BROADCAST engineering

AN INTERTEC PUBLICATION

December 1988/$3

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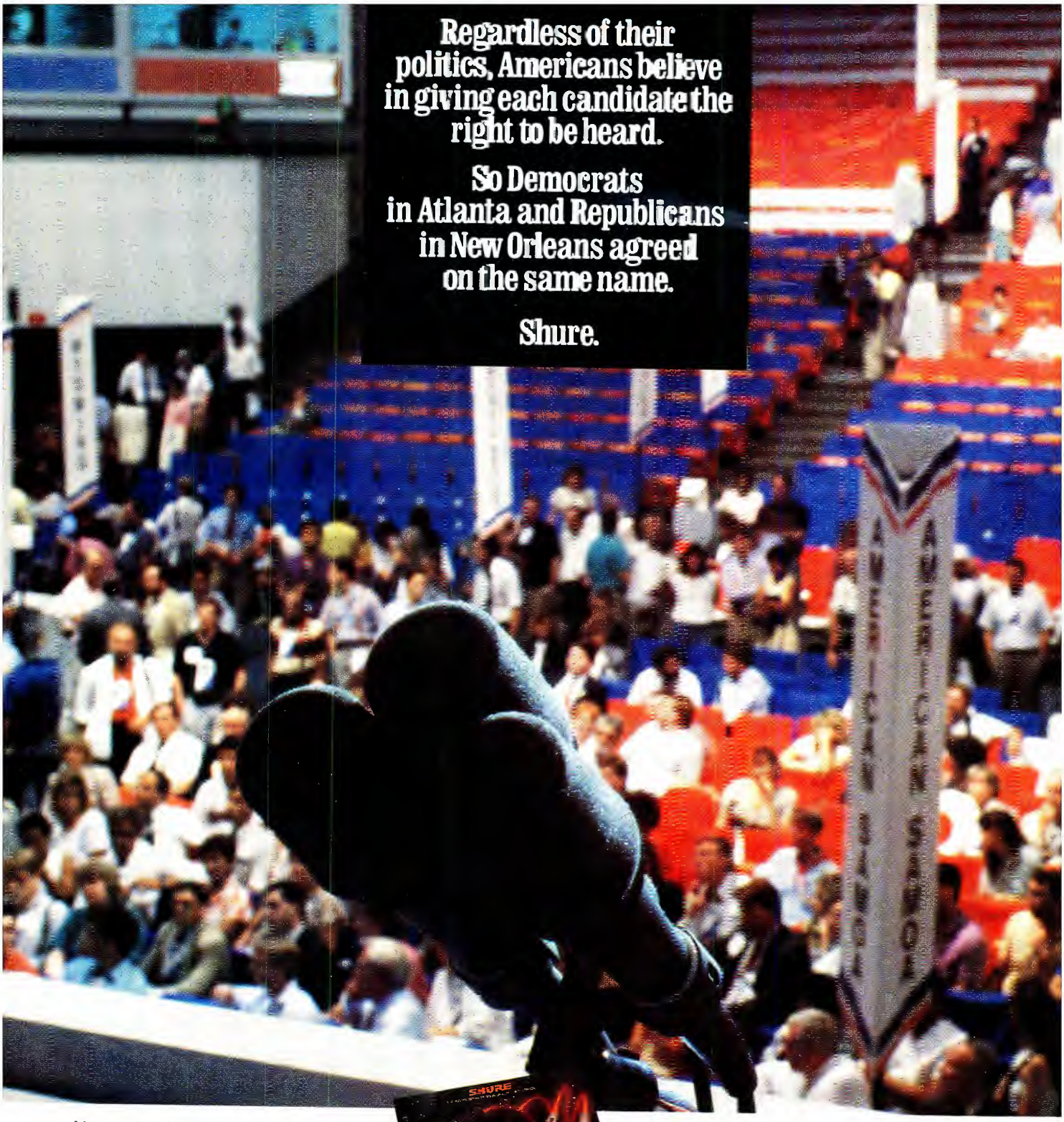

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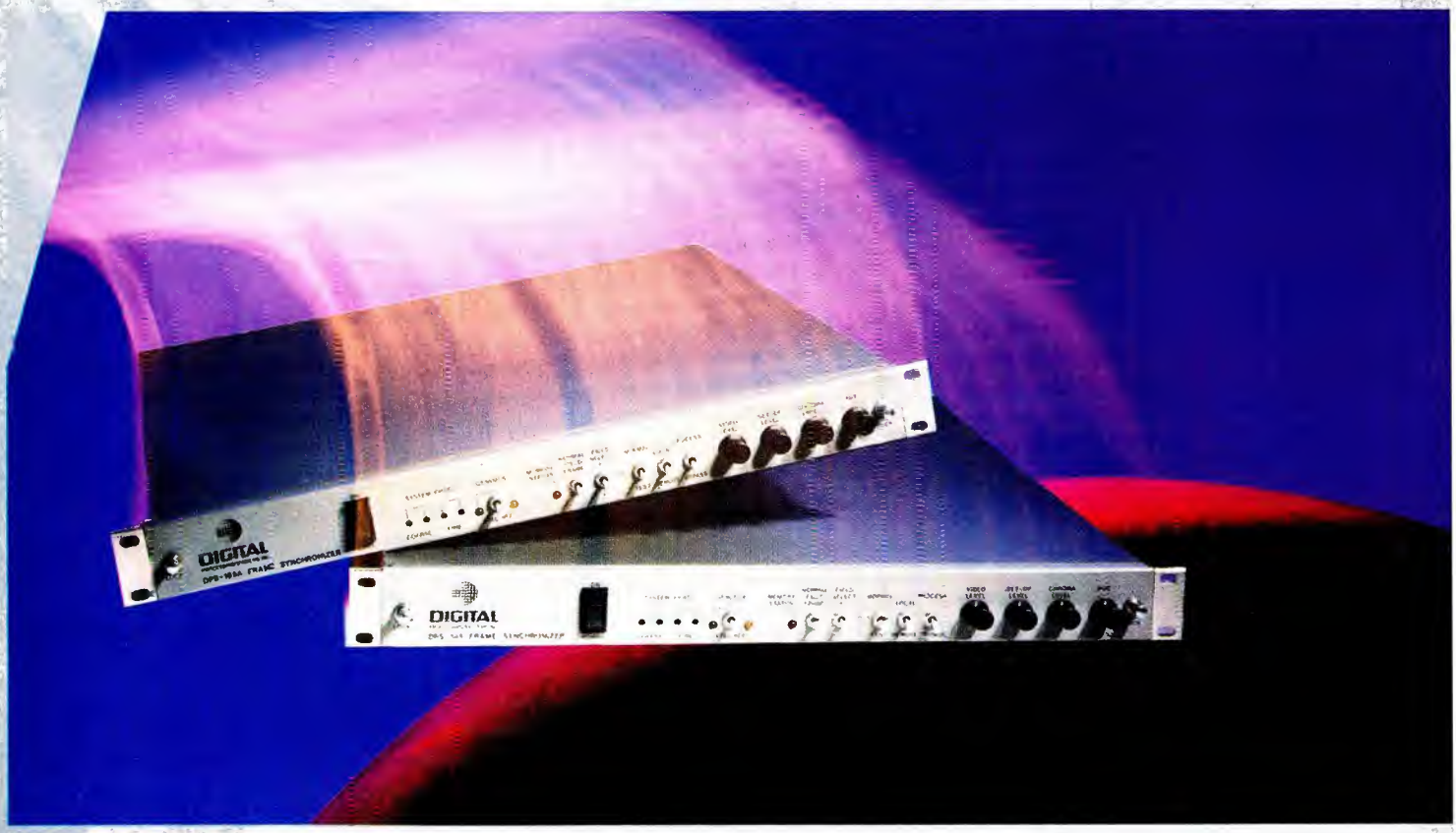

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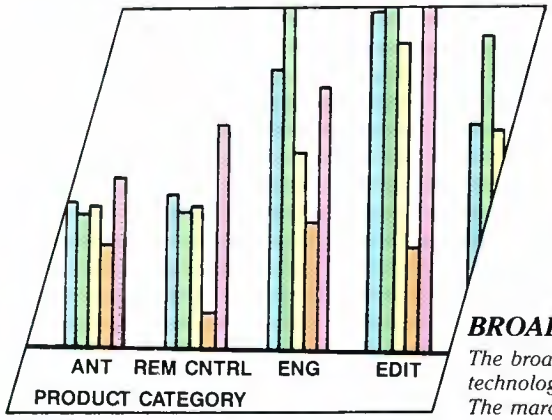

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BROADCAST engineering

BROADCAST TECHNOLOGY FORECAST FOR 1989

The broadcast industry is moving rapidly as advancements in technology bring stations new ways to solve old problems. The march of progress is not, however, without its drawbacks. Our annual Broadcast Technology Forecast *examines where technology is today, and where it is likely to lead us.*

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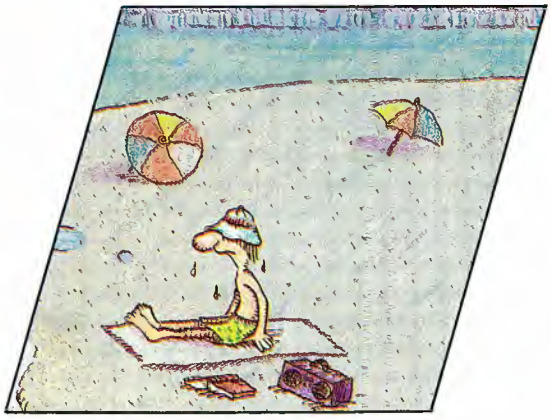

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ON THE COVER

Digital technology has revolutionized radio and TV broadcasting. Besides giving users new ways to accomplish tasks, new semiconductors have opened the doors to a wealth of opportunities. Our cover this month shows a semiconductor wafer processing stage. (Photo courtesy of Hughes Aircraft. Photographed by Gary Panton.)

DEPARTMENTS

News

Claudy joins NAB as staff engineer

Lynn D. Claudy has been named a staff engineer for the National Association of Broadcasters (NAB). Claudy is former manager of Communications Engineering Operations, Hoppmann Corporation, Chantilly, VA.

As an adjunct professor of physics at The American University, Washington, DC, Claudy teaches acoustics and the fundamentals of audio technology.

NBC proposes HDTV production standard

NBC has submitted a high-definition TV (HDTV) production standard to the Society of Motion Picture and Television Engineers (SMPTE).

The documentation describes the basic characteristics of the video signals that would be associated with origination equipment operating in the 1,050/59.94/2:1 and 1:1 and the 525/59.94 1:1 HDTV production formats. These parameter values were specifically chosen to provide an economic and evolutionary means to implement HDTV production in an NTSC environment.

Although the exact implementation is subject to the SMPTE process, this additional production standard has been endorsed by Capital Cities/ABC, Zenith, Thomson Consumer Electronics, North American Philips, The Center for Advanced Television Studies (CATS), Faroudja Laboratories and Tribune Broadcasting.

SMPTE is the accredited standards-drafting body under the American National Standards Institute (ANSI) for voluntary national standards in the area of TV production and motion pictures.

The delivery of the HDTV pictures produced by these and all other HDTV systems requires three different standards: a production standard for sending signals from cameras and studio facilities to satellites; a satellite standard for delivering signals from satellites to local stations and a transmission standard for deliver ing pictures from local TV stations tc homes.

NBC's proposed production standard i: technologically significant in that, if eacl of the three standards used to deliver pic tures from the camera to the viewer's se is compatible, the conversion steps tha diminish picture quality and add cost car be avoided. The production standarc would be completely compatible with the transmission standards used by Advancec Compatible Television and other leading HDTV alternatives, and is meant to be evaluated in parallel with FCC delibera tions on transmission systems.

Crutchfield joins ATTC staff

E. Benjamin Crutchfield, a communica tions industry analyst specializing in ad vanced TV systems development, ha

Continued on page 12

BROADCAST engineering

Editorial and advertising correspondence should be addressed to: P.O. Box 12901, Overland Park, KS 66212-9981 (a suburb of Kansas City, MO); (913) 888-4664. Telex: 42-4156 Intertec OLPK. Circulation correspondence should be sent to the above address, under P.O. Box 12937. RAPIDFAX: (913) 541-6697.

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FCC relaxes media diversification

By Harry C. Martin

The duopoly rule for radio stations and the cross-interest policy, which applies to all broadcast services, have been modified. Common ownership of two commercial stations in the same service with overlapping 1mV/m signal contours was prohibited by the duopoly rule. The new rules, reflecting the acknowledgment that the 1mV/m AM and FM signals are different in their service capabilities, change the overlap prohibition standard to the principal-city contour for each service (5mV/m for AM and 3.16mV/m for FM).

The cross-interest policy prevented parties such as advertising agencies and consultants to serve competing media outlets in the same market. Individuals, in particular, were barred from having an ownership interest in one broadcast station while having a "meaningful relationship" with a competing facility in the same market. The policy revision lifts the ban on cross-interest relationships for consultants, joint ventures, time brokers and advertising agencies. A proscription remains, however, against key employees at one station having an attributable ownership interest in another station in the same market, or a non-attributable interest that has cross-interest implications. In a future proceeding, the commission will explore the need to retain cross-interest bans of any type.

The revisions are a result of the perception that, with the large number of new media services available, the marketplace is less susceptible to control by a single voice than it was at the time the multiple ownership rules were instituted. The rule changes are an attempt to balance the need for a variety of outlets for differing views against the economic efficiencies and potential for improvement in programming that will result from a less stringent regulatory scheme.

Proposing AM modifications

To help AM stations compete more effectively, the following four proposals to modify the rules governing AM operations have been put forth:

- Allow Class II-S and Class III-S stations to establish separate nighttime antenna systems without having to meet current minimum power, city coverage or operating schedule requirements. Also permit full-service Class II and Class III stations to reduce power below the current 250W minimum.
- Replace the current curves for calculating skywave propagation with a recently developed computer-based model. This model improves representation of the field strengths of AM stations and their potential for interference. It also provides more accurate predictions of AM field-strength contours.
- Replace the existing groundwave propagation curves with newly developed curves derived from analytical techniques that overcome mathematical deficiencies associated with the existing curves. The new curves also provide a better basis for predicting AM service and interference.
- Revise the methods for calculating the protection afforded the nighttime service of AM stations. Specifically, modify the rules relating to the calculation of nighttime skywave Class II and Class III stations and the skywave service contours of the Class I clears. (Comments also are being sought concerning inclusion of adjacent-channel skywave signals in such calculations.)

Seeking repeal of compulsory license

The commission has made a recommendation to Congress calling for the elimination of a compulsory license for cable retransmission of distant broadcast signals. Under the present statutory scheme, the commission determines the signals that are eligible for compulsory license treatment. Copyright fees paid for distant signals are set by statute and collected by the Copyright Office. Distribution of the fees is handled by a Copyright Royalty Tribunal in Washington that adjusts rates for inflation and in response to changes in the commission rules.

According to the commission, consumers also would benefit from the elimination of the compulsory license. At present, the system makes some programming too expensive for cable distribution. Similarly, broadcasters would benefit because their share of copyright fees may be too low under the current compulsory license system.

The report to Congress also may include a recommendation on the compulsory license for local signals. Cable systems currently are permitted to carry local signals without payment of any royalty fees. Action has been prompted by numerous complaints by members of Congress, the TV industry and program suppliers who say cable is getting preferential treatment in the program distribution marketplace.

Typical rule violations

The commission has released a list of problem areas that frequently surface in station inspections. Many of these can be remedied easily and could result in a substantial fine if not resolved.

Safety-Related:

- Inadequate painting and lighting of towers.
- Inadequate locked fencing around AM towers.
- EBS operation, including missing or malfunctioning EBS monitors; failure to receive or transmit weekly EBS tests; failure to log EBS tests; and lack of a current EBS check list or authenticator word list.

Interference Potential:

- AM directional antenna parameters and monitoring-point levels outside tolerance.
- Inadequate meters and transmitter control at operator's position.
- Frequency and modulation outside of tolerance at TV stations.
- Overpower and other unauthorized operation of non-commercial educational FM stations.

Administrative:

- Failure to have, or items missing from, the station's public file.
- Lack of availability of station's authorizations.

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

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

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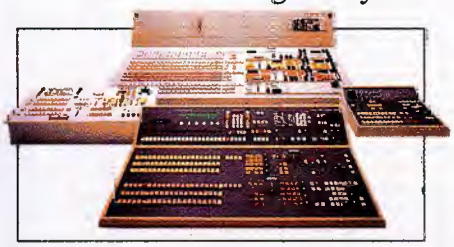

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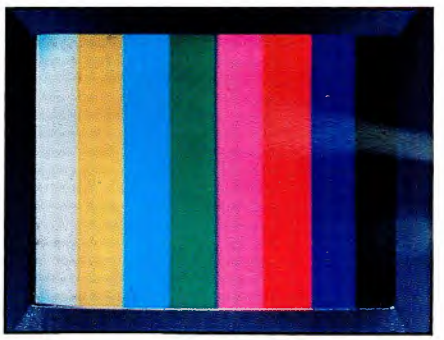

Inside the visual PA

By Carl Bentz, technical and special projects editor

Last month we considered the tilt and rounding of relatively low-frequency (50Hz to 15kHz) pulses or transients. When it comes to transients of higher-frequency components (15kHz to 250kHz), new phenomena appear, such as tendencies of overshoot on the leading edge of transitions and, possibly, ringing at the top and bottom of the waveform area. The shorter duration of the "flat" top and bottom lowers concern about tilt and rounding.

A square wave contains a fundamental frequency and numerous odd harmonics. The number of the harmonics determines the rise or fall times of the pulses. Square waves with rise times of 100ns (T) and 200ns (2T) are particularly useful for TV measurements. In the 2T pulse, significant harmonics approach 5MHz, and a T pulse includes components approaching 10MHz. Because the TV system should carry as much information as possible, and its response should be as flat as possible, the T pulse is a common test signal for determination of group delay.

Group delay is the effect of time- and frequency-sensitive circuitry on a range of frequencies. Recall that time, frequency, phase shift and signal delay are related and can be determined from circuit component values. For simplicity, consider the time constant formula for a resistor and capacitor, T = R×C. The resistance (in ohms) is a relatively simple value and, theoretically, is not frequency-dependent.

The impedance presented by the capacitor depends on the frequency of the signal passing through the capacitance. The value of Z suddenly involves the product of frequency F and 2π (approximately 6.28). For a range of frequencies, the impedance and response of the RC combination vary. A signal component of 75kHz passing through an RC circuit experiences a different amount of phase shift and delay than a component of 3.58MHz.

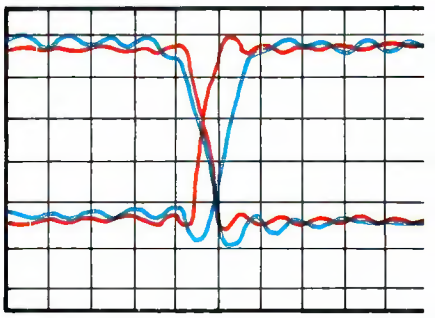

Figure 2. *When measuring transients from 10% to 75% of peak voltage, envelope detection (red trace) includes quadrature error. Synchronous detection (blue trace) is a better indicator of response.*

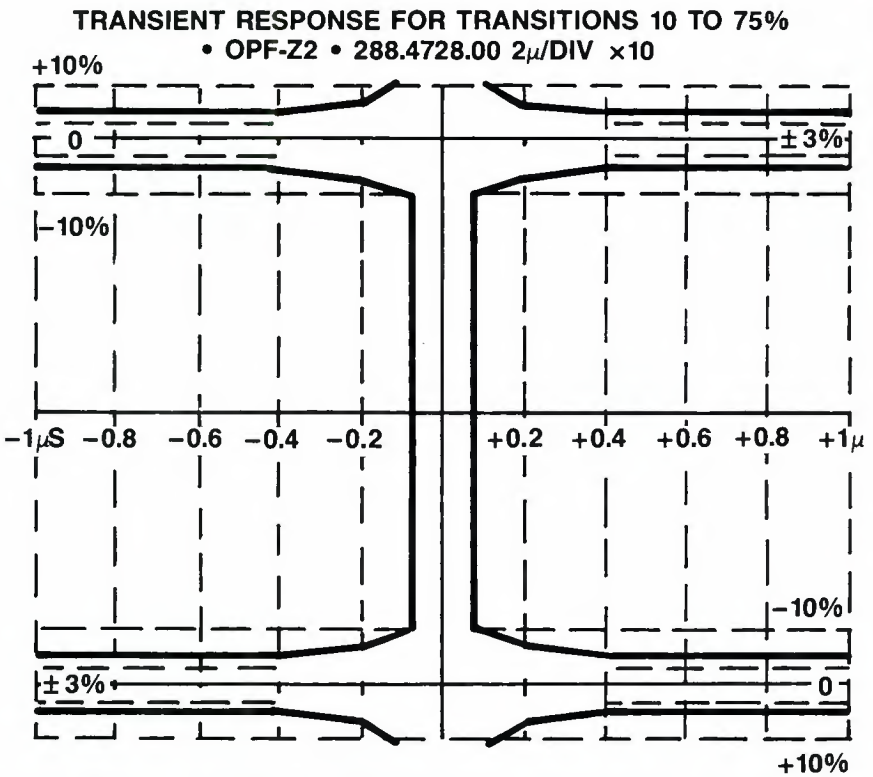

Figure 1. *Tolerance graticule mask for measuring transient response of the visual transmitter. A complete oscillation is first displayed on the screen. The time base then is expanded, and the signal X–Y position controls are adjusted to shift the trace into the tolerance mask.*

Excessive group delay in a video signal appears as a loss of image definition. Group delay is a fact of life that cannot be avoided, but its effect can be reduced through predistortion of the video signal. Group delay adjustments can be made before the modulator stage of the transmitter, during monitoring of the signal from a feedline test port.

One approach to transient and group delay monitoring is to use a special scope or waveform graticule. The goal in making adjustments is to fit all excursions of the signal between the smallest tolerance markings of the graticule. Because quadrature phase errors are caused by the vestigial sideband transmission system, synchronous detection is needed to develop the display. As the differences in the red (synchronous) and blue (envelope) traces indicate, the result of envelope detection would fall completely out of the graticule markings at certain points.

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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STUDER REVOX

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re: Radio

Reach for LPTV opportunities

By John Battison, P.E.

Although this is a radio column, I'd like to talk about low-power television (LPTV) this month. To me, the recent Community Broadcast Association convention in Las Vegas, NV, was highly reminiscent of the early days of FM, with one exception. Back then, few radios were capable of receiving the broadcasts of the brave FM broadcasters. Today, the entrepreneurs have a ready-made body of receiver set (TV) owners.

LPTV should be of interest to radio engineers. Many of the station operators already own AM or FM stations. In fact, approximately 10 of my clients are either operating or holding construction permits for new LPTV stations.

There is no doubt that the service will spread. The early backlog of more than 35,000 applications has been whittled down considerably. Approximately 700 authorizations are now outstanding. Many of the phony and quick-buck applicants either sold their CPs or did not win the lotteries. This means the astute radio engineer has the opportunity to acquire new areas of expertise and the potential to earn additional income.

The standard TV station engineer normally will not be involved much in LPTV for several reasons. It is doubtful that many of the regular TV stations have LPTV plans. LPTV is small—the mom-and-pop type of operation. Owners typically have little or no knowledge of broadcasting unless they are current owners of a radio station. It has been my experience that, even if they are FCC licensees, they know little about LPTV or television.

An LPTV station can use up to 10W transmitter power output per antenna at VHF and up to 1kW TPO at UHF. There is a possibility that 1kW per antenna from a single, higher-power transmitter may be allowed in some UHF cases. This issue was raised at the LPTV conference, and Keith Larson, head of LPTV for the commission, did not rule it out.

Full-time engineers

Many radio station managers are beginning to look for full-time staff engineers again. These owners are willing to provide support in return for loyalty, good service and an understanding of the station's needs.

The annual salary survey, reported in the October issue of **BE**, seemed to confirm this shift. Although many engineers can cite examples of reduced staffs, modern technology does not eliminate the need for technical expertise. Perhaps the pendulum is finally swinging back toward supporting engineers in an effort to maintain market share in competitive areas.

FM radio

The U.S.-Canadian FM agreement makes provision for 50W low-power FM stations. It's true that no licenses have been granted yet in the United States, but the provision is there. Currently, the nearest U.S. approach to low-power FM is with translators and boosters. These types of installations, however, are not permitted to operate as stand-alone originating FM stations.

In response to inquiries received, the commission claimed no present intention of activating low-power FM operations. However, with the recent changes in the FM translator and booster rules, it may be that the commission is leading up to low-power FM broadcasting. Groups that are authorized to operate low-power (Class D) FM stations are limited to those who can prove education, religious or non-commercial operation.

However, the days of the Class D, 10W stations are numbered. The next round of rule changes may specify operation at 50W. With low-power FM stations, a commercial operator would be able to specify 50W, instead of the present 3kW at 100m equivalent. This is the foundation upon which all Class A commercial FM broadcasters must base their station-to-station separations.

A different set of parameters is used by non-commercial broadcast stations. They look at coverage and interference parameters, actual power output and effective antenna height. A minimum of 100W is required for Class A operation.

Don't hold your breath waiting for the gates of low-power FM to open. Remember, in spite of the agreement between the United States and Canada, there is no provision for such operation in the current rules. However, tentative inquiries may start the ball rolling at the commission. All that is needed is a revision of the rules to allow provisions for low-power FM.

A multitude of small villages and cities in the United States would benefit from LPFM. Now that the last window of Docket 80-90 is closed, there may be FCC engineers who would like to tackle LPFM. Perhaps the time is ripe to push for it.

Prepare for winter

Winter is here, and broadcasters soon will notice the effects of wind, rain and ice on the antennas and towers. Now is the time to make sure that you know how your antenna will respond to this weather. If a tower falls or a line breaks, it is important to know how the antenna worked before the accident.

Table 1 shows the minimum parameters for both directional and non-directional stations that should be recorded in a maintenance log. The station's license application should include much of the information. A prudent engineer will have all the information recorded in the station notes before any problems develop.

- **All phaser dial settings**
- **All phaser coil data (such as number of turns active and inactive)**
- **Common-point current**
- **Line current at the phaser end for each transmission line**
- **Operating line impedance into each line at the phaser output**
- **Line current into each ATU at the ATU input**
- **Input impedance measurement of each ATU under operating conditions**
- **Complete ATU inductance and capacitance data (including coil taps and capacitors)**
- **Antenna base operating impedance**
- **Antenna base current**

Table 1. *Troubleshooting will be quicker and easier if your maintenance logs contain detailed information about the system.*

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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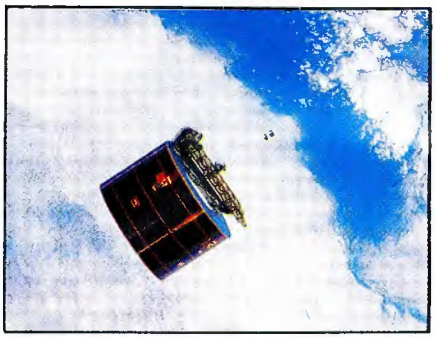
Getting into orbit



By Elmer Smalling III

Launching a spacecraft is the first and the simplest step in getting the craft into orbit. Past "Satellite Technology" columns have examined the process of overcoming Earth's gravity with powerful rocket engines, whose brute force propels the spacecraft to a preliminary or parking orbit about 100 miles above the Earth. Let's look at the mechanics of obtaining and maintaining the final orbit.

Low Earth orbit

There are two basic types of orbit. One, called a *low Earth* orbit, is usually 200 to 600 miles above the Earth's surface. Some military scanning satellites orbit from pole to pole, and allow a full view of the Earth's surface as the planet travels "underneath" the satellite. Some satellites have odd-shaped elliptical orbits that cause them to cover preselected areas for as much of their orbits as possible. The Soviet Molniya communications satellites are of this type. They roam the skies from the northern part of the USSR to the Antarctic and must be tracked with steerable antennas.

Low Earth satellites, such as the space shuttle and various reconnaissance vehicles, usually are placed in orbit in three steps. First, they are launched into a low parking orbit, which is usually about 100 miles above the Earth. At this point, the post-launch condition of the vehicle can be evaluated, and time is available to update computers and to process telemetry. The next step is an elliptical orbit with a perigee (low point) at the parking orbit and an apogee (high point) at the altitude of the desired orbit. This acutely elliptical orbit is called a *transfer* or *Hohmann* orbit. When the vehicle reaches the apogee of the transfer orbit, an apogee kick motor is fired to place the vehicle in a circular orbit at the desired altitude.

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

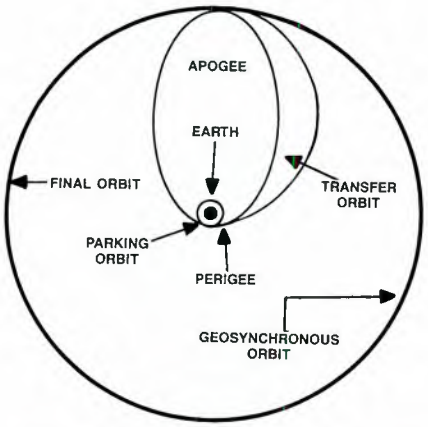
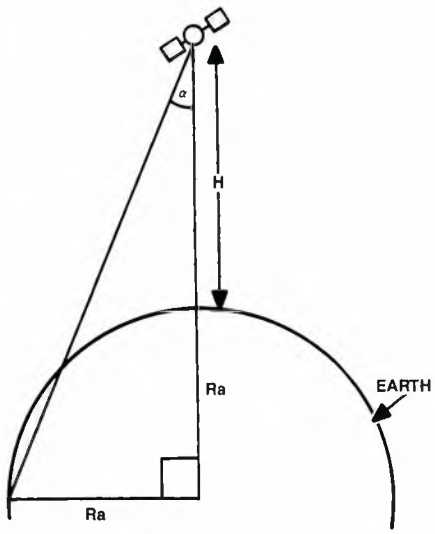


Figure 1. *For low Earth orbit, a rocket burn moves the craft from a parking orbit through transfer to the final orbit. To achieve a geosynchronous orbit, the satellite goes directly through the transfer orbit to the final altitude.*



$$\alpha = \cos^{-1}\frac{Ra}{Ra + H}$$

H	α
MILES	DEGREES
100	13
1,000	37
22,300	81.5

Figure 2. *Calculation of α, the angle of visibility.*

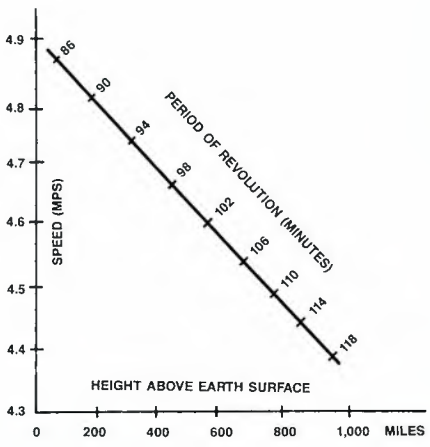


Figure 3. *This nomograph shows satellite speed and period of revolution vs. spacecraft altitude.*

Geostationary orbit

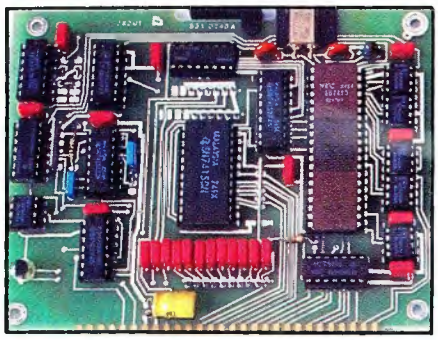
The second type of orbit is called *geostationary* or *geosynchronous*. A satellite that is placed in orbit at the proper altitude over the equator, and at the proper velocity, will move at the same rate as the spin of the Earth, appearing to be stationary. This type of satellite is used for C- and Ku-band TV communications.

Geostationary satellites are launched in two steps. The vehicle first is placed into an elliptical transfer orbit—bypassing the parking orbit stage of low Earth orbital craft. The apogee of the transfer orbit is at the height of the final geosynchronous orbit (23,000 miles above the equator). To inject the satellite into final orbit, the apogee kick motor is fired, at apogee, to insert the satellite into its geosynchronous parking place. See Figure 1.

Various factors contribute to the instability of a geosynchronous orbit. The bulge of the Earth at the equator (mass asymmetry) causes a satellite to lose precise synchronism with the Earth's rotation. Effects of the sun and moon will cause minor variations to the orbit in the north-south direction. Satellite positioning or station keeping is accomplished by controlling the east-west location of the vehicle. Because synchronous satellites orbit above the equator, moving a satellite to a new location (longitude) is relatively easy.

Figuring the angle

The higher the satellite, the more Earth surface that is visible. This is the satellite's *angle of visibility*. Figure 2 shows a simple formula for calculating the angle of visibility. The nomograph, shown in Figure 3, relates low orbit satellite altitude, speed and period of revolution.



Application-specific ICs

By Gerry Kaufhold II

High-speed analog-to-digital (A/D) converters, which were discussed in last month's column, are common in applications such as digital frame synchronizers or frame stores. To obtain an accuracy of 1% resolution in the conversion, a circuit might use 100 comparators, each adjusted to capture 1/100 of the input signal. Then, the 100 discrete levels are converted to a digitally encoded word with the 100 levels translated into a 7-bit word. (Recall that a 7-bit word can assume 128 different states.)

The circuitry that performs the conversion uses numerous AND, OR and NOT (inverter) gates. Such circuitry could involve enough standard TTL logic packages to fill an entire printed circuit board and present problems.

TTL logic operates at a high current level that causes the circuit board to run hot. Numerous interconnection points of TTL dual-in-line (DIP) packages are prone to failure because the units are inserted into sockets. The time needed to insert a large number of parts into a board and follow up with wave-soldering, may slow production and decrease reliability of the products using the assembly. TTL device availability may result in delivery problems for the company that manufactures a TTL subsystem.

Custom circuitry

Semiconductor companies have developed solutions to some problems associated with designs that involve large arrays of standard TTL devices to implement complex logic functions. The designer can compress all the circuits shown on a schematic into a *full-custom* IC. To do so, each transistor, capacitor or resistor is converted into part of a customized IC.

The designer has freedom of choice in the full-custom IC design. For example, transistors can be created with desired gains and bandwidth characteristics. The final version of the circuit is made as small and as silicon-efficient as possible.

Drawbacks of full-custom ICs include the time and investment required to create, simulate and test the unproven parts. The design, debugging and preparatory production stages of a full-custom IC may take several years. For that reason, only applications requiring high-volume production justify creation of a full-custom IC. For broadcasting, the A/D front end of a CCD camera may be such a device.

Standard cells

Semiconductor manufacturers have large libraries of circuits stored in their design systems, including the designs to create original TTL functions. Semiconductor companies offer the elements o their device libraries as *standard cells*.

One practical use of standard cells is the development of an *application-specific* IC (ASIC) to duplicate a collection of TTL functions. Benefits of ASICs include low power consumption, fast operating speed reduced parts count, improved reliability and, occasionally, cost savings. In addition the ASIC protects the design from being copied by competitors.

Standard cells use device geometries that have been well-characterized Although the transistors and many TTL logic functions are standard, some functions may not be implemented. For non standard functions, the designer can pul the necessary elements from the library

When the design is finished, a computer simulates performance of the proposed IC After the circuit passes simulation tests, i is turned into silicon in the wafer fabrication plant. Creation of an integrated circuit may involve as many as 150 steps o masking, etching and implanting controlled impurities into the silicon.

Even with proven standard cell parts the complexity of the IC manufacturing process is expensive, especially for a pilo production run. Yields of less than 50% are not unrealistic. Standard cell designs require a heavy initial investment because the device is created from the wafer up One-time engineering costs may begin a $100,000. Time to develop and debug the ASIC may run into several years, but the cost savings for a high-volume application could be quite dramatic.

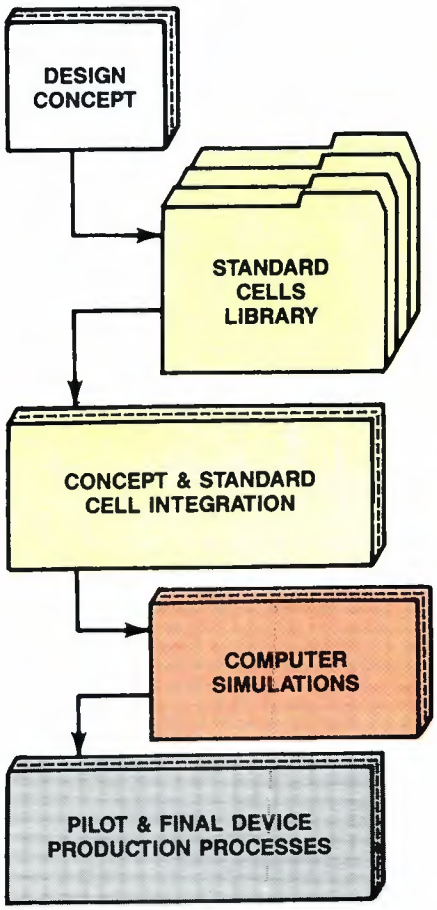


Figure 1. *In the process of developing full-custom ICs and application-specific integrated circuits, the designer can rely on a vast library of standard cells as a starting point for the design.*

Kaufhold is an independent consultant based in Tempe, AZ.

THE EDGE

Orban's 222A Stereo Spatial Enhancer is a powerful, new, on-air processing weapon that gives your station a more competitive "leading edge" sound.

Hundreds of stations of widely varying formats have already pleased their audiences with an attractive, magnified stereo spatial image, and have gained noticeable improvement in brightness, depth, and transient definition as a bonus.

But, they haven't experienced the traditional curses of stereo image enhancers—increased multipath distortion, unnatural exaggeration of reverberation, mono incompatibility, and homogenization of the stereo image due to the 222A's new, patent-pending approach.

Here are a few user comments about the 222A:

Frank Foti, Consultant (formerly WHTZ/Z-100, New York, NY/WMMS, Cleveland, OH): "Sublime on some material, very dramatic on others. Retains natural quality of music. A device to keep the competition guessing at a very affordable price."

Bill Ruck, KFOG-FM, San Francisco, CA: "Wow! On-line, pre-Optimod 8100A, set at maximum enhancement. Sounds very dramatic. Management loves it; I love it!"

Bob Leembruggen, KLOS-FM, Los Angeles, CA: "Sweet separation with center channel power."

John Alan, KLOL-FM, Houston, TX: "Unit works well; no additional multipath, even in Houston!"

Egidio Giani, WLR South East Radio, Waterford, Ireland: "Nice overall stereo sound which does not *sound* enhanced when in fact it is."

Unnamed Source (at user's request), Columbus, OH: "Good job at a great price. Subtle intensity!"

Whether your station is protecting top ratings or striving to provide a more pleasing product, the 222A can give you that *extra edge* by naturally enhancing your existing stereo spatial image.

The 222A delivers a sound that is crisp, natural, and, well-defined for just $995.*—a cost that is within reach of any station, small or large. Ask your Orban Dealer for a demo, or call today for more information on the 222A—your next audience-pleaser and ratings booster.

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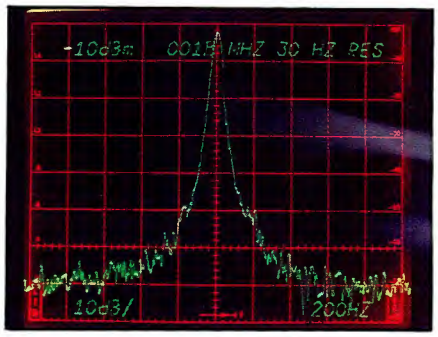
*(Suggested List)

Take the option to rent



By Jill Ryan

The digitally based recorders, processors and special-effects devices in today's rapidly changing broadcast technical environment require not only a trained maintenance staff, but also complex and expensive test equipment. However, purchase of that equipment may not be justified if a station needs the test equipment for only a short time.

Consider renting

Equipment rental may be the answer. Rental companies offer a wide variety of benefits and services, and they are equipped with a large assortment of general-purpose and specialized equipment. With one telephone call, you can get detailed specifications and prices on many different brands of equipment.

Often, rental companies have an applications engineer or specialist on staff to assist with recommendations for the equipment. These individuals are knowledgeable about the various available equipment and are impartial to any particular brand. Sometimes, a popular brand may be more expensive than another brand with equivalent specifications that also will fill your needs. (This is often true when you're considering purchasing equipment too.)

As a rule of thumb for pricing rental equipment, costs should be 5% to 10% of the current manufacturers' list price. A 1-month minimum rental period is usually required. However, some companies may be more flexible, especially if stock is retained locally. Rented test equipment also is delivered fully calibrated. The customer does not have to be concerned with charges for the equipment's upkeep and maintenance.

Cost allocation also is a major benefit of equipment rental. Some facilities charge the rental fees directly to contracts or individual projects. In this way, renting allows use of the equipment without any capital expenditure.

Rental payments are deductible from pre-tax income; therefore, leasing equipment can postpone tax payments. Also, rental payments usually are higher than the depreciation rate on equipment. This results in a tax decrease during the rental term, which means an increase in available capital.

Choosing a rental company

Two important factors should be considered when choosing a rental company: delivery and technical support. Before renting, ask the following questions:

- Is stock kept locally so that it can be picked up or delivered in a satisfactory amount of time?
- If the equipment is shipped from another area, who will be responsible for the shipping costs?
- After the equipment is used, how is it to be returned?
- Who will pay the return shipping costs?
- Are there any insurance costs?

Technical support also is a big concern, even for facilities that already have knowledgeable technicians. They may run into a problem using the equipment because of a lack of familiarity. What if the test equipment fails? Can the device be replaced or repaired immediately? It's also important that someone at the rental company is available to come on-site if help is needed.

Study the options

Many rental companies offer a rent-with option (RWO) plan. A percentage of the monthly charge builds equity on the equipment. When the last invoice is converted over to a sale, the tax benefits can double from the equipment depreciation.

Rental companies keep state-of-the-art inventory in stock. Therefore, they often sell instruments that are still highly useful but have been superseded by a newer model or modification. Buying pre-owned equipment allows you to pay less to get the needed features. This equipment will meet original manufacturers' specifications and will come with a warranty. Extended warranties sometimes are available. A pre-owned purchase can save you from 10% to 50% off the list price.

Although most rental equipment inventory is state-of-the-art, rental companies often can provide equipment for older systems. It may be that an obsolete piece of equipment that is needed to keep a system working may be in the rental company's inventory.

Don't choose a rental company just because it happens to have a huge inventory. Service often makes the difference between rental companies. Look for the rental company with the most reliable products, that can deliver immediately, can back you with its support and can work with you on a variety of financial options. That is the company to choose.

Advantages of selling

- Save time
- Control budget
- Free capital
- Maximize cash flow
- Reduce equipment maintenance costs
- Wipe out repair/calibration costs
- Lower inventory overhead
- Evaluate equipment before buying
- Help with short-term projects
- Address emergency situations
- Help with last-minute projects
- Fill in when a supplier fails to deliver on time
- Improve use of equipment
- Eliminate obsolescence

Table 1. Before deciding you can't afford to have access to an important piece of equipment, consider the advantages of rental equipment.

Ryan is sales and marketing manager for Advanced Test Equipment Rentals, San Diego, CA.

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Part 4

Management for engineers

Techniques for dealing with problem behavior

By Brad Dick,
radio technical editor

In the first three parts of this series, different types of problem-causing behavior have been described in detail, so that you can more easily identify them in your own facility and respond effectively. Now, let's look at what triggers people to exhibit these behavioral patterns on the job.

Case study

Alan had spent the past two weeks using his home computer to prepare drawings of the new control room. The work he'd been doing at home wasn't assigned; he wanted to impress Carl, the chief engineer, with his abilities and those of the computer. Besides, Alan had been trying to get the chief to approve the purchase of a computer for the engineering department for months, and he saw this project as the key to convincing Carl.

On Monday, after he'd spent the weekend finishing the drawings, Alan took the prints into Carl's office. He had to wait briefly while Carl finished a telephone conversation. Alan then began to describe the work he had completed. Carl gave the drawings a perfunctory review and said, "Say, this is great work, Alan, but can we talk about it later?"

No matter what Carl's intentions were, Alan now feels hurt, deflated and unappreciated. He will recover from the incident, especially if Carl makes an effort to praise Alan's work that same day, but he is faced with returning to work with a major hole in his ego. The next person he encounters may suffer the consequences.

If Alan has time to bounce back from the meeting, he may suffer only a short-term letdown. However, if he returns to a pressure-filled situation, he may not be able to perform at his best. It's unlikely that he will be able to think and plan as clearly and rationally as before the encounter. Because broadcasting is a fast-paced, intensive business, adequate recovery time from incidents of this type often is not available. When this happens, any further conflicts or threats may be met not with logic and planning, but with learned responses—defensive strategies.

Identifying defensive strategies

Everybody deals with pressure and threats differently. Although the specific methods are unique to each individual, four general types of coping behavior are commonly found.

The first type, *blame others/fight*, is seen as a first line of defense against personal attack. The defensive person will blame others. A supervisor approaches the tape operator and asks why several of the spots in the evening strip didn't run properly. Instead of a logical explanation, the operator says, "It's this damn machine. I've complained about the tracking problems for weeks. It's not my fault that they can't fix it. If you want perfection, then fix the machine."

Note that little information was passed from the operator to the supervisor. Instead, the operator blamed someone else (in this case the blame was directed toward *they*, a convenient and nebulous scapegoat).

A related approach is referred to as *blame self/give in*. In the same situation, a tape operator who behaves this way might say, "Yeah, I know. It was probably my fault. I shouldn't have tried to do my dubbing at the same time."

The *dig-in/withdraw* defensive response is used by people who seem to like fights. They will dig in their heels and hold their ground, even when they know they are wrong. After these types make a show of holding their position, they make a swift withdrawal from the situation. To them, this is a quick way to save face by allowing themselves to make a point without having to defend it later.

The fourth defensive strategy is *distract/make peace*. The tape operator using this approach may respond, "You're right, chief. The Ford spot had more stripes than a zebra. Oh, by the way, because you have such a knack with these old machines, I wonder if you could take a look at tape 4. It seems a little slow in locking up."

The response appears to acknowledge the problem at first, but the operator quickly changes the subject with a little ego-patting for the chief engineer. The intent is to distract the attacker and make peace, often by massaging the other person's ego.

Breaking down the defenses

Coping with these behaviors is a 4-step process. First, you must be able to recognize when defensive behavior begins.

The second step, and for many the most difficult, is to interrupt this cycle of defensive behavior. Let's say the GM jumps you about missed spots. You immediately storm into the tape room to "get an explanation." Just as you reach the tape operator, you realize that your finger is in the air, pointed at the operator, and your voice is raised. Stop. No matter how strange it may appear to others, stop talking, turn around and go back to your office.

If you can do this, you have interrupted the defensive behavior cycle. Cutting off your behavior abruptly may seem drastic, but the rewards are worth the effort.

Third, be alert to the signs of defensive reactions toward you. Failing to quickly recognize defensive behavior when it appears makes it more difficult to take effective action.

Identifying and addressing the threat, as perceived by the other person, is the last step in dealing with this behavior. It also is the most difficult unless you know the other person well. You can offend someone deeply without even knowing it. Let's say you're touring the station with Pete, the new chief engineer, and you make a comment about the previous chief engineer. "John sure was talented. I was always impressed with the thought and care that went into his designs. His abilities show up in how good these studios look."

Whether John was or was not a great engineer, Pete could view the complimentary statements about him as a threat.

There is evidence that people often respond emotionally to events before the situation has been analyzed consciously. The defensive strategies are used unconsciously. Unfortunately, these emotional responses seldom benefit the job environment. The result usually is increased tension among staff members, lowered morale and decreased efficiency. Preventing emotional traps from becoming problem behavior lies in early detection.

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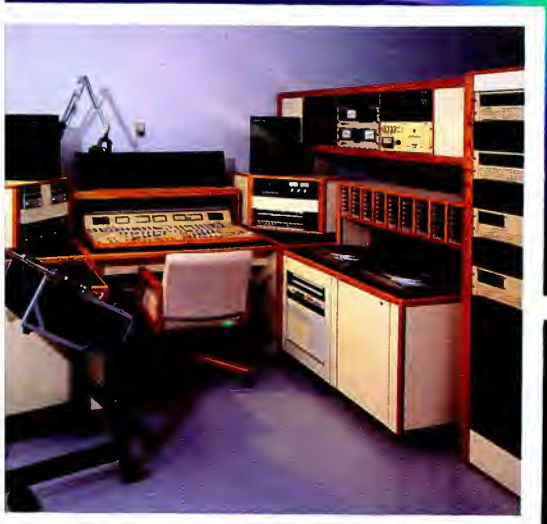

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What's in store for '89

By Brad Dick, issue editor

December is when most of us reflect on the successes of the past year and look forward to beginning anew in January. The past year has been filled with doom-and-gloom comments, and, unfortunately, some of them proved to be correct.

A recent survey conducted for the NAB shows that AM radio has suffered another 3% to 11% loss in listenership. Although AM broadcasters see stereo as AM's salvation, many radio listeners aren't even aware that AM stereo exists. The study found that a large group of respondents (15.2%) had never even heard of AM stereo.

TV broadcasters also are facing new challenges. New competitors for the same audience increase the pressure on bottom-line thinking. The National Telecommunications and Information Administration (NTIA) released a report in October outlining some of the changes that may take place over the next decade. The report, *NTIA Telecom 2000*, predicts that over-the-air broadcasting will remain a vital element in this country's electronic media. However, it continues by noting that television may prove to be less profitable in this period.

What do these changes mean to you, the engineering manager? For one thing, it means you have to become more aware of industry trends and technology. If you don't understand how technology can benefit your station, how can you expect your manager to support your equipment requests? The engineering manager's role is no longer one of fix and repair; today, it is to plan and implement.

The successful use of new technology may even be the key to your station's survival. New equipment may produce cost savings crucial to a station's existence. New technology may even increase your station's audience share through improved production capabilities or enhanced audio and video products. Properly used, new technological developments can help your station stand out in a crowded marketplace.

The engineering manager's task is to identify the appropriate technology and apply it effectively. Those engineers who recognize technological trends and opportunities will be key players in making their stations successful.

This month, we examine several areas that are significant to today's technical managers. Building on the past is no longer sufficient to guarantee success. Use the **BE** Annual Broadcast Technology Forecast to help you plan for the future success of your station.

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State-of-the-industry report

By Brad Dick, technical editor

Television might be picking up the pace a little, but radio is hitting the brakes.

You've probably heard stories about seeing the light at the end of the tunnel. Well, the light may be there for TV broadcasters, but radio stations seem to think that light may be an oncoming train. As TV stations grapple with new digital techniques, many radio stations struggle to cope with increased debt and stiffer competition.

The **BE** annual state of the industry is the second of a 2-part overview of trends and conditions in broadcasting. The results of the first half of the project, the annual salary survey, were published in the October issue. That article looked at salaries and benefits paid to radio and TV management, engineering and operations staffs. The state of the industry survey completes the project with an overview of purchasing and budget plans.

The survey was scientifically conducted by the marketing research department of Intertec Publishing, under the direction of Kate Smith. On Sept. 9, 1,686 questionnaires were mailed to **BE** recipients on an "nth name" basis. By Nov. 8, 572 questionnaires had been received, representing a 33.9% response rate. The data contained in this report is based on those responses.

TV plans

More TV stations than last year indicate plans to upgrade facilities during 1989. Measured over all markets, 87.6% of the TV stations indicate plans to upgrade their stations. This is a 7.5% increase compared with last year.

Reflecting the pressure of a competitive marketplace, 94.4% of the stations in the top 50 markets plan new projects. There is no change from last year in the percentage of stations in the top 100 markets planning upgrades. The below top 100 market TV stations are tightening their belts. Only 75% of these stations plan to upgrade their stations. This is almost 10% lower than last year. The planned purchases for TV stations, broken down by equipment category and market size, are shown in Figure 1.

Measured over all markets, the No. 1 equipment purchase category still is production equipment. This has been the case for the past four years. The No 2. spending category is master control equipment. This year's No. 3 spending category is editing equipment, followed by transmitters. Planned spending by equipment category is shown in Figure 2.

For the first time, the **BE** survey looked at spending plans for non-commercial stations. The percentage of non-commercial stations that plan on purchasing equipment is higher in almost every category than for commercial stations. The percentage of non-commercial stations planning purchases from each of the eight categories never drops below 21%. That's the good news. The bad news is that non-commercial stations may have smaller budgets than same-market commercial stations.

Radio plans

Radio spending plans appear to be more restrained than TV spending plans. In only one category do TV spending plans drop to the single-digit figures. That is not

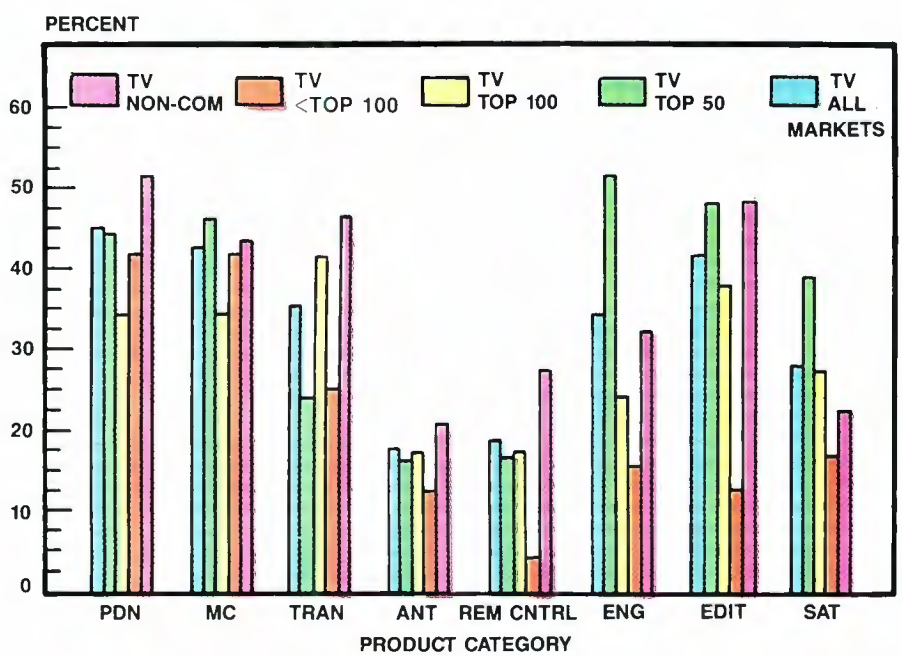

Figure 1. Relative spending plans of TV stations, broken down by category and market size.

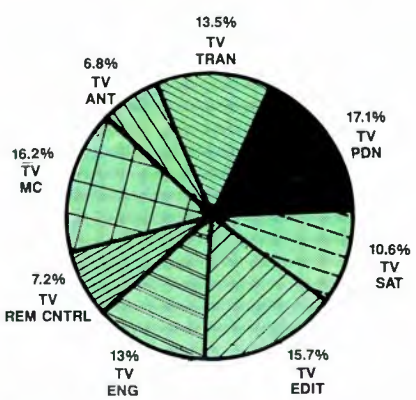

Figure 2. Planned spending by TV stations, broken down by equipment category.

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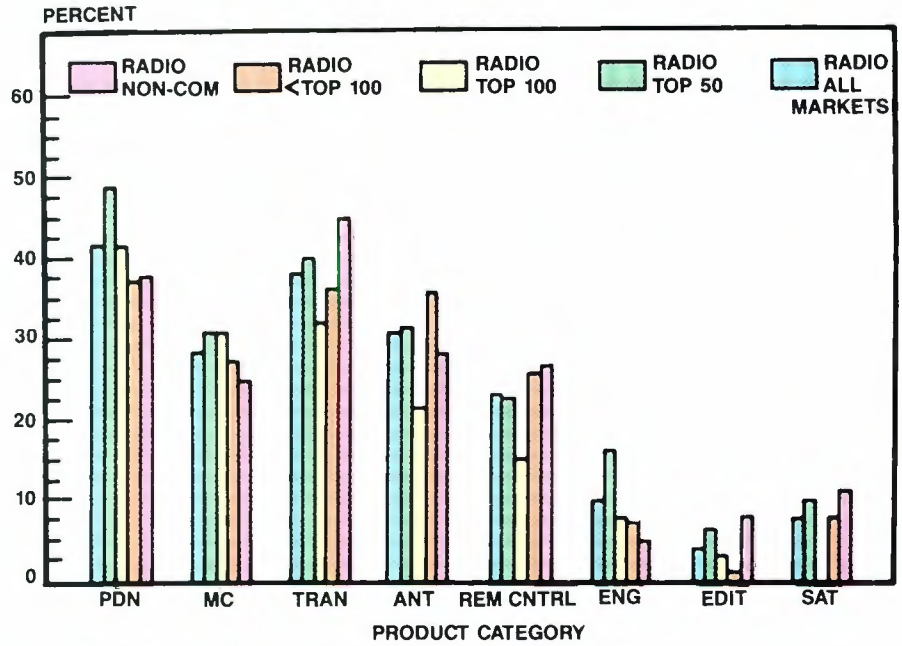

Figure 3. Relative spending plans of radio stations, broken down by category and market size.

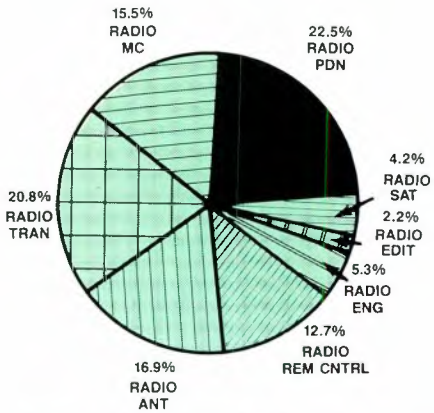

Figure 4. Planned spending by radio stations, broken down by equipment category.

the case for radio. In one-third of the equipment categories, less than 10% of the radio stations plan purchases. Radio spending plans broken down by equipment category and market size are shown in Figure 3.

Radio stations are interested primarily in four categories of equipment: production, transmitters, antennas and master control. Commercial stations, across all markets, rate production equipment as the No. 1 priority. The No. 2 item on the wish list is transmitters. The No. 3 priority is antennas, and master control equipment rates as No. 4. Radio station spending plans by equipment category are shown in Figure 4.

Equipment budgets

This year's median TV equipment budget is $320,000, an increase of 6.7%. Budgets for 1989 are up in both the top 50 and top 100 markets. The top 50 market budget is $460,000, up 10.6% from last year. In the below top 100 markets, equipment budgets are 22.2% lower than last year. Results are summarized in Figure 5.

The 1988 median equipment budget for non-commercial TV stations is $212,000. Because no previous data is available, it's not possible to ascertain whether this represents an increase or decrease from last year. It is worth noting that the median non-commercial TV budget is slightly higher than what's available in the below top 100 markets. The non-commercial TV budget is less than one-half that available in the top 50 and top 100 markets.

Reduced spending plans are reflected again in radio budgets. This year's median radio budget is $17,900, down 23.8% from last year. The top 50 market budget was the only category showing an increase. The net increase was 8.9%, representing a median budget of $52,000. The top 100 market budget fell by 40% to $17,100. Below top 100 market equipment budgets fell by 18% to $11,200. The median non-commercial radio station budget is a mere $10,700. See Figure 6.

Some differences in spending plans showed up between the AM and FM stations. Only 65.4% of the AMs plan to upgrade their facilities, compared with almost 80% of the FM stations. Planned spending by equipment category for AM stations is typically below that for FM stations. The median equipment budget for FM stations is $28,250. The AM station's median equipment budget is $9,150. Comments about the lack of money for new equipment for AM stations were voiced repeatedly by respondents.

Maintenance budgets

TV engineers seem to be taking it on the chin with their maintenance budgets. Last year, 62.4% of the stations reported adequate maintenance budgets. That figure fell by almost 10 points this year, to 53.8%. Survey comments note that new technology equipment creates additional maintenance problems. Although the survey data indicates that TV stations are purchasing new equipment, respondents complained about a lack of funds to support the new devices.

The satisfactory rating given radio engineering maintenance budgets also fell. Last year's approval rate of 67.9% dropped to 66.1% this year. This is still

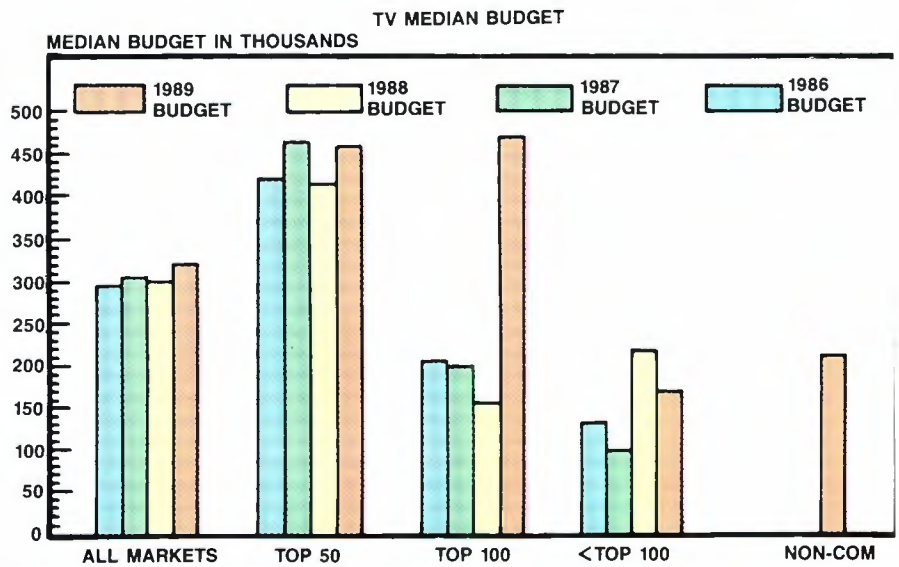

Figure 5. TV station budgets for the period from 1986 to 1989.

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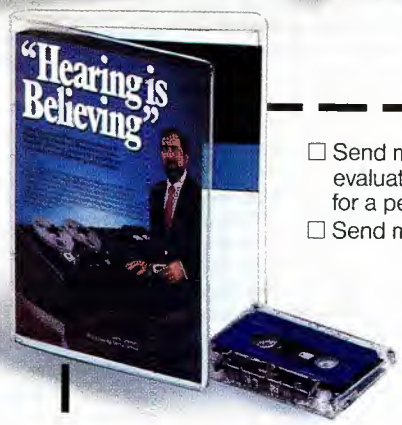

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Electronics training schools

By Jim Wulliman

Where will the next generation of engineers come from? And where can someone obtain professional training to get a job in broadcasting? Even with the reduced number of broadcast engineers, there is still a demand for qualified personnel to service, install and operate today's sophisticated broadcast equipment. The problem for newcomers is that they don't know where to obtain the training necessary to get that first job.

SBE certification

Good technical training seems to be hard to come by. Many of the older engineers entered broadcasting through the military. Even today, military electronics training can open the door to technical opportunities in stations. But if you choose to remain a civilian, where can you obtain quality electronics training? The question has been answered partially through the work of the Ennes Foundation and the Society of Broadcast Engineers.

The SBE maintains an industry-recognized standard by which potential broadcast engineering and operations job applicants can be evaluated.

Getting that first level of certification takes some work. Only after you've been in the business for a while can you advance up the ladder of certification. And, if you've seen the salary survey results in the October issue, you know that SBE certification can be a path to higher earnings.

Certified training

If you're wondering how to obtain electronics training, SBE has done some of your homework for you. Table 1 lists those schools with programs that have received SBE certification or are in the process of being certified. Graduation from these schools provides the student with *broadcast technologist* level certification. This means that the programs have been reviewed by the SBE and found to provide a level of technical training sufficient to permit the graduate to pass the SBE technologist exam.

Table 2 lists schools that have requested approval of their programs for SBE certification.

The SBE continues to review the technical training programs of schools requesting society certification. Although a school may not yet have received SBE certification, the process may be complete by the time you're ready to attend. Contact the school for information on the training programs and the SBE for up-to-date information on certification. Call the SBE national office at 312-842-0836.

Wulliman is executive director of the SBE Ennes Foundation, Washington, DC.

Dave Westerman
Department of Communications
University of Wisconsin-Platteville
Platteville, WI 53818
608-342-1379

Telecommunications Division
Mercer County Community College
1200 Old Trenton Road
Trenton, NJ 08690
609-586-4800

John Wood Community College
150 S. 48th Street
Quincy, IL 62301
217-224-6500

J. R. Carver, Ph.D.
Queensborough Community College
Bayside, NY 11364
718-631-6262

Cayuga Community College
Franklin Street
Auburn, NY 13021
315-255-1743

Milwaukee Area Technical College
1015 N. 6th Street
Milwaukee, WI 53203
414-271-1036

Dan Muck
Mitchell Vocational Technical School
821 North Capital
Mitchell, SD 57301
605-995-3024

David C. Ostmo
Rogers State College
Will Rogers and College Hill
Claremore, OK 74017-2099
918-341-7510

Reed Smith
Radio-TV Department
Ohio University-Zanesville
1425 Newark Road
Zanesville, OH 43701
614-453-0762

Keith Kintner
Pasadena City College
1570 E. Colorado Blvd.
Pasadena, CA 91106
818-578-7123

Bill Luckhurst
Bates College
1101 S. Yakima Ave.
Tacoma, WA 98045
206-596-1500

*Hocking Technical College
Nelsonville, OH 45764
614-753-3591

*Program currently under review by SBE.

Table 1. *These schools have programs that have been reviewed or are in the process of being reviewed by the SBE. Students receive broadcast technologist certification upon graduation.*

Albuquerque Technical-Vocational Institute
525 Buena Vista SE
Albuquerque, NM 87106
505-848-1400

Wayne Michie
Engineering/Industrial Technologies Division
Virginia Western Community College
P.O. Box 14007
Roanoke, VA 24038
703-982-7275

Robert Effland
Wabash Valley College
2200 College Drive
Mt. Carmel, IL 62863
618-262-8641

Henry Wooten
Navarro College
3200 W. 7th Ave
Corsicana, TX 75110
214-874-6501

Hamilton Technical College
425 E. 59th Street
Davenport, IA 52807
319-386-3570

John H. Spurlin
Wayne County Community College
801 W. Fort Street
Detroit, MI 48226
313-496-2500

Stephen E. Brown
Parkland College
2400 W. Bradley
Champaign, IL 61821
217-351-2200

Gene Nelson
San Antonio College
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Edward B. Jasuta Jr.
American Educational Complex
Central Texas College

Table continued on page 32

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KEY PERFORMANCE SPECS	AUDIO PRECISION SYSTEM ONE	H-P 8903B	S-T 3100/3200	TEK AA5001/SG5010
Flatness 20-20kHz, gen/analyzer	**0.03/0.03 dB**	0.06/0.2 dB[1]	0.1/0.1 dB	0.05/0.1 dB
Amplitude accuracy, gen/analyzer	**0.1/0.1 dB**	0.2/0.2 dB	0.2 dB/no spec	0.2/0.3 dB
Generator amplitude range	+30 to **−90 dBm**	+17 to −68 dBm	**+30.6 to −90 dBm**	+28 to −72 dBm
System THD + N 20-20kHz, 80 k BW	**0.0015%**	0.01%	0.0018%[2]	0.0032%
Min. amplitude for THD + N function	**25 microvolts**	50 millivolts	30 millivolts	60 millivolts
Residual noise (80 kHz BW)	**3.0 μV**	15 μV	4.0 μV	**3.0 μV**
Analyzer stereo separation @ 20 kHz	**140 dB**	function not avail.	100 dB	function not avail.
Common mode rejection ratio	**70 dB, 50-20kHz**	60 dB, 20-1kHz	**100 dB @ 60 Hz**	50 dB, @ 50/60 Hz
Speed, THD function (autorange)	10 sec 16-pt sweep	1.5 sec to 1st rdng	2.5 sec to 1st rdng	2.5 sec to 1st rdng
Speed, amplitude function (autorange)	10 sec 30-pt sweep (2 chan simultaneous)	1.5 sec to 1st rdng (1 channel)	1.3 sec to 1st rdng (per channel)	2.0 sec to 1st rdng (1 channel)
PRICE (U.S. DOMESTIC)				
Computer-interfaceable instrument	$6950	$5800	$9985	total system $16490[6]
Software package	included	none available	$575-$1220	
Typical controller	$600-$3000[3]	$5750[4]	$1000-$3400[5]	

[1] *Analyzer flatness not specified separately; analyzer accuracy 0.2 dB 20 Hz-20 kHz*
[2] *Total system THD + N not specified; generator THD plus analyzer distortion specs added together equal 0.0018%*
[3] *Personal computer. Interface card included in instrument price.*
[4] *H-P Model 310M IEEE-488 compatible*
[5] *Personal computer plus IEEE-488 interface card*
[6] *Total of instruments, software, Tek 4041/4205 IEEE-488 controller*
Competitive data compiled from H-P 1988 catalog, S-T data sheet 3000A 1987, Tektronix 1988 catalog.

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Pudacah, KY 42001
502-444-6976

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Iowa Central Community College
330 Avenue M
Fort Dodge, IA 50501
515-576-7201

Missouri Technical
School-Electronics
3167 Fee Fee Road
Bridgeton, MO 63044
314-739-6008

Tom Cook
Ferris State College
Big Rapids, MI 49307
606-796-0461

C.E. Buzzard
Phoenix College
1202 W. Thomas Street
Phoenix, AZ 85013
602-264-2492

Dr. Andrew Evans
Santa Fe Community College
Electronics Technology Program
P.O. Box 1530
Gainesville, FL 32602
904-395-5286

Edward A. Nelson
Ward Technical College
University of Hartford
200 Bloomfield Ave.
West Hartford, CT 06117
203-243-4308

Gary Vann
Napa College
2277 Napa-Vallejo Highway
Napa, CA 64558
707-253-3000

Kelly M. Brumley
Northwest Alabama State Technical
College
P.O. Drawer 9
Highway 78 South
Hamilton, AL 35570
205-921-4094

Ed Rutledge
Electronic Computer Programming
Institute
1030 Jefferson Street SE
Roanoke, VA 24016
703-342-0043

Charles Adams
Dordt College
Sioux Center, IA 51250
712-722-3771

Table 2. *These schools have contacted the SBE regarding certification. If you are interested in attending one of these schools, contact the national office of the SBE to find out whether it has been certified.*

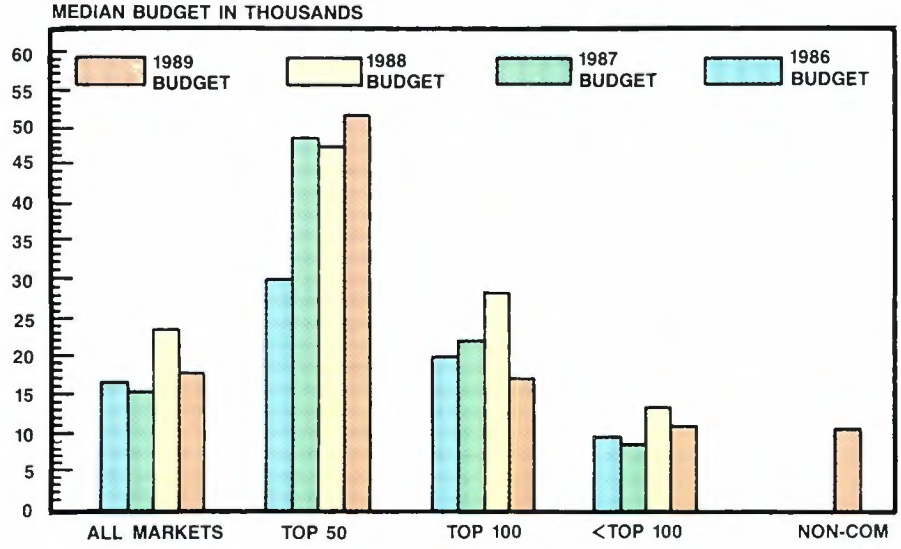

Figure 6. *Radio station budgets for the period from 1986 to 1989.*

higher than the low of 61.6% reported in 1986.

Survey comments

Reading the survey comments was deja vu. After reviewing the survey numerical data, it was easy to predict many of the comments.

TV engineers are concerned about the lack of standardization with videotape formats. "It's a mess," one engineer said. "My station now has six operating formats in master control."

The No. 1 complaint for both radio and TV engineers remains the trafficking of broadcast properties. Respondents often suggested that the 3-year holding rule be imposed. One recommended that owners be required to hold stations for a minimum of five years.

Respondents also complained about the emphasis on immediate, rather than long-term, solutions to problems. "The industry is running away from the problems of our time," one said. "Managers seem to have forgotten that anything worth doing is worth doing well. Our management thinks that quick fixes are the solution to a poor bottom line. They have no interest in the long-term view."

The problems caused by new technology were addressed in the survey comments. One engineer wrote, "Manufacturers claim lower maintenance costs for new technology equipment. What they don't tell you is that when the costs of board swaps are calculated, the actual maintenance cost of the new hardware is higher."

Equipment manufacturers also were chastised for failing to provide adequate support. "Support from local manufacturers' representatives is a joke. The local rep can't help 99% of the time. And, when you call the national office, the other person can't speak English."

A common thread of concern between both radio and TV engineers centered on training. The comments paralleled those expressed in the salary survey. Today's engineers want to know where the next generation of broadcast engineering talent will come from.

SBE is aware of the problem and has compiled a list of technical schools. The related article, "Electronics Training Schools," lists some schools that offer programs that are applicable to broadcast engineering.

The future

The engineering fraternity is going to be disappointed if it is looking for the FCC to change course. In October, the National Telecommunications and Information Administration (NTIA) released a study of the nation's telecommunications industry. That study, "NTIA Telecom 2000," suggests further changes are in store for the broadcast industry.

Many of the report's suggestions conflict directly with the desires expressed in the **BE** survey. Engineers are asking the commission to take a larger role to decrease competition and improve programming. The NTIA study, on the other hand, suggests that content regulation is not in the best interests of the public. The report notes, "Expansion in media outlets...will continue to increase the amount of competition faced by broadcasters well into the next century. The government should foster an environment conducive to maximum competition...."

Engineers are a resilient lot. Both engineers and broadcast stations will survive despite the frequently mentioned problems.

Perhaps the best advice for the upcoming year would be: Hold on to your hats. The fun has just begun.

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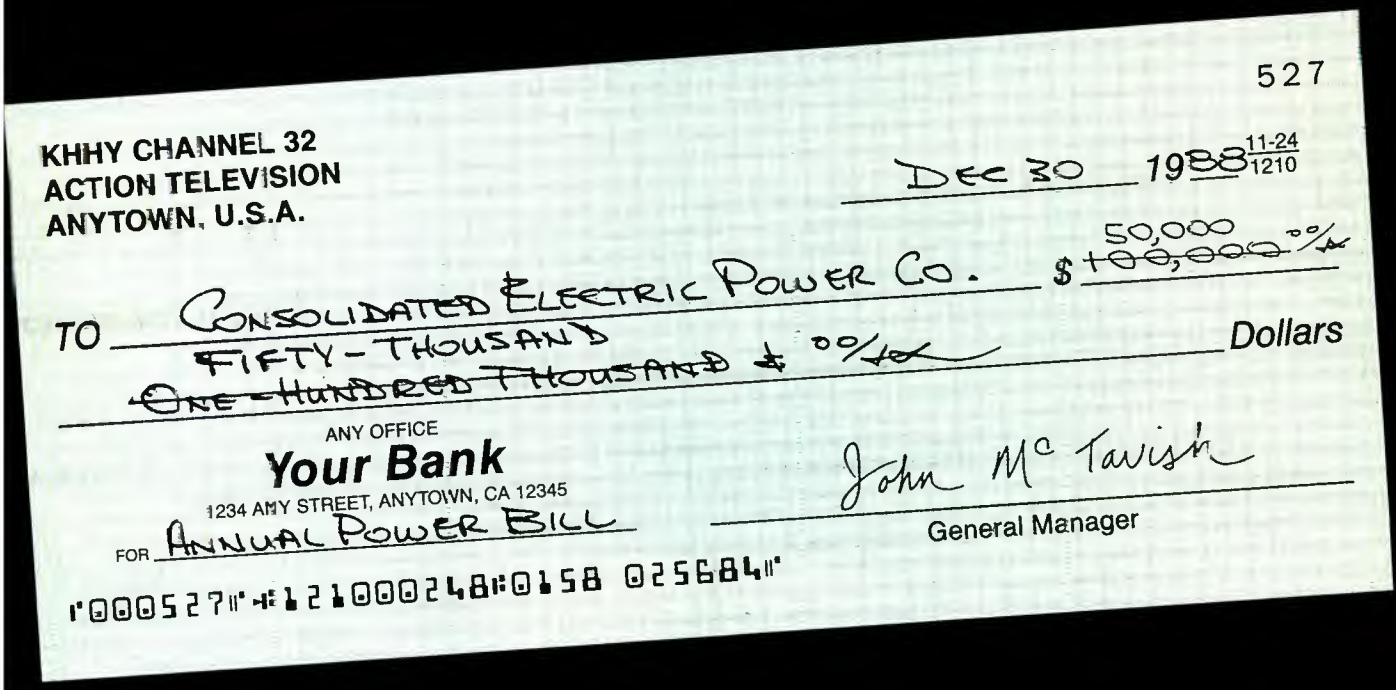

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View from the top

By Jerry Whitaker, editorial director

New technologies have presented the broadcast industry with unprecedented opportunities and challenges.

Broadcasting today is a far cry from what it was five years ago, let alone 10 years ago. It is no secret that the industry has gone through some tough times lately. Tougher times are yet to come.

Increased competition from alternative entertainment mediums, such as cable television and VCRs, have eaten into the traditional strongholds of over-the-air TV broadcasting. Now, high-definition television looms on the horizon, with the possibility of telephone company fiber-optic video distribution not far behind.

The problems presented by the relentless march of technology are difficult, and they will force our industry to make difficult choices. With any challenge, however, comes opportunity.

No one can say for certain how the broadcast industry will respond to the challenges that it faces today, and will surely face in the coming years. It is clear, however, that the decisions made now regarding audio-video delivery technology will have long-ranging effects on the future health of our industry.

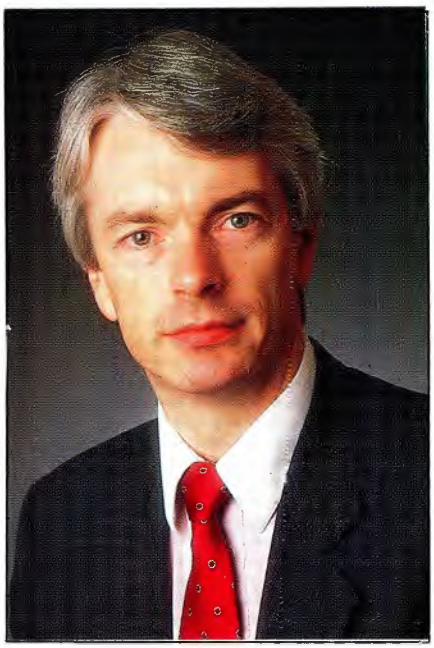
To better understand the challenges and opportunities facing broadcasters as we approach the 1990s, **BE** interviewed three TV engineering executives:

- Karl Renwanz, WNEV-TV, Boston
- Joseph Gianquinto, Group W Television
- Otis Freeman, Tribune Broadcasting

Each had different views on most topics discussed, with one exception: They all agreed the TV industry is changing, and changing rapidly.

Editor's note: The interviews with Karl Renwanz and Joseph Gianquinto were conducted by the author. The interview with Otis Freeman was conducted by Blair Benson, **BE**'s television technology consultant.

Karl Renwanz
Vice President, Engineering and Operations, WNEV-TV, Boston



Q: High-definition television is looming on the horizon. Does that excite you or scare you to death?

A: Both. It excites me because it offers higher-quality video. It is more dramatic for the viewer, and it is a way for broadcasters potentially to be associated with top-end video and audio. It scares me from the standpoint of standardization, and this one is more serious than previous challenges.

There are approximately 20 proponents of systems for the transmission of various forms of HDTV. The amount of time it is going to take to just sift through them technically may put us behind the delivery-medium eight ball of software products. If you can start renting tapes or buying disks to get high-definition programming into your home before broadcasters can transmit it over the open air, our involvement in the whole HDTV process could be significantly limited. Broadcasting could wind up being a small player in HDTV. If the quality of the non-broadcast mediums is as good as we have seen in HDTV, broadcasting could become an obsolete conduit for video to consumers.

Q: Do you think the television industry, unless it makes wise choices now with respect to HDTV, runs the

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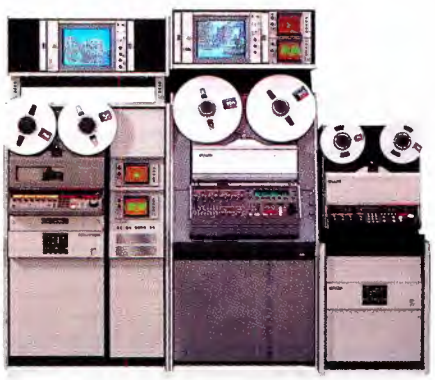

(left to right) VPR-6, VPR-3, VPR-80

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risk of becoming the AM radio of the future, facing a steadily declining market share?

A: It can be much worse than AM radio. AM still has a place in some markets. I'm not so sure that television can maintain any significant market position in 20 years if it isn't involved in technologies such as high-definition television.

The problem we face is competing with delivery mediums that are far more efficient than ours, such as fiber optics. *Fibercasting*, if you will, is an efficient way to get signals into consumers' homes. We need to rethink how we can use the TV spectrum more productively to maintain free, over-the-air video service. As difficult as it may be, we need to look at spectrum utilization in terms of where we want to be in the year 2020. If we don't, any fix the broadcast industry can fashion for high-definition television in the short term could just be that—*short term*.

Q: Do you see the local Bell operating companies as a long-term threat, or as the salvation of terrestrial TV broadcasting?

A: A long-term threat. I don't believe the local Bell operatives can be the salvation for broadcasters. They have the power to be the new conduit. All we own as broadcasters is a license and a spectrum for delivery of information. Without that, we cannot originate programming, we cannot be entrepreneurs. If someone else owns the delivery conduit, then why would they not as well be involved in program distribution?

We have no claim to programming if we don't have the keys to delivering the signal to the home. I believe that fiber is, by far, the biggest threat—much bigger than HDTV. HDTV is a small part of technology that we have to face and address, and that, too, can hurt us significantly. But, in the end, fibercasting can obsolete everything we try to do with regular broadcasting.

"We need to rethink how we can use the TV spectrum more productively to maintain free, over-the-air video service."

Q: Do you get a sense that the broadcast industry realizes the challenges it now faces and is ready to do something about them?

A: Some people in the industry se HDTV and fiber as a serious threat to th future of open-air broadcasting. I believ there are too few of those people. I fe it may be too late when the great ma of broadcasters realize that the light at th end of the tunnel is a *train*.

By the time the majority of broadcaste recognize what they're up against, it ma be too late to get involved in alternativ delivery mediums or to solidify their pos tions as program-producing entities.

Q: There have been a lot of change within the past eight years in the wa networks and local stations ar operated. The general assumption that the bottom line is king today. the bottom line king, and is that s bad?

A: The bottom line is king, and it is n all bad. Broadcasters are now facing th potential of shrinking revenues, whic they have never faced before. In order t avoid becoming obsolete, you must pay a tention to your operating costs. The bo tom line is the yardstick by which w measure our operations.

Let's face it, our audience has bee shrinking over the past few years, and am certain it will continue to shrir because of the myriad of choices viewe now have. You have VCRs and cable c fering program choices from all arour the nation. These options are only goir to grow.

For broadcasters, when we look at shrinking audience, we have to examir our operations very carefully to make su that in the future we are lean enough survive. As income begins to diminish, yc will see broadcast stations with seriou financial difficulties. Stations cannot co tinue to see their revenue grow and the audience shrink.

"We have no claim to programming if we don't have the keys to delivering the signal to the home. I believe that fiber is, by far, the biggest threat..."

Q: How do you combat this negativ trend?

A: You get into a more efficient mod of operation as quickly as possible. Yo look beyond just the technical realm your station and study every facet that yc

The Abekas A53-D Digital Special Effects System adds WARP option. The hottest digital 3-D effects system in the video universe is now even hotter with its new WARP option.

WARP lets you turn the page all-the-way-over picture borders, cleanly and smoothly. Bend and warp the picture to make a circle, cylinder, wave, roll, twist, zigzag, split, slide and much more.

Add perspective, rotation, multi-pictures and other standard effects to WARP shapes to create the most dazzling transitions.

The A53-D comes in composite or component digital versions. The A53-D can be configured as a single- or dual-channel system with up to four control panels. The dual-channel version with WARP gives you live page-turn with a different picture on each side.

Throttle on up to WARP speed. And leave the competition in your wake. For details, contact Abekas Video Systems, Inc., 101 Galveston Drive, Redwood City, CA 94063 (415) 369-5111.

Move on up to WARP speed

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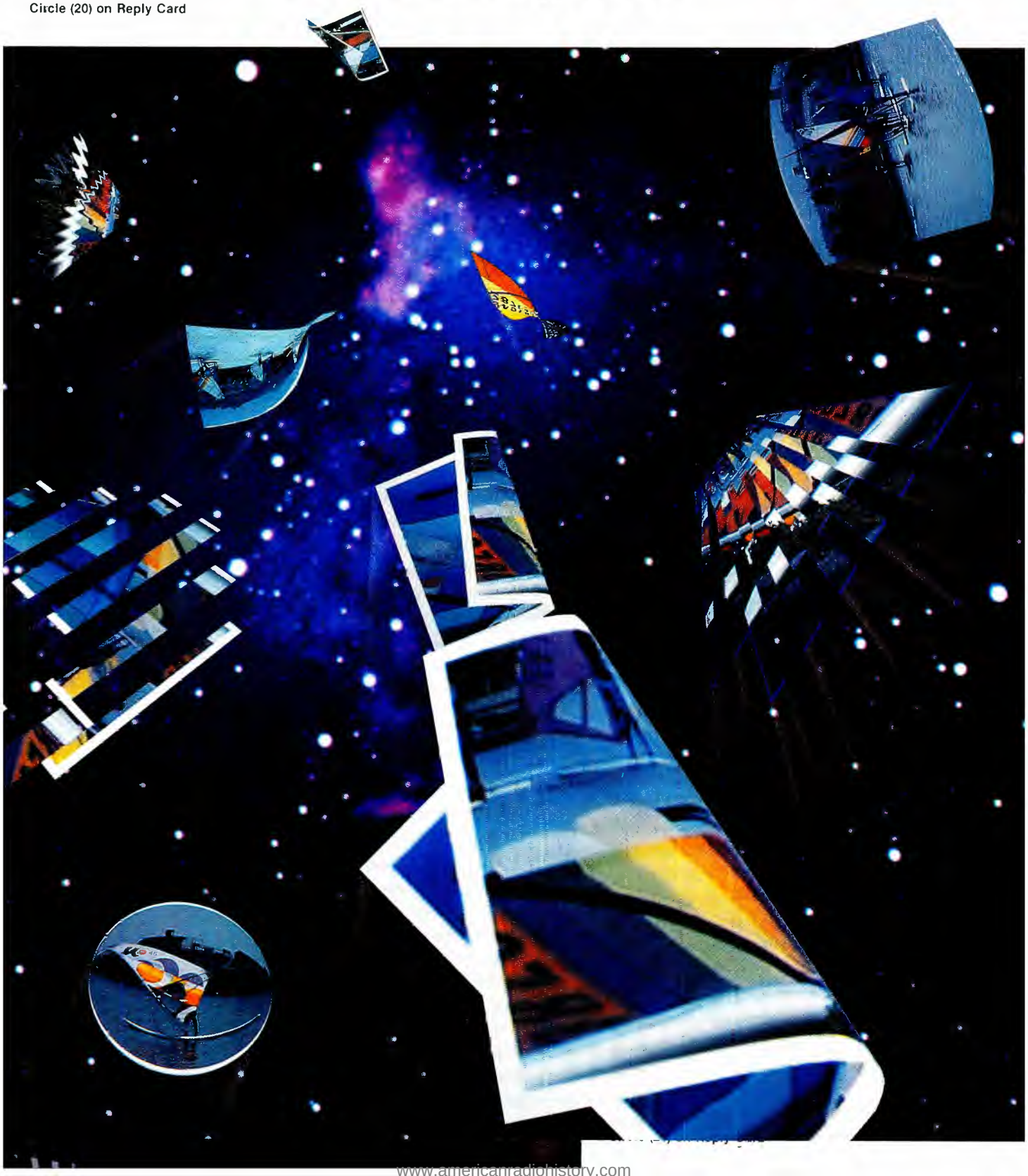

WHAT YOU SHOULD KNOW ABOUT MULTI-FORMAT INTEGRATION.

Multi-Format Integration is an exciting, cost-effective way to merge your existing video equipment with today's technology and tomorrow's expectations. The result is superior performance and enormous versatility. Best of all, Multi-Format Integration doesn't come with a high price tag.

The beauty of Multi-Format Integration is its ability to get the most out of key formats — MII, ¾", S-VHS, and VHS. Combine them, and you've got much more than any single format can provide. And JVC is the only manufacturer who can offer all four.

Unfortunately, there is a widespread misconception that these formats cannot work together. That each format was created separately to work separately. That one format can and should serve all your video needs.

It's just not true.

For example, the ¾" format was never designed for camcorder applications. When ¾" was introduced, it simply wasn't possible to put all the necessary components into a small package. While ¾" technology has evolved brilliantly over the years, it still doesn't have the portability, convenience, or playing time necessary for all field applications. JVC's full array of S-VHS camcorders solve the problem. They offer two-hour playing time, outstanding resolution, one-person operation, and all the features you'd expect in a product designed for the professional. You can make superb tapes in the field without a support staff to carry the equipment. JVC's S-VHS camcorders are true camcorders — the ones you never had. And there's one designed especially for you.

So how can you shoot with JVC's S-VHS camcorders, and integrate them with your existing systems?

Simple. Transfer raw S-VHS footage through JVC's KM-F250U Multi-Format Frame Synchronizer/ Time-Base Corrector right to JVC's KR-M800U MII Editing Recorder.

Now you can edit the best way possible — in component video. Your edited master will have the quality of your original S-VHS

footage. Since you're editing in component form, you'll retain that quality from generation to generation, with virtually all the resolution and fidelity of

the original raw footage. So you can make as many copies as you want — in any format.

It's a dream come true in post-production applications, where multi-generation quality is absolutely essential.

Think about it. The field performance of S-VHS, the component editing qualities of MII, and the ability to continue a commitment to your present format. It makes sense. And you can reap all these benefits for a lot less than you'd expect.

It's just one more way JVC keeps you a step ahead. At JVC that's more than a slogan. It's a promise.

To see how MII, ¾", S-VHS, and VHS work together, call JVC PROFESSIONAL PRODUCTS COMPANY, 1-800-JVC-5825. You'll see how Multi-Format Integration lets you link your past, present, and future video technologies.

JVC

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

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Otis Freeman
Director of Engineering, Tribune Broadcasting Company

Q: How do you view the future of high-definition television, and how can broadcasters become involved in it?

A: As I understand it, the Japanese think they are going to market HDTV receivers, laserdisc players and videocassette recorders in the U.S. about 1991. This has broadcasters concerned.

If manufacturers can get the cost of HDTV receivers down to a $500 to $700 range, they may have a market. If HDTV receivers are going to cost $3,000, only a few people will buy them.

There are a number of proposals for an HDTV transmission standard. There are single-channel, channel-and-a-half, and 2-channel systems being proposed. The FCC has wisely decided that any HDTV transmissions must be compatible with the receivers in the field today.

Our company's position is that the industry would be best served by a single-channel 6MHz HDTV system, of which several have been proposed. We see great potential for the Del Ray system. Tribune, Cox and Group W have invested in the Del Ray system after seeing some preliminary work at INRS (the Institute National de la Recherche Scientifique) in Montreal, which was funded by the Canadian Broadcasting Corporation.

The Del Rey approach has great advantages for a broadcaster. The signals are treated inside a plant, just like NTSC. Most equipment can be used, with the exception of live or film cameras; these will have to be 1125/60 or whatever production standard is finally adopted. No 2-channel video switchers, no second or special transmitter or antenna would be required. If successful, Del Rey will offer the lowest-cost entry for broadcasters into ATV (advanced TV) or HDTV.

Q: When do you think we can see broadcast HDTV available to the public?

A: My best guess is 1994 or 1995.

Q: Does the likelihood of fiber-optic delivery of video and data services to consumers speak to a continued decline in over-the-air broadcasting? Where is this road taking us?

A: I don't think the situation is all that gloomy. Consider this: A station might have a channel on the air and another on the fiber. There will always be terrestrial broadcasting; there are too many talented people in this field to think otherwise.

Some day, fiber could bring to your home data services, television programs, shopping, the yellow pages and other things we haven't thought of yet. All-cable or all-fiber systems would deprive the "have not" segment of our population of a lot of information, because they could not afford the ongoing fees. We would no longer have a universal television system.

Q: Direct broadcast satellite transmission appears to be in a holding pattern at this point. Is DBS practical for the United States?

A: DBS will have a place in the market, in locations where cable is not available.

Q: What do you think the future will be for the various tape formats available today? How do you think that will shake out?

A: I think the future will be driven primarily by M-II and Beta-SP, with islands of D-2. I think you will find D-2 being used where operators want multigeneration capabilities, such as post-production. But I think the most used formats for broadcasting will be Beta-SP and M-II.

Q: When do you think the digital formats will begin to make inroads into broadcasting?

A: We can't hold up equipment replacement waiting for digital. The price of digital is an important consideration to a broadcast station. I see the primary benefit of digital as having multigeneration capabilities. In post-production houses, digital is a must.

Q: How do you view the future for 1-inch type-C recorders?

A: Most companies, Tribune included, are bottom-line operations. One-inch will not disappear, because of the tremendous investment we have in that technology. The machines work well, and 1-inch is the universal distribution medium for most programming.

Down the road, maybe in 10 years, 1-inch will fade away as we move toward total cassette-based systems. Cassettes are easier to handle and afford greater protection to the tape itself.

Q: Do you think Super-VHS has a place in broadcasting today?

A: S-VHS is very big in the corporate-industrial area. That is a big market, bigger than broadcasting. Sometimes I think broadcasting is being driven by what's happening in the industrial market.

I think S-VHS has a place for news. The equipment is inexpensive and, in news, since you rarely go down more than two or three generations, the quality is sufficient. I think it has a future.

"If manufacturers can get the cost of HDTV receivers down to a $500 to $700 range, they may have a market."

Q: How good are CCD cameras today?

A: Very good. I don't think we will buy any more tube cameras.

Q: Television, by and large, has been a fun business to be in. Is it still enjoyable?

A: The old days at W2XWV, and later at WABD (the Allen DuMont station where I got my start), was pure pleasure. You were using your hands all of the time. If you needed something, you went into the shop and built it. Now all you do is shuffle papers and computer reports. That's sure as hell not as much fun as it was working on a show, repairing a camera, setting up the lighting and making a station work.

It's the difference between using your hands and not using your hands. No, it is not as much fun. |:(-))))|

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In the field or on the run, the AKG C 522 ENG, mics it just like you hear it — in stereo. Wherever you are, whatever you're recording, from courthouse interview, press conference, rock concert, to forest fire, the C 522's clarity, rugged performance, and convenience are exactly what you need to add a true-life dimension.

Inside its sturdy housing are two matched cardioid condenser capsules, elastic-mounted for low noise and pre-configured to give you a smooth, one-handed XY-stereo field. It's a workhorse mic, with the little extras a working pro needs, like a built-in rechargeable battery, low-power warning LED, integrated on/off switch and boom mount shock suspension.

Get it live in stereo with the AKG C 522.

Reporter: Denise O'Brien.
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The bottom line in broadcasting

Edited by Jerry Whitaker,
editorial director

1988 offered the broadcast industry about as much excitement as anybody could stand in one year.

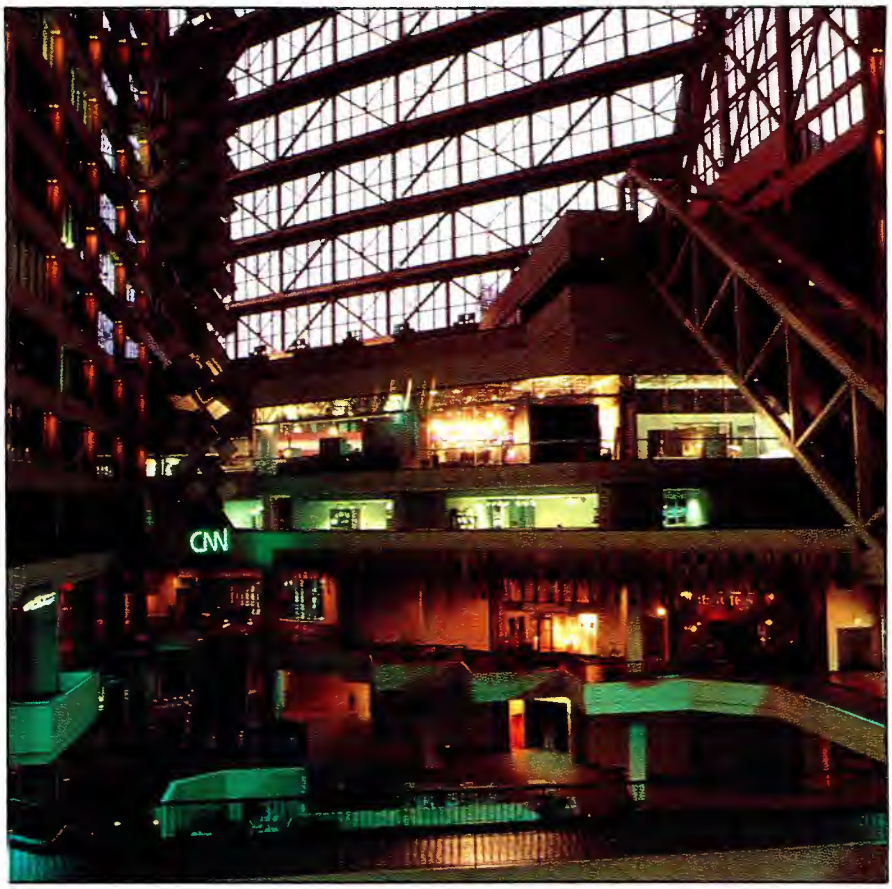
Whew! What a year. After all that happened in the broadcast industry during 1988—HDTV proposals galore, advancements in digital technology, the writers' strike, the election, the Olympics and the growth of corporate television—should the broadcast industry expect an encore in 1989?

Not really. It's not that 1989 will be an off-year for audio-video enthusiasts. That's not the case at all. In fact, consumers probably will toast next year with warm, extended applause. However, don't expect broadcasters to stand up and cheer. '89 may not warrant it.

Easy come, easy go?

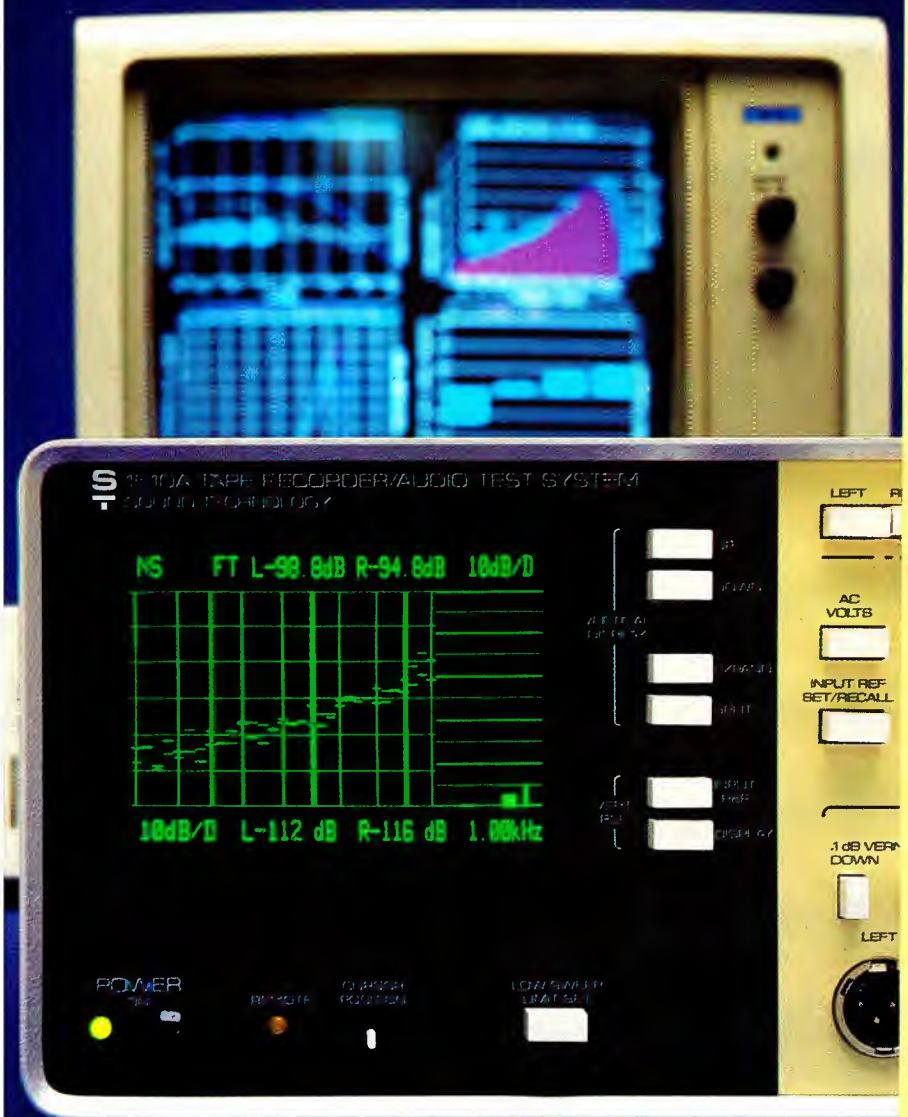
Thanks to the Olympics and the presidential election, 1988 was a good year financially for the broadcast industry. Budgets were up, and advertisers spent a lot of money. Broadcasters were, in a sense, selling target audiences, not programming. These big events aside, radio and TV stations did reasonably well in their local markets.

A survey compiled by the NAB and Broadcast Financial Management Association (BFMA) shows that although national advertising seems to capture most of the attention of viewers, it is the local ads that pay the bills. As illustrated in Figure 1, a little more than half of all time sales for the "average" TV station comes from local advertising sources. National/regional



The atrium of the CNN Center in Atlanta, headquarters for Ted Turner's Cable News Network. CNN is an example of the facility of the future: One based on connectivity . *(Photos courtesy of CNN.)*

The best of both worlds:



THE SOUND TECH 1510A AUDIO TEST SYSTEM

Until recently, most Audio Test Systems have been either manual stand-alone systems or external-computer driven automated systems.

Engineers have long enjoyed the portability, ease of operation and cost effectiveness associated with manual stand-alone systems. Unfortunately, these systems have always lacked speed and documentation capabilities.

On the other hand, the ideally configured external-computer driven test system can provide speed, data analysis, documentation, graphics and integration with other GPIB test systems. Unfortunately external-computer driven systems are designed for production testing and are not suitable for troubleshooting or field work.

However, Sound Technology has combined the **Best of Both Worlds** into a portable, intelligent stand-alone system with complete PC compatibility: the Model 1510A! The Model 1510A can be used as an intelligent stand-alone system, and when connected to an external computer it becomes the ideal Automated Test System.

The ST1510A as a Stand-alone System

- Built-in Intelligence
- Portable
- Semi-automatic and Manual Test modes for fast troubleshooting
- Built-in CRT/Graphics

The ST1510A as an Automated Test System

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- Compatible with Automated Switchers
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Put The Best To Test!

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advertising accounts for about 45% of sales, and the rest comes from network compensation.

On the radio side, local advertising accounts for a whopping 77% of total time sales, with national/regional spots making up nearly 21% and network compensation picking up the rest. (See Figure 2.)

Making money is one thing; keeping it is quite another. Figure 3 shows how TV stations spend the money they make. Program and production costs make up the largest single category, followed closely by general and administrative costs. In Figure 4, which shows radio station expenses, the single largest expense category is shown to be general and administrative, with program and production costs a distant second. It is interesting that relatively small amounts were spent on radio and TV engineering as a portion of total budget.

Terrestrial broadcasters no longer have a captive audience, and advertisers know it.

If you have wondered why so many investors outside the broadcast industry have gotten into the business, consider these statistics from the NAB/BFMA survey. For 1987 (the most recent figures available), the average cash flow margin as a percentage of net revenue for affiliate TV stations was 30%. The corresponding value for the average independent station was 9%. An operation that returns 9% to the bottom line is not exactly a star performer, but 30% is sure to get any investor's attention.

What does next year hold? That's the big, unanswered question. A recent forecast from the TV Advertising Bureau predicts modest, single-digit growth for most broadcasters next year. Time will tell.

Crunch time

The major networks and their affiliates continue to feel the pinch of alternative entertainment sources. The encroachment of cable television into the living rooms of consumers has changed the face of broadcasting today. Add to that the growing numbers of home VCRs, and you have a recipe for trouble.

Most observers agree the biggest challenge for local TV broadcasters today is coming from the cable TV industry. It is estimated that cable may reach more than 70% penetration by the end of next year. Programs such as HBO, the Movie Channel, Cable News Network, Lifetime, Discovery, TNT and others have provided consumers with a wide variety of program choices that they never had before. The positive side of increased competition is the additional jobs these new services create, and the increased equipment sales generated for broadcast hardware manufacturers. The downside is that the pie is being sliced thinner for all the programmers.

...New formats and other technical goodies are approaching as fast as the next trade show.

Continued on page 5

Auditronics' transparency helps us stay number one in Las Vegas"

says Jay Pierce, Chief Engineer of KLUC-FM 98.5, Las Vegas' number 1 hit music station. "Now that we're almost 100% CD and Bernoulli disks, we've virtually obsoleted vinyl."

"As the heart of the station, the Auditronics 200 lets our superior program come through to the listener. We only have one console left that isn't Auditronics, and when it goes on the air you can definitely hear the degradation."

"Our 200 is my first exposure to Auditronics and I really like it. It's easy to access and all the active devices are socketed. If there's ever a problem you just pop a module out and pop another one in. Though it's not recommended practice, you can even change modules while you're on the air without shutting down the board."

"In three years I've had no problems, just the usual meter lamp replacements. I've changed the headphone pot once (our jocks are tough on gear!), but other than additions the signal path remains untouched to this day."

"Incidentally, our jocks love the Auditronics 200 because everything's laid out well for them. What you need is at your fingertips. The meters are easy to see and easy to read. The monitoring system's easy to use. Multiple inputs are at the top and out of your way. The calibration system's easy to get to. If Auditronics could just supply meter lamps with infinite lifetime, I could forget the consoles even exist."

You can have a trouble-free console that's transparent to digital programming by calling us free at 800-638-0977 for complete information about our 200 Series.

Photo: Jay Pierce, Chief Engineer, KLUC/FM, KRSR/AM, Nationwide Communications, Inc.

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How Good is Our 3rd Generation?

TBC-200 Time Base Corrector

IFP-44 Editing Interface

UTP-1 Signal Transcoder

AG-7400 Portable VCR

AG-7500A Editing VCR

AG-A750 Editing Controller

CCD Cameras

SVHS Video Cassettes

Take a Look at Our 5th!

PERFORMANCE DATA
(AG-7500A)

	1st Generation	3rd Generation w/o TBC	3rd Generation w/TBC-200	5th Generation w/TBC-200
Horizontal Resolution (Color Mode)	400	370	360	350
S/N Ratio (dB)				
Luminance (Color Mode)	57.2	51.7	52.0	49.0
Chrominance (AM)	51.8	47.5	51.4	44.5
Chrominance (PM)	44.3	40.1	43.8	35.2

Data represents measurements by independent engineering evaluation. VCRs taken at random from inventory.

- Signal Source: Shibasoku TG-7/1
  - Luminance: 50 IRE flat field w/burst
  - Chroma: 50 IRE w/100 IRE p-p
  - Resolution: Monoscope Shibasoku 58A/1
- Noise Meter: Rohde & Schwarz UPSF2/UPSF2E2
  - Y-S/N: 200 kHz HPF, subcarrier trap on, 4.2 MHz, LPF, weighted
  - C-S/N: 100 Hz HPF, 500 kHz LPF, unweighted

From the first tc the third, even to the 5th generation Panasonic SVHS Pro Series specifications speak for themselves. And they say "outstanding.' Here are some of the reasons:

The AG-7500A editing VCR with its new lamir ated amorphous heads produces superb quality generation after generation.

The AG-A750 editing controller has everything you need for highly accurate single event editing.

And the AG-7400 portable 2-hour VCR is a natural performer in the field.

Our TBC-200 time base corrector has a 6-line correction window, chroma plus/ enhancement, chroma noise reduction and no-roll circuitry. To make multi-generation recordings even better.

The UTP-1 signal transcoder is more than ready to transcode virtually any component signal into any other component signal. Saving you an extra generation.

The IFP-44 editing interface controls Pro Series decks on both the source and edit side. To easily integrate into selected 3/4" systems.

Our CCD Cameras are equally spectacular. And with the Panasonic SVHS Pro Series you not only get outstanding performance, you also get the added economy of 2-hour operation in the field and in the studio.

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For more information on the Panasonic Pro Series, call Panasonic Industrial Company at 1-800-553-7222, o· your local Panasonic Professional/Industrial Video dealer.

S-VHS

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Continued from page 48

Then there's the plague of *remote-control madness*. How many new TV sets have remote controls today? Most. It's hard to buy a color set today that doesn't offer a remote-control option. And what are viewers doing during commercials? Many are flipping through channels. Terrestrial broadcasters no longer have a captive audience, and advertisers know it.

Although the current wave of station buying and selling by venture capitalists has slowed down, the repercussions have not. Most new owners have been criticized for their bottom-line thinking and for having little interest in or understanding of broadcasting. That may or may not be the case, but the industry is, nevertheless, feeling the effects of a new economic climate.

Wages for skilled engineers, especially in smaller markets, are no longer competitive with salaries in many other electronics-based industries. As a result, broadcasters are having trouble finding and keeping qualified technicians. And with technology stopping for no one, the industry cannot afford to slip into technical mediocrity.

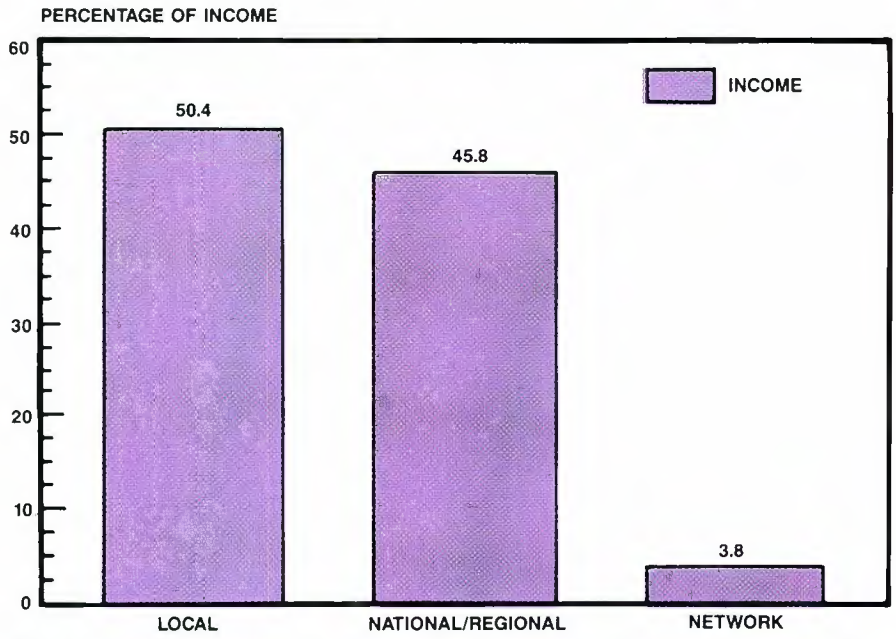

Table 1. *Division of income for the average TV station. Data is taken from the* 1988 Television Financial Report, *a survey of TV stations conducted by the NAB and the Broadcast Financial Management Association.*

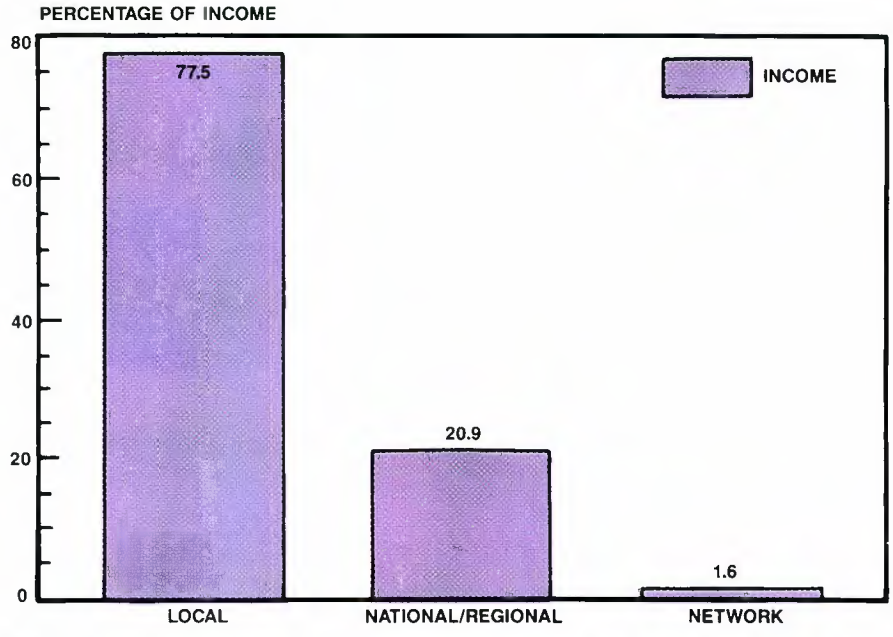

Table 2. *Division of income for the average radio station. Data taken from the* 1988 Radio Financial Report, *a survey of radio stations conducted by the NAB and the Broadcast Financial Management Association.*

The march of digital

The introduction of component D-1 and composite D-2 VTRs continues to affect the industry. Digital video brings with it the ability to record multiple generations without loss of video quality. It also gives users significantly better audio. The result has been enhanced productions using a new generation of recording formats, graphics and computer animation. Advancements in digital recording technology will continue to be implemented on a cost/performance basis.

The D-2 digital format has gained acceptance because of its compatibility with the NTSC plants of today. The format has the benefit of commonality in terms of facility systems, keeping the costs of installing new hardware at a reasonable level. Most switching, distribution and effects-processing equipment are composite analog-based.

The D-1 digital component format, on the other hand, is finding a home primarily in high-end, specialized production work. Component digital switchers, routers and accessory peripheral devices are available. Current applications include multigeneration layering, film-to-tape processing and high-end multilevel compositing. This work requires the highest-quality imaging available.

Although digital video suites are being built now, don't expect everyone to jump on the bandwagon. The main drawback is cost. Also, the improvement in video quality may not be sufficient to warrant the investment, except for multilevel compositing, component layering and matting. Finally, the transition time from one technology to another will take years.

Meanwhile, new formats and other technical goodies are approaching as fast as the next trade show.

Facilities

Production facilities for the professional audio-video industry span an enormous range of sophistication, from simple in-house TV station production rooms to major post-production houses with all the new bells and whistles. Regardless of facility type, the objective is to book time, whether the facility is creative- or service-oriented. Changes in business conditions are reflected in the types of facilities being built today.

The *boutique* production facility is a relative newcomer to the professional audio-video industry. Boutiques specialize

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3.5KW ——— 5KW ——— 10KW

When-and-if you're ready to UP your transmitting power, will your FM transmitter be ready too? If it's one of the QEI "New Reliables" FMQ series, the answer is YES!

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If you're shopping for a 10KW unit in the first place, the QEI FMQ-10000 has lots to recommend it. No other FM transmitter packs this much power, reliability and performance into a single 24" wide rack cabinet. And the FMQ-10000 is designed to operate on single-phase power, so there's no need to pay for installing new three-phase electric service.

What's more, for upgrades to power levels beyond 10KW, each of these FMQ series transmitters can serve as the driver section for QEI's 20, 30 or 60KW transmitters, again resulting in major cost savings.

Every QEI "New Reliables" FM transmitter is built to deliver ultra-dependability and performance. So—whether your station is thinking of upping its power down the road, or if the power you start with is the power you stay with—you'll be glad you chose QEI. Call us toll-free at (800) 334-9154 for the full story.

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The New Reliables

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in a particular type of video or audio work. They compete in the marketplace by offering highly skilled people and specialized hardware directed toward a small range of production functions. Small boutiques also may operate within large facilities, depending on the budget constraints and insight of the facility operator.

The corporate video facility also is an area of growing interest. During the early 1980s, most corporate video communications projects were farmed out to outside vendors because of the large investments needed in equipment and personnel to produce quality programming. Recently, however, corporations have found it advantageous to bring that work back in-house.

If you have the idea that most corporate video departments use basically *prosumer* (part professional, part consumer) hardware, think again. Corporate video departments use the same types of hardware TV stations do, and in large numbers. In order to spread out their costs, some corporate facilities take on outside business, operating much like a post-production house.

Corporate television is, in many respects, an unknown marketplace. Although it spends hundreds of millions of dollars a year, corporate television is difficult to define. "Corporate" encompasses a multitude of business operations, including government, Fortune 1,000 corporations and medical and educational institutions. Within each of these markets may be multiple submarkets, which are even harder to track.

Over the past few years, the corporate communications marketplace has become the largest and most dynamic force in the business communications sector. Defined or not, corporate television is just beginning to blossom and will have a major impact on how video is used. Increasing numbers of corporate businesses and institutions will look to television as a medium to get their message across to employees, customers and shareholders. For better or worse, this move will affect the broadcast industry in the years to come.

Because the corporate-industrial market is now growth-oriented, many traditional broadcast equipment companies have made the strategic decision to move into that market. Although corporate-industrial users often have needs similar to those of broadcasters, there is usually greater cost sensitivity.

As manufacturers move down the market with traditional broadcast technology, benefits accrue for broadcasters. Larger markets translate into higher-volume production, and that allows companies to view the manufacturing process in a totally different light. Companies now can look at factory automation as a viable option for the production of some products.

The downside of the growing corporate-industrial sector, as viewed by broadcasters, is that radio and TV stations will find it more difficult to dictate new product development. Broadcasters used to be in the driver's seat. They're not there any more.

The technology race

Changes in the economics of broadcasting are being reflected in the products and attitudes of equipment manufacturers today. In the early days of radio and television, equipment producers could put technology into the marketplace and, because of the high market share enjoyed by the major players of the day, command a premium for their products. Without competition, technology was the only game in town. Now, however, the engineering-driven company is disappearing in favor of the market-driven company. Is this trend good for equipment manufacturers? Probably. Is it good for end-users? You bet.

Within the past 10 to 15 years, the broadcast equipment industry has become substantially more competitive. Manufacturers can no longer just develop technology and take it to the marketplace. The hardware has to fill a need and meet a particular price point. Today's successful companies are market-driven.

Technology is a resource. Sales and distribution systems are a resource. Factories are a resource. A market-driven company marshals these resources to identify the needs of the market and to design products to meet those needs.

In terms of volume, the television/radio industry is small, compared with other high-tech industries. Research and development is extremely expensive and is now borne almost exclusively by manufacturers. The days of network-supported developmental labs are long gone. Fortunately for broadcasting, many R&D projects in the semiconductor and consumer electronics industries can be applied to radio and TV products as well. This spin-off effect provides the industry with the latest technology at reasonable prices. In today's business climate, it is the only way broadcasters can keep up with technology. The stakes are too high for manufacturers to *go it alone* any more.

Timing is everything

New product development is as much art as science. It is part listening to customers, part listening to marketers who work with customers day in and day out, and part engineering. During the 1960s and '70s, broadcast television was the premier market for video products. That is changing now, however, because of

Continued on page 58

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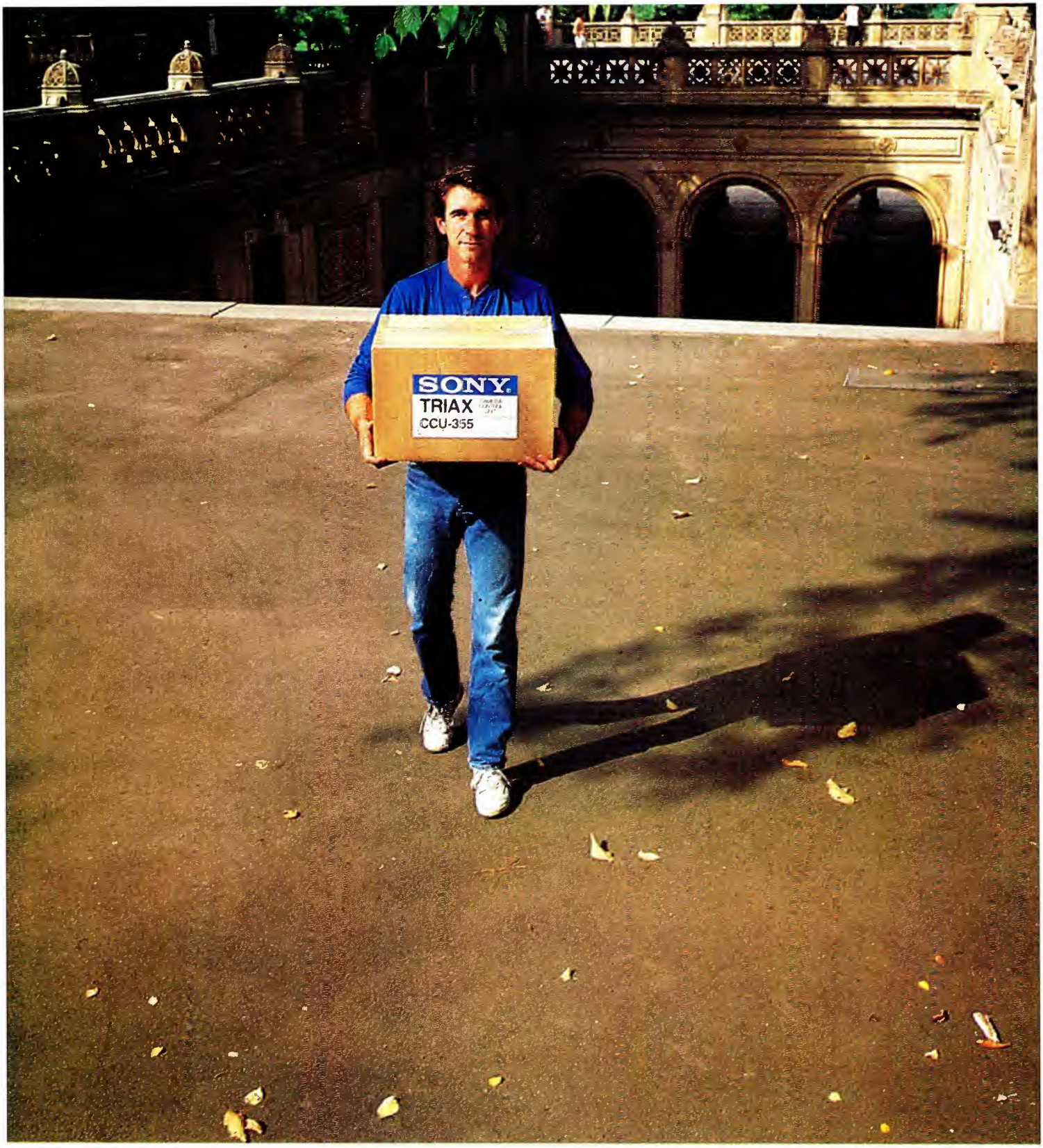

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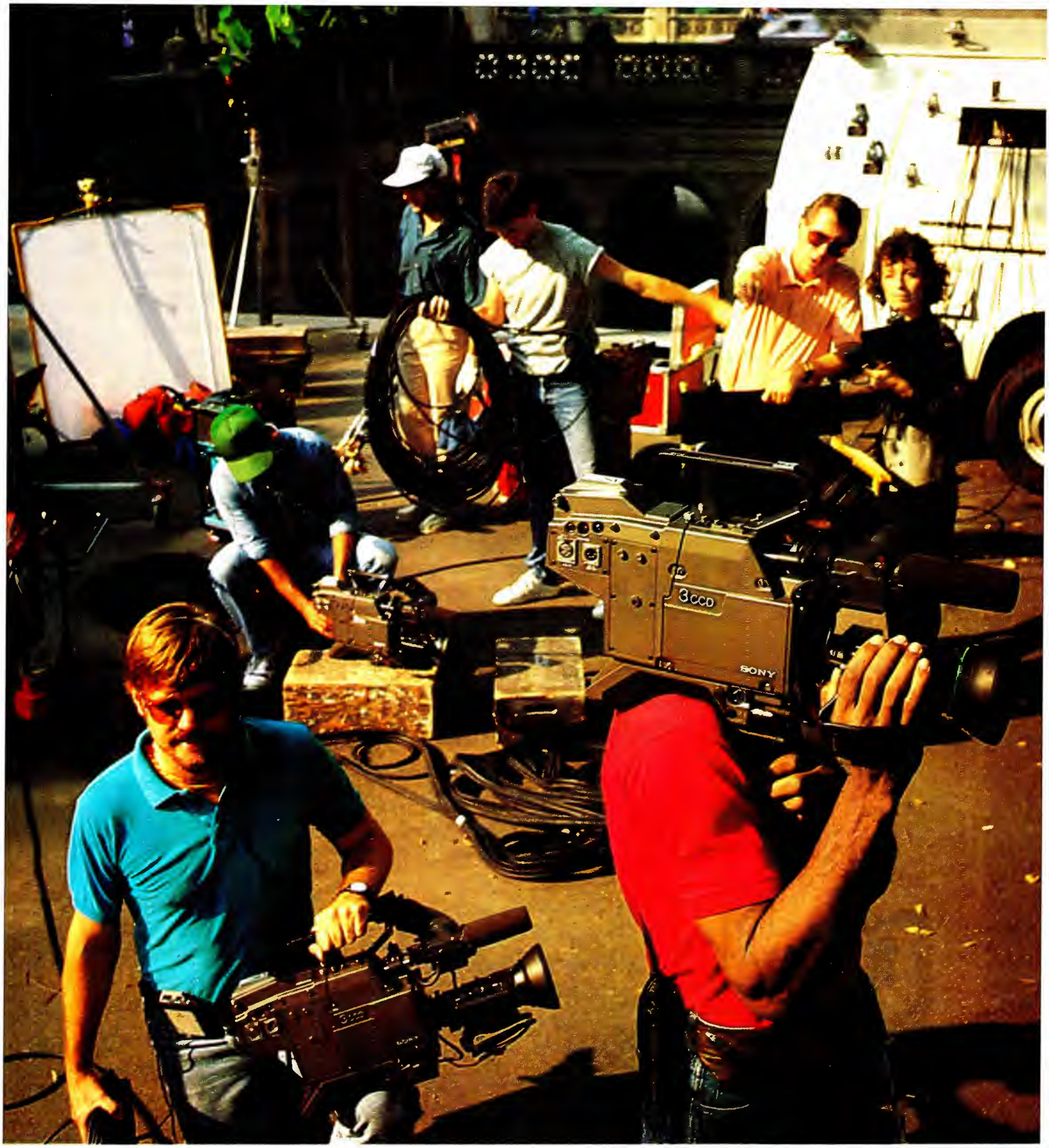

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considering the broad range of leading edge products Sony offers.

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BROADCAST PRODUCTS

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Sign of the times

The concept of network news has been changed dramatically by Ted Turner's Cable News Network. The 24-hour service and its sister operation, CNN Headline News, have redefined the news business. From a technical standpoint, CNN Center has demonstrated the value of *connectivity* between systems and services.

The operation, headquartered in Atlanta, is a monument to news-gathering technology. The CNN Center houses Turner's four news operations: CNN, CNN Headline News, CNN International and CNN radio. The CNN Center serves as the corporate headquarters of the Turner Broadcasting System, with more than 1,400 employees at the downtown Atlanta location.

Statistics on the facility are impressive, to say the least. The CNN plant includes about 600,000 feet of coaxial cable and 90 miles of telephone and computer cable. It also houses 1,000 TV monitors and 500 computer terminals and printers. Fiber-optic cables are used to transmit programming from the CNN Center to the company's uplink across town.

The CNN newsroom at the CNN Center in Atlanta. Extensive use has been made of networked computerized text-entry systems.

One of the control rooms for the Cable News Network. The facilities operate 24 hours a day, seven days a week.

Computers are used extensively in the facility, both for news-gathering functions and program switching. Automatic execution of program elements, such as tape rolls, font switching and camera shots, is not contemplated at this point, however, because of the rapidly changing character of most newscasts.

Graphics is a big part of the CNN plant, with multiple character generators networked together, then interfaced with still-store systems. Graphic work stations are available for use by operators in both the CNN and Headline newsrooms.

The numerous innovations found in the CNN headquarters point the way to future systems integration. The CNN facility has demonstrated that connectivity works and that it provides a significant payback in increased employee efficiency.

Continued from page 54

economic pressures on the radio/TV industry and the tremendous growth of other video uses, principally corporate television.

The economics of the 1980s has forced broadcasters to operate as businesses.

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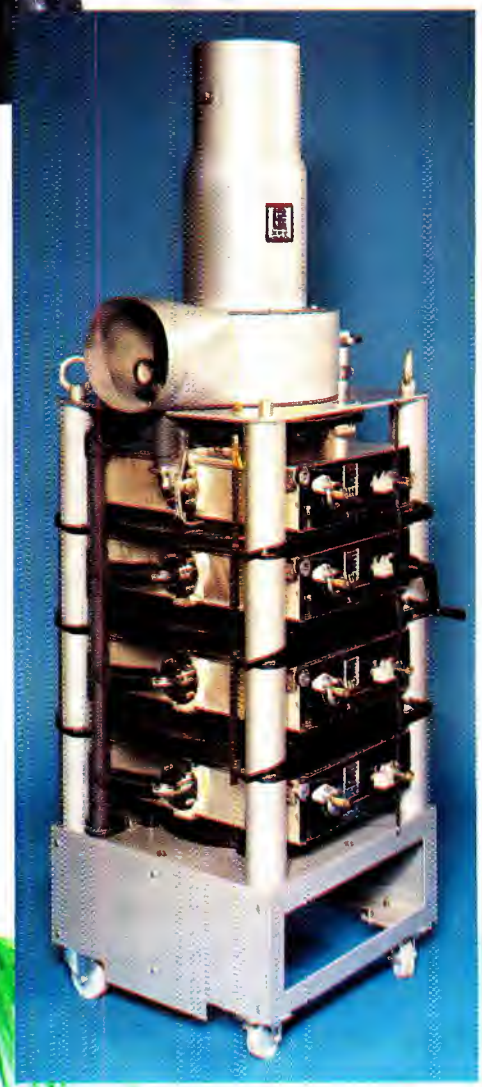

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nd for further details of the K3153BCD which has been developed from the established ıge of tubes now accepted as the world standard.

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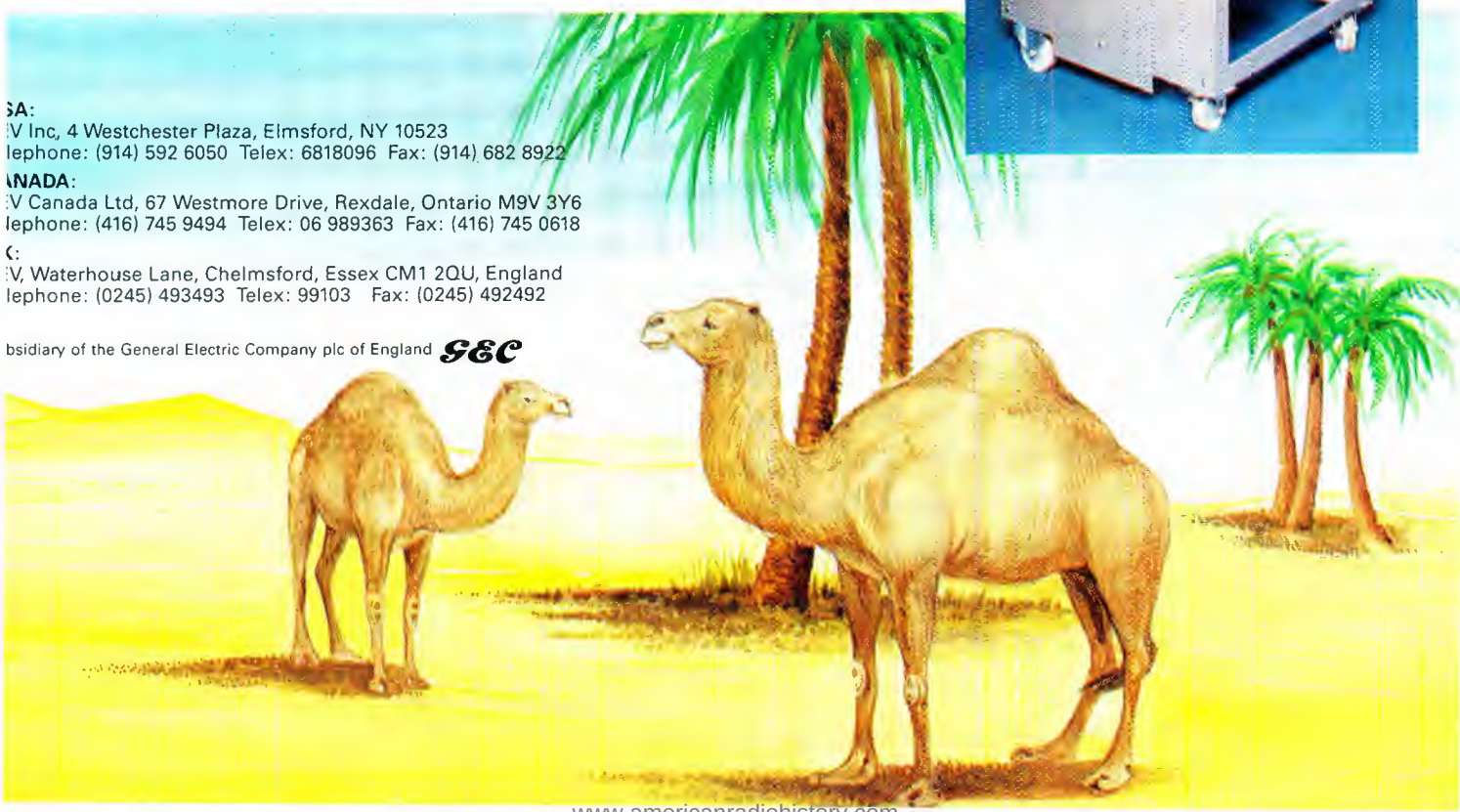

Before they can spend money on technology, stations must have a clear view of how the equipment will not only pay for itself, but also make money for the station.

In years gone by, major players in the broadcast and post-production industries bought hardware customized to their particular methodology. Not any more. The economics do not support it. The competition among networks, TV stations and post-production facilities today is fierce. Facilities simply can't afford the capital expenditures required for customized products.

In the current marketplace, influential customers often provide input to manufacturers on a particular product or technology during the early stages of product development. In this way, the user is able to influence the functions and features of the final product without having to pay a customization premium. This point is important because, with the move to more software-based products, customization becomes a larger question.

You might, at first, assume that it is easier to customize a software-based product. In many respects, however, it is more difficult. To say, "It's just a matter of software," can be a gross understatement. Although many software changes are relatively simple to make, others can take months of engineering. Recent efforts to build software in *modules* that can be mixed and matched between functions and products promise to streamline the development process significantly.

Building boxes

Most technical managers at broadcast and post-production facilities have a love-hate relationship with new technology. They are thrilled by the numerous features of a new product, but terrified at the prospect of seeing the system they purchased at the last trade show made obsolete by some new development.

Whether you love it or hate it, technology marches on at an ever-increasing rate. A typical development cycle today—from specifications to a deliverable product—runs two to three years, depending on the complexity of the system. Manufacturers are working to speed up the development cycle to permit faster response to industry needs.

Part of this effort involves the use of better tools. Computer-aided design and manufacturing (CAD/CAM) systems speed up the process significantly. New circuit simulation programs also permit both software and hardware concepts to be tested before a single PC board is etched. This allows design engineers to be sure that a PC board or system will meet its specifications even before the hardware is built. Replacing traditional hardware functions with software is another tool in shorten-

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ing product development lead times.

The development process for a new product varies significantly, depending on the product. By and large, hardware takes longer than software. With hardware, you have drafting work that needs to be done, printed circuit boards that must be made and refinements once a prototype system is assembled.

New construction techniques have radically changed the mix of elements that go into making up a professional audio or video product. About 80% of the costs to build a product today (not including management or marketing expenses) goes for materials such as PC boards, components, sheet metal, front panels, monitors and other hardware. The actual labor to assemble and test the product accounts for the remaining 20%.

Ten years ago, the split was about 55% materials and 45% labor and test. The use of digital technology, whether for simple control panels or sophisticated image processing, is cheaper to build and test than analog hardware. This is one of the reasons for the steady decline of hardware costs.

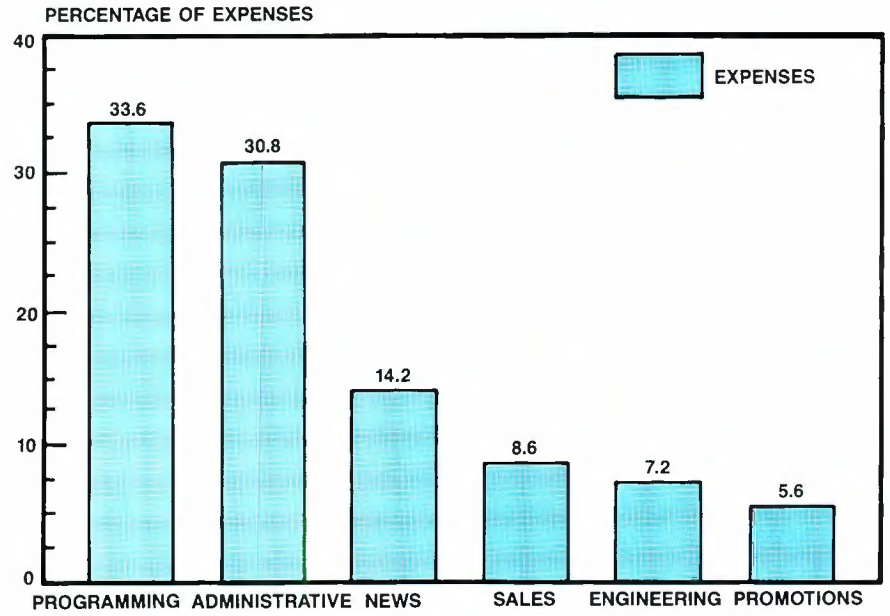

Table 3. *Division of expenses for the average TV station. (Source* 1988 Television Financial Report.)

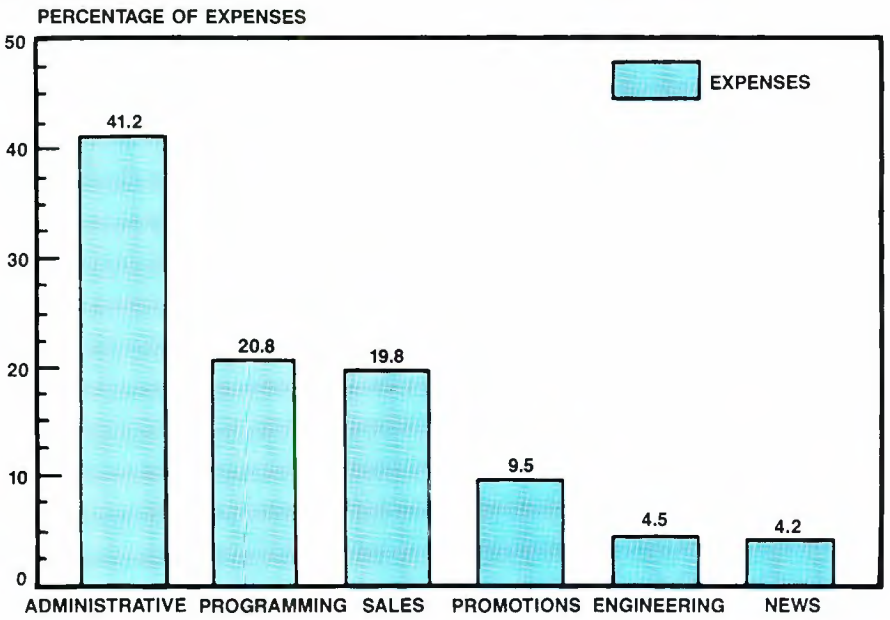

Table 4. *Division of expenses for the average radio station. (Source* 1988 Radio Financial Report.)

Chasing our tails

The goal of every technical manager today is to get the maximum return on every investment in equipment. A benchmark on product life can be gained by looking at what equipment manufacturers see as the typical market life of a high-tech system. How does four to eight years sound, depending on the product? Equipment producers say that if the product has good distribution (allowing it to reach into overseas markets) the life can be extended beyond that estimate.

The ability to upgrade software and/or hardware is a key element in extending the useful life of a product. Many manufacturers have realized that offering users *upgradability* is one of the most effective ways of keeping—and expanding—market share.

Product upgrades accomplish two things: They protect the customer's investment and make buying decisions less threatening. Users need to know that the system they buy today can keep up with developments in technology for the near future.

In virtually all products manufactured today, the ability to communicate and interface between boxes is an important consideration. This is often easier said than done, however. Communications protocols are complicated and require detailed planning to permit future growth. The professional audio-video industry has made significant strides in this respect within recent years. You can expect to see more companies capitalizing on the *connectivity* of their products.

The bottom line

There can be no question that the broadcast industry of today has a bottom-line orientation. The economic realities faced by the industry require closer attention than ever to operating efficiencies. The economic climate also demands careful and thorough evaluation of any new technology before equipment purchases are made. Furthermore, the engineering department can no longer afford to operate as its own entity at a station. To prosper today, everybody needs to be pulling in the same direction.

Broadcasting in 1989 is a different ball game. Wishing for the "good old days" is a waste of time. This is reality, folks.

Editor's note: Contributors to this article include:
- George Merrick, vice president, video systems division, Ampex
- Steve Bash, manager of engineering, Centro
- Chris Genereaux, sales manager, Centro
- Jack Ormond, chief engineer, Cable News Network
- Dave Silver, chief engineer, CNN Headline News

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Circle (39) on Reply Card

The Klystrode in operation

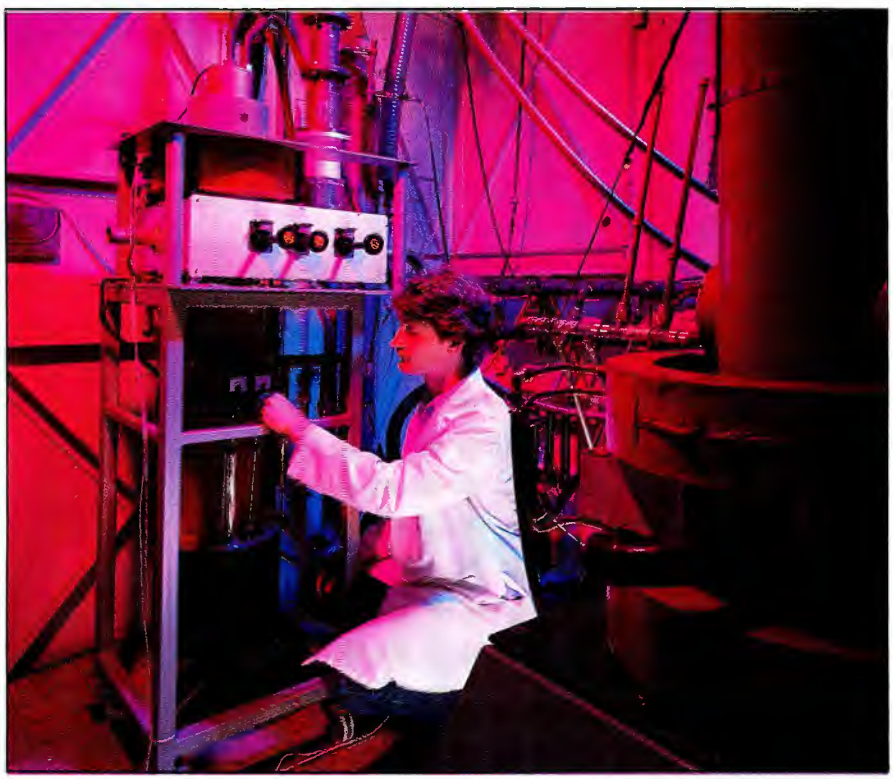
By Jerry Whitaker, editorial director

The Klystrode is alive and well and on the air in Georgia.

The phrases "history-making" and "breakthrough" are two of the more overused expressions being bandied about these days. But at WCES-TV, Channel 20 in Wrens, GA, they are justified. For the past six months, a 120kW UHF-TV transmitter built around the Klystrode® tube has been in service at WCES. The station has experienced no unusual problems. The Klystrode, under development for years, has met or exceeded the promises of its supporters and the expectations of UHF broadcasters.

If you think the WCES transmitter is an experiment, think again. A second 120kW Klystrode transmitter went on the air two months ago at WABW-TV, Channel 14 in Pelham, GA. Both stations are operated by the Georgia Public Telecommunications Commission, a PBS affiliate group run by the state of Georgia. One, possibly two, additional Klystrode-based UHF transmitters are expected to be on the air by the end of this year at WIIB-TV, Channel 63 in Bloomington, IN, and WHTJ-TV, Channel 41 in Charlottesville, VA.

It is quite an experience to stand in front of a UHF transmitter and watch the beam-current meter vary as the average picture level changes. It doesn't quite compute, but it works.



After years of development, the Klystrode is on the air in regular TV service. In a pioneering move, the Georgia Public Television system has placed in service two Klystrode-equipped transmitters. With those installations, the Klystrode moves from the lab to the field. A Klystrode is shown undergoing final tests before shipment. (Photo courtesy of Varian EIMAC.)

Serial No. 1

The Georgia Public Telecommunications Commission operates radio and TV facilities that cover 96% of the state's population. The Georgia Public TV (GPTV) system provides programming 18 hours a day, seven days a week. The 9-station network consists of six UHF stations and three VHF stations.

GPTV was faced with the need to replace some or all of its aging UHF transmitters. The efficiency of the new transmitters was a key concern. GPTV had to look at two things: the up-front capital costs and the operating costs over the next 20 years. With utility power costs rising steadily, the obvious question was how much efficiency could be gained by trying a new design. After researching the subject, GPTV decided to go with Klystrode transmitters (CTT-U-120SKT manufactured by Comark Communications) at its facilities in Wrens and Pelham. The job of convincing the state purchasing office then began.

The state of Georgia, like any government entity, prefers to buy only proven

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technology offered by multiple vendors through a competitive bid process. GPTV officials, however, provided projections based on Klystrode-equipped transmitters showing a significant payback in energy savings over the expected 20-year life of the units. The argument fell upon receptive ears, especially in view of the more than $550,000 GPTV spends each year on electricity.

All six of the UHF transmitters in the system are at least 20-year-old GE units. Although they still are in good operating condition, the transmitters are nearing the end of their designed life spans. The GPTV replacement program is making it possible to increase both the operating power and the coverage area of the affected station.

WCES increased its transmitter power fourfold, from 30kW to 120kW, and increased its ERP by a factor of 13, from 331kW to 5MW. When the utility company bills started coming in for the Wrens operation, an astounding fact became clear: The power bill for the facility had increased by only 22%! Even though the station had quadrupled its transmitter output power, ac power consumption had increased only slightly because of the efficiency advantage of the Klystrode-based system.

WCES accomplished the conversion process in 31 days. Because of the scope of the rebuilding work, the station did not attempt to stay on the air in the interim. The work began with the removal of the old transmitter, transmission line and antenna. The transmitter manufacturer and the Klystrode manufacturer (Varian EIMAC) each supplied three factory engineers to supervise installation of the equipment. GPTV provided five chief engineers from stations around the state to do the work, including all wiring, plumbing and support system installation. For the GPTV engineers involved, it was a once-in-a-lifetime opportunity.

Preliminary work began about five days before the old transmitter was taken off the air. The only major delay in the effort involved delivery of the antenna.

The long journey

The Klystrode development program began in 1980 with UHF-TV in mind as a major application. By 1982, test results on an early version were encouraging enough to justify the publication of an IEEE paper titled, "The Klystrode—An Unusual Transmitting Tube With Potential for UHF-TV." Its full potential, however, was not realized until more development had been done, including major improvements to both the tube and its associated RF circuitry. By 1986, a TV transmitter manufacturer perceived this potential, resulting in the installations in Georgia described in this article.

Refinements to the tube have been made during the past two years to optimize the operating parameters. Tube-to-tube variations have been minimized with the development of the production version of the device. Now that the Klystrode has proved to be an operating product, the manufacturer says it can produce sufficient tubes to meet the expected demand.

The fundamental advantage of the Klystrode is its ability to operate Class B. Compared with a conventional klystron, it results in higher efficiency. The Klystrode is a hybrid device that combines the cathode/control grid structure of a tetrode and the accelerator anode/drift tube/collector structure of a klystron. The basic concept dates back to the late 1930s,

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but it was not until this decade that serious engineering effort was put into the tube to make it a viable product for high-power UHF service.

The production version of the 60kW Klystrode is shown in Figure 1. Double-tuned cavities are used to obtain the required bandwidth. The load is coupled into the second cavity (see Figure 1a). This arrangement proved to be an attractive way to couple power out of the device because no coupling loop or probe is required in the primary cavity, which can be a problem at the high end of the UHF band.

Two tubes cover the UHF-TV band, with the dividing point at Channel 35. The low-band version of the tube differs only in the height of the output cavity and the size of the input and output circuits. Measurements on the low-band tube are similar to those on the high-band version, and they indicate good bandwidth, efficiency and power gain.

A 15kW air-cooled Klystrode also has been developed. The tube is more compact than the 60kW version and needs to dissipate an average power only slightly greater than black level (about 9kW). This results in a device with a small collector fin structure, low airflow requirements, low pressure drop across the fins and low acoustical noise. Development engineers are working to determine the feasibility of air-cooled Klystrode tubes operating at the 30W, 40W and even 60kW power levels.

Operating efficiency

Because the klystron is a Class A device, the *figure of merit* and *efficiency* figures can be used interchangeably. The average dc input power does not vary with picture content. The figure of merit is defined as:

Figure of merit =
RF peak power output
(at peak of sync)
dc beam input power at 50% APL.

Theoretically and under ideal conditions, a high-efficiency klystron, fully pulsed and tuned with full-linearity compensation, can achieve a figure of merit 1.69 times its out-of-the-box performance.[1] For a tube that has a basic efficiency of 50%, a pulsed figure of merit of 84.5% is the best that can be achieved

These levels are not, however, seen in actual broadcast operation because fully pulsed linearity correction is difficult to achieve on a stable basis. Practical values of 60% to 70% are common.

The Klystrode, on the other hand, provides both beam power variation during sync pulses (as in a pulsed klystron) and variation of beam power over the active video waveform. It provides full-time beam modulation as a result of its inherent structure and Class B operation. The figure of merit for a Klystrode has been measured consistently at 125% or higher

Inside the box

Reliability of the Klystrode transmitter was the overriding consideration in the design of the WCES system. As many as four *fall-back* operating positions are designed into the transmitter and combiner. As shown in Figure 2, the system installed at WCES features a *magic Tee* RF output network that permits operation at −3dB from rated power in the event of a failure in one side of the parallel visual amplifiers. Emergency multiplex operation

Continued on page 7

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Among digital equalizers, the Yamaha DEQ7 is unequalled. There's both digital and analog I/O.

in digital audio technology is.

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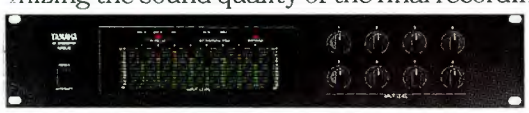

AD808 Format Converter.

Once again, it's easy to see when it comes to innovation, there's nothing new about the name Yamaha.

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Continued from page 68

also is available. In addition, a failure of the aural Klystrode can be bypassed by operating one of the visual Klystrodes as the aural and remaining on the air at 50% of power.

The cooling system for the Klystrode transmitter is of the same basic design as a klystron transmitter. It is, therefore, overbuilt for the amount of heat generated by the tubes. The heat exchanger system is capable of handling three times the heat generated by the transmitter. The completely redundant cooling system permits patching around pump or plumbing problems.

The ruggedness of the Klystrode's pyrolytic graphite grid has received a good deal of attention from designers and potential users. Protection of the grid begins with the basic tube geometry. The grid is placed in a protected location away from potential arc paths. Protection external to the tube is centered on a fast, high current crowbar system that limits the energy that can be delivered to an transmitter component during an arc other fault.

Lined up and ready to go. The three Klystrode tubes used in the WCES 120kW transmitter await installation at the GPTV station in Wrens, GA. The fourth device is a spare. (Photo courtesy of Comark.)

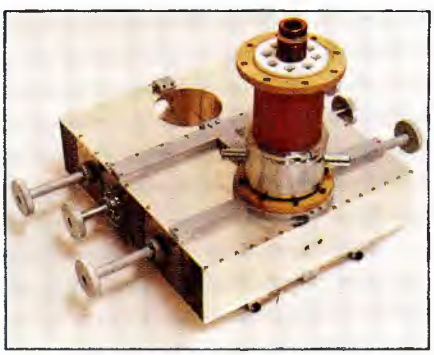

Figure 1. *The 60kW Klystrode tube mounted in its support stand with the output cavity attached (a). A close-up view of the double-tuned output cavity is shown in (b). (Photos courtesy of Varian EIMAC.)*

A block diagram of the crowbar circu is shown in Figure 3. The trip point is s at 50A. In actual tests, the energ delivered from an arc of the full 32k beam supply was sufficient to produc only a pinhole in a piece of aluminum fo The response time of the crowbar is le than 10μs. The peak current permissib through the discharge tube is 3,000A.

The beam power supply (of which ther are two in the 120kW transmitter) unique. The supply actually is designed t be dual-purpose, in that it can operate a a Klystrode or klystron beam supply wit a flick of a switch. The externally mounte vault also has the ability to change fror 32kV output to 18kV in four steps, agai by throwing a selector switch.

Aside from flexible operation, the ma jor difference in the new Klystrode sup ply is its response to a varying load. If standard klystron beam supply were use in a Klystrode-equipped transmitter, per formance under varying picture level would be unacceptable. Consider the ap plication of a *bounce* (black-to-white signal to the transmitter. Beam current fo a typical Klystrode 60kW transmitte would change from approximately 400mA to 2A. The effect with a conventiona klystron supply would be ringing of abou 20% on the beam voltage. The Klystrod power supply, therefore, must be designe for tight transient regulation.

The transmitter is set up as a closed-loop system. The output signal, after the com biner, is sampled at the pedestal level and used as a reference to control the IF drive going to the driver amplifiers. The AGC loop corrects for long-term sags in beam voltage caused by changes in utility com pany input power.

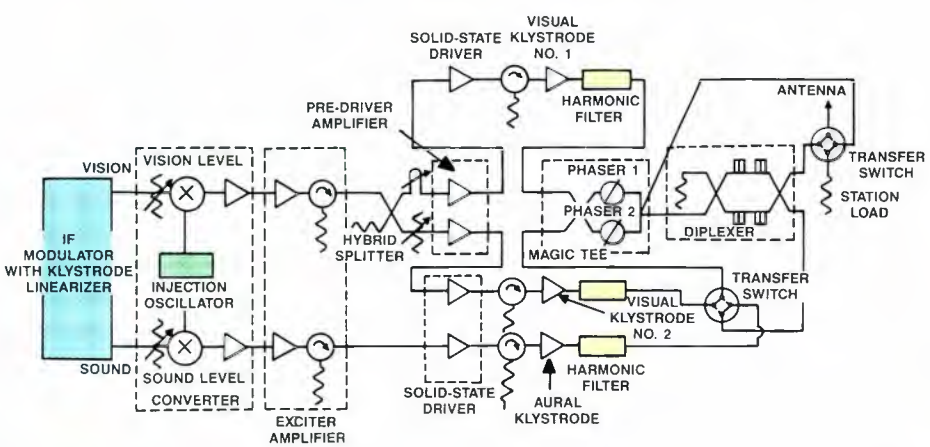

Figure 2. *Block diagram of the 120kW SK-series transmitter installed at WCES in Wrens, GA. The same basic design was used at the Pelham, GA, GPTV installation. Redundancy was a primary concern in the design of the transmission network.*

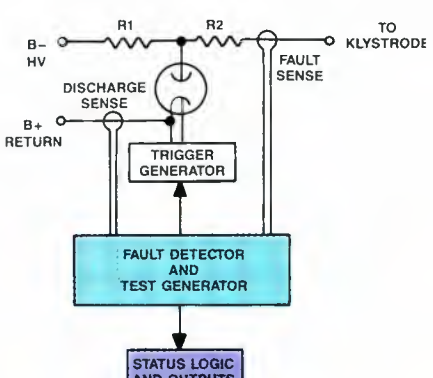

Figure 3. *Simplified block diagram of the crowbar circuit designed into the Klystrode SK-series (Comark) transmitters. The circuit (developed by EIMAC) is intended to protect the tube from damaging fault currents.*

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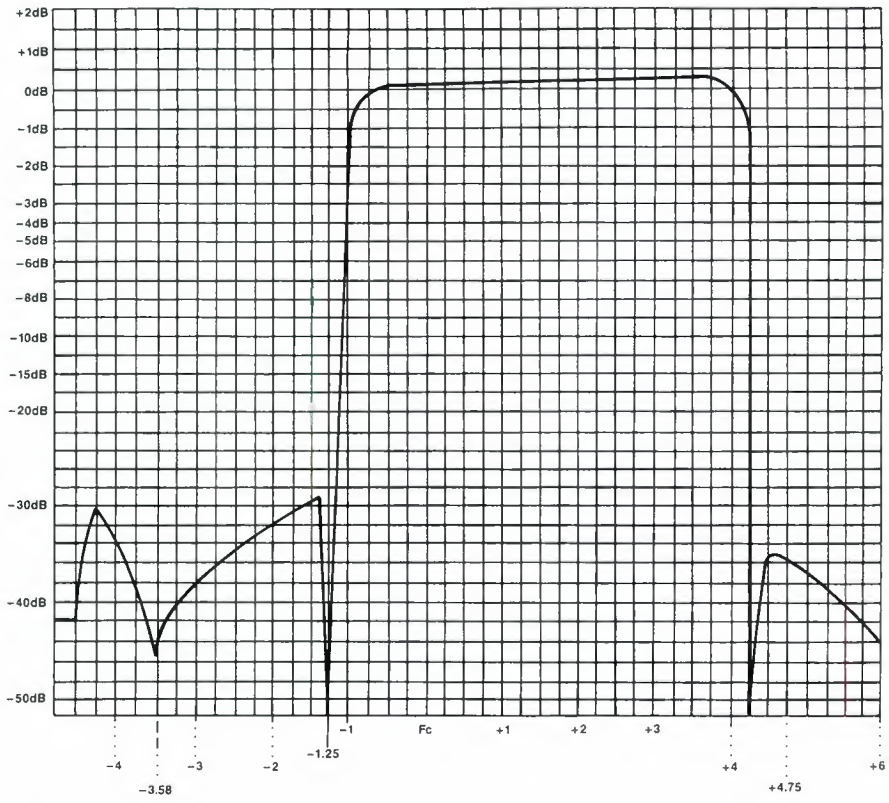


Figure 4. Measured lower sideband regeneration of the WCES Klystrode transmitter taken at full operating power into a dummy load. Note that the lower sideband is held to a maximum of −30dB.

Surprises

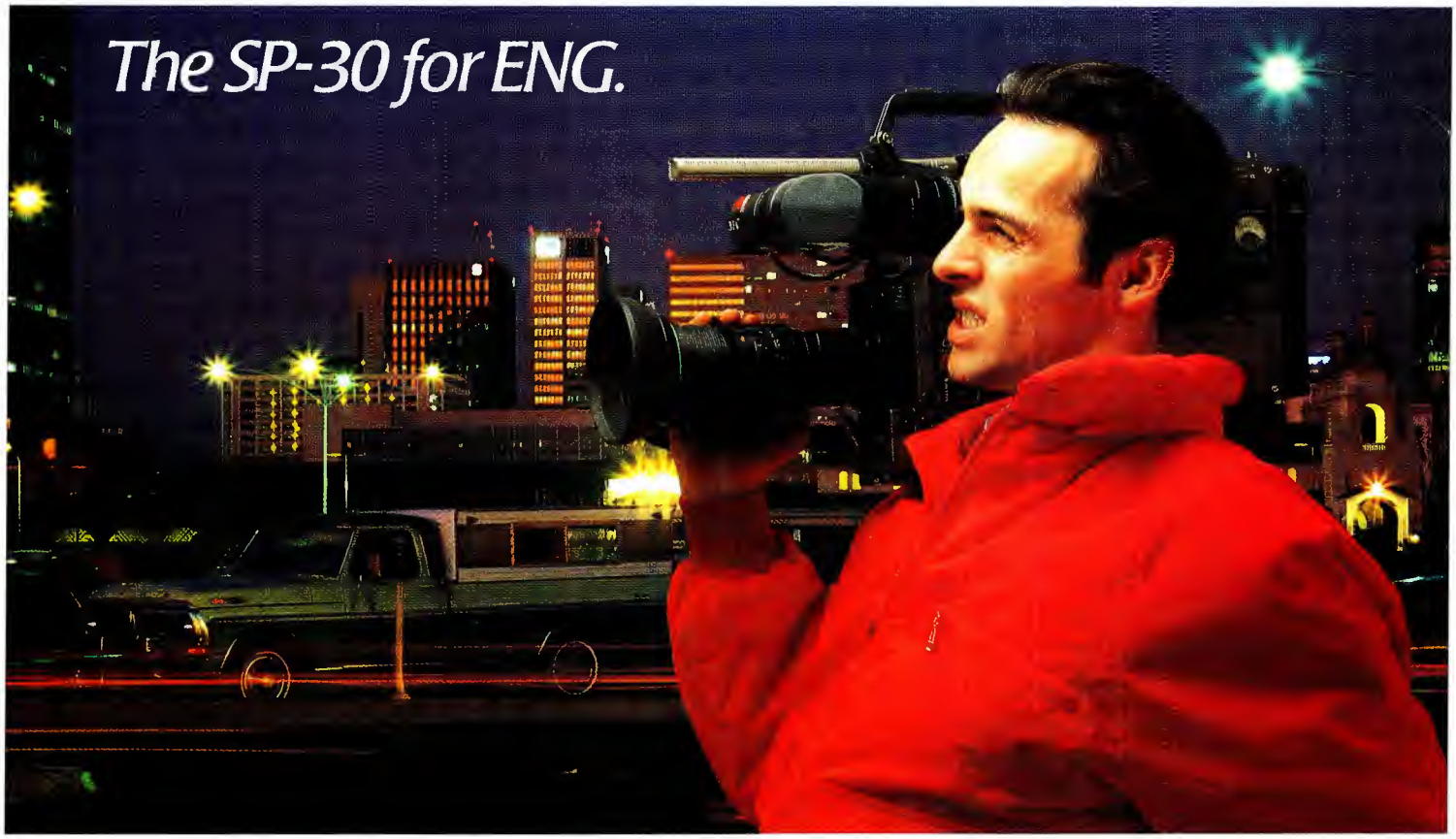
A few surprises come up in any development project. This one was no exception. It is interesting, however, that some of the problems the engineers involved in the project expected to see with the device didn't turn out to be problems after all. The operating power gain of the tube is a case in point.

Based on test data in 1986, it was expected that a Klystrode tube running a 60kW peak of sync output would require 600W peak sync drive power. In fact, only 300W was needed in Georgia.

The potential for electromagnetic interference (EMI) within the transmitter and to the outside world turned out to be less of a problem than first thought. The EMI concern was twofold. First, because the final amplifiers run Class B, the beam lead

Continued on page 7

The second CCD sensation.



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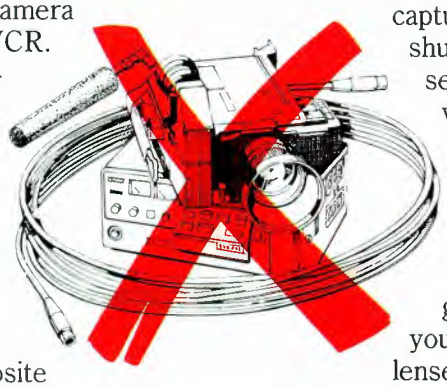

Combine the BR-S410UN with your existing composite camera or any color camera, and it's a portable VCR.

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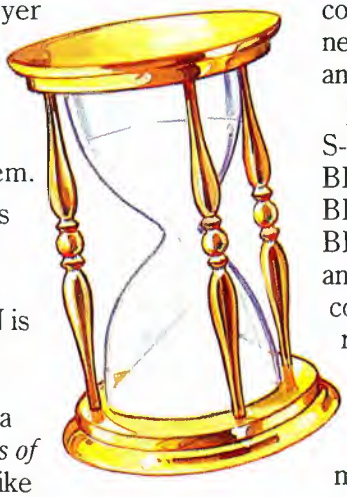

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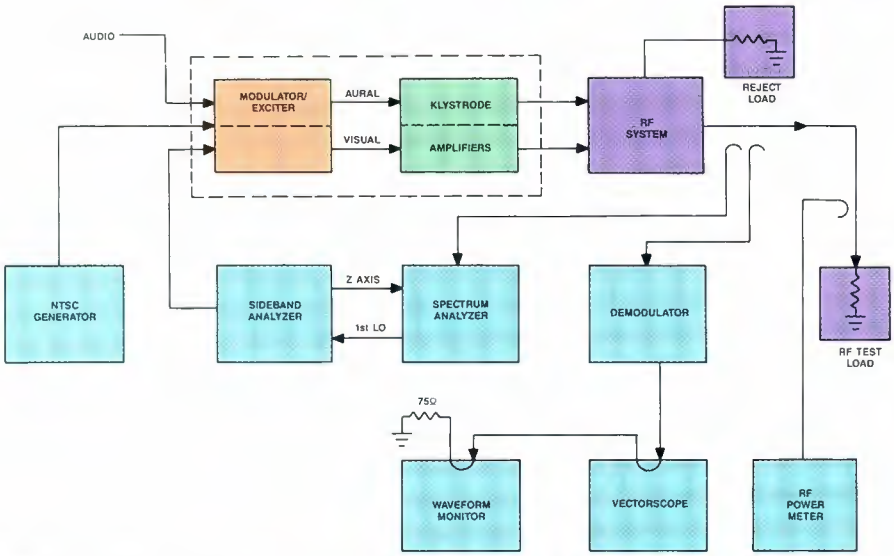

Figure 5. *Test equipment setup for the measurements taken in Figures 4, 6, 7 and 8.*

Continued from page 74

becomes a source for the emission of RF in the form of the applied video signal. This problem was solved through careful mechanical shielding of the power-supply components and bypassing of the beam supply leads.

The second source of EMI concern was the crowbar protection system, which, when activated, dumps 32kV and 8μF of capacitance in a few microseconds. That energy must be contained so that it goes to ground and does not distribute itself to other parts of the transmitter. The solution involved good grounding techniques and mechanical shielding.

The Klystrode tube does not have the same hard saturation characteristic as the klystron. The Klystrode high-power transfer curve flattens more slowly than a klystron and continues to increase with more drive power, requiring a different approach to linearity correction. The Klystrode has an S-shaped linearity curve, and the klystron has a C-shaped linearity curve.

Correction is required at white level and at black and sync. Furthermore, correction must be done at IF after the SAW filter to permit proper sideband cancellation. It is possible to improve linearity by increasing the tube idling current. This would, however, degrade the overall efficiency of the system. Instead, extended linearity correction was built into the modulator.

Proof of performance

After the transmitter was installed and tuned up in Wrens, a complete proof of performance was run, with some impressive results.

Of particular interest was the lower sideband regeneration. Figure 4 shows the

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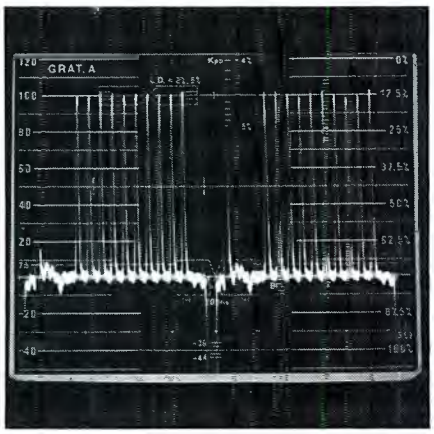

Figure 6. *Low-frequency linearity performance of the WCES transmitter. (Scope photos courtesy of GPTV and Comark.)*

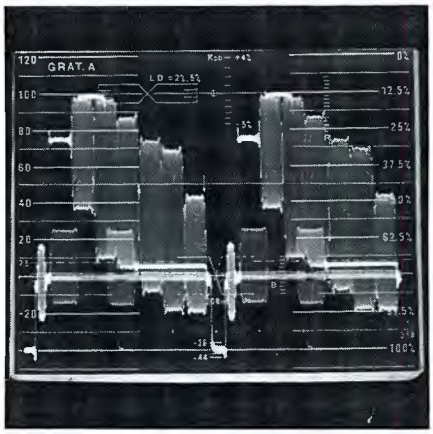

Figure 7. *Waveform monitor display of color bars (horizontal rate) taken during the WCES proof.*

Figure 8. *Vectorscope display of color bars taken during the WCES proof.*

lower sideband response of the transmitter operating at rated power into a dummy load. The equipment setup is shown in Figure 5 for 50% APL and 50IRE units of video. Measurements showed the transmitter within FCC specifications.

The most significant element of the trace is the level at which the lower sideband is operating. Lower sideband regeneration is a measure of the performance of the overall transmitter. Ideally, the lower sideband should be as low out of the final amplifier as it is out of the modulator (approximately −40dB). Because of non-linearities in the power amplifier, however, some lower sideband energy usually is regenerated through intermodulation.

The FCC spec for lower sideband regeneration is −20dB. The limiting factor in most klystron transmitters, and the factor that establishes a break-even point on pulsing, is the lower sideband regeneration level. As the klystron is pulsed deeper, more non-linearity results. To compensate,

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more correction is needed and, at some point, the non-linearity exceeds the range of correction available.

The worst-case lower sideband reading of the Klystrode transmitter placed into service at WCES was −30dB. That measurement is better than typical performance from a multiplexed transmitter, which is designed specifically to have low intermodulation. Figure 6 shows low-frequency linearity of the transmitter, taken with a stairstep waveform. Linearity is within about 1%, confirming the lower sideband regeneration data.

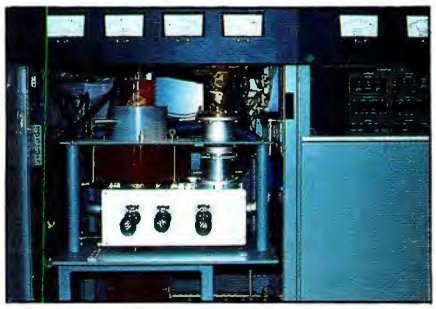
Waveform monitor and vectorscope displays with color bars are shown in Figures 7 and 8. These traces, and the remaining data taken in the proof, show performance essentially identical to a conventional klystron-based transmitter.

Tube life

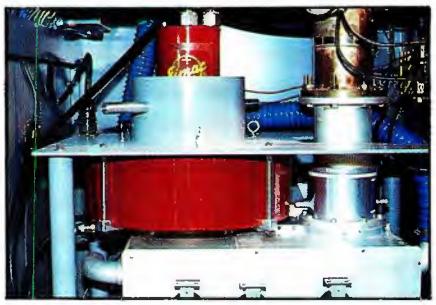
A question often raised with regard to the Klystrode is, "What about tube life?" In theory, it can be argued that the Klystrode will last just as long as a klystron, maybe longer because of the additional protection built into the supporting system.

What kills a tube often has nothing to do with what's going on inside the device. You can lose a tube because the support system fails to provide a proper operating environment.

In any event, with every passing day, there is more evidence that the Klystrode has finally arrived.



One of the Klystrode visual amplifiers in operation. The double-tuned output cavity can be seen in the center of the photo.



Klystrode installed in one of the visual sockets of the WCES transmitter. The red focusing magnet and RF output connector can be seen above the output cavity.

Editor's note: Klystrode is a registered trademark of Varian EIMAC.

The author wishes to thank the following individuals for providing information for this article:

- Al Korn, director of engineering and technical services, Georgia Public Telecommunications Commission
- The staff of WCES-TV, Wrens, GA
- Nat Ostroff, president, Comark Communications
- George Badger, Varian EIMAC

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IBC '88: The HDTV showdown

By Jerry Whitaker, editorial director

The 1988 International Broadcasting Convention in Brighton, England, was the site of two miniature hurricanes. One drenched attendees and made doing anything in the town a trying experience. The other swirled around the future of high-definition television. The HDTV hurricane is the one people will remember.

How windy was it?

To say that the weather in Brighton during the show (Sept. 23-27) was bad probably would be the understatement of the decade. It was miserable. The wind howled. The rain poured. An umbrella was of no use. And it was cold, too.

For most conventions, bad weather would not be a big deal, but it is at IBC. The convention is spread out like no other trade show in the professional audio-video industry. Exhibits are located in the Metropole Hotel, the Grand Hotel, the Brighton Center and the sea front esplanade. The distance separating these venues is relatively small, but the weather was so bad that every attendee probably got soaked at least once.

Not surprisingly, the biggest weather-related problem involved the outdoor exhibits along the esplanade. Only die-hard attendees dared to venture to the sea front.

Weather experts said that Brighton was experiencing the backlash of hurricane Gilbert, which had upset the normal fall weather patterns in England. Honestly, though, Brighton weather in September is rarely anything to write home about. It is usually overcast and cool. If people use the beach (and I am assured they do), it isn't during September.

Welcome to Brighton

Bad weather aside, Brighton is a beautiful location for a convention. The sea front stretches for miles, and there are plenty of non-convention activities available for attendees and spouses. One of the two amusement piers at Brighton has been restored and was open to the public. A few blocks away, restoration work continued on the Royal Pavilion, which also was open for public tours. Numerous shops dot the winding streets of the city, and quaint restaurants can be found on almost any corner.

Perhaps the biggest change in Brighton itself since the last IBC show in '86 was the opening of a new hotel (the Ramada Renaissance) near the convention center. In most convention cities, the opening of a new hotel is not a big deal. But in Brighton, it was an event worthy of celebration.

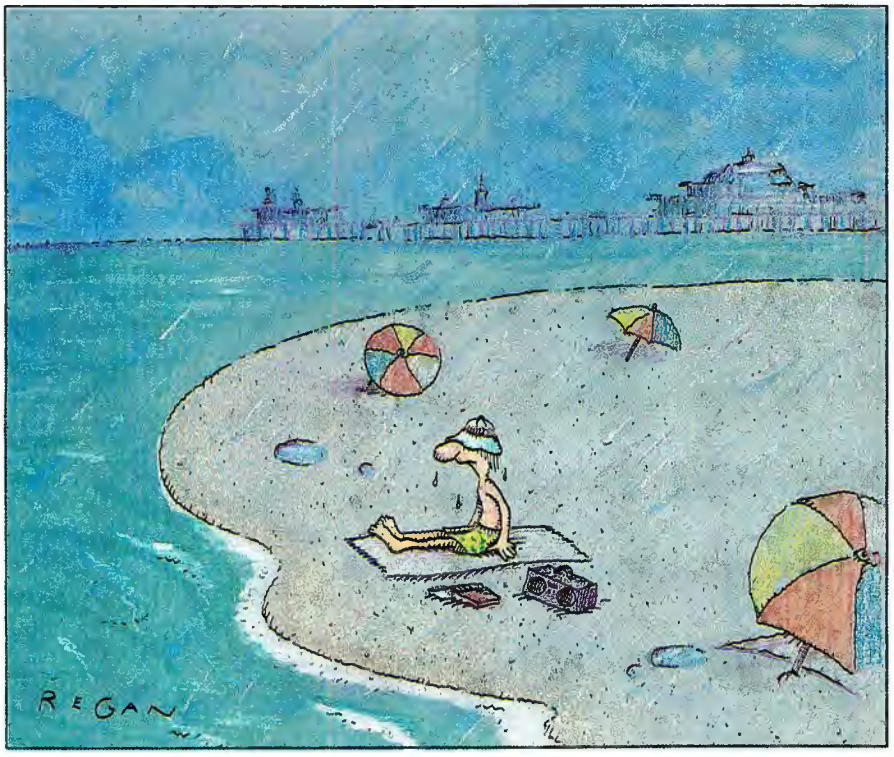
Brighton is hard-pressed to house, with any reasonable amount of comfort, all the persons that want to attend the show. There are really only three hotels in town in which you would want to spend any time: the Metropole, the Grand and, now, the Ramada. Many attendees stayed at hotels around Gatwick Airport near London and commuted by train each day (30 minutes each direction).

A second problem facing IBC organizers was the inadequate size of the exhibit area. The show this year featured 22,000 square meters of exhibit space, divided among 216 exhibitors. A number of other companies wanting to exhibit were turned away because of the lack of space.

These concerns led to discussions during the show of a new location for IBC other than Brighton. The conclusion reached by most at the end of the 5-day convention was that, at this point, no other venue in the United Kingdom would be much better.

This year's show was a record-breaker by all accounts. It was attended by more than 20,000 persons from 62 countries. The technical program featured 114 papers presented by authors from 14 countries.

The papers were, as usual, excellent. As might be expected, the vast majority came from the United Kingdom and other countries in Europe, although countries such as Australia and Japan were represented. The U.S. contingent was highly visible,



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despite the differences between U.S. and European broadcasting methods and standards.

The technical program opened with an address by Peter Mothersole, chair of the technical programs committee. Sessions covered a wide range of topics, from high definition to electromagnetic radiation. HDTV unquestionably stole the show.

Eureka! We've seen it!

Any hope of a single worldwide standard for high-definition television did a slow dissolve to black at IBC. Brighton was the first public debut of the HDTV system developed by the European consortium known as Eureka EU95. The system is intended to be a direct competitor to the 1125/60 system developed by NHK (the Japanese Broadcasting Company).

The Eureka project was launched in October 1986 with the goal of defining a European HDTV standard of 1,250 lines/50Hz that would be compatible with existing 50Hz receivers. EU95 brought together 30 television-related organizations, including major manufacturers, broadcasters and universities. The Brighton showing included products and technology necessary for HDTV production, transmission and reception.

HD-MAC is the transmission standard developed under the EU95 program. HD-MAC is an extension of the MAC-packet family of transmission standards.

The primary movers in EU95 are Bosch, Philips and Thomson. The aim of the Eureka project is to define a 50Hz HDTV standard for submission to the plenary assembly of the CCIR in 1990. The work carried out under this project involves defining production, transmission, recording and projection systems that will bring high-definition pictures into viewers' homes.

Supporters of the 1125/60 system also are planning to present their standard to the CCIR in 1990 for endorsement. The entry of EU95 into the HDTV arena will change the complexion of the plenary assembly meeting considerably.

The Eureka group cites compatibility with existing production, transmission and reception systems as key elements in standards development. Proponents say EU95 offers producers compatibility in the exchange of TV programs at the international level and affords easy conversion of programs into PAL, NTSC or SECAM. At the transmission stage, EU95 offers compatibility with the MAC (multiplexed analog component) transmission channels that will become operational in Europe during the next few years.

The Eureka EU95 program is divided into 10 project groups, each of which is responsible for part of the development work. The division of responsibility has worked well. On display at IBC, just two years into the project, were the following types of equipment:

- 1,250-line/50Hz cameras, one featuring progressive scanning (1:1) and one featuring interlace scanning (2:1).
- 1250/50/2:1 analog VTR.
- 1250/50/2:1 slide scanner.
- 1250/50/2:1, 25fps telecine.
- Digital vision mixer.
- HD-MAC encoder and decoder.
- HD-MAC microwave and satellite link.
- Projection displays measuring 50, 100 and 200 inches.
- 20- and 35-inch monitors capable of 50/100Hz operation.
- HD VCR recorders.

The battle of Brighton

The extent of development shown by the Eureka group surprised most attendees, and probably the proponents of the NHK 1125/60 system as well. The slick brochures prepared by EU95 for attendees

Commentary

Shortchanging short wave

Television has been the darling of the decade, and at this year's IBC, its importance became further enhanced with the all-consuming subject of HDTV. It was the flavor of the week at Brighton. If this trend continues, it would be better to drop all pretense of IBC being an International Broadcasting Convention, and adopt a more appropriate name. This would be perfectly understandable if AM was dead. But it is not.

Indeed, some of the most remarkable developments in the field of international broadcasting have taken place in the past decade. Such developments in transmission science have not been restricted to high-power transmitters. Significant inroads have been made in the areas of components, matrices, feeder systems and high-gain steerable short-wave arrays. Much of this technology has stemmed from massive research and development investments by companies in Western Europe. So why haven't these achievements been highlighted at the IBC?

One reason is that short-wave technology does not make news. Few persons in Western Europe benefit from it directly. It is the listeners in Eastern Europe, the USSR and China who benefit.

Meanwhile, back in the United Kingdom, listeners to the BBC have to put up with broadcasts from AM transmitters that are at least 20 years old. Until a few years ago, the transmitters used by the BBC to broadcast national programs were of 1937 origin.

Revolutionary advances in technology have a way of invading, even controlling, the lives of ordinary people. Examples of this are the camcorder, VCRs and home computers. New models appear with monotonous regularity. With international broadcasting there is no such spin-off. Notwithstanding the amount of R&D spent on pushing high-power transmitter technology to the limits of physics, short-wave news rarely makes headlines. There is no spin-off insofar as the domestic market is concerned.

The reason is that, by definition, in international broadcasting the user of the technology is beyond a country's political boundaries. When the Soviet Union built possibly the largest international broadcasting network in the world, Western European countries did not exhort their citizens to invest in the latest short-wave radios with which to receive these broadcasts. Equally so, there is no evidence that the Soviet Union has built up a thriving radio receiver market so that its citizens can listen to Voice of America broadcasts.

The result of this curious, but understandable, state of affairs is that high-power international broadcasting is, from a reception viewpoint, an orphan that no country wants. At the same time, it is an asset to which most countries aspire.

Finally, the main reason for the popularity of television with people in general, and the organizers of shows such as IBC '88 in particular, is the nature of the TV industry itself. Technical developments come by the carload, invariably hailed as spectacular (sometimes even before they really exist).

The world of the high-power, frequency-agile, superpower transmitter is a different world. It is a multidisciplined science embracing micro-electronics, solid-state technology, computer sciences, vacuum sciences, heavy electrical engineering and the generation of radio frequency energy on a scale that is pushing the barriers of natural physics. This technology is not stagnant. It just isn't sexy.

James Wood

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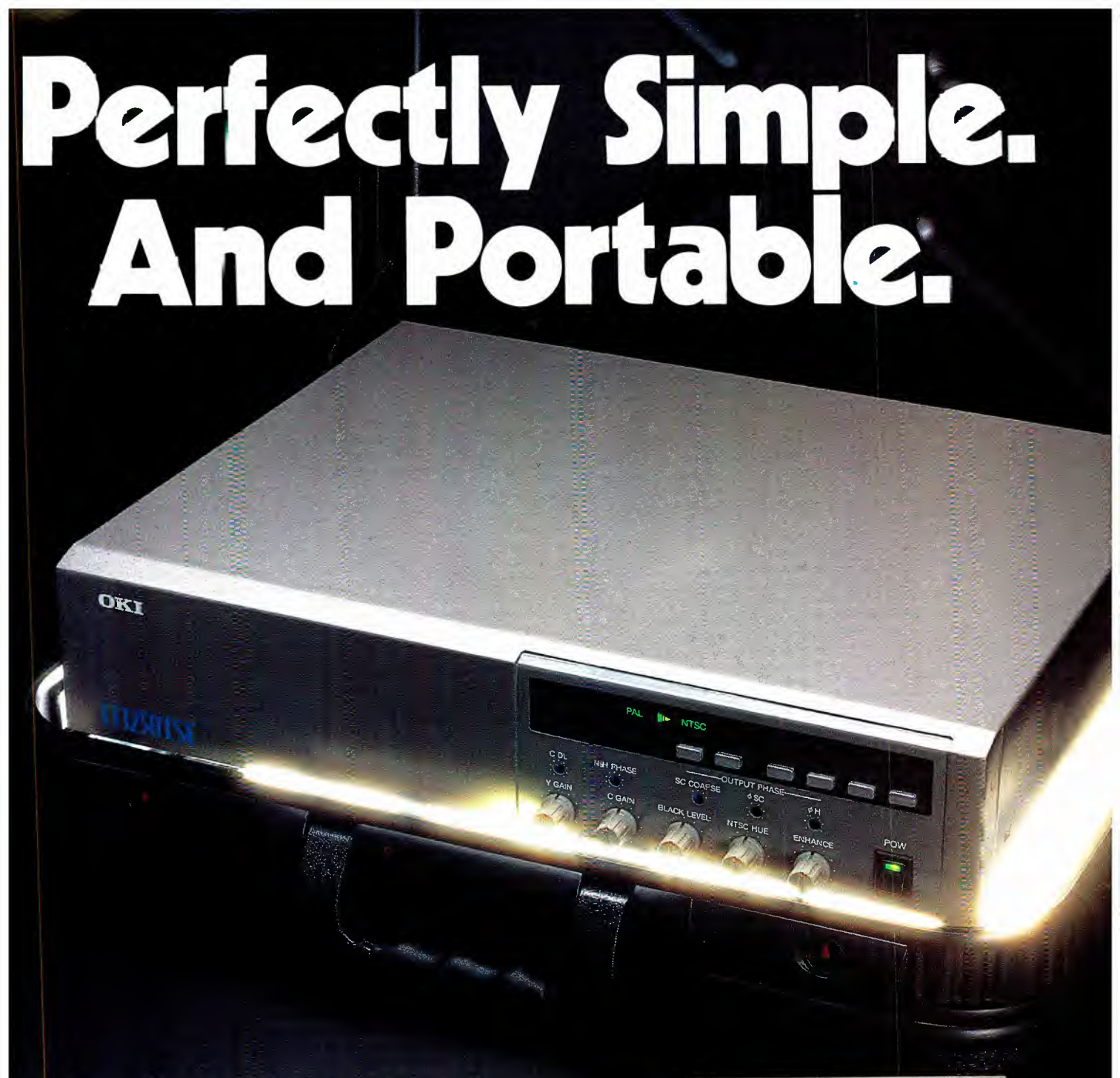

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and the press described the project as "A challenge born in Europe: to reach HDTV in a compatible world." The significant part of that slogan is "born in Europe."

Lord Young, the U.K Secretary of State for Trade and Industry, opened the Eureka HDTV exhibit on the first day of the show with a wholehearted endorsement of the European-based project, saying, "We hope to prevent the adoption of an inappropriate world HDTV standard and instead place this more suitable alternative standard on the world agenda." With that, the fight was on, and it soon became clear that the Eureka proponents planned to take no prisoners.

The first of several salvos from the Eureka group came from P.W. Boegels, Eureka HDTV Directorate (the Netherlands), in a technical session paper describing the philosophy and implementation of EU95. Boegels described EU95 as the proper evolutionary road forward, adding, "Even in Japan itself, doubts about their own approach have arisen, and industry there has been forced into introducing an evolutionary path for terrestrial transmission.

"As a result of our action, Japan has realized it cannot force its technology on the world and has agreed to discuss future ideas in international forums."

Traffic on the show floor at IBC was brisk. With three primary exhibit halls and other exhibits outside, attendees did a lot of walking. (Photos courtesy of IBC.)

So much for diplomacy.

The Eureka demonstrations were held in a specially constructed building on the sea front across from the Brighton Center. The security measures surrounding the project were unusual, bordering on excessive. Attendees or press members who wanted to view the demonstrations had to sign up beforehand for the shows. Uniformed security personnel were located at various points in the facility. We assume the arrangements were intended to protect visiting dignitaries. Still, it was a little unnerving.

The front-runners

Despite the rapid progress made by the Eureka group, the 1125/60 forces are still clearly in the driver's seat insofar as high-definition production equipment is concerned. Extensive demonstrations were held by proponents of the 1125/60 system at the University of Sussex several miles away from Brighton. It was unclear whether the 1125 group was forced out of

Continued on page 92

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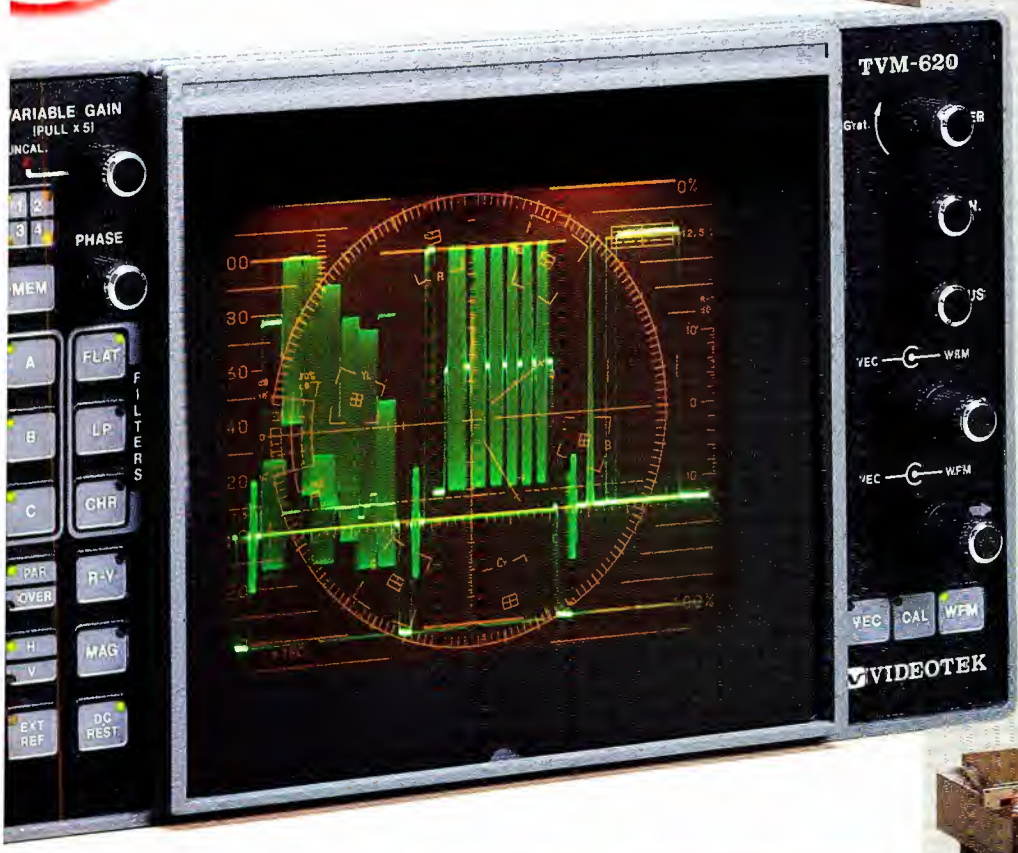

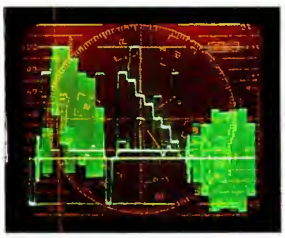

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With that in mind, it's easy to understand why the BVE-9000, BVE-900 and BVE-600 editors differ, yet share Sony's key operating controls and features. For instance, they all automatically detect and identify the type of Sony VTR being used and set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

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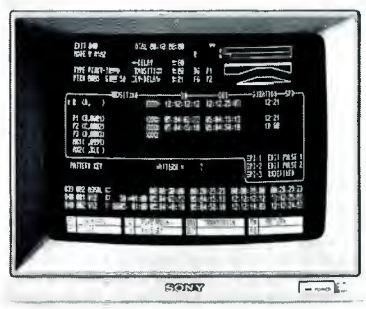

BVE-900

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

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

is on the technology.

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

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

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

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

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BVE-600

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Continued from page 88

the primary venues in Brighton because of politics or simply space restrictions. The demonstrations were impressive just the same.

Buses ran regularly from the Brighton Center to the university. The 20-minute ride was actually quite pleasant—a welcome change of scenery from the howling winds and rain of Brighton.

In addition to the university setting, 1125 proponents demonstrated the capabilities of their hardware at two theaters in the Kingswest Center, a movie house complex next to the Brighton Center. The big attractions were a Phil Collins concert shot in HDTV and what was described as the world's first HDTV videoconference.

The show was put together by SVC Television, British Telecom (BT) and Sony Broadcast. Live interviews conducted in the SVC studios in London were relayed to Brighton via fiber-optic cables supplied by BT. A return video link provided attendees the opportunity to speak directly with guests in London.

Several HDTV productions were shown in the Kingswest Center. Some were projected using high-definition video projectors; others were transferred from video to 35mm film stock using an electronic beam recorder.

The number of independently produced programs collected from companies across Europe and other countries made an important statement to attendees: 1125/60 equipment is in use today around the world.

The Sussex University demonstration center offered enough to make even the most cynical attendee a believer in the future of high-definition television. Five years ago, the broadcast industry saw HDTV as a technology in search of an application. Well, it has found an application.

Some 28 manufacturers from Europe, Japan and the United States combined forces to assemble the largest quantity of 1125/60 high-definition equipment ever found under one roof. All facets of production were demonstrated, from film-type single-camera shooting to blue-screen work to conventional TV studio operation. Behind the cameras were computer graphics systems, off-line editors, video switchers, projection displays, large-screen monitors, standards converters, recorders and film-transfer hardware.

Anything necessary for video production could be found at the Sussex University center in high definition. The demonstration proved that HDTV today is a business, not an experiment.

It is interesting that some manufacturers exhibiting at the Sussex complex also were participating in the Eureka EU95 project. Manufacturers are doing their best to keep a foot in both camps in the belief that both systems will find a market.

The technical sessions were well-attended, featuring a wide range of topics. In all, 114 papers were presented during the conference.

Lord Young, the U.K. Secretary of State for Trade and Industry, opened the Eureka EU95 exhibit at IBC. Young labeled the European project as "the success story."

Bill Connolly, president of Sony Advanced Systems Company, and technical spokesman for the HDTV 1125/60 Group, told **BE** he hoped there might be some room for compromise with the Eureka group. However, he said that the 1125/60 system developed initially by NHK already has been through an extensive review process by SMPTE and other groups. He dismissed the notion that the 1125 system was being pushed on anyone. "During the review process by SMPTE, input was sought both from the television and film communities," he said. "Because of that input, changes were made in almost every phase of the initial NHK proposal."

Connolly added that the 1125 system has taken all the correct steps and played by the standardization rules. "Our system has been approved by SMPTE and is now before ANSI for final implementation as a national standard. We have done our homework and have come up with a standard our industry can live with," he said. Connolly said the 1125 standard has been studied and refined by industry experts since 1982.

Connolly characterized the Eureka project as a "catch-up program" that is still in the experimental stage. He described the 1125 equipment demonstrated at the Sussex center as "real products with serial numbers."

RF engineering

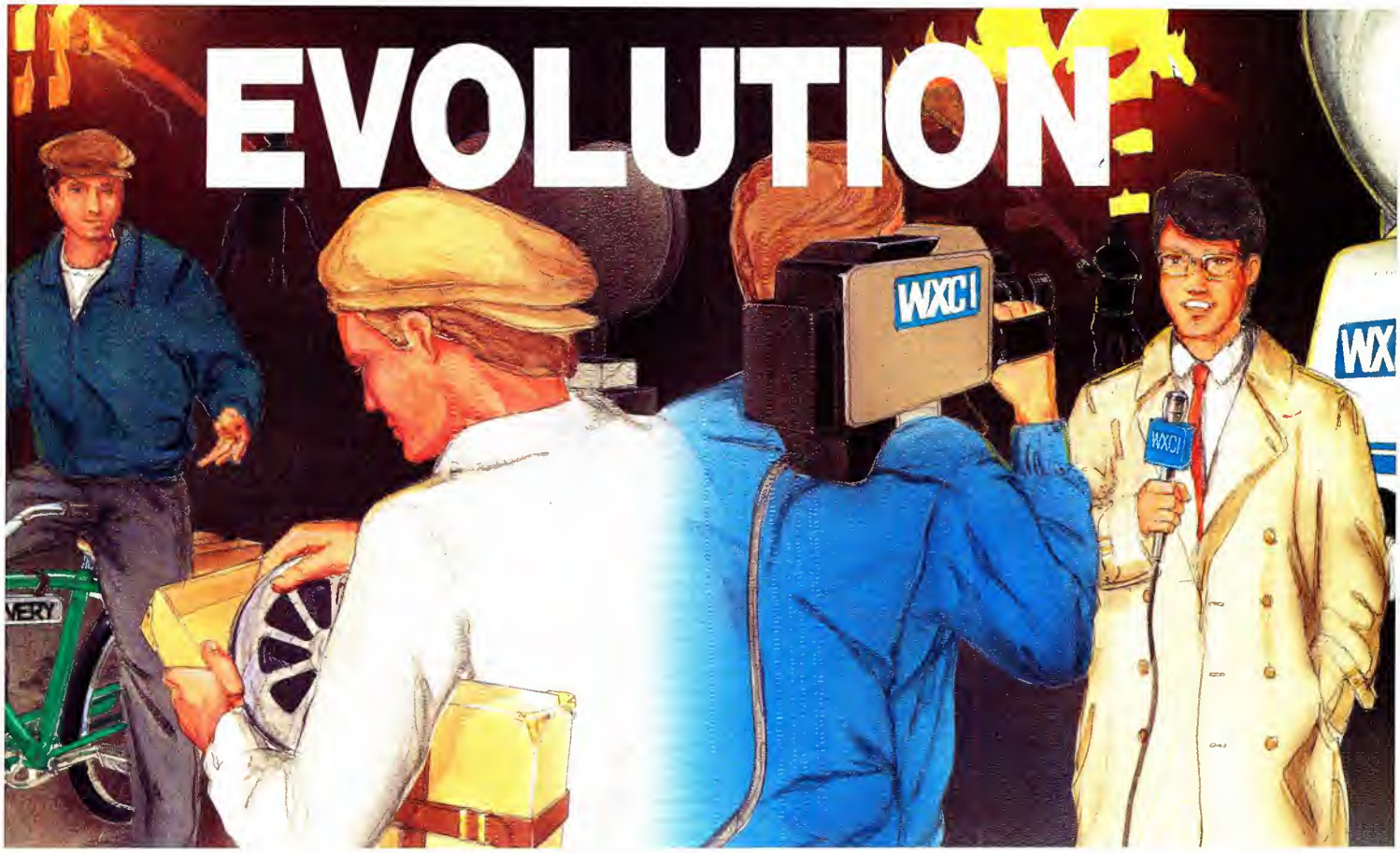
Although HDTV stole the show at IBC, a number of other important developments were discussed in technical sessions and on the exhibition floors. Stanley Hubbard of Hubbard Broadcasting (Minneapolis) gave an overview of satellite ENG development in the United States and highlighted the strides made since 1983 in satellite news-gathering.

Europeans often have a hard time understanding American radio and TV broadcasters. The entrepreneurial spirit that pervades American broadcasting is unfamiliar to many Europeans. With increased commercialization of radio and TV in Europe, however, this situation is beginning to change.

If you thought non-ionizing radiation was a concern only in North America, think again. A paper given by BBC engineers outlined the health and safety questions raised by electromagnetic radiation. The same subject also was examined in a paper from Telecom, Australia. The prevalence of shared transmitter sites in Europe and the use of high-power short-wave transmitters has raised the same health concerns in Europe that have been raised in the United States.

Although RF engineering was touched upon in several sessions and papers, attendees interested in high-power radio broadcasting probably left wanting more. With each passing IBC show, the importance of AM broadcasting seems to sink deeper into decline as far as the technical committee of the IBC is concerned.

At this year's show, AM was certainly a second-class traveler. This situation is unfortunate because IBC has been the only major international forum for discussion of super-power short-wave systems. (See the related article, "Shortchanging Short Wave," page 86.)



REEL NEWS

Early newsreel makers were hungry for news. Studio cameramen were responsible for developing their own leads, and they aggressively sought exclusive footage to scoop their competition. As fast as the film was shot, it was taken to the lab, developed, and distributed to theaters. Sometimes, as in the case of a presidential election, these pioneers of the broadcasting industry would produce two endings for timely viewing. The newsreel producers' wizardry probably culminated during a parade of WWII soldiers in New York City, when audiences were able to see the event before it had ended!

Today's broadcasters still rely on speed to deliver up-to-the-minute coverage. News crews travel in sophisticated SNV's and broadcast live from the field. Their ability to communicate instantly to almost anywhere in the world has diminished the once-phenomenal feats of their earlier counterparts.

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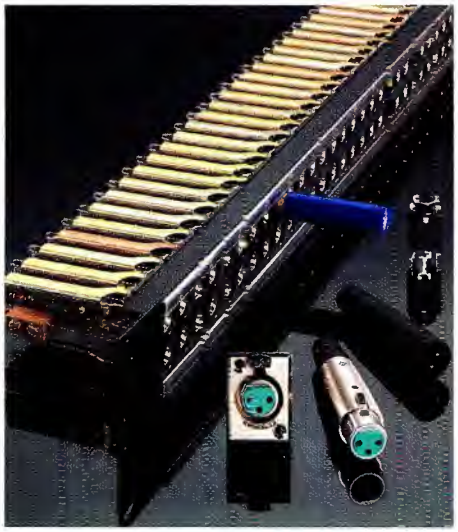

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IBC Award

The IBC '88 Award was given to Professor Henri Mertens, assistant director, technical center, of the European Broadcasting Union (EBU). The award recognized his major contributions to broadcasting over a period of four decades. Professor Mertens was unable to attend the show because of ill health, so the presentation was made on his behalf to colleague David Wood, head of division at the EBU technical center in Brussels.

Professor Mertens' career in broadcasting stretches back to the early 1950s. His studies over the years have included stereophonic sound, satellite frequency allocation and teletext transmission. More recently, he has been involved in developing new formats and systems for satellite broadcasting.

Professor Mertens was a driving force behind the successful development of the MAC-packet family. He also has been involved in the development of a new digital sound system for aural broadcasting in the 1GHz-2GHz band, termed ADS.

Same time, same station

The next International Broadcasting Convention will be in Brighton Sept. 21-25, 1990. Within the next few months, the management committee and various subcommittees of IBC will evaluate the comments they received on this year's show and technical sessions. The IBC organization seems to be eager to please both attendees and exhibitors. Other conventions should take lessons from the Brighton group.

This was the last IBC show in which Leslie Turner will be functioning as publicity consultant. Turner has been an integral part of the convention since it began, 21 years ago. He was a member of the first IBC committee in 1967. When he retired from the BBC in 1971 after nearly 40 years of service, Turner was named IBC publicity consultant. He has held that position ever since.

Although he will not be involved in an official capacity, we trust Turner will be in attendance at the 1990 show with the rest of us. Bring your raincoat.

Additional information for this article was provided by John Battison, **BE**'s consultant on antennas and radiation, and James Wood, U.K.-based technical writer.

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1988 Annual editorial index

The "Annual Editorial Index" is designed to put a year's worth of **BE** articles at your fingertips. Here's how you use it.

The index begins with a month-by-month compilation of all feature articles, regular columns and field reports that appeared in the magazine during the past year. Each article review includes a brief list of key words—words and phrases that were defined and used in the story—along with a reader interest classification. Related article material is indicated, when applicable.

Beginning on page 114, you will find a cross-reference listing of articles and columns, arranged alphabetically by general subject area. If you know you saw an article about a particular topic, but can't remember which issue, this listing will guide you in the right direction, and maybe lead you to a related article.

(Subject listings begin on page 114)

JANUARY 1988

Theme: Broadcasting From the Field

Editorial (page 6)
• News Technology
(Innovation and quality programming result from cooperative efforts among departments at the station.)

FCC Update (page 8)
• Eligible Daytime AMs May Operate Full Time
• Presunrise Rule
• Technical Standards for Cable Broadcast Switches
• TV-to-Land-Mobile Interference Issue

Strictly TV (page 10)
• Bird Watchers' Guide to Computer Graphics
(Classification of the varieties of digital video products is difficult when they contain many of the same functions.)

re:Radio (page 12)
• Updating Your Proof-of-Performance
(Monitoring directional antenna performance may require establishment of new monitor points; DA-NDA antenna switching systems.)

Satellite Technology (page 14)
• Using Parabolic Antenna Systems, Part 2
(A look at parabolic antenna gain, types of losses and antenna efficiency.)

Circuits (page 16)
• Inside Digital Technology, Part 16
(The concept of number systems includes binary, decimal and hexadecimal systems and conversion methods.)

Troubleshooting (page 18)
• Maintaining Computer Storage Devices, Part 1
(A discussion about hard disk drive media testing, drive repair and computer disk memory system troubleshooting.)

Management for Engineers (page 20)
• Time Management, Part 2
(Keeping a time diary can help you keep tabs on your valuable work time.)

• **Mobile Mast Safety** (page 26)
By Richard Wolf, Wolf Coach, Auburn, MA
Pressure to get the story creates situations in which staff members are more likely to stretch safety policies. The operator of the vehicle must be aware of elevated masts, overhead power lines or other obstructions and proper vehicle parking procedures. To reduce hazards and prevent accidents, safety must be made a priority.
Interest: remote field crew technicians, engineers; production crews.
Key words: mobile vehicles, ENG masts, parking procedures.

• **Applying Cellular Technology** (page 36)
Edited by Brad Dick, radio technical editor
Like 2-way radio, cellular telephones provide needed communication between remote crews and station personnel without the usual problems of station-maintained repeaters and typical 2-way equipment. The burden of system operation falls to the cellular operator, except for the cellular units in station vehicles. The network of cellular systems allows greater communications range and flexibility.
Interest: engineering, management, production.
Key words: mobile telephone systems, geographic sharing, mobile telephone switching offices, cells, paging channels, hand-off, trunking, roaming.

• **Catching the News Crew** (page 46)
By Ron Smith, KENS-TV, San Antonio, TX
Trunking radio—using frequencies in the 800MHz spectrum—increases communications flexibility and channel capabilities while adding a new level of information security. Similar to cellular radio in some respects, trunking expands the reach of normal 2-way transmitter-receiver equipment.
Interest: engineering, production, remote technicians.
Key words: trunking, radio channel efficiency, information security, hand-helds.

• **Powering Portable Production** (page 58)
By F. Kurt Shafer, The Energy Source, Manhattan Beach, CA
Rechargeable batteries provide a more economical means of powering portable equipment than non-rechargeable sources. The discussion covers different types of battery technologies as well as the proper care and

Why we called it HARRY

It sometimes seems as if the only thing we *haven't* given Harry is a proper name. But to name it, you've got to define it. We asked five users to help us out. Here's what they said:

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handling of lead-acid, NiCad and silver zinc devices. Comparisons of the three battery types show strong and weak points of various portable powering units.
Interest: engineering, remote technicians, production.
Key words: primary/secondary batteries, amp-hour ratings, longevity, cost for power, dendrites, memory effects, self-discharge, sulfation, C rate of discharge, fast charging, cutoff.

• **Stereo Microphone Techniques** (page 80)
By Stephen Toback, University of Miami, Coral Gables, FL
Achieving quality stereo sound and mono compatibility places special demands upon correct microphone placement. One or more of four kinds of audio cues, enabling the ear and brain to localize the source of a sound, play a role in stereo mic techniques. Those involving time differentials create problems with mono compatibility.
Interest: audio engineers/technicians, production.
Key words: aural cues, phase differences, acoustic baffles, bidirectional mics, mono compatibility, ORTF, NOS, DIN, M-S stereo, comb filtering.

Show Replay (page 104)
• A Back-to-Back Success
By Brad Dick, radio technical editor
(The National SBE Convention and Broadcast Engineering Conference brings double the attendance of the 1987 event and is rated a success by exhibitors and attendees.)

Show Replay (page 108)
• 129th SMPTE Reflects New Attitude on HDTV
By Jerry Whitaker, editorial director
(High-definition television dominated the conference, along with additional digital video products.)

Applied Technology (page 114)
• Rank Cintel Gallery System
By J. T. Way, Rank Cintel
(An examination of digital still-image storage and management techniques in the Logica/Rank Cintel system focuses on system requirements, digitization processes, image manipulation and modification, as well as retrieval capabilities.)

Field Report (page 118)
• da Vinci Unified Color Correct System

Station-to-Station (page 122)
• Split Signals Without Sacrifice
By Jack Cunkelman, WLWT-TV, Cincinnati
(Suggestions explain lattice-splitter pads and active combiner circuitry and construction.)

SBE Update (page 124)
• McKain Plans to Build on the Past
• Chapter Chairmen's Meeting
• 1988 Convention Dates

FEBRUARY 1988

Theme: Digital Technology for Broadcasting

Editorial (page 6)
• The Road to Success
(SBE continues to grow in membership, in its status as a professional organization and in terms of its national convention.)

FCC Update (page 8)
• Focus is on Tower Lighting and Painting
• Obscenity and Indecency Policy
• Equipment Authorization Procedures
• Must-Carry Rules Rejected

Strictly TV (page 10)
• Prepare for Graphics Hardware Repair
(A better understanding of the elements of a graphics system makes it easier to learn repair procedures of such equipment.)

re:Radio (page 12)
• Bring Your DA Back With Phaser Rocking
(Careful phaser adjustments, each followed with measurements at monitor points, can return a DA to its licensed parameters; transverse radials can help locate DA phase errors.)

Satellite Technology (page 14)
• About Waveguide Components
(Isolators, directional couplers, circulators and power splitters play a part in many typical satellite uplink/downlink systems.)

Circuits (page 16)
• Inside Digital Technology, Part 17
(This continuing discussion of digital ICs focuses on decoding of thumbwheel switches, decimal-binary converters, ROM, shift-subtract-shift and various math conversions.)

Troubleshooting (page 18)
• Maintaining Computer Storage Devices, Part 2
(Suggested procedures to keep the computer disk-based memory operating at top performance include head alignment and drive read/write functional tests.)

Management for Engineers (page 20)
• Time Management, Part 3
(If you conduct a careful audit of your time, you probably will find that 80% of what you achieve is accomplished in 20% of your time.)

• **Disk Recording Technology** (page 26)
By Jerry Whitaker, editorial director
Hard disk drives have become an integral part of audio and video recording systems. Other types of disk recording units also find applications in broadcasting and related industries. The article examines how these disk units operate and some of the requirements that are placed upon such technologies to make them usable in audio-video systems.
Interest: engineering, technicians.
Key words: Winchester drive, head actuator, voice coil assembly, servo surface, flying heads, access times, sectors, cylinders, data tracks, error correction, Nyquist criteria, WORM drive, magneto-optical disk, Kerr rotation, modulated laser beams.

• **Controlling Graphics Systems** (page 46)
By Carl Bentz, technical/special projects editor
The input interface to computer-controlled equipment largely determines how easily the equipment interprets the operator's instructions. The user interface combines programming with the actual input device, such as keyboard, light pen, mouse or touch-screen. Personal preference plays a part in the selection of an input device for the system as well.
Interest: video engineers, production technicians.
Key words: low-level, high-level programming; assemblers, interpreters, tokens, compilers, peripherals, distributed intelligence, RISC, ASIC, bit-slice, pipelining, graphics pads, styli, mice.

• **HDTV: Where It Is, Where It's Going** (page 62)
By Jerry Whitaker, editorial director
Because of the economic, political and technical implications of HDTV in the United States, where does it fit in? Should the system be NHK, MUSE or one of the U.S.-sourced improved-definition systems? An overview of the systems contains the latest listing of their parameters and includes interviews with Julius Barnathan, ABC; Joseph Flaherty, CBS; and Michael Sherlock, NBC.
Interest: engineering, management, production.
Key words: HDTV, MUSE, NHK 1125/60, ACTV, the Glenn system, HD-NTSC, HDMAC-60, Del Ray.

• **HDTV: The European View** (page 94)
By Howard T. Head, **BE** European correspondent
European implementation of HDTV awaits a choice of field frequency, although 50Hz may win, based on proposed compatibility with the vast number of receivers currently in use. The Eureka 95 HDTV demonstration (Berlin, August 1987) proposed a picture viewable on standard TVs, containing information that can be decoded by HDTV models for additional resolution and width. Factors steering Europeans away from Japanese HDTV systems are national pride and economics.
Interest: management, engineering, production, programming.
Key words: flicker, Eureka 95, aspect ratios, production standards, MAC packets, DBS.

• **Time Synchronization for Broadcasters** (page 108)
Edited by Brad Dick, radio technical editor
Broadcasters are interested in time, either for a program or for a commercial. For many years WWV, WWVH and WWVB have provided time announcements, standard time intervals, standard frequencies, Universal Time corrections, meteorological information and BCD time code. The article describes the signals transmitted by these National Bureau of Standards time and frequency stations.
Interest: engineering.
Key words: NBS, time scales, cesium or atomic clocks, time pulses, BCD codes, GEOS time signals, state selection.

• **News Special Report: Europe Enters the New Era of DBS** (page 122)
By Howard Head, **BE** European correspondent
TV SAT-1 initiates DBS service to a large portion of Europe using MAC D-2 transmission standards.

SBE Update (page 126)
• Deadlines Coming up for Scholarships

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Circle (66) on Reply Card

- New (Ennes) Foundation Director
- Certification Exams
- Sustaining Membership
- New Board of Directors

Station-to-Station (page 130)
- Designing a Time-Code Reader

By John McGaughey, Univ. of Georgia, Athens, GA

(Development of a time clock system uses drop-frame mode of time-code generator.)

Applied Technology (page 132)
- Adaptive Delta Modulation

Edited by Brad Dick, radio technical editor

(An examination of A/D and D/A conversions includes the use of adaptive techniques based on instantaneous signal levels.)

Field Report (page 136)
- Eventide BD980 broadcast delay

MARCH 1988

Pre-NAB Show Issue

Editorial (page 6)
- The Audience is Watching

(When previewing products at shows, consider what will improve your signal.)

FCC Update (page 8)
- AM Stereo Policy Affirmed
- Minority and Female Preferences Reinstated
- FCC Asserts Jurisdiction Over Obscene Broadcasts

Strictly TV (page 10)
- Y/C Systems Require New Test Signals, Part 1

(The latest generation of component video and component recording equipment calls for new and different kinds of test signals.)

re:Radio (page 12)
- Working With DA Design Constraints

(Directional antenna system design depends upon the site, economic means and aeronautical concerns.)

Satellite Technology (page 14)
- Communications Plans Brew Controversy

(Two areas of contention in communications involve the use of the mobile satellite service and satellite transmission vs. fiber-optic signal transportation.)

Circuits (page 16)
- Inside Digital Technology, Part 18

(Explanations involve irrational and binary fractions, decimal-to-binary conversion and changing from binary numbers.)

Troubleshooting (page 18)
- Monitoring the Digital Bus

(Determining how digital signals are behaving in a system suggests a type of digital probe that can turn the set of digital pulses on a parallel bus into video.)

Management for Engineers (page 20)
- When Your Style Cramps Leadership

(How you approach management has a definite effect on your leadership skills.)

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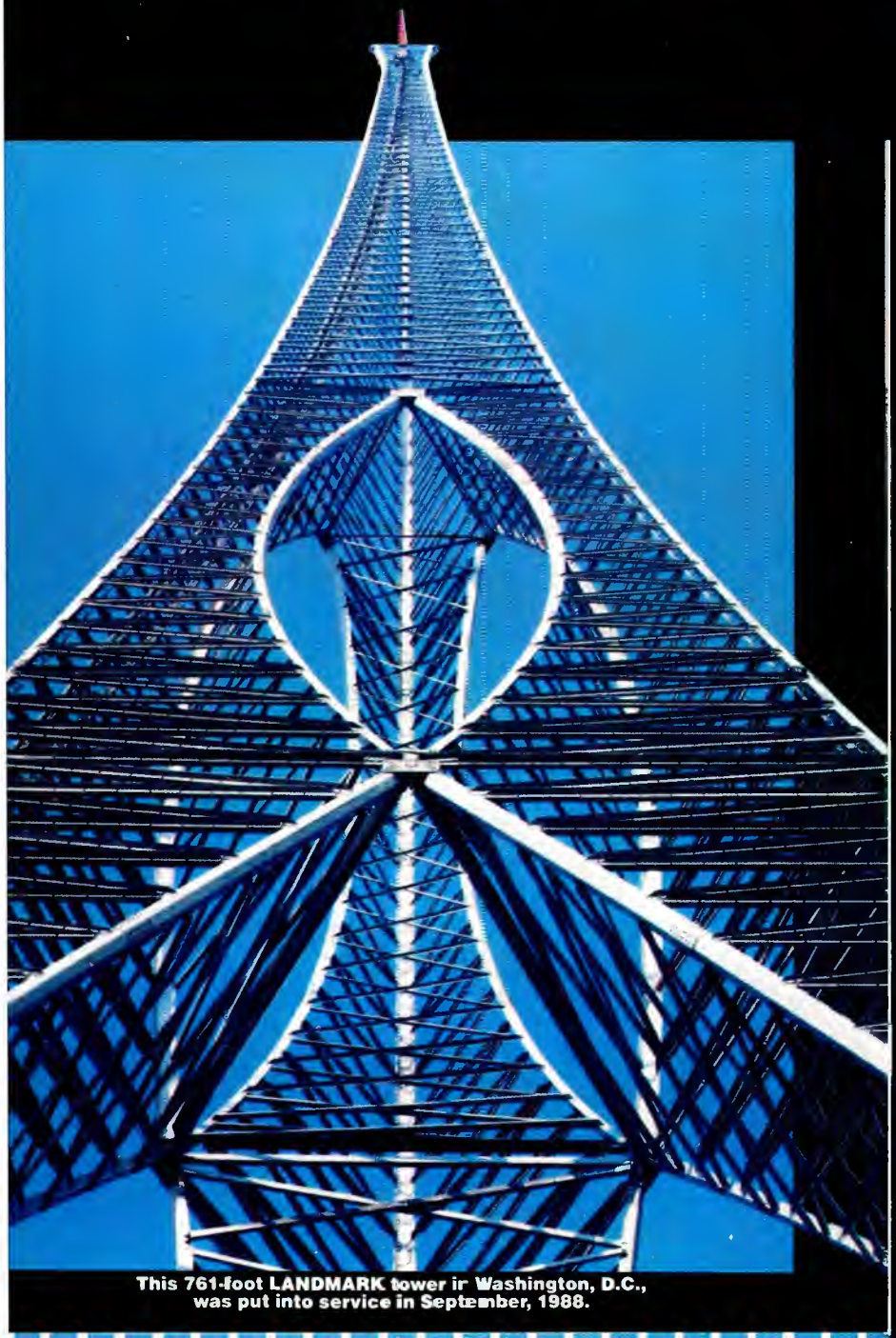

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SBE Update (page 22)
- McKinney Receives Fellowship Award
- Convention Plans Confirmed
- Membership Dues Increase
- Current Voting Procedures
- Frequency Coordination Handbook
- Certification Exams at NAB

• **Breaking New Ground: the MSDC Klystron** (page 36)
By Jerry Whitaker, editorial director
UHF, high power and high cost go hand in hand, but the development of the MSDC klystron (multistage depressed collector) brings to light the possibility of much higher efficiency for UHF TV. A series of collector elements, each at a different potential, returns electrons to the circuit more efficiently. The more complex power supply and cooling systems are offset through the higher efficiency of the advanced technology.
Interest: engineering.
Key words: depressed collector, cooling systems, beam-reconditioning, secondary yield, sputter coating.

• **Comparing Klystron Designs** (page 54)
By Jerry Whitaker, editorial director, and Earl Blankenship, Varian Associates, Palo Alto, CA
External vs. integral cavities and 4-cavity vs. 5-cavity klystron designs have been the subject of many debates about UHF efficiency, reliability and cost. Misconceptions about the two types of UHF power devices have developed over the years, but product improvements, different tuning methods and studies show the differences between the two devices are not as great as we may have thought.
Interest: engineering, engineering management.
Key words: integral/external cavity, 4-/5-cavity, tuning, saturated efficiency, peak-of-sync figure of merit, compliance, beam pulsing, device longevity, MTTR, MTBF.

• **In the Chips** (page 70)
By Terry Pennington and Larry Winter, Rane Corporation, Mountlake, WA
Solid-state devices simplified the matter of designing operational amplifiers, but when the integrated circuit form of the op-amp appeared, many broadcast equipment items became smaller. A tutorial on the operation of op-amp circuits and the major parameters of these devices provides insight on the desirability of the solid-state units.
Interest: engineering, technicians.
Key words: op-amp, open/closed loop gain, infinite bandwidth, common mode rejection ratio (CMMR), inverting, non-inverting, slew rates, noise, negative/positive feedback.

• **Researching the Future** (page 84)
By Jerry Whitaker, editorial director
The broadcast industry can thank applied research efforts for many of the advancements in equipment performance. The closing of the RCA/Sarnoff Labs and the CBS Labs ended an important era of network involvement in research and development—or did it? The question is discussed by ABC, CBS and NBC engineering top brass.
Interest: engineering, management.

• **80-90 One Year Later** (page 98)
By Jerry Whitaker, editorial director
FCC Docket 80-90 brought many changes to the FM broadcast world with expanded classifications of stations, new antenna-height rules and more stringent power-level rules. The regulations brought about changes in the approach to new facility design. A case study examines the circumstances of a construction project under 80-90.
Interest: radio engineering, management.
Key words: Docket 80-90, FM classes, community tower facilities, FAA approvals, cantilever design, RS-222-D, Docket 86-144, FM reclassification.

• **A New Home for PBS** (page 124)
By Brad Dick, technical editor
Forced to move from its Washington, DC, location after a fire, PBS has established its technical operations center in Alexandria, VA. In the process of moving, the new PBS center incorporated many advanced products. The design goals included system and plant integration and automation.
Interest: engineering, management.
Key words: HVAC, grounding, UPS, interconnection, routing, downloadable mnemonics.

• **Acoustical Design and Construction** (page 268)
By Eric Neil Angevine and Renee Kolar, Oklahoma State University, Stillwater, OK
Acoustics is a critical factor in the design of studio facilities, yet many architects contracted for facilities design have little understanding of the science of sound. This tutorial approach to sound and its control shows why more emphasis must be placed on acoustical concerns during the design and construction phases.
Interest: engineering, audio technicians, technical management.
Key words: acoustics, acoustical comfort, sound intensity, transmission, reflection, absorption, Sabins, reverb, diffusion, noise control, bass traps, quiet.

• **High-Definition Radio: Will It Work?** (page 296)
By Douglas Fearn, D.W. Fearn & Associates, West Chester, PA
High-definition radio (HDR) is proposed for AM operation in the UHF band. With mandatory FMX encoding, the result would be a high-quality broadcast service. Phase-locked loop (PLL) synthesized tuning of FM receivers could make it possible to receive the new service without a complete receiver design change.
Interest: engineering, radio technical management.
Key words: HDR, FMX.

• **News Special Report: VOA Program Trains Field Engineers** (page 320)
By Brad Dick, technical editor
The Voice of America has developed a program to teach engineers how to operate high-power broadcast installations.

Applied Technology (page 302)
• Digital Modulation: DX-10 AM Transmitter
Edited by Brad Dick, radio technical editor
(The DX-10 AM transmitter uses 48 RF amplifier stages and controlled logic signals to achieve amplitude modulation.)

Field Report (page 330)
• Howe Technologies Phase Chaser 2300

APRIL 1988

Theme: Automation in Broadcasting

Editorial (page 6)
• Engineering for Utility
(People buy things for different reasons, based on place, function, need and time. To keep listeners and viewers tuned in, they must be given utility as well.)

FCC Update (page 8)
• Minority Preference System Reactivated
• Problems/Programs Listing Conformed
• Carroll Doctrine and "UHF Impact" Policy Rescinded

Strictly TV (page 10)
• Y/C Systems Require New Test Signals, Part 2
(New small-format, better-than-broadcast VCR performance is improved through butterfly and special interchannel timing test signals.)

re:Radio (page 12)
• Reducing AM Band Skywave Interference
(The fading wall, the composition of received signals and new antenna designs to reduce skywave radiation are discussed.)

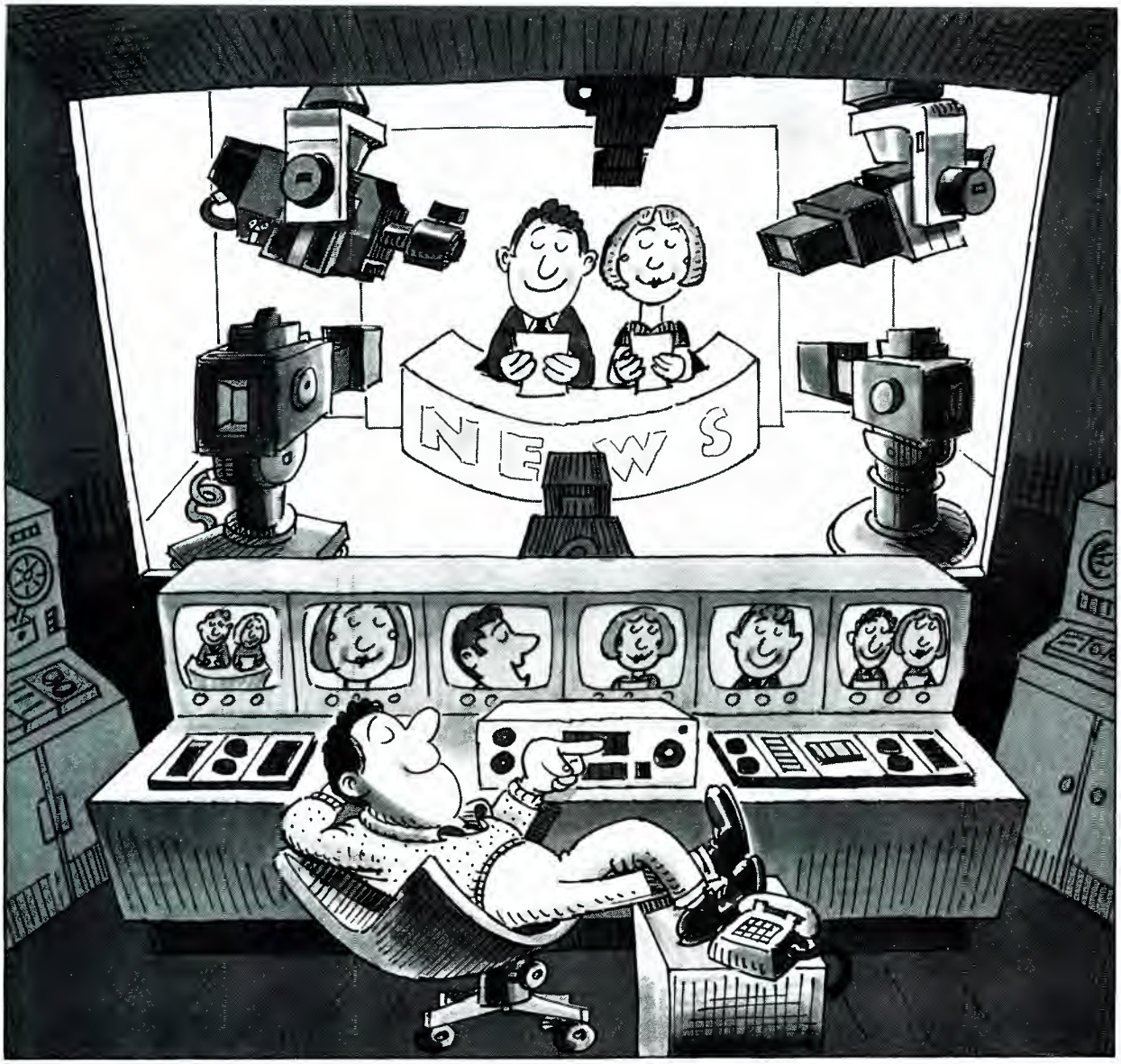
Satellite Technology (page 14)
• Basic Operations of Modern Satellites
(Two methods of satellite stabilization and housekeeping are examined.)

Circuits (page 16)
• Inside Digital Technology, Part 19
(Expressing large and small numbers with scientific notation requires special consideration in conversion to digital counting systems.)

Troubleshooting (page 18)
• CD Player Repair Requires Skill, Part 1
(CD player troubleshooting means a mix of spindle motor, tracking, radial/traverse and laser focus servos.)

Management for Engineers (page 20)
• When Your Style Cramps Leadership, Part 2
(Leadership style for management is shaped by many factors, including external influences of the company and past experiences of the staff.)

• **Perspective on Broadcast Automation** (page 26)
By Peter Granet, technical writer, Weybridge, UK
Broadcast automation requires more than just human intelligence to plan and construct computer-driven systems. But a successful, effective implementation of automation requires that the computer change the station operations as little as possible. How well the staff accepts automation will have a great deal to do with how disruptive it is.
Interest: engineering management, station management.
Key words: firmware, software, EOM, process control.



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• **RoboCam** (page 32)
By Rick Lehtinen, TV technical editor
Programmed control of the camera lens and support systems has become a reality for the TV and production studios. Servo-controlled truck, dolly, pedestal, pan and tilt now join the intricate servo systems that have been used with camera lens systems for some years. The discussion focuses on requirements placed on the mechanisms suitable for automated camera operation.
Interest: engineering, technical management, station management, production.
Key words: camera robotics, X–Y positioning systems, auto-tracking, talent tracking.

• **Transmitter Remote Control** (page 46)
By Harold Hallikainen, Hallikainen and Friends, San Luis Obispo, CA
The repertoire of modern remote-control systems for transmitters is varied and flexible and includes the capability to customize functions for almost any level of manual operation to full automation. From the simplest of systems (transmitter and studio units) for single-site control to highly complex multiple-site, multiple-control-point systems, several methods can be used to interconnect the system units for communications.
Interest: engineering, transmitter engineers technical management.
Key words: ATS, multisite, multiple control point, metallic pairs, duplex, half-duplex, FSK DTMF/voice, P-channels, remote intelligence control points, monitor points, common-mode voltage range, tower light sampling, satellite link.

• **Installing Computer Hardware** (page 68
By Brad Dick, radio technical editor
Installing a computer or computer-controlled system in the broadcast facility involves more than just plugging it in. Standby power and uninterruptible power supply (UPS) systems are necessary to protect the systems and to keep them running. Environmental concerns and proper interfacing, including RS-232, also are essential.
Interest: studio maintenance technicians engineering management.
Key words: standby power, UPS, environment RS-232, LAN, crosstalk.

• **Facility Design Using CAD** (page 90)
By Curtis Chan, Centro, Salt Lake City
Computer-aided design and engineering software (CAD, CAE) for personal computers serves a variety of useful purposes around the broadcast and production area. From the cut-and paste layout stage to determining whether the equipment will fit the allocated space to preparing 3-D renderings of a control room to producing completed drawings of system wiring CAD and CAE can make the design project much easier. The drawing time is further shortened through the use of libraries of predrawn components for wiring diagrams.
Interest: engineering, technical management
Key words: CAD, CAE.

• **It's About Time** (page 100)
By Robert Kastigar, WGN-TV, Chicago
Programming and commercial break timing are important to the economy of the TV station. This discussion considers the number of TV frames contained in various time segments and makes suggestions on how this information can be used to clean up program/commercial switching for a smoother look and a reduction in the number of make-goods necessary.
Interest: engineering, operations, production
Key words: time resolution, drop-frame time code.

• **Time Code: Bridging the Gap** (page 106
By Rick Lehtinen, TV technical editor
Cutting and splicing still may be used for editing with some audiotape and film, but for videotape, electronic editing is much more practical. The key to precise editing of audio and video from film, tape or disk is the use of SMPTE (and EBU) time codes. The longitudinal and vertical interval code types—and more recently, MIDI (musical instrument digital interface) code—allow flexible, but frame accurate, editing not possible with cut/splice or punch-n-crunch manual methods.
Interest: engineering, production technicians
Key words: BCD, LTC, VITC, SMPTE, EBU, time code, frame count, user bits, MIDI, virtual track ATR.

Field Report (page 116)
• Vital station automation manager

Station-to-Station (page 126)
• Test Signal is More Than Reference Level
By Frederick M. Baumgartner, KHOW-AM and KSYY-FM, Denver
(A multiple-purpose test generator creates a 4-part signal useful for level setting, phase checks, tape-speed measurement, wow and flutter checks and audio channel identification.)

SBE Update (page 134)
• Goals, Committees Set for Coming Year
• Convention-related Committees
• Public Relations, Membership Committees
• Job Bank
• National Office Expands

MAY 1988

Theme: Transmission Systems Special Report

Editorial (page 6)
• Graphics Steps Up to Bat
(The popularity of computer graphics has brought broadcasters face to face with computer whizzes, and that means the opportunity to learn from one another.)

FCC Update (page 8)
• FM Short-spacing to be Studied
• IF Distance Separations Examined
• FM "Downgrading" Procedures to be Streamlined
• TV Technical Rules to be Streamlined
• Public File Retention Period Changed

Strictly TV (page 10)
• Inside NTSC Encoders
(Improved filtering, detail processing and other encoder techniques deliver better NTSC signals to viewers.)

re:Radio (page 12)
• DA's Origin is in Parasitic Radiators
(Antenna pattern directivity results from distortion caused by the introduction of non-driven elements into the RF field.)

Satellite Technology (page 14)
• Scrambling Methods Change With Cable
(Restricting access to TV signals by unauthorized viewers has passed from polarity inversion and simple filters to digital methods.)

Circuits (page 16)
• Inside Digital Technology, Part 20
(A/D converters bring an analog world to the digital forefront.)

Troubleshooting (page 18)
• CD Player Repair Requires Skill, Part 2
(CD player servo systems can operate only if the laser and recovery circuits function properly.)

Management for Engineers (page 20)
• Work Scheduling Increases Efficiency
(Well-defined work schedules will reduce the frequency of last-minute, hastily performed projects.)

Transmission Systems Special Report:

• **Safety: The Key to Staying Alive** (page 26)
By Brad Dick, technical editor
Respect for electricity, a necessity in every broadcast installation, demands the attention of the technician and engineer. Electrical shock, and methods to avoid it, are explained in this safety tutorial. Suggestions are given for planning an effective safety program.
Interest: all station personnel.
Key words: electrocution, ground faults, safety testing, protective equipment, grounding, OSHA rules, National Electrical Code.

• **Grounding Procedures for Broadcast Facilities** (page 46)
By Jerry Whitaker, editorial director
The well-designed ground system provides protection for operators and equipment from electrical line disturbances and stray RF energy. Proper grounding improves broadcast signal quality. The article discusses proper grounding methods to keep the ground system from becoming visible to station employees as well as listeners and viewers.
Interest: engineering, technical management.
Key words: power-line disturbances, earth grounds, ground rods, chemical grounding methods, grounding systems, cadwelding, skin effects, star ground point.

• **Selecting Coaxial Cable** (page 66)
By Robert D. Perelman and Thomas M. Sullivan, Andrew Corporation, Orland Park, IL
Transmission line plays an important part in any broadcast installation. Coaxial cable material, connectors, hangers and grounding devices form the cable system. That system will serve the station well if proper consideration is given to required power levels, cable lengths and installation methods.
Interest: engineering, technical management, facilities planning.
Key words: coax, characteristic impedance, relative velocity of propagation, propagation modes, dielectrics, tensile and crush strength, VSWR, windloading.

• **Multiplexing FM Transmitters** (page 84)
By Bill DeCormier, Dielectric Communications, Raymond, ME
A variety of reasons have led to increased use of community broadcast sites and multistation antennas. This trend is a result of the development of diplexing and multiplexing systems based on directional coupling devices. The article describes multiplexing operation and factors to be considered when designing a multiple-station transmitting facility.
Interest: engineering, technical management, facilities planning, management.
Key words: Docket 80-90, community broadcast site, branch diplexer, constant impedance diplexer, bandstop and bandpass diplexers, input bandwidth, RF hybrids, intermodulation, group delay, cavities.

• **Reducing IPM in AM Transmitters** (page 106)
By Dominic Bordonaro, WAAF-AM/WFTQ-FM, Worcester, MA
Before AM stereo, few knew of, or understood, incidental phase modulation. IPM exists in all AM installations, but it can be controlled by careful tuning of the transmitter in most cases. Reducing IPM improves spectrum occupancy, transmission efficiency and AM signal quality.
Interest: transmission engineering, technical management.
Key words: IPM, phase modulation, AM, slope detection, phase rotation, PA neutralization, AM stereo.

Applied Technology (page 114)
• The All-Solid-State Video Recorder
By Richard Dienhart, NEC America, Wood Dale, IL
(Factors leading to the development of a solid-state video recording system based on DRAM devices explain the operational concepts of this milestone in semiconductor technology.)

Station-to-Station (page 122)
• RF Tuning for Maximum Performance
By Richard Walsh, WHCN-FM, Hartford, CT
(Suggestions are provided to simplify tuning procedures for FM transmitter engineers.)

Field Report (page 128)
• Calaway CED+ editor

SBE Update (page 134)
• Officer Elections Are Around the Corner
• Continued Growth
• Chapter Rebates
• Sustaining Membership Campaign
• Certification Examinations
• Scholarship Announced
• Awards Committee

JUNE 1988

Theme: NAB Convention Replay

Editorial (page 6)
• A Curtain Call for NAB
(NAB shows courage in firsts, such as HDTV, laser projection, 40GHz STL.)

FCC Update (page 8)
• Exploring the Role of FM Translators
• New Rules for NCE-FM Translators
• Freeze on FM Translator Applications
• Cable Systems Subject to Rate Regulation
• Further Study of Must-Carry

Strictly TV (page 10)
• Good Connectors Prevent Signal Loss
(Fiber-optic material can be spliced when attention is given to the proper connectors and method of installation.)

re:Radio (page 12)
• Designing a Parasitic Array
(The pattern produced by a directional array is related to the height and distance of each element from a reference point, as well as the phase of the RF current fed to the elements.)

Satellite Technology (page 14)
• Satellite Internal Electronics
(An overview of the equipment package aboard communications satellites includes antenna direction control, RF amplification and solar power systems.)

Circuits (page 16)
• Improving Accuracy of the A/D Converter

(A reduction in component count and an increase in the number of comparisons made to detect errors improve quad-slope detection A/D converter accuracy.)

Troubleshooting (page 18)
• CD Player Repair Requires Skill, Part 3
(Operation of the laser diode, its adjustments and the focus servo are examined.)

Management for Engineers (page 20)
• Are You Listening?
(To improve manager-employee communications, various methods help to keep the employee's attention.)

NAB '88 Replay:

• **Engineering Conference Report** (page 28)
By Brad Dick, technical editor
An extensive engineering session program highlights a number of high-technology answers to the complex problems faced by today's broadcaster.

• **Pick Hits of the '88 NAB** (page 68)
By Brad Dick, radio technical editor, and Rick Lehtinen, TV technical editor

Radio products were:
—CompuSonics disk storage and editing system
—Delta Electronics splatter monitor
—Design Radio Labs ACM-1 noise meter
—Gentner Electronics RDA routing distribution amplifier
—Gentner Electronics 3-line frequency extender
—Henry Engineering MixMinus Plus differential summing amplifier
—Moseley RPL remote programming system
—Pinzone Communications Corum anti-skywave AM antenna
—Potomac Instruments 1500 PC intelligent, programmable controller
—TFT 8888 remote pickup unit

TV products were:
—Ampex ACE-25 editor
—Ampex VPR-300 D-2 VTR
—BTS LDK-900 studio CCD camera
—Eventide BD-1000 video/audio delay
—Innovision endoscopic lenses
—Larcan M-series solid-state VHF TV transmitters
—Magni Systems 560 component/composite waveform/vector monitor
—Nikon TV-Nikkor ENG/EFP lenses
—Sony BVW-200 camcorder
—Sony DVR-10 D-2 VTR
—Tektronix VM-700 video measurement set

• **Show of Shows** (page 80D)
Coordinated by Carl Bentz, special projects editor
A comprehensive list of the new products introduced at the equipment exhibition.

SBE Update (page 182)
• New Version of Database Program Released
• Lost Grandfathers
• Certification News
• More Scholarship Awards
• Convention News

JULY 1988

Theme: Audio Technology Update

Editorial (page 6)
• AM: Crisis or Opportunity?
(The critical state of AM can be turned to opportunity if broadcasters, the FCC and Congress correct the deficiencies in the AM delivery system.)

FCC Update (page 8)
• "Syndex" Rules to be Reinstated
• LPTV Filing Window
• Change in Minimum Power Requirements for Class A FMs
• FM "Downgrading" Procedures to be Changed

Strictly TV (page 10)
• A Little TLC for Tape Will Pay Off
(Common-sense suggestions to extend videotape life.)

re:Radio (page 12)
• Measure Performance of DA With rms, rss
(The pattern rms value is a measure of DA efficiency and performance.)

Satellite Technology (page 14)
• The Rocket Engine Makes it All Possible
(An overview of rocket engines discusses propulsion systems, types of propellants and possibilities for the future.)

Circuits (page 16)
• D/A Accuracy Comes at a High Price
(Tolerances of components, internal switches and stability of the reference voltage drive up costs of D/A converters.)

Troubleshooting (page 18)
• CD Player Repair Requires Skill, Part 4
(Data recovery through eight-to-fourteen-bit-modulation detection and adjustment of the EFM eye pattern are the focus of this segment.)

Management for Engineers (page 20)
• Planning for Success, Part 1
(Working hard is no guarantee that your employer will reward you. If you don't look out for yourself, no one else will.)

• **New Approaches to Audio Console Design** (page 26)
By Brad Dick, technical editor
Broadcast consoles have evolved from limited-feature, fixed-application devices to full-feature, flexible designs. Because these consoles have more outputs than yesterday's console had inputs, additional control of each audio source may include EQ, forms of audio processing and even automation. The newest designs, using digital techniques, pack more into smaller space by using assignability with 1-button recall of numerous complete-console setups.
Interest: general, audio engineers/technicians.
Key words: ergonomics, control surfaces, assignability, programmability, dynamic automation, motorized faders, parallel control.

• **Active-Balanced Inputs and Outputs** (page 42)
By Richard Cabot, Audio Precision, Beaverton, OR
This tutorial discussion of audio circuit interfacing investigates balanced lines, differential input circuits, common mode rejection and active-balanced inputs and outputs. Hum and noise often prove to be a problem unless the interfacing circuitry is planned carefully. However, by using proper methods, many of the problems can be alleviated.
Interest: audio engineers, technicians.
Key words: balanced line, actively balanced, differential inputs, common-mode, CMMR, instrumentation grade, RF rejection filter.

• **The Audibility of Electronics** (page 58)
By John Eargle, JME Consulting Corporation, Los Angeles
The price of a piece of equipment does not guarantee performance. What makes one amplifier sound better than another is the manner in which the system is constructed, component interfacing and a proper test environment. Double-blind testing may be the best approach to equipment evaluation.
Interest: audio engineers, technicians.
Key words: double-blind tests, controlled listening environments.

• **Display Technology Update** (page 64)
By Rick Lehtinen, TV technical editor
What's new in CRTs is perhaps best answered by what happens in the last few inches before the electron beam strikes the phosphorescent screen. Shadow masks and flat-square tubes are bringing monitor performance to new levels of resolution and reliability. For many applications, LCDs challenge the common electron-gun, phosphor-screen CRT, but a good deal of work is still necessary to perfect video LCD devices.
Interest: general, video technicians/engineers, digital graphics operators.
Key words: delta-dot, dot-mask, slot-mask, in-line gun, dynamic/static convergence, LCDs, twisted nematics, guest-house displays.

Field Report (page 78)
• Ampex ESS-2 still-store system

Station-to-Station (page 84)
• Testing BTSC Stereo System Parameters
By Eric Small, Modulation Sciences, Brooklyn, NY
(Measurement of separation provides accurate information about modulation levels.)

Show Preview (page 88)
• Back to Brighton
(A look toward the 12th International Broadcasting Convention to be held in Brighton, England.)

SBE Update (page 90)
• Goza Takes Wulliman Board Position
• SBE Committees
• Membership Committees
• Golder Scholarship Awarded
• Convention Committee Survey

AUGUST 1988

Theme: Video Technology Update

Editorial (page 6)
• Invest in Your Future
(Invitation to attend SBE National Convention and SBE/**BE** technical seminars in Denver.)

FCC Update (page 8)
• Comparative Renewal to be Examined
• Compulsory License Reviewed

• Telco Permitted to Enter Cable Business
• Capitol Hill Hearings (cable TV vs. broadcast)
• TV Station Fined for Indecent Broadcast
• HDTV Report Issued

Strictly TV (page 10)
• The Definition of High Definition, Part 1
(Higher-definition television will join the electronic entertainment media alternatives, but questions of NTSC compatibility, aspect ratio and bandwidth continue to obscure the future.)

re:Radio (page 12)
• Know the FCC Rules on DA Calculations
(Computer programs assist in calculating DA and maintaining the DA pattern, but a knowledge of DA theory, operation and careful observation is equally important.)

Satellite Technology (page 14)
• Up, Up and Away
(An examination of the sections of satellite launch vehicles and the sequence of events in a typical launch procedure.)

Circuits (page 16)
• A Dynamic Waveform Can Make Waves
(A D/A converter plays a role in digital-based analog waveform generators.)

Troubleshooting (page 18)
• CD Player Repair Requires Skill, Part 5
(Tracing the cause of tracking or skipping problems of the CD player may point to electrical or mechanical failures.)

Management for Engineers (page 18)
• To Achieve Success, You Have to Define It
(Never trying means that you won't fail, but it also guarantees that you won't succeed.)

• **Directions in Camera Design** (page 26)
By Rick Lehtinen, TV technical editor
The increasing use of CCD pickups and the interest in improved definition has placed new requirements on TV lens systems. To a large measure, the quality of the picture created with a TV camera is determined by the sensor, but even with the best of sensing devices, pictures are no better than the lens. New designs in lens systems seek to avoid chromatic and other optical errors.
Interest: general, video/camera operators, engineers.
Key words: chromatic aberration, dispersion, refractive indices, prisms, microprocessor control, shutters.

• **Weather Radar Systems** (page 32)
By Raymond L. Durand, Technology Service Corporation, Santa Monica, CA
Radar is one of the most important tools in observing and tracking weather conditions. In addition to dial-up radar information, a new development allows compositing of data from overlapping National Weather Service radar sites to improve the image of the weather. The compositing process resolves some of the shortcomings of regular radar installations.
Interest: general, engineering, weather forecasters.
Key words: radar compositing, precipitation attenuation, earth curvature, ground clutter, S-band RF, X-band RF, NWS radar.

• **Newsroom Automation** (page 44)
By Rick Lehtinen, TV technical editor
Newsroom computers have grown from super word processors to systems that serve as the hub of news generation and production. Connectivity ties the newsroom computer to a wide range of peripherals, such as prompters, titlers, automated cart machines, still stores, switching and camera automation controllers. The result is a simplification of the presentation of the local news as well as election night coverage and other special events.
Interest: general, video technicians, production.
Key words: connectivity, embedded commands.

• **Stereo TV Grows Up** (page 52)
By Dennis Ciapura, Noble Broadcast Group and TEKNIMAX, San Diego
The reception of stereo television by viewers brings the importance of this TV medium upgrade to the spotlight. The question in 1986 was when to convert to stereo, but the concern in 1988 is how to engineer the best stereo sound to be competitive. Suggestions for implementation of stereo include cautions in regard to compatibility with surround sound and the use of stereo synthesis equipment.
Interest: general, management, programming, technical management.
Key words: MTS stereo, surround sound, stereo synthesizers, X–Y/M-S stereo mics, differential distortion.

• **Moving Into R-DAT** (page 63)
By Brad Dick, radio technical editor
Combining the concepts of digital signals with rotating-head recording, R-DAT provides new capabilities to audio production and new levels in performance. Six operating modes cover the gamut of possible applications with 32kHz, 44.1kHz and 48kHz sampling frequencies, but certain modes may not be included in some equipment as a means to reduce CD pirating. This factor, combined with the price tag associated with R-DAT and new optical disk technologies, contributes to a questionable future for R-DAT.
Interest: general, audio technicians, engineers.
Key words: rotary head, stationary head, sampling frequencies, overwriting, automatic track finding, subcodes, copycode.

Applied Technology (page 76)
• The D-1 and D-2 Formats
By Rick Lehtinen, TV technical editor, and Carl Bentz, technical and special projects editor
(An examination of the signal-processing systems of D-1 and D-2 digital video recording systems uncovers some similarities and differences in the two formats and includes a discussion of the concepts of error detection and correction.)

Station-to-Station (page 94)
• Formulas Aid in Plotting Coordinates
By Dane E. Ericksen, P.E., Hammett & Edison Consulting, San Francisco
(A discussion of methods and programs to calculate the length of degrees in longitude and latitude can bring greater accuracy to plotting and retrieving of geographic coordinates.)

Field Report (page 102)
• Shure SM89 shotgun microphone

SBE Update (page 107)
• Candidates Prepare for Election
• Board of Directors
• Frequency Coordination Manual
• National Involvement (in frequency coordination)

SEPTEMBER 1988

Theme: Audio-Video Control Systems

Editorial (page 6)
• Enough Already!
(Technical and financial aspects have an impact, although not always favorable, on the broadcast industry and local markets as additional station licensees join in the quest for advertising dollars.)

FCC Update (page 8)
• Power Boost Proposed for Class A FM Stations
• RKO Permitted to Sell Stations
• Telco-Cable Rules May Relax
• Anti-Lottery Rules Enforced
• Broadcast of Telephone Conversations

Strictly TV (page 10)
• The Definition of High Definition, Part 2
(Continued observations of HDTV, proposed "compatible" higher-definition systems and an improved NTSC signal leave the TV industry uncertain as to which route to take. Equally uncertain is the industry's ability to get behind a system and push it into reality.)

re:Radio (page 12)
• Some Tips on Antenna Matching
(Getting the directional array to operate correctly requires an understanding of matching networks, phase shift and antenna resistance.)

Satellite Technology (page 14)
• Let's Call it Frequency Sharing
(More efficient use of satellite system frequencies is the purpose of frequency reuse or sharing, made possible through signal polarization.)

Circuits (page 16)
• Looking Behind the Glass, Part 1
(Consumer electronics and economic realities influence the design and availability of equipment for professional and broadcast applications, witness the status of the video monitor display device.)

Troubleshooting (page 18)
• CD Player Repair Requires Skill, Part 6
(This installment in the series on compact disc players investigates the RF amplifier, the EMF decoder and wave-shaping necessary to recover the signals read from the disc.)

Management for Engineers (page 20)
• Techniques for Dealing With Problem Behavior, Part 1
(The behavior of manipulative or otherwise difficult members of the staff creates problems and stressful working conditions, as well as limiting creativity and productivity.)

• **Wiring an Audio-Video Facility** (page 26)
By Tony Mitchell, Centro Corporation, Salt Lake City
System design requires attention to equipment and building costs, just as much as to

technical operation aspects. With the concepts of a CAD system, the designer is able to track details as block diagrams, equipment lists, architectural/mechanical layouts and other aspects are developed. Another advantage of designing by CAD is the ability to analyze "what if" situations when trying to justify expenditures and functionality.
Interest: management, chief engineers.
Key words: cost justification, system ergonomics.

Related material:
• **Acoustical Problems of Studio Wiring** (page 30)
By Eric Neil Angevine, P.E., School of Architecture, Oklahoma State University, Stillwater, OK
Careful handling of studio wiring prevents sound paths that may jeopardize the acoustical integrity of a studio enclosure.

• **Distributing Audio-Video Signals** (page 40)
By Richard Maddox, technical writer, Lynnwood, WA
Upgrading the broadcast facility, especially for a move toward stereo audio, means increased attention to the needs of signal distribution. Do sources tie directly to a master router, followed by appropriate distribution amplifiers, or is it better to use a DA for each source? A new generation of DAs offers improved slew rates, wider bandwidths and lower noise ratings.
Interest: engineering, facilities designers, studio technicians.
Key words: composite, component and digital facilities; distribution amplifiers; equalization; signal bandwidths; cable characteristics.

• **The Science of Close-Field Monitors** (page 46)
By John Eargle, JME Consulting, Los Angeles
The large monitor speaker systems typically found in recording and production studios are essential during the original recording and overdubbing sessions. In the final stages of preparing material to be released to the public, engineers lean toward a pair of smaller speakers, more in line with equipment the public will use to listen to the recording. The article explains close-field and its advantages.
Interest: audio technicians, engineers.
Key words: close-field, near-field, free-field, direct-field, far-field, frequency response, array size, power capability, dispersion, time-domain response.

• **Broadcast Satellites: Making Connections** (page 52)
By Rick Lehtinen, TV technical editor
An overview of satellites as a communications medium provides insight to satellite construction, launch, control and operation. Of interest to broadcasters is the use of satellites as a method of program delivery or in newsgathering operations from remotely located sites. A new service, radio determination satellite systems, has potential applications for broadcasters as well. No matter what the use of the satellite system, care and maintenance of the downlink (and uplink) play an important part in continued successful communications.
Interest: general, engineering.
Key words: Molniya, geosynchronous, stabilization, orbital dynamics, polarization, VSAT, RDSS, LORAN, de-icing.

• **Translator System Planning and Installation** (page 70)
By Richard Maddox, technical writer, Lynnwood, WA
The limitations imposed by the spectra of FM radio and television, terrain and earth curvature and manmade structures can be overcome through the use of translator systems. Translators, boosters and, to some extent, LPTV installations extend the coverage area by receiving the primary signal and retransmitting it into shadowed areas.
Interest: engineering, management, RF technicians.
Key words: translators, boosters, LPTV, Part 74, frequency coordination, multipath interference.

• **Inside Fiber Optics** (page 90)
By Robert Griffiths, Telemet, Amityville, NY
This article provides a tutorial on the use of glass fibers as a medium of communication. Glass as a conductor, rather than copper, exhibits advantages unattainable by wire, one being the immunity of the signal to external RF and magnetic influences. Readers will gain insight into how signals, modulated onto light beams through LED devices, move through the glass material and what requirements must be met by the glass for successful use of optical fibers.
Interest: management, engineering, general.
Key words: fibers, cladding, reflections, modes, graded index, intermodal dispersion, critical angles.

Show Preview (page 104)
• A Rocky Mountain Setting for SBE
(A look at the combined efforts of the Society of Broadcast Engineers, the Rocky Mountain Video Expo and the Rocky Mountain chapter of the ITVA in preparation for the third annual convention to be held by SBE in the Denver convention center in September.)

Show Preview (page 110)
• SMPTE Sessions to Shine in Big Apple
("Innovations in Imaging and Sound" is the theme selected for the 130th SMPTE technical conference and equipment exhibit, to be held at the Jacob Javits Center, New York, in October.)

Applied Technology (page 116)
• Designing Facilities for Digital Video
By Curtis J. Chan, Centro Corporation, Salt Lake City
(Successful integration of the elements of a digital production facility places particular attention on the interfacing of data and communications format, as well as protocols that allow bidirectional conversations between all the equipment elements.)

Station-to-Station (page 126)
• Videotape Remote Control
By Art Battram, CFCN-TV, Calgary, Alberta, Canada
(A small panel with push-buttons provides 3-function control of four, remotely located VTRs or other equipment. Selection of which four transports are controllable at any given time is made through a patch panel.)

Field Report (page 130)
• Etron Programs Aid in Circuit Design

SBE Update (page 142)
• Future Convention Dates Are Set
• NFCC Manual
• Honorary Member (Dr. Thomas Goldsmith)
• Upgrade Your Membership

OCTOBER 1988

Theme: Managing Technology, Salary Survey

Editorial (page 6)
• Attack of the Telcos!
(A combination of fiber optics, computer technology and the telephone company has the potential to make major changes in the electronic entertainment industry.)

FCC Update (page 8)
• Advanced Television Policies Announced
• Main Studio Rule Clarified
• Cable Technical Standards to be Changed
• Network Affiliation Term to be Extended

Strictly TV (page 10)
• Inside the Visual PA, Part 1
(The first of a tutorial series on basics of TV concentrates on the components of the TV signal.)

re:Radio (page 12)
• Who Takes the Blame for Lo-Fi AM?
(After surveying the players in the AM broadcast world, it appears the most likely culprit for the state of AM is the receiver manufacturer.)

Satellite Technology (page 14)
• Artificial Intelligence System in the Works
(NASA demonstrates the Systems Autonomy Executive Controller, suggests that artificial intelligence could oversee much of the routine duty in space flight control, command and communications.)

Circuits (page 16)
• Looking Behind the Glass, Part 2
(What are the technical differences between the delta-gun/dot-matrix CRT and the in-line gun CRT?)

Troubleshooting (page 18)
• Video Terminations Play Important Role, Part 1
(Proper matching of circuits and signals is important in audio, RF and video.)

Management for Engineers (page 20)
• Techniques for Dealing With Problem Behavior, Part 2
(Effective responses to problem behavior depend upon objectivity.)

• **8th Annual Salary Survey** (page 26)
By Brad Dick, technical editor
The annual survey of salaries paid to broadcast industry employees in management, engineering and operations positions shows a 1% drop for operators to an increase of 14% for managers, based on across-the-board calculations for all markets. Engineering paychecks increased by a modest 4%. Non-

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Circle (73) on Reply Card

commercial station salaries fall in line with top 100 market commercial stations. SBE-certified engineers enjoy a 16% advantage over non-certified colleagues.
Interest: general.

• **Using Management Science in Broadcasting** (page 44)
By Marvin Born, Gulf Coast Broadcasting, Corpus Christi, TX
To help realize a major construction project, to complete the project on time and to stay within the budget, computer projects can handle much of the detail work. Some of the available management tools, such as Pert and Gantt charts, help to line out the project, determine the critical path to its successful conclusion and prevent pitfalls that might result in delays. Although all this is possible without using a computer, the ability to re-evaluate and adjust plans and consider "what-if" situations shows how useful the PC can be.
Interest: engineering management, management.
Key words: Pert and Gantt charts, project management, strategies, tactical planning, critical path.

• **The Art of Project Management** (page 56)
By Rick Morris, broadcast systems division, NBC
Management of a project can be broken down into seven major steps, ranging from performance objectives, equipment selection and getting bids to testing the equipment and conducting training sessions. Just making the plans is not enough, however, because proper management means you also must track the progress. Besides helping you do the job better, the step-by-step approach will make others more confident in your performance.
Interest: general, management.
Key words: performance objectives, environmental needs, project tracking.

• **Managing the PCB Risk** (page 68)
By Brad Dick, radio technical editor
At one time, polychlorinated biphenyls seemed to be a cost-effective solution to the problems of keeping high-power capacitors, inductors and transformers working at top efficiency. Little did anyone realize the health hazards presented by PCBs. Now that we know the PCB legacy, we must try to rid ourselves and our transmitting facilities of these hazards.
Interest: general, engineering management.
Key words: PCBs, polychlorinated biphenyls, Askarel, PCDFs, PCDDs, bioaccumulation, biomagnification, approved disposal.

• **Formulating Tape for Digital Applications** (page 96)
By Rick Lehtinen, TV technical editor
With each improved videotape recording format come new requirements to be met by the tape medium. The increased packing of data is accomplished by smaller, more refined magnetic particle size in the oxide layer. Binders and base films, as well as abrasives and lubricants, all determine whether a tape formulation will serve a format properly. To match the requirements of today's magnetic recorders, manufacturers have moved to metallic tapes to meet coercivity specifications.
Interest: recording technicians, engineers, general.
Key words: base film, oxide, magnetic coating, lubricants, abrasives, binders, coercivity, retentivity, RF output, MET, adsorption.

• **Planning an STL System** (page 116)
By Ronald Balonis, WILK-AM, Wilkes-Barre, PA
Designing the STL microwave path includes calculation of Fresnel zone clearance to achieve a reasonable reliability factor and the identification of sources of multipath effects. Topographic maps are useful in determining possible obstructions in the path. Frequency coordination is also important in planning and designing a reliable, trouble-free STL system.
Interest: RF engineers, engineering management.
Key words: path engineering, Fresnel zones, frequency coordination, multipath fading, minimum clearance, system reliability, fade margins, critical path.

• **News Special Report: The American View of HDTV** (page 140)
By Howard T. Head, A. D. Ring & Associates, Washington, DC
From its inception, television has undergone many increases in definition. HDTV represents a larger step in the evolutionary story than any yet taken and poses a change in broadcasting as we have come to know it. Many questions remain unanswered, and many decisions must be made. Among the uncertainties are the ultimate definition, aspect ratio and compatibility with present TV systems.
Interest: general.
Key words: Nipkow disks, the Fibonacci rectangle, aspect ratio, compatibility, spectrum requirements.

Applied Technology (page 146)
• New Suspension Design Yields Improved CRTs
By C. Admiraal and H. Bongenaar, Philips Components Division, Eindhoven, the Netherlands
(A new method of suspending the shadow mask of the CRT improves the stability of the mask-to-screen dimension to maintain color purity.)

SBE Update (page 152)
• Awards Bestowed in Denver
• Chapter Awards Presented
• Professional Licensing and Certification
• Convention Review

Station-to-Station (page 154)
• Auto-Start Circuit Can Save the Day
By Carl Shelenberger, WFTW-AM/FM, Ft. Walton Beach, FL
(An auto-start circuit on the emergency power generator helps to reduce downtime.)

Field Report (page 156)
• The Fortel Turbo 2 TBC

NOVEMBER 1988

Theme: 5th Annual Station Maintenance Special

Editorial (page 6)
• Parts is Parts
(One solution to the replacement parts problem is to order spares when you buy a product.)

FCC Update (page 8)
• Follow the Rules That Still Exist
• Operator on Duty
• Chief Operator
• Station Log
• Controlling Remote Sites

Strictly TV (page 10)
• Inside the Visual PA, Part 2
(Square wave test signals at 60Hz and 15kHz for monitoring of tilt and rounding detect low- and high-frequency response problems.)

re:Radio (page 12)
• Let the FCC Know What You Think
(Broadcasters should respond to FCC-proposed rulemaking MM Docket 88-376 regarding AM technical changes and 88-375 regarding FM Class A power.)

Satellite Technology (page 14)
• Space Junk Caught in Dangerous Orbit
(Four million pounds of debris pose possibility of disaster in space program.)

Circuits (page 16)
• Digital Sampling in Real Time
(Direct comparison method with a fast A/D converter, memory buffer and fast digital signal manipulation needed for real time work.)

Troubleshooting (page 18)
• Video Terminations Play Important Role, Part 2
(Replacing all video terminations with units of 0.1% precision may solve inexplicable level variations.)

Management for Engineers (page 20)
• Techniques for Dealing With Problem Behavior, Part 3
(Methods to circumvent negative attitudes are discussed.)

• **Maintaining Broadcast Equipment** (page 23)
By Jerry Whitaker, editorial director

• **On the Bench** (page 26)
Servicing of many types of hardware requires special test fixtures and test equipment. Budgetary consideration should be made for the acquisition of special test products needed to maintain newly purchased equipment. Making certain that the workshop is well-equipped leads to more efficient troubleshooting and maintenance of station equipment.
Interest: engineering management, maintenance technicians.
Key words: oscilloscopes, PWBs, jigs, fixtures; device side, cable side.

• **Solder: the Tin That Binds** (page 32)
As technology introduces new types of components to broadcast equipment, new approaches to maintenance are needed. A range of soldering and desoldering products are now available to aid in the repair of PWB circuitry. Characteristics of solder and components used on modular equipment help the technician to perform repair projects.
Interest: engineering management, maintenance technicians.

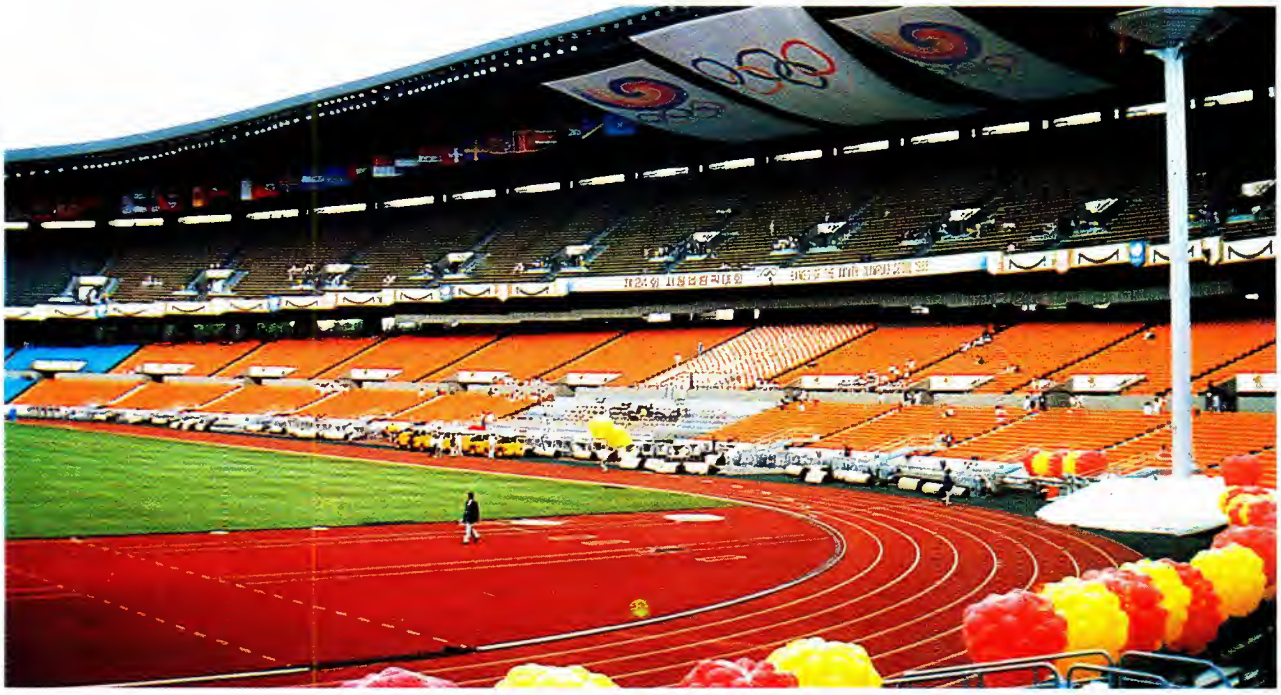
We built the machine that brought home the gold.

The 1988 Summer Olympics.

Recorded, edited and aired on

Panasonic MII equipment.

MII Panasonic
Broadcast Systems Company



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

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

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

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

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

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

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

Panasonic MII

Official Video Equipment Of The 1988 Olympic Games

Title 36 United States Code Section 380

MII Panasonic Broadcast Systems Company

Circle (75) on Reply Card

Key words: solder/desolder, silver solder, rosin core, reflow; corrosion, flux; surface mount.

• **Using Chemicals in the Shop** (page 38)
A variety of chemical products makes equipment maintenance procedures less difficult. Among these chemicals are a range of cleaning solvents and agents in aerosol and liquid forms for removal of normal and foreign contaminants. A knowledge of solvents and their reaction with materials is important for proper equipment maintenance.
Interest: engineering management, maintenance technicians, equipment operators.
Key words: solvents, applicators, compressed gas, lubricants.

• **Preventing ESD Failures** (page 46)
Electrostatic discharge (ESD) has become one of the greatest hazards to the new generation of solid-state devices. With the introduction of advanced IC and discrete devices, maintenance personnel must realize the importance of static-control procedures. Following correct procedures in regard to static electricity and new technology can spell the difference between a successful repair project or serious damage to the equipment.
Interest: engineering management, maintenance technicians, equipment operators.
Key words: ESD, static electricity, static discharge.

• **Finding Replacement Parts** (page 54)
The task of maintaining older equipment often proves difficult, either because the equipment manufacturer fails to maintain a stock of some parts, or the component manufacturer changes the design of the component. The repair technician must have a basic understanding of system operation to know whether a replacement part will perform in the same manner as the original component.
Interest: engineering management, maintenance technicians.
Key words: universal replacements, JEDEC outlines.

• **Managing a Studio Maintenance Program** (page 62)
By Ronald Balonis, WILK-AM, Wilkes-Barre PA
Maintenance programs usually break down to three areas: preventive, crisis and predictive maintenance procedures. A trouble log, located near equipment, provides an effective form of documentation on studio systems, assists in maintaining a replacement parts inventory and increases repair shop productivity. The engineering do list places priorities on tasks for more efficient maintenance procedures.
Interest: engineering management, maintenance technicians.
Key words: levels of maintenance, trouble logs, do lists, task pyramids, time management.

• **Maintaining the Studio Environment** (page 74)
By Eric Neil Angevine, P.E., Oklahoma State Univ., Stillwater, OK
Lighting fixtures, room surfaces and acoustical materials, and their effects on studio operation, must be considered as the studio ages. The studio is more than just a room; it requires maintenance just as much as the equipment in it.
Interest: engineering and production management, maintenance technicians, production personnel.
Key words: acoustical materials, lighting fixtures, carpet, sound seals, mechanical noise sources.

• **The National Electrical Code: What's in it for Us?** (page 78)
By Elmer Smalling III, Jenel Systems & Design, Dallas
The National Electrical Code (NEC) is a compendium of proper application of electrical power for any purpose. Included in the code are practical safeguards to protect people and property from electrical hazards. Although much of the code is simply common sense, it should be studied by all personnel involved in power distribution in the broadcast facility.
Interest: engineering, building maintenance management.
Key words: NEC, electrical safety, grounding, branch circuits, electrical calculations, wiring methods.

Field Report (page 90)
• Otari MX-55 Tape Recorder

Station-to-Station (page 102)
• Using a Computer for Engineering
(Various applications for CAD programs in the broadcast facility are examined.)

SBE Update (page 114)
• Convention Rates High Marks
• Satisfied Attendees and Exhibitors
• People Are the Key
• Election Results
• Board Meeting
• Office Changes (new mailing address for national office)

DECEMBER 1988

Theme: Industry Forecast

Editorial (page 6)
• Too Many Shows?
(Is the large number of broadcast industry trade shows really necessary?)

FCC Update (page 8)
• FCC Relaxes Media Diversification
• Proposing AM Modifications
• Seeking Repeal of Compulsory License
• Typical Rule Violations

Strictly TV (page 10)
• Inside the Visual PA, Part 3
(Response to mid and upper frequencies determines transient and group delay characteristics.)

re:Radio (page 12)
• Reach for LPTV Opportunities
(AM and FM broadcasters can enhance business income with LPTV license.)

Satellite Technology (page 14)
• Getting Into Orbit
(The processes of obtaining and maintaining final orbit are discussed.)

Circuits (page 16)
• Application-Specific ICs

(Various areas of the IC design process are investigated.)

Troubleshooting (page 18)
- Take the Option to Rent

(Test equipment rental plans make economic sense for occasional-use, high-ticket items.)

Management for Engineers (page 20)
- Techniques for Dealing With Problem Behavior, Part 4

(Examples are given of events that trigger behavior problems on the job.)

- **State of the Industry Report** (page 26)

By Brad Dick, technical editor

Based upon the results of the annual survey, this article examines the health of the broadcast industry. Equipment buying plans for 1989 is the key information taken from the survey to determine the major equipment trends on the industry horizon.
Interest: engineering management, station managers.

- **View From the Top** (page 34)

By Jerry Whitaker, editorial director

Interviews with top engineering vice presidents of major radio and TV group operations examine opinions and views about where technology will take us in the next few years. Group and network operations are key players in the development of new technologies that will benefit all participants in the radio and TV industry.
Interest: engineering management, station managers.

- **The Bottom Line in Broadcasting** (page 46)

By Jerry Whitaker, editorial director

How is technology reshaping the broadcast industry? This article focuses on the key trends for the professional audio and video industries as a whole. The unrelenting push of technology continues to change the rules, even as the ball game is being played.
Interest: engineering management, station managers.

- **The Klystrode in Operation** (page 64)

By Jerry Whitaker, editorial director

When the hybrid device that combined the best parts of power tetrodes and klystrons was announced, advantages provided by the new amplifier product included predictions for greater efficiency in UHF TV transmission. With the first Klystrode transmitter in operation for approximately six months, this article examines how well the device has measured up to the predictions and discusses what lies ahead in UHF transmissions.
Interest: engineering management, RF engineers.
Key words: Klystrode, klystron, power tetrodes, efficiency.

Show Replay (page 84)
- IBC '88: The HDTV Showdown

(A review of the 1988 International Broadcasting Convention, in Brighton, England, considers some of the technical presentations and equipment introductions from the exhibition.)

SBE Update (page 120)
- Apply for Testing
- International Interest (about certification)
- Official Attends Texas Convention
- Professional Licensing
- Membership Directory

SUBJECT LISTING
(Monthly listing begins on page 96)

ANTENNAS/TOWERS/TRANSMISSION SYSTEMS

AUDIO

Ready to Score Another Scoop!

Satellite Scoop System
Mt-3

Toshiba's Mt-3 Satellite Scoop System makes live coverage of fast-breaking news events routine.

This complete Ku-band system fits in 10 compact, lightweight flight cases that meet IATA carry-on baggage regulations.

Once on site, an array of proven Toshiba design advances facilitate set-up. A 1.8M parabolic antenna with a simplified 360° azimuth rotary mechanism in addition to an easy polarization, 6-segment FRP antenna reflector make set-up short and sweet.

The synthesized exciter minimizes MCPC/SCPC carrier phase noise and provides all-purpose control flexibility. And advanced microprocessor controls assure complete access with all existing international communication satellites.

Toshiba's Mt-3 Satellite Scoop System effectively takes the work and worry out of live news coverage.

The Mt-3 was developed jointly by Toshiba and CBS Engineering and Development.

TOSHIBA

TOSHIBA CORPORATION TOKYO JAPAN

ELECTRONIC SYSTEMS DEPARTMENT
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TELEX J22587 TOSHIBA CABLE TOSHIBA TOKYO PHONE 457-3246-8

TOSHIBA AMERICA, Inc.

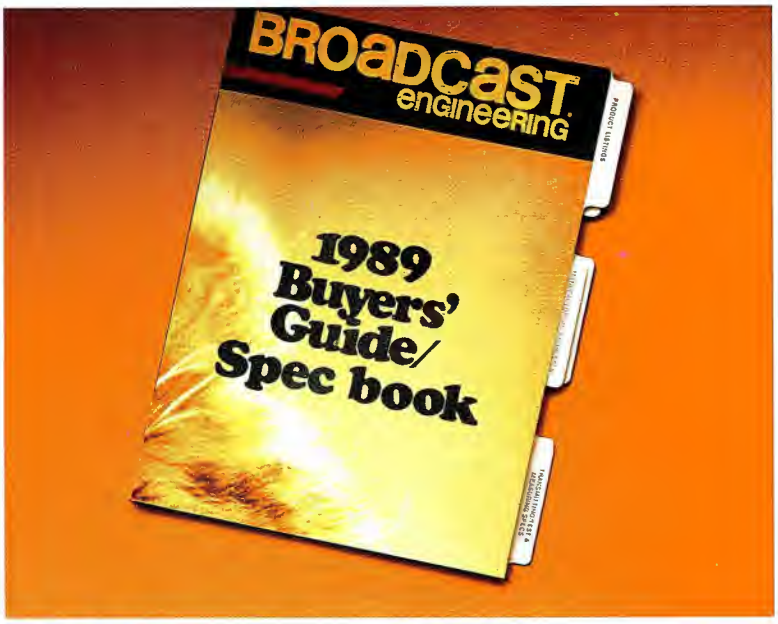
ARMONK OFFICE: 111 BUSINESS PARK DR., ARMONK, NY 10504 PHONE: (914)273-1750 FAX: (914)273-9516 TELEX: 131-556

Circle (112) on Reply Card

MEASUREMENT/MONITORING/TESTING

RECORDING/EDITING/PLAYBACK

RF/RADIO FREQUENCY



The monthly seminar

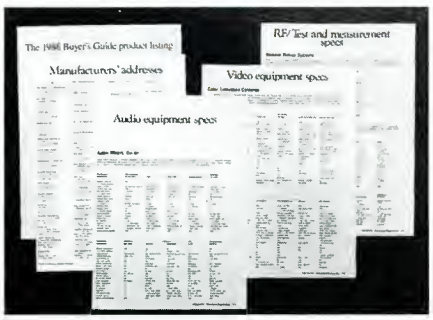
The year-long reference manual

BROADCAST ENGINEERING gives you the information you need to plan your station's future. In fact, every issue is like attending a technical seminar in print.

But *BE's* seminars don't stop with our regular 12 issues. *Buyers' Guide/Spec Book* is the perfect complement to your "monthly seminar," dramatically simplifying your equipment purchases.

Past *BE* seminars have given you the technical information you needed to keep your station up and running, and to make informed purchasing decisions. Now you need the equipment to make it happen.

And that's where *Buyers' Guide/Spec Book* — your year-long reference manual — comes in.



Over 350 types of equipment and services in the Product Listings. Over 1,000 entries in the Manufacturers' Addresses section. More than 40 categories of equipment with major specifications in a side-by-side presentation.

So many products . . . so many manufacturers . . . so many choices.

You are bombarded with so many advertising impressions and sales calls every day, it's easy to become overwhelmed. *Buyers' Guide/Spec Book* helps simplify your overwhelming purchasing task by giving you everything you need in one neat, easy-to-use reference manual.

Equipment specs, technical data, manufacturers' addresses and phone numbers . . . and much more. Packed into the only comprehensive broadcast equipment directory of its kind.

With *Buyers' Guide/Spec Book*, you have at your fingertips everything you need to make equipment purchases your company can live with for a long time.

Make *Buyers' Guide/Spec Book* a permanent part of your reference library today. Read it. Use it. And save it.

***Buyers' Guide/Spec Book* — the year-long reference manual to *BE's* "monthly seminars in print."**

BROADCAST ENGINEERING

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SBE Update

Apply for testing

By Bob Van Buhler

Engineers are invited to apply for SBE certification testing, which will take place at the National Association of Broadcasters (NAB) convention in Las Vegas, NV, April 29 through May 2, 1989. Testing will be administered in the convention center. The application deadline is March 10, 1989. Following NAB, the next regularly scheduled test cycle for local chapters will be June 9-19, 1989. The application deadline to take the test at that time is April 14.

Members interested in taking the exam should contact the local chapter's certification chairman for forms and information. If you are unable to reach the chairman, please contact the national office, SBE Certification, P.O. Box 20450, Indianapolis, IN 46220. Study guides for the different certification categories are available for $4.95 from the national office.

Linda Whitehead of Indianapolis, IN, is a new full-time staff member in the certification department at the national office. She replaces Sharon Templeton. Whitehead joins Mary Brush, certification secretary, who has been involved with certification since its inception. For information on certification, call Linda or Mary at 317-842-0836.

International interest

Certification examinations were given at several foreign sites, as well as in the traditional domestic locations during last month's testing cycle. The U.S. Embassy proctored certification examinations in Singapore. The St. Vincent Secondary School in Dublin, Ireland, also hosted a November testing session.

Inquiries about testing have been received from a certified broadcast technologist in Belize, Central America. According to Brush, recent inquiries regarding the certification program have been received from Australia, Borneo, Brazil, Burma, Hong Kong, Iceland, Israel, Jamaica, Kenya, Mexico, Nigeria, Pakistan, the Philippines, Saipan, Saudi Arabia and West Germany. The Central Intelligence Agency (CIA) also has expressed an interest in the program.

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

Chuck Kelly, former board and executive committee member who is now international sales manager for Broadcast Electronics of Quincy, IL, returned from a sales trip to Caracas, Venezuela, with inquiries concerning membership and chapter information. Kelly is enthusiastic about spreading the word about the society wherever he travels. As a member and ham radio operator in Durango, CO, Kelly was responsible for forming the Chapter of the Air, which conducted meetings by short-wave radio.

Official attends Texas convention

Helen Pfeiffer, executive secretary of the national office, represented the board and officers at the Texas Association of Broadcasters Convention in San Antonio, TX, Oct. 21-23. She attended the all-Texas meeting held at the convention, and presented a special award on behalf of the board of directors to Gerry Dalton. Dalton received the special service recognition award in honor of his involvement in coordination, which has spanned the better part of the decade. He single-handedly produced the software now used for frequency coordination in chapters throughout the country.

Professional licensing

The main topic of discussion at the Texas session was professional licensing of broadcast engineers. Gil Garcia, chairman of Chapter 79, Austin, has been working, along with others, with the State Board of Regulation on the matter. Garcia's goal is the acceptance of SBE certification as the criterion for the use of the title "broadcast engineer" in the individual's daily professional life within the broadcast community.

This has been a hot issue of discussion within the Austin chapter in particular. To date, the national board has heard more from Chapter 79 on this matter than any other chapter.

Other states, including Washington, New Mexico, Alaska and Michigan, appear to be involved in the issue at various levels. Some questions being considered are whether the chief operator has a right to be called the chief engineer and whether contract engineers have the right to render certain services to their customers.

You are encouraged to send your comments on professional licensing to the national office to help the board of directors define the society's position. Mail those comments to Professional Licensing, SBE, P.O. Box 20450, Indianapolis, IN 46220. (Refer to the "SBE Update" column in the October issue for further information.)

Membership directory

In response to a membership survey, the board has approved plans to publish a membership directory. According to the board resolution, the directory will be published by March 31, 1990. It will list members' names, addresses and phone numbers, based on membership rolls as of Jan. 1, 1990.

The dates may seem distant, but a long lead time is needed to secure each member's permission to publish this data. Information, and permission to use it, for the directory will be obtained as part of the 1989 membership renewals process. Steps will be taken to prevent the commercial exploitation of the list by outside parties. The list, which will be copyrighted and protected aggressively, will not be sold or rented to third parties.

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

Continued from page 4

joined the staff of the Advanced Television Test Center (ATTC) as program officer. His primary responsibility is planning the center's test procedures.

The ATTC was formed by a coalition of broadcasting companies and industry associations to test and report on transmission systems for advanced TV service, including HDTV. The results of this work will assist the federal government and the American industry in selecting from proposed new systems and determining necessary national standards to implement the new service.

Crutchfield is former director of special engineering projects for the NAB, where he worked mainly on HDTV. He is chairman of the working party on system testing and evaluation of the FCC's Advisory Committee on Advanced Television Service. He also is chairman of the Advanced Television Systems Committee's technical group on delivery of HDTV to the consumer.

Plans unveiled for Boston fiber network/teleport

Officials at Teleport Boston Corporation plan to build a 100-mile fiber-optic network and teleport facility in the metropolitan Boston area. When complete, the fiber-optic network will be the largest private network in the area and will provide communications users with an alternative to local telephone company service. The network will access approximately 60% of the offices located within the Boston metro area. The teleport will be the area's first, state-of-the-art satellite communications facility.

A recent Booz-Allen survey of communications users in the greater Boston area cited poor quality, high cost and unreliable service as reasons for selecting an alternative private telecommunications service.

The planned network route is from Boston to Cambridge, west to Waltham, north to Burlington and back to Boston. The network will be marketed by Metro FiberOptic, a division of Teleport Boston. Located on the fiber-optic network west of Boston, the teleport facility will house five earth stations capable of transmitting and receiving simultaneous voice, data and video communications throughout the world.

The fiber-optic network will be built over a period of approximately 21 months. The first phase of the project will be the construction of the fiber-optic network in downtown Boston, which will provide communications service from carrier to carrier, end-user to end-user, and end-user to carrier.

Teleport Boston will construct an automated computer control center that will monitor the network 24 hours a day for transmission errors or network failure. Voice, data and video information can be carried simultaneously over the redundant network that is designed to minimize information loss in the event of a problem in the system. For example, if the network is damaged, data in transit would be rerouted in the reverse direction to ensure that the information reaches its destination. The planned fiber-optic backbone will consist of up to 144 optical fibers, each operating at a rate of 565Mb/s.

The teleport will feature one of the largest state-of-the-art earth stations on the East Coast, measuring 18.3 meters in diameter.

People

Bruce A. Hall has been appointed vice president of sports services for Bonneville Satellite Communications, Salt Lake City. He is responsible for the satellite broadcast of major sporting events.

Gerard Vargas, **Clayton Creekmore** and **Debra Ernzen** have all joined the staff of Circuit Research Labs, Tempe, AZ. Vargas has been appointed international sales manager. Creekmore is the Western U.S., radio and TV sales associate. Ernzen has filled the newly created position of marketing coordinator.

Steve Lose, **Eric Pohl** and **Mike Weaver** have been added to the customer support staff at Digital F/X, Mountain View, CA. Lose is responsible for building up and managing the customer support/field service department. Pohl, a customer support engineer, supervises the East Coast engineering and maintenance of technical operations from New York City. Weaver, also a customer support engineer, serves the Midwest from Detroit.

Kelly Hannig has been appointed a product line specialist at Gentner Electronics, Salt Lake City. He is responsible for new product development of RF and audio-processing lines, and will make presentations to professional groups representing these lines.

William Thompson has been elected chairman of the board of directors for Hedco Electronics Devices, Grass Valley, CA. Thompson also has been appointed chief executive officer.

Ben Haynes and **Garry Mahoney** have joined Pinnacle Systems, Santa Clara, CA. Haynes is vice president of engineering. Mahoney is Pacific regional manager in the newly opened Australian office located in Sydney.

Rhys Paddison has relocated to the United States to assist Rank Cintel, Valley Cottage, NY, in the sales and marketing efforts on behalf of the Logica Gallery 2000 automated image library.

Susan Wickersham has been named a communications sales specialist at Richardson Electronics, LaFox, IL. Wickersham is responsible for communications sales nationwide.

Donald J. Power has been appointed director of marketing at Alamar Electronics USA, Campbell, CA.

Business

Alamar moves organization

Alamar Electronics USA has relocated its office and manufacturing facilities to 489 Division Street, Campbell, CA 95008; telephone 408-866-9373; fax 408-866-4367.

Ampex opens test facility

The Magnetic Tape Division of *Ampex*, Redwood City, CA, has opened a test facility in the Opelika, AL, processing plant. The center has 9,600 square feet, and features eight separate labs for 1-inch video, cassette video, audio, instrumentation, plastics, physicals and microscopy. State-of-the-art equipment will be used to analyze tape performance for a wide variety of formats and user conditions. The lab also will be used to evaluate competitive products as part of Ampex's audit program.

Barco honored with Emmy

Barco Industries, Nashua, NH, has been awarded the 1987/88 Emmy Engineering Award for Outstanding Achievement by the Academy of Television Arts and Sciences. The award recognizes the engineering contributions and development of the first all-digitally controlled, intelligent broadcast monitor. The monitor combines microprocessor capabilities with a modular design to establish new standards of performance regarding color temperature stability, repeatability and system reliability.

Digital F/X moves headquarters

Digital F/X has moved its corporate headquarters to 755 Ravendale Drive, Mountain View, CA 94043; telephone 415-961-2800. The facility represents a transition from an engineering phase into one of manufacturing, sales, marketing, customer support and continued development of the DF/X 200 digital video production system.

EMC debuts

Editing Machines Corporation has been formed by a group of former computer graphics professionals. The facility is located at 1825 Q Street, NW, Washington, DC 20009; telephone 202-232-4597.

Prime Image expands warranty

Prime Image, Saratoga, CA, has announced a warranty policy change. A full 3-year warranty is being offered on the entire product line. Warranty repair units will be Federal Expressed both ways (at Prime Image's expense), repaired, brought up to current production release level, revibrated, reburned in and quality checked.

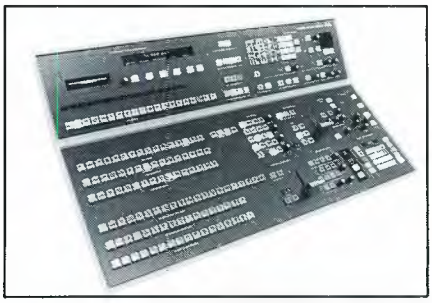
New products

Switcher, amplifier, effects storage, linear keyer, edit system, digital router and edit suite

Grass Valley Group has introduced the following products:

• The model 200-1 single mix-effects configuration of the model 200 video production switcher features extensive key and wipe facilities; three key levels, each capable of linear and luminance keying; and 20 analog wipe patterns.

• The model 7510 processing amplifier is manufactured on a single module, and frames are available that will take two or four modules. Each module has front-panel adjustments for chroma-gain and chroma-phase and level adjustments for video, sync, burst and setup. (These controls can be remotely accessed.) Video AGC, hard and soft clips and relay bypass are standard, as is cable equalization. Each module has four outputs.



Model 200-1 Mix Effects Switcher

• The E-DISK II+ effects storage system for the model 300 series production systems offers dual 3.5-inch floppy disk drives as a standard feature. The system is menu-driven, and the user interface is improved through the use of a 2-line by 40-character alphanumeric display. The basic system is self-contained in a 5.25"×19"×15" rack-mountable chassis. A hardware set with wood sides and a tip-up base is provided for desktop setup. The system is self-powered and requires the RS-422 serial interconnect to the model 300. The system also features built-in diagnostics to check system memory, microcomputer, serial I/O and control-panel operation. Copying disk files is a standard facility in the system.

• The DSK-101 linear keyer performs linear keying for anti-aliased character generators and digital video effects units; additional keying for production switchers; and the use of Borderline, a feature for adding border shadow and outline to graphic-stand camera inputs and character generator images. The keyer is based on the linear keyer circuits designed for the model 200 production system. PAL or NTSC are selectable, GPI input is programmable and there are E-MEM register stores. Other features include frame-accurate auto transition with pause mode, internal matte generator, mask generator, four key source and fill inputs and look-ahead preview monitoring.

• The compact VPE-141 edit system is based on a single-board computer featuring an LSI 11/73 CPU with extensive RS-422 serial communications capability. Thirteen serial ports are provided for up to seven VTRs, switchers and other peripherals. It also has the ability to boot the operating program from battery-backed CMOS. An additional benefit of battery-backed memory is that any decision list is automatically saved in the event of a power failure. The controller runs on the Super Edit software.

• The DHX-532 parallel digital routing system is designed to operate as a level

of a HORIZON routing system or to extend a level of a HORIZON control panel. The system comes in blocks of eight I/O increments, from 8×8 to 32×32. The system is compliant with international parallel digital standards. Each input is terminating: Two outputs are provided for each destination, regardless of frame configuration. Eight-bit signals are fully accommodated at both input and output even when used alongside 10-bit signals.

• The IPS-100 integrated production system includes a model 100 production switcher; specially configured edit controller based on the model 141; AMX-170 audio mixer; and sync and pulse generator system with built-in test signals. The system can handle up to four VTRs via an RS-422 serial interface. The edit controller is based on the DEC LSI 11/73 high-speed microprocessor with 512K RAM. It allows more than 1,000 edit lines to be stored in active memory. The system boots from battery-backed CMOS memory, allowing immediate operation.

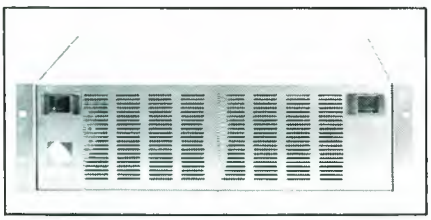
Circle (350) on Reply Card

Scan converters

The RGB/Videolink line of scan converters has been introduced by *RGB Technology* for the Mac II, PS-2 and PC. Models 400 (for the PS-2 and Mac II) and 300 (for the PC) convert computer graphics to TV video for videotaping, projection and transmission. The converters accept full-screen, non-interlaced RGB input; provide gen-lock, sync generation and encoding to output NTSC video; accomplish complete scan conversion in real time; and offer line averaging and full color.

Circle (351) on Reply Card

Signal processors



The Stage*1 E-NTSC line of video signal processors, designed to enhance NTSC TV images, has been released by *Central Dynamics*. The product line includes digital translators, digital encoders and decoders. Stage*1 E-NTSC uses multidimensional digital signal processing and filtering technology to process E-NTSC color images that are indistinguishable from original RGB and component color signals. The systems employ 2-D filtering techniques to shape the signal spectrum and separate chrominance from luminance, allowing elimination of cross-color and cross-luminance artifacts.

Circle (352) on Reply Card

Graphics work station expansion

Harris Video Systems has introduced three software applications for the HarrisVws 1000 video/graphics work station. The work station offers paint, composition and titling packages. The paint software offers true-color, high-resolution design capabilities for complex image manipulation. Features include multiple imaging, rotating, rescaling, cell animation and multiple brushes (including user-definable brushes). Colors may be hand-mixed from

an on-screen palette or created by altering the numeric parameter values. The composition package is designed for keyed insertion and cut-and-paste applications. It includes image compression and magnification, bordering, rescaling, adjustable color and background design. The titling package includes automatic anti-aliasing; multiple fonts, including italics, bold and reverse type; foreign language symbols; kerning adjustment; and subscript and superscript capabilities.

Circle (353) on Reply Card

CCD telecine, still stores, graphics tablet and HD telecine

Rank Cintel has introduced the following products:

- The ADS 2 CCD telecine features improved picture resolution with a 135 linear array imaging sensor. The telecine provides electronic concealment of dirt and scratches, multiple transfers, low-light detection, automatic color correction, anti-blooming control and single switch 16mm/35mm selectability on each transport.
- The Slide File II is a dual-user version of the Slide File still store. A 4:2:2 component imaging storage system, the Slide File II, allows two users shared access to a common picture library stored on Winchester disks and features both a production and an editing control panel. Production capabilities include crop, border, overlay and resize. The editing capability allows users to grab and clean video frames, sequence stills, cut, mix and fade. The system will broadcast direct to air, and it can be used in conjunction with the Gallery image management system.
- The Gallery PhotoCall is a single-user still store and image library. Features include high-quality RGB and 4:2:2 digital video imaging, paint system and standard graphics interface, picture index and optical disk compatibility with Gallery 2000 drives. When combined with Slide File, Gallery PhotoCall also offers cut, mix and fade presentation facilities.
- The Art File option is a graphics tablet for telecine suite applications. It allows the operator to perform electronic graphics applications with the telecine itself. Art File is a part of Matchbox, which provides users with a digital 4:2:2 store for color referencing and storyboarding. It also provides an on-screen color palette including color mixing, keying and anti-aliased artwork from a small tablet that can be installed in either a telecine or edit suite.
- A preproduction high-definition telecine for use in the United States is available in any of the proposed HDTV standards—1,050, 1,125 or 1,250. The unit will allow broadcasters to transfer the existing archive of 35mm motion pictures to these future HDTV formats. The preproduction models include all the features of a Rank Cintel telecine, including X–Y and flying-spot imaging.

Circle (354) on Reply Card

Comb filter decoder and production system upgrades

Digital F/X has introduced the following products:

- The DF/X-2A NTSC adaptive comb filter decoder provides NTSC decoding in a 1-rack-unit package. It is designed to be used for upstream decoding for component digital signal-processing devices. The decoder has low residual subcarrier with wide frequency response in both luminance and chrominance. The comb filter decoder has outputs in both Betacam

The Faroudja **NTSC ENCODER**

Ahead of its time

The Faroudja CTE-2 NTSC Encoder delivers to your viewers the best picture quality on screen. This is why so many broadcasters use it.

By pioneering the use of comb filters and detail processors within their encoders, Faroudja Laboratories has changed the nature of NTSC.

No more rainbow patterns

No dot crawl—no softness

No blurry reds (with DP option)

The Faroudja Encoder is one of the building blocks of the fully compatible SuperNTSC™ ATV System.

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946 Benicia Avenue
Sunnyvale, California 94086
Telephone 408/245-1492
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Circle (96) on Reply Card

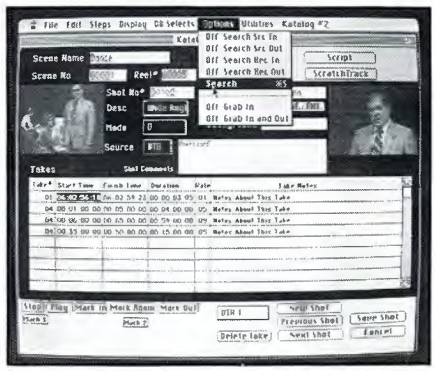
and RGB formats.

• The DF/X 200 digital video production system includes a machine control option that introduces keyframe editing for control of videotape and digital disk recorders. In and out points can be keyframed directly into the master decision list for integrated management of all aspects of the effects sequence. This option allows control of up to five upstream tape decks. It includes advanced rotoscoping software for sequence setup and fast *buying* and *selling* of frames to and from digital disk recorders and videotape machines. The system also includes advanced paint and video typography features.

Circle (355) on Reply Card

Desktop video system

Seehorn Technologies has introduced the multimedia integrated database authoring system. The system is called Midas, and the system software is called 3-2-1 Video. Midas and 3-2-1 Video combine machine control, scripting, editing and list management software with a multi-user database in one integrated desktop video system. The system includes a catalog manager to keep track of stills and clips, and allows the editor to use icon-driven point-and-click commands to edit strings of video clips into complete programs. Midas and 3-2-1 Video includes software, frame grabber, main board and edit controller.



Circle (356) on Reply Card

Effects systems, animation and graphics system and TBC

Microtime has introduced the following video products:

• A post-effects frame store option for the RP-1 consists of a single plug-in card. It provides effects that can be used in conjunction with all the standard RP-1 effects. The effects featured include shadow, sparkles, trails, multifreeze and mosaic wipe.

• The Genesis ACT 3, a digital video effects system, offers true 3-axis rotation and perspective. It has fully programmable size and position, infinite compression and expansion to two times normal size, and it can manipulate live or frozen video. The proportional borders with soft edges between the picture and the border can be selected and programmed on a keyframe-by-keyframe basis. The effects system is available in PAL-B, PAL-M and NTSC.

• The IP-25 system is a 25MHz version of the Imageplus 3-D animation and graphics system. It is available in PAL and NTSC. Version 5.0 system software has been released for use with the IP-25 system. Standard features include 3-D sculpting of models; 3-D metamorphosis; phong, gouraud and solid shaders; metal shaders; glass shader; reflectance; and texture mapping.

Circle (357) on Reply Card

Effects system

Chyron has introduced the ACG real-time character, graphics, animation and digital graphics effects system, which stresses an open-ended architecture. The system features real-time operation and animations, automatic character kerning, color ramping for shaded backgrounds, color and font change, sequencing for message playback, disk-loadable fonts and software, multiple speeds of roll and crawl, visual color palette, variable character edges, color encoder and linear keyer/ fader and a built-in sync generator with gen-lock.

Circle (358) on Reply Card

Monitor amplifier

DYMA Engineering has introduced the 815M, a modular, rack-mounted audio monitor amplifier. The stereo amplifier is individually powered and rated at 10W output. The unit occupies two module slots in a standard 10-module frame. The amplifier features an input arrangement that allows for both balanced and unbalanced sources.

Circle (359) on Reply Card

Audio level system

FM Systems has introduced the ALM673 Audio Level Master dual-mono audio-level control system. The system can control as many as six mono or three stereo audio channels. It uses split-spectrum control, program-dependent time constants and independent noise gating. With the flip of a switch, the system may be converted from two separate monaural channels to one stereo channel. The unit offers 30dB of true automatic level control without the waveform distortion that is caused by compression or limiting.

Circle (360) on Reply Card

CCD camera

The SK-F1 3-chip FIT-CCD portable camera has been released by *Hitachi Denshi America*. This unit uses a frame interline transfer CCD device to eliminate vertical smear. The camera, with a resolution of 700 lines and 60dB signal-to-noise ratio, features electronic variable speed shutter, auto knee and knee aperture, masking and flare compensation.

Circle (361) on Reply Card

Disk drive tester

Model 470 disk drive tester has been introduced by *HUB Material Company*. The unit is designed to perform on-site realignment of disk drives to a 100% accuracy level. It provides all the standard alignment testing and exercising functions for all 3-, 5- and 8-inch disk drives. The tester is powered by the disk drive and is portable.

Circle (362) on Reply Card

Harmonic filters

Micro Communications (MCI) has introduced the following UHF waveguide harmonic filters:

- The model 44119 has a frequency range of 470MHz-608MHz and 120kW of power.
- The model 44118 offers a frequency range of 566MHz-728MHz and has 120kW of power.
- The model 44117 has a frequency range of 698MHz-812MHz

and 120kW of power.

The filters are factory-tuned for high rejection at the second and third harmonics by restricting higher-order waveguide modes. Field-adjustable tuning allows the filter reactance to be optimized for each installation, providing even higher system harmonic rejection. The VSWR and insertion loss at the fundamentals are low to maintain system efficiency.

Circle (363) on Reply Card

Routing switcher

The model 8×16 routing system has been introduced by *Novadyne*. The composite video/2-channel audio routing switcher is designed to provide electronics, vertical interval switching and computer-controlled routing for TV production facilities. A single motherboard accepts between 1- and 16-output channel boards plus an options board for expansion. The output channel boards will accept as many as eight external composite video signals, each coupled with two audio channels. Audio channels may be used to route stereo audio, multilingual audio, data transmission or time-code and editing information. The system features large numeric LED front-panel status indicators for each output channel; simultaneous switching of all preset channels; lithium battery backup of routing status circuits that guards against loss of routing data during power interruptions; video outputs that are sync-tip clamped; gold-plated internal connectors; and a chassis of all-metal construction.

Circle (364) on Reply Card

Controller

NTSC Productions has introduced a controller designed to upgrade small production switchers for frame-accurate, editor-triggered cuts, wipes and dissolves. The rise time event controller allows any manual switcher to function in A/B roll edit systems, triggered by any edit controller's GPI pulse. The controller allows push-button remote control over the host switcher in camera applications. Rise time locks to NTSC, PAL and non-standard video automatically. It also may be jumpered to clock from the ac line.

Circle (365) on Reply Card

Recorder

The MX-50 audio machine has been introduced by *Otari*. The unit is available in 15/7.5ips and 7.5/3.75ips versions. Features include a built-in tape timer display with search-to-cue and search-to-zero, a front-panel ±7% vari-speed, 10.5-inch reel size capacity, a headphone amplifier, electronic lifter control and a dump edit function. A voice editing module that provides 2× playback without pitch shift for fast editing and review of news or dialogue material is optional.

Circle (366) on Reply Card

Power system

Sola has introduced the Mini-UPS/2, a portable electronic uninterruptible power system. The plug-in unit offers an overload bypass and eliminates the need to oversize the power-protection unit to meet the high inrush and peak-current demands of equipment using switch-mode power supplies. The power system is a true on-line UPS that operates continuously during normal line power conditions to provide voltage regulation and offers isolation from noise and transients. The battery reserve is always on-line and automatically supplies the no-break uninterrupted power in the event of a line power failure.

Circle (367) on Reply Card

Delay units, fader and modules

Klark-Teknik has introduced the following products:

- The model DN726 is a stereo delay line that accepts two inputs and provides stereo, in-phase outputs. It offers frequency response of 20Hz-20kHz and range of delay from 0s to 1.3s, adjustable in 20ms increments.
- The model DN775 is a stereo-mastering preview delay that provides a 2×2 input/output configuration. The frequency response is 20Hz-25kHz, and the unit has a delay range of 0s to 5.55s in 16ms increments.
- The VCA fader automation system for the DCM 232 in-line console adds recording and replay of the fader and mute information to the off-line editing and preparation of channel switch settings. The individual faders may be set to read, write, update and isolate modes. The package allows three levels of operation: VCA only, channel switch only and a combination of the two functions.
- The Q-series mute group modules enhance audio control in sound reinforcement applications such as concert halls, auditoriums, theaters and churches. The group includes input and master modules. The input modules include the Q-series standards in addition to eight mute group select switches with LED indicators, 10-segment LED level indicators and large, illuminated input channel cut switches. The master mute module provides eight master mute switches. The consoles have eight individual bus assigns, eight aux buses and a direct output with level control.

Circle (368) on Reply Card

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