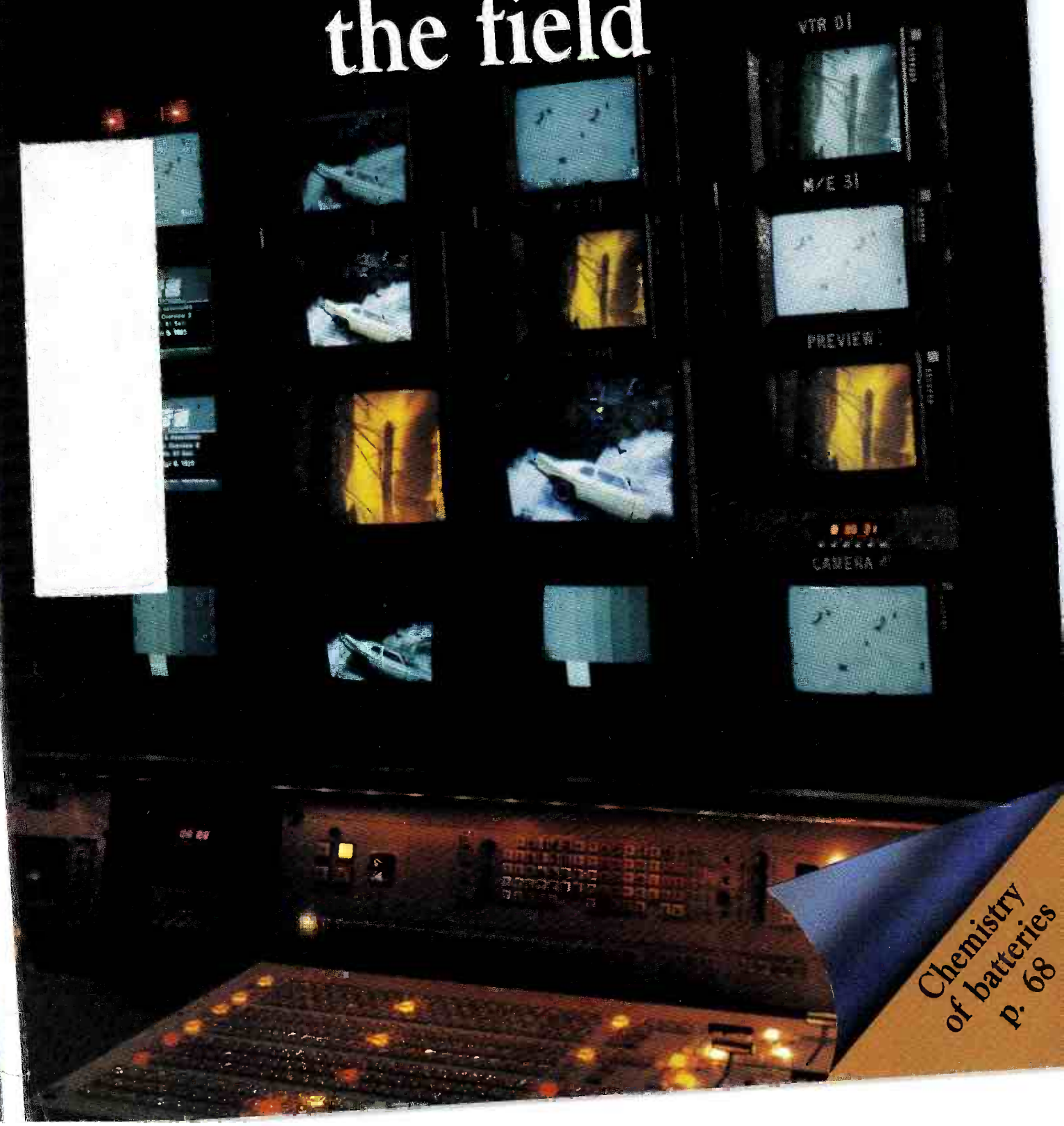
BROADCAST ENGINEERING®

AN INTERTEC PUBLICATION

January 1989/$3

Broadcasting from the field



Chemistry of batteries p. 68

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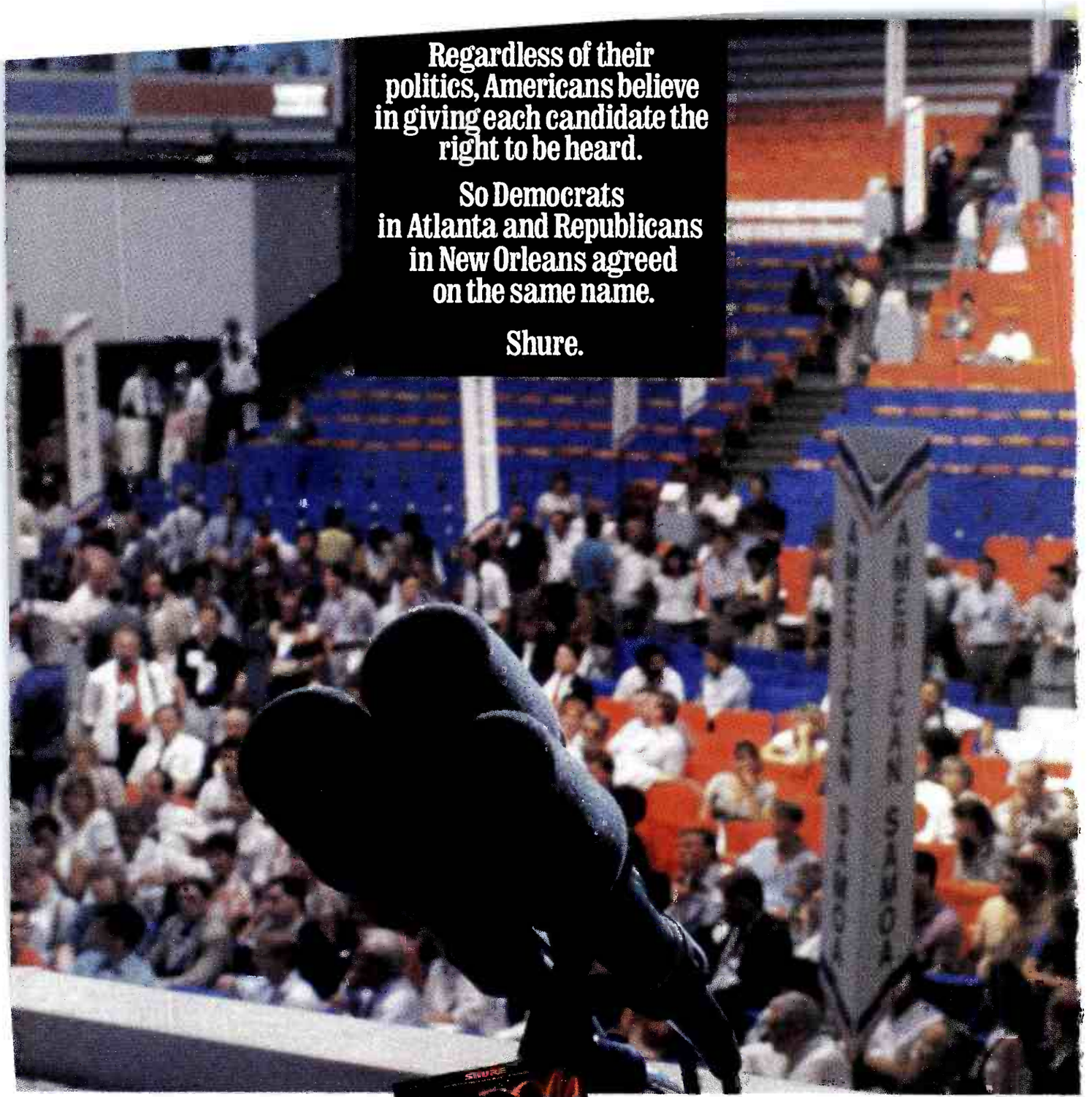

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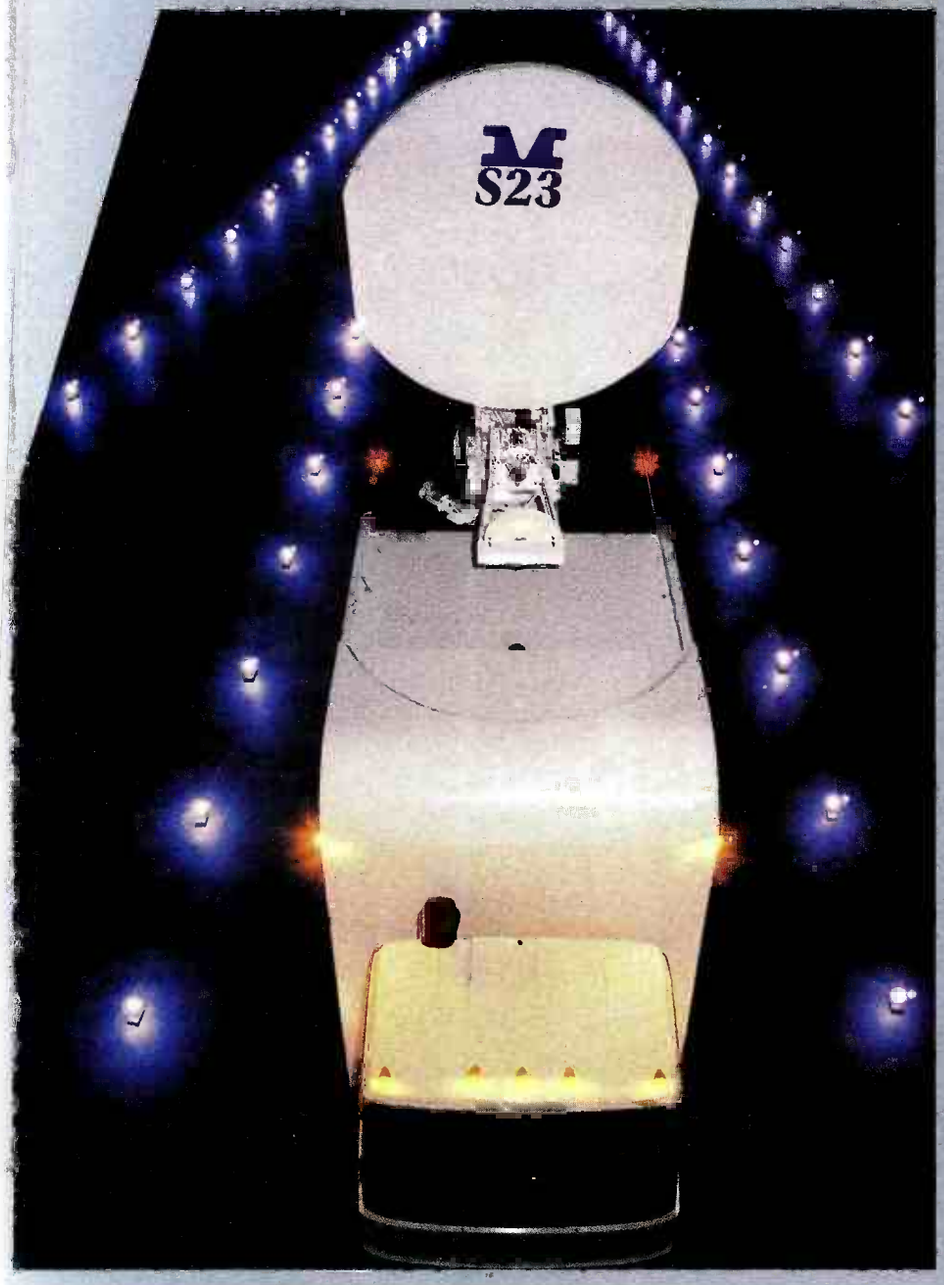

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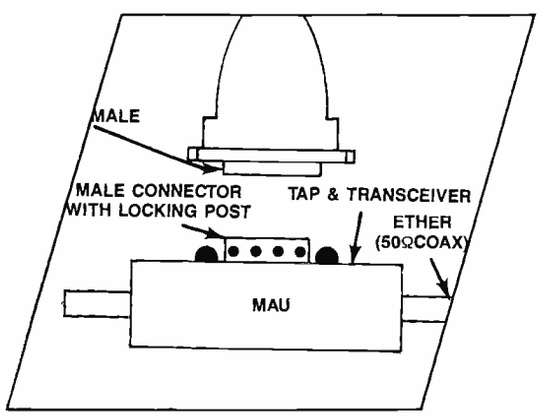
Contents

January 1989 • Volume 31 • Number 1

Page 26

Page 42



Page 58

BROADCAST engineering

BROADCASTING FROM THE FIELD:

Radio and TV stations are moving into the field in increasing numbers. Live remote broadcasting adds interest and immediacy to any program and is invaluable in the coverage of news events. Field work also is proving to be a potent marketing tool for local radio and TV stations. This month, we examine how stations can keep up with the pace of mobile technology.

OTHER FEATURES:

ON THE COVER

Field remote broadcasts are a vital link in a radio or TV station's news coverage. Our cover this month features videowalls, which reflect scenes from outdoor news events. (Photo courtesy of Centro. Photography by Derek Smith.)

DEPARTMENTS

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By Paula Janicke, staff editor

ATTC open for business

The Advanced Television Test Center (ATTC) has announced plans to begin over-the-air propagation tests in Washington, DC, to analyze advanced TV service possibilities at various broadcast frequencies. ATTC chairman Joel Chaseman told a Washington news conference that "the term, 'broadcast quality' has always meant the very highest quality in television, and we are determined that it always will."

The ATTC was organized to test and evaluate the many proposed high-definition or *advanced television* transmission systems, which promise to bring better pictures and sound to consumers. Results of the test center's analyses will be made available to government, industry and the public to help in determining national standards to speed the implementation of an advanced-definition service to consumers.

The center is designing a laboratory and test facility to be built in the Washington area. Advanced TV system proponents have been invited to submit their systems for a series of objective (technical) and subjective (perception) tests. Those tests are being devised in cooperation with the FCC Advisory Committee on advanced Television Service. In general terms, the tests will measure the quality, susceptibility to interference and operating characteristics of the proposed systems. In addition, over-the-air and cable tests are planned using the facilities of cooperating TV facilities.

The center will check the feasibility of various dual-channel ATV systems including two UHF channels operating together, one UHF and one VHF in tandem, and transmission in the spectrum above 1GHz (specifically 2.5GHz and 12GHz). The tests are expected to take until mid-year to complete.

Some 20 different proposals already are under design or in the prototype stage for the transmission of advanced TV signals. Chaseman emphasized the ATTC's hope that the proponents of the various ATV systems will remain open to the notion of loosely patenting their systems in order to facilitate sharing of the strong points of certain designs. Chaseman says the ATTC will stress cooperation among system proponents as the competing technologies begin to sort themselves out into a single, clear standard.

The center will provide raw data on the test results, first from laboratory measurements, and later from in-field measurements of the various systems. The center will not, however, be making recommendations to the FCC. Chaseman says the center will serve as an open, fair testing site.

Chaseman (who is chairman and CEO of Post-Newsweek Stations, Washington, DC) was optimistic about the ultimate out-

Continued on page 125

BROADCAST engineering

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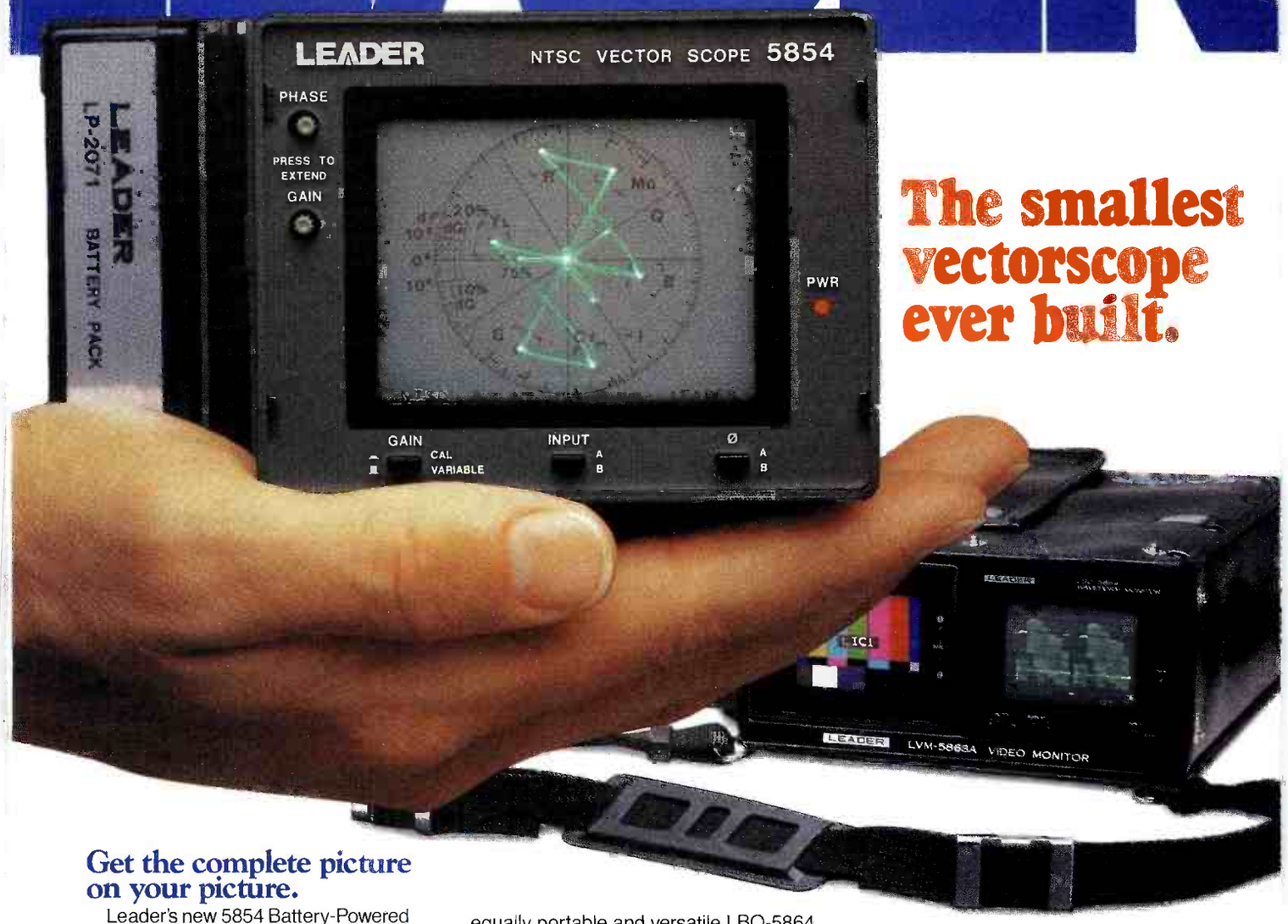

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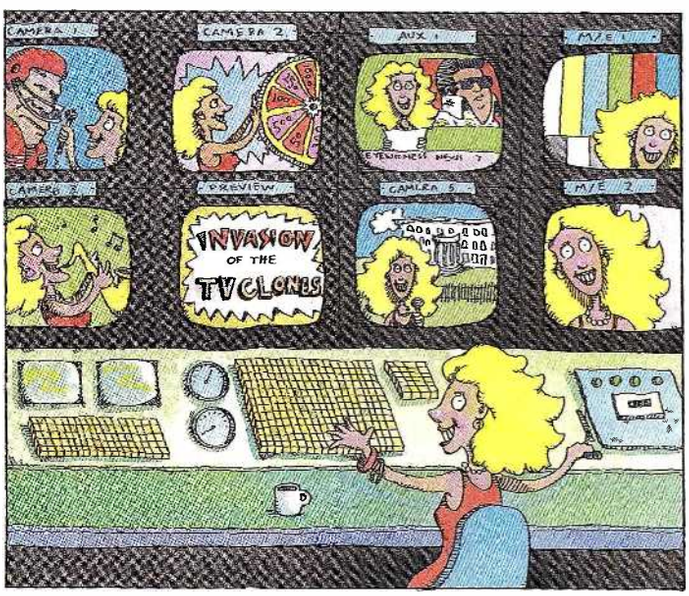
No guts, no glory

A guest editorial

As we enter the 1990s, broadcasting faces a number of challenges: tighter budgets, declining network shares, expanding cable and home video services and lifestyle changes that affect the amount of time people watch television. How will challenges be handled in the 1990s? The only answer is through innovation.

Innovation means looking for new and creative ways to meet the demands of the next decade. Inside all of us there are ideas that can create *new* solutions with systems, equipment and people. Consider looking "outside the lines" when hiring new employees. Broadcasting has many good people, but a world of creative individuals with fresh ideas exists outside broadcasting. The 1990s offer new hope, challenges and opportunities. We should be hiring creative problem-solvers, not copycats.



Innovation in programming does not mean copying each other. It means encouraging new ideas, creativity and risk-taking. Companies outside broadcasting spend millions of dollars developing new technologies, systems and procedures. R&D is a vital part of thriving companies, but where is R&D within the broadcast industry?

Why is it that companies that thrive on communications do not communicate well with one of the biggest groups they work with—the viewers? Dozens of stations treat viewer phone calls and letters with arrogance, insensitivity, form-letter responses or no response at all. How many stations take the time to regularly invite their viewers in and listen to what they say? Market research is vital, but how many stations make the extra effort to listen to their viewers in detailed sessions?

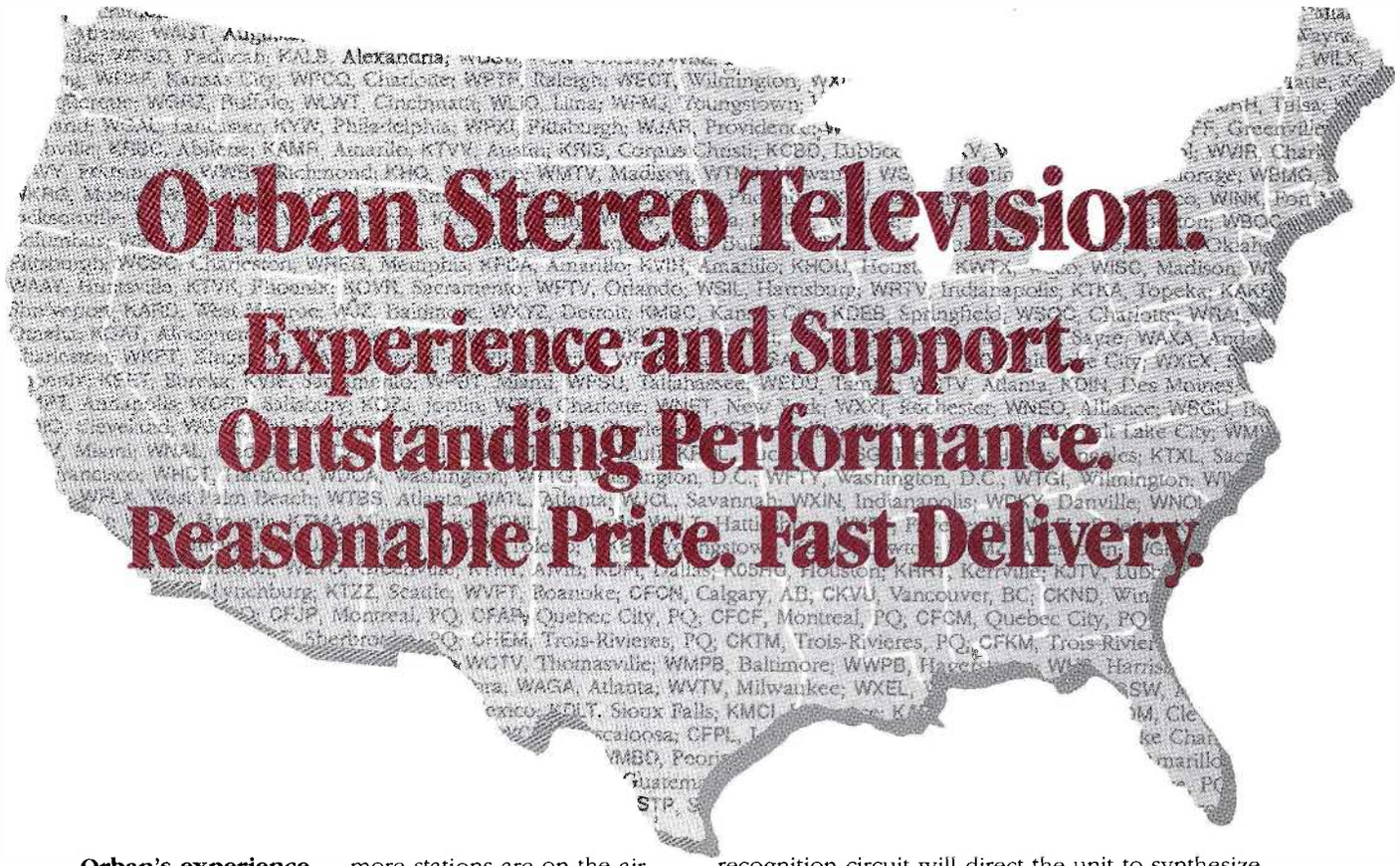
Tabloid TV is selling well today. So what happens? Everyone wants to get into the act. But what about the future? Who is developing the creative and innovative TV shows of the 1990s and beyond? Is television in the year 2000 really going to consist of soundbite news, Ken and Barbie anchors, *Wheel of Fortune* clones and tabloid mania? How can a multibillion-dollar industry thrive on imitation and lack of innovation?

Just because you're in the engineering department, don't think that news, programming and viewer relations are not your concern. Viewers watch programming, not technology. Successful broadcast stations work together as a unit, not as a collection of little empires.

What about the research? Is the answer still going to be ARB and NSI, which sometimes don't agree, and formula-produced station research studies? Stations must demand more. Inside every station and market, the innovation needed to improve ratings, revenue and programming does exist. But it requires managers who will work at making innovation a top priority.

Remember why most of us entered broadcasting? It was fun and exciting. Remember why most of us rose to management ranks? We had good ideas. Now should be the time to reach inside ourselves and bring out the best—the best ideas. *Innovate, don't copy.* You'll find the challenges easier, the work more fun and the gains more meaningful.

Joseph Barnes,
Joseph Barnes and Associates,
TV news consultant



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Rule changes permit short-spaced DAs

By Harry C. Martin

The FCC has adopted new rules permitting limited short-spacing of FM broadcast station assignments by using directional antennas. The new rules will allow applicants for commercial FM facilities to request the authorization of transmitter sites that would be short-spaced to the facilities of co-channel or adjacent-channel stations, provided these stations are protected from interference.

Such short-spaced facilities are needed, in many instances, to accommodate the operations of FM stations that encounter various antenna-site restrictions because of FAA clearance difficulties, government land ownership, zoning restrictions, other environmental and economic concerns or signal-coverage considerations.

In addition to the use of directional antennas, interference protection may be afforded by appropriate reductions in operating facilities, such as power and/or antenna height. The amount of short-spacing will be limited by the amount of separation specified for the next lowest station class. For Class A, spacing considerations will be based on protection requirements for a minimum Class A facility of 100W at 30m above average terrain. The commission will publish a table that will give full information on the allowed short-spacing for each class.

Because of budget-based limitations on the commission's FM application-processing resources, permissible short-spacing will temporarily be limited to five miles (approximately 8km). This limit will enable the commission to be responsive to the majority of applications that currently require consideration on a waiver basis and, moreover, will assist the commission in identifying any unforeseen problems in the evaluation of such applications. When resources permit, the commission will consider applications involving greater short-spacings consistent with the new standards.

In changing its rules, the commission reiterated its position that the mileage separations included in the table of allotments are not being disturbed. Thus, short-spaced allotments based on the use of directional antennas will not be considered.

By giving a "measured response" and making these changes without reducing the protection afforded to Class B or B1 stations, modifying or doing away with the table of allotments or permitting widespread short-spacing, the commission hopes to afford its licensees flexibility in site selection while preventing the "AM-ization" of the FM band.

City-of-license rules eased

The commission has proposed a modification of its rules for FM and TV licensees that would permit a station to apply for a change of city of license without risking its current authorization.

Under current rules, proposals to amend the FM or TV tables of allotments to change a station's city of license trigger an opportunity for other parties to file competing applications for the facility. In other contexts, however, the commission protects an incumbent seeking to amend the table. For example, a proposal to upgrade an FM station from Class A to C2 on the same or an adjacent channel does not open the upgraded facility for new applications. Permitting competitors to file in such situations effectively blocks existing stations from attempting to improve their facilities.

By similarly allowing FM and TV stations to change their cities of license without facing competition for their facilities, the commission believes the public interest will be served in several ways. First, the agency's present allotment priorities would be better served by a more expeditious system of permitting city-of-license changes. Second, the system would permit licensees greater flexibility in choosing and modifying their technical facilities. Specifically, by using the proposed procedure either in conjunction with a transmitter site relocation or in upgrading to a higher class of channel in the course of rulemaking proceedings, licensees may be able to improve their technical facilities in circumstances in which they might not otherwise be able to do so.

Synchronous AM transmitters

After examining responses to a 1987 inquiry proceeding, the commission has decided not to amend its rules to authorize the use of multiple, synchronous AM transmitters. Although the proceeding provided a great deal of information about the regulatory problems associated with synchronization, the technical difficulties have yet to be resolved. The commission has decided to wait for three to five years to permit the technology required to precisely synchronize AM carriers to develop and become more widely available. In the meantime, waivers will be permitted on a case-by-case basis.

Once implemented, synchronous broadcasting will permit two or more stations to transmit identical material from different locations on the same frequency. Although such a practice can increase dramatically the coverage pattern of an AM station, difficulties in synchronizing the carrier phases may result in destructive interference where the multiple signals overlap.

"One-to-a-market" rules

The commission has refined its multiple ownership rules to permit co-ownership of radio and TV stations in selected markets on a waiver basis.

Describing its move as a moderate approach, the commission set forth some guidelines under which it will look favorably upon proposed combinations in the same market. TV-radio cross-ownership is likely to be approved if the proposed combinations involve stations in one of the top 25 markets and if, after a merger, there still will be at least 30 separately owned full-service broadcast voices in the market. In below top 25 markets, the commission will consider waiver requests on a case-by-case basis after balancing certain public interest criteria, including the types of facilities involved, the potential benefits of the combination, the number of stations already owned by the applicant, the financial difficulties of the stations and the nature of the market, including the degree of cable penetration.

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

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Part 4

Strictly TV

Inside the visual PA

By Carl Bentz, technical and special projects editor

Picture quality requires that the characteristics of the visual transmitter be as linear as possible. The transmitted channel bandwidth (6MHz for NTSC and even greater for PAL and SECAM) introduces various obstacles to achieving a high degree of linearity. The wideband amplifiers of television must have a flat response over the entire frequency range of interest. The design process considers solutions for the problems of spurious harmonics resulting from stray component parameter and distortions to signals from all sources.

Frequency distortion in TV systems, ranging from 15kHz to several hundred kilohertz, is more visible on test equipment if a line-frequency square-wave signal (with a rise time of 200ns) modulates the visual transmitter. Distortion characteristics of this range generally fall into the category of rounding and tilt. If an excessive amount of rounding and tilt exist, a transmitter exhibits poor response at the lower range of frequencies involved.

What happens in middle and upper frequencies of the system can be determined in several ways. If you drive the transmitter with a sweep generator, monitoring the result with a spectrum analyzer, you can observe effects of the system at all frequencies. Procedures for tuning the klystron cavities of visual and aural PAs, where the need to know the actual response of the power devices is critical, often include the use of a spectrum analyzer.

The T pulses

For overall system performance checks, another useful signal is the *2T pulse*. The term is derived from the transient time constant for television, that is, $T = 1/(2f_C)$. It is a sine² pulse with a half-amplitude duration of 200ns. As a 2T pulse moves through the TV system, its shape and size suffer the ills of luminance frequency-response errors in the middle of the bandwidth. Distortions of the pulse shape are measured and rated with k-factors. A k-factor for pulse height ($k_{2T}/_B$) compares the 2T pulse amplitude with that of the line-frequency square wave. Using the output from a synchronous demod, $k_{2T}/_B$ = 25(b/h)%, where *h* is the height of the square wave, and *b* is the variation of the 2T pulse from that amplitude. (See Figure 1.) The k-factor for pulse shape (k_{2T}) involves distortions occurring on or along the baseline. To make this more apparent, increase vertical channel gain setting of the oscilloscope or waveform monitor, making the total amplitude of the demodulated 2T pulse equal to the 100% level. The amount of error is found by comparison with a 2T pulse tolerance mask.

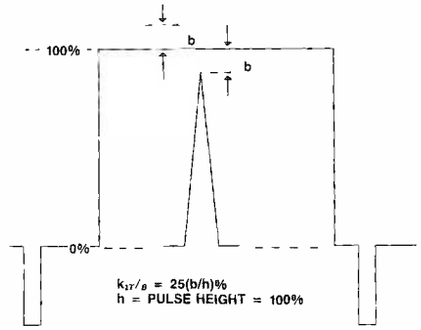

Figure 1. *A $k_{2T}/_B$ value is based on the 2T deviation of* b *from 100% amplitude.*

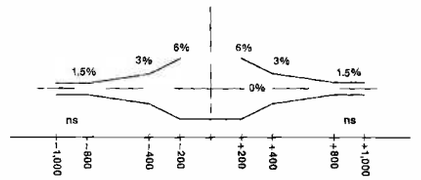

Figure 2. *The lower portion of a 2T pulse tolerance mask shows baseline errors.*

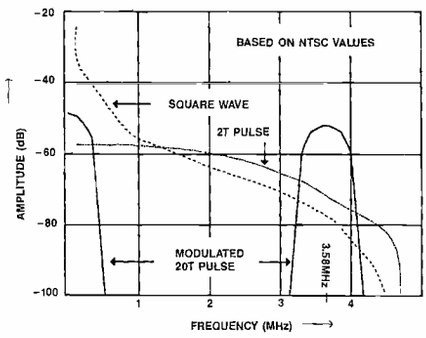

Figure 3. *Relative spectra of 2T pulse, modulated 20T pulse and line-frequency square-wave signals.*

The demodulator must be set for synchronous detection if this measurement is to be devoid of effects from quadrature errors. (See Figure 2.)

A test signal that extends into the area of color also contains the 20T pulse. None of the previous test signals include the subcarrier. However, the 20T pulse brings 3.58MHz into the picture, modulating a sine² pulse with the color subcarrier signal. The result adds additional information into the spectrum at both 0MHz and at the frequency of the subcarrier. (See Figure 3.)

Although the 20T pulse can be used by itself, it often is combined with the square wave, 2T pulse and a 5-step staircase signal. In this combination, the 20T signal enhances problems in group delay and amplitude of the signal, and the staircase signal indicates errors in line-time linearity.

The problems of linearity in phase and amplitude await you each time you couple a signal from one circuit to another. An error at only one location probably would not be particularly troublesome, but any error along the way is compounded at subsequent junctures between circuits. If you don't take steps to avoid linearity errors, you might produce an unrecognizable image.

Next month we'll examine the 20T pulse and what it can show us about our system.

Editor's note: This article has been adapted with permission from "Rigs and Recipes: How to Measure and Monitor," a publication of Rohde & Schwarz.

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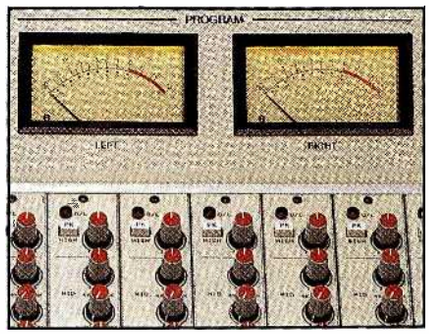

Time may be ripe for new low-power FM

By John Battison, P.E.

Last month, I mentioned that the development of a low-power FM service could be possible under the recent U.S./Canada agreement. The idea has not yet been implemented. At a recent meeting, someone suggested that the FCC's latest increase in FM on-channel booster power was the same thing. I don't think so.

FM boosters

An on-channel booster is designed primarily to operate within the station's licensed 1mV/m contour. The intent is not to extend the normal 1mV/m contour. A low-power FM station would, on the other hand, operate like any other FM station.

Boosters and translators increase signals up to standard levels within the primary station's service contour. Again, the contour cannot be extended through the use of boosters or translators. A recent case confirms this aspect.

A station in the Western United States installed a booster with a power level that was 20% of the primary station level. However, by doing this, the station increased its service area and caused interference to another station. The interference was stopped promptly by the commission.

Observers think that the recent relaxation of the rules allows non-commercial FM stations to program boosters and repeaters via means other than off-the-air reception. This could represent a step toward independently operated low-power stations. Now that Docket 80-90 is almost concluded, the commission must have some spare FM engineers available. The time might be ripe for the start of a new low-power FM service, but don't hold your breath.

Class A FM upgrade

There has yet to be a decision on the proposed power hike to 6kW for Class A FM stations. The odds seem to favor such a rule change, probably sometime this year. There may be cases in which a unilateral power increase just won't work because of intolerable interference. It may be necessary for some stations to employ directional antennas to take advantage of the new power level. Such a rule would help antenna and transmitter manufacturers reap a small harvest of new sales.

A word of caution may be in order. There is often the temptation to save money when upgrading to higher power. This approach sometimes may lead a station manager to think that a new antenna is the most cost-efficient approach. The required 3dB power gain normally will require approximately twice as many antenna bays. The larger antenna size creates additional weight and windloading to the tower. Be careful about adding such loads to a tower without adequate study.

An important related factor is sometimes overlooked when higher-gain antennas are used. The more bays an antenna has, the more horizontal, and less vertical, radiation it has. As the horizontal gain is increased, the vertical beam width decreases. If a station is located close to its city of license, an extremely high-gain antenna (and reduced vertical radiation) could result in reduced coverage. The new high-gain beam might pass over the population on its way to the horizon.

If a new antenna is chosen, be sure to consider the vertical beam width. Beam tilt and null fill can be used to help ensure adequate coverage near the tower area. Check with your station's consulting engineer or the antenna supplier before deciding.

Additional transmitter power

Increasing the transmitter power is another way to reach the 6kW ERP power level. For many stations, this will require doubling the transmitter power. Engineers may want to push for a new transmitter employing the latest RF generation technologies. These new transmitters often provide lower operating costs and greater reliability.

Installing a higher-power transmitter does have additional costs. Consider the ac power-supply distribution system. If the station is operated remotely, special attention must be given to the incoming power feed. Fortunately, most transmitter sites will not have a problem accommodating the extra power load.

But don't take a chance. If you are not sure that the building's wiring system is adequate for the extra load, have a competent electrician check it. Wiring that is too small may produce intolerable voltage drop and create a fire hazard.

Environmental concerns

Increasing to 6kW ERP also may present environmental problems. Some older stations have not yet had to certify compliance with non-ionizing RF radiation guidelines. Changing to the higher power will require completion of FCC form 301. The form, "Application for Construction Permit or Modification of License," asks whether the proposed site complies with the guidelines.

It may be that operation at the old power level created no problems. Or maybe a problem existed, but no one knew about it. In the latter case, the new power level certainly would produce an unacceptable RF power field.

It doesn't matter what you think about the hazards of RF radiation or the requirement to certify compliance. The licensee must certify that the station is meeting all the requirements.

Personally, after 43 years of experience, I have not found many areas where this protection appears to have been needed. However, I do recall a site in Annapolis, MD, that may have had a problem meeting today's standards.

The site was home for an old high-power, low-frequency Navy transmitter. The shock excitation to receiving antennas was quite noticeable. The RF in the transmitter tuning house was so high that arcs could be drawn, and neon tubes glowed at relatively far distances from the coils. Here, perhaps, was a case for RF hazard study. Of course, back then, no one thought anything about RF radiation hazards, especially at these long wavelengths.

A fraction of a wavelength in the FM band can approximate a human being's height. This means that FM and low-band TV transmitters probably are more likely to cause problems than other services. Your best source of information on this subject is booklet "OST 65," available from the GPO and other sources. |:-)))|

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

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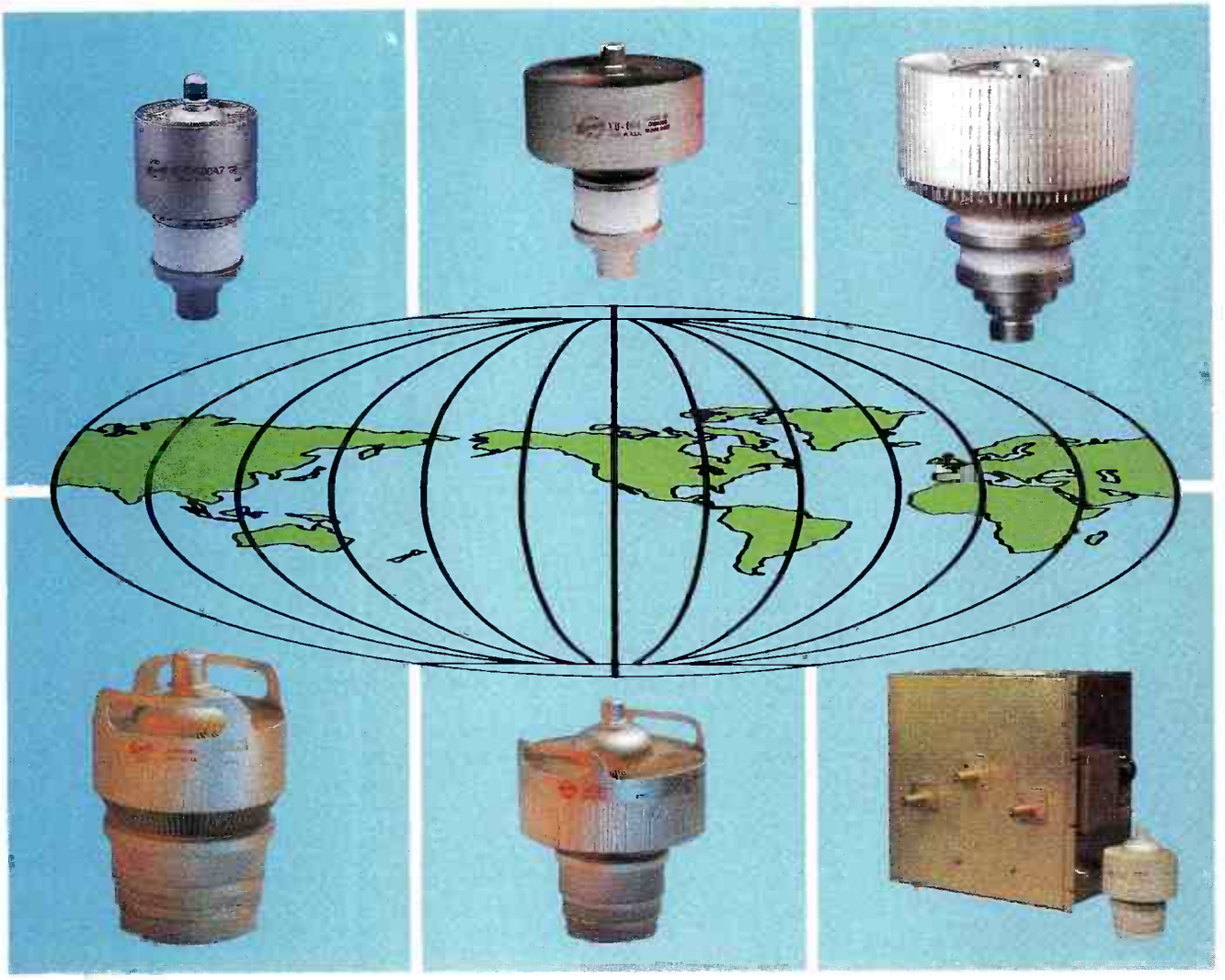

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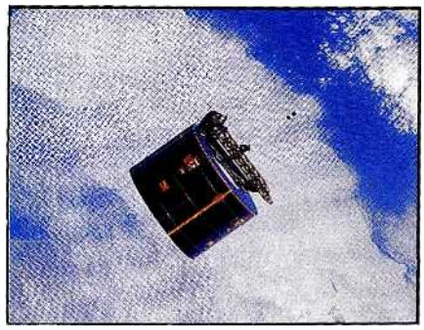
A look back at 1988



By Elmer Smalling III

The year 1988 will not go into the record books as a landmark for satellite communications. No radical new technologies were announced, but the following items, when taken together, point to trends in broadcast satellite operations.

Interference

To the surprise of many satellite watchers, 1988 saw little program disruption due to accidental interference caused by transmitting to the wrong transponder or sweeping across the arc with the HPA turned on. This was the result of vigilance on the part of broadcasters, as well as a less-than-anticipated amount of news gathering by satellite. Considering the high sidelobe response and beamwidth of many mobile antennas (especially C-band), the low incidence of interference is a credit to the engineering crews who operate satellite news-gathering equipment.

There were no reported cases of major purposeful interference.

Scrambling

Most of the full-time C-band satellite signals now are scrambled. PBS scrambles all but one of its C-band transponders. By government edict, PBS has kept one feed unscrambled to serve those living in areas not covered by a local PBS station. A small satellite program guide is available each month on written request.

Many pay channels and most of the "non-premium" programs provided for cable line-ups were encrypted during 1988. Descramblers soon will be available from more major manufacturers and will cost less as the Pacific rim electronics companies enter the U.S. cable TV and satellite TVRO hardware market. A few off-shore companies that persisted in manufacturing consumer hardware when most U.S. manufacturers quit are in a good position to meet the new demands for improved encryption and increased picture and sound fidelity.

Fiber TV

Two major common carriers began to install fiber-to-the-house TV systems during 1988. You may wonder what this has to do with satellite television. Cable operators have not shown much interest in distribution over fiber even though it is superior to coaxial cable for TV transmission in almost every way. Because fiber technology will accommodate more channels (and HDTV) with a higher picture quality, cable operators gradually will change their systems, especially since fiber technology is becoming affordable.

There will be a greater need for 36MHz or 72MHz transponder time as cities are *light cabled*. Also, the need will increase for digital modulation and transmission schemes to match the superior quality and added benefits of fiber plants.

When the HDTV and "high-fidelity audio and video" bug strikes the home market, the program distributors, broadcasters and cable operators will feel the push to keep pace with technology by upgrading their systems. Because of the new consumer products being made available and the high-quality distribution benefits of fiber, transponder usage should increase over the next four or five years until more satellites can be launched. Digital modulation techniques that require much greater bandwidths than present-day analog modulation will improve the signal-to-noise ratio of the TVRO, and noise distortion will be reduced greatly.

Flat TVRO antennas

Two flat antennas have been announced. Flat antennas come in two flavors: Fresnel units and phased-array systems. Although the electronically steerable phased-array design is the only real competition for the steerable parabolic reflector antenna, this system is expensive. However, microstrip construction eventually will lead to satellite receiving antennas that can be mounted on a roof, are inexpensive and are no more obtrusive than a skylight. The availability of flat antennas will boost TVRO system sales to businesses and the public because so many potential locations are limited by zoning laws, aesthetics and the physical size of existing antenna systems.

Programming alternatives

Satellite television has made it possible for hundreds of broadcasters and production companies to become program distributors. Network TV is losing viewers at an alarming rate because of the variety of competitive, quality programming that is available to local stations and cable operators at low costs. Costs for common carrier services — local loops, long lines, terminations, switching and the nightmare of tape bicycling — kept many distributors out of the game for years. They now are coming on strong.

Launches

After a 2-year hiatus, NASA got back on track with the successful launch and mission of Discovery STS-26. Although most of the space vehicles launched from shuttles during the next few years will not be communications satellites, launch alternatives will be provided by private U.S. rocket system delivery companies, as well as by Europe, China, Japan and the USSR. Four communications satellites are scheduled for launch during 1989, and three more are backlogged from 1988. It seems improbable that these will be launched by the shuttle in the near future.

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

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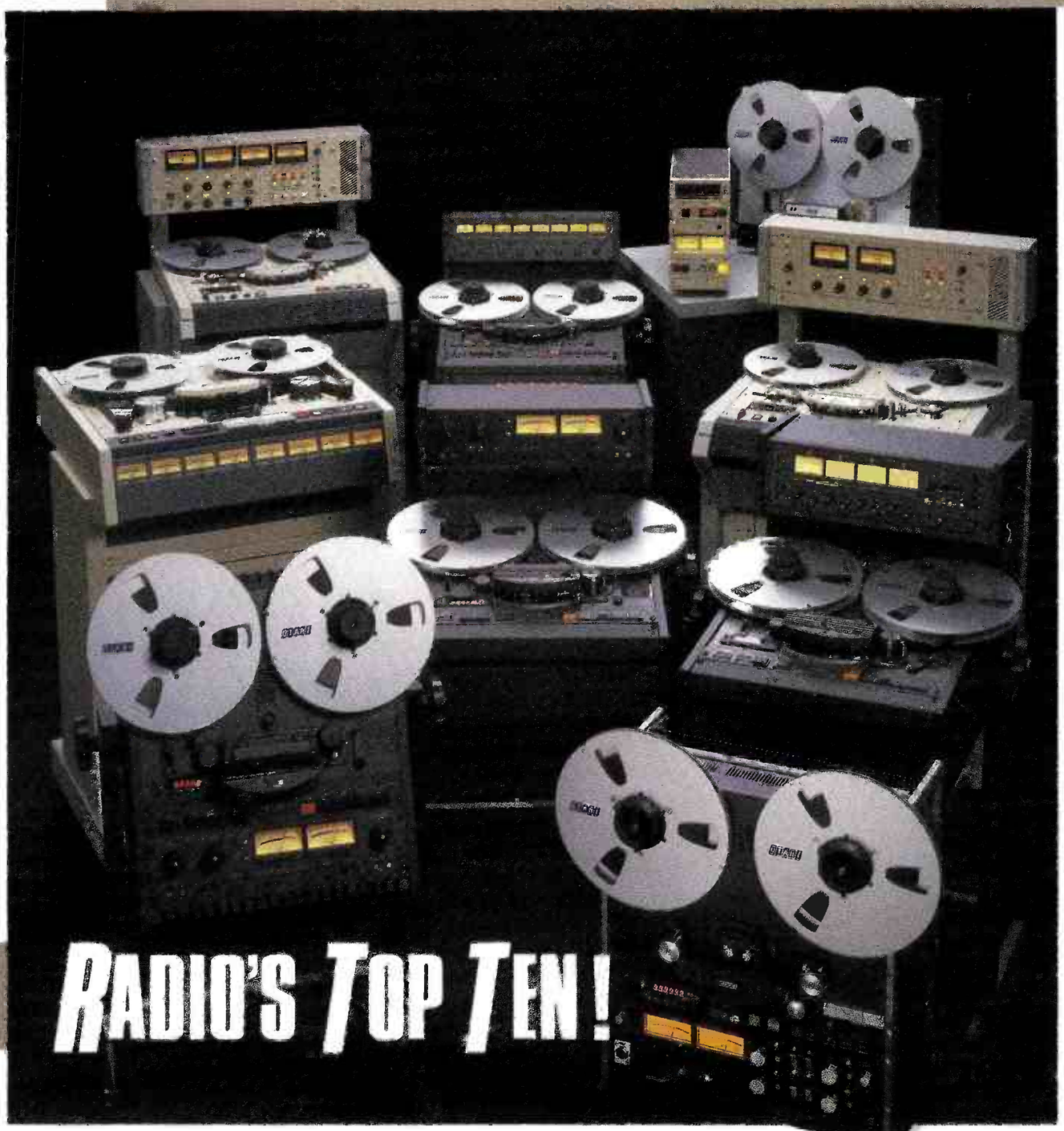

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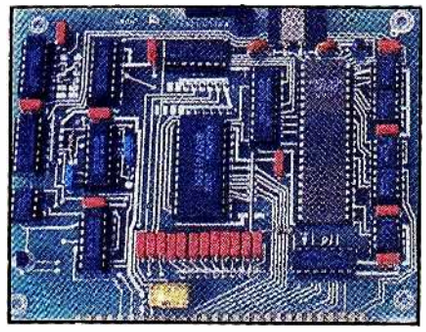
Semi-custom ASICs



By Gerry Kaufhold II

The full-custom and standard-cell technologies used to create application-specific integrated circuits (ASICs) was introduced last month. Although these technologies provide design freedom for the engineer, the up-front costs are great, and the time from concept to working chip is measured in years.

To save money and time in the manufacture of custom ICs, semiconductor manufacturers have created semi-custom ASICs. Included in these are gate arrays, programmable logic devices and generic array logic.

Implementation of these devices requires the chip designer to mix and match the parts available on-board to fit the application. To do this, the designer must be good at manipulating basic logic gates to create complicated structures. For example, if the semi-custom part has OR gates on the inputs and AND gates on the output, the designer can use product-of-sums logic. If the device has AND gates on the inputs and OR gates on the outputs, the designer can use sum-of-products logic. (See Figure 1.)

Kaufhold is an independent consultant based in Tempe, AZ.

Gate arrays

Gate arrays (large arrays of transistors arranged on a silicon substrate) can be the basis for an IC design. Such an array is an IC that is *almost* complete — the first 100 steps of the manufacturing process are completed. By adding two layers of metallic interconnections, the circuit designer creates a road map that connects components and turns the array into the desired logic gates. After the map is programmed into the array, the design is fixed.

Gate arrays can implement numerous complicated circuits. As a rough estimate of size, the arrays are measured by the number of 2-input AND gates that can be used per chip. The number ranges from 3,000 to 100,000 with a single array.

Logic cell arrays

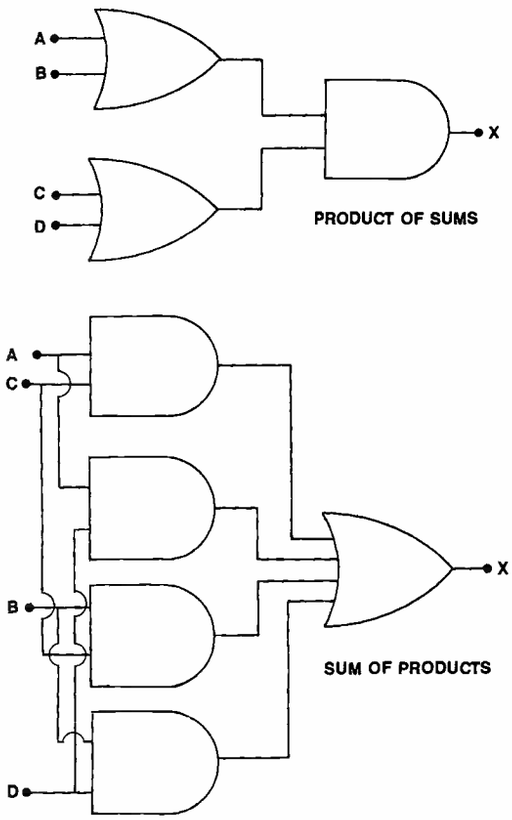
Another cost-conserving step leads to the *programmable logic cell*. These devices include programmable array logic, programmable logic devices and generic array logic.

Applications with programmable logic cells cost less because they require no designing by the semiconductor manufacturer. Programmable logic devices can be programmed quickly using off-the-shelf EPROM programmer tools. Several software packages for development of logical cell circuits with PCs are available.

On a cost-per-chip basis, programmable logic cells cost more than standard cells and gate arrays, but less time is required to develop a logic cell than for the other methods. Cells are available in a variety of styles. Those that are programmable only once are called *one-time programmable logic devices*. Many new equipment designs will make use of programmable logic cells because of their ease of programming.

The future

ASICs already may be more common than you think. Check around for an ASIC the next time you look inside a PC. The graphics adapter may contain several large ceramic chip carriers that incorporate ASICs designed specifically for graphics calculations. Much of the new equipment coming into radio and TV facilities contains chips with unfamiliar names. The schematics and documentation that come with the equipment will reflect the inputs and outputs of these special-purpose devices, but what goes on inside the ASIC will be hidden.



TRUTH TABLE

A	B	C	D	X
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	1
0	1	1	0	1
0	1	1	1	1
1	0	0	0	0
1	0	0	1	1
1	0	1	0	1
1	0	1	1	1
1	1	0	0	0
1	1	0	1	1
1	1	1	0	1
1	1	1	1	1

Figure 1. *Equivalent circuit implementations using product-of-sums and sum-of-products logic.*

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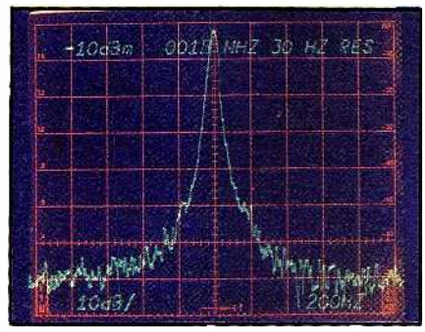
Use a color scheme for wiring



By C.A. Pennock

Colored wire has been available for many years, and most engineers are familiar with the color conventions used in electronic equipment. Standardized wiring colors make it easier and quicker to troubleshoot complex equipment. Until recently, however, video installations were doomed to using black coax, making signal tracing difficult at best.

Colored RG-59 coax cable is available. However, using it just because it's colored is not efficient use of the product. Instead, wiring a video facility using a planned color-code scheme provides all the advantages of colored wire in other projects.

Cable labels

Most video facilities use some form of numerical and/or descriptive labels to identify cables. The addition of colored cable will not replace cable tags. Color coding can provide a fast, shorthand form of notation and is helpful in densely wired coax areas.

Colored coax also is finding a market in broadcasting for other reasons. For example, using colored coax means you don't have to twist cables sideways to read the labels. Although reading the labels was tough enough, cable twisting often could lead to damage if the coax were accidentally pulled from a twist-on BNC connector. In essence, you've traded off reading the coax label for an intermittent connector or interrupted service. That's not a good trade.

Using colored coax, on the other hand, makes it possible to troubleshoot signals based solely on color. An engineer knows instantly whether a particular output from a DA is an important program line or just a monitor feed. Even at a casual glance, an engineer can see that the cables are connected correctly to a TBC. The color-coding scheme at KHSK-TV enables us to swap TBCs in the middle of a newscast, all in less than 60 seconds.

Color convention

Adopting a color-coding system is both easy and hard. The hard part is deciding what color to use for what signal. After you have adopted the color scheme, the rest is easy. Just remember what color is used for what signal, and stick with it.

Coax is available in seven colors, ranging from black to purple. In practice, wire functions do not flow continuously from one function to another. Even so, there still exists sufficient similarity in signals to follow a standardized color convention.

An important part of the coding scheme is the *spectrum concept*. In the future, if you decide to add a new color, you can do so without major changes. Brown, for example, would take on wire functions between red and orange. But you would never have light blue taking on wire functions totally different than blue. This practice could result in light blue representing H-sync and blue representing computer video — two totally unrelated signals.

Color-coded signals

At the bottom of the color spectra is black, which represents the base for upward compatibility. A black coax may carry any signal. A black cable may be used alone or with a colored band as a modifier. This allows for a smooth transition from black to banding to full color. This practice also permits the continued use of existing black cables through the addition of a simple color band.

The next color is red. Red signifies that dc or ac power is carried on the center conductor. Red cables also are used to carry RF from pre-amps or antennas. This category represents the longest runs of existing black cable, so a simple red-banded black cable means the same thing. The 70MHz IF loop-outs from satellite receivers also use red or red-marked black coax.

Cables going to microwave subcarrier demods (such as 6.8MHz, 7.5MHz and 8.3MHz) should be red. In this case, red means raw and unprocessed RF and is normally associated with a source device. An oscillator signal is carried in red cables, providing the signal is not used for timing. Adding any timing information to the signal requires moving up the spectrum one color to orange.

Orange signifies horizontal or vertical sync or composite blanking. Although these are old-fashioned signals, they still are used today. Also included with these primitive timing signals is continuous subcarrier.

For borderline cases such as dropout compensator (DOC) signals, either red or orange cables could be used. Because of the color-coding used on our VCRs, red cables are used for DOC.

Yellow represents one more step up in signal sophistication. Yellow cables carry blackburst. Blackburst is used so much in today's facilities that it deserves a color of its own. The complexity of blackburst is somewhere between sync and video. Blackburst (yellow) retains the function of its ancestor sync (orange), but also begins to look more like video.

Composite video is carried on green coax and represents the next upward step in signal complexity. Green represents a signal with some intelligence while still relying on its predecessor (yellow), blackburst.

Blue cables are used only for monitoring signals, but they can also go to edit bays. For example, a blue cable with a blue band may go to an edit bay where a permanent record is considered a form of monitoring. A blue cable with a green band may go to the patchbay or to a switcher representing a possible program feed.

Purple represents the most sophisticated signals, such as component video. Our station also uses this color to represent special engineering applications. Permanent test signals, test cables and emergency routing currently use purple cable.

Prevent mistakes

One color-conscious, albeit absent-minded, engineer finally found his lost purple scope cable amid all the other cables in the back of a rack. It still was connected to an important DA output. Because of the color, the engineer was able to identify the cable immediately, and he removed it. In this case, the purple color saved the engineer from an embarrassing situation because an important signal had been disconnected for testing.

The key to effective use of color coax is a carefully thought-out plan. Don't just pick a color and begin wiring up your station. Adopt a wiring code that makes sense to you, and stick with it. |:-)))|

Pennock is chief engineer of KHSK-TV, Chico, CA.

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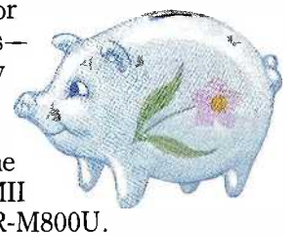

And this is just the beginning. The KR-M800U has the professional features you'd expect too, including selectable CTCM and component outputs. Y/C 3.58 output for compatibility with S-VHS recorder/players, so you can dub S-VHS tapes from MII component masters without any decoding—eliminating signal degradation. A 45-pin parallel remote control connector for compatibility with existing parallel editing controllers. High-speed search at 32 times normal speed. Jog control for fast access to edit points. Comprehensive editing functions including preroll, auto edit, edit in/out, trim, go to, and preview/review. Meters for audio and video tracking. RF output for external DOC.

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Part 1

Management for engineers

Management profiles and personalities

By Walter Borys Jr.

Have you noticed how people react in different ways to the same events? We've all met those who see day-to-day happenings as a series of trials and tragedies. To them, everything is a problem. The world is going to hell in a handbasket, and no one seems to care but them.

Yet, others seem to be able to handle the situation, no matter what it is. There's the secretary who always has a smile and kind word for you despite the urgency or pressure of the job. And there's the busy supervisor who never fails to ask how your day is going.

Different personalities

Each of us maintains a certain basic outlook on life. This perspective carries over from our homes, into our jobs, schools and almost every other aspect of our lives. Optimist and pessimist are perhaps two of the largest classes into which we divide people. But it's not quite that simple. Most people are not so extreme that they can be typecast easily as optimists or pessimists.

There is a veritable library of management literature that better describes and explains the behaviors of different personality types. The research shows that certain personalities will never get along well with certain other personalities. This requires us to make continual adjustments in how we operate on the job if the work is to be completed.

Are you a tough guy?

Why doesn't everyone view similar situations in the same way? In 1960, Douglas McGregor published "Human Side of Enterprise." In the book, he described management as a process of thinking and acting based largely on two different sets of assumptions about people. These assumptions were applied later to two styles of management: *Theory X* and *Theory Y.*

McGregor said the Theory X manager believes:

- The average person has an inherent dislike for work and will avoid it whenever possible.
- Most people must be controlled, directed or threatened in order to get them to work.
- The average person wishes to avoid responsibility and is inherently lazy.

The Theory Y manager takes the opposite approach, believing that:

- Work is as enjoyable and natural as rest or play.
- People are willing to work hard toward goals to which they are committed, and commitment builds self-fulfillment.
- There is a high degree of imagination, ingenuity and creativity in the general populace. Most jobs do not demand the full use of an employee's abilities.

The manager's own perspective determines how the employees will be treated. This, in turn, helps determine how the employees will respond and perform for their managers. An employee's ability to produce results is, therefore, directly related to the views and perspectives of the manager.

Workaholics

Another essential ingredient is the personal view supervisors take about their own jobs. You may have worked for a manager who was dead serious about work and placed the welfare of "the company" above any personal considerations. This type of supervisor, the *workaholic,* often expects the same amount of dedication from employees.

The term workaholic describes a person for whom the job is the center of emphasis. To work is to live. Workaholics hate to leave the office, where there are triumphs and successes. Those kinds of little victories aren't so easy to repeat at home, which serves to further emphasize the work aspect in the person's life.

Unfortunately, this is a self-exacerbating situation. As the workaholic spends more and more time at the office, home life may deteriorate.

Workaholics are common, especially in a pressure business such as broadcasting. Unfortunately, they can be tough to work for and generally are not understanding bosses. This is especially evident if you can't work overtime or won't be able to make it in on Saturday because of your son's piano recital or some other "unimportant" event.

Decision-making style

Managers also can be characterized by their decision-making style. Some managers are direct and decisive, seeing life as a series of struggles and conflicts to be solved by quick, hard decisions. General George S. Patton Jr. is cited frequently as the epitome of the directive-style manager. This style worked successfully on the battlefield, but it doesn't work well in the typical radio or TV station.

Other managers are participative, seeking a consensus in all decisions. The participative manager asks to hear all sides of an issue, needs adequate discussion and wants to be sure everyone is happy with the decisions. This type of person can be easy to work for. However, if you are responsible for achieving results that call for quick action, the participative manager may drive you crazy.

Next month, we'll discuss personal values and how they can lead to conflict in the workplace.

Borys is a project manager at Voice of America, Washington, DC.

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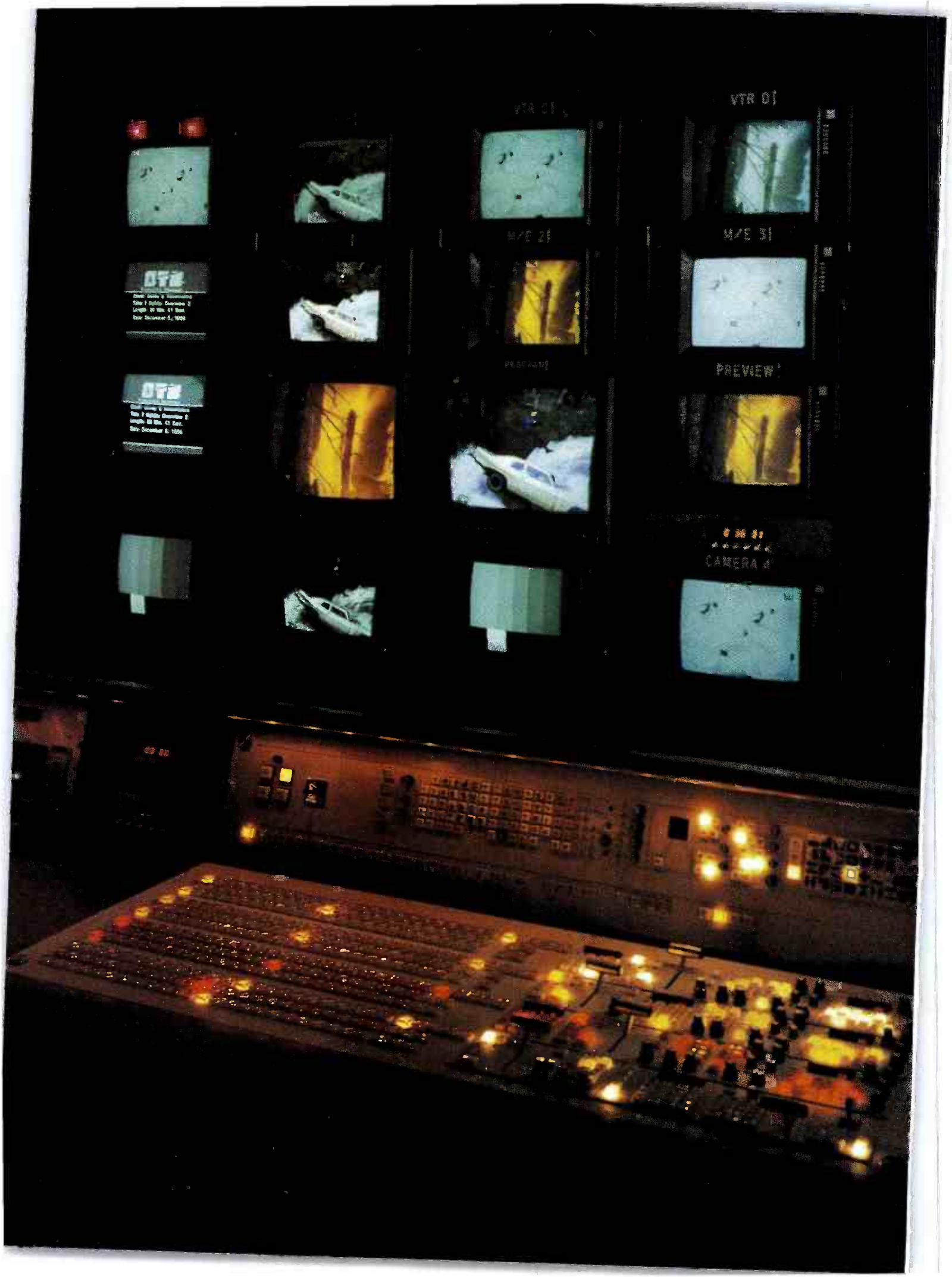


Transmitting "live from the scene" is one of broadcasting's oldest challenges and one of its most rewarding opportunities.

Broadcasting from the field

By Rick Lehtinen, TV technical editor

This special report focuses on broadcasting in the field. Radio and TV stations are moving into the remote business in ever-increasing numbers. The reasons for this are compelling: Live remote broadcasting adds interest and immediacy to any program; it shows a station's involvement with the community; and, in the coverage of any news event, the capability to go live is invaluable.

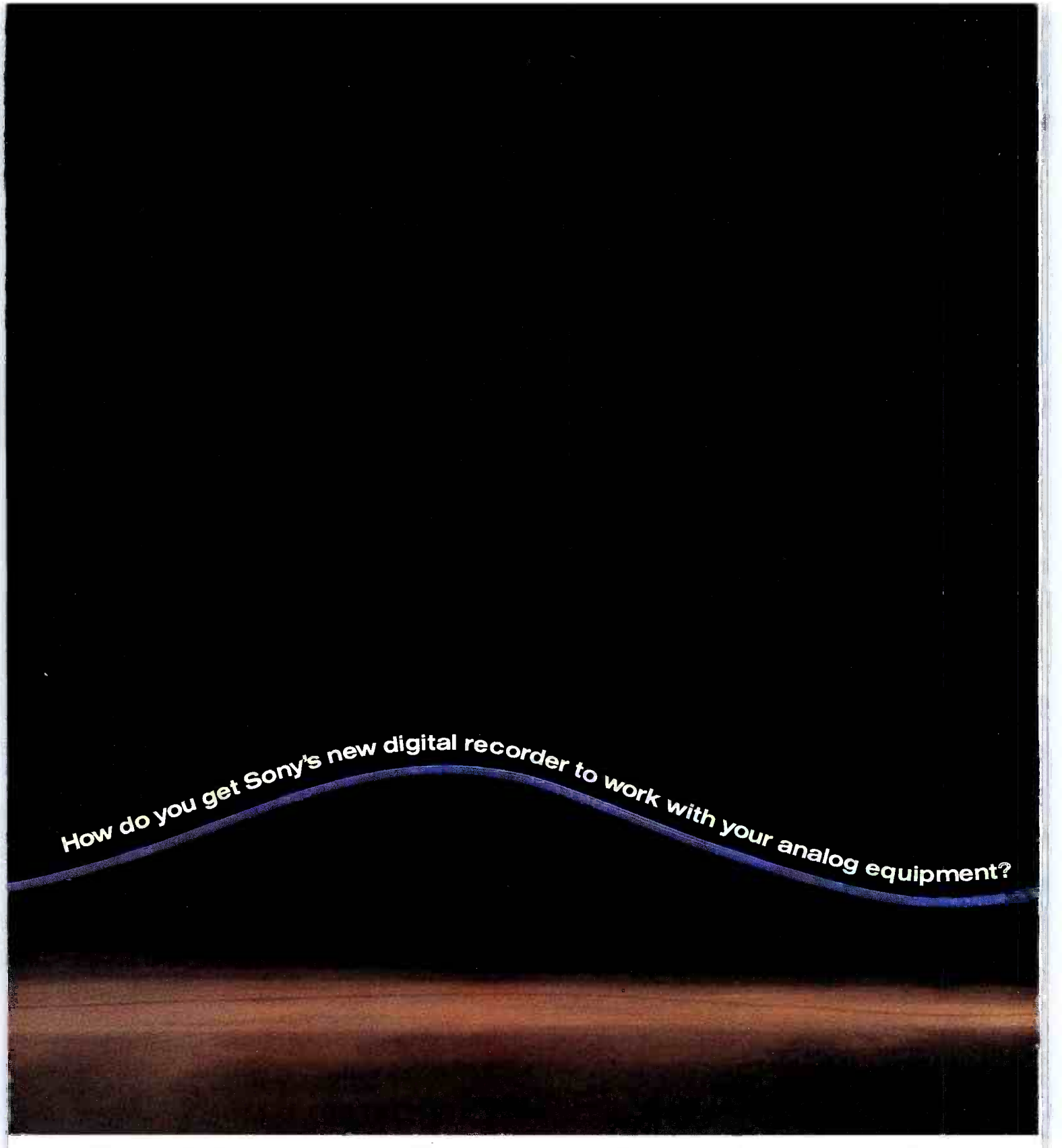
Perhaps more important, broadcasting from the field is the purest form of "localism." No one can tell the hometown stories better than the hometown folks. In the face of plentiful, high-quality, audience-fragmenting nationally syndicated programs (not to mention the looming prospect of HDTV), it just might be that localism becomes the lifeline that saves broadcasting as we know it.

This month we will examine how stations can keep up with the pace of mobile technology. Richard Rudman, of KFWB-AM, Los Angeles, who also is well-known for his work with the Society of Broadcast Engineers, has provided an article on building radio ENG vehicles. Consulting editor Michael Heiss explains how cellular telephones can boost a station's remote production power.

Other articles deal with remote computers that gather election data automatically and local area networks that tie a newsroom together. Batteries are a key part in any phase of remote production, from the tiny penlight cells in portable tape recorders to the muscle-building cells built into belt-packs. Because so little is generally known about what goes on inside batteries, technical and special projects editor, Carl Bentz, has written an article about battery chemistry.

Successful production in the field requires special strengths of engineering personnel. Localism has its price. But rising to meet challenges always has been a vitalizing force to the engineering professional.

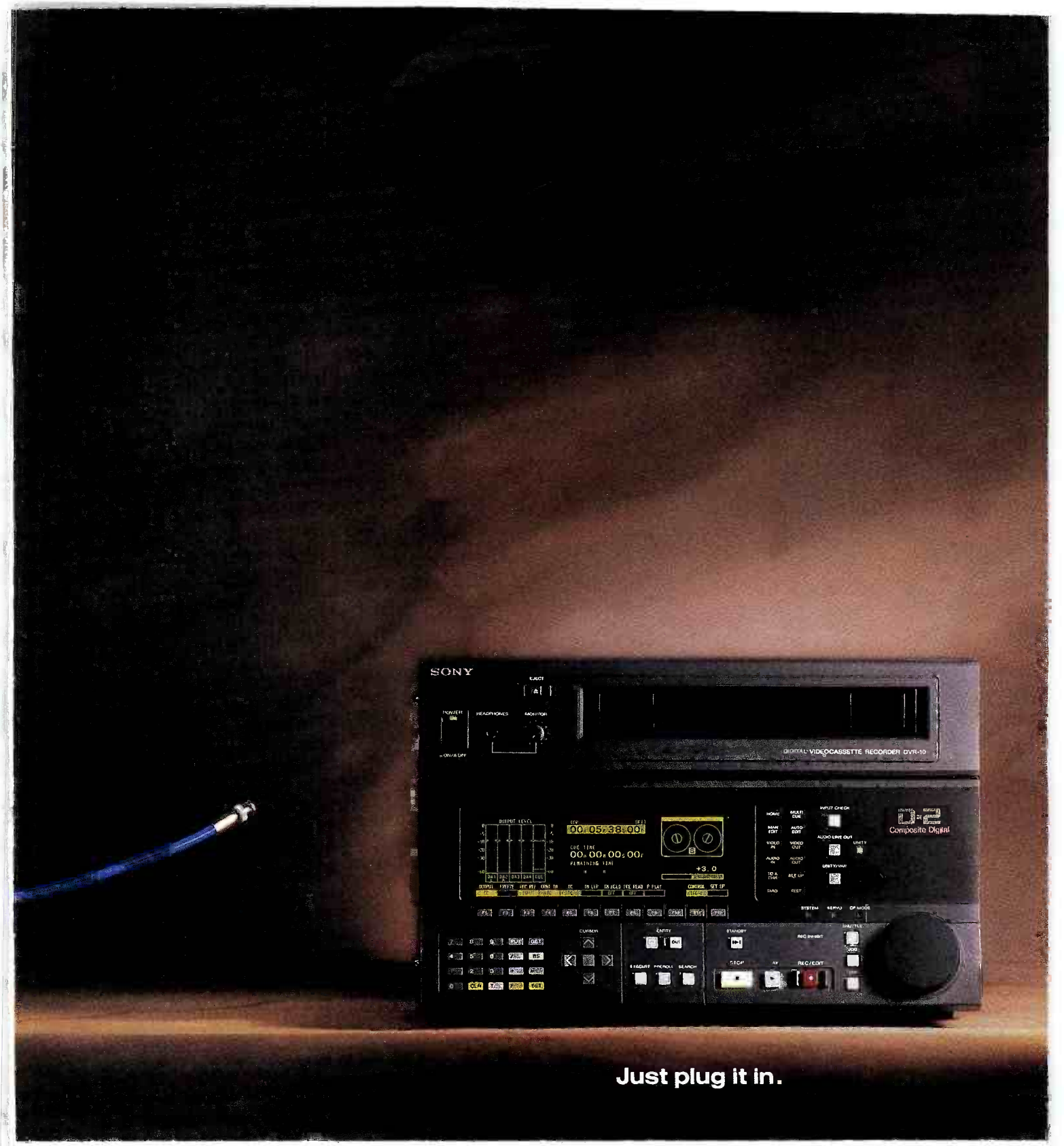
Photo courtesy of Centro Corporation. Video courtesy of KTVX-TV, Salt Lake City.



You can slip Sony's new composite digital video recorder right into your current editing suite. With its analog inputs and outputs, it connects directly to your existing equipment.

Yet it does what only digital can do. For example, the Sony DVR-10 composite DTTR gives you more than 20 generations of transparent digital dubbing. And with its write-after-read capability, one machine can operate simultaneously as both a source and recorder.

The DVR-10 is physically small—half the size of a BVH-2000 recorder—and its price is as compact as its size.



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BROADCAST PRODUCTS

Building a newsroom on wheels requires a combination of skills.

Planning for mobile operations

By Richard Rudman

Mobile studios have been a part of broadcasting from the beginning. The needs of today's news formats present unique challenges to the broadcast engineer faced with building a mobile unit. Reporters often must have access to both cellular and 2-way radios for communication. Scanners are needed to monitor public-safety frequencies. If that's not enough to keep the reporter busy, the car's AM/FM radio is used to monitor the station's broadcasts. In addition to these special communication and monitoring requirements, news vehicles must provide facilities for recording and feeding audio materials. This combination of demands and space restrictions requires more than luck if the project is to be a success.

Offices on wheels

Working conditions for reporters in a mobile unit are somewhere between imprisonment in the "black hole" of Calcutta and life in a corporate executive suite. But, generally, they're more like the black hole. The vehicle's size is the primary determining factor of how comfortable the working conditions will be.

Some stations use subcompact cars as mobile units in an effort to economize. That is a major mistake. Larger vehicles provide more room inside to mount equipment without crowding the driver. A medium- or full-sized vehicle allows more mounting options and results in happier reporters.

Police departments also recognize the importance of larger vehicles. Most police vehicles are full-sized cars with heavy-duty everything. A 145A alternator and heavy-duty battery are standard equipment in those cars. Also, industrial-strength shocks, radiators and oil coolers help provide longer and more reliable vehicle life. These cars often are equipped with old-fashioned gauges to warn the driver before the engine overheats or if the oil pressure drops to zero. No idiot lights here.

Although it may be difficult to obtain a vehicle with a police package, your goal should be to get as close as you can to this ideal combination. If you cannot order a police package for your news cars, some acceptable compromises are possible. For example, if you order a trailer-towing package for a standard car, you'll get a

Rudman is chief engineer at KFWB-AM, Los Angeles.

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heavy-duty radiator, oil cooler and shocks. It may be easier to convince management of these requirements than some others.

Management may view some accessories as frills. But power steering and seats, cruise control and electric door locks are real necessities for the modern news mobile unit. Power seats and cruise control may be called creature comforts, but reporters are human, after all. Electric door locks, another alleged frill, can become an important part of an electronic vehicle security system.

Power windows also are an important addition. Today's power windows are far more reliable than those of 10 years ago. Don't worry about them failing in the down position. Our experience with them has been quite satisfactory. The key is to recognize when maintenance is needed. If the window does not bind while being activated, it will most likely have a long and useful life. A straining window motor, however, is trying to tell you something.

Vehicles acquired on trade can create many problems for the engineer charged with building the mobile unit. If you don't have a choice of the model or its equipment, many of your options may be severely limited. Suggest that your station avoid using trade for vehicles. But if you don't have a choice, you will have to demonstrate your creativity and self-control.

Field production studios

Let's take a glimpse of the latest version of the KFWB-AM news mobile unit. Although each station's needs differ because of location and format, perhaps you'll find that some of your requirements are similar.

After several generations of vehicles, we arrived at an equipment layout and selection that provides reporters with many production options. These include the ability to do voice-over background sound that is prerecorded on cassette. A block diagram of the car's audio and RF system is shown in Figure 1.

For cassette tape recorders, we chose the Sony TCM-5000. The machines are modified so they can function as 2-channel mixers to produce complete wraparound stories. Wraps open with the reporter on mic, incorporate cassette sound and end with the reporter again on mic for the lockout. This system also works well when reporters file their stories by telephone.

Dedicated mixers are installed in the mobile units, so complete wraps can be done just as easily on the 2-way. The mixers were custom-built for us by a local company. You may be able to duplicate the mixer's functions with standard remote equipment.

A do-it-yourself mixer project is also an option. Remember that such projects generally take longer than you'd think, and they usually wind up costing much more than you anticipate.

A mobile news vehicle becomes the reporter's office. Closely study the location of the equipment from the standpoint of convenience as well as safety.

Stacking the equipment allows maximum use of space. Note the audio mixer, which permits wraparounds on both the 2-way and cellular phone.

A vehicle 2-way mixer should include the following features:

- Excellent RF immunity.
- A microphone pre-amplifier with good dynamic range and sensitivity.
- At least one external input for cassette audio.
- Push-to-talk capability at the microphone input.
- Cue audio input from your cue source (either car radio or another RPU channel).
- Car radio muting when transmitting (mute relay).
- The ability to listen to cassette audio for editing, previewing and cuing.
- Some type of metering arrangement to indicate audio levels.
- Standardized connectors so that equipment can be interchanged between vehicles or spare equipment can be installed quickly.
- An internal or hidden audio-output-level control to adjust the balance between mixer audio-output level and FM transmitter deviation.

Other highly desirable mixer features include:

- Self-indicating pots and switches.
- An audio limiter external to your RPU radio.
- An actual VU meter. LEDs are hard to see in a bright, sunlit car.
- Easy maintenance access coupled with rugged circuit design and housing.
- A size and shape compatible with scanners and 2-way control heads for easy mounting and an attractive appearance.

Equipment placement

The physical arrangement of equipment in the vehicle is critical. In fact, it is your single biggest challenge. You will meet that challenge if you stick to a few basic ground rules.

Arranging the equipment is much easier if the vehicle has split front seats with a console between them. Removing or shortening the center console may provide all the room you will need. You can remove the console entirely if the vehicle has a steering-column-mounted shift handle. If you are stuck with a floor shift, shortening the console is often a workable option. This approach has worked well in our vehicles.

Either use the actual hardware or construct mockups of control heads, mixers, scanners and cassette recorders. Cigar boxes, duct tape, string and paper clips all can help to support or hang components so your reporters can see and test the proposed arrangement. Don't assume you know best where to locate the hardware; seek their input.

Sit in the driver's seat. Arrange the system components for your mockup so all controls are within easy reach. This is especially important for the cassette machine. Don't place components so close to the driver that they could inflict injury in case of an accident. Improperly placed equipment can even cause accidents. Find out whether your state has any laws about equipment installations.

When in doubt, use common sense. Ask yourself if you would want to drive this vehicle once everything is installed. Don't forget to allow for maintenance and installation access. There are few working positions more uncomfortable than upside down under a car dashboard.

Special problems

We designed a special cassette-machine mount that lets the machines pivot close to the driver when needed. The machine also swivels out of the way when not in use. The height of the mount is adjustable

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Compare. Except for the Zeus processor, there's no better time base correction anywhere. And it's available as an upgrade for *all* Ampex Type C studio VTRs—including the VPR-2 and 2B.

Zeus processor (left), TBC-7 (front)

Status At A Glance operational display. It's like having a full-time assistant.
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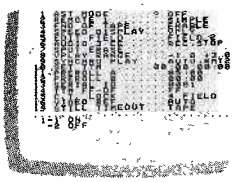

Its unique on-screen menu eliminates cumbersome reference cards by displaying operational setups and non-standard conditions in plain English.

And it's interactive, so you can check and quickly change setup parameters—without getting lost.

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(left to right) VPR-6, VPR-3, VPR-80

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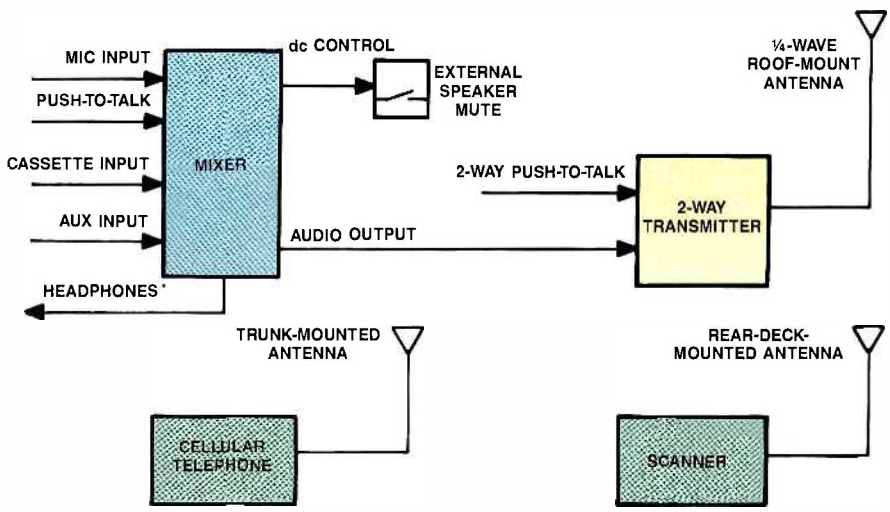

Figure 1. *There is a lot of equipment to mount in a news vehicle. Consider carefully the interconnection scheme and mounting configuration.*

to accommodate reporters of different sizes. Special end clips keep the machines firmly in place, but allow rapid removal for service and emergency use out of the car. The machines rely on internal battery power, even when used in the vehicle.

It's always a challenge to interconnect with a car's existing speakers. We send the cars out to a small, but top-notch, auto radio shop. When the car returns, male and female Molex connectors have been installed on the radio audio outputs and all speaker leads. When radio tests are needed, or the car is finally sold, we just unplug our equipment and plug the connectors back together.

Accommodating cellular phones in your installation takes some thought. Although many states have laws about drivers operating equipment while in motion, the laws seem to be ignored when it comes to the use of cellular phones. Avoid placing the cellular phone where it may take the driver's attention away from the road. Most cellular phones now incorporate hands-free operation and preprogrammed numbers. These features simplify installation greatly.

Two-way speaker mounting is another challenge. Attempting to mount the speaker on the rear-window ledge may be a mistake. This position requires high speaker volume. Also, the distance from the driver reduces the intelligibility of the audio. Burying the speaker on the front passenger side of the car under the dashboard is another common mistake.

A better location for the speaker is on the floor, to the right of the gas pedal and aimed upward toward the driver. A direct, short sound path is best. If you are using land-mobile equipment, use the speaker provided. Aside from being rugged, the speaker has sound quality optimized for 2-way communications.

Obtain expert help

Getting components mounted securely in the vehicle and located where they can be used easily is a dilemma. The services of an expert on automobile interior modification is invaluable.

You may have to look around a bit to find a qualified installation service. We were able to locate a company in Los Angeles that specializes in setting up police cars. These people are experts in fabricating innovative and extremely sturdy brackets, modifying dashboards and installing mobile radio equipment and scanners.

Retaining professionals for this part of the project has another important advantage: The installation will look professional. Unless your hobby is custom car work, leave this task to people who know what they are doing.

The cost for such custom work may not be as high as you think. These companies often have to bid on police car projects, and they may surprise you with a price you can afford. Unless you are a car buff, it will cost you more in the long run to do it yourself. Also, custom shops are likely to have special tools and parts on hand that might take you days to find.

Heat problems

Think of your vehicles as metal ovens with radio equipment inside. Some equipment will perform better over time in these conditions than others. Although some RPU equipment manufacturers also provide mobile equipment, not every unit was designed for the day-to-day pounding it will encounter in a car. Make sure whatever you purchase will perform as well as the cast-iron work horses manufactured for the land-mobile industry. There are advantages to the construction techniques used in that type of equipment. Such equipment remains in operating condition even after years inside car trunks in sweltering Los Angeles summers.

Another reason to select a full-sized vehicle is that it will have a larger trunk. Summer temperatures mean high temperatures inside trunks where the mobile equipment is mounted. Larger trunks provide some measure of air space and circulation for cooling. Full-sized vehicles also provide ample trunk space for radios and vital road safety equipment.

Securing equipment

All trunk-mounted equipment must be mounted securely. The 2-way radio should be attached to a thick plywood sheet or metal plate that is bolted solidly to the vehicle. Note the plywood plate. Quick-release latches on mobile radios allow them to be removed quickly for service. Yet, the radio will not break free in case of a sudden stop.

Make sure the radio's antenna and power connectors are routed properly so they can be removed easily. We once had a radio that could not be removed by standard means once the latch had snapped shut because the radio shop installer didn't plan properly. Bad language and a chisel had to be used to extract the unit.

Also make sure that the power and antenna leads have sufficient slack to allow for testing and normal motions required for equipment removal. Tightly bundled cables may look pretty, but they impede maintenance.

Cellular phones

Reports from the field are transmitted back to the studio on telephone or radio link. Through our extensive repeater system, enhanced with remote receivers, 2-way audio is returned to the studio on 5kHz telco loops. However, because the RPU system cannot cover the entire 10,000-mile Los Angeles county area, we supplement its coverage with cellular telephones. Cellulars are also used for dispatch purposes.

Reporters and managers must understand that cellular phones are not scanner-proof. They are, however, much more secure than transmissions on our 2-way system. Our 2-way frequencies are programmed into scanners in every other newsroom, fire and police station in Los Angeles.

Although some cellular phones now cost less than $1,000, a strong case can be made for top-of-the-line units. Rugged and reliable circuitry plus longer battery life in the portable mode are two benefits that will save you time, money and grief. Leave the installation to an experienced cellular shop, especially when glass-mounted

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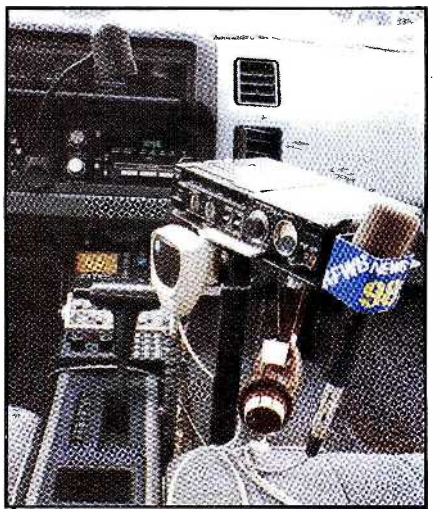


The special mount permits the cassette recorder to pivot away from the driver when not needed.

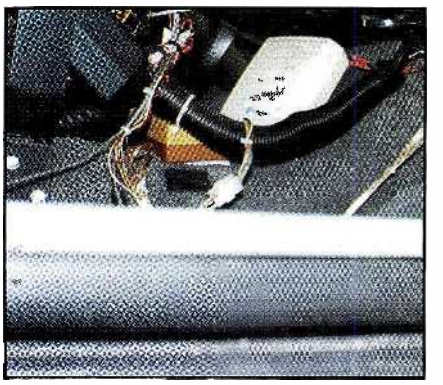
antennas are used. These antennas work well, but only if they are installed properly.

Because the phones are complex and compact, adding any features is quite difficult. It's important, therefore, to purchase one with all the features you need. Try to purchase cellular models with external, hands-free mic jacks. The handset should mute when placed on its pedestal, just as it does in the hands-free mode. If the hands-free mic jack is used as an input, a cassette machine can be used to transmit recorded and live material.

Antennas

Everything competes for space in a mobile vehicle, including the antenna. The best place for a transmit antenna on a standard sedan is in the center of the roof. Many stations opt for a trunk-lid antenna mount to keep the antenna lead short and make installation easier. But there are three reasons this should not be done. First, the coax loss differences between the two locations are minimal. Second, you are placing the driver's compartment in the antenna's center of radiation. This may result in 100W of RF being transmitted directly into the driver's compartment. Third, the trunk location produces an unwanted, highly directional antenna pattern.

Many stations prefer stacked, co-linear mobile antennas. But any gain antenna also is a loss antenna in some direction. Typically, the 2-way receivers you are aiming toward are located above the horizon on hilltops or building roofs. An antenna



Mount the 2-way speaker on the floor, directed up, toward the driver. This permits maximum intelligibility without requiring high speaker volume.

with a low angle of radiation may affect the overall system's communication performance. We have obtained excellent results using quarter-wave stubs. This type of antenna has other benefits. One is that it is less likely to become damaged in parking garages with low ceilings. Another is that it is inexpensive to replace when vandals strike.

The effects of RF (non-ionizing) radia-

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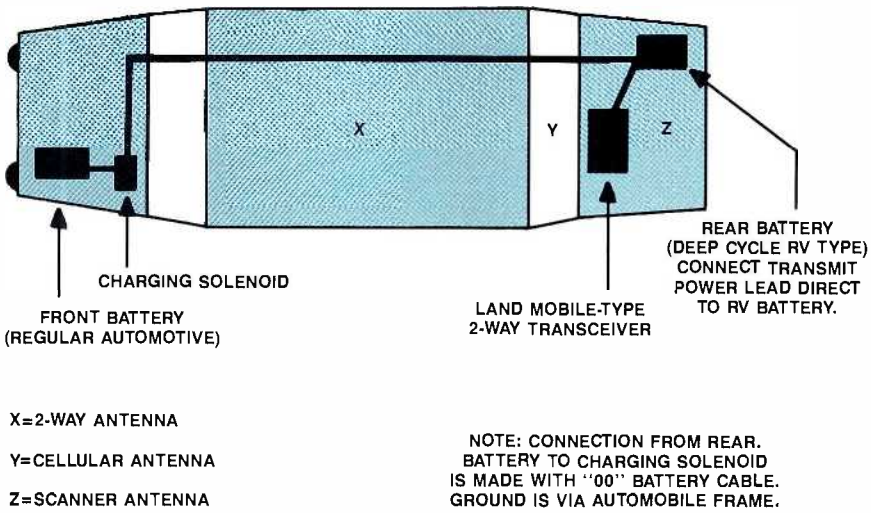

Figure 2. The primary and auxiliary batteries are interconnected through a charging solenoid with heavy-gauge wire. The RV-style battery is trunk-mounted and secured to a plywood base.

tion hazards have been better defined legally than medically. If you do decide to mount the antenna on the trunk lid, measure the RF field in the driver's compartment. A temporary magnetic mount antenna can be used for the test until you can satisfy yourself that the driver's compartment is RF safe. This also will help you verify that the audio equipment in the driver's compartment will not be subject to troublesome RF interference.

Providing RF shielding and bypassing for audio equipment inside a car is not easy. Trying to remove RF from the mounted equipment may make a center-roof installation look easy by comparison. Many of today's car radios use microprocessors, which are RF-prone. A roof-mounted antenna places the driver's compartment below a solid-metal ground plane. This configuration usually results in a relatively quiet RF environment.

Consider letting your 2-way shop or the police vehicle installation company put in all the antennas, coax and other wiring at one time. This means that the interior trim will have to be removed only once. Most cars seem barely able to tolerate one removal and reinsertion of the self-tapping screws used for trim. Repeating the process merely invites trouble.

Scanners

A scanner can be an extremely useful tool for your reporters. Before you decide to install one, however, be sure they are legal in your location. It may be necessary to obtain special police or fire department authorization. Remind your reporters that although it is possible to listen to cellular and other types of conversations, it is illegal to divulge messages heard.

There are several types of scanners, all of which seem to be subject to intermodulation problems. Older scanners with red LED displays should be shunned. The newer LCD models are far superior for mobile use.

Mounting the scanner antenna on the rear deck is your best option if the 2-way antenna is on the roof. You need maximum separation between the two antennas to avoid coupling transmitted RF directly into the scanner. Fortunately, newer scanners seem to tolerate RF overload better than their predecessors did.

One liability of the newer scanners, however, may be the mounting of the internal speaker. You may find that speaker audio is muffled or baffled by the rest of the equipment once the scanner has been mounted. If so, consider using an external speaker for the scanner. If you will be wiring up only one muted car speaker for the AM/FM radio, a rear- or passenger-side speaker may be available for use with the scanner. A transformer or small amplifier may be needed to power the external speaker. Even so, this approach may be easier than trying to fit another speaker housing into the driver's compartment.

Vehicle security

There are two types of vehicles in America: those that have been vandalized or stolen, and those that will be. At KFWB, we thought it would never happen to us, but it did. A reporter who was covering a story left the car in broad daylight on a busy street. The car was stolen. We finally got the vehicle back, but it was out of service for a month while vandalized and stolen parts were replaced. We considered ourselves lucky. Not everyone gets the car back.

We have since come up with a highly effective vehicle-security system. The security system disables the ignition system and sounds a reasonably loud alarm if someone without a key tries to get in. The alarm also goes off if someone forgets to disarm the system with the key-ring transmitter.

When the key-ring transmitter activates the system, it automatically locks all the car doors and chirps once to let you know that the system is activated. Many auto thefts occur because cars are left unlocked accidentally, so this is a strong selling point for news vehicles.

The transmitter also serves as an instant panic alarm. If someone threatens the driver, the alarm can be set off by pushing both transmitter buttons. Wiring the alarm to the second battery is an added precaution against clever thieves who might find a way to disable the front battery.

Dual batteries

All our mobile units are equipped with dual batteries. See Figure 2. The second battery powers the 2-way equipment, scanner, work light and cellular phone. Wired in parallel with the vehicle battery through a heavy-duty solenoid, the second battery is mounted in the trunk because of a lack of space in the engine compartment.

The solenoid is energized when the car is running, which permits both batteries to charge. An override switch can energize the solenoid when the engine is not running, allowing the second battery to charge the front vehicle battery in a few minutes. (See Figure 3.) Even though a 00-gauge cable is used to interconnect the batteries, starting the car on the rear battery is not recommended.

The second battery is a recreational vehicle (RV), deep-cycle type, not an automotive battery. Auto batteries are designed to power high-current starter motors for short periods of time. RV batteries are designed for lower current demands over much longer periods of time. They are much better suited to power radio equipment.

Like the 2-way transmitters, the RV batteries located in the trunk are fastened securely to a plywood base. This plate is bolted firmly to the car frame. The RV batteries are not sealed and are heavier than their automotive counterparts, so make sure they are tied down securely.

We ask reporters to regularly check the battery electrolyte level when they make gas stops. Unfortunately, it's easy to forget something that's tucked away out of sight in the trunk. A weekly check by your fleet maintenance organization, local garage or the engineering staff is prudent.

Make sure the battery is not covered by safety equipment or a reporter's personal effects. Also check for proper trunk ventilation. Because lead-acid batteries generate hydrogen gas, the trunk must have some outside air circulation. If your car has a well-sealed trunk, it may be

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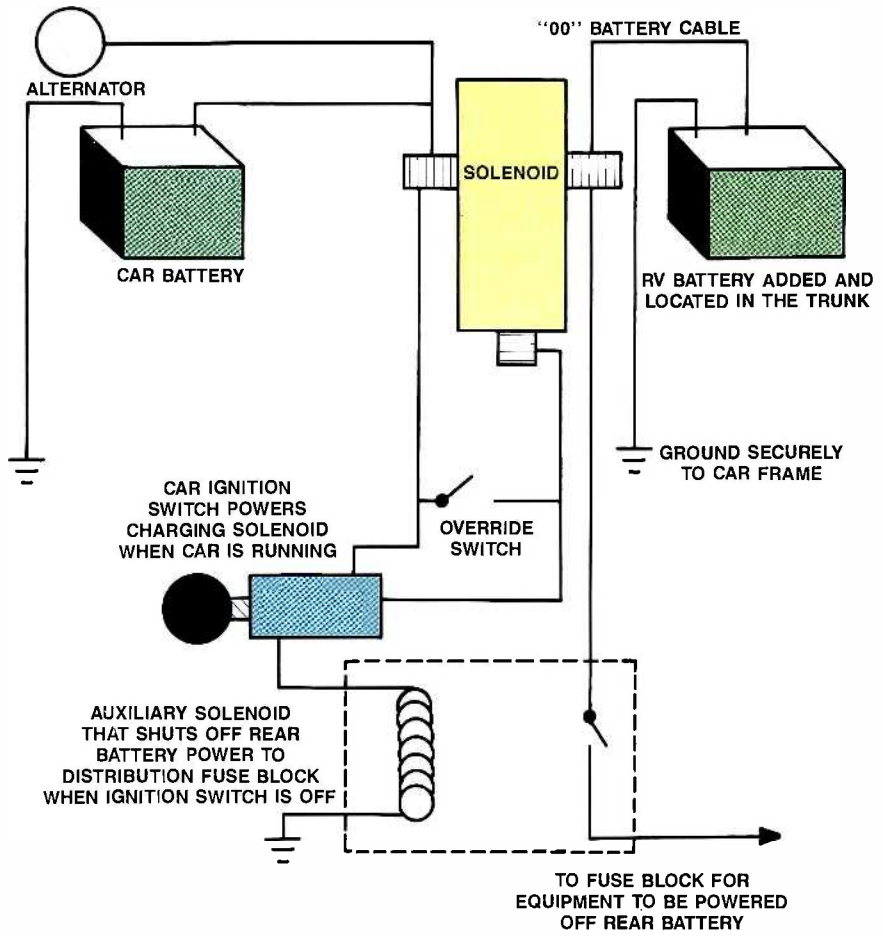

Figure 3. The charging solenoid is powered through the ignition switch. If the primary battery becomes discharged, it can be recharged from the auxiliary battery by activating the charging solenoid from the override switch.

necessary to provide an air vent. Trunk-mounted radio equipment should not use open-relay contacts. Any contact arcing could produce sparks that might set off a hydrogen explosion near the gas tank.

Accessory wiring

Automotive electrical systems were not designed for a large number of dc accessories. If you have had the experience of trying to jam lugs into automotive fuse clips, you already know that. The best approach is to add one or more separate fuse blocks for the front and rear batteries with enough separate fuse positions for all dc-powered accessories. Be sure to properly label each fuse. Otherwise, in six months, it will be impossible to remember what device each fuse is supposed to protect.

The auxiliary fuse block should be powered by the auxiliary battery and turned on and off by a relay. The relay closes when the ignition key is in either the on or accessory position. It may be necessary to install blocking diodes to prevent some equipment from receiving full or partial dc power back through other equipment.

The 2-way radio's receiver can be powered from either of the batteries. One approach is to assume that the current for control and receive modes is minimal and will not represent a huge drain for the car battery. If you do use the auxiliary battery to power the 2-way, the transmit power lead should go directly to it through a fuse. A land-mobile 2-way can draw 40A. This approach reduces resistive losses, but still provides protection against shorts.

A further word about fuses: Fuse everything. Make sure a fuse is installed at the positive terminal of the auxiliary battery on both the lead to the 2-way transmitter and to the charging solenoid. It is much easier to live with a blown fuse than a dc meltdown if something happens to that long cable between batteries.

Noise elimination

Fighting alternator whine in many cars is a losing battle. Here's how to cheat. Make it a rule to have reporters stop the engine and turn the ignition key to the accessory position before they file a story. We have tried many types of alternator filters, including a 20-pound device we bought at a surplus yard.

Nothing takes out all the hum. Moreover, each make of car seems to exhibit different hum characteristics. Some news departments like alternator whine because it makes reports sound more like 2-way.

A disadvantage of our cheating method is that the air conditioner or heater must be turned off while reporters file stories. (Some news editors might regard this as an incentive to make sure reporters file short reports.)

A word of warning: Although it's hard to believe, not everyone knows about the accessory position on the ignition switch. We had one reporter who always had a peculiar hum on his reports. Other people using the same vehicle did not have the problem. We traced the hum to the solid-state ignition. The noise disappeared for good when we showed the reporter the accessory position on the ignition switch.

This probably also saved us from having to prematurely replace the solid-state ignition. Car manufacturers warn against leaving the key in the ignition "on" position and with the engine off for excessive periods of time. If this had been an older car, it's likely the ignition points would have been burned.

Consider the details

Check all dc wiring after the installation. Many of the installation shops use practices that became obsolete 20 years ago. Do not overlook the possibility that someone has used acid core solder by accident.

Specify that thick grommets be used if holes are drilled through metal for cable access. If wiring must be run under the chassis, make sure the insulation can withstand the corrosive effects of water and road chemicals. In some parts of the country, you might want to install PVC or rustproof tubing as a conduit. Avoid hot mufflers and car parts that twist and turn when you route cables.

Don't just drop off the car at the installation shop and assume you can convey properly what you want. Prepare a clear outline of where everything will go and how you want it wired. Provide a word description and sketch. Conduct an in-person briefing with the shop foreman before each car is modified. Be as explicit as possible when you write the purchase order.

Final test

Before you turn the car over to the news department, road test it, then check all cable runs. Make sure all dc terminals are covered and that the cables are not located near rotating engine parts. If wiring gets caught in the fan belt, it probably will be mentioned during your next salary negotiation.

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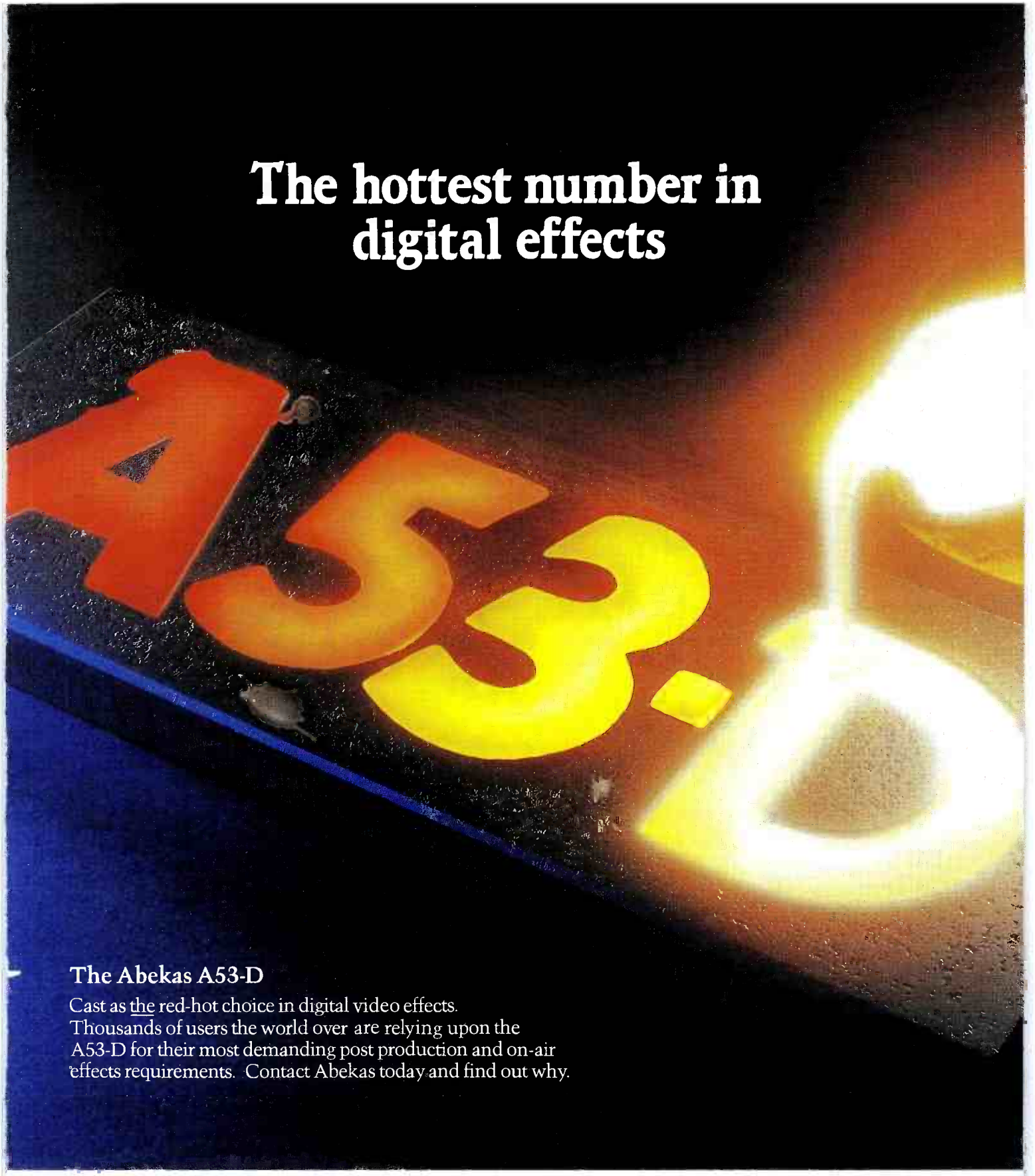

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Circle (19) on Reply Card

Note the wood base under the transmitter. All trunk-mounted equipment should be secured to a wood or metal base for maximum stability and safety.

Also be sure that the 2-way RF does not cause the car's microprocessor-controlled brakes to lock or result in a malfunction of the electronic fuel or ignition system. Such problems are well-known in the land-mobile business.

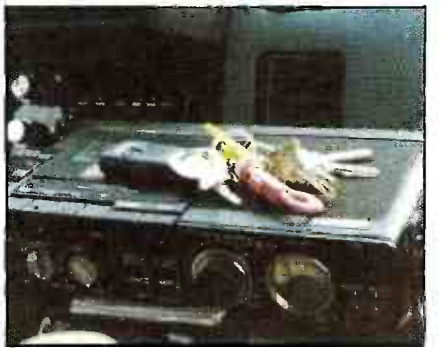
Make sure all radios really are turned off when the ignition key is removed. Connect an ammeter at the terminals of both batteries, and look for current flow. Even a pilot light can thoroughly drain a fully charged battery over a long weekend.

Preventive maintenance

Don't allow your vehicles to become maintenance headaches before their time. Because of the acids that are deposited in the oil, it should be changed every three months. Do this even if the vehicle is not used frequently. If you cannot arrange for some type of regular service, consider installing engine hour-meters on all mobile units. Oil changes then can be based on the number of hours the engine has run.

Require that the drivers check all vehicle fluid levels at each gas stop. Designate one person at the station to be in charge of vehicle maintenance. That person should keep a file on each car's maintenance history. Recurring problems can be tracked and perhaps be prevented. This person also should be in charge of the extra sets of keys. It is prudent to make more than two backup sets per vehicle. It is an immutable law of the universe that someone will go home with the car keys in a pocket or purse.

Building a news vehicle is not an easy task. One important key is to plan the installation carefully. Because the vehicle will likely be in constant use, emphasize reliability as you construct it. There is no advantage in having the best looking or most expensive mobile unit if it doesn't start when you turn the key.



The vehicle security system is controlled by a small key-ring transmitter. In an emergency, the operator can press both buttons to activate the car's alarm system.

As news becomes an even more important part of a broadcast station's programming, mobile units will increase in importance. If you are faced with building one, don't panic. Get as many ideas as you can from fellow engineers and reporters. Use outside expertise where appropriate. Purchase quality equipment, and use reliable installation techniques. If you follow these basic steps, both you and the station will be proud of the result.

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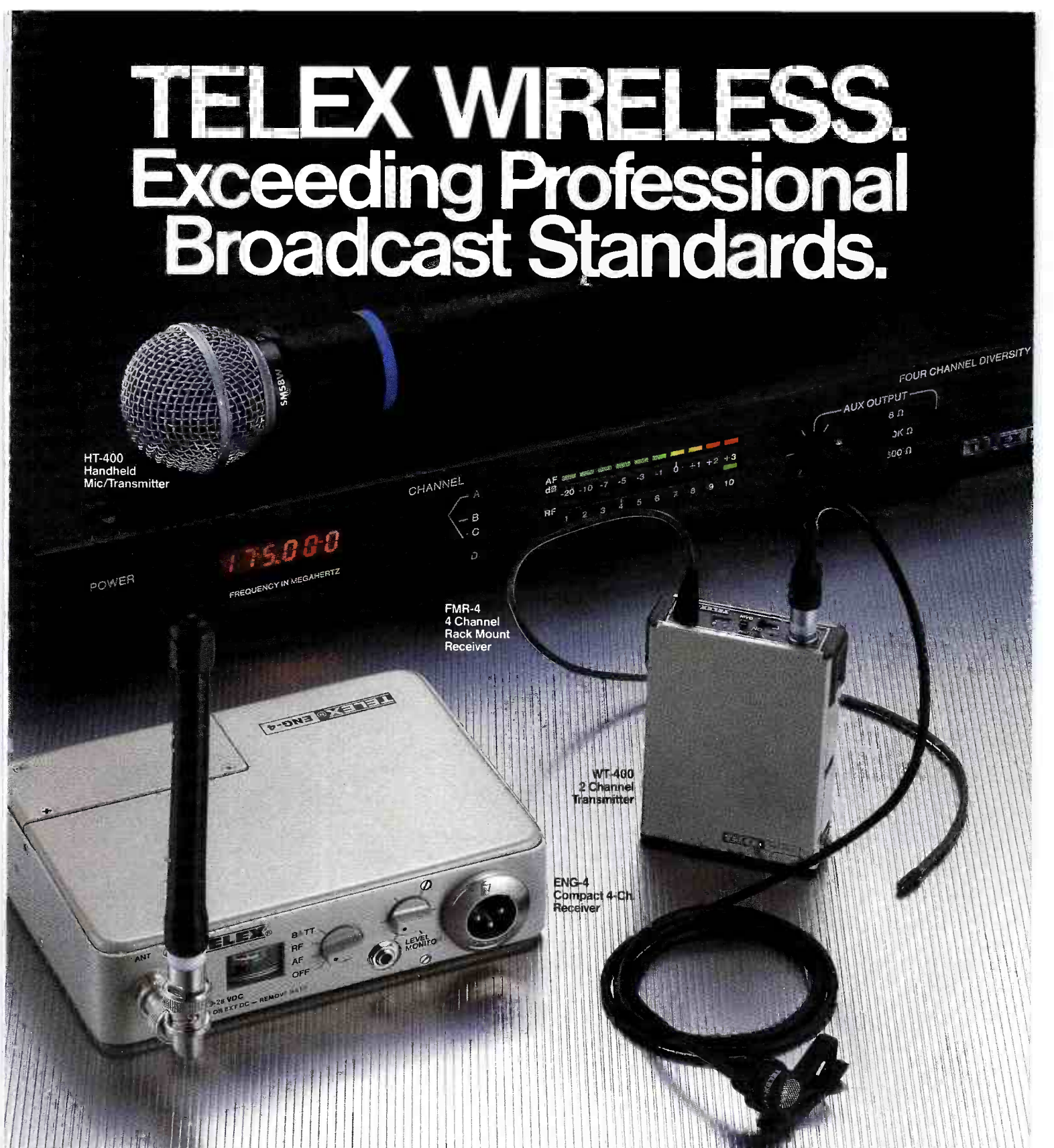

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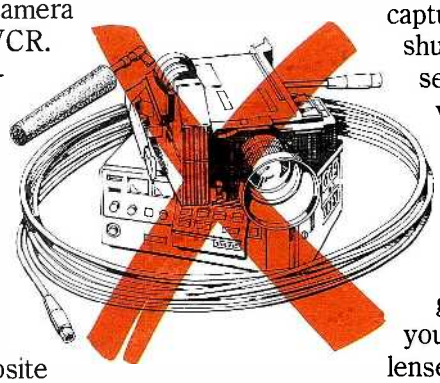
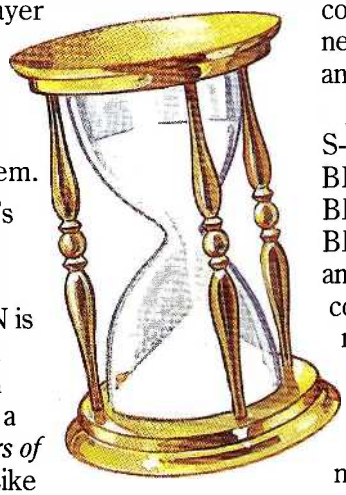


Combine the BR-S410UN with your existing composite camera or any color camera, and it's a portable VCR.

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



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Circle (22) on Reply Card

New cellular phones are powerful production tools.

Using cellular telephones

By Michael Heiss

When you notice all those squirrel-tail antennas rising from back windows of cars these days, it's hard not to marvel at the ever-increasing popularity of cellular telephones. Cellular's growth is even more impressive when you consider that the first cellular system went up in Chicago barely five years ago. Today, 306 markets are licensed for cellular systems, 240 are on the air, and the number of subscribers is approaching two million.

The cellular phone is now an important communication tool, linking people, computers and facsimile machines everywhere from the SNV to the boss's car to the news director's briefcase. Squeezing the most productivity from cellular technology, however, calls for awareness of the options available in the phones themselves, in the phone accessories, and from the companies that provide the cellular phone service.

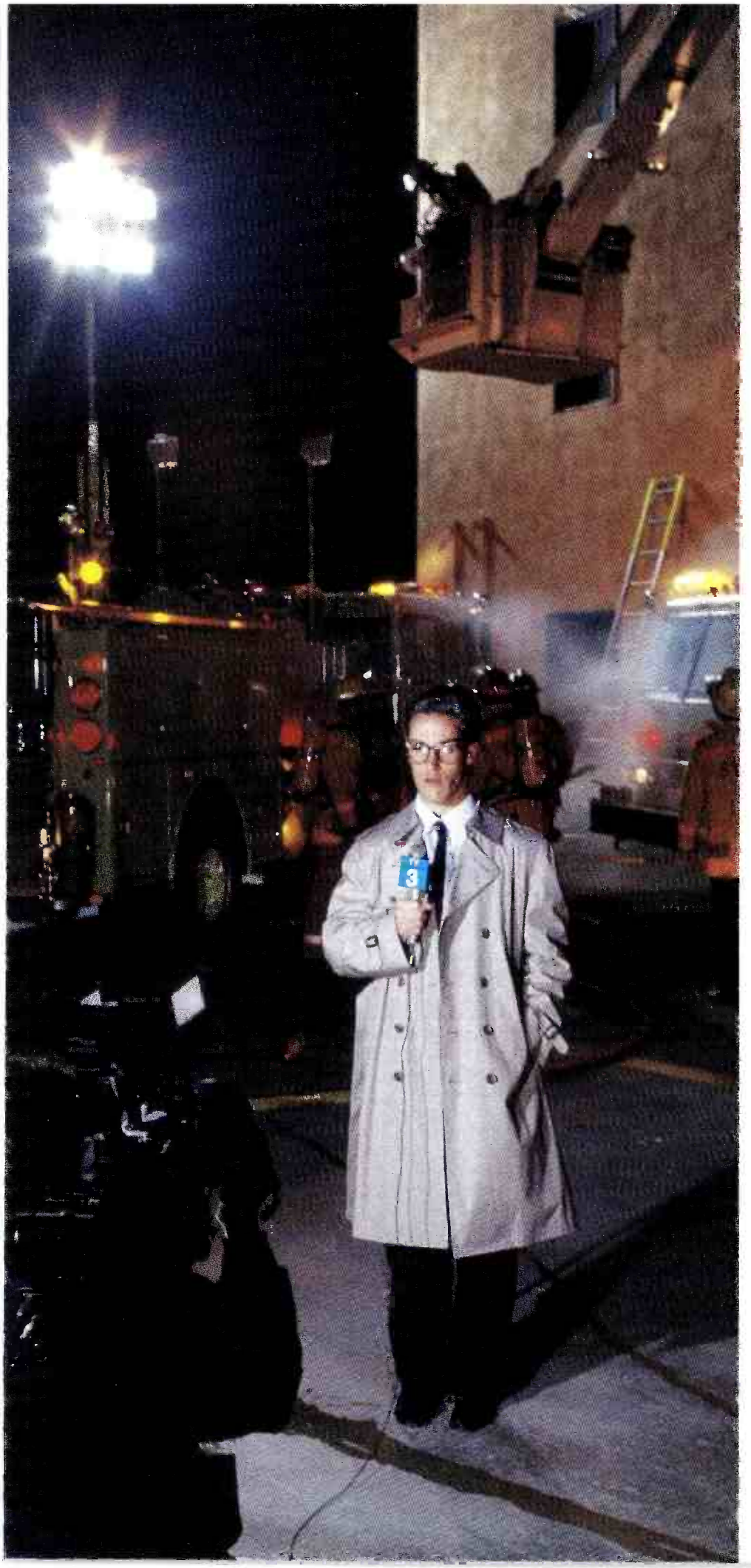
Papa phone, mama phone, baby phone

Many people consider cellular telephones to be "car phones." Broadcasters, however, have used them on everything from 45-foot production trailers to golf carts, motorcycles, boats and even little red wagons. The "car phone" would more accurately be called a "vehicle mount" unit. It is designed to have a receiver unit with a key pad, speaker and microphone in the vehicle cabin, with the actual radio transceiver mounted in the

Heiss is a **BE** consulting editor based in Los Angeles.

Courtesy of Octel Communications

Cellular communications can increase remote-production capability. User options for cellular telephones include use with lap-top computers or portable fax machines.



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"Transportable" cellulars dock to a vehicular bracket that provides an external antenna and power. When not in the bracket, they operate with self-contained batteries and a detachable whip antenna.

trunk or other out-of-the-way place. Permanent connections are made to the vehicle's 12V power supply, and the antenna is routed to the rear window, trunk lid or roof. These units are not portable, but the lack of concern about system weight means that they can offer the full 3W maximum power and unlimited standby and talk time, provided the vehicle's charging system is run once in a while.

This type of system has been around awhile and usually can be found for $300 to $600. If you are on a tight budget or have no need to use the phone outside of a car or van, this is the way to go.

Some people want portability that isn't limited to a vehicle. As soon as the first phones came out, the tinkering started. The ABC staffers that covered the 1984 Olympics were among the first to place a cellular headset, transceiver and some batteries in a standard aluminum travel case, creating what we now call "transportable" cellulars. Current transportables are about the volume and weight of a top 50 market phone book. They operate on internal batteries that will handle up to 24 hours of standby time or about three hours of power-intensive talk time. These specs make them favorites for radio remotes.

Of course, the new portables are the ultimate in cellular phones. Although they're not quite down to the size of Dick Tracy's 2-way wrist radio, some weigh as little as a pound and a half. Some are actually small enough to fit into a shirt pocket. Because of their small size and weight, operation time is limited to about 1 hour of talk and 12 to 15 hours of standby. Power output is limited to 0.6W, a problem if you are on the fringes of a cell.

As is the case with most transportables, however, many of the portables are available with option kits that allow you to install them back into a vehicle. This gives you portability when you need it, and the use of car batteries, higher-gain antennas and transmitter power boosters when you don't. In fact, this kind of "quick disconnect" technology is rapidly blurring the distinction between mobile and transportable units.

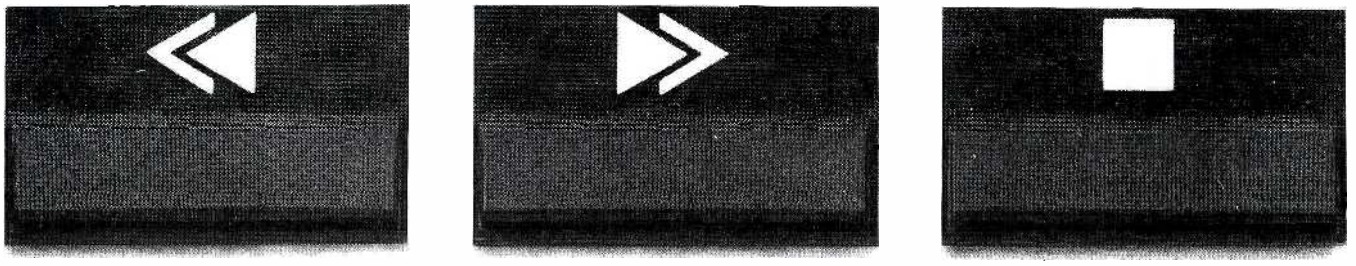
The way to go roam

Many options are available that can make cellular technology more useful in the broadcast environment. Some of these options are available as packages from the phone manufacturers, and some come from service providers or third-party vendors.

If you often travel beyond the coverage area of your local cellular system, consider getting "dual NAM" (number assignment module). This means that the phone is capable of having two number registrations. This does not give you two lines, but it means that you can register in more than one city.

Any phone can operate outside of its home area through the use of "roaming" arrangements, but these can be time-consuming to arrange, and although it is easy to call out, it is occasionally hard to get incoming calls. Dual NAM lets you have one local phone number for your own city and a separate number for any other cellular system in the United States. Beware, however, that you may have to pay monthly base fees in the second city.

THE BROADCAST DECK FOR PUSHY PEOPLE.



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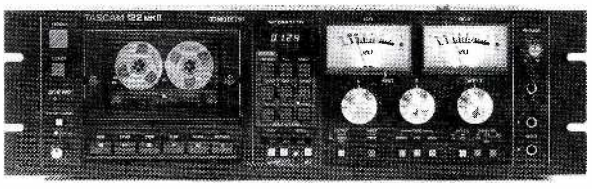
TASCAM



Circle (25) on Reply Card

Portable fax machines can operate with cellular telephones to provide remote hard copy for news gathering or station business. They can also do double-duty as on-the-scene copiers.

If you plan to take frequent trips outside your system's coverage area, you may want to inquire about the cooperative arrangements your system has with others for roaming. This kind of arrangement will not cut the cost of roam calls, but it may make them easier for you. An intersystem hand-off capability, scheduled to be in place in early 1989, will make it easier to "find" roamers. Callers will simply dial your standard cellular number, and the computers of the various systems will ring your phone regardless of your location.

Jack be data, jack be quick

Another feature that manufacturers are beginning to make available is a *data jack*. This is an RJ-11C modular jack that lets you connect outboard items such as a fax machine, modem, hybrid or line extender. Such connections are commonplace in the office, but you can't simply unplug the headset on a cellular phone, because it is part of the control system of the unit. Yes, outboard accessories provide data ports, but if you can find a phone that already includes a port, you won't have to pay for anything else.

Another variation on the extra port is the "limousine system," designed to give a driver and passenger extensions from the same phone in limos. This has obvious applications in remote vans because it is an easy way to provide two complete control headsets without the need for any warranty-busting modifications.

An added benefit of this package is that it allows one receiver to put the line on hold. (You even can set the interface for music-on-hold.) For secure conversation, the "master" set can invoke a privacy function that locks out the other set. Also, these systems provide an interface for dictation equipment that easily can be used for radio remote applications. Of course, you also can use the RJ-11C jack as an interface to modems or fax gear.

Fax and computers

If you have the data port, whether it is built into your phone or added through modifications or accessories, you will look for something to hook up to it. Although fax machines have become standard in many businesses, until recently, they could become a part of your remote activities only if you were hooked up to ac "shore" power or had an on-board ac generator. All that has changed, however, because several new fax systems operate on ac, 12Vdc, or internal, rechargeable NiCads.

These machines work best if your phone has an RJ-11C jack, but all of them will hook up to your phone through acoustical couplers. You even can use a coupler to hook your fax machine to the AirPhones now available on many airliners. Another benefit of portable fax machines is that most will do double duty by serving as copiers.

The other business implement that people often want to use with a cellular phone is a lap-top computer. This type of system lets you access your station's traffic or newsroom computers, send or read electronic mail and connect with database services for on-the-road research. If you connect to a system such as Western Union EasyLink or MCI Mail through your

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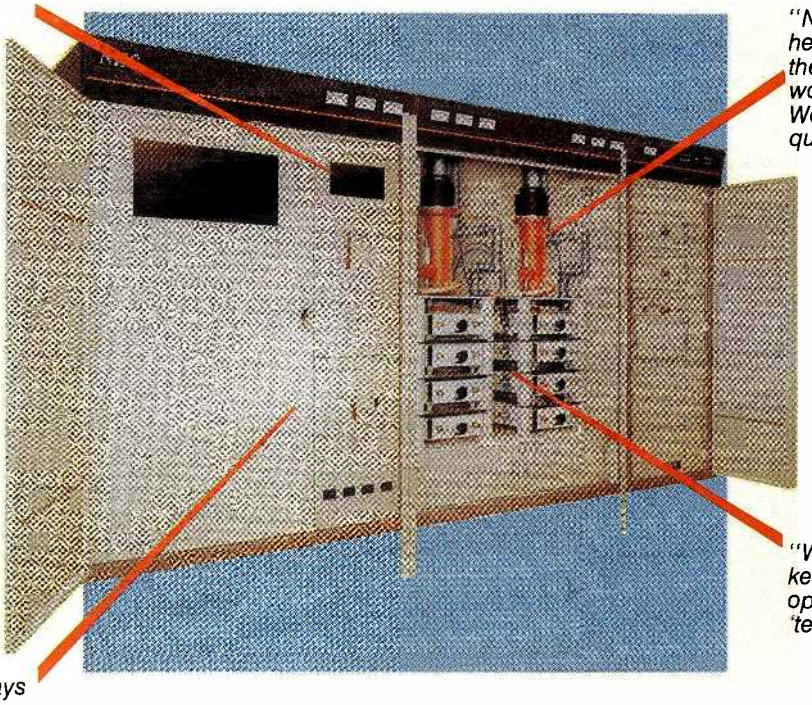

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cellular phone, you will not only be able to send telex and electronic mail messages, but you also can send your word-processing text files to a fax machine at their destination, without having to print out a hard copy.

If you plan to make extensive use of modem communications through a cellular phone, you may wish to bypass your computer's standard modem and invest in one of the new special modems specifically designed for interface to cellular systems. They offer additional error correction, and some even are designed to monitor the strength of the incoming radio signal and request a retransmission from the host computer as required.

Look Ma, no hands

If it's your voice, rather than your data, that needs to be heard more clearly, at least one manufacturer has applied its microphone technology to cellular applications to improve the audio performance of "hands-free" systems. One system combines a specially designed unidirectional mic with a dual, low-noise amplifier system that allows your voice and those of everyone in the vehicle to be heard clearly on the other end of the connection. This could be a great advantage in reporting, either for filing stories or for voicing traffic reports.

Talk isn't cheap

One thing to know about cellular phones is that those time charges can mount up. Check the price and service options offered by your carrier. Don't be afraid to shop between the two systems operating in most markets.

The first option to consider is the ability to limit calls to incoming only or outgoing only. Remember, cellular calls are charged anytime you speak, whether you call out or someone calls you, and you might not always require both capabilities. Some systems provide a restriction that accepts no calls from outside the cellular service.

Another way to control costs, or at least to enable departmental charge-backs, is to order a system that details all call charges. Originally designed for use in the limo and taxi industry, this option documents who called whom and when, handy in the face of today's cost-cutting campaigns.

A sneaky cost-control system is an interface circuit and ring generator that lets you hook up a cellular phone transceiver to a standard pay phone. This may sound like the accountant's ultimate tool of revenge, but it does make everyone pay for their own phone calls. This is an adaptation of a service called "fixed cellular," something the telcos dreamed up to bring phone service to locations that are within the range of the cells, but are prohibitive to a land line, such as mines, remote farms and solar-cell-operated roadside emergency telephones.

From luxury to necessity

The key to effective use of cellular phones in the broadcasting environment is to think of them as more than simply an extension of the old black phone on your desk. Instead, consider them an extension of all the telecommunications tools broadcasters now work with. Do this, and you'll be surprised to find that what may have seemed an expensive luxury suddenly becomes a cost-effective necessity.

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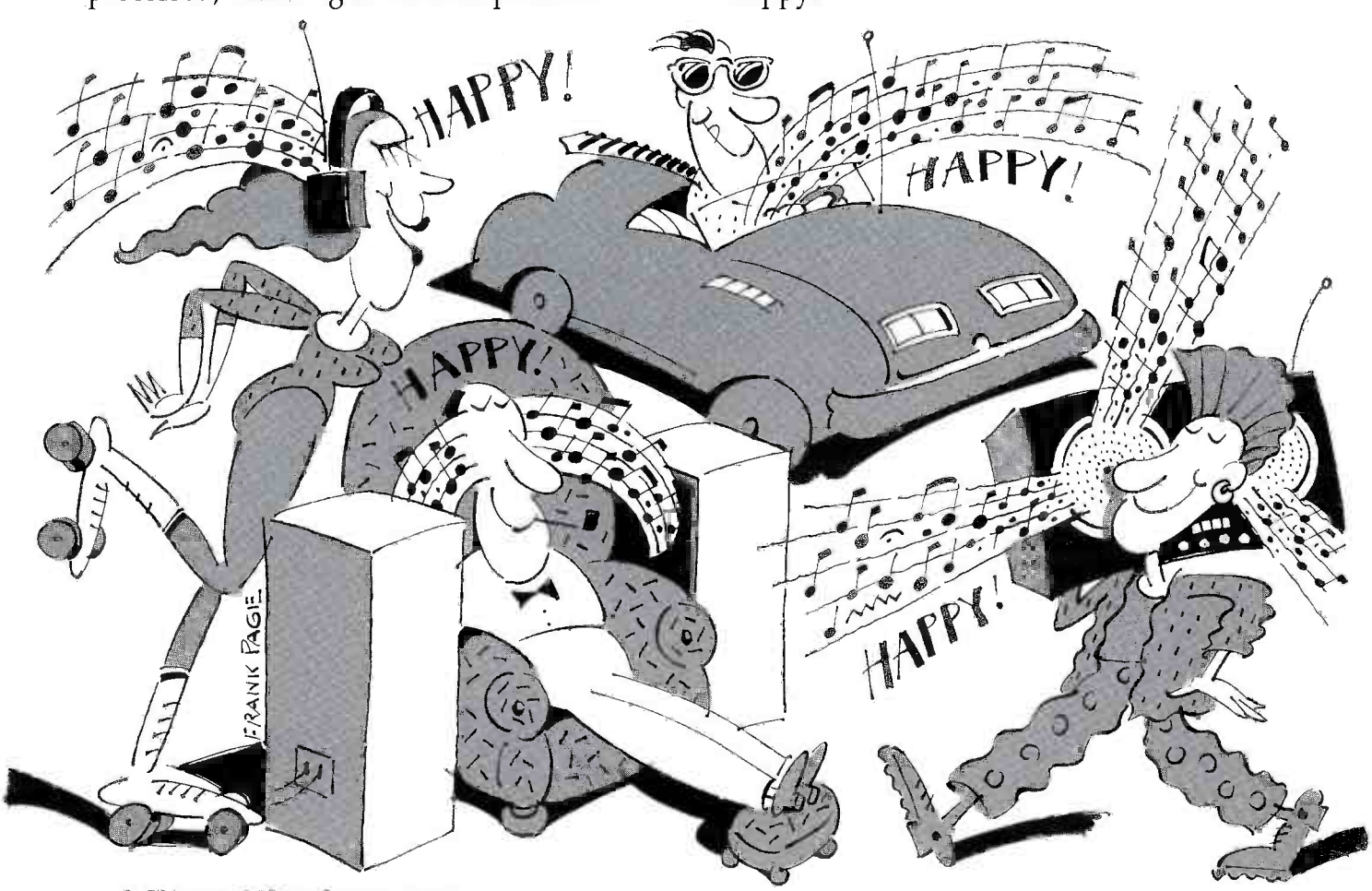

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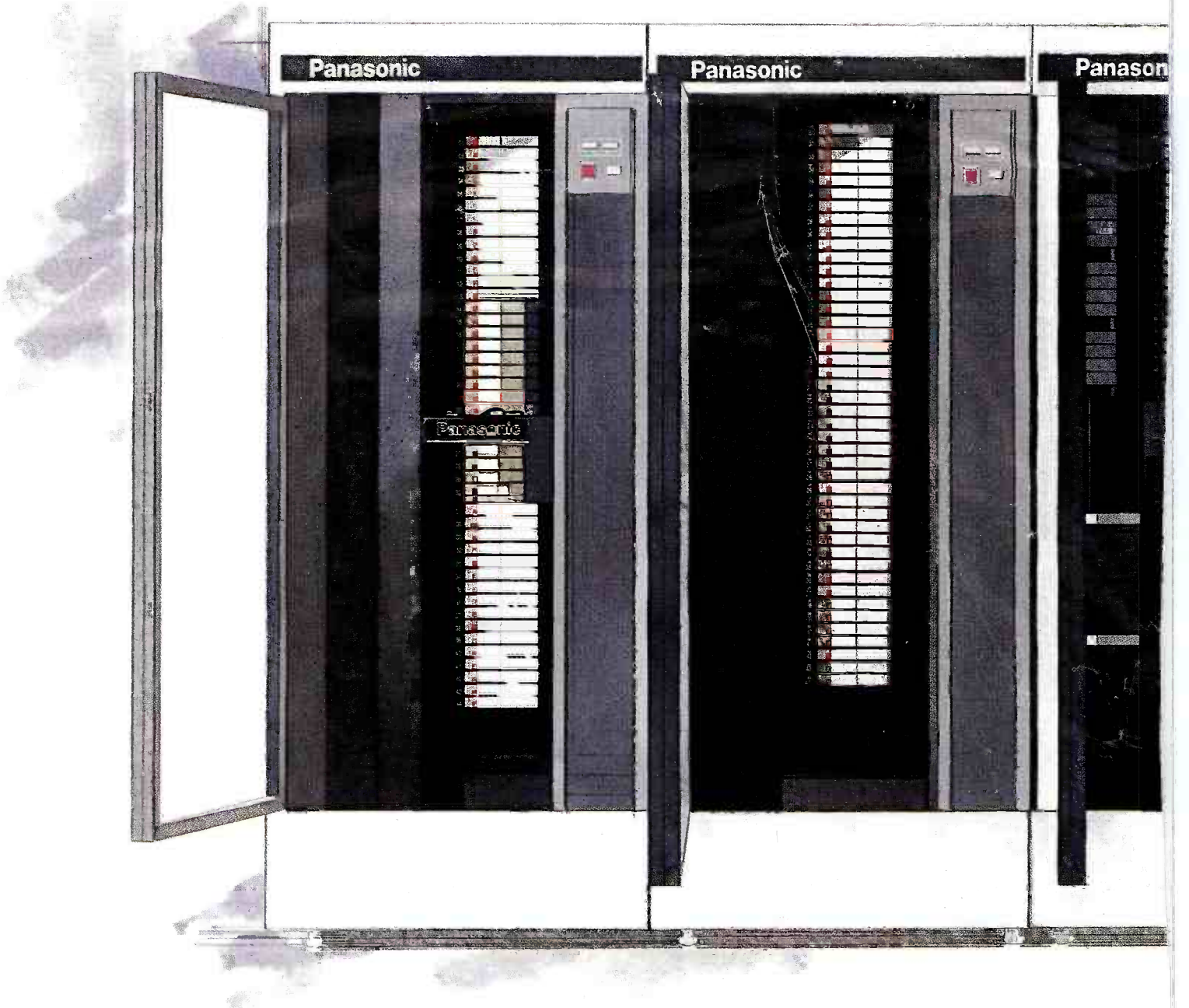

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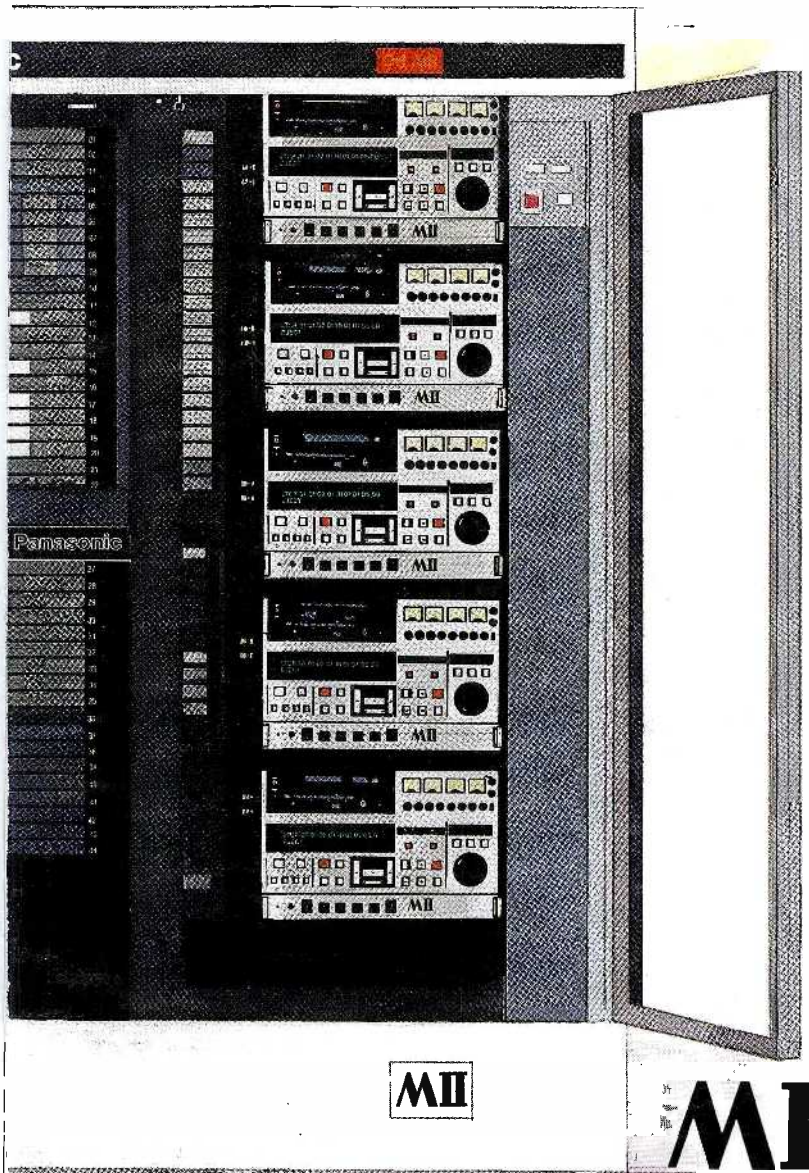

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Remote computers speed election news gathering.

Computerized election reporting

By Mark Fenton

The goal of election reporting is to get vote totals on the air as quickly as possible. For this purpose, KSL-TV, Salt Lake City, has, for several years, pursued better and faster ways of collecting election data. Computers, of course, play a major part in this endeavor.

A basic process in computerized election return reporting is linking a station PC or other computer with an "election service" computer through a modem, then downloading the vote totals, processing them into a usable form and dumping them into the on-air character generator. (See Figure 1.) Although several commercially available programs can perform these functions, KSL came up with several new twists in the election of 1988. These included the use of remote, off-site computers to prefilter the datastream before transmission back to the station, and the use of a local area network (LAN) to feed other areas of the news operation—KSL Radio News and KSL-TV's Teletext-5.

Election data problems

Election reporting is subject to idiosyncrasies. A candidate may be dropped anytime, right up to election day. This raises havoc with the data structures used to fill the various "pages" displayed on a character generator. Also, the data received from election system computers may change format suddenly. The aesthetic demands of the audience require displays that are attention-grabbing, attractive and easy to read. Above all, the data must be "fresh," requiring efficient uploads into the CG.

Data integrity is also a problem. Although election service computers supposedly are designed to talk to other computers, they often fail to incorporate error-checking schemes. This means an operator may be required to watch the incoming data to verify its accuracy. Bad characters detected even on the last line of data may require the download to be started all over again. Poor phone lines and other factors may necessitate frequent restarts, drastically affecting cycle time.

Remote PCs

To speed the process, KSL took its PCs directly to the election services computer and downloaded there. The PCs at the election services site then communicated with other PCs at the station. The main advantage of this arrangement was that downloading from the election computer could be accomplished at a higher speed (9,600 baud vs. 1,200 baud). Data comparisons between "reads" detected which races had changed, and only those were transmitted back to the station. This method greatly decreased the cycle time.

Because remote PCs were now talking directly to the election computer, no errors could be introduced by phone lines, and the limited error-checking provided was deemed sufficient. For the link back to the station, however, KSL designed extensive error-checking using a checksum character. If the PC at the station did not compute the same checksum, it would ask for the data again until the transmitted data was verified as correct. This meant that the operation could go into total automation, with high confidence in the transmitted data.

As soon as the remote PCs at election services downloaded to the PCs at the station, they would do a new read from the election service computer while the PCs at the station fed their information to the LAN and the character generator. This provided a logical advantage to the work flow—the PCs on the slower end of things were now doing the shortest reads and "writes." The average amount of information transmitted on a single cycle was less than 10% of all the election information.

As a result, KSL was able to provide updates of 340 races on an average cycle of 60 seconds to 90 seconds. This represented a speed increase of approximately 15 times the best previously attainable.

Extra features

While making all these changes, the station added a few frills, one of which the staff members now think of as an essential tool for interfacing two computers. This is a data scope, which displays all

Fenton is a studio engineer at KSL-TV, Salt Lake City.

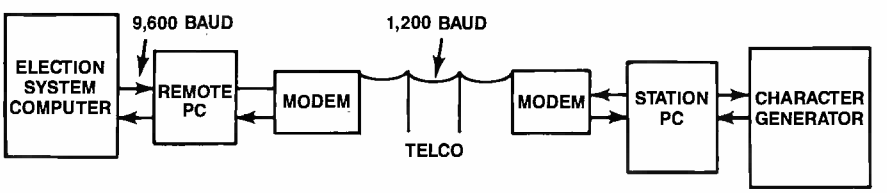

Figure 1. *The election system at KSL achieved a speed increase of 15 times. The system uses remote PCs to record the race totals at a high baud rate, then transmits only updates back to the station. The link back to the station uses an automatic error-detection scheme to ensure data integrity.*

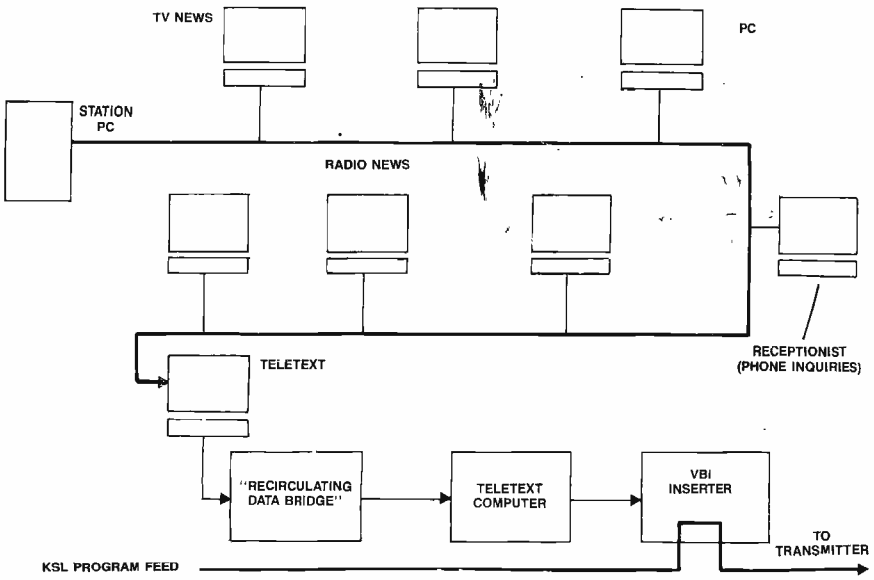

Figure 2. The LAN provides current election data to all points in KSL, including TV and radio news and teletext.

characters coming into it, including control characters. A situation in which incoming data may change format without any warning, either through error or lack of communication, is much easier to cope with if you can find out exactly what those changes are, including non-printing control characters.

Another addition was a full-screen editor, which displays all information for a single race or group of races on one screen. This allows easy entering and editing of data. This feature also allows manual entry of data for races not covered by the election service. Also, in the event of some system or communications failure, it provides an alternate path for data entry.

On the LAN

KSL supports a LAN that distributes election information throughout the station (see Figure 2). The network gave the station three important boosts:

- Because producers or directors could review the important races before they were aired, they could keep the air talent informed and help direct the flow of on-air reporting.
- Sister company KSL radio used the information for its own coverage. This reduced the number of people in the field collecting data and increased efficiency for both stations.
- "Teletext 5," KSL's teletext service, used the network information to automatically update continuously rotating pages of current race totals.

Computers here to stay

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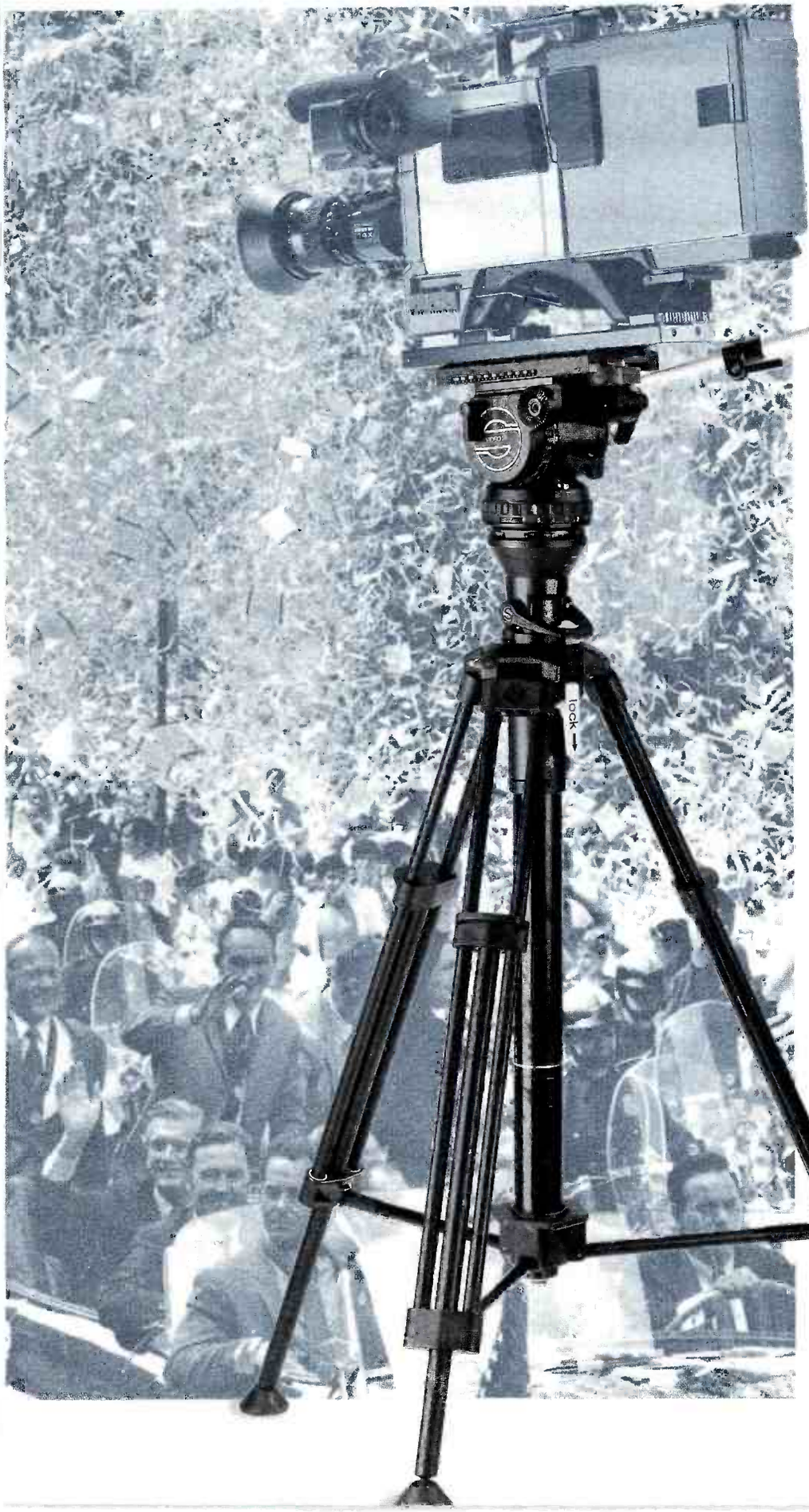

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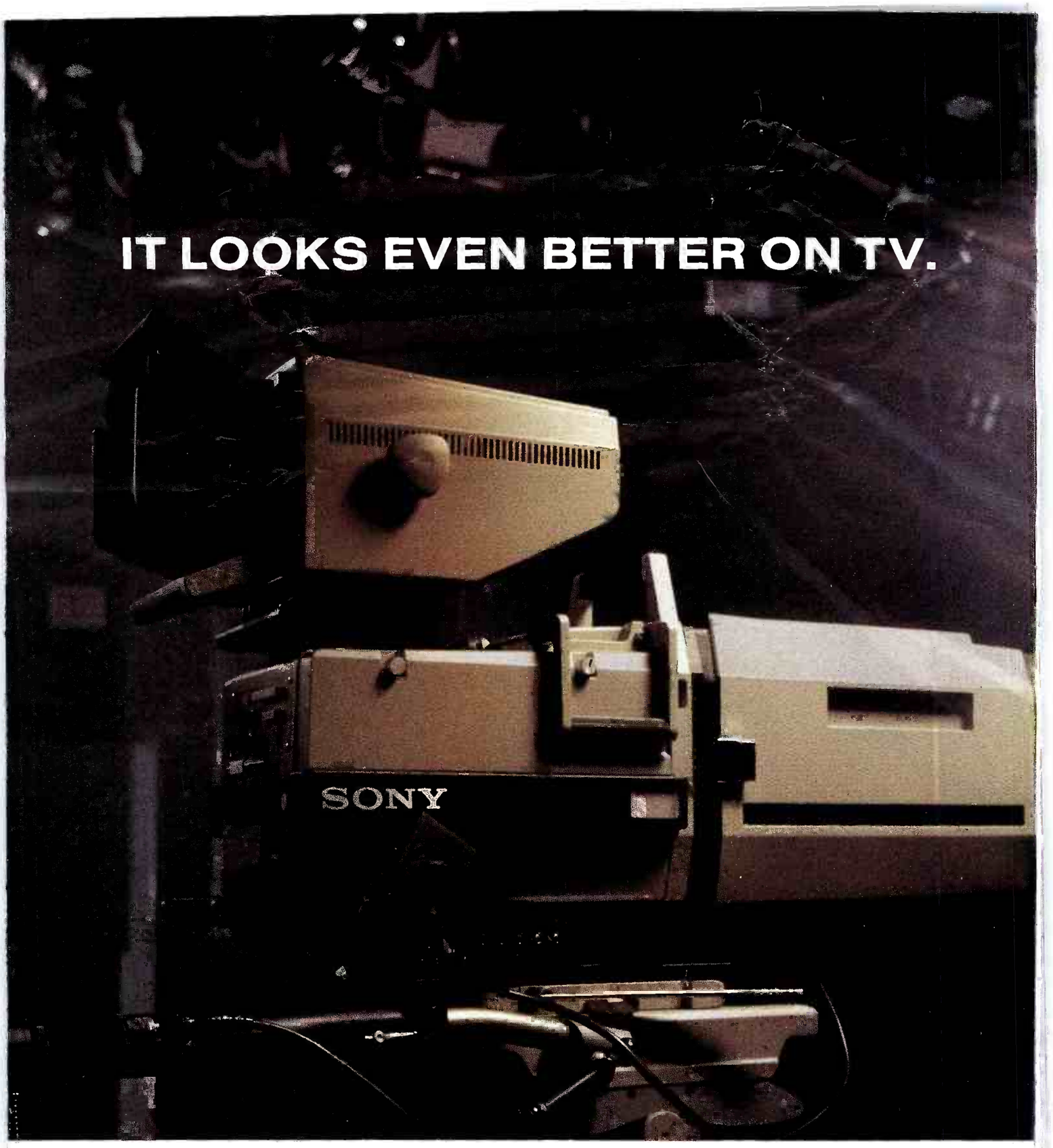

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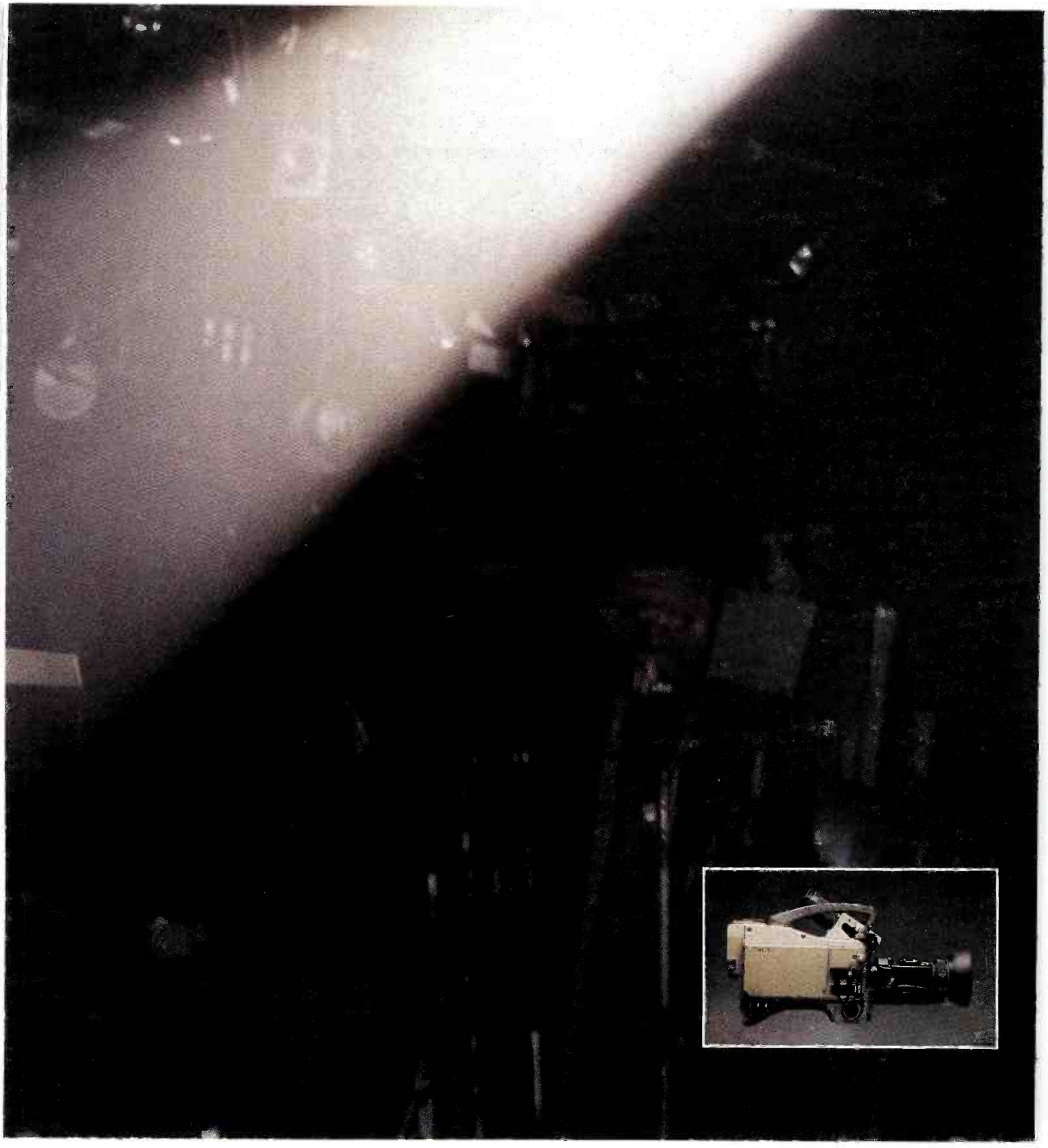

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Automated newsrooms get on the bus.

Ethernet in the newsroom

By Tyler North

A newsroom automation system or, for that matter, a complete station automation system, must:

- Be capable of real-time control and communication.
- Access a wide variety of terminals (from VCRs to cart machines).
- Provide rapid, accurate transmission of relatively short data sets (such as a news story script or a machine control command).
- Optimize the use of all connected equipment.
- Operate reliably and efficiently.
- Be able to communicate with the "outside world."

A local area network (LAN), an architecture for interconnecting electronic devices, enables an automation system to meet these requirements. This article discusses one of the major LAN architectures and its potential influence on newsroom automation system design.

Understanding networks

A computer network consists of a set of one or more computers, communication links and terminals interconnected to provide a service to all users on the network. Although networks were not developed specifically for the broadcast environment, they are ideally suited to broadcasting requirements, hence they are used in a number of automation systems.

Networks come in three basic forms: *linear*, *tree* and *ring* (see Figure 1). Terminals that talk on the network are "hosts." "Repeaters" can be used to extend the network where necessary. In some applications, it is preferable to have a cluster of devices operating in a network of their own, with "gateways" to other networks.

Networks generally communicate using "packet switching," in which messages are chopped up into uniform short lengths. Each packet consists of address and reconstruction information, a portion of the message and a checksum for error detection. One advantage of sending packets is that long messages from some devices will not delay short, but important, messages from others. Enhanced error checking brings further advantages.

Packet switching is suited to interactive real-time applications involving bursty, low- and moderate-rate data transfer. The network is time-shared intelligently to avoid "packet collisions" on the network while minimizing delay of packet transmissions.

Ethernet

Ethernet, one of the most commonly used LAN systems, is a branching (unrooted tree) "broadcast" communications system for carrying digital data packets (bit serial transmission) among distributed data terminals. Ethernet is named for the historical luminiferous "ether" through which electromagnetic radiations were once thought to propagate. The ether is a passive broadcast medium with no central control (typically 50Ω coax).

A broadcast-type network transmits (or broadcasts) its packets onto the entire ether. The packet is heard at each station and copied at the appropriate station based on the unique destination found in the leading 48 bits of each packet. This method requires that only one unique path exist on the ether between any two

PARAMETERS	VALUES
TRANSMISSION RATE	10Mb/s
SLOT TIME	412 BIT TIMES
INTERFRAME GAP	9.6
ATTEMPT LIMIT	16
BACKOFF LIMIT	10
JAM SIZE	32 BITS
MAX FRAME SIZE	1,518 OCTETS
MIN FRAME SIZE	512 BITS (64 OCTETS)
ADDRESS SIZE	48 BITS
ERROR RATE	<1 PER 10^9
TERMINAL ADDRESS	281 × 10^{12}
CABLE	50Ω, RG-11 COAX
CABLE LENGTH	500m MAX PER SECTION
CABLE EXTENSION	VIA REPEATERS
CABLE TERMINATION	50Ω N-TYPE TERMINATOR
CABLE TAPS	100 MAX PER SEGMENT
PROPAGATION VELOCITY	231,000km/s MINIMUM
PROPAGATION DELAY SEGMENT	2,165ms END-TO-END PER COAX
INTERFACE CABLE LENGTH	50m MAX
PROPAGATION VELOCITY (interface cable)	195,000km/s
PROPAGATION DELAY (interface cable)	257ns

Table 1. *Proposed by Xerox and developed by Xerox, Digital Equipment Corporation and Intel as IEEE standard 802, Ethernet complies with the ISO OSI 7-layer model.*

North is a station automation consultant for Dynatech Corporation, Madison, WI.

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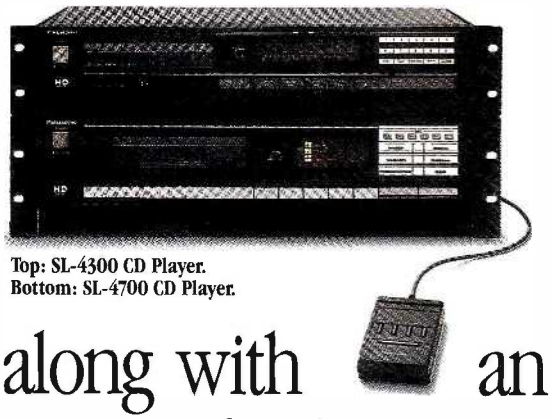

Top: SL-4300 CD Player.
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stations. The unrooted tree concept reflects a non-central nature that allows the network to be expanded in any direction from any point.

Among the advantages of Ethernet are its wide user base, its simple and reliable design and its speed. Ethernet, which was jointly developed by Xerox, Digital Equipment Corporation and Intel, is widely accepted and used by many computer and broadcast equipment manufacturers.

Thousands of installations have proved Ethernet's reliability. The absence of master/slave relationships, looping cables and routing circuits eliminates most single points of failure. Failure of a single device (or its temporary removal from the network for routine maintenance) does not affect the rest of the network. Also, putting a device on the Ethernet does not preclude temporary return to manual operation in the event of worst-case network failure. Extensive diagnostics facilitate servicing.

Ethernet conforms to IEEE specification 802.3. Hardware components are standard, readily available and reasonably priced. Real-time operations on a 10Mb/s network provide the speed required to properly automate the newsroom and the rest of the station.

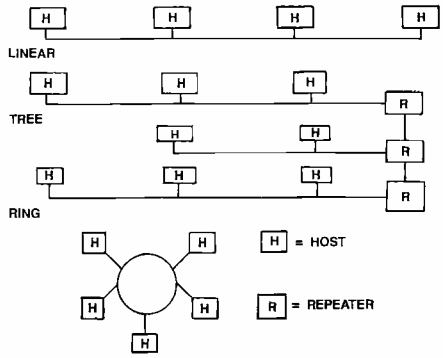

Figure 1. *Typical LAN configurations. Linear and tree would be used in Ethernet, and ring would be used in token ring network architecture.*

Collisions on the bus

In a seldom-used system, most transmissions will be cleanly transmitted and received, resulting in a smooth-running network. As the number of stations or broadcasts increases, so does the incidence of packet collisions. Ethernet controllers in each station are designed to adjust retransmission as a function of collision frequency, thereby maximizing ether efficiency.

The system is accessed through the technique of *carrier sense multiple access with collision detection* (CSMA/CD). This breaks down as follows:

- Carrier sense (CS)—A device listens for a clear channel before transmission. If the channel is in use, a random transmission delay is enforced before transmission. (This also is referred to as *listen before transmit*, or LBT.)
- Multiple access (MA)—With no central control, all terminals have equal access to the ether. (Access priority may be established in specific application implementations.)
- Collision detection (CD)—Two or more terminals may (and surely will) broadcast simultaneously. Ethernet senses this data collision, which would garble data, then jams the system to further broadcasts while the ether clears. Each station then "backs off" for a random interval, before attempting to retransmit. (This also is referred to as *listen while transmitting*, or LWT.)

Tapping in

Each station is connected to the ether by means of a tap and a transceiver. The tap is the device that physically attaches to the ether. The transceiver, in addition to handling CSMA/CD, also provides electrical isolation, logic that disconnects the transceiver from the ether if the transceiver is not powered, and a physical connection to the data terminal equip-

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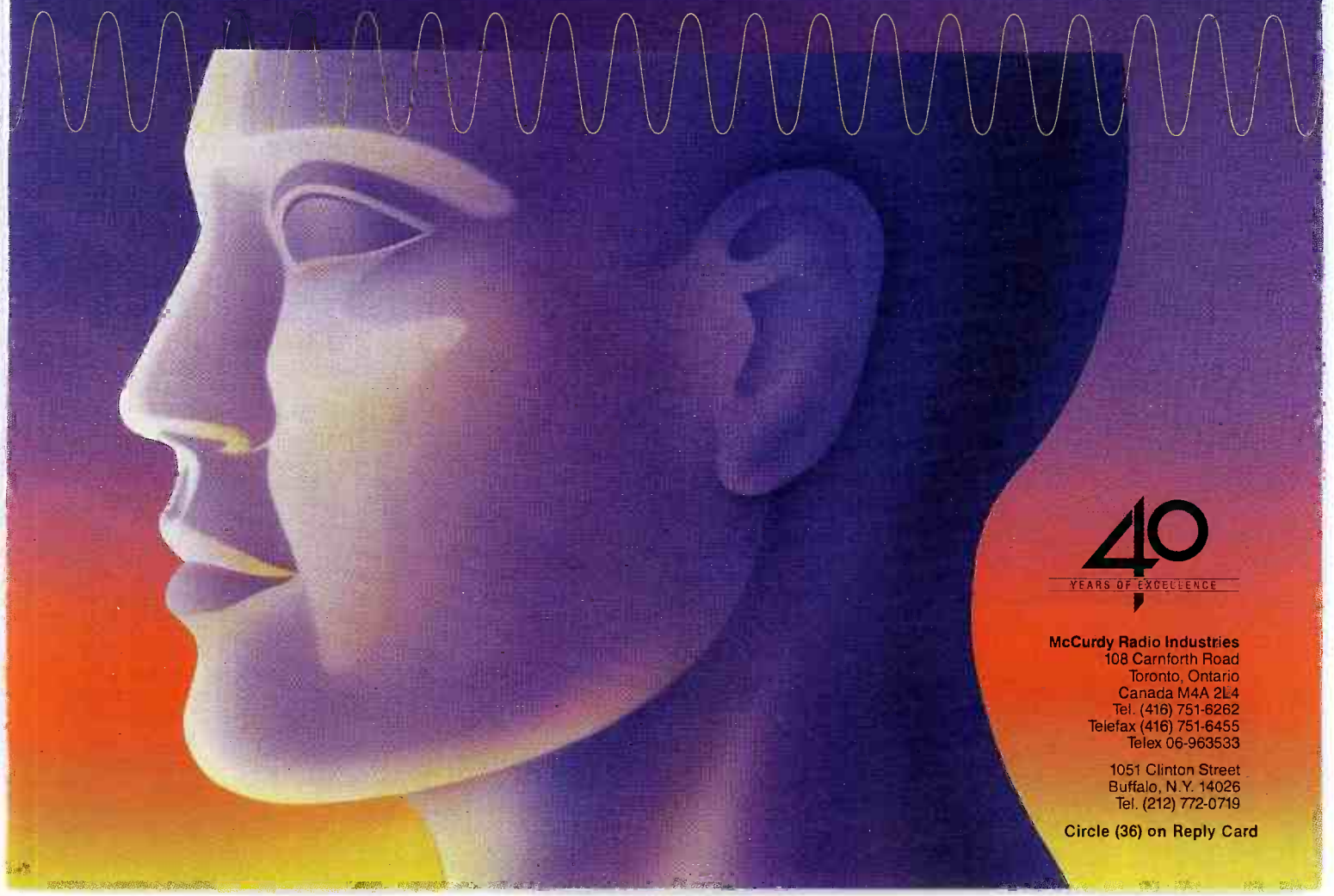

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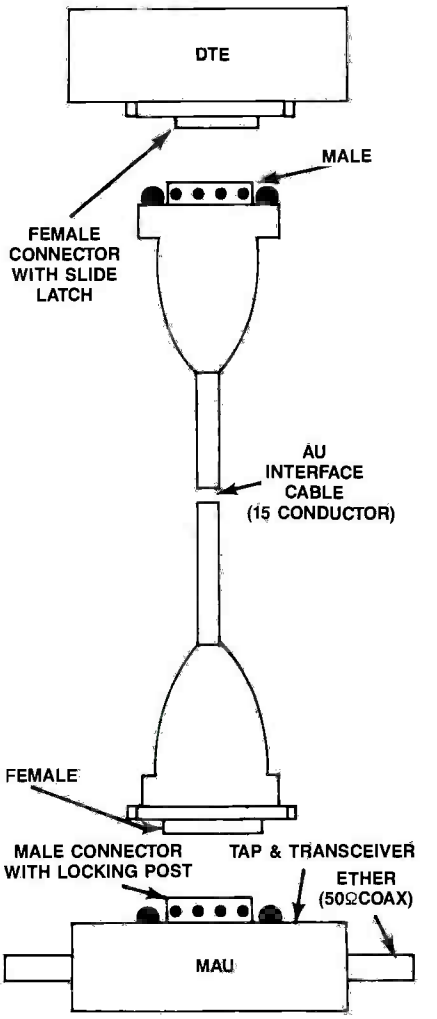

Figure 2. *Ethernet AUI cable is a 15-conductor cable interfacing the data terminal (VTR, terminal or cart machine) with "ether," a passive 50Ω coaxial cable. The tap and transceiver connect to the ether and provide interface electronics.*

ment via a 15-pin connector. (See Figure 2.)

Alternately, some Ethernet implementations build the transceiver into the hosts and use thin coax and BNC connectors to perform the interconnection.

A few operators have seized on the 50-meter maximum length provision of the Ethernet standard (see Table 1) as a way to avoid the coax altogether. In this case, all the 15-conductor cables join at a "hub box," which simulates the electrical characteristics of the coaxial ether. Typically, up to eight hosts can be joined this way. This is adequate for many installations.

Ethernet is flexible. Taps can be connected anywhere along the ether. Taps can be added to an existing system without even shutting the system down. Virtually any computer system and any broadcast machine capable of external control can be interfaced to the network. A variety of ethers can be integrated into a single system, including fiber optics. Modems provide contact with the world.

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Token ring

Although they are certainly popular, Ethernet-type networks are not the only architecture for a LAN. One alternate network design is known as a token ring. In this arrangement, the terminals are interconnected in a continuous loop or ring. In operation, a "token" is passed around the ring from station to station. As the token arrives, the station can replace it with a transmission. When the transmission is completed, the token is again circulated around the ring. This network method precludes two or more messages being on the network simultaneously, thereby avoiding collisions, their detection and the time-consuming retransmission of collided messages.

In a highly used network, a token ring generally is believed to be faster. Normally, this refers to a system with a large number of computer terminals. However, an evaluation of typical broadcasting facility computer networks shows several "dumb" terminals; tape machines, film machines, still stores; several "computerized" terminals; cart machines, character generators, master control, satellite dish control; and a few computer systems, such as newsroom automation, traffic and completed station automation.

Because the computerized systems control only their own operational area (that is, a cart machine may control an external tape deck), the computer systems dominate the transmissions on the network. Most of the devices transmit only in response to a command or inquiry from the main computers. This results in a network that may have a large number of terminals and still achieves a high communication rate.

For broadcasting, where reliability is paramount, perhaps the most important distinction between token ring and Ethernet is that in an Ethernet, if a single station fails, the rest of the system remains operational. The probability of staying on the air is high, and the chance of circumventing the failed equipment is excellent—undoubtedly better than with a comparable manual facility. In a token ring, if one station fails, the entire network goes down. Obviously, this is not acceptable in broadcasting.

Coming soon to a station near you

In the coming years, expect to see Ethernet-based automation become commonplace in broadcasting. Ethernet is not an end in itself, but supplies the platform on which station automation application software rides. The true measure of Ethernet's desirability in broadcasting will occur when users come to realize that they think only about accessing and using their automation system and don't give a moment's thought to the fact that Ethernet made it all possible.

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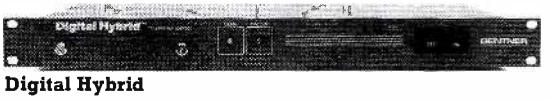

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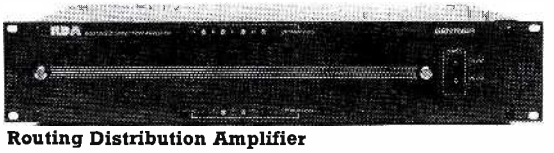

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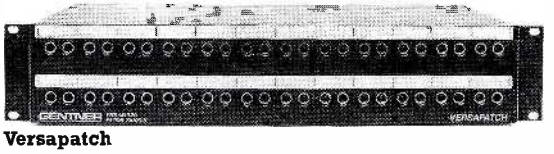

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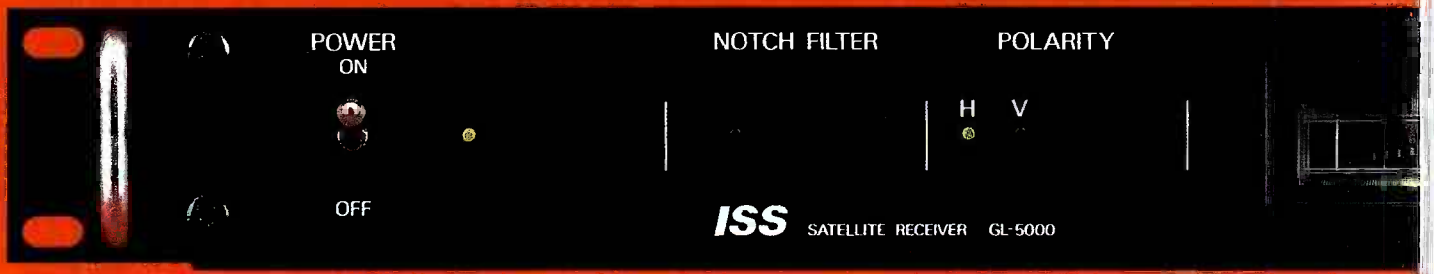

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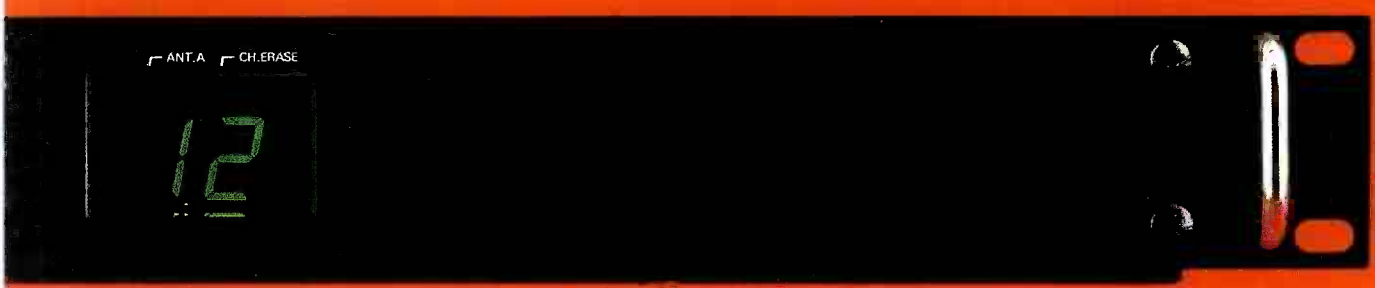

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Circle (42) on Reply Card

They've changed the rules for battery charging. To find out why, take a trip back to the science classroom.

The chemistry of batteries

By Carl Bentz,
technical and special projects editor

Until recently, instructions provided with NiCad batteries called for slow charging. Now, fast charging is preferred. Why the new philosophy? Let's look inside NiCad and lead-acid batteries. With some knowledge of the chemistry of batteries, we'll be better able to understand the reasoning behind the change.

Atomic attractions

If you think back to your chemistry and science classes, you'll remember being taught that all matter is made of atoms and that each atom contains protons, an equal number of electrons and enough neutrons to keep everything stable. The secrets of the chemical elements, their properties and their reactions to form compounds, heat and electricity are based upon the electrons that orbit the atomic nucleus. Some atoms release electrons easily, but other elements place a greater attraction on their "active electrons," restricting the ease of reactions with other chemicals. (See Figure 1.)

If a comparison of different metals and their abilities to release electrons is charted, several things become obvious. The lighter elements hold the active electrons somewhat more than the heavier ones with many electrons. The difference has much to do with how the electrons that take part in chemical reactions are shielded from the nucleus and protons by the less active ones.

The Periodic Chart that hangs in most chemistry classrooms includes a good deal of information about the elements, but for our purposes, a simplified electromotive force series indicates relative reactivity of metals. In the table below, the reactivity of hydrogen is the reference with a value of zero. The greater the positive value, the more reactive the element. Negative values indicate a much smaller reactivity. The voltage produced by "batteries" created from these metals is *related* to the electrode potential shown.

We can classify reactions by referring to *oxidation* and *reduction* of the elements. When oxidation occurs, one or more electrons are taken from an atom, turning it into a positive ion, and the oxidation state has been increased. (For an atom, the oxidation state is zero.) The ion forms compounds with other elements or combinations of elements. Reduction is the opposite situation. If electrons are given to an ion, it is said that its oxidation state is reduced.

Some elements have only one oxidation state, which limits the kinds of compounds they can form. Others have several stable oxidation states. Lead, for example, forms lead oxide (plumbous PbO) and lead dioxide (plumbic PbO_2). Nickel also exhibits several different oxidation states. In metallic salts (compounds with metal

ELEMENT	½-CELL REACTION	ELECTRODE POTENTIAL
Lithium	$Li = Li^{+} + e^{-}$	3.05
Potassium	$K = K^{+} + e^{-}$	2.93
Barium	$Ba = Ba^{2+} + e^{2-}$	2.90
Calcium	$Ca = Ca^{2+} + e^{2-}$	2.87
Sodium	$Na = Na^{+} + e^{-}$	2.71
Magnesium	$Mg = Mg^{2+} + e^{2-}$	2.37
Aluminum	$Al = Al^{3+} + e^{3-}$	1.66
Zinc	$Zn = Zn^{2+} + e^{2-}$	0.76
Iron	$Fe = Fe^{2+} + e^{2-}$	0.44
Cadmium	$Cd = Cd^{2+} + e^{2-}$	0.40
Nickel	$Ni = Ni^{2+} + e^{2-}$	0.25
Tin	$Sn = Sn^{2+} + e^{2-}$	0.14
Lead	$Pb = Pb^{2+} + e^{2-}$	0.13
Hydrogen	$H = H^{+} + e^{-}$	0.00
Copper	$Cu = Cu^{2+} + e^{2-}$	-0.34
Mercury	$2Hg = Hg_2^{2+} + e^{2-}$	-0.79
Silver	$Ag = Ag^{+} + e^{-}$	-0.80
Platinum	$Pt = Pt^{2+} + e^{2-}$	-1.20
Gold	$Au = Au^{3+} + e^{3-}$	-1.50

Electromotive force shows electrical potentials existing when elements react, and can be used to predict the voltage of a battery involving two elements.

Editor's note: Alexander Manufacturing, Anton/Bauer, Frezzolini Electronics, General Electric, PAG and Sanyo provided valuable information toward the development of this article.

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elements), the metallic ion is usually the positive (oxidized) *cation*, and a nonmetallic or complex, negatively charged ion, the *anion*, stabilizes the electrical charges to form a stable chemical compound.

The nickel-cadmium interface

A NiCad battery consists of a number of individual cells, each with positive and negative plates. The positive plate consists of nickel oxyhydroxide, NiOOH, and the negative plate is metallic cadmium, Cd. An electrolyte of potassium hydroxide, KOH, and a small amount of water, H_2O, complete the contents of the cell in the form of a separator that keeps the two plates from touching.

During charge and discharge, the nickel and cadmium materials undergo changes in oxidation, but not in physical state. That is, the Ni and Cd compounds before and after the reaction remain insoluble in the alkaline electrolyte, so there is little or no deterioration of the plate structures during charge and discharge reactions. The electrolyte, KOH, promotes chemical action with the hydroxyl ion, OH^-, taking an active role. The potassium serves more as a catalyst and is not involved in the equations that explain the production of electrons.

During discharge, NiOOH is the active material at the positive plate. In the presence of water and with the addition of electrons returning from the external circuit, it is chemically reduced to form nickel hydroxide, $Ni(OH)_2$, with a potential of 0.490V generated. The equation is

$$2NiOOH + 2H_2 + 2e^- \rightarrow 2Ni(OH)_2 + 2OH^-.$$

At the negative electrode, cadmium is oxidized from the metal to cadmium hydroxide, releasing electrons into the external circuit from its potential of −0.809V. The equation is

$$Cd + 2OH^- \rightarrow Cd(OH)_2 + 2e^-.$$

As long as an external connection exists between the negative and positive plates, and the supply of the oxyhydroxide and the cadmium metal exists, the two reactions continue, producing a potential of 1.299V, the characteristic voltage of the NiCad cell.

External influences

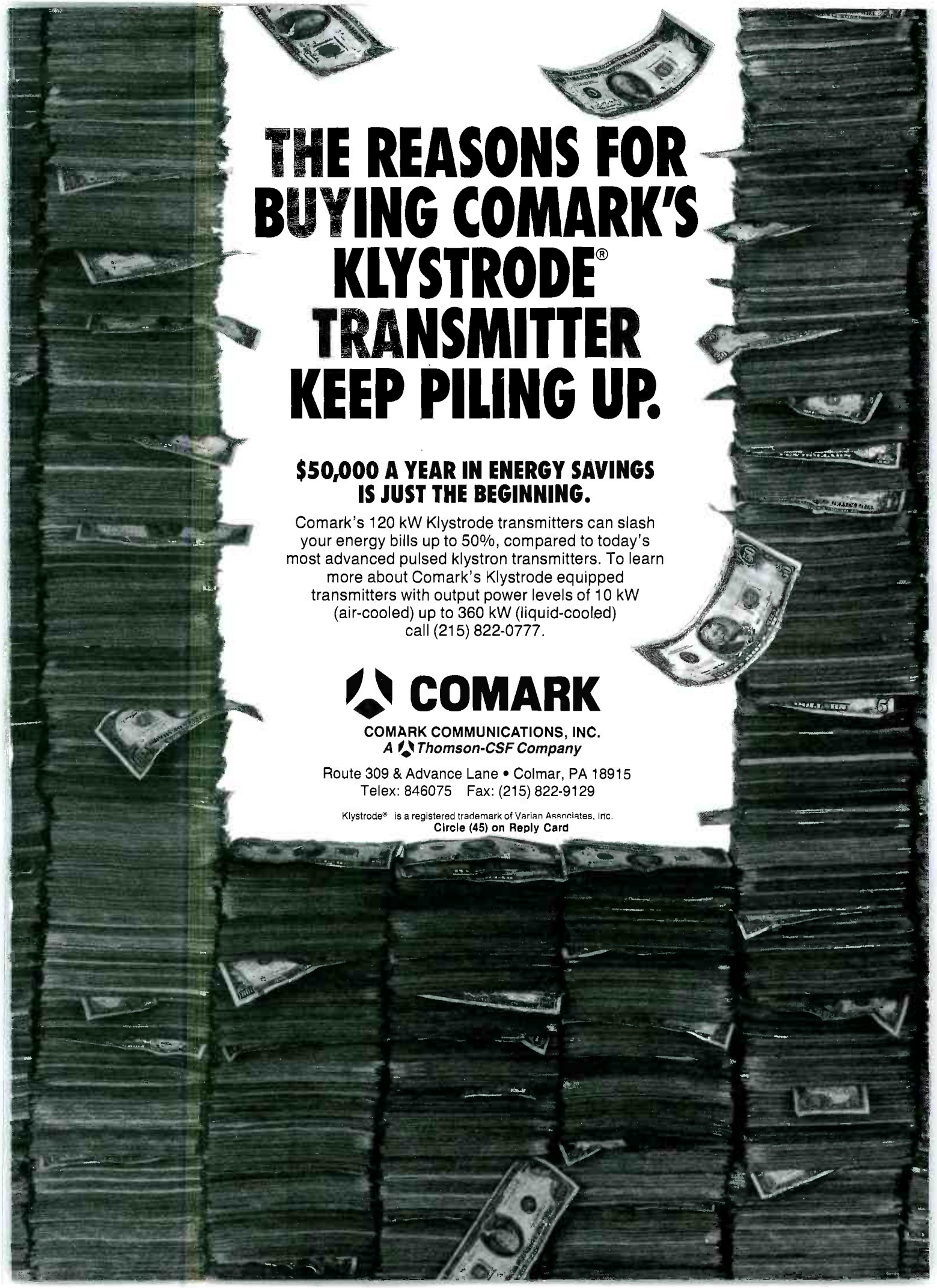
In the charging cycle, the reactions are exactly reversed under the influence of the external electromotive force of a battery charger. Electrons from the charger, applied to the negative plate, reduce $Cd(OH)_2$ to Cd metal. At the positive plate, $Ni(OH)_2$ oxidizes to NiOOH.

When the reaction at the positive plate is complete, that is, all nickel hydroxide returns to the oxyhydroxide form, the battery is completely recharged. From this point on, if charging current continues, a new reaction begins ushering the cell into overcharge. Specifically, the potential at the positive plate becomes sufficient to change hydroxyl ions into oxygen gas, O_2, and water, with the release of electrons. Under ideal conditions, all oxygen gas diffuses through the electrolyte to the negative plate. When there, oxygen is reduced back to hydroxyl ions. The two reactions are

$$2OH^- \rightarrow \tfrac{1}{2} O_2 + H_2O + 2e^- \text{ (positive plate) and}$$

$$1/2\ O_2 + H_2O + 2e^- \rightarrow 2OH^- \text{ (negative plate).}$$

These reactions do occur throughout the charge cycle, but usually at... If a low-charging current... is applied, for...



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Continued from page 70

prevalent, and it is this reaction that defines the minimum effective charge current for the cell. For charging, a significantly larger charge rate of 0.05C or greater is applied. (C is the current in amperes equal to the numerical value of the nominal ampere-hour capacity of the cell. For example, with an AA cell rated 500mAh, the C rate is defined as 500mA. The 0.1C rate for the AA cell would be 50mA.)

When the charge is complete and overcharge begins, all applied current is involved in the generation of oxygen gas and, to the extent that the gas moves to the negative plate, recombination of oxygen to hydroxyl ions.

Two detrimental effects may occur. First, oxygen gas causes an internal pressure that, if unchecked, can build to a dangerous level. NiCad cells include a pressure-release vent to relieve excessive pressure. Second, recombination of oxygen and hydrogen ions generates heat. In an ideal cell, generation of oxygen and recombination of oxygen to hydroxyl ions reach a point of equilibrium, at which point heat from the recombination is in equilibrium with a cooling trend caused by the generation of the oxygen gas.

Safety measures

NiCad cells can be manufactured with an overcharge capacity that is determined by the pressure setting of the release valve (and strength of the cell container) and the effectiveness of recombination of oxygen and hydrogen at the negative electrode. To increase overcharge capacity, manufacturers can do two things. First, the plates are *sintered*, a process that leaves the plate structure extremely porous. Sintered material has a much greater surface area, which allows an increased rate of chemical activity and a higher charge current. Second, the *chargeable* capacity of the negative plate is made sufficiently greater than that of the positive plate. Full charge of the cell (and the positive plate) occurs well before full charge of the negative plate. This creates a safety overhead.

If charging current continues and the negative plate does become fully charged, a new problem occurs: Hydrogen gas is released. Although oxygen gas could be recombined to hydroxyl electrolyte ions, the hydrogen gas does not undergo such a reaction easily. With hydrogen escaping as a gas, the overall concentration of the hydroxyl electrolyte is reduced. With the quantity of Cd metal and NiOOH in the plates, the amount of OH^- also determines the cell's capacity. If the quantity of the OH^- electrolyte is decreased, so is cell capacity. This loss of capacity is commonly termed the *memory effect* with NiCad cells and battery assemblies.

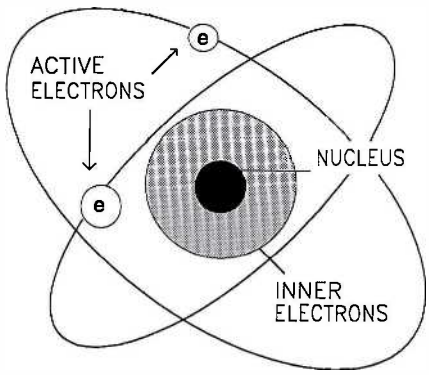

Figure 1. *In heavier atoms, a cloud of electrons shields the outer, more active electrons from the strong attraction of the nucleus.*

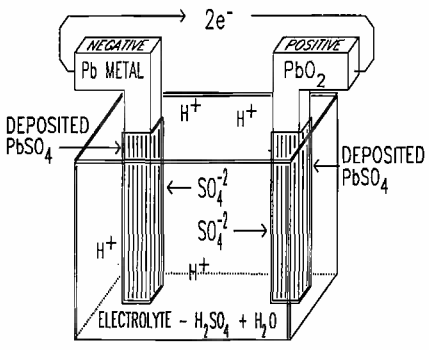

Figure 2. *In a lead-acid cell, sulfate ions form lead sulfate on both positive and negative plates during discharge.*

The original standard

Although many think NiCad battery technology is quite new, the nickel-cadmium combination was discovered and developed near the turn of the century. Even before, the lead-acid system was already in use.

The lead-acid battery still enjoys some applications for powering of portable equipment. Usually packaged as sealed units, lead-acid technology involves a series of reactions between lead metal (Pb), lead dioxide (PbO_2) and lead sulfate ($PbSO_4$) with sulfuric acid (H_2SO_4) as the electrolyte. (See Figure 2.)

In discharge, the activity at both plates of a lead-acid cell works toward the creation of $PbSO_4$. At the negative plate, which is initially lead metal, a loss of two electrons in a reaction with sulfuric acid forms insoluble lead sulfate. The plate surface becomes coated with the sulfate. The chemical equations for the reaction are:

$$Pb \rightarrow Pb^{+2} + 2e^-, \text{ and}$$

$$Pb^{+2} + SO_4^{-2} \rightarrow PbSO_4.$$

At the positive lead dioxide plate, electrons reduce the oxidation state of lead from a +4 state to +2. Water is produced, and the new state of lead combines with sulfate from the electrolyte. Lead sulfate coats this plate as well. The reactions are:

$$PbO_2 + 4H^+ + 2e^- \rightarrow Pb^{+2} + 2H_2O, \text{ and}$$

$$Pb^{+2} + SO_4^{-2} \rightarrow PbSO_4.$$

Discharge usually stops before all the materials are consumed. Because the coating of lead sulfate builds on the plates, the acid can no longer get to the original material. The voltage drops to a low level and, with a reduced available current, is insufficient to accomplish the task to which the battery is applied.

In the charge cycle, activity at the plates of the lead-acid cell is reversed. Sulfate on the negative plate returns to metallic lead; on the positive plate, it returns to lead dioxide. Meanwhile, the concentration of sulfuric acid in the electrolyte increases, theoretically to its original concentration.

The amount of sulfuric acid in the cell serves as a gauge of charge condition. This is based on measurement of the *specific gravity* of the electrolyte solution with a hydrometer. Specific gravity is defined as the weight of a given volume of a liquid compared with the weight of an equal volume of pure water. At 100% charge, the specific gravity should measure about 1.28; at 75%, 1.25; at 50%, 1.18; at 25%, 1.13; and at 0%, 1.080. Lead-acid batteries used with ENG equipment would show the same characteristics, if such measurements were made. You probably are more familiar with the use of a hydrometer in connection with automotive batteries (before the Gel Cell and other sealed, no-maintenance, lead-acid units came into vogue).

Lead-acid batteries can charge at high speeds, if the evolution of gas does not become excessive and the temperature does not rise above 120° for an extended period of time. The gas mixture released during charging primarily contains hydrogen and oxygen—an explosive combination, if ignited by a spark or open flame—along with other noxious and possibly poisonous gases. For that reason, charging of lead-acid batteries always should be done in a well-ventilated location.

When the battery goes to overcharge, only a small portion of the charging current is directed to normal battery reactions. Much of it causes decomposition of water to hydrogen and oxygen gases. At least half the current is expended in heat, causing the temperature to rise rapidly. An elevated temperature for a prolonged period causes deterioration or aging of the battery and reduces its productive life. Excessive temperature also may cause warping of the plate structures. Release of the gas reduces the available hydrogen ion from sulfuric acid, the concentration of the

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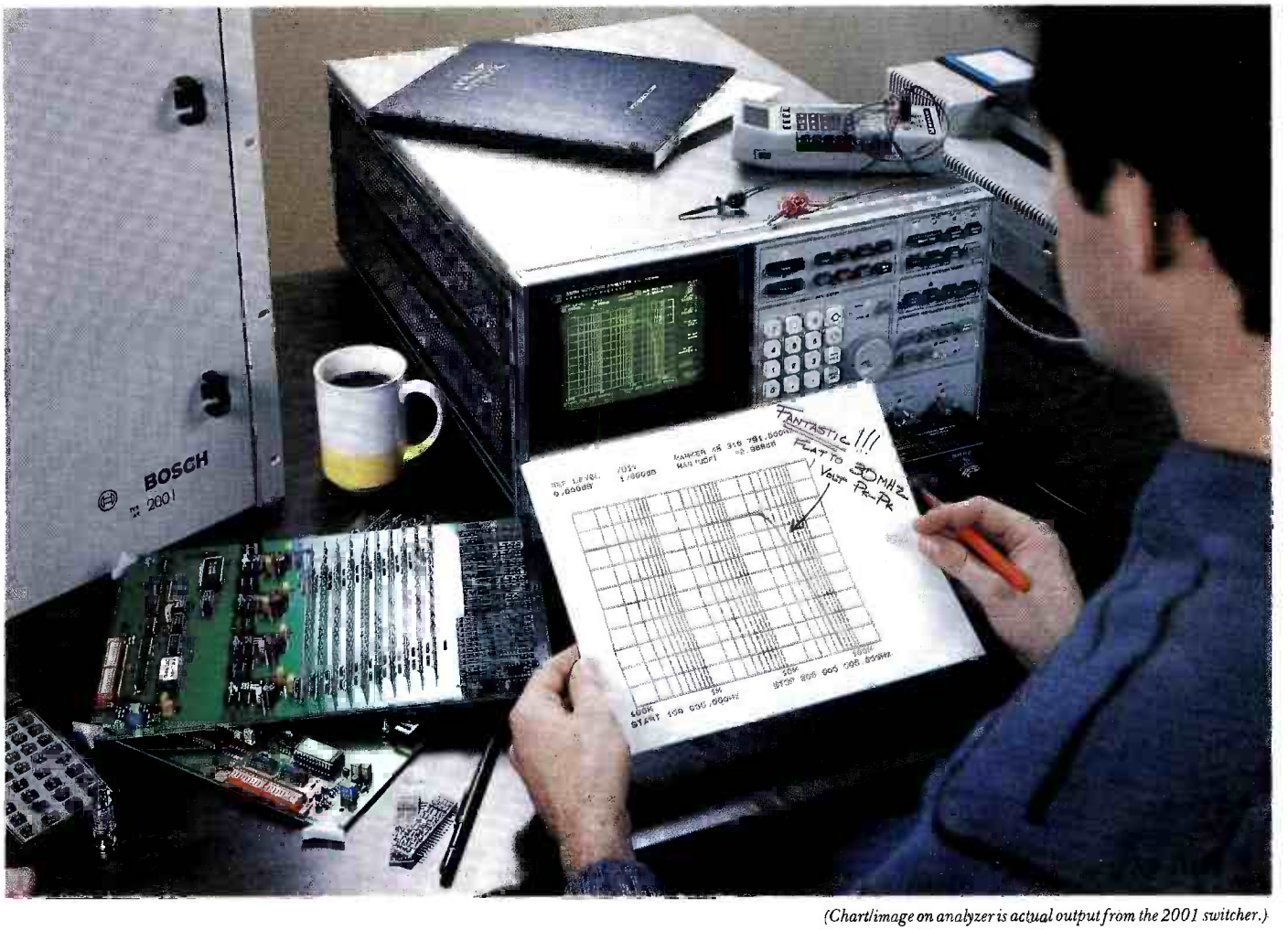

(Chart/image on analyzer is actual output from the 2001 switcher.)

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electrolyte and the capacity of the battery.

A change in philosophy

With the battery chemistries outlined here, careful control of the charging process is necessary to get the most out of your battery investment. For quite some time, slow charging was usually recommended as the safest method. Now, most manufacturers recommend fast charging of video batteries. The reason rests more with charger technology than it does with cell technology.

Developments over the years have improved cells and battery packs. Sintering of the plates increased the reactive surface area of the plates, meaning more and faster energy transfers between plates and electrolyte. A pressed-plate technology increases the energy density or capacity of cells, giving more charge capacity for a given size.

NiCad cells of tomorrow may enjoy an additional boost in capacity through a *foam-plate* technology, which will again increase the charge density and reactive surface of the plates. At present, foam-plate cells continue to undergo tests in the lab. There is concern whether these cells will withstand the stresses placed upon batteries in video applications.

The fast-charge philosophy arises from new designs in charging-current control. The rugged diode rectifiers haven't changed much. They still develop a brute-force charging current to be applied to the battery. A major change, however, is the ability of chargers to more accurately detect the point at which a battery reaches full charge. Without that ability, severe overcharging occurs more often than not. The development of hydrogen gas during overcharging increases the tendency of the NiCad cells to develop memory effects. In some cases, the increased temperature and pressure in the cells can, conceivably, cause explosive destruction of the battery assemblies under charge as well as cause cell aging.

Many of today's generation of chargers read thermal-sensing devices integrated into the battery packs. Nearly all chemical reactions cause a change in temperature, most being exothermic and producing heat. During normal charging, heat is generated at one plate, but an equilibrium condition requires that heat is applied at the other plate. As the point of full charge is reached, temperature changes rapidly.

Some batteries contain a device to automatically identify the battery type to applicable charging units. Such a charger can be constructed with microprocessor control to communicate with the battery, identifying the battery, then applying the proper charging sequence for that unit. With the microprocessor chip, such a system may be capable of charging a group of batteries of different types, each being treated according to its individual needs.

Making a choice

A proper matching up of batteries, chargers and the equipment to be powered by the battery is wise, no matter which type of chemistry you select. Voltage and ampere-hour capacity are primary specifications to consider for almost any application. Reliable battery power is essential for efficient portable equipment operation. Safe charging procedures play an important role in that reliability.

No less important is careful handling of your batteries. Physical abuse, such as dents and punctures, may result in shorted cells, leakage and eventual failure. And it usually happens at a critical time, when you least need battery problems. In the long run, however, any battery afforded correct charging and careful handling should perform to the best of its ability, keeping tape rolling and live pictures of breaking news stories on the air.

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Tracking the state-of-the-art

By Jerry Whitaker, editorial director

How good must your station be to keep up with FM receiver developments?

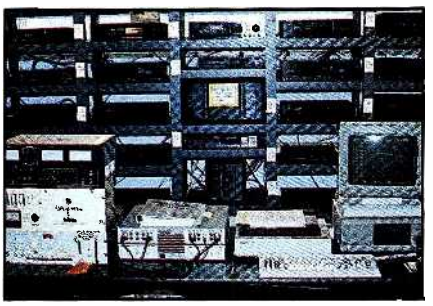
The radio industry has made great strides in recent years toward the realization of a transparent medium through which programming can flow to listeners. And now, more than ever before, the need for excellence in all phases of station operation is becoming painfully obvious to engineers and managers across the country. The public is more discriminating, and competition has never been tougher.

The consumer has demonstrated a strong desire for high-quality music programming. Compact disc players are gaining wide acceptance in the marketplace, and consumers are beginning to judge the performance of all audio systems against the CD. That's a tough act to follow.

Consumer FM stereo receivers also have achieved an impressive level of sophistication. In fact, some units can out-perform FM radio stations.

To compete, broadcasters must keep current with the state-of-the-art. And that means defining the state-of-the-art.

In an effort to identify just how good the current crop of FM receivers is, and thereby determine how good FM radio stations need to be, detailed audio performance tests were conducted by the author on a representative sample of 10 consumer receivers in the price range of $299 to $850. The measurements were made under the same conditions for all units tested.



Setup of equipment for the audio performance tests. The measurements were conducted on stereo FM receivers selected at random at an audio dealer's showroom.

Results of the study indicate that although FM receivers have reached an impressive level of sophistication, a well-maintained radio station using current-technology equipment still can outperform the receivers used by most consumers today. However, the gap between *broadcast quality* and *receiver quality* is narrowing.

Testing procedure

The latest available broadcast hardware was used to perform the tests. To facilitate rapid and accurate measurements, an automated audio test set (Audio Precision System One, or AP/S1) was employed and used for all measurements. The stereo signal was generated with an audio processor/FM stereo generator (Orban 8100-A FM Optimod), switched to the *proof mode* and fed to an exciter (Continental Electronics 802-A) operating into a dummy load. Monitoring was accomplished with a modulation monitor (TFT 844).

A test procedure was programmed on the AP/S1 to measure the following parameters on each channel of the sample stereo FM receivers:

- Frequency response from 30Hz to 15kHz at 95% modulation.
- Total harmonic distortion (THD) at 95% modulation as a function of frequency (30Hz to 7.5kHz).
- SMPTE intermodulation distortion (IMD) as a function of amplitude (from 95% modulation to 15dB below 95% modulation).
- Separation from 30Hz to 15kHz at 95% modulation.
- Noise referenced to 95% modulation (400Hz reference frequency).

The receivers were fed by an over-the-air RF signal. The FM signal was provid-

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ed by leakage from a 5-foot-long coaxial cable that connected the exciter output to the 100W dummy load. The RF output of the exciter was adjusted to provide sufficient field strength to drive the receivers under test.

All receivers used only a wire dipole antenna connected directly to the back of the unit. The physical separation from the receiver antennas to the exciter-to-load cable was about 10 feet. It was found that a power output of 5W to 10W was sufficient to provide full quieting of the receivers.

On units that featured a front-panel signal-strength indicator, the FM exciter was adjusted to provide a reading of approximately 75% of full scale. On receivers that did not feature a signal-strength indicator, RF power output was adjusted to the point that when the receiver's *station scan* feature was used, the unit would lock onto the test signal.

The modulation monitor was driven using the same approach. The 844 features a switch-selectable field-strength meter, which was driven to about 75% of full scale.

No efforts were made to optimize any of the receivers for the tests. The measurements were taken at a suburban Kansas City stereo dealer showroom using receivers selected at random. The left and right *tape-out* ports were used to provide the input signal to the AP/S1 audio test set. Because the goal of the study was to characterize the level of performance typically achieved in the consumer's home, no special adjustments or optimization was conducted on any of the test receivers.

Baseline performance measurements also were taken on the broadcast equipment used for the test. The hardware was supplied to the author on a loan basis and aligned before shipment from the manufacturer's factory. No additional adjustments were made by the author.

Measurement parameters

The procedures used to make the measurements were simple and straightforward. They were patterned as closely as possible after the old FCC equipment performance measurements (EPM) for FM broadcasting.

The AP/S1 provides a generator amplitude-regulation feature that permits EPM-type constant-modulation measurements, but the procedure requires access to a signal source without de-emphasis. When a modulation monitor is used, such a signal is readily available. Measurements on consumer receivers, however, do not permit access to a flat (no de-emphasis) demodulator output. In fact, to bypass the de-emphasis circuit in the receiver would have failed to check an important element of receiver operation.

An automated audio-measurement system was used to facilitate rapid and accurate collection of data.

One of the receivers tested in the FM performance study.

The AP/S1 does permit the generation of test signals at amplitudes determined by preselected pre-emphasis or de-emphasis curves. The 75μs de-emphasis curve was switched into the generator output to provide a modulating signal that would maintain approximately 95% modulation. This approach was taken after confirming the accuracy of the AP/S1 de-emphasis curve and 8100-A pre-emphasis circuit.

A total of 31 test points were made per sweep on each channel of the device under test (DUT). A total of 250 individual measurements were conducted on each DUT.

The load impedance on all DUTs was 100kΩ, unbalanced. Baseline noise readings, taken before the tests began, confirmed that RFI and 60Hz hum were not problems.

Automatic ranging of input signals was used for all measurements. The AP/S1 auto-ranging control circuitry responds to the peak value of the input signal, rather than the rms or average value, preventing overload and non-linearity on signals with high crest factors.

Measurements of noise and separation were made with the generator outputs back-terminated in a resistance equal to the selected source impedance (600Ω). This permitted measurements to be made without the necessity of disconnecting cables or connecting termination resistors to the inputs of the stereo generator.

Measurements of total harmonic distortion (THD) were made using true-rms detectors and a 22Hz high-pass filter and 30kHz low-pass filter switched into the analyzer. THD measurements were conducted up to and including 7.5kHz. Measurements were not made above this frequency because of the inherently invalid results that are produced when testing an FM transmission system for THD at frequencies above 8kHz. Because all stereo generators filter the input audio above 15kHz to 17kHz to protect the 19kHz pilot, even the second harmonics of 8kHz and higher frequencies also are filtered. Under these conditions, the distortion meter is basically reading residual noise and analyzer filter irregularities.

Reference readings

A series of baseline readings was taken before testing began on receivers to establish the fundamental performance levels of the assembled equipment. Figures 1 through 5 show the results of the tests, which can be assumed to represent the performance possible today from a well-maintained FM station using current-technology equipment.

Frequency response was within 0.2dB from 40Hz to 15kHz. As shown in Figure 1, both channels track well over the range of measurements. The furthest excursion from the 75μs pre-emphasis curve occurs at 30Hz, which is down 0.5dB on both channels.

Baseline distortion was less than 0.3% from 30Hz to 7.5kHz. Figure 2 shows that THD was well below 0.2% at frequencies less than about 3.5kHz.

Intermodulation distortion at 95% modulation measured 0.3%. Figure 3 charts IMD as a function of modulating level. The chart shows the effects of noise on the measurement, reaching 0.45% IMD at 15dB below 95% modulation.

Stereo separation tracked well between the left and right channels. Low-frequency separation was, at worst, approximately −40dB, improving to about −54dB at the high end of the audio passband. Figures 4 and 5 show the baseline stereo separation performance for each channel of the test setup.

The measured signal-to-noise ratio was −61dB for each channel (with de-emphasis). Because of the types of measurements conducted in this study, de-emphasis was used on all baseline measurements. As mentioned previously, tests on consumer FM receivers, by definition, require the use of de-emphasis.

The factory test performance data supplied with each piece of equipment used in the measurements was significantly better than the measurements documented in Figures 1 through 5. The explanation is the methodology used to perform the

Continued on page 84

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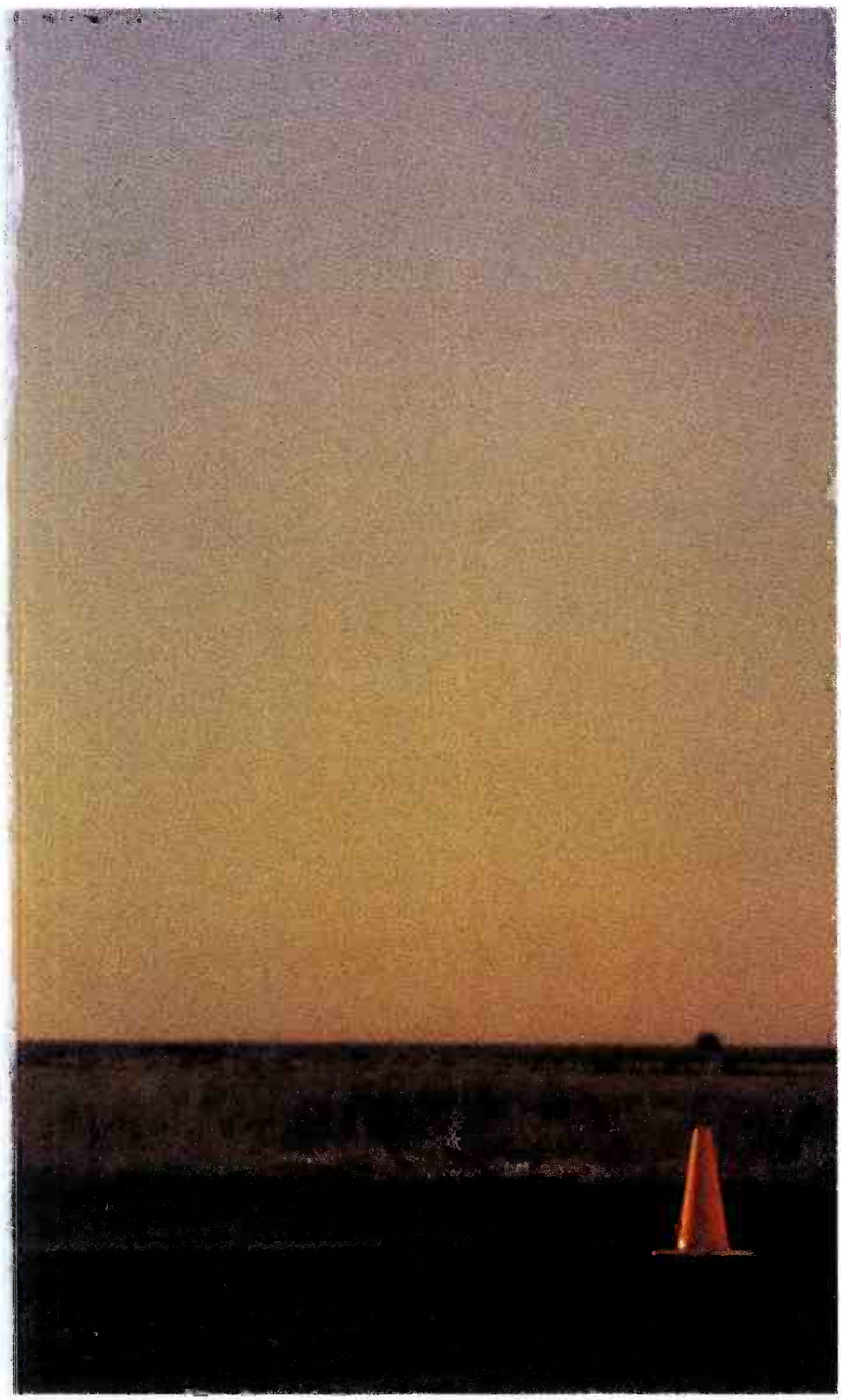

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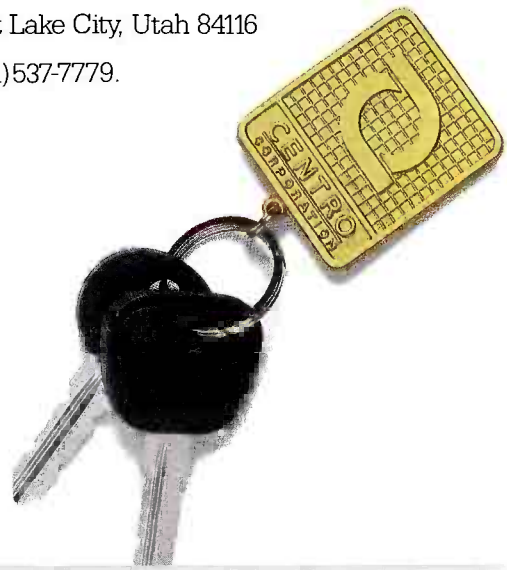

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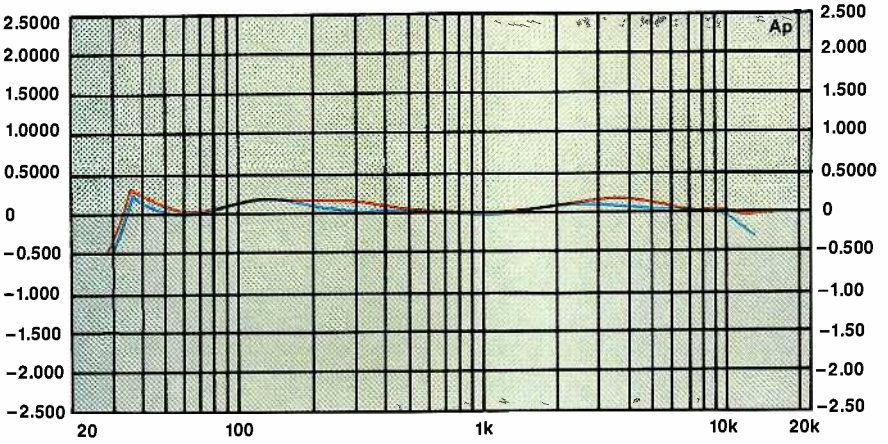

Figure 1. *Baseline frequency response for the right and left channels of the test setup used to examine the receivers. The blue line represents the left channel, and the red line represents the right channel. The printout shows net deviation from the 75μs pre-emphasis curve.*

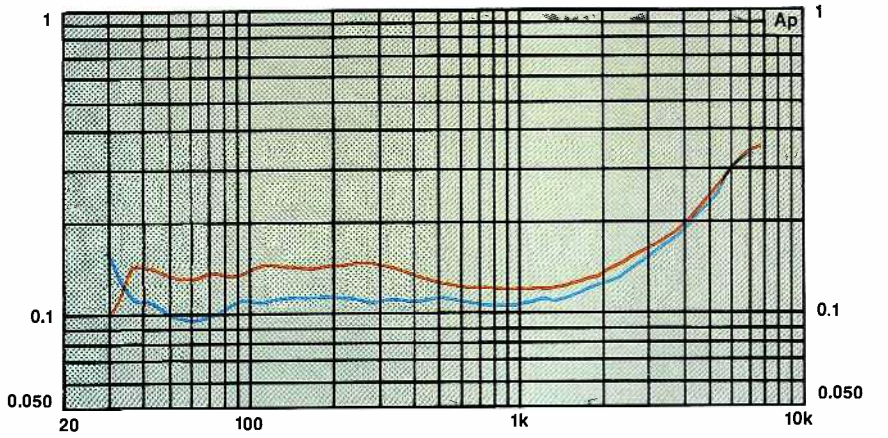

Figure 2. *Total harmonic distortion (plus noise) as a function of frequency for the test hardware. Note that all THD components are below 0.3%.*

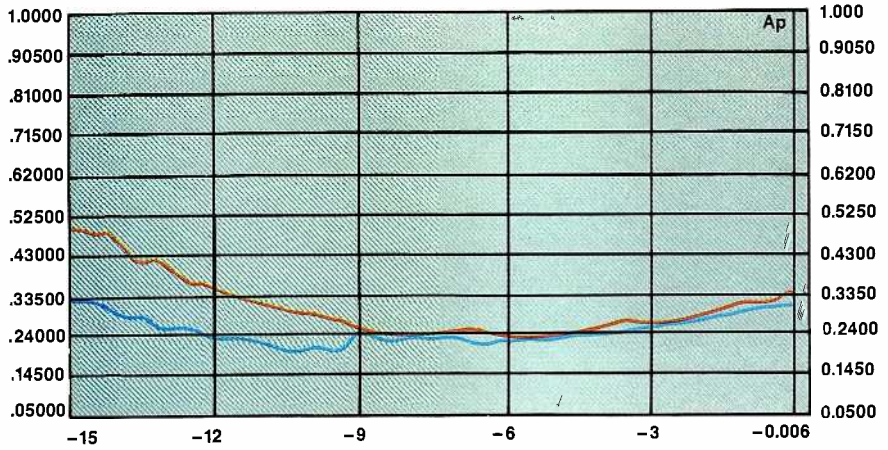

Figure 3. *Baseline SMPTE intermodulation distortion as a function of modulation level. 0dB on the chart represents 95% modulation.*

Continued from page 80

tests. Because an off-the-air test routine was required to check receiver performance, the same method was used to make the baseline measurements.

The goal of the study was not to establish the performance level of broadcast equipment or consumer receivers, but to assess the *relative quality* of each. All tests contained in this report should be viewed from that perspective.

Test results

FM broadcasting has certain limitations that prevent it from ever being a completely transparent medium. At the top of the list is multipath distortion. In many locations, some degree of multipath is unavoidable. Running a close second are the practical audio bandwidth limitations of the FM stereo multiplex system. The theoretical limit is 19kHz, but real-world filter designs result in a high-end passband of between 15kHz and 17kHz.

Receiver IF bandwidth is another limitation placed on the FM system. The problem involves adjacent-channel interference that usually is hidden by narrowing the receiver IF bandwidth. This effect can be demonstrated using a tuner that features switch-selected IF bandwidth. Many stations are not listenable in the "wide" mode because of interference. But, when the receiver is switched to the "normal" mode, most stations are reasonably clean and well within the practical limitations of current broadcast technology. Often, a clearly audible reduction in high-frequency distortion and noise is noted when switching from "wide" to "narrow."

Some receivers do better than others in dealing with these inherent limitations. The tests documented in this report were conducted to establish the current state-of-the-art in consumer receivers, and thereby establish the performance requirements for FM radio stations. Table 1 lists the overall performance of the receivers tested.

Because of the large number of readings taken on each piece of equipment (250 for each receiver), averaging of most data was required to provide realistic numbers for meaningful comparison. It should be emphasized that the performance of an individual unit is not the primary concern of this report. Instead, the intent is to identify basic performance levels. The approximate list price of the units tested is given to roughly classify the intended market for the receiver.

It must be noted that price alone does not characterize the expected performance level of the FM section of a receiver. The features offered to consumers vary widely depending on the manufacturer. Variables include the number of inputs, type and sophistication of equalization provided and, most important, the power

output of the stereo amplifier section. It is, therefore, dangerous to classify a consumer FM receiver based on price alone.

The quality of the power amplifier section of receivers tested was not a factor in the measurements conducted for this report because the output signal from the receivers was taken from the *tape-out* port, bypassing the power amplifier.

Virtually all receivers tested performed well with regard to frequency response. No significant problems were noted on any units. The greatest deviation measured from the 75μs pre-emphasis curve was $\pm$1.5dB.

Total harmonic distortion, however, is another matter. Some of the receivers had serious problems with THD at high modulating frequencies. Many of the units performed well with regard to THD up to about 2.5kHz. Receiver No. 2, for example, measured about 1% THD from 30Hz to 2kHz. Above 2.5kHz, however, distortion rose rapidly and reached 4% at 7.5kHz. All the receivers experiencing excessive THD did so between 2.5kHz and 7.5kHz.

Intermodulation distortion (SMPTE 4:1) measurements produced some rather impressive figures on the receivers tested, especially when compared with THD performance. Most IMD figures were below 1%. The data given for IMD reports performance with the test signal modulating the exciter to 95%. At lower levels of modulation, IMD rose significantly on most units tested, apparently because of the effects of the noise floor.

There was one exception to the IMD rule, however. Receiver No. 10 had its best IMD performance (1.5%) at 10dB below the operating level and rose to about 4% at operating level (95% modulation).

Separation figures for both left and right audio channels tracked closely. It was unusual to see more than 1dB difference between channels. Separation performance was dependent on the modulating frequency, with figures on most receivers lower at low frequencies and higher as frequency increased. It was common to see separation numbers between −35dB and −45dB at midband.

Signal-to-noise performance ranged from excellent to poor. One receiver's measured S/N reading was only −38dB for each channel. At the other end of the spectrum, however, another unit (receiver No. 1) provided an outstanding showing of −63dB for left-channel noise and −71dB for right-channel noise. The author is at a loss to explain the 8dB difference between the two channels, especially in view of how closely the other measurements on the receiver tracked.

The S/N measurements also provided an interesting paradox. In three instances (receivers No. 4, 6 and 8), the measured S/N was several decibels worse than the measured stereo separation for those same units. It is reasonable to assume that the noise floor would place a limit on the separation figures that could be measured. In any event, the numbers shown are those recorded by the test equipment.

Full documentation was taken on all receivers measured. Figures 6 through 10 show the measured data of the top-performing unit (receiver No. 1). The unit performed well with respect to frequency response, as shown in Figure 6. Particularly impressive were the tuner's THD and IMD performance, graphed in Figures 7 and 8. No other tested unit exhibited such low distortion and, in the case of IMD, linear distortion with regard to modulating amplitude. Channel separation performance (shown in Figures 9 and 10) was impressive, reaching as much as −55dB at about 10kHz. As mentioned previously, the S/N performance of the receiver was remarkable (−63dB and −71dB).

Receiver No. 1 and a couple of others tested featured a front-panel selectable bandwidth control with "wide/normal" positions. If selectable by the consumer, the control was placed in the "wide" mode. Whether the consumer could use the receiver in that mode, given the field strength of the desired station, is another matter. It was thought, however, that use of the "wide" mode would provide the data needed on what constitutes the current state-of-the-art in FM receiver development.

As far as the author knows, no dynamic noise reduction (DNR) circuits were active in any of the receivers during the tests. Most receiver designs place the DNR circuits (if used) in the pre-amplifier section of the power amplifier, which was bypassed by using the tape-out ports.

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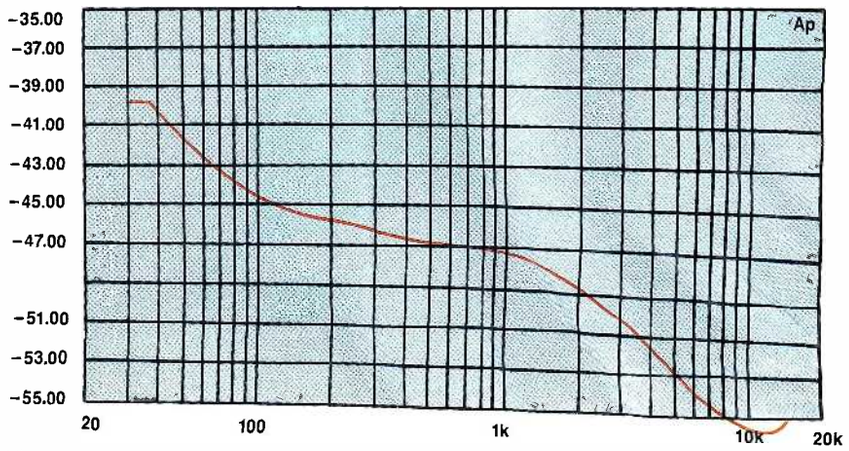

Figure 4. *Left-channel separation for the test setup. Tracking between left and right channels was well within 1dB.*

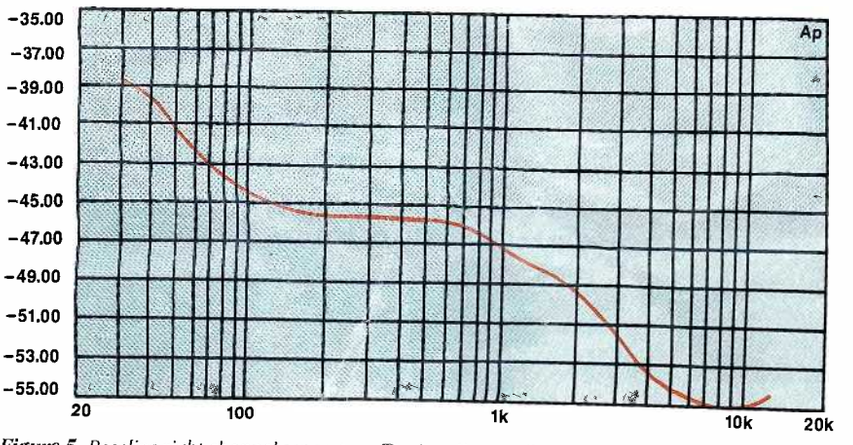

Figure 5. *Baseline right-channel separation. The baseline readings for the parameters documented in Figures 1 through 5 were taken just before the FM receiver tests were conducted.*

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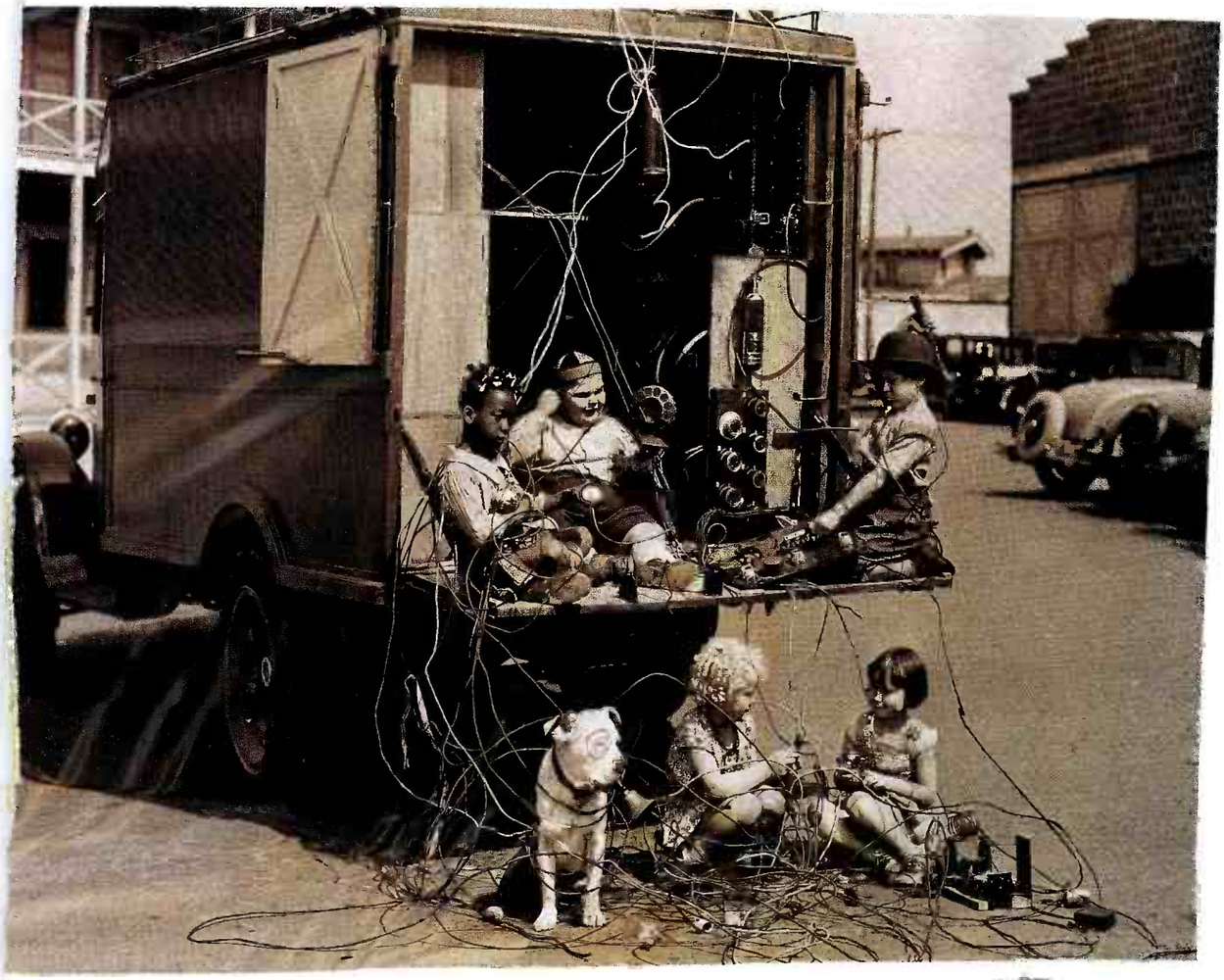

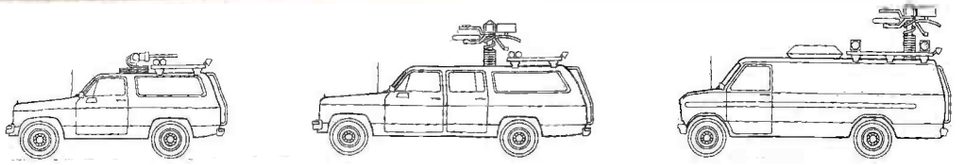

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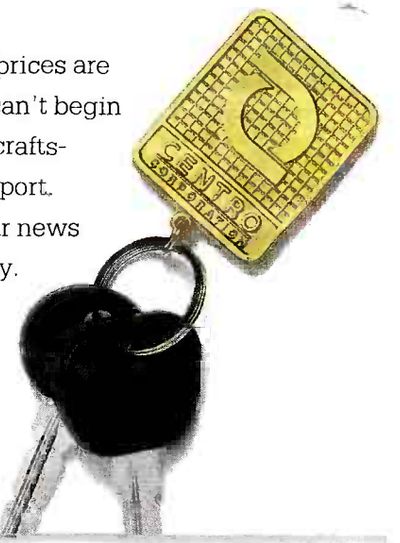

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Continued from page 86

DUT	FREQ. RESP.	THD	IMD	SEP/L	SEP/R	S/N
BASELINE	±0.2dB	0.3%	0.3%	−41/−55dB	−39/−53dB	−61/−61dB
RECEIVER 1 (Yamaha T-85 tuner only, $450)	±0.2dB	0.3%	0.1%	−37/−52dB	−37/−50dB	−63/−71dB
RECEIVER 2 (Onkyo TX-82 receiver, $359)	±0.3dB	4.0%	0.8%	−17/−28dB	−17/−28dB	−41/−41dB
RECEIVER 3 (Carver 150 receiver, $850)	±0.2dB	1.0%	0.9%	−45/−55dB	−43/−55dB	−58/−57dB
RECEIVER 4 (Sony STR AV-780 receiver, $750)	±0.5dB	1.5%	0.5%	−39/−53dB	−39/−52dB	−50/−50dB
RECEIVER 5 (Onkyo TX-82 receiver, $459)	±0.5dB	2.0%	0.65%	−41/−47dB	−41/−46dB	−53/−53dB
RECEIVER 6 (Yamaha RX500U receiver $420)	±0.3dB	1.9%	1.5%	−35/−41dB	−35/−41dB	−38/−38dB
RECEIVER 7 (Onkyo T4150 tuner only, $299)	±0.3dB	2.0%	0.65%	−35/−41dB	−35/−41dB	−47/−48dB
RECEIVER 8 (Yamaha RX-700U receiver, $589)	±0.5dB	1.8%	0.9%	−35/−53dB	−33/−53dB	−48/−49dB
RECEIVER 9 (Carver 900 receiver, $635)	±1.0dB	1.9%	0.6%	−49/−57dB	−45/−54dB	−58/−58dB
RECEIVER 10 (Technics SA-937 receiver, $315)	±1.5dB	7.5%	4.0%	−24/−42dB	−24/−43dB	−43/−42dB
COMPOSITE AVG.	**±0.5dB**	**2.4%**	**1.1%**	**−36/−47dB**	**−35/−46dB**	**−50/−51dB**

NOTES:

Measurement categories are defined as follows:

DUT . . . . . Device under test.

FREQ. RESP. . . . Typical measured frequency response of both channels from 30Hz to 15kHz, reference to the 75μs pre-emphasis curve.

THD . . . . . Typical measured total harmonic distortion of both channels over the frequency range of 30Hz to 7.5kHz at 95% modulation.

IMD . . . . . Typical measured intermodulation distortion of both channels at 95% modulation.

SEP/L . . . . . Left-channel separation with the right channel modulated at 95% with tones from 30Hz to 15kHz. The first reading is the lowest separation reading recorded, and the second reading is the highest separation reading recorded.

SEP/R . . . . . Right-channel separation with the left channel modulated at 95% modulation with tones from 30Hz to15kHz. The first reading is the lowest separation reading recorded, and the second reading is the highest separation reading recorded.

S/N . . . . . Measured signal-to-noise reading referenced to a 400Hz tone at 95% modulation. The first reading is the left-channel noise figure, and the second reading is the right-channel noise figure.

COMPOSITE AVERAGE . . . . . The average reading in each category for all 10 receivers tested.

Table 1. *Measured performance of a representative sample of consumer FM receivers. All units were tested using the same parameters in the same environment.*

Continued on page 94

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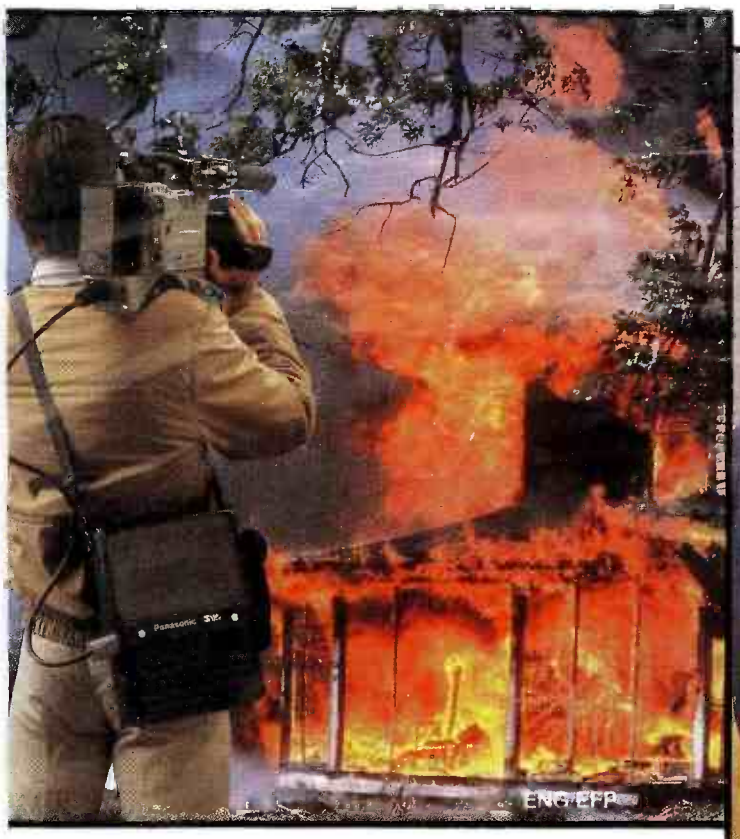

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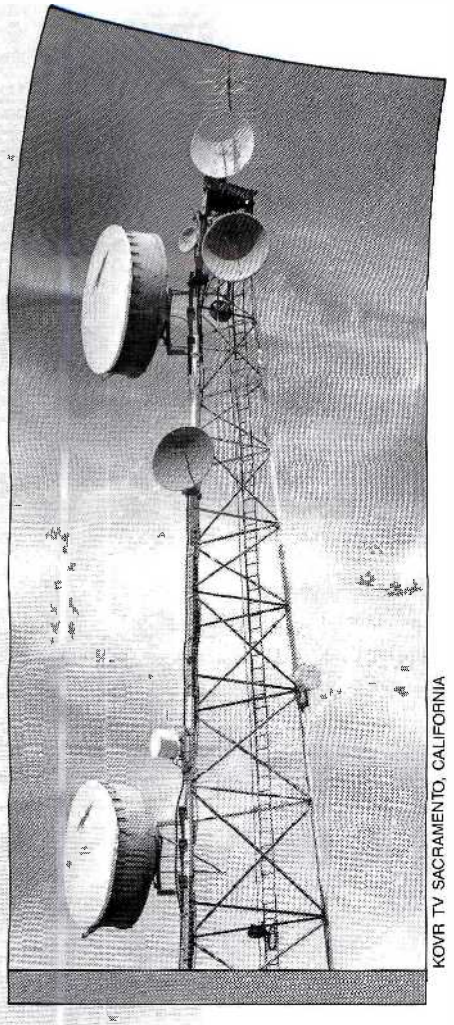

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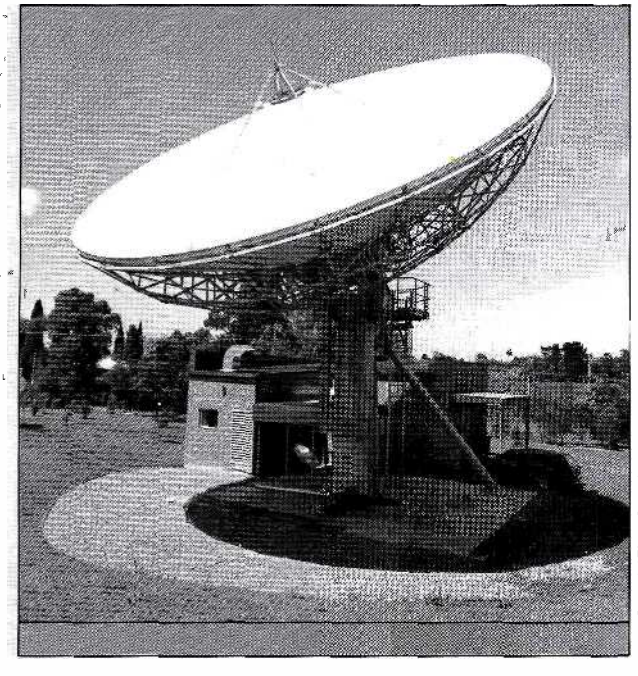

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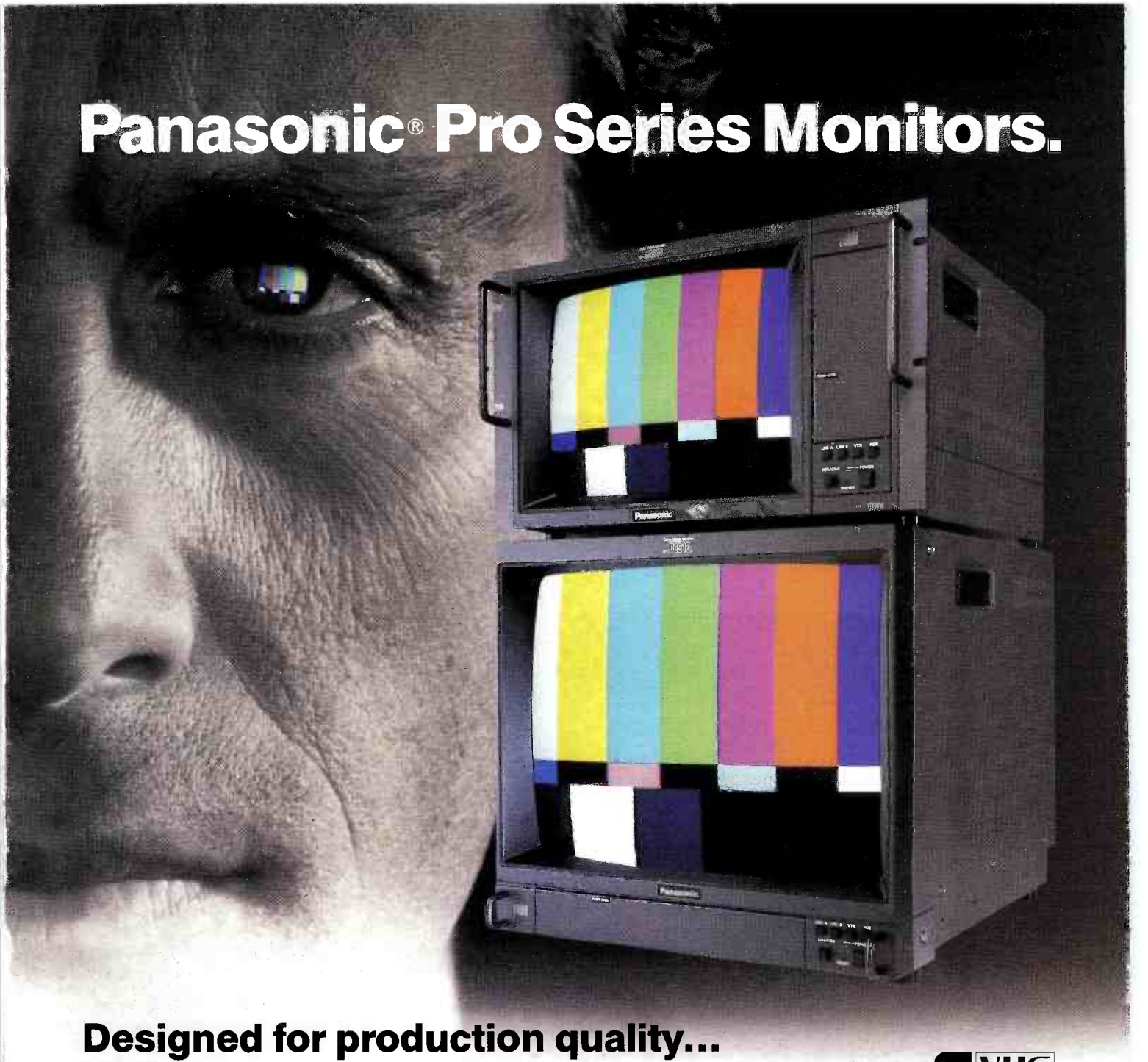

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of the transmitter is recommended, a high-quality off-air demodulator is preferred, if available. This approach provides the advantage of taking transmitter and antenna bandpass irregularities into account in the measurements. The demod must, however, be extremely flat for valid results.

Frequency response targets

Absolute frequency-response accuracy over the audio passband does make an audible difference. Researchers exploring subtle differences in audio amplifier designs have found that errors as small as 0.2dB can be heard. Therefore, flat response (strict adherence to the 75μs pre-emphasis curve) is reflected in the performance targets. The recommended frequency-response limits are $\pm$1dB, 30Hz to 15kHz, $\pm$0.5dB 50Hz to 15kHz, and $\pm$0.2dB, 100Hz to 10kHz.

Because most musical content is in the 100Hz to 10kHz range, tighter specifications are recommended for this band. With the equipment available to broadcasters today, there is no reason an FM system cannot be absolutely flat over this range. In view of how critical flat response is to overall fidelity, it pays to optimize.

Somewhat looser tolerances are specified at the frequency extremes in recognition of the practical high-pass and low-pass filter considerations of stereo generator design.

Distortion targets

It is preferable to make the distortion measurements with the AGC (and limiter) voltages switched on. This simulates the real-world operation of a radio station. Excessively fast attack-time constants will produce low-frequency and IM distortion in older limiter designs, and excessive high-frequency clipping, obviously, will increase high-frequency distortion.

It must be noted that, depending upon the setup of the audio processor, the distortion targets of 0.3% THD (30Hz to 7.5kHz) and 0.3% IMD probably are impossible to meet with the AGC voltages switched on. Because of the highly competitive nature of broadcasting today, audio processors cannot always be adjusted to provide for the purest reproduction of the incoming signal. Although this is regrettable, it represents the real world that engineers must deal with.

When making the distortion measurements, take a set of readings with the AGC and limiter engaged, then with the audio processor in the proof mode. Save both sets of readings for reference. This way, at least you will know the effects of your audio processing.

It is fair to point out that listeners do not listen to test tones, but to program material. With this in mind, it is possible to rationalize audio-processor settings that produce steady-state distortion in the range of 1%-2.5% at mid-to-high frequencies.

The recommended THD test frequencies are kept low enough (7.5kHz maximum) that at least the second harmonic of the input signal will fall within the system's 15kHz passband.

Although the IMD tests are relatively impervious to system noise at full modulation, THD tests are limited by the noise floor. It is important, therefore, to get the noise floor as low as possible, so that low levels of THD can be read.

THD and IMD tests alone do not check dynamic instability problems such as transient intermodulation distortion (TIM). However, careful selection of high slew-rate components in the audio chain and THD/IMD figures in the noise floor will leave an audiophile audience impressed.

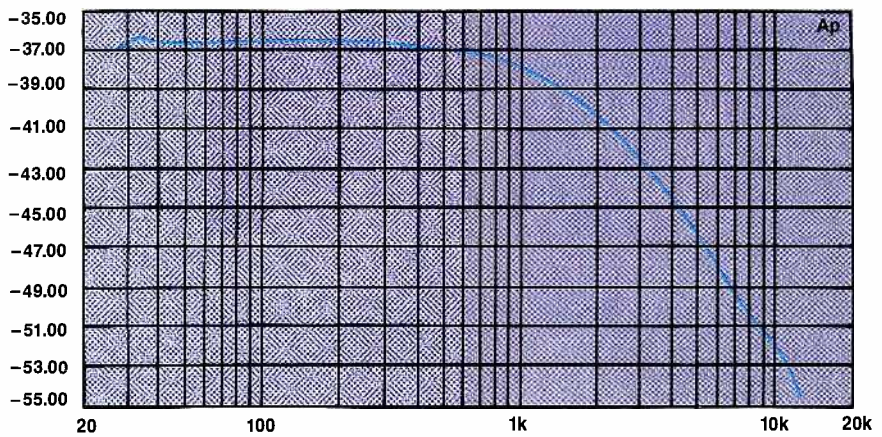

Figure 9. Left-channel separation as a function of frequency for test receiver No. 1. Because of de-emphasis, most receivers exhibited their best separation performance at frequencies above 2.5kHz.

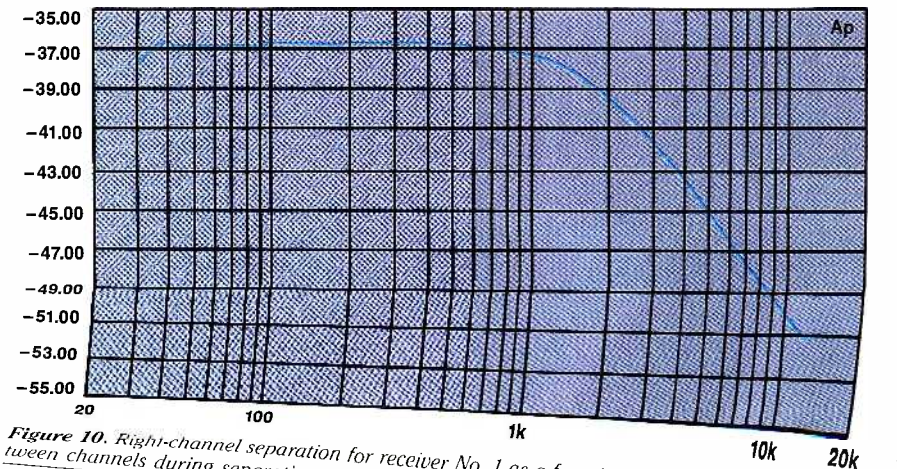

Figure 10. Right-channel separation for receiver No. 1 as a function of frequency. Tracking between channels during separation measurements was within 0.5dB.

Noise targets

In many cases, system noise is the most difficult parameter to bring under control. The recommended performance target of $-$60dB per channel reflects state-of-the-art exciter/transmitter performance (about $-$66dB baseband noise) and assumes that the *noise* contribution of other elements of the audio signal chain is minimal. Referenced to 100% modulation, $-$66dB noise at the transmitter means $-$60dB out of each audio channel. If the audio chain noise is kept down to $-$70dB or lower, the overall S/N reading for the system will be close to $-$60dB. Because the recommended noise measurements are performed with the audio processor switched to the operate mode, it is important that all equi... preceding the compres...

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GENERAL TEST CONDITIONS

- Switch system to stereo mode.
- Apply input signals to the console line input used for most program sources.
- Sample and demodulate the system output at the transmitter antenna output.
- Leave all processing and equalization in-line.
- Define the *operating level* as 0VU or equivalent at the main audio console.

FREQUENCY-RESPONSE MEASUREMENTS

Test conditions:
- Switch the AGC voltages off. Do not simply patch around the audio processor. Not all processors provide this feature; in such cases, patch around the unit.
- Set modulation for any convenient level between 75% and 100%. It is suggested that the normal modulation level produced by feeding a 400Hz tone into the system be used as the *reference modulation level*.
- Adjust the input level as required to maintain the reference modulation at each frequency used.
- Calculate the response error as the input level deviation required to maintain reference modulation, compared with the 75μs pre-emphasis curve.

Recommended performance:
- ±1dB, 30Hz to 15kHz.
- ±0.5dB, 50Hz to 15kHz.
- ±0.2dB, 100Hz to 10kHz.

DISTORTION MEASUREMENTS

Test conditions:
- Switch AGC voltages on, if appropriate (see text). Otherwise, switch AGC voltages off. Do not simply bypass the unit unless absolutely necessary.
- Set modulation for any convenient level between 75% and 100%. It is suggested that the normal modulation level produced by feeding a 400Hz tone into the system be used as the *reference modulation level*.
- Adjust the input level as required to maintain the reference modulation level at each frequency measured.
- Switch the monitor de-emphasis in.

Recommended performance:
- THD = 0.3%, 30Hz to 7.5kHz
- IMD = 0.3%, 60Hz and 7kHz, 4:1 (SMPTE IMD)

NOISE MEASUREMENT

Test conditions:
- Measure noise at each stereo audio channel output with all processing equipment in-line and adjusted for normal operation.
- Reference the noise measurement to the output level produced by a 400Hz input signal at 0VU at the console.
- Take the measurements *unweighted*, with de-emphasis switched in.

Recommended performance (each channel):
- −60dB

SEPARATION MEASUREMENT

Test conditions:
- Set modulation for any convenient level between 75% and 100%. It is suggested that the normal modulation level produced by feeding a 400Hz tone into the system be used as the *reference modulation level*.
- Adjust the input level as required to maintain reference modulation at each frequency used.
- Switch the AGC voltages off. Do not simply patch around the audio processor. Not all processors provide this feature; in such cases, patch around the unit.
- Terminate the unused input channel with a 600Ω wirewound resistor (or other appropriate value resistor).
- Measure residual leakage into the other stereo audio channel.

Recommended performance:
- 40dB, 400Hz to 15kHz
- 35dB, 30Hz to 400Hz

Table 2. *Recommended test procedures and performance targets for FM radio stations. These measurements are designed to simulate, as closely as possible, real-world operating conditions.*

noise floor. Any residual noise in the audio console, STL or other components in the chain will be boosted by the amount of compression typically delivered by the processor.

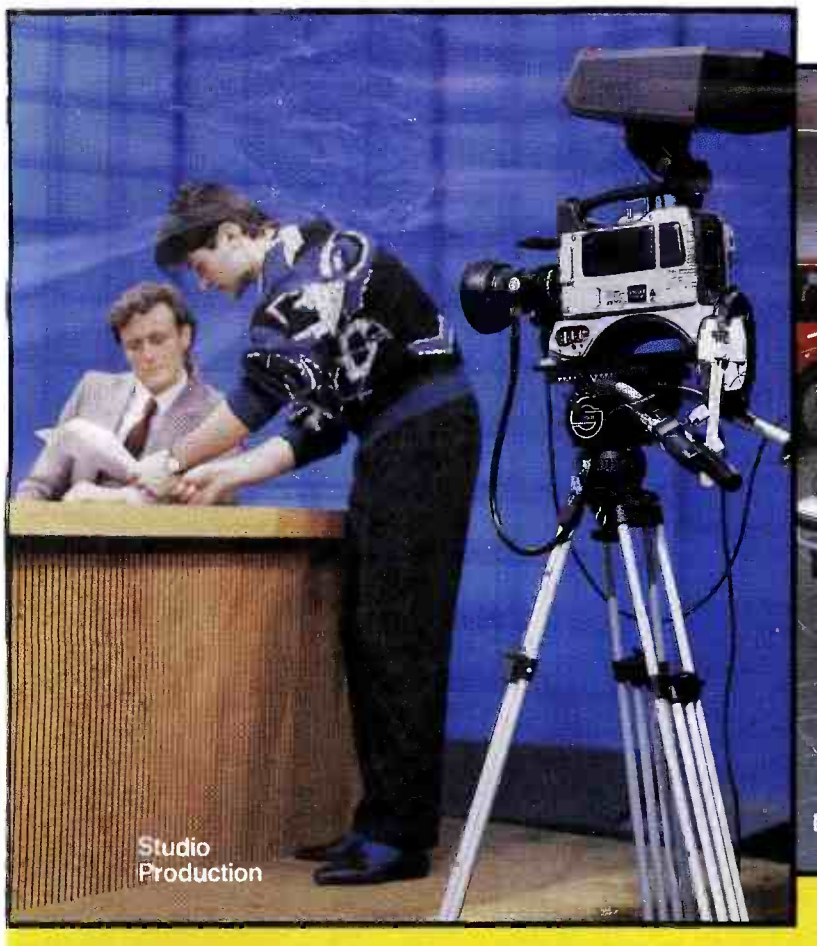
Although 60dB of dynamic range doesn't sound too impressive in this age of compact discs, it is important to keep two facts in mind. First, limited dynamic range isn't limited at all unless the program input signal exhibits greater dynamic range. Most program material in most formats stays within a 20dB range most of the time.

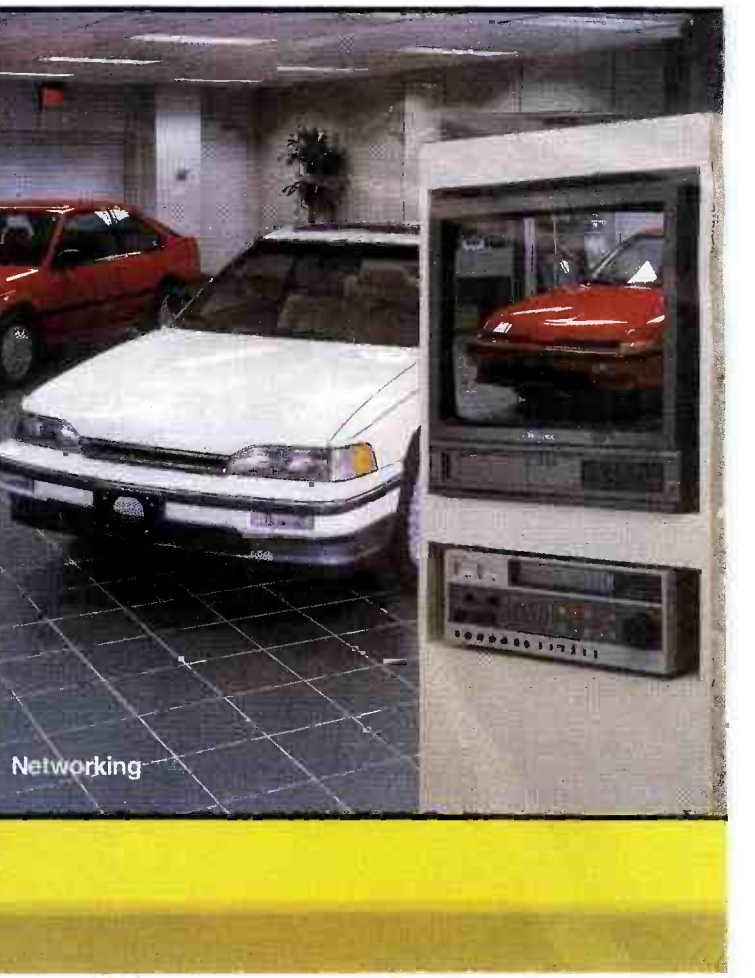
Another key factor is that apparent loudness continues to increase as the threshold of limiting is exceeded and compression begins. The limiter may present a peak modulation barrier, but loudness pushes ahead as density increases.

Separation targets

The separation test is performed in the traditional manner by feeding tones into

even as you sharpen your pencil.





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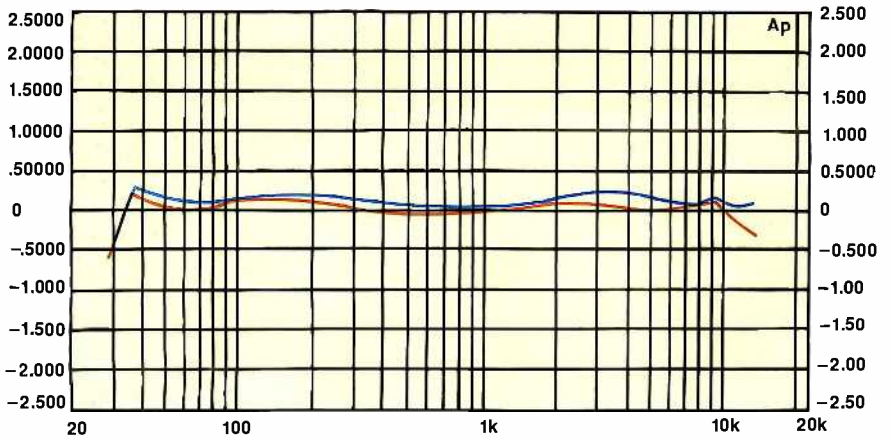

Figure 6. *Frequency response relative to the 75μs pre-emphasis curve for test receiver No. 1. Most receivers measured showed adherence to the pre-emphasis curve of within ±0.5dB.*

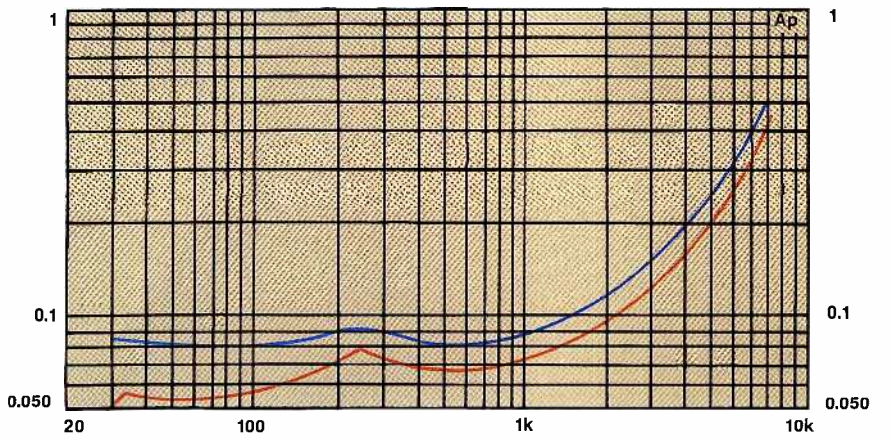

Figure 7. *THD performance of test receiver No. 1. Note the exceptionally low distortion below 2kHz. This receiver, like most tested, exhibited sharply rising distortion at frequencies above 2.5kHz.*

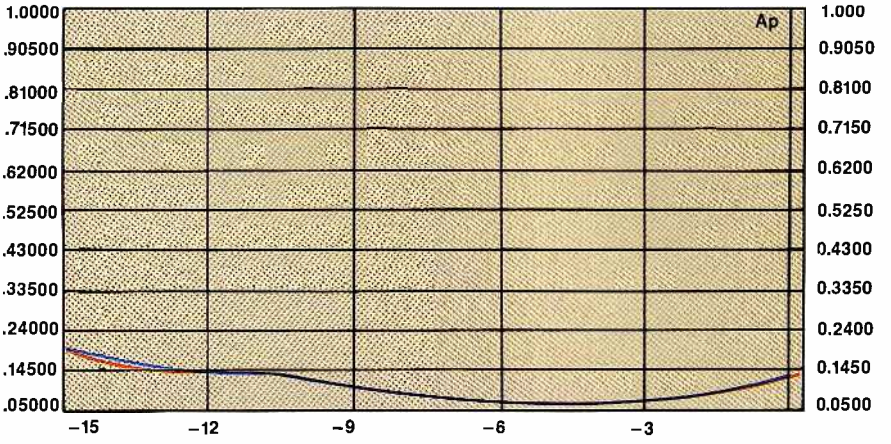

Figure 8. *Test receiver No. 1 SMPTE IMD as a function of modulating level. This receiver exhibited the most uniform IMD performance across the modulating range of any unit tested.*

Continued from page 90

The measured performance of receiver No. 1 demonstrates the sophistication available to consumers in the marketplace. Although few other receivers tested came close to the performance of that unit, most did quite well overall. Broadcasters cannot assume that the receivers being used by consumers are the limiting factor in the delivery of programming to the public. Quality is a moving target, and FM radio stations need to stay ahead in the race.

The transmission end

The receiver performance tests documented in this report demonstrate that to remain competitive in the marketplace today, a high level of audio quality is required of FM stations. To that end, a set of recommended performance targets is proposed. Those targets are based on three fundamental constraints:

- Practical fidelity requirements.
- Inherent system limitations.
- The need for effective average modulation levels.

It is much easier to engineer a loud station than it is to fashion a loud and clean one. Cleaning up the signal without losing level is a much more complicated task than simply turning down the processing. It starts with a transmission system that is as clean and flat as possible. In the end, a *systems design approach*, involving everything from the tape heads and microphones to the antenna, is required.

The performance targets suggested by the author are tough, but they are achievable. Table 2 lists the recommended performance levels and measurement procedures. Even though some of the targets may be tighter than the manufacturers' specs on some individual links in the system, factory specifications are usually conservative with regard to product performance. If a component of the transmission chain, when tested by itself, does not make the grade, replacement (or at least maintenance) should be considered.

Don't overlook the modulation monitor when aiming for high performance. Although the mod monitor has no effect on how the air signal sounds, it is the reference by which the entire system is measured and adjusted. If the monitor provides less than optimum performance, consider replacement or maintenance to bring it up to spec. The monitor, by itself, must be capable of residual distortion of less than 0.1% and a S/N performance of at least 70dB when using the high-level RF (transmitter sample) input.

The recommended equipment performance measurement (REPM) test conditions are designed to simulate as closely as possible the normal operating conditions of an FM radio station. Although sampling of the transmission system at the output

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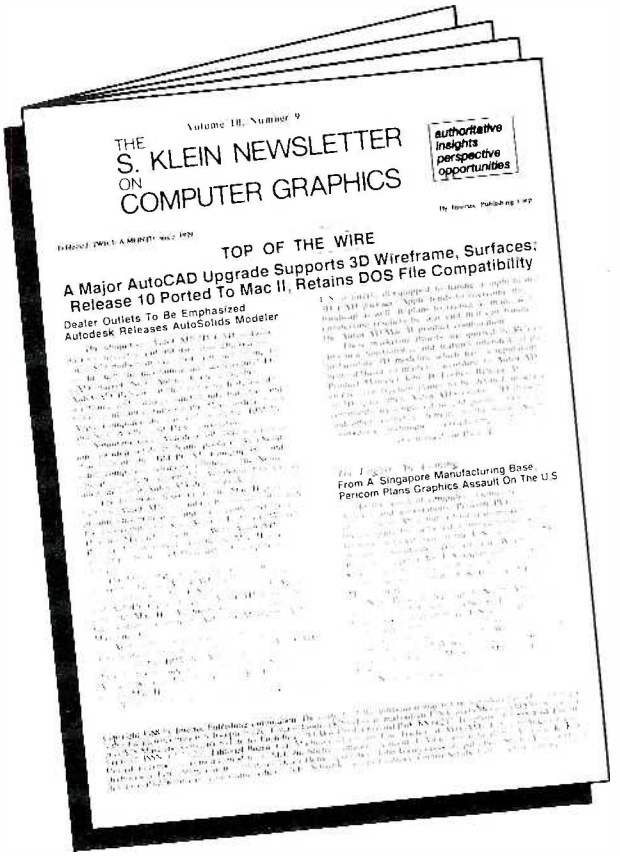

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one channel while measuring leakage into the other channel (whose input should be terminated with a 600Ω wirewound resistor or other appropriate value). The target readings are −35dB, 30Hz to 400Hz, and −40dB, 400Hz to 15kHz.

The low-frequency separation recommendations are looser than targets for mid and high frequencies in recognition of the non-directional acoustical properties of long audio wavelengths. In the mid- and high-frequency ranges, greater separation is recommended to preserve stereo imaging. Program sources rarely provide greater than 30dB of separation, so an additional 10dB of *separation headroom* is recommended to be sure that the transmission system is not the limiting element.

Test equipment

For any test measurements to be of value, the test equipment must be selected carefully and calibrated accurately. The following instruments will be required to correctly run the measurements recommended:

- A low-distortion audio signal generator with a metered output and calibrated attenuator. Distortion must be below 0.1% at all frequencies and output levels to be used in the tests.
- A distortion analyzer capable of measuring THD and SMPTE IMD to an accuracy of at least 0.1%.
- An audio voltmeter capable of accurately measuring signals to at least −70dBm. This function usually is provided on distortion analyzers. Frequency-response linearity across the audio frequency band must be within 0.1dB (20Hz to 20kHz).
- A properly calibrated FM stereo modulation monitor. Because measurements will be made with de-emphasis, the accuracy of the built-in de-emphasis circuits must be verified and documented.

Before attempting to run the REPM tests, check the audio generator and distortion analyzer frequency response and residual distortion at all frequencies of interest. Confirm that response is flat to within at least 0.1dB from 20Hz to 20kHz, distortion is below 0.1% for all frequencies to be measured, and the noise floor of the distortion analyzer/audio voltmeter is at least −70dBm. If adjustments or repairs are indicated in the closed-loop tests, make them before attempting to take any measurements.

The residual test equipment distortion values *may not* be subtracted from the total system distortion figures obtained when running the actual REPM. Subtracting test instrument residual distortion is not a valid procedure because distortion components do not necessarily add. In fact, the only time they add is when all the harmonics are in-phase, a near impossibility when you consider that this would have to be true for every modulating frequency used during the measurements.

FREQUENCY	FREQUENCY
30Hz	800Hz
40Hz	1.0kHz
50Hz	1.25kHz
63Hz	1.6kHz
80Hz	2.0kHz
100Hz	2.5kHz
125Hz	3.15kHz
160Hz	4.0kHz
200Hz	5.0kHz
250Hz	6.3kHz
315Hz	7.5kHz
400Hz (reference)	10.0kHz
500Hz	12.5kHz
630Hz	15.0kHz

Table 3. *Recommended frequencies for measurement of frequency response, separation and distortion of FM broadcast systems.*

How many frequencies?

To accurately evaluate a broadcast transmission system, the performance of the equipment must be checked at a sufficient number of discrete frequencies. It is recommended that 28 separate frequencies be measured between 30Hz and 15kHz. These points are based on 1/3-octave ISO (International Standards Organization) center frequencies, with three minor modifications. The measurement frequencies are shown in Table 3.

The lowest frequency to be measured is 30Hz. The actual ISO frequency is 31Hz. All other frequencies are standard ISO centers, except 7.5kHz (the standard ISO frequency is 8kHz) and 15kHz (the standard ISO frequency is 16kHz). These modifications to the ISO 1/3-octave center frequencies provide compatibility with the key frequencies specified in the old FCC EPM tests. This provides a measure of comparison between data taken now and that taken in previous audio proof-of-performance tests.

If an automated audio test set is available, it is desirable to use swept frequency measurements. Automated systems provide the user with improved flexibility in conducting audio measurements and greater information on performance of the overall system.

Audio-processing considerations

Every station engineer and program director will have personal opinions as to what the optimum processor input level (and other settings) should be. The author is not so presumptuous as to suggest a set of compression figures that will suit different stations programming different formats. However, some thoughts about high compression ratios are in order.

If 0VU on the console is just at the threshold of limiting (under these conditions, 6dB to 10dB of compression will be indicated with program material), a 7.5kHz input signal will be compressed by nearly 12dB because of pre-emphasis. If the input level is increased 10dB, 22dB of compression will result. Most systems still should provide fairly low distortion at 22dB compression. At levels above this point, however, the signal will likely get into the safety clippers. The resulting distortion will not buy you additional loudness, but listener fatigue instead. In the case of audio processing, sometimes less is more.

It is an unhappy fact of life that audio processing of any type involves a trade-off between loudness and distortion. In general, you can trade one for the other. The current generation of audio processors makes the trade-offs slight and generally acceptable. However, each station should know the cost, if any, of its on-air "sound." The best way to gain this information is to conduct *before-and-after* measurements of all key audio parameters, with the processing switched in, then switched out.

The future

The future holds many exciting possibilities for radio broadcasters, including digital-based program source equipment, computer-controlled transmission gear and improved consumer receivers. If broadcasters are to hold their positions in the marketplace, they must move with the times. Those who fall behind will find that new technologies and more aggressive competitors have walked away with their audiences.

The broadcast industry is faced with unprecedented challenges from alternative programming sources and new technologies. Stations can compete with these services only by delivering to their audiences top-quality programs through top-quality transmission systems. Excellence in broadcast audio is an expensive and time-consuming enterprise, but it pays handsome dividends.

Bibliography

1. Ciapura, Dennis. "FM Fidelity: Is the Promise Lost?" (Part 1), **Broadcast Engineering** magazine, August 1984.

2. Ciapura, Dennis. "FM Fidelity: Is the Promise Lost?" (Part 2), **Broadcast Engineering** magazine, September 1984.

3. Instruction manual for the Audio Precision System One automated test system.

4. Instruction manual for the Orban Optimod 8100-A stereo generator.

Editor's note: The author wishes to thank the following individuals and companies for contributing equipment that made preparation of this report possible:

- Bob Metzler, Audio Precision
- Howard Mullinack, Orban Associates
- Jesse Maxenchs, TFT
- Steve Claterbaugh, Continental Electronics
- The staff of BrandsMart (a consumer audio-video outlet in Overland Park, KS)

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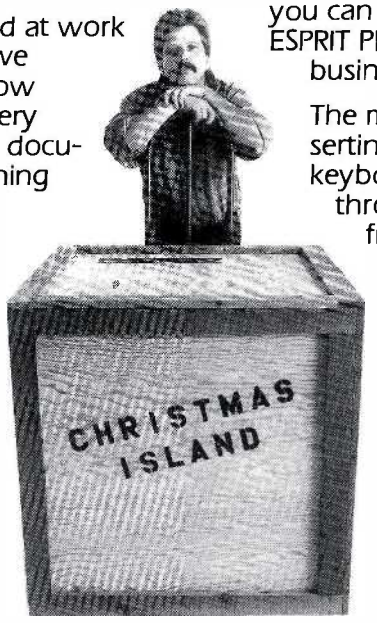

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Show replay

Denver show was a mile-high triumph

By Brad Dick,
radio technical editor

The move to Denver was a success. The SBE Convention and **Broadcast Engineering** Conference was relocated to Denver in an attempt to draw more West Coast attendees. The Colorado setting was a first for the SBE; its previous conventions had been held in St. Louis. Although the location was different, the tradition of high-quality seminars and a large number of exhibits continued.

The combination of exhibits and seminars attracted a total of 3,300 attendees, according to SBE officials. Convention show manager, Eddie Barker, said that 197 vendors occupied 340 booth spaces in the exhibition hall.

Outstanding seminars

The **Broadcast Engineering** seminars are known for their excellence, and the 1988 production was no exception. Organized once again by John Battison, the seminars provided three and one-half days of intensive instruction.

The Thursday opening session led off with new technology and applications for broadcast stations. Two speakers, Russell Brown and Tom Osenkowsky, reviewed how standard personal computers can be used effectively to solve engineering problems. Other new-technology papers were presented by Oral Evans, Control Concepts, and Harold Walker, Pegasus Data Systems.

The Thursday afternoon sessions addressed two important topics for career engineers: expanded broadcast services and engineering education. Michael Rau, NAB, reviewed the status of AM and FMX, two important radio topics. He also discussed current HDTV efforts in the United States.

A panel of experts in training and education assembled for the Thursday afternoon session. The highly attended session confirmed that broadcast engineers recognize the importance of proper training. One of the key issues discussed was the number of schools that offer broadcast electronics training. (A complete list of SBE-certified schools appears on page 30 of the December issue.)

High-tech video was the main topic of the Friday morning sessions. Curtis Chan, Centro Corporation, reviewed the proper integration of these new digital video-recording formats into video and TV production studios. If you are planning to install D-1 or D-2 recorders, you might find it helpful to obtain a copy of Chan's paper. It is available in the SBE "Proceedings."

Following the theme of new video technology, James Carnes, Sarnoff Research Center, discussed his company's proposed implementation of advanced compatible television (ACTV). Numerous questions from the audience caused the session to last longer than expected. It was obvious that broadcast engineers are very concerned about the HDTV issue.

Those who had planned to attend Geoffrey Mendenhall's presentation on measuring synchronous AM noise in TV transmitters were disappointed. Because of bad weather and canceled airline flights, Mendenhall was unable to make it to the convention. However, his paper, complete with graphics, is contained in the "Proceedings."

Radio topics

Radio engineering was not forgotten, as the Saturday sessions verified. Consulting engineer Ralph Evans discussed the hot topic of directional FM antennas. He avoided the political controversy surrounding the issue and reviewed how these antennas are designed and how they can be implemented effectively. Evans acknowledged that the use of such antennas is complex. However, with careful planning and FCC permission, he said, they may be a good choice for many stations.

If you've ever wondered what a broadcast signal looks like, you should have attended the presentation by Ron Nott, Cortana Corporation, who reviewed the scientific literature on RF radiation and transmission. Although it covered a complex and somewhat theoretical subject, Nott's presentation helped the attendees obtain a better understanding of signal propagation and how it is affected by transmission towers.

Engineers seem to be especially interested when an FCC engineer is scheduled to appear on a technical panel. Appearing before a filled room, FCC engineers Bob Greenberg and John Sadler fielded questions from the attendees. Their no-holds-barred approach was appreciated by engineers, as evidenced by the number of tough questions put to the panel.

Evening sessions

This year's evening sessions were moderated by Don Borchert, WHA-TV, Madison, WI. The Thursday evening session centered on audio processing. Panel members—Bill Ammons, CRL; Andy Laird, KDAY-AM, Santa Monica, CA; and Dane Ericksen, Hammett & Edison—led the charge for NRSC implementation.

Panelists reviewed the current problems with adjacent and second-adjacent interference. Through several enlightening visuals, the attendees soon learned how NRSC processing could benefit their stations. Laird showed, through spectrum analyzer photographs, the advantages he obtained by implementing NRSC. After the presentations, the panelists took questions from the audience. As usual, questions on audio processing for AM signals were the most common.

The Friday evening session addressed engineering management topics. Panelists Harry Martin, Marvin Born and Brad Dick discussed project management techniques, engineering salaries and FCC issues. Questions ranging from the subject of FCC matters to employee discrimination were answered by the panel. The session was forced to conclude when the convention hall employees turned off the lights.

The final night-owl evening session was held on Saturday. The topic, "Care and Feeding of Directional Antennas," was presented before the lightest attendance of the three evening sessions. Nevertheless, the panel and audience produced a lively debate on the maintenance of directional antennas. The related issue of FCC requirements and licenses also received close attention.

National meeting

One of the convention highlights for SBE officials was the national meeting. At-

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tendance was the highest on record, with more than 200 members present. President Jack McKain announced the results of the recent officer election. The 1988-89 officers and board members are listed in Table 1.

The exhibition hall opened on Thursday evening for a reception for attendees and exhibitors.

As more and more non-broadcast engineers attend the show, cameras and other pieces of video equipment are becoming a larger part of the exhibition.

Several companies highlighted new product introductions at the convention.

President: Jack McCain
Vice President: Bob Van Buhler
Secretary: Richard Farquhar
Treasurer: Bill Harris

Board Members:

Jeff Baker
Steve Brown
Bob Goza
Mary Beth Leidman
Joe Manning
Ed Roos

Table 1. *Recently elected SBE officers and board members. All officers serve for one year; board members serve for three years.*

SBE fellowships were presented to Richard Rudman, past president, and Jerry Whitaker, editorial director of **Broadcast Engineering** and **Video Systems** magazines. The yearly chapter awards also were announced. These awards, listed in Table 2, will be presented by officers at the local chapter meetings.

The 1988 convention brought several "firsts." The convention was held outside St. Louis, a convention daily newspaper was printed on-site and the exhibition was organized by Eddie Barker Associates. These factors helped to improve the convention for the attendees as well as the exhibitors.

Two technical achievements for the convention should be mentioned. A synchronous stereo AM broadcast system was operated daily throughout the exhibition hall. Through the use of low-power AM transmitters and a microwave interconnection system, the exhibit hall was filled with AM stereo.

The second technical coup was accomplished by Denver's Chapter 48, which unveiled an educational tape in the registration area. The 18-minute presentation discussed tower collapse, nonionizing radiation interference and other tower concerns. It will be of special interest to stations facing unsympathetic

city, county and state officials. The VHS tape, which puts to rest several misconceptions about tower safety, is available from Chapter 48, International Map Service, 85 South Union Blvd., Suite D2, Lakewood, CO 80228.

For those who weren't able to attend the convention, two items are available to help fill in the gaps. Copies of the seminar audiotapes are available from Audio Archives International, 3043 Foothill Blvd., Suite 2, La Crescenta, CA, 818-957-0874.

The SBE "Proceedings" contain most of the presentations made at the convention. Even if you attended the convention, you'll want a copy of the "Proceedings." Each of the papers included contains the graphs and charts used by the speakers. Copies are available from the national office for $20. If you would like to pay by MasterCard or Visa, you may telephone your order to the national office at 317-842-0836.

A silver event

This year's convention, slated for Kansas City, MO, promises to be exciting. Because the 1989 show marks the SBE's 25th anniversary, several special events are scheduled. Mark your calendar for Oct.5-8, and plan to attend what's shaping up to be a bigger show with more sessions—and a few surprises.

The show drew many first-time exhibitors. Vendors expressed satisfaction with attendee response, and more than 50% of the booth space for the 1989 exhibition was sold before the show closed.

- **Best Local Chapter:** Chapter 28, Milwaukee, and Chapter 16, Seattle (tie)
- **Best Regional Convention or Conference:** Chapter 16, Seattle
- **Best Chapter Frequency Coordination:** Chapter 28, Milwaukee
- **Best Liaison Between Local Chapter and National Office:** Chapter 47, Los Angeles
- **Local Chapter With Highest Member Attendance Ratio:** Chapter 94, High Plains, KS
- **Local Chapter With the Most Certified Members:** Chapter 50, Fort Collins, CO
- **Chapter With Greatest Growth in New Members:** Chapter 79, Central Texas
- **Best Chapter Newsletter Editor:** John Forbes, Chapter 16, Seattle

Table 2. *These chapter awards were announced at the annual meeting and will be presented by society officials at local chapter meetings.*

Network unveils an HDTV surprise

By Rick Lehtinen,
TV technical editor

The 1988 fall Society of Motion Picture and Television Engineers (SMPTE) Technical Conference and Equipment Exhibit, that annual extravaganza featuring everything electronic and cinemagraphic, took place once again in New York, in October. The Jacob Javits Convention Center housed the event, which featured record numbers of technical papers, several technical demonstrations and the equipment displays of 186 companies, which took up 71,750 feet of exhibition floor space.

HDTV news

One of the big shockers at the show was NBC's announcement that it has developed, and has submitted to SMPTE, a 1,050-line, 59.94Hz HDTV system. ABC immediately announced full support for the standard, and a number of other industry figures rapidly jumped on the bandwagon. NBC apparently made the introduction in light of European enthusiasm for the Eureka standard, which is 1250/50. Because acceptance of such a standard in Europe would forestall worldwide embrace of the 1125/60 system, the NBC system could emerge as an acceptable HDTV system that is readily transcodable to NTSC's 525/59.94.

Transmission technology

Several new sparks glowed in the transmission technology arena. One was shown by HRS Systems, a California-based company. The HRS premise is simple: In each NTSC line are 227.5 subcarrier cycles. By raising the horizontal frequency 0.2%, this can be changed to an even 227. This attenuates the chroma dot crawl that works its way up the screen at the edges of brightly colored images. The system also attenuates the artifacts that occur when luminance information in detailed patterns is interpreted as chroma. The conversion takes place in a device resembling a TBC. It takes nearly seven minutes for the discrepancy in line rates to result in the dropping of one frame.

Of course, such tampering with line rates is not yet FCC-approved, but HRS officials point out that the modified frequency is well within the tolerance range of TV sets and VCRs. There is nothing to prevent the operation of such a system on cable, however, and the demonstration by HRS included both live camera demonstrations and "off-air" (off-cable) reception of a major cable network that uses the technology.

Another transmission system that raised some eyebrows was not shown on the floor, but in a suite at the Marriott Marquis. Production Services, Tucson, AZ, showed its Genesys Technology in conjunction with Larcan Transmitters.

Although it has appeared in the press as such, Genesys is not an HDTV system per se. Actually, it is an NTSC-compatible technique capable of superimposing extra information on a traditional NTSC channel.

Through the Genesys system, an "inflection," or small bump, is placed on the leading and trailing slopes of each cycle of color subcarrier in a TV signal. The amplitude and position of the inflection represent digital bits of information. A data-compression scheme allows these bits to carry large amounts of information. (The relationship among bits is not binary.) Genesys promoters claim the system has the capacity to encode an entire full-bandwidth HDTV (30MHz) signal, several (perhaps four) NTSC signals, or any of the proposed HDTV transmission systems into an existing NTSC signal, *without disturbing the original NTSC picture.*

As demonstrated, the system passed a 3MHz video signal riding on a test pattern through a standard TV modulator operating on channel 5. A standard TV decoder recovered both the test signal and the piggybacked signal. A spectrum analyzer fed from a tap on the modulator showed no out-of-band harmonics. Presumably, Genesys would allow any of the HDTV systems using a 3MHz augmentation channel (such as the NYIT system proposed by William Glenn) to begin operation immediately.

Other new products

Whether it's breathtakingly revolutionary or a solid refinement of existing technology, any new product shown at a major convention such as SMPTE deserves a proper introduction. Starting in December 1988, **BE** began providing information about SMPTE introductions in our popular "New Products" section. We invite you to turn to this section to learn more about these and other new products.

On the floor

Products, products everywhere, but not much new to see. Instead of being a breakthrough year, this seemed to be a year of refinement. With a few exceptions, manufacturers generally showed products that had been better tailored to the demands of broadcasters.

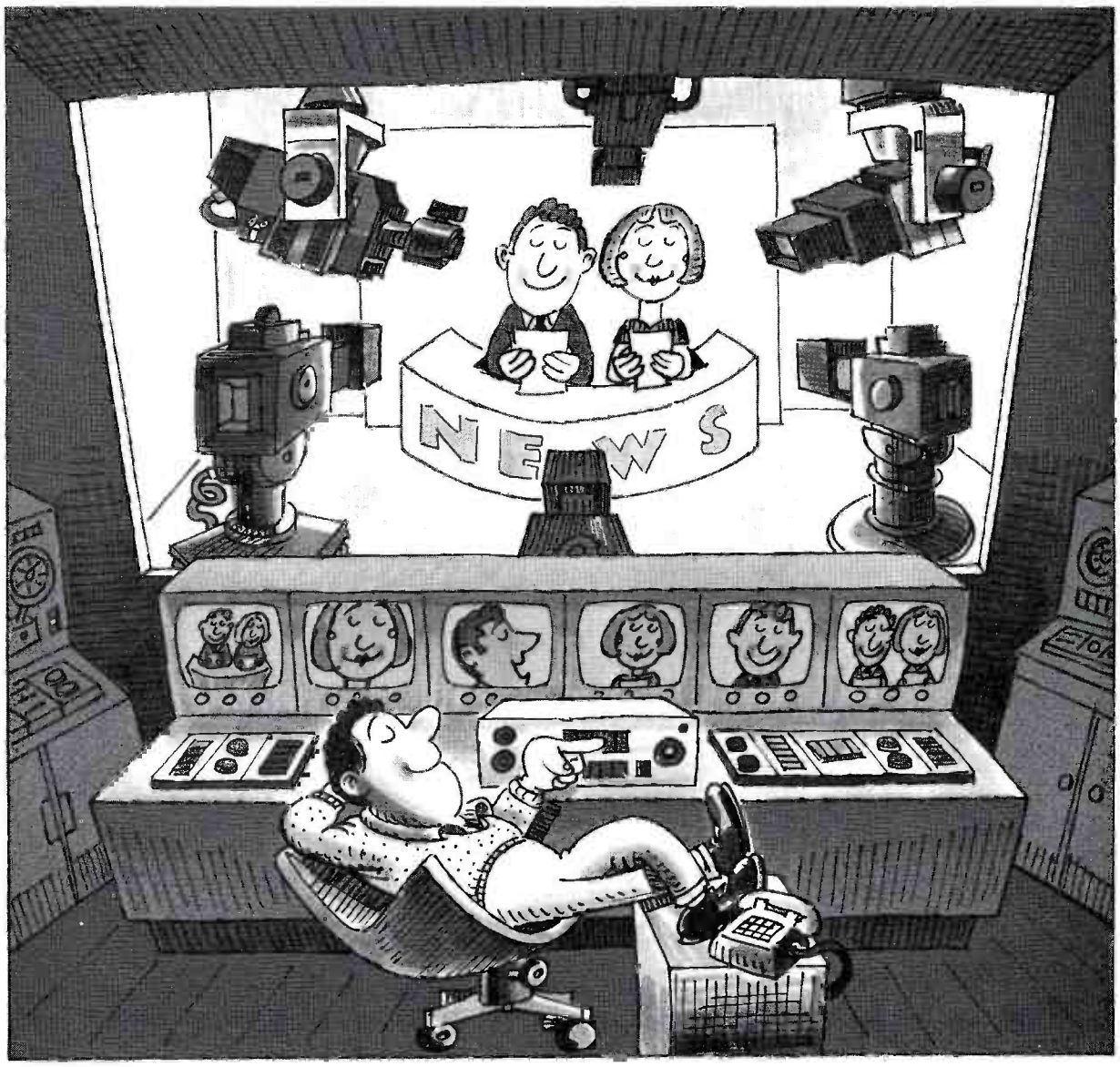
Among the exceptions, Panasonic Broadcast Systems brought out a prototype of its new ½-inch component digital VTR. Some have nicknamed the product "D-3," although society officials have unequivocally stated that *SMPTE*—no one else—hands out the format designations. The system is targeted at being portable, but the prototype comes with a rackful of hardware that Panasonic says will soon be taken down into IC form.

Encoders, encoders

In the wake of recent FCC announcements that any HDTV service must retain compatibility with existing 6MHz NTSC services, a number of manufacturers have moved to clean up NTSC's act. A place to start is the encoder, and several manufacturers displayed improved encoding technology at SMPTE. Among them were Faroudja Labs, Central Dynamics and Digital F/X.

Demonstrations

Two working groups brought the fruits of their labors to SMPTE. One was the working group on professional/studio picture monitor systems. In an informative



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45-minute demonstration, presenters showed that it was indeed possible to set up monitors from different manufacturers to look the same. The keys were explained to be, first, the environment in which the monitors are viewed (even, gray background with specific amounts of backlight) and, second, the use of an electronic setup device to accurately set color temperature.

A laserdisc, which includes special monitor setup test patterns not readily available, has been produced to explain monitor setup procedure and to guide technicians through it. The project was produced on laserdisc because it is the only medium that can pause indefinitely on a test pattern (allowing time for an adjustment to be made).

Some are fearful of using a reproduction device as a signal generator. After all, how can you be sure that the output levels are correct? The ingenious answer is to record some extra test signals for setting up the disk player, then record pictures of what a waveform monitor and vectorscope should display when the disk player is playing those signals back properly.

A demonstration by the SMPTE New Television Technology Committee showed the technology needed to convert from HDTV at 60 fields per second to HDTV at 59.94Hz, the frequency required by NTSC. Prototype hardware was on display.

Awards

An important part of each year's SMPTE is the awards presentation. The Progress Medal, the society's premier award, went to Dr. Kerns H. Powers. Throughout his 40-year career, Powers contributed to the development of practical color TV systems and TV signal-processing techniques. He was part of the RCA team that pioneered color television and ultimately produced the NTSC color TV system.

Honorary membership, the society's highest grade of membership and greatest distinction, was granted to Stefan Kudelski, Kudelski, S.A.; and Kenjiro Takayanagi, Victor Company of Japan (JVC). Kudelski developed the lightweight Nagra recorder and crystal-controlled camera driver, which made possible high-quality sound recording on location. Takayanagi, named the "father of Japanese television," made his first TV transmission in 1926. He has devoted his life to television and holds more than 200 patents.

William E. and Karen G. Glenn were the recipients of the 1987 Journal Award. This prestigious honor is bestowed upon the authors of the most outstanding papers in the "SMPTE Journal" the previous year, one award for a motion-picture paper and one for a television paper. The TV award was given for "HDTV-Compatible Transmission," published in March 1987.

New Fellows

This year, the society awarded 14 fellowships to worthy individuals. A Fellow of SMPTE must be at least 30 years old and must have attained, through proficiency and contributions, an outstanding rank among engineers or executives of the motion-picture, television or related industries.

Cab 54, where were you?

Attendance at the show was 15,500, off a little from the 17,000 or so officials had hoped to see. But this is easily explained. The rest of the attendees were either trying to find the shuttle bus or hail a cab. For some reason, the normally bustling lanes in front of the convention hall were tranquil. The only sounds to be heard were the voices of "gypsies" hawking trips in their limousines at somewhat inflated prices. Those truly dedicated to finding a taxi had to take a 2-block walk up to a busier road. |:-)))|

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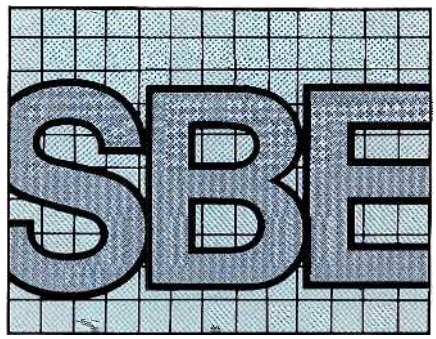

Express your view on licensing issue

By Bob Van Buhler

The national office has received many comments concerning state licensing of broadcast engineers from grandfathered senior broadcast engineers and licensed professional engineers. Those expressing opinions have been thoughtful and articulate. This issue centers on defining the work of the broadcast engineer to the satisfaction of state regulatory agencies.

Licensing opinions

Gus Roundtree, P.E., from the Austin, TX, chapter thinks that October's "SBE Update" contained some "misstatements and misunderstandings" regarding the issue. Roundtree says that Texas "...has not the slightest bit of interest in licensing a person doing the actual work of installing, operating, repairing or servicing...mechanical and electrical, electronic or communications equipment or apparatus." The issue, he says, focuses on the representation to the public of an individual engaged in this work as an *engineer.*

According to Roundtree, referring to a non-state-licensed individual as an engineer "within the organization for which he or she works" is permitted. However, it is not permissible for these individuals to represent themselves to the general public as qualified to perform engineering services.

This raises the question of how Texas and other states might interpret the legality of soliciting work as an engineering contractor. Would solicitation of new business within the industry, but outside the organization for which the person works, run counter to the edicts of the state licensing boards?

William B. Martin, certified senior broadcast engineer from Osage Beach, MO, responded that if the FCC allows individual states to control federally regulated practices and policies within the broadcast industry, "the result would be an extremely chaotic and somewhat confusing series of conflicting laws." Martin thinks that state licensing of broadcast engineers may be a backdoor attempt to control the industry. He also views the attempt at state-licensing as another way for state governments to generate additional revenue. Martin urges an aggressive stance by the SBE on this matter.

F.L. Pierce of WMBW-FM, Chattanooga, TN, writes to say that widespread success in state licensing of broadcast engineers could be damaging to the SBE certification program. Pierce said even if some accommodation were made, the jobs would survive, albeit without the title of broadcast engineer.

Professional engineer

Board member Dane Erickson, in response to Roundtree's letter, expressed his concern about the use of the term *professional broadcast engineer* in its highest level of certification. The title is similar to that of professional engineer, the term used in many state-licensed programs. Erickson suggests a disclaimer be affixed to the certification to clarify that it does not purport to certify the person as a professional engineer.

Erickson points out that the term engineer is used in many other industries and organizations including Society of Cable Television Engineers, National Association of Radio and Telecommunications Engineers, Society of Motion Picture and Television Engineers, Operating Engineers Union (heavy equipment), and the Marine Engineers Union (a subsidiary of the National Maritime Union).

The issue may come down to refined descriptions of the permitted duties and practices of the TV or radio station engineer. Many of the proposed rules call for states to allow operation, installation and maintenance of broadcast equipment. But several questions remain. Will state regulatory agencies use interpretations that allow the station engineer to design a point-to-point STL or microwave link? Will contract engineers be allowed to solicit their services freely to stations without full-time engineering staffs?

A serious question also exists as to whether contract engineers will be precluded in some states from representing themselves as consulting engineers. Some broadcast engineers think the term consulting engineer is far too loosely applied and should be restricted to PEs.

The next board of directors meeting will address the issue. If you have suggestions, send them to the national office. With proper guidance, the board may attempt to develop a policy statement and action plan at that meeting.

PCB projects warning

Members thinking about participating in joint PCB disposition projects may want to consult the station's attorney before doing so. Pooling your waste PCBs with those of another station may also pool your company's legal exposure in the event of improper disposition or accident. The EPA has indicated that liability for PCBs remains with the PCB owner, and it is not transferable to others to whom the devices are sold or consigned.

The great fear of most corporations is the so-called deep pockets method of legal pursuit. Often in these cases, everyone — even those only loosely involved in a liability issue — is sued rather than just those directly culpable. This occurs, in part, because of the perception that peripherally involved parties are more able to pay.

Legal advice fees concerning participation in such projects may be small when compared with costs that could be incurred by an accident. Industry sources indicate that it is not uncommon for attorney fees for dealing with EPA violations to run as high as $30,000 to $40,000.

Frequency coordinator list

The October issue contained a list of the national SBE frequency coordinators. The list, incorporated in the article, "Planning an STL System," appeared on pages 136 and 138. Any changes to the list should be communicated to the national office as soon as possible. Provide the area contact person's name, address and phone number. Send the changes by letter to Frequency Coordination List, SBE, P.O. Box 20450, Indianapolis, IN 46220. The coordinator list will be updated regularly, posted on CompuServe and disseminated to industry contacts needing the information. Copies of updates also will be mailed to other frequency coordinators.

Van Buhler is chief engineer for WBAL-AM and WIYY-FM, Baltimore.

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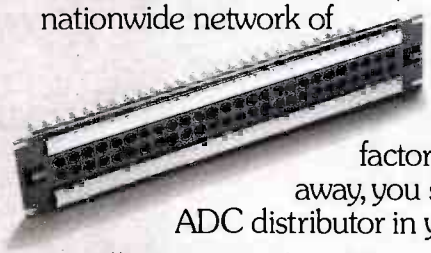

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Updating the VOA

By James Wood

You've probably heard of the Voice of America (VOA), but do you know how large and widespread the agency's work really is? Following an upgrade of its Washington, DC, facilities, the VOA is now turning its attention to the RF portion of the international network. Last summer, the United States Information Agency awarded a contract for several high-power transmitters for the VOA.

Modernization plan

The VOA's modernization program has not been an overnight project. The agency has been forced to use obsolete equipment for many years. Only recently has adequate federal funding become available for renovation. Although it may appear that the modernization plan was started in 1984, it really began much earlier.

The agency actually began planning more than 10 years ago to update its transmitter network. The VOA is not a covert broadcasting authority. Information and technical data on its worldwide transmitter and relay network is readily available. This information shows that many of the VOA's short-wave and medium-wave transmitters are more than 35 years old. Only 18% of the agency's transmitters could be classified as modern—that is, built within the past 15 years.

Several factors contributed to the urgency in modernizing the VOA's equipment. A major factor was the increased congestion on the short-wave bands, which severely reduces the signal's audibility at distant points. Another serious problem in short-wave reception was the unprecedented growth of manmade radio noise. Some of this radio noise is produced by the thousands of radio transmitters in service around the world. The white noise and harmonics radiating from these transmitters combine to further congest the airwaves.

New-technology transmitters

When the VOA decided to replace many of its old transmitters, it quickly became obvious that the agency was not equipped for adequate evaluation of the new-technology equipment. To prepare properly for the bidding process, the VOA purchased one transmitter from each of four manufacturers.

Purchasing four different transmitters afforded the VOA several advantages. The technical staff could become familiar with the installation, operation and maintenance of each type of transmitter. The VOA staff could compare manufacturers' specifications and claims with the actual performance of the transmitters in everyday use. Also, the experience allowed the staff to devise realistic installation timetables for the construction project. More important, as a result of the information learned, the agency was able to develop effective bid specifications for the remaining transmitters.

Selection process

The selection process required a detailed technical analysis of the competing transmitters in six areas: performance, operability, maintainability, safety, training/support and price. Each of these areas contained up to 16 subcategories for evaluation. In the final selection process, price carried twice the evaluation weight of the five technical parameters.

The initial phase of the project called for the construction and installation of 10 transmitters in Morocco. This site proved to be particularly difficult because of local water conditions. The high-water area required that the RF be carried in coax all the way from the transmitter to the antennas. Building the earthen berms to carry the coax required moving more than two million cubic feet of earth.

The RF package includes transmitters, RF switching bays, dummy loads and coax. The initial project costs have totaled to $56 million. If all options within the contract are selected, the cost of the entire project may exceed $150 million.

Multiyear contract

The first phase of the contract includes options for three additional RF systems. These new stations will be located in Thailand, Botswana and Sri Lanka. The contract provides for the future manufacture of 22 transmitters and related equipment. The total number of transmitters that could be built as a part of the entire contract is 32 (30 short-wave and two medium-wave). The purchase of these transmitters depends on federal appropriations in future years.

The contract was awarded to Marconi, which will rely on its U.S. subsidiary, Cincinnati Electric, for much of the transmitter construction. The arrangement provides a U.S. parts and labor content of approximately 70%.

The VOA contract eventually may produce benefits for American broadcasters. A large order such as this stimulates research and development, which later may be reflected in new, lower-powered designs. Although you may not need a new 500kW transmitter, the technology developed through this project may show up in your next AM transmitter.

Wood is a consulting engineer and journalist in the United Kingdom.

References

"Broadcasting the Voice of America." *International Broadcasting*, IBSO Publications, July/August 1987.

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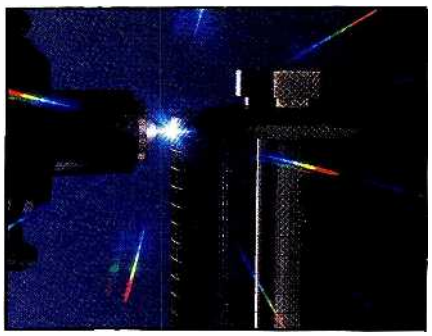
Doubly truncated waveguide

By Dr. Oded Ben-Dov
and Cole Plummer



When hollow circular waveguide was introduced to the broadcast industry seven years ago, its early promises were enticing: The theoretical efficiency of hollow circular waveguide exceeded the rectangular waveguide by approximately 3% for 1,000 feet (WC1500 vs. WR1500, channels 39 to 55).

Moreover, the windload for the circular shape was less than 33% of that for rectangular waveguide of the same maximum dimension. Lower windload would lower tower costs, and higher efficiency would lower the electricity bill. The expectations for circular waveguide, however, may have been based on simplified theoretical analysis, made without the benefit of field experience.

Performance issues

The lower windload of the circular guide was never in question. But issues relating to its electrical performance may not have been aired properly. The field reports from early installations were rather disturbing: high VSWR and ghosting during variable weather conditions. At that time, open discussions of the symptoms pointed to improper installation as the cause. Later discussions, however, targeted the fundamental problems of the hollow guide itself.

In 1982, when Dielectric was still part of RCA, the authors began a joint research program with the Princeton Labs. Completed in 1985, the program focused entirely on the inherent problems of hollow circular guide rather than on problems resulting from improper installation.

It became clear that (1) a somewhat different cross-section guide was desirable; and, (2) the published efficiency (or loss) of the hollow circular guide was optimistic. The effect of the latter is an ERP that is lower than expected or allowable.

High Q

The problem is that the hollow circular guide works as a high-Q resonant cavity for some energy and as a transmission medium for the rest. It is important to recognize that the energy that is sucked into the cavity formed by the guide will appear as multiple ghosts and high VSWR if not disposed of.

Ben-Dov and Plummer are with Dielectric Communications, a unit of General Signal, Raymond, ME.

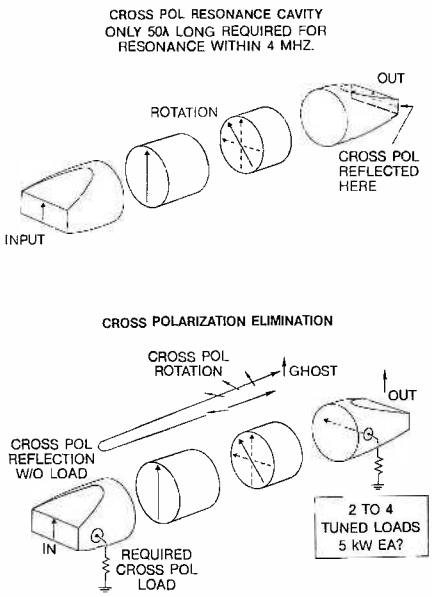


Figure 1. *Cross-polarization energy (depicted at top) sometimes becomes trapped in hollow circular waveguide, causing high VSWR and ghosting. Energy becomes trapped when it cannot exit from the end of guide because it has rotated in polarity, and it "bounces" off the transition points. Trapped energy (shown at bottom) eventually may rotate to a point at which it can exit, but time delays from extra bounces render it a "ghost." Loads are installed at feedline top and bottom to "drain out" cross-polarization energy.*

The polarization in the guide meanders and rotates as it propagates from the transmitter to the antenna. The end pieces of the guide, in this case, circular to rectangular transitions, are polarization-sensitive. See the top portion of Figure 1.

If the polarization of the incidental energy is not matched to the transition, energy will be reflected. If the energy bounces again at the bottom of the guide and has shifted further in polarity by the time it again reaches the antenna, it could end up being radiated, but it will be time-delayed with respect to the energy emitted on the first try. The result is ghosting.

Several factors can generate this undesirable polarization. One cause is out-of-round guides that result from standard manufacturing tolerances. In Figure 2, the solid lines depict the situation at launching—perfectly circular guide with perpendicular polarization. The dashed lines show how certain ellipticities cause polarization rotation into unwanted states, while others have no effect. Accurate calculations show that a 0.2% change in diameter produces −40dB cross-polarization component per wavelength. This is roughly 0.03-inches in 18 inches of guide length. The typical guide is many wavelengths long so that the cross-polarization component can grow to a significant level.

Out-of-round deformation of the circular guide is not the sole source of cross-polarization. Other sources of cross-polarization include twisted and bent guides, out-of-roundness, offset flanges and transitions. It is difficult to measure accurately the total cross-polarization from all sources of any installation. Clearly, the cross-polarization component exists in hollow guide installations regardless of manufacturer, and it must be disposed of properly.

Various methods are used to dispose of this energy trapped in the cavity. In some cases, an auxiliary antenna is installed at the tower top, and absorbing loads are placed at the ground level. In other installations, tuned absorbing loads are placed only at the tower top (none at the ground level). Although the authors' information about these loads may be incomplete, the tower-top absorbing load appears to be made with two to four individually tuned loads of 4kW capacity each.

To eliminate unwanted cross-polarization, absorbing loads are required at both ends of the guide, as shown in the bottom portion of Figure 1. Tuned loads at the tower top contribute to low system VSWR. The addition of a tuned load at the ground level enhances picture quality and system VSWR.

Efficiency questions

The expected efficiency of circular guides warrants close attention. Some engineers say the original efficiency tables

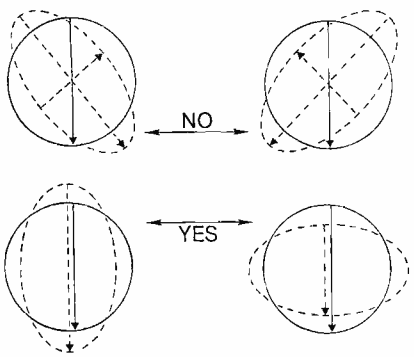
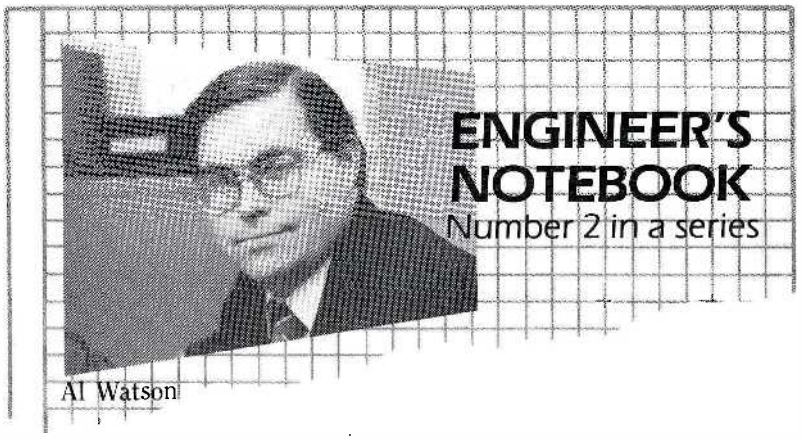


Figure 2. *One cause of cross-polarization in hollow circular waveguide is a slight change in the shape of the guide, caused by manufacturing and installation tolerances. Solid lines show desired states, and dashed lines show effects of various deformations, some of which can cause cross-polarization.*

still apply because they have measured data. Others say the losses are small and intermittent. The methods traditionally used to report the efficiency of hollow circular waveguide, however, may not take some important factors into consideration.

True efficiency of the hollow circular guide must account for the disposed cross-polarization energy. It doesn't matter if useful energy is lost because of the guide wall conductivity, or because some energy is dumped into loads at the guide input and output ports. Also, the hollow circular guide requires *mode filters* at both ends of the guide, in addition to the loads. The insertion loss of these is not zero; it must be included in efficiency calculations.

Engineers can approximate the actual efficiency by temporarily removing all loads and observing the change in VSWR of the wanted polarization. Analysis of the relationship between VSWR and losses is simple. For example, if the VSWR on a 1,000-foot run rises to 1.5, the efficiency must be further derated by 2%. This value is probably on the low side. One manufacturer's patent application estimates 8.8kW in a 220kW installation, meaning that 4%



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By Alan Watson, Director of Engineering
Electro-Voice, Inc.

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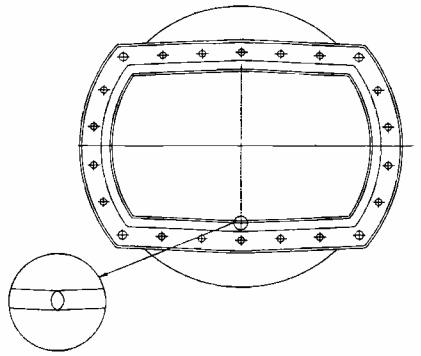


Figure 3. *Doubly truncated waveguide features elliptical waveguide (which does not support cross-polarization), housed in a circular sheath. The ridge formed by the weldline (circle) adds rigidity to guide.*

of the launched power is converted to cross-polarization, then dumped.

Doubly truncated waveguide

One solution to the circular waveguide problems seen by the authors is *doubly truncated waveguide* (DTW), an almost elliptical guide inside a circular shell. (See Figure 3.) This guide does not support cross-polarization, so there is no need for tuners, absorbing loads or other hardware. The low windload of hollow circular guide is maintained, except for the flange area.

Each length of waveguide is actually two separate pieces: a doubly truncated center section and a circular outer skin, joined at the flanges on each end. The doubly truncated center section is assembled from two "deep drawn" halves welded in the center of each broadwall. The "peak" in the center of each narrow wall provides mechanical stiffness and dimensional stability. An 1100-H18 aluminum alloy is used for this section because of its high conductivity and resulting lower insertion loss. The four corners then are welded in an automatic MIG process. The circular outer skin is made of rolled and welded 6061-T6 aluminum alloy for strength.

The flange joint provides RF contacts and a transition from the circular outer skin to the DTW inside shape. The flanges are permanent mold 356-T6 aluminum,

and are relieved in the area of the seal and bolts so that the flanges contact only on the DTW tube and on the outer periphery of the flange. Once the assembly is welded, the flanges are faced flat on a horizontal boring mill.

A large hole in the broadwall serves to pressurize the circular outer skin. Equal pressure inside the DTW and inside the circular skin ensures that the DTW will not "breathe" or buckle with VSWR changes caused by rapidly changing weather.

The measured efficiencies for a 1,000-foot run of DTW (available in 13.5-, 14.5- and 15-inch diameters) are 5% to 15% higher than for the correspondingly usable coax lines. Efficiencies vary from 86% to 91% for channels 39 to 55. DTW can be used at lower channels, down to channel 27, with somewhat lower efficiency. The 13.5-inch guide can be used down to channel 42.

A windload comparison of DTW, rectangular and circular waveguide shows that DTW is less than 3% higher than circular (because of the transition section at the flange joints) and 32% less than the comparable rectangular waveguide.

Installing DTW is similar to installing rectangular, as shown in Figure 4. With the exception of the rectangular "E" plan sweep at the bottom of the vertical run, the DTW cross-section is used in both the horizontal and the vertical runs. The transition from rectangular to DTW on either end of the elbow happens solely in the flanges. Constant-force hangers provide lateral support and have large sliding contact points.

Trial run

To test the DTW concept, a 720-foot run was built. The waveguide was bolted together in a continuous horizontal run, without tuner sections, and was checked for VSWR and insertion loss using an 8753 Hewlett-Packard network analyzer. The insertion loss checked out reasonably close to predictions, and the measured VSWR from channels 27 to 55 was less than 1.06. Figure 5 shows actual return loss measurements for channels 38 to 42. When the length of the section consists of an even number of ¼-wavelengths, addition of the flanges is necessary. As with rectangular

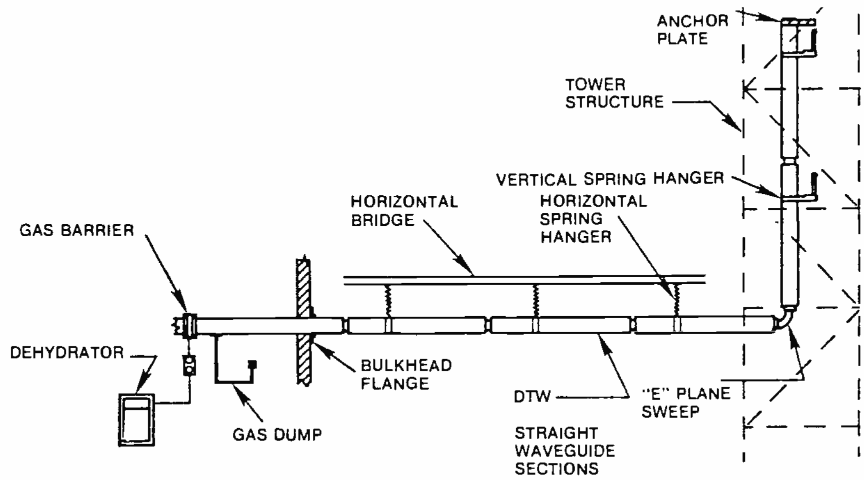


Figure 4. *A typical DTW installation. Note that the special flange sections and "E" plane sweep result in only slightly increased windloading with respect to hollow circular guide.*

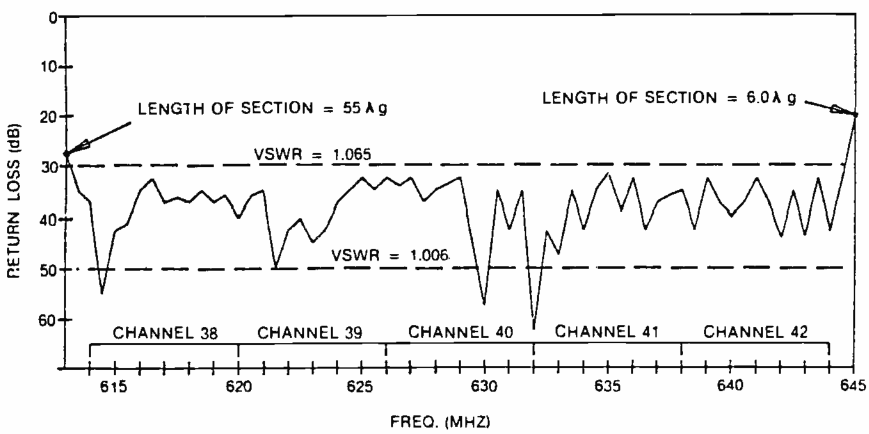


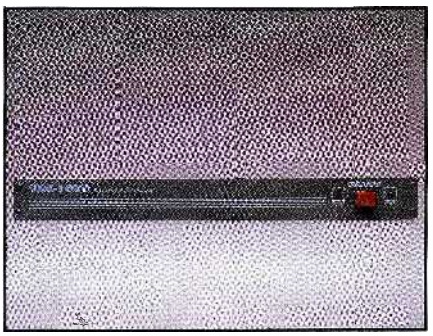
Figure 5. *Plot of return loss vs. frequency on 720-foot test section. DTW will be available in 11.5- and 12-foot lengths to avoid problem of "flange add-up" at even, ¼-wave multiples.*

waveguide, doubly truncated waveguide will be offered in both 11.5-foot and 12-foot lengths to avoid flange add-up.

DTW waveguide offers the broadcaster a viable alternative to both rectangular and circular waveguide.

Gentner VRC-1000 remote control

By Gary Schmidt
and Jack Spiess



When our company was contracted to build WIXI-FM, Naples Park, FL, we faced a critical decision when it came to the transmitter remote control. Because the station would be operating largely unattended, the remote-control requirements would be different from those of many other stations. The station's programming would be delivered via satellite, with local inserts triggered by the network, so the station could operate without an announcer on nights and weekends. After careful review of the remote-control equipment marketplace, we selected a Gentner VRC-1000.

System features

The remote-control system is a different approach to transmitter control than that used in many broadcast stations. Instead of using a 2-part, transmitter-studio device, the remote-control system relies on a single unit located at the transmitter site. The unit has none of the conventional operating controls and does not rely on meters or digital readouts of any kind. Telemetry is provided through voice-sensitized readings.

The device provides two methods of control. One way is the use of an internal modem through which the unit can be controlled via any IBM-compatible PC. Alternately, a non-computing video display terminal with keyboard and modem also can be used.

The device also can be accessed and control/telemetry functions can be activated via standard dual-tone multiple-frequency (DTMF) telephones. It was this feature that convinced us to use this remote-control system.

The return data is provided in synthesized voice form by a National Semiconductor MM54104 digital talker. The synthesized voice provides meter readings, status indications and even setup instructions. Its 800-word vocabulary is sufficient to convey just about any transmitter information a station would need.

For unattended single-transmitter operation, the advantages of this type of control scheme are obvious. The transmitter can be accessed from any standard DTMF telephone, even a cellular one. Once the security code is presented properly, the telephone can be used to perform any transmitter-site adjustment that would normally be done from the studio location. In this installation, this feature was especially important because of the amount of time the station would be running unattended. This approach also avoids the cost of dedicated phone lines, which are typically required for remote-control purposes.

Security provisions

To prevent unauthorized access in either DTMF or computer-control modes, a user-determined 5-digit code must be entered within 10s after the unit comes on-line. To change the system's setup parameters, a 7-digit code must be entered within 10s after the parameter change command is given.

Another concern with either computer or tone/voice control is loss of the phone

Gary Schmidt and Jack Spiess are principals of RF Engineering, a broadcast systems design and implementation company in Naples, FL.

Performance at a glance

- *Provides remote control of any TV or radio broadcast transmitter and its associated systems via conventional phone lines and DTMF telephones.*
- *Unit also can be controlled by a video terminal or IBM-compatible computer and printer via optional modem and software.*
- *Uses a synthesized voice with an 800-word vocabulary to provide return metering and status reports.*
- *Can automatically initiate correctional commands to the transmitter when operating parameters fall outside preset tolerances.*
- *Can automatically call up to five telephone numbers to report out-of-tolerance conditions.*

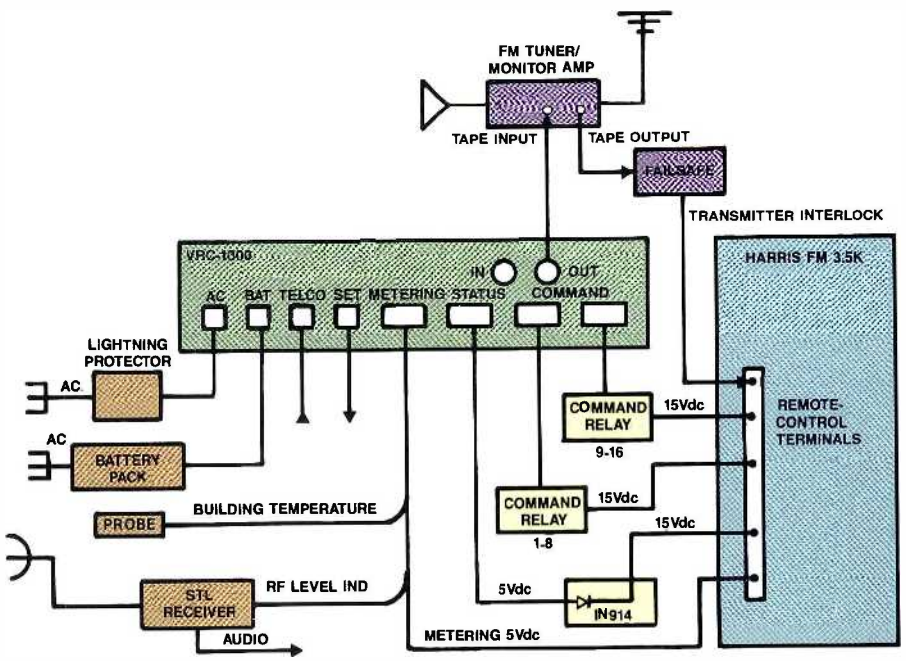


Figure 1. *A typical FM station remote-control interconnection scheme. This basic setup provides the needed control, metering and status features.*

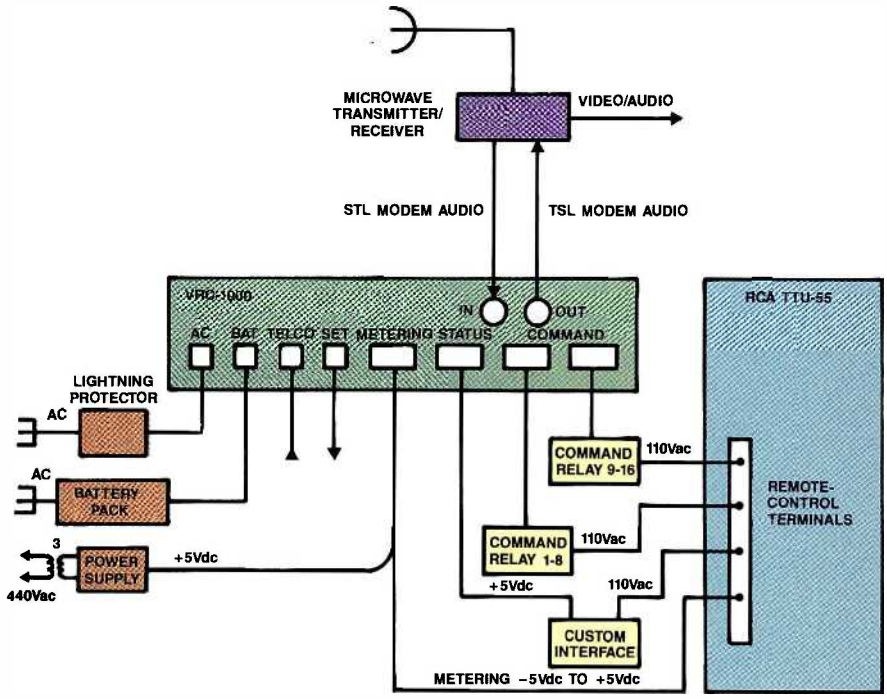


Figure 2. *A typical TV installation using both microwave and phone lines for communication between the transmitter and studio.*

line. One solution is to avoid phone lines entirely by using an STL subcarrier to send commands to the transmitter, and to use an SCA or STL channel for return telemetry. Although the device is capable of this option, WIXI elected to rely on phone-line control.

To conform with FCC Emergency Broadcast System (EBS) requirements, some form of positive carrier control beyond the phone line is necessary. A silent sensing unit is available from the manufacturer for this purpose. If the phone line fails for a period exceeding three hours (under current FCC rules), and no one is at the transmitter site, station personnel simply remove the program audio from the STL. After a 4-minute safety delay, the silence sensor commands the remote control to take the transmitter off the air.

In the event of any selected out-of-tolerance operating parameter or outright transmitter failure, the remote control can be programmed to alert station personnel instantly by calling up to five phone numbers. Once the call is answered, the synthesized voice informs the person about the particular problem at the transmitter site.

Installation

The station's 3.5kW FM transmitter is located in a small outbuilding at the foot of a tall TV tower near Bonita Springs, FL. The studio, located a few miles away in Naples Park, is linked to the transmitter site via an STL.

The installation of the remote control was fairly straightforward and uncomplicated. Figure 1 shows a block diagram of the necessary interconnections.

This installation required a relay interface panel to link the unit's open collector outputs to the transmitter's 15Vdc control system. Each interface panel provides eight control channels. Relay panels also were required to control auxiliary functions such as the STL and air-conditioning equipment.

Because of the frequency of power failures in southwest Florida during the summer, an optional battery backup system was installed with the system. Although the internal memory is protected by a lithium battery, the external battery provides full remote-control operation during a power outage. In this way, the VRC-1000 can, for instance, inform the operator that the reason for a transmitter failure is indeed a power outage at the site and not some other cause.

Setup

Once installed, the remote control must be configured properly. This is a process that takes a little getting used to. Digital codes are entered on the DTMF keypad to set up all metering, status and control functions. To make the job easier, the synthesized voice guides you along.

Sixteen input metering channels accept −5Vdc to +10Vdc. Sixteen status channels report on-off/high-low conditions. A total of 32 command channels initiate on-raise/off-lower commands. Each metering channel has a name, comprising two words, selected by a 6-digit code along with a "unit" designation. For example, it might be voltage or current, selected by another 6-digit code.

In this way, a metering channel might be set up to identify itself audibly as *plate voltage* or *plate current*. Similarly, status and command channels are set up using their own sets of identifiers. All identifier and unit words are part of the device's 800-word vocabulary.

In addition, each metering channel has four out-of-tolerance set points that can be used to trigger an alarm, activate a command channel (such as raise/lower power) or perform both functions. Out-of-tolerance alarm times can be configured from 1s to 9s. Status channels also can be set up to alarm and/or activate command channels.

The unit even can multiply the readings on two adjacent metering channels (such as plate voltage times plate current), multiply this value by an efficiency factor and report the result on a third channel—in this case, indirect power output. This feature provides a quick check on transmitter performance.

Command channels can be made either momentary (1/16-second to 16s) or latching, depending on need. In addition, 20 memory positions can activate any command channel via the built-in clock, which makes tower lighting control easy. Also, the unit can be set up to identify itself with up to 15 words when telephoned.

Calibration of the metering channels is accomplished with the keypad and the unit's voice output. The metering voltage representing a given parameter is entered. This value is then multiplied by a constant factor to obtain a 100% reading. For instance, with a metering input of 5V, a constant of 20 would be programmed into the system. This procedure is repeated for each metering channel.

Operation

With setup procedures completed, the unit is ready to be put on-line. To better understand how the remote control functions on a day-to-day basis, let's look at a typical call to the unit. Upon receipt of ring voltage, the device answers the line and identifies itself: "Hello, this is the WIXI-FM stereo transmitter. Please enter access code." After the proper code is entered via the phone keypad, it responds: "Thank you. No alarms pending." This indicates that all monitored parameters are within preset limits.

At this point, the operator is free to select metering, status or command channel. This is done by entering a 3-digit code. The first digit selects the type of channel, and the remaining digits select the channel within that type. The letter M, (6) on

the phone's keypad, is used to select the metering channels. The S, or (7), key accesses the status channels. The C, or (2), key controls the command channels. Once a command channel is selected, the operator must use the star (*) or pound (#) keys to control the function assigned to that channel.

To better understand the whole control process, let's look at a few typical commands along with the unit's voice responses. If an operator entered 605 via the phone keypad, the remote control would respond audibly with: "Metering channel five. Power output, 2,992W." Inputting 706, the operator would hear: "Status channel six. Tower lights, lights on (or lights off)."

Alarm features

Now let's see how the VRC-1000 responds to an alarm situation. Assume that the STL receiver's signal level drops below an established 350μV set point. The remote control immediately goes into the alarm mode, calling as many of the preprogrammed personnel phone numbers as necessary to elicit a DTMF response. Its voice synthesizer reports the alarm condition as follows: "Hello, this is the WIXI-FM stereo transmitter. Please enter access code." After the code is entered, the unit continues with: "Thank you. Alarm condition detected. Metering channel 10. STL level, 295.1μV. Below first low limit, 350μV. Time was 4:30 p.m., Monday, March 7, 1988." After the alarm condition is acknowledged, the unit announces any additional alarms. If no other alarm conditions exist, the unit responds with "No alarms pending."

If off-air monitoring proved program audio was not degraded by the RF signal level drop, and no one was immediately available to go to the transmitter, three courses of action would be possible. Via the phone keypad, all alarm functions could be disabled for up to one hour, the alarm function only on that particular channel could be disabled, or the out-of-tolerance set point could be temporarily changed, perhaps from 350μV to 275μV. If the station were equipped with a backup STL receiver, the remote control also could have been programmed to switch to the second unit. This action would trigger alarm calls to report the signal level drop and the remedial action taken.

Other features

The remote-control's sound-monitoring system proved to be useful at the next FM transmitter installation. The unit's built-in microphone makes it possible to listen in on the transmitter blower and the station's rotary converter operation. Such monitoring also provides an audible security check of the building. Given this transmitter's remote location, the feature is especially helpful. It also is possible to interface traditional intrusion sensors.

Another useful application involved backup control of the transmitter site air-conditioning system. The building temperature is monitored by a National LM-34 temperature sensor. If the air-conditioning system's thermostat were to fail, the sensor detects the abnormal temperature, allowing the remote control to take direct control of the cooling system.

The tower lights are controlled by the system's internal clock. Although a photodiode acts as the primary control, the remote control's internal clock can override the photodiode 15 minutes after sunrise and 15 minutes before sunset. This provides absolute time-based control of the tower lights, independent of the amount of daylight in the sky. Each month, sunset/sunrise times are changed by phone without going to the transmitter. Because the system also monitors the tower flasher and sidelight current, it's possible to activate an alarm if a tower light fails.

RC-1000 REMOTE-CONTROL UNIT — APR 23 1988 08:00 AM

THE WAVV 22,560W FM STEREO TRANSMITTER
LOCATED IN GOLDEN GATE, FLORIDA, ERP 100,000W

METERING CHANNELS			STATUS CHANNELS		COMMAND CHANNELS
01 CONTROL VOLTAGE	15.00 VOLTS	01	INTERLOCKS CLOSED	01	PHASEMASTER/START ON
02 SINGLE PHASE AC	239.1 VOLTS	02	TRANSMITTER AIRFLOW	02	HI-VOLTAGE/PLATE ON
03 PLATE VOLTAGE	9.528 DC KV	03	NO OVERLOAD PRESENT	03	RAISE OUTPUT POWR
04 PLATE CURRENT	3.116 AMPS	04	AUDIO DETECTOR OK	04	AUTOMATIC FULL POWER
05 COMPUTED POWER	22.90 KW DC	05	FILAMENT DETECTED	05	NORM ALPERT CHECKED
06 RF OUTPUT POWER	101.2 %	08	PLATE POWER DETECTED	06	OVERLAND RESET (*)
07 REFLECTED PWR 1	0.0195 :1	07	AFC LOCKED	07	STL NO. 1 SELECTED
08 CALIBRATION VOL	100.0 %	08	GRID CURRENT CORRECT	08	ALL RIGHT TO LEAVE
09 AIR TEMPERATURE	82.11° F	09	COAX PRESSURE OK	09	AUDIO DETECTION ON
10 STL NO. 1 RECEIVE	418.7 μV	10	SCREEN CURRENT OK	10	ALL SYSTEMS NORMAL
11 AC OUTPUT Ø 1	239.1 VOLTS	11	PLATE CURRENT OK	11	GARY SCHMIDT CHECKED
12 AC OUTPUT Ø 2	242.4 VOLTS	12	REFLECTED POWER OK	12	GENERATOR STOP (OFF)
13 AC OUTPUT Ø 3	244.3 VOLTS	13	LIGHT REPORTING OFF	13	FPL AC LINE FEED
14 STL NO. 2 RECEIVE	419.5μV	14	REMOTE-CONTROL ARMED	14	AIR CONDITION (AUTO)
15 SIDE LIGHTS	0.0000 AMPS	15	STL NO. 1 ON THE AIR	15	TOWER LIGHTS NORMAL
16 TOWER LIGHTS	0.0000 AMPS	16	GENTNER ON FPL	16	LIGHTS AUTOMATIC

AUTO LOG MODE COMMAND : ____

Table 1. *Using a computer results in this type of telemetry display. The information can be printed automatically if desired, providing accurate records of the transmitter's performance.*

By monitoring and alarming both RF power output and indirect power, the remote control can tell the operator if the transmitter starts to detune. Although the automatic power control on the transmitter is excellent, it is used only for coarse control between ±3%. Because of the VRC-1000's capability to measure and automatically adjust parameters, transmitter output power variations are held to within ±0.5%, even during major power-line fluctuations. A 50kW generator is now being installed and also will be remotely controlled.

Under normal conditions, the remote control automatically calls the computer at 8 a.m., noon, 4 p.m. and 8 p.m. each day. Upon command from the computer, the device sends metering, status and command channel conditions back to the computer at 300 baud, where it is printed to aid in long-term transmitter maintenance. Transmitter control is accomplished through the computer keyboard. A typical printout for the station is shown in Table 1.

A TV installation

The same device was recently installed on an RCA TTU-55 UHF transmitter. Despite the transmitter's age and technology, it was readily adaptable to the VRC-1000 through various interface panels. Metering was relatively easy to accomplish, but some users may wish to install dc isolation amplifiers for greater metering accuracy.

Interfacing the necessary control and status functions was a bit more complicated. Because the transmitter's control ladder relied on 115Vac transformer and relay logic, interface relay panels were required. The remote control was then programmed to deliver the momentary outputs necessary to latch the transmitter's internal control relays.

Obtaining the needed status signals was more complex. Because the transmitter also employs 115Vac logic for status indications, solid-state interface modules were used to produce a logic high with a 0V input and logic low with a 115Vac input. The modules' TTL outputs worked perfectly with the remote-control's TTL inputs.

The transmitter site provides both phone lines and microwave interconnection with the studio. Because the station's satellite dishes are located at the transmitter site, a TSL routes the ABC network feeds back to the studio. This link, along with the STL, provides a dedicated 2-way control link between the studio and transmitter.

The computer or DTMF commands are sent to the transmitter site via the STL, while the TSL sends metering and status data back to the studio. Because the remote control has both conventional audio-line inputs and outputs as well as phone-line connections, this dual-interconnection scheme was easy to install. This station's overall remote-control system configuration is shown in Figure 2.

Reliable performance

Since the first VRC-1000 installation, both our company and our station clients have been satisfied with the system. No downtime directly attributable to a remote-control failure has been encountered. In fact, the only unit failure so far was caused by a lightning strike, a situation beyond the manufacturer's control.

Despite the high marks we've given the Gentner VRC-1000 remote-control system, some engineers may view it with a certain degree of skepticism. Lack of a dedicated studio control and metering unit, plus the absence of direct carrier control, may cause some engineers to hesitate to embrace this technology. Also, compared with more conventional remote controls, this device is more difficult to set up.

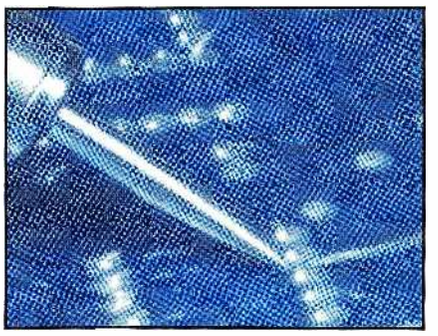
However, our experience shows these objections to be more perceptual than actual. Once an engineer becomes familiar with the system, its utility and versatility become obvious. In addition, many engineers may find it preferable to have the system warn them of a potential problem in the middle of the night than to receive a call from an irate station owner because a preventable problem deteriorated into an off-the-air situation.

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 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. |:-(=)))|

Audio step generator makes testing easier



By Jack Cunkelman

Audiences are demanding higher-quality audio signals from broadcasters, and many TV stations are responding with the introduction of stereo TV audio. Engineers recognize that TV audio has been a neglected area for many years. Finally, it is attracting the attention it deserves.

The audio step generator, which will be described in this article, will make some of this testing easier. A frequency-response check can be completed in a matter of seconds. It's also easy to view the phase relationships of two channels with an oscilloscope as the sweep is being made.

Cunkelman is engineering supervisor at WLWT-TV, Cincinnati.

Specifications

Although a sweep or continuously variable oscillator achieves the same results as a step generator, the advantage of knowing the precise frequency at any one time is lost. For this reason, our station chose the technique of stepping through 10 discrete frequencies. The stepping rate can be varied from 1s to approximately 10s for the entire frequency range. Changing the value of a single capacitor allows this time range to be increased or decreased.

The generator's output level is flat within ±0.5dB across the frequency range of 20Hz to 20,000Hz. Two identical, electronically balanced, 600Ω outputs are provided, so the response and phase integrity of both channels of a stereo path can be checked easily in one setting.

The circuit

The circuit's heart is a XR2206 FSK modulator, or function generator, as shown in Figure 1. Capacitor C1 and the resistor (Rx) connected from pin 7 to ground determine the oscillator frequency. Ten values for Rx (R9 through R18) are switched into the circuit, one at a time, using 4066 CMOS analog switches. The frequency is determined by the formula:

$$f(Hz) = 1 \div (Rx)(C1)$$

Where Rx is in ohms
C1 is in farads

When switch S1 is in the *set level* position, pin 9 is grounded. This produces a steady tone that is used for setting levels before the response run. Grounding pin 9 of the XR2206 switches in resistor R6, which determines the oscillator frequency. The frequency formula again applies. Setting this switch to *step* position starts the sequence.

Resistors R1 and R2 are adjusted for minimum sine-wave distortion. The output from pin 2 feeds an output buffer amplifier, which provides an electronically balanced output signal. A 5532 dual op-amp is a good choice for this application, although almost any wideband op-amp will work.

An oscillator using two of the NAND gates in a 4011 IC (IC6), R7 and C5 determine the step rate. The values of R7 and C5 can be adjusted as desired. The step-rate pot R7 was mounted on the front panel of our test set. Placing switch S2 (*run/stop*) in the *stop* position disables the oscillator and stops the stepping action. An LED connected across the oscillator output serves as an activity light and flashes with each oscillator output pulse.

The output from this oscillator feeds into the clock input, pin 14, of a 4017 divide-by-10 counter (IC2). The counter advances each time the clock pulse goes from ground to positive. As the counter advances, each of the 10 outputs is forced

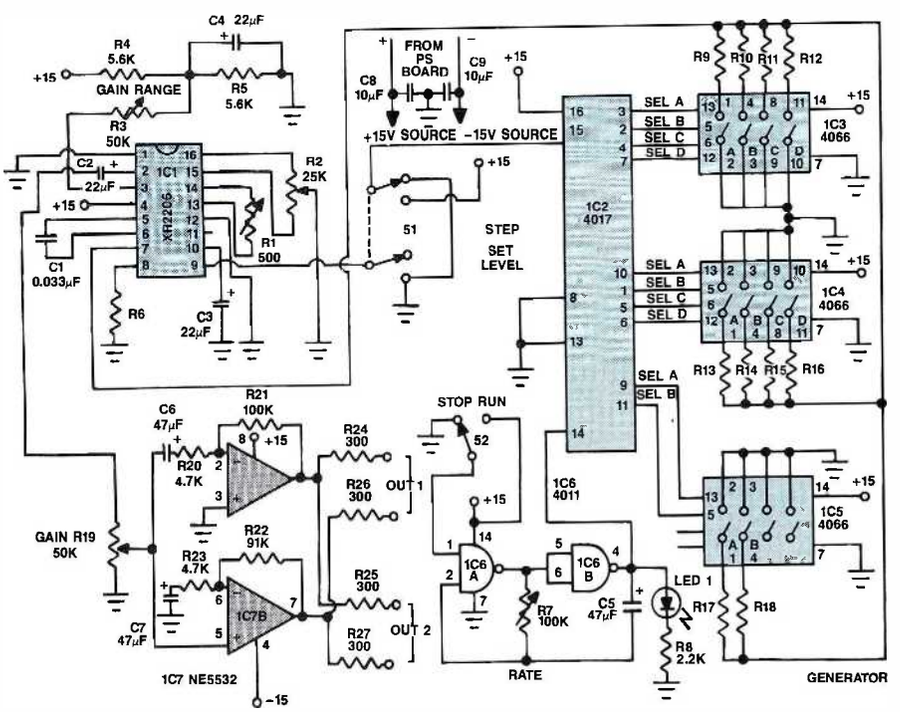


Figure 1. The stepping audio generator relies on an XR2206 function generator and provides discrete frequencies for audio tests.

FREQUENCY	RESISTOR VALUE
20Hz	1.515MΩ
100Hz	302.88kΩ
400Hz	75.607kΩ
1,000Hz	30.153kΩ
2,000Hz	15.000kΩ
4,000Hz	7.425kΩ
10,000Hz	2.880kΩ
16,000Hz	1.743kΩ
20,000Hz	1.365kΩ

Table 1. The listed frequencies are produced with these resistor values, and C1 is set to 0.033F.

SEMICONDUCTORS

D1 through D4	1N4005 rectifier diodes
IC1	XR2206 function generator
IC2	4017 counter
IC3, IC4, IC5	4066 CMOS switch
IC6	4011 quad NAND gate
IC7	NE5532 dual op-amp
IC8	7815 +15V regulator
IC9	7915 −15V regulator
LED 1	Panel-mount light-emitting diode assembly

CAPACITORS

C1	0.033μF 5% Mylar
C2, C3, C4 electrolytic	22μF 25V
C5, C6, C7 electrolytic	47μF 16V
C8, C9	10μF 25V tantalum
C10, C11 electrolytic	2,200μF 25V

RESISTORS

R1	500Ω trim pot
R2	25kΩ trim pot
R3	50kΩ trim pot
R4, R5	5.6kΩ ¼W
R6	See Table 1
R7	100kΩ audio taper pot
R8	2.2kΩ ¼W
R9 through R18	See Table 1
R19	50kΩ audio taper pot
R22, R23	4.7kΩ ¼W
R21, R22	100kΩ ¼W
R24, R25	300Ω ¼W
R26, R27	300Ω ¼W

MISCELLANEOUS

S1	DPDT switch
S2, S3	SPST switch
T1	30Vac ct, 500mA transformer
F1	¼ a SB fuse and holder, output connectors, line cord, chassis (LMB CR864), knobs, decals, perf board, flea clips, wire, solder

Table 2. *The needed parts are commonly available and inexpensive.*

positive, one at a time. The counter outputs are connected to CMOS switches IC3, IC4 and IC5, which switch in various values for Rx. The other half of switch S1 resets the count each time the switch is thrown from *set level* to *run*. This ensures that the counter always starts at count equals zero.

Use a high-quality capacitor for C1. I found 0.033F to be a good value choice. If exact frequencies are required, multiturn trim pots can be used for resistors R9 through R18. Nominal values for these resistors using a 0.033F capacitor are shown in Table 1.

A ±15V power supply should be used to power the generator. The maximum level out of the generator is limited by the voltage swing of the output op-amps. A +28dB output level should be achieved easily with ±15V supplies and 5532 op-amps.

We located a 400Hz reference signal between the highest and lowest frequencies. This serves as a marker during a sweep. A complete parts list is shown in Table 2.

Continued from page 4

come of the ATTC efforts. "Through the early creation of the test center, broadcasters have demonstrated their commitment to bring the highest-quality advanced television to American consumers at the earliest possible moment," he said.

Members of the ATTC include Capital Cities/ABC, CBS, NBC, Public Broadcasting Service, the Association of Independent Television Stations, Association of Maximum Service Telecasters and the NAB.

Philips demonstrates HDTV system

Philips Laboratories has unveiled its HDTV system specifically designed for satellite transmission. It is the first American-based effort to present HDTV satellite hardware for field testing. The Philips HDTV system, known as HDS-NA (high-definition system for North America), consists of two elements: a satellite feeder signal format and a terrestrial distribution format. The satellite feeder is used to relay HDTV programming from studio distribution sites to local broadcast stations and CATV head-ends, and for delivering HDTV signals directly to consumers via direct broadcast satellite (DBS) systems.

The terrestrial distribution signal format is used for local broadcast and for CATV. The satellite and terrestrial signals are a matched pair designed so that conversion from the satellite signal to the terrestrial signal can be accomplished without degradation. Philips says conventional NTSC signals are easily derived from the satellite signal, and that the terrestrial signal is directly compatible with current NTSC broadcasts. Viewers of conventional television would continue to see NTSC-quality pictures.

Dr. Mark Rochkind, president of Philips Laboratories, told the Briarcliff Manor, NY, press conference, "The hardware demonstrates a breakthrough solution."..."The HDS-NA satellite signal can deliver 1,050 lines of TV information per frame to the consumer's display; it transmits the video signal without introducing motion artifacts, and it accommodates a 16:9 aspect ratio and CD-quality digital sound."

Philips will begin field testing the HDTV satellite feeder signal later this year as part of a joint effort with Hughes Communications.

FCC asked to examine FM translators

The NAB has reiterated its position that the Federal Communications Commission should critically examine the use of FM translators. The service was set up originally to enable FM stations to reach their licensed service areas better and to

provide FM radio service to underserved areas on a non-interfering, non-profit basis. In reply comments filed with the commission, NAB urged the agency to reject proposals that would amount to an expansion of the FM translator service and would lead to the inauguration of a *low-power FM* service.

NAB FM Translator Subcommittee chair Denise Shoblom said, "The abuse of translator service can result in a serious erosion of the local service provided by broadcasters." Shoblom is vice president and station manager, KFWJ/KBBC, Lake Havasu City, AZ.

A recently completed study by the NAB refutes comments filed by the Federal Trade Commission that claim an increased number of operating radio facilities necessarily would increase the number of programming formats offered, and increase audience listenership. The NAB study shows that radio listeners in all parts of the country have access to far more radio stations than suggested by the FTC. Furthermore, according to the NAB, the diversity sought by the FTC through wholesale elimination of translator/low-power FM restrictions already has been achieved.

Justus is president of IEEE Broadcast Technology Society

Ralph H. Justus, director, Engineering, Regulatory and International Affairs for the NAB's Science and Technology Department, has been elected president of the Institute of Electrical and Electronics Engineers (IEEE) Broadcast Technology Society. He will serve a 3-year term.

The society is composed of engineers from around the world who are active in the design, manufacture and use of new transmission technologies that support the broadcast industry. Its predecessor, the Institute of Radio Engineers, evolved into the IEEE, which is the world's largest scientific/engineering society with more than 280,000 members in 130 countries. The Broadcast Technology Society is one of the 33 operating societies that make up the IEEE.

NAB offers test CD

The NAB has prepared a new compact disc with a wide variety of test signals for use by broadcast and audio engineers. NAB's *Broadcast and Audio System Test* CD can be used for routine maintenance and troubleshooting work on audio and transmission systems. The 99-track test CD is 100% digitally mastered and contains specifically chosen signals to confirm adequate performance of the CD player used in testing.

The disc is available from NAB Station Services at $40 for members and $80 for non-members.

New birds planned for Hughes

The FCC has approved Hughes Aircraft Company's acquisition of the 3-satellite Westar fleet and has authorized Hughes to construct three new satellites and replace five in-orbit satellites. The move officially clears the way for Hughes to acquire control of the Westar III, IV and V satellites, purchased last year from Western Union. The three new satellites authorized by the commission are designated Galaxy V (C-band) and Galaxy A and B (Ku-band).

The Westar fleet acquisition and newly authorized satellites will make Hughes the world's largest private satellite owner and operator.

By John Blau, European correspondent

TV production center caters to private channels

Work on a 4-channel TV production center at the headquarters of Sky Channel in London is in full swing. Sky Channel, Sky Movies, Sky News and Eurosport are expected to begin broadcasting from the center in February. British Telecom International is to transmit the Rupert Murdoch programs via an uplink station to the Astra satellite. Viewers can receive the channels via cable or parabolic dish antenna.

DBS in strong demand in Europe

An estimated 700,000 households in Europe will be receiving programs beamed by direct-broadcast satellite by the end of this year, reports the British consulting group Frost & Sullivan (F&R). F&R predicts that by 1997, as many as 20 million European households will be using DBS technology. These figures depend, however, on the success of the French TDF 1 satellite (launched at the end of October), Sweden's Tele-X (sched-

uled for February), Germany's TV-Sat 2 (scheduled for May) and Great Britain's BSB (scheduled for this summer).

In terms of subscriber fees and reception equipment, Great Britain will be the largest DBS market, according to F&R. The country also can expect some fierce competition when Astra (eight programs), BSB (three English programs) and the Irish Atlantic Satellite (five channels) begin broadcasting by the end of 1990. Demand for DBS technology in Holland and Belgium, on the other hand, will be weak because of cable saturation.

Earnings from subscription fees for DBS and medium-power television are expected to grow from $8 million in 1989 to some $700 million by 1997. Here, too, Great Britain will be a forerunner with earnings estimated at $190 million, followed by Germany with $150 million and France with $147 million. The survey further predicts that European satellite viewers will spend some $260 million on antennas.

Commercial satellite viewing in Europe holds steady

Commercial satellite channels reach 7.3 million, or 16% of Europe's TV viewers, in 11 countries every day, according to the 1988 Pan European Television Audience Research (PETAR). Although the survey shows that satellite TV is continuing to grow, it has produced some disappointing results as well. Broken down on a country-by-country basis, the information indicates that satellite television is declining in popularity in Germany and Scandinavia and has remained unchanged in the Netherlands and Belgium. Total satellite share in Switzerland, on the other hand, has increased by 10%.

PETAR was funded by 10 European satellite channels together with McDonald's, the IBA and SIPRA, the research arm of RAI TV.

Independent producers form association

Europe's plan to form a unified market in 1992 is expected to have a major impact on the continent's film industry. Anticipating increased competition from overseas, independent film and TV producers in five EEC countries have formed an association (CEPI) headquartered in Paris. Member countries include France, Italy, Belgium, Germany and Denmark.

Correction

The figures contained in the Otari MX-55 Field Report, page 90 of the November issue, were missing the vertical scale markings. Each major vertical division on the graphs represents 1dB.

New products

Upgrade for hard disk audio editor

AMS has introduced the Version 8 (V8) software for its AudioFile. It provides operational enhancements for new and existing systems. Features include varispeed through the digital port, digital outputs available in all pages, faster lockup, digital de-emphasis, dc offset removal, high-resolution metering, simplified screen structures, automatic dialogue replacement features, record punch-in/out, time code in, "disk full" warning, backup media time indication and SMPTE output.

Circle (350) on Reply Card

Monitor speakers

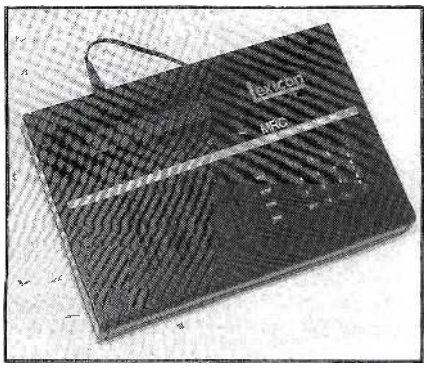
Clear-Com Intercom Systems has introduced models 1020 and 1020M amplified monitor speakers. They are self-contained, 2-channel audio monitoring systems. The speakers feature full range audio frequency response (100Hz-12kHz), XL-3-type balanced line level inputs and RCA phono-type unbalanced inputs.

Model 1020 combines low-frequency information from both channels into a single amplifier and specially baffled speaker to provide extended bass response.

Model 1020M has an optional LED bar-type input level meter.

Circle (351) on Reply Card

Software and controller



The MRC MIDI remote controller

Lexicon has introduced the following products:

• The model 2400 audio time-compressor expander has two software options. Software version 2.20 expands the comprehensive interfacing capability to include several videotape machines and *related operations.* Menu-selectable machine choices include the Ampex VPR-6/VPR-80, Sony BVH-3000, Panasonic AU-660 and time-code slave operation. A bypass play command issues a servo-locked play command from the front panel of model 2400. Software version 3.0 provides all the interfaces of version 2.2 plus a dc servo capability for controlling the Panasonic AU-650 M-II format VCR.

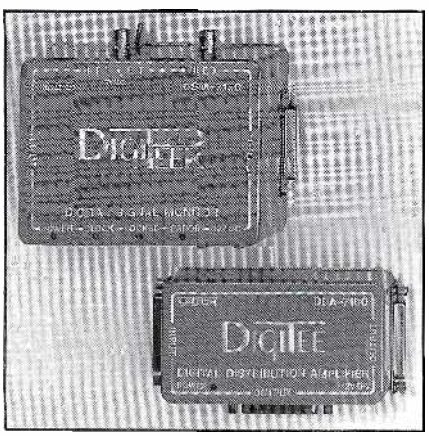
• The MRC MIDI remote controller improves the performance of the LXP-1 and PCM 70 effects processors. It adds fast analog-style patch modification to any Yamaha 6-operator FM synthesizer. The faders, switches and external jacks of the MRC can be defined as any MIDI controller, allowing it to control any MIDI device. With the MIDI system exclusive, the MRC increases the capabilities of the LXP-1 multi-effects processing module. The user can access six "hidden" parameters for each of the LXP-1's 16 programs in addition to the two parameters from the front panel, decay and delay. The parameters all can be altered in real time, and personal LXP-1 setups can be stored in the memory.

Circle (352) on Reply Card

DAs, signal monitor and analog decoder

Leitch has introduced the following digital products:

- The model DDA-6000 digital distribution amplifier distributes CCIR 601 standard digital video per SMPTE RP 125 and EBU 3246. The unit has four reclocked outputs and a 10-bit data path. As many as four amplifiers can be installed in a 2RU FR-6002 mounting frame.
- The DigiTee DDA-7100 digital distribution amplifier provides compact distribution for CCIR 601 standard digital video per SMPTE RP 125 and EBU 3246. The DDA-7100 has two reclocked outputs and a 10-bit data path.
- The DigiPeek DSM-7150 digital signal monitor is designed for troubleshooting in CCIR 601 systems. It provides 75 composite luminance signal output, which allows monitoring of CCIR 601 standard digital video per SMPTE RP 125 and EBU 3246. It has switch-selectable 75 output of sync, horizontal and vertical. The unit provides error detection and correction on SAV and EAV data.
- The model DAD-6000 digital-to-analog decoder converts CCIR 601 into analog formats including luminance only, RGB, YIQ, Y, R-Y, B-Y and M-II. Sync can be added to the video outputs, and separate composite sync is externally available. The unit provides full error detection and correction on SAV and EAV data.



DigiTee and DigiPeek

Circle (400) on Reply Card

Telephone hybrid

The digital adaptive telephone hybrid (DATH I) has been introduced by *Audix*. DATH I is fully automatic and uses advanced digital signal-processing techniques to implement a 128-tap adaptive finite impulse response filter. The filter, in conjunction with an electronic hybrid, splits the bidirectional telephone line signals into separate send and receive paths. Sidetone is minimized as the adaptive filter coefficients join to values appropriate to the particular telephone connection. Features of the system include better sidetone cancellation on all telephone connections, cancellation of delayed echoes and the potential for future signal-processing additions to clean up the received signal.

Circle (401) on Reply Card

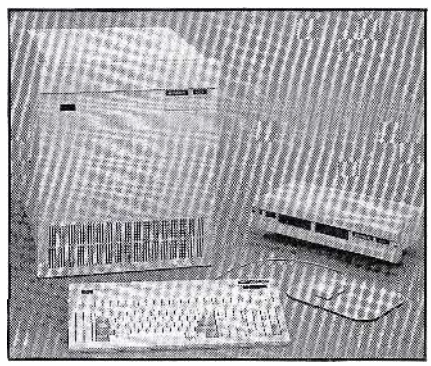
Memory cartridge and software

Kurzweil Music Systems has introduced the following products:

- A RAM intelligent memory cartridge increases the user memory facilities of the K250. The cartridge contains one quarter of a megasample of RAM for up to 5s storage of user samples at 50K, or 10s at 25K, or adds an additional 40,000 note storage capability for sequencing. Memory can be allocated for the storage of user samples, sequences, MIDI setup data or user-created keyboard setups.
- The Version 6.0 software for the K250 and 250RMX includes a user's guide and a reference guide. The software is designed to streamline the operation of the 250 system. It allows operation of the new RAM cartridge and remote-control operation of the 1000 series expanders. The software also features cycle mode.

Circle (402) on Reply Card

Broadcast equipment



Alex character generator

Ampex has introduced the following products:

- The Alex is a high-performance character generator that offers 256 levels of transparency and anti-aliasing of characters and symbols. An internal color palette can generate more than 16 million colors. The system, available in a 1- or 2-channel configuration, consists of a keyboard with mouse, local 3.5-inch floppy disk drive and a rack-mountable signal system with an internal 40Mbyte hard drive.
- The AVC component Vista switcher is a component analog version of the Ampex switchers. The switcher is available in 10- or 18-input configurations, component or composite video formats, and features a graphics-oriented display.
- A 3-D effects option has been added to the ADO 1000/2000 systems to allow creation of digital effects with intersecting planes. The 3-D keyer option allows the user to pass planes, frames, solids and digimatte key signals through each other, while the full range of ADO effects is simultaneously incorporated into each channel's separate image.
- The ESS series of graphic composition and storage systems and the AVA 3 video art system have received additional features. The ESS 5S single-channel version of the digital still-store can be upgraded to a 2-channel system as needed. It features an optical disk storage option, a still library system, 160Mbyte Winchester disk drive and a streamer tape drive. Standard features include still auto sequencing, list-n-list, component analog and component digital input/output. The upgraded versions of the AVA 3 video art system eliminate the need for a separate encoder. The AVA 3 systems can be configured with CCIR-601 digital component with a digital key I/O; high-quality analog composite; analog component RGB; and analog component Y, R–Y, B–Y. All analog I/O combinations have an 8-bit linear key output.
- The Zeus Port interface option for the Zeus advanced video processor allows type C videotape recorders to transfer composite digital video directly to D-2 composite digital VTRs. The interface eliminates the additional digital-to-analog and analog-to-digital conversion steps normally required. The option is available only for Ampex type C VTRs.
- The Tapemobile is designed for high-density storage of U-matic, Betacam and VHS cassettes. It can hold more than 100 U-matic videocassettes or 160 ½-inch cassettes. It features swivel wheels, handles on both ends for pulling and easily configured shelves.
- The model CVR-200 Betacam SP format system integrates a camera and recorder into one unit. The system includes recorder, camera, lens, viewfinder, battery and cassette. It is designed for ENG applications and has 550 lines of resolution. The system is compatible with standard Betacam format tape and can record up to 30 minutes on a single cassette. It offers two longitudinal channels with Dolby type C noise reduction and two AFM channels.
- The CVC-7 color video camera features CCD chip technology that offers 700 lines of resolution for ENG, EFP and studio applications. The camera includes a speed-selectable electronic shutter and an ergonomic viewfinder.

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Photo shows 8600 STL System (Model 8600 Transmitter) as a single link with redundant receivers (Model 8601 x 2)

Circle (83) on Reply Card

• The model CVR-22 front-loading Betacam SP format accepts large and small Betacam and Betacam SP cassettes. The player has a built-in time-code reader, a remote-control unit and four channels of audio (two high-performance AFM tracks and two longitudinal channels with Dolby type C noise reduction).

Circle (353) on Reply Card

Camera lenses

Angenieux Corporation of America has introduced the following camera lenses:

• A microprocessor-controlled 20×8.5 f/1.3 (constant) studio lens for 2/3-inch CCD or tube-type cameras. The lens weighs 39 pounds and has a relative aperture of f/1.3 that is constant without ramping throughout the entire zoom range of 8.5mm to 160mm. Features include high transmission, minimal iris ramping, modulation transfer function and reduced chromatic aberrations.

• The microprocessor-controlled 40×9.5 f/1.3 studio/field lens and the 40×14 f/1.9 studio/field lens both offer all the functions of the 20× in addition to an optional mechanical shutter for tack sharp slow-motion pictures.

• The 14×7 lens features a zoom ratio of 7mm-98mm. It can reach 196mm using the 2× extender. The lens weighs 3.3 pounds.

• The 14×6 lens has a 6mm-84mm angle and can zoom to 168mm with the 2× extender. The 14×6 weighs 4.2 pounds.

Circle (354) on Reply Card

Betacam camera, color monitor, analog recorder and software

Sony has introduced the following products:

• The BVP-7 Betacam camera is based upon enhanced chip design. It provides greater image resolution, sensitivity and control in an acquisition package that is applicable for both ENG and EFP operations. The camera offers 380,000 pixels, with 768 horizontal elements. It can be used in a Betacam camcorder configuration or as an interface with the CCU-350 camera control unit in an EFP system.

• The BVM-1315 13-inch color monitor is designed for broadcast and video production applications. The monitor has 600 lines of resolution and a frequency response in RGB of 100Hz to 10MHz. The non-linear distortion and dynamic gain is less than 3%. Features include an AFC switch for fast and slow mode, built-in cross hatch and white signal generator, automatic and manual degaussing and comb and notch filters.

• The model APR-5003V is an upgraded 2-track analog recorder with center-track time-code capabilities for video post-production, audio-for-film and recording studio applications. Enhancements include an external lock reference for the chase capability; the play operation can be preset to resolve 60Hz input reference signals to 24 frames-per-second film time code; and the locations have been improved for memory storage, preview, edit and review facilities.

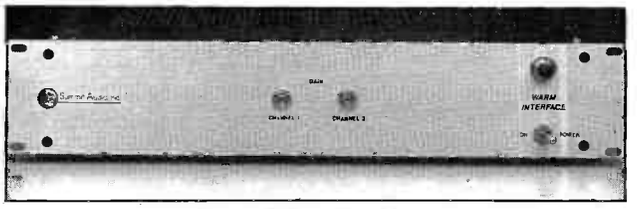
• The library management system has been enhanced with the addition of several software features. The features allow replay of program material using external VTRs and automated spot reel backup for the on-air commercial schedule. Also, program replay can be completely automated using the segment identification code that permits identification of all program segments. The software also allows control of up to three external VTRs.

APR-5003V IEC recorder/reproducer

Circle (355) on Reply Card

Interface

Summit Audio has released the Warm Interface. It may be used to "warm up" and enrich hard-edged or metallic digital signals, tape machine output or signal-processing equipment. The Warm Interface is used between CD players, R-DAT recorder/players and any analog audio equipment to provide tube sound and level matching. The interface offers two channels, electronically balanced input/output, an input designed to work with −10dB or +4dB systems, a maximum output of +25dBm, a maximum gain of 20dB, a maximum input of +24dBm, a dynamic range of 110dB, harmonic distortion of less than 0.1% and a frequency-response range of 3Hz to 90kHz.



Circle (356) on Reply Card

Digital switcher, character generator fonts and disk recorder option

The following products have been released by *Abekas Video Systems*:

• The A84 digital post-production switcher is a 12-input, CCIR 601 compatible digital switcher. The core of the switcher is an

advanced digital key processor that uses adaptive subpixel intelligent keying or ASPIK processing to provide key edges that are free from stair-stepping. Features include 12 video, key and mask framestores; 10-bit digital input/output; 32 separate color matte generators; eight keying layers (with two keyers per layer); four auxiliary video buses and four auxiliary key buses; three digital wipe pattern generators and nine color modifiers.

• *The A72* digital character generator has received font enhancements, including soft characters, soft shadows and character aspect. The soft characters font allows the user to soften the edges of any character. Soft shadows creates edge softening of cast drop shadows that are separate from the character itself. The character aspect font allows creation of characters with expanded or condensed style.

• Touch-Up is a digital video and menu control interface option for the A60 digital disk recorder. It allows for enhancement of the operational capabilities of the Quantel Paint Box. Video may be recorded onto the A60 in real time, then randomly accessed by the Paint Box a field or frame at a time. Touch-Up also includes complete VTR control for quickly transferring video between the A60 and a VTR.

Circle (357) on Reply Card

Measuring labels and paint

Spirig has introduced the following products:

• Celsiclock is a round, irreversible temperature-measuring label with values from 40°C to 260°C. It is designed for permanent registration of maximum temperatures in inaccessible,

dangerous areas or electric live surfaces. Each dot, originally white, has its own threshold value. It changes permanently into black when the temperature is exceeded.

• Celsilack is an irreversible temperature-measuring and registering paint. It is available in more than 100 values between 40°C and 1,200°C. The paint is applied by brush onto the test area and dries in a few minutes into a measuring spot with good adhesion. When the predetermined temperature is exceeded, the paint remelts. After cooling, the recrystallized measuring spot gives a clear optical indication as to whether the melting temperature was reached.

Circle (358) on Reply Card

TV transmitter

Acrodyne Industries has introduced the first 25kW UHF TV transmitter that uses a single-tetrode final amplifier. The TRU-25KVC uses Class A solid-state amplifiers and tetrodes in combined amplification service. The internally diplexed approach makes it a compact transmitter suited to small TV markets and as a standby unit.

Circle (359) on Reply Card

Fixed attenuators

JFW has introduced a line of high-power fixed attenuators. The 5W and 10W are available in 1dB-20dB values as stock items. Other values can be ordered. Units also available are 30W, 50W, 100W and 300W. The same power packages are available in terminations.

Circle (360) on Reply Card

Character generator and control station

Quantel has introduced the following products:

• The Cypher Sprint is a digital character generator. Features include the multichannel capability, power, speed and digital quality of its brother, the Cypher Sports, incorporated into a fast-response facility for instant on-air graphics and text. The Cypher Sprint can generate and compose captions and display logos, cutouts and pictures transferred from Paint Box. Bumper 3-D animation and graphics packages can be downloaded from the Cypher Sports to facilitate the on-air response and to free the Cypher Sports for graphics and animation creation.

• Harry Encore HUD incorporates the Harry and Encore Head-Up Display under a single pen, tablet and menu control system. Editing and effects composition can be carried out from a single control station. By selecting the Encore menu on Harry, effects can be built, previewed and composited. Harry Encore HUD includes all the individual features of the Harry and Encore configurations and adds real-time effects simulations, random-access keyframe preview and final sequence composition with Harry from a single command.

Circle (361) on Reply Card

VTRs

Panasonic Broadcast Systems has introduced the following VTRs:

• The model AU-660SE is an advanced performance M-II studio VTR for production editing and on-air playback. The system

uses a 9-bit time base corrector with 32 HP-p correction capability to reduce quantizing noise and provide a signal-to-noise ratio of better than 50dB. The unit features 90 minutes of recording/playback, an adaptive edge comb filter, amorphous video heads, dual video and audio heads that allow real-time monitoring of picture and sound during recording, two FM audio tracks and two longitudinal tracks. Functions available include audio split, variable memory, on-the-fly in the AT mode, preview, review, trim, go to, auto tag, retry and discontinuous time code.

• A prototype of a ½-inch composite digital VTR features longitudinal cue and time-code tracks; complete editing functions; and auto tracking with piezo element for variable speed playback. The video signal has 4fsc 8-bit sampling; and the audio signal has 4-channel PCM, 48kHz, 20-bit sampling capability.

Circle (362) on Reply Card

Audio editor

Alpha Audio has introduced the Boss/2 second-generation audio editing system. The system features digital waveform editing, concurrent multiprotocol communication and direct serial control. When synchronizers are called for, the user may select whatever combination is best for the system. The system includes a master processing unit, EGA monitor and keyboard with integrated touchpad.

Circle (363) on Reply Card

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ATTENTION: WOMEN WHO SOUGHT EMPLOYMENT WITH THE VOICE OF AMERICA (VOA), THE UNITED STATES INFORMATION AGENCY (USIA), OR THE UNITED STATES INTERNATIONAL COMMUNICATION AGENCY (USICA) BETWEEN OCTOBER 8, 1974 AND NOVEMBER 16, 1984.

YOU MAY BE A VICTIM OF SEX DISCRIMINATION ENTITLED TO A MONETARY AWARD AND A POSITION WITH THE AGENCY.

UNITED STATES DISTRICT COURT FOR THE DISTRICT OF COLUMBIA

CAROLEE BRADY HARTMAN, et al.,
Plaintiffs,
v.
CHARLES Z. WICK,
Defendant

Civil Action No. 77-2019
Judge Charles R. Richey

PUBLIC NOTICE

On November 16, 1984, the United States District Court for the District of Columbia found in this class action lawsuit that the United States Information Agency (USIA or the Agency), including the Voice of America (VOA), is liable for sex discrimination against female applicants for the following positions at the Agency. The USIA was also formerly known as the United States International Communication Agency (USICA). On January 19, 1988, the Court issued its opinion ordering relief in a variety of forms to potential class members. Accordingly, this case is now in the remedial phase.

JOBS COVERED

Specifically, the Court has found that the Agency has discriminated against women in hiring in the following jobs:

- Electronic Technician (Occupational Series 856)
- Foreign Language Broadcaster (Occupational Series 1048)
- International Radio Broadcaster (Other) (Occupational Series 1001)
- International Radio Broadcaster (English) (Occupational Series 1001)
- Production Specialist (Occupational Series 1071)
- Writer/Editor (Occupational Series 1082)
- Foreign Information Specialist/Foreign Affairs Specialist/Foreign Service Information Officer/Foreign Service Officer (Occupational Series 1085 and 130)
- Radio Broadcast Technician (Occupational Series 3940)

WHO IS INCLUDED

All women who sought employment with the Agency in any of the jobs listed above between October 8, 1974 and Noverrber 16, 1984 and were not hired may be eligible for relief. Also included are those women who were discouraged from applying for these positions during that time period. Even those women subsequently hired by the Agency in some capacity may be entitled to participate in the remedial phase of this case.

Women who sought employment with the Agency as Foreign Service Officers or Foreign Service Information Officers may be eligible for different kinds of relief depending upon the date of application and whether they sought employment at the entry level or mid-level. Women who sought employment with the Agency as **entry** level Foreign Service Officers or Foreign Service Information Officers in the years 1974-1977 must use the procedure outlined below. Women who sought employment with the Agency as **mid-level** Foreign Service Officers or Foreign Service Information Officers in the years 1974-1984 must also use the procedure outlined below. However, women who sought employment with the Agency as **entry** level Foreign Service Officers or Foreign Service Information Officers in the years 1978-1984 cannot use the procedure outlined below, since the Court has ordered an alternative form of relief for them and selected women in this group will be notified individually as to their rights.

RELIEF AVAILABLE AND HOW TO OBTAIN IT

Relief available to class members may include a monetary award and/or priority consideration for a current position with the Agency. If you think you may be entitled to relief, you **must** obtain a claim form, complete it fully, and return it to counsel for the plaintiff class, Bruce A. Fredrickson, Esq., Webster & Fredrickson, 1819 H Street, N.W., Suite 300, Washington, D.C. 20006 (202/659-8515), postmarked no later than July 15, 1989.

You may obtain a claim form in person and/or in writing from several sources: counsel for the plaintiff class, whose address is listed above; in person from USIA, Front Lobby, 301-4th Street, S.W., Washington, D.C. (8:15am-5:00pm), Office of Personnel Management (OPM), Federal Job Information Center (First Floor, Room 1425), 1900 E Street, N.W., Washington, D.C. (8:30am-2:30pm), or from area OPM offices throughout the country; in writing, VOA-Hartman, P.O. Box 400, Washington, D.C. 20044. You should carefully consider all questions on the claim form, **sign** it, and return it to counsel for the plaintiffs. **Do not, under any circumstances**, return the claim form to the Judge, the Court or the Clerk of the Court. The Judge, the Court and the Clerk of the Court **will not accept** the claim forms and **will not forward** claim forms to plaintiffs' counsel.

PROCESSING OF CLAIMS

The process for handling claims has not been finally decided. Thus far, the Court has ordered that responding class members demonstrate their potential entitlement to relief at an individual hearing to be scheduled at a later date. However, the Court has reserved the right to reconsider this procedure in the event the number of claims filed makes this approach unmanageable.

Should individual hearings be used, you will be fully informed as to the date and time of your hearing. Moreover, you will be entitled to legal representation by counsel for the plaintiff class or his designee at no cost to you. Legal counsel will discuss your claim with you prior to your hearing, help you prepare your case and represent you at your hearing. You may, of course, retain your own attorney to represent you, if you so desire.

At the individual hearing, you will be asked to demonstrate your potential entitlement to relief by showing that you applied for one or more of the covered positions during the period October 8, 1974 and November 16, 1984 and that you were rejected, or that you were discouraged from applying. Evidence may be required in the form of testimony, documents, or both. Once you have demonstrated these facts, USIA is required to prove, by clear and convincing evidence, that you were not hired (for **each** position for which you applied) for a legitimate, non-discriminatory reason, such as failure to possess requisite qualifications. Should USIA make such a showing, you would then be entitled to demonstrate that the Agency's reason is merely a cover for sex discrimination or unworthy of belief.

Following the hearing, the Presiding Official will decide whether you are entitled to relief and, if so, what relief is appropriate. You may be entitled to wages and benefits you would have earned if you had been hired (back pay) from the date of your rejection until the date relief is approved. Under the law, back pay is offset by earnings you may have had during the period. In addition, you may be found to be entitled to front pay (that is, compensation into the future until an appropriate position is afforded you). Similarly, you may be found to be entitled to priority consideration for employment with the Agency. If hired, you may further be entitled to retroactive seniority with the associated benefits and the value of any promotions you would likely have had if you had not suffered discrimination.

REQUIRED STEPS TO FILE YOUR CLAIM

To participate in the remedial phase, **you must fully complete the claim form** and return it, POSTMARKED NO LATER THAN July 15, 1989, to counsel for the plaintiff class. Your failure to do so will result in your losing all rights you may have in this lawsuit. If you have questions about your rights or procedures available to you, you may contact counsel for the plaintiff class:

Bruce A. Fredrickson
Webster & Fredrickson
1819 H Street, N.W., Suite 300
Washington, D.C. 20006
(202/659-8515)

October 4, 1988
Date

/s/ Judge Charles R. Richey
United States District Court
Judge Charles R. Richey

Classified

FOR SALE

HELP WANTED

TELEVISION MAINTENANCE ENGINEER Lifetime Television seeks an experienced Maintenance Engineer for its new broadcast facility in Astoria, Queens, New York. Knowledge of Sony 1", ¾", Beta SP and Betacart desired. Familiarity with G.V.C. Switchers, Editors and FX a plus. Position will involve custom construction and routine maintenance. Available to work evenings. Salary commensurate with experience. Full Benefits, 401K Savings Plan, Discounts. EOE. Send resume with salary history to: Lifetime Television, 36-12 35th Avenue, Astoria, NY 11106. ATTN: Personnel Department. 01-89-1t

ENGINEERS NEEDED

Maintenance Supervisor - 5 years experience component level, 2 years supervisory, trade school or college technical degree preferred. SBE, NARTE, or FCC General or First Class License. Experience with Ampex, Harris, Grass Valley and Ikegami required.

Assistant Director of Engineering - 5-8 years in TV broadcast engineering, excellent interpersonal skills, thorough understanding of broadcast systems a must, 2-3 years experience in management, familiarity with capital and operational budget process preferred. SBE, NARTE, or FCC General or First Class License required. College degree or technical school also preferred.

APPLY TO: Director of Finance
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No Telephone Calls!

WYES-TV is an Equal Opportunity Employer 01-89-1t

NATIONAL PUBLIC RADIO SENIOR ENGINEER Seek experienced engineer to manage engineering development projects, provide system-wide engineering support and technical assistance, and administer and supervise all activities relating to assigned projects. BSEE degree preferred. Minimum 5 years training/experience in broadcasting engineering to include design, construction and installation of broadcast facilities and/or recording studios. Project management experience dealing with plan development, contract management, radio regulatory issues, procurement, work scheduling, and budget control desired. Excellent benefits package. Send resume including salary history in confidence to: NATIONAL PUBLIC RADIO, Personnel Department, 2025 M Street, N.W., Washington, DC 20036. Women and minorities are encouraged to apply. EOE/AA 01-89-1t

TV TRANSMITTER MAINTENANCE ENGINEER FOX Television, KRIV in Houston is seeking a qualified transmitter maintenance engineer with strong background in RF. Previous experience with Harris TV-110U UHF transmitter preferred. Modern well equipped facility. Please send resume to KRIV-TV, P.O. Box 22810, Houston, Texas 77227. Attn: V/P Chief Engineer. No Phone Calls. E.O.E.01-89-1t

RIGGER WANTED to work on TV, AM-FM tower and antenna systems. If you have the experience and can manage your own crew, we should talk. Call Jim Tiner (214) 891-0555. 01-89-1t

BROADCAST ENGINEER II KUAT AM-FM/TV, licensed by The University of Arizona, is looking for a broadcast engineer. Responsibilities include maintaining a variety of broadcast electronic equipment for the three stations. Minimum qualifications: Associate's degree in radio and television or related field and three years experience in broadcast equipment, design, repair, and/or installation. Prefer broadcast engineering technical training/experience. Desire FCC general license. Applications may be obtained through University of Arizona Staff Employment Office, 1717 E. Speedway, Tucson, Arizona 85719, phone number (602) 621-3668. An offical U of A application is required (résumes will not substitute). Closing date: January 30, 1989. Equal opportunity/affirmative action employer.01-89-1t

CHIEF ENGINEER - Access station seeks Chief Engineer to be responsible for overall engineering operations. Must have experience with maintenance/troubleshooting of Sony ¾" field and studio equipment, signal modulators, as well as system design. Computer skills desirable. 3-5 years experience in broadcast/cable/production house environment required. BSEE or equivalent. Send resume and salary history to: CHANNEL 10, Attn: Engineer, P.O. Box 2465, Fairfax, VA 22031. 01-89-1t

ASSISTANT TELEVISION SYSTEMS ENGINEER TCJC, SOUTH CAMPUS, Fort Worth, Texas 76102-6599. Three years in an educational network or broadcast facility. F.C.C. General Class Radio-Television License or S.B.E. Broadcast Technologist Certification. Call (817) 336-7851. AN EQUAL OPPORTUNITY EMPLOYER. 01-89-1t

CHIEF ENGINEER in tropical Guam! KUAM-TV, FM and AM station require chief engineer to re-build operation. Operation includes microwave STL, video satellite downlink and studios. Please send resume to D. Kameya, 582 Market Street, Suite 2000, San Francisco, CA 94104 or call (415) 986-8881. 01-89-1t

SALES REPRESENTATIVES and video dealers needed in Canada and South America. We are the sole source for BAL COMPONENTS and ALLEN AVIONICS delay lines, filters and hum eliminators. CONTACT: Allen Avionics, Inc., 224 East Second Street, Mineola, NY 11501, Attention: Richard Mintz, (516) 248-8080. 01-89-1t

TELEVISION MAINTENANCE ENGINEER: Responsible for repair and maintenance of all production equipment consisting of Sony BVHs, BVWs, BVE & BVP and Bosch & CDL switches at the University of Wisconsin-Stout Teleproduction Center, Menomonie, Wisconsin. 4-5 years experience required. Send resume' by February 6, 1989 to UW-Stout Personnel Office, Room 13, Harvey Hall, Menomonie, Wisconsin 54751. (715) 232-2415. UW-Stout is an equal opportunity employer functioning under an affirmative action plan. 01-89-1t

BROADCAST ENGINEER: Strong on preventive maintenance and repair of studio and transmitter. To 20K. Send resume to: Chief Engineer, WAXA TV, PO Box 40, Anderson, SC 29621. 01-89-1t

MAINTENANCE ENGINEERS: Top New York Post Production Facility seeks Maintenance Engineers. Experience with VPR-2, VPR-3, CMX, GVG-300, ADO, MIRAGE, RANK, SONY VCR, System Installation preferred. Excellent benefits. Send resume with salary history in strict confidence to: Broadcast Engineering, P.O. Box 12901, Dept. 702, Overland Park, KS 66212. 01-89-1t

MAINTENANCE ENGINEER experienced in TV & FM studio and transmitter repair. Must have valid F.C.C. license. Send resume to Director/Engineering, KMGT-TV, 970 N. Kalaheo Ave., Ste. C-314, Kailua, Hawaii 96734. 01-89-1t

TELEVISION PRODUCTION SPECIALIST The Centers for Disease Control announces an employment opportunity at its headquarters in Atlanta, Georgia. Candidates must have broad experience and training in television operations and engineering. Must be a hands-on and creative individual capable of assuming primary responsibility for all technical aspects of television studio and field production activities including video and audio operations, videotape computer editing, video production system design and installation and electronic maintenance supervision. Experience with video teleconference technical operations and/or interactive videodisk production is desirable. $34,510 annual salary. Federal Civil Service benefits and retirement program. Interested candidates should send their applications (Standard Form 171, Application for Federal Employment) to Mr. Paul Herrington, Centers for Disease Control, Personnel Office, Building 1, Room 1050, 1600 Clifton Road, N.E., Atlanta, GA 30333, to be postmarked not later than January 31, 1989. For more details about this position contact Paul Horton (404) 639-1746. CDC is an Equal Opportunity Employer and provides a smoke-free work environment. 01-89-1t

TRANSMITTER/STUDIO ENGINEER needed for Worcester, Massachusetts UHF television station. Strong background in UHF transmitters. Also, studio maintenance background helpful. Contact Fran Vaccari, Chief Engineer, WHLL-TV, 617-799-2727. 7-88-tfn

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Beyer Dynamic, Inc.	54	516/935-8000
Broadcast Supply West	86	800/426-8434
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BTS Broadcast Television Systems	47	801/972-8000
Cablewave Systems	110	203/239-3311
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Centro Corp.	105,106	619/560-1578
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Chemtronics, Inc.	96	516/582-3322
Cine 60	44	212/586-8782
Cipher Digital, Inc.	100	301/695-0200
Clear-Com Intercom Systems	40	415/861-6666
Comark	45	215/822-0777
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Crosspoint Latch Corp.	112	201/688-1510
Delta Electronics	89	703/354-3350
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Electro-Voice, Inc.	68	616/695-6831
ESE	90	914/592-6050
Evertz Microsystems, Ltd.	101	416/335-3700
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Faroudja Laboratories, Inc.	88	408/245-1492
For-A Corp. of America	50	213/402-5391
Fujinon, Inc.	51	201/633-5600
GE Support Services	74	609/866-3147
Geleco Electronics, Ltd.	104	416/421-5631
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Hitachi America Ltd.	4	800/645-7510
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M C G Electronics, Inc.	75	516/586-5125
3M Magnetic Media Div.	31	800/328-1684
Markertek Video Supply	107	800/522-2025
McCurdy Radio Industries	36	416/751-6262
MCL, Inc.	37	312/759-9500
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Mikrolab	115	213/306-0120
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North Hills Electronics, Inc.	79	516/671-5700
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Orban Associates, Inc.	7	800/227-4498
Orban Associates, Inc.	12	800/227-4498
Otari Corp.	11	415/341-5900
Otari Corp.	59	415/341-5900
Paltex, Inc.	61	514/838-8833
Panasonic Industrial Div.	30	201/348-7671
Panasonic Pro Industrial Video	57	800/553-7222
Panasonic Pro Industrial Video	58	800/553-7222
Pinnacle Systems, Inc.	62	408/970-9787
Polyline Corp.	73	312/297-0955
Prime Image, Inc.	17	408/867-6519
Ram Broadcast Sytems, Inc.	81	516/832-8080
Ramsa/Panasonic	34	714/895-7277
RTS Systems, Inc.	80	818/843-7022
Sachtler Corp. of America	33	516/867-4900
Shintron Electronics	76	508/486-3900
Shure Brothers, Inc.	1	312/866-2553
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Sony Corporation/Pro Mavica	105	800/222-0878
Spectrum Communications	77	215/631-1710
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Standard Tape Laboratory, Inc.	111	415/786-3546
Studer Revox America, Inc.	9	615/254-5651
Tascam Div. TEAC Corp of America	35	213/726-0303
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Telex Communications, Inc.	69	612/887-5550
TFT, Inc.	83	408/727-7272
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1989 Buyers' Guide/Spec Book Update

The following additions and corrections are provided as a means to update the 1989 "Buyers' Guide/Spec Book." Companies not included in the published volume are listed here with the categories of equipment they produce. Remove this page, and place it with your latest issue of the **BE** "Buyers' Guide."

Alpha Video & Electronics/AVEC
200 Keystone Drive
Carnegie, PA 15106
PHONE: 412-429-2000
FAX: 412-429-2015

AZDEN Corporation
147 New Hyde Park Road
Franklin Square, NY 11010
PHONE: 516-328-7500
•*Wireless microphones*

Dotronix
160 First Street, SE
New Brighton, MN 55112
PHONE: 612-633-1742
FAX: 612-533-7025
• *Video monitors, color & B/W*

Eastman Kodak
Electronic Photography Division
343 State Street
Rochester, NY 14650

Generic Designs
▼*DeskTop is withdrawn as an Editing Controller (Spec Book, page 132) at the company's request. Generic Design manufactures machine control interfaces for videotape recorders.*

I.DEN Videotronics
9620 Chesapeake Drive, Suite 204
San Diego, CA 92123
PHONE: 619-492-9239
FAX: 619-279-2569
•*Time base correctors*
•*Amplifiers, pulse/video distribution*

Magni Systems
9500 SW Gemini Drive
Beaverton, OR 97005
PHONE: 503-626-8400
FAX: 503-626-6225
TELEX: 650-2769743 MCI
▼*For all contact with the company, including service requirements*

McCurdy Radio Industries
108 Carnforth Road
Toronto, Ontario M4A 2L4
CANADA
PHONE: 416-751-6262
FAX: 416-751-6455
TELEX: 06-963533
▼*For contact with the company, including service requirements*

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Deer Park, NY 11729
PHONE: 516-586-5125
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25 Commercial Street
Medford MA 02155
PHONE: 617-391-4097 (MA)
or 800-548-5040
FAX: 617-395-1014
•*Speaker mounting hardware*
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Rees Associates
4200 Perimeter Center Drive, Suite 245
Oklahoma City, OK 73112
PHONE: 405-942-7337
FAX: 405-948-1261
TELEX: 46-7415
•*Engineering consulting, design, plans*

Vector Technology
203 Airport Road
Doylestown, PA 18901
PHONE: 215-348-4100
FAX: 215-348-3167
TWX: 910-250-3310 VECTOR UK
•*AM antenna systems*
•*AM directional antenna systems*
•*Antenna remote indicators*
•*Antenna sampling equipment*
•*Antenna tuning units*
•*Combiners, power*
•*Contactors, vacuum*
•*Diplexers*
•*Exciters, FM*
•*Filters, antenna*
•*Switches, coaxial/RF*
•*Transmitters, FM*

Video Processing Systems

Manufacturer	White & Black	
Model/Series	**3240-20**	**7510**
Enhancement	White & black clip	White & black clip
Noise reduction	Inherent in chroma sep.	No
Color correction	Gain, phase	Gain, phase
Contrast correction	AGC option	AGC
Sync regeneration	w/H & V blanking adj	w/H & V blanking adj
Standards conversion	No	No
Production application	Yes	No
On-air application	Yes	Yes
Format conversion	No	No
Video response	±0.2dB to 6MHz	±0.2dB to 6MHz
S/N ratio	70dB below 1Vp-p, 5MHz	60dB below 1Vp-p, 5.5MHz
Envelope delay	±10ns to 5MHz	±5ns to 4.5MHz
Diff phase/gain	0.25°/0.5% 10-90% APL	0.35°/0.35% 10-90% APL
Video level adj	±6dB	−6, +9dB
Chroma level adj	±6dB	±6dB
Pedestal level adj	±15IRE	±15IRE
Subcarrier phase range	±13°	±10°
Sync level adj	-6, +3dB	Internal adjustment
Programmable system	No	No
Component formats	None	None
Remote-control type	Wire per function	Wire per function
Reader Service Number	**291**	**292**

Wireless microphones

Manufacturer	**HM Electronics**	
Model/Series	**System 50 (55)**	**System 515 (525)**
RF frequency	160-216MHz	169-216MHz
Audio response	±2dB, 50-15k	±3dB, 50-15k
Distortion, system	<1%	<1%
Modulation control	Includes NRX II	Includes NRX II
Companding function	Yes	Yes
Transmitter model	**TX550 (TX555)**	**TX550 (TX555)**
Transmitter package	Body-pac (hand-held)	Body-pac (hand-held)
RF output level	>50mW w/9Vdc	>50mW w/9Vdc
Carrier deviation	15kHz±1kHz -13dBV	−13(−12)dBV, 15kHz±1kHz
Microphone type	Dynamic, condenser	Dynamic, condenser
Power requirement	9Vdc	9Vdc
Operating weight	4.7oz (10oz) w/battery	4.7oz (10oz) w/battery
Receiver model	**RX520**	**RX522**
Sensitivity	1μV 30dB quieting	1μV 30dB quieting
Spurious rejection	>60dB image	>50dB image
Output connection	Xfmr bal	Phone jack
Audio output level	Mic, line	−4dBV
Power requirement	120Vac, 12-20Vdc	120Vac, 12-16Vdc
Metering	LED bar graph	None
Panel indicators	RF, AF, power	RF, power
Antenna types	2-Whip & DN100 system	Whip
Diversity receiving	Yes	No
Multichannel system	No	No
Reader Service Number	**293**	**294**

Video TBCs, Frame Synchronizers

Manufacturer	**I.DEN Videotronics**
Model/Series	**IVT-9**
Function	TBC & framestore
Sample freq/bits	13.5MHz, 8-bit
Correction window	Infinite
Video bandwidth	Y-5.5MHz, C-3.58MHz
S/N ratio	58dB
Differential phase/gain	2°, 2%
Residual error	Y ±15ns, C 2°
Advanced sync out	Blackburst
Component in	YC, Dub, YC,C_b opt
Component out	YC
Velocity compensation	No
Heterodyne processing	¾", ½"
Non-servo capstan	Yes
Dynamic tracking	No
Noise reduction	No
Image enhancement	No
Production effects	Freeze frame, field
Reader Service Number	**295**

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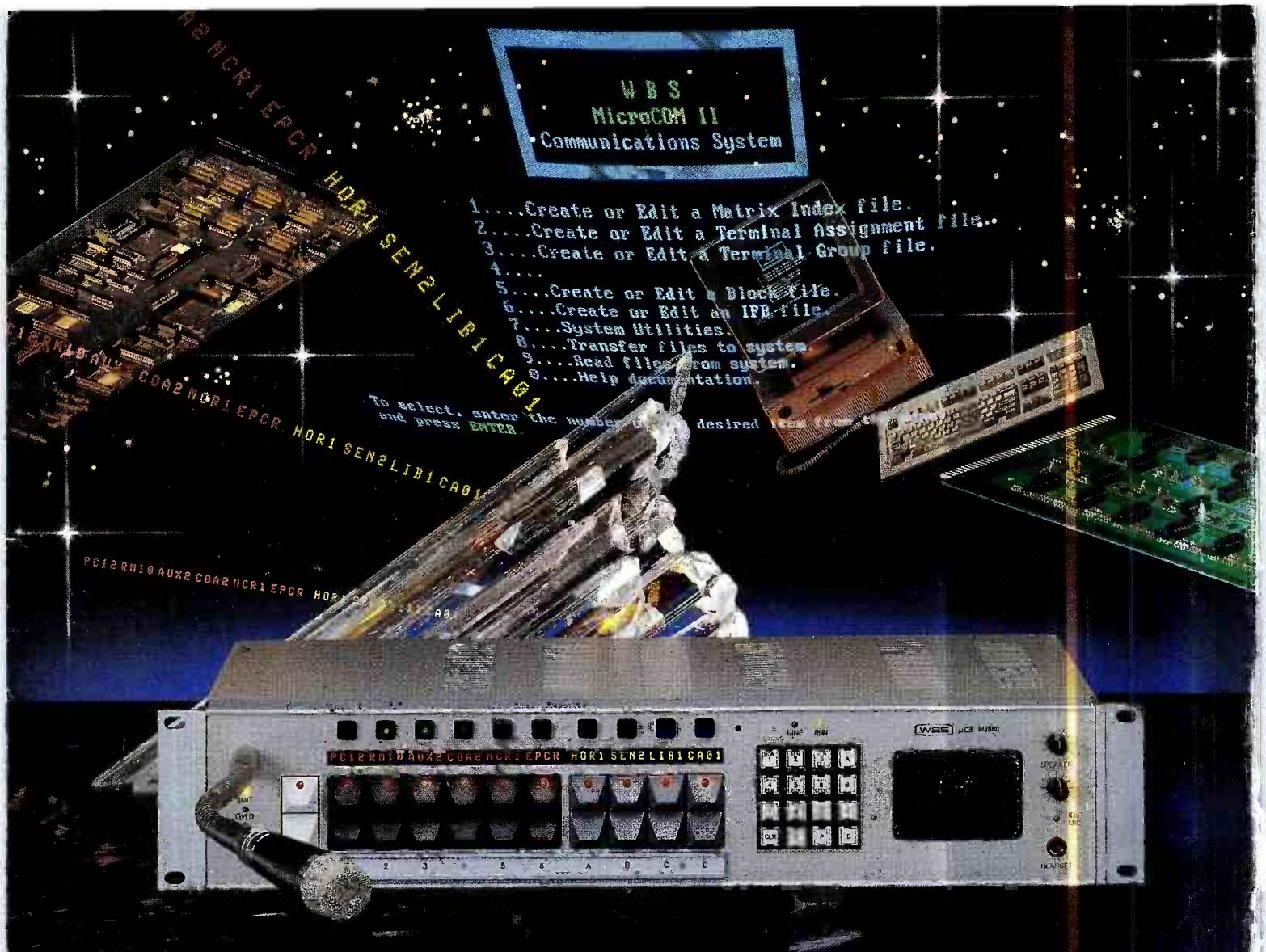

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