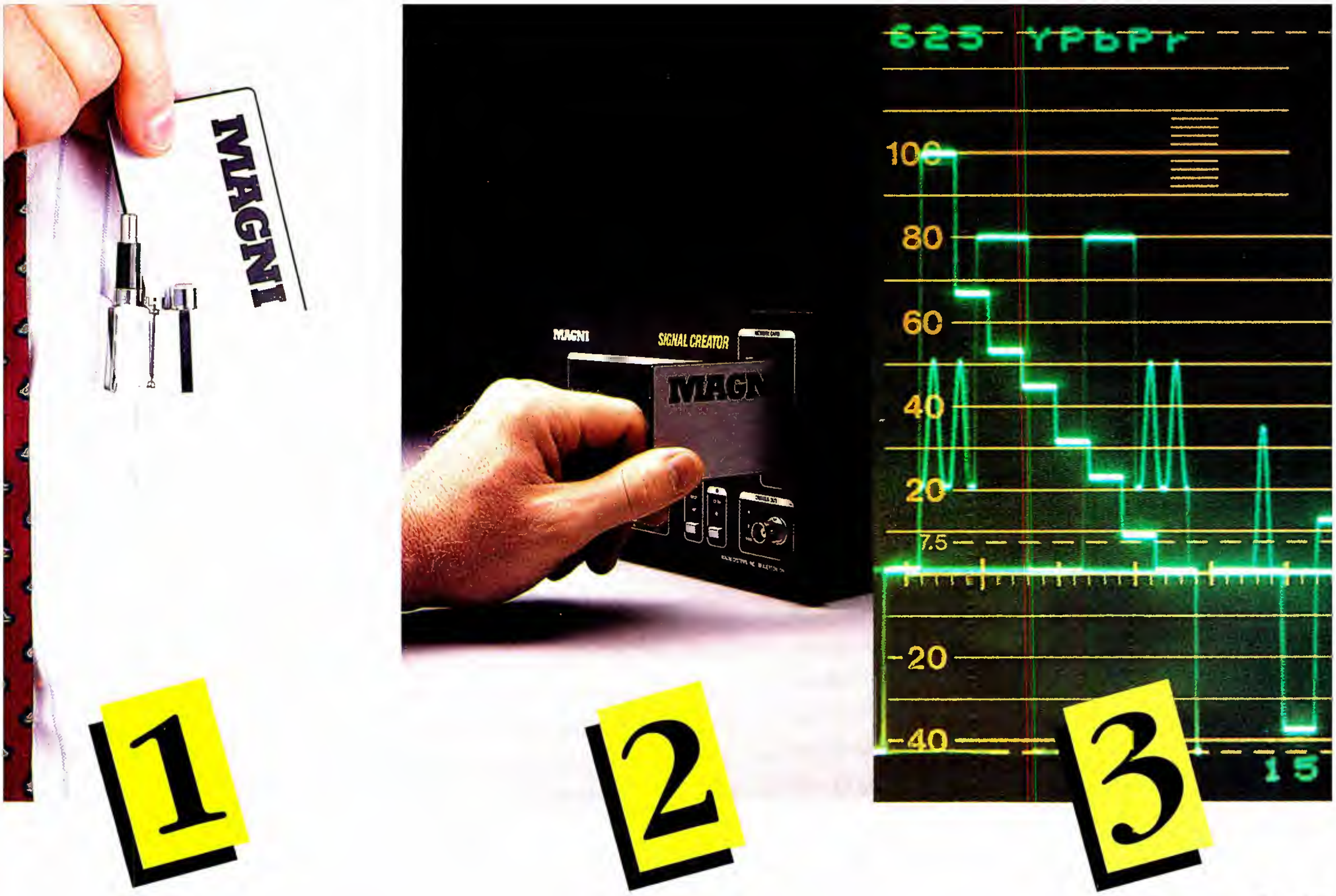
Sunday, Oct. 8, 1989

• Morning Session: Frequency Coordination
Session Coordinator: Richard Rudman

8:30 a.m.	No-host continental breakfast
9 a.m. Paper #4.1	**Frequency Coordination Update** • Gerry Dalton, KKDA-AM, Grand Prairie, TX • Richard Rudman, KFWB-AM, Los Angeles *The latest developments on frequency coordination, and how SBE members can help the effort.*
10 a.m.	Close of session

• Engineering Safety Workshop
Session Coordinator: Jerry Whitaker, editorial director, ***BE*** *magazine*

10 a.m. Paper #4.2	**Safety in the Workplace** • Kent Kroneman, KUED-TV, Salt Lake City *Safety is more that just a good idea, it's a must for every station.*
10:30 a.m. Paper #4.3	**RF Radiation Compliance** • Milford Smith, Greater Media *How to be sure your station complies with the latest guidelines on electromagnetic radiation.*
11 a.m. Paper #4.4	**Transmitter Maintenance Safety** • Marvin Born, D.E., WBNS-TV, Columbus, OH *How to keep your transmitter on the air, and keep yourself alive.*
11:30 a.m. Paper #4.5	**How to Handle PCBs** • Christopher Holthaus, attorney *If you have an old transmitter, you probably will have to deal with PCBs.*
Noon	**Good-bye until next year** • John Battison, Session Chair



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SMPTE to be the season finale

By Rick Lehtinen, TV technical editor

In the West Coast phase of its biennial flip-flop, the Society of Motion Picture and Television Engineers will convene its 131st technical conference and equipment exhibit in golden California. The Los Angeles convention center will host the conclave, slated for Oct. 21-25, just about the time the last bat has cracked in the World Series. SMPTE will be the last of the major-league equipment exhibitions until the NAB convention next spring.

All registrants are invited to the Welcoming Reception at the Academy Theater in Beverly Hills on Friday. Saturday morning, SMPTE president Maurice L. French will officially open the conference in the convention center hall (room 217-A). The keynote address then will be presented by J. Phillip Samper, Kodak. Stan Baron, NBC, will give the engineering report. The speakers will be introduced by program chairman John Baptista, CFI.

The honors and awards luncheon will take place on Saturday in the convention center's Petree Hall. The Fellows Luncheon is set for Monday, also in Petree Hall. The annual banquet is planned for Tuesday evening in the Westin Bonaventure Hotel, California Ballroom.

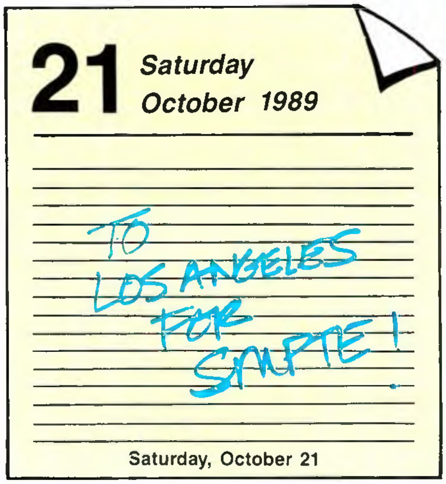
Equipment exhibition

As of press time, 230 companies have reserved booth space for the equipment exhibition, which will be set up in Yorty Hall. Attendees may visit the exhibit area, which will cover 79,000 square feet, during the following hours:

- *Saturday, Oct. 21:* 2:30 p.m. to 6 p.m.
- *Sunday, Oct. 22:* 10 a.m. to 6 p.m.
- *Monday, Oct. 23:* 9 a.m. to 7 p.m.
- *Tuesday, Oct. 24:* 9 a.m. to 5 p.m.

Technical program

The SMPTE technical program, which bears the theme "Technology and Tradition — Partners in Progress," will span five days. Program organizers have included special presentations, scattered throughout the conference, to commemorate the 100th anniversary of 35mm film and the 50th anniversary of television.



Two of the sessions will be held away from the convention center. Saturday's archival session will be held at UCLA, and Sunday's film production/presentation session will be held at USC. Shuttle service will be provided.

Season finale

Now that the Winter SMPTE Television Conference no longer includes an equipment exhibition, this fall's SMPTE will close out the trade show season for 1989. The next major opportunity to shop will be NAB 1990 in Atlanta at the end of March. Although the respite will give manufacturers and flat-footed editors a chance to regroup, there is a certain nostalgia in putting away the suitcases. This SMPTE will be, for many, one of the last rites of summer.

SMPTE program schedule

Saturday, Oct. 21:

Morning
- Opening session

Afternoon
- Session A: Archival (at UCLA)
- Session B: Advanced Television I Transmission
- Session C: Computer Interactive Video and Graphics

Sunday, Oct. 22:

Morning
- Session A: Film Production
- Session B: Advanced Television II Transmission/Productions
- Session C: Ancillary Services and Distribution Systems

Afternoon
- Session A: Film Productions/Presentation (at USC)
- Session B: Advanced Television III Production Equipment
- Session C: Quality Control and Measurement

Monday, Oct. 23:

Morning
- Session A: Laboratory Technology
- Session B: TV Production I Equipment
- Session C: TV Post-Production

Afternoon
- Session A: Sound Technology I
- Session B: TV Production II Equipment
- Session C: Recording

Tuesday, Oct. 24:

Morning
- Session A: Film/Electronic Interface I
- Session B: Encoding/Decoding for Composite Video and Techniques for Standards Conversion (with panel discussion)

Afternoon
- Session A: Film/Electronic Interface II
- Session B: Automation and Robotics
- Session C:

Wednesday, Oct. 25:

Morning
- Session A: Digital Tutorial I
- Session B: Television Sound Technology

Afternoon
- Session A: Digital Tutorial II

Field report

Audio-Technica AT4462 portable mixer

By Allan J. Stokes

Portable field mixers are often lumped into a common generic category in which characteristics and capabilities are assumed to be standard across the board. After all, how many features can you pack into a unit before it loses its status as a truly portable piece of gear? Quite a few, based on my experiences with Audio-Technica's model AT4462.

Particularly well-suited for ENG applications, the mixer offers mono and stereo capabilities that allow it to serve effectively as a remote audio section to any tape machine. Speaking of field use, a good way to begin this review is by looking at physical properties and dimensions.

The mixer weighs in at four pounds, 10 ounces and measures 8 3/8" × 7 3/8" × 3 5/16". It comes with a shoulder strap and Cordura/leatherette case. The mixer features an aluminum housing with rounded corners, and steel side flanges that extend beyond the front-panel controls for impact protection in this critical area. On top of the mixer is a silk-screened block diagram for a quick signal-path reference. The mixer is operable with a variety of power sources. Normally, it is powered by two 9Vdc alkaline batteries. An optional third battery can be used with the twin 9Vdc power supply to provide 12Vdc phantom microphone power. The unit also accepts external power of either polarity, from 12Vdc to 18Vdc or from an ac adapter.

Stokes is president of Stokes Production Services, Hendersonville, TN.

Performance at a glance

- *4 × 2 portable mixer*
- *Frequency response: +1dB/−3dB, 20Hz to 20kHz*
- *Distortion: <0.1% THD (100Hz to 20kHz at +4dBm)*
- *Crosstalk: better than 65dB*
- *Built-in limiter*
- *Built-in Modu-Comm communications link*
- *VU metering with LED peak indication*
- *Three-frequency slate/oscillator*
- *Powering: Internal, two 9Vdc batteries*
  External, 12Vdc to 18Vdc, either polarity
  Consumption, 82mA idle, 180mA maximum

Operating controls

The four input-level controls are located at the left of the control panel, stacked vertically in two rows. At the center of the

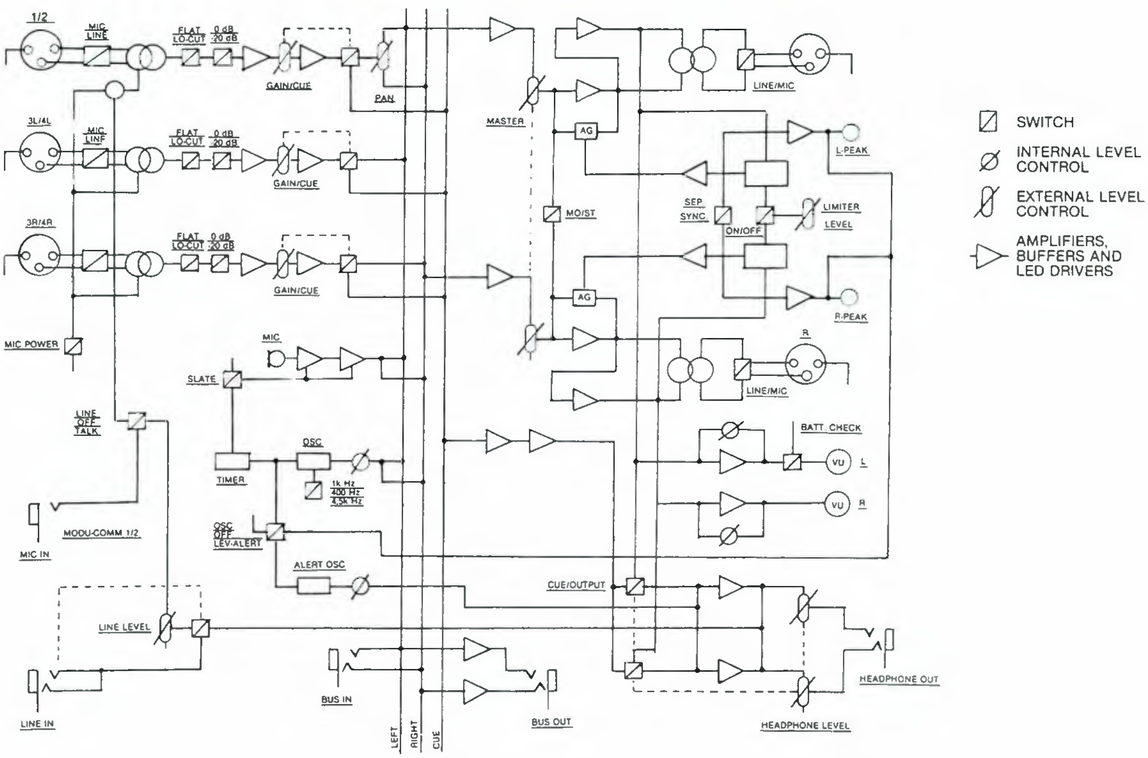


Figure 1. *A close examination of this block diagram reveals only some of the versatility provided by the mixer.*

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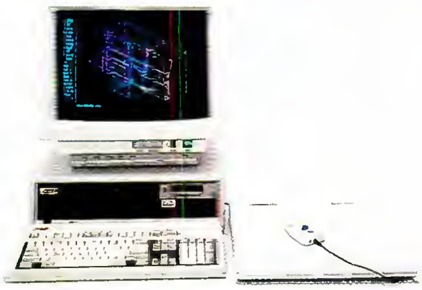

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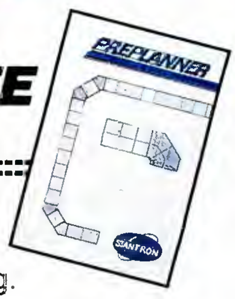

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panel lie twin VU meters, a meter lamp, battery check switch, built-in slate mic and adjacent control, *Lev-Alert* and limit controls, a selector switch for a built-in oscillator and an LED power indicator. Two-color LEDs also are located in this section to indicate audio peaks, switching from red to green when the limiter is switched in.

To the right are the master and headphone-level controls and twin toggle switches controlling a unique feature called *Modu-Comm*.

Of the four input channels, two are continuously pannable mono varieties, and two are individually adjustable stereo inputs. These inputs can be used to handle stereo micing, paired microphones or an external tape source. Each of the XLR-type channel inputs is switchable to accept either mic or line-level signals. When the switch is in the line position, phantom power cannot be used with that channel.

Another back-panel switch, located next to each input, reduces incoming signals by 20dB. The pad works in both line or mic modes. When switched in, this attenuator decreases overload distortion potentials to an ideal point for close micing situations or for mixing high-level line signals. From my experience, full gain is perfect for normal line levels and distant micing. To reduce ambient low-frequency noise (such as handling noise), each input also features a selectable low-cut filter that operates at 6dB per octave with a −3dB point of 150Hz.

Both left and right outputs are transformer-coupled balanced. The output levels can be switch-selected to either mic or line levels. An output mode switch lets you convert the stereo outputs to dual mono. In the mono mode, the unit is capable of mixing six inputs, with the summation of the signal being available at either output.

Operational considerations

It's usually hard to achieve a nice, wide audio depth of field for stereo satellite remotes without carting out some hefty gear. The versatility offered by the mixer's mono/stereo input combinations make the task easier. If you choose to use a few ambient microphones to build a stereo image, you have total control over them at your fingertips. The raw stereo output bus is available on the back panel.

This versatility also comes in handy if you need to produce a 2-channel mix for Betacam or M-II, and you have post-production demands to keep in mind. I've also used it as a 6×2 mono mixer, as shown in Figure 1. This is particularly useful in situations that require several inputs and a location mix feeding down to a tape machine. Few assignments follow your original game plan, so the flexibility to switch back and forth according to your needs is extremely handy.

Automatic level control

The mixer's Lev-Alert feature will be appreciated by operators who, like me, frequently find themselves on an ENG assignment where they are not only in charge of the mixer, but also have to handle a camera and a thousand other details. The circuits control the audio levels automatically, thereby freeing you for other duties. Once the Lev-Alert is activated, an adjustable signal will sound in your headphones if the levels reach a point of overmodulation.

The built-in limiter works in two modes: *sync* and *sep*. An overmodulated signal on either channel will activate limiting on both channels in sync mode, and the sep mode applies two discrete limiters (one per channel) to the left and right outputs. This

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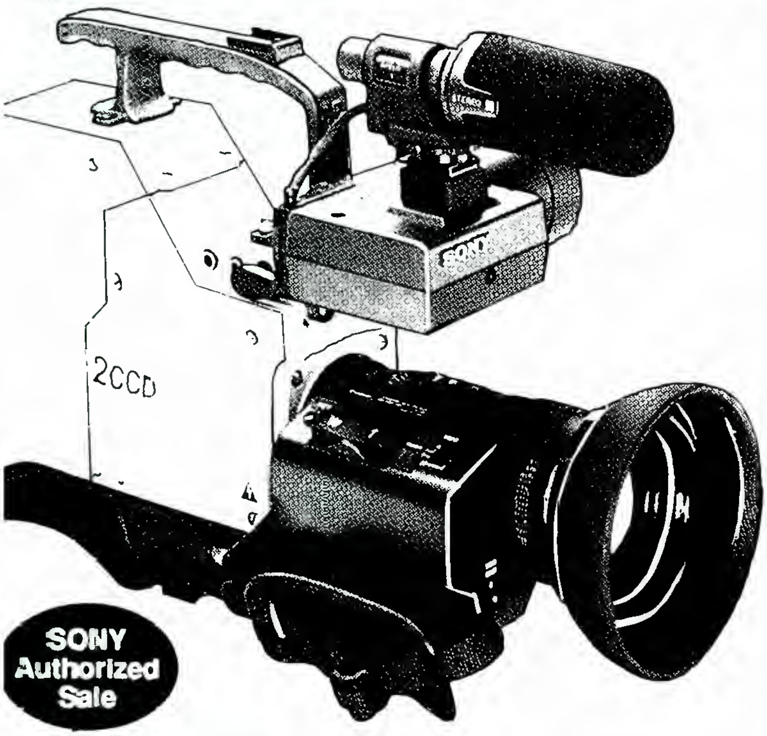

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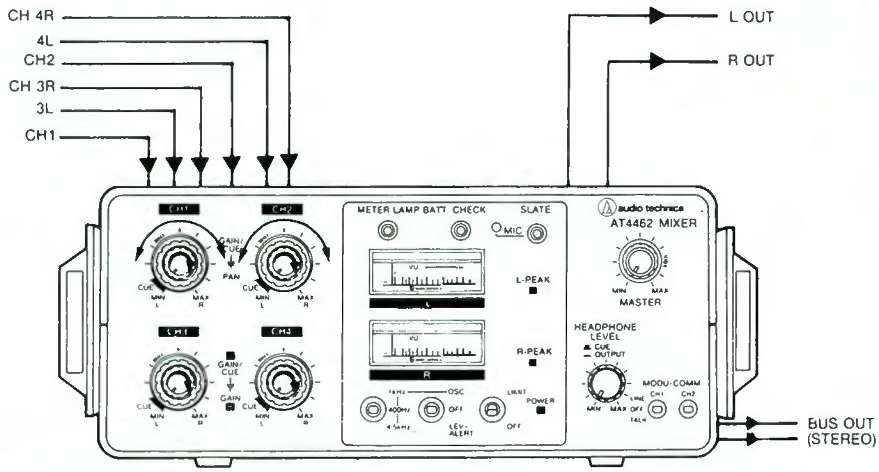

Figure 2. The mixer can be configured in three basic configurations: 4 × 2 (shown here), 6 × 1 or 4 × 1 with 2-way intercom.

is especially useful if the two outputs are handling unrelated source material.

Although a cue function is common in broadcast consoles, it is not often available in small portable mixers. The AT4462 provides a cue feature, which I often use to spot-check the cues for multiple announcers or tape roll-ins. Turning any input-channel control fully counterclockwise activates a prefader cue and disconnects that channel from the mix bus. The cue mix is available only at the headphone output.

Pressing the slate button on the front panel activates a 1s tone. After the tone, the built-in omnidirectional electret condenser microphone becomes live for track and cuing announcements. The internal microphone is good enough to be used in a pinch as a broadcast backup mic. The slate tone/oscillator provides three different frequencies, selectable from the front panel. The tones can be activated in a continuous mode for tests or line identification.

Another helpful feature on the AT4462 is Modu-Comm, as shown in Figure 2. To put it simply, Modu-Comm permits program audio from the mixer output to be sent down the incoming microphone line and be monitored at the mic via a decoding accessory. These program audio signals are independent of the microphone gain, and they do not interfere with the mic's performance.

I've found the feature to be convenient, especially on larger productions where I have a separate boom operator with a fishpole or a boom mic. With the single cable used by the boom man feeding the mic signal back to me, I can feed program material back up the line so he can hear what's going on through the headset. With the headset, you essentially have an intercom that lets you give direction or allows the boom operator to hear the results of various mic placements.

The feature also is useful when the on-camera talent is wearing a lapel mic. In this instance, you can feed the signal back up the talent's mic line and into an earpiece. Now, the talent can hear himself or other program material, and you can talk back to provide on-air cues.

The mixer has the capability to become part of an easily expandable system. Multiple AT4462s can be interconnected with a single cable simply by using the ¼-inch stereo bus in and bus out jacks provided. Output of the bus out jack is a premaster mix of all input signals, while the bus in jack is probably most useful as an additional unbalanced stereo input.

I found that the Audio-Technica AT4462 has the versatility to be used in seemingly countless applications. Yet, it is simple to use, lightweight and portable, and it's built to take the punishment remote gear always receives.

Editor's note: The field report is an exclusive **BE** feature for broadcasters. Each report is prepared by the staff of a broadcast station, production facility or consulting firm.

In essence, these reports are prepared by the industry and for the industry. Manufacturer's support is limited to providing loan equipment and to aiding the author if support is requested in some area.

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

Choose your candidate carefully

By Bob Van Buhler

Eleven candidates will vie for six seats on the SBE Board of Directors at a time dubbed a "crossroads" for the society. The membership will vote on these candidates this month. Results will be announced at the SBE national convention.

• *Philip A. Aaland* of Tucson, AZ, is seeking a second term as director. He is a past chairman and secretary of Chapter 32, and chief engineer at KGUN-TV. Aaland is an SBE-certified professional broadcast engineer, a member of SMPTE and NARTE-certified (first-class).

Aaland thinks the SBE should emphasize training and education. He says that getting broadcast courses into local colleges is important to an engineer's professional development. Aaland also is a strong proponent of a national frequency coordination database.

• *Fred Baumgartner* has been involved in broadcast engineering since 1971. He was an instructor of vocational electronics and has served as a contract engineer for stations in the Wisconsin area. He also was manager of technical operations for KWON-TV and KHOW-AM in Denver. He currently is director of engineering for All Pro Broadcasting.

Baumgartner has held all chapter offices for Chapters 24 and 48 and is active in the SBE chapter-of-the-air (No. 73). He sees a need for emphasizing the development and promotion of policies, ranging from rules restricting work to supporting technical standards. Baumgartner also emphasizes the importance of expanding training and certification.

• *Terrence M. Baun*, Milwaukee, is seeking re-election to the board. He has served as chairman, vice chairman and secretary of the Milwaukee chapter, and is completing a term on the national board.

Baun is a principal of Criterion Broadcast Services in Milwaukee, with more than 20 years of experience. He is certified as a professional broadcast engineer, and has been recertified twice as senior broadcast engineer.

Baun stresses the need for good communications with the membership. He advocates that board members and officers visit each local chapter, and views the hiring of a full-time executive director as a high priority.

• *Dennis E. Behr* also seeks election to the board. He is a master chief petty officer in the Naval aviation reserve, and chief engineer of the Wisconsin public TV telecommunications operations center.

Behr is a 2-term chairman of Chapter 24. He also has served as chapter vice-chairman and treasurer. Behr's stated priorities for the SBE are in the following order: education, certification, a full-time executive director and expanding membership. He places a high priority on local chapter involvement in the SBE's education program.

• *Stephen K. Bramham* of Smyrna, GA, joins the list of candidates by membership petition. He currently is an audio engineer with Turner Broadcasting System, assigned to the CNN and HNN networks. He previously served as engineering supervisor for WXIA-TV in Atlanta, and has worked with AFRTS in Taiwan and Vietnam. Bramham is a member of SBE, SMPTE and NARTE.

His goals for the SBE include increasing participation and acceptance of the SBE certification program, and placing more emphasis on HDTV, digital audio and fiber optics. He seeks to promote better understanding between SBE and SMPTE, AES and IEEE. Bramham also is an advocate of pre-emptory legislation to prevent state and local licensing of broadcast engineers.

• *Dane E. Ericksen*, senior staff engineer with Hammett & Edison Consultants, San Francisco, is another of the board's incumbents seeking re-election. Ericksen, formerly an FCC field engineer, places a high priority on regulatory matters and the filing of comments on FCC proceedings. He made significant contributions in this area over the last two years. Ericksen also was a dominant figure in the SBE's investigation and policy formulation on professional licensing of broadcast engineers.

Ericksen has an intriguing goal for SBE: to seek amendment of the Communications Act requiring that at least one FCC commissioner have an engineering background. As proof of that background, he would advocate certification as a senior broadcast engineer or equivalent by a major engineering society, or the commissioner's registration as a professional engineer.

• *Joe Snelson* of Fairway, KS, seeks election to the board. Snelson is a certified senior TV broadcast engineer and has served in various engineering management capacities since 1970. For the past six years, Snelson has been director of engineering for KCTV-TV in Kansas City, MO.

Snelson's priorities include continuing to fulfill the purposes set forth in the by-laws and encouraging the active participation of each member in local chapter meetings. Snelson also places a priority on seeking a full-time paid executive director and the regular publication of the "SBE Signal."

• *Tom Weems* of Simi Valley, CA, has served two terms on the board of directors and is seeking re-election. Weems is certified as a senior TV broadcast engineer and has served on several national SBE committees, including the nominating committee, chapter awards and SMPTE-SBE liaison.

Weems is an advocate of open government for the SBE, with more decision-making by the board of directors and less by the executive committee. Weems has been a longtime advocate of greater openness in the financial affairs of the society, including complete financial reporting to the membership. His priorities include the establishment of a formal finance committee.

• *Larry White* of Tulsa, OK, also is an incumbent seeking re-election. White is director of engineering for KVOO-AM/FM, and has served at the local level as secretary-treasurer of Chapter 56.

White seeks greater visibility of the national SBE at the local level. He thinks this will make the society a more effective force within the industry. White sees providing chapter support as a key unifying element vital to the success of national efforts. He identifies the SBE's greatest assets as the certification program and the national convention, and urges members to support these efforts.

• *Charles W. Kelly, Jr.*, a former board and executive committee member, seeks to return as a director. Kelly is director of in-

Continued on page 133

Van Buhler is manager of engineering at KNIX-AM/FM, Phoenix.

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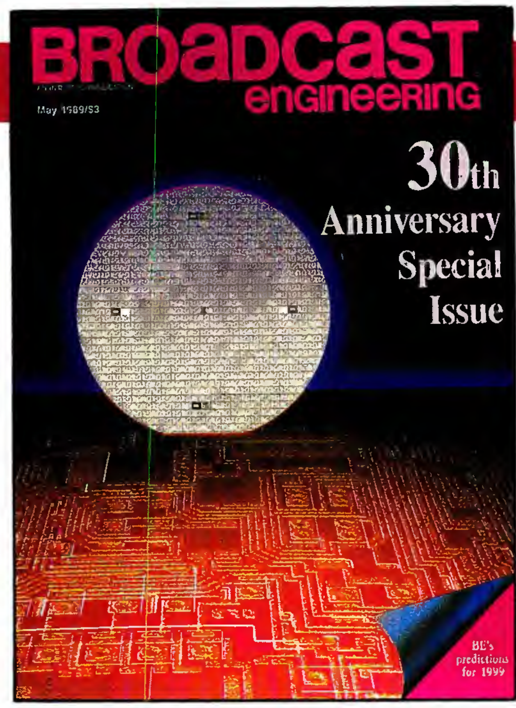

Radio: the roots of broadcasting

By Jerry Whitaker,
editorial director

AM radio, the grandfather of the broadcast industry, has reshaped our view of the world and of ourselves.

"Just a minute! Something's happening! Ladies and gentlemen, this is terrific. The end of the thing is beginning to flake off! The top is beginning to rotate like a screw! The thing must be metal!
...This is the most terrifying thing I have ever witnessed! Wait a minute. Someone is crawling out of the hollow top. Someone or...something. I can see peering out of that black two luminous disks...are they eyes? It might be a face. It might be. . . ."

With that, Orson Welles and his Mercury Theater players unleashed the "War of the Worlds" on Halloween Eve of 1938. The play, only an hour long, caused people to dash hysterically into the streets, flock to churches to pray, or fatalistically face death at the hands of Martian invaders. From the CBS Radio Studio One in New York, Welles demonstrated, convincingly and disturbingly, the power of radio.

Since 1887, when Heinrich Hertz first sent and received radio waves, to the present, an amazing amount of progress has been made by radio and TV engineers and scientists. We take for granted today what was considered science fiction just a decade or two ago. The route from the primitive spark-gap transmitters to the present state-of-the-art has been charted by the pioneering efforts of many.

Broadcasting (along with telephone technology) has linked the world more closely than the early pioneers of the art could have imagined. Eighty years have passed since Charles D. (Doc) Herrold founded a voice station (as it then was known) at San Jose, CA. Developments between then and now have been marked by many inspired breakthroughs and many years of plain hard work.

In the beginning

In 1895, when Guglielmo Marconi was 21, he and his brother Alfonso first transmitted radio signals across the hills behind their home in Bologna, Italy. Unable to interest the Italian government in his invention, Marconi took his crude transmitter and receiver to England, where the British navy quickly realized the maritime potential of radio. Within two years, the Marconi Wireless Telegraph Company had been founded.

The invention of the vacuum tube diode by J. Ambrose Fleming in 1904 and the triode vacuum tube amplifier by Lee DeForest in 1906 launched broadcasting as we know it. Early experimental stations took this new technology and began developing their own tubes using in-house capabilities, including glass-blowing. As the young electronics industry began to grow, vacuum tubes were produced in great quantity and standardized (to a point), making it possible to share new developments and applications.

It is difficult to answer the question, "Who was the first broadcaster?" Much depends on what is defined as *broadcasting*. When it comes to AM radio, the grandfather of the broadcast industry, five stations established a rich tradition of broadcasting firsts:

- *KDKA, Pittsburgh*. Dr. Frank Conrad conducted the experimental work that led to the establishment of KDKA, which made its formal debut on Nov. 2, 1920. Conrad was apparently the first to use the term "broadcast" to describe a radio service.
- *WWJ, Detroit*. The birthplace of broadcasting at WWJ was the Detroit News. The station signed on the air on Aug. 20, 1920. It was the first station to be operated by a newspaper, and the first commercial station to broadcast regularly scheduled daily programs.
- *KCBS, San Jose, CA*. Doc Herrold's station at San Jose (which eventually became KCBS, San Francisco), began as an experimental operation with the first documented transmissions occurring in 1909. It is said of Herrold that he conceived the idea of broadcasting information and entertainment programs to the public.
- *WHA, Madison, WI*. 9XM-WHA achieved its first successful transmission of voice and music in 1917 from the University of Wisconsin campus in Madison. Pioneers in the establishment of the station

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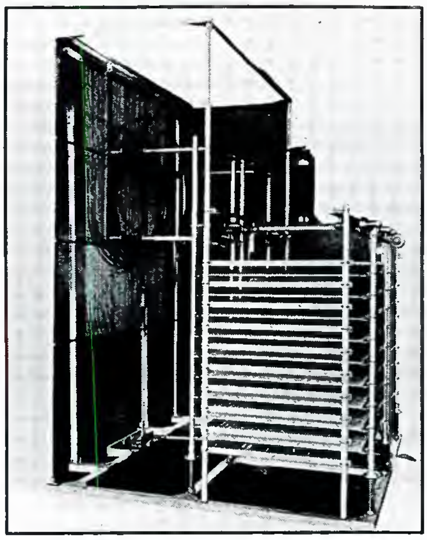
Sarnoff: the visionary

The "broadcasters" of the 1920s and early '30s were experimenters, not business-people. Some businesses did, however, spring from the makeshift laboratories of the early scientists. David Sarnoff, general manager of RCA, was quick to capitalize on the new medium.

Sarnoff was a powerful figure in the development of radio broadcasting in the 1920s and '30s, and a key mover in the development of television from its beginning in the late 1920s through maturity in the '50s and beyond. Sarnoff was born in Russia in 1891, and came to the United States at the age of nine. After completing his schooling, Sarnoff secured a job as a telegraph operator with the Marconi Wireless Company and quickly proceeded to make a name for himself. In 1912, at the age of 21, he intercepted the first distress signals from the doomed ship "Titanic." Sarnoff stayed at his post for 72 straight hours to keep the world apprised of the rescue attempts and to broadcast the names of survivors. When the disaster was over, Sarnoff was a household word.



A portion of the WLW power amplifier tank circuit partially assembled. The 500kW transmitter used three such units.

Four years later, Sarnoff was a contracts manager at the Marconi Company. He sent a memo to his boss suggesting the use of radio for entertainment:

"I have in mind a plan of development which would make radio a household utility in the same sense as the piano or phonograph. . . . The receiver can be designed in the form of a simple 'Radio Music Box'...(which) can be placed in the parlor or living room."

Sarnoff's marketing vision and appetite for hard work led him in 1919 to join the Radio Corporation of America (RCA) as general manager. RCA was created by General Electric when the American Mar-

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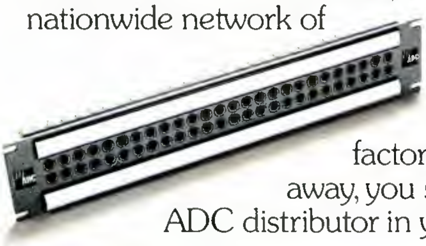

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4900 West 78th Street, Minneapolis, MN 55435 coni Company was returned to private control by the U.S. government following wartime operations. RCA's function was principally to handle the nation's overseas communications. RCA later became a stand-alone company, independent of GE. Because he had been awarded the rank of Brigadier General, Sarnoff was best known at RCA in the years following World War II as "The General."

Radio Central

Sarnoff's and RCA's first major project was the construction of a huge radio transmitting station at Rocky Point, NY. The facility, completed in 1921, was hailed by President Harding as a milestone in wireless progress. In fact, Harding put the station into operation by throwing a switch that had been rigged up at the White House. Wireless stations around the globe had been alerted to tune in for a congratulatory statement by the president.

For a decade, Radio Central, as it was known, was the only means of direct communication with Europe. It was also the "hopping off" point for messages transmitted by RCA to Central and South America.

Three plate transformers, a rectifier filter reactor and a modulation reactor were placed outside the WLW transmitter building. A protective fence was installed shortly after this photograph was taken in 1934.

The WLW 500kW transmitter building as viewed from the front entrance. The 50kW exciter can be seen on the left, with the 500kW amplifier-modulator in the background. The audio control room is situated at the right. Circa 1934.

The Rocky Point site was not only famous for its role in communications, but also for the pioneers of the radio age who regularly visited there. The guest book lists such men as Guglielmo Marconi, Lee DeForest, Charles Steinmetz, Nikola Tesla, David Sarnoff and many others. Radio Central was a milestone in transatlantic communications.

There were originally two antenna structures at the Rocky Point site, each with six 410-foot towers. The towers stretched over a 3-mile area on the eastern end of Long Island.

The facility long outlived its usefulness. RCA demolished one group of six towers in the 1950s; five more were destroyed in early 1960. The last tower of the once mighty Radio Central was taken down on Dec. 13, 1977.

WLW: The nation's station

Radio station WLW has a history as colorful and varied as any in the United States. It is unique in that it was the only station ever granted authority to broadcast with 500kW.

The station began with 20W of power, as a hobby of Powel Crosley Jr. The first license for WLW was granted by the Department of Commerce in 1922. Cros-

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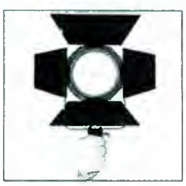

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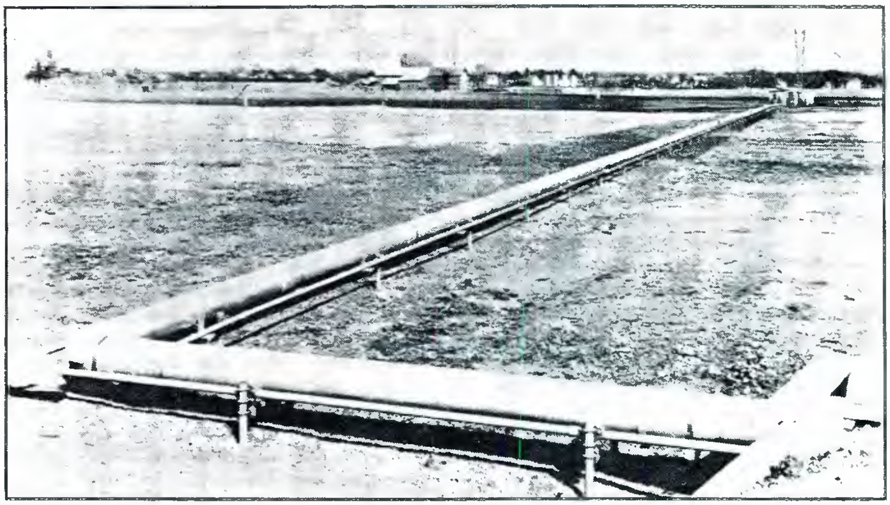
ley was authorized to broadcast on a wavelength of 360 meters with a power of 50W, three evenings a week.

Growth of the station was continuous. It operated at various frequencies and power levels until, in 1927, WLW was assigned to 700kHz at 50kW and remained there. Operation at 50kW commenced on Oct. 4. 1928. The transmitter was located in Mason, OH, but the station could be heard as far away as Jacksonville, FL, and Washington, DC.

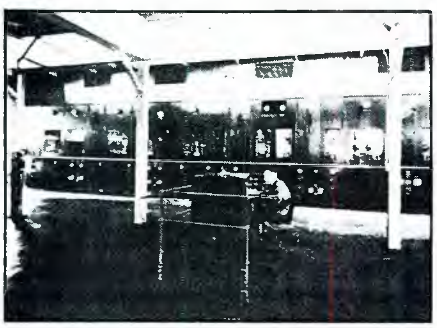
The superpower era of WLW began in 1934. The contract for construction of the enormous transmitter was awarded to RCA in February 1933. Tests on the unit began on Jan. 15, 1934. The cost of the transmitter and associated equipment was approximately $400,000 — not much today, but a staggering sum in the middle of the Great Depression.

At 9:02 p.m. on May 2, programming was commenced with full 500kW of power. The superpower operation was designed to be experimental, but Crosley managed to renew the license every six months until 1939. The call sign W8XO occasionally was used during test periods, but the regular call sign of WLW was used for programming.

"Immense" is the only way to describe the WLW facility. The antenna reached a height (including the flagpole at the top) of 831 feet. The antenna rested on a single ceramic insulator that supported the combined force of 135 tons of steel and 400 tons exerted by the guys. The tower was guyed with eight 1 7/8-inch cables anchored 375 feet from the base of the antenna.



The RF transmission line to the antenna was 775 feet long. The outer tube had an inside diameter of 9.78 inches, and the inner tube had a diameter of 1 7/8 inches. The surge impedance of the line was 100Ω.



Another view of the WLW transmitter and control console as it appeared in 1934. Full-time operation of the monster 500kW system began on May 2, 1934.

The main antenna was augmented by a directional tower designed to protect CFRB, Toronto, when the station was using 500kW at night. The directional system was unique in that it was the first designed to achieve both horizontal directivity and vertical-angle suppression.

A spray pond in front of the building provided cooling for the system, moving 512 gallons of water per minute. Through a heat exchanger, the water then cooled 200 gallons of distilled water in a closed system that cooled the transmitting tubes.

The transmitter consumed an entire building. Modulation transformers weighing 37,000 pounds each were installed in the basement. Three plate transformers, a rectifier filter reactor and a modulation reactor were installed outside the building. The "exciter" for the transmitter produced 50kW of RF power! A motor-generator was used to provide 125Vdc for control circuits.

The station had its own power substation. While operating at 500kW, the transmitter consumed 15,450,000kWh per year. The facility was equipped with a complete machine shop because station personnel had to build much of the ancillary hardware needed. Equipment included gas, arc and spot welders, a metal lathe, milling machine, engraving machine, sander, drill press, metal brake, table saw and other equipment. A wide variety of electrical components were also on hand.

WLW operated at 500kW until March 1, 1939, when the FCC ordered the station to reduce power to 50kW. The station returned to superpower operation a few times during World War II for government research. However, the days when WLW could boast to being "the nation's station" were in the past.

The FCC enters the picture

As broadcasting began to develop, it became obvious to lawmakers that some type of regulation was needed to provide for orderly use of the airwaves. To fill this need, the Federal Communications Commission was formed in 1934, the result of the Communications Act of the same year. The commission, now observing its 55th year, was established officially on June 19, 1934, when President Franklin Roosevelt signed the enabling legislation. During the first year of its life, some of the commission's noteworthy actions were to:

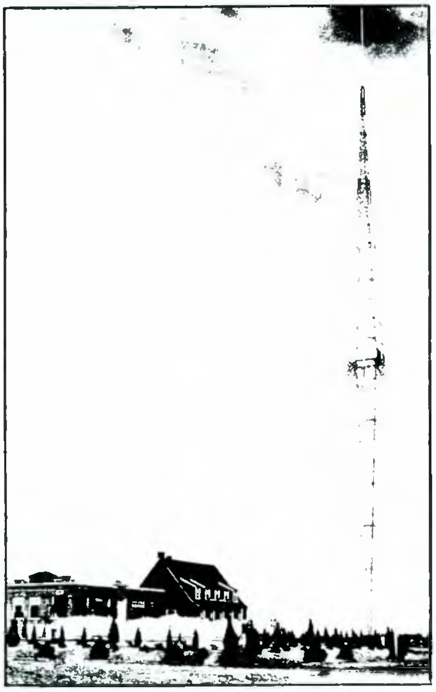
- Deny the first broadcast license (KGIX, Las Vegas) for failure to complete its construction as required.

WLW was equipped with a well-stocked machine shop. Station personnel constructed the majority of the ancillary equipment needed at the station.

- Require current ownership information from broadcast stations.
- Hold hearings on non-profit education broadcasting allocations.
- Survey allocations for clear and other channels (with several stations operating simultaneously at night).
- Revoke the first amateur license.

The "golden era" of radio

Radio of the pre-World War II days was more than an entertainment and information medium. It was a friend, a connection with the rest of the world, an escape from the hardships of the Great Depression. Radio was special. People involved in it were special. This, legend has it, was



The WLW transmission facility as it appeared in 1934. With the flagpole on top, the tower extended 831 feet. The spray pond in the foreground was used to cool water for the 500kW transmitter.

the "golden era" of radio.

If you were to step back 50 years into the studios of a local station, you would find a much different world than the broadcast station of today: different equipment, different types of people and different business goals. Broadcasting of this era was more than just a business or a job. It was the profession of magic.

Radio had a distinctly formal air about it. Announcers, musicians and performers dressed in tuxedos or other elegant attire, even when there was no studio audience. Announcing was formal. Broadcasting was regarded as a grand production, almost theatrical in nature. Enunciation and vocal clarity were essential, partly because of limitations of the equipment, but also because of the tradition of the theater. This formality of attitude and style would remain a part of radio well into the 1940s.

Many local stations had staff orchestras, some for playing jazz, others for symphonic programs. A few stations had their own dramatic groups. Each station had its following of loyal fans who would structure their days around their favorite radio programs. Those were the days that brought radio to its peak of popularity and influence.

Nearly every station had several studios of varying sizes. In New York and Hollywood, the networks used theaters for programs presented before audiences. Because audio consoles of stock design did not appear until the late 1930s, each station assembled its own facilities. Mixers were put together from individual faders. Amplifiers were stock items consisting of several basic types. Monitor loudspeakers were usually electrodynamics mounted in a baffle of no particular design. Performance left a lot to be desired.

The standard volume unit indicator (VU meter) was adopted by the industry in 1939. Before that, many different instruments were used to adjust program levels. Ballistic characteristics were far from standard, and the rectifier configurations inside the meters varied from model to model.

The mainstay of the studio was the venerable RCA 44 series ribbon. The microphone provided fairly good directional characteristics, but its size and vulnerability to wind noise limited its use mainly to inside pickups. Condenser microphones were used to some extent in the '30s. Compared with today's versions, the early condensers were large, heavy and prone to produce noise under humid conditions. Dynamic microphones also enjoyed

The old Voice of America master control room. Built in the early 1950s, the facility was used until recently to transmit programming in a wide variety of languages to the far-flung VOA system. The equipment shown was designed by Gates Radio to distribute 26 different programs simultaneously from 100 different sources. (Courtesy of VOA.)

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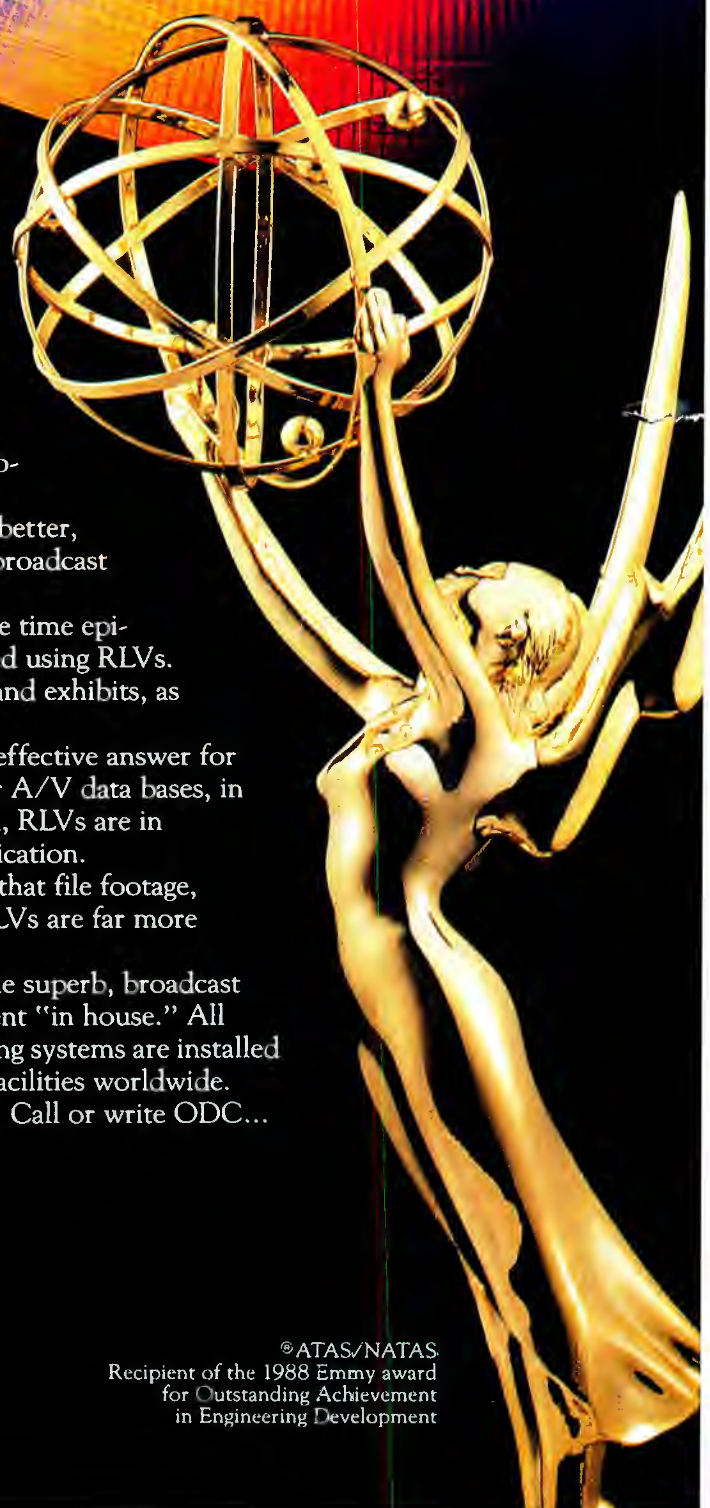

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- **Corporate and Interactive Video**—The RLV is the cost effective answer for low volume use in business, government and education. For A/V data bases, in large random access libraries where confidentiality is critical, RLVs are in demand. RLVs can even act as a source for ½″ and ¾″ duplication.
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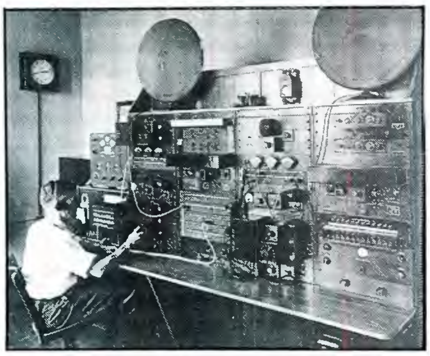
Circle (77) on Reply Card

popularity, chiefly for remotes, because of their ruggedness.

For many years, phonograph records were frowned upon for actual broadcast use, partly because of questions regarding license and royalty matters. The main sources of recorded music were transcription libraries, which were leased to stations for use on the air. The 16-inch discs used various forms of modulation. Some used a vertical — "hill and dale" — cut, and others used a laterally modulated groove similar to that of modern discs. Turntables had to be large to accommodate the 16-inch discs; the machines were heavy for speed stability.



The master control room adjacent to WTIC's Grove Street studios in Hartford, CT (circa 1929). Programs from the studios were amplified and sent by telephone lines to the station's remote transmitter 12 miles away. Engineer Bob Coe is shown at the controls. (Courtesy of WTIC.)

Remote amplifiers were back-breakers in the literal sense. These "portable" units weighed in at 35 to 40 pounds. Add to this several microphones, stands, cables and headphones, and you can see why only the bravest souls liked to do remotes.

The use of radio relay equipment was limited to frequencies between 1.6MHz and 3MHz. This required relatively long antennas, even when loaded with an inductance. Skywave effects also were a problem, frequently causing interference. Because AM was the only method available, the systems were highly susceptible to noise.

The origins of the networks

The formation and growth of the national radio networks is an exciting chapter in the history of broadcasting. The growth and prosperity of networks was linked tightly with the number of potential affiliates.

The giant RCA organization was the first company to recognize that the development of broadcast technology and management of broadcast services could best be performed by an independent organization. Accordingly, RCA, under the guidance of David Sarnoff, set the trend in network formation by creating the National Broadcasting Company in 1926. By the following year it had two divisions, the "Red" and "Blue" networks.

The introduction of audiotape recording revolutionized radio station operation. For many years after the introduction of the first recorders, stations continued to use their transcription equipment for a variety of purposes. Shown is a transcription system at WTIC (Hartford, CT), with engineer Al Jackson checking the transcription lathe. A "new" audiotape recorder can be seen to his left. (Courtesy of WTIC.)

The origins of the Columbia Broadcast-

The transmitting facilities of WEFM, Chicago, one of the first stations to begin broadcasting in FM stereo. WEFM switched on its stereo generator at midnight, June 1, 1961, the earliest time authorized by the FCC to begin stereo operation.

ing System (CBS) can be traced back to 1926 and a company called United Independent Broadcasters (UIB). The firm came close to bankruptcy several times during its first year or so of operation. One of the organizations that kept UIB afloat for awhile was the Columbia Phonograph Company. When the record company sold back the interest to the original investors, they retained the name Columbia Broadcasting System. In 1927, William Paley became interested in the fledgling company, and decided to invest in it and help run it. The rest, as they say, is history. Incidentally, in 1938 CBS bought the Columbia Phonograph company (now Columbia Records) and held it until recently.

In 1934, the Mutual Broadcasting System was created to serve the increasing number of radio stations on the air at that time. During the 1940s, two additional radio networks were founded — the DuMont Network (1946) and the Liberty Broadcasting System (1949). They played an important role in the broadcast industry of their time, but later bowed to the giant networks and their well-established affiliates.

In 1943, Edward J. Nobel bought the NBC Blue Network (operated by NBC) and renamed it the American Broadcasting Company. The sale to Nobel was prompted by a federal antitrust ruling. The sale price to the Life Savers candy manufacturer was $8 million. In 1953, the company was merged with Paramount, providing the network a valuable entry into the telefilm business.

FM radio was the forgotten stepchild of broadcasting until the early 1960s. The awakening came as the result of FM license allocation changes and stereo transmission. In 1962 the FCC revised its commercial FM rules to divide the United States into three zones (instead of the previous two). Three classes of commercial FM stations also were created. Until the '62 decision, FM stations were authorized on the basis of protecting the predict-

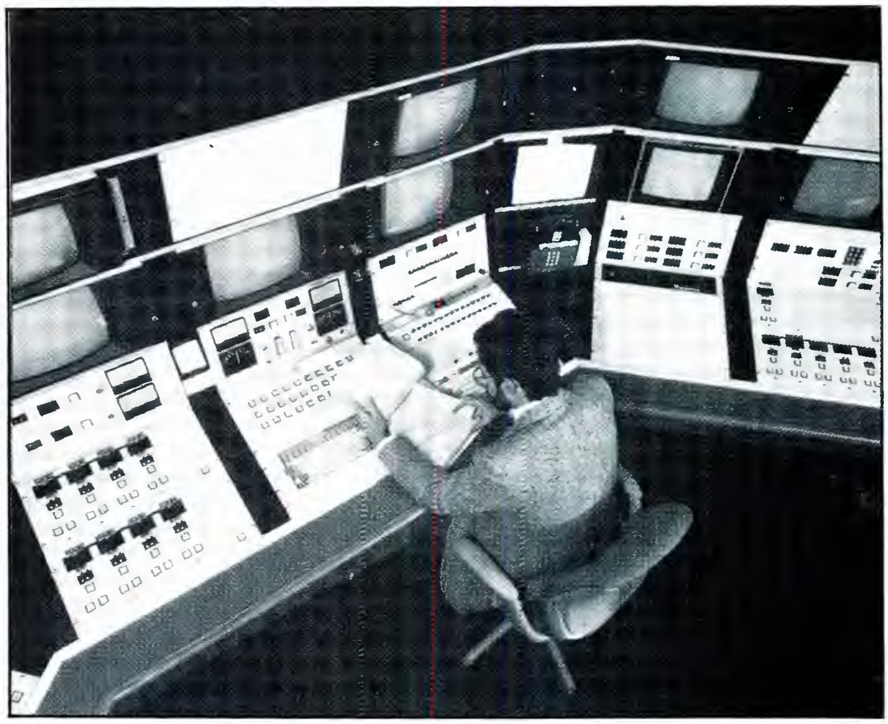
Whatever happened to the storefront studio? During the 1960s and early '70s, the show-window control room was a popular method of attracting public awareness of a station. Today, noise problems and concern for security have all but eliminated the practice.

ed service contours of existing stations. The new rules, however, changed the FM assignment scheme to one requiring minimum mileage separations between stations.

In 1963 the "table of assignments" for commercial FM stations was created, and nearly 3,000 assignments were made to nearly 2,000 mainland communities. Assignments in Alaska, Hawaii, Puerto Rico and the Virgin Islands were added in 1964.

The new scheme enacted by the commission was not universally popular, however. Some FM stations on the air at the time were faced with having to reduce their power level and/or antenna height to meet the new guidelines. Stations operating at high powers — 125kW ERP was not uncommon — protested and sought to gain public support. In Northern California, for example, stations that were to be influenced by the new rules organized an appeal to listeners, which was broadcast simultaneously on the stations. All the stations to be affected reduced their power during the broadcast to show the public the negative impact such a reduction would have on service.

The effort was copied in Los Angeles and other markets. Finally, in 1963, the grandfather rights of stations that had



Satellite distribution systems have provided expanded flexibility for radio networks. The number of networks offering programming of various types also has increased. Shown is the switching control center of ABC Radio in New York. (Courtesy of ABC.)

power in excess of Class B limits were granted.

The second spark that made FM come alive was stereo. Although stereo audio dates back to experiments performed over wire lines by telephone engineers in the 1880s, real development came only with post-World War II technology. In 1959, the National Stereophonic Radio Committee was created to examine the many proposed systems of transmitting FM stereo and to submit a final recommendation to the FCC. In the summer of 1960, six systems were field-tested over KDKA-FM in Pittsburgh, with receivers set up at Uniontown, PA. The system proposed by General Electric and Zenith was adopted, with broadcasting authorized to start on June 1, 1961.

The first stations to begin stereophonic programming under the new rules were, quite appropriately, WGHM, Schenectady, NY (owned by General Electric), and WEFM, Chicago (owned by Zenith).

Circular polarization of the transmitted signal was another major step for FM radio. One of the early proponents was KPEN-FM, Atherton (on the San Francisco Peninsula), which later would become KIOI (better known as K-101), San Francisco. KPEN received a special temporary authorization from the FCC late in 1963 to start testing the effects of adding a vertical component to the existing horizontal signal.

A second Western Electric 10kW transmitter was purchased and modified to provide the needed power. Separate vertical dipoles were manufactured and installed on the station's tower. With this setup, engineers were able to vary the phase relationship and amplitude so that the station could switch from a horizontally polarized signal to a circular pattern. Monitoring points were established in rugged areas of San Francisco to observe the results. It was found that as the vertical component of the transmitted signal was increased, reception of stereo signals improved significantly.

At the same time, Lew Wetzel of WFIL-FM was proving to the commission that the vertical component of a circularly polarized transmission did not extend the 1mV contour. With these two reports, the FCC decided that it would indeed be in the public interest for FM stations to transmit with circular polarization.

Bibliography

"Radio Pioneers." **Broadcast Engineering**, May 1979.

Nelson, Cindy. "RCA Demolishes Last Antenna Tower at Historic Radio Central." **Broadcast Engineering**, February 1978.

Burke, William. "WLW: The Nation's Station." **Broadcast Engineering**, November 1967.

Riggins, George. "The Real Story on WLW's Long History." *Radio World*, March 8, 1989.

"The Last 20 Years at the FCC." **Broadcast Engineering**, May 1979.

Gabbert, Jim. "Case Study: K101, an FM Pioneer." **Broadcast Engineering**, May 1979.

Dorschug, Harold. "The Good Old Days of Radio." **Broadcast Engineering**, May 1971.

Wallechinsky, David, and Irving Wallace. *The People's Almanac*, No. 2, Bantam Books, 1982.

"WTIC: Radio to Remember." WTIC 60th anniversary publication.

Schubin, Mark. "From Tiny Tubes to Giant Screens." *Video Review*, April 1989.

Continued from page 114
ternational sales for Broadcast Electronics and has been chief engineer of three separate AM and FM stations.

Kelly wants to see the national office relocated to Washington and promises to work for growth of the national convention. He was involved in planning the first conventions during his earlier service to SBE.

• *William C. Hineman*, director of operations at WTHR-TV, Indianapolis, seeks a seat on the board. He is past vice president of Chapter 25 and a member of the national certification committee. Hineman would like to work on the professional licensing issue and SBE certification. He has been a broadcaster since 1960.

His goals include actively pursuing legislation to prevent states from imposing arbitrary licensing regulations on broadcast engineers. He also would work toward universal acceptance of SBE certification as an evaluation standard.

Selecting your candidate

SBE members are advised to choose their candidates carefully. You are encouraged to question the position of the candidates directly. The candidates' telephone numbers are available at the SBE national office (317-842-0836).

Questions you might ask the candidates include the following:

• Does the candidate have a track record of service to the society?
• Has the candidate served his local chapter?
• Have incumbents been responsive to their own goals and priorities for the SBE?
• Have incumbents attended the twice-yearly board meetings?

In addition to the slate approved by the SBE nominating committee, another candidate will appear on the ballot for president. By a petition of 10 SBE members, Paul Montoya requested that he be added to the ballot for SBE president.

He is chief engineer at KXKL-AM/FM, Denver, and is past chapter chairman of Chapter 48. He holds technologist-level certification. Montoya's goals include better communication with members and the national convention. His petition was filed too late to be included in the slate of officers listed in the August "SBE Update" column.

Editor's note: Additional information regarding SBE activities is available on CompuServe. !GO BPFORUM

New products

Visual effects option

Abekas Video Systems has introduced the Touch-Up, an option to the A60 digital disk recorder. Control is available from the paint system artist's tablet, which provides rotoscoping, animation and retouching of digital images stored on the recorder.

Circle (350) on Reply Card

Weather systems

Accu-Weather provides Accu-Strike lightning graphics data on national and regional map backgrounds. Also available on individual custom backgrounds, the information is provided in formats for PC-compatible, Macintosh, Commodore and various other computer systems.

Circle (351) on Reply Card

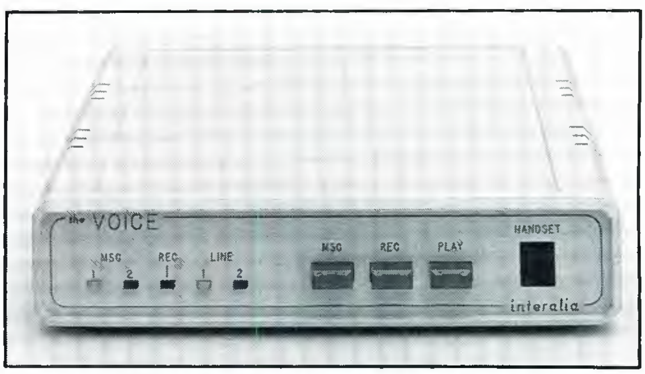
Public service receiver

ACE Communications has introduced the AR950 100-channel scanning base and mobile receiver, which accesses public service radio frequencies in both VHF and UHF bands for police, fire and other emergency services. It operates on 120Vac or 12Vdc. A telescoping whip and flexible rubber antenna for 800MHz also are included in the package.

Circle (352) on Reply Card

Automated message source

Allied Broadcast Equipment and *Interalia* have introduced The Voice. It offers listeners an automatic message system for weather, concert or other information. The solid-state memory allows short commercial messages to be quickly tagged onto primary messages to bring in additional revenue. The unit interfaces directly to telephone lines and provides easy changing and relinking of messages.



Circle (353) on Reply Card

Portable monitor/test unit

American Broadcast Systems has introduced the NuTronics TC-10 Bug Catcher. The portable video level monitor and test unit uses LEDs to indicate video level and presence of color and monochrome video signals as well as burst and sync. It is available with a leather carrying pouch, and fits into a shirt pocket.

Circle (354) on Reply Card

Stereo microphone

AMS/Calrec has introduced the M/S stereo microphone. Its associated control unit, powered from 110-240Vac, internal C cells or phantom power, gives the instrument a range of flexibility from variable patterns. The patterns include omni to figure 8, L/R or M/S output signals, variable angle control from 0° to 180° and high source-level attenuation.

Circle (355) on Reply Card

Coaxial test cable

Andrew has introduced the type 39812-11 HELIAX coaxial test cable assembly. The cable is constructed of FSJ1-50 superflexible 50Ω material with SMA 41SWS male connectors. It can be used as a jumper in equipment racks where RF interference presents problems.

Circle (356) on Reply Card

HDTV monitors

Barco Broadcast Division has announced the HD-MONITOR 5153, a 20-inch HDTV monitor for broadcast and post-production facilities. For resolution greater than 1,000 lines, the scan system adapts to various high-definition scan requirements over a range of 28-33.75kHz. RGB inputs are used for component processing.

Circle (357) on Reply Card

Automated signal routing

Azimuth Productions has introduced a series of computer-automated patching systems. Connections to a console can be reconfigured by SMPTE pulses, MIDI triggers or the touch of a control button. Patch patterns are stored on an integral 3.5-inch disk drive with configurations shown on an HR color monitor or ink-jet printer hard copy.

Circle (358) on Reply Card

Wireless headphones

beyerdynamic uses infrared light to drive the IRS 690 wireless headphones. An infrared transmitter with wide-angle transmission path drives the DT990 Pro headphones. FM modulation at a carrier frequency of 95kHz/250kHz brings 20Hz-20kHz audio response to the headphones. Power for a 9V battery in the receiving unit is derived from the transmitted signal.

Circle (359) on Reply Card

High-power couplers

Bird Electronics has introduced a series of coaxial directional couplers that cover frequencies from 125MHz to 2GHz. The 12 different units of the series sample forward power in the transmission system, without undue disruption of power sent to the transmitting antenna. The 200W units provide 10dB to 30dB coupling without probes.

Circle (360) on Reply Card

Computer-prompting system

Blue Feather Company has announced the Portaprompt XTE-3, a portable teleprompter that provides IBM PC compatibility. Features include a remote-script speed control for talent operation. The system includes computer, monitor, camera display, software, remote control and all accessories.

Circle (361) on Reply Card

Digital patch fields and CCD/tube resolution

Brabury Porta-Pattern International (BPI) has introduced the following products:

- The PDJ-101 digital video jackfield is housed in a 2RU 19-inch rack panel. It provides 10 male/female pairs of 25-way D-type connectors. Connectors with slide-lock posts are used, but screw-lock versions may be supplied.
- Two resolution charts for use with CCD and tube cameras include the concentric, 001-50, and radial, 001-51, resolution charts, which are designed for CCD pickup devices. Both are available in 9×12 field, 18×24 Dura Chart and illuminator transparency forms.

Circle (362) on Reply Card

Utility light

Cool-Lux Lighting has introduced Astro-Lux. The 1-piece light includes a 22W quartz halogen lamp with a battery to operate it for 40 minutes. A diffusion lens softens the 3,250°K light.

Circle (363) on Reply Card

Antenna brackets

Bogner Broadcast Equipment has developed a series of brackets to sidemount low- and medium-power UHF antennas. The brackets are designed for each tower installation to simplify the rigger's job of attaching the antenna to the tower. The brackets also provide additional distribution of windloading and the stresses caused by the antennas.

Circle (364) on Reply Card

Voice-over auditioner

C.A.S.T., a computerized audition service for talent, allows voice-over talent to leave samples based upon prerecorded voice prompts (straight announce, character, narration, etc.). You use the telephone keypad to review digitally recorded audition samples and make voice selections.

Circle (365) on Reply Card

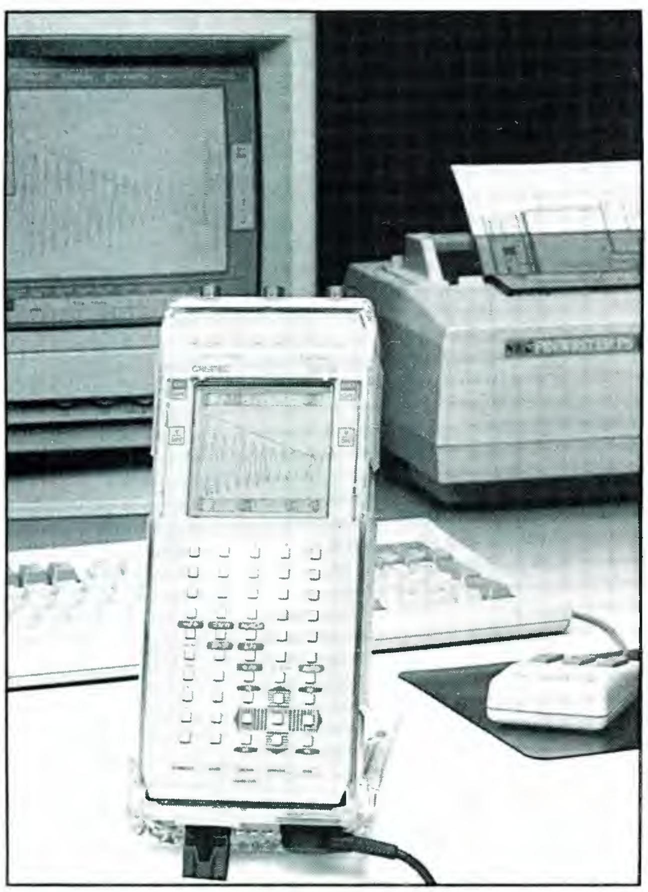
HDTV image enhancer

BTS has introduced the CPH 1000 digital image processor. The HDTV sharpness corrector provides independent adjustment of H and V filtering as well as diagonal filtering characteristics with variable noise suppression and linear and level-dependent gain controls.

Circle (366) on Reply Card

Portable oscilloscope

Createc Signal Computer has introduced the SC-04 hand-held instrument combining digital oscilloscope, frequency counter and multimeter functions. The unit may be controlled from a personal computer and provides a Centronix output for waveform, data and setup parameter printouts.



Circle (367) on Reply Card

Production music libraries

Capitol Production Music has released volumes 4 and 5 to the Optional Line CD music library, containing selections from classics or famous titles and sounds from around the world. The One-Stop Broadcast series is a 15-CD collection with 18 hours of 60-second, 30-second and 10-second variations and theme sets.

Circle (368) on Reply Card

Cable protector

Catamount Manufacturing has introduced a grommet material to protect cables passing through sharp-edged holds in panels or racks. Available in various sizes, the material has a groove that slips over the sharp edge to prevent abrasion.

Circle (369) on Reply Card

Vehicle mount

Cinekinetic Pty. has introduced the Cine•Saddle, a vehicular camera-mounting system. Made of water-resistant canvas, the 4-pound device molds itself to the shape of the camera in use and attaches to the vehicle with special clips and anchors. The mounting device has applications for many other hard-to-accommodate situations.

Circle (370) on Reply Card

Intercom interface and wireless intercom

HM Electronics has introduced the following products:

- The RW760 interface connects the HME 700 intercom products to 2-wire, 4-wire, non-compatible 3-wire and telephone intercom systems. A modular phone plug is used. In operation, the interface is capable of capturing and holding a telephone line. An ac adapter is available.
- The 8000 series wireless intercom consists of a base station, two Communicator transceivers, a battery charger and batteries. Any number of the dual-channel Communicators can be used with the wall-mount or tabletop base station.

Circle (371) on Reply Card

CAD interface and fonts

Digital Arts has introduced the Solid Design software, which allows CAD systems to create B-Rep solid models from 3-D wireframes for import into DGS software. The software supports DXF, CADL and IGES file formats. In addition, more than

100 PostScript-compatible fonts are available for the DGS graphics systems providing immediate resizing without loss of resolution.

Circle (372) on Reply Card

Time-code readers

Denecke has introduced the TC-MAXI and TC-MIX studio time-code reader units. Both provide variable intensity of the 4-inch LED display, showing SMPTE or EBU LTC information from 1/20th to 50 times reverse and forward speeds. TC-MAXI reads hours, minutes, seconds and frames. TC-MIX shows only minutes and seconds.

Circle (373) on Reply Card

Expanded data storage

Digital F/X has introduced a removable cartridge disk drive as additional data storage capacity for its DF/X 200 and Composium integrated production systems. The 40Mbyte units are accommodated by a slot in the DF/X 200 chassis. The 5¼-inch cartridges are available preformatted. A starter cartridge is included with the kit and includes generic background images.

Circle (374) on Reply Card

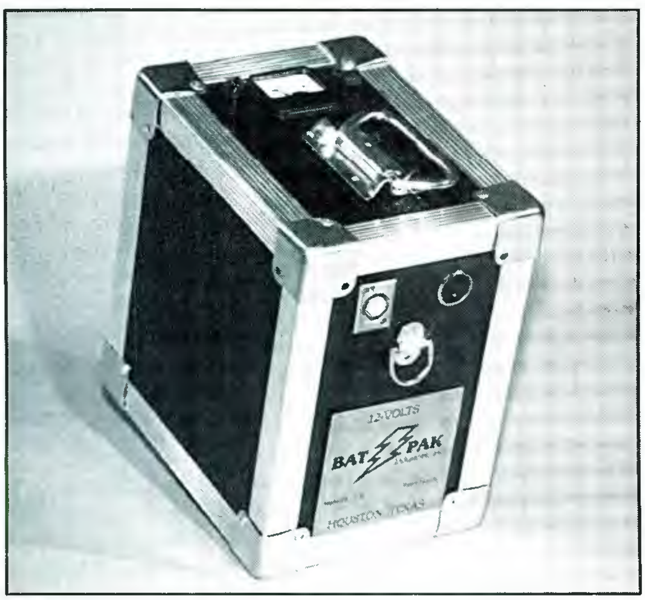
Bias lighting

EEV has introduced an integral variable light bias control for the XQ1410 TV camera tube. Bias lighting reduces picture smear and increases tube life. The lamp, mounted in the base of the tube, is routed to the rear surface of the target through light pipes.

Circle (375) on Reply Card

Extended battery power

Horizon Entertainment has introduced the Bat/Pak BP-12/30 30Ah battery pack designed for use in powering any 12Vdc equipment with an adapter to support equipment that requires less than 12V. For extended remote productions or higher-current requirements, the sealed lead-acid battery is packaged in a custom flight case covered with fiberglass. Both XLR and cigarette lighter output receptacles are provided. An optional automatic charger also is available.



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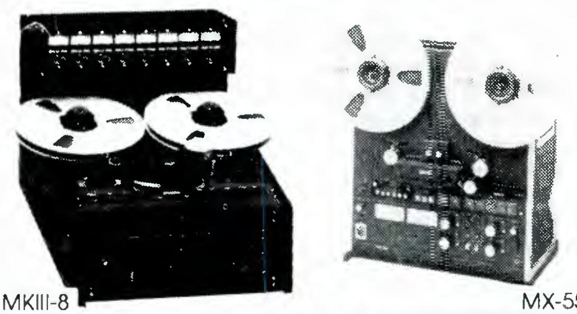


Circle (97) on Reply Card

Circle (98) on Reply Card

ISA modules

Focusrite Audio Engineering supplies ISA audio-processing modules directed primarily at multitrack studios. The series includes the ISA 130 dynamics processor, 110/115 mic preamp/4-band equalizers with filtering, 116/116L remote-controlled mic amps and 131HD twin-channel dynamics unit.

Circle (377) on Reply Card

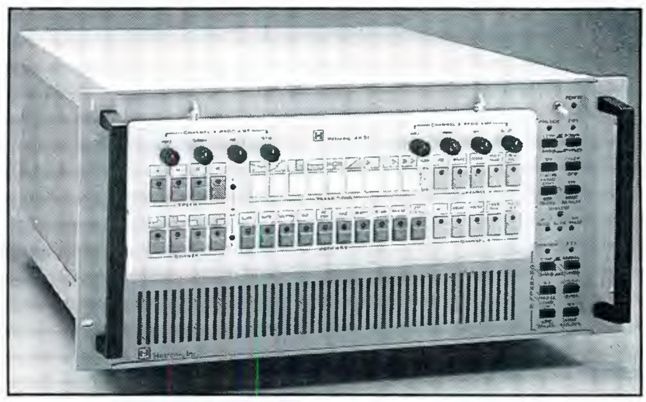
Glare protection

Hoodman has introduced the HVF37 Eclipse view-finder hood. Folding flat for storage and weighing less than one pound, the nylon material wraps around any camera view finder. Fiberglass stiffening and nylon hook-loop fastening secures the hood into a cylindrical shape to exclude sun and glare from all sources.

Circle (378) on Reply Card

TBC with options

Hotronic has announced optional packages for the AH91 dual-channel TBC and frame synchronizer. Specifically, a serial interface (RS-232/422) and stereo audio switcher are not available, allowing editors to control all digital functions from the AH91 control panel. The audio may be switched separately from video or automatically follow the choice of A or B channel video.



Circle (379) on Reply Card

Equipment bags

K & H Products has added a 25-inch size to its Run Bag series. Dividers in the bag create three compartments in addition to expandable cable pockets on each side and Velcro closure pockets for notes, maps or other small items. The bags include leather grip handles and 2-inch-wide shoulder strap.

Circle (380) on Reply Card

Computer video encoders

Lyon Lamb Video Animation Systems offers the ENC-7 color video encoder with sync generator and RTC real-time converter for conversion of higher scan-rated signals to NTSC or PAL timed composites. The encoder produces composite, component and S-VHS video with or without gen-lock. The real-time converter processes 23kHz to 75kHz signals to maintain proper geometric proportions without image distortion.

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