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FACILITY DESIGN SPECIAL REPORT:

Broadcast and post-production work requires a state-of-the-art facility, one that can expand to meet new demands. In this special report, we discuss how to plan for the future.

OTHER FEATURE:

ON THE COVER

The 1990 NAB convention moves to Atlanta, March 30-April 3. The theme, "Broadcasting Works for America," heralds the beginning of a new decade for our industry. The change in location for the show is a refreshing break from the past and an exciting step toward the future. Cover design illustrating the Atlanta skyline by Stephanie Chiles, **BE** graphic designer.

DEPARTMENTS

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News

Academy commends SMPTE contributions

The Society of Motion Picture and Television Engineers (SMPTE) has received a special commendation from the Academy of Motion Picture Arts and Sciences in recognition of the work of SMPTE engineering committees in establishing industry standards. The award was presented at the Academy's technical awards ceremony on March 3 in Beverly Hills, CA. The society received an Oscar from the Academy in 1957 for its contribution to the advancement of the motion-picture industry.

Kodak, Bellcore join ATSC Exec Committee

Eastman Kodak Company and Bell Communications Research have been appointed to 3-year terms as members of the United States Advanced Television Systems Committee (ATSC) Executive Committee. Their terms will expire in December 1992. Sony Advanced Systems Company and Thomson Consumer Electronics were reappointed for the same 3-year term. In addition to these members, the following companies will serve on the ATSC Executive Committee this year: Ampex, Capital Cities/ABC, CBS Broadcast Group, Electronic Industries Association, Institute of Electrical and Electronics Engineers, Maximum Service Telecasters, National Association of Broadcasters, National Broadcasting Company, National Cable Television Association, North American Phillips, Society of Motion Picture and Television Engineers, Westinghouse Broadcasting Company and Zenith Electronics.

Klystrode transmitter operates at 240kW

Comark Communications has placed into service a 240kW Klystrode-equipped transmitter at WDRB-TV, channel 41 in Louisville, KY. The Fox network affiliate station began broadcasting at its new, increased power level of 5MW ERP on Feb. 1. This is the first time a transmitter output power level as high as 240kW has been achieved.

The transmitter uses four visual Klystrodes and one aural Klystrode. Two independent, phase-locked modulator/exciters provide for automatic redundancy. The total plant ac power consumption, during transmission of an average picture, is about 300kW, which represents an overall average plant efficiency of 80%.

MSDC transmitter makes on-air debut

Harris, Broadcast Division, has announced that its first UM series UHF-TV transmitter to use the multistage depressed-collector (MSDC) klystron has begun operation at WNVT-TV, Falls Church, VA. The transmitter, which went on the air on Feb. 4, is the first of its type to be used for on-air broadcasting. The UM

Continued on page 35

BROADCAST engineering

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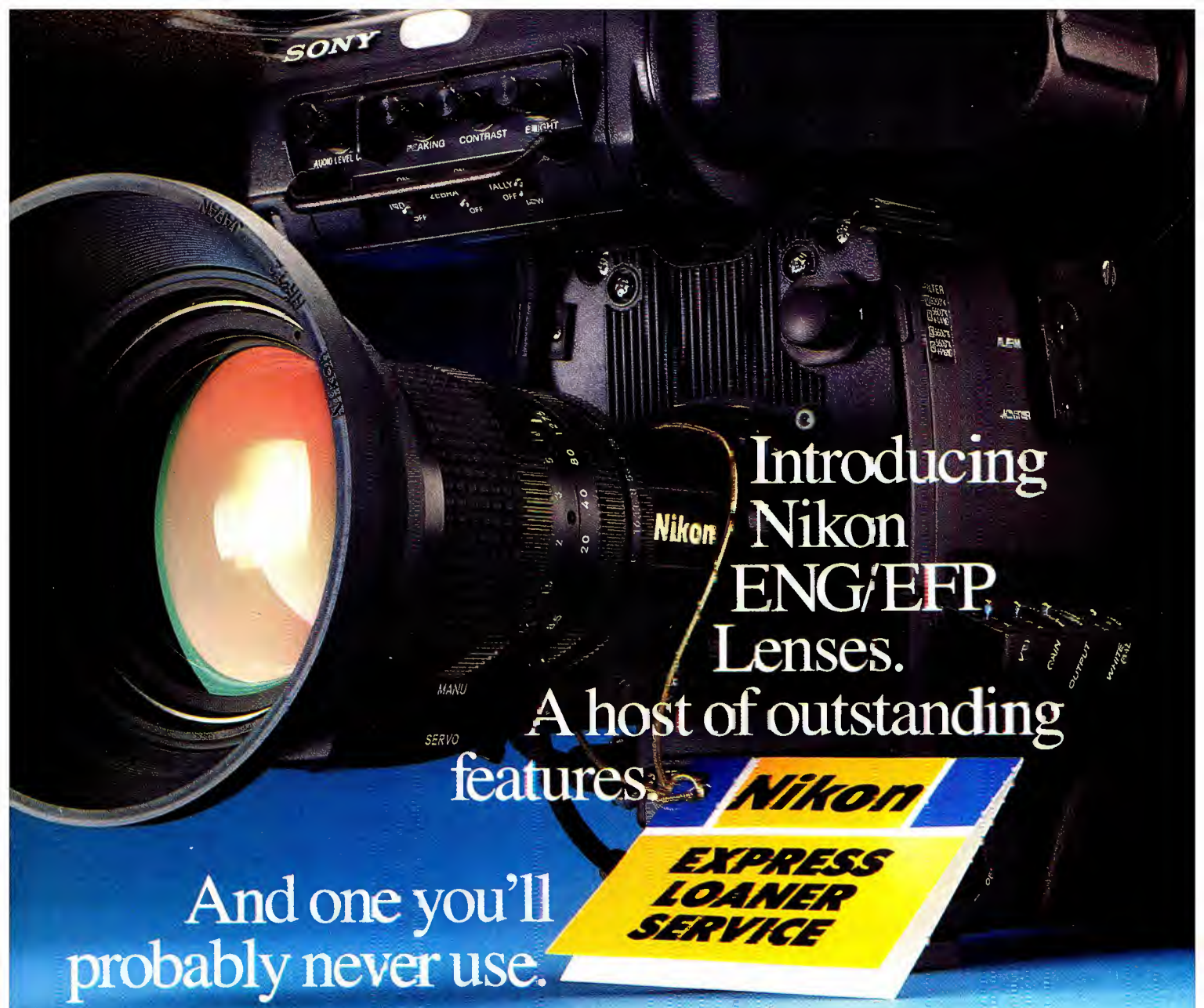

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Quit whining

I received a letter last week from an engineer complaining about the "moral imbeciles calling themselves radio and TV station owners and managers." The poor fellow saw himself as the victim of bottom-line pressures, and ultimately jobless.

Although many of the issues raised in his letter were symptomatic of a less-than-spectacular broadcast market, frustration was another important element that was present. The engineer was frustrated because he has to compete in the free marketplace, a situation brought about by FCC deregulation. He felt rejected and insecure and longed for the days of microregulation, when it was safe.

What this engineer doesn't realize is that during the many years of heavy regulation, which helped protect engineering jobs, no one else enjoyed such treatment. News and program directors, sales personnel and even station managers never could lean on the federal government for their job security. If they didn't perform well, they were out on the street. The tables have turned, and now everyone's on a level playing field.

I know of a program director who was hired by the market's No. 2-rated station three years ago. The most recent ratings place the station 10 out of 17 FM stations. Do you think he still has his job? Of course not; he was fired. Certainly he was upset about losing his job, but he didn't whine for the FCC to protect him. Why should engineers receive different treatment?

Some people in this business just can't understand that broadcasting is and has always been a business. If you don't produce or aren't cost-effective, you might as well find another job.

We forget that managers aren't immune to the effects of their work. They, too, have lost their jobs because of roller-coaster performance. If the station produces an inferior product, whether it's because of lousy programming or an inferior sound or picture, the axe also can fall on them.

Engineers need to realize that they are more important to the profitable operation of broadcast stations than ever before. That importance, however, is measured much differently from what it was 15 or 20 years ago. Back then, engineers fixed the equipment and maintained the logs. Technology has changed the first task dramatically, and it is no longer mandatory to keep logs.

Engineers must change their emphasis and learn new skills. It's no longer enough just to fix equipment. Now, engineers must show a return on the station's investment through their work. And that's as it should be.

Look at what you do, and consider how you can help make the station more profitable. Is there a way to perform the same tasks more efficiently? What technical changes can be made to improve the station's operation or make it more competitive?

Instead of arguing for a new transmitter because it would lower the distortion by 2%, show how much electricity it would save. Stop trying to justify replacement simply for technology's sake. Show how the new technology will improve the station's performance. Forget justifying new equipment because it might make your job easier. Put yourself in the manager's position. What technical improvements could help the station compete more effectively and become more profitable?

Engineers are the only ones who can answer these questions. So, throw away that pocket protector full of screwdrivers and fire up the computer. Load a spreadsheet, word processor and maybe even a project manager. Put on your bean-counter hat and show a return on the management's investment in you. Tell your manager how to make more money, or at least how to save some.

Brad Dick

Brad Dick,
editor

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FCC update

Local cable-rate limits to be relaxed

By Harry C. Martin

The FCC is planning to change the standards that have sharply limited regulation of basic cable service rates by local franchising authorities since 1985.

The current standard

In 1985, the commission adopted a standard for determining whether cable systems face effective competition, and therefore not be subject to local rate regulation, based on whether there were three over-the-air TV signals available in the cable community. According to the commission, changed circumstances in the video marketplace warrant review of the 3-signal standard.

In the Cable Communications Policy Act of 1984, Congress sought to relieve cable systems of local regulation of their basic service rates to promote the growth of cable. However, Congress required the commission to periodically review its effective competition standard to take into account developments in technology relating to the video marketplace. The current proceeding involves redefining effective competition in light of changed marketplace conditions.

New data on basic tier composition

The increase in the number of channels generally offered on the basic tier is the fundamental change that the FCC says justifies re-examination of the effective competition standard. The commission's latest studies show that the basic tier now includes, in addition to retransmitted broadcast signals, cable networks, superstations and other non-broadcast services. One major reason that basic tier expansion has occurred is because cable operators have an incentive to shift programming to the basic tier to make that service more attractive to potential subscribers. With rate deregulation of the basic tier in effect, enhancement of the basic tier has maximized cable operators' pricing freedom and net revenue. Although subscribership has increased, rates for basic cable service also have risen.

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

Alternative methods of effective competition

The commission is considering the following alternative ways of determining whether cable systems face effective competition in light of the changed composition of the basic tier:

- Increase the number of over-the-air signals that would constitute effective competition and require some combination of network, independent and non-commercial signals.
- Define effective competition by the availability of alternative video delivery systems, such as a second cable system, MMDS, SMATV, DBS or home satellite dishes.
- Use high cable penetration as an indicator of undue cable market power or, alternatively, as an indication of the value of cable service when a competitive video marketplace is found to exist.
- Consider effective competition to exist when all subscribers in the cable community can purchase cable service on an "unbundled" or per-channel basis.
- Use any combination of the above measures to ensure effective competition.

Rate regulation methodology

To assist local franchising authorities' oversight of cable rates, the commission is considering the adoption of uniform reporting and accounting systems similar to those that apply to telephone companies. Another proposal is to reinstitute the commission's annual financial reporting system and require the reports to be made publicly available. The commission also will consider alternative forms of rate control, including incentive regulations such as "price caps," which would place limits on the rate a cable system may charge for basic service. Price caps might give cable systems incentives to avoid unnecessary costs while offering consumers strong protection against increased rates and market dominance by a cable operator.

New criteria developed for evaluating RF radiation

The commission has adopted new criteria for evaluating the environmental effects of RF radiation when ANSI exposure guidelines are exceeded because of emissions from multiple transmitters. In the future, the actions necessary to resolve a multiple-station RF problem will be the shared responsibility of all licensees who contribute more than 1% of the applicable exposure limits.

The allocation of responsibility for corrective action is expected to be shared in proportion to the respective contributions of the stations involved, except when a newcomer to a site causes an increase in RF level to the point of non-compliance with ANSI guidelines. In such situations, responsibility for corrective action will fall on the newcomer.

The commission also has established guidelines for the measurement and interpretation of intense localized RF fields (hot spots) in relation to reradiating objects that distort the field. The FCC recommends a minimum separation distance of 20cm between a reradiating object and the closest sensing probe of a measuring instrument. The agency also advises that where the presence of a hot spot is indicated at a separation distance of 10cm-20cm, precautionary measures, such as posting warning signs, should be undertaken. Additional guidance on the measurement and interpretation of hot spots is included in the FCC's OST Bulletin 65, footnote 4.

Notification deadline for aural STLs/ICRs postponed

The FCC has set July 1, 1993 as the new deadline for all aural STL and intercity relay (ICR) transmitters to have a valid FCC notification authorization.

In 1985, the commission adopted a rule requiring all new STL and ICR transmitters designed to operate in the 944MHz-952MHz band to complete the FCC notification process to demonstrate that the equipment meets the agency's bandwidth limits. As of July 1, 1990, all aural STL/ICR transmitters in use were to be notified models.

In extending the deadline, the commission stated that the delay should not be interpreted as modifying the commission's intent to require licensees to use more spectrum-efficient bandwidths in congested areas.

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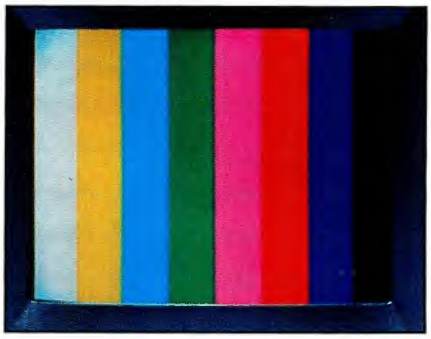

Check CAV with Lightning displays

By Margaret Craig

Electronic news gathering (ENG) launched component analog video (CAV) as a practical technology. The problems solved by CAV and the many benefits for video signal processing and distribution have expanded CAV's role in the production, post-production and broadcast environments. In addition, CAV is becoming the interconnect format of preference for many new facilities.

Most of the available test equipment, however, is designed for monitoring composite video signal quality. Although some adjustment in method and interpretation is possible for accommodating component signal monitoring, it can be a cumbersome and time-consuming process. A new type of display developed specifically for CAV monitoring addresses some of these issues. Because of its zig-zag nature, this display is referred to as the *Lightning display*. (See Figure 1.) The Lightning display provides an extremely powerful means of quickly evaluating CAV quality with a standard color bar signal.

Craig is an engineer, technology development group, Tektronix Television Division, Beaverton, OR.

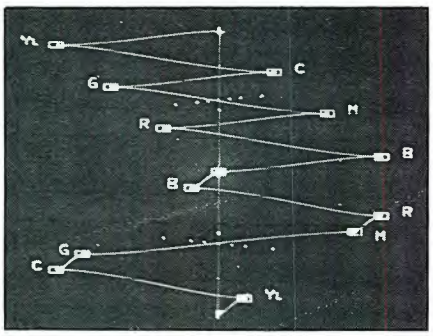

Figure 1. *The Lightning display provides a quick, easy way to check CAV signals.*

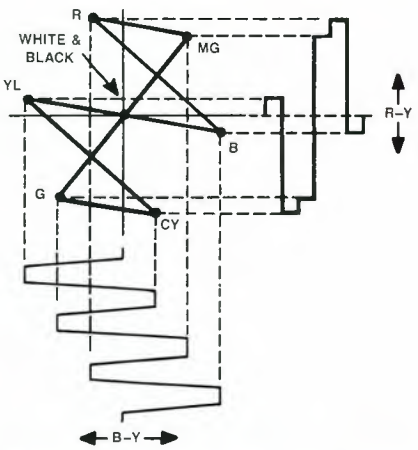

Figure 2. *In the component domain, plotting B–Y and R–Y signals yields a display similar to a conventional composite vector display, but this display tells us little about the luminance (Y) component.*

Creating a Lightning display

The purpose of the Lightning display is to provide a single XY display of the three component signals (Y, R–Y, and B–Y). This display contains all the information needed to ensure that the correct timing and amplitude relationships are maintained among the three component signals.

The Lightning display is similar in concept to the familiar vectorscope display used in composite monitoring. A composite vector display is obtained by applying the decoded B–Y and R–Y signals to the horizontal and vertical axes of an X–Y display. A similar vector display can be obtained in the component domain by applying the R–Y and B–Y channels directly to the X–Y display. The resulting display, shown in Figure 2, looks somewhat different from the composite vector display because the two channels are not scaled in the same way.

A complete CAV monitoring solution somehow must include the third component, luminance (Y), which imposes a 3-D vector display requirement. The question becomes, "How do we plot three components in a practical and easy-to-interpret 2-D vector display?" The answer is the Lightning display, which essentially combines two 2-D plots into one. The basic concept behind this display is illustrated in Figure 3.

The top half of the Lightning display is created much like a conventional vector pattern, except luminance (Y) is plotted vertically and B–Y is plotted horizontally. This half of the display, therefore, shows the relationships between these two components (Y and B–Y).

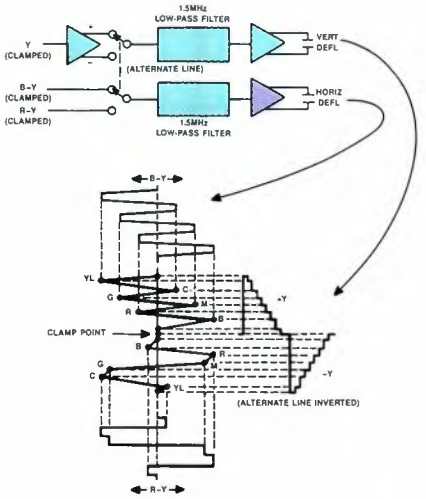

Figure 3. *The Lightning display plots B–Y signal against positive luminance signal and R–Y signal against inverted luminance, yielding a zig-zag or "lightning bolt" display.*

The lower half is similar, again plotting Y vertically, but now R–Y is plotted horizontally. In this part of the display, luminance has been inverted so that increasing luminance plots downward.

Plotting luminance vs. B–Y and *inverted* luminance vs. R–Y separates the two halves of the display, providing easier viewing and interpretation. The three components are compared two at a time, with luminance common to both halves of the display.

Signal processing prior to the display also includes backporch clamping and filtering. Clamping each of the three signals stabilizes the reference levels at the center of the display, even with changing APL of the components. The center dot of the display represents zero signal (backporch level) in all three components. Low-pass filtering provides a "cleaner" display without the distractions of unnecessary high-frequency video or noise signals.

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Circle (7) on Reply Card

Bring your array back into tolerance

By John Battison, P.E.

Last month's column outlined the initial steps to realign a DA system. An important first step is to know exactly what's in your system. Consider having a consulting engineer develop a computer printout of the array parameters required to produce your desired patterns. This information may enable you to use a different set of parameters that are more stable or efficient.

Network arms

The report will show the reactance of every individual unit in the system. (See Figure 1.)

To properly tune the array, each ATU must be adjusted to the proper transfer ratio, which means that the base operating impedance is matched to the line impedance. Incidentally, the approximate phase change is planned by the designer.

Make some tests

With a bridge and signal generator, connect the ground lead to the junction of L_1, L_2 and L_3. This junction should be grounded via a wide ground strap to the ATU ground. Use wide straps to avoid unwanted inductive reactance; even short, thin wires can introduce unexpected and misleading inductive reactance values.

Clip the other lead of your bridge to the input of L_1. There should be no other connections to L_1 or the section you are measuring. Record the resistance and reactance measurements.

When measuring coils or capacitors, you should find *only* reactance. There is no resistance in a coil or capacitor at RF, unless the coil connections are dirty or the capacitor is faulty. A capacitor should normally read zero or a low resistance. Any value above 0.5Ω is suspect. Check the component for poor connections or faulty dielectric.

Next, measure L_2 and C_2 in the same manner. Make sure nothing else is connected to the arms that you are measuring. Also, make sure that the jacks are open and that you're recording only the arm components of interest.

It is a good idea to begin thinking of each arm as an equivalent reactance: X_1 for the input arm and X_2 for the output arm, including both the inductive (+) and capacitive (−) values. When you begin calculating and looking for specific values, you will be dealing with reactance (jX).

When measuring $X_3(L_3\text{-}C_3)$, you reverse the connections and ground your bridge to the ground side of C_3 and lift all connections to the junction of the three arms.

When you have finished, the ATU should be set to transform the antenna's base operating impedance to the transmission line impedance. Actual values may vary slightly from theoretical values, so a small adjustment may be necessary.

Determining line length

Sometimes it's important to know accurately the actual phase shift (electrical length) in a transmission line. A common method is to go by physical length. If higher accuracy is needed, however, the following test can be performed.

Short the far end of the line. Use a signal generator capable of up to 5MHz operation and connect the high-impedance output to the coax line input using a series 500Ω to 1kΩ resistor. This prevents shorting the generator output. A low-impedance generator will not work because it will load down the line. Also, connect a VTVM and a frequency counter at the same point. If you have an extremely accurate generator whose frequency can be read precisely, the counter is not needed.

Tune the generator up or down the band until a deep null is found. Record the frequency as F_1.

Continue in the same direction and find the next null. Record that frequency as F_2.

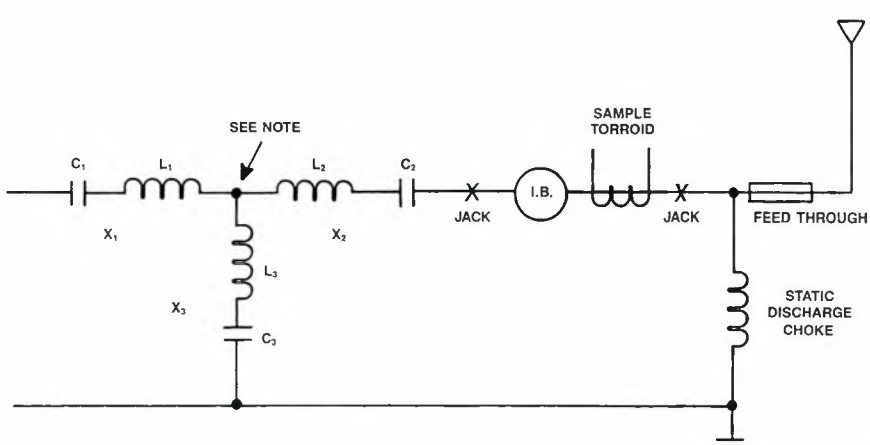
Determine the phase shift using the following formula. Make sure all frequencies are expressed in the same units, kHz or MHz.

$$\text{Electrical length in degrees} = \frac{F_0}{F_1 - F_2} \times 180$$

F_0 = station transmitter frequency
F_1 = frequency of first null
F_2 = frequency of second null

This method is useful in situations where lines are buried or otherwise impossible to measure for length.

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



Note: Disconnect all arms here. Connect "hot" bridge lead here to measure X_3. Ground this point when measuring X_1 and X_2.

Figure 1. *Example of an ATU schematic. When measuring the reactance of each arm in the ATU, be sure it is disconnected from other components; otherwise, the values measured will be incorrect.*

qual·i·ty \'kwäl-ət-ē\ *n, pl* **-ties** [ME *qualite,* fr. OF *qualité,* fr. L *qualitat-, qualitas,* fr. *qualis* of what kind; akin to L *qui* who — more at WHO] **1 a** : peculiar and essential character : NATURE **b** : an inherent feature : PROPERTY **c** : CAPACITY, ROLE **2 a** : degree of excellence : GRADE **b** : superiority in kind **3 a** : social status : RANK **b** : ARISTOCRACY **4 a** : a distinguishing attribute : CHARACTERISTIC **b** *archaic* : an acquired skill : ACCOMPLISHMENT **5** : the character in a logical proposition of being affirmative or negative **6** : vividness of hue
syn QUALITY, STATURE, CALIBER *shared meaning element* : distinctive properties or character (as of merit or superiority : as in EIMAC power grid tubes—the industry-wide standard for quality).

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Uncommon engineers

Ogden Prestholdt

By Elmer Smalling III

If you ask Ogden Prestholdt how today's aspiring broadcast engineer should prepare for a full, long-term career, he'll strongly recommend a firm grasp of the basics — physics, mathematics and engineering. He should know. After all, it certainly worked for him.

Starting out

Today, Prestholdt's name looms large in the broadcast field, especially in the area of antenna design. Back in 1938, however, his name was where it mattered most at the time: on his diploma. He had just earned his bachelor's degree in electrical engineering from the University of Minnesota, Minneapolis. While doing graduate work in physics, math and engineering, he taught math and physics at the Institute for Technology in the engineering department.

Not long after, Prestholdt took a position as director of technical operations for WLOL-AM, a 1kW, 24-hour Minneapolis station. He built the station, ran the entire operation and hired the staff, duties not expected of today's DOEs. WLOL went on the air on his first wedding anniversary, in June 1940. Four years later, he made his way to New York for his new job in the engineering department at CBS.

A network career

As an engineer for the network, Prestholdt worked at a transmitter plant in Wayne, NJ, the site used by CBS before it moved its AM antenna to Columbia Island in the East Bronx. One of his many new facilities projects was the layout of the CBS TV transmitter atop the Empire State Building, in 1952. The engineering department was separate from the technical operations department, which worked on studio design.

In 1965, he disassembled the Columbia Island AM transmitter after moving the network radio antenna to High Island, another privately owned island just north of City Island. There on High Island, which was inhabited by a handful of summer cottage dwellers, CBS shared its new antenna with NBC radio. The dual antenna became famous, but not only because it symbolized cooperation between the two biggest competitors in the world's largest market. The ingenious design of the antenna also caught the attention of the industry.

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

Profile

- *Director of Radio Engineering, CBS*
- *Developed skywave antenna*
- *Awards:*
  IEEE Fellowship
- *Registered professional engineer in Maryland, New York and the District of Columbia*
- *Member and past president of the AFCCE Association of Federal Communications Consulting Engineers.*

Prestholdt had played a major role in the design and installation of this unique facility. To dramatize the 110dB isolation between the two signals on one antenna, he had a $^1/_{10}$W resistor placed across the final circuit of the WCBS transmitter while the WNBC portion was radiating full power. He still has the intact resistor!

Prestholdt was appointed CBS Director of Radio Engineering in 1960. During this period he became active in the Institute of Electrical and Electronics Engineers (IEEE), presenting a number of technical papers on antenna systems and support facilities.

Other projects

In 1969, after 25 years with CBS, Prestholdt joined the Washington, DC, consulting firm of A. D. Ring as a partner. He became involved in a number of projects in which clients' buildings impinged on AM antenna arrays, affecting the antenna patterns. He developed detuning schemes that made certain radiators electrically invisible. This allowed the placement of buildings on precious real estate sites that had been off limits because of the possibility of interference with antenna systems and the subsequent distortion of FCC license parameters.

One of these cases involved several FM stations in Prestholdt's home town of Minneapolis, which were multiplexed into a common antenna on top of one of the city's tallest buildings. Third-order harmonics caused a great deal of intermodulation and were a source of interference with receivers throughout the city. Because of this problem, these transmitters were operating at reduced power. Prestholdt undertook a study to determine the cause of this interference, evaluate possible solutions and develop a program that would predict this type of interference at the many multiple-transmitter, single-antenna FM sites across the country. He released his recommended program to the FCC last year.

Prestholdt retired from A. D. Ring in 1985 and is now a consultant to the Washington, DC, firm of duTreil, Lundein and Rackley.

An ingenious scheme

Prestholdt has developed a revolutionary method to control skywave and groundwave antenna patterns. If a station in city No. 1 must protect a station in city No. 2 from its skywave, its horizontal radiation pattern usually is designed with a big notch on the city No. 2 directional coordinates. This protects the second station and also affects the close-in coverage in the direction of the first station. Using Prestholdt's scheme, however, the skywave can be controlled without notching the horizontal pattern.

In the field of radiator detuning, he is working on a project involving two 500,000-square-foot, 30-foot-high buildings (each large enough to hold two football fields), located near an antenna farm that includes a 5-tower directional array. When he is finished, the buildings and antennas will co-exist peacefully.

More to come

An IEEE Fellowship, an honor reserved for those who are truly outstanding in the area of broadcast engineering, recently was bestowed upon Prestholdt. This uncommon engineer doesn't intend to rest on his laurels, however. He has a number of projects planned for his retirement years, including the writing of books on antenna systems and their design.

No doubt he will continue to contribute improvements to the field of broadcast engineering.

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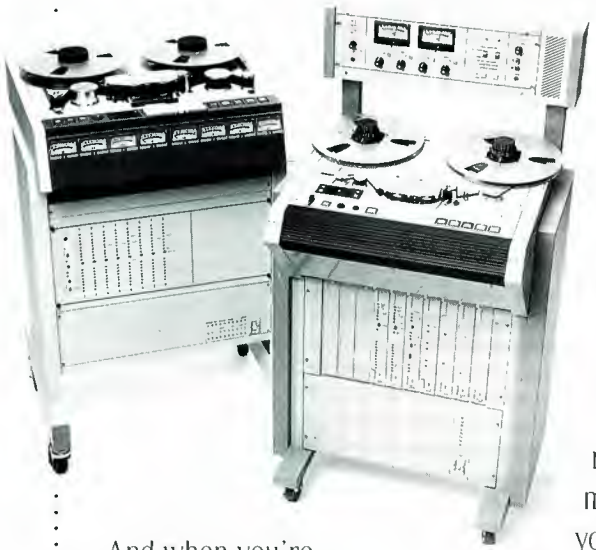

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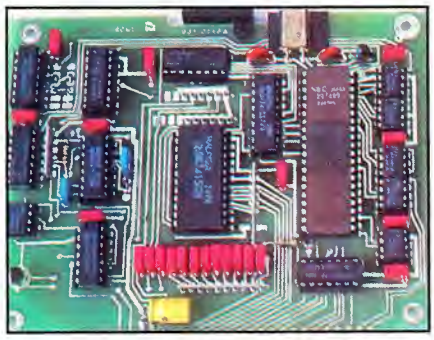

Using Smith chart scales

By Gerry Kaufhold II

Some scales of the Smith chart are placed horizontally off to the side. The SWR and attenuation scales are *radial* scales. Last month, we showed how to use these scales by aligning a straightedge at right angles to the scale of interest, finding the desired value, and tracing a line up to the Smith chart. We used the intersection of the traced line and the resistance component scale as a radius for an attenuation or SWR circle.

The bottom transmission coefficient scale is a *magnitude* scale, and must be used differently. Use a magnitude scale by taking a compass or dividers to transfer lineal distances from portions of the Smith chart. (See step A in Figure 1.) More about this later.

Admittance, conductance and susceptance

The Smith chart shown (refer to Figure 1) is for series circuits. Normalized resistances and reactances are given in ohms and can be plotted directly on the chart. The general equation for impedance is:

$Z = R \pm jXR$ (in ohms)

Where reactance jXR includes inductive and capacitive reactance components:

$X_C = 1 / jC$

$X_L = L$

For most applications, parallel (shunt) circuits also must be included in circuit calculations. This introduces admittance.

The general equation for admittance is:

$Y = G \pm j\,B$ (in mhos)

The specific components are:

$+jB = 1 / X_C$

$-jB = 1 / X_L$

As can be seen, mathematical conversion between series and shunt circuits can be difficult.

Graphical solutions

The Smith chart can make this conversion graphically. Using series impedance $1 + j1$ as an example, plot the normalized impedance of each component. (See step B of Figure 1.) Using a straightedge, draw a line from the plotted point, through prime zero, and on through the other side of the Smith chart. Align the compass or dividers between prime zero and the plotted impedance point and draw an arc that intersects the line 180° away from the beginning point. (See step C of Figure 1.) Mark this new point, which is the same distance away from prime center but 180° across the chart. This is the admittance value. To read off the normalized conductance and susceptance values, notice that the lower portion of the Smith chart (negative) is labeled *inductive susceptance component*. If the admittance point lies in the bottom half of the chart, read it as inductive susceptance ($-jB$). The upper portion of the Smith chart (positive) is labeled *capacitive susceptance*. If the new point lies in the upper half of the chart, read it as capacitive susceptance ($+jB$).

This graphical solution may seem simple when compared to the mathematics, but next month we will introduce a simple trick that allows us to eliminate the conversion altogether.

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

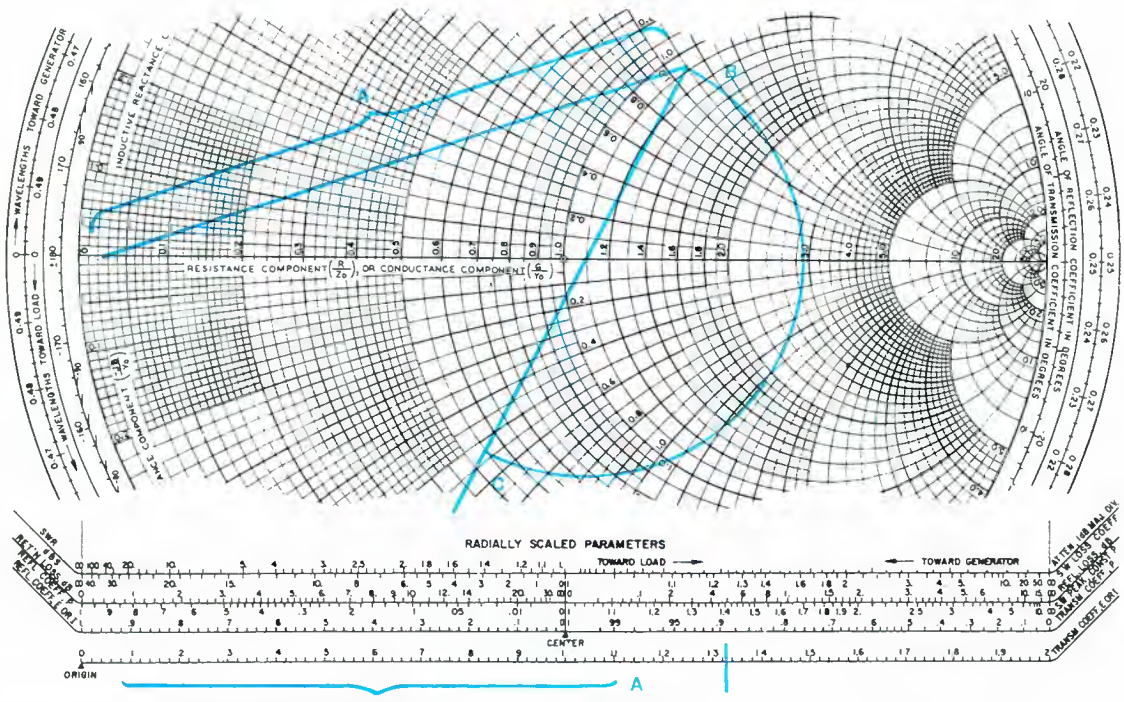

Figure 1. Impedance to admittance conversion using linear scales on Smith chart.

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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!"

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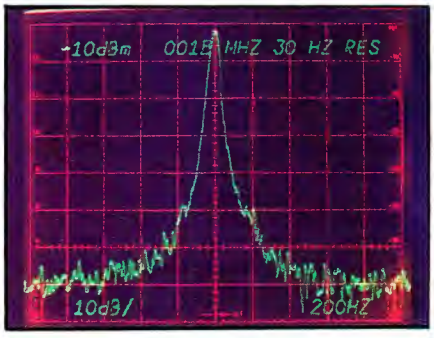


Aerosol cans can be deadly

By Brad Dick, editor

It was going to be a hot and humid weekend, thought the engineer as she parked the company car in the office parking lot on Friday. She went into the station to pick up a few things, returned to her own car and headed home. When she went to work on Monday, this is what she found.

Aerosol-powered bomb

The windshield of the company car looked as if it had been attacked by vandals or shattered in a violent storm. The damage actually was caused by a small aerosol can, commonly used by technicians and engineers, that had exploded in the heat.

Warning labels on these cans should be taken seriously.

Even though the engineer left the window open slightly to let in some air, the temperature inside the car rose to an extreme level, causing the aerosol can of cleaning solution to explode. It damaged the dashboard, hit the windshield twice and finally broke through it, landing in a vacant lot more than 100 feet away from the car. Fortunately, the accident occurred over a weekend in an empty parking lot.

To avoid an accident like this, and to keep unexpected expenses off your vehicle operating budget and monthly expense statement, warn your staff about the danger of leaving aerosol cans exposed to direct sunlight. Warning labels on these cans should be taken seriously. If the aerosol can had exploded when someone was driving the car, the driver and any passengers could have been injured or possibly killed.

As a result of high temperatures in the car, the small aerosol can, shown here, caused severe damage to the windshield and dashboard.

The windshield of the company car looked as if it had been attacked by vandals or shattered in a violent storm.

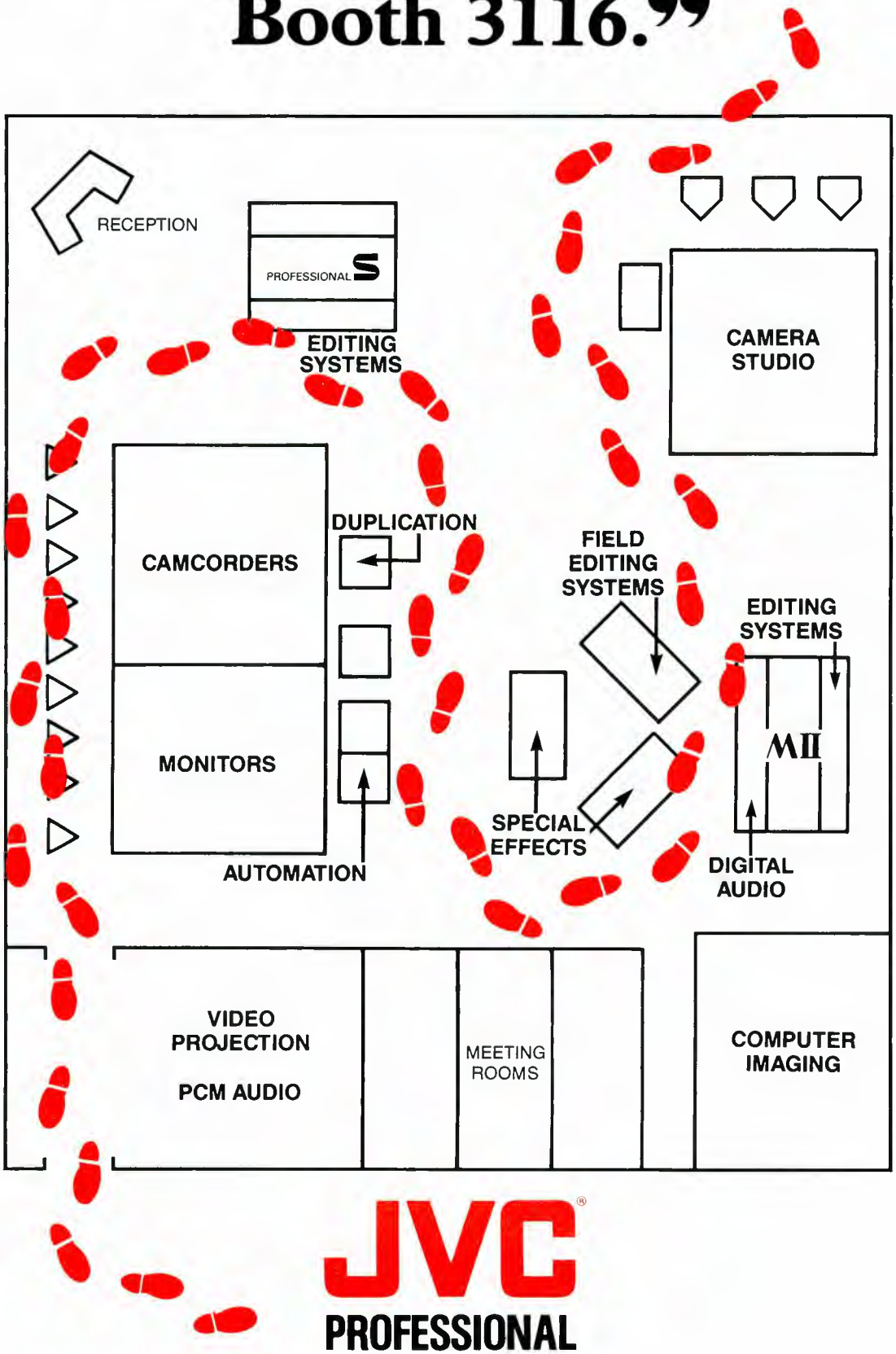
Aerosol cans should not be left on the passenger seats, on the dashboard or in a place where they can be exposed to direct sunlight. Such cans should be stored in a sealed tool box and placed in the trunk. If they should explode there, the damage would not be as great, and you wouldn't lose the use of your company car while the damage was being repaired.

As we approach warmer weather, don't let a $2 can of cleaning solution cause $1,000 worth of damage to your vehicle. Even during the cooler months, strong sunlight can send internal temperatures of vehicles well above the 100° mark. Remind your staff of the potential for injury and damage when aerosol cans are exposed to high temperatures.

Interior dashboard damage. If the can had exploded when the car was being driven, the results could have been fatal.

Editor's note: This technical tip originally appeared in *Micro-Service Management*, an Intertec Publishing magazine, and was submitted by William Herbert of Coordinated Service, Littleton, MA.

"There are 14 good reasons to visit JVC at NAB Booth 3116."



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Motivate from the employee's viewpoint

By Brad Dick, editor

What motivates your employees to perform their jobs? It could be the money, or it could be other, less obvious reasons. If your employees are working for other reasons, you are missing out on some effective inducements for improved performance that may not cost you anything.

What is motivation?

Motivation has been described as the psychological process that gives behavior purpose and direction. By appealing to this process, managers attempt to get their staffs to willingly pursue the organization's goals.

It sounds simple, but motivating people can be one of the most difficult tasks a supervisor undertakes. Motivating others is an unending task, because performance and morale will fall if you stop.

Walk in my shoes

Every employee is motivated; the only differences are in the motivations. You may have found yourself saying that you have an employee who is unmotivated. More often than not, the employee is not producing the work the supervisor expects.

An investigation often will reveal that the employee does not understand what the supervisor expects. It's common for employees to believe they are performing well when their supervisors believe just the opposite.

Supervisors often are guilty of looking at the work to be completed only from their position. It's easy to tell a VTR operator to record the children's show at 1 p.m., but what if the operator also is supposed to record a network feed and dub a spot reel for the 5 p.m. news, all on three machines?

To the supervisor, the assignment was just another simple task, but the operator thinks that she's been asked to perform an almost impossible feat. This misunderstanding of the employee's view of the situation by the supervisor can affect employee morale. As supervisors, we need to consider the job from the employee's point of view.

What's in it for me?

People work for reasons other than money. It would be much simpler to encourage their actions if that weren't the case. All you would have to do is determine the amount of money required to motivate an employee, and you would have instant success. Successful supervisors understand that the people in today's work force seek to satisfy other needs, such as acceptance, social interaction, autonomy, control and power.

Reward me

As employees' needs change, supervisors must seek to better understand what those needs are. Sometimes that's difficult, but some generalizations are apparent.

A survey taken of hourly employees revealed what is important to workers. The respondents were asked to rank, in terms of personal importance, 10 job-related factors. The supervisors then were asked to rank in order the factors in terms of how they expected the employees to rate them. The results are summarized in Table 1.

The factors the employees rated as important did not match the expectations of the supervisors. The employees rated *interesting work* as the number one factor to job satisfaction. That same factor was rated 5 by the supervisors. *Good wages* were rated 5 by the employees, but 1 by the supervisors. These differing viewpoints could be the cause of conflict.

The best way to get others to perform a task is to make it worthwhile to them. Make it in your employees' best interest to do what you want done. Structure the job environment so that their needs are met and yours (and the company's) will be, too.

It's been estimated that as much as a 300% increase in output could be realized by paying attention to what's important to the employees. Keep them informed about what's going on, and involve them in the process.

FACTORS:	EMPLOYEE RANKING	SUPERVISOR RANKING
• Interesting work	1	5
• Full appreciation of work done	2	8
• Feeling of being in on things	3	10
• Job security	4	2
• Good wages	5	1
• Promotion and growth in the firm	6	3
• Good working conditions	7	4
• Personal loyalty to employees	8	7
• Sympathetic help with problems	9	9
• Tactful discipline	10	6

Table 1. *Comparison of job satisfaction as viewed by hourly employees and their supervisors. Matching company-provided inducements to the desires of the employees is an important key to profitable operation.*

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SBE Update

Regulations delay requested

By Bob Van Buhler

The society filed a letter with the FCC last November requesting a 3-year delay in implementation of the Report and Order in Mass Media Docket No. 85-36. This action, adopted in 1985 after predicted aural STL band congestion in a variety of markets, was designed to ensure that all aural studio-to-transmitter links (STLs) and intercity relays (ICRs) met long-standing technical standards. It also encouraged the production of STL and ICR equipment capable of using narrower bandwidths. As of July 1, 1990, all STLs would be subject to new regulations that would have forced many stations to modify or replace their STL systems.

The society's request was supported in December by a filing from National Public Radio (NPR), who pointed out the expense involved to the public. NPR contended that the change should be spaced over several years to enable the use of NTIA public telecommunications facilities program funds to meet this need.

Although the implementation of the rules would affect all licensees financially, SBE and NPR were the only organized groups to request a delay. Several individual public and commercial licensees asked for a delay, but broadcast organizations representing management and ownership were silent on the issue. The commission, responding to the arguments of the society and NPR, granted a 3-year delay in enforcement of the measure. Licensees remain responsible for compliance of their equipment, but now have up to three years to certify or replace any equipment manufactured before Oct. 31.

SBE president Brad Dick encouraged members to let their managers know that the society's action in obtaining the delay will have a positive impact on their operation and pocketbook. "Tell them now," said Dick, "and remind them again when you request funding for your trip to the SBE national convention this fall." SBE Director Dane Ericksen of Hammett & Edison, and SBE Counsel Chris Imlay were the key players in the successful action.

Another SBE project is a petition proposing amendment of aural STL rules to make these facilities subject to minimum antenna standards, similar to TV auxiliary stations' standards since 1981. The proposal would require all future aural STL stations to provide specific desired-to-undesired signal ratios to existing co-channel and first-adjacent channel stations. These would be based upon higher-performance antenna assumptions in congested areas, and a less-strict standard in areas where interference is not as likely.

Due to a misprint in section 74.651, the frequency tolerance for aural STLs is listed as ±0.005%. At 950MHz, this corresponds to a tolerance of 47.5kHz, which is unacceptable for a 200kHz-300kHz channel. SBE proposes to change the listed tolerance to ±0.0005%. Other revisions in the petition include a 10W limit on aural STL transmitter output power and a 22.1km minimum path length.

Membership survey

Dick has met another goal of his administration, commissioning a demographic survey of SBE members. In the next *President's Newsletter*, members will find a survey, which will help the society better identify the needs and desires of its members. The information will be used to develop member services and training programs.

All members must complete and return the survey. Full participation will result in more customized programs to benefit the members. The survey was prepared and will be tabulated by a professional researcher. All responses will be anonymous and treated confidentially.

Renewal time

SBE membership renewals, which will be mailed April 1, will reflect a new look. The form will contain a brief demographic survey. The results will help the society to design mailings to better meet individual member career paths and interests.

The application also will contain an order form for SBE products. Members can order past convention *Proceedings*, the SBE lab coat, T-shirts and membership pins. The SBE certification pin is a special new product. A pin has been custom-designed for each level of certification in both the radio and TV categories. Don't miss this opportunity to show others your certification level. Order your pin today.

Frequency coordination and computers

Gerry Dalton, who has served the society in frequency coordination, has been appointed director of management and information services for SBE. He is responsible for policy, direction and supervision of the society's computer systems and practices.

Dalton is currently interviewing Indianapolis computer companies who will provide the local hardware and software support. Dalton will supervise the company's work. The criteria for selection will be familiarity and skill in the use of database, compiler and local area network programs in use at the national office.

The latest version of the frequency coordination database software, version 2.9, is now complete. The update, with proper documentation, will be mailed to every coordinator listed on the National Frequency Coordination Committee (NFCC) list. The list, which was to have been taken over by the All-Industry National Frequency Coordinating Council, has been maintained by SBE's vice president Paul Lentz in absence of NFCC action.

Washington luncheon

At the SBE executive committee meetings in Washington, the society hosted a luncheon, attended by representatives of the FCC, Corporation for Public Broadcasting, public and commercial TV stations, training foundations, consulting engineers and the broadcast trade press.

A special service award was given to the society's second president, Charles Hallinan. John Battison presented the award. Hallinan, chairman of the first local chapter, was responsible for successfully moving the society from its embryonic stage to national recognition.

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

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

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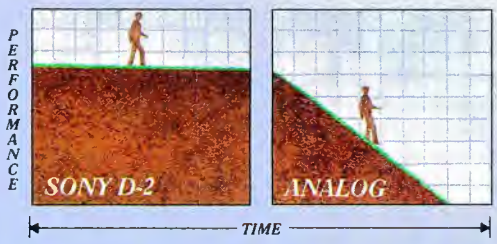
D-2 takes the amazing possibilities of digital technology and makes them a practical reality.

In fact, revolutionary is the only way to describe it. D-2's digital world is a place where performance is consistently extraordinary. Where every tape copy is as good as the original. Where audio is as important as video. And where machines operate without the need for constant adjustments.



D-2 maintains consistently high performance.

In the digital world, a D-2 VTR does its job just about perfectly. So you can too.

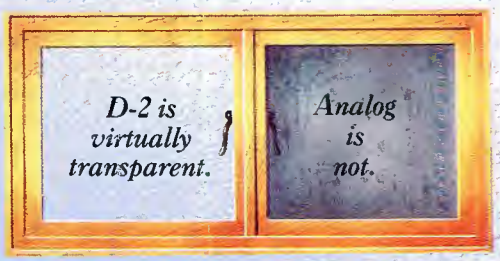
And it's all a matter of fact.

D-2's picture quality is exceptional from the start, and it stays that way consistently. Here's why:

D-2 effectively eliminates dropouts.

D-2's unique error correction and concealment system means you'll never have to worry about dropouts.

D-2's digital transparency is another clear advantage.



And copies of D-2 tapes aren't dubs.

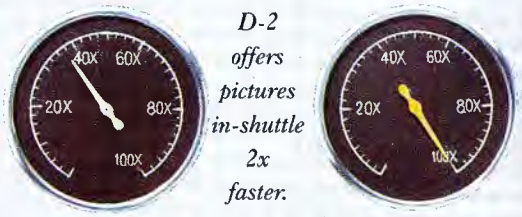
They're "clones." Digital replications indistinguishable from the original.

As for audio, D-2 VTR's have broadcast sound quality previously unheard of.

formance machine would be hard to work with. But in fact, D-2 is quite easy to use.

For example, D-2 shows you pictures-in-shuttle faster and in color. So you can work more quickly and efficiently. And one person can comfortably operate up to eight D-2 VTRs. Which makes it a lot easier to do a lot more.

ANALOG *D-2/DVR-18*



D-2 offers pictures in-shuttle 2x faster.

who's satisfied tape recorders, face the facts.

D-2 combines digital audio with digital video.

Four independently editable channels of CD quality digital sound. In stereo that never needs a phase adjustment.

Fact is, no other composite VTR performs as well as D-2. In both video and audio. You might think such a high performance machine would be hard to work with. But in fact, D-2 is quite easy to use.

Given all this intelligence, you'll have to agree. Sony D-2 sets a new standard in recording technology. After all, you can't argue with the facts.

D-2 lets one person easily operate up to eight VTRs.

For more information call (800) 635-SONY.

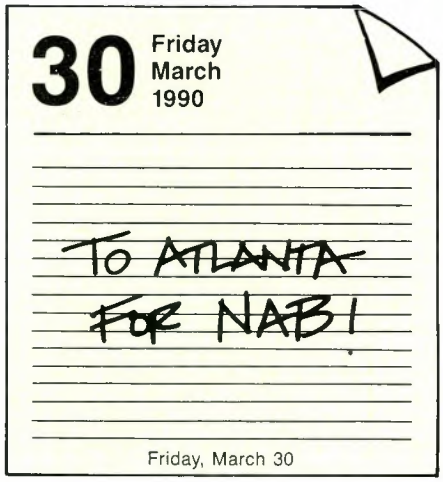
SONY

BROADCAST PRODUCTS

D-2

Show preview

Frankly, my dear, it's time to pack



That broadcast industry show of shows — the National Association of Broadcasters Engineering Conference and Exhibition — is only days away. This year, attendees of the annual event will find themselves deep in the heart of Dixie: Atlanta. The Engineering Conference will begin on Friday, March 30, one day before the official opening of NAB '90. The sessions will offer a wide variety of technical information covering the latest in technology for both radio and TV applications.

If you've ever attended an NAB convention, you know it's a grueling exercise in setting priorities. There is so much to do and so little time to do it. To help you get the most out of the show, the **BE** staff has compiled the following condensed schedule for the Engineering Conference. Use it to work out your own personal agenda beforehand. No matter how talented or organized you are, you can't be everywhere at once, so consider joining forces with your colleagues to help in covering sessions. With the buddy system and some good note-taking, you can trade useful information with fellow attendees.

Cassette tapes will be available, and many of the papers will be contained in the "NAB Proceedings." It might be a good idea to have your copy mailed back home. It promises to be a real backbreaker.

Radio sessions

FM Systems Engineering and Improvement
Friday, March 30
9 a.m.-11:30 a.m.

1. "NRSC Report," Wes Whiddon, *Group W Radio.*
2. "The Application of FM Boosters Without Terrain Obstructions," Mark S. Olkowski, *Osborn Communications*, and Edward A. Schober, P.E., *Radiotechniques Engineering.*
3. "Optimizing the FM Transmitting Antenna," Dr. Stephen Jon Blank, *Bogner Broadcast Equipment.*
4. "Customized Pattern Applications of the FM CBR Antenna," Fred A. Pantsios, *Harris Corporation.*
5. "The Significance of RF Power Amplifier Circuit Topology on FM Modulation Performance," Mukunda B. Shrestha, *Broadcast Electronics.*
6. "A New Approach to Prediction of Service and Interference for FM, VHF and UHF Television Broadcast Stations Using Terrain Sensitive Propagation Analysis," John Kean, *Moffett, Larson and Johnson.*

Digital Audio Systems
Friday, March 30
1:30 p.m.-5 p.m.

1. "Digital Audio Broadcasting for Television and Radio: Efficient Modulation Techniques," Craig Todd and Menno Merringa, *Dolby Laboratories.*
2. "Digital Audio Techniques for Remote Broadcasts," Paul Donahue, *Gannett Radio*, and Mark Durenberger, *WCCO-AM.*
3. "EBU/DAB Sound Broadcast System," George T. Waters, *European Broadcasting Union.*
4. "7kHz Audio in ISDN B-Channel Channels," Tony Masiello, *CBS Radio Division.*
5. "PCM Digital Audio Technology for S-VHS Video Cassette Recorders," Neil Neubert, *JVC Professional Products Company.*
6. "Low-Cost Digital Audio Storage System," Tim P. Valley, *MacroMedia.*
7. "Narrowband Digital Systems," Skip Pizzi, *National Public Radio.*
8. "CD Player Maintenance," Laura Tyson, *Denon America.*

Radio Engineering
Sunday, April 1
9 a.m.-12:05 p.m.

1. "Building and Operating a Multipurpose Remote Studio Vehicle," Michael D. Callaghan, *KIIS-FM.*
2. "Design and Development of a Computer-Controlled On-Air Automatic Music System," Michele Sanders, *Drake Chenault Enterprises*, and Steve Kadner and Kevin Ferguson-Aquila, *Technologies Group.*
3. "Digital Program Control: Extending the Environment," David J. Evers, *Broadcast Electronics.*
4. "Simplified Maintenance Procedures Using Stereo Noise," John Bisset, *Delta Electronics.*
5. "Radio Data Systems, A North American Plan and an Update on the European Experience," Gerald M. LeBow, *Technical Marketing Consultants.*
6. "National Supervisory Network," William Sepmeier.

AM Systems Engineering and Improvement
Monday, April 2
9 a.m.-11:35 a.m.

1. "FCC Regulations Update," Roy Stewart, Mass Media Bureau Chief, *Federal Communications Commission.*
2. "NRSC Update," John Marino, *New City Communications.*
3. "Correlating AM Transmitter Performance with the Ability to Comply With the NRSC-2 'RF Mask'," Glen Clark, *Glen Clark and Associates.*
4. "On the Relationship Between AM Transmitter Out-of-Band Emissions and the FCC's Second and Third Adjacent-Channel AM Separation Requirements," E. Glynn Walden, *Group W Broadcasting*, and John Kean, *Moffet, Larson and Johnson.*
5. "Designing Radio Receivers for NRSC Specifications," Almon H. Clegg (consultant.)
6. "NAB Anti-Skywave Antenna Project," Kelly Williams, *NAB.*
7. "Test of a Four-Wire Counterpoise Antenna," Ogden Prestholdt, P.E., consultant.
8. "Computer Design of AM Directional Phasing Equipment," Jerry Westberg, *Westberg Consulting.*

FM Systems Engineering and Improvement
Tuesday, April 3
9 a.m.-11:25 a.m.

1. "Federal Communications Commis-

Harris Technology in Action

"The beacons were blown out of their sockets, but our transmitter barely blinked."

Robert LaFore knows all about lightning. As Chief Engineer for WQPW-FM "Power 96" in Valdosta, Georgia, he'd better: His 600 foot tower

WQPW'S 600 FT. TOWER TAKES THEM WHENEVER THERE'S LIGHTNING.

is the tallest object for miles around. "We've been hit so hard the tower beacons were blown out of their sockets," he told us recently, "and so often that the lightning rod looks like someone's been beating chunks out of it with a sledgehammer. But so far our new Harris HT 20FM transmitter barely blinks at lightning. Occasionally we get a PA Plate Overload message, but that's it."

Robert also knows something about Harris reliability: Until they received a power increase to 50,000 Watts last year, WQPW had been on the air with a 3.5 kW Harris transmitter for thirteen years. "That transmitter was very good to us," Robert reports. "Still is, in fact—it's our back-up now. Basically, we shopped around enough to be sure Harris could match or top the competition in both price and features: Things like Automatic Power Control for simple remote operation. Then we ordered a 20 kW HT 20FM transmitter."

About 45 days later WQPW's transmitter arrived (meanwhile, Robert supervised construction of a new transmitter building, tower and antenna). "We just took it out of the box and put it right on the air," he says. "Even the tuning movements were small. The installation went so smoothly, I told the factory 'You've got to do something—this transmitter's *boring*.' "

After a number of months of service, WQPW's HT 20FM remains just as "boring." Robert has only shut it down for routine monthly maintenance. "Even that is minimal," he told us. "I vacuum the cabinet out, check tube cooling, make sure nothing's overheating, and that's about it. Two or three times a week I do a meter check and log the readings. They hardly ever change. In fact, we're still using almost the same tuning numbers we got from the factory. And we're getting a very noticeable improvement in audio quality from our new Harris THE-1 exciter."

Chief Engineer Robert LaFore...

WITH HIS NEW HARRIS HT 20FM 20 KW FM TRANSMITTER.

As you can tell, WQPW is very proud of their new transmitter. We're just as proud that

FROM WQPW'S TOWER. AND YOU CAN SEE ALL THE WAY TO FLORIDA.

our HT 20FM is living up to their confidence in Harris engineering. But then, we expected it do exactly that from the moment it took shape on the drawing board.

For more information on HT family FM transmitters from 1 to 35 kW, call toll-free (800) 4-HARRIS, Ext. 3022. Outside the continental US, fax us at (217) 224-2764. And for the widest selection of studio products, call Allied Broadcast Equipment toll-free at (800) 622-0022.

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Circle (51) on Reply Card

sions Update," William Hassinger, Assistant Bureau Chief, *Federal Communication Commission.*
2. "Broadband FM Master Antenna," Robert Surette, *Shively Labs.*
3. "What Can Be Expected From the New Technologies in FM Stereo," Tom Keller, *Broadcast Technology Partners.*
4. "FM Limiting and Generation of the Composite Baseband," William H. Gillman, *Gentner Electronics Corporation.*
5. "A New Approach to FM Composite Baseband Overshoot Control," Greg J. Ogonowski, *Modulation Index.*

TV sessions

Television Automation
Friday, March 30
9 a.m.-12:05 p.m.

1. "News Automation and Machine Control: The Marriage of Journalism, Production and Engineering," Richard Pierceall, *BASYS.*
2. "An Automation Workstation — The Final Integrator," B.J. Goldsmith and M. J. Wolfe, *Connolly Systems Ltd.*
3. "Automatic Closed-Captioning Insertion," L. Sanders Smith, *Dynatech Newstar.*
4. "Studio Camera-Control Motion System," Bran Ferren, *Associates and Ferren.*
5. "Application of the Library Management Systems at the New CBS Broadcast Operations Center," John Beyler, *CBS.*
6. "The Use of Cart Systems at NBC," A. Siegel, *NBC.*
7. "Database Management for an Automated Cassette Recorder/Player System," William F. Carpenter, *Ampex Corporation.*

Graphics and Animation
Friday, March 30
1:30 p.m.-4:10 p.m.

1. "Broadcast Graphics: Balancing Budgets and Equipment Specifications," David Scammell, *Quantel.*
2. "The Engineer's Role in Implementing a New Look — Technical, Production and Management Considerations," Steven M. Davis, *WPRI-TV.*
3. "Real Time Weather Information in the '90s," Todd Glickman, *WSI Corporation.*
4. "3-D Graphic Animation Systems at NBC," J. Keane, *NBC.*
5. "Limelite Video Graphics Techniques," Marco Obdea, *Limelite.*
6. "Computer-Generated Graphics," Rick Lehtinen, ***Broadcast Engineering*** *magazine.*

Television Engineering
Saturday, March 31
1:30 p.m.-5 p.m.

1. "TV Optics for TV Cameras, the Implications...and the Challenge," Gerard Corbasson and Bernard Angenieux, *Angenieux Corporation of America.*
2. "A New Element That Provides Pattern Versatility in the Wavestar Antenna," Fred A. Pantsios, *Harris Corporation.*
3. "New Adaptive Digital Technology for Interfacing Production Intercom Systems to Dial-Up Telephone Lines," Steve Church, *Telos Systems.*
4. "Systems-Based Control of the Broadcast Process," Dan Desmet and Martin Piepers, *Barco.*
5. "The Role of Image Data Compression in Professional Video Recording," John Kearney and Charles Colleman, *Ampex Corporation.*
6. "Design Considerations for the New Format Composite Digital VTR Using 1/2-inch Tape," Yoshinobu Oba and Katsuaki Murayama, *NHK.*
7. "Broadening the Applications of Zoneplate Generators," John Horn, *Tektronix.*
8. "Switcher Crosspoint Reduction Techniques," David P. Bird, *Broadcast Television Systems.*

UHF Transmission Systems
Sunday, April 1
9 a.m.-11:40 a.m.

1. "Channel 69 Filter System," William A. DeCormier, *Dielectric Communications.*
2. "Improved Technological Solutions for UHF Power Tubes," H. Bohlen, F.T. Clayworth, R. Heppinstall and D.M. Wilcox, *EEV.*
3. "Field Performance of a Multiple-Stage Depressed-Collector Klystron Transmitter," James B. Pickard, *Harris Corporation.*
4. "Klystrode Transmitter Operation Progress Report," Al Korn, *Georgia Public Telecommunications Commission.*
5. "Recent Advances in Klystrode-Equipped Transmitters," N.S. Ostroff and R.C. Kiesel, *Comark.*
6. "Solid-State High-Power Transmitters," Jean-Marc Barrier, *Thomson-LGT.*

Advanced Television
Sunday, April 1
9 a.m.-12:30 p.m.

1. "High-Definition Production at Telesat Canada," Peter Plekaitis, *Telesat Canada.*
2. "The Antenna/Transmission-Line System and HDTV," Geza Dienes, *Andrew Corporation.*
3. "A Codec for HDTV Transmission Through Terrestrial and Satellite Digital Links," Mario Cominetti and Francesco Molo, *Telettra USA.*
4. "The Costs of Converting a Broadcast Facility to HDTV: An Update," Robert J. Ross, *WJZ-TV.*
5. "The Proposed SC-HDTV Program Production Standard," Wayne Breti, *Zenith Electronics.*
6. "HDTV Image-Compression for Reducing Bandwidth and Improving Received Image Quality," Robert L. Dhein and John Marcinka, *New York Institute of Technology.*
7. "The Common Image Format and the Common Data-Rate Approaches to HDTV Standards European View," T.J. Long, *IBA.*
8. "Using Genesys Technologies for Today's NTSC Expanded Services," Richard C. Gerdes, *Production Services Inc. (PSI).*

Advanced Television
Sunday, April 1
1:30 p.m.-5:05 p.m.

1. "Development of Advanced-Television (ATV) Planning Factors," Donald Jansky, *Jansky/Barmat Telecommunications.*
2. "ACTV Progress Report," Jack S. Fuhrer, *David Sarnoff Research Center.*
3. "HDTV Advanced Research," William E. Glenn, *Florida Atlantic University.*
4. "High-Definition Optical Disc System," Larry Thorpe, *Sony Advanced Products.*
5. "EDTV Development and Experiments," Nobuo Katsura, *NTV.*
6. "HDS/NA-6: A Simulcast High-Definition System," Mikhail Tsinberg and Alan Cavallerano, *Philips Laboratories.*
7. "Compatible MUSE Systems for Terrestrial Broadcasting of HDTV Signals," Yutaka Tanaka and Taiji Nishizawa, *NHK.*
8. "Widescreen 525 — An Economical Entry Into ATV," Merrill Weiss, *NBC.*

Television Audio
Monday, April 2
9 a.m.-10:50 a.m.

1. "A Practical Approach for Applying the M-S Stereo Microphone," David Ross, *Shure Brothers.*
2. "A Broadcaster's Experience With Locally Originated Stereo Broadcasts," Larry Posey, *KCNC-TV.*
3. "The Electromechanical Architecture of a Software-Based Television Audio Console," Richard S. Hajdu, *Orion Research.*
4. "SAP, Uses and Problems," Cary Wight, moderator, *PBS.* Presenters:

- Ira Goldstone, *KTLS-TV (Spanish language)*
- Robert Good, *WGAL-TV (NOA weather, IFB, translator)*
- Joseph J. Manning, *KAET-TV (classical music)*
- Bruce T. Herget, *WMPB-TV (data)*

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- Donald Sussman, WNET-TV (FM 13 music)
- Barry Cronan, WGBH-TV (descriptive video)

NTSC Ghost Canceling
Monday, April 2
10:50 a.m.-12:15 p.m.

1. "Predicting Television Ghosting Interference," Jack Dadourian, *Canadian Department of Communications.*
2. "Development of a Ghost Cancel Reference Signal for Television Broadcasting," Sigeo Matsuura, *Hitachi, Ltd.,* Hiroshi Miyazawa, *NHK,* Susumo Takayama, *Nippon Television Network,* Masao Usui, *Fuji Television Network,* Relichi Kobayashi, *NEC Home Electronics,* and Hiroyuki Iga, *Toshiba Corporation.*
3. "Ghost Canceling," A.G. Uyttendaele, *Capital Cities/ABC.*

Television Production and Editing
Monday, April 2
1:30 p.m.-4:35 p.m.

1. "The Integrated Digital Production Suite," Ken Carson, *Digital F/X.*
2. "Cost-Effective Digital Editing for Broadcasters," David Scammell, *Quantel.*
3. "Video and Audio Post-Production Switcher Systems," David E. Acker, *For-A Corporation of America.*
4. "Electronic Production Techniques for '60 Minutes' and '48 Hours'," Howell W. Mette, *CBS.*
5. "The Price/Performance Revolution in Digital Special Effects," Greg McCartney, *Ampex.*
6. "Broadcast and Video Production Applications of the Stereosurround Audio Production Process," Robert B. Schulein, *Shure HTS.*
7. "Synthevision — A New Chroma-Key Imaging Technique With Hi Vision Background," Shigeru Shimoda, Yasuaki Kanatsugu and Masaki Hayashi, *NHK Science and Technical Research Laboratories.*

Other sessions

Safety, Interference and Environmental Concerns
Saturday, March 31
1:30 p.m.-3:50 p.m.

1. "New Fire Protection Requirements for Indoor Installation of Coaxial Cable and Waveguide," Robert D. Leonard, *Andrew Corporation.*
2. "An Investigation of RF-Induced Hot Spots and Their Significance to Determining Compliance with the ANSI Radiofrequency Protection Guide," Richard A. Tell, *Richard Tell Associates.*
3. "Standards-Setting Work to Control Interference to Broadcasters," Kelly Williams, *NAB.*
4. "Field Testing of a Shortened EBS Alert Tone," Larry Estlack, *WSYM-TV.*
5. "Introduction and Presentation — Durham Life Broadcasting EBS Film," Robert B. Butler, *WPTF-TV.*

New Broadcast Technology
Sunday, April 1
1:30 p.m.-5:25 p.m.

1. "New Tower Construction Techniques," Ramon D. Upsahl, *Skilling Ward Magnusson Barkshire,* Larry Holtz and Gary Haerig, *KGON Radio.*
2. "Multichannel TV Combiners — Technology for the '90s," Jim Stenberg, *Micro Communications.*
3. "Distribution of Broadcast-Quality Video Using Telephony Transmission," Nicholas C. Stanley, *ADC Telecommunications.*
4. "Dynamic Precorrection of Component Video Signals for Improved NTSC Color-Encoded Pictures," John P. Rossi, *Intelvideo.*
5. "Transmission-Line Maintenance Using a High-Power Pulse Reflectometer," John Bisset, *Delta Electronics.*
6. "8-City DS3 Digital Video Trial — What Makes It Work," Robert J. Blackburn, *Bell Communications Research.*
7. "True 3-D Broadcast Television Without Glasses," Chris Mayhew, *Vision III Imaging.*
8. "Cable's Application of Fiber Optics for Improved Video Quality and Bandwidth," Walter S. Ciciora, *American Television & Communications.*

Computers and Communications for Broadcast Engineers
Monday, April 2
1:30 p.m.—5 p.m.

1. "How to Design a Computerized System for Scheduling Technicians and Engineers," Jim Fink, *PROMPT Corporation.*
2. "Practical Use of the Computer for the Broadcast Engineer," Matthew A. Sanderford Jr., *MARSAND.*
3. "PC Communications for Broadcasters," Phil Katz, *PKWare,* Chuck Forsberg, *Omen Technology,* John Hoffman, *New York Management Services, CompuServe,* Bill Tullis and Mark Leff, *Turner Broadcasting,* and John McAffee, *McAffee Associates/Interpath.*

Broadcast Auxiliary and Satellite Systems
Monday, April 2
2:45 p.m.-5:25 p.m.

1. "Utilization of Earth-Station Antenna Systems to Track Satellites That are in

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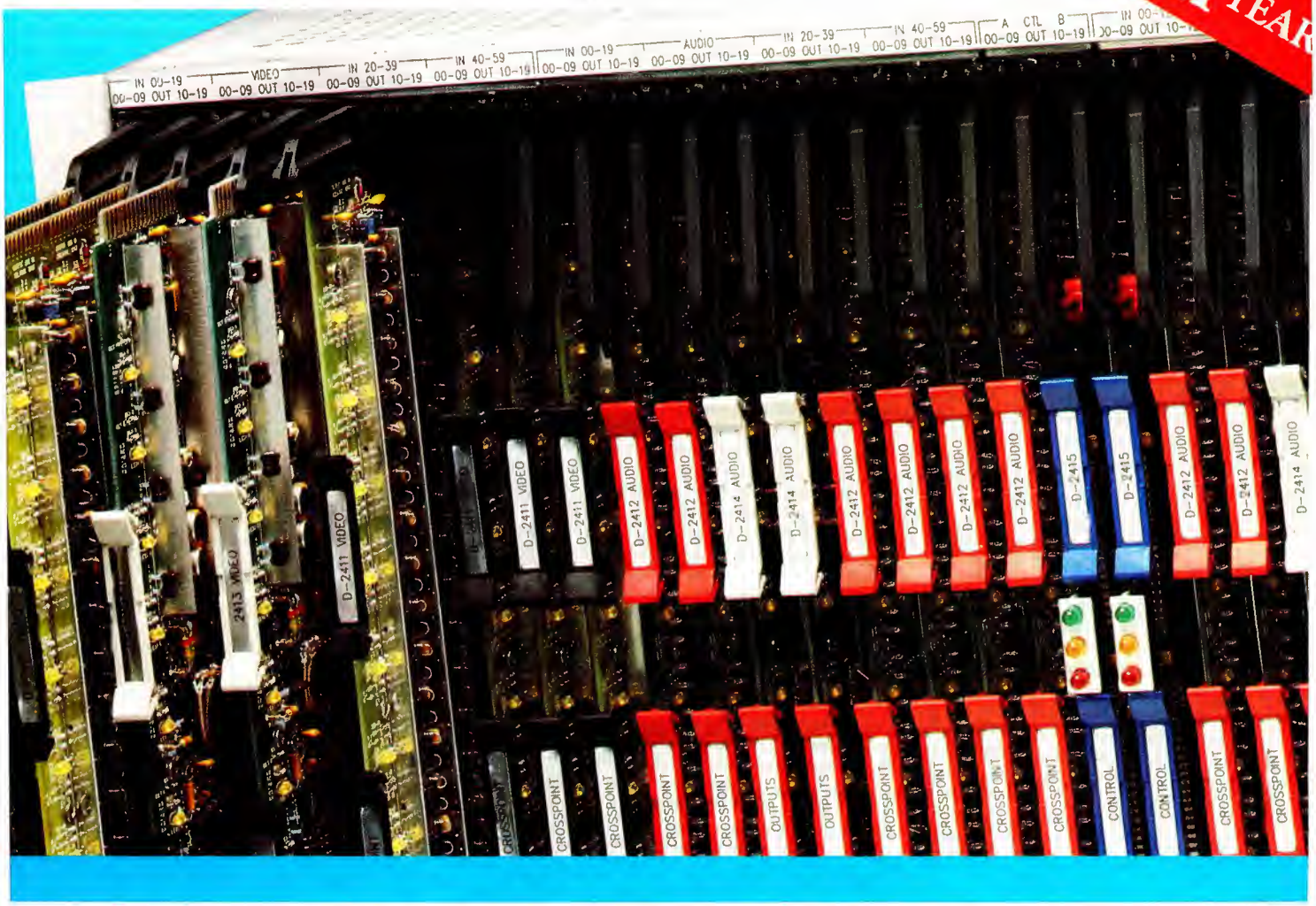

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Datatek's D-2400 switcher offers the flexibility to satisfy today's needs without sacrificing tomorrow's goals.

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an Inclined Orbit," Barbara Hodge and Walter Maciejewski, *Andrew Corporation.*
2. "Multichannel Audio Multipoint Distribution Service," Robert M. Unetich, *ITS Corporation.*
3. "PBS and the Next Generation of Satellites," C.V. Girod, P.E., *PBS.*
4. "Improved Audio Quality of Remote Broadcasts Using Multiline Telephone Extenders," Michael McKenzie, *Gentner.*
5. "A Personal Satellite Communications System for Voice and Data," Mark A. Harris, *CBS.*

Professional Development
Tuesday, April 3
9 a.m.-12:05 p.m.

1. "Careers in the '90s," Neil Fink, *Neil Fink Associates,* and Howard Lipson, *Lipson and Company.*
2. "Keeping Current: New Educational Opportunities for Broadcast Engineers," David Harris, P.E., *NAB's Department of Science and Technology,* and Rick Lehtinen, ***Broadcast Engineering*** *magazine.*
3. "Conflict Resolution," Judy E.A. Sheets-Perkinson, *Calumet Group.*
4. "Professional Development as Leaders," Richard Cupka, *Cupka Corporation.*
5. "PBS Technical Operations Total Quality Program," Cary Wight, *PBS.*

Workshops

AM Antenna Systems Workshop
Saturday, March 31
9 a.m.-10:45 a.m.

Panelists:
- Benjamin Dawson, moderator, *Hatfield and Dawson.*
- Thomas G. Osenkowsky, *radio consultant.*
- Karl Lahm, *Lahm, Suffa and Cavell.*
- Thomas King, *Kintronics Laboratories.*

RF Radiation Regulation Compliance Workshop
Saturday, March 31
9 a.m.-10:45 a.m.

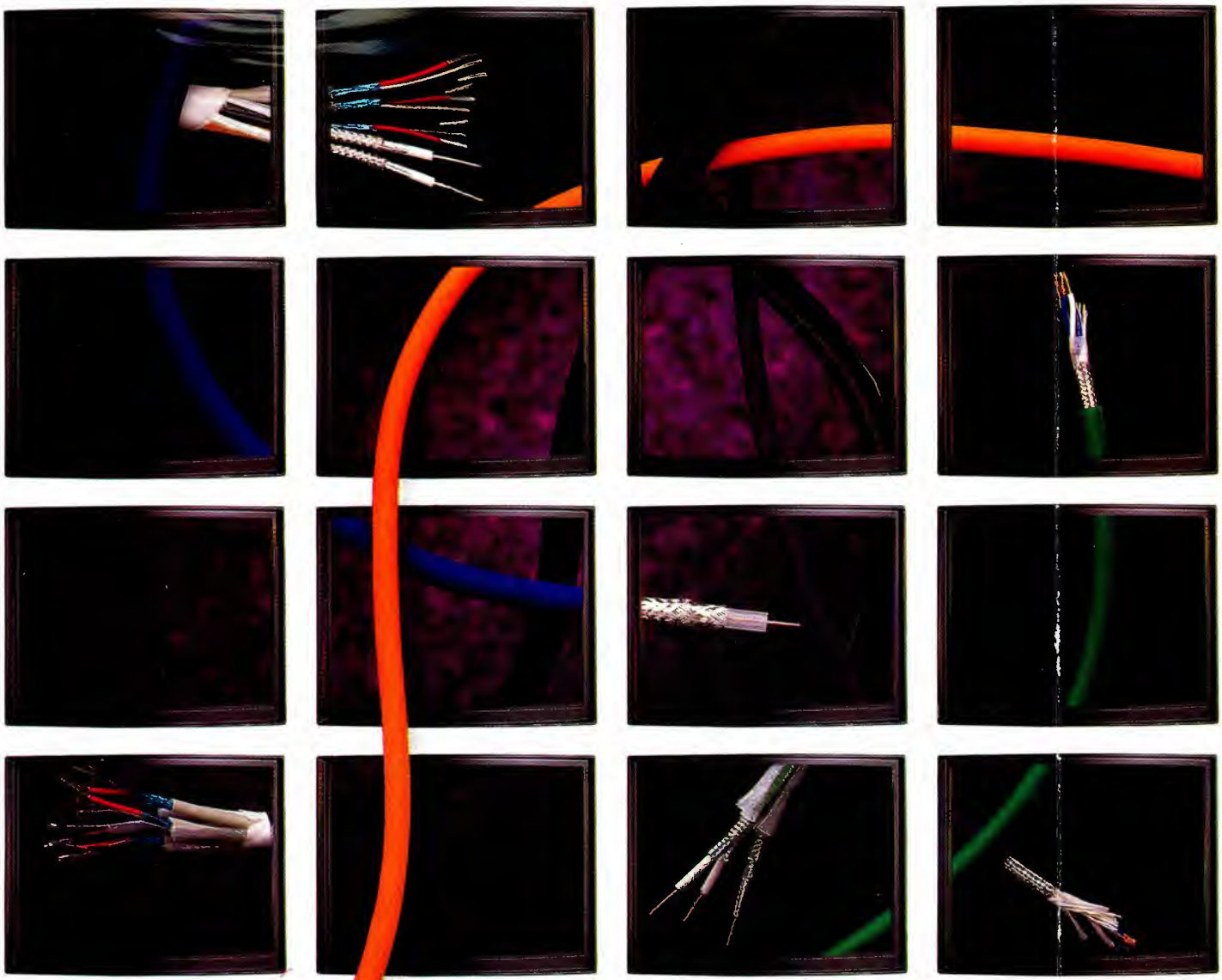
Panelists:
- Richard Tell, moderator, *Richard Tell Associates.*
- Barry Ulmansky, *NAB.*
- Dane Ericksen, *Hammett and Edison.*
- James Hatfield, *Hatfield and Dawson.*

Contract Engineers Workshop
Saturday, March 31
10:50 a.m.-12:35 p.m.

Panelists:
- James Stanley, moderator, *consultant.*
- Barry Victor, *The Victor Group.*
- James Loupas, *James Loupas Associates.*

Television Test and Measurements Workshop
Saturday, March 31
10:50 a.m.-12:35 p.m.

Panelists:
- William Dougherty, moderator, *Capital Cities/ABC.*
- Robert Weirather, *Harris Corporation.*
- Margie Craig and Adolfo Rodriquez, *Tektronix.*



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they're affordable

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News
Continued from page 4

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AES announces conference program, convention dates

The Audio Engineering Society (AES) has announced the preliminary program for its 8th International Conference on "The Sound of Audio." The conference, to be held in Washington, DC, May 3-6, will include the presentation of papers, panel discussion by audio industry magazine experts and aural demonstrations in specially treated listening venues, such as automotive environments. Skip Pizzi, National Public Radio, will chair the conference committee. Floyd Toole, Canadian National Research Council, is acting as papers chair for the conference.

The 89th AES convention has been rescheduled for Sept. 21-25. The revised show dates will make it possible to increase the exhibit space as well as contain all convention activities — exhibits, paper presentations, workshops, seminars and tours — in one location, the Los Angeles Convention Center. The new schedule allows for expansion of all convention programs and provides more time for exhibitors to load in and load out.

FCC grants request for rule delay

The FCC has granted a request by the Society of Broadcast Engineers (SBE) for a 3-year delay in the implementation of STL-type acceptance compliance. The SBE petitioned the agency in November 1989 to allow stations three additional years to meet recent rule changes. A study by the SBE had shown that many stations would suffer severe financial penalty if they were required to comply by July 1, the original deadline. It is hoped that new technology developed during the 3-year period will provide transmission characteristics superior to those of today's analog systems. Meanwhile, stations may continue to use their current STL equipment.

SBE petitions for aural STL rulemaking

The Society of Broadcast Engineers (SBE) has filed a rulemaking petition to make several amendments to the aural STL rules. The proposed changes, designed to reduce interference on the aural STL band, would require that some installations meet minimum antenna standards similar to those TV auxiliary stations have been obliged to comply with since 1981.

The petition also includes recommendations that:

- New aural STL stations provide specific desired-to-undesired (D/U) ratios to existing co-channel and first adjacent-channel stations.
- STL sites be classified as either "congested" or "not congested." Congested sites would require Category A receive antennas.
- Frequency tolerance be tightened to 0.0005%.
- Transmitter output power be limited to no more than 10W.
- Aural STL stations limit EIRP for paths of less than 22km.
- A 3-year grandfather period be permitted.

News from Europe

By John Blau,
European correspondent

Radio Free Europe to open bureau

After decades of scrounging for scraps of news, the Radio Free Europe staff is being flooded with information pouring over the Iron Curtain via telefax and telephone. To take advantage of this changing situation, the station plans to open a bureau in Budapest. Additional offices may someday be opened in Warsaw and Moscow.

French state TV names new director

Philippe Guilhaume, head of Société Francaise de Production, the state-controlled film and TV production company, has been named the head of France's state television. He will be chairman of both Antenne 2, the main state channel, and FR3, the regional network. The appointment is crucial to French state television because of the high rate of viewers that have been lost since commercial broadcasting began there.

Pioneer to produce PAL laserdiscs

Pioneer plans to manufacture laserdiscs in the PAL format for the European market at its Carson, CA, plant. The company may set up a laserdisc factory in Europe too.

Austria reviews its media policy

Officials have introduced a plan by which the Austrian public-service network, Osterreichische Rundfunk (ORF), could be converted into a private company, with its radio and TV channels opened gradually to private program sources.

Switzerland signs European broadcasting directive

Switzerland has become the first non-EC country to ratify the Council of Europe's "Convention on Broadcasting" by passing its broadcasting bill. The convention has 10 signatures, with West Germany and France yet to sign.

Spanish TV viewing continues to grow

Spain's viewing audience has grown during the past year by 3.8% to 26.2 million viewers, according to statistics released by the governing agency Estudio General de Medios. Satellite programs experienced the most growth, up 88.5% to 1.2 million viewers. Video viewing was up 19.5% to 11.9 million viewers. Cable, which currently reaches about 1.5 million viewers, reported to have a potential viewing audience of 4.5 million.

Almost half of the inhabitants in cities with more than 250,000 homes are willing to pay for cable television, according to a survey conducted by Telefonica, Spain's national PTT.

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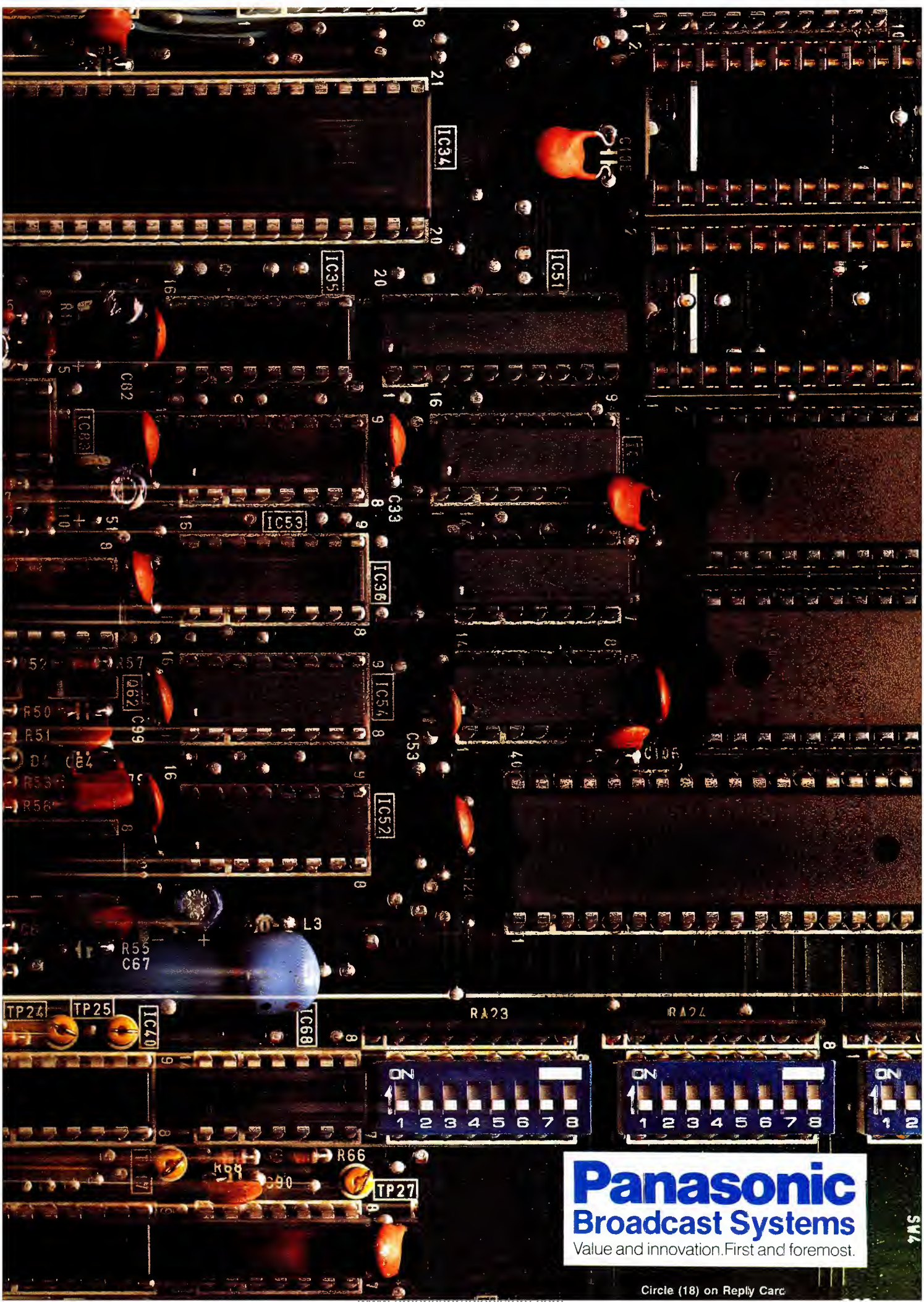

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Facility design special report

Building broadcast facilities for tomorrow.

Some things are hard to predict. For instance, who would have guessed that the collector's price for an early Barbie Doll could exceed the cost of a diamond ring. Or that baseball cards would be traded, not under the shade tree in the backyard, but in specialty stores that have sprung up for that purpose. If we had the slightest inkling that things would turn out this way, we might have acted differently back then.

It is just as hard to make guesses in our industry. Great changes are afoot. More of our daily work is accomplished on personal computers. FM rose, AM fell. MTS has increased the importance of producing quality audio for video. For a few hundred dollars, you can buy consumer gear today that rivals professional equipment costing tens of thousands of dollars just a few years ago.

Engineers charged with building and equipping broadcast plants must make choices to ensure that those plants are still viable years from now. For instance, if we think too big, we may be left with an elephantine facility that eats up our profits. If we design too small, we may end up in cramped quarters no better than the stations that were left behind.

This leaves us in a dicey position. We've got to build to last, but we're not sure what adversities we have to face. We must harden our facilities against crime, vandalism, terrorists and the increasingly restless forces of nature. Tommorrow's uncertain economic and competitive environment, in which our facilities will operate, also is questionable. The only constant we face is change. Even if things remained the same, that in itself would be a change, compared with the advances and upheavals of the past few years.

In this special report, we will discuss how to plan for the future. Facility integration specialist Fred Powers discusses some of the design strategy behind Chicago's WMAQ-TV, the NBC owned and operated station, which chose real estate that could either expand or contract to meet future needs. Architect Jay Ritchie shares his views on designing properties that will stay on the air in the event of natural disasters. Satellite access is addressed by consultant Tim McCartney in an article on uplink design. We even discuss how to keep towers vertical in adverse conditions.

An old song goes, "Don't worry about tomorrow, for tomorrow never comes." This is good advice for preventing ulcers, perhaps, but in facility design, our decisions are literally cast in concrete. We must plan carefully for tomorrow, to avoid wishing we had done things differently, when today has become "back then."

Rick Lehtinen

Rick Lehtinen,
issue editor

Photo courtesy of Flower Adams

Audio control room in Chichago's recently relocated WMAQ-TV.

By Fred Powers

Facility design in a changing world

To keep your broadcast plant functional, build in plenty of room for change.

The winds of change are scattering many of the venerable traditions of broadcasting. New forces have been thrust into the market, protective barriers have been lifted, and equipment has undergone extensive changes, many of which are tied to automation. What used to be a straightforward philosophy for connecting the component parts of a broadcast facility is being buffeted about. Caught in the midst of the storm are the broadcast engineers. The ones who will remain unscathed are those who do not cling to the seemingly safe old ways.

This article will explore four facets of facility design in today's broadcast environment: the market, automation, designing for change and using outside services. The ideas presented may help engineers who must make decisions today about equipment and buildings that will be in service for many years to come, even though the future may be shrouded with uncertainty.

Market trends

Some financial market analysts predict a difficult time ahead for broadcasters. Declining market domination by the networks and the growing strength of cable are fueling competition for the advertiser's dollar. Individual programs compete for smaller audiences and lower per-program revenues, yet per-program production costs are rising. These factors are forcing facilities to re-evaluate their existing operations in order to survive in a more competitive environment.

Broadcasters are finding that the market is not only shrinking, but also is becoming more fragmented. Cable companies are attracting more of the advertising revenues with their ability to focus on specific local, regional or demographically distinct market areas at a lower cost. The expense of national advertising is becoming prohibitive to the advertiser whose intended market is not distributed evenly across the country.

Photo courtesy of Flower Adams

Chicago's NBC Tower is the new home of WMAQ-TV. Station operations and management occupy the first six floors of the 39-story building.

Many broadcasters are in the first phase of responding to these market trends. Their reactions are coming in the form of reductions in overhead, with sometimes dramatic cutbacks in administrative, engineering and operations staffs. The result is that many broadcast operations have too few people working to service sprawling, multifaceted, operationally segregated facilities that were built in free-wheeling times, when broadcasters operated under government regulations designed to ensure the survival of the industry.

However, the demand for good programming is stronger than ever, and that doesn't seem likely to change any time soon. In other words, business will be good, but it will be more competitive, hence different.

Automation

Over the years, the industry has adopted increasingly complex technologies, met the changing needs of customers and formed a series of labor union contract agreements. Meanwhile, however, broadcast plant layout, equipment distribution and job description categories have be-

Continued on page 44

Powers is marketing director, SAIC (Science Applications International Corporation) Broadcast Systems, San Diego.

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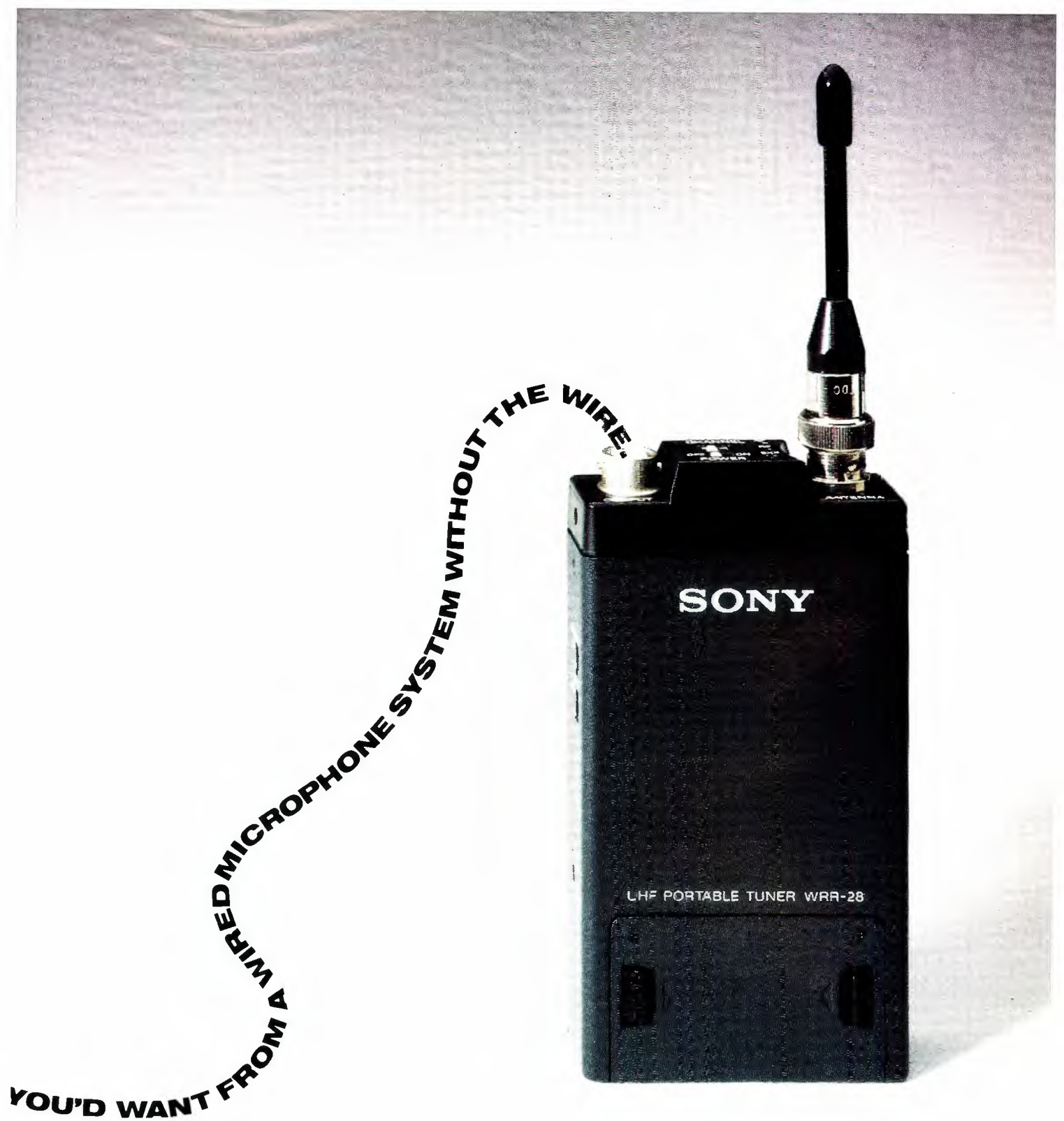

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PROFESSIONAL AUDIO

Continued from page 40

come unnecessarily complex. Today's shifting economic climate is forcing many broadcast stations and production facilities to simplify their operations. One way to do this is through increasing use of automation.

The concept of automation in a broadcast facility is certainly not a new one. It has been a topic of discussion for many years. However, what has been missing from these discussions is a common definition of automation.

Photo courtesy of Flower Adams

The WMAQ Studio B production control center features separated console positions. Director (center) shares console with associate director. Technical director operates switcher from separate console in right background. Foreground positions are for producers. Photo is taken from rear console, which has space for observers and ENG coordination.

One person might describe automation as automatic remote control of a plant's videotape machines from a distant location outside the tape room. Another might say it is the capability to automatically control many varied mechanical and electronic devices throughout the broadcast plant from several specified operator locations. Everyone seems to have a different perspective on it. Because perceptions of the meaning, purpose and value of station automation vary so widely, it is unlikely that a truly meaningful exchange ever has taken place on the subject, or that realistic solutions have been offered.

Duffy Sasser, vice president of operations and technical services for NBC TV Stations, has a more far-reaching vision of station automation. What he calls the "Holy Grail solution" to successful station automation begins with bridging the gap between sales and program production. Sasser says the automation process must begin at the time the sales representative enters the order for programming material into the system.

Sasser also thinks all information regarding a program segment should be available to any department upon request. Traditionally, this information exists within all departments, but in independent files. When a change is required, the new information must be re-entered in separate computer systems or reproduced in paper form and hand-delivered to all departments that need to update files. For optimum efficiency, it should be a requirement that the initial sales order, all the pertinent routine information and any changes be entered into the system only once.

A common database running throughout the facility, which also controls the daily broadcast routine, is the backbone of true station automation, Sasser said. "Eventually, even advertising agencies could be given access to the system to directly input sales orders in much the same manner that travel agencies can book tickets with the airlines. The agencies could also verify commercial runs to reconcile invoices," he said. Sasser predicts that this service will be available from some broadcasters within five to 10 years.

Another advance that would help close the automation loop would be an industry standard data header for every program, commercial and promo. When a new book arrives at the public library, it is accompanied by several electronic cards that contain pertinent information about it. Sasser thinks a similar electronic system could bear information about the contents of a piece of videotape.

Designing for change

As a broadcast engineer, you may not be able to predict change, but you certainly can prepare for it. In equipment terms, this means that it is unwise to build your facility around any one piece of equipment or operating philosophy. Pretend that any equipment you integrate today may be obsolete and replaced or reconfigured in six months. This is an extreme viewpoint, to be sure, but look at the design choices it prompts. If you are certain you'll have to access cable trays repeatedly over the years, you'll make them big enough. You'll use more computer flooring. You'll make sure you can easily access any area that may be needed in the future. You'll provide, or at least allow for, equipment racks to make it easy in case you need to expand the central rack room.

But what about buildings? All the broadcaster's equipment, computers, stages and sets must be housed in some sort of permanent, businesslike structure that can be modified easily to accommodate whatever curves the future throws.

Plans for a new facility for Chicago's WMAQ-TV, an NBC owned and operated station, began more than five years ago. After developing a master plan with architects, station personnel reviewed more than 40 potential sites. Sasser described the facility plans as being "as definitive as possible" while allowing for a certain amount of uncertainty and risk. "After all, our industry was experiencing some pretty drastic changes, and we didn't know how it would be configured 10 years down the road," he said.

The planners originally wanted a stand-alone, single-use building with a good line of sight for microwave transfer of the signal to the transmitter site atop Chicago's John Hancock Center. However, they decided to approach site selection and structure design in such a way that space for the facility could someday be expanded or, if necessary, reduced.

The result is a multi-use building, a 39-story tower that houses station operations and management offices on the first six floors. Station personnel use a bank of

Photo courtesy of Flower Adams

WMAQ "Day-of-Air" console, used for switching program feed. Master control, which controls all feeds in and out of the station, is seen in rear. Photo is taken from a news producer's platform, used for cut-ins and breaking events.

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dedicated elevators that are separate from the public elevators that serve tenants of the upper floors. The building's classic architectural theme visually supports the 50-year association between WMAQ and NBC. The network's peacock symbol resides in a lighted full-color display with a solid brass framework at the top of the structure, identifying it as the NBC Tower. The structure is a focal point between Lake Shore Drive and Columbus Avenue just west of the Navy Pier.

Part of the reason the site was selected was a height restriction on a center parcel of three adjacent parcels. The lots on each side are zoned for tower structures. However, the center parcel is limited to a maximum of four stories in order to preserve a view corridor to the lake from the downtown area. The station located its on-site production stages in the center parcel.

"This is the only area where we have some concerns about remarketing the space in the future," Sasser said. "They are large, fully isolated spaces which employ construction techniques unique to production sound stages, whereas all of our spaces in the tower are fully capable of being converted for traditional office use, should conditions change and we find that at some future time we must re-market the real estate."

Using outside services

At one time, networks and many of the larger stations fabricated much of their own equipment. Gradually, as the industry matured, manufacturers began to fill broadcasters' needs. Today, a minimum of equipment is fabricated in-house.

Similarly, all system integration and equipment maintenance once was performed by staff engineers. The economic climate of broadcasting today, however, forces broadcasters to look at new ways of operating and maintaining their facilities. In some cases, outside contractors, consultants and temporary employment agencies are providing peak-period support for engineering and production requirements. Engineering managers should consider carefully the use of outside services for the design and installation of new facilities as well as the relocation of broadcast plants.

Photo courtesy of Flower Adams

The camera control console at WMAQ, with TSM robotic control console.

In the case of WMAQ, engineering managers reviewed five separate proposals for the redesign and relocation of the station. They eventually narrowed the field to three, finally selecting SAIC (Science Applications International Corporation), San Diego, as the system integration and relocation contractor for the project. The total complement of equipment was one-third existing WMAQ equipment, one-third from the Seoul Olympics, and the rest was supplied new by SAIC.

The job was tricky because of a hard deadline of Oct. 1, 1989, as well as a requirement to move all technical, studio and news operations on a single night without any period of split operations. To accomplish this task, crews were detailed to wire the new plant ahead of time. Equipment was installed into the awaiting slots. WMAQ asked for and obtained cooperation with labor. For a 48-hour period, each of the unions operating in the technical area of the station agreed to drop

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their jurisdictions, and all station and contract personnel were allowed to pitch in, working side by side as needed.

Trusting the design and implementation of a new station to others can be a gut-wrenching decision. It is especially difficult for engineers who have been with the same properties for a long time. They may feel an emotional attachment with the maze of cable and equipment we call a broadcast station.

After assuring yourself, through background checks and references, that the proposed system integrator knows its business, your next undertaking is to lay out the level of support required. Some broadcasters want the integrators to simply build their technical plants to order. Perhaps the operational philosophies are fixed firmly, and they need the integrators to attend to the details of construction and equipment acquisition and installation. Other broadcasters want to work alongside the integrators, giving input on items considered key to the success of their facilities and relying on the experience of the integrators for other details. Some want turnkey installations, opting to have relatively little to do with the day-to-day complexities of design and construction.

Thoroughly establish the approval process in advance. Spend the time necessary to completely define the project. The system integrator must be able to visualize the desired results. The best process for ensuring that the station's requirements are met is to prepare well-written specifications. The system integrator should be able to assist with this, but expect to pay for that service, because it is a tedious process. Make sure you have defined a clear route for resolving differences of opinion once construction is under way. At the outset, determine who is responsible for approving changes. Who will be responsible for making final operational and technical decisions?

Photo courtesy of Flower Adams

WMAQ-TV newsroom, with three TSM full-motion robotic camera systems, with one pan-and-tilt overview camera in the background.

Obtain an agreement of when, and in what format, you can expect to receive the "as-built" drawings. These are vital to continuing maintenance operation of a facility. Many stations require the documentation from the integrator on a compatible CAD program. This allows them to follow progress and trade information during the construction phases and easily upgrade the documents to reflect future system upgrades.

The show must go on

For the foreseeable future, broadcasters will continue to play a role in the distribution of information. What form that information takes, as well as the methods of delivery, are subject to change as the industry moves into a new economic climate and evolves with expanding technology. Engineers can help their facilities to meet the future gracefully by designing plants with change in mind, by seeking automated solutions to existing bottlenecks and by considering contracting with reliable, experienced integration firms when moving into new quarters or remodeling an existing facility.

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Planning for good acoustics

By Eric Neil Angevine P.E.

Many of the TV studios constructed in the past 20 years are little more than warehouse-style boxes. As such, they are incapable of keeping out exterior noise, let alone controlling the noise created within. Yet these facilities have spent untold sums on studio lighting and magnificent sets and cycloramas. Even the smallest local station now has an extravagant set from which to broadcast its nightly news program.

With the advent of stereo television and the "home entertainment center," in which consumers can interconnect their TV receivers and their high-quality audio components, the importance of sound has begun to catch up with that of picture quality. As producers, directors, talent and engineers pay closer attention to sound quality, they desire and expect better facilities from which to broadcast.

The science and art of architectural acoustics deals with two discretely different phenomena regarding sound control. One is sound transmission or, more specifically, how to keep unwanted external sound out of the studio. The other is commonly referred to as room acoustics, or how sound behaves within an enclosed space.

Sound transmission

The principles of sound transmission and engineering "noise control" that accompanies it are simple, yet often hard to implement in practice. The basic tenet is that materials that are effective noise barriers are solid and massive. The "mass law" tells us that the sound attenuation provided by any material is related directly to the weight of the material and the frequency of sound:

$$TL = 20 \log w + 20 \log f - 33dB$$

Angevine, **BE**'s broadcast acoustics technical consultant, is an associate professor at the Oklahoma State University School of Architecture, Stillwater, OK.

Where w is the weight of the material in pounds per square foot of area, irrespective of material thickness, and f is the frequency of sound.

Because of the logarithmic relationships in this equation, two important observations can be made. First, the sound transmission loss of any wall or material will increase 6dB for every doubling of the weight of the wall. Second, the attenuation will increase at 6dB per octave (doubling of frequency).

The sound transmission loss of any wall usually is limited by doors, windows or other openings in the wall, rather than by its inherent sound attenuation properties. Door and window areas should be kept to a minimum, and care should be taken to seal any opening left during construction, as well as the operational clearance around doors.

Room acoustics

Older construction materials were massive, providing sufficient sound transmission loss to keep all but the loudest sounds from outside and from adjacent interior spaces. The place where many older studio facilities really fall short is in the realm of room acoustics.

The fundamentals of room acoustics are nearly as simple as those of sound transmission. It is helpful to remember that sound waves have a physical size that can be reckoned with. The speed of sound in air at typical room temperatures is about 1,130 feet per second, so the wavelength of audible sound waves ranges from less than one inch at the highest audible frequencies to more than 10 feet at frequencies below 100Hz.

Like a guitar string or organ pipe, a room will sustain sounds only at frequencies that are related to its dimensional characteristics. Because TV studios typically are large rooms, they seldom have poor low-frequency response. However, this problem may occur in small voice-over booths. To provide the best mixture of sustained frequencies or resonances, it is best if the room dimensions not be the same, or even-integer multiples of one another.

Sound absorption

The most common problem in studio spaces is a lack of adequate sound absorption. Despite some arguments to the contrary, most broadcasters still prefer studios that are overly "dead" to those that are too "live." They argue that it is a simple matter to introduce some synthetic reverberation into the audio feed, but it is still not possible to electronically remove excessive reverberation.

In reality, the amount of sound absorption that can be added to any studio space is limited by the area of surfaces suitable for treatment and the owner's budget. At the very least, a quantity of sound absorption equal to a full acoustical ceiling with some wall treatment is essential. Wall treatment should be distributed around the room, rather than concentrated on one wall or in one area. It is most effective when placed in exposed areas, possibly behind thin curtains, but not behind hard cycloramas. A designer who has thought far enough ahead will have included structural materials, such as roof decks and masonry walls, that are acoustically absorptive. Even ordinary concrete block, if left unpainted, is moderately sound-absorptive. However, unpainted concrete masonry does not have high absorption coefficients, and some added wall treatment is recommended.

New options in wiring

By C. Robert Paulson

In the 1980s, your options for hooking up systems in broadcast facilities were simple: You could use twisted pair or you could use coax. In the '90s, interconnection options are multiplying. In addition to traditional wiring, you may now choose from a plethora of digital cables and fiber optics. Even good old coax and twisted pair have an updated look for the new decade.

Paulson is a communications consultant and managing partner with AVP Communnications, Westborough, MA.

The reason for new types of cable is the advent of new types of signals. Whereas the video interface was once nearly 100% NTSC, a multitude of analog component formats exists today. Add to that the increasing use of dub signals and digital video.

Wider bandwidth, more channels

Audio has undergone a reformation from simple mono to multichannel TV sound (MTS). Three channels, and often three channels plus time code, travel together. (Note how many new tape formats come with at least four audio channels.)

Supposedly, HDTV is lurking in the

By James C. Ritchie, AIA, and
Rick Lehtinen, TV technical editor

Hardening broadcast facilities

Maintaining the integrity of a broadcast facility is vital to staying on air during a natural catastrophe.

Any event that takes a broadcast facility off the air is a catastrophe, whether it is caused by nature, a design error or a manmade activity.

Following are a few of the critical aspects of construction that should be considered in the design of a new facility, or in the evaluation of an existing facility, in order to minimize damage in the event of a natural or manmade disaster.

Lateral forces

On Nov. 29, 1988, an explosion at a Kansas City, MO, construction site took the lives of six firefighters. The explosion was felt over a large area of the city. The computer facilities of a nearby major corporation suffered considerable damage, not from failure of the building structure, but primarily from the failure of suspended ceilings, lighting fixtures, suspended ductwork and unbraced pipework above the ceiling of the computer room. Had this computer facility been a TV or radio station, in all probability, it would have been put out of commission.

A *lateral force* is any pressure that causes a building to move horizontally. The cause may be an earthquake, high wind or, as in the Kansas City example, an explosion. (See Figure 1.)

Building codes for earthquake design in seismic zones 2, 3 and 4 now require that all suspended ceiling systems, including lighting fixtures, be braced to resist lateral forces. (See Figure 2.) Existing facilities constructed under earlier versions of the building code or buildings in seismic zone 1 may not have this requirement. Nevertheless, it would be prudent to include lateral bracing above the critical areas of a broadcast facility.

Bracing is accomplished by attaching a series of 12-gauge wires, using angle clips and power-driven pins, at 12-foot centers, to the ceiling grid. (See Figure 3.) The wires run at a 45° angle from the ceiling grid to the structure above, where they are fastened mechanically. Bracing can be accomplished in either existing or new construction for about 50 cents to 60 cents per square foot.

Access-type flooring systems (computer floors) are available for use in both seismic and non-seismic zones. In critical areas of a broadcast facility, it is wise to select a system that will resist lateral forces, whether or not it is required by local building codes. Several systems have provisions for fastening each floor panel to the supporting pedestal at all four corners instead of relying upon friction to hold the panels in place. (See Figure 4.)

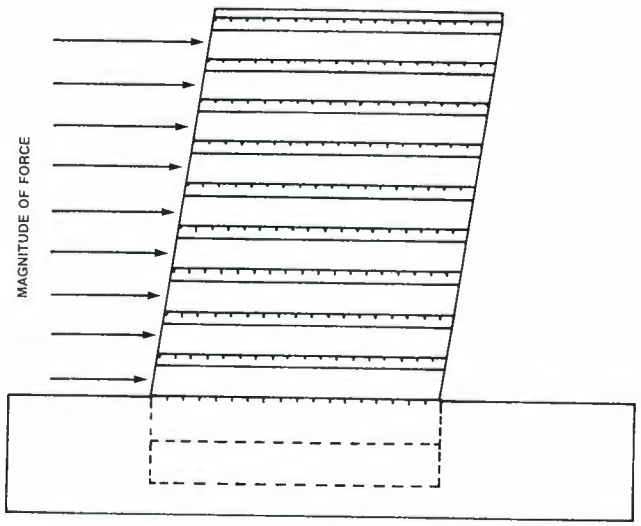

Figure 1. A building with lateral force applied.

Ritchie is chairman of Cooper Carlson Duy & Ritchie (CCDR), an architectural firm in Kansas City, MO.

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wings. Whereas NTSC required cables capable of passing 6MHz or so without rolloff, HDTV at 1125/60 requires 20MHz to 30MHz. Digital formats for both audio and video now are emerging. These signals require special cables because of their high bit rates — from D-1 at 140Mb/second to almost 2Gb/second for digitized HDTV.

And remote control, time code, MIDI and even automation signals require some kind of interconnection.

Transmitting even simple NTSC through coax is far from trouble-free, requiring equalization after several hundred feet. These problems only grow worse when the signal is higher-bandwidth analog or high-speed digital. All these new signals have placed demands on cable manufacturers to supply products worthy of the challenge.

Some like it flexible

As electrical codes have tightened over the years, cable manufacturers have responded with cables designed to withstand National Electrical Code (NEC) flame tests. Unfortunately, cables designed to be highly flexible usually won't meet the test. This has led some manufacturers to provide cables in both NEC-acceptable and flexible versions. The advantage of greater flexibility is that cable pulls can be much longer, because the cable doesn't fight you as much in tight places.

Some twisted pairs achieve superflexibility by using many strands of extremely fine wire, 40-gauge or so, laid together into a wire that is 22- to 26-gauge overall. Although it is ideal for some situations, make sure this cable is right for you. Check whether it will hold securely in the punch block or terminal strips you plan to use.

New cables

A space-efficient method for routing many audio pairs from one location to another is with a multiple-pair cable. These cables usually have a foil shield around each pair and a common sheath around them all. Using these cables can be an exercise in reading color codes, because the pairs are differentiated by the color of the individual wires in the pair.

Some manufacturers now offer "audio snake" cable. Separately shielded and jacketed pairs are enclosed in a common sheath. Pairs are identified by numerals printed on the individual jackets.

Coax has moved into bundles as well. This has been brought about, in many cases, by computer graphics applications that require separate cables for red, green and blue, and sometimes, sync. It is vital that these cables be identical in length, to avoid relative timing errors between channels. Furthermore, the velocity characteristics of the individual cables must be matched closely to prevent the introduction of similar errors. Broadcasters may find that multiconductor coaxial cables are a convenient way to avoid problems in this area.

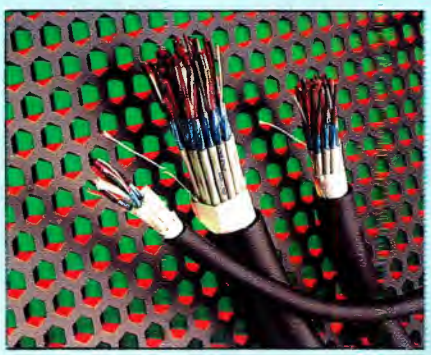
New variations of the popular "Siamese" cable, in which a video coax and an audio pair are sealed in a common jacket, are arriving. These new versions contain larger cable counts than before, allowing single cables to connect more equipment.

Can you get there from here?

None of the formats in existence today are likely to simply retire and go away. Rather, they will continue to be

Continued on page 258

Bundled coaxial cables simplify installations involving RGB video. Bundling ensures that cables are of identical length, preventing interchannel timing errors.



Multiple-pair "audio snake" cables identify individual pairs by number and free installers from color codes.

Take It On The Road

Panasonic lets you hit the ground running with compact SVHS and MII camcorders. They give you less to carry on your shoulder and your budget by combining component recording technology with the efficiency and flexibility of half inch cassettes.

No matter what your specific application requirements may be, Panasonic has the right camcorder for you, including both dockable and fully integrated one-piece units. In addition, only Panasonic has SVHS camcorders available with three, two and single CCD image sensors and up to 700 lines of resolution. Panasonic lets you decide what's best for you.

Panasonic SVHS and MII camcorders don't cut any corners when it comes to recording in the field. With high performance features like on-board vertical interval and longitudinal time code, hi-fi audio, and a variety of auto adjustment functions. They're features that Panasonic brings to the field so you have less work when you're back in the studio.

Panasonic Has V Down To

Selecting the most comprehensive video production system has never been easier. The Panasonic® Professional Video Production System is designed for total systems operation in the field, studio, editing suite and for virtually any playback application.

The SVHS recording format is at the heart of Panasonic's comprehensive video production system. It provides a new level of high performance and cost effectiveness across the spectrum of video recording and playback applications. One look at the numbers tells it all. Five generations of signal integrity, 400 lines of resolution and two-hour operation on a single cassette.

You can complement the performance of SVHS with the sophistication of Panasonic's MII. The MII format delivers the operational characteristics

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STUDIO

Improve The Studio Scene

Panasonic makes studio productions productive. With high performance studio components that provide efficiency through versatile applications.

Whether you are planning a studio with a multiple camera system, a single camera, or looking to expand an existing facility, Panasonic CCD cameras will capture every detail. With features that include up to 700 lines of resolution, gen-lock capability and remote control operation. They provide the results you need today with an eye on expansion tomorrow.

Panasonic's exclusive three and two CCD cameras let you specify the configuration and features that meet your requirements best. And as an added benefit, Panasonic CCD cameras operate as well in the field as they do in the studio.

Panasonic's three CCD cameras also feature component outputs to take full advantage of SVHS and MII studio recorders. And to see that all the action you've recorded looks its absolute best, Panasonic monitors give you more than just a pretty picture. They allow you to easily analyze any video signal from any video source in your studio. A safeguard you'll appreciate during postproduction and final playback.

ENG/EFP

Panasonic Has Video Production Down To A System.

STUDIO

Raise The Editing Standard

Panasonic is setting new standards in editing excellence. With SVHS and MII VCRs and editing components that maintain the integrity of your original footage through multiple generations of recording. And a host of sophisticated features designed for any application.

Panasonic has the editing system you need for demanding broadcast and post-production applications. Like a luminance bandwidth of 4.5MHz, a K factor of 2% and a signal-to-noise ratio in excess of 50dB. To produce images that equal one inch VTRs with signal integrity that exceeds five generations of recording.

The integration of SVHS and MII video production components adds a new dimension to video system specialization. Because you can select the Panasonic components you need for the highest degree of performance and flexibility for specific system applications. And for highly efficient playback operation, there's Panasonic's line of professional VHS recorders and players.

Anyway you add it up, the cost/performance characteristics of the Panasonic Video Production System are revolutionary.

deo Production System.

configuration you need. From sophisticated programmable 128 event A/B roll systems with time base correction to highly accurate insert and assembly systems. It's everything you need to turn ordinary footage into extraordinary productions.

In addition, Panasonic speaks the industry's language for inter-format editing with RS-422 VCR control interface components. And video signal transcoders that allow you to integrate virtually any video signal with the Panasonic Video Production System.

Whether your editing operation requires single format or inter-format editing, Panasonic delivers the high performance and signal integrity you demand for final playback.

EDITING

PLAYBACK

Feed Your Channel

Preserve the quality of your finished production through distribution and playback. With professional playback components from Panasonic. They offer you the performance and versatility required to satisfy even the most demanding applications.

Panasonic VCRs and TBCs are perfect for closed circuit, cable and even broadcast transmission. They're ideally suited for stand-alone operation and can easily be configured for station automation.

For general viewing and large screen presentations, Panasonic has the right combination of SVHS and VHS VCRs, monitors, and video projection components to suit virtually any size audience.

If your playback application involves program distribution to a corporate network, Panasonic will carry your message. With VCR features like video sensor recording that allows you to record programming transmitted during off-peak hours. So you can save on transmission and personnel cost. And for large scale duplication and point of sale playback, Panasonic professional VHS VCRs are the industry's standard for excellence.

Small Monitor. Big Difference.

In the recording business, little things can often make big differences. Studio monitors, highly sophisticated critical listening devices, are certainly no exception. Our Control Series™ compact personal monitoring systems each provide the performance characteristics demanded in today's recording environments.

Take our Control 5™ for example. You get power handling capacity of 175 watts, outstanding dynamic range, smooth frequency response and excellent clarity and imaging. This high power, low distortion system is housed in a non-resonant polypropylene structural foam enclosure.

Today you can find Control 1's in home studios and midi workstations; Control 5's in major recording and teleproduction facilities; Control 10's in foreground and background systems, corporate boardrooms and teleconferencing facilities. And the two-way horn loaded Control 12SR, a logical extension of the technology, in sound reinforcement applications from supper clubs and discotheques to small tour sound systems. Control Series meets such diverse applications because they are, above all else, powerfully honest.

Control Series. Compact high performance monitors designed to meet a broad range of fixed and mobile applications.

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Designed to accommodate a wide variety of specialized mounting brackets, Control Series monitors can go virtually anywhere. On the console, on the wall, on the ceiling, in a rack, on a tripod, keyboard or mic stand. Control 10's and 12SR's even come with a built-in handle so they travel like a seasoned professional.

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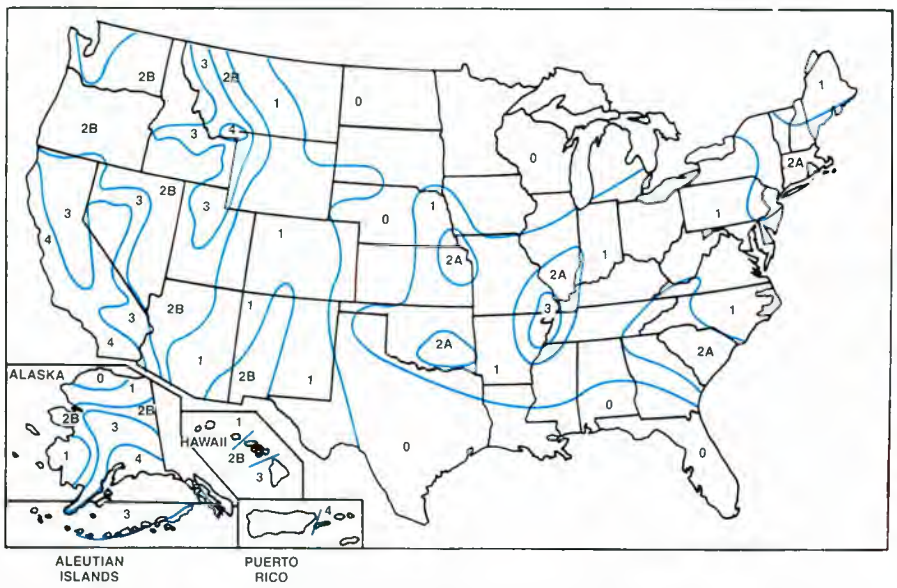

Figure 2. *Seismic zone map of the United States (from the Uniform Building Code).*

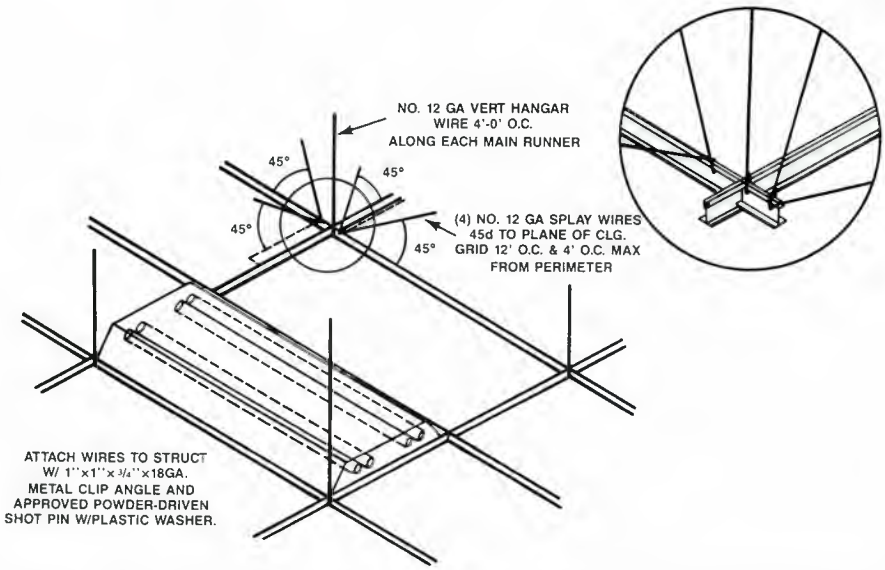

Figure 3. *Bracing for ceiling and lighting fixtures will allow the ceiling to withstand greater lateral force.*

This provides lateral stability, yet allows relatively easy access to the under-floor plenum. The pedestal height should be maintained at 12 inches or less, for a more rigid system.

Water woes

Water, regardless of the source, is a potential cause for disaster in a broadcast facility. Water leaking from the roof membrane can migrate horizontally and create havoc with electronic equipment great distances away. Hot and cold water lines, condensate and roof drains, steam pipework, fire-sprinkler systems and sanitary sewers all can fail because of mechanical faults or installation shortcomings. The following are the most common causes of water problems.

- *Roof penetrations.*

Every penetration in a roof membrane is an opportune place to develop a leak. Broadcasters must minimize roof penetrations, and develop a system for attaching roof-mounted equipment that will allow flexibility without punching holes in the roof. One successful technique is to build a grid of structural beams, supported on stub columns above the roof. (See Figure 5.) When equipment is changed or new equipment is added, it is easy to provide the necessary support without having to penetrate the roof membrane.

When KSL Broadcast House in Salt Lake City was completed in 1984, there were three satellite dishes. Five years later, several additional pieces of equipment have been added, and no additional roof supports or conduits for cabling have been required.

Using a roof-mounted grid allows broadcasters flexibility to update and change outdoor equipment without having to risk damaging the roof membrane.

- *Poor placement of pipework and HVAC equipment.*

In the design of a new facility, it is imperative that the mechanical design — the placement of pipework and equipment for heating, cooling and plumbing — be coordinated so that water is kept as far as possible from electronic equipment.

In an existing facility, it is often too difficult or expensive to relocate pipework above critical areas. It usually is possible, however, to build sheet-metal troughs or tubs below the pipework or above sensitive equipment to divert water in case a leak develops above the ceiling. Although this solution will not be of much use in the event of a major failure in the pipework, it will take care of many of the problems that do arise.

- *Common ceiling plenum.*

Another possible trouble spot is the ceiling plenum, the space between the finished ceiling and the structural floor above the ceiling. The architectural design of a broadcast facility should avoid the use of a common ceiling plenum above both technical and non-technical areas.

One telephone company learned this the hard way, when a soldered joint on a 140° hot water line failed. Even though the water line was 20 feet away from the telephone computer switching room, the hot, leaking water produced tremendous amounts of vapor that spread throughout the ceiling plenum and rained down like a tropical storm on the electronic gear. Although some of the switchers were saved, the manufacturer voided the warranty on more than $1 million worth of equipment.

As a matter of interest, the manager of the facility, in an effort to restore service as quickly as possible, moved equipment

Continued on page 60

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When we tell you that our new GraphicSmart Projection System creates superior big-screen images, we're not just wagging our tail. Because in addition to giving you clearer images, GraphicSmart gives you better color quality, brightness and higher definition. Whether you're displaying video images or computer graphics, our digital convergence memory technology allows you to program almost 100% accuracy from a wireless remote control. Resulting in a consistent, sharp picture on your screen. That same technology allows you to switch from a video to a data source in the middle of your presentation. Without having to readjust your image, turn on the lights or get up from your chair. And if you think that's a bright idea, wait till you see what our 600 lumens of light will do for your picture. The GraphicSmart Projection System also has a wide horizontal scanning

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frequency range. Giving you the flexibility to project higher resolution computer graphics. And the freedom to make a presentation in any size. From five feet to twenty-five feet diagonally, with all the color quality and definition you demand. You'll find GraphicSmart's projector has a sleek design that won't compromise the look of your boardroom. And the projection system includes interface cables, wired or wireless user and set-up remote controls, power cables and a ceiling mount. It also comes with the NEC name. Plus, all of the experience that goes with being a leader in the fields of digital technology and multiple frequency monitors. So, if you've been looking for a superior projection system, remember—you won't find a better breed than GraphicSmart. For more information call NEC at (708) 860-0335.

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With ours you know it's a girl.

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Continued from page 56

without documenting the damage properly. This may have weakened the telco's legal position.

All of this might have been avoided if the walls surrounding the building's equipment core had run all the way up to the structural ceiling.

- *Condensation.*

The ceiling plenum also can be a problem if the exterior walls and roof of the building are not insulated properly or lack adequate vapor barriers. Cooper Carlson Duy & Ritchie, Kansas City, MO, recently designed a broadcast facility in Boston that was being relocated from a high-rise office building to a renovated, reinforced-concrete factory building.

The design of the heating and air conditioning systems called for a relative humidity of 35% to 40% and used the ceiling plenum for return air. The original walls and roof of the building did not have enough insulation to prevent condensation on the warm side of the wall. Also, there was no vapor barrier that would prevent the build-up of condensation above the ceiling. Remedial work was included in the design documents to alleviate this situation. Had this condition not been recognized at the outset of the design program, there is a good chance that damage may have occurred while the station was in operation.

- *Accidental discharge of fire-protection systems.*

Fire inspectors are understandably reluctant to omit fire-protection systems in technical areas, but they are generally cooperative in allowing systems that minimize the risk of accidental discharge.

Dual-signal systems require that two detectors must activate before the fire system will be engaged. (See Figure 6.) This can be accomplished with either two smoke detectors or one smoke detector and a heat detector. Typically, dual-signal systems are dry systems using automatic valves. In a dry system, water is not allowed to enter the sprinkler line servicing the room until a smoke or heat detector has been activated.

Figure 7 shows an alternate system using one smoke detector and a high-temperature, fusible-link sprinkler head.

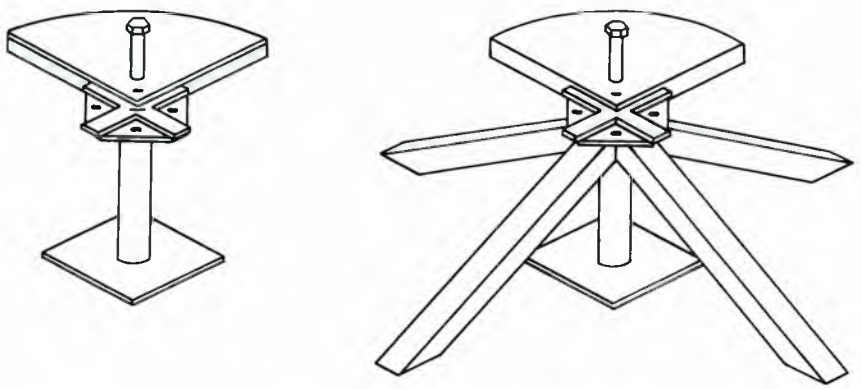
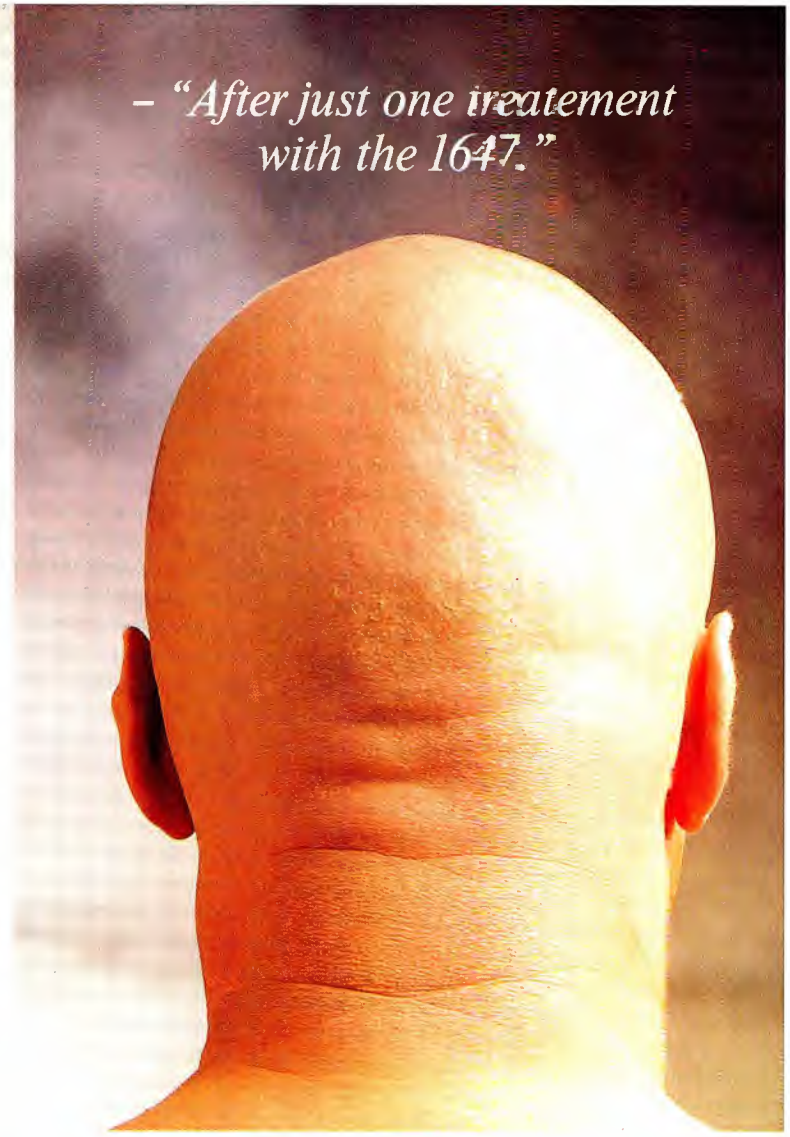


Figure 4. *Diagram of corner-lock or freestanding access-floor systems.*

– *"Before..."*



Use the 1647 on problem scalps and you will once again enjoy full, rich colours undamaged by the sun.

Introducing the 1647, the CCD portable broadcast camera from Thomson Vidéo Equipement. It's the most effective product on the market for eliminating bothersome problems like burnt out areas, washed-out colours and loss of detail.

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Take a look at the numbers:

- **450 000 pixels/new high resolution CCD.**
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Shutter speed variable between 1/50 and 1/2000 sec – enough to stop the fastest action! And it takes aliasing and smear to new, breathtaking lows.

Lightweight and rugged like the 1640, its thoroughly ergonomic design makes your job easier than ever. It also doubles as a superb EFP camera ready to work alongside your studio cameras. There's a whole range of EFP rear modules for Triax operation.

The 1647 is highly recommended for all those who want brilliant images, not images with burnt out areas. Contact us at the address below for a demonstration.

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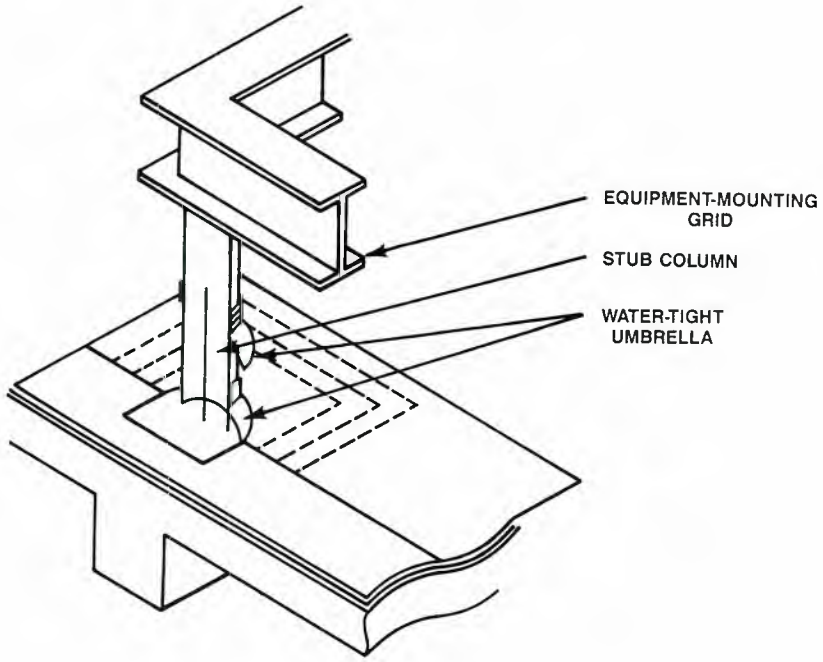


Figure 5. An equipment-mounting grid allows future flexibility of roof-mounted equipment, without requiring future puncturing of the roof membrane, which can lead to water damage.

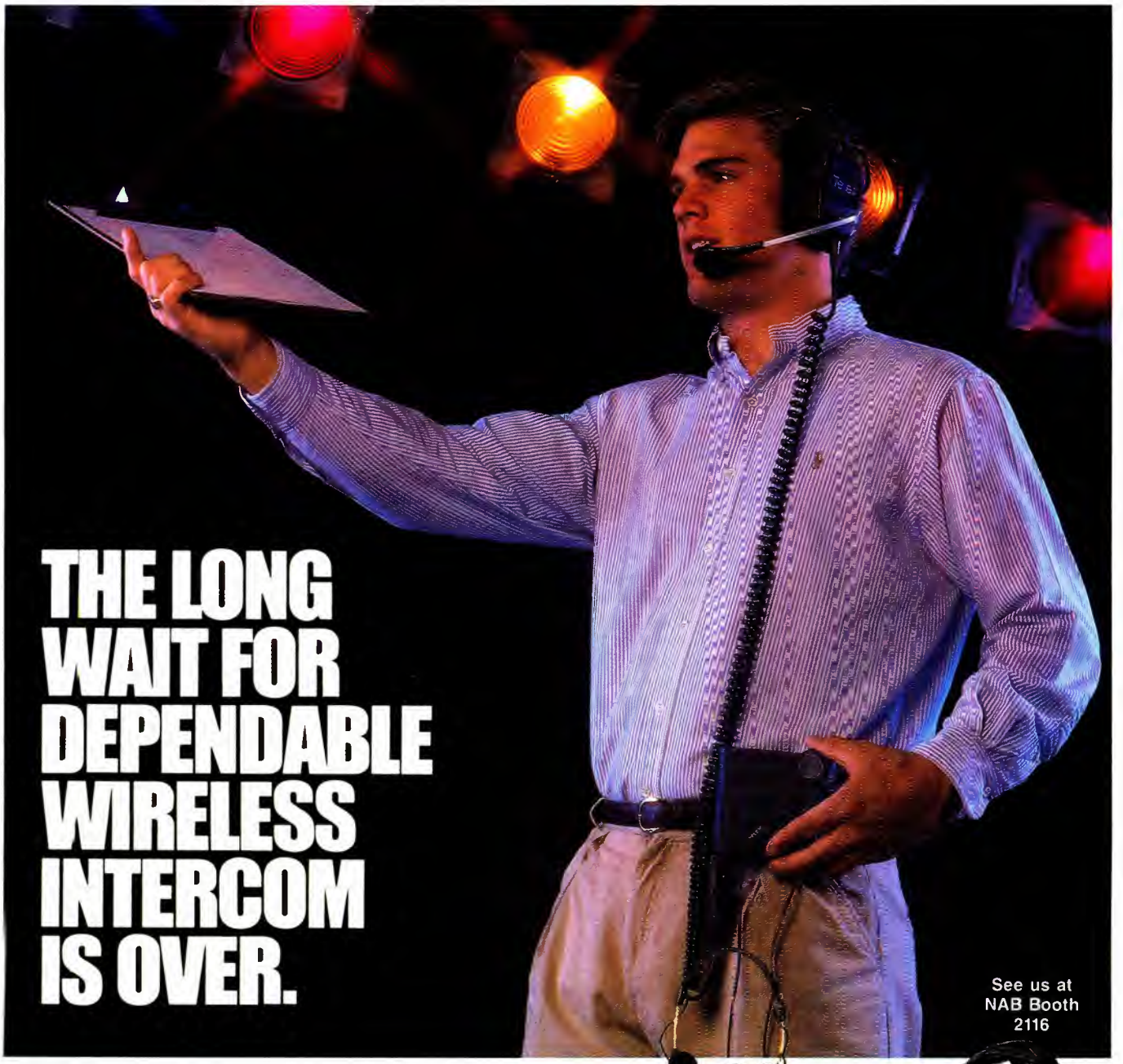
Water is allowed to enter the system when the fire alarm control system receives a signal from the smoke detector. Water does not discharge into the room until there is sufficient heat to melt the fusible link.

Building owner's maintenance and operation procedures

When the broadcaster owns the station's building, the facility's mechanical system preventive maintenance procedures are usually the chief engineer's responsibility. But if the station is a tenant, engineering may have little to do with building preventive maintenance. It is important to make sure that the landlord protects the integrity of the emergency electrical system, remote chilled water system and other essential services throughout the period of the lease.

If you work for a station that rents or leases space, follow these guidelines:

- Know the preventive maintenance procedures that have been established for the building.
- Take nothing for granted. Verify that preventive maintenance procedures actually are followed.
- Arrange for access to critical building systems during "off hours."
- Participate with the landlord in the testing of critical equipment, such as emergency generator and fuel systems and air-conditioning systems for technical areas.
- Verify that the building electrical system provides surge protection to the broadcast areas.
- Determine the potential sources of trouble. Learn whether other tenants' building system failures will jeopardize your broadcast operations.
- Verify that critical building systems have sufficient redundancy to prevent the



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Yes the long wait for dependable wireless intercom is over but it was worth it. Each Telex system is completely tested as a system before it's shipped and carries the exclusive Telex THREE YEAR limited warranty. For complete details write to: Telex Communications, Inc., 9600 Aldrich Av. So., Minneapolis, MN 55420.

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CHECK LIST:

1. Try to keep all water-carrying pipework out of the ceiling above technical areas.
2. Consider suspending sheet-metal troughs or tubs beneath existing pipework.
3. Recognize the hazards related to condensation above suspended ceilings. Separate the ceilings above technical areas from other ceiling plenums in the facility.
4. Provide bracing above the ceiling of critical areas for lighting fixtures, pipework and ductwork to prevent damage to personnel and equipment in case lateral forces cause the ceiling to collapse.
5. Use access-floor systems designed to withstand lateral movement in critical areas of broadcast facilities.

station from being put out of business in case a minor piece of equipment fails.

Protection of emergency power systems

Several important items must be considered in the design and maintenance of emergency power systems:

- *Location.* Generators and fuel-storage systems should be located in areas protected from vandalism or accidental damage.
- *Lateral forces.* Generators and fuel-storage systems must be mounted to withstand movement that might occur as a result of an explosion, earthquake, tornado or other disaster.
- *Testing generators.* Periodic testing of the emergency power system is essential.
- *Fuel storage.* Diesel fuel gels in cold weather. Solids will settle out of gas. Propane is heavier than air, and if it leaks, can form explosive pockets of gas.
- *Adequate power for broadcast operations.* In older buildings, the emergency power systems may have been designed primarily to handle life-safety requirements, and they may not be adequate to handle the emergency requirements of tenants with heavy electronic loads.
- *Location of transfer switch.* In many buildings, the transfer switch is located near the main switchboard, with little or no separation. An explosion, lightning strike or fire that damages the transfer switch can eliminate both normal and emergency power. (See Figure 8.)

Maximum reliability can be obtained by locating the automatic transfer switch at the power panel and providing separate fire enclosures for the main switch and emergency generator. The current National Electrical Code requires that the generator and transfer switch be installed in a fireproof room. (See Figure 9.)

Building security

Short of turning a broadcast facility into an armed fortress, little can be done if an armed terrorist enters a station either to take it over or to put it off the air. Fortunately, a more frequent security problem is encountered with persons "off the street" who want to get on the air to express their views or perhaps vent their anger at a specific on-air personality.

In stations that were designed before security was a serious consideration, the receptionist frequently was given the responsibility of admitting persons from the reception area to the station operations area through electrically controlled doors. Recent experience has shown that this solution is no longer acceptable. Receptionists must not be so isolated from the operations area that they have no escape route from their workstations. (See Figure 10.)

Visual control of the exterior entrance corridor and electronic control of the entry door allow some screening of visitors before they actually enter the premises. A concealed switch that actuates an alarm within the station provides added protection for the reception area.

- *Code access doors.* If forced intrusion occurs, one method of deterring, or at

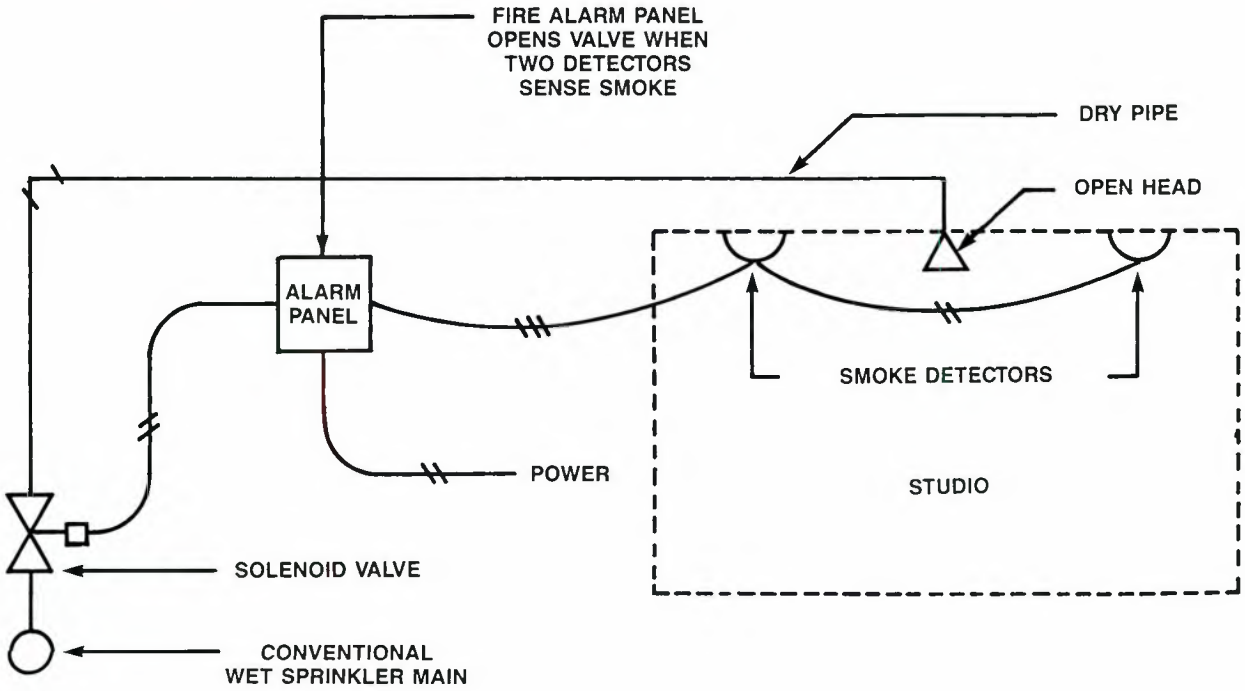

Figure 6. A dual-signal fire-protection system that requires two smoke detectors to sense smoke before activating the system.

Day's dawn breaks on misty morn

With all its promises, all its hopes;

While youthful minds their follies express

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least slowing down, an intruder is to provide code access doors to technical areas. Of course, management must see to it that staff members do not deactivate or wedge open the doors to avoid a perceived hassle when going from one part of the station to another.

• *Hardened windows.* Nearly everybody in a broadcast facility wants to have an outside window at their workstation. From a security standpoint, it is wise to avoid placing sensitive broadcast operations against windows or glazed exterior walls. When the functional planning dictates this situation, consider providing bullet-

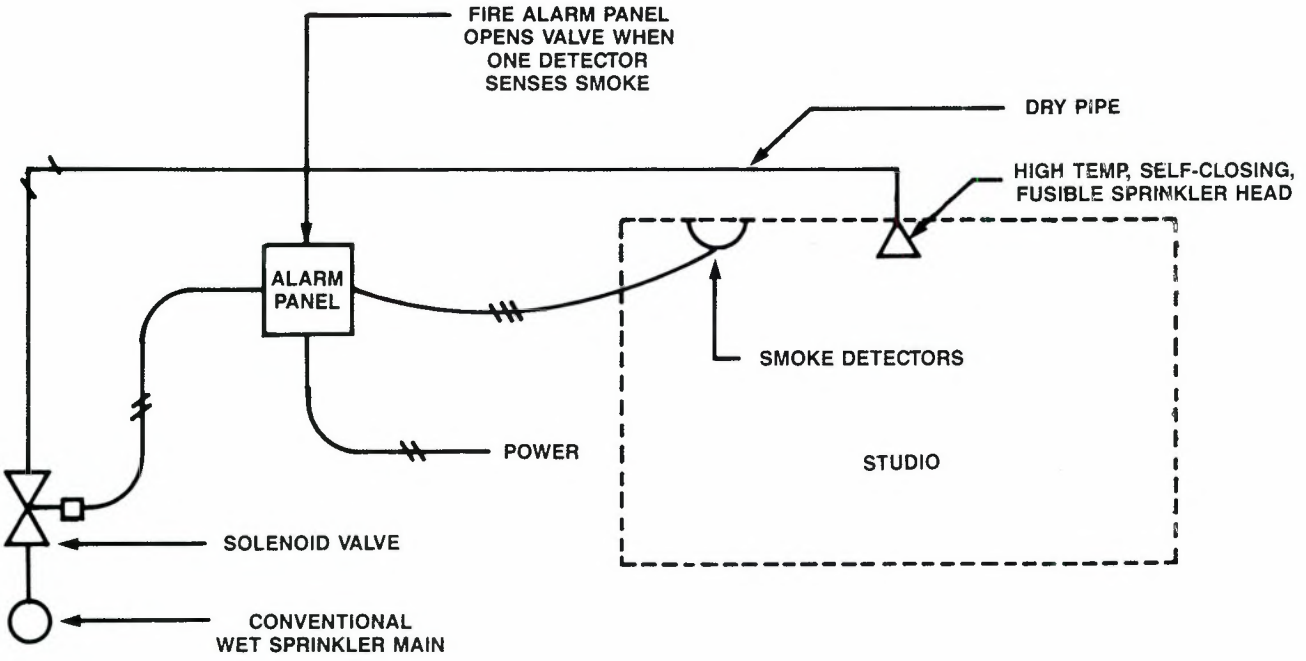


Figure 7. *A dual-signal fire-protection system with one detector and a fusible-link sprinkler. The pipe will flood when the detector signals, but the water will not be released until the heat melts the link.*

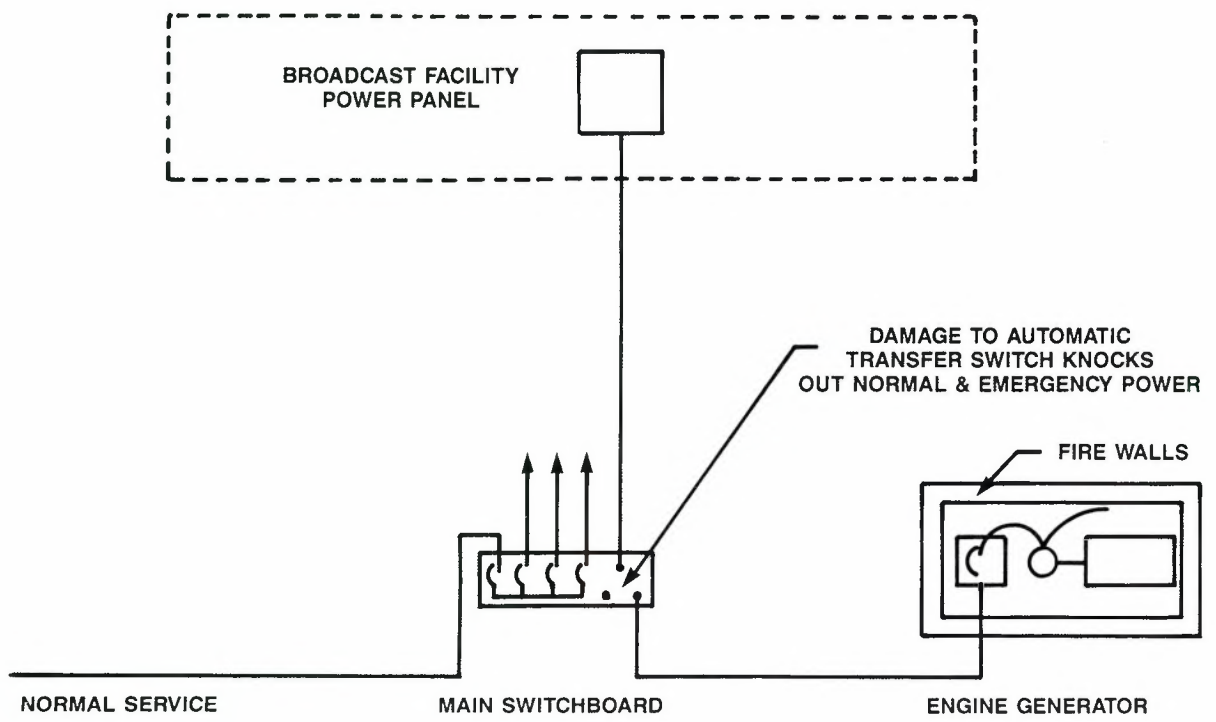
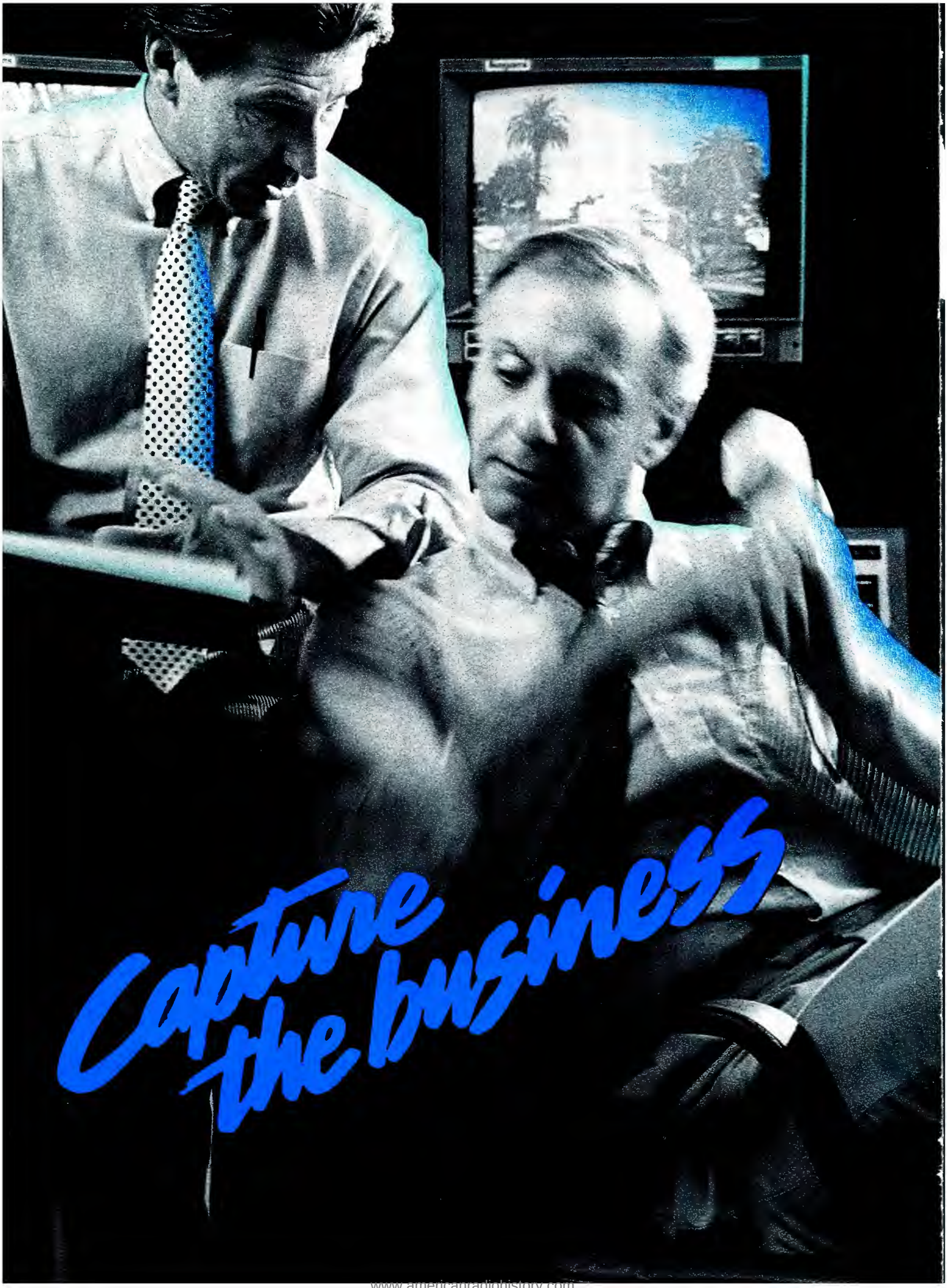


Figure 8. *Emergency power transfer switch must not be co-located with switchboards. A disaster that would take out the switchboard might also disable the transfer switch.*

It's your show



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resistant or intrusion-resistant glazing.

Site selection

Many of the building problems that a broadcast engineer inherits are the results of decisions made by others before the station was constructed. Often, the site for a broadcast facility is selected by management, or perhaps a real estate department, before there is serious involvement by design professionals and those persons who will have responsibility for operating the facility.

If the architect and consultants are involved in the site-selection process, whether for a stand-alone building on a new site or the relocation of a station to an existing building, they may identify potential problems that may affect the final site selection and the financial negotiations.

Ideal building sites are becoming scarce. The sites that are available may have characteristics that increase construction costs significantly. For instance, sub-surface soil investigations made before closing on a new piece of property will help detect unstable or low-bearing-capacity soil, rock, ground water and other common problems. It is important to be aware of these conditions up front.

In cases where a station is being relocated to an existing building, make use of the architect/engineer team for assistance in the selection of a building and in reviewing leases. A team experienced in the design and construction of broadcast facilities will frequently spot conditions that can have a major impact on station operations.

Obtain the assistance of a professional who knows the building and zoning regulations. Determine the extent to which broadcast operations will be affected if, several years down the road, neighboring construction has blocked or is interfering with satellite dishes and microwave feeds. Such new construction also may affect antenna patterns. Make the tests necessary to establish that the broadcast signal can reach all areas of the market. In one instance, because of inadequate testing, it was discovered too late that a significant part of a 2-city metropolitan market could not receive an adequate signal. The transmitter and tower had to be relocated to a new site, and the chief engineer took early retirement.

Professional services

Although the broadcast engineer's rugged individualism and natural inventiveness are legendary, it is important to know one's limits. In matters of site selection, facility design, building construction and tower design, the use of a competent professional design team is strongly encouraged. It costs no more to bring architects and consultants on board at the beginning of a project than it does to bring them in after certain critical decisions have been made. It makes sense to get all the help that will be needed at an early date. Failure to do so is to invite greatly increased project costs and may spawn maintenance headaches that will tax your resources indefinitely.

(See the related article on page 70.)

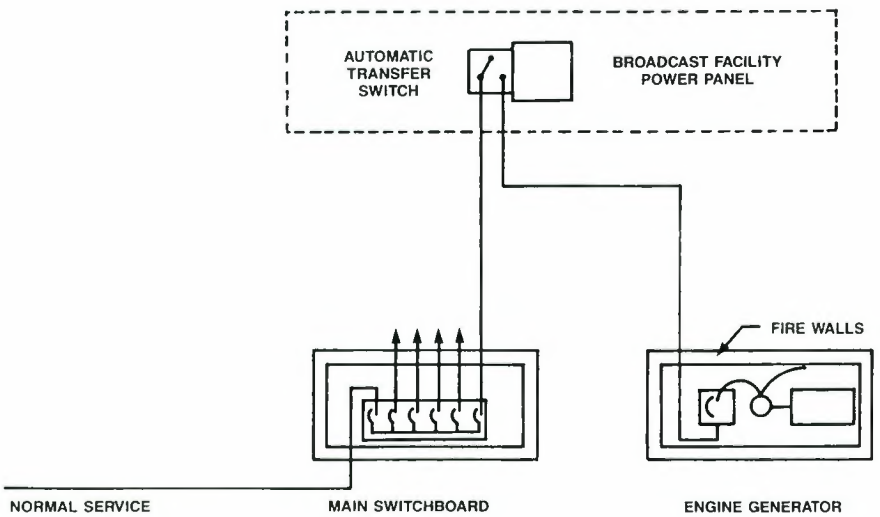

Figure 9. *The most reliable emergency power installations isolate the switchboards and transfer switches from each other.*

Acknowledgment: The authors wish to thank the following persons for their contributions in the preparation of this article:
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- Robert E. Smith, P.E., chairman, Associated Engineering Consultants, Overland Park, KS.

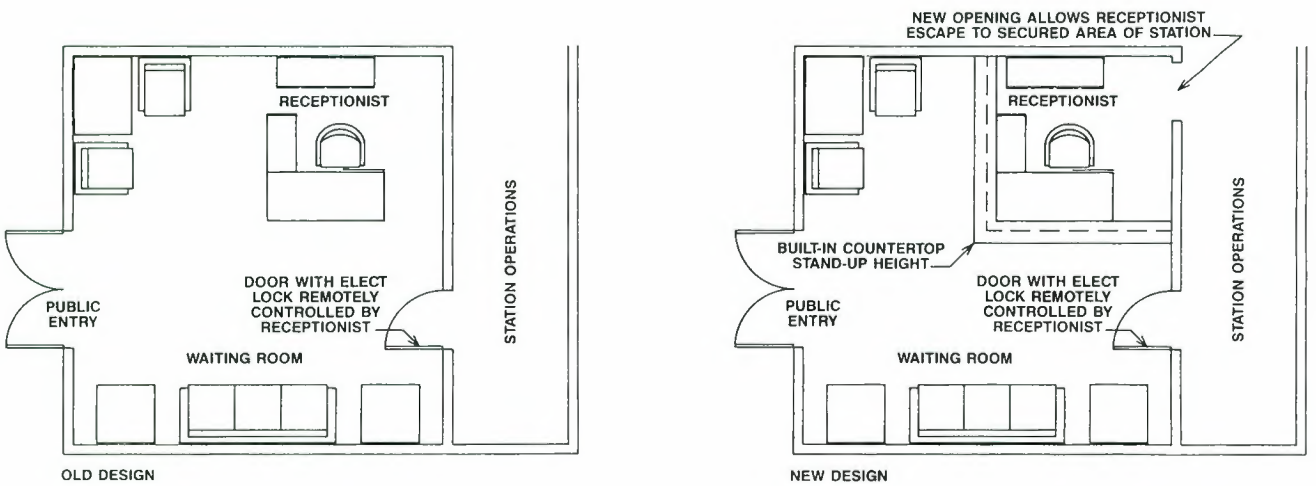

Figure 10. *A modified foyer that leaves an escape route from the reception area.*

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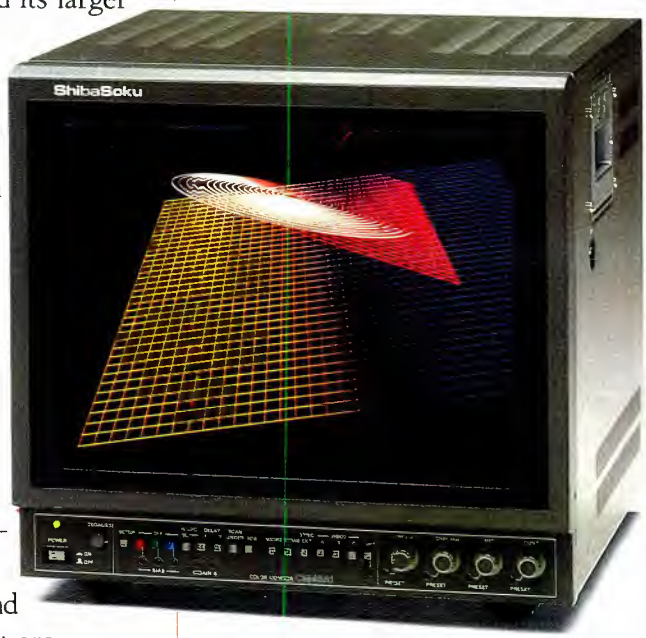

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Continued from page 67

If there's fire...

By Craig Hardman

In the broadcast field, as in any industry, fire prevention is the key to saving lives and property. Fire hazards within work areas in the broadcast facility must be eliminated or, at least, reduced.

The engineering department plays an important role in any fire-prevention program. Engineering areas related to fire protection and fire prevention include building design and construction, building equipment and facilities, fire-protection systems and water supply and distribution.

Where there's smoke...

Fire is a chemical reaction known as combustion. It's defined as the rapid oxidation of combustible material accompanied by a release of energy in the form of heat and light. The "fire triangle" (see illustration) explains the combustion and extinguishment theory. It shows that oxygen, heat and fuel combined in the proper amounts create a fire, and that if any element is removed, fire cannot exist.

Hardman is a firefighter and paramedic for the Salt Lake County, UT, fire department.

A fire hazard is defined as any material, condition or act that will contribute to the start of fire or will increase the extent and severity of a fire. Once again, if any of these are eliminated, a fire cannot occur. Oxygen is normally present and, for the most part, beyond human control. The fuel supply and heat source are more readily controlled. Many fires have been started in both homes and industry through something as simple as an improperly discarded cigarette.

It is not uncommon for materials to generate their own heat to the point that combustion begins. Oily rags, improperly stored chemicals or explosives, even metal shavings from a drill press or lathe have the capacity to self-ignite. Certain reactive materials even burn in an atmosphere of nitrogen, or they produce their own oxygen. Problems of this type have led to advanced research on fire and its control.

Electrical fires

If properly designed, installed and maintained, electrical systems for lighting, power, heat and, in the case of broadcasting, radio-transmitted power, amplifiers, receivers and computer banks should be safe. However, electricity may become a fire hazard through arcing or overheating of electrical equipment. It can present a casualty hazard through burns, electrical shock or falls resulting from contact with live parts. To minimize these hazards, only suitable and safe materials, which have been tested and listed by a recognized testing laboratory, should be used.

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System 25 II	$7,400	$6,734	$1,380	**$2,046**	$5,354	V-25II, DA 150 med/long, dolly S, Free case.
System 30 II Combi	$15,325	$13,870	$2,771	**$4,226**	$11,099	V-30II, Combi-Pedestal, rubber feet, Free case.
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Equipment should be installed in conformance with accepted standards and maintained and used in accordance with these standards. If electrical equipment malfunctions at any time, it should be turned off, circuit breakers should be pulled and qualified people should be notified for repairs. Intentional overloading of electrical circuits, although not as common as in the past, still occurs. This should never be permitted. All equipment should be maintained on a regular basis, and any signs of wear or overheating should be noted.

With the increased use of solid-state components, electrical fires have declined. This is because of the lower voltages and current requirements of these parts and, as a result, lower operating temperatures. All equipment operating within dangerous voltage limits should be marked properly with warning signs, and protective doors kept closed. Even static electrical charges produced by friction may be dangerous under the right conditions, but this can be controlled by proper grounding.

"Fire!"

If a fire occurs, top priority is evacuation. Get everyone out of the building, and close the doors behind you. A good fire door will prevent the fire from traveling and will add precious minutes in containment for the responding fire department.

The second thing to do is call the fire department. Although this seems obvious, it is not unusual for building occupants to assume that someone else has or will call for help. As a result, the reporting of a fire is greatly delayed.

Once everyone is out of the building, someone should be responsible for accounting for all employees in each department. Establish a safe zone away from the building, free of falling glass, bricks and other debris, for everyone to meet.

Never re-enter a burning building. Beyond the hazard of burning, embroiled structures can be unstable and subject to collapse. Furthermore, the smoke created by the combustion process frequently contains dangerous gases. Some fire fatalities are people who, following their escape from burning structures, return to porches or balconies, where they are overcome by smoke.

Assign one person to communicate with the fire department officer. (It is difficult for firefighters to communicate with more than one staff member at a time.) If someone is missing, tell the fire officer at once. Other information fire officials need include the contents of the building, the location of the gas and electric shutoffs and the estimated location of the fire.

Right tool for the job

Don't try to fight the fire yourself if there is any question as to whether you can put it out. Some types of extinguishers, or rather the agents they contain, can damage electrical equipment, especially computer systems. Portable fire extinguishers are classified according to their intended use on the four classes of fires (A, B, C, D). In addition to the letter classification, certain extinguishers also receive a numerical rating. The number preceding the letter designates the potential size of fire the extinguisher can be expected to extinguish. The rating system is based on tests conducted by the Underwriters Laboratories (UL).

The classifications for fire extinguishers are:

A. Ordinary combustibles.
B. Flammable liquids.
C. Electrical equipment.
D. Combustible metals.

Continued on page 76

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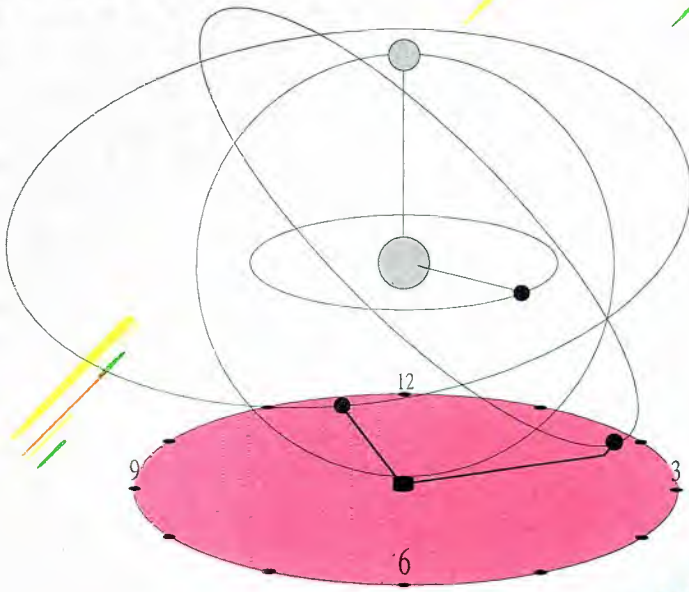

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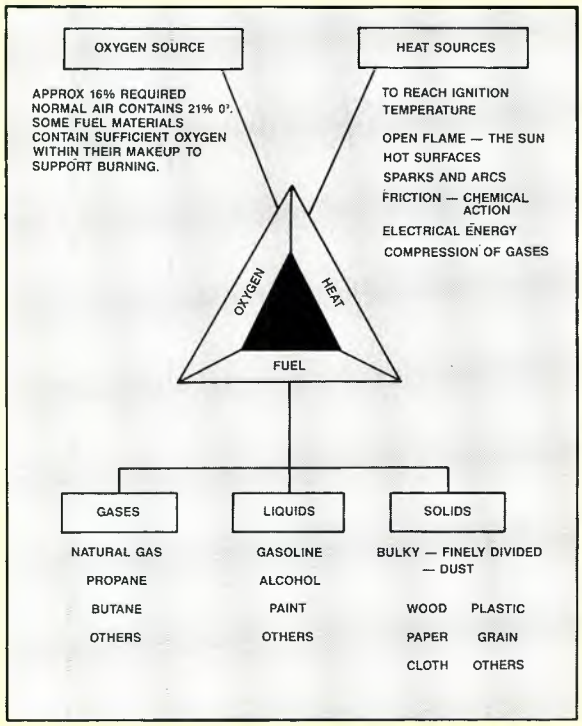

The fire triangle explains the necessary components for combustion to occur.

Continued from page 72

These classifications arise both for efficiency of extinguishment and operator safety. For instance, it is never a good idea to play a water or soda-acid extinguisher, which shoots a stream of liquid, into an electrical fire.

Numbers are used with letters on Class A and Class B extinguishers only. A 2-A model extinguishes twice as much fuel as a 1-A extinguisher.

In an emergency, every second is of great importance. Under the right conditions, fire can double in size every five minutes. Everyone should be acquainted with the general instructions applicable to most portable fire extinguishers.

Damage control

The first concern of the fire department will be life safety. The second will be extinguishment of the fire. When practical, firefighters will next take steps to limit damage. Equipment will be covered with salvage blankets that prevent dust, smoke and water from getting into delicate locations.

Water damage is an especially severe problem. Although the equipment may be on a lower floor, away from the fire, water may drip down from the upper floors, causing damage. The fire depart-

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ment always tries to extinguish the fire with a minimum amount of water, to help prevent this kind of damage.

Overhaul

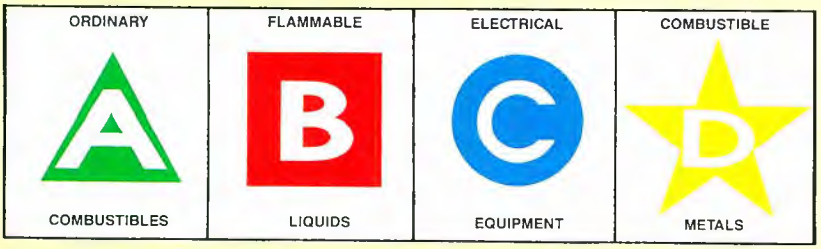
After the fire is out, the "overhaul" phase begins. Overhaul is the practice of searching a fire scene to detect hidden fires or sparks that may rekindle, and to detect and preserve as evidence any signs of arson. The building, its contents and the fire area will be returned to as safe a condition as possible at this time, so that everything worthwhile can be salvaged. Water will be pumped out of basements and elevator shafts, floor runners will be placed over carpets, and dirt and debris will be removed. The building will be ventilated so that personnel can return without protective breathing apparatus. Every effort will be made to get the building back in service as quickly as possible.

Planning

The best time to fight fire is before it starts. Engineering personnel should take the following steps:

- Develop a primary and alternate escape route for each area of the facility. Practice exiting the building by these routes at least once a year, no matter how much the staff complains.
- Determine what would be a safe rendezvous area, free from falling glass, bricks and other debris, where the staff can assemble for a head count following evacuation.
- Decide whose duty it will be to call the fire department. After evacuation, verify that it was done.
- When the fire department arrives, pick someone to communicate with the fire officer. Report immediately any people you suspect might be missing, and give their likely locations inside the building.
- Know the location of all emergency shutoffs (gas, electricity, water and heating oil). Print these on a laminated sheet of cardboard that you can hand to the fire officer in case of emergency.
- Know which fire extinguishers to use on what materials, and how to use them. Do not waste time fighting a fire that you think might be too big for you to handle.

If these steps prevent even one injury, let alone save a life, they will be well worth your effort.



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Pricing for a product of this quality is more than competitive and is yet another reason why AMEK BCII is the first choice of the world's leading broadcast and video production organizations.

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By Tim McCartney

Planning a satellite uplink

Take one satellite uplink project, a tight schedule, lots of players and some unexpected problems. Then fasten your seatbelt.

When things go along the way they're supposed to, it's easy to be lulled into comfortable indifference. The daily operation of a satellite earth station, for instance, is taken for granted after a few years of dependable service. But when equipment fails or something else goes wrong, everyone in the station suddenly realizes how important the system really is.

Ensuring the reliable operation of an uplink/downlink requires diligent planning and construction. This article will describe the process Boise State University (BSU), Boise, ID, and National Public Radio (NPR) went through to build a system on the university campus.

Case study

The satellite uplink/downlink was placed in operation in 1989 by the BSU radio network. The entire process spanned more than 18 months, once the proposal was approved and funded.

NPR uses a single-channel-per-carrier (SCPC) analog voice-transmission system to feed programs from 21 regional uplinks through Westar IV to 260 downlinks. It owns the main origination system in Brenmar, VA. Other uplinks are associated with public radio affiliates and provide program distribution for NPR, American Public Radio (APR) and other users. The network relies on standard C-band transmission techniques, 6GHz transmit and 4GHz receive.

The BSU radio network originally considered merging with a major AT&T uplink project in Boise. The university's final decision, however, was to construct a dedicated system to guarantee 24-hour access. The AT&T system, remotely controlled from Hawley, PA, is a movable design, capable of transmitting video and audio to nearly all of the geostationary communication satellites. As a result of the AT&T project, space became available at the new antenna farm for the BSU installation.

Planning

The facilities provided at the AT&T site greatly simplified the project, resulting in considerable cost savings. Otherwise, planners would have had to not only find an alternate site, but also secure access and permits, construct a new building with heating and air-conditioning systems and erect a fence. BSU and AT&T people discussed some of the concerns of sharing space, such as building security, operator safety and construction dust that might accumulate inside the positive-air enclosure.

Several decisions had to be made at this point, such as antenna size, waveguide length and pressurization, equipment configuration and how to handle rack heat exhaust. The power and mechanical considerations were electrical power, antenna de-icing, grounding and interfacing the program and control circuits to the studio.

Organization was key at this critical stage. A master calendar of the project addressed the hundreds of details related to each phase. For example, it was necessary to estimate the length of time required for FCC approval of the application. This information was vital in developing the project timetable.

Table 1 lists key resource personnel and businesses for the project. They were contacted regularly to discuss concerns and expectations, as well as to advise on costs,

University administrators, financial personnel, engineers
AT&T managers and engineers
Broadcast attorney
Architect
Frequency-coordination company
Contractors
Equipment manufacturers and suppliers
Shipping companies

Table 1. Key resource personnel and businesses involved with the BSU project.

McCartney is a contract engineer in Bemidgi, MN.

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Financing

As the sponsoring organization, BSU was responsible for mapping out its financial strategy. The initial estimated budget is shown in Table 2. Although price increases were a clear threat to the budget, of far greater concern were unanticipated costs.

Because it was possible that the project would take two years to complete, finance personnel wanted to know when particular payments would be necessary. This meant that contingency plans had to be developed early in the project. For example, the decision was made to equip the initial system only for monaural operation. Operating with one instead of the two planned modulators would delay a $5,000 expense.

Site and antenna selection

Choosing an appropriate site and antenna system were the next major decisions. It was important to thoroughly investigate this aspect because a site change greater than about 50 feet would invalidate the frequency search. In addition, any change of the antenna system probably would mean different specifications, which also could invalidate the original study. Fortunately, no major changes were needed. The selected site provided the required clear vertical view up to 33° above the horizon and a clear azimuth view from 67° east to 143° west.

The antenna system needed to meet the FCC's 2° satellite spacing requirement. Parabolic antenna systems may exhibit half-power (−3dB) beamwidths of less than 1°. This is more than adequate to distinguish between two satellites parked just 2° apart some 22,000 miles above the Earth. With help from NPR, a 5-meter, prime-focus, fiberglass reflector dish was chosen.

Frequency coordination

The frequency-coordination and licensing processes are intended to help eliminate terrestrial interference, not adjacent satellite interference. Just as with other bands, the FCC requires frequency coordination for satellite uplink transmissions. This helps prevent interference with existing, licensed, land-based microwave links. Frequency coordination and FCC licensing are optional for receive sites. The uplink/downlink licensing procedure places information in databases so that interference to and from high-powered, land-based microwave links can be avoided.

A company hired to investigate potential interference initially concluded that interference would not exist to or from existing or proposed common-carrier facilities. The firm also sent the frequency-coordination data to seven Western U.S. telephone companies and one pipeline corporation.

After reviewing the data, one of the telephone companies objected through its frequency-protection service. It requested that BSU verify actual blockage provided by a building near the proposed uplink. The company wanted to be sure its link was protected because the path was along a potentially interfering azimuth.

The telephone company and university reached an agreement to coordinate uplink testing. It was decided that if interference to the telephone company's link was detected, it would be NPR's problem to resolve. A copy of the agreement was filed with the FCC and the company's protection service.

Licensing

The required FCC documentation was prepared and submitted to the commission. Some of the uplink's specifications are shown in Table 3.

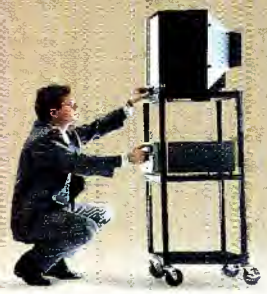
When the commission issued the construction permit and license just six months after the filing, it brought an unwelcome surprise: The construction deadline was only six months away. Such a tight schedule seemed unrealistic, especially to broadcasters accustomed to 18-month CPs.

Fortunately, the commission has provisions that permit an additional 6-month

Continued on page 86

Table 2. Original budget estimates. The final project cost was quite close to that predicted.

Antenna system (5-meter), including spar, feedhorn assembly, reject kit, waveguide section and foundation kit	$14,000
Transportation for antenna system	5,000
HPA (75W)	18,000
Upconverter	11,000
Modulators (two at $5,000 each)	10,000
Downconverter	2,500
Demodulators (two at $2,150 each)	4,300
Elliptical waveguide (70 feet)	1,300
Flanges, rigid line sections, elbows, waveguide twist-flex, pressurization parts, hanging & mounting hardware, wall feedthrough	1,600
Attenuators, combiners	500
Equipment rack, with rear mount rails	700
Electrical power to rack	200
Cement foundation, waveguide support system, protection barriers, drill and fill holes in building	2,000
Architect	800
Frequency coordination study	750
Broadcast attorney	500
Crane rental/operation (2 uses)	300
LNA	150
Coax, connectors, divider, ground wire	600
TOTAL:	$74,200



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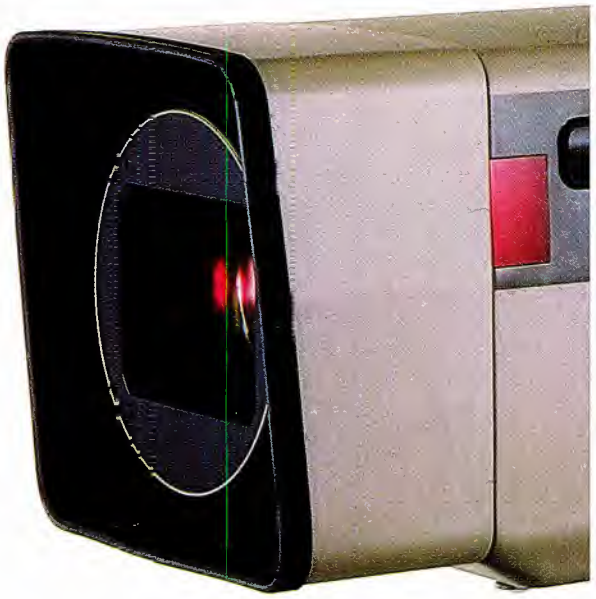

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Continued from page 82

extension. Most of the typical reasons, such as seasonal limitations and manufacturer delays in building custom-designed equipment, are acceptable. A shortage of funds, however, does not justify an extension by the commission. As it turned out, BSU needed and received a 6-month extension.

The construction permit and license is basically an operating license. After construction was complete, BSU was required to certify that the uplink was built and operating by the specified date. The commission issued an actual license about a month later.

Equipment selection

Figure 1 outlines the overall uplink system design. Stereo program audio is coupled to the modulators where the standard 70MHz IF frequencies are produced. Up to 16 separate audio channels are possible through variation of the IF by ±18MHz.

The IF signals then are attenuated and combined to feed the upconverter, where the 6GHz carrier signal is developed. This low-level RF signal drives the HPA. From 13W to 25W of RF power is fed into the elliptical waveguide. The signal then is transferred to the antenna in the feedhorn assembly and effectively increased by the 5-meter reflector.

Photo courtesy of Dr. Catherine E. McCartney

Lightweight dishes are especially vulnerable to warping if the dual rear support brackets are not properly adjusted. Both brackets must be moved equally to prevent misalignment of the dish focus point.

The major equipment purchased included the antenna system, HPA, upconverter, modulators and waveguide. Because of the high cost of the elliptical waveguide ($18/feet), it was important to purchase enough, but not too much. Other RF components required were tunable and pre-tuned flanges, elbows, flex-line, rigid line and pressurization equipment.

Downlink equipment

Figure 2 outlines the overall downlink system. The received 4GHz satellite transponder signal is reflected up into the feedhorn assembly. It then passes through a reject filter and into the antenna LNA. The LNA provides sufficient amplification so the signal can travel through the waveguide to the downconverter.

At this point, a power block isolates the coax so the LNA dc-supply voltage can be fed through the coax. The RF signal is downconverted to a 70MHz IF and split for distribution to the two demodulators. The same kind of considerations that guided the selection of uplink equipment were applied to the downlink purchases. The major items purchased were the downconverter, demodulators and the LNA.

The timing for equipment purchases turned out to be a problem. Because of the two national political conventions and the summer Olympics in Korea, demand for uplink equipment was high. This created unexpected delays in the custom-construction of some of the uplink equipment. Careful follow-up was necessary to be sure that each piece of equipment ar-

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rived in time.

Good fortune allowed construction of the antenna system and HPA to be completed ahead of the promised 4-month schedule. Considerable difficulty was encountered with transporting the dish over a long distance during the winter. The upconverter was the last piece of equipment to arrive, five months after the order was placed.

Dish construction

The earth-station manufacturer provided the foundation kit several months before the dish arrived. This enabled the architect to draw foundation plans. When the plans were in hand, the cement was poured with mounting bolts located properly.

A crane was used to unload the pieces from a flatbed truck and then again during the final assembly. With the two dish sections bolted together on the ground, the crane hoisted it onto the base. The spar (tripod support) was bolted to the dish and feedhorn assembly. A rigid section of 6GHz waveguide was attached to one leg of the spar. Once the basic assembly of the dish was complete, it was possible to stand inside to connect and seal the fittings properly. This was especially important for all of the coax fittings and assemblies. Then, a final tightening of the dish to its support system aligned the reflector roughly toward Westar IV.

Line installation

Because of the extremely high frequencies, proper waveguide installation was critical. On the transmit side, a short piece of flexible waveguide couples the signal from the feedhorn to a 10-foot section of rigid line. The rigid line runs along a support beam and exits near the bottom of the dish. Elliptical waveguide then is used to connect with the HPA.

The waveguide, downlink coax and ground wire are supported on braces made of 2-inch pipe. Bending the elliptical waveguide required a special tool. The manufacturer's instructions explained how to bend and twist the waveguide to route it along the support system and inside the building.

A waveguide flange was field-installed inside the building for attachment to a section of twist-flex waveguide, which is kept pressurized.

Rack equipment

The equipment rack was located in the AT&T building. The rack was connected to the main AT&T building ground. After rack equipment was installed, each chassis was tied to ground with copper braid.

A telephone line was used to connect the uplink site with the studio for remote control. It's possible to remotely control the filaments, high-beam and fault-reset circuits in the HPA. Remote readings were limited to high-beam status. The ac power for the upconverter can be turned on and off remotely.

The modulators were not so easily interfaced. There was no provision to turn the power on or off from the studio. This feature typically is not needed because most users switch the IF output of unused modulators to dummy loads. It also was not possible to remotely retune program channels on the modulators.

Modulator output levels are adjusted manually by external rotary attenuators. If motorized versions or solid-state attenuators had been used instead, remote control of the attenuators would be possible.

Alignment

Initial system alignment was performed using the downlink side. The dish was aimed and the LNA rotated to achieve maximum signal. It's possible to do this simply by reading the demodulator AGC

Continued on page 92

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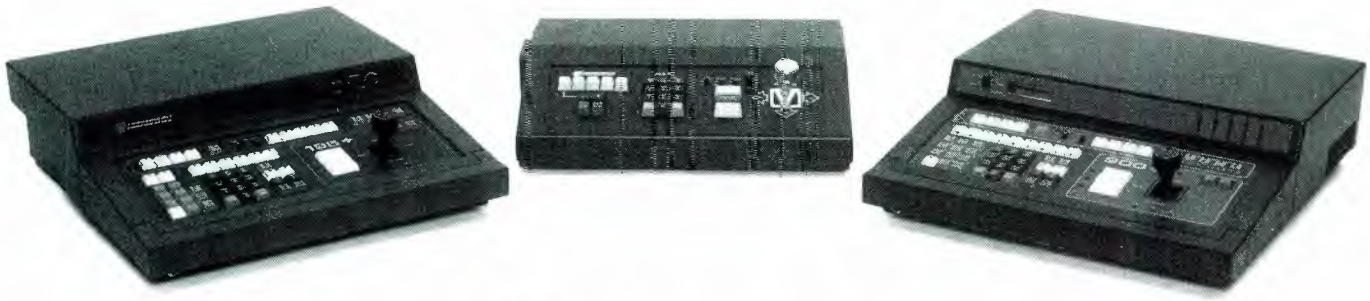

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Continued from page 88

voltage. Maximum voltage coincides with minimum program audio noise.

This procedure not only aimed the dish at Westar IV, but also simultaneously provided the correct polarity for both receive and transmit signals. This occurred because the feedhorn is constructed to offset the uplink and downlink feeds by 90°. NPR indicated that, although this setup would be close to the final positioning, minor adjustments might be required. When discrepancies occur, the uplink settings take precedence over any preferred downlink setups.

At this point, the system was ready for transmission alignment. The initial transmission required considerable coordination. Two people were stationed at the uplink, and additional staff members were required at NPR, the satellite owner's monitoring site and the telephone company, which was concerned about interference. It was necessary to schedule two hours of test time to complete the work.

Problems develop

The first problem encountered was not the one expected. The initial concern had been about reflected power in the elliptical waveguide or its connections, but it proved unfounded. As a result, it was not necessary to adjust the tunable waveguide flange. However, the satellite, Westar IV, was receiving insufficient power. After three hours of re-aiming the dish and reorienting the feedhorn assembly, the problem still existed.

Of even greater concern was the 14dB cross-polarization figure. The satellite owner required no less than 27dB isolation between the receive and transmit planes. In fact, to protect other users, the company preferred at least 30dB.

NPR and the satellite owner agreed that the problem was related to the dish. Ruled out was the possibility that a side lobe, instead of the main beam, was reaching Westar IV. Because of the 2° spacing requirement, side lobes are too far down to be a problem with these types of dishes.

The antenna manufacturer disagreed that the dish was at fault, but agreed to replace the feedhorn assembly. After its installation, a second attempt netted the same unacceptable results.

NPR decided to send an engineer to Boise to troubleshoot the problem. The visit was called off, however, because a wild guess during the third try resolved the matter.

Unlike many dishes, this model has two rear support brackets. Thus, any re-aiming should have involved both support brackets. However, only one bracket was adjusted in the initial tests. Once the problem was discovered, the power level increased easily and cross-polarization improved to an acceptable 27dB. The satellite owner and NPR both certified the new uplink, and the telephone company detected no interference.

NPR engineers recalled similar problems they had encountered, mostly with portable uplinks. Another new, permanent uplink had experienced the same type of problem, however. That dish had to be removed from its foundation so that each bolt could be loosened until one "banged into proper place." Even one piece of hardware can cause structural misalignment, which may result in a warped antenna-reflector surface.

Satellite dish surfaces must be perfect parabolas, with no surface anomalies or bumps. Any distortions may cause colliding waves to shift out of phase and detract from the total gain of the antenna. Even moderate surface warping may reduce antenna gain. When proposing new licensing rules in 1987, the FCC expressed similar concern about additional interference as a result of the new 2° satellite spacing. The commission noted the potential for problems from small uplink antennas that are easily damaged in transport.

Testing

After RF certification, audio performance tests were conducted with NPR's help. An audio oscillator fed +4dB of signal directly into the modulators. Signal-to-noise was down 73dB, frequency response was ±0.5dB from 20Hz to 20kHz, and THD was under 0.30% at all tested frequencies.

A pulse-code modulator (PCM), coupled with a videocassette recorder, was supposed to provide playback of recorded programs for the transmission tests. Unfortunately, because of the strong RF being generated at the site by the AT&T and BSU uplinks, the recorder wouldn't work properly. The final tests used audio fed from the studio over telephone lines.

Operation

Several operational procedures were established by the engineering staff. The uplink operators received thorough instruction in these procedures. Proper level controls were paramount. Guidelines were developed using VU meters and an intercom between uplink and studio.

Careful coordination with NPR during setup and takedown was necessary. The BSU operators also were trained on how to use NPR's coordination channel. The channel allows network stations to start tape decks automatically for automated program recording.

Special procedures were developed to help obtain the longest possible filament life from the HPA traveling-wave tube. The AT&T uplink personnel suggested that the filament remain powered continuously to improve reliability. Although this was appropriate for AT&T's operating schedule, the limited use of the system by BSU dictated a different approach. The TWT fila-

Continued on page 278

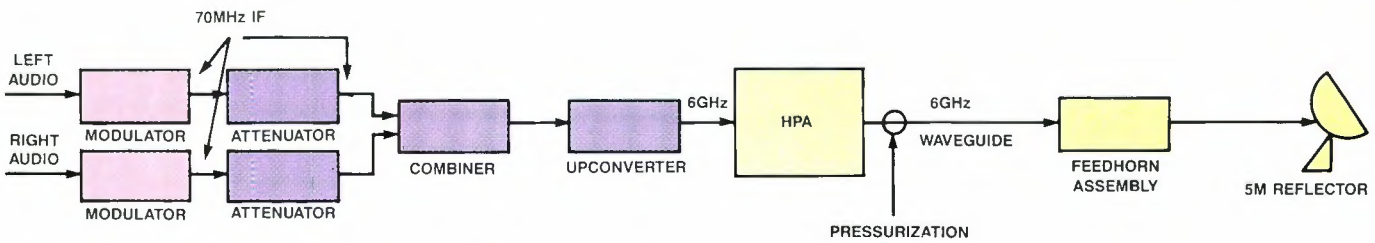


Figure 1. *Basic block diagram for the 6GHz uplink portion of the system.*

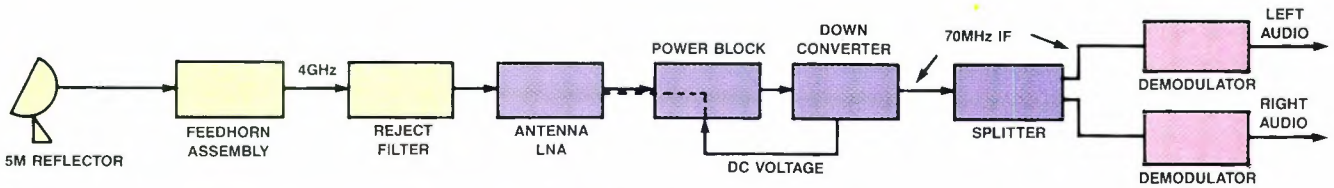
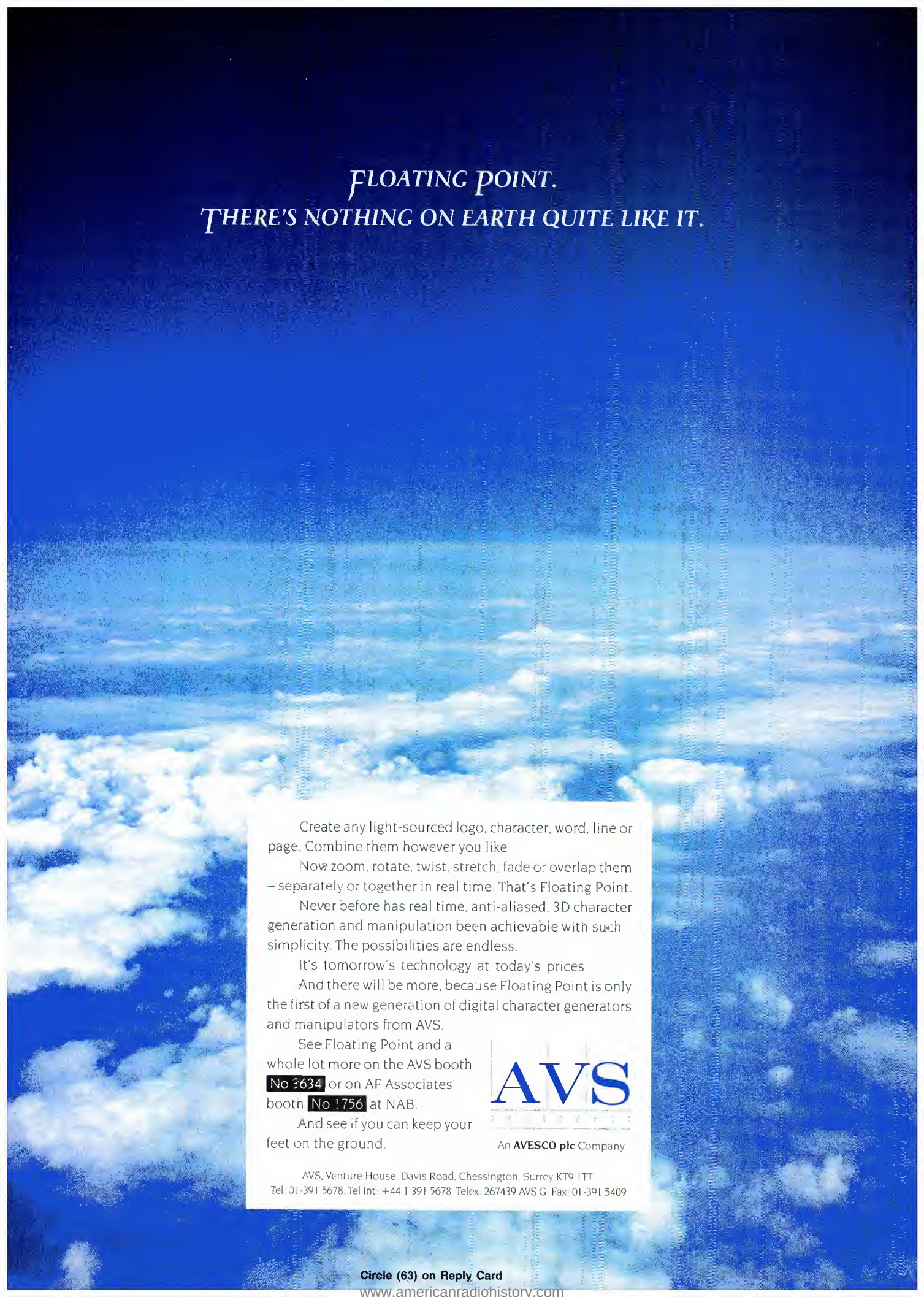


Figure 2. *Downlink portion of the satellite uplink/downlink system.*



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By Rick Lehtinen,
TV technical editor

Hardening towers

Standing tall in the face of adversity.

After all we do to keep our stations on the air in the face of natural and manmade catastrophes, if the tower fails, it is all for naught. This was borne out in May 1989 when an errant F-15 from Tyndale Air Force Base clipped the guy wires on a 1,500-foot tower in Panama City, FL, in September 1989 when Hurricane Hugo snapped a 1,600-foot tower in Charleston, SC, and in October, when the Bay Area quake toppled several towers and damaged others. The goal for the station engineer is to keep the tower erect in the face of natural and manmade forces until the structure is no longer needed. Five reasons for tower failure are poor construction, poor maintenance, overloading, icing and accidents.

Build it right

Poor construction is avoidable, but that requires diligence on the part of the station representative. Frankly, you get what you pay for. Rumors about highly paid tower specialists possessing nerves of steel abound in the industry. In reality, what you might see is a low-paid, poorly treated, justifiably nervous crew, made up of individuals who will put up with the dangerous, uncomfortable job of tower work for only a short time before quitting. As a result, inexperience runs high. Try to find a crew that has been working together for some time and that takes pride in its work.

Next, inspect the work in progress. If you can't climb the tower yourself, hire someone who can. Verify that the connections are joined properly, using the right-sized hardware, appropriately tightened. If a joint doesn't fit at assembly time, it certainly won't be easier to fix once a couple hundred extra feet of tower are stacked above it.

Contact your tower designer to learn what variances are acceptable. Decide ahead of time what your recourse will be in case you observe shoddy work. Nitpicking will make you your own worst enemy, in that nobody, including you, will stay on schedule. However, an improperly built tower that fails will not only raise serious liability issues, but will also deprive you of revenue and incur expenses for cleaning up the mess and rebuilding.

Beyond the tower structure itself, there is the issue of how the antenna and feedline are mounted. These items are expensive to service, so a job well done is worth the effort. One expert indicates that 90% of the problems he has seen with antenna systems are attributable to poor installation.

Tower maintenance: what to look for

Even if the tower is about to topple, unless the marking lamps or paint are bad, the FCC usually takes no action. This means the responsibility to inspect the tower falls to you, the station engineer.

Any obvious structural damage, such as if the tower was hit by lightning or struck by a vehicle, an airborne object or instruments wielded by vandals, should be looked into at once.

Hollow tower members usually are equipped with drain holes, but if they are plugged, either by galvanizing or paint, water may accumulate and lead to rust. What's worse, trapped water may freeze, leading to expansion and breakage.

Check for tower straightness periodically with a high-quality transit. A bow in a tower may be due to sinking foundation or to a slack guy wire.

The guy system needs to be checked thoroughly. Verify first that the guys are in position. Next, ensure that the turnbuckles have safety wires in them to keep them from unraveling. A dynamometer and a come-along can be used to check individual guy tension.

Paint

Recent rule changes allow station owners to leave tower structures unpainted, in many instances, if strobes are installed. (See Figure 1.) Towers with traditional beacons still need paint.

In the case of towers built with galvanized materials, paint is strictly for tower marking. For towers made of black iron, the paint protects the tower from corrosion. Tower experts allow that galvanized towers may be painted with water-based paint, but for black iron, use oil.

Surface preparation for each paint is different. In all cases, clean off areas of bad paint and rust. Next, for water-based paints, wire-brush loose paint from the sur-

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face, and apply paint. For oil-based paint, scrape, then paint bare spots with primer before applying the final coat. Water-based paint is likely to fade in five years, oil-based in eight.

Be cautious in your choice of painting contractors. Some unscrupulous operators have painted only the undersides of tower members, making them look good from the ground. Also, some contractors thin the paint excessively to cut costs.

Lamps

Because licensees must keep their towers properly illuminated, it makes good sense to relamp at regular intervals, and spare the expense of unscheduled trips. The relamping climb is a good opportunity to inspect the other items previously mentioned.

Wide load

Station owners may find it profitable to rent space on the tower and in equipment shelters to other broadcasters or land-mobile radio users. Remember to design in these extra loads when the tower is specified.

Also, it is important to remove feedline when it goes bad or the antenna comes down, unless it is to be reused. The extra weight and windloading provided by even a single transmission line can be considerable. After a few years of adding antennas onto antennas, it is easy to approach the design limits of smaller towers. This situation must be avoided.

Always use proper installation hardware to mount antennas and feedline. Nylon wire ties and black tape may seem adequate at first, but the ravages of weather and ultraviolet radiation may soon make them brittle.

Ice

Broadcasters have long known that atmospheric icing of radio and TV towers can cause problems ranging in severity from transmission pattern distortion to complete tower collapse. Ice forming between antenna radiating elements can cause electrical shorting and equipment burnout. Ice can stretch guy lines. Also, towers near populated areas are subject to the added liability of falling ice, which threatens lives and surrounding property.

How ice forms

There are two recognized sources of ice accretion. The first is "in-cloud" icing, in which supercooled water droplets float in the air and contact a surface because of air movement. The second is precipitational icing, where the droplets are massive enough to fall from the atmosphere onto the tower structure.

These two sources form three types of ice. (See Figure 2.) *Glaze* ice is usually the product of freezing rain or of airborne spray from nearby bodies of water. It forms at relatively high temperatures (0°C to −3°C) and forms on surfaces as a tightly bonded, clear, dense, glasslike coating. This type of icing is the most serious threat to structures because of its density and the large additional loads it may impart.

Rime, or fluffy, white ice, forms more frequently than glaze in mountainous areas. Rime ice varies from "soft" to "hard" depending on its density, clarity and crystal structure. Soft rime forms at low temperatures (−5°C to −25°C) and low wind speeds. The impinging droplets freeze quickly, trapping air as the accretion grows. The large amount of entrapped air is responsible for the opaque-white and fluffy appearance of rime.

Because of its lower density, soft rime is not too problematic for broadcasters. Hard rime, on the other hand, is halfway between glaze and soft rime in terms of density, clarity and hardness. It can be as dangerous as glaze ice. *Frost*, a fairly harmless form of icing, forms when in-cloud moisture freezes on a surface, in still air.

Many forms of ice can form simultaneously on the same structure, depending on surface features such as shape, exposure and heat-dissipation characteristics of the structure part.

Problems caused by icing

Icing imparts additional dead weight to the structure and also presents a larger surface area to the wind. Towers must be periodically surveyed for signs of structural fatigue from repeated ice accretion and windloading, and guy lines should be inspected for wear and retensioned to counteract stretching. When ice falls, it is called

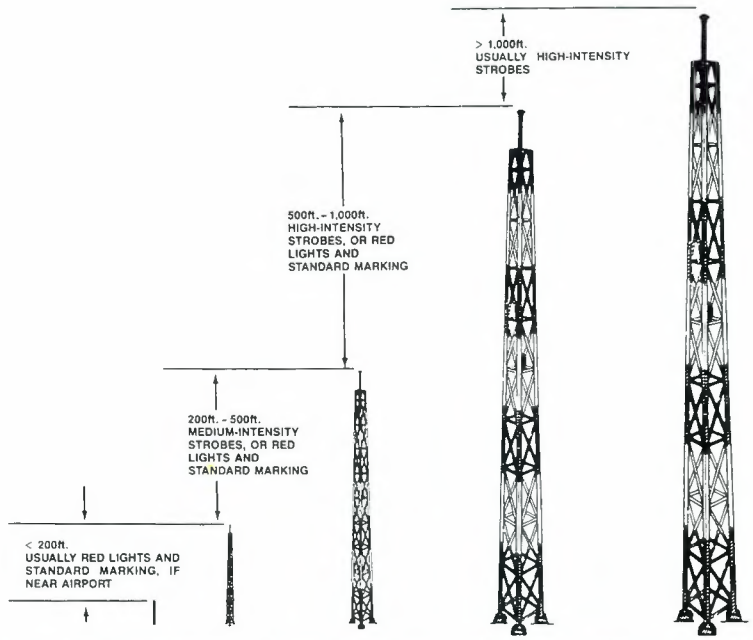

Figure 1. *General information about tower obstruction marking and lighting. The use of medium-intensity, white flashing lights for 200- to 500-foot-tall towers is a relatively new option.*

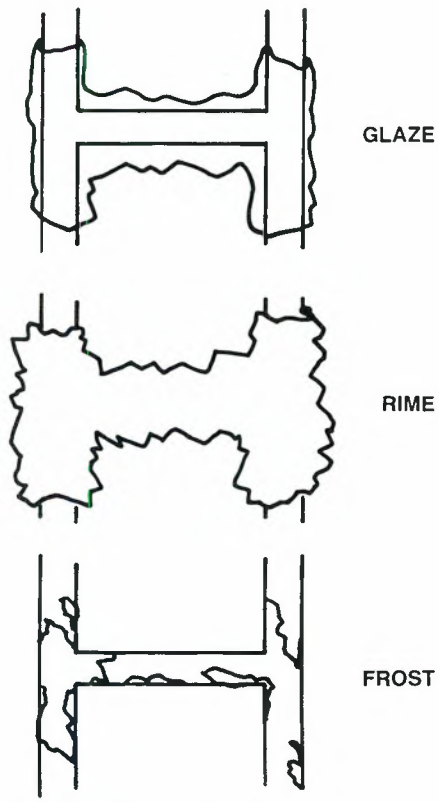

Figure 2. *Glaze ice forms a clear, hard envelope around tower members. Rime forms a fluffy, needlelike sheath, and frost forms a light layer. Most of the danger from tower ice comes when it "sheds" or falls.*

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"shedding."

Guyed towers are especially prone to failure from uneven shedding. Heavy iceloading on the guys exerts tremendous tension, and when individual guy lines suddenly release a load, torsional forces may overcome the strength of the tower.

Harmonic oscillation of guy lines, or "guy galloping," is a rare but extreme type of ice-induced stress. It has been proposed that a small amount of ice building up on the windward side causes a cable to assume the shape on an airfoil. A moderate wind then can induce the cable to move because of an aerodynamic lift and drop phenomenon. Galloping occurs when the movement matches the resonant frequency of the cable, resulting in increasing oscillation amplitudes. The danger lies in the fact that galloping usually affects only one or two lines of an entire guy system, which can produce violent twisting of the tower. An added danger is the fact that metal becomes more brittle and subject to failure when cold. Damping guys can be installed, which tend to limit such oscillation.

Tower-mounted items are subject to damage from falling ice shed from the upper levels. Threatened items include transmission lines, reflector dishes and antenna elements. Falling ice chunks of considerable size, weighing tens of kilograms, are common during shedding events.

Weatherwise

Icing and shedding are usually the result of specific storm patterns, and station personnel often can predict from past experience the onset of a dangerous situation. In light of the likely storm track and the associated wind directions, buildings beneath the tower normally are situated to the windward side, for protection from falling ice. Transmitter roof buildings are likely to be constructed to absorb impacts and resist punctures. Vulnerable items on the tower can be shielded from above with wood, sheet metal or wire-frame construction.

Prevention and ice control

Falling ice is a difficult problem because there are no feasible proven means of prevention available for tall masts. The best way to guard against damage to adjacent property is to restrict land usage in the icefall shadow of the tower. Initially, the tower should be constructed on a vacant parcel of land large enough to encompass the highly probable fall zone. Thereafter, land-use planners should be cognizant of the danger and restrict development in this zone.

Many different approaches have been taken to prevent ice accretion, to minimize its severity or to aid in its removal. "Anti-icing" methods minimize or prevent accretion, whereas "de-icing" methods remove the ice once it has formed. Because of the large size of transmitting towers, many of the traditional anti-icing and de-icing methods are not cost-effective when applied to the whole tower. They usually are applied only to sections immediately surrounding the antennas.

Popular techniques for ice control include the following:

- *Shrouding.* Atmospheric icing has been shown, in theory, to be diminished by increasing the diameter of superstructure elements. This reduces the ability of the structure to collect water droplets. This idea has been used with success on arctic oil drilling platforms by enclosing the superstructure in a solid panelwork. Radomes are an example of the use of this principle. Application of this concept to broadcasting is limited to short, sturdy towers that are not subject to excessive windloading.
- *Flexure.* It has been discovered that out-

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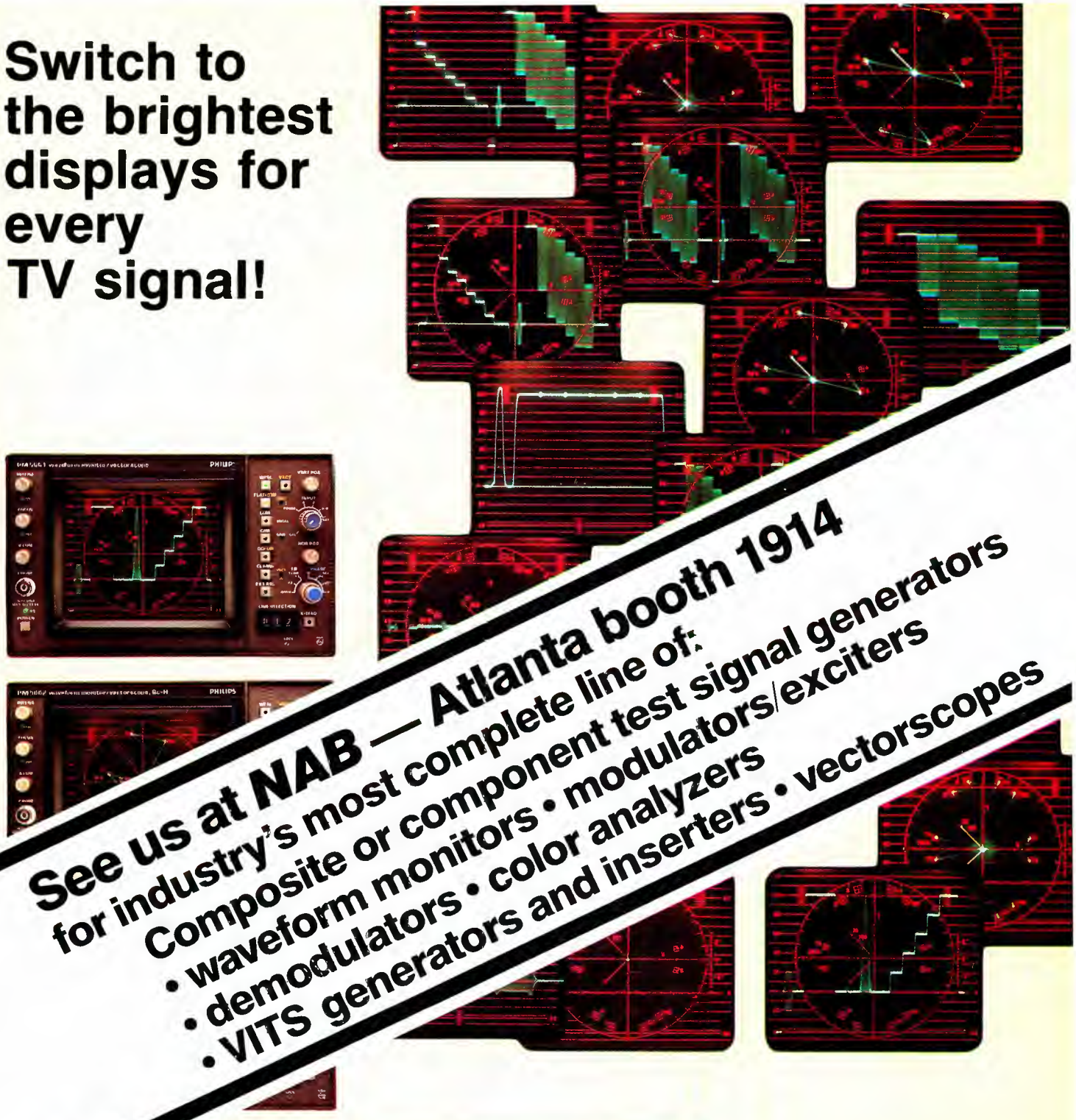

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fitting radomes or exposed elements with a flexible sheathing has been successful at some installations. Flexure is caused either passively by wind and vibratory action, or by an active pneumatic system. Ice was removed from the guys of an antenna tower in Finland during the winter of 1981-82 using a common concrete vibrator attached to a guy line. Other tests have been inconclusive.

Although removed for this photograph, use of protective clothing and headgear is important. (Photo courtesy of Rick Murphy.)

• *Low-adhesion coatings.* Another approach to icing protection has been in the areas of icephobic or low-ice-adhesion coatings. The types of coatings studied have been freezing-point depressants and low-wettability substances. Freezing-point depressants, such as glycol solutions, soluble salt solutions and gas-evolving coatings, function by contaminating the accreting droplets and reducing the freezing point to below that of pure water. Sloping or vertical surfaces then will shed the liquid so ice doesn't form. As such, freezing-point depressants are classified as "sacrificial coatings" because they are continually being washed away and must somehow be replenished. Highway salting and aircraft wing de-icing are common applications of these materials.

Low-wettability oils, greases and permanent coatings have been pursued because of their hydrophobicity. However, it is incorrect to assume that because a coating

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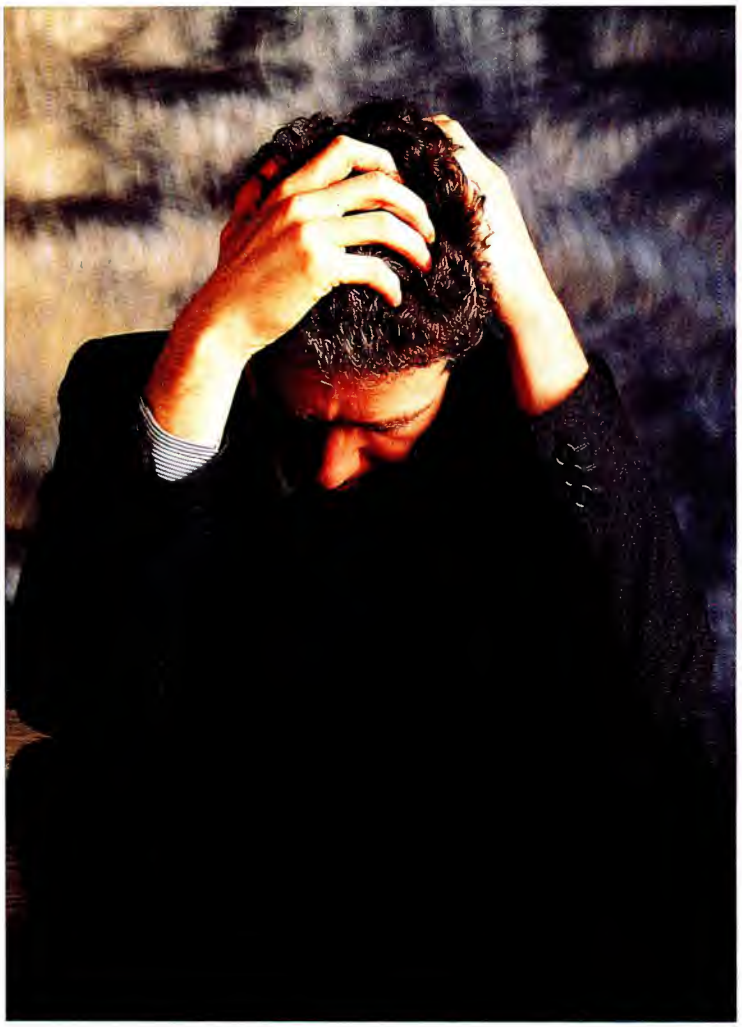

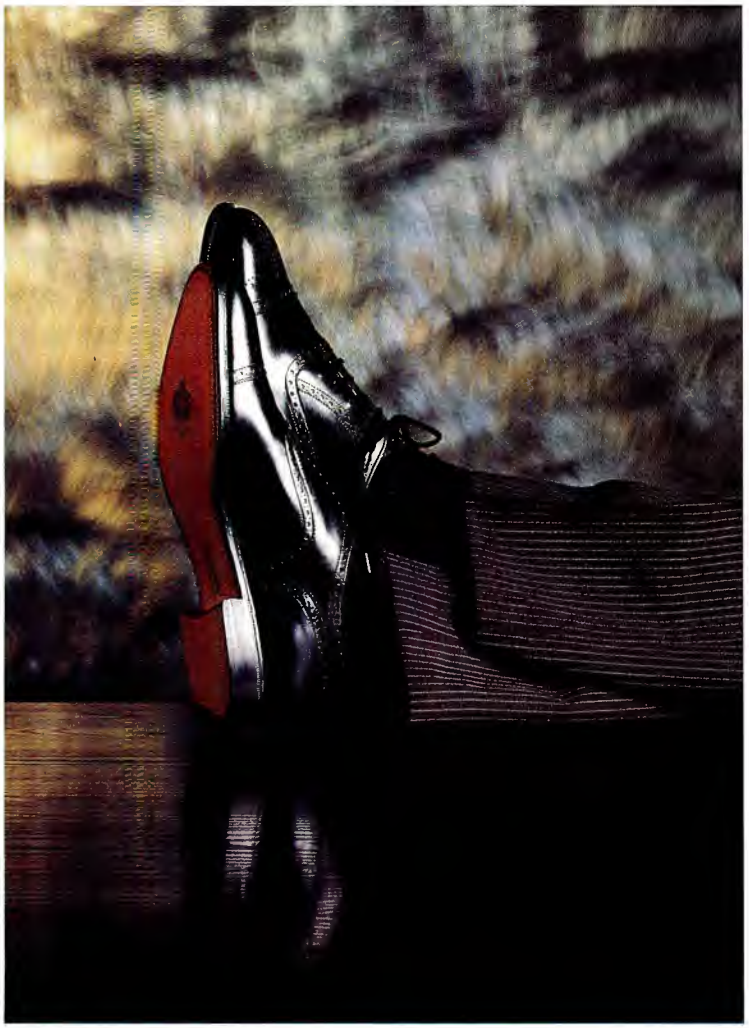

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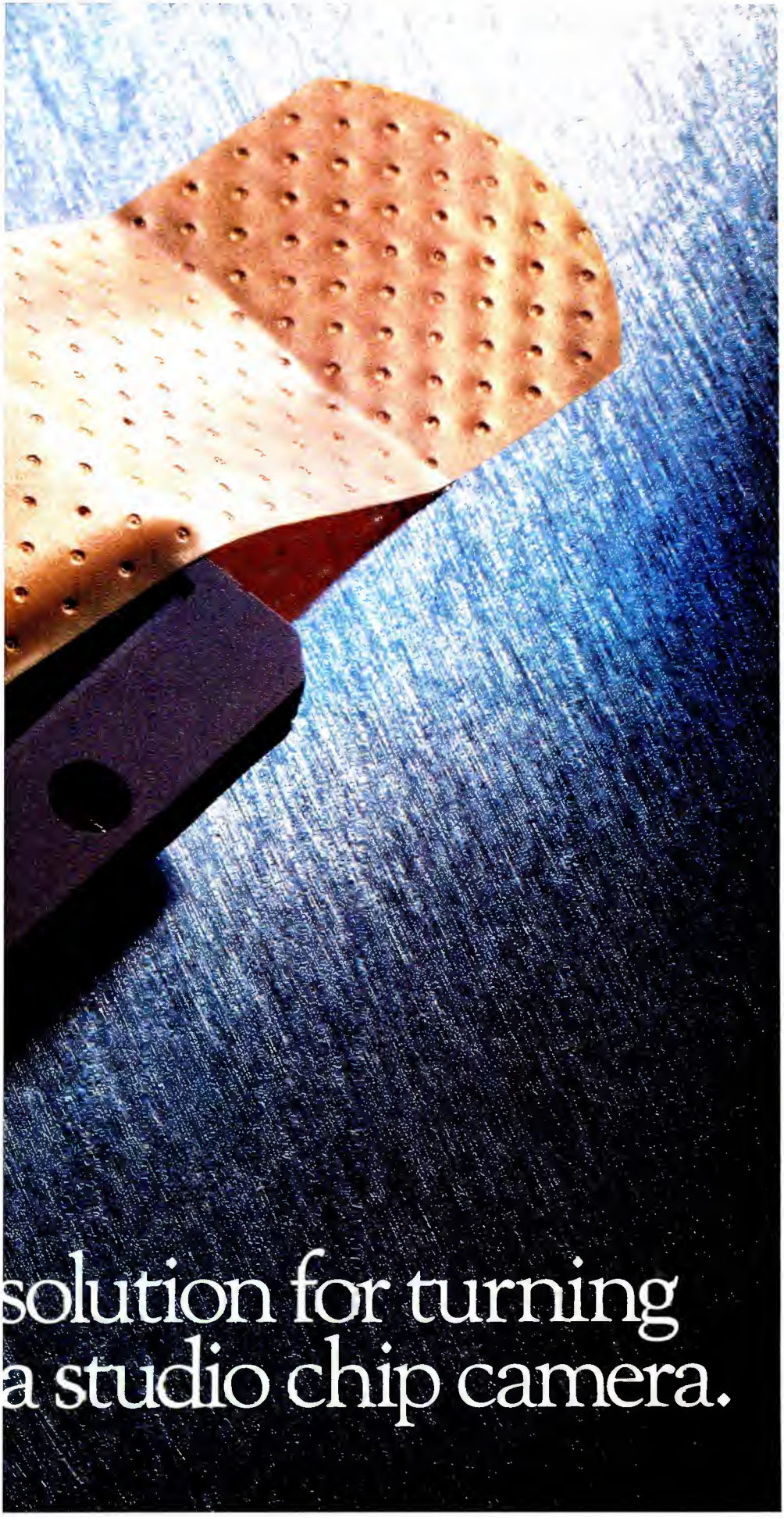

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sheds water it will necessarily shed ice. During the early stages of icing, these substances allow the droplets to run off a sloping surface more rapidly before freezing can occur. Eventually, some droplets accrete before they can be shed. In turn, these create sites for further accretion and the hydrophobic coating thereafter rapidly becomes coated with ice.

Studies have shown that certain polymer coatings exhibit a lower adhesive strength for ice than bare metal surfaces. Many broadcasters insist that the glossy surfaces of their antennas' radiating elements help prevent the formation of ice.

Heating

The only totally effective anti-icing method available today is heating, and it is the method of choice for most station owners. Given the large power demands, heating is, in general, used only to prevent icing of the radiating elements of FM and TV antennas. The popular heating units are factory-built into "batwing" or whip-type antennas and must be activated before icing can begin. These low-wattage heaters usually cannot keep up with the accretion rate if ice is allowed to accumulate appreciably before the heaters are activated. Some station operators manually activate heaters based on the local weather forecast or individual judgment. Others prefer the more cautious alternative of operating de-icers for the entire season. A third alternative is to provide for automatic activation via thermal, precipitation and/or icing sensors.

Future towers

Further reliability in towers will be achieved through constantly improving tower design methods. The construction code used currently for tower construction is TIA/ANSI/EIA RS-222-D. This code takes into account the static forces of tower design, but dynamic loads are covered for by building in a safety factor. Additionally, there is no provision for specific cases of iceloading, although loading guidelines are mentioned in an earlier version of the code. The soon-to-be-released RS-222-E code will account for ice. Subsequent revisions will begin to take into account dynamic loading. As a result, future towers will not be overbuilt to accommodate blind safety factors, but also not underbuilt against the dynamic loads.

Accidents

There is not much hope of making a tower stand tall against a direct hit by an aircraft, or resist a nearby explosion, intentional or otherwise. The best protection against this type of disaster is proper tower maintenance, with particular emphasis on tower marking, and good security at the tower site.

It is noteworthy that in the recent San Francisco quake, the Mount Sutro tower, which was built to withstand such things, came through unscathed. It may be time for more broadcasters to consider forming joint ventures on the construction of such multistation transmission facilities.

Playing the odds

It is unlikely that there will be a movement to harden broadcast antennas against all the forces they might endure. The trend is to strike a balance between the most likely potential problems and tower costs. This means broadcasters should consider their hedges. At what cost will underwriters replace damaged towers and transmitters, answer liability claims and replace the station's income during the period of reconstruction?

Many stations that have recently fallen victim to tower tragedies were able to recoup a substantial part of their audiences within days or hours by connecting into cable systems by microwave or satellite. This might suggest that strengthening the

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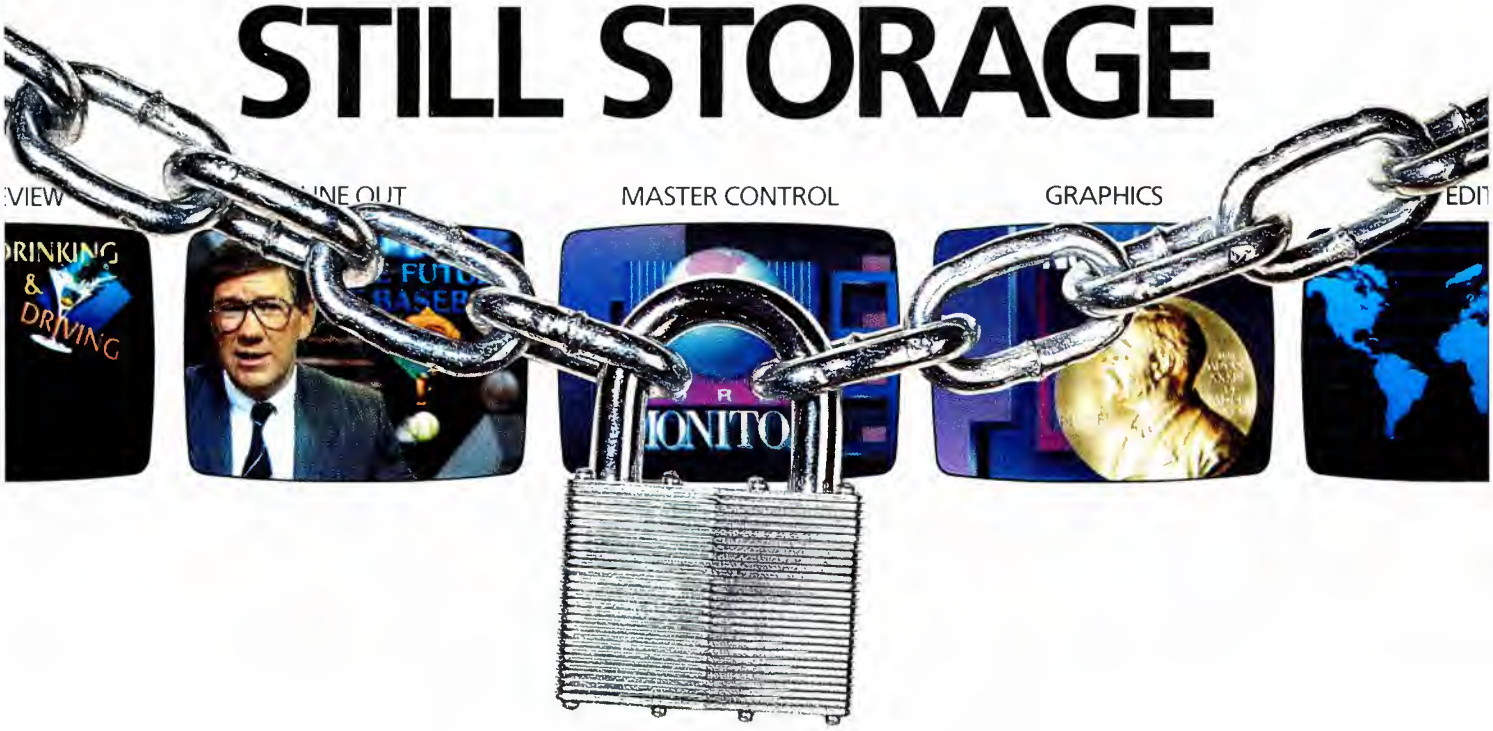

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TV/cable interface is an important aspect of tower hardening. But this only applies toward problems with the station itself. Any general catastrophe that knocks out a broadcast facility will likely raise havoc with the cable systems and telcos as well. Engineers must estimate what it is worth to keep giving the viewers a signal in times of trouble and invest in tower construction and maintenance accordingly.

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- Richard Bell, president, Transmission Structures Ltd., Vinitia, OK.

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Voodoo engineering

By Dennis R. Ciapura

When it comes to evaluating audio, too many engineers abandon good engineering practice for something resembling sorcery.

Radio broadcasting is probably the least scientifically engineered technology-based industry on earth. Unfortunately, the technical decisions are more often based on audio superstition and rhetoric than on logical testing of any kind.

Years ago, when only a relative handful of vendors were developing products for broadcasters, and equipment performance was improving by leaps and bounds, it was easy to make upgrade decisions. The business was far less competitive, and the technology was simpler and easier to understand. In today's complex and fast-paced broadcast environment, however, it pays to know what makes a difference and what does not. The astute broadcaster does not derive technical strategy from electronic folklore.

The non-comparative evaluation trap

The worst possible way to evaluate a potential improvement is to install new equipment or make some adjustment or modification, then listen to the station to gauge the results. This may seem to be a radical statement, but given the ear/brain system's short audio retention time, the sonic difference between the before and after performances would have to be quite substantial to be truly audible.

The typical non-comparative evaluation trap might develop like this: A signal processor or console is removed from service, "upgraded" with the latest integrated circuit and placed back on-line the next morning. The engineer who makes the modification hears a distinct improvement in clarity and transient response and informally reports those findings to associates at the next SBE meeting. Before long, stations all over the country are trying the modification and reporting impressive results.

More than likely, the "improvement" everyone is hearing is a psychogenic effect — the numerical refinement of the unit's performance parameters leads to the expectation of an audible improvement. These placebo effects can be extremely powerful; participants in this kind of non-comparative testing usually are convinced of an audible enhancement, even if it doesn't exist.

Clinical psychologists sometimes plant carefully designed placebos to enable their clients to solve problems. Dr. Jefferson M. Fish wrote a fascinating book in 1973 entitled "Placebo Therapy," which actually set forth a system for formulating, communicating and even maintaining placebos. It is surprisingly easy to intentionally generate placebos. It is frighteningly easy to become a victim of unintentional placebo effects.

Scientists and researchers are well aware of this risk, and they go to extreme lengths to avoid contamination of experimental objectivity. Broadcasters, however, seem generally unconcerned about psychogenic factors affecting objectivity. Until, of course, they've had the opportunity to actually test industry rhetoric in a controlled environment.

A case history

An interesting experiment was conducted at the last Noble Broadcast Group national engineering meeting. The attendees, all chief engineers of major-market radio stations, were briefed on the performance capabilities of an audio amplifier consisting of 20 stereo stages of 741 op-amps R/C-coupled through tantalum capacitors. They also were shown the performance graphs (see Figures 1 and 2), which clearly indicate the cumulative effects of the 741's modest slew rate.

The actual circuit then was made available for listening tests with a bypass switch to allow comparison with a straight-wire bypass. The stated objective of the demonstration was to illustrate the audio degradation said to result from the use of slow ICs and tantalum capacitors.

Electrostatic headphones were provided for supercritical listening acuity, and everyone was invited to switch back and forth with the straight-wire bypass. Six of the eight engineers who participated in the test reported hearing anomalies in the 20X741 circuit, and those who articulated what they heard generally described the effects implicit in the performance graphs they had just seen.

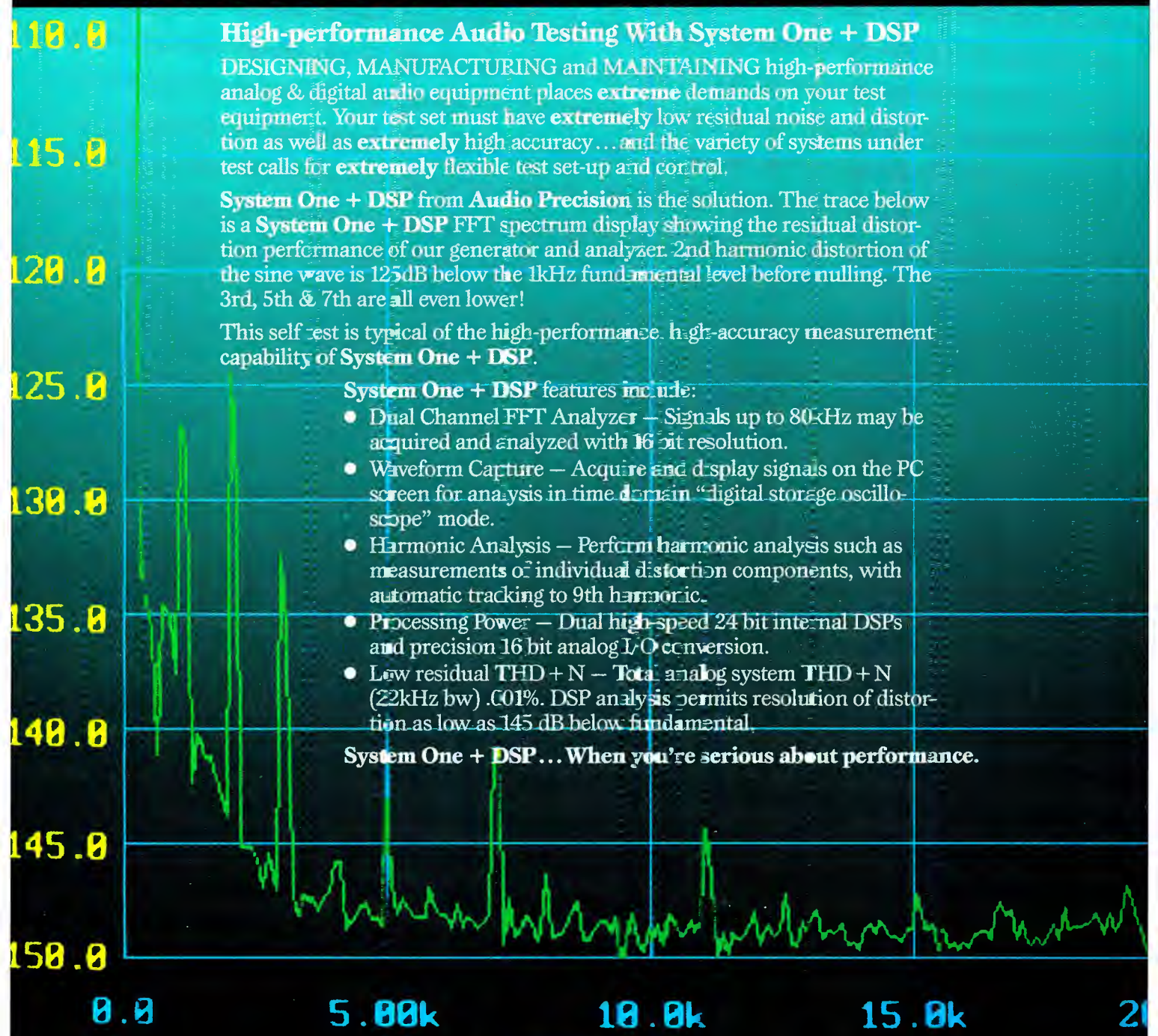
The group then was challenged to try the A-B test again, with someone else doing the switching. Only three accepted, and none of the three scored better than chance in picking out the 20X741 circuit from the straight wire. All the participants were surprised at the results of the demonstration, and one skeptic even checked the wiring to be sure that the amplifier was really in the circuit!

Comparative evaluation vs. belief structure

The Noble 20X741 demonstration is not a unique event in comparative testing. A leading consumer audio magazine recent-

Ciapura is senior vice president of technical operations for Noble Broadcast Group and presicent of TEKNIMAX Telecommunications, a San Diego-based technical management consulting firm.

Extreme Measures



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ly conducted rather extensive blind listening tests to determine whether any audible differences exist among CD players, in light of the varied prices and levels of circuitry sophistication. None were found, despite the fact that audiophiles with strong biases were included in the sample base. Similar tests have been done in comparing time-aligned speaker systems and identical systems with conventional driver alignment. None of the reviewers could hear a difference, although audiophiles typically report less phase "smearing" with time-aligned systems.

To a certain extent, the fields of broadcasting and professional audio have been infiltrated by the same kind of rhetoric-borne generalizations that have become so popular in the consumer electronics industry. All sorts of esoteric audio imperatives that either can't be heard at all in A-B tests, or are perceptible only with highly specialized test inputs, have become the beliefs of a kind of audio religion. The faithful repeat dogma without objectively testing or even questioning it. As engineers, we know better, but we're compelled to go along with the momentum of opinion.

This illogical and almost spiritual approach also is evident in many common qualitative statements. For example, a prominent radio programming executive once declared that a certain station with a reputation for extremely clean audio must be having a problem because Neil Diamond's voice didn't sound right. But what is *right*? Did he listen to the master tape of the recording on the same speakers in the same room? Perhaps the station in question was really providing the "most right" version of the recording than any other station he had heard play it.

Another example is the engineer who reported on the superior performance of a new type of wiring installed in a recording studio. Not reduced hum or crosstalk, but actual audio clarity. However, no tape of the sound before and after was made, so in the absence of any objective comparative testing, how could he know?

If you expect an improvement, you will most likely hear it. Conversely, if you think there are deficiencies, you will hear those, too.

The point is certainly not that improvements are rarely audible, but that well-controlled blind comparison testing can cut through audio mythology to reveal changes that really are audible. After all, if the result of some new equipment, modification or adjustment isn't detectable in a blind A-B evaluation test, what difference would it make to the listening audience?

The long-term listening myth

The classic proponent response to a failed blind test is, "Oh, you can only hear the difference in long-term listening. It won't show up in A-B tests." This actually may be true, but not because the difference is really audible. Rather, the absence of an immediate direct comparison leaves the reviewer vulnerable to the plethora of psychogenic influences that affect the overall sonic impression. If you expect an improvement, you will most likely hear it. Conversely, if you think there are deficiencies, you will hear those, too.

When audio equipment is being evaluated on a non-comparative listening basis, knowledge of the internal circuitry or performance specifications may strongly

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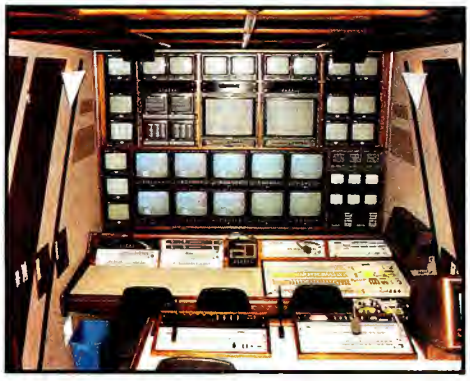

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influence sonic impressions. Under certain circumstances, even the appearance of the equipment can be a significant factor. However, the most powerful factor may be the "after-acquisition glow." Once you've spent either the company's money or your own on some new item for the audio chain, you are strongly biased in favor of the acquisition. This phenomenon is known to psychologists as the "halo effect."

Let's say an audiophile buys a new amplifier and "hears" an improvement that is totally psychogenic. It may be argued that there has been an actual benefit. After all, does it really matter whether the sonic virtues of the new equipment are really audible as long as the user is convinced that they are and derives pleasure from the illusion?

The broadcaster, however, must deal in realities. The listener is buffered from all those psychogenic factors as they relate to the broadcast station, and can react only to real audible differences. Granted, listeners may be subject to a host of psychogenic effects relative to their receiving equipment, but it's the perception of the station that concerns the broadcaster. Consequently, it is critical to know what makes an audible difference and to channel fiscal and human resources in that direction.

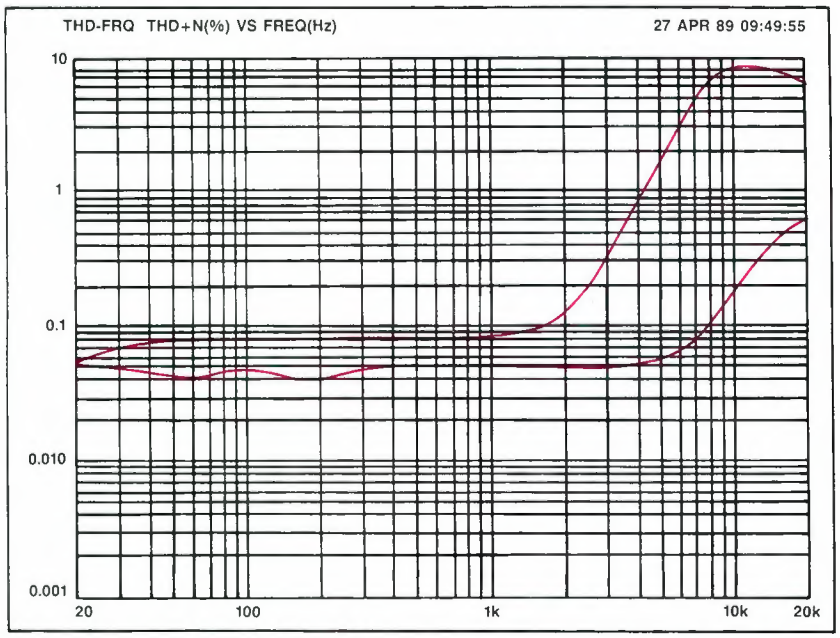

Figure 1. This performance graph shows the 20X741 demo circuit's distortion at 0dBm operating level.

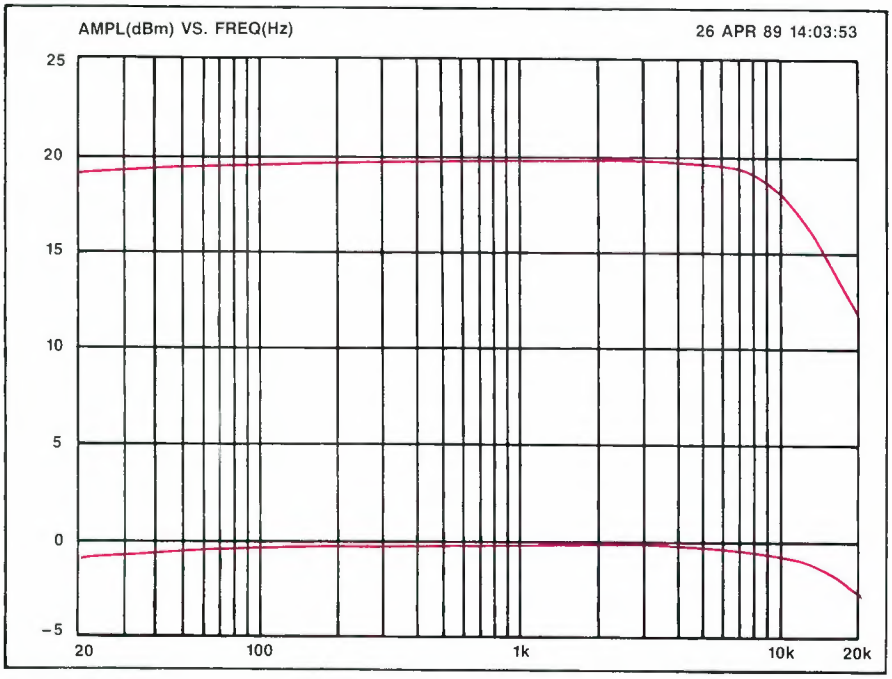

Figure 2. Frequency response of the circuit shown in Figure 1.

What about listening fatigue?

Listening fatigue really does exist, but the high levels of processing and routine clipping that generally cause it are easily detectable in blind comparative testing. In fact, A-B testing of new processing adjustments is probably the quickest and surest method of quantifying average level differences and artifact generation. The role of comparative testing in the case of listening fatigue evaluation is to block irrelevant psychogenic effects while focusing the analysis on the truly audible artifacts.

Follow-up longer-term listening tests then are more productive because the A-B testing will have suggested potential problem areas to listen for. This kind of bias can be useful in that it allows the broadcaster to focus on potential irritants quickly, making it possible to subjectively evaluate the processing impact on the overall format.

Evaluating audio-processing equipment

Audio-processing equipment is really the easiest class of audio equipment to evaluate, because the artifacts generated by even moderate processing are relatively audible. This is fortunate because processing is, at almost any station, the point of greatest audio alteration.

The first step is to formulate an evaluation strategy, starting with deciding what method of comparison will be used for the new processing unit. In general, three useful ways are:

- comparison with a straight-wire bypass.
- comparison with other processing.
- comparison with itself.

Stations configured for maximum fidelity might be interested in the straight-wire comparison, but most stations would be more interested in comparing a new processor with the station's existing equipment. If the new processing proves to be more appealing in general, then comparison of various settings of the new processing will yield the optimum adjustments and familiarize the user with the sonic effects that result from various individual adjustments.

The most critical stage of evaluation of processing is the first. Is the proposed system really better? There are two ways to put both systems on an equal footing for comparison.

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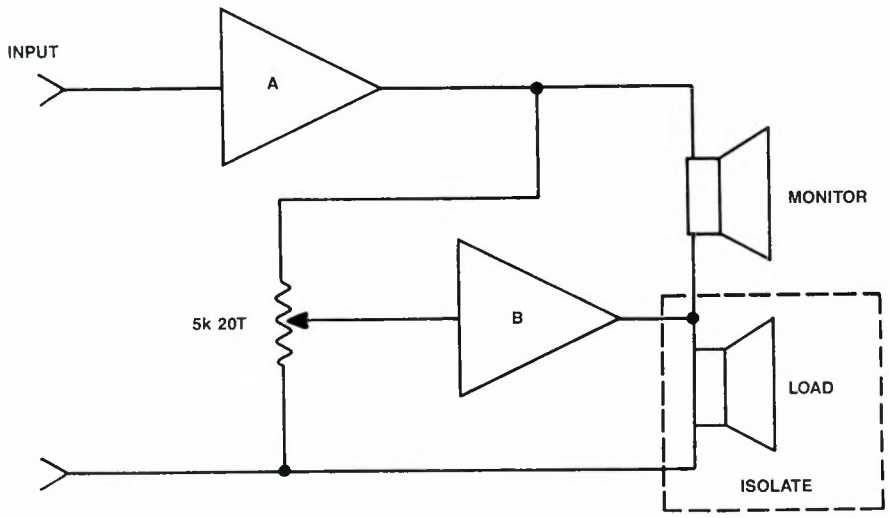

Figure 3. Differential power-amplifier test circuit.

The most direct method is to temporarily install the new processor or processing system with a set of locally switched or remotely controlled gold-contact relays in the inputs and outputs. Start with the new unit or system adjusted according to the manufacturer's recommendations, and adjust the audio or composite output to the transmitter for identical peak flasher activity. Now the new and old processing can be compared directly with a variety of typical program material. A DAT or 15ips analog tape record should be made for future reference. It's always a good idea to monitor on small speakers as well as studio monitors, and having both systems available on-line makes it easy to compare them on a variety of auto receivers.

It is *extremely important* to either use an A-B-X box or have someone else do the switching while the person doing the evaluating listens and records the results in writing. It also is critically important that the levels be matched within at least 0.2dB. You may be shocked to find that even though the systems sounded different when you knew which ones you were listening to, your score in identifying one from the other is no better than chance. In fact, this is frequently the case in comparing high-quality, state-of-the-art processors set for identical peak output and average levels. You also may find that if one system has a slightly higher average level than another, they sound alike when the lower one is readjusted for the same density.

The second, more complex method of comparison (if you have backup main processing) is to set up both processors on the bench using a signal generator or exciter to simulate the transmitter, and a modulation monitor to calibrate the outputs for identical peak activity. This is much easier to do for FM than for AM because most AM generators are balanced modulator designs incapable of positive modulation beyond 100%. It's easy enough to do for FM, however, as long as the modulation monitor used has an amplified front end that will work from the FM generator output.

The advantage of the off-air method is that the same segment of typical program material can be played over and over to explore the equipment's capability to handle the most difficult inputs. And, because there's no problem with on-air repetition, both systems also can be recorded easily in near synchronization on a 4-track. It's also easier to explore extreme processing settings that you really wouldn't want on the air. Hearing what happens at the extremes often is helpful in deciding how much of a certain parameter you might accept in the mix of artifacts.

The listener is buffered from all those psychogenic factors as they relate to the broadcast station, and can react only to real audible differences.

Can modern amplifiers sound different?

Compared with processing artifacts, the audio imperfections exhibited by modern audio amplifiers are minute, and it really takes comparison with a straight-wire bypass to determine whether any audible problems exist. Be sure to set the operating levels for at least 20dB of headroom. At less than 16dB of headroom, live microphone signals and some CD sources will clip. Most current-generation audio gear exhibits extremely good fidelity, and any audible differences are far more likely to be the result of application and interface problems.

When comparing line-level amplifiers, be sure that the operating levels be adjusted for equal headroom. Up to a certain point, a higher-headroom amplifier always will sound better. Psychogenic effects aside, this is probably the reason that some consoles are reported to sound better than others. It has less to do with any audible difference in the active devices employed than with the operating levels selected and maximum output device dissipation and buffering.

Low-level amplifier design is driven more by the input device equivalent input noise and device supply voltage limits. Although 30dB of headroom is not unusual for a microphone pre-amplifier these days, it's a good idea to check if you're evaluating a console.

Evaluating power amplifiers

Because of their extremely low output impedance, power amplifiers these days have high damping factors. As a result, significant adverse effects arising from interaction with the load are rare, but not impossible. A useful comparative test circuit, shown in Figure 3, was suggested by amplifier designer David Hafler.

One channel of the subject stereo amplifier is used as an active dummy in the bridge circuit. The speaker connected to the dummy amplifier should be in another room or someplace where you can't hear it blasting away. To the extent that the amplifiers are identical *and* distortionless, there will be no output from the speaker connected to the test amplifier channel. The circuit is simply nulled like a distortion meter. What's left in the test speaker is the difference between the amplifiers and between the test amplifier channel and the straight-wire bypass.

Any distortion you hear is the actual total non-linearity under actual operating conditions, including any mysterious distortions that haven't been named yet. If all you hear is a little clean audio, it's a phase difference. The Hafler amplifiers included trim controls in the feedback loop to optimize the phase linearity in the audible band, and the test circuit provided an easy means for the avid audiophile to make the adjustment with the actual speakers to be used.

The results of this kind of power amplifier testing can be quantified and documented by comparing the voltage across the test speaker with the voltage across the dummy speaker. The result can be expressed as the total operating non-linearity

Continued on page 260

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Equipment Exhibitors

BROADCASTING WORKS!

Broadcasting works in numerous ways, and the 1990 NAB convention and exhibition (March 30-April 3, Atlanta, GA) intends to show you how it works for everyone involved. NAB officials are planning on another attendance record, this year more than 50,000. An equipment exhibition area greater than 430,000 square feet will show the wares of more than 700 manufacturers and distributors. In addition to the hardware on exhibition, there will be numerous papers presented and hands-on workshops, covering topics from engineering to management. Tours through some of the broadcast facilities in Atlanta are also offered and a gala finale to the event will be the 50th Anniversary Peabody Awards dinner on April 3.

Not far from the Georgia World Congress Center the Advanced Television Exhibit will offer a look at tomorrow's television. Combining the NAB ATV and 1125/60 Group, more than 100,000 square feet of exhibits will feature concepts for high definition television and video production. That event, at the Atlanta Inforum is expected to draw a larger crowd than the 15,000 who visited the special exhibits in 1989. (**Note:** *an NAB exhibit badge will be required for admission to the Inforum.)*

To help you prepare for your visit to the NAB exhibition in Atlanta, the following pages list the manufacturers who had booked space at the show as of February 1. The first section of this special *who's who and what's new* coverage is an alphabetic listing of exhibiting companies, including some who will be represented by their exclusive US representatives. The exhibit stand numbers indicated in this list are also current as of February 1, but realize that the manufacturers keep jockeying for better positions up until the show starts. As a result some of those numbers will change. Check for an updated list when you register for the convention and be sure to get an updated copy of the **BE/VS** map at the convention center. Manufacturers known to be participating in the ATV exhibition are indicated by **HDTV** as a booth number or by a dagger † preceding their booth assignment.

Advertisers in this Pre-show issue are indicated in the alphabetic list by a highlighted *See ad page* line. Reader service numbers are included, to allow you to get information direct from the manufacturers about the products they will be showing.

The second section of this special coverage lists the *new* to be introduced by the manufacturers. Many companies were apparently victims of the early date for this year's event and were unable to provide new product information. Others offered very sketchy comments. The products included in the coverage are those introduced following NAB '89 and production models of prototype products as well as items which were described as upgrades from original models. Products introduced in the past, and not noted as upgrades, are not included. If new products will be shown by an exhibitor, codes (such as A1, S5, V7) will be included in the company's generic equipment comment in the alphabetic listing. A guide to the range of those codes is provided at the beginning of the ***New at NAB*** section, page 180.

Come, join us in Atlanta, and learn how broadcasting can work even more!

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A.F. Associates 1756
Remote production vehicles, facilities design, construction; AVS standards converters; test/monitoring equipment; Radamec-EPO robotic camera pedestals and camera control systems. (V2, V7)
Circle (502) See ad page 157

Abbott & Company 6608
Power connectors, distribution products.
Circle (503)

Abekas Video Systems 160W
Videodisc recorders, still stores; digital video effects systems; video production switchers; graphic titlers. (V5, V6)
Circle (504) See ad page 41, 66A-D

Absolute Broadcast Automation 7118
Circle (599)

ACCOM Inc 2900
Video noise, grain reducers. (V7)
Circle (505)

Accu-Weather 6723
Weather data services, graphic displays, maps. (V5)
Circle (506)

Accurate Sound Corporation 4111
Mics; reel, cassette audio recorders, duplicators; tape conditioners. (A3, S4)
Circle (507)

Acoustic Systems 1019
Acoustic materials; broadcast booths.
Circle (508)

Acrodyne Industries 6000
VHF, UHF TV transmitters, exciters.
Circle (509) See ad page 91

Adams-Smith 6808
Time code systems, transport synchronizers, emulators; A-V editing controllers. (A3, V2)
Circle (510)

ADC Telecommunications 6001
Machine control, signal patching; patch panels, cords; wiring management; switching equipment. (S5)
Circle (511)

Adrienne Electronics 8059
Computer hardware, software; PC time code-cards; routing, distribution systems. (V2)
Circle (513)

Advanced Designs 2021
Weather radar, related video graphics equipment. (V5)
Circle (514)

Advent Communications 1300-A208
Satellite news collection flyaway systems; video exciters, modulators, data converters; communications package systems. (R6)
Circle (515)

ADx Systems 7119
Time code equipment, transport synchronizers, controllers. (A3, V2)
Circle (516) See ad page 212

AGAP 7021
Audio playback automation.
Circle (517)

Aircraft Digital Music Library 6802
Production music on CD, record, tape.
Circle (518)

AKAI Professional/IMC 3902
Digital audio recorders, samplers. (A5)
Circle (519)

AKG Acoustics 6500
Mics, headphones; audio effects, delays; digital audio workstations. (A4, A5)
Circle (520) See ad page 155

Alamar Electronics 2948
Broadcast programming automation equipment; machine controller interfaces. (S1)
Circle (521)

Alcatel-ATFH 3107
Video, audio, multiple pair cables. (S2)
Circle (522)

Alden Electronics 5153
Weather graphics, radar displays. (V5)
Circle (523)

Alexander Batteries 5155
Batteries, charger, analyzers. (V4)
Circle (524)

Allen Avionics 5607
Video delay, timing systems; hum eliminators; audio, video processors, filters, distribution equipment; test, monitoring products. (S6, V7)
Circle (525) See ad page 266

Allen Osborne Associates 7124
Portable, pneumatic masts.
Circle (526)

Allied Broadcast Equipment 4430
AKG digital workstations; digital audio spot systems; A-V dubbing centers; telco hybrids; radio receivers; microwave, satellite electronics, antennas by Tectan, Wegener, Fairchild, Microdyne. (A2, A5, R4)
Circle (527)

Allied Tower 5606
Broadcast towers, construction, services.
Circle (528)

Alpha Audio 6701
Audio editing systems; digital audio hard disk recorders; acoustic material. (A5, S3)
Circle (529)

Alpha Image 7017
Digital interface, routing, encoding/decoding equipment; video frame stores. (S5, V7)
Circle (530)

Alpha Video & Electronics/AVEC 3111
Enhanced VTRs/VCRs; IFB systems; ENG antenna mast accessories. (A4, R1, V2)
Circle (531)

ALTA Group/Dynatech 6030
Video production systems; TBCs, synchronizers, video effects systems. (V6)
Circle (532) See ad page 88

Altronic Research 6814
Water-, air-cooled RF dummy loads. (S6)
Circle (533)

Amber Electro Design 4900
Audio test, distortion analyzers. (S6)
Circle (534)

AMCO Engineering 2009
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Circle (535) See ad page 160

AMEK Consoles/TAC 3164
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Circle (536) See ad page 79

American Lightwave Systems N.A.
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American Studio Equipment 6506
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Ampex Corporation 2200
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Circle (539) See ad page 276-7

Ampex Recording Media 2200
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Circle (540) See ad page 263

AMS/Calrec 6338
Digital and digitally assignable analog audio consoles; audio workstations. (A4)
Circle (541) See ad page 87

Amtel Systems 6008
Time code, machine control, signal distribution systems; editing controllers. (V2)
Circle (542)

Andrew Corporation 1860
C-/Ku-band earth station antennas, LNA/LNC controls; transmission line, connectors; microwave equipment. (R1, R6)
Circle (543)

Angenieux Corporation 6112
TV camera lenses. (V1)
Circle (544)

Anixter Brothers 1506
Mark microwave antennas.
Circle (545) See ad page 62

Anritsu America 6549
RF test equipment. (S6)
Circle (546)

Antenna Technology 6406
Earth station antennas, HPAs; demods, receivers. (R6)
Circle (547)

Anton-Bauer 5013
Batteries, chargers; battery analyzers.
Circle (548) See ad page 275

Anvil Cases 2110
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Circle (549) See ad page 212

Aphex Systems Ltd. 6054
Audio processors. DAs; MIDI equipment; clock systems. (A2)
Circle (550) See ad page 116

Apollo Lighting/Audio-Visual 3800
Slide-to-video transfer systems; AV/TV furniture; lamps; video presentation systems. (A3, S3, V4)
Circle (551)

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Circle (83) on Reply Card for product demonstration.

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Jazz. That may strike the professional video producer as a strange name for an effects system. But Jazz music is open-ended. It can change mid-stream. It's not elitist or highbrow. Jazz is always creating and re-creating within an ever evolving structure.

That's how we came to name our system. It can evolve, adapt, modify or improvise. All to suit your service or your customer's needs. It's advanced enough to offer every compatibility. Yet it boasts a startling simplicty in operation. And an even more surprising price tag. So as your company changes, Jazz can change right along with you.

OUR KEYFRAME EDITING ALLOWS YOU TO PRE-PROGRAM ALL YOUR EFFECTS. (AND STORE ALL YOUR SECRETS ON DISKS.)

How? Well Jazz is easily upgradeable through both software and hardware. And soon Jazz will offer the functionalities of an edit suite without the need of a switcher. But for now, you can play with all this Jazz:

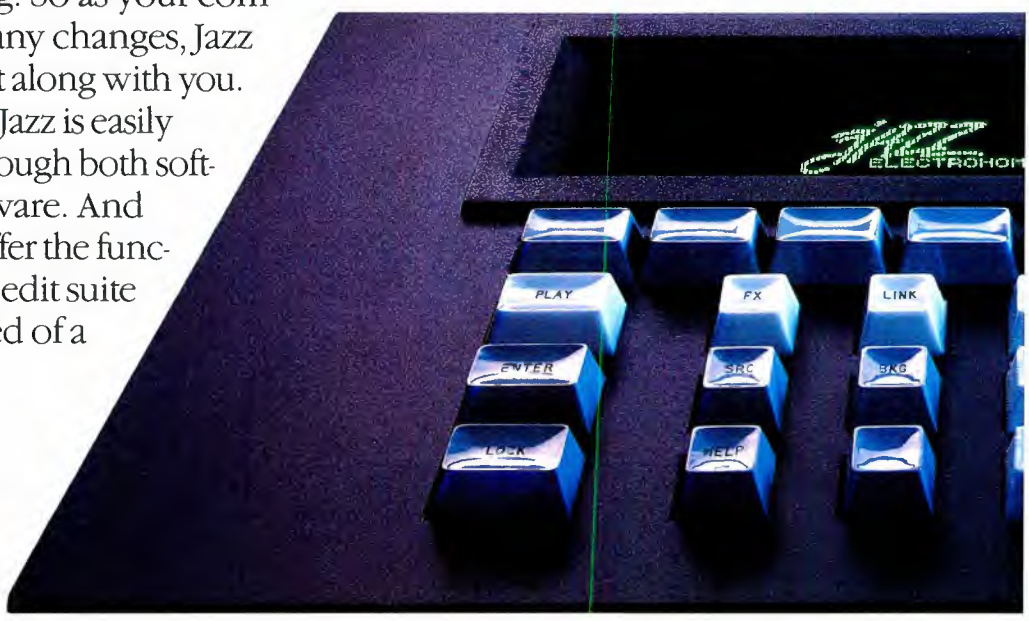
Flip and Tumble. With Jazz, you can change the axis. Or you can change the size. Which means you have an infinite number of possibilities.

Or you can Rotate if you like. That means clockwise or counterclockwise. With variable speed in both directions. Maybe you want to blow it out of proportion? Jazz offers you Overexpansion just in case you want to reframe that perfect shot.

And our Posterization is as pretty as a picture. It operates to an infinite level with a surprising smoothness.

$14,995

A SMALL PRICE FOR A GREAT SYSTEM. AND SOON YOU CAN ADD EDIT SUITE FUNCTIONALITY WITHOUT THE NEED FOR A SWITCHER.



DON'T LET THE SIMI
INTERFACE FOOL YC
JAZZ IS ONE OF THE

r to perform great video effects.

You can crop an image. Pan a crop over an image. Pan an image within a crop. Or just pan a cropped image. Sounds confusing? It's not. And if you want to change it again, you can. It's easy and it's fast.

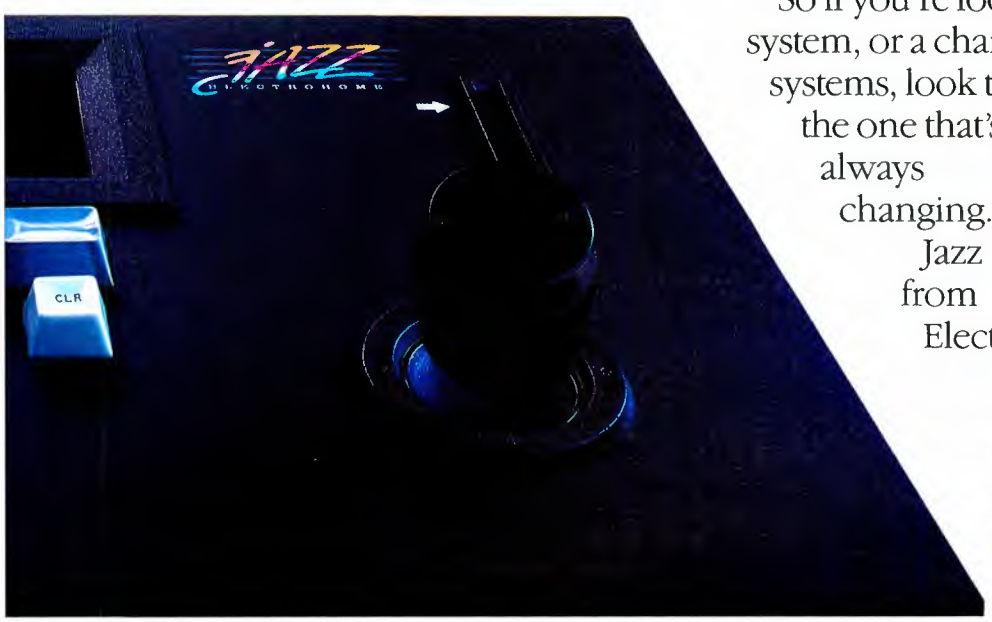
That brings us to another key function. Jazz's Link Function allows you to manipulate a keyframe like never before. And virtually eliminates the kind of guesswork and legwork usually associated with creating key sequences.

And Jazz also creates Mirror Image. Horizontal and Vertical Inversion. Borders of any size or colour. And in the near future we'll be adding Dissolve Functionality and Transparent Drop Shadows.

NO COMPLICATED NUMBERS OR QUOTIENTS HERE. JAZZ PLAYS RIGHT ALONG WITH YOU USING A SIMPLE SET OF WORDS.

Of course it all comes together with our Keyframe Editing capabilities. It's the ultimate in cut and paste. You just step through the keyframes and modify any or all of the variables that have been recorded. And we don't have to tell you how helpful that is when a job is tight for time or money. How can we sum it up? It's fast, clean and direct. You don't have to be a techno-wizard to operate it. And you don't have to be a financial wizard to see that it's profitable. Jazz keeps your production services flexible. And it keep your company growing.

So if you're looking for a new system, or a change of systems, look to the one that's always changing. Jazz from Electrohome.



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VERFUL TOOLS FOR
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DUCER.

For more information, contact Marilyn Weber at Jazz Systems, 809 Wellington St. N., Kitchener, Ontario Canada N2G 4J6. 1-519-749-3134. Jazz is a trademark of Electrohome Limited.

Circle (84) on Reply Card

Applied Research & Technology 8117
Digital audio delays, stereo equalizers; dynamics processors.
Circle (552)

Arben Design 3906
Modular, custom studio fixtures, sets; consoles; hard cycloramas; facilities designs.
Circle (553)

Arrakis Systems 4052
On-air, production mixers; audio distribution switchers, DAs.
Circle (554) See ad page 21

Arriflex 5314
Film cameras, lenses, accessories; lighting ballasts, accessories; time code products; video accessories; studio grid systems.
Circle (555)

ASACA ShibaSoku 5152
Video monitors; AF, RF, video test equipment; demod; VTR test systems; videotape, videodisc automation; HDTV products; magneto-optical recorders. (S6, V2, V7, V8)
Circle (557) See ad pages 68-9

Associated Computer Services 9024
Automation software.
Circle (558)

Associated Production Music 6438
Production music library, services. (S8)
Circle (559)

Aston Electronics 1106
Still stores; titling, graphics systems. (V5)
Circle (560)

AT&T Graphics Software Labs 3433
Graphic software; graphics boards.
Circle (561)

ATI/Audio Technologies 5051
Audio mixers, processors; mic, phono, headphone, monitor amps, DAs; monitor, test equipment. (A4)
Circle (562)

Audi-Cord 4204
Audio cart recorder.
Circle (563)

Audio Accessories, Inc 4810
Printed circuit board jacks; prewired patch panels, patch cords, jacks.
Circle (564) See ad page 202

Audio Broadcast Group 4039
Studio furnishings; facility designs, turnkey installations; mobile radio studios. (S3, S7)
Circle (565)

Audio Developments 1942
Audio mixers for ENG, editing; modular mic/line distribution systems. (A1, S5)
Circle (566)

Audiopak 4811
Audio cartridge tape.
Circle (571)

Audio Precision 3252
PC-based audio test, proof of performance measurement systems. (S6)
Circle (567) See ad page 95

Audio Processing Technology/SSL 1321
Digital audio compressors. (A2)
Circle (568) See ad page 182

Audio-Technica US 4214
Portable audio mixers; instrument, wired,

THINK OF US AS A UNITED NATIONS OF SOUND

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

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

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

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Telex 126191. Cable "Magtech"
Fax 212-265-3638.

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MTE
The Sound Heard Round the World

Circle (87) on Reply Card

wireless microphones; headphones. (A4)
Circle (569)

Audio-Video Engineering 4740
Hum-stop coils.
Circle (570) See ad page 196

Auditronics 4542
Audio DAs; on-air, audio production consoles, console mix-minus systems. (A1)
Circle (572) See ad page 153

Aurora Systems/Chyron Group 1834
Graphics paint systems. (V5)
Circle (573)

Autogram 4806
Audio on-air, production mixers.
Circle (574)

Automated Business Concepts 3813
Automation software.
Circle (575)

Automation Associates 5352
Video keyers. (V7)
Circle (576) See ad page 274

AVCOM of VA 3151
RF measurement equipment. (S6)
Circle (577)

AVID 1119
Non-linear video editing systems.
Circle (578)

Avitel Electronics 3006
DAs, distribution switching, patching equipment; time code systems. (S5, V2)
Circle (579) See ad page 140

AVS/Applied Video Systems 1756
TV standards converters. (V7)
Circle (580) See ad page 93

AVS/Audio Visuel Systemes 7009
A/V DAs; video titling inserters. (V5)
Circle (581)

B&B Systems 1116
Test, monitoring equipment; facility design, consulting services. (S6)
Circle (582)

BAF Communication 1564, A238
Satellite uplinking, radio/TV production, ENG vehicles. (R6, S7)
Circle (583)

BAL Components 9050
TV timing systems; delays, filters.
Circle (584)

Barbervision 1901
Camera support equipment.
Circle (585)

Barco Industries 2944
Video monitors; TV modulators, demods; signal switching equipment. (A4, S5, V8)
Circle (586) See ad page 151

Barrett Associates 4606
Audio mixers, processors, recorders, monitors; transmitter, microwave systems; signal distribution, test equipment.
Circle (587)

BASYS 1256
Newsroom automation; machine controllers; recording systems; prompters, captioning equipment; camera support controls. (S1)
Circle (588)

BCS Broadcast Store 9019
Broadcast equipment brokers.
Circle (589)

Beaveronics 4740
Video production switchers; timers, clocks; A-V Engineering hum-stop coils. (S1)
Circle (590)

Beekman Laboratories 7117
Circle (591)

Belar Electronics Lab 4308
Radio, TV modulation, frequency monitors. (R4)
Circle (592) See ad page 210

Belden Wire & Cable 6007
Wiring, cables; optical fiber materials.
Circle (593) See ad page 33

Belko Konnektor BV 7012
Coaxial cable, connectors.
Circle (594)

Bencher 3105
Camera support, lighting, copy stands. (V1)
Circle (595)

Benchmark Media Systems 1318
Microphone/audio amps, buffer/mixer, matrixing, gain control modules. (A4)
Circle (596) See ad page 138

BEXT 8104
FM amplifiers, exciters, generators. (R1, R2, R4)
Circle (597) See ad page 252

beyerdynamic 1938
Wired, wireless microphones; headphones; infrared headsets; audio cable, connectors; microphone cases. (A4)
Circle (598)

BMS 5108
ENG transmitters, receivers, antenna pointer; RF power amplifiers, exciters, generators. (R2)
Circle (603)

Bogen Photo 5948
Camera support products.
Circle (604)

Bogner Broadcast Equipment 2028
TV UHF/VHF broadcast antennas.
Circle (605)

Boonton Electronics 1437
Microwave power meters, sweepers; audio distortion, impedance analyzers; modulation monitors. (R4)
Circle (606)

Bowen Broadcast Service 3008
RCA TCR-100 modification, repair kits. (V2)
Circle (607)

Brabury/Porta-Pattern (BPI) 2518
A-V DAs; camera test charts. (V1)
Circle (608)

Bradley Broadcast Sales 6354
Audio mixers, processor systems, analog/digital recorders; racks, cases, studio furnishings; tape, tape maintenance products; signal distribution equipment.
Circle (609)

Bretford Manufacturing 3637
Video equipment carts, cabinets; video

Who makes the best ENG wireless microphone system?

The best mini-receiver . . .

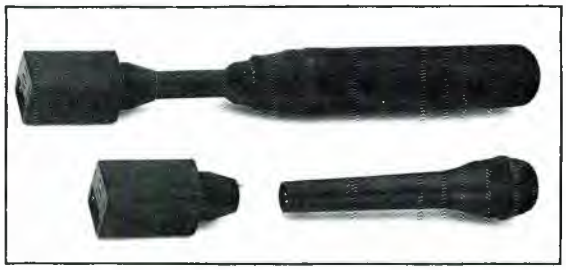
The CR185 offers a six-pole helical resonator front-end, followed by narrow-band crystal IF filtering at 21.4 MHz. This provides unmatched selectivity and sensitivity, and minimizes drop-outs and interference. A balanced, XLR output interfaces with any professional camcorder.

The best belt-pack transmitter . . .

The M185 is a highly refined belt-pack transmitter. It matches any input requirement and provides "phantom power" for almost any lavalier microphone via a standard 5 pin jack. The belt-clip is constructed of machined aluminum and steel parts, spring-tensioned for a secure fit on any belt or fabric. Audio level LEDs are provided on the control panel for accurate level adjustment.

The best "plug-on" transmitter . . .

The H185 introduces new flexibility to your ENG operations. It makes any hand-held or shotgun mic with an XLR connector wireless. The microphone body becomes part of the antenna circuit, forming a very efficient RF radiator. The audio input level is indicated by two LEDs next to the microphone coupler. These LEDs are clearly visible with the microphone attached for accurate level adjustment.



The best construction . . .

All external parts are constructed of machined aluminum for ruggedness and durability. Shock-mounted crystals are used in the IF filtering and oscillators for reliable operation. The transmitters and receiver are built for the real world of hard knocks.

The best factory support . . .

Whether it's frequency coordination or follow-up service, Lectrosonics will come through. Our commitment to the needs of broadcasters is second to none. Call us with questions, and you will get answers that make sense.

Call us toll-free to locate your nearest dealer:

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P.O. Box 15900 ▪ Rio Rancho, NM ▪ 87174
581 Laser Rd. NE ▪ Rio Rancho, NM ▪ 87124
(505)892-4501 ▪ (800)821-1121

Circle (90) on Reply Card

screens; wall-mount brackets, shelves. (S3)
Circle (610)

Brite Voice Systems/Cityline **3203**
Interactive voice information services.
Circle (611)

Broadcast Audio **4452**
Audio on-air, production mixers, distribution equipment.
Circle (612)

Broadcast Automation **8121**
IGM automation; audio recorders, processors.
Circle (613)

Broadcast Electronic Services **8047**
Computer peripherals, interformat editing equipment, interfaces, accessories.
Circle (614)

Broadcast Electronics **4500**
FM transmitters; audio mixers; cart recorders; radio program automation; stereo exciters, generators; pre-amp; phono systems; remote control equipment.
Circle (615) See ad page 11

Broadcast Products **6454, A201**
Promotional vehicles for radio stations.
Circle (616)

Broadcast Supply West/BSW **4046**
Distributor; audio mixers, recorders; processors; mic, phono, CD players; tape storage racks; audio distribution equipment.
Circle (617) See ad page 164

Broadcast Technology Partners **1415**
FM broadcast enhancement products.
Circle (618)

Broadcast Video Systems/BVS **5041**
Video encoders, keyers; RGB processors; safe-area, time/date character generators; video, pulse delays; test equipment; title assembler; multistandard decoders. (S5, V7)
Circle (620) See ad page 250, 254

Broadcast Yellow Pages **1143**
Industry directories.
Circle (621)

Broadcasters General Store **8016**
Newsroom workstations; audio processors, noise reduction; remote controllers. (A2, S1)
Circle (622)

Bruel & Kjaer Instruments **8029**
Low-noise, high-intensity microphones; recording, measurement simulator. (A5, S6)
Circle (623)

Bryston Ltd **6039**
Audio monitor amplifiers.
Circle (625) See ad page 218

BSM Broadcast Systems **3210**
Distribution systems, routing switchers; patch panels. (S5)
Circle (626)

BTC Test & Measurement/Philips **1914**
Test equipment, signal generators, modulators, demods.
Circle (627) See ad page 99

BTS **5808**
Cameras; analog, digital video recorders, editing equipment; telecines; digital graphics systems; production, master control switchers; audio, digital video signal processors, format converters, sync generators; routing, DA, test equipment. (A5, S1 S5, V1)
Circle (628) See ad pages 81, 97

Burk Technology **9022**
Transmitter remote control systems. (R1)
Circle (629)

BURLE INDUSTRIES **5024**
Video camera tubes. (V1)
Circle (630) See ad page 245

Cablewave Systems/RF Systems **4020**
Coaxial, waveguide transmission line; tower, antenna products, services. (R1)
Circle (631) See ad page 49

Cal Switch **1453**
Test, measuring products distributors.
Circle (632)

Calculated Industries **1455**
Time code, accounting calculators.
Circle (633) See ad page 199

Calzone Case **2045**
ATA-rated transport cases; permanent, portable rack-mountable workstations; editing system racks. (S3)
Circle (634)

Cam-Lok **9017**
Multiconductor control wiring, power connectors, interlocks.
Circle (635)

Camera Mart **6330**
Distributor, audio, video products; cameras, recorders, lighting; batteries, chargers; audio mixers; sales, rentals. (V7)
Circle (636) See ad page 72

Camera Platforms Int'l **A254**
Circle (637)

Canare Cable **3730**
Video coaxial cable, component cable, BNC plugs, jacks, terminations. (S2)
Circle (638) See ad page 76

Canon USA/Broadcast Optics **†3134**
TV camera lenses; camera support products; still video cameras, reproducers; HDTV signal coders, decoders. (V1, V2, V7)
Circle (639) See ad page 241

Capitol/Production Music **5047**
Production music libraries.
Circle (640)

Carpel Video **1153**
New, reconditioned, recycled videotape.
Circle (641)

CASCOM **1206**
Animation services; telecine accessories; camera support systems. (S8)
Circle (642)

Case Editing Systems **7205**
Videotape editing systems.
Circle (643)

Catel Telecommunications **5510**
Modulators, demodulators; multichannel transmission systems.
Circle (644)

CBSI Custom Business Systems **4652**
Station business automation software. (S1)
Circle (646)

CCA Electronics **4442**
AM, FM radio transmitters, FM exciters. (R5)
Circle (647)

Show Panasonic Broadcast Systems **your busiest log, your toughest break. We'll make your day,** and we'll make it easier.

Over 50 systems operate worldwide with Panasonic's M.A.R.C.—relied upon to handle every scheduled playback from I.D.'s, spots and promos to programs and network. M.A.R.C. works elegantly with traffic systems from Bias, JDS, Columbine or Enterprise, and finds trouble long before it hits air. As-run logs document what ran, when, and if not, why not.

The M.A.R.C. is one tough customer. Its superior 1/2-inch MII image quality, its street-smart software and its advanced Matsushita robotics make the M.A.R.C. unbeatable.

Panasonic's M.A.R.C. stays ahead tecnnologically. Optional VTR interfaces control three outboard 1-inch VTR's; a new Off-Line Cassette Dub System enables dubbing material onto MII cassettes with minimal operator entry.

So, go ahead. Sit down at M.A.R.C.'s keyboard, and let M.A.R.C. make your day.

Booth 2534

Panasonic Broadcast Systems Company Field Offices: (Northeast) Washington, DC (703) 759-6900; (Southeast) Norcross, GA (404) 925 6721; (Midwest) Arlington Heights, IL (312) 981 7325/(317) 852-3715; (Southwest) Fort Worth, TX (817) 685 1152; (Western) Cypress, CA (714) 373-7209; (Northwest) (408) 866-7974

Panasonic Broadcast Systems Company One Panasonic Way Secaucus, NJ 07094 (201) 348-7671

Panasonic
Broadcast Systems

Circle (91) on Reply Card

CEL Electronics 1212
Digital video effects systems, standards converters; editing control accessories. (V2, V5, V7)
Circle (648) See ad page 107

Central Dynamics 2052
Production, master control switchers; digital encoding, decoding, translators. (V7)
Circle (649)

Central Tower 6602
Tower products; tower maintenance, installation services. (R1)
Circle (650)

Century 21 Programming 4203
Radio programming services.
Circle (651)

Century Precision Optics 3808
Lenses, special purpose optics; wide-angle, telephoto, zoom accessories. (V1)
Circle (652)

Channelmatic 6014
Videocassette record/play automation, commercial insertion, related products; signal distribution systems. (S1)
Circle (653)

Chapman/Leonard Studio 8031, A244
Equipment
Circle (654)

Christie Electric 1419
Batteries, chargers, analyzers. (V4)
Circle (656)

Chyron Group 1834
See:
Aurora Systems
Chyron
CMX
Digital Services/DSC

Chyron 1834
Character generators; electronic graphics, paint systems. (V5)
Circle (657)

Cine 60 3129
Batteries, belts, packs; battery chargers, conditioners; portable lighting products.
Circle (658)

Cinema Products 2124
Cine cameras; camera stabilizers; wireless camera control equipment; video assist units; film-transfer accessories. (V1, V3)
Circle (659)

Cinemills 1546
Lighting equipment, accessories, gels. (V4)
Circle (660)

Cipher Digital 1800
A-V editing controllers; transport synchronizers, controllers; time code products. (V2)
Circle (661)

Circuit Research Labs 4656
Audio processors; radio, TV stereo, subcarrier generators, exciters. (A2)
Circle (662)

Clear-Com Intercoms 1407
Digital matrix, analog intercom systems; single, multichannel wired/wireless headset, speaker, mic operation; IFB, ISO interfaces; stereo monitors, speakers. (A4)
Circle (663) See ad page 276

CMC Technology 5754
Replacement videotape recorder heads; upper drum refurbishing.
Circle (665)

CMX/Chyron 1834
Videotape editing controller systems. (V2)
Circle (666)

Coaxial Dynamics/Kirkwood Ind 6816
Power terminations, loads; RF test equipment, wattmeters. (S6)
Circle (667)

Colorado Video 2933
Slow-scan video transmission systems; still stores; video noise reduction equipment.
Circle (668)

PAG CHARGES INTO THE 1990s

With the World's most advanced Superfast Charger – PAG SF1

INCORPORATING PAG ACS

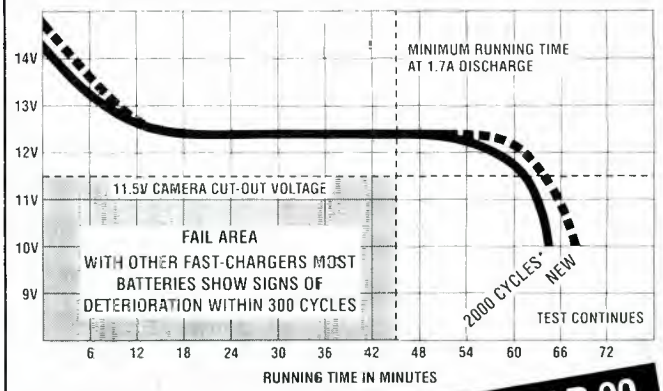
PAG SF1, a new microcomputer-controlled four channel multi-function charger.

- PAG SF1 has 3 charging programs:
  Superfast charge - *one battery every 30 minutes.*
  Fast charge - *two batteries every 60 minutes.*
  Slow charge - *four batteries in eight hours.*
- Accepts NP1 type batteries of any manufacture, voltage or capacity.
- Maintains the balance of individual cells, thereby removing the most common cause of battery failure.
- Fully indicates the charge status of each battery.
- Detects and indicates faulty batteries.
- Adjusts automatically to AC power supplies, permitting use virtually anywhere in the World.
- Incorporates the advanced charging system - PAG ACS.

So accurate is the PAG ACS two wire sensing and full charge detection that the duty cycle life of a battery is significantly increased, beyond that achievable by any other system.

PAG ACS PERFORMANCE TEST

Over 60 minutes running time achieved from NP1A battery after 2000 cycles. Charged in 30 minutes and discharged at 1.7A.



Frezzi PAG

Circle (93) on Reply Card

For full details contact:

Frezzolini Electronics Inc. 5 Valley Street, Hawthorne NJ 07506.
(201) 427-1160 (800) 345-1030 FAX: (201) 427-0934 TWX: 710-988-4142.

SEE US AT NAB 90 BOOTH #2834 + 2836 TO OBTAIN PAG SF1

PAG Ltd. is approved by NATO to AQAP1 (Registered No. 391 PO1)

ColorGraphics Systems/Dynatech 6030
Electronic graphics equipment; weather graphics, data services. (V5)
Circle (669)

Columbine Systems 2522
Music library/programming, newsroom, traffic management software.
Circle (670)

Comad Communications 2448
FM radio, TV antennas; distributors, SIRA Sistemi Radio antennas. (R1)
Circle (671)

Comark Communications 5920
Thomson-CSF
UHF TV transmitters. solid-state, Klystrode designs. (R1)
Circle (672) See ad page 156, 173, 234, 256

Comband Technologies 3439
ITFS, MMDS equipment. (R2)
Circle (673)

COMLUX 9037
Fiber optic transmission, terminal equipment; video codecs. (S1, V7)
Circle (674)

Commodore Business Machines 165W
Personal computers, peripherals. (S1)
Circle (675)

Compact Storage Systems 9000
Videotape storage systems.
Circle (677)

Comprehensive Video Supply 1660
Pro videographer equipment; computer-aided video; editing systems; S-VHS titlers, video processors; script software; lighting; modular effects, keyers, A-V mixer, DA products. (A1, A4, S2, S5, V2, V4, V5, V7, V8)
Circle (678)

Comprompter 6355
Electronic newsroom, prompting systems.
Circle (679)

Computer Concepts 4040
Broadcast automation, business hardware, software; programming services. (S1)
Circle (680)

Computer Engineering Associates 1102
Circle (681)

Computer Music Consortium 9006
Computer-generated music equipment.
Circle (682)

Computer Prompting 3137
Video promptings, monitors; automation hardware, software. (V5)
Circle (683)

Comrex 5214
Audio mixers; telco frequency extenders; IFB, off-air cuing equipment. (A2)
Circle (684)

Comsat World Systems 3316
Satellite system video codecs, modems.
Circle (685)

Comtech Antenna 3002
Earth station antennas. (R6)
Circle (686)

ComTek 3908
Wireless microphone, receiver systems. (A4)
Circle (687)

COMWAVE 2904
Microwave equipment. (R2)
Circle (688)

Concept Productions 4330
Computer-assisted programming systems for radio; radio formats on DAT.
Circle (689)

Conifer 1334
ITFS, MMDS antennas, electronics. (R2)
Circle (690)

Connectronics 1922
Multipair, audio cables, connectors. (S2)
Circle (691)

Connolly Systems Ltd 1256
Automation systems.
Circle (692)

The standards converter with the smoothest moving image of any system.

OKI's Digital Television Standards Converter Model LT2000 achieves *True Motion Continuity*. Next Generation Technology has produced the "Motion Vector System" (MVS™), making possible the first portable standards converter to eliminate motion discontinuity, or jerkiness, that occurs with high-speed camera panning and fast-action video program material. Other standards converters, using the 2-and 4-field interpolation systems, fail to reduce motion discontinuity, and as a result have been objectionable to the professional market.

MVS™ divides each field of video into pixel sections for motion vector detection and measurement, using the Interactive Gradient Method (IGM). IGM, the most advanced method ever developed for precise and finite motion detection, allows the LT2000 to produce the smoothest moving image of any system available. MVS™ accomplishes this without the resolution loss common on other high-end standards converters. The displayed video picture is not only free from conversion artifacts, but also without interpolation resolution loss. The end result... a clean, sharp picture with *True Motion Continuity!*

With the LT2000, your only problem is telling the output from the input!

*IGM is a development of Kokusai Denshin Denwa Co. Ltd.

TV STANDARDS CONVERTER

LT2000TSC

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10-3, Shibaura 4-chome,
Minato-ku, Tokyo 108, Japan
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Fax (03) 452-5214
Telex J22627
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Fax (416) 255-9260

OKI

Oki Electric Industry Co., Ltd.
Tokyo, Japan

Circle (96) on Reply Card

Conrac Display Products 5800
Video monitors. (V8)
Circle (693)

Continental Electronics/Varian 4316
AM, FM broadcast radio transmitters. (R1)
Circle (694) See ad page 100

Control Concepts 2025
Power line filters, conditioners. (S6)
Circle (695) See ad page 154

Convergence 1734
Video editing controller systems. (V2)
Circle (696)

Corporate Communications 2602
Film-to-video transfer, signal correctors.
Circle (697)

Cortana Corporation 3734
Lightning protection systems.
Circle (698) See ad page 252

Countryman Associates 2043
Microphones, audio accessories.
Circle (699)

Crosspoint Latch 3308
Video production switchers, switcher/TBC production systems. (V5, V7)
Circle (700)

Cubicomp 6700
Digital graphics, animation systems (V5).
Circle (701)

Current Technology 9026
Power line conditioners. (S6)
Circle (702)

Cybermation 8046
Circle (703)

Cycle-Sat 3428
Satellite program and commercial relay services; addressable receivers. (S8)
Circle (704) See ad page 203

Data Center Management 1002
Electronic newsroom systems.
Circle (706)

Data Security 7001
Degaussers videotape, metal particle, instrumentation, computer recording media.
Circle (707)

Datacount 8030
Station management software.
Circle (708)

Datatek 5652
Signal routing, distribution equipment. (S5)
Circle (709) See ad page 31

Dataworld 4456
Broadcast engineering databases; mapping services; allocation, interference, population studies; subscriber databases. (S7)
Circle (710) See ad page 277

dbx/AKG Acoustics 6500
Noise reduction equipment. (A2)
Circle (1263)

DEC/Digital Equipment 1600
Computer hardware.
Circle (712)

Delcom USA 3204
Facilities designs, construction.
Circle (714)

Delta Electronics 4518
RF test products; transmitter control, transfer switching, power, modulation controllers; AM stereo processors; HV toroidal current transformers. (R1, R4, S6)
Circle (715) See ad page 249

Denon America 8114
Compact disc player systems.
Circle (716) See ad page 205

DeSisti Lighting/DESMAR 6100
Studio rigging, fixtures; lighting instruments, mounting, lamps; light controllers.
Circle (717)

DeWolfe Music Library 2758
Production music, effects libraries.
Circle (718)

Di-Tech 2954
Distribution routers; tally systems. (S5)
Circle (719) See ad Inside Back Cover

DIC Digital 7002
Circle (720)

Dielectric Communications 4108
Transmission line, waveguide; CP, panel antennas; RF switching, patch panels, power combiners, diplexers.
Circle (721)

Digital Arts 1464
PC graphic software. (V5)
Circle (722)

Digital Audio & Video 3742
Circle (723)

Digital Audio Research 8000
Digital audio disk-based workstations; dialog synchronizers. (A5)
Circle (724)

Digital Dynamics 7024
Audio hard disk recorder, workstation. (A5)
Circle (726)

Digital F/X 5308
Video effects, production systems. (V5)
Circle (727)

Digital Microwave N.A.
Video microwave systems. (R2)
Circle (728) See ad page 74-5

Digital Processing Systems 3234
Digital frame synchronizer, TBCs. (V7)
Circle (729)

Digital Services-DSC/Chyron 1834
Digital video effects, compositing systems, digital disk recorders. (S5, V2)
Circle (730)

DKW Systems 1115
Automation systems.
Circle (731)

Dolby Labs 4443
Audio noise reduction systems; aural spectral enhancement processors; digital audio coding/decoding equipment. (A2, A5)
Circle (733) See ad page 45

Dorrough Electronics 5506
Audio test equipment; audio mixers, dynamics processors; exciters. (S5, S6)
Circle (734) See ad page 46

DSI Communications 1512
Remote transmitter controls: site monitoring; design, installation, consulting.
Circle (735)

Dubner Computer Systems 5830
Still store; digital graphic art, titlers, master control systems. (V5)
Circle (736)

Duggan Manufacturing 8027
Case hardware.
Circle (737)

Dwight Cavendish 3804
Videocassette duplicators, QC units. (V2)
Circle (738)

DX Communications 3113
Satellite receivers.
Circle (739)

DYNAIR Electronics 5122
Routing switchers; modular distribution equipment. (S5)
Circle (740) See ad page 216

Dynatech Corporation 6030
See:
ALTA Group
ColorGraphic Systems
Dynatech NewStar
LEA
Quanta
Utah Scientific

Dynatech NewStar 6030
Newsroom automation systems, software.
Circle (742)

E-N-G Mobile Systems 5307
ENG, news gathering vehicles.
Circle (743)

Eastman Kodak 1905
Videotape products; photographic films; HDTV film-to-video. (V3)
Circle (744)

Echolab 6716
Video production switchers; digital effects systems. (V5, V6)
Circle (745)

Econco Broadcast Service 5756
Power transmitter tube, low power reflex klystron rebuilding service.
Circle (746)

Editing Machines Corporation 1006
Videotape editing controller equipment.
Circle (747)

EEG Enterprises 2838
On-screen text, caption, vertical interval data encoders, decoders. (S1)
Circle (748)

EEV 6310
Leddicon camera tubes; high-efficiency, UHF TV klystrons; RF power devices; satellite electronics. (R3, V1)
Circle (749) See ad page 189

EG&G/Electro-Optics 5031
Tower lighting, controls, beacons.
Circle (750)

Elcom Bauer 1036
AM, FM transmitters.
Circle (751)

Electro Impulse Laboratory 4305
RF loads, colorimeters, wattmeters.
Circle (752)

Electrohome/Jazz Systems 2850
Video monitors/projectors; digital video ef-

Quality Equipment for Professional Audio and Broadcast

aeq

AP_ICACIONES ELECTRONICAS QUASAR S.A.

Pol. Inc Leganés. C/Rey Pastor, 35 23914 LEGANÉS, MADRID (SPAIN)

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fects systems. (V5)
Circle (754) See ad page 136-7

Electronic Research 4013
FM antennas, diplexers, notch filters.
Circle (755)

Electronic Script Prompting 8039
Prompter systems.
Circle (756)

Electro-Voice 4618
Audio mixer; microphones, speakers.
Circle (753) See ad page 161

EMCEE 2440
TV transmitters, ITSF, MMDS equipment; tower products, services. (R1, R2)
Circle (758)

Emcor Products/Crenlo 3064
Modular electronic equipment enclosures, components, accessories.
Circle (759) See ad page 211

Emergency Alert Receiver 6442
EBS receivers; SCA receivers. (R4)
Circle (760)

Energy-Onix 4746
FM transmitters, exciters, amplifiers; AM NRSC filters. (R1, R4)
Circle (761)

Enterprise Electronics 6047
Weather radar systems. (V5)
Circle (762)

The Equipment Broker 1017
Broadcast equipment broker services.
Circle (763)

ERGO 90 1060
Equipment rack, slide kits; lighting, battery products. (S3)
Circle (764) See ad page 210

ESD/Environmental Satellite Data 6538
Weather graphics, displays, services.
Circle (765)

ESE 6714
Time code equipment, clocks; DAs; graphic titlers; video black generators; video faders. (S5, V7)
Circle (766) See ad page 261

Eventide 6701
Digital audio delays, effects processors; time modification systems. (A2)
Circle (767)

Evertz Microsystems 6444
Time code systems; editor controllers. (V2)
Circle (768) See ad page 266

Excalibur Industries 6200
Equipment transport cases.
Circle (769)

Fairlight ESP Pty. Ltd 1046
Video effects computers.
Circle (770)

Faroudja Laboratories 5938
Video encoders, decoders; video component transcoders; scan converters. (V7)
Circle (771) See ad page 109

Fast Forward Video 3143
Time code systems; editing interfaces. (V2)
Circle (772) See ad page 146

Ferno Washington/Salesmaker 3117
A/V carts; batteries, lighting accessories.
Circle (773)

FGV Panther 6822
Studio cranes; HMI lighting. (V1, V4)
Circle (774) See ad page 166

Fiberbilt Cases 6017
Shipping, carrying cases, containers. (S3)
Circle (775)

Fidelipac 4624
Dynamax cart recorders; Audimax audio recording tape; on-air warning lights.
Circle (776)

Field Engineering 1146
Video safe area/title generators. (V7)
Circle (777)

Film House 4053
TV spots for radio stations.
Circle (778)

FirstCom 6733
Financial services.
Circle (779)

Flash Technology 5612
Tower obstruction lighting, beacons. (R1)
Circle (780)

FloriCal Systems 6730
Automated videotape record, playback, tape-delay systems; TV automation; video compositing systems. (S1, S6)
Circle (781)

Focal Press 1946
Books on video, photographic techniques, digital audio, audio/video equipment.
Circle (782)

Folsom Research 7014
Computer-to-video conversion equipment.
Circle (783)

FOR-A 3522
Audio mixers; DAs; video processors, TBCs, synchronizers, format converters; titling, digital effects systems; video switchers. (S5, V1, V6, V7)
Circle (784)

Fort Worth Towers 4730
Broadcast, communications towers, services; equipment shelters.
Circle (785)

Fostex 2506
Audio recorders, event controllers; headphones, microphones.
Circle (786)

Frezzolini/PAG Electronics 2834
Batteries, chargers, analyzers; portable lighting equipment. (V4)
Circle (787) See ad page 145

Fujinon Optics †1700
TV camera lenses.
Circle (789) See ad page 243

Future Productions 3201
Videotape duplicators; camera control units; audio, video DAs. (S5, V1, V2)
Circle (790)

G&M Power Products 3633
Battery products.
Circle (791)

Garner Industries 2027
Tape degaussing systems. (S4)
Circle (792) See ad page 110

GDI/Generic Designs 3026
Machine control equipment. (V2)
Circle (793)

GE American Communications 5722
Satellite services for radio, TV; C-/Ku-band; international interconnections; SCPC, SNG, occasional, business video, digital audio.
Circle (794)

GE Lighting 5500
Stage, studio lamps.
Circle (795)

Gefen Systems 8038
CD players; computer software; sound effects libraries.
Circle (796)

Gennum/Video Broadcast 7126
Wideband switching components, ICs.
Circle (797)

Gentner Electronics 5852
Transmitter controllers; audio processors; telco interfaces; recording systems; distribution equipment; patching. (A2, R5)
Circle (798) See ad page 65, 225

Geocam 9035
Video matte boxes, brackets; camera mounting base plates; follow focus modules. (V1)
Circle (799)

Giant Boom Box Industries 4116
Mobile promotional vehicles. (S7)
Circle (801)

GLW Enterprises 4124
Audio consoles, console automation. (A1)
Circle (802) See ad page 156

GML 3744
Mics; motorized faders; console automation; audio processors. (A1, A2)
Circle (803)

Gorman-Redlich 4902
EBS encoders, decoders; NOAA weather radios; digital AM array antenna monitors.
Circle (804)

Gotham Audio 2342
Neumann microphones; EMT-Franz audio noise reduction, signal processors; CD recorders, players; audio recorders; K&H speakers; complete digital studio; A&D processors, R-DAT equipment. (A2, A4, A5)
Circle (805)

Graham-Patten Systems 1654
Audio edit mixers; component video keyers; audio signal transmission systems. (A1)
Circle (806) See ad page 195

Grass Valley Group †5830
Routing, production, master control switchers; video effects, Dubner graphics systems; analog, digital, component video products; edit controllers; fiber optic products. (S5, V5, V7)
Circle (807) See ad page 9, 229

Great American Market 5300
Studio, location lighting; visual effects, pattern projectors; lamps. (V4)
Circle (809)

BRIDGING THE GAP.

BARCO intelligence—spanning the distance between independent products to create an intelligent system.

The BARCO EVRS Routing Switcher extends the concept introduced by the Emmy Award-winning BARCO CVS monitor, the first broadcast monitor crafted with micro-processor control of every function. Designed to accept any composite or component source, the routing switcher reaches new horizons in flexibility, and can be easily expanded to meet future needs. Used in conjunction with the CVS monitor, the switcher provides an unambiguous on-screen source or "destination" ID, while the monitor functions as a menu-driven remote control panel for the routing switcher.

See us at NAB Booth #2944

For more information on the CVS monitor and BVRS Routing Switcher, contact us at:

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Kennesaw, Georgia 30144
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Northeast: (201)729-0710
Southeast: (404)432-2346
Midwest: (708)213-3114
Western: (916)631-8113

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INTELLIGENCE RUNS IN THE FAMILY

Grunder & Associates 1212
Distributor; CEL effects, standard converters; edit controllers. (V2, V5, V7)
Circle (810)

GTE Spacenet 1648
Satellite transmission services; news, voice, data services; signal-turnaround, bandwidth conversions.
Circle (811)

GTE Sylvania Lighting 5904
Stage and studio lamps.
Circle (812)

H&E Micro-Trak 4722
Portable audio mixers, audio recorders.
Circle (813)

Hallikainen & Friends 4202
Earth station remote controllers; news wire computer software; audio mixers; automation equipment. (R1, R6)
Circle (814)

Harris Broadcast Division 4430
Audio mixers, recorders; AM, FM, TV transmitters; terrestrial microwave; modulation monitors; RF exciters, generators. (R1)
Circle (815) See ad page 27

Harris Video Systems 6700
TBCs, frame synchronizers; graphics workstations. (V5, V7)
Circle (816) See ad page 239

HEDCO 3416
Audio, video, and data routers. (S5)
Circle (817)

Hi-Tech Furnishings 3910
Studio furnishings.
Circle (818)

Hipotronics 5912
Voltage regulators, power line conditioners.
Circle (820) See ad page 226

Hitachi Denshi †2034
TV cameras; video recorders; encoders; HDTV recorders, displays; video monitors; test equipment; microwave systems.
Circle (821) See ad page 3, 197

Holaday Industries 5049
RF radiation, EMF metering; data recorders. (S6)
Circle (823)

Hollywood Film Music Library 1141
Circle (824)

Hoodman 6628
Monitor, viewfinder sun shades. (V1)
Circle (826)

Horita 9012
Timers, time code equipment.
Circle (827)

Hotronic 2935
TBCs, frame synchronizers; solid-state V/A recorder. (V2, V7)
Circle (828) See ad page 186

Hudson Audio Video Enterprises 7106
Audio, video equipment distributors.
Circle (830)

Hughes Communications 6554
Satellite communications services.
Circle (831)

Hughey & Phillips Inc 8107
Tower lighting equipment. (R1)
Circle (832)

ICA/Miralite Communications 9018
Satellite antennas, receiving equipment.
Circle (834)

IDB Communications 3634
Satellite mobile uplink services, C-/Ku-band equipment; flyaway systems.
Circle (835)

I•DEN Videotronics 1016
TBCs; component video transcoders. (V7)
Circle (836)

IGM Communications 4612
Radio broadcast automation; multideck audio playback equipment. (S1)
Circle (837)

Ikegami Electronics (USA) †6216
Cameras, camcorders; monochrome, color monitors; ENG microwave; telecines; projection equipment.
Circle (838) See ad page 84-5

ILC Technology/Daymax Lamp 3048
TV lighting equipment; Daymax DMI studio lamps, accessories.
Circle (839)

Image Video 2910
Master control, production, routing switchers; digital audio recorder, editing systems; station automation. (S1, S5)
Circle (840)

Industrial Acoustic/IAC 6818
Acoustic structures, components, materials; sound-absorptive modules, HVAC silencers for studios.
Circle (842)

Inline 7110
Video format convertors, distribution switchers. (S5, V7)
Circle (844)

Innovative Automation 8113
Automation hardware, software.
Circle (845)

Innovative TV Equipment/ITE 5714
Camera support, tripods, pedestals, pan/tilt heads. (V1)
Circle (846)

Innovision Optics 9032
Portable lighting; specialty lenses systems; animation motion control tables. (V2, V4)
Circle (847)

Inovonics 5601
Audio processors; magnetic recording electronics; RF FM generators; video processors. (A2, R5)
Circle (848) See ad page 200

Integrated Arts Ltd 5354
Circle (850)

Intelliprompt 1457
Video prompting systems.
Circle (853)

Intelvideo 6509
Video encoders, decoders; video-to-film accessory. (V7)
Circle (854)

Interactive Motion Control/IMC 1308
Camera control systems for animation. (V2)
Circle (855)

International Tapetronics/ITC 3422
Audio reel, cart recording equipment. (A3)
Circle (856) See ad page 29, MAP

IO Research/Electronic Graphics 1428
Electronic graphics equipment.
Circle (857)

ISS Engineering 6648
Satellite receiver equipment. (R6)
Circle (858)

ITELCO 1416
FM, TV transmitters; microwave systems; RF power amplifiers; receivers, demods; exciters, RF generators.
Circle (859)

ITS/Information Transmission 1622
VHF TV exciters, modulators; ITFS, MMDS transmitters, amplifiers. (R1, R2, R5)
Circle (860)

J-Lab 1146
Video recorder interfaces. (S5, S6)
Circle (861)

Jampro Antennas 5030
FM, TV transmitting antennas; towers, guys, lighting; tower services.
Circle (863) See ad page 30

JBL Professional 2916
Audio monitor amplifiers, speakers. (A4)
Circle (864) See ad page 55

Jefferson Pilot Data/JDS 5014
Station business systems software. (S1)
Circle (865)

Jem-Fab Corporation 6644
Digital signal patching, distribution products.
Circle (866) See ad page 252

Jensen Tools 4117
Electronic tool kits, tools, cases; fiber optic maintenance, VCR alignment tools. (S6)
Circle (867)

JNS Electronics 5601
A-V routing, distribution systems. (S5)
Circle (862) See ad page 78

JVC †3116
Tube, CCD cameras; video recorders, edit controllers, duplicators; TBCs, frame synchronizers; video monitors, effects generators, switchers. (A5, V1, V2, V6)
Circle (868) See ad page 19

K&H Products 6055
Camera support products; equipment carrying, transport cases. (S3)
Circle (869) See ad page 272

Kahn Communications 4410
Audio processors; telephone bandwidth extenders; AM stereo equipment. (A2)
Circle (870)

Kalamazoo Technical Furniture 9052
Equipment racks, studio furnishings.
Circle (871)

Kalamusic 8119
Radio broadcast programming services, all music formats on tape.
Circle (872)

Get Auditronics' IFB/Mix-Minus System!

Because people can't think when they hear themselves talk.

Now you can have multiple mix-minus feeds with IFB for super smooth newscasts, commercial production, sports events, and more with Auditronics' revolutionary new 1900 IFB/Mix-Minus system, voted a "Pick Hit of the 1989 NAB" by Broadcast Engineering Magazine.

Simply speaking, the 1900 offers eight discrete mix-minus outputs to eight remote locations, plus IFB busses for direct communications, and more than a dozen other state-of-the-art features — just what you'd expect from Auditronics, of course.

Call these factory direct engineering representatives today for information.

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See us at NAB. Booth #4542

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auditronics, inc.

3750 Old Getwell Road, Memphis, TN 38118 901-362-1350

Kangaroo Video Products 2945
Equipment transport cases.
Circle (873)

Karl Heitz 5916
Camera pan/tilt heads, tripods. (V1)
Circle (874)

Kavouras 1628, A226
Weather graphics displays, map files. (V5)
Circle (875)

Kay Industries 4051
Phase converters, power conditioners. (S6)
Circle (876)

Keith Monks Audio 5946
Audio accessory products.
Circle (877)

Kings Electronics 3133
RF, video, coaxial, triaxial connectors; satellite-related equipment. (S2)
Circle (878)

Kintronic Laboratories 6638
Antenna phasors, tuners, inductors; RF contactors, switching panels; HV insulators; tower transformers, lighting chokes; equipment shelters; shortwave antennas. (R1)
Circle (880)

Klark Teknik 8109
Audio processors; DDA mixing consoles; Milab microphones.
Circle (879)

Kliegl Brothers Stage Lighting 1552
Lighting instruments, lamps; lighting control systems.
Circle (881)

Kline Towers 8034
Design, fabrication, erection, maintenance, inspection services; guyed, self-supporting, platform, multi-array towers, antenna support structures.
Circle (882)

Knox Video/GML Grove 3060
Digital graphics, titlers; video switchers; video processors. (V5)
Circle (883)

L. E. Nelson Sales 3147
Lighting instruments, lamps; accessories.
Circle (884)

Laird Telemedia 2350
Distribution equipment; telecines; video processors; character generators. (V5)
Circle (885)

Lake Systems 1712
Facility design, construction; distributors, audio, video, support products; cable, patching systems; studio furnishings; video format converters.
Circle (886)

Laserdub 1044
Circle (888)

LDL Communications/Larcan 1634
FM, TV transmitters, transmitting antennas; multistation power combiners; towers. (R1)
Circle (889) See ad page 23

LEA Dynatech 6030
Lightning deterrents; surge suppressors.
Circle (890)

Leach Microwave Systems 7108
Circle (891)

Leader Instruments 3012
Sync, video, test signal generators; waveform, vector monitors; oscilloscopes; video level meters; video monitors. (S6, V8)
Circle (892) See ad page 135

Lectrosonics 8043
Wireless microphone systems.
Circle (893) See ad page 141

Lee Colortran 5452
Lighting instruments, lamps, gels. (V4)
Circle (894)

Leitch Video 3516
Sync, test signal generators; VBI inserters; video processors; DAs, master clock systems; still stores. (S1, S5, V2, V7)
Circle (895) See ad page 105

LEMO USA 2949
Audio, video coax, triax, multicore, mixed coax-multiple pin connectors. (S2)
Circle (896)

Leonetti Company 9028
HMI, SunRay lighting products.
Circle (897)

Lexicon 2452
Digital audio production systems; time compressors/expanders; audio effects, processors; MIDI equipment. (A2, A5)
Circle (898)

Light Sales 8055
Studio lighting products.
Circle (899)

AKG's DSE 7000. Digital Solutions to Analog Problems.

Creating polished audio tracks with analog equipment while under the gun is a real problem.

Have you ever ruined a track by punching in or out at the wrong moment? AKG's Digital Sound Editor stores your takes in RAM memory, so you can "undo" any mistakes and make adjustments quickly and precisely.

Have you ever had to hand-synchronize three or more analog decks in order to time-align narration with music and effects? The DSE 7000 allows you to synchronize any combination of tracks in perfect timing.

Have you ever used your last track and wished you had more? The DSE 7000 provides 8 tracks plus lossless digital bounce to give you all the freedom of multi-track, and more.

Have you ever wished for a sound editor that's as powerful and easy-to-use as your word processor with controls as familiar as your mixer and tape deck? With the DSE 7000, you can easily cut, copy, move, slip and adjust sound elements. It's an AT compatible-based, digital sound editor that combines both record and mix functions together in one convenient unit — with ease, speed and flexibility.

Contact AKG to learn how the affordable DSE 7000 will provide digital solutions to your analog problems.

AKG acoustics

Focusing on new technology.
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(203) 348-2121

See us at NAB Booth #4308

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Lighting Methods 3445
Lighting dimmers, dimmer controllers. (V4)
Circle (900)

Lightning Eliminators, Consultants 5027
Lightning deterrents; power conditioning consultation; grounding systems.
Circle (901)

Listec Video 5042
Video prompters, prompter displays. (V5)
Circle (903)

Lites 9015
Studio lighting products.
Circle (904)

Logitek 4750
Audio mixers, monitor amps, speakers; impedance interfaces; DA amplifiers, LED audio metering units.
Circle (906)

Lowel-Light 6210
Studio, portable lighting instruments, lamps.
Circle (908)

LPB 4512
Audio mixers; phono pre-amps; studio furnishings; low power AM transmission. (A1)
Circle (909)

LTM Corp of America 2608
Location, portable, studio lighting instruments, ballasts, follow spots; microphone accessories. (V4)
Circle (910)

Lynn Greenberg Electronic Teleprompting 2035
MS DOS-based teleprompters. (V5)
Circle (912)

Lyon Lamb Video Animation †1540
Video animation controls; video encoders, scan converters, transcoders. (V7)
Circle (913)

M&R Data Services 8101
PC-based video editing systems; PC-based transmitter remote controllers. (R1, V2)
Circle (915)

M/A-COM MAC 2152
Microwave radio; 18GHz and 23GHz. (R2)
Circle (916)

3M Magnetic Media 1824
Video, audiotape products.
Circle (917) See ad pages 82A-B, 83

Macrovision 7123
Videotape copy protection systems.
Circle (918)

Magni Systems †1026
Video test equipment; waveform, vector monitors; SC/H-phase measurement products; video encoding systems. (S6, V7)
Circle (919) See ad page 193

Magnum Tower 6712
Broadcast towers, accessories; services.
Circle (920)

Manhattan Production Music 6618
Production music, effects libraries.
Circle (921)

Marconi Communications Systems 1825
Telecines; frame synchronizers, decoders; UHF, VHF TV transmitters.
Circle (922)

Mark Antennas/Radiation Systems 3100
Microwave antennas.
Circle (914) See ad page 62

Markertek Video Supply 9007
Distributors of cable, wire, connectors; batteries, mics, stands; components.
Circle (923) See ad page 250

Marshall Electronics 9031
Circle (924)

Marti Electronics 4400
STL microwave receivers, transmitters; RF exciters, generators. (R2)
Circle (925)

Mastercraft Woodworking 7109
Studio furniture.
Circle (926)

Matco Mfg. & Test 3641
Machine sequencers, routers; DAs; dubbing controllers, commercial insertion. (S1)
Circle (927) See ad page 200

Matthews Studio Equipment 2720
Camera pedestals, cranes, tracks; grip equipment; lighting products.
Circle (928)

Matthey Electronics 5501
Video, HDTV filters, delays; digital audio filters.
Circle (929)

Maxell Corporation of America 2248
Audio, video recording media for analog, digital systems. (S4)
Circle (930)

Maze Broadcast 1150
Pre-owned equipment; equipment brokering, appraisals, liquidation services.
Circle (931)

McCurdy Radio Industries 5322
Audio consoles, delays, intercoms, speakers; automation; signal distribution; audio test equipment; telco hybrids. (A2, A4, S1, S5, S6)
Circle (932) See ad page 215

Media Computing 3540
Automated newsroom, machine control software, interfaces. (S1)
Circle (935)

Media Touch Systems 1200
Touch-screen control for broadcast automation; audio recording products; distribution systems.
Circle (937)

Merlin Engineering Works 2100
Standards converters; HDTV-TV converters; custom VTRs, accessories; video encoders, decoders; time delay equipment.
Circle (938)

Merlin Snell & Wilcox 1041
Standards converter equipment. (V3, V7)
Circle (939) See ad page 101

Micro Communications 2728
RF transmission line, circular waveguide; switchless combiners; computer drafting; field service. (R1)
Circle (940)

Microdyne 1433
Satellite receivers, programmable satellite terminals.
Circle (941)

Micron Audio Products 6727
Wireless microphone systems.
Circle (942)

Microsonics 1439
Video filters, delay lines.
Circle (943)

Microtime 5740
TBCs, frame synchronizers; digital graphics, special effects systems; A/B roll, effects production system. (V5, V7)
Circle (944) See ad page 113

Microwave Radio 2960
ENG electronics, antennas.
Circle (945)

Midwest Communications 3234, A126
TV production facilities, vehicles; A.C.E. graphics, signal routers, color correcters, scan converters; DPS TBCs/synchronizers; Technalogix, Townsend, Toshiba TV transmitters; microwave, earth station systems; racks, studio furnishings. (R1, S5, V5, V7)
Circle (946) See ad page 1

Miller Fluid Heads (USA) Inc 6204
Camera support, tripods, pan/tilt heads. (V1)
Circle (947) See ad page 207

Minolta 3119
Light metering products; monitor color analyzer systems.
Circle (948) See ad page 98

Mitsubishi Electric Sales †162W
Video monitors, printers, projectors. (V8)
Circle (949)

Mobile-Cam Products 5352
ENG vehicles; audio/video routers; mobile antenna control systems. (S7)
Circle (950)

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

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

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

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

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

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

THE RADAMEC EPO ROBOTIC CAMERA CONTROL SYSTEMS.
Distributed exclusively in the U.S. by

NAB BOOTH #1756

A.F.ASSOCIATES INC.
ADVANCED SYSTEMS AND PRODUCTS FOR THE VIDEO INDUSTRY
100 STONEHURST COURT, NORTHVALE, NJ 07647
A.F. Associates, Inc. is a Video Services Corporation company.

Circle (103) on Reply Card

Modulation Sciences 4802
MTS TV, FM exciters, generators; RF composite signal distribution; aural spatial image enlargers; test equipment, modulation monitors. (R4)
Circle (951)

Mole-Richardson 5600
Lighting instruments, lamps.
Circle (952)

Moseley Associates 4336
Remote control systems; STLs; RF generators, exciters; audio processors. (R1)
Circle (953) See ad page 223

Motorola C-Quam/AM Stereo 4704
AM stereo radio exciters, modulation monitors, receivers; communications products; semiconductors. (R2, R4, R5, S6)
Circle (954)

MSE Video Tape Services 8057
Circle (955)

Musco Mobile Lighting A269
Self-contained, remote production lighting.
Circle (956)

MYAT 6708
Rigid coaxial transmission line. (R1)
Circle (911) See ad page 70

MZB/Gray 2500
Mobile production vehicles; cameras, video recorders, processors, displays; routing, DA equipment; ENG microwave.
Circle (957)

Nady Systems 6505
Wireless microphone systems. (A4)
Circle (958)

Nagra 2128
Audio recorders, film, video applications.
Circle (959)

Nakamichi 6614
Audio cassette recorders/players.
Circle (960)

Nalpak Video Sales 1401
Rack, tripod cases; production vests; lens accessories. (S3)
Circle (961)

Narda Microwave/Loral 5757
STL, ENG electronics, signal feed line components; RF radiation measurement equipment. (R2, S6)
Circle (962)

National Photronics Inc N.A.
Fiber optic remote camera control systems. (S2)
Circle (963)

Nautel 4144
Solid-state AM transmitters. (R1)
Circle (964) See ad page 158

NCA Microelectronics N.A.
Transmitter remote control equipment. (R1)
Circle (965) See ad page 240

NEC †1524
Solid-state video recorders; TBCs, frame synchronizers; digital video effects systems; CCD cameras.
Circle (966) See ad page 58-9, 185

Nemal Electronics International 7203
Wire, cable, connectors.
Circle (967) See ad page 272

Neotek 8116
Reinforcement, production audio consoles.
Circle (968)

Network Music 4220
Music, sound effects libraries.
Circle (969)

Neutrik USA 6610
Digital audio equipment; wire, cable, connectors; audio test equipment. (S6)
Circle (970) See ad page 178

Neve 4152
Audio consoles production, post production; console automation; digital audio recorders. (A1, A5)
Circle (971) See ad page 115

New England Digital 161W
Digital audiodisc recorders, effects, edit systems. (A5)
Circle (972)

Nexus Engineering/Broadcast Div 7018
Circle (973)

Nielsen Media Research 1545
Audience research.
Circle (974)

Nikon Photo/Electronic Imaging 6512
TV camera lenses; still video systems; HDTV products; video printers. (V1, V3, V8)
Circle (975) See ad page 5

New Products.
New Research & Development Center.
New Manufacturing Center.
New Service Centers.

(1), (4) & (5) Routing switchers
(2) Intercom
(3) Signal monitoring & terminal equipment
(6) Character Generators

The New PESA America, Inc.

PESA recently acquired 3M's R&D, production and service facilities for audio/video routing systems and character generators.

With our new combined facilities, we can now offer you an extensive range of quality products which are presently used by broadcasters, corporate and teleproduction studios, video conferencing and government communication centers.

Our new company, staffed with experienced people you know, is committed to providing you with the very best customer service and sales support from eleven offices located close to you.

Pesa America, Inc. Sales & Service Centers.
East Coast: (516) 360-7382 West Coast: (818) 563-4566
Customer Services Dept.: (205) 883-7370

PESA

Circle (105) on Reply Card

•Meet your new old friends. Booth 2708, Hall B

WIN A PRIZE!

Bring this coupon to PESA Booth 2708, Hall B East Exhibit Area
(at bottom of escalators)
any time during show hours.
A drawing every day...
with the Grand Prize drawing Tues. April 3 at 3 PM.
(You do not have to be present to win.)
For the prize you may win?
Look for this ad every day in NAB Daily News.

Name
Title
Company
City/State
Phone

Norpak 3915
Teletext, NABTS data delivery equipment.
Circle (976)

Nova Systems 2922
TBCs, frame synchronizers; video format conversions. (V7)
Circle (977) See ad page 162

NPR Satellite Services 6545
Satellite interconnections for radio broadcasters; transportable uplink facilities; digital fiber-optic audio channels; audio signal distribution on occasional, full-time bases.
Circle (978)

Numark Electronics 8040
Audio, MIDI products. (A4)
Circle (979)

Nurad 2810
ENG, STL electronics, antennas.
Circle (981)

Nytone Electronics 3054
Flying spot slide-to-video telecines; color analyzers, integrated production units. (V3)
Circle (982)

O'Connor Engineering Lab 5930
Camera tripods, pan/tilt heads. (V1)
Circle (983)

Odetics Broadcast 5704
Automated video large-library management systems. (S1)
Circle (984) See ad page 187

OKI Electric Industry 3806
TV standards converters. (V7)
Circle (985) See ad page 147

Olesen 2618
Lighting instruments, accessories.
Circle (986)

Omicron Video 2953
Routing, production switchers; signal distribution equipment; video format converters, computer-to-video scan converters. (V7)
Circle (987) See ad page 146

Omnimusic 4343
Production music libraries.
Circle (988)

Optical Disc 3415
Videodisc recorders, playback systems; digital audio processing equipment. (A5)
Circle (989) See ad page 194

Optima Enclosures 7112
Equipment racks, studio furnishings.
Circle (990)

Orban/AKG Acoustics 4208
Audio processors for AM, FM, TV, studio; equalizers; stereo synthesizers; sibilance controllers. (A2)
Circle (991) See ad page 7, 17, MAP

Orion Research 3440
Software-based audio mixers. (A1)
Circle (992)

Osram/Siemens 6518
Lamps for stage, studio lighting. (V4)
Circle (993)

Otari 4352
Digital,analog audio recorders; video duplicators; audio mixers. (A1, A3, V2)
Circle (994) See ad page 15

Pacific Radio Electronics 9045
Video cable, connectors; utility lighting; test, monitoring equipment. (S2, S3)
Circle (995)

Pacific Recorders/Engineering 4130
Audio mixers; audio cart recorders, reproducers; signal processors, distribution equipment.
Circle (996)

Paco Electronics USA 6726
Batteries, charger systems. (V4)
Circle (997)

Paltex 1734
Videotape editing control systems, VTR interfaces; Quantum/Weircliffe tape degaussers. (V2)
Circle (998) See ad page 89

Panasonic Industrial/Broadcast †2534
TV cameras; digital, analog videotape recorders. (S1, V1, V2)
Circle (999) See ad page 36-7, 50A-H, 51 143, 176-7

Pansophic Systems/Graphics 3140
Electronic graphics systems, ancillary equipment. (V5)
Circle (1000)

Patch Bay Designation 1346
Designation labels for patch bays.
Circle (1002)

Rack up twice the performance in the same amount of space.

The Problem

How to upgrade and increase your microphone mixing capability without sacrificing your valuable rack space or your budget.

The Solution

The new ELX-1R.

Here's Why

The ELX-1R is a portable, four-channel mic/line mixer.

It's half the size of our nearest competitor, the Shure M267, and fits into a single rack-mount space. Think of it. By utilizing two ELX-1R's, you can double your mixing capabilities in the same amount of space it takes to mount one M267.

Also, it's less expensive than the M267 because our rack mount is standard—you have to pay for theirs.

And it offers you the kinds of features that theirs doesn't . . .

Like half the distortion. Or individual input LED clip indicators. Or a 10-segment, three-color LED PPM bargraph display. Or ¼" auxiliary phone connections, as well as professional XLR input-output. Or positive action push-button switching.

And last but not least—better specs across the board and a two-year warranty opposed to one.

You Decide

Naturally, we don't expect you to take our word on this . . . you have to see for yourself. Contact your local EV dealer today. Ask for our comparison chart and an engineering data sheet. Better yet, ask for a no-pressure demonstration.

We think you'll be pleasantly surprised.

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Circle (107) on Reply Card

Peerless Sales 3821
Utility equipment carts. (S3)
Circle (1003)

Penny & Giles 6804
Audio, video faders; motorized faders; joystick controllers; patch panels, accessories.
Circle (1004)

PEP 5700
Batteries, charger systems.
Circle (1005)

Perrott Engineering Labs 2939
Batteries, chargers; equipment covers; optical filters; portable lighting. (V4)
Circle (1006)

PESA Electronica 2708
Character generators; master control, production switchers; video processors, monitors, test equipment; TV transmitters, translators; intercom/talkback systems.
Circle (1007) See ad page 159

Philips Components 5512
Camera tubes; RF power tetrodes, klystrons. (R3, V1)
Circle (1008) See ad page 163

Philips Lighting 1352
Lamps for stage and studio. (V4)
Circle (1009)

Philips Test & Measurement/BTC 1914
Test equipment, signal generators, modulators, demods.
Circle (1010) See ad page 99

Pinnacle Systems 2101
Digital graphics, effects, video workstations. (V5)
Circle (1012)

Pinzone Communications 1558
Specialized subcarrier communications; AM antenna designs.
Circle (1013)

Pivotelli/USA 7116
Equipment mounting, support products.
Circle (1014)

Potomac Instruments 4406
Antenna monitors; field strength meters; remote, programmable transmitter controllers; RF generators, detectors; audio test equipment. (R1)
Circle (1015)

Practel Sales International 9048
Audio source, monitoring products; signal distribution, video processing equipment.
Circle (1016)

Premier Metal Products 6334
Equipment racks, cabinets. (S3)
Circle (1017)

Prime Image 7010
Timebase correctors, synchronizers with integral effects features. (V7)
Circle (1018) See ad on MAP

Pro Battery 3125
Batteries, chargers.
Circle (1019)

Pro Co Sound/Pro Division 3109
Circle (1020)

Professional Design Products 1948
Circle (1021)

Professional Label Service 1020
Videocassette label materials, label printing software. (S1, S4)
Circle (1022)

Professional Sound Corporation 9001
Wireless mic, recorder accessories; Sonosax mixers; rental plans for motion picture, video production. (A3, A4, S5, V8)
Circle (1023)

Profit Plus Software 8041
Circle (1024)

Progressive Computer Products 8012
TBC/effects generators; video format converters; computer video encoders. (V7)
Circle (1025)

Promusic 9035
Circle (1026)

Visit Us At Booths
5512-5518 At NAB Show.

The Performance Name In Camera Tubes Means Energy Savings In UHF Klystrons Too.

The broad Philips line of Plumbicon® tubes includes broadcast, ENG and EFP types, low-power and high-definition types. With lots of options. And they're available overnight.

Philips broadcast experience in camera tubes also covers UHF transmission. With UHF klystrons, Philips is a global leader in terms of market share and innovation. Immediate U.S. availability, strong technical field support, and energy-saving MSDC design are yours from Philips.

Philips. Components for TV imaging and transmission. With guaranteed supply continuity. And worldwide availability.

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Circle (109) on Reply Card

Q-TV 2234
Video prompting equipment. (V5)
Circle (1027)

QEI 4300
FM transmitters; modulation monitors; studio-transmitter T1 links. (R1, R2, R5)
Circle (1028)

QSI Systems 3034
Video SID, message generators; video processors, switch-over units. (R4, V7)
Circle (1029)

Quality Video Supply 1446
Video and audio accessories; supplies.
Circle (1030)

Quanta/Dynatech 6030
Quanta Editing Products
Anti-aliased character generators; 2D, 3D, paint, titling, animation system; videotape editing controllers. (V2, V5)
Circle (1031) See ad page 201

Quantel 1134
Digital video effects, graphics/paint systems; caption generators; still library systems. (V5)
Circle (1032) See ad page 34

Quickset 5048
Camera tripods, pan/tilt heads, dollies. (V1)
Circle (1034)

R-Columbia Products 3000
Headphones, camera operator headsets; intercom systems. (A4)
Circle (1035)

Radiation Systems Inc/RSI 3100
Earth station antennas, controllers; flyaway systems; Mark microwave antennas. (R6)
Circle (1037) See ad page 62

Radio Computing Services 8024
Automated music, commercial verification equipment. (S1)
Circle (1038)

Radio Design Labs 6646
Circle (1039)

Radio Systems 4903
Audio mixers; SCA receivers; audio DAs, preamps, monitor amps; cart machines; studio cabinetry. (A5)
Circle (1041)

RAM Broadcast 6820
Distributor, audio, radio, video equipment; audio phase monitors, routing switchers; video monitors; studio furniture, cabinetry; consultant service.
Circle (1042)

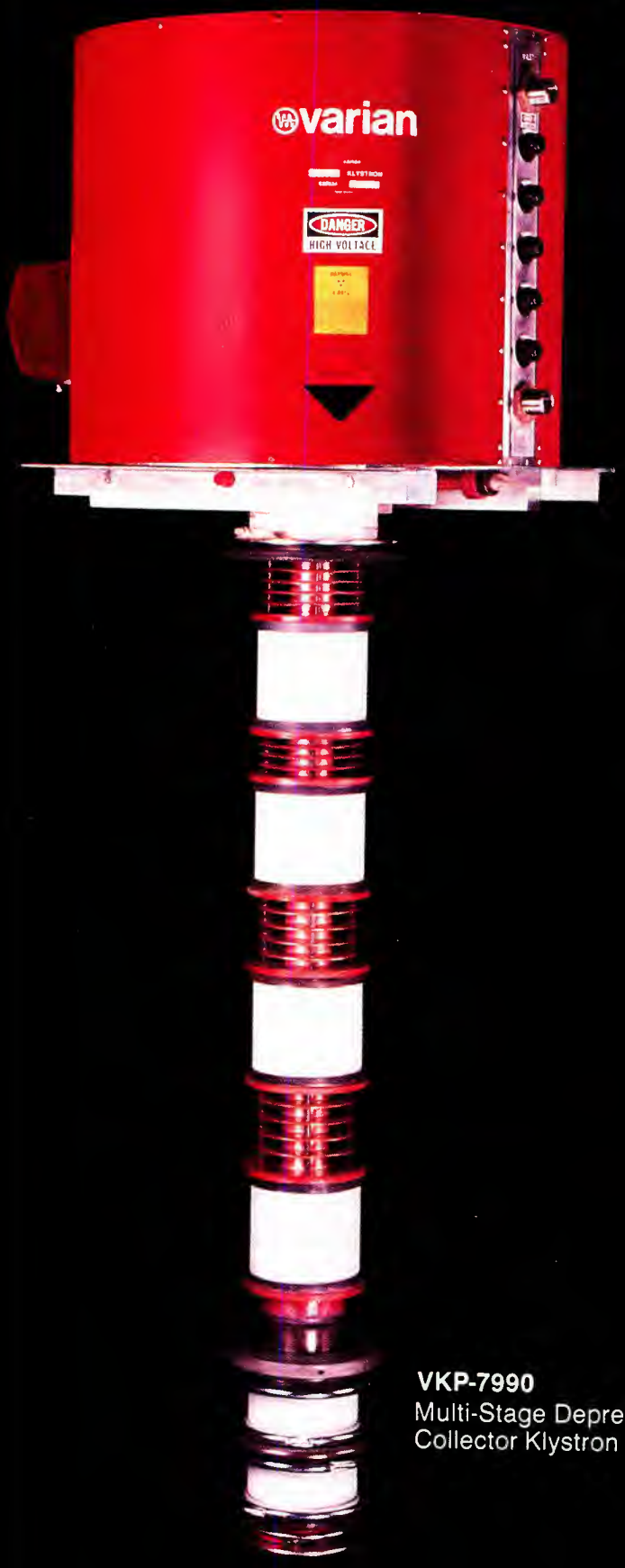
Rampart Cases 7020
Equipment cases.
Circle (1043)

Ramsa Audio/Panasonic 2534
DAT recorders; CD players; mixers; speakers. (A4)
Circle (1044) See ad page 209

Rangertone Research 1952
Multi-Track Magnetics
Audio film recorders; film projection equipment. (V3)
Circle (1045)

Rank Cintel 3156
Telecines; still stores; disc-based video recorders; graphics systems; weather receiv-

THE SHAPE OF THINGS TO COME...



VKP-7990
Multi-Stage Depressed
Collector Klystron

...CAN SAVE YOU MORE THAN 50% ON POWER COSTS* WITH THE MSDC KLYSTRON!

*Compared to a typical UHF-TV transmitter

SEE **THE SHAPE OF THINGS TO COME** AT VARIAN BOOTH 5100 — NAB 1990, ATLANTA

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microwave power tube division

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ing, display equipment; color correction equipment. (V3)
Circle (1046) See ad page 179

Reach Electronics/Veetronix 5908
Electronic components.
Circle (1047)

REBO HDTV
High definition TV products. (S2, V2, V7)
Circle (1048)

Recortec 2557
Videotape conditioners; VHS adaptations.
Circle (1049)

Rees Associates 2037
Studio, production facility design.
Circle (1050)

Register Data Systems 6106
Traffic, accounting business systems. (S1)
Circle (1051)

Research Technology Int'l/RTI 2049
Videotape degausser, evaluators, cleaners; film cleaning equipment. (S4)
Circle (1052)

RF Technology 2612
ENG transmitters, receivers, power amplifiers, antennas; fiber optic systems; delay lines; video processing. (R2, S2, V7)
Circle (1053)

Richardson Electronics 2844
Power grid tubes, rectifiers; klystrons, TWTs, RF transistors; RF cavities, components; camera, video display tubes.
Circle (1054)

Rockwell International 1924
STL/ICR microwave systems; weather radar, displays.
Circle (1056)

ROH/Anchor Audio 6430
Intercoms, headsets; audio routers, mixers; audio, time code monitors; PA automation. (A1, A4)
Circle (1057)

Rohde & Schwarz 5408
Audio, video, RF test, analyzer systems; signal generators, modulation monitors; FM, TV demods; automatic test equipment. (S6)
Circle (1058) See ad page 73

ROHN 6400
Tower products, design, construction; maintenance services.
Circle (1059)

Rosco Laboratories 1808
Chroma-key background fabrics, paints; visual effects; lighting gels, projectors; stage electrical plugs. (V4)
Circle (1060)

Roscor 6524
Mobile production, news vehicles.
Circle (1061)

Ross Video 5304
Video production switchers, keyers. (V6)
Circle (1062)

RRN Inc 9034
Packaged sales promotions, specialized programming for radio, TV, cable. (S8)
Circle (1064)

RTNDA 6705
Circle (1065)

RTS Systems 2624
Multiple-channel, programmable, modular intercom systems; headsets; intercom telephone couplers; hard-wired systems; audio test tone generators. (A4)
Circle (1066) See ad page 198

Sachtler 1610
Camera support equipment; lighting instruments for studio, ENG. (V4)
Circle (1067) See ad page 71

SAIC/IDS 163W
Large screen projectors, Eidophor distributor.
Circle (1068)

Samson Technologies 6542
Wireless microphones, receivers. (A4)
Circle (1069)

San Francisco Satellite 3913
Satellite communications services.
Circle (1070)

Sanken/Audio Intervisual Design 1340
Stereo field microphones. (A4)
Circle (1071)

SAS Institute 8061
Circle (1072)

SBE 1043
Circle (1073)

Scala Electronic 4224
Antennas for radio broadcast, microwave.
Circle (1074)

You are invited
to the premiere showing of
360 SYSTEMS'

Digital Audio Cart Machine

The Broadcast Products Group of 360 Systems is pleased to present the first digital recorder/reproducer designed specifically for the needs of today's broadcasters. Key features include:

- Removable low-cost recording medium
- Instant cueing to any selection / Zero start time
- Highly reliable drive and cartridge
- True 16-bit stereo performance
- Standard half-rack form factor
- Standard cart operating controls
- Price competitive with analog tape carts

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360 Systems

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Phone: 818/342-3127 • Fax: 818/342-4372

Schafer World Communications 4602
Automated CD players.
Circle (1075)

Schmid Telecommunication 1035
Audio system test equipment. (S6)
Circle (1076) See ad page 213

Schneider Corp of America 5616
TV camera zoom lenses; optical filters for TV, film. (V1)
Circle (1077)

Schwem Technology 3153
TV camera lenses, stabilizers. (V1)
Circle (1078)

Scientific Atlanta 5730
Earth station antennas, electronics, controllers. (R6)
Circle (1079)

SECK 2916
Production, remote audio mixers.
Circle (1080)

Selco/Sifam 5504
Wire, cable, connectors, patching products; instrument knobs, lighting kits. (S6)
Circle (1081)

Sellmark Electronic Services 7101
Circle (1083)

Sennheiser Electric 3101
Studio, field microphones, dynamic, condenser designs; headphones, headsets. (A4)
Circle (1084)

SESCOM 2015
Modular audio DAs, mic/phono preamps; line, monitor amps.
Circle (1085)

Shima Seiki †3241
Electronic graphics equipment.
Circle (1086)

Shively Labs 4030
Transmission line; antenna radomes; directional array consultants. (R1)
Circle (1087)

Shook Electronics USA A100
Remote TV production vehicles. (S7)
Circle (1088)

Shure Brothers 4524
Microphones, wireless mics; audio mixing systems; signal distribution systems. (A4)
Circle (1089) See ad page Inside Front Cover

Siemens Components 3546
Circle (1090)

Sierra Video Systems 9005
Distribution, routing switchers. (S5, V7)
Circle (1091) See ad page 254

Sigma Electronics 6300
Distribution equipment; videographics devices; sync, test signal, video ID generators. (S5, V5, V7)
Circle (1092) See ad page 268-9, 271, 273

Signature Music Library 7015
Music, effects libraries; CD formats.
Circle (1093)

Singer Products 4611
Distributor, audio, radio products.
Circle (1094)

Skotel 1536
Time code generators, readers, inserters. (V2)
Circle (1096)

SMPTE 6720
Circle (1097)

Snell & Wilcox 1041, 2100
Standards converters. (V3, V7)
Circle (1098) See ad page 101

Soc. of Professional Videographers 1055
Circle (1099)

Solid State Logic 1321
Audio consoles; integrated digital audio production, post systems. (A2, A5)
Circle (1100) See ad page 182

Solutec 6800
Automation hardware, software; A-V DAs; audio level monitor equipment. (S1, S5, S6)
Circle (1101)

Sono-Mag 4301
Radio program automation; multicart audio carousel players, audio recording source/monitoring equipment.
Circle (1102)

Sony Communications/Broadcast †5130
Video cameras, camera-recorders; analog, digital video signal conversion, processing products; editing systems; video monitors; videocassette automation systems. (S1, V1, V2, V6, V8)
Circle (1103) See ad page 24-5, 102-3, MAP

Sony Communications/Pro Audio 5130
Analog, digital audio recorders; analog-digital signal conversion products; audio mixers; wireless microphones. (A1, A3)
Circle (1104) See ad page 43

Sony Magnetic Tape 5130
Video tape, analog, digital in reel, cassette formats; audio tape.
Circle (1106) See ad page 257

Sony Still Imaging †5130
Still image cameras, recorder/reproducers, transmission equipment.
Circle (1107) See ad page 169, 171

Sound Ideas 5011
Production music, sound effects. (S8)
Circle (1108)

Sound Technology 4344
Audio test equipment, signal analyzers.
Circle (1109)

Soundcraft/USA 2916
Audio consoles. (A1)
Circle (1110)

Soundmaster International 3720
Integrated audio editing systems; transport synchronizers, controllers. (A5)
Circle (1111)

Soundtracs 6542
Audio mixers. (A1)
Circle (1264)

Spaceward Systems 7022
Electronic paint, 3-D graphics, titling equipment. (V2, V5)
Circle (1113)

Spectra Image/Spectra Systems 8042
Videodisc recorders, playback equipment.
Circle (1114)

Sprague Magnetics 5406
Audio heads, head refurbishing service.
Circle (1115)

Stainless/SG Communications 5613
Broadcast towers, accessories, services.
Circle (1116)

Standard Communication 3900
Earth station electronics.
Circle (1117) See ad page 253

Stanton Magnetics 4726
Phono cartridges, headphones. (A4)
Circle (1118) See ad page 48

Stanton-Video Services Unlimited 9043
Camera cranes, booms. (V1)
Circle (1119)

Stantron Unit/Zero 3534
Modular equipment cabinets, consoles; VTR/VCR dubbing/duplicator racks, editing workstations; wood trims, fan, rack slide accessories.
Circle (1120) See ad page 106

Star Case 3810
Equipment transport cases. (S3)
Circle (1121)

Steadi-Film (VTA/Atlanta) 3446
Motion control systems; telecine accessories.
Circle (1122)

Steenbeck 6408
Film, mag film editing tables, film-to-video transfer equipment. (V3)
Circle (1123)

Storeel 2434
Videotape storage systems. (S3)
Circle (1124)

Strand Lighting 3148
Stage, studio lighting instruments, dimmers, controllers, accessories.
Circle (1125)

Studer EdiTech 1406
Hard-disk digital audio recording, editing equipment. (A5)
Circle (1126)

Studer ReVox 4552
Audio consoles; analog, digital tape and hard-disk audio recorders, synchronizers; FM monitor/tuners; CD players, controllers; monitor speakers. (A1, A3, A4, A5)
Circle (1127)

Studio Technologies 5605
Microphone preamps; stereo simulation, stereo signal identification products. (A4)
Circle (1128)

Sure Shot Satellite Network 8112
Mobile, fixed production services; uplink, satellite time brokers. (S7)
Circle (1129)

Swintek Enterprises 6531
Wireless mics; intercoms; headphones. (A4)
Circle (1130)

Switchcraft 6043
Audio patch panels, cords, jacks. (S2)
Circle (1131)

SWR 5005
FM, TV antennas; transmission line.
Circle (1132)

The new Sony Video Scanner. The most successful screen debut since the copy stand.

No light! No cameras! Just action! The new Sony UY-T55 Color Video Scanner plays the role of a copy stand. With a performance that matches high-end copy stands, yet at a price and convenience they can't match.

The Sony UY-T55 Video Scanner converts flat art into high quality video images for video production, broadcast presentations and computer/video graphics for frame capture applications. And in a lot less space than conventional copy stands.

What's more, the Sony Color Video Scanner captures an image in full color, and finishes its performance in a mere 6 seconds. All without focusing or lighting. And if you need to crop and zoom, you can do it in one take.

To give this talented video scanner a screen test, call Sony at **1-800-833-6302.** We'll put you in touch with a Sony dealer, and he'll show you why the new Sony Color Video Scanner is a tough act to follow.

SONY

Circle (114) on Reply Card

Symbolics/Graphics Div †1156
Digital graphic systems.
Circle (1133)

Symetrix 6342
Audio processors, phone hybrids; digital audio recorders; audio meters. (A2, A5, S6)
Circle (1134)

Synergistic Batteries 6540
Battery products.
Circle (1135)

System Associates 1429
Used broadcast TV equipment brokers.
Circle (1136)

Systemation 6722
Radio automation hardware, software.
Circle (1137)

Systems Wireless Ltd 7113
Wireless microphones.
Circle (1138)

Taber/AVSC 2556
Audio recording heads; degaussers, cleaners, conditioners; recording tape.
Circle (1139)

Tamron Industries 3050
Camera lenses; video printers. (V1)
Circle (1141)

Tannoy North America 6630
Audio reference monitors. (A4)
Circle (1142)

Tapscan 3817
Business software systems.
Circle (1144)

Target Tuning 8110
Promotional specialty products.
Circle (1145)

TASCAM 3352
Reel, cassette audio recorders; audio consoles; signal processors; transport synchronizers. (A1, A3, A5)
Circle (1146) See ad page 265, 267

Taurus Communications 8049, A265
Satellite communications services.
Circle (1147)

TEAC 3352
Videodisc recorders, players. (V2)
Circle (1149) See ad page 144

Teatronics/Lighting Innovations 2820
Lighting dimmers, controllers. (V4)
Circle (1150)

Teccom 3434
Distributor, video products.
Circle (1151)

Techni-Tool 2857
CRT degaussers; tool cases; cleaning products. (S6)
Circle (1152)

TEKNO 1110
Lighting products, lamps; cycloramas, backdrops; studio rail systems.
Circle (1153)

Tekskil Industries 3802
Computer prompters. (V5)
Circle (1154)

Tektronix †2016
Component/composite video signal generators; transmission test signal generator; video measurement sets; aural modulation monitor with remote monitoring; signal development software. (S6)
Circle (1155) See ad page 52-3, 181

Tektronix-Telcom 1425
Circle (1156)

Telcom Research 3046
Time code products.
Circle (1157)

Telemet 5114
TV demods; routing switchers, DAs; video encoders, decoders; fiber optic products; sync, test signal generators; sideband analyzers, envelope delay test sets; video switchers, keyers; titling generators. (V5)
Circle (1158)

Telemetrics 1449
Triaxial camera control systems; pan/tilt camera support with computer control. (S1, V1)
Circle (1159) See ad page 220

Sony's new definition of still video recording: 500 lines of resolution.

Words can hardly describe the image clarity when viewing 500 lines of resolution. Which is precisely what Sony has added to the new MVR-5600 still video recorder/player.

It lets you record, play back and store video signals from just about any video source, in never before seen sharpness. Whether it's still video pictures, frames from video cameras, videotape recorders, copy stand and video scanner images or computer graphics. With the MVR-5600, you have immediate random access to any image on the 2" floppy disc in as little as 30 milliseconds. Which in turn makes it easy to integrate high quality images into broadcasting, video production, computer imaging, business presentations and demonstrations. You can even use it as a low cost video still-store device or for image-archiving applications.

For a demonstration of this revolution in resolution, call Sony at 1-800-833-6302 We'll put you in touch with a Sony Still Image dealer who'll show you our full line of products. And what 500 lines of resolution means for you.

SONY

Telepak San Diego 3815
Soft cases for professional cameras, recorders, monitors, accessories. (S3)
Circle (1160)

Telesat Canada A228
Satellite communications services.
Circle (1161)

Telescript 1934
Video prompting systems, accessories. (V5)
Circle (1162)

Television Engineering 2240
Facilities designs, production vehicles; equipment packages, systems. (A4)
Circle (1163)

Television Equipment Associates 5501
Matthey video delays, filters; audio anti-aliasing filters; Racal headsets, 2-way radio accessories; miniature camera; miniature video transmitter. (R1, V1)
Circle (1164)

Telex Communications/Pro A-V 2116
Wired, wireless microphones; intercoms; headphones, headsets. (A4)
Circle (1165) See ad page 63

Telmak Television 1009
Modular video switcher, distribution products.
Circle (1166) See ad page 202

Telnox Telecommunications 8025
Digital signal routing switchers.
Circle (1167)

Telos Systems/TLS 6354
Telephone hybrid systems. (A2)
Circle (843)

Teltest 2934
Video production switcher. (V6)
Circle (1168)

Tennaplex Systems 4325
FM, TV antennas; music automation systems. (S1)
Circle (1169) See ad page 196

Tentel 2033
Tools, gauges for VTR/VCR alignment. (S4)
Circle (1170)

TFT Inc 4642
AM, FM, TV modulation monitors; STL equipment; remote pickup systems; transmitter remote control systems; FM generators, exciters. (R2)
Circle (1171)

Theatre Service & Supply 2903
Theatre, studio lighting instruments, lamps; facility design, construction, consulting.
Circle (1173)

Theatre Vision/TVI 3040
Studio fixtures, lighting dimmers, power distribution systems; cycs, tracks, chroma-key fabrics.
Circle (1174)

Thermodyne International 6154
Cases, protective shipping containers, support systems for electronic equipment. (S3)
Circle (1175) See ad page 219

Thomson-CSF 5920
See:
Comark Communications
Thomson Digital Image
Thomson Electron Tubes & Devices
Thomson-LGT
Thomson Video Equipement
See ad pages 61, 90, 156, 173, 234, 235, 256

Thomson Digital Image/TDI 1424
Digital graphics, computer animation software.
Circle (1176)

Thomson Electron Tubes & Devices 6348
RF power tubes, solid-state devices; camera tubes, CCDs. (R3, R6)
Circle (1177) See ad page 90

Thomson Video Equipement 5920
EDTV/HDTV, CCD studio/OB cameras; component digital, production, routing switchers, color correctors. (V1, V6, V7)
Circle (1178) See ad page 61

Thomson-LGT 5920
VHF, UHF solid-state TV transmitters, transposers; FM transmitters.
Circle (1179) See ad page 235

360 Systems 7201
Permanent playback digital audio message systems; audio routing equipment. (A5, S5)
Circle (1172) See ad page 167

Tiffen Mfg 1916
Optical filters, lens accessories for film, video. (V1)
Circle (1180)

TimeLine 4345
Console automation; time code equipment, transport synchronizers. (V2)
Circle (1181)

Titus Technological Laboratories 4430
Audio distribution equipment; FM stereo signal analyzers, synthesizers. (A2)
Circle (1182)

Torpey Controls & Engineering 5404
Master clock, central timer, central thermometer systems. (S1)
Circle (1184)

Toshiba /OEM Div †3322
Miniature video cameras; transmitter equipment; HDTV products.
Circle (1185)

Total Spectrum Mfg 1814
Camera mounting systems; remote, automation controllers; ENG accessories.
Circle (1186) See ad page 227

Townsend/Midwest 3106
UHF TV transmitters.
Circle (1187) See ad page 1

Transmission Structures 4025
Communications, broadcast towers, services.
Circle (1188)

TRF Production Music Libraries 3010
Production music, effects.
Circle (1189)

Trompter Electronics 2854
Distribution patch panels, cords, connectors; cable assemblies.
Circle (1190)

TrueVision 8051
Computer graphics display equipment.
Circle (1191)

TTC/Television Technology 2006
FM translators, solid-state transmitters; UHF TV transmitters. (R1)
Circle (1192)

27th Dimension Inc 6817
Production music libraries on CD. (S8)
Circle (1193)

TWR Lighting 6539
Tower lights, beacons, controllers.
Circle (1194)

Ultimatte 1122
Video compositers; computer-controlled camera mounting systems. (V7)
Circle (1195)

Uni-Set 1959
Studio fixtures, furniture, set pieces.
Circle (1196)

Union Connector 3260
Studio wiring, connectors; power contactors, panels. (S2, V4)
Circle (1197)

Unique Business Systems 9008
Rental system software. (S1)
Circle (1198)

United Ad Label 1348
Adhesive label products.
Circle (1199)

United Media 2826
Videotape editing controllers; editing switchers; time code products. (V2)
Circle (1200)

United Ropeworks (USA) 5406
Tower guy materials, accessories.
Circle (1201) See ad page 248

UREI 2916
Audio processor; on-air audio mixers. (A4)
Circle (1202)

US Tape & Label 4804
Cassette labels; promotional materials.
Circle (1203)

Ushio America 9041
Halogen studio lamps. (V4)
Circle (1204)

Utah Scientific/Dynatech †6030
Automation equipment; distribution, routing, master control switchers, production switchers. (S1, S5, V6)
Circle (1205) See ad page 47

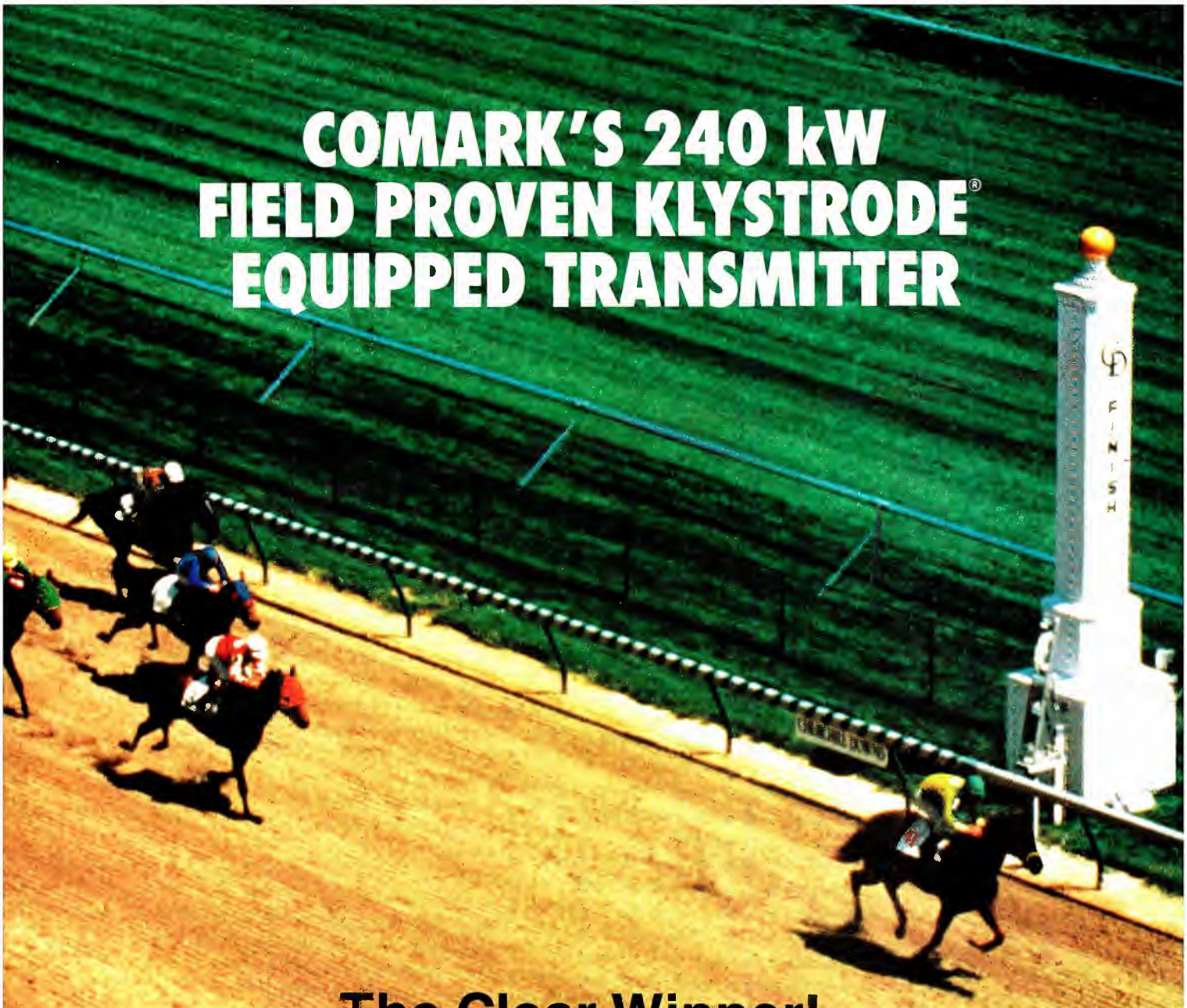
Utility Tower Company 4717
Tower products; maintenance services. (R1)
Circle (1206)

Valentino Production Music 5400
Music, sound effects library. (S8)
Circle (1207)

Valley International 6710
Analog, digital audio processors, audio distribution products. (A2)
Circle (1208)

Valmont Industries 6626
AM radio antennas, support products.
Circle (1209)

Varian Associates
See:
Continental Electronics
Varian EIMAC Salt Lake City
Varian EIMAC San Carlos
Varian Microwave Equipment
Varian Microwave Power Tubes
Varian TVT
See ad pages 13, 100, 165, 237



COMARK'S 240 kW FIELD PROVEN KLYSTRODE® EQUIPPED TRANSMITTER

The Clear Winner!

Now In Service At WDRB-TV Channel 41 Blade Communications, Louisville, KY

Comark financing or leasing available to qualified buyers.

Comark has the only proven track record in advanced technology transmitter performance.

For further information on Comark's complete line of water or air cooled Klystrode equipped transmitters call or write:

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Full Power Air Cooled UHF Transmitters NAB Booth 5920

Circle (118) on Reply Card

Varian EIMAC Salt Lake City 5100
RF power triodes, tetrodes.
Circle (1210) See ad page 13

Varian EIMAC San Carlos 5100
RF power amplifiers, devices, Klystrodes.
Circle (1211) See ad page 13

Varian Microwave Equipment 5100
RF microwave amplifier assemblies.
Circle (1212) See ad page 237

Varian Microwave Power Tube 5100
RF power devices, klystrons, circuitry. (R3)
Circle (1213) See ad page 165

Varian TVT 4316
FM radio, TV transmitters. (R1)
Circle (1214)

VEAM/Litton Systems 6547
Quick-disconnect, multiwire, power connectors, distribution panels. (S2)
Circle (1215)

Vector Technology 1364
TV transmitters, exciters; FM exciters. (R4)
Circle (1216)

Vega 4618
Wireless microphones, receivers.
Circle (1217)

VGV Incorporated 5522
Video switchers; digital effects systems.
Circle (1218)

Vicon Industries 9039
Remote controllable camera mounting, support equipment.
Circle (1219) See ad page 191

Video Accessory 1330
Sync, color, video black generators, DAs; monitor power controls. (V7, V8)
Circle (1220)

Video Associates Labs 1910
Video, computer titling keyers.
Circle (1221)

Video Brokers 1056
Equipment broker services.
Circle (1222)

Video Communications 1412
Station business systems; traffic, accounting, film/automation interfaces. (S1)
Circle (1223)

Video Design Pro 1356
CAD, engineering design stations, engineering documentation software. (S1)
Circle (1224)

Video Engineering Ltd 7105
Circle (1225)

Video International Development 3020
Video standards converters. (V7)
Circle (1226)

Video Lab Para Technologies 1005
¾" VCR retrofits; time code, RS-422 interface, shuttle retrofits.
Circle (1227)

Video Logic 7120
Computer software for automated logging of videotape. (S1)
Circle (1228)

Video Technics/Pixelator Graphics 7115
Circle (1229)

Videomagnetics 1445
Tape degaussers; VPR video head refurbishing services. (S4, V2)
Circle (1230)

Videomedia SED 1434
Video editing, animation controllers. (V2)
Circle (1231)

Videotek 1246
Frame-store, synchronizers; video production switchers; color monitors, receivers, demods; blackburst DAs; waveform, vector monitors. (R4, S6, V7, V8)
Circle (1232) See ad page 57

Videssence 1122
Lighting for video compositing/keying.
Circle (1233)

Viking Cases 5855
Transport cases, equipment enclosures.
Circle (1234)

Vinten Broadcast 1452
Camera support, pedestals, pan/tilt heads; camera support automation. (V1)
Circle (1235) See ad page 231

Vistek Electronics 1010
Standards transcoders; distribution matrix amplifiers. (V6, V7)
Circle (1236)

Vortex Communications 5214
A-V DAs, routers; video encoders/decoders, format transcoders; audio detectors, VCAs; clock systems; time code products.
Circle (1237)

THE PROFESSIONAL CD PLAYER FOR THE PROFESSIONAL CD PLAYER.

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

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

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

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

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

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

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

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

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

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

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

Technics
The science of sound

Circle (120) on Reply Card

Booth 2534

THINK SYSTEMS.

THINK PANASONIC BROADCAST SYSTEMS.

You know about our recording systems—from players to editors to the sophisticated M.A.R.C. automated cassette system. You know about our unmatched standards for price/performance with component analog VTRs at 3/4" prices.

But we want you to know we're more than that. We are the source of the world's first digital processing cameras, as well as some of the most cost-effective analog cameras ever made.

And, we've got just about everything in between: auto-setup monitors, cables, adapters, switchers, editors, etc.

When you're looking for value, performance and innovation, think systems. Panasonic Broadcast Systems.

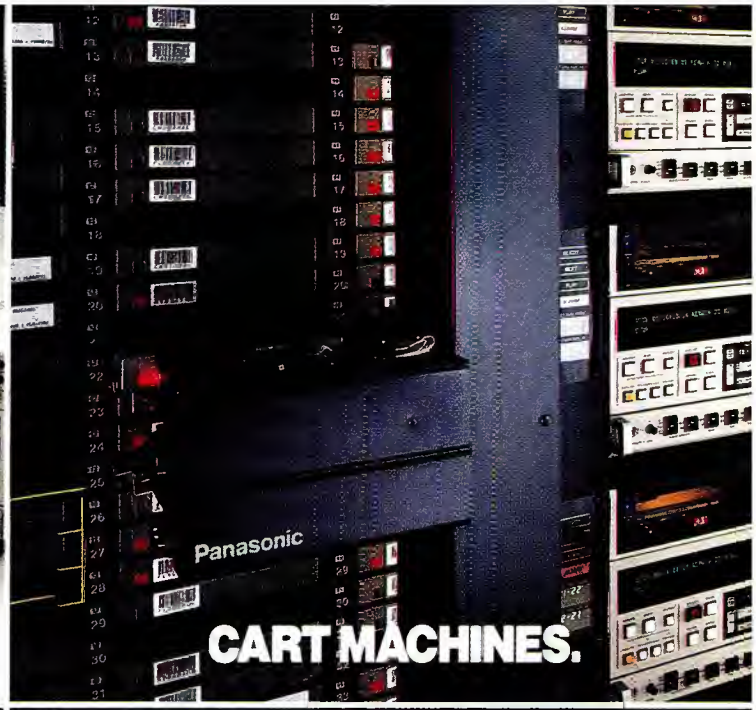
Panasonic
Broadcast Systems
Value and innovation. First and foremost.

Panasonic Broadcast Systems Company, One Panasonic Way, Secaucus, NJ 07094 (201) 348-7671

Panasonic Broadcast Systems Company Field Offices **(Northeast)** *Washington, DC (703) 759-6900,* **(Southeast)** *Norcross, GA (404) 925-6721* **(Midwest)** *Arlington Heights, IL (312) 981-7325/(317) 852-3715* **(Southwest)** *Fort Worth, TX (817) 685-1132,* **(Western)** *Cypress, CA (714) 373-7209* **(Northwest)** *(408) 866-7974.* **Parts, Service, Technical Information:** *1-800-222-7401*

Circle (126) on Reply Card

VTRs.



CART MACHINES.

PORTABLE CAMERAS.

AUTO SETUP MONITORS.

FIELD OPERATIONS.

ESSORIES.

VTE HDTV
Solid-state digital video recorders. (V2)
Circle (1238)

Ward-Beck Systems 5002
Audio consoles; intercom systems; signal distribution equipment; test products. (A4)
Circle (1239) See ad on Back Cover

WaveFrame 164W
Digital audio sampling conversion. (A5)
Circle (1241)

Wavefront Technologies 3642
Videographics systems, workstations.
Circle (1242)

Weather Network 1100
Weather service, data.
Circle (1243)

Weather Services Corp 3024
Weather data services.
Circle (1244)

Weathernews America 3023
Weather forecast services.
Circle (1245)

Wegener Communications 6530
SCPC, microwave, earth station electronics; digital audio, data, video systems. (R6)
Circle (1246)

Weircliffe 1734
Tape degaussers. (S4)
Circle (1247)

Wheatstone Broadcast Group 4010
Stereo switching, audio DAs; audio consoles for on-air, production, MTS. (A1, A4, S3)
Circle (1248)

Whirlwind 5052
A-V cable, connectors; turnkey design of A-V interface systems; transformers; press boxes, distribution systems; patch bays, reels, rack panels.
Circle (1250)

Will-Burt/TMD 6806
Pneumatically-controlled antenna supports, positioning controls. (R1)
Circle (1252)

Winsted 5748
Videotape storage systems; workstation furniture; utility equipment carts. (S3)
Circle (1254) See ad page 77

Wireworks 4800
Audio, mic, video cable, multipair audio cable; stageboxes, racks, isolation splitters, multitail fan-outs; test equipment. (S6)
Circle (1255)

Wolf Coach 2928
Mobile production vehicles; mobile unit antenna masts, accessories.
Circle (1257)

World Tower 5023
Broadcast towers, services.
Circle (1258)

Yamaha Music 1440
Audio consoles, digital mixing processors; A/D, D/A converters; powered monitor speakers; effects processors. (A1)
Circle (1259)

Yamashita Engineering Mfgr./YEM 1312
Video scan convertors, sync generators, encoders. (V7)
Circle (1260)

Zaxcom Video 6543
TBC control systems; camera accessories; video processing equipment. (V1, V7)
Circle (1261)

Zonal 6812
Audio tape, reel, cassette formats; magnetic sound recording film.
Circle (1262)

The Telecine People...

URSA

URSA offers the quality of flying spot, the accuracy of digital processing and the flexibility of video effects by combining advanced CRT technology, totally new scanning techniques and a full digital color channel.

The premium top of the line film transfer equipment.

ADS-2

Rank Cintel's versatile multi-purpose CCD Telecine featuring a unique electronic dirt and scratch concealment system, lever operated film gauge change and "state of the art" 135 sensors. The ideal transfer telecine for dailies, features, archival, broadcast and documentary use.

Now with optional AMIGO pre-programming system.

MK III TURBO

The Unimedia MKIII TURBO, based on Rank Cintel MKIII Telecine. The outstanding features and quality of flying spot technology at an economical price.

MK III HDTV

Available now, HD version of the world acclaimed MK III telecine. A flying spot high definition equipment to meet all proposed HDTV standards.

TO THE FUTURE

A joint venture between Rank Cintel and Kodak to develop a CCD HDTV TELECINE.

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Rank Cintel
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California 91605, U.S.A.
Tel: 818-765-7265
Fax: 818-765-3315
Telex: 182694

NEW AT NAB

The following pages provide brief descriptions of new products that exhibiting manufacturers plan to debut at NAB '90. Products included are those items brought to market following the '89 exhibition, unless there were indications noted of enhancements to previous models. Some products shown as prototypes last year have been brought back as production models this year.

The BE "New at NAB" contains four general categories: audio, RF, support and video products. Each category is further subdivided and given a two character code. The codes, shown in boldface type below are cross-referenced in "Exhibitors at NAB," which begins on page 133. Parenthetical numbers following the codes below are page numbers upon which that equipment type begins.

Group A - Audio Products

A1 (183): Mixers, console automation.
A2 (183): Processor systems (dynamics, delay, effects, noise reduction), telephone-related equipment.
A3 (184): Recording systems (all analog formats), anciliaries.
A4 (184): Sources, monitors (wired, wireless mics, intercoms, headphones, speakers; RPU, phono, CD).
A5 (188): Digital audio, MIDI.

Group R - RF Products

R1 (192): Broadcast transmitters, antennas, transmission line; remote controllers; towers, tower anciliaries.
R2 (196): Terrestrial microwave (aural, video; ENG, STL, ITFS/MMDS; electronics, antennas).
R3 (199): Power amplifiers, cavities, power devices.
R4 (199): Receivers, demodulators; modulation monitors.
R5 (199): Exciters, generators (SCA, MTS stereo, SAP, PRO, FM, AM).
R6 (199): Satellite antennas, electronics.

Group S - Support Products

S1 (200): Automation; computer hardware, software; timers, clocks; data transmission systems.
S2 (204): Cable, wire, fiber-optic products; connectors, patch panels, cords.
S3 (204): Bags, cases, racks, studio furnishings; acoustic treatments.
S4 (208): Recording media; degaussers, tape maintenance products; film, film maintenance products.
S5 (208): Distribution amplifiers, routing switchers.
S6 (210): Test, measuring equipment; tools; filters, delay lines; power conditioners.
S7 (214): Fixed, mobile facilities design, construction; consulting services.
S8 (214): Program services, music/effects libraries; promotional products.

Group V - Video Products

V1 (217): Cameras; lenses; camera support products.
V2 (218): Recording systems (all video formats); still-stores; video editing controllers; animation products; time code equipment.
V3 (222): Cine/film cameras, telecines.
V4 (222): Batteries, support products; lighting instruments, lamps; grip equipment.
V5 (224): Graphics, titling, effects equipment; weather graphics systems; prompting, captioning.
V6 (228): Production, master-control switchers.
V7 (228): Processing systems (TBC, synchronizer, standards conversion; sync, VID generators; keyers, compositors).
V8 (232): Monitors, projectors; video printers.

Just what you're looking for in a television generator.

The performance. The price.

Tektronix offers the industry's most complete line of sync and test signal generators. Each one precisely matched to your specific application requirements. You don't pay for capability you don't need and won't use. Ask your Tek representative for a demonstration. There's a perfect fit, whatever your format.

TSG-170A **TSG-170D**	NTSC sync and test signal generators. Correctly SCH-phased outputs. Genlock sync generator with timing presets. Character identification with ID presets and tape leader countdown.
TSG-170D Only	D-2 digital video output plus parallel and serial audio outputs. Ideal for the NTSC house with D-2 in its future.
TSG-370	Simultaneous and independent component and NTSC composite test signal generators. Up to eight color black outputs for equipment synchronization. Ideal for component edit suite operation and maintenance. A hedge on the future for NTSC houses contemplating but not yet using analog component.
TSG-422	4:2:2 digital component test signals per CCIR Rec. 601 and SMPTE RP 125. Full test signal complement including signals for testing co-siting, dynamic range and digital/analog blanking width. Receiver test facilities including digital gray signal and data-to-clock timing offset. Genlock and color black outputs.
1910	NTSC Test Signal Generator/VITS Inserter. NTC7, FCC, ANSI T1.502 and EIA RS-250-B test signals. Provisions for insertion of externally generated signals. Remote control via RS-232-C.

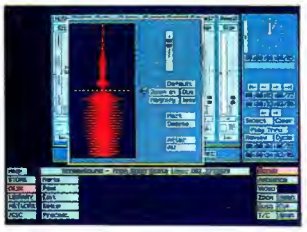
Tektronix
COMMITTED TO EXCELLENCE

Circle (124) on Reply Card

ScreenSound. A fully integrated audio for video editing suite

AUDIO STORE
The hard disk store of sound clips gives title and duration, in addition to powerful search and sort routines.

SCRUB EDITOR
Provides accurate edit marking and scrub of audio waveform.



OPTICAL LIBRARY
An off-line library of sound clips and effects can be compiled on a Write Once Read Many (WORM) optical disc.

MACHINE CONTROL
For control of multiple VTRs, laserdisc or film reproducers.

Post production facilities need to take advantage of the efficiency offered by today's technology. Speed and creative flexibility are essential to commercial success. Digital sound quality is no longer a luxury.

ScreenSound is a fully integrated audio for video editing suite. It combines digital audio storage and editing with machine control of multiple VTRs, Laserdisc or film reproducers. It also interfaces with Quantel's digital video editor, Harry.

Simple to learn and fast to use, a cordless pen, tablet and RGB monitor provide control of all ScreenSound functions.

Multiple sound reels enable music, dialogue and effects to be laid back to picture and synchronised to the exact video frame.

Edit, review, time offset, track slipping, cross fades and many other production techniques are available at the touch of a pen. Gain and stereo pan controls can be automated to timecode.

AES/EBU interfacing keeps digital audio transfers free of analogue distortions and losses, preserving the highest audio integrity through to the final format.

Above all, ScreenSound is a dedicated system - purpose-built to bring the advantages of hard disk sound manipulation to audio post production.

SSL DIGITAL
Solid State Logic

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Circle (125) on Reply Card

Audio Products

A1: Mixers

- Console automation

AMEK Consoles/TAC **3164**
TAC AFV Bullet: 10/4/2 format compact console; rack-mount or free-standing; used with Sony BVE900 video editor.
Serial interface: links Bullet to edit control with ESAM protocols.
MOZART: 40-, 56-, 80-input audio console frames; *all-input* avoids in-line, split monitoring concepts; 32 mix buses, 12 stereo aux returns, 16 aux send paths; on-board grouping computer.
Circle (536)

Audio Developments **1942**
Editing mixers: emphasis on interfacing with a range of edit controllers.
ENG series audio mixers.
Circle (566)

Auditronics **4542**
Model 900: TV on-air and production audio console; computer control system.
Circle (572)

Comprehensive Video Supply **1660**
Primebridge mixer: includes audio mixer, monitoring, audio ADs, balanced/unbalanced inputs, outputs; battery power or external DC.
MM-3100: EFP mixer; three balanced inputs.
Circle (678)

GLW Enterprises **4124**
PRO-790: enhanced 8-track production console.
AP-100: enhanced software; sequencing; selective operator lock-out of assignment, other functions; European fader logic.
Circle (802)

GML **3744**
Series 2000: automated graphics unit; provides total recall of console automation.
Circle (803)

Graham-Patten Systems **1654**
D/ESAM 800: digital edit suite audio mixer; ESAM II protocol but will operate with any editor using any ESAM protocol; Motorola DSP-56000 device; 32-input, 4-output analog or digital audio.
Circle (806)

LPB **4512**
C2-10: audio console from the Citation II series; for on-air, production use.
Circle (909)

Neve **4152**
VRP: post production console.
Circle (971)

Orion Research **3440**
NewsMaker-II: broadcast, production software-based console; enhanced software, metering and audio features.
Circle (992)

Otari **4352**
TC-100 transfer console: for transfer/dubbing in film/video production; rack-mount card frames with meter panel, 4-bus; 9-18 inputs per audio rack.
Series 54: consoles in 24-, 36-input models; DISKMIX 3 VCA/moving fader automation option; from Sound Workshop division.
Circle (994)

ROH/Anchor Audio **6430**
ROHPAC 1: programmable audio control system; for automated PA.
Circle (1057)

Sony Communications/Pro Audio **5130**
MXP-2000 series: new, enhanced models.
MXP-3000: mixer with GML fader automation.
VSP-8000: digital mixer; complements D-1/D-2 VTRs, CD mastering; 48kHz, 99.7kHz.
Circle (1104)

Soundcraft/USA **2916**
Model 200 Delta: audio production console.
Model 8000: audio production console.
Circle (1110)

Soundtracs, PLC **6542**
FMB console: on-air for community, local radio stations; production work; mono, stereo inputs; telco, mix-minus modules; talkback.
Circle (1264)

Studer ReVox **4552**
A-779: 6×2 expandable (to 12×2) portable mixer; VCA gain elements, allowing optional, external dc remote control of channel levels, mutes.
Model 990: digitally controlled, analog mixer; VCA level automation with optional Studer proprietary motorized faders; storage, retrieve all control settings; 4-band EQ, two inserts per channel; 16 aux masters, four independent accessible stereo masters.
Circle (1127)

TASCAM **3352**
M-3500: 24-, 32-channel in-line mixer; 28dB headroom, -130dB DIN mic preamps; supports 24-track ATR, MIDI; linear faders; in-line monitor section; *Flip* function doubles input capability.
Circle (1146)

Wheatstone Broadcast Group **4010**
A-32ex, A-50: radio on-air consoles.
TS-500: talent station.
Circle (1248)

Yamaha Music **1440**
MT3X: 6-input combo mixer unit with pan control, 2-band EQ; for line and mic level signals; 4-track audiocassette recorder.
Circle (1259)

Audio Products

A2: Processors

- Compressor, limiter, EQ
- Delay, effects, noise reduction
- Telephone equipment.

Allied Broadcast Equipment/Harris **4430**
Gentner PeopleLink: broadcast telephone system.
Circle (527)

AMEK Consoles/TAC **3164**
Medici equalizer: dual-path, each with 4-band EQ, high-/low-pass filters; paths combine to form one 8-band equalizer.
Circle (536)

Aphex Systems Ltd **6054**
Expressor: full feature compressor, limiter; for voice, music or single tracks; creates sounds, enhances detail often lost in wideband systems.
Circle (550)

Audio Processing Technology/SSL **1321**
Enhanced apt-X 100: production models of encoder/decoder cardsets; includes AUTO-SYNC features for synchronous operation of decoder for use with satellite and radio transmissions.
Circle (568)

Broadcasters General Store **8016**
S.M.O. 900: stereo modulation optimizer, by Hit Design.
Tailor: Hit Design dynamic equalizer.
Digimod 2000: replacement processor cards for Orban Optimod 8100 from California Digital.
Circle (622)

Circuit Research Labs **4656**
Audio Signature: programmable 4-band EQ and compressor system.
IPP-100R: remote control unit for IPP-100 mic processor.
MBL-100 series: 7.5kHz model for news/talk AM radio.
Circle (662)

Comrex **5214**
Multiline Frequency Extender: 1, 2, or 3 dial telco lines; 1-button auto dial, setup; auto line EQ; multiband noise reduction; real-time processing; supports 1s satellite delay differential.
Circle (684)

dbx Pro Products/AKG Acoustics **6500**
140X Type II: noise reduction system; dual channel type II encode, decode electronics; inputs, outputs at standard professional line levels; for all broadcast tape.
Circle (1263)

Dolby Labs **4443**
MT series: 24-channel noise reduction; switches between Dolby SR or A-type NR.
Circle (733)

Gentner Electronics **5852**
Prizm: digital processor for FM broadcast.
PeopleLink: multiline, modular broadcast telephone system.
Circle (798)

GML **3744**
Model 8900: compressor, limiter.
Circle (803)

Gotham Audio **2342**
Processing systems: Audio+Design*superdynamic limiter*, SPL*SX2 PsychoDynamic* processor.
Circle (805)

Inovonics **5601**
Model 222: NRSC AM processor; international shortwave version.
Circle (848)

Kahn Communications **4410**
POWER-talk: audio processor; maximize coverage for all-talk, all-news AM; with POWER-side, Good-n-Loud systems; FCC compliant filtering.
Circle (870)

Lexicon **2452**
LXP-5 multi-effects processor: five simul-

taneous effects; 3-octave pitch shift; wide-range delay sweeps; chorus, flanging, ambience, reverb; dynamic MIDI interface; complements LXP1.
Model 300: digital effects, reverb, pitch shift; fluorescent display, menu-driven; 50-event, time code triggering; dynamic MIDI; DAT interface; keypad, softknob, dedicated key control.
480L cartridge #10: four algorithms load without chip change; Ambience, Random Hall, Panorama; stereo digital compressor/expander, 0.1 to 100:1; adjust attack, release, gain, rotation.
Circle (898)

McCurdy Radio Industries 5322
TIF-800: eight telephone hybrids in one 3RU rack.
TIF-951: telephone interface; DTMF decoding; 1RU cabinet for use with McCurdy intercom systems.
Circle (932)

Orban/AKG Acoustics 4208
Model 4000: transmission limiter; controls peak modulation level for analog, digital microwave, telco lines; holds on-air loudness with peak-to-average ratio changes in program audio.
Circle (991)

Solid State Logic 1321
Logic FX G383: dual mic amplifier, equalizer.
Logic FX G384: stereo compressor.
apt-X digital audio compression system.
Circle (1100)

Symetrix 6342
SX-206: multimode dynamics control; compressor, limiter, expander, gate, duck and slave; LED GR display; balanced or unbalanced output, mono with stereo link.
Circle (1134)

Telos Systems/TLS 6354
Link interface: telephone-to-intercom interconnection; maintains full-duplex operation without gain or feedback problems; direct connection with RTS, ClearCom and other intercom systems; metering of intercom, telco levels; auto-answer function, filtering for hum and high-frequency interference.
Circle (843)

Titus Technological Laboratories 4430
TLW-2: The Last Word 2 automatic stereo synthesizer, corrector; avoids problems of loss-of-channel, loss of signal and inverted polarity; use in stereo production for TV.
Circle (1182)

Valley International 6710
Model DCE: digital compressor, expander system; stereo.
Circle (1208)

Audio Products

A3: Recorders

- Non-digital equipment
- Editing, synchronizing
- Ancillary equipment

Accurate Sound Corp 4111
MCS-500: cassette recorder/logger; runs at 15/64ips to 3¾ips; 4-8 channel; uses standard Philips cassette, dual transport, time code read/write; 16-hour continuous record.
Circle (507)

Adams-Smith 6808
System 2600 A/V: enhancements and features.
Circle (510)

ADx Systems 7119
ADx-25: multitransport synchronizer.
ADX-10: "Smart machine" TC-based controller.
Circle (516)

Apollo Lighting/Audio-Visual 3800
PA-2060: portable cassette recorder with public address system.
Circle (551)

International Tapetronics/ITC 3422
Series 1: NAB cartridge machine; available as playback, record/play systems; numerous standard features.
Circle (856)

Otari 4352
MX-5050 MKIV-2, -4, -8: ¼", ½" transports, 2-, 4-, 8-track; three memory point autolocator; 20% varispeed, display; TC-based synchronizing; gapless, seamless punch-in/-out editing.
MTR-15: ¼", ½" widths; mono, stereo, 2-track, 2-track with center track time code.
MX-5050 B-III: ¼" 2-channel ATR; three memory point autolocator; vari-speed; SMPTE/EBU interface; time code-based synchronizing.
Circle (994)

Professional Sound Corporation 9001
PSC sound assist tape counter for Nagra recorders.
Circle (1023)

Studer ReVox 4552
Model A807TC: 2/2-TC 2-channel recorder; SMPTE center-track time code; rack, console configurations.
Circle (1127)

TASCAM 3352
MSR-24: 24-track ATR; 1" tape, 10½" reels, 7½"ips or 15"ips; dbx Type 1 noise reduction; 108dB S/N at 15ips; 8-bit μP logic, record/bias control.
688 Midistudio: portable 8-track mixer, recorder; 20 position mixer, gain, pan, effects, four effects returns; 10×2 form; 99-scene storage; LED metering; cassette ATR; serial interface.
Circle (1146)

Audio Products

A4: Ancillary audio

- Wired, wireless mics
- CD, phono equipment
- Headphones, headsets
- Intercoms, speakers

AKG Acoustics 6500
K280: parabolic headphone; produces L/R perspective of concert hall.
Micromic series: miniature clip-on electrets; better stage mobility, micing convenience for musicians.
C1000S: multiple pattern mic; 9V or phantom power; pattern change from cardioid to hypercardioid.
C525S: budget-priced electret; fast transient response; 9V or phantom power.
K 270-S: switched headphones; auto muting when removed from a listener's head to avoid stray leakage into open mic; sealed circumaural design; parabolic setting of two transducers per muff.
Circle (520)

Alpha Video & Electronics/AVEC 3111
NC-102: telephone IFB system.
SI-106: IFB switching interface.
Circle (531)

AMS/Calrec 6338
ST250: stereo mic; remote control unit selects X-Y, M-S stereo; adjustable from end-fire to vertical operation; 20Hz-20kHz response; 110/250Vac, dc power.
Circle (541)

ATI/Audio Technologies 5051
SDA200, SMDA200: stereo 1×4 modular DAs; meter option for L, R, Sum signals; dipswitch selects stereo, sum, difference, L only 1×8, R only 1×8; plugs into ATI DA-10000 equipment frame.
Circle (562)

Audio-Technica US 4214
AT825: X-Y stereo microphone.
AT841a: OmniPlate, omnidirectional boundary mic.
AT851a: cardioid boundary mic.
Series 600: studiophones.
Circle (569)

Barco Industries 2944
Professional CD player system.
Circle (586)

Benchmark Media Systems 1318
System-1000 modules: 1201 input buffer/mixer; 1202 matrixed output module; 1203 gain control modules.
Circle (596)

beyerdynamic 1938
DT 158/159: headset microphones; on-air, intercom applications.
HM 560: headworn microphone.
SHM 20: podium condenser mic.
M260DJ, M500DJ: ribbon mic for on-air talent.
Circle (598)

Clear-Com Intercoms 1407
ICS-1000, -1500 Matrix Plus: point-to-point user stations; 12-, 24-key stations for digital system; cost effective station where full feature ICS-2000 is more than necessary.
Model 1021: stereo monitor; fully amplified; fits in one rack unit; front panel mono-stereo switch.
Circle (663)

Comprehensive Video Supply 1660
Wireless microphone systems.
Headphones: stereo; dynamic design.
Microphones: unidirectional, concert dynamic, special purpose types.
Circle (678)

ComTek 3908
M-182: hand-held wireless mic; 50mW rating; 50-hour operation; all metal package.
MR-180: portable wireless receiver used with ENG cameras.
Circle (687)

C&C Computers and Communications

Because it takes many cuts to make a gem . . .

VUES™ gives you sparkling simplicity in digital video editing.

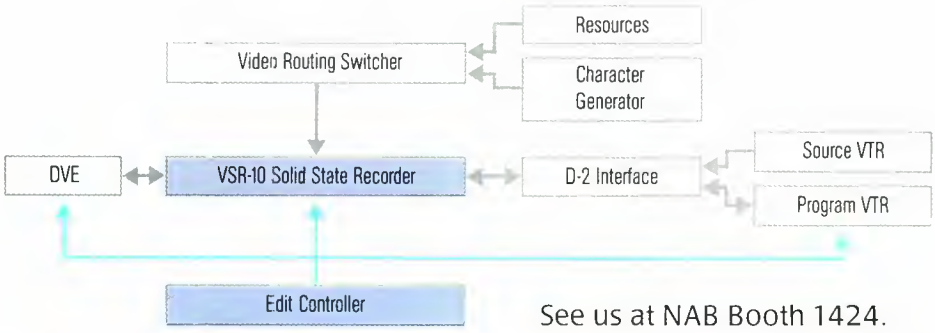
Fifty eight facets make a perfect diamond. In the editing business, you make as many cuts as you need to create a gem. VUES is a simple, economical editing system designed to make every cut look brilliant.

VUES is the first fully-integrated system for digital composite video editing. It makes dissolves and wipes as easy as cuts and offers high-powered features including infinite digital layering.

Engineered around NEC's RAM-based VSR-10 digital video sequence recorder, the VUES system uses a popular PC to let you control all video equipment with full-list management.

To provide all the capabilities of a complex A-B-C-roll editing studio, VUES needs only a single source VTR of any format, plus one channel for digital video effects, and one channel for character generation. Forget about a costly production switcher, still-store and disk system. The VSR-10 incorporates all their functions.

From any viewpoint, the VUES system offers outstanding economy. It uses less hardware, saves space, cuts power, shrinks cooling and maintenance costs. And VUES lets you achieve highly polished results with true economy of effort.



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NEC Corporation Overseas Department, Broadcast Business Promotion Division Tokuei Building, 33-7, Shiba 5-chome, Minato-ku, Tokyo 108, Japan. Tel: 03-798-6364. Telex: 22686.

Circle (129) on Reply Card

NEC

Gotham Audio **2342**
KM-100 series: Neumann unit; with AK43 wide cardioid capsule, fet-100 transformerless system.
Audio Tool Kit: Audio+Design Proboxes, Propacks, ModeDefier for digital interfacing.
Circle (805)

JBL Professional **2916**
Control 1 Plus: personal monitor loudspeaker system; high performance design.
SR series: power amps in 2RU package; air-cooled; 150W, 300W, 500W; 4Ω 0.1% THD.
Circle (864)

McCurdy Radio Industries **5322**
ISO-950: camera ISO software enhancement for McCurdy CS-9500 intercoms.
CDP-100: camera delegate panel for CS-9500 intercoms.
Circle (932)

Numark Electronics **8040**
CD6020: dual-drive CD player; independent controls for both players with mixer system; beat sync feature for fades from one drive to the other.
Circle (979)

Professional Sound Corporation **9001**
PSC universal power supply: supports 12T, 48V phantom-powered microphones.
Circle (1023)

R-Columbia Products **3000**
TR-160: FM wireless intercom headphones; long range covers 1-2 miles with VHF, UHF models; full 2-way operation.
Circle (1035)

Ramsa Audio/Panasonic **2534**
500 series: modular speaker components; WS-A500 mid-high, WS-A550 low frequency modules for full range, high output; acoustically inert enclosures in slate grey or white.
Circle (1044)

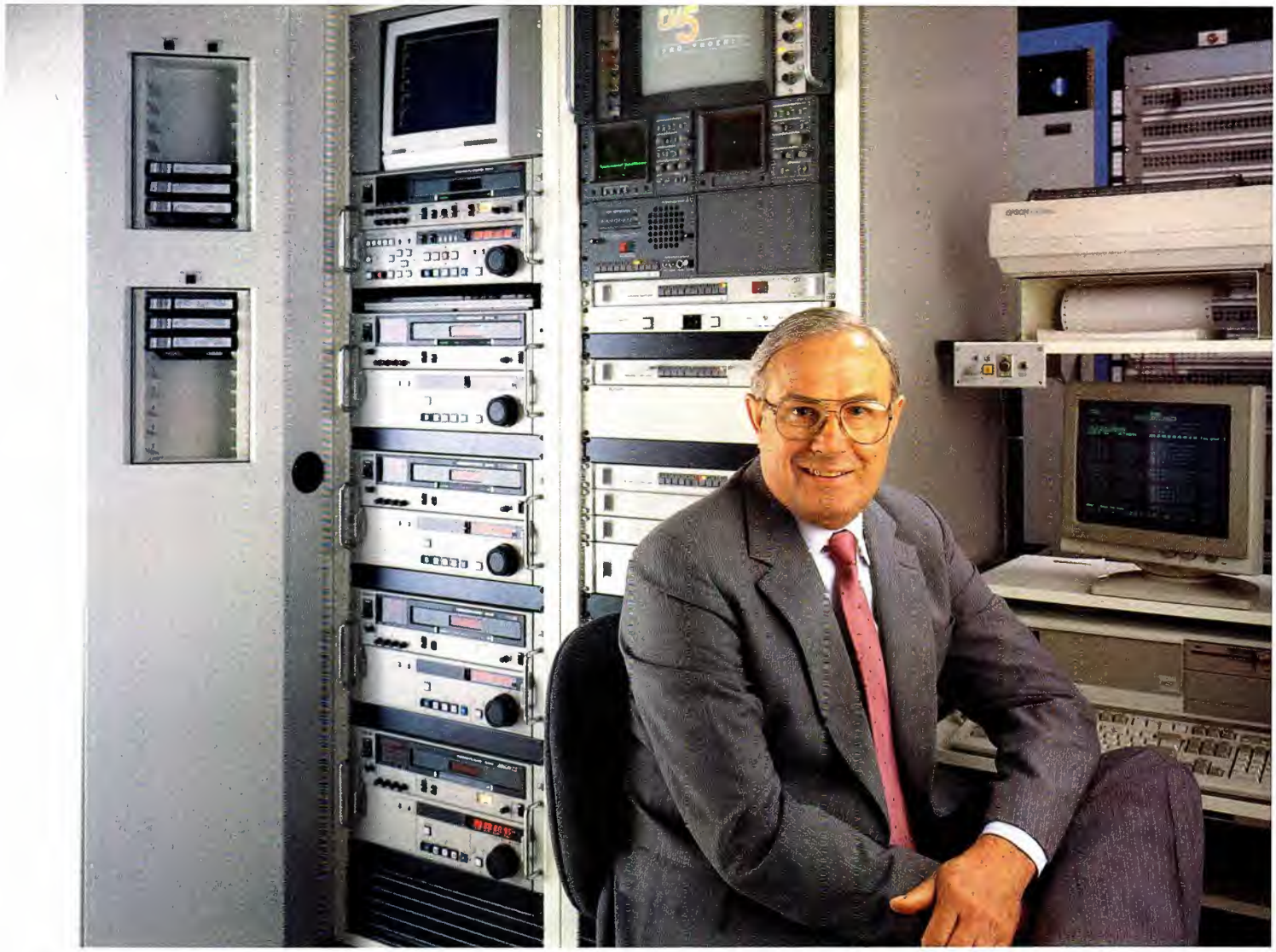
ROH/Anchor Audio **6430**
192S-2D: stereo audio monitor; with time code monitoring, Dorrough metering.
Circle (1057)

RTS Systems **2624**
MRT 327: modular intercom user station component for TW intercom system.
2100 series: wireless intercom system.
2200 series: wireless IFB system.
Circle (1066)

Samson Technologies **6542**
Super TD wireless: improved concert TD system; dual power supply, doubled sensitivity, increased headroom; powered antennas; 14 VHF frequencies standard.
Circle (1069)

Sanken/Audio Intervisual Design **1340**
COS-11, COS-12: lavalier mics; wide frequency response, high sensitivity; miniature size.
Circle (1071)

Sennheiser Electric **3101**
HD450 studio headphones: Open-Aire model; high-Z with neodymium ferrous magnets; 10-foot cable, ¼" stereo phone plug.
Circle (1084)



"For Dependability and Quality, You Can't Beat the Odetics Cart Machine..."

"Since we switched over to the Odetics TCS2000 Cart Machine, on-air discrepancies have dropped from about six per day to virtually none. And the quality has improved dramatically .

Our old machines were labor intensive. Too much time was spent daily pulling carts from storage and programming. We needed a machine that would do away with human effort...and human error.

I shopped and compared for over two years before I settled on the TCS2000. The other machines I researched didn't have the Odetics level of automation, and they were not nearly as dependable.

I've been especially impressed with the Odetics machines ability to download from our traffic computer and generate a play list. Not only does that feature save time and effort, it eliminates the error factor. And, of course, if we don't have on-air failures, we don't worry about makegoods.

The on-air appearance of the station is 100% better now. That's a big morale booster for everyone here. And the machine has certainly made my job easier. I don't miss those phone calls about our old machines problems at all hours of the night.

I didn't know a lot about Odetics before I bought their equipment, so I asked for a factory tour and demonstration. After I saw the large-scale robotics work the company was doing for the space industry as well as the broadcast business, I knew Odetics had the automation expertise I needed. In fact, I would strongly recommend that any chief engineer looking at cart machines take that factory tour. Also, I knew Odetics had already installed about 80 machines at other stations, so I called some of those chief engineers. I didn't talk to anyone who wasn't happy with the Odetics machine.

Most of the engineers I talked to emphasized the exceptional after-sale service and support Odetics provided. We found that out for ourselves when our new machine was installed. The training and support our operations people got was efficient, thorough and highly professional.

If you'd like to know about what the Odetics cart machine has done for KPHO, why not get some firsthand information? Feel free to give me a call at (602)264-1000."

Bill Strube, ***Director of Engineering***
KPHO, Phoenix

Odetics Broadcast

1515 South Manchester Avenue, Anaheim, California 92802-2907 Phone (800) 243-2001 or (714)774-2200

Circle (132) on Reply Card

Shure Brothers 4524
Model VP 88: Mid-Side stereo condenser microphone.
LS24/58, LS24/96, LS24/Beta 58: handheld wireless mics (SM58, SM96, Beta 58 capsules); MARCAD diversity receiver.
Circle (1089)

Stanton Magnetics 4726
890AL: back-cue phono cartridge; extra stylus; tracks 2-7gr.
45M/MC: headphone, unidirectional mic; for DJ, studio announcers.
ST-10: headphone; closed-back, dual-driver design; titanium diaphragm, rare earth magnetic materials.
Circle (1118)

Studer ReVox 4552
A-723: active studio monitor system.
A-729: CD player system controller; operates four players; RS-422 port.
Circle (1127)

Studio Technologies 5605
IFB system: production intercom equipment.
Circle (1128)

Swintek Enterprises 6531
MARK 200D/RJ: remote telephone link.
MARK QDC-HiFi: high fidelity pocket-size receiver.
MARK 50A-HiFi: high fidelity pocket-size transmitter.
Circle (1130)

Tannoy North America 6630
AVM-DMT: shielded, high resolution A/V reference monitor.
NFM8-DMT: reference monitor.
Circle (1142)

Television Engineering 2240
IFB-19: audio controller; monitor programs, cue talent for easier live feeds.
FM-19: audio controller; source monitoring system.
Circle (1163)

Telex Communications/Pro A-V 2116
PC-25 carrying case: for FMR-25/-25TD wireless equipment; holds 10 AA batteries for 10-15 hour operation; *rubber duck* antenna.
RADIOCOM: wireless intercom; 150-216MHz;*BTR-200* base station with 4-channel receive, one transmit;*TR-200* belt-pack transceiver, one receive/transmit channel.
BP-1, BP-2 belt-packs: 1-, 2-channel intercom units for AUDIOCOM series; match balanced or unbalanced systems with integral selector switch; light-signalling; male/female XLR connectors.
Circle (1165)

UREI 2916
SR power amplifiers: air-cooled, two rackspace; high frequency power conversion; loads into 2Ω, balanced bridging input; stereo/dual mono; SR6615/6630/6650, 150W/300W/500W, 4Ω with 0.1% THD.
Circle (1202)

Ward-Beck Systems 5002
M7884/M7885: communications terminals for WBS MicroCOM II digital communication system; enhanced software to extend power of the intercom.
Circle (1239)

Wheatstone Broadcast Group 4010
Intercom: station communications system.
Circle (1248)

Audio Products

A5: Digital, MIDI

- Recorders, workstations
- Editing, interfacing

AKAI Professional/IMC 3902
DD-1000: stereo recorder/editor; records directly to optical disk.
DIF-1200: AES/EBU interface for Akai A-DAM digital MTR.
Circle (519)

AKG Acoustics 6500
DSE-7000: digital sound editor; new features, enhancements.
Circle (520)

Allied Broadcast Equipment 4430
AKG DSE-7000: digital workstation, sound editing system.
Digispot: commercial spot system; digital storage with touch-screen control capability.
Circle (527)

Alpha Audio 6701
DR-2: digital hard disk recorder; *tape recorder* style control; 60 minutes capacity of 16-bit stereo at 44.1kHz, 48kHz sampling; emulates BVU-800 for serial control.
Circle (529)

AMEK Consoles/TAC 3164
M.I.C.E.: multiple interface control element; allows MIDI control for mute switches.
Circle (536)

Bruel & Kjaer Instruments 8029
R-DAT archiving system: set contains two Type 4006 microphones, stereo mount, nosecones; battery, charger; Panasonic SV-255 portable R-DAT recorder; packaged in FAA-spec carry-on luggage case.
Circle (623)

BTS 5808
BAC-3000 encoder, decoder: converts stereo/mono analog audio or stereo to digital AES/EBU spec digital signals; bidirectional process.
Circle (682)

Digital Audio Research 8000
SoundStation II: enhanced multichannel digital audio recorder, editor; optical disc subsystem for 2-hour rewriteable storage; removable 650Mbyte 5.25" magneto-optical cartridge; multidrives.
WORDFIT: automatic dialogue synchronization.
Circle (724)

Digital Dynamics 7024
Cue List: software for ProDisk-464 digital re-

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The wonders of sound and vision found in nature are hard to reproduce. In fact, if anyone has come close it's EEV.

Whatever your broadcast requirements, you'll find EEV has the technology to match. High-efficiency UHF Television Klystrons from 5kW to 70kW for Television Transmitters. A range of Broadcast Tetrodes and Vacuum Capacitors for AM and FM transmitters, and Leddicon® camera tubes to fit virtually every broadcast color camera available today.

Our experience is the key to technological leadership. Our manufacturing know-how ensures the highest quality and reliability. Above all, our professional dedication to our customers' needs makes us the natural choice of broadcasters the world over.

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CANADA: EEV Canada Ltd, 67 Westmore Drive, Rexdale, Ontario M9V 3Y6. Telephone: (416) 745 9494 Telex 06 989363 Fax: (416) 745 0618
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Subsidiary of the General Electric Company plc of England. GEC

Circle (135) on Reply Card

corder/editor; prepares EDL to control editing operation of 4-64 tracks.
Circle (726)

Dolby Labs **4443**
DP501/DP502: digital encoding system; 2-channel audio coding for data storage or transmission; 128 kbits/s/channel operation.
Circle (733)

Gotham Audio **2342**
HMA BA-102: modular digital broadcast system; source-to-telco-lines processing in the digital domain.
Ferrograph 9500: digital disk recorder; upgraded software for central library network.
SPOT 90: recordable CD system; PQ codes for fast, accurate cuing; allows any CD player to become a digital cart machine.
All Digital DJ Suite: from Harmonia Mundi Acustica.
A+D ProDat: electronically balanced inputs, outputs, XLR connectors; Apogee filters; AES/EBU, S/PDIF formats; 44.1kHz, 48 Hz sampling; copy protect switch.
Circle (805)

JVC **3116**
Professional DAT recorder, player.
Circle (868)

Lexicon **2452**
MRC software V 3.00: MIDI remote control; talks with 16 machines; controls LXP-1, LXP-5 with storage for 64 setups each; two slider pages; user-defined SysEx strings; upgrade has hardware change.
OPUS/e: editing system; random access; use with existing consoles or as stand-alone unit; multitrack edit/record; multiformat I/O, soft patching; compatible with, expands to OPUS.
Circle (898)

Neve **4152**
Mitsubishi X-880: 32-track digital tape recorder.
Mitsubishi X-86: 2-track, 20-bit recorder.
Circle (971)

New England Digital **161W**
Release 2.2: digital recorder control for Macintosh PC; graphic environment; Edit-View point-and-click marking of changes; Autoconform creates CMX format EDL; optical disk option.
PostPro SD: Direct-to-Disk series; sound design system; 16-track with 60 minutes record time; integrated Synclavier; 32 voices; 64Mbytes RAM in single workstation; MIDInet, digital I/O.
Circle (972)

Optical Disc **3415**
Model 534: EFM digital processor encodes digital audio, subcodes into standard CD format; provides sound channel for videodisc, CD; transfers direct from AES digital or D-1/D-2 video.
Circle (989)

Radio Systems **4903**
RS-1000: DAT machine production models; hybrid of Sony DTC-1000, µP control for studio interface; balanced audio.
Circle (1041)

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Professional Products Division

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V6033PT

V7000C

V7100C

V6100PT/V6000PT

Circle (137) on Reply Card

Solid State Logic 1321
SoundScreen: production model with enhanced software; audio-for-video editing system.
Circle (1100)

Sony Communications/Pro Audio 5130
PRO RDAT: editor, player.
Circle (1104)

Soundmaster International 3720
Soundmaster: integrated editing system.
SyncRAM: random access digital editing system.
Circle (1111)

Studer EdiTech 1406
Studer Dyaxis 2+2: multichannel hard disk recorder, editing system; 4 mono or 2 stereo channels; full DSP, EQ, pan, metering, level control; VPR3 emulation; full system synchronization.
Circle (1126)

Studer ReVox 4552
Dyaxis 2+2: hard disk digital recorder, editor.
D820-48: digital 48-channel recorder; compatible with multitrack DASH; high-precision A/D converters, matched low-noise passive filters, 4× oversampling D/A converters; internal synchronizer; selectable cross-fade times; integral digital test signal generator.
Circle (1127)

Symetrix 6342
DPR-100 enhancements: Apple Macintosh system control accesses 40 channels of recording in blocks of eight; real-time level control, EQ, compression, limiting, gating; dynamic recall all parameters.
Circle (1134)

TASCAM 3352
DA-800: 24-track digital ATR; pinch roller tape drive; zero-distortion circuitry; two analog audio, time code, control tracks.
Circle (1146)

360 Systems 7201
Digital cart machine: 16-bit audio; instant cuing; removable media; all standard cart operating features.
Circle (1172)

WaveFrame 164W
CyberSound-Editorial: digital editorial automation system for audio post production in film, video; tools for ADR, dialogue, effects, music editing; auto assembly by time code or EDL data.
Circle (1241)

RF Products

R1: Transmission

- Antennas, masts, towers
- Transmission line
- Remote control

Alpha Video & Electronics/AVEC 3111
SR-2100: safety riser; power line sensor attaches to mobile masts.
Circle (531)

Andrew Corporation 1860
SCL 950: 9" diameter semi-flexible feedline.
HELIAX: plenum-rated feedline; additional materials to product line.
Circle (543)

BEXT 8104
LPTV, broadcast systems: 5W, 25W drivers; 100W, 1kW amplifiers; complete transmitters.
Circle (597)

Burk Technology 9022
CI-16 interface: enhanced unit for ARC-16 remote control system.
Options for TC-8, ARC-16 transmitter control systems, including dialup feature.
Circle (629)

Cablewave Systems/RF Systems 4020
FM broadcast antenna: non-directional; high power.
Semiflex transmission line: 5", 6" diameters; connectors.
Circle (631)

Central Tower 6602
Single source option: complete program of custom in-house engineering, fabrication, installation; structural analysis service.
Circle (650)

Comad Communications 2448
UTV-7, UTV-08: SIRA UHF panel TV receiving antennas; H and V polarization; narrow-beam, high-gain; low sidelobe increases rejection of interference.
Circle (671)

Comark Communications 5920
Thomson-CSF
CCT-U-30SKA: UHF transmitter with Magic Tee; 30kW air-cooled; Klystrode PA device.
CCT-U-60SKA: 60kW UHF TV transmitter; air-cooled Klystrode PA circuitry.
CCT-U-70S: UHF TV transmitter; 5-cavity, water-cooled klystrons; 70kW rating; includes control cabinet.
Circle (672)

Continental Electronics/Varian 4316
Model 813A: 500W solid-state FM transmitter.
Model 814E: 1kW solid-state FM transmitter.
Circle (694)

Delta Electronics 4518
TCT-XHV: super high voltage toroidal current transformers.
Circle (715)

Energy-Onix
SST-30, -500, -1000: solid-state FM exciter, amplifiers; 30W, 500W, 1kW power ratings; broadband, programmable.
Low-power AM: 2.5-10kW transmitters; solid-state control systems; conventional high-level plate modulation; low cost PA, modulator tubes; NRSC options.
Circle (761)

Flash Technology 5612
SC-110: tower lighting controller.
FTB-301, 205: medium, high intensity obstruction lights.
Circle (780)

Hallikainen & Friends 4202
DRC200: transmitter remote control; standard CRT terminal/computer at studio; program through *spread sheet* for logging; alarms, auto control; communications through telco, subcarrier, UHF radio.
Circle (814)

Harris Broadcast Division 4430
Gates series: medium wave transmitters; solid-state design; 1kW, 2.5kW, 5kW ratings.
DX-100: solid-state medium wave transmitter; digital modulation; 100kW rating.
HT 1FM: 1kW solid-state FM transmitter.
HT 7FM: FM transmitter; rated 3-8kW; single, 3-phase models.
HT 1LS: 1kW solid-state low band VHF TV transmitter; Platinum series.
Circle (815)

Hughey & Phillips 8107
KG225F00010: medium intensity strobe light; requires no new wiring for retrofit to existing *red light* systems.
Circle (832)

ITS/Information Transmission 1622
ITS-230A: 1kW UHF TV transmitter; compact, simplified design.
Circle (860)

LDL Communications/Larcan 1634
Lambda CP antenna: production model; circularly polarized lowband VHF system.
Spearhead: FM master antenna; for 10 full-power, Class C FM stations.
Larcan 30kW: solid-state VHF transmitter; multiple 1.5kW modules, combine through printed-circuit wiring to achieve desired output power.
Circle (889)

M&R Data Services 8101
RF Manager: PC-based enhancement for TFT-7900 transmitter controller; versions includes direct interface to 7900 systems and three levels of stand-alone remote control systems.
Circle (915)

Micro Communications 2728
FM, UHF, HDTV SPI: super power isolator; protects transmitter from reflections from antenna system; reduces VSWR.
Coaxial transfer switching: 1⅝", 3⅛", 6⅛" coplanar coax switch; high-torque ac motor, manual override.
MicroSwitcher: EPROM µP-based controller; local, remote; 12-input, expandable.
Slide hangers: for UHF waveguide; eliminates rail-mounting system on tower.
Flange tuners: for UHF waveguide; cancels reflections and permits use of different length line sections.
LPTV combiner: multichannel for two or more UHF transmitters to one antenna; inter-digital filter design.
UHF 2-channel combiner: dual-channel system; two waveguide bandpass filters, hybrids; more than 35dB isolation.
Circle (940)

Midwest Communications 3234
UHF transmitters: Townsend and Technalogix TV transmitters.
VHF transmitters by Toshiba.
Circle (946)

Moseley Associates 4336
MRC1620: remote control system; TaskMaster 20 PC, Smart options.
MRC2: remote control; Master Controller PC, Smart options.
Multiplex, SCA: series of products.
Circle (953)

MYAT 6708
Transmission line: 50 Ω coaxial material, now available in 9 3/16" as well as standard

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First waveform/vector/test signal generator combination	**First** component/composite waveform monitor
First fully programmable test signal generator	**First** component/composite vectorscope
First PC-based test signal design software	**First** dual-standard vectorscope
First component/composite test signal generator	**First** D1 test signals

1988	1989
First programmable HDTV test signal generator	**First** component/composite waveform/vector combination
First D2 test signals	**First** half-rack programmable test signal generator
First Betacam SP test signals	**First** PAL D2 test signals
First S-VHS test signals	**First** S-VHS waveform/vector monitoring

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Circle (138) on Reply Card

sizes from 7/8" to 6 1/8".
Circle (911)

Nautel **4144**
AMPFET ND1, ND25, ND50: solid-state AM transmitters; NRSC-2 compliant; 1kW, 25kW upgradable, 50kW; second generation design; distortion below 0.5%, response 0.25dB; 80% efficiency.
Circle (964)

NCA Microelectronics **N.A.**
R-2000: transmitter monitor, remote control system; uses DTMF Touch-Tones on telco line; synthesized voice report; CRT, keypad; 32-input analog, digital; alarm reporter dials up to four phone numbers.
Circle (965)

Potomac Instruments **4406**
Type 1900: directional antenna monitoring system.
Circle (1015)

QEI **4300**
BTT-500: exciter/transmitter in 10½"× 19" rack-mount package; FET PA available from 10W to 600W; full remote control; could replace IPA of older FM transmitter.
Circle (1028)

Shively Labs **4030**
Balanced band-pass combiners, protection systems.
Antenna spacing configurations for special situations.
Circle (1087)

Television Equipment Associates **5501**
Model 200: miniature video transmitter; special-purpose roving camera for security camera applications.
Circle (1164)

TTC/Television Technology **2006**
FMS series: solid-state FM transmitters; 1kW, 4kW, 8kW output levels; no tuning required; modular *fail-on* design for improved reliability.
Circle (1192)

Utility Tower Company **4717**
Type 920: 84" face tower; design capable of heights to 1,500 feet.
Circle (1206)

Varian TVT **5100**
1891+90 enhancement: 120kW VISTA TV transmitter; including MSDC high efficiency UHF klystrons.
Circle (1214)

Will-Burt/TMD **6806**
Model 6-25-357/367: pneumatic, telescoping mast assembly; includes low profile pan/tilt

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Circle (140) on Reply Card

positioner.
Circle (1252)

RF Products

R2: Microwave

- Antennas, electronics
- ENG, ITFS, MDS, STL

BEXT **8104**
LC series: composite aural STL system; programmable from front panel.
Circle (597)

BMS **5108**
BMT-2GP: 2-2.5GHz microwave transmitter; 30-channel, frequency agile.
Circle (603)

Comband Technologies **3439**
Baseband scrambling: addressable scrambling equipment for *wireless cable* MMDS distribution.
Circle (673)

COMWAVE **2904**
SBM1-8: multichannel transmitter; supports eight 1W composite television signals.
SBR-11: response transmitter; for voice, data; output power rated to 1W.
Circle (688)

Conifer **1334**
QL-1015: 31-channel wireless cable downconverter for marginal reception areas; internal GaAs FET preamp; noise figure below 2dB with 35dB conversion gain.
2.1-2.7GHz preamps: low-noise, GaAs FET design; enhances fringe area reception; operates as microwave line amplifier.
Beam bender: wireless cable/ITFS repeater.
Circle (690)

Digital Microwave **N.A.**
DMC 18V: digital video microwave radio; operates in 18GHz range; audio, video performance unaffected by signal levels; spectrum conservation; secure signals; forward error correction; STL/ICR.
Circle (728)

ITS/Information Transmission **1622**
ITS-1640D: 31-channel MMDS/ITFS/OFS transmitter; frequency agile, 20W.
ITS-1694D: 4-channel ITFS/MMDS/OFS channel combiner; 1-4 model configurations; optional remote switching for backup.
Circle (860)

M/A-COM MAC **2152**
MA-23CX: 23GHz video microwave system.
Circle (916)

Marti Electronics **4400**
Model PA-48: full parabolic reflector; 940-960MHz operation; 4-foot diameter structure.
Circle (925)

Motorola C-Quam/AM Stereo **4704**
Communications systems: microwave; 2-way radio, cellular telephone equipment.
Circle (954)

Narda Microwave/Loral **5757**
Expanded line: coaxial and waveguide components.
Circle (962)

QEI **4300**
CAT-LINK: STL/TSL for BTSC TV stereo; auxiliary channels for PRO, SAP baseband; configured for T1 phone line; may carry BTSC digitally on standard subchannel above video; digital encoding causes no delay.
Circle (1028)

RF Technology **2612**
RF-C series: miniature portable microwave equipment; 1.8-15.6GHz; frequency agile, dual audio (mic, line), high transmitter outputs; low-noise receivers.
RF-QUADSCAN: central receiver horn antenna; ENG system with dual, quad polarization, high gain; low profile horn elements.
Circle (1053)

TFT Inc **4642**
Model 9000: aural STL transmitter; economically price, meets FCC 1 July '90 rules.
Model 8600A: monaural STL system.
Circle (1171)

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RF Products

R3: RF amplifiers

- Cavities, devices

EEV **6310**
UHF TV devices: high power amplification equipment.
Circle (749)

Philips Components **5512**
UHF klystrons: depressed collector design for high efficiency operation.
Circle (1008)

Thomson Electronic Tubes/Devices **6348**
TH 563 tetrode: for UHF TV service; 35kW separate visual or 25kW multiplexed visual/aural amplification; Pyrobloc grids, Hypervapotron cooling.
TH 558 tetrode: 600kW for long/medium wave.
TH 537 tetrode: 350kW LW/MW service, 300kW SW.
TH 343: 25kW coaxial metal-ceramic tetrode; 17dB gain; operates to 120MHz; use with *TH 18230G* cavity in grounded grid configuration for FM.
Circle (1177)

RF Products

R4: Reception

- Demodulators, receivers
- Modulation monitors

Allied Broadcast Equipment **4430**
SqueezePlay: AM/FM radio/cassette system; integrated skimmer.
Circle (527)

Belar Electronics Lab **4308**
Modulation minder: new concept for accurate monitoring of L+R or loudness content and stereo composite; simultaneous view on two displays; complies with pre-'83 FCC rules; FM, TV versions.
Circle (592)

BEXT **8104**
LCR-FM: composite FM receiver; covers 88-108MHz; front panel programmable controls.
Circle (597)

Boonton Electronics **1437**
Model 8220: modulation meter; 0.01-1.3GHz carrier range; to 500kHz FM deviation, 99% AM, 0-500 rad; -27dB to 19dB level range; ratio or level display of modulation; IEEE-488 interface; RMS, peak.
Circle (606)

Delta Electronics **4518**
Metering panel: for AM/FM modulation monitoring.
Peak hold: option for SM-1 splatter monitor.
Circle (715)

Modulation Sciences **4802**
ModMinder: measures, displays peak FM deviation; digital design uses one millisecond delay before registering peaks to avoid transient overshoot; allows improvement in modulation 1-4dB.
Circle (951)

Motorola C-Quam/AM Stereo **4704**
Receivers: C-QUAM type AM stereo receivers.
Model 1410: modulation monitor.
Circle (954)

QSI Systems **3034**
Demod: TV tuner.
Circle (1029)

Videotek **1246**
DM-141S: TV demod; stereo audio, dual buffered outputs of composite baseband video; 139-channel access to UHF, VHF, CATV signals.
DM-14: 69-channel demod for VHF, cable, CCTV; IR remote control.
Circle (1232)

RF Products

R5: Exciters, generators

- Radio, TF, stereo

CCA Electronics **4442**
Model FM 30G: high performance FM exciter.
Circle (647)

Gentner Electronics **5852**
Lazer: digital FM limiter, stereo generator.
Circle (798)

Inovonics **5601**
Model 706: FM/FMX stereo generator, production models.
Circle (848)

ITS/Information Transmission **1622**
ITS-20A: exciter-modulator retrofit upgrade; 3W visual, 3W aural to drive UHF TV transmitter.
Circle (860)

Motorola C-Quam/AM Stereo **4704**
Model 1400: C-Quam AM stereo exciters.
Circle (954)

QEI **4300**
695-SYNC: synchronized FM exciter system; permits sync of multiple auxiliary 695 exciters to a master exciter; sync can be sent through SCA channel or CAT-LINK auxiliary channel.
Circle (1028)

RF Products

R6: Satellite

- Antennas, electronics
- SNV systems.

Advent Communications **1300**
Mantis 1900: SNG flyaway, phase-combined system.
AVM2700: video modulator; 70MHz.
AVC27XX range: satellite up/down converters.
LYNX: vehicle-based uplink systems.
Circle (515)

Andrew Corporation **1860**
ASC 2000: satellite earth station antenna controller.
FLY-AWAY: 1.8 meter system, 8-piece segmented reflector.
Circle (543)

Antenna Technology **6406**
Simulsat series: multibeam antennas; view 70° arc from 69°W to 139°W simultaneously; three models.
Parabolic antennas: 8m to 32m diameters;

new, used available.
Circle (547)

BAF Communication 1564
Models 450-D, 450-C: satellite news vehicles with 6- and 4-camera production capability; -D, 32-foot; -C, 29-foot.
Circle (583)

Comtech Antenna 3002
EC-6: µP-based antenna controller.
2.4M: Ku-band transmit, receive antenna; 2.4m diameter.
Circle (686)

Hallikainen & Friends 4202
SAT201: satellite dish steering system; multipoint control for multiple antennas, receivers; 3-axis steering; preprogrammable for antenna steering, receiver tuning; telco, subcarrier communications.
Circle (814)

Radiation Systems Inc/RSI 3100
Model 5000: enhancements; to earth station control system software.
Circle (1037)

Scientific Atlanta 5730
Model 7530: broadcast quality satellite receiver.
Model 7790: data up/down converter.
Model 8880: satellite data modem.
Antenna: 6m satellite antenna for transmitting, receiving.
Circle (1079)

Thomson Electronic Tubes/Devices 6348
TH 2456: 14GHz klystron for satellite uplink service; 3kW minimum output power at saturation with instantaneous bandwidth of 85MHz; servo tuning to six or 12 preset channels, depending on model.
Circle (1177)

Wegener Communications 6530
Series 1800: addressable satellite video receiver.
Series 2800: compact satellite data receiver.
Circle (1246)

Support Products

S1: Automation

- Hardware, software
- Business, program
- Newsroom, equipment
- Clocks, timers
- Data transmission

Alamar Electronics 2948
MC-2055: 3rd generation automation links traffic, switching, playback transports; LAN via IBM/compatible PCs; optional net delay, record playback; GP machine control.
Circle (521)

American Lightwave Systems N.A.
LC series: Lightwave, compact fiberoptic transmission systems; single, multimode fiber; 67dB S/N with audio; meets RS-250B over 15.5-mile links; NTSC, PAL, SECAM versions; to audio subcarriers.
Circle (537)

Ampex Corporation 2200
ACR-225: automation video cart system; *automatic conflict resolution* makes break tape when multiple cuts from one cart are to closely spaced or short duration events are too short; precue feature.
Circle (539)

BASYS 1256
PET: portable editing terminal compatible with BASYS newsroom computers; software for IBM/compatible laptops; terminal becomes a field extension of the newsroom system.
Circle (588)

Beaveronics 4740
QMS series: station clocks from Favaq & Bosshard.
Master Clocks: for station time keeping.
Circle (590)

Broadcasters General Store 8016
R.F.C. 1B: Sine Systems remote facilities controller; dial-up capability.
Circle (622)

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Circle (148) on Reply Card

BTS **5080**
BCS-3000: LAN-based facility control system; supports multistage routing switchers; permits routers from 160×160 to 2000×2000. *BRC-2000 series;* automation systems; *BRC-2000* configuration editor, captures, restores router crosspoint settings; *BRC-2100* for real-time control of TVS/TAS distribution system; *BRC-2200* switcher automation controller for real time control of TVAS/TAS distribution and TCS-1 machine control system.
Circle (628)

CBSI Custom Business Systems **4652**
IAS software: interactive accounting system.
Circle (646)

Channelmatic **6014**
CARE: Channelmatic automated recording/editing system; 2-9 VCR capacity; SMPTE/EBU time code; 3,000 event EDL; generates spot tapes for ad insertion playback; serial, parallel interfaces.
SCU-2A: enhanced control unit for Adcart ad insertion system; remote system monitor produces remote error, system status report; parallel printer serves all channels operating.
CCU-202A: channel control unit for Adcart systems; for one VCR per channel using *run of system*; flexibility to operate two VCRs on two channels with some configuration variations.
Circle (653)

COMLUX **9037**
Models 3581/82: 780 Mbits/sec optical terminal set; eight video channels per fiber; 29dB optical span for 50km separation between units.
Circle (674)

Commodore Business Machines **165W**
A2091, A2091-40: Amiga autoboot hard disk controller, 2Mbyte memory expansion; SCSI interface; space for 3.5" hard disk; *-40* with 40Mbyte SCSI hard disk.
A2630: 68030 accelerator board for Amiga 2000, 68882 math coprocessor, 68851 memory management; 2Mbyte 32-bit memory expands to 4Mbyte; enhances 3-D modeling.
Amiga A2500/30: personal computer, DOS compatible.
A2232: 7-port serial card for Amiga; RS-232, independent or simultaneous operation at 19.2kbaud.
Circle (675)

Computer Concepts **4040**
CMS: Commercial Management System; PC-based, combines digital audio board, software; record/playback commercials, jingles, liners; integrates to Broadcast Traffic System or operates as stand-alone.
Circle (680)

EEG Enterprises **2838**
High data rate network: 9.6kbaud data service uses VBI line; forward error correction; *EN512* data inserter, *TE511* data bridge; *DD430* video data decoder.
Circle (748)

FloriCal Systems **6730**
TimeShifter-Plus: tape delay system; flexible control includes indeterminate delay feature.
ShowTimer: program rundown sheet gener-

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WLTX WUPW KATC KOMU KLBK KCBS WVIR WBKB KXAN KLAX WHOA
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WOWL KCBD WDKY KNTV WCJB KEZI KBJR KIDY
KING KVEO WHTM WTAT WGHP WBBM KMCY KTHV
KBTX KMSB KOLO KEYC WPIX KNOE KIVV KSLA
KTAL WOIO KABC WTKR KTVY WAXA KARD WJHG
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WICZ WSEE WVSB KJRH KXGN WPXT KVHP WHOI
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WTOG WSBT
KAVU WGBA
WVII WTVO
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KFDM KZKC WZTV KXJB KDUH KXMB WSMH KQCD
WXMT WTVX KMGH WYFF KTBS KTSF WTGS WHBF
KUPK KLAS WCAX KAMC KCAU WKCH WUHQ WQRF
KMIZ WWNY WMGM KBVO KLRT WMTV WIBW WUTV
WNDU KLST KTTU KATV WLFL KSTU WETO KGET
KNDU KWKT WKXT KSAS KTXH WLNS KMIR WOAC WNDS WXVT WAKC
WRGB KDOC WNCT WMSN WMAZ KAUZ KEYT KUSK WHCT KRTV KODE
KETK KSHB KTAB WGRB KDFI WOGX WAOW KDLH KREZ KATU KWNB
KTTW WJPR KVOS WPXI WPHL KTBY WKBT WWL WFXI KHSL KXMA
KXXV KBIM WRBL WPMT WSAZ KNDO KTVH WREX WSAW KOOG
WTTE WJAL WTRT KREQ KTMA KAMR WYZZ WRSP WILX KBSI WGNT
KJTV KCTZ KUMV WTMJ KIEM KWHB KDSM KITN WTSG WFLA KMVT
WVTV KIVI WTVA KLFY WTWC KUTP KJTL WVTM WLMT WDSI WDAM
KLMG KDEB WWBT WVFT WXEX KADN KSWO KAPP WBOC KREG KFDA
KVRR KTEN WPTT KCWT WRC WTVG KLJB WZZM WYMT WJTC KOAA
KDNL KIDK WADL WICU WRGT KDAF WKFT KCPM WALB KHAS WBNX
KTRK WLOX KERO KVIJ WHIZ KABB KULR KBAK WENY KOUS KAUT
WJWT WGGS WETM WEYI KREY WPTY WMUR KPOB WKYT WGN WSIL
WMDT WLUK KTRV WJFW WTTO KAAL KDFW WDHN WDAY WMCC KCBA
KSNW KRRT WLFI KDLO KHQA WINT WQOW KGUN KGCT KCCI KTTY
KVII WFCT WDBD WLTZ WVVA KSGW KTTC WJBF KRCG WTWO WPSD WLEX
WPTA WPDE WHO WDIO KPLO WUTR KIMT KRCG WTWO WPSD WNOL
KTXL WSPA WNUV WOWT WDAZ KSPR WKRC WLS WGAL WAAY WCBI KTBC
WTHR KPOL WROG WHSP KQTV WXXV KTLA WGCB WAAY WISC WTRF
WXII KHOG WFYF WSJV WSYM KBSH WJLA WOLF KOMO WEVU KRNV
WPMI WTZA KPAX WGEM WBTW WJZ WLWT WEVV KWTV WLOS WVLA
WCHS KRCR WCOV WAYK KGSW WFLI KSNB KOTI WXGZ WDCA WZDX
KGBT WHSV WKCF WWLF WFXT WMGC WSET KGAN WCIV KPLR WTVZ

THE FORTUNATE 500

The 500 television stations listed all share a piece of good fortune. They all had the foresight to become part of the Cycle Sat Network* for satellite spot delivery. And that is fortunate. Fortunate for stations because spots and instructions are conveniently received right in their control room. And fortunate for their clients who now can traffic their television buys without the hassles of making and delivering dubs. Isn't it time your station made this list?

CYCLE•SAT, INC.
A COMMUNICATIONS NETWORK
A SUBSIDIARY OF WINNEBAGO INDUSTRIES, INC

*Cycle Sat is adding new stations to the Cyclecypher network every week. For those stations not yet part of the network, Cycle Sat delivers spots via conventional methods.

Circle (151) on Reply Card

ator; signal quality reports.
PrograManager: integrated traffic, control for satellite programming.
Circle (781)

IGM Communications 4612
IGM-MC: PC-based control for radio program automation; 12-channel switcher, RS-232 protocol; full automation, live assist, satellite; interface to InstaCart, Go Cart 24, reel-type, R-DAT transports.
Circle (837)

Image Video 2910
EDAAS: station automation for complete TV, radio facility system; high-speed Ethernet communications with window-based operating system.
Circle (840)

Jefferson Pilot Data/JDS 5014
DCM NewsData: Data Center Management newsroom computer system; DCM to provide sales and system support, installation.
SalesLine: for DEC systems; networks sales to other station departments.
Circle (865)

Leitch Video 3516
UDT-5700: up/down counter for Leitch Master Clocks.
Circle (895)

Matco Mfg & Test 3641
MA-204: playback automation; 700-event capability; real-time clock, event memory with backup battery; 12×1 AFV switcher.
MA-303: duplication control; distribution switching, verification.
Circle (927)

McCurdy Radio Industries 5322
Multibus automation: LAN-based system.
Circle (932)

Media Computing 3540
PROtec: PC-based programmable, remote control system for equipment.
Circle (935)

Odetics Broadcast 5704
CGF: character generator/titler.
EDI-8: external machine control interface.
LEM series: library expanders; D-2, SP, M-II.
MCDB-1: multicut software with conflict avoidance feature.
SCS800: sequencing cart system; VTR cart loading management; CRT display indicates sequence, transport for loading; multicut software plays multiple segments per cartridge; 65,000 cart database.
TCS 2000D: digital format (D-2) automation cart machine.
TCS 3000: automation cart system with UNIX operating system.
NCT-1: networked news control terminals.
Circle (984)

Panasonic Broadcast 2534
MARC system: cost effective automated cart system.
Circle (999)

Professional Label Service 1020
Vid-Label: software prints videocassette tape labels; diecut labels, LaserSheet, pin-feed material.
Circle (1022)

Radio Computing Services 8024
Listener: audio recognition system; PC-based unit for music, commercial verification.
Circle (1038)

Register Data Systems 6106
Traffic Master 5: multiuser traffic, billing, accounting system.
Circle (1051)

Solutec 6800
SOL-6800 enhancements and features for automated broadcast system.
Circle (1101)

Sony Communications/Broadcast 5130
LMS systems: DVC-500 library management system; DVC-1000 D-2 library management system.
Circle (1103)

Tennaplex Systems 4325
Music Manager: production model automated digital radio station studio; updated software.
Circle (1169)

Torpey Controls & Engineering 5404
CLK-50: desktop time/temperature display; connects to CLK-5 master clock output.
Circle (1184)

Unique Business Systems 9008
RentTrace: software package for integrated rental/point-of-sale system; inventory, reservations, contract processing, maintenance, invoices, accounts receivable.
Circle (1198)

Utah Scientific/Dynatech 6030
TAS-1C: time code control total automation system; advanced Novell/Ethernet LAN, multichannel control; full facility interface; modular C programming, distribution process.
Circle (1205)

Video Communications 1412
SQL report generator.
Film management system.
Desktop tools.
Circle (1223)

Video Design Pro 1356
Touch & Cable 2: interface between CableDOC, VidCAD/AudCAD drawings; touch source output, destination input; automatically draws cable, documents jack field, telco block; prints labels.
Generic Designer series: documentation tools, 2-D drawing libraries; predrawn symbols drop into drawings to reduce operator time; CableDOC, label printer, PathROUTER options.
Circle (1224)

Video Logic 7120
Log Producer 22: automated tape logging for Betacam, U-matic VTRs using RS-422 ports; adapter cable, custom microchip for PC control of tape movement, search/retrieve functions.
Circle (1228)

Support Products

S2: Interconnections

- Wiring, cable
- Connectors, patch cords
- Patch panels
- Fiber optics

Alcatel-ATFH 3107
Precision video: 75Ω; meets '87 NEC CL2 spec.
Audio cable: single pair, multiple pair.
Audio PRJ series: individually jacketed pairs in multipair audio cable; quick installation.
Circle (522)

Canare Cable 3730
VWJ2-W: dual video jack.
VWP-C4: video patch plug.
BCP-T: 75Ω termination plug.
Circle (638)

Comprehensive Video Supply 1660
Cables, connectors: multipin camera cables, S-VHS connectors; heat-shrink accessories; Comp-Tie fasteners.
TK-160: field interface, repair kit.
Circle (678)

Connectronics 1922
Multipair 2: flexible cable with two balanced pairs; single black jacket over both; for stereo, dual discrete mono balanced line or mic signals.
BODGE Plug line: Bantam (T.T.), BNC male, RCA phono male/female, TRS ¼" A gauge jack socket, mono (TS) ¼" A gauge jack.
Circle (691)

Kings Electronics 3133
KS6464: RBGS component jackfield with patch cords.
Circle (878)

National Photronics Inc N.A.
SIDEWINDER: ENG optical fiber transceiver; for video, audio, data in ENG, EFP; portable remote transceiver mounts on heavy duty tactical fiber optic cable reel; 3-camera operation per fiber.
Circle (963)

RF Technology 2612
RF-FOM-13: fiber optic link; 40-mile operation without repeaters; video, four audio; 8Mbit/sec data rate; IF signal used at repeaters.
Circle (1053)

VEAM/Litton Systems 6547
CIR series: quick-disconnect, multipin connectors; 1-150 contacts, dry circuit to 1000A.
VSC series: Socapex compatible multipin connectors.
CIR/GRH series: UL approved, 5-wire 100A power distribution connectors.
B-Lock: sequential power panel; 600A capacity; operator safety features.
CISS series: ep-8 compatible connectors; stainless steel for abusive environments.
Circle (1215)

Support Products

S3: Cases, racks

- Acoustic material
- Storage systems
- Studio furnishings

Alpha Audio 6701
Sonex acoustic material: addition to line; 2"×2" drop-in ceiling tiles; class 1 fire rating.
Circle (529)

Apollo Lighting/Audio-Visual 3800
Furnishings: expanded line of mobile A/V carts, computer furniture.
Circle (551)

GIVE YOUR STATION OVER 50 YEARS OF BROADCAST EXPERIENCE WITH THE DENON CD CART PLAYER.™

Experience. Over 50 years of broadcast audio experience went into designing Denon's DN-950FA CD Cart Player.™ Denon has been making broadcast equipment and breakthroughs since 1935. Our trail-blazing research in digital recording paved the way for us to build the world's first digital recorder good enough for commercial record production in 1972. Denon is uniquely qualified to put CD On Air. And we stand behind that — our Professional Products staff is always just a phone call away.

Easy. That's the best way to describe the control panel and functions of Denon's Broadcast CD Player. You already know how to use this machine. CD in tape cart format means today's quality sound built to broadcast standards. Standard XLR outputs make for easy connections, while a fully dedicated remote control port allows this machine to talk to your console. And its small footprint takes up half the space of other players.

Reliable. The strong chassis and heavy duty transport ensure reliability while the cartridge protects your CD investment. Cartridges extend the life of CDs by shielding them from fingerprints, dust and scratches. They cut down on the steps from loading to play. And they're shatterproof if dropped. Just ask one of the 400 stations using our CD Cart Player.™ Denon, the choice of professionals.

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NIPPON COLUMBIA CO., LTD., 14-14, Akasaka 4-Chome, Minato-Ku, Tokyo 107-11 Japan

Circle (152) on Reply Card

Audio Broadcast Group 4039
Studio furniture: for AM, FM, TV facilities.
Circle (565)

Bretford Manufacturing 3637
VTRPN44: widebody cart; 8" pneumatic tires; use with screens to 35"; cart stands 44"; three shelves.
BBUL44, BBULC48: widebody equipment carts; 44", 48" heights; *-44* with three shelves; *-C48* with two shelves and locking cabinet; 32"W×27"D; 4" casters; safety strap secures monitors.
Circle (610)

Calzone Case 2045
Studio Series: workstations for permanent installations.
Rack Mount workstations for portable use.
Editing system cases: rack-mount units for A/B roll editing system.
Circle (634)

ERGO 90 1060
EIPB series: broadcast audio, video patch bays.
EIP 7500 series: tilting rack-mount slides for S-VHS systems.
EICR-1: cable retractor; spring-loaded; keeps cables out of the way.
Circle (764)

Fiberbilt Cases 6017
Model 909: heavy-duty molded shipping cases.
Circle (775)

K&H Products 6055
Shoulder Case: lightly padded case for Sony BVW 200, 300 camcorders.
Video Vest: production vest design for video, audio professionals.
Light Pack: compact, soft-side carrying case for lighting equipment, accessories.
Tech Case: over-the-shoulder bag for personal gear, engineering tools.
Circle (869)

Nalpak Video Sales 1401
TPA, TDA: Tufftotes production and directors soft bags.
20-6, 20-14: Tuff-Rak rack-mounted cases.
Circle (961)

Peerless Sales 3821
VCR/VCP mount: yoke bracket mounting frame for small VCR/VCP units; includes space for 9" to 13" monitor.
Circle (1003)

Premier Metal Products 6334
Legend Series TM: equipment racks, 22-77" heights; sloped-front cabinets, consoles with 10½-21" panel space; turrets, desk top instrument cabinets; accessories.
Circle (1017)

Star Case 3810
Case products: new series; dedicated case models, broad-based application rack-mounts.
Circle (1121)

Storeel 2434
CD1120: CD setup truck.
SCD-64D: CD storage system.
RS240-II: M-II cassette storage system.
S883612/10-I: D-2 cassette storage system.
Circle (1124)

Telepak San Diego 3815
T-SM/CAM, T-LG/CAM: soft carrying cases for Betacam and small cameras.
T-METAL: custom cases; high shielding effectiveness; meets electromagnetic compatibility, protects sensitive data.
Circle (1160)

Thermodyne International 6154
Rack-Pack: shock-mounted support system; cushioned shock migitation.
Circle (1175)

Winsted 5748
Editing/Post production consoles: low profile, "Pro-Gray" colors.
Instant Assembly: console design for quick setup; ships disassembled, uses positive locking pins for 3-minute assembly.
Universal rack mount: shelving for 19" racks; secure support for equipment measuring to

To avoid friction in the studio you need a good fluid head

You can now replace your not-quite-perfect cam-type friction heads.

Miller proudly announces true fluid-head performance for the studio environment.

The all-new Miller 80 Fluid Head will easily carry all camera configurations up to 80lb (35kg) more smoothly than any other, in any studio situation.

It employs an advanced viscosity drag system with an increased range of damping. It offers four preset fluid ranges in tilt action and three presets, plus free wheeling in pan action.

The Miller 80 is also designed to handle either O.B. cameras or 35mm cameras on any tripod, pedestal, dolly or crane, in ball-levelling or flat base configurations.

It counterbalances teleprompters, large zoom lenses, or any other offset weight with fingertip control.

The new Miller 80 Fluid Head works as well in-studio as all Miller Fluid Heads work in the tough field conditions for which they were originally designed.

MILLER

VISCOSITY DRAG

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SEE US AT NAB BOOTH #6204

Circle (155) on Reply Card

17⅜"×14", 3½-10½"; 14ga, 16ga.
Circle (1254)

Support Products

S4: Recording media

- Audio, video
- Cassette, reel
- Cleaners, degaussers
- Conditioners

Accurate Sound Corp **4111**
AS-6000B: tape conditioner for audio, video media; 150, ¼", ½", ¾", 1"; to 16½" reels.
Circle (507)

Ampex Recording Media **2200**
Hanger caps: snap-on device permits storage of 33 Betacam shipping boxes per Storage/Rail system rail; adapts to non-Ampex systems; allows 28 U-matic cassettes per rail.
Circle (540)

Garner Industries **2027**
Model 680: bulk eraser; -70dB erasure in less than 7 seconds; S-VHS and 850 Oe rated media.
Model 4000: bulk eraser for high coercivity metal particle tape; -70dB erasure within 12 seconds.
Circle (792)

Maxell Corporation of America **2248**
D-2: videocassette for composite digital recording.
Betacam SP: videocassette for ½" Betacam SP.
Master DA series: ¾" for professional digital audio mastering.
Circle (930)

Professional Label Service **1020**
Videocassette cases: for various format VCR tape.
Circle (1022)

Research Technology Int'l/RTI **2049**
TapeChek 400 series: videotape cleaner, inspection system, rewinders; grades tapes, determines length with number and locations of defects; VHS format; 2-hour tape checked in two minutes.
Circle (1052)

Tentel **2033**
T2-H7-SLCX: Tentelometer tape tension gauge for D2 recorders.
TSH-B7, TSH-M-II: Beta and M-II spindle height, reference plane gauges.
Circle (1170)

Weircliffe **1734**
Expanded line: BTE magnetic media degaussers.
Circle (1247)

Support Products

S5: Distribution

- Routing switchers
- Patch panels, cords
- Distribution amps

A.C.E **3234**
ARRAY: production model A/V routing system; digital system handles analog and digital signals.
Circle (501)

ADC Telecommunications **6001**
MCS 3800: video multicast switching system.
Circle (511)

Alpha Image **7017**
Alpha 264S: D-1, D-2 digital serial router.
Alpha 216: D-1, D-2 digital parallel router.
D1, D2 router: serial format digital signal system; single coax flexibility; comprehensive range of simultaneous control systems.
Circle (530)

Audio Developments **1942**
Distribution systems: 1-in×4-out to multiple-in×multiple-out.
Circle (566)

Avitel Electronics **3006**
Digital video jackfield: 8-bit, 25-pin jackfield; eight circuit pairs.
Digital video DAs: D-1 or D-2 signals; mix in single 1RU frame; 3-input, 9-output channels; all outputs reclocked; optional cable EQ to 500 feet; remote control output module assignment.
3200 series: 10 outputs per channel modular DAs; video, video EQ, video delay, extended range sub-modules; single, dual channel audio; 8×1 video switcher; pulse DAs; LTC reader, inserter; operate mixed in 3RU frame.
Circle (579)

Barco Industries **2944**
BVRS 16×16: video routing switcher; 16×16 matrix serves composite, component signals; user reconfigurable; control from local panel, CVS series monitors, standard PCs; 40MHz bandwidth.
Circle (586)

Broadcast Video Systems/BVS **5041**
BB500/2, BB1200: 4-layer, 5×1 and 12×1 passive switchers; provides stereo audio-follow-video, time code switching.
Circle (620)

BSM Broadcast Systems **3210**
MR 207: X-Y remote controller for MODULA routing switcher; includes memory capabilities.
C216PP: audio patch panel.
C310PP: video patch panel.
C312PP: video clamp, DA; 4×4 design.
Circle (626)

BTS **5808**
BVA-3000, BAA-3000: wideband distribution amplifiers; 1-in×5-out video units with 30MHz bandwidth and crosstalk less than -70dB at 5MHz; 1-in×6-out audio unit; 20kHz bandwidth with less than 0l005% THD.
TDS-2000 digital audio router: AES/EBU compliant; 10×10 matrix expandable to any size.
TAS/TVS-3000: wideband routing switcher; output monitoring feature, indicates information about the output signal without disturbing the signal or its final destination.
Circle (628)

Comprehensive Video Supply **1660**
Matrix switchers: S-VHS model; composite video model, VIS-4×4.
Primebridge MicroSeries: audio DA, balanced/unbalanced interface.
Circle (678)

Datatek **5652**
D-2400 enhancement: PC software automates control of D-2400 routing switchers.
Circle (709)

Di-Tech **2954**
Serial routing switcher: for D-1, D-2 signals.
Circle (719)

Digital Services-DSC/Chyron **1834**
DD-4 enhancement: digital distribution amps; support both D-1, D-2; allows mixing internally with automatic processing of signals.
Circle (730)

Dorrough Electronics **5506**
Model 120-S: routing chassis; interconnects multiple source signals to Model 1200 stereo signal test set.
Circle (734)

DYNAIR Electronics **5122**
DYNA MITE enhancements: full alphanumeric source, destination displays five mnemonic characters; control for operation from any computer or a VDT.
Series 3100: 30MHz utility video, equalizing, pulse DA products; 1×6 mix/match DAs in 1-/2-rack unit packages; EQ compensation to 1,000 feet of Belden 8281 coax.
DYNASTY enhancements: bandwidths from 60-70MHz; applications for aerospace, graphics, C3I.
DYNASTY 100 enhancement: bandwidth extended to 120MHz; plug-in modules mix/match I/O connections for fiber optics, coaxial cable.
Series 1200: 10MHz, 30MHz bandwidth modules for fiber optic video terminal equipment; 5km spacing between 10MHz units with high S/N ratio; numerous plug-ins for fiber-coax combinations.
Fiber Optic series: in 10MHz, 30MHz, 100MHz bandwidths; CCTV, broadcast, high resolution systems.
Circle (740)

ESE **6714**
ES-227: S-VHS compatible video DA.
ES-SW90: 16×1 audio-follow-video switcher; 1RU rack space.
Circle (766)

FOR-A **3522**
VRS-3000: video routing switcher.
Circle (784)

Future Productions **3201**
AVD-10A, ADV24A: audio/video DAs; 1×10, 1×24 designs; improved models.
Circle (790)

Grass Valley Group **5830**
MAX-900 series: 3RU modular DA frame with 12 cells, power supply; optional second power supply; component analog video DA with 3-in×6-out, single tracking gain adjustment; sync add, optional EQ, delay.
Circle (807)

HEDCO **3416**
HDV-4X, HDV-8X: 4×1 and 8×1 routing switchers; for D1, D2 digital video signals.
Model HD: 32×32 to 256×256 routing switcher; for audio, video, time code signals.
Circle (817)

Time delay.

The SV-255 portable Pro-DAT: It's *A Time Machine*. What goes in comes out, whether it's one minute or one year later!

To do this the SV-255 brings you the best pre-amps and A-D's in the DAT world. Our low noise pre-amps, with optimum headroom and "gapless" trim range, match the widest variety of sources and levels for the best possible sounding recordings.

MASH A-D converters significantly lower noise and distortion compared to conventional A-D systems, especially at low levels and high dynamic ranges only DAT lets you use. And the 64-times oversampling rate allows the use of gentle 18dB per octave filters for notably enhanced phase and frequency response.

This kind of engineering integrity has made Panasonic portable professional DAT's today's best selling DAT machines.

Come into your Panasonic Pro-Audio Dealer today and judge the superior sonic qualities for yourself.

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Professional Audio Systems

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For enhanced performance use Panasonic DAT tape.

Circle (156) on Reply Card

Image Video 2910
9540: 40×20 video router switcher; 3RU.
9541: 40×20 dual audio switcher; 4RU.
9520/9521: 20×10 1RU video, dual audio router.
SDR-128 serial data router: RS-232/-422 data communications switcher; to 128×128 matrix by groups of 16 in 6RU; redundant power supply.
Circle (840)

Inline 7110
IN3510, IN3520: utility RGB+S switchers; 4-in×1-out and 6-in×1-out; remote, RS-232 control; 200MHz video bandwidth.
Circle (844)

J-Lab 1146
Shirt Pocket video DA: looping balanced input; hum bucking; 5 75Ω outputs; EQ for 1000 feet Belden 8281 cable.
Shirt Pocket audio DA: looping balanced input; four balanced outputs; transformer input option; 9V battery operation.
Circle (861)

J.N.S. Electronics 5601
8000 series: "The Frame" modular audio, video, RF functions.
Models 8300, 9000: audio routers.
Additional modules: for series 8000 system.
Circle (862)

Leitch Video 3516
ADA-882: stereo audio DA.
ADA-816: unbalanced audio DA.
Circle (895)

McCurdy Radio Industries 5322
MDA-100: 1×8, 8×1 mixing DA; individual level adjustments.
Circle (932)

Midwest Communications 3234
ARRAY: A.C.E digital router for digital or analog A/V signals.
Circle (946)

Professional Sound Corp 9001
CVM series: video, audio DAs.
Circle (1023)

Sigma Electronics 6300
Series 2100: A/V, pulse, graphics signal distribution modules; fiber-optic, wired models; 1×6 units; 6×1 switching modules, switcher control; black burst generator.
Circle (1092)

Solutec 6800
SOL-2510: audio DAs.
Circle (1101)

360 Systems 7201
AM-16/R: remote control for AM-16 series audio crosspoint router; rack-mount, customized installation; remote interface software to PC or MAC computers.
Circle (1172)

Utah Scientific 6030
AVS2: production models; audio, HDTV router; SMD reduces physical size.
Circle (1205)

Support Products

S6: Test equipment

- Tools

Allen Avionics 5607
Matchman Mk II: color patch generator.
Circle (525)

Altronic Research 6814
Model 6775: 75kW air-cooled coaxial dummy load.
Power test load system: complete water-cooled dummy load with calorimeter, interlock.
Circle (533)

Amber Electro Design 4900
Total Solution: audio measurement package; Model 5500 programmable audio measurement system and AudioCheck PC menu-driven software; available as separate generator, analyzer.
Circle (534)

When your broadcast specs call for consoles,

call for Emcor®

You know what the station needs in its control room; now you want the right enclosures. Emcor's modular design allows you to customize a console to fit your needs. Choose from slope front, vertical and low silhouette enclosures and much more — just what you need to mount your control panels, switchers and preview monitors. In all, there are 6 distinct product lines and more than 9,000 standard items, including a full range of accessories such as drawers, equipment shelves, slide out shelves and hundreds of console writing top configurations.

Emcor enclosures are attractive as well as rugged. Consider your appearance options — decorative trim in a variety of styles, 16 standard paint colors in a smooth or textured finish, and 14 standard laminates from which to choose. Also, our ACS Digital Color Computer allows us to match any color you desire.

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Phone 507-289-3371
FAX #507-287-3405

EMCOR

See us at the NAB Show, Booth #3064.

Circle (160) on Reply Card

Anritsu America 6549
MP1601A/MP1602A: BER bit error rate test set; operates 50MHz-5GHz; separate receiver, transmitter units creates pseudo-random bit patterns to test digital communications systems.
Circle (546)

ASACA ShibaSoku 5152
Model AM50B: 2-channel audio analyzer.
Model AM51A: audio analyzer.
Model TG91E6: HDTV test signal generator.
Circle (557)

Audio Precision 3252
APP-FM1: audio proof of performance package for System One; performs FM stereo audio proofs.
Dual Domain: production version analog, digital domain audio test package for System One.
Circle (567)

AVCOM of VA 3151
PSA-65A: portable spectrum analyzer; to 1GHz in single sweep with sensitivity to -95dBm over narrow spans; battery operated; optional frequency extenders.
DCP-20: dc power inserter, isolator; insertion loss less than 0.3dB through 2GHz, impedance of 50Ω; allows remote powering of in-line amplifiers, protects test equipment.
RFP-24 preamplifier: enhances LSA-1000 log surveillance antenna or other requirements where low-noise amplification is needed; 22dB gain, noise figure 2.2dB at 1.2GHz; 12Vdc.
Circle (577)

B&B Systems 1116
1M-1HR: Imagescope; stereo audio display scope; available in side-by-side half-rack model.
Circle (582)

Bruel & Kjaer Instruments 8029
Model 2143: portable real-time frequency analyzer; input mic preamp, direct; 80dB dynamic range; DOS compatible disk drive; 100-step learn mode; four range digital filters.
Circle (623)

Coaxial Dynamics/Kirkwood Ind 6816
WATTCHMAN 81072, 81080: rack-mount station monitor, alarm systems; 250W-100kW, 8kW-80kW systems; 100μ-5mA meter movements.
Model 83010: peak/CW rack wattmeter; 0.1W-5kW range.
Circle (667)

Control Concepts 2025
ISLATRON series: power protection for broadcast transmission, studio equipment; *active tracking* of lightning induced spikes and other transients absorbs energy before it damages equipment.
Circle (695)

Current Technology 9026
PC-series: professional power protection for small systems.
MPA/MPAP: integrated *digital quality* power panels.
OptiSiftor: data line protection; complete optical isolation.
Circle (702)

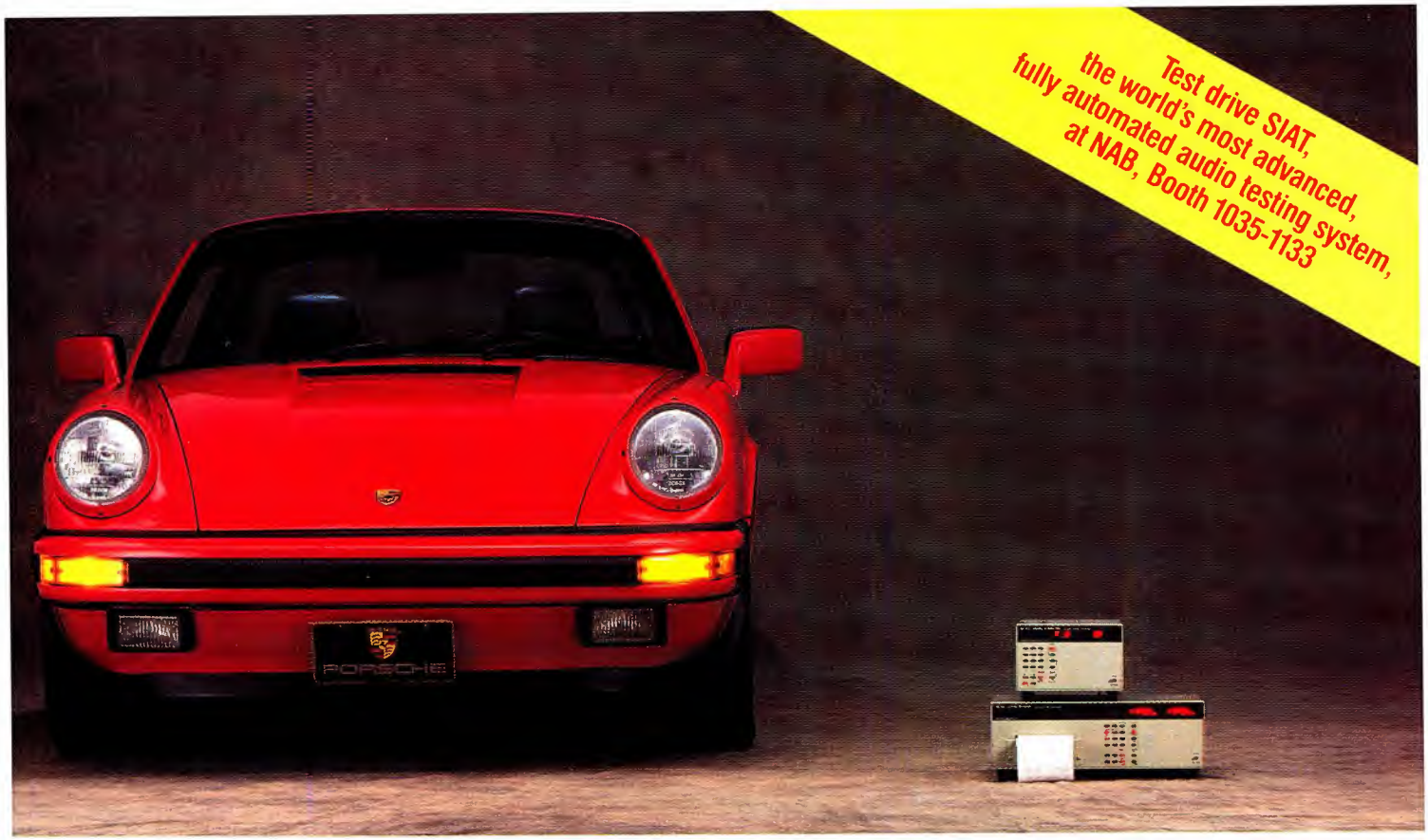
Delta Electronics 4518
PRH-1: high power pulse reflectometer.
Circle (715)

Dorrough Electronics 5506
Model 40-P: Loudness Meter; peak hold feature.
Circle (734)

FloriCal Systems 6730
Validator: A/V signal level, timing monitor; RS-232/-422 port.
Circle (781)

Holaday Industries 5049
HI-3320: data logger for FCC compliance regulations.
Circle (823)

ISS Engineering 6648
GL5020A: IRD satellite receiver; shipped with proof of performance results from VM



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Switzerland ☐ Tel: 011 41 1 206-1111 Fax. 011 41 1 201-2372

SZ Schmid Telecommunication

Circle (163) on Reply Card

700 test unit, serial communications program for remote control; prepped for VideoCipher II Plus descrambler use.
Circle (858)

J-Lab **1146**
Color bar generator: SMPTE bars; source ID; 9Vdc operation.
Circle (861)

Jensen Tools **4117**
JTK-87TEK: field engineer's electronic service center; deep-case tool kit; more than 70 tools; options include Fluke 88 DMM, TEK 222 scope; available without meter, scope.
Circle (867)

Leader Instruments **3012**
Model 5100: component video waveform monitor.
Model 425: component video signal generator.
Circle (892)

Magni Systems **1026**
Signal Creator: software designs custom test signals for multiformat test signal generator.
Circle (919)

McCurdy Radio Industries **5322**
SA14023A: audio level meter, test set; extended range capabilities.
Circle (932)

Motorola C-Quam/AM Stereo **4704**
Semiconductors: analog and digital types.
Circle (954)

Narda Microwave/Loral **5757**
Model 8700: RF radiation compliance meter, electric and magnetic field probes.
Model 8820 SMARTS: surface-mounted compliance system.
Circle (962)

Neutrik USA **6610**
Model A1: audio sweep generator, analyzer; dual channel.
Circle (970)

Rohde & Schwarz **5408**
TIF: video timing analyzer; supports NTSC, PAL, SECAM color subcarriers; measures jitter from VTRs; non-volatile memory card; portable SMD, multilayer technology design.
SGMF, SGPF: NTSC, PAL signal generators; 30 test patterns including composite test signal; 12-bit digital generation; optional VIT inserter and source ID; supports SMPTE, NTC-7, FCC standards.
UAF video analyzer: measures 25 video signal components at three rates; eight VITS configurations; user-defined limits, parameters; non-volatile memory card retains setup, results, operation modes.
Circle (1058)

Schmid Telecommunication **1035**
SIAT system: short-interval audio test equipment; complete audio test procedure completed within five seconds after operator presses one button; transmitter, receiver units for all audio networks.
Circle (1076)

Selco/Sifam **5504**
Meter light: LED illumination kit for full spec VU, PPM meters.
Circle (1081)

Solutec **6800**
SOL-20/20enhancement: improved graticule on color-keyed in-video audio level meter.
Circle (1101)

Symetrix **6342**
SX-205: precision audio meter; VU, PPM ballistics; 1kHz calibrator; reads power or voltage on dual LED ladder display.
Circle (1134)

Techni-Tool **2857**
Degausser: for various CRT displays; demagnetizes tools; continuous service time 2.5 min; weight one pound.
Tec-Tuff tool kit: case with valance design; 3-tumbler combination lock; durable.
Tech Duster: precision cleaning system; 12oz, 20oz premeasured dry, Freon gas to remove dust; non-corrosive, non-flammable; variable flow control valve; extension applicator.
Circle (1152)

Tektronix **2016**
TSG1001: programmable HDTV signal generator.
2721/2722: non-interfering sweep transmitter, receiver; continuous swept response measurements without degrading the video signal.
VM700A Option 40: audio measurement option expands capability of the video signal monitoring unit.
ASG-100: audio signal generator; provides test tones, voice record source for VM700A Opt 40.
Circle (1155)

Videotek **1246**
VNG-1: video noise generator.
Circle (1232)

Wireworks **4800**
TE-3: mic cable tester system.
Circle (1255)

Support Products

S7: Facilities

- Studio, mobile
- Construction, design
- Consultants

Audio Broadcast Group **4039**
Rolling Radio II: mobile radio studio; complete installation in a van.
Circle (565)

BAF Communication **1564**
Model ENG-18: ENG van; on Ford E-350 chassis.
Model MRS-31: mobile radio studio; 31-foot unit includes interview set for nine people; BMX-22 audio board, Marti redundant stereo transmitter.
Circle (583)

Dataworld **4456**
Engineering data: including 3-second terrain data.
Engineering maps: power density, coverage maps, population density, terrain shadowing.
LPTV interference studies.
Circle (710)

Giant Boom Box Industries **4116**
Mobile studios: oversized replicas for promotional programs; Giant Money Machine, Giant Juke Box.
Circle (801)

Mobile-Cam Products **5352**
Modular One: modular news truck; 4-wheel drive cab and chassis.
Production One: 4-camera production vehicle.
Mobile-Cam Four: Surburban-based news truck.
Circle (950)

Shook Electronics USA **A100**
Model 48-63-102: network production trailer for sports; 48-foot length.
Model 25-34: mobile TV production vehicle; 25-foot length.
Circle (1088)

Sure Shot Satellite Network **8112**
Sure Shot I: production truck and uplink service; 48-foot vehicle; 5 cameras, 4 VTRs, complete production capabilities; C-/Ku-band uplink; five units available.
Circle (1129)

Support Products

S8: Programming

- Music, effects
- Services

Associated Production Music **6438**
Briton Gold Classics: recorded library of familiar classics.
Coombe library: re-recorded hit songs.
Sound FX: 40 digitally recorded CDs; sound effects series.
Circle (559)

CASCOM **1206**
Select Effects Vol. VII: 200 special graphics elements; use as-is or enhance with paint systems; part of a library of more than 2,000 animated elements for video production.
Circle (642)

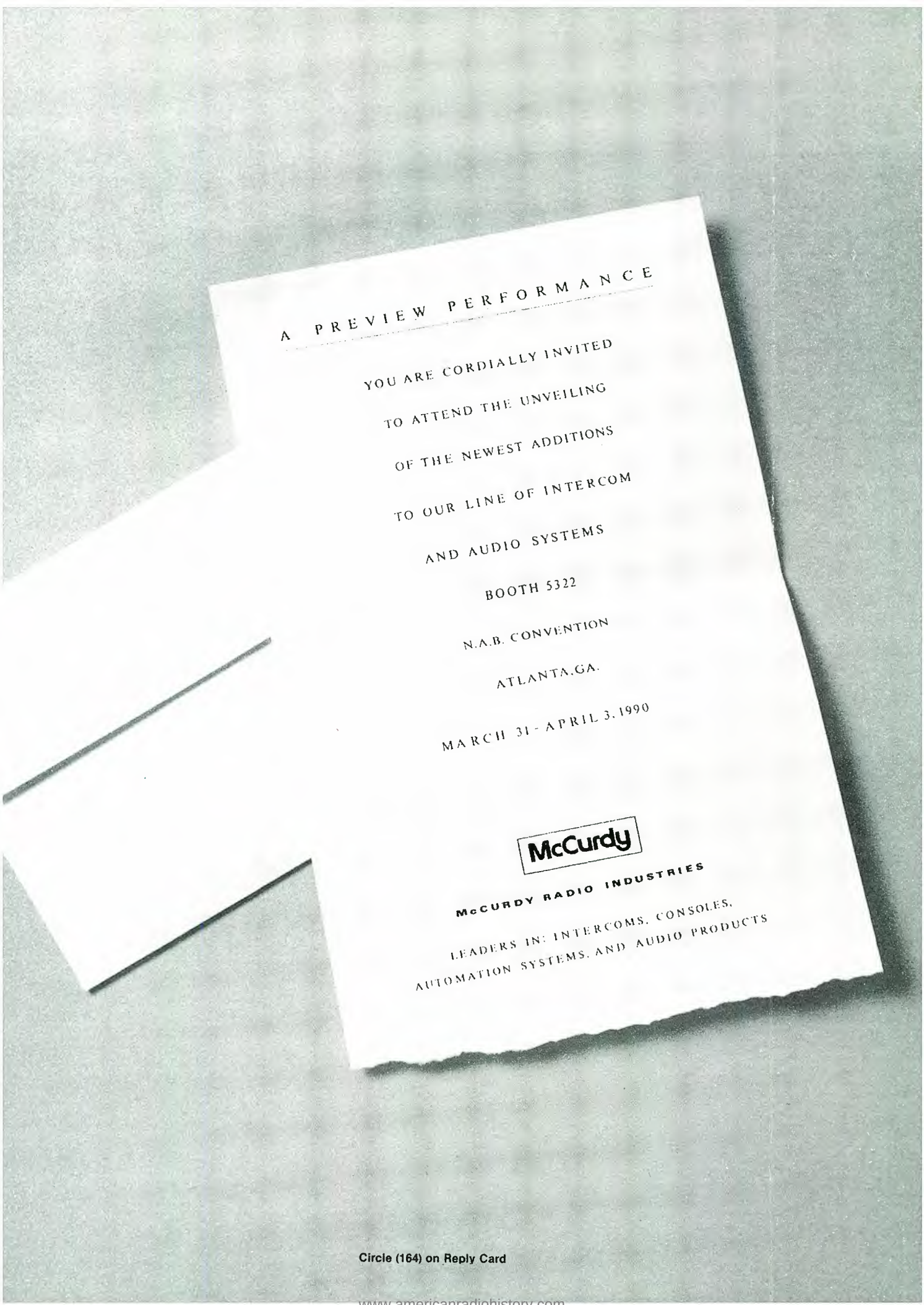
Cycle-Sat/Winnebago Industries **3428**
Satellite relay: services include automated downloading of advertising and program materials during typical off-air time.
Circle (706)

RRN Inc **9034**
Year of Great Promotions: by Mike McDaniel; how to plan, execute promotional events.
Circle (1064)

Sound Ideas **5011**
Sound Libraries: three series of material; sound effects, production music, sampler.
Circle (1108)

27th Dimension Inc **6817**
Library additions: Christmas music and non-seasonal material.
Circle (1193)

Valentino Production Music **5400**
Music library: 42 production music discs; CD format.
Sound effects library: CD format with 30 production sound effects discs.
Circle (1207)



Circle (164) on Reply Card

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FIRST - 20 MHz solid state video switching system (NASA), 1963

FIRST - 360 x 800 20 MHz switching system —worlds largest (JPL), 1964

FIRST - 30 MHz bandwidth switching system (USAF), 1965

FIRST - 30 MHz equalizers for up to 200 feet of coaxial cable, 1967

FIRST - 90 MHz video matrix (Satellite Tracking Center), 1969

FIRST - 42 MHz bandwidth switching system (USAF), 1969

FIRST - Use of laser-trimmed hybrid video circuits, 1978

FIRST - Switching of high res computer generated graphics, 1980

FIRST - 120 MHz switching system, 1987

FIRST - 135 MHz switching system, 1987

FIRST - 150 MHz video DA's, 1988

FIRST - 40 MHz 2 RU V/A router, 1989

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Circle (165) on Reply Card

Video Products

V1: Cameras

- ENG, EFP, studio
- Tubes, CCDs
- Lens, filters, matte boxes
- Pan/tilt heads, tripods
- Pedestals, automation

Ampex Corporation **2200**
Betacam production system: HR studio CCD cameras; Betacam SP camcorders, studio recorders/players; ACE editor, ADO effects, AVC Vista switcher.
Circle (539)

Angenieux Corporation **6112**
Zoom lens: for studio applications.
Circle (544)

Bencher **3105**
Model 900-30 Copymate II: copy stand; light arms attach at rear of baseboard leaving copy area clear; 3200°K quartz lighting; optional safety glass, polarizers, light control.
Circle (595)

Brabury Porta-Pattern/BPI **2518**
 # 001-50, 001-51: concentric and radial resolution charts for CCD type cameras; in illuminator transparency, 18×24 DuraChart and 9×12 field operation forms.
Circle (604)

BTS **5808**
LDK 391: frame-transfer CCD camcorder; Betacam SP VCR; FT-5 BTS chips for 700TVL resolution; highly portable; high sensitivity, resistance to smear; ½" format.
Circle (628)

BURLE INDUSTRIES **5024**
Saticons: mixed-field types.
Harpicons: HDTV camera tubes.
Circle (630)

Canon USA/Broadcast Optics **3134**
J55×9BIE: field production lens; 9-500mm focal length; f/1.4 ramps to f/2.8; macro focus within millimeters of front glass; 1.5×, 2× extenders; external LED indicators of zoom, iris, extender.
Circle (639)

Century Precision Optics **3808**
0.6× wide-angle adapter: for S-VHS, Hi8 industrial camcorders; converts zoom lens to super-wide fixed focal length; increases field coverage by 40%, no light loss.
Circle (652)

Cinema Products **2124**
EFP Steadicam: lightweight camera support for 15-23lb cameras, EFP/ENG applications; retains standard Steadicam features.
Steadicam/JR: for personal 8mm and VHS-C camcorders.
J-7 zoom control: fingertip control with Steadicam EFP.
WRC-4: 4-channel wireless control for focus, iris, zoom lens.
CP amplifier: for Heden lens motors.
Circle (659)

EEV **6310**
XQ1410/06: 30mm Leddicon camera tube; variable light bias improves picture quality, reduces picture smear, extends tube life.
Circle (749)

FGV Panther **6822**
Lightweight dolly: platform design for Panther accessories; runs on floor and straight or curved track.
Motorized column: for mini-Panther dolly; in-shot vertical movement from stable motor control.
Circle (774)

FOR-A **3522**
SA-1010: HDTV precision analysis camera.
Circle (784)

Future Productions **3201**
MCU-400, PS-400: 4-camera CCU; supports Ikegami HL-79/-95, ITC-730, Sony BVP-3, -30, -5, 50 and others; power for four cameras, each on 300 foot cable.
Circle (790)

Geocam **9035**
4/4.2-OB: matte box; direct-mount to ENG lenses; carbon-fibre material.
GeoFX: light weight 4×4 camera filters; optically clear resin in carbon-fibre frame.
GeoFocus: follow-focus system; balanced movement adapts to any lens diameter; for ENG, film lenses.
Circle (799)

Hoodman **6628**
HVF37: view finder hood; cuts glare for camera operator during outdoor operation.
Circle (826)

Innovative TV Equipment/ITE **5714**
T/H series: ENG tripod/head combinations; T/H-400, low cost; T/H 500, compact unit; T/H 600, top quality.
Circle (846)

JVC **3116**
Cameras: 3 FIT CCD system; 3 IT CCD system.
TK-1070U: RGB frame-capture camera.
Triaxial control system.
S-VHS-C ENG system.
Circle (868)

Karl Heitz **5916**
340B3-480: InterPro Studex Ball 3.
410B4-480: Pro Studex giant ball 4.
505B4-480: Tele Studex compact ball 4.
Models 380, 580, 680: Gitzo fluid heads; adjustable drag for fluid motion of leveling balls.
Gitzo Pro 240, 245: reporter tripods.
Models 583, 290: offset bracket and intermediate bracket; simplifies camera mounting when lens, camera grips or other attachments cause interference to normal mounting.
Circle (874)

Miller Fluid Heads (USA) Inc **6204**
Model 155: Miller 30 series II fluid head.
Model 160: Miller 50 series II fluid head.
Circle (947)

Nikon Photo/Electronic Imaging **6512**
S19×8: ENG/EFP lens; 2× extender.
S9×5.5: ENG/EFP lens; 2× extender.
1500C: high definition camera.
Circle (975)

O'Connor Engineering Lab **5930**
Ultimate 10-30: fluid head; for cameras to 30lb; fully adjustable counterbalances, 90° tilt; smooth fluid drag performance.
Circle (983)

Panasonic Industrial/Broadcast **2534**
AQ-11: portable 3-IT CCD chip camera; digital signal processing; 400,000 pixel array for 750-line resolution.
Prototypes: digital camcorder and studio camera.
Circle (999)

Philips Components **5512**
XQ3550, XQ3555: HDTV Plumbicon tubes.
XQ3477: Plumbicon tube; ultra miniature size; all electrostatic design.
Circle (1008)

Quickset **5048**
QYTH-B #4-20080-4: tripod with cam-fluid head; adjustable spreader; load capacity to 40 pounds; ±45° tilt angle; black finish; *QYTH-S 4-20090-3* has a silver finish.
Circle (1034)

Schneider Corp of America **5616**
Demonstrations: B+W series color filters for color correction, compensation; series includes over 100 types in screw-in, drop-in, square, rectangular forms; also special-effects attachments.
Circle (1077)

Schwem Technology **3153**
GX-3 "ENG": hand-held model of GX-3 series; integrated camera with stabilizing lens; CCD pickup for 430TVL; 6× zoom, f/1.2; stabilization 87% at 1Hz, 98% at 10Hz.
Circle (1078)

Sony Communications/Broadcast **5130**
HDC-300: HDTV camera conforming to SMPTE 240M; 18lb unit uses three ES focus/deflection Saticons for f/4.5 at 2,000 lx, 1,000-line resolution; emulations for ease of use by film camera operators.
Production models: BVP-70, EFP camera with HAD CCD devices; BVP-270, -370.
One-piece camcorder.
Circle (1103)

Tamron Industries **3050**
Video conversion lens kit: 1.5× tele, 0.75× wide converters; expand typical 6× zoom on 8mm camcorders to 8-99mm.
Circle (1141)

Television Equipment Associates **5501**
Model 150: miniature CCD color camera; system includes cover and camera units.
Circle (1164)

Thomson Video Equipement **5920**
PROSCAN camera: production models of EDTV/HDTV camera; studio/OB system based on non-interlaced scanning; enlarged bandwidth with 16:9 aspect ratio.
TTV 1542: CCD studio/OB camera; mechanically similar to 1530/1532 series; ⅔" CCDs with low fixed-pattern noise; dynamic lens correction.
Circle (1178)

Tiffen Mfg **1916**
New filter series: including *Star*, *Contrast* and *Black Pro-Mist* filters.
Circle (1180)

Vinten Broadcast **1452**
Microswift series: remote camera control systems; pedestals with pan/tilt heads with full remote control capability.
OSPREY: portable, pneumatic pedestal; for studio, field.
Servo height pedestal: with steering ring for

manual lift, steering; addition to Microswift line.
Circle (1235)

Zaxcom Video 6543
IR10: infrared viewing adapter.
Circle (1261)

Video Products

V2: Recording

- Analog, digital
- Tape, disk
- Editing, animation
- Time code equipment

Adams-Smith 6808
Zeta-Three B: reduced cost A/V/Midi synchronizer.
Circle (510)

Adrienne Electronics 8059
AEC-BOX-1: LTC to RS-232/RS-422 converter.
PC-VITC/RG1: VITC reader, enhanced generator board, for IBM PCs.
AEC-BOX-19: Ampex-to-Sony VTR serial protocol converter.
AEC-BOX-14: VITC-to-LTC translator.
Circle (513)

ADx Systems 7119
ADx-03: VITC, LTC reader, generator, analyzer system.
Circle (516)

A.F. Associates 1756
DIVA: electronic animation system.
Circle (502)

Alpha Video & Electronics/AVEC 3111
CVR-22ESX: modification to Betacam SP for TBC, T/C and machine control.
Circle (531)

Ampex Corporation 2200
ACE Micro V3.7, ACE 200 V8.7: interfaces to GVG 200 switcher, AMX-170 audio mixer, Sony DVR-10, Panasonic M-II; upload, download control of AVC Vista switcher panel memory; TurboTrace.
VPR-300 update: new software package upgrade available for existing systems.
ACE 25 V3.0 software: expanded file input/output control; source/record VTR swap, sync roll, new interfaces.
ACE MIF: serial/parallel interface box; permits control of Sony Type 5 VTRs, numerous parallel control audio transports.
ESS 5 networking: permits user to record, browse on other system ESS 5s.
VPR-200, -250, 350: D-2 VTRs; -200 accepts all three D-2 cassette sizes; -250/350 accept small, medium sizes; -200 series optimized for broadcast applications; -300 series targetted for post use.
Circle (539)

Amtel Systems 6008
E-PIX: hybrid, non-linear editing system; control for 16 transports; complete production logging; 10-input switcher, 8-input audio mixer; film conform; compatible EDL; by Evertz
Circle (542)

ASACA ShibaSoku 5152
Model TM056A6: HDTV, NTSC video memory system.
Circle (557)

Avitel Electronics 3006
TPR 1040: time code processor; 24, 25, 30, 30-drop frame formats; reads, generates sync/non-sync codes; accepts LTC, VITC, parallel, RS-232, bi-phase, sine/square wave signals; 2-input, 2-output.
Circle (579)

Bowen Broadcast Service 3008
Canoe guide post, lower tape guide, post: for RCA TCR-100 player, recorder; construction from super hard metal or coating.
Circle (607)

Broadcast Electronic Services 8047
BETABOX: converts between Betacam, M-II, U-matic for editing system.
GPI Network 410: expands editor with four GPI pulses trigger 10 devices.
Circle (614)

Canon USA/Broadcast Optics 3134
HDTV-CDDR: prototype HDTV-compatible cassette data recorder; Canon technology for picture coding, error correction, high-density recording.
Circle (639)

CEL Electronics 1212
P167: video still store system.
P159: ERIC Plus editing controller.
Circle (648)

Cipher Digital 1800
CDI-1000: VITC time code reader, translator.
CDI-1200: TC reader, character inserter.
CDI-1400: time code generator system.
Model 4815 Phanton II: VTR emulator; protocol conversion, TC functions, synchronizer; links parallel audio, video transports to Ampex, CMX, Sony editors.
Circle (661)

CMX/Chyron 1834
CMX OMNI: large-scale, linear video editor.
CMX 300 upgrade: 3-machine off-line, on-line; Slo-mo control; Fit/Fill calculates speed change to compress or expand material to fit available time slot; audio split; match-cut calculation.
CMX 3600B upgrade: large-scale editing system; Swap, Hard disk and Bins features.
CMX 3100B upgrade: multiple configuration files and Bins features.
Circle (666)

Comprehensive Video Supply 1660
LOG MASTER: software with TC reader board; log film, video footage; search for scenes; generate best take list or CMX compatible EDL; CVNET hardware interface for VTR control.
Circle (678)

Convergence 1734
Enhancements: for ECS series edit controllers and peripherals.
Circle (696)

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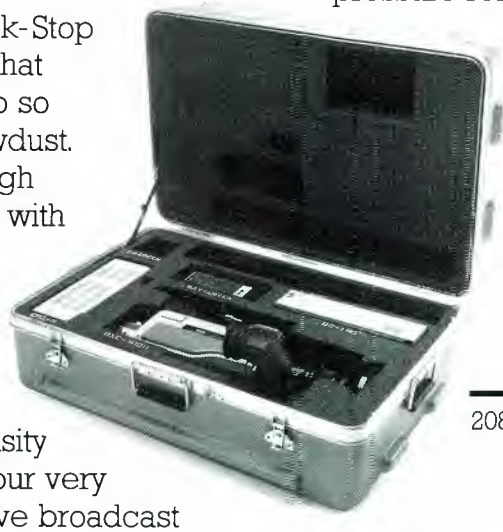
Shok-Stop™ cases are tough. Hit the road with them once, and you'll know exactly what we're talking about.

Built like no other, Shok-Stop cases can take a beating that would turn other cases into so much scrap metal and sawdust. The Shok-Stop's rugged high density polyethylene shell, with its unique ribbed design, absorbs virtually all impact shock. The little remaining vibration reaching the interior is instantly overcome by the high density custom fitted foam. And, your very valuable extremely sensitive broadcast equipment is left totally unharmed.



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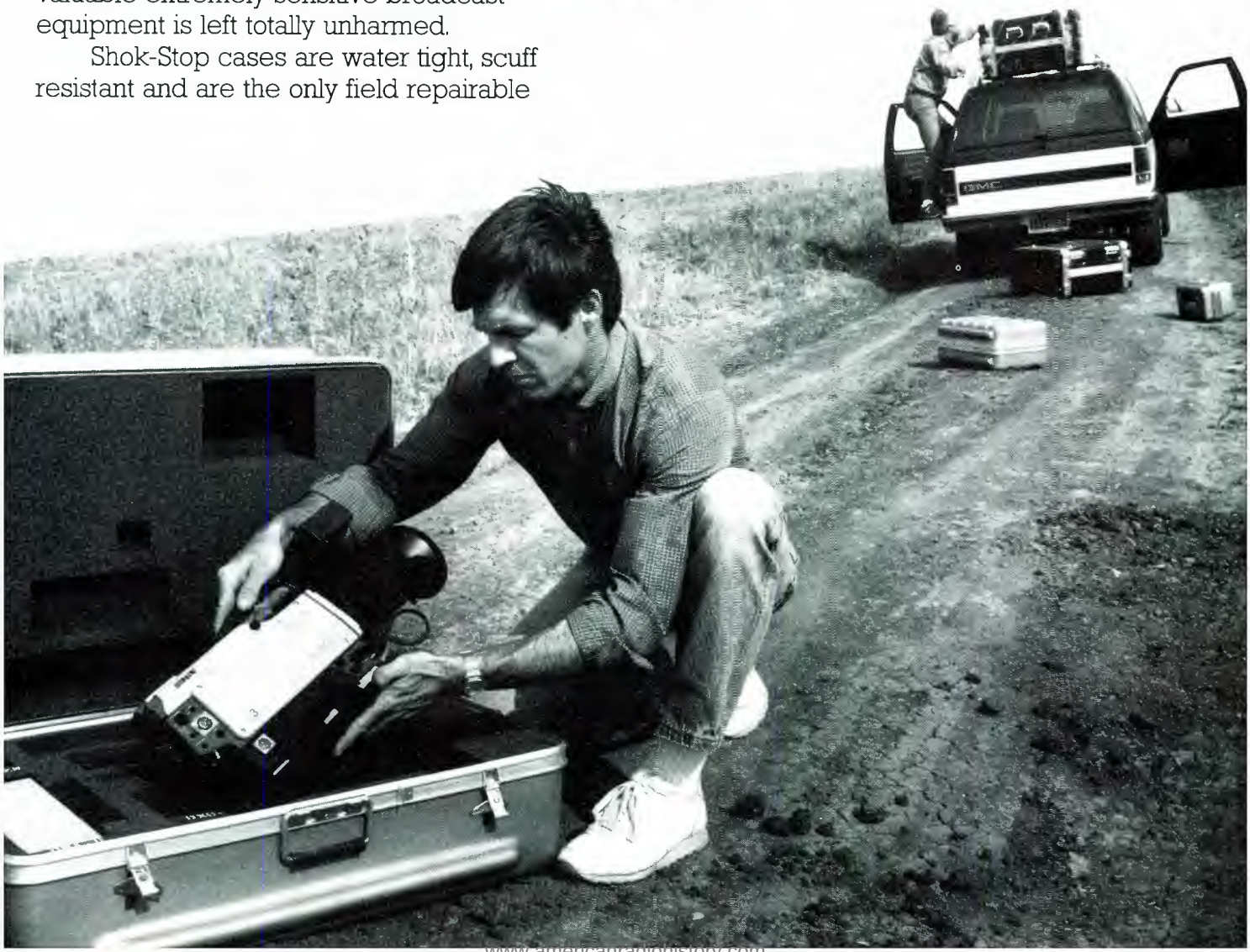


Digital Services/DSC 1834
DiSC production models: digital disc recorder system; software update with shuttle, variable speed play; record protect, CMX/VPR-6 interface; 1-frame record, automation, mark-in/out.
Circle (730)

Dwight Cavendish 3804
CM7000: computer-based auto quality control station; tests finished cassettes electronically; failure documentation.
CS811 automated VCR: alternative to mechanical cassette changer.
Circle (738)

Evertz Microsystems 6444
Model 7100: enhanced emulator ATR interface; supports automatic track arming for some ATRs.
Model 7200: enhanced e^2 VCR interface for Sony Type 5, Ampex VPR 2, Fostex R-DAT.
Model 4015: LTC/VITC generator; for video post of material originated on film.
Model 627: LTC/VITC reader; serial I/O, optional character inserter.
LTC system: low cost TC generator, reader, character inserter unit.
Circle (768)

Fast Forward Video 3143
F-22: SMPTE/EBU TC generator, reader, character inserter; RS-422, MIDI interfacing. *Remote Module:* SMPTE/EBU time code RS-422 edit controller interface.
Circle (772)

Future Productions 3201
FP series: duplicators; three models for 80-100, 200-500, 1,000 or more VCR transports.
QC station: operates 80-to-100 VCRs.
Circle (790)

GDI/Generic Designs 3026
GD422: serial to parallel interface.
GD500: VITC to LTC translator.
Circle (793)

Grunder & Associates 1212
CEL P159 ERIC Plus: editing control system.
CEL P167: video still store.
Circle (810)

Hotronic 2935
AL82: solid-state frame recorder; 5.6 second time delay for audio, video, profanity delay; full bandwidth video, 16-bit digital stereo audio, 20Hz-20kHz.
Circle (828)

Innovision Optics 9032
Mini Motion Tables: portable animation motion control tables; joystick controllers; for location production.
Circle (847)

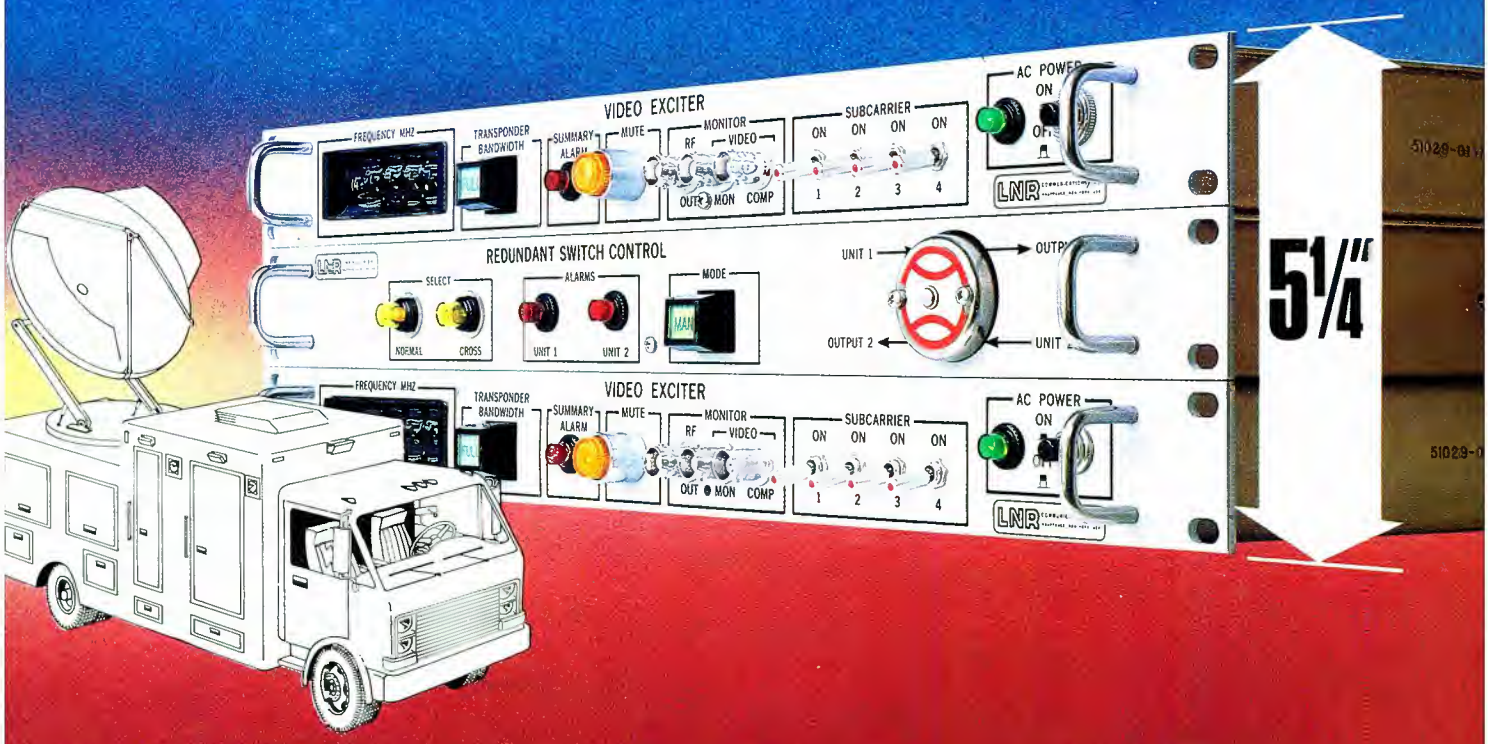
Interactive Motion Control/IMC 1308
Model 3025H: hand-held controller; operates with #3025 remote control head; back-lighted LCD 4-linex20-character display, 32-key keyboard, 20 user-defined functions, encoded jogging knob; provides full control of animation system.
Circle (855)

JVC 3116
S-VHS duplicator.
BR-S411U: dockable, portable VCR; S-VHS format; operates with any JVC CCD camcorder; integrated adapter for use as editing feeder transport; interface to RM-G410U editing controller.
SA-F911U: interface with TC reader, generator; S-VHS and M-II compatible.
BR-S811U: full feature S-VHS edit recorder.
BR-S611U: S-VHS video recorder, optional SA-T411U TBC.
Circle (868)

Leitch Video 3516
Still File enhancements: networking option *3100NW*; software upgrade with Bernoulli read/write optical storage; D-2 frame buffer with composite, D-2 I/O.
Circle (895)

M&R Data Services 8101
ENSEMBLE: PC-based A/B-roll editing controller system.

TWO for the Road.



Now, LNR puts two Video Exciters and a Switch in the space of one Exciter for your SNV.

That's right! LNR's new Video Exciter is only 1¾" high. Together with an automatic redundancy switch and a backup Video Exciter, the entire package fits into a 5½" slot. So you can eliminate worry about down time—even uplink two simultaneous video signals if you wish.

LNR hasn't sacrificed quality in bringing you a compact video exciter. The model LVE-14 uses a highly integrated Ku-Band RF section, together with proven, reliable video circuitry to provide RS250B performance. And, for the first time, you can go from full to half transponder operation at the press of a button.

Here are a few of the special features of the new LVE-14 Video Exciter: • Reduced size and weight • Up to 4 synthesized audio subcarriers • Full or half transponder operation • High power output: 0 dBm standard, +6 dBm optional • Compatibility with all video standards and scrambling techniques • Optional PTT and MCPC voice channels • 6 GHz version also available.

A new low package price is now available. For information on the LVE-14 or other new LNR slimline products for compact mobile applications, call LNR marketing today, or write for detailed literature.

See us at the BAF booth Mobile Unit

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180 Marcus Blvd., Hauppauge, N.Y. 11788 • Tel: (516) 273-7111 • Telex: 221620 • FAX: (516) 273-7119

Circle (168) on Reply Card

ENSEMBLE PLUS: enhanced and expanded upgrade for editing system.
Video Manager: real-time video enhancement for Symphony, Ensemble edit systems.
Circle (915)

Otari **4352**
TMD T-700 MK-II: modular videotape duplicator system; forced, filtered air, digitally controlled reference levels; auto copy tape cutting; central air, water, power hookup.
Circle (994)

Paltex **1734**
Enhancements: for Paltex E-series editing controller systems and peripherals.
Circle (998)

Panasonic Industrial/Broadcast **2534**
AU-63: cost-effective MII player; includes autotracking feature.
AU-410: portable MII VTR.
½ digital: engineering models; composite D-2 format VTR; 6MHz bandwidth, 54dB S/N; full-featured studio recorder slides into same housing as M-II VTRs.
Erasable optical disk recorder.
Circle (999)

Quanta Editing Systems/Dynatech **6030**
CE-75: expandable 3-VTR editor control; simplified keyboard design.
Circle (1031)

Sony Communications/Broadcast **5130**
HDD/HDDP-1000: HDTV digital VTR; per SMPTE 240M; 1.18Gbit data rate; 30MHz luminance, 15MHz chroma for 1000-line resolution; 56dB S/N; 8-channel DASH audio format at 48kHz/16-bit sampling.
Production models: DVR-2, DVR-18 D-2 VTRs.
Enhanced D-1, D-2 video recorders.
Betacam SP: additional equipment.
BZE-9001/02: version 02 editing system software enhancements.
BKE-series: BVE-910 accessories; serial, parallel switcher, mixer interfacing.
EVV-9000: dockable Hi8 VCR; shown with DXC-325 3-chip camera.
BVE-910 editor: low-cost, 2-VTR, cuts-only; expands to four VTRs with video switcher, audio mixer, preview switching control.
Circle (1103)

Spaceward Systems **7022**
Showcase: presentation still-store.
Circle (1113)

TEAC **3352**
LV-220P: recordable videodisc player; access to 108,000 stills or continuous play of a 1-hour program.
Circle (1149)

TimeLine **4345**
Lynx SSL Data Interface: links SSL studio computer directly to ATRs, VTRs, film.
Lynx KCU: keyboard control unit; programmable to control six transports through timecode modules.
System supervisor: communications network for transport control from console computers, editors, computer terminals.
Circle (1181)

United Media **2826**
UMI 500, UMI 600: multitasking standard keyboard videotape editors: direct serial control of 4, 6 transports; uses standard rather than dedicated key layout; amber monitor; switcher control, full EDL.
Circle (1200)

Videomedia SED **1434**
VLC-3: multiprocessor cuts, A/B roll editor; 240 event non-volatile memory; upgrade to Mickey or VLC-32 systems; V-LAN universal control network.
Circle (1231)

VTE **HDTV**
DVSR 100: digital video silicon recorder sequencing system; internal bus structure provides simultaneous recording, display with different TV rasters; 312 MB/sec data rates; 1.8Gbyte RAM.
Circle (1238)

Video Products

V3: Film, cine

Cinema Products **2124**
SteadiMag: extended throat magazine for Arri 2C, 3C cameras used with Steadicam.
CP Keykode reader: Rank Cintel accessory; transfers film frame ID data to video for recording.
CP Workprint Logger: automatic, accurate workprint logging; operates with CP Keykode reader.
Circle (659)

Eastman Kodak **1905**
HDTV telecine: demos of film-to-tape transfer with alternate HDTV technology.
EXR media: enhanced motion picture films.
Circle (744)

Merlin Snell & Wilcox **1041, 2100**
DEFT: digital electronic film transfer, standards conversion produces PAL copies from NTSC material originated on film; overcomes 3/2 pull-down telecine systems for reduced image blur and judder.
Circle (939)

Nikon Photo/Electronic Imaging **6512**
LS-3500: film scanner.
Circle (975)

Nytone Electronics **3054**
Video slide scanner: 35mm slide format; 80-slide trays for standard, glass slides; Pan, Zoom, 360° roll, 180° flips; joystick for pans, width, height; programmable, 250-steps.
Circle (982)

Rangertone Research **1952**
Multi-Track Magnetics
HS1635: combination 16mm/35mm studio projector; high speed operation.
HP1635: telecine transfer system; combination 16mm/35mm operation.
Circle (1045)

Rank Cintel **3156**
URSA: digitally-controlled flying spot scanning telecine; digital color channels; post production special effects; 4:2:2 sampling; X-Y zoom, pan; rotation, perspective; 5-track ball control system.
Mk 3 Turbo: modified 4:2:2 telecine.
Circle (1046)

Snell & Wilcox **1041, 2100**
DEFT: digital electronic film transfer, standards conversion for PAL copies from NTSC material originated on film; overcomes 3/2 pull-down telecine systems for reduced image blur and judder.
Circle (1098)

Steenbeck **6408**
ST-7230: magnetic film recorder; three independent film transports for 16mm, 17.5mm, 35mm film formats.
ST-7320: 35mm film scanner; 24-face holoscope with JVC 3-CCD camera.
Circle (1123)

Video Products

V4: Batteries, lighting

- Chargers, analyzers
- Lamps, gels

Alexander Batteries **5155**
Beta Battery Optimizer: one unit combines charger, discharger, analyzer, conditioner.
Circle (524)

Apollo Lighting/Audio-Visual **3800**
Lamps: expanded line with SSTV, floods, spots; dichroic materials, gobos.
Circle (551)

Christie Electric **1419**
CASP/1200: universal battery support system; rejuvenation, charging, analysis; computer interface to list battery condition.
Circle (656)

Cinemills **1546**
Silver Bullet: HMI flicker-free lighting equipment; 1.2kW PAR; 1.2kW, 2.5kW axial design; 6kW, 12kW, 18kW Super.
Circle (660)

Comprehensive Video Supply **1660**
Lighting equipment: camcorder lights, kits; Softouch Deuce with light stand; portable Fresnel kits.
MAGNUM Logic series: NiCad batteries; Lifesaver charger; Camchargers; surge protection.
Circle (678)

FGV Panther **6822**
FLIB 575: HMI luminaire; ultra compact unit.
Circle (774)

Frezzolini Electronics/PAG **2834**
#9754: advanced 4-channel charger; supports NP-1 and other batteries.
#9704: 8-channel battery charger, management system.
BP-143: Frezzi On-Board high energy pak.
MFK-90: professional mini-fill lighting kit.
Circle (787)

Great American Market **5300**
#1102 Fog machine: heavy-duty unit; variable high volume, continuous delivery; local, remote, manual/autocycle control.
GAMCOLOR series: additional colors of color filter line.
#4540 PANACHE: memory lighting console; 250-channel; big board features.
#4580 EASY RIDER: ACCESS system companion; playback-only device for long continuous repetitive control needs.
#4200: ColorQuick rolling color changer; analog, digital dual switchable input; 110V/220V; auto pushbutton loading; variable quantity of colors.
Lighting patterns: including ShadowPlay 4.
Access Pro: lighting console; expanded with 24 overlapping pile-on Scenemasters, flash

The Most Innovative Aural Program Links Available Today

Features

- Frequency Agile
- Excellent Se ectivity
- Switchable Monaural/ Composite Operation
- Comprehensive Metering
- Built-in Receiver Transfer Circuitry

Specifications

- 145 MHz to 1.9 GHz
- 76 dB SNR
- 100-500 KHz Channel Spacing
- 126 dB System Gain
- 0.1 dB Response

The Moseley PCL 6020 and PCL 6030 blend technology and innovation to offer the world's first truly user-programmable transparent aural program link.

Totally Transparent

The system specifications are the tightest in the ndustry with better than 76 dB Signal to Noise Ratio (SNR), 0.1 dB frequency response and 0.1% distortion for a transparent, high quality sound.

True World Product

Both the Transmitter and Receiver are fully synthesized with up to 40 channels per link and available in all frequencies from 145 MHz to 1.9 GHz. Each unit can be operated in either monaural or stereo mode with channel bandwidth from 100 to 500 KHz .

User-Programmable

Frequency, channel bandwidths, monaural or stereophonic operation are all user-programmable in the field eliminating costly factory/testbench realignment.

Moseley Experience and Support

Moseley has over 30 years of experience in over 120 countries worldwide and has engineered numerous national and international program networks. All Moseley products carry a standard *2 year warranty (extended warranty is available for up to five years).* You can put your trust in a company that has a worldwide reputation for customer support and technological leadership.

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Circle (169) on Reply Card

buttons; 4-bank memory, 96 assignable memories, programmable labels; 96 control channels, 256 dimmers.
Circle (809)

Innovision Optics **9032**
Dedocool: portable lighting; high-intensity units for use with specialty lens systems.
Circle (847)

Lee Colortran **5452**
602-100, -102: STATUS 12/24, 24/48 control consoles.
602-001: Scene Master 60 Plus console.
602-030: Prestige 2000 Plus control console.
196-001: ENR 96-dimmer rack; freestanding.
LEC 2001: ENR 24-dimmer, wall-mount rack.
600-106: ENR pack; portable 12-pack, 20A or 50A ratings.
600-902: ENR universal control module.
Circle (894)

Lighting Methods **3445**
Acclaim series: lighting consoles; *-100* 2-scene preset; *-200* 2-scene preset with memory; *-300* 2-scene preset, memory, patching.
Circle (900)

LTM Corp of America **2608**
Cinepar light: 2.5kW unit.
Circle (910)

Osram/Siemens **6518**
Metal halide lamps: HM010, 123W; HM035, 250W/SE; HM040, 400W/SE; HM086, 1.2kW/SE; HM116, 2.5kW/SE.
Circle (993)

Paco Electronics USA **6726**
DP NiCad series: ENG camera, VTR batteries; high power cells for increased battery life; *-10* 12V, 1.9Ah; *-11* 3.2V, 1.9Ah; *1240* 12V, 4.4Ah; *1340* 13.2V, 4.4Ah.
Circle (997)

Perrott Engineering Labs **2939**
Mini Lite II: dual portable light unit; two 75W lamps may be operated individually or simultaneously; metal construction; 2 lb.
Pouch Pak: belt-mounted pouch for BP90 battery.
Circle (1006)

Rosco Laboratories **1808**
Super Blue video paint: high blue content for Ultimatte compositing when shooting film with sufficient separation in blue, green without saturation of blue layer of negative; reduces noise.
Circle (1060)

Sachtler **1610**
Production 575D: lightweight, 2-sided HMI burns; oval-shaped, reduce volume, weight.
Production 1200D: location, studio open-faced HMI flood; wide focus range 1:5.
Circle (1067)

Teatronics/Lighting Innovations **2820**
Comstar Genesis 6120: 12kW dimmer pack; dimming performed by SCR-pair modules; input from 208V "Y" 3-phase; 0-10Vdc control via AMX192, DMX512 protocol simultaneously.
Circle (1150)

Ushio America **9041**
Halogen lamps: GCA, GCB, GCC for Pro-light, GDA for V-light from Lowel-Light; FKW for ARRI 300 Fresnel, FRK, FRG for ARRI 650W.
Circle (1204)

Video Products

V5: Digital systems

- Graphics, effects
- Titlers, prompters
- Weather graphics
- Integrated production

Abekas Video Systems **160W**
A53-D enhancements: added features for digital special effects system.
Circle (504)

Accu-Weather **6723**
UltraGraphix AniMotion: demonstrations of animated graphics material.
UltraGraphix: high color resolution weather graphics with satellite, 4-D satellite, Radar-Plus images; *240* is Macintosh-based.
Services: Forecast/Briefing, WeatherShow, WeatherBreak.
Circle (506)

Advanced Designs **2021**
DOPRAD II enhancement: Collins Doppler turbulence detection; 8-bit graphics; map builder, time-lapse animation, color mixing.
WDDS systems: weather data displays with time-lapse animation.
Circle (514)

Alden Electronics **5153**
Color weather radar system: PC-based graphics system, ingests, stores, displays HR government weather radar data; option to use with weather satellite, charts, text.
Circle (523)

Ampex Corporation **2200**
ADO 100: component analog model; Digi-Matte key channel; X/Y/Z rotations; optional perspective 3D effects; integrates with Vista switcher for operation from switcher control panel.
ALEX package: frame-based animation; definable individual paths, trajectories assignable to characterss; DAM dynamic attribute manipulation; resizing font editor; integrated drawing package.
ADO 100: component video effects, digital optics capability; 3-axis flips, tumbles, Z-axis spins; 2-D, true variable perspective 3-D, Autocube; DOS disk storage; switcher interface; Digi-Matte keys.
Circle (539)

Aston Electronics **1106**
Power Station: paint, draw, slide output, 3D animation; Gouraud and other shadings of solids, outlines; three interactive screens, "instant undo" screen; polyphoto browse; 32-bit, 13.5MHz clock.
Circle (560)

Aurora Systems/Chyron Group **1834**
AU240: paint, animation system.
Circle (573)

AVS/Audio Visuel Systemes **7009**
S161 series: superimpose messages, graphics with video images; NTSC, PAL and SECAM standards; integral or external message storage; LTC/UB data; audio VU-metering; time, symbols, logos per model.
Circle (581)

CEL Electronics **1212**
MS-851, MS-852: digital effects units; integrates P164-38XP effects, TBC, framestore with *Maurice touch-screen* controller; integral mixer card combines 2, 3, 4-level picture with various effects.
P152B: Maurice II touch-screen controller; menu-based system for CEL effects equipment; 3-axis joystick control and touch-screen; six serial ports; 3½" floppy storage.
Circle (648)

Chyron **1834**
Transform: real-time animation for Super Scribe Graphics.
iNFiNiT!: production models, the Ultimate Graphics, Animation system; options provide paint, 3-D animation, still-store functions; 2-channel titling; compatible with Chyron IV through Font Converter.
Scribe Jr.: compact Scribe; latest software.
ACG: compact charter, graphics generator; latest software.
Circle (657)

ColorGraphics Systems/Dynatech **6030**
Mosaic: integrated digital paint, animation, real-time disk recorder system.
Morph the Animator: 2-D animation system.
Circle (669)

Comprehensive Video Supply **1660**
CUE MASTER: teleprompter with laptop or desktop computer; stand-alone system; wordprocessing with foreign characters, multiple fonts; hand-held controller, underlining, colors.
Primebridge Micro-Series: includes portable video DA, switcher, keyer, mixer, wiper.
Circle (678)

Computer Prompting **3137**
CPC-1000: prompting software for all IBM and compatible laptop computers.
CPC-1000N: software interfaces to any TV newsroom via LAN.
CPC-1000D: nine-pound gas plasma prompter display.
Circle (683)

Crosspoint Latch **3308**
Picture Mover 6063: creates push-pull effect.
Circle (700)

Cubicomp **6700**
Vertigo 3D animation V 9.3: Silicon Graphic-based workstations; modeling, paint, choreography, render; VideoPak interface for RGB, Beta, NTSC, PAL; D-1, D-2 options; real-time preview; variable aspect ratio rendering; luminance attenuation over distance; supports Bitstream typefaces.
IGES Translator: allows files generated by specific CAD systems to be converted to Vertigo geometry formats to streamline 3D animation and rendering.
Circle (701)

Digital Arts **1464**
DGS V 3.1: enhanced graphics system.
DGS/386: graphics system uses native mode of 80386 µP; 80387 math coprocessor;
Circle (722)

Digital F/X **5308**
Composium enhancement: removable cartridge disk drive; 40Mbyte unit fits slot in the DF/X 200 chassis; 5¼" cartridges available in preformatted programs; kit includes

PeopleLink™ – A Powerful New Solution

This is the most complicated control you'll find on the new PeopleLink™ telephone system.

PeopleLink translates your every desire into reality. Our new multi-line modular telephone system is no more complicated to operate than a simple tone pad and most functions can be initiated with the touch of a single button. PeopleLink is a powerful multi-purpose system that is absolutely user friendly. It is expandable, allowing you to spec exactly what you need to meet today's requirements with an open-ended design that easily grows with you. The system handles up to 40 lines and works with any KSU.

PeopleLink provides the ability to custom program "personalized" applications. A few simple keystrokes and each operator can easily preset their preferred applications and quickly access their program from any control surface in the system.

PeopleLink is human engineering with the emphasis on human.

The new PeopleLink integrated telephone system, designed for broadcasters by broadcasters, brings to its uniquely designed control panel every capability and every function you ever wanted.

The First Fully Personalized Phone System

Multiple control surfaces may be connected to the system and used in simultaneous independent operation.

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PeopleLink makes caller access clean and simple. Touch a single button to take the next call. PeopleLink ends the previous call and puts the new voice on-air. PeopleLink allows multiple callers to be on-air at the same time and, with the GUEST feature, protects VIP callers from accidental disconnection.

Running contests on-air couldn't be easier. Simply select the number of callers, announce the contest, and punch the CONTEST button. PeopleLink answers the calls, delivers a pre-recorded message and instantly puts the "winner" at your fingertips.

Recording calls is as easy as punching one button. Depress the REC button and PeopleLink sends audio to the recorder and rolls tape. Because PeopleLink includes Gentner's DH-2 Digital Hybrid, you always get the finest audio quality possible.

How To Get In Touch With A Very Simple Solution.

We've only touched on the versatility of PeopleLink. To fully grasp its potential, its flexibility and expandability, its ease of installation and operation, just pick up your phone and give us a call. It's that simple.

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Call me I'm interested. Circle (171) on reply card.
Send literature. Circle (170) on reply card.

generic background images.
Circle (727)

Dubner Computer Systems **5830**
Turbo D-1: paint system supports analog component, D-1 video; input sync reference with auto select of 525/60, 625/50 operation; 68020 μP and math coprocessor; uses 4:2:2 sampling format.
GF-600/TP: Graphics Factory magnetic tape input/output option; transfers images to, from WaveFront 3-D graphics system; introduces additional features to graphics from both systems.
Circle (736)

Echolab **6716**
Tempest-900: digital effects processor; meets broadcast specifications.
Circle (745)

Electrohome/Jazz Systems **2850**
JAZZ: digital video effects system for professional video producer; production models.
Circle (754)

Enterprise Electronics Corp./EEC **6047**
DWSR-90CTV: Doppler radar for TV uses; complete narrow-beamwidth antenna, pedestal package with radome, transmitter, receiver, control, display console; RGB monitor; NTSC colorizer; high resolution graphics; multicolor map drawing; full time-lapse capabilities.
Doppler upgrades: for WSR-74C or WR-100-2/77 EEC radar systems; 250kW peak; rainfall intensity; more.
Circle (762)

FOR-A **3522**
VTG-33G: video timer; superimpose month, day, hour, minute, second into video images.
VTW-222S: S-VHS compatible titler; 32-page memory or 256 lines of text; 14 of 512 colors on screen.
Circle (784)

Grass Valley Group **5830**
KURL option: for Kaleidoscope digital effects; non-linear transformation for page-turn, page-roll, ripple, slits, sphere, position/size modulation; XYZ axis 1-light and multilight modeling.
Circle (807)

Grunder & Associates **1212**
CEL P152B: enhanced touch-screen controller for Maurice II digital effects; joystick, hard key, touch-screen selections of functions.
Circle (810)

Harris Video Systems **6700**
Advanced Creation: enhanced HarrisVws workstation; 2-D Journal Animation; frame animation; capture, store, output linear key frames with associated images; erasable optical disk holds 750 images.
Circle (816)

Kavouras **1628**
Wx Data Base: world-wide weather database and service.
PC-Weather: database with interactive 2-way service; PC-based.
Production models: RADAC 2100 24-bit color weather radar remote display, NEXRAD compatible; Triton A/P 32-bit weather graphic, animation system.
Circle (875)

Knox Video/GML Grove **3060**
K40, K40S: professional titler; S-VHS, NTSC outputs; for live or post-production use.
IMAGR II: high resolution titler; complex dynamic motion, picture capture, paint; 16 million colors; 4nsec resolution.
Circle (883)

Laird **2350**
Model 1480: model 1450 titling generator with integrated remote disk drive.
LEGEND-LTL: Legend series character generator; no disk drive, but fully upgradable.
Circle (885)

Listec Video **5042**
A-6000: prompter software editor.
A-5000-NET: LAN-based A-5000 prompter.
A-5500: ScrollBox Script Generator with A-2009.
Field prompter: 9" fold-away mirror, hood assembly.
Circle (903)

Lynn Greenberg Electronic Teleprompting **2035**
Telescroll PC: prompter system; MS-DOS.
LG-300: universal camera prompter display.
LG-400: executive speech prompter system.
Circle (912)

It's 5:53! Where's Charlie, Jim and Jane?

There's nothing to worry about. AutoCam's™ ACP-8000 has control.

Repetitive and boring manual camera control is eliminated. AutoCam's ACP-8000 menu driven touch screen control easily learns and reproduces precisely and consistently all camera shots and floor positions. Now, experienced personnel can accept more challenging and rewarding assignments.

An example of AutoCam's power: After the opening Anchor stories on the 6 o'clock news, cameras 1 and 2 are easily relocated to the Weather desk during a 2 minute video. After Weather, cameras 1 and 3 are quickly repositioned to Sports during a 30 second break...then all 3 cameras return to the Anchor desk to close the show. Preset camera shots, floor positioning and cable management are performed easily and automatically with the HS-110P Pan/Tilt head and the SP-200 servo pedestal with X-Y base.

Circle (172) on Reply Card

The proprietary X-Y base guidance system repositions the cameras within an 18 arc second rotational error. As the cameras are moved from position to position, there is zero cumulative error. Its sophisticated locating and collision avoidance system eliminate the need for rails or studio floor grics. If desired, AutoCam's manual control mode can be initiated at any time.

The AutoTrak™ talent tracking option maintains accurate framing of the Anchor even on tight head and shoulder shots (An essential operating requirement with key shots.)

AutoCam's newsroom computer option gives the news director quick access to all camera resources. Scripted stories with all camera moves are automatically played via the ACP-8000 newsroom computer story list. Last minute changes are executed quickly and smoothly.

AutoCam can provide you with the most efficient communication link between your director and your on-air product. And, its reliability and sophisticated moves improve your on-air image. Call for a proposal and demonstration ...now.

NAB Booth 1814, Hall 6
East Exhibit Area

TSM

TOTAL SPECTRUM MANUFACTURING INC.
709 Executive Blvd., Valley Cottage, NY 10989
914-268-0100 FAX: 914-268-0113

Microtime 5740
3D digital effects: reduced cost video effects; maps live video to 3-D surfaces in single pass; page turns; user-defined hard key control panel; VTR emulation; GPI triggering.
Circle (944)

Pansophic Systems 3140
Nimble animation: 2-D system uses 80386 CPU, TrueVision Vista graphics board; 32-bit signal processing; 1024×768-pixel resolution; 300Mbyte hard disk capacity; MIDI interface.
Circle (1008)

Pinnacle Systems 2101
Series 2100 video workstation: enhanced with optional PRIZM effects.
Model 3000E: graphic design workstation.
Circle (1012)

Q-TV 2234
MVP-11: intermediate, light-weight, studio prompter.
QCP Mark II: full-scale newsroom prompter; IBM/compatible system.
Circle (1027)

Quanta 6030
ACM all channel message system: CATV, CCTV equipment; 124 channels with 4 channels/chassis; each channel can key a unique message over program video; switches to alternate programming.
Orion Business Graphics: bar, column charts, line, pie graphs; anti-aliased; animation capability for "growing" effects; graph pages fully compatible with standard Orion video pages.
Circle (1031)

Quantel 1134
Presenter option: for Paintbox V graphics; sequences pictures, builds multiple layered graphics through sequenced cutouts; linear key channel for *floating graphics* effects.
Paintbox V-6: software package; high-speed library browse, real-time cutout manipulation; *Headup* sequence animation from stylus/tablet.
Circle (1032)

Spaceward Systems 7022
Titler II: graphic titler system; 3-D imaging capabilities.
Rodin: electronic graphics system.
Circle (1113)

Tekskil Industries 3802
SpeakEasy: speech prompter; invisible to audience.
Circle (1154)

Telescript 1934
T 'POD: off-camera monitor and prompter support device.
MPS monitor prompting systems: programs for IBM, compatibles, Commodore C-64.
Model E-M: monitor prompting system with Telecue or Telescriptor transport.
Circle (1162)

Video Products

V6: Switching

- Master control
- Production

A.C.E 3234
ARENA C: 13-input production switcher; four keyers; for component video facilities.
Circle (501)

Abekas Video Systems 160W
Enhancements: additional features to A84 digital post production switcher.
Circle (504)

ALTA Group 6030
Pegasus: video switcher; 3-bus architecture; four video levels of keying with multilevel transitions; 8-input; linear/hard key, optional RGB modes; Y/C component capability; serial interface.
Circle (532)

Ampex Corporation 2200
AVC VISTA component analog: 10-, 18-input configurations; integrates with ADO 100 effects system controlled from switcher panel.
AVC Century software: V15.0 firmware package; user-programmable macros, macro button assignments; non-volatile storage; aux buses in panel memory; improved SMPTE communications; status monitor.
Circle (539)

Echolab 6716
DV-7: 6-input post production switcher.
DV-5: 10-input analog switcher; includes memory capabilities.
Circle (745)

FOR-A 3522
CVM-400: component video mixer, switcher.
VPS-500: integrated digital video mixer.
Circle (784)

Grass Valley Group 5830
M-VEP option: video effects for MASTER-21 master control switcher; 10 wipe patterns; 5-input accumulative linear keyer, RGB chroma keyer; mat, background generators; optional linear BORDERLINE.
Circle (807)

JVC 3116
KM-1600U: Y/C special effects generator.
Circle (868)

Midwest Communications 3234
ARENA C: A.C.E production switcher; 13-input, four keyers; component video.
Circle (946)

Ross Video 5304
Model 424: 24-input production switcher; two MLEs, downstream keyer; 12 keys, four backgrounds on screen simultaneously; 50-event memory; optional disk-based extended memory for effects dissolve, sequences, switcher setup storage.
Circle (1062)

Sony Communications/Broadcast 5130
BVS-3200C: production switcher; diverse features, capabilities.
DVS-8000: digital mixer; 2.5 mix/effects, digital multi-effects systems; digital routing of 4:2:2 D1, 4×F_{SC} D-2, audio router.
Circle (1103)

Thomson Video Equipement 5920
IMPULS: component digital mixer; 4:2:2 mix, switching system for medium size post-production; *Key Compose* creative feature.
Circle (1178)

Utah Scientific/Dynatech 6030
PVS series 2: production switcher; live or post-production system; multimix/effects, program, preset buses; DSK, analog key edgers, automated memory effects system.
Circle (1205)

Vistek Electronics 1010
VISION 5001: digital video mixer; post production and graphic preparation; conforms to CCIR 601, 656; digital input, output, analog component options; recall control settings from memories.
Circle (1236)

Video Products

V7: Processing

- Compositing, keying
- Format conversion
- Signal correction
- Standards conversion
- TBC/synchronizer
- VBI ID, sync generators

A.C.E 3234
DMG1000: digital matte generator enhancements; optional framestore functions.
Circle (501)

A.F. Associates 1756
DVNR 1000: digital noise reduction system; use at any junction in a video signal path, such as in dubbing/re-editing; reduces film grain, allows poor quality tapes to be enhanced; 10-bit with motion adaption, 2-D non-linear median filtering; 2-D aperture correction; from Digital Vision/Sweden.
Circle (502)

ACCOM Inc 2900
D-Bridge 122: digital video encoder.
Circle (505)

Allen Avionics 5607
Series 6 filters: for 4:2:2 component signal processing.
Digistream Mk II: CCIR-601/656 signal decoders.
BLC 100: composite video black level clamp.
Circle (525)

Alpha Image 7017
NTSC/D-2 decoder: adaptive frame decoder.
Alpha 330/340: D-1/D-2 digital serializer, deserializer.
Alpha 350N: NTSC/D-2 digital frame decoder.
Alpha 311/320A: digital encoders, decoders.
Alpha 400: D-1 digital framestore, synchronizer.
Circle (530)

ASACA ShibaSoku 5152
VK12A1: GCR inserter: ghost correction system.
TG98AX: ghost signal generator.
Circle (557)

Automation Associates 6330
CKM-4: multilevel keyer; provides keying, layering for various switchers.
Circle (578)

AVS Applied Video Systems 3634
Enhancements to product line.
Circle (580)

Broadcast Video Systems/BVS 5041
SA102: safe area generator; miniature, portable unit.
Model 734: RGBS to Y/P_B/P_R transcoder; H-

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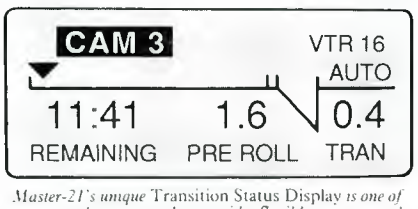

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phase adjust, adjustable Y setup.
Model 735: $Y/P_B/P_R$-RGBS transcoder; jumper selects sync to any channel.
D100: multiformat decoder; NTSC to Y/C, Y/R-Y/B-Y and RGB; digital adaptive comb filter for 35dB luma, chroma separation.
MASTERKEY: four models; downstream, linear keyers for on-air, post production; frame accurate mix-to-key, fade-to-black, key masking, full preview, key source select with key set memory.
Circle (620)

Camera Mart **6330**
CKM-4: multilevel keyer from Automation Associates.
Circle (636)

Canon USA/Broadcast Optics **3134**
HDTV-CODEC: switches between satellite communications, optical fibre modes; transceiving for local area networking; new digital transmission protocol developed with KDD.
Circle (639)

CEL Electronics **1212**
P165 Tetra: standards converter; 4-field temporal, four 8-line vertical spatial filtering, 8-field storage, DSP control pipelining; PAL/-M, SECAM, PAL-M, NTSC 3.58/4.43, Y/C, DUB, component signals.
Circle (648)

Central Dynamics **2052**
Stage>Xencoder: component analog video to NTSC composite.
Stage>Xtranscoder: D-1/D-2 format translator.
Circle (649)

COMLUX **9037**
Models 3803/04: quad 8-bit video codec; serves NTSC and baseband video scrambling; four digital NTSC channels with 5.2MHz channel bandwidths; linear digitizing without compression.
Circle (674)

Comprehensive Video Supply **1660**
Signal generators, processors: computer-to-video encoders, composite video equipment; SG-2 black burst generator.
S-VHS signal corrector, decoder.
Circle (678)

Crosspoint Latch **3308**
Model 6901: rack frame; supports seven plug-in transcoder modules.
Model 6051: RGB-Y/C encoder.
Circle (700)

Digital Processing Systems **3234**
DPS-265: 4-field frame synchronizer; TBC functions for playback of color-under VTRs; auto mode switching; 6MHz bandwidth synchronizer with fixed SC/H relationship; digital adaptive comb filter.
RC-270, RC-275: remote controllers for DPS-270, DPS-275 TBC systems.
DPS-245: quad framestore, synchronizer; four independent 4-field buffers, RS-170A outputs; independent freeze; 6MHz bandwidth; separate previews, GPI inputs per channel; preview channel feedback.
Circle (729)

ESE **6714**
ES-235: video auto-fader with video black generator.
Circle (766)

Faroudja Laboratories **5938**
CTE-3 encoder: RGB-to-NTSC with computer output; pre-filters luminance, chroma; Y/C (S-VHS) inputs, output; locks to composite black or separate sync signals, provides advanced black reference.
CFD-3 decoder: NTSC-to-RGB; active comb-filter for dot crawl suppression; 6MHz bandwidth; chroma enhancement; RGB, color difference, combed Y/C sync delayed NTSC composite outputs.
Circle (771)

Field Engineering **1146**
Model 389: in-camera miniature safe action/title generator; works with most broadcast cameras.
Model 190: in-monitor miniature safe action/title generator; operates with most monitors.
Circle (777)

FOR-A **3522**
CT-100: component transcoder.
EVM-4300: color correction system with event memory.
FA-425: TBC optimized for U-matics.
FA-700: dual channel TBC for S-VHS.
MF-1000: TBC system with digital effects.
Circle (784)

Grass Valley Group **5830**
DSK-102: control panel for DSK-101 linear keyer; rack-mount panel for vans, edit suites; luminance, linear keying; four key source/fill inputs; key mix/fade-to-black, frame accurate; GPI inputs.
EMPHASYS: converts any component analog video signal to composite digital D-2, NTSC or PAL; 16 filter combinations of encode processing, artifact removal, HF boost requirements; SPG, timing function.
Circle (807)

Grunder & Associates **1212**
CEL P165 Tetra: broadcast standards converter; NTSC 3.58/4.43, PAL/-M, SECAM, DUB/Y-C, component inputs, outputs; 4-field temporal, four 8-line spatial filtering; 8-field storage and DPS pipelining.
Circle (810)

Harris Video Systems **6700**
HarrisVws 100: 2-channel framestore.
Circle (816)

Hotronic **2935**
AH91: dual-channel TBC, digital effects; 3.58, Y/C-688, composite switching; wide bandwidth freeze frame/field; chroma noise reduction; DOC; audio switcher.
Circle (828)

I•DEN Videotronics **1016**
IVT-7: TBC/frame synchronizer.
IVT-7P: TBC/synchronizer for PAL.
IVT-9 PLUS: production model TBC, synchronizer; multiformat transcoding.
IP-500: video standards converter; supports NTSC, PAL, SECAM.
Circle (836)

Inline **7110**
IN2095, IN2096: interface for NTSC, S-VHS to RGB+sync monitor or video displays; adjust color, brightness, contrast, hue, peaking.
Circle (844)

Intelvideo **6509**
Model IV-3A: NTSC color encoder; dynamic enhancement of detail as a function of color and saturation; digital comb filtering, color modulation, SMPTE color bars; optional D-2 output.
Model IV-5 Pre-coder: luminance correction, enhancing, color detail enhancement; used prior to NTSC encoding for improved NTSC pictures.
IV-6 NTSC color encoder: digital comb filtering, color modulation; variable vertical enhancement/de-enhancement; optional D-2 output.
Circle (854)

Leitch Video **3516**
SPG-1302: D-2 sync generator.
1300SI: source ID module for SPG-1300N, -2600N systems.
SPG-2600N: NTSC modular sync generator.
DFS-3002N: D-2 frame synchronizer.
Circle (895)

Magni Systems **1026**
VGA Producer: enhancements to IBM AT/compatibles video encoder; NTSC, S-VHS outputs with full genlock; remote control of effects features; 640×480 pixel with 256 colors.
Circle (919)

Merlin Snell & Wilcox **1041, 2100**
ME 9900 Merlin: standards converter; 4-field, 4-line aperture; *advanced motion processing;* features include TBC, synchronizer, color correction, detail enhancement, noise reduction functions.
Circle (939)

Microtime **5740**
FS-8, FS-10: frame synchronizers; 8-bit, 10-bit production models; FS-10 produces D-2 composite digital outputs, $4\times F_{SC}$ sampling; dual inputs for AB source select; programmable *bad video* features.
Circle (944)

Midwest Communications **3234**
DPS-265: Digital Processing Systems 4-field frame synchornizer.
DPS-245: DPS quad framestore.
RC-270, RC-275: remote control units for DPS-270, DPS-275.
DMG1000: A.C.E digital matte generator enhancements; optional framestore feature.
Circle (946)

Nova Systems **2922**
NOVASync 2F: frame synchronizer, TBC with freeze; full bandwidth; A, B, S-VHS Y/C, alternate input; heterodyne, VTR-SC, S-VHS: video AGC; digital DOC; default to any input. black, color, freezeframe.
NOVASync F: synchronizer with freeze; full bandwidth; A, B, alternate inputs.
NOVASync 2: TBC, synchronizer; A, B, S-VHS Y/C, alternate inputs; video AGC, DOC.
Circle (977)

OKI Elecric Industry **380(**
LT2000: TV standards converter; *motion vector system* reduces jerkiness, fuzzy resolution of moving objects; algorithm produces new field from previous and present fields; production model.
Circle (985)

Omicron Video **295:**
#481: transcoder; for composite, com

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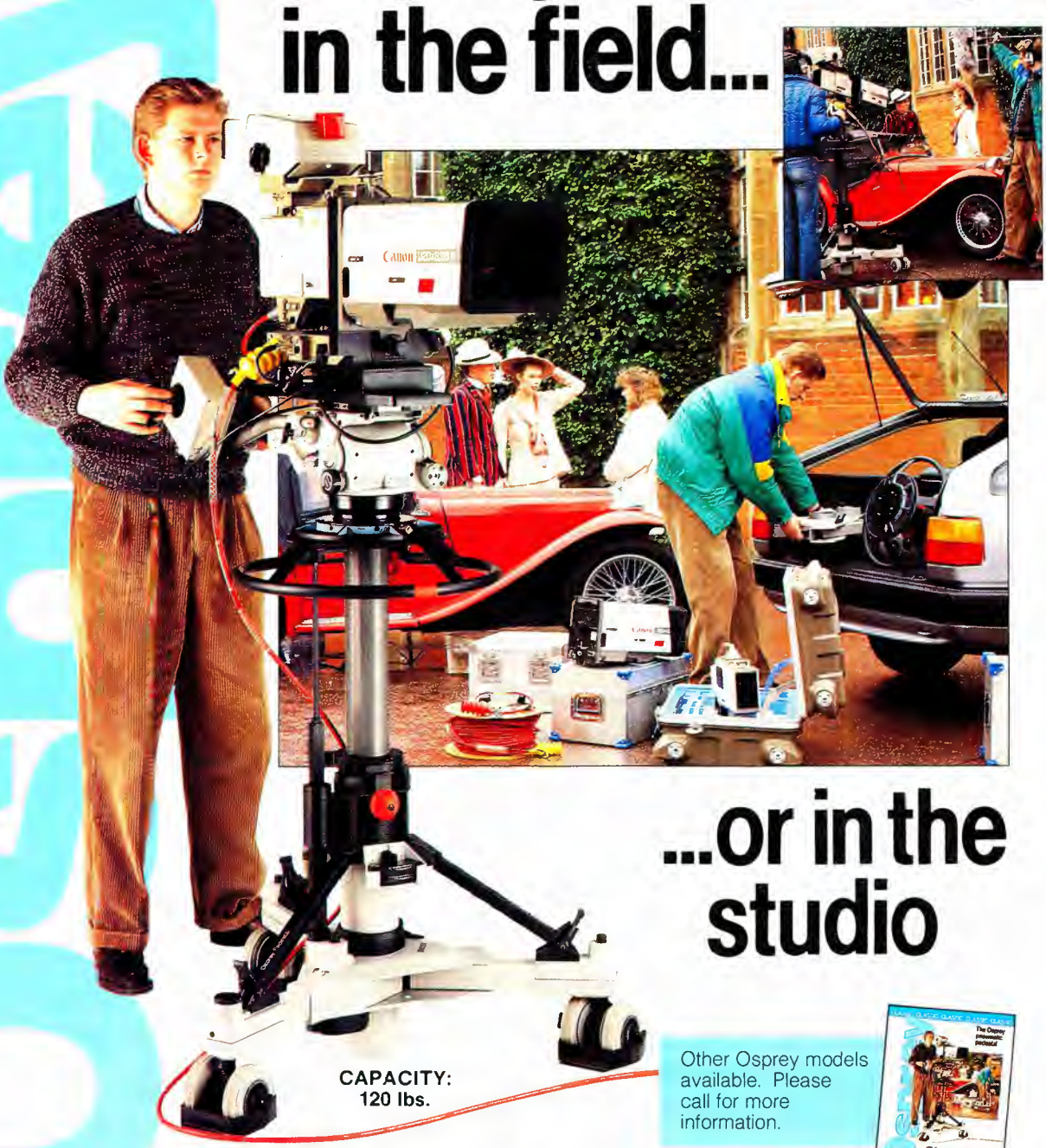

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ponent, S-video and Y/C-688 formats.
#711: S-video/Amiga computer genlock.
#721: multiformat Amiga computer genlock system.
Circle (987)

Prime Image **7010**
Series 300: 6.0MHz bandwidth synchronizers, TBCs; with, without digital effects features; NTSC, PAL models.
Noise reduction: 20dB variable noise control for HR600+ and 7.5MHz systems.
Circle (1018)

Progressive Computer Products **8012**
V-Machine: TBC, special effects "video computer."
Whackit: S-VHS to Y/C-688 translator.
Circle (1025)

QSI Systems **3034**
Model 2048: message generator.
Model 5400: sync processor.
Model 3000: safe area generator.
Model 5700: auto video switchover system; activates on high noise or low signal levels.
Circle (1029)

RF Technology **2612**
RF-ACC-5L: auto chrominance corrector; use with moving source microwave links; fast response, switchable clamp; auto reference for luminance level, adjustable gain, stabilized chroma flutter.
Circle (1053)

Snell & Wilcox **1041, 2100**
ME 9900 Merlin: standards converter; 4-field, 4-line aperture; *advanced motion processing*; TBC, synchronizer, color correction, detail enhancement, noise reduction functions.
Circle (1098)

Thomson Video Equipement **5920**
TTV 7655: 8-to-10 universal data converter.
TTV 4450 Colorado: production model; 4:2:2 color corrector.
Circle (1178)

Ultimatte **1122**
Ultimatte System 6: video compositing system with Screen Correction; permits fully linear matte even when blue screen shows results of vignetting and other imperfections.
Circle (1195)

Video Accessory **1330**
Black burst generator: 9 outputs or 6 black burst plus subcarrier, and composite blanking and sync.
Circle (1220)

Video Associates Labs **1910**
MicroKey Mark 10 series: expansion products for video, text, graphics overlays; requires one slot of IBM/compatible PCs; fade, RGB, fade/RGB modules; videodisc controllers.
Circle (1221)

Video International Development **3020**
DTC-2504: standards converter; digital image enhancement, noise reduction; 4-line, 4-field interpolation; NTSC, NTSC-4.43, PAL support; 8-bit quantizing of luminance and R-Y/B-Y.
DTC-3604: standards converter; full-feature 4-field design; digital interface per EBU spec; includes image enhancement of DTC-2504 with comb filter decoder; 4:2:2/13.5MHz luminance sampling.
Circle (1226)

Videotek **1246**
RGB-1 chroma keyer: compliment to Prodigy switcher, or other systems; remote control; adjustable sensitivity; *proximity* indicator shows relative closeness of keyer setting to background color.
Circle (1232)

Vistek Electronics **1010**
VECTOR: bidirectional standards conversion for NTSC, PAL (I, B, G) composite standards, analog component, 4:2:2 inputs, outputs; options for PAL-N/-M, SECAM, HDTV.
Circle (1236)

Yamashita Engineering Mfgr/YEM **1312**
CVS-900B: auto scan convertor; NTSC, PAL output from analog computer input, 1024x512-pixel resolution; composite, component, RGB/S, RGB/S, S-VHS outputs.
CVS-910 series: real-time auto scan conversion; NTSC, PAL; RGB, RGB-TTL inputs produce RGB, sync, composite video, component video, superimpose, key outputs.
Circle (1260)

Zaxcom Video **6543**
ZX400: four TBC/D-2 control system.
Proc Amp: allows independent adjustment of Betacam component levels.
LSM1500: TBC control for Betacart and Sony Library Management Systems.
Circle (1261)

Video Products

V8: Displays

- Monitors
- Projection systems
- Video printers

ASACA ShibaSoku **5152**
CM30A6: 30" HDTV color monitor.
Circle (557)

Barco Industries **2944**
AVM series: Grade 2 color monitor; auto alignment of color temperature, contrast; RGBS, S-VHS, Y/R-Y/B-Y component inputs; 10" HR CRT or 10", 14", 21" flat-square CRT, standard resolution.
Circle (586)

Comprehensive Video Supply **1660**
FDM-027: hand-held flat display monitor.
Circle (678)

Conrac Display Products **5800**
Model 6545 upgrade: Y, R-Y, B-Y input option; digital decoder; on Class A 13", 19" color video monitors.
Circle (693)

Leader Instruments **3012**
Model 5130: color monitor; half-rack size.
Circle (892)

Mitsubishi Electric Sales **162W**
VS-F100: rear projection system, 100" diagonal; through-the-wall operation.
VS-S100: rear projection system, 100" diagonal; free-standing.
CP-200U: large format color video copy processor.
CP-100UA: small format color video copy processor; upgraded product, accepts higher input frequencies.
AM-2751A, 3151A: 27", 31" multiscan monitors; track horizontal frequencies in 15-36kHz range.
Circle (949)

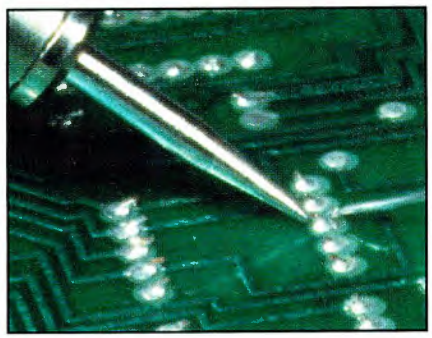
Nikon Photo/Electronic Imaging **6512**
Video printer: thermal dye transfer system; accepts analog, digital inputs.
Circle (975)

Professional Sound Corp **9001**
CVM series: computerized video monitoring systems.
Circle (1023)

Sony Communications/Broadcast **5130**
BVM-1910 video monitor: enhanced models.
Circle (1103)

Video Accessory **1330**
Monitor power switch: applies power to monitor, based on presence of a video signal.
Circle (1220)

Videotek **1246**
AVM-13sv: 13" color monitor; audio, Y-C input feature.
Circle (1232)



Frame-line generator defines picture area

By John McGaughey

A common problem in TV systems is the loss of video information at picture edges. The cause is receiver overscanning, and the result is that viewers miss action and are unable to read text. Studies on this subject have led to SMPTE-recommended practice RP 27.3-1983. This recommendation specifies a safe title area in a video frame, consisting of lines defining the 10% and 90% points both horizontally and vertically. Using this as a visual aid, camera operators and directors can see where to confine information so that, statistically, the entire audience will be able to see it.

McGaughey is an engineer with the University of Georgia Telecommunications Center, Athens, GA.

System design

The cutoff points can be generated electronically on a camera viewfinder. Two modifications to the basic pattern are to add a cross-hair defining picture center and to make the borders a black-to-white transition increasing visibility under varying video levels.

The frame-line generator is designed to work in conjunction with a video switcher to which the cameras are timed. Figure 1 shows how the generator would connect into a typical system. Frame-line timing is derived from switcher sync and blanking. To achieve correct horizontal timing of frame lines, the camera video must be timed properly to switcher black.

The generator has two sections: a digital section that generates all timing and an analog section that creates borders in the video signal. The typical system would have one digital section feeding multiple analog sections, each servicing one video source.

Circuit description

The digital board, shown in Figure 2, separates sync into its horizontal and vertical components. To generate horizontal lines, an 8-bit counter (U7) is reset by vertical sync and clocked by horizontal sync. The count addresses a 356 × 8 PROM (U11) that looks up where to create black and white lines.

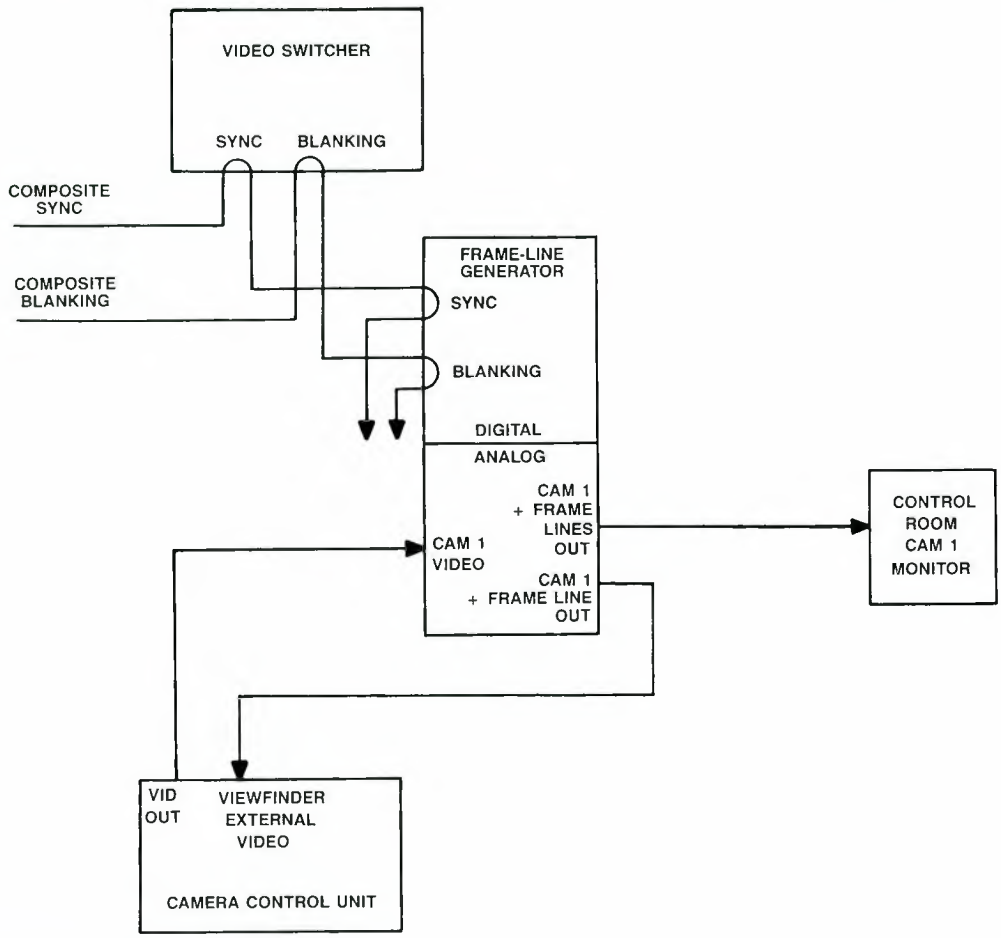


Figure 1. Frame-line generator in a typical configuration.

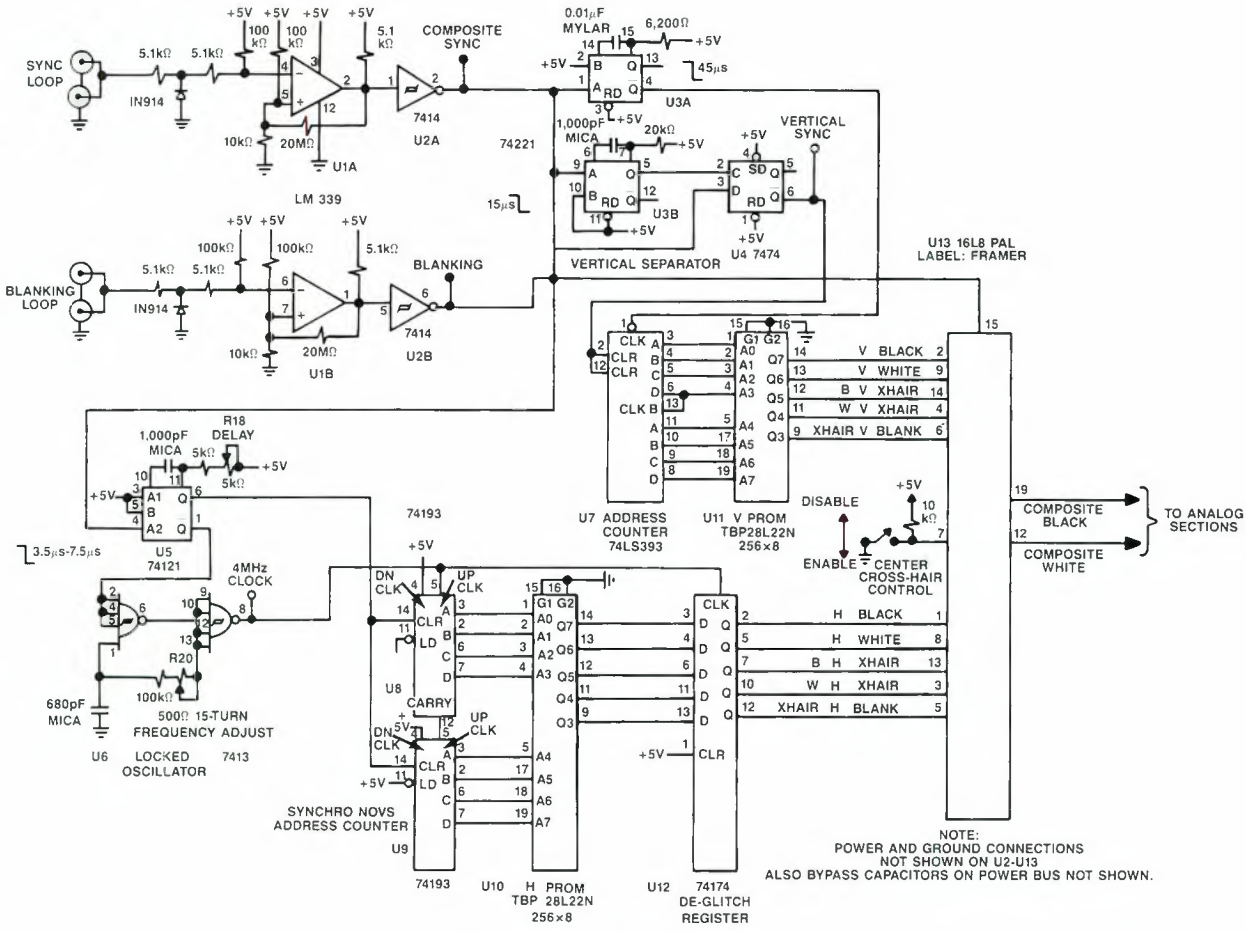


Figure 2. *Frame-line generator digital section. This section generates the required timing signals that control the analog board.*

The vertical lines are created similarly using a synchronous 8-bit counter composed of U8 and U9. The counter is reset during sync and clocked by an oscillator running at approximately 256 times the horizontal rate. The count addresses PROM U10, which looks up where to place vertical black and white lines.

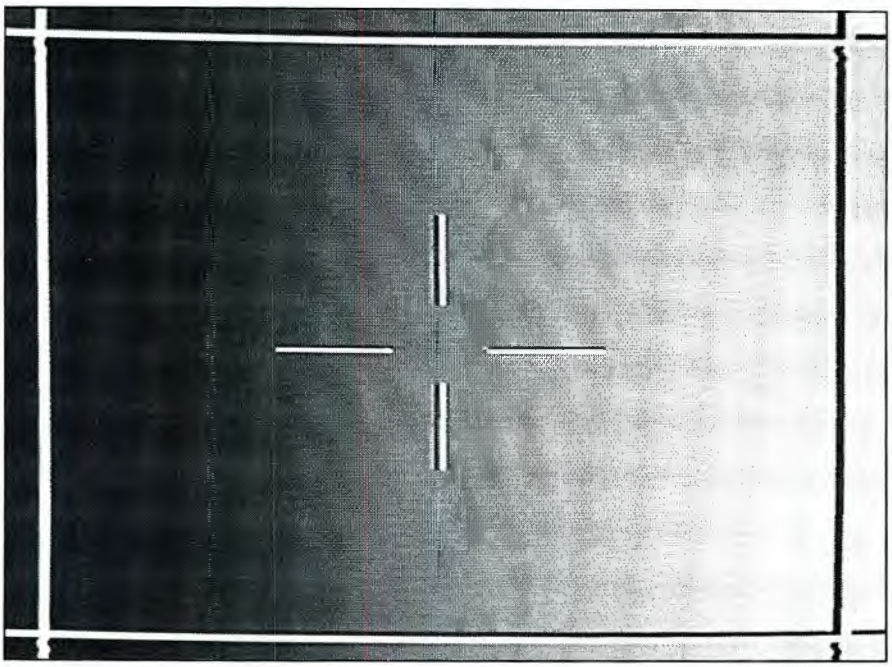
Potentiometer R18 provides an adjustment for delay and will move vertical lines in the video. Adjustment R20 is the oscillator frequency and will move the right-hand border. These two controls are used for precise location of the left and right borders at the 10% and 90% points.

The logic that combines the outputs of the horizontal and vertical PROMs into two switching signals for the analog section is implemented in a PAL (programmable array logic) chip (U13). Use of this type of device allows implementation of a rather long logic expression in one IC. Blanking is applied to this IC to stop generation during that time.

The analog board, shown in Figure 3, deliberately was kept simple because many are needed in a typical system. The circuit is basically a 3:1 high-speed video switch followed by the video-distribution amplifier.

The incoming camera video is clamped and applied to one input of the switch. The remaining inputs come from the trimmers that set the black-and-white border levels. The switch is a 74HC-4052 analog multiplexer. Do not substitute a CD-4052 for this part; its switching speed is not high enough. The video with borders is then ac-coupled to a distribution amplifier.

The circuit provides two outputs. One feeds the camera viewfinder external input, and the other goes to the control room video monitor.



A cross-hair pattern defines the center of the picture. The borders have been modified to be visible despite varying video levels.

A helping hand

To assist those who would like to build this system, the University of Georgia is making available the three programmable chips required in the digital section. The $20 fee includes a comprehensive waveform chart to help in troubleshooting the system. Contact J.T. McGaughey, University of Georgia Television Center, Room 183, Georgia Center Building, Athens, GA 30602; telephone 404-542-1226.

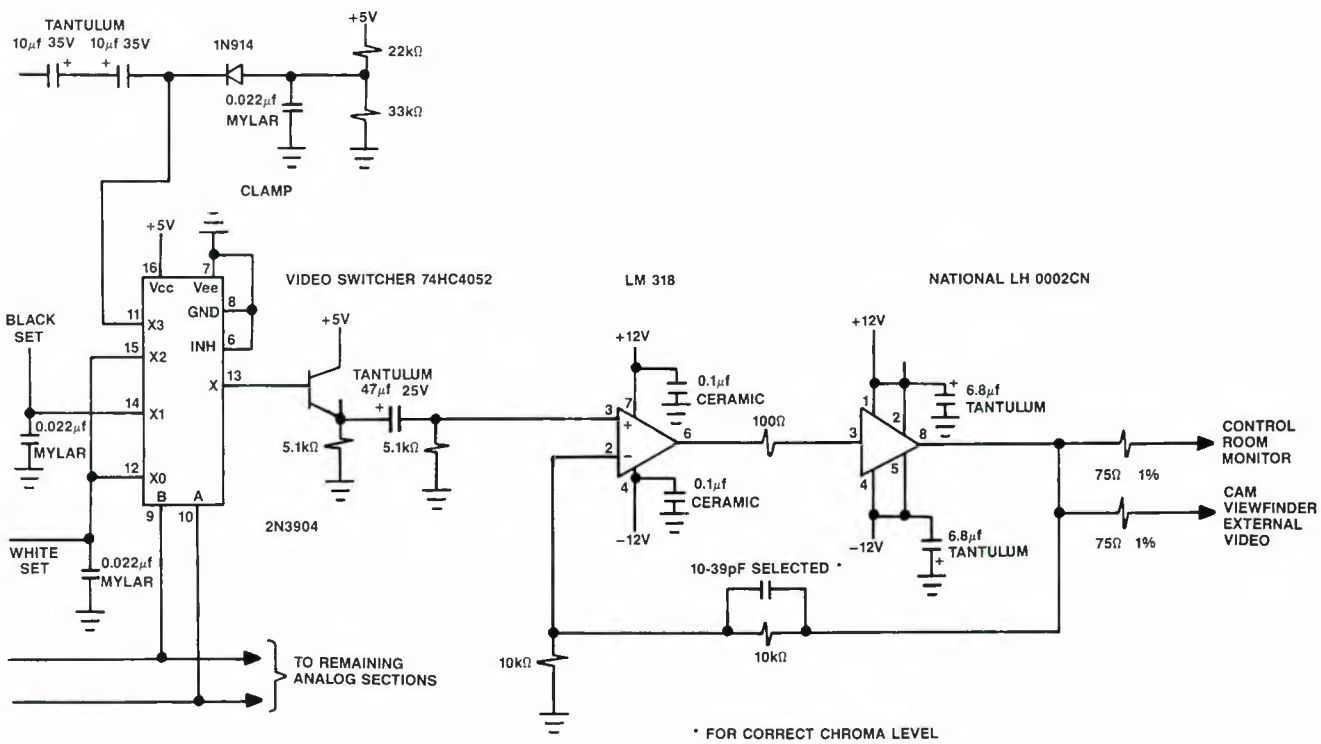


Figure 3. *Analog board. Each video source is passed through one circuit. Simple construction keeps costs low and permits the circuits to be located together in a rack-mount configuration.*

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Lexicon LXP-1, MRC MIDI controller

By John Bennett

Lexicon's LXP-1 multi-effects processing module and companion MRC MIDI remote control represent the company's first major effort to produce low-priced items of this description. Although the LXP-1 and MRC are sold as separate units, they work well as a pair. In an ideal setup, one MRC unit would control two LXP-1 units, as shown in Figure 1. Such a configuration would provide a lot of power without costing a lot of money.

Features

The processor is rack-mountable with the proper kit. By itself, the unit occupies about half the width of a rack-mount space and weighs 3.5 pounds. The MRC will sit comfortably in almost any location and is even smaller than the processor.

The processor's front panel contains a receive signal light, a signal peaklight and controls for input, output, wet-to-dry signal ratio, decay and delay. A program-selector knob provides access to 16 different algorithms.

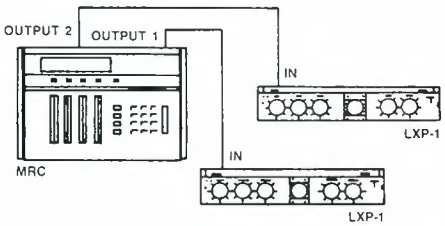


Figure 1. An optimum setup would contain two LXP-1 processors and a single MRC controller.

A MIDI button, located in the upper right corner of the front panel, is used to assign MIDI channels. The back panel contains the stereo inputs and outputs, a defeat foot switch port and MIDI in and "thru" connections. If a mono output is desired, the unit internally sums the left and right channels.

A unique feature of the LXP-1 is that the decay and delay control knobs do not have a mechanical stop. The knobs turn freely. This feature allows the user to switch from the minimum to the maximum setting simply by turning the knob one notch counterclockwise.

The decay and delay knobs have no numbers, just markers. This means you do not know exactly what setting you've selected. I liked the fact that I was moving the dials and listening more closely rather than guessing what setting would sound good and trying to dial it in.

The LXP-1 uses 16-bit linear PCM analog-to-digital and digital-to-analog converters to process audio. It has a dynamic range of about 85dB.

Bennett is chief engineer at WVUM-FM, Coral Gables, FL.

Performance at a glance

LXP-1:

- *Frequency response 20Hz-20kHz, ±0.5dB (dry) ±1dB (wet)*
- *Dynamic range 85dB*
- *THD at 1kHz <0.05% (dry) <0.07% (wet)*
- *Available programs:*
  Reverb (halls, rooms, plates,
  Inverse room
  Gated room
  Delay 1
  Delay 2
  Chorus 1
  Chorus 2

MRC:

- *Dual MIDI outputs*
- *Dual MIDI inputs*
- *LCD display*
- *Operates in conjunction with the LXP-1*

MIDI control panel

The MRC control panel contains an LCD screen with contrast control, which at times is difficult to read. Four sliders and slider buttons control the parameters of the selected program, as well as allow you to scroll through selected menus. Several function keys are available, as well as a keypad for manual entry of data.

The way these two units work together is simple. A program is selected on the LXP-1. That same program must be selected on the MRC using one of the sliders and the *edit* and *setup* keys. Once you have selected that program, you have control over eight parameters. This configuration offers more flexibility than the processor alone could.

Two pages of parameters are available to each program, with four parameters to a page. (See Table 1.) By depressing the *page* button, you can alternate between pages. The four sliders control each of the parameters. Two 1/4-inch jack inputs at the back of the MRC provide for external control from a pedal control or other device.

Also on the back panel are two MIDI inputs and two MIDI outputs, which enable the unit to be connected to other machines. Although there are only eight user-adjustable parameters, I did not find myself at an impasse at any time. I was able to achieve awesome-sounding effects in any situation.

Operating modes

Operating the processor is extremely easy. That's important if you'll be using it in a high-pressure studio environment. The controller, however, takes some getting used to, and I found the manual to be

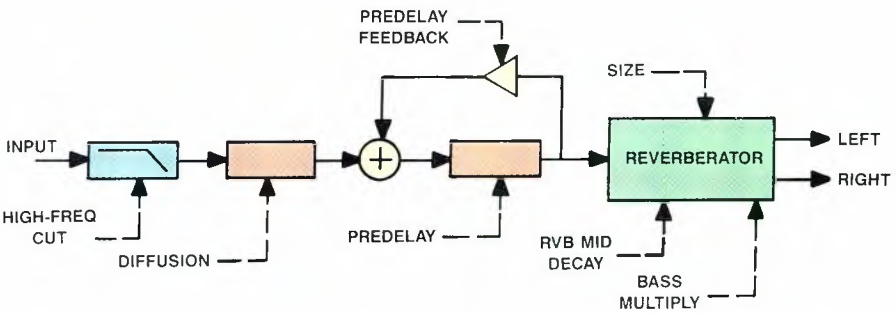
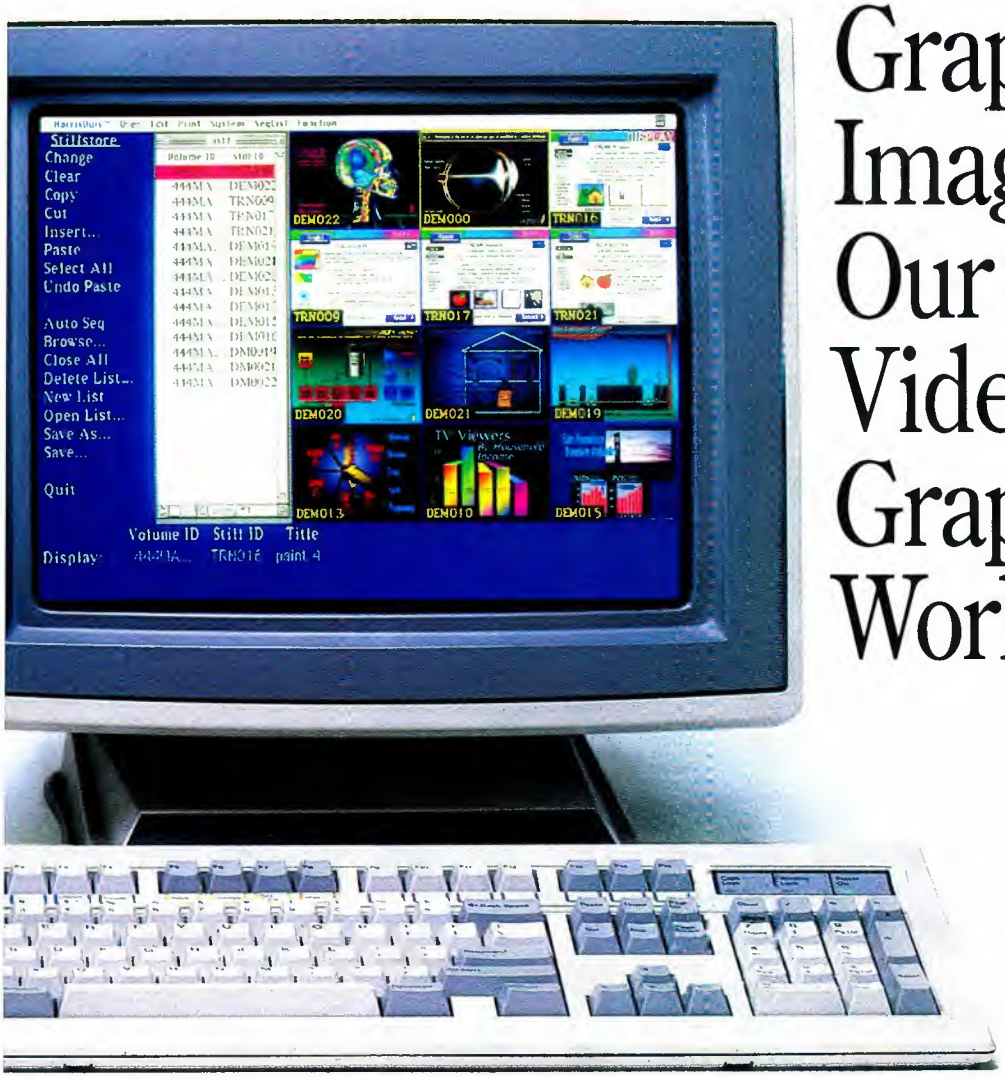


Figure 2. When using the reverb algorithm, room size, high-frequency cutoff and diffusion can be adjusted.



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somewhat difficult to comprehend.

Five different *modes* are available from the MRC. Even though a diagram illustrates each mode, it takes awhile to get used to the machine. I wish that the manual had been better laid out. It really tries to be operator-friendly, but the diagrams need to be clearer and the explanations more detailed. I will say that once I got the hang of the MRC, the unit became an invaluable tool in my studio. Because it was easy to use, I could change both the parameters and the programs quickly.

There is room in the system to store 128 user presets, which gives you a good deal of space in which to alter the LXP's initial programs. I was able to use the processor and controller in a variety of situations, from live PA to the recording studio. In all cases, the units held up beautifully.

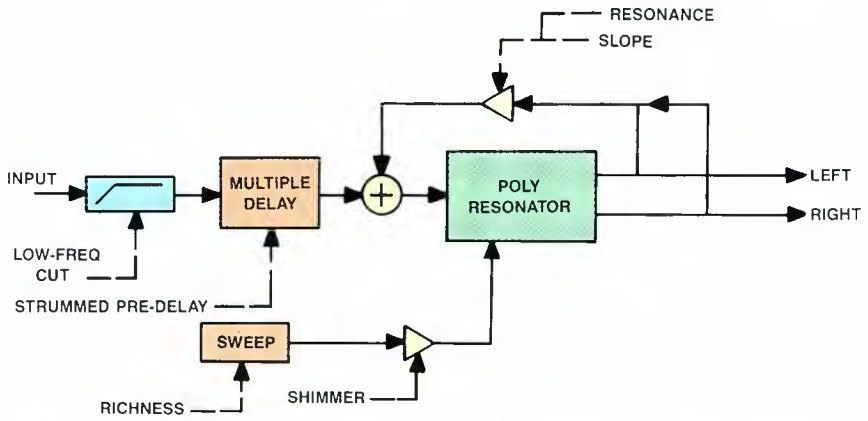

Figure 3. *The chorus algorithm provides access to specialized parameters such as richness, shimmer and resonance.*

Multimode features

Four types of algorithms are available in the LXP: *halls and rooms*, *plates*, *reverb effects* and *delay effects*. The halls-and-rooms mode is self-explanatory. The same goes for the plates mode, which mimics the sound of reverberation off of metal plates. Reverb effects include gated reverb and inverse room. The delay effects include chorus and digital delay. The reverb mode's adjustable parameters are shown in block diagram form in Figure 2.

I found that the halls-and-rooms settings were ideal for vocals and drums. Keyboards and guitars sounded good, too. Adjustment of the room size and sound was done quickly and efficiently and allowed me to come up with some attractive reverb sounds. The inverse and gate programs both proved to be useful in making my snare drum sound great. I used a saxophone and guitar with the chorus program (see Figure 3) and found that it sweetened up the sounds nicely. The guitars came through well, and were fattened up just enough. Placing basses and keyboards through the chorus also yielded impressive results. As you might be able to tell, I was quite pleased with the sounds that the units provided.

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er prices, you'll really like the Lexicon LXP-1 processor and MRC MIDI controller combination. These units don't have all the features of higher-priced devices, such as pitch change and harmonization. However, their great sound and reasonable price would make them a welcome addition to just about any studio.

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

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

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

REVERB AND PLATES

PAGE 1	Reverb Time 0.63 - 8.9 sec.	Room Size 8-71 m	High-Freq Cutoff 0.321 - 13.8kHz	Effects Level 0 - 100%
PAGE 2	Bass Multiply 0.3 - 2.5×	Predelay 0.000 - 0.262 sec.	Feedback −99 - +99%	Diffusion 0-100

CHORUS 1

PAGE 1	Rate 0 - 15	Depth 0.25 - 8.00ms	Waveform 0 - 7	Effects Level 0 - 100%
PAGE 2	Left Delay 0 - 1 sec.	Left Feedback −99 - +99%	Right Delay 0 - 1 sec.	Right Feedback −99 - +99%

CHORUS 2

PAGE 1	Tune −64 - +63	Resonance −99 - +99%	Low-Freq Cutoff 0.002 - 27.3Hz	Effects Level 0 - 100%
PAGE 2	Predelay 0.000 - 0.262 sec.	Slope −15 - +16	Richness 0 - 100	Shimmer 0 - 100

DELAY 1

PAGE 1	Rate 0 - 15	Delay 8.2 - 6.47ms	High-Freq Cutoff 0.321 - 13.8kHz	Effects Level 0 - 100%
PAGE 2	Delay - 2 0 - 1.02 sec.	Delay - 3 0 - 1.02 sec.	Feedback 3 −99 - +99%	Diffusion 0 - 100

DELAY 2

PAGE 1	Group Delay 0.005 - 0.635 sec.	Feedback −99 - +99%	High-Freq Cutoff 0.321 - 13.8kHz	Effects Level 0 - 100%
PAGE 2	Left Delay 0 - 1.02 sec.	Right Delay 0 - 1.02 sec.	Diffusion 0 - 100	

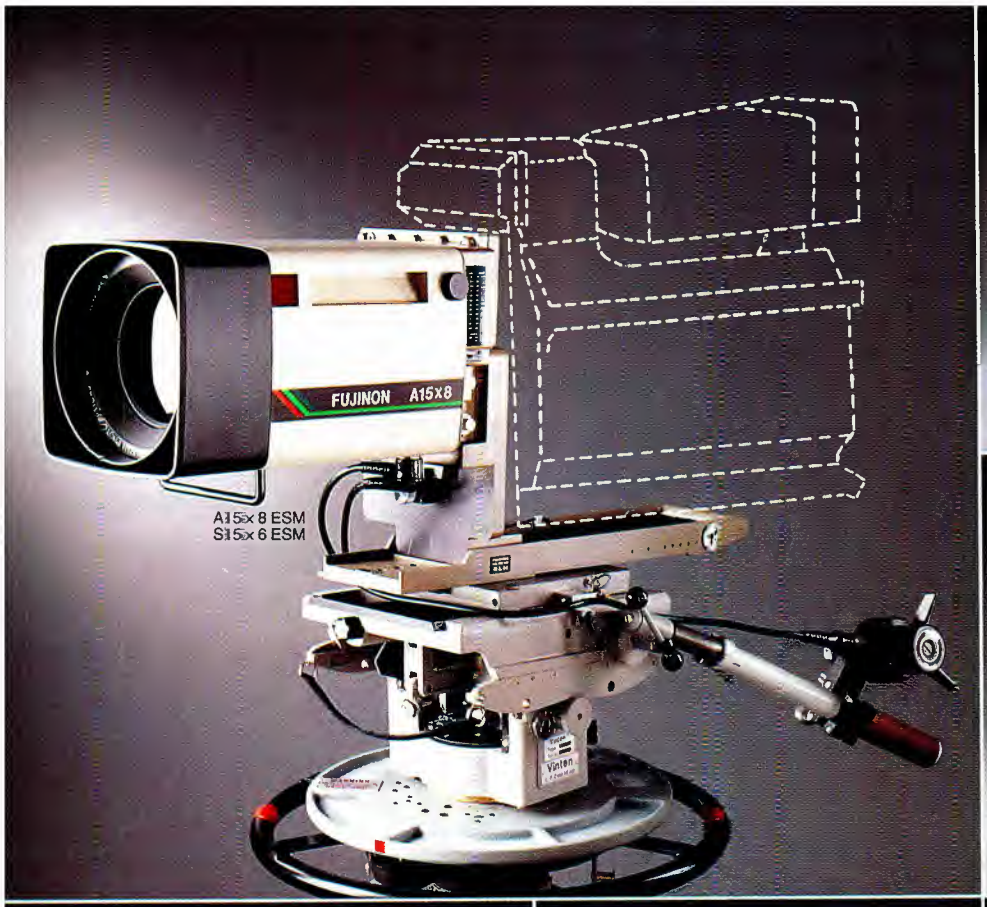
INVERSE

PAGE 1	Slope 0 - 31	Size 1 - 32	High-Freq Cutoff 0.321 - 13.8kHz	Effects Level 0 - 100%
PAGE 2	Feedback −99 - +99%	Predelay 0.000 - 0.262 sec.	Diffusion 0 - 100	

GATE

PAGE 1	Slope 1 - 16	Time 150 - 390ms	High-Freq Cutoff 0.321 - 13.8kHz	Effects Level 0 - 100%
PAGE 2	Feedback −99 - +99%	Predelay 0.000 - 0.262 sec.	Diffusion 0 - 100	

Table 1. *There are two pages of parameters available to each program with four parameters to a page. The processor provides a great deal of flexibility.*



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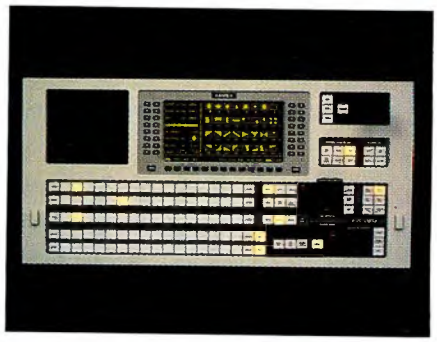
Ampex Vista production switcher



By Fred Lass

In 1928, when WRGB-TV, Schenectady, NY, began experimental broadcasts to the public, the scientists had to devise a switcher to put one of three cameras on the air. For many years, a simple mix was the only effect possible. Today, the station's engineers experience few limitations in selecting or mixing video sources. They are able to achieve a variety of transitions and effects through an Ampex 18-input Vista production switcher.

New production demands

In 1988, station management proposed a new program that required the construction of a second control room. The program, the "Big Money Movie," presented a way for the station to beat the high cost of syndicated material, by airing films from tape with live wraparounds. A host would introduce the feature and, during breaks, make telephone calls to viewers, who were offered prizes for correctly answering questions about the movie.

Two cameras, three VTRs and a character generator made up the complement of equipment to put the films on-air. When movies were not being broadcast, the new room would be used for dubbing the films to tape as well as editing the movies, creating promos for the films and burning in time code.

The budget limited the choices of video switchers. Because the consensus at the station was that live programming could be switched easier with program and preset buses, in addition to the effects bus, many basic switcher models were eliminated. The Ampex Vista was attractive because it had the necessary capability and offered numerous other features within

Lass is chief engineer at WRGB-TV, Schenectady, NY.

Performance at a glance

- *NTSC/PAL/PAL-M composite, 525/625 component standards*
- *10- and 18-input systems*
- *Digital effects interface*
- *Multiple-panel storage of switcher setups, including transitions and sequences*
- *Three linear keyers with key memory storage and key masking*
- *32-pattern mix/effects system with auto panning*
- *Variable border types*
- *RS-232, RS-422, GPI control ports*

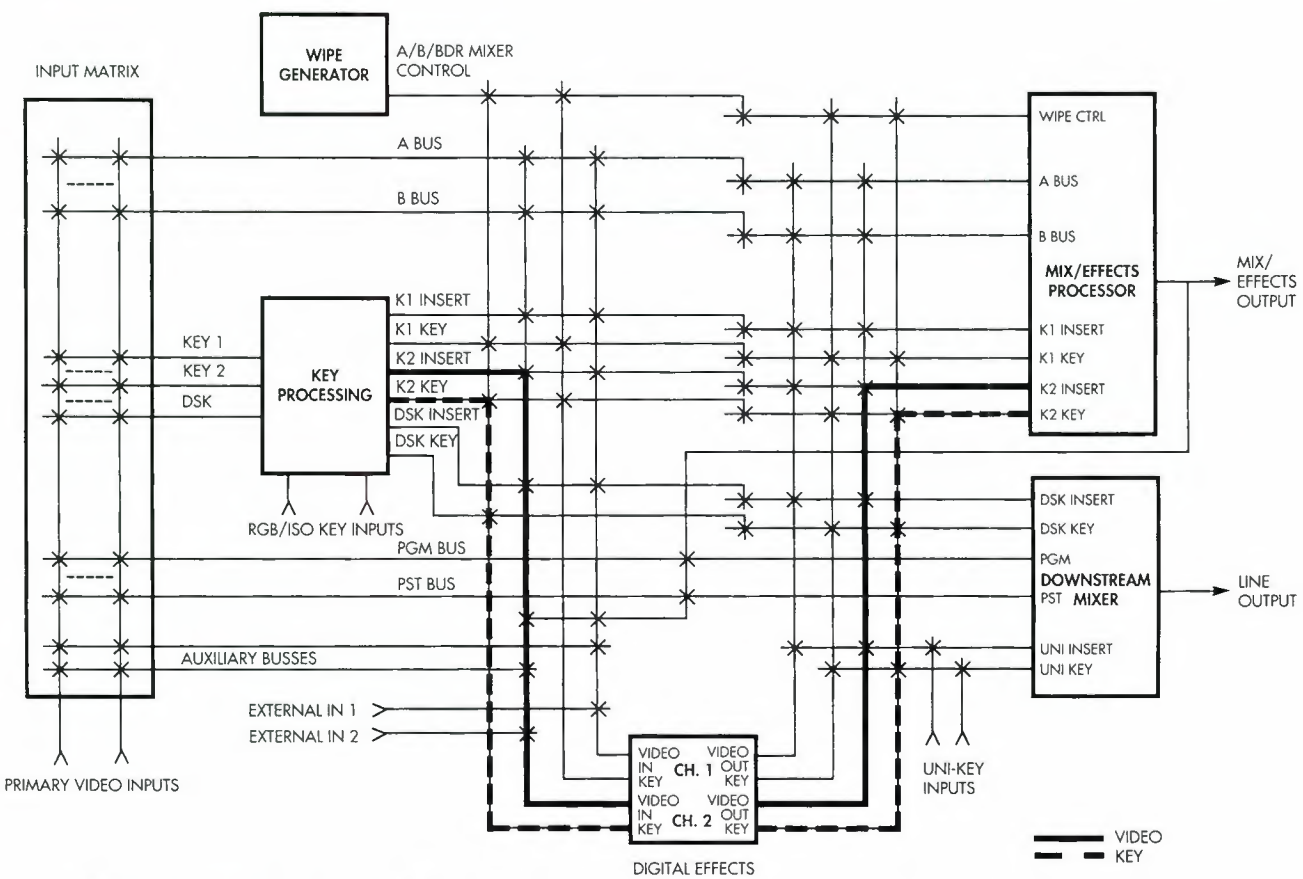


Figure 1. External routing of key signals with Digi-Loop. The feature proved important to production needs at WRGB-TV.

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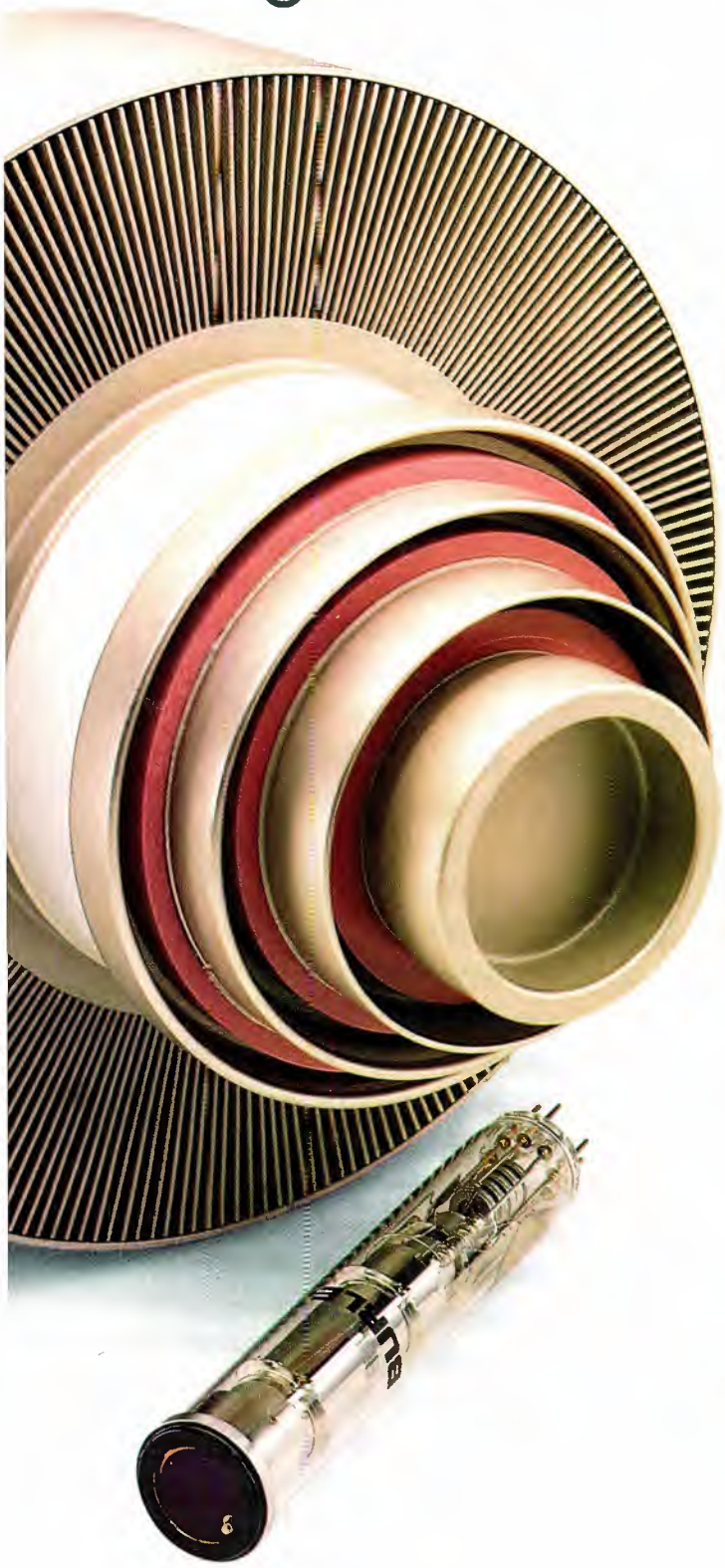

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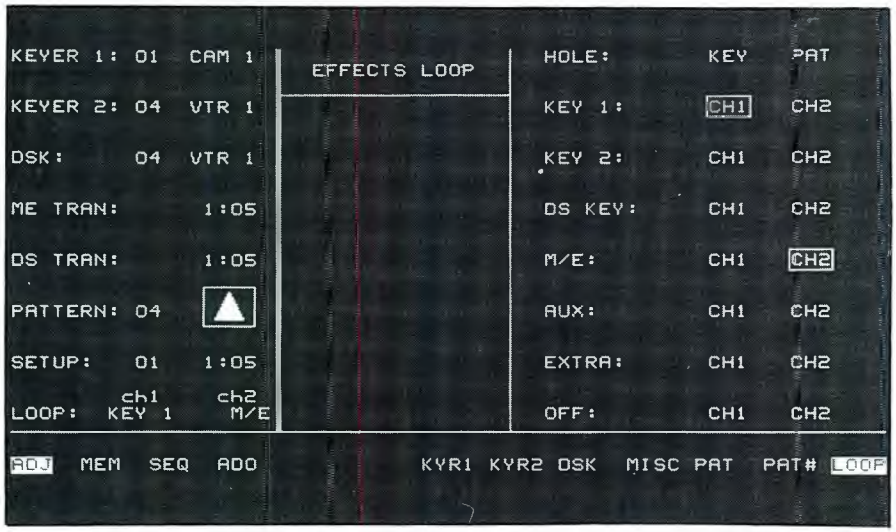
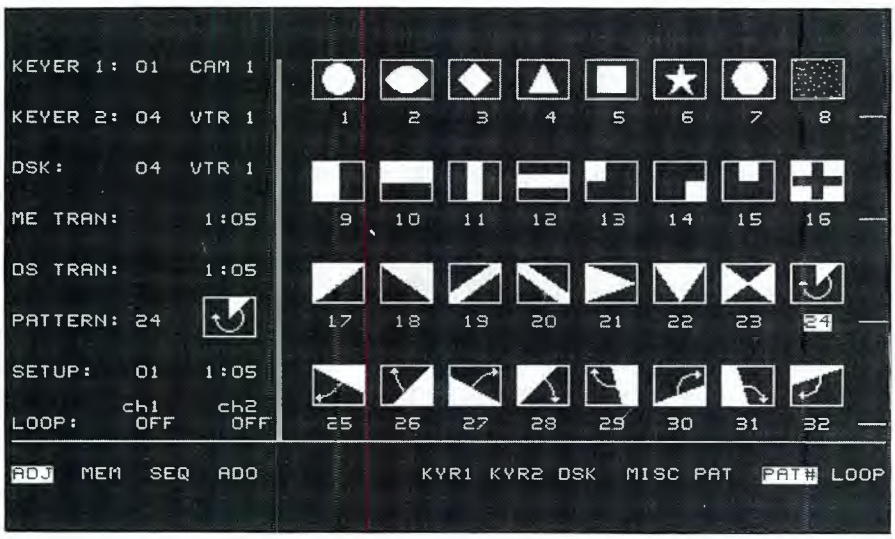
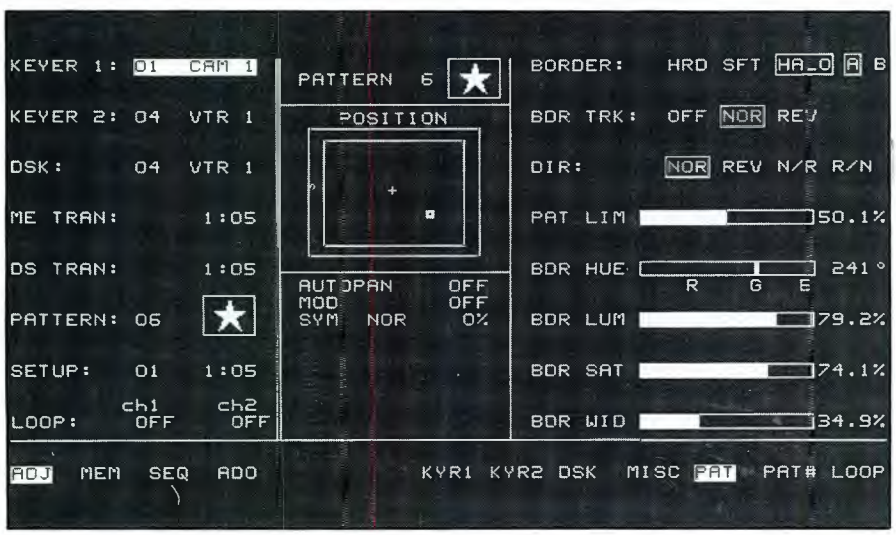


Digi-Loop effects menu allows selection of any six paths for DE insertion. Selections also are shown at the bottom of the on-air area.



Patterns are selected by using the control panel up-down button adjacent to the desired row of patterns.



A change in pattern and values. Pattern No. 6, the star, is represented in the same area used for key masks in the keying menus.

the station's budget.

Some of the primary requirements were: an editor interface; at least two levels of keying, including several internal key inputs to allow for digital effects; compact design and ease of operation.

The operators also requested switcher panel memory. The WRGB staff, using an AVC-33 in the main control room, had found that panel recall made difficult switching functions much easier for live operation. With its microprocessor control system, the Vista switcher can store 24 different panel configurations. In addition, 24 sequences, involving any combination of transition configurations, can be stored. One sequence can call another or loop back to itself, and manual control is available to the operator at all times.

Mix/effects and keys

The mix/effects architecture also was familiar to the operators. The effects system has two keyers and can be configured to cut key No. 1 over key No. 2, or vice versa, over two background buses. Keys can be mixed or wiped with the A and B background buses individually or in combinations, with key transition functioning in concert with, or independently from, the normal M/E transition system. Both keyers are full-function linear keyers, performing luminance, RGB chroma, composite chroma and ISO-type (external) keying.

The range of 32 patterns includes rotary wipes and pixel dissolves between sources. In addition, the operator has four levels of pattern border softness — hard, soft, soft halo, half halo — and border widths that can proportionally track the size of the pattern. Key masking, which is separate from the wipe patterns, can work on key No. 1 and key No. 2 individually for different positions of the key mask.

The downstream keyer also has two independent keyers. The simple Uni-Key is a non-adjustable unity gain linear keyer with external inputs for key signal and fill video as well as digital effects re-entry inputs.

The main DSK is a full-function keyer. Like the effects keyers, it performs luminance, RGB chroma, composite chroma and ISO-type keying. Each keyer has its own, separate matte generator. The key selector does triple duty.

A single row of push buttons controls three source buses and is easily switched between key No. 1, key No. 2 and DSK. The optional ISO-key switching module was installed to route the key signal from the character generator to these three keyers.

Digi-Loop

The capability to integrate an external digital effects system within the switcher is one feature that sets the unit apart from other systems. Although most switchers

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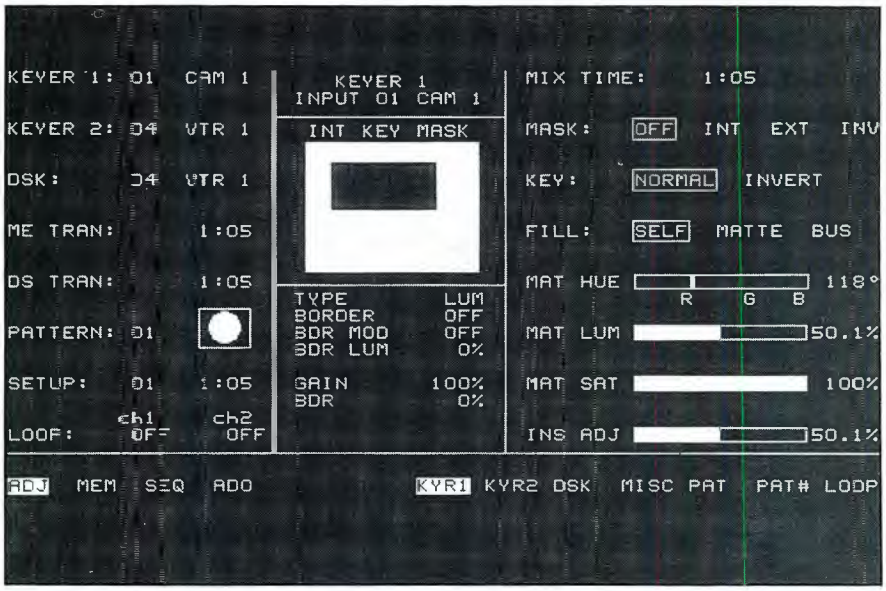

When a keyer value is changed, the source name appears in reverse to indicate that the current adjustments differ from key memory.

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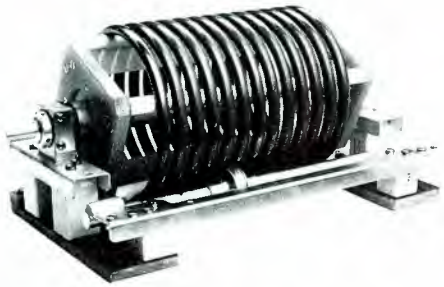

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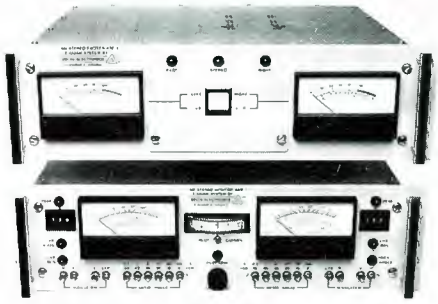

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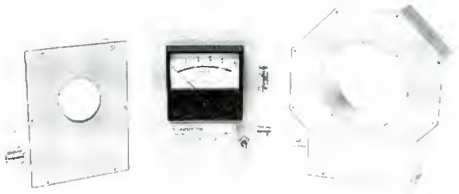

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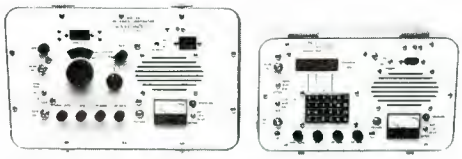

RF Receiver/Generator—A rugged, high output (2 watts) generator and correlation detector receiver virtually eliminate false nulls caused by interfering signals. The RG-3A operates from 0.5 to 1.65 MHz, and the expanded range of the RG-4 generates signals from 100 kHz to 30 MHz.

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High Power Pulse Reflectometer—Strong interfering fields that would destroy time domain reflectometers are virtually ignored by the PRH-1. This instrument can handle up to 1,000 watts of induced power on an intermittent basis as it locates faults on transmission lines. Provides a visual representation of the transmission or sample line, STL coax, or antenna, using your oscilloscope.

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Transmitter Power Controller—Your insurance against over- and under-power citations. Continuously monitors transmitter power levels, compensating for AC power line sag by adjusting the transmitter to 100% power.

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Digital Controlled Processor—This inexpensive, stereo tri-band processor boasts user-friendly controls and an aggressive sound. Mono stations can take a step toward AM Stereo, at a price that won't break the budget.

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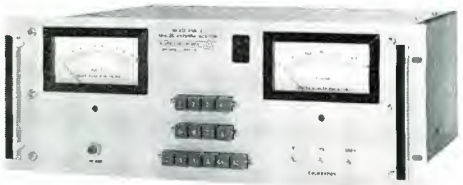

AM Antenna Monitors—These are true ratio monitors which deliver a ratio reading without the need to continually reset the reference tower to 1.000. This simple operation reduces errors by non-technical personnel and makes tuning an array easier.

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use the M/E systems to route signals to and from digital effects units, this switcher provides an auxiliary routing scheme, called Digi-Loop. (See Figure 1.)

The Digi-Loop allows for any 1- or 2-channel digital effects unit to be interfaced within the switcher and be in both the video and key signal path at any point that the operator wishes. One of the ADO 2000 channels already owned by the station was interfaced into the Digi-Loop without tying up the effects buses. These types of considerations make the unit comparable to switchers with multiple effects systems.

System control

When the switcher was unpacked, the producers were surprised at the small size of the control panel. The panel measures 12¼ inches from front to back, so it hardly seemed that it could live up to its many promises. It took a demonstration of the panel functions to convince everyone of its capabilities.

The adjustable values and status of the switcher are displayed in an electroluminescent window. Although the display looks imposing at first, operators soon learn what is being shown. Setting of parameters is accomplished through a series of menu levels, selected with a row of buttons located along the bottom of the panel. Along both sides of the panel are up and down "soft keys" to digitally adjust parameters; changes are shown graphically in the display. Functions of the soft keys change, based on the current menu level. Also, complete control of the new ADO 100 is possible with this arrangement.

In addition to the menu display, two remote-control panels are available. The first is an X–Y-type bus control panel that can be used to access eight of the switcher's 12 buses from a remote position. The station opted for the second remote option, a rack-mount 24-button control panel. Linked to the setup and sequencing memories and GPI capabilities of the switcher, this panel provides immediate remote access and triggering for 24 preprogrammed functions.

This controller makes it possible to recall frequently used setups without using the menu system in the electronic display. Communication from these panels to the switcher electronics bay uses looping RS-422 connections through a 9-pin D connector.

Installation

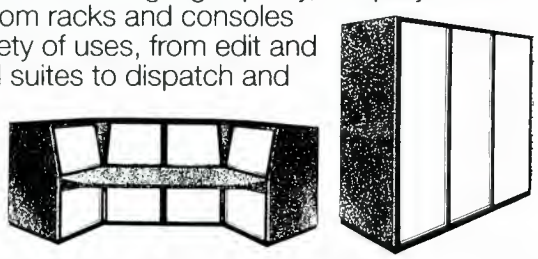
Putting the switcher into service was easy, and no problems came up. It did, however, take time to get incoming video and pulse lines cut to proper lengths for timing requirements throughout the plant. After connecting the timed inputs and a reference, the staff adjusted black and background timing to match the station's sources. It then took only a slight tweak of program/preset timing. Since the installation, few adjustments have been needed. Other than indicator lamps, there have been no component failures in 14 months of continuous use.

The equipment that is tied into the switcher includes three VPR-80 1-inch VTRs and a BVU-950 ¾-inch VTR. Their inputs are fed from one of four auxiliary switching buses. Two of these buses have switcher mix/effects re-entry available as sources. Also connected is an editor, a character generator, one ADO 2000 channel, two TK-45 cameras and two router output channels for other external sources.

For audio, a reel-to-reel recorder, two cart machines and a harmonizer are connected to a 12-channel audio board. Telephone audio for the console is supplied from a speaker phone. A separate audio operator is involved only when the control room is on-air. He's often busier than the Vista operator.

STS builds custom racks and consoles at modular prices.

One of the problems with buying "5-day delivery specials" and "off-the-shelf," standard-size racks and consoles is that you get standard quality. That never happens at Skaggs Telecommunications Service (STS). We specialize in fabricating high quality, uniquely designed custom racks and consoles for a wide variety of uses, from edit and master control suites to dispatch and military command centers. And you're not limited to a standard height, depth or width.



STS custom builds racks and consoles to meet your specifications.

We can meet your exact equipment specifications. And even though you may need only one rack or console, you can still choose from an array of woods, moldings and colored laminates to match your color scheme.

Our custom racks and consoles are welded, not bolted together. A tough, baked-on epoxy-powder finish guarantees a long life and great looks. An adjustable rear rack rail allows you to position any size equipment, any way you want.

There are no middlemen to mark up the price because you buy directly from us. You can receive custom racks and consoles at a modular cost. Invest the time to get the quality you deserve, call STS today.

"I'm interested in STS custom racks and consoles."

☐ Please call me at your earliest convenience.
☐ Please send me more information about STS.

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Title: _____
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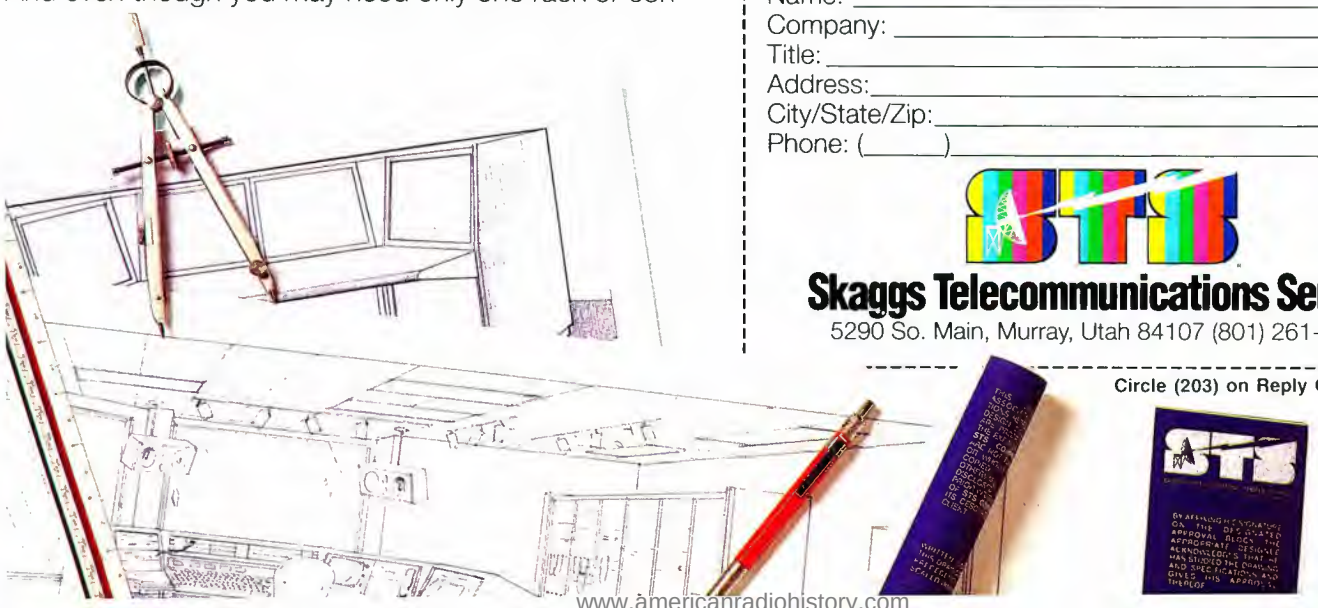
City/State/Zip: _____
Phone: (_____) _____

Skaggs Telecommunications Service
5290 So. Main, Murray, Utah 84107 (801) 261-4400

Circle (203) on Reply Card



Production

The promos for the movies are completed in this room by one operator following directions from a producer. Movie editing follows a cut list prepared by the film department. A 3/4-inch cassette, with time code burned in, is made simultaneously with all film-to-tape transfers or dubbed from existing 1-inch copies of the movies. The promo producer and film department use the 3/4-inch copy to make their decisions and selections for editing and promotions.

Promos created in this control room are as good as any production originating in the large control room, which is primarily used for newscasts and commercial work. Some projects actually move faster in the smaller room. It is impressive to see how much a single operator can accomplish when given the right tools.

The challenge

A big test of the switcher's capabilities recently came when the station agreed to do a 3 1/2-hour telethon during prime time. The main control room was committed to preparing the newscast that immediately followed the special program, and the remote truck couldn't handle everything that was planned. Five cameras were being switched at the remote site. Two additional cameras were used in the studio.

Other local sources included preproduction tapes and a continuous keying of telephone numbers. Occasional keys of name supers and titles also were needed. The newscast ran immediately afterward, and the transition to the main control room was smooth.

The WRGB staff would like to think that the switcher was one of the reasons pledges ran $200,000 over the goal and why reviews by the local newspaper credited the crew's efforts for this top-notch production. At any rate, the Ampex Vista brought some magic to this telethon.

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

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

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

In control.

Take control of news and program feeds with the new Agile Omni Broadcast satellite receiver.

Capture virtually any C/Ku band feed by manually or remotely selecting the preset satellite format and transponder position. The receiver automatically sets the satellite RF center frequency; full/half transponder channel spacing; I.F. filters; antenna polarity; audio subcarrier bandwidth, center frequency, and de-emphasis; and video polarity.

And with remote control options, you can set up one or a whole network of receivers from a master control computer. The analog-to-digital converters allow remote diagnosis of signal strength, monitoring of receiver performance and diagnosis of problems. So you can reduce costs, human involvement—not to mention human error—and never miss an important satellite feed.

There's a lot more you should know about the Agile Omni Broadcast—and Standard—than we can tell you in a single ad. Like the RS250B (satellite) proof of performance and certificate option, and Standard's unique Gold Standard warranty and repair program.

Which is a very good reason to call Standard today at (800) 243-1357.

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Circle (208) on Reply Card

People

Greg Smith has rejoined EEV, Elmsford, NY. He is responsible for the sale of broadcast products in Arkansas, Iowa, Kansas, Louisiana, Missouri, Nebraska, Oklahoma and Texas.

John W. Shike has been appointed director of marketing for CMX, Santa Clara, CA. Shikes was previously a senior product manager for the company.

Peter du Fosse has been appointed general manager of the traveling wave tube division (TWTD) of Varian Associates, Palo Alto, CA. He will direct the engineering, marketing, manufacturing, personnel and financial functions of the division, which has approximately 500 employees.

Franklin B. Sullivan and **David Hartley** have been appointed to positions with New England Digital, White River Junction, VT. Due to a realignment of the sales and marketing departments, Sullivan becomes vice president of marketing and product development. He is responsible for all of the company's marketing, market development and new product programs. He also will develop the third-party developers program and the joint product development program already under way with Lucasfilm Ltd. He was previously vice president of sales. Hartley is vice president of sales.

Steven B. Pequinot has been named systems sales manager, systems division, for A.F. Associates, Northvale, NJ.

AMS Industries, under the direction of Ridge Nye, president, has appointed **Interface Audio**, Atlanta, to represent its products in Tennessee, North and South Carolina, Georgia, Florida, Mississippi, Alabama, Louisiana and Texas.

Rolando C. Esteverna has been appointed to the newly created position of CEO for Digital F/X, Mountain View, CA. He is responsible for directing the company's business management team and developing corporate strategic plans.

Joseph A. Flaherty, vice president and general manager, engineering and development, CBS, was decorated as a "Chevalier dans l'Ordre des Arts at des Lettres" by the Republic of France. The award was conferred by Jack Lang, the French Minister of Culture and Communication. The decoration was presented by Annie Cohen Solal, Conseiller Culturel, at the French Embassy in New York. The award rewards persons who have distinguished themselves by creative work in the fields of the Arts and Letters and by their contribution to propagating the Arts and Letters in France and all over the world.

Michael B. Hobart has been appointed to the newly created position of Southern regional sales manager for For-A Corporation of America, Newton, MA. He is responsible for support of factory representatives, dealers and end-users throughout an 11-state territory.

J. Gordon Bridge has been appointed senior vice president of Hughes Television Network (HTN), New York. He will coordinate HTN's live TV sports transmissions, and will work with broadcast rights holders for the NHL, NFL, NBA and Major League Baseball, the main markets for HTN's backhaul transmission services. Bridge was previously vice president, communications services.

Jerry Rankin has been named Southeast regional sales manager for James Grunder & Associates, Mission, KS. He will handle sales for the CEL and YEM product lines in North and South Carolina, Georgia, Tennessee, Alabama, Florida and Puerto Rico.

Mike Yoshida has been named vice president of JVC Professional Products Company, Elmwood Park, NJ. He is responsible for overseeing the sales/marketing and administration departments.

Ron Radio Communications, Brightwaters, NY, is North American distributor of commercial audio and RF products for Electron Processing.

Mark L. Sanders has been appointed president and chief executive officer at Pinnacle Systems, Santa Clara, CA. **Walter E. Werdmuller** has been promoted to vice president, sales.

Broadcast-90

Professional Equipment for Radio and TV.

May 16/19 1990

11:00 am to 8:00 pm

(closing on the 19th at 5 pm)

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Madrid Spain

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Circle (212) on Reply Card

Business

Carle and Associates purchase 3M's ITC

Carle and Associates, in an agreement with 3M, purchased its International Tapetronics plant and operations. The acquired company operates under its previous name of International Tapetronics Corporation (ITC).

In addition to ITC's hardware lines, the company will market the ScotchCart II broadcast cartridge and Scotch 219 brand lubricated tape. These products will be manufactured exactly as they have in the past, however, the ScotchCart II cartridge will be renamed because it is a 3M trademark.

The Radio Club of America announces competition

The Radio Club of America, New York, has announced a cash prize competition for the best original essay by an undergraduate or graduate student on the life and accomplishments of the founder of FM broadcasting, the late Major Edwin H. Armstrong.

Three awards of $1,000, $750 and $500 will be awarded to the three best entries as determined by the prize committee. The winning entries will be published in a special issue of *The Proceedings* of the Radio Club, to be published in November, in commemoration of the centenary of Major Armstrong's birth.

Essays must be in English, should not exceed 7,500 words and must not have been previously published. Three copies of the entries must be received by June 1, accompanied by documentation of student status. Mail entries to Dr. John Ryder, chairman of the prize committee at 1839 SE 12th Ave., Ocala, FL 32670

AMS expands U.S. operations

AMS Industries plc, United Kingdom, plans to relocate its wholly owned subsidiary, AMS Industries, to Northern California.

Anvil Cases relocates facilities

Anvil Cases has relocated its facilities to City of Industry, CA. The new, larger facility houses more than 300 employees and features state-of-the-art equipment. Anvil also is introducing a 16-page full-line product brochure.

Bryston announces 20-year warranty

Bryston, Toronto, Canada, has announced its 20-year warranty policy. It is retroactive and includes all audio products previously manufactured and sold under the Bryston name. The company will pay shipping costs one way and all parts costs and labor are fully covered. The warranty is fully transferable from first owner to any subsequent owners. If you have any questions concerning the warranty, call Martin Bartelstone at 800-673-7899.

Comark doubles the size of manufacturing facility

Comark Communications, Colmar, PA, has completed the expansion of its Southwick, MA, manufacturing facility. The plant has 40,000 square feet, which allows the company to increase the volume of its RF component manufacturing and warehousing and improve customer response time through additional stocking capability.

Asaca signs Honeywell

Asaca/Shibasoku, Los Angeles, has entered into a supply agreement with Honeywell, Test Instruments Division, to sell robotic systems. Honeywell will purchase a variety of robotic configurations. It will integrate its digital tape products and control software with Asaca's robotic library management system, creating a random access data storage system. The robotic digital storage system has a formatted capacity of more than 3 terabytes and can connect to most computer systems via standard network protocols. The entire robotics systems requires only the floor space of an average office desk.

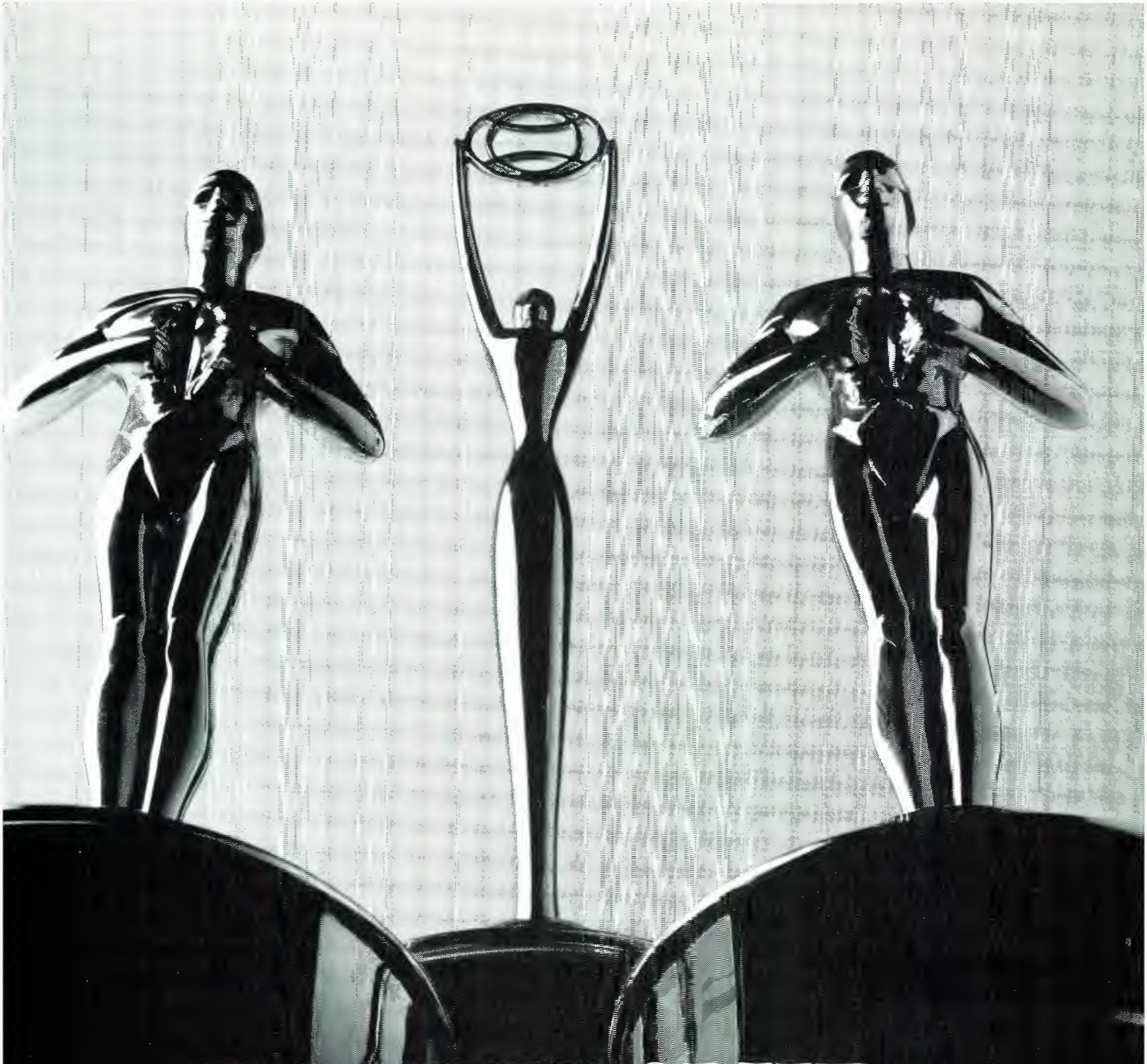
Taurus Communications expands operations

Taurus Communications, Framingham, MA, has begun operation in Nashville, with the affiliation of Link Up Communications. A segment of the organization's fleet of satellite transmission vehicles will be permanently assigned to Nashville, and will cover a 750 mile radius. Taurus Communications and Link Up will provide Ku-band satellite transmission vehicles carrying state-of-the-art encryption, satellite communications packages, airborne Ku-band fly-away packages and guaranteed transmission with tridundant amplifier systems and equipment.

New England Digital opens headquarters in UK

New England Digital UK has moved into a new 3,000 square foot state-of-the-art facility in West London's Hammersmith section. The office is comprised of three fully equipped demonstration studios (music recording, post-production and broadcast) that are all serviced by a central computer room containing five of the company's systems. The office also features seminar and classroom facilities.

Continued on page 261



LEADERSHIP HAS ITS REWARDS.

Video leaders see the Sony difference not only in the quality of their pictures, but in their trophy cases.

Award-winning producers, editors, news teams and duplicators rely on Sony professional videotape to capture their best creations. They see a virtually perfect balance of durability, reliability audio-video performance and responsiveness in sales and service.

That's why Sony, the leader in professional videotape, is the choice of video leaders. Worldwide.

SONY
PROFESSIONAL VIDEOTAPE

Circle (213) on Reply Card

MATRIX OF VIDEO SIGNAL TRANSMISSION REQUIREMENTS

	Composite 1 Channel	Component 3 Channels	Component 2 Channels	Component 1 Channel
Analog Bandwith (MHz)	NTSC 4.2	RGB 30 per channel	Y/C Up to 10	MAC Up to 12
Digital Bit Rate (Mb/s)	D-2 140	CCIR 601.1 (D-1) 108 (Y)	None —	D-1 Serial 270 Max

Table 1. *Several interconnect options shown in the matrix of signal transmission requirements.*

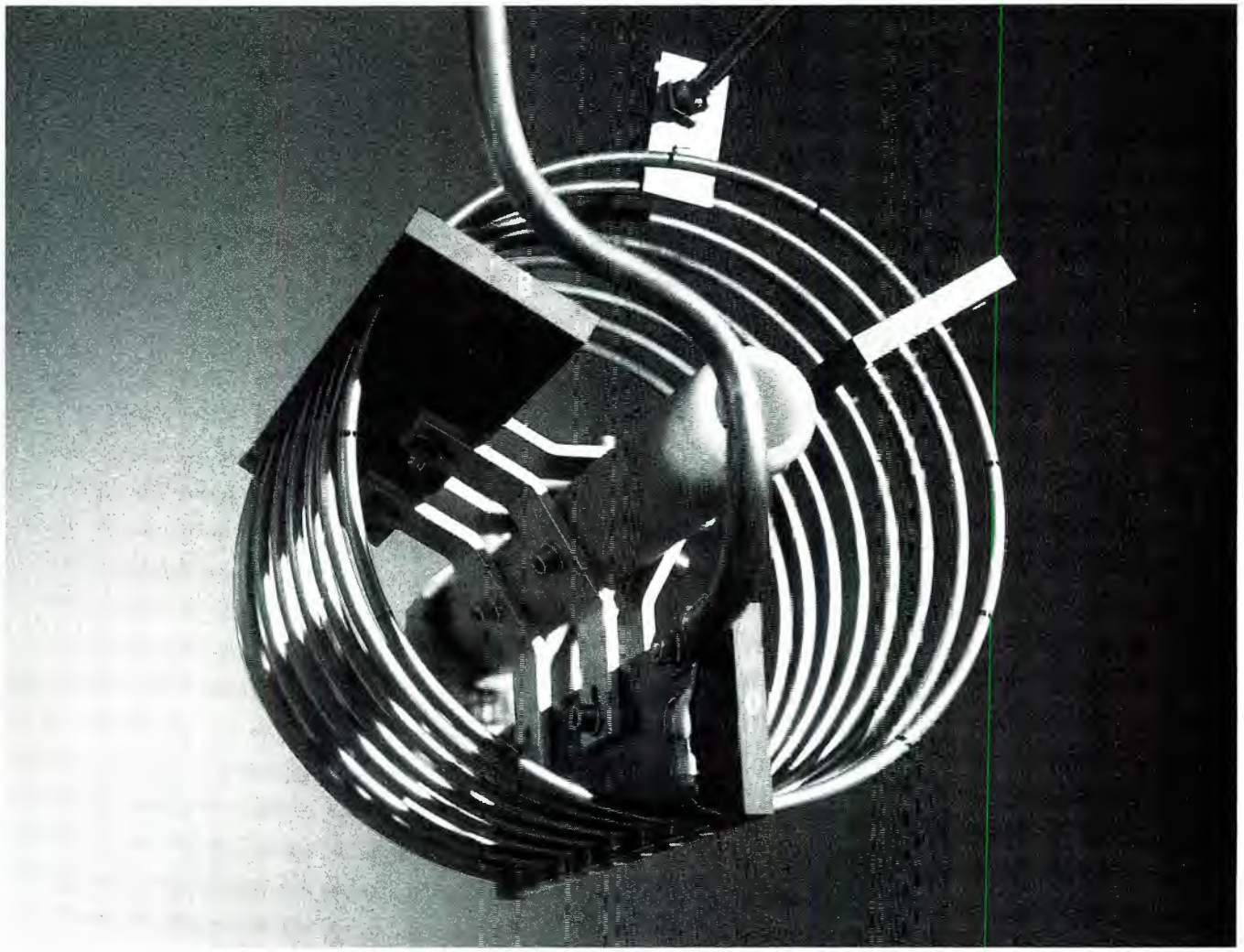
Continued from page 51

used as newer formats are phased in. That means that for some time, TV facilities will be hybrids of several formats, requiring several different interconnection options. (See Table 1.)

All these options call for a new generation of routing switcher, one that can keep its signals straight. This may mean that the router is built for high bandwidth and that it switches signals together, as for analog component and HDTV, or singly as for NTSC. Perhaps the incoming signals will be converted immediately to digital and switched in the digital domain, as in telephone switchgear. It remains to be seen.

Although fiber optics presents a convenient, proven method of transporting signals, with no rolloff and bountiful bandwidth, the industry still lacks a convenient, multiformat, reasonably priced interface. When this "missing link" is provided, fiber undoubtedly will become a primary system for interconnecting devices.

Until then, the signal pathway of choice is still copper.



On the Air with AEG.

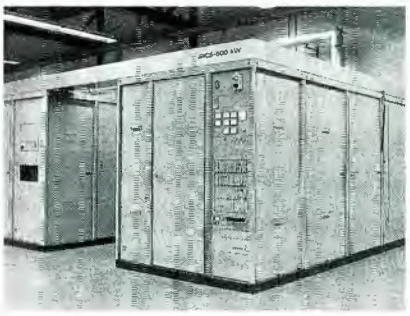
First-class technological achievements are a tradition at AEG. These successes are based on wellfounded experience, since AEG can look back on 80 years of proven transmitter design experience.

Moreover, AEG has been building broadcasting transmitters since 1923, and today it is one of the leading manufacturers offering innovative expertise in broadcasting.

Modern high-power transmitters with ratings from 100 to 600 kW, a program of long, medium and short wave broadcasting transmitters and more than 80 Pantel transmitters throughout the globe represent ultramodern engineering perfection.

Pantel is a PDM method of modulation having high overall efficiency. Significant savings of energy are achieved by using DAM (volume dependent amplitude modulation) conveniently applicable to Pantel transmitters. All short wave transmitters are offered with SSB, the operation mode of the future.

AEG supplies on a turnkey basis complete broadcast transmitting stations that guarantee high operational reliability, economic operation and long life. Further advantages are full remote-control facilities suitable for unattended operation, and compact mechanical design.



In addition to the high-power transmitters, AEG also supplies complete broadcast transmitting stations for VHF FM and Band IV/V television including suitable antenna systems satisfying all directivity and gain requirements. Of course, maintenance and thorough technical training by experts are considered natural elements of the total AEG service.

TELEFUNKEN Sendertechnik GmbH
Sickingenstrasse 20–28 · D-1000 Berlin 21
Federal Republic of Germany · Telephone: (30) 34 63-0 · Telex 181 819 · Telefax: (30) 34 63 24 19

Coupon

Please send me further information on high-power transmitters:

Name: _____

Company: _____

Address: _____

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AEG

Circle (215) on Reply Card

Continued from page 114

with program input at a specified peak power level, which should, of course, be confirmed to be below the clipping level.

Calculating the odds

When A-B or A-B-X comparison tests are employed, the correlation between the subject equipment being compared to the control equipment — either straight-wire bypass or another unit — is sometimes so poor or so good that there is no question about the audibility of the factors being tested. However, on occasion, the results are a little better than 50/50. This might seem a paradox, because the results don't strongly confirm audibility, but they do appear to be a bit better than chance. Well, in statistics and probability analysis, things are not always quite what they appear to be. In the case of A-B listening comparisons, there is an underlying probability that a certain proportion of correct identifications are guesses. Consider the case of 75% correct identifications. An estimate of the proportion of *known* correct responses can be calculated as follows:

$$pk \begin{cases} 2c/n - 1 & \text{for } c/n \ 0.5 \\ 0 & \text{otherwise.} \end{cases}$$

Where

pk = an estimate of the proportion of known correct responses.

c = total correct responses.

n = number of trials.

Solving this equation for 75% correct identification yields an estimated known correct proportion of just 50%! In other words, to be reasonably sure that something is really audible half the time requires correct identification three-fourths of the time. For small sample bases, such as the 16 trials in A-B-X comparator tests, the calculation is clearly an approximation, but more complex analysis can define the confidence limits. (The Burstein article referred to in the bibliography provides an excellent overview of listening test statistical theory, but for most station-level work the approximation described here is certainly adequate.)

Putting it all into perspective

The outstanding stations in the highly competitive 1990s will be those making the best use of available resources in every department. For engineering departments, this means selecting equipment that best meets the station's technical objectives and spending engineering time on those things that really matter. Most broadcasters believe that good audio and intelligent processing really matter, and so it's worth doing right.

It may take considerable extra effort to employ well-controlled procedures, but there is a special satisfaction that comes from really knowing, rather than speculating or trusting industry fairy tales. Researchers in every field of science take extreme steps to guarantee that adequate controls are in place to ensure the validity of their work. If broadcast engineering is to remain more science than voodoo, our work deserves the same structured approach.

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Fish, J. M. "Placebo Therapy." The Jossey-Bass Behavioral Science Series, 1973.

Srednicki, M. "A Bayesian Analysis of A-B Listening Tests." *Journal of the Audio Engineering Society*, March 1988, Vol. 36, pp. 143-146.

Continued from page 256

ODC triples space in new facility

Optical Disc Corporation, Santa Fe Springs, CA, has relocated to a new 45,000-square-foot facility in Santa Fe Springs. The address is 12150 Mora Drive, Santa Fe Springs, CA 90670. The telephone number is 213-946-3050; fax 213-946-6030. The building houses a new recordable laser videodisc (RLV) manufacturing line with four times the current capacity, a new videodisc and compact disc mastering process line, plus larger engineering, manufacturing and marketing facilities.

Pinnacle announces operations training courses

Pinnacle Systems, Santa Clara, CA, announces its operations training seminars for the spring. Courses will be held at various locations nationwide. The 4-day seminars are designed for current and potential users of the company's video work stations. For more information or to enroll in a course, contact Walter Werdmuller at 408-970-9787; fax 408-970-9798.

Studer opens larger Los Angeles office

Studer Revox America, Van Nuys, CA, has relocated its Western regional sales office to larger premises in the San Fernando Valley. The new office complex has been divided into a showroom and demo area, enlarged office space and a fully equipped service center. The address is 16102 Hart St., Van Nuys, CA 91406; telephone and fax remain unchanged at 818-780-4234.

NHK receives Paul Nipkow Award

The Japan Broadcasting Corporation, *NHK,* received the 1990 Paul Nipkow Award from the Academy of the International Institute of High-Definition Television Arts & Sciences Feb. 14, at the second annual HDTV Conference and Exhibition. The award honors NHK's leadership in the development, application and standardization of HDTV, in recognition of the contribution it represents to worldwide communications, peace and human understanding. The Academy made clear that the award commends the worldwide contribution to communications generated by NHK's leading research, but is not specific to any particular technical or standards solution.

New products

Digital multimeters

By A. W. Sperry Instruments

• **DM-4100A, 4200A, 4300A:** 3 1/2-digit multimeters; nine functions measured in 35 ranges; pocket-size, 1-hand operation; tilt stand for desktop use; models vary in capabilities with measurement options of diode, battery, HFE transistor and capacitance tests.

Circle (350) on Reply Card

Acoustics control system

By Acoustic Sciences Corporation

• **Super Trap:** broadband sound absorber controls room resonance sometimes accentuated by dynamic speakers and subwoofers; extended base response, enhanced damping of standing waves to 70Hz; reactive acoustic circuit for self-regulating absorption; diffusion panel adjusts to scatter mid-, high-frequency components.

Circle (351) on Reply Card

PC/digital audio

By Antex Electronics

• **Series 2/model SX-10:** plug-in card for IBM/compatible 286/386 expansion slot; digitizes two channels of audio for storage on hard disk or CD-ROM media; programmable sampling from 6.25kHz-50kHz, 16-bit for 20Hz-20kHz bandwidth audio; 4:1 ADPCM data compression to reduce storage requirements; requires 1:1 data interleave controller, hard disk with less than 28msec access time and DOS 2.0 or greater; PCMEDIT option for data manipulation.

Circle (353) on Reply Card

Digital multimeter

By Analogic

• **DP-100:** precision multimeter with 5 1/2-digit readout; fixed, auto-ranging DMM; dc accuracy to 0.003%+2 counts; measures frequency, temperature, resistance, Vdc, true rms, Vac, current; voltage range covers microvolts to 450V, current to 2A, frequency to 25MHz; optional temperature probe.

Circle (352) on Reply Card

Audio source

By Audio Cause

• **Reference Signal Source:** composite waveform generator; assists measurement of frequency response of audio system; output contains equal energy levels in 1/3, 1/2 and whole octave band over 20Hz-20kHz range; accuracy at 0.05dB; use instead of pink noise for tape electronics EQ, azimuth reference.

Circle (354) on Reply Card

Swept-function source

By Beckman Instrumentation Products

THE WORLD'S MOST SUCCESSFUL TELEVISION FAMILY.

You've seen it for yourself. Many of the world's favorite television programs have been produced, edited, or broadcast on Ampex tape. From our industry standard 196 1" master broadcast videotape to our state-of-the-art 319 D-2 and Betacam SP metal-particle videocassettes, you get the same high quality consistently, tape after tape, carton after carton. Because every tape is manufactured to the same exacting specifications by the same experienced technicians in the same ultraclean plant. No wonder more demanding professionals demand more Ampex tape. It's a television success story... all around the world.

AMPEX

THE PROFESSIONAL CHOICE

Ampex Recording Media Corporation
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CA 94063, (415) 367-3809

SEE US AT NAB BOOTH #2200

Circle (217) on Reply Card

• **FG3A:** sweep-function generator; seven frequency ranges from 0.2Hz to 2MHz; sine, triangle, square wave, TTL/CMOS pulse outputs; linear, logarithmic sweep and AM/FM modulation of internal, external signals; 5-digit counter; external control 0V-10V input provides 1,000:1 frequency change.

Circle (356) on Reply Card

Data noise filter

By Ball Company

• **DigiFilter:** modem noise filter; for data rate range 300-4,800 baud internal, external modems; variable threshold; improves reliability of data communications on otherwise noisy telephone pairs; RJ-11C connectors; available with integrated lightning/surge protection; requires no external power.

Circle (355) on Reply Card

Frequency measurements

By Beckman Instrumentation Products

• **FC130A:** dual-channel frequency counter; 0.01Hz-120MHz, 50MHz-1.3GHz ranges; 8-digit LED readout of frequency, period, rate/minute measurements; 10mV input sensitivity with ac/dc-coupled inputs; continuously variable gate time, triggering adjustments.

Circle (357) on Reply Card

Lab power units

By Beckman Instrumentation Products

• **MPS60, MPS100:** ±15Vdc or ±30Vdc dual-output, benchtop power supplies, rated 2A and 3.5A; for maintenance shop or R&D facility; digital meters show voltage and current simultaneously; current limiting, reverse polarity protected; isolated outputs.

Circle (358) on Reply Card

Power-line monitoring

By Electro Industries

• **DMMS100:** digital multifunction metering system; provides full metering of voltage, current, power, power factor and power frequency; EEPROM holds preset parameters, maximum readings, total kilowatt/kVA hour values; two alarms based on out-of-tolerance conditions; for 3-phase, 4-wire service to 600V, 12kA; software allows link to PC running MS-DOS for constant power-condition monitoring.

Circle (367) on Reply Card

Solenoid repair

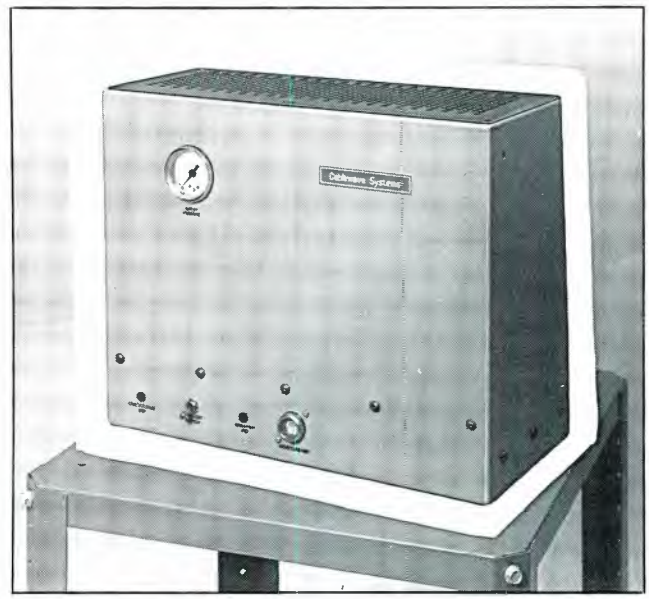
By Broadcast Automation

• **PN 250-020A:** spring-loaded solenoid plunger screw; replacement part for use with SMC 250 Carousel systems; avoids pinchroller sticking in the engaged position, which may result in a jammed automation machine.

Circle (359) on Reply Card

Feedline dehydrator

By Cablewave Systems

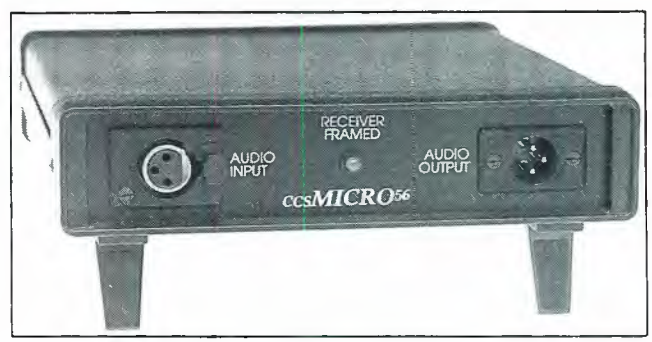


• **APD-70:** automatic pressurization dehydrator; operates from 117Vac; rating of 0.7 SCFM for use in systems to 1,700 feet of 6 1/8-inch diameter transmission line; provides close control over output pressure; accessory includes high-pressure alarm.

Circle (360) on Reply Card

Digital signal processor

By Corporate Computer Systems

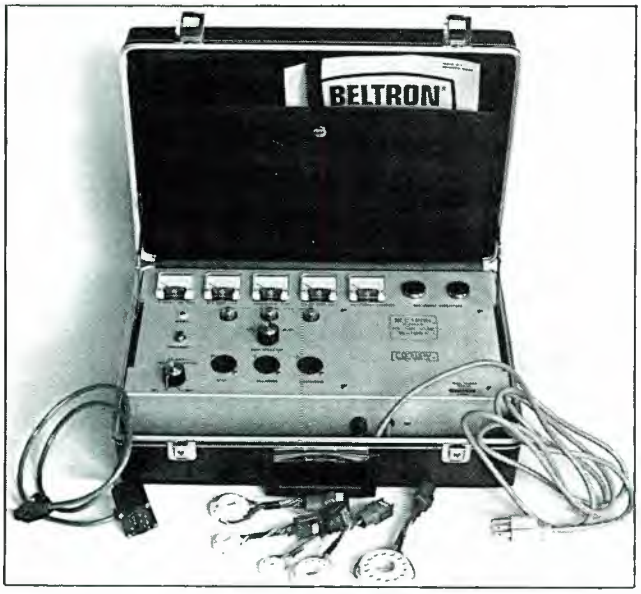


• **MICRO56:** digital audio terminal; bidirectional 7.5kHz channel using 56k to RAM; 64× oversampling on input, 8× oversampling on output avoids brickwall filtering; meets CCITT G.722 Mode 2 ADPCM standard for signal compression; XLR connectors for analog input, output connections at standard signal levels to dial-up telephone, earth-station facilities.

Circle (362) on Reply Card

CRT maintenance

By Conway Manufacturing

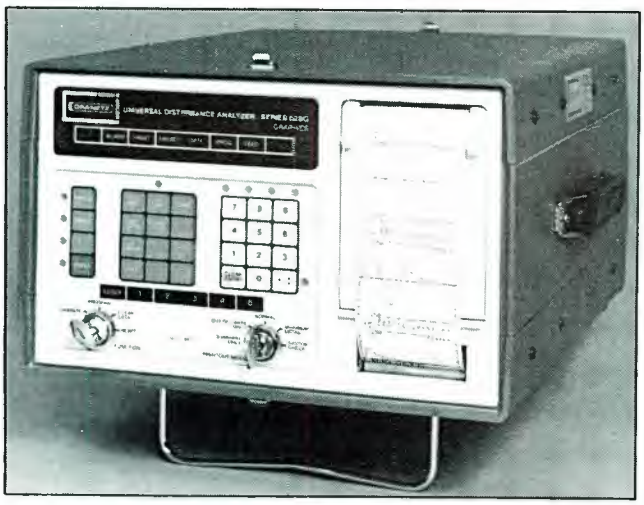


• **Beltron System:** restoration unit for picture tubes; available as manual or microprocessor controlled; usable with monochrome, color CRTs; isolation transformer, regulated filament circuit; current-limiting for positive protection of operator and CRT; range of adapters and accessories to match any tube type.

Circle (361) on Reply Card

Power analyzer

By Dranetz Technologies



• **626G analyzer:** full-time power-line monitor analyzes disturbances of power source; integral recording capability, waveform graphics printing; array of plug-in modules available for monitoring of voltage current, temperature, humidity, harmonics, demand, impulse energy, alarm events; software package for retrieval of data and control from remote PC.

Circle (365) on Reply Card

Satellite signal simulation

By CTS Systems/Wavetek

• **Model 1470:** satellite receiver test set; 45MHz-95MHz IF sweep signal, 0 to −79dBm level, crystal-controlled markers; simulates signals from satellite to troubleshoot earth-station receivers; modulation available from external source or internally with color bars, dispersion and audio subcarrier signals.

Circle (363) on Reply Card

Time-code source

By Denecke

• **Dcode SYNCBOX:** LTC generator works with TS-1 time-code slate; generates all common time-code formats; operates stand-alone or jam-synced from an external source; 60 hours of use from one 9V alkaline battery.

Circle (364) on Reply Card

Maintenance software

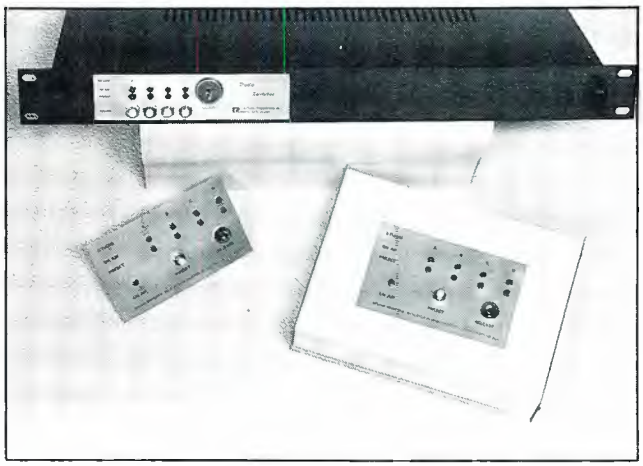
By Eagle Technology

• **EMM 3.0:** Expert Maintenance Management software; combines artificial intelligence and expert system concepts to maintain equipment history, preventive maintenance, spare parts inventory and other information for equipment maintenance department; interface for dBASE, LOTUS, DIF file formats, mainframe systems; bar code label module available.

Circle (366) on Reply Card

Audio routing

By Electron Processing



• **Studio switcher:** controls signal routing of four stereo sources to one stereo output; preset button puts one studio ready to go on-air when the current studio release button is pressed; status indicator panels, override control panels; sealed reed-relay switching; 9-conductor control cable kept separately from audio signal lines to avoid crosstalk.

Circle (368) on Reply Card

Mic mixer

By FSR

• **MPA-2 2-mic mixer:** for dynamic, phantom-powered microphones; independent gain, sensitivity adjustments; 600Ω transformer-coupled output; silent switching; uses EZ15, EZ-PHP-15 power supply.

Circle (372) on Reply Card

Patchbays, rack slides

By ERGO Industries

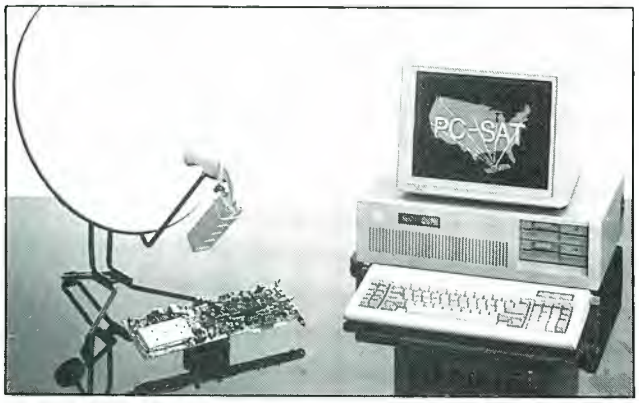
• **Audio patchbay:** prewired audio patching products; various connectors, configurations available.

• **EIS-5000T:** VCR tilt-and-lock slide mount kits for VCRs; equipment remains in rack while maintenance is being performed.

Circle (369) on Reply Card

Microwave/satellite antenna

By ISS Engineering

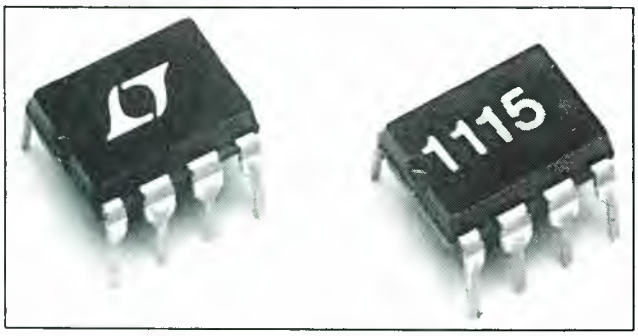


• **No. 4518 antenna system:** 18-inch dish antenna, high gain, directivity to 23GHz; fiberglass-based plastic construction; Ku-band feedhorn, LNB; use with PC-SAT satellite receiver card for single slot in PC.

Circle (374) on Reply Card

Audio op-amp

By Linear Technology



• **LT1115:** low-noise audio operational amplifier; less than 120nV rms noise over dc-20kHz frequency range; configured to drive a 60Ω load, THD is less than 0.002% at 10kHz; CCIF IMD less than 0.0002%; gain is 2 million, gain-bandwidth product is 40MHz; minimum slew rate of 10V/μsecond.

Circle (377) on Reply Card

Still-frame audio

By Fast-Trax Digital Technologies

• **SES-300/PCAT-300:** still-frame audio encoder, decoder; converts audio signal to analog video for storage as still frames on videodiscs; 300:1 compression of data permits one frame to contain 10 seconds of voice-over narration or other au-

dio; 54,000 still capacity of disk enables 150 hours audio storage; can be intermixed with video or data on the disc.

Circle (370) on Reply Card

Satellite-receiving equipment

By R. L. Drake Company

• **ESR1250 receiver:** PLL-synthesized tuning satellite receiver; dual video outputs, fixed audio channel; optional subcarrier demod boards; decoder outputs for VideoCipher II, MAC compatibility; C-/Ku-band H/V polarization switching; 30MHz-16MHz IF SAW filters.
• **No. 2864 LNB:** low-noise block converter; converts 11.7GHz-12.2GHz Ku-band signals to 0.950GHz-1.450GHz range; 50dB gain.

Circle (380) on Reply Card

Audio power amp

By FM Acoustics Ltd.
• **FM 1000-1 amp:** monophonic, peak power capability to 7kW, 2.5kW rms; can drive loads below 1Ω; parameters normally causing various distortions through compression, limiting is individually sensed, shutting the system down if values fall beyond set limits; returns to full operation as soon as errors are corrected; protects amplifier and speaker.

Circle (371) on Reply Card

Spot cleaning system

By Hub Material Company
• **Micro Care system:** series of packaged solvents for cleaning of electronic circuit boards; trigger grip approach avoids dip-and-brush or aerosol spray applications; solvents include formulas to remove solder flux, rosins, pastes and various oils; 16 oz. containers have twist-lock nozzle to connect heat-resistant hose that attaches to the hand applicator unit.

Circle (373) on Reply Card

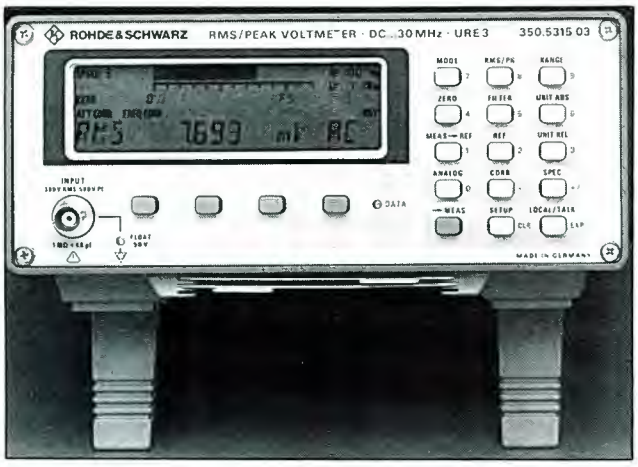
Digital audio equipment

By Waveframe
• **DSP-X:** digital signal processing expander for AudioFrame disk recording module; for 12 digital inputs and outputs in PD or SDIF-1 formats, and one pair of inputs, outputs in SDIF-2 or AES/EBU format.
• **Magneto-optical drive:** removable, erasable MO drive for archiving, backup for AudioFrame system.
• **Storage expansion:** rack unit for four SCSI devices to increase convenient disk storage capacity to eight hours per rack; racks can be linked for greater capacity.

Circle (409) on Reply Card

Lab measurement package

By Rohde & Schwarz



• **rms voltmeters:** high-accuracy units with IEEE-bus remote control; covers LF/audio to HF/HDTV signal ranges; URE-2, 10Hz-25MHz, 50μV-300Vac, digital display of 30 measurements; URE-3 rms/PEAK, 0.1Hz-30MHz, peak-value rectifier for positive, negative, peak-to-peak readings of non-sinusoidal signals.

Circle (382) on Reply Card

CAD design software

By L. J. Engineering

• **VideoCAD:** software adjunct for AutoCAD on IBM/compatible PCs; facilitates signal-flow diagrams; generates wiring list including wire number, point-to-point designations, notes; no link to database or spreadsheet program required.

Circle (375) on Reply Card

Soldering system

By Leads Metal Products

• **Power vacuum:** desoldering system pulls molten solder from insertion holes on a circuit board, ejects solder into a receptacle; no filters to clog; reduces time heat is applied to the circuitry; available with/without temperature control and ESD conductive handle.

Circle (376) on Reply Card

Satellite-receiving equipment

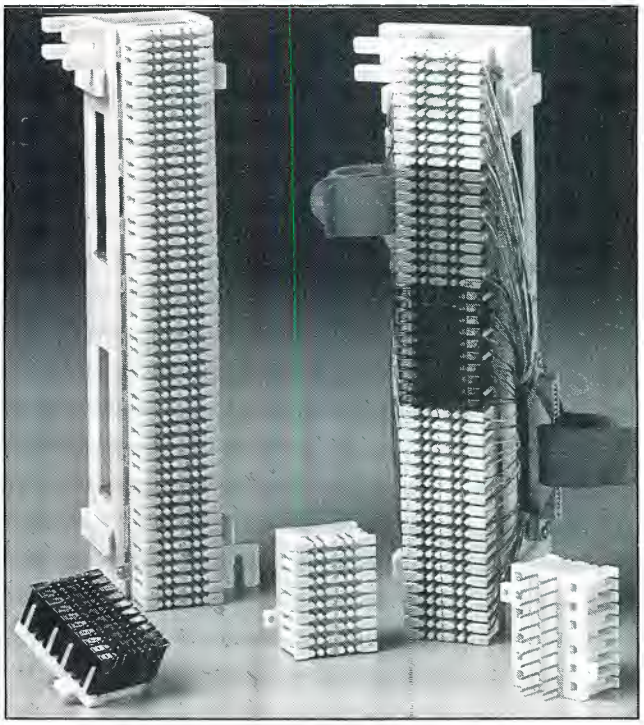
By Standard Communications

• **MT-830:** frequency agile omni satellite receiver; RS-250B spec; PLL tuning for center of RF channel and audio subcarriers; panel indication of channel, format, subcarrier frequency, antenna polarity; EPROM handles automatic operation after given the desired transponder number and satellite format; remote control via telco line or satellite link.

Circle (388) on Reply Card

Wiring accessories

By Siemon Company



• **Multiflex blocks:** wiring connecting blocks for various signal types beyond 20MHz; for stranded, solid conductors; two termination slots per quick clip; clips reset for protection from accidental changes; various sizes, configurations; color-coding available for easier wiring, troubleshooting.

Circle (385) on Reply Card

Power stabilizers

By Superior Electric Company

• **UPSY Stabiline series:** uninterruptible power supplies; maintains proper power level with internal battery if input drops below a set level; RS-232 interface for interactive computer-operating systems; 400Va, 800Va, 1,250Va load models for 110Vac and 220Vac requirements; PWM inverter system produces spike-free power.

Circle (391) on Reply Card

Post-production console

By Trident Audio

• **Vector 432:** audio mixer with four stereo buses, 32 group outputs; programmable muting system operates from SMPTE, MIDI code; in-line system includes additional mix busing for post-production needs; integral machine control can be used in audio, A-V fixed and mobile installations; compressor/limiter on main output.

Circle (404) on Reply Card

Cable ties

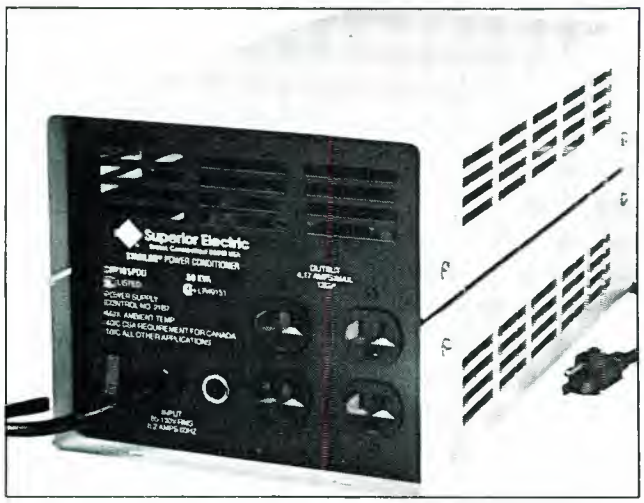
By Toleeto Fasteners International

• **Cord-Lox:** fabric strips to tie and bundle cables; highly visible colors with nylon hook-loop closures; allow color coding, identification of cable bundles with sizes from $^{5}/_{8}''\times3''$ to $1^{1}/_{2}''\times24''$.

Circle (402) on Reply Card

Power conditioners

By Superior Electric



• **Stabiline CR series:** power conditioners: protect voltage-sensitive equipment from brownouts, overloads, surges, spikes; output voltage maintained at 120Vac ±3% from 95V-130V input range; 120dB common-mode noise rejection; 60dB transverse-mode noise attenuation; 500VA, 1kVA, 2kVA models.

Circle (390) on Reply Card

Battery pack

By Paco Electronics

• **BP-11 NiCad:** increased life battery pack; replacement for NP-1/-1A; 13.2V, 1.9Ah rated with 02C discharge rate; integral thermal sensor protects against short circuits; for ENG camera, VTR combinations; use with Dememorizer KD-120A II charger.

Circle (379) on Reply Card

Satellite transceiver

By SSE Technologies

• **ASAT-1124:** solid-state Ku-band transceiver; 16W output; system includes power supply, LNB amplifier; broadband operation between 14GHz-14.5GHz; compatible with INTELSAT, EUTELSAT, AUSSAT standards; use individually or in redundant systems; for teleconferencing, in high-fade margin areas, transportable terminals.

Circle (387) on Reply Card

Videotape editing equipment

By Time Logic

• **TLI-4400:** editing controller; operates dual-standard NTSC/PAL, complete list management; 15 ports with 32 GPI relays; EDL protected by battery; keyboard layout and color display screen similar to other editing systems; 4-channel audio, variable speed motion with trackball job panel; VTR, switcher interfaces.

Circle (398) on Reply Card

Power conditioning

By Sola

• **CPC series:** computer power conditioner; 3-phase unit corrects load imbalance conditions, offers electrical line-to-load isolation and protected pass; protects against transients, overvoltage and undervoltage events; 97% efficient ac-to-ac; models from 10kVA to 30kVA.

Circle (386) on Reply Card

Noise-reduction cards

By THAT Corporation

• **dbx 321-series noise-reduction circuits:** for audio transmission by satellite, microwave and other applications; 35dB of noise reduction, maintains a response flat from 50Hz to 15kHz; series includes 321CS compressor, 321ES expander; compatibility between these cards and previous dbx equipment.

Circle (395) on Reply Card

Work station console

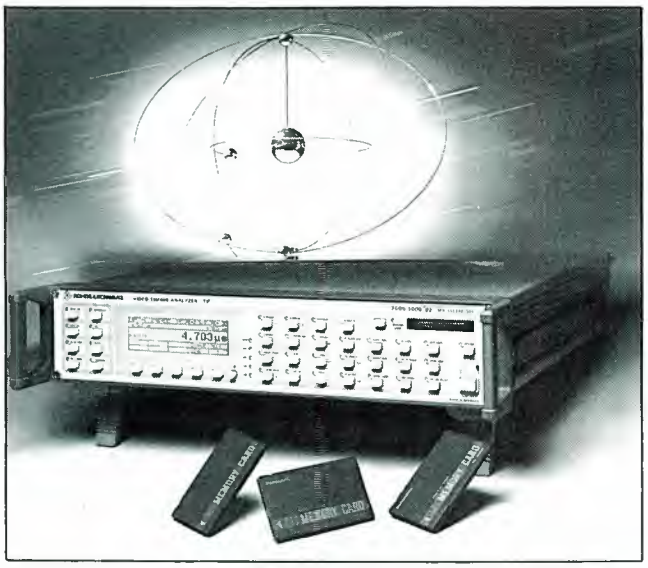
By Console Masters

• **The TV Work Station:** provides unprecedented human design and flexibility, in sizes from 1-10 bays; 1-piece construction, with tapped equipment mounting rails and sloped mounting adaptors; extension bridges are used to mount equipment with controls closer to the operator; tube steel frames are finished in matte black; a designer's kit is available.

Circle (412) on Reply Card

Timing measurement

By Rohde & Schwarz



• **TIF analyzer:** video signal t ming verification system; auto measurement system requires one second to sense, measures 20 timing parameters of video signals in 525-, 625-line standards and component signals; measures color subcarriers of NTSC, SECAM, PAL; usable with noisy, substandard signals.

Circle (383) on Reply Card

Editing/synchronizing unit

By Time Logic

• **TLC Time Logic controller:** field-accurate film-to-tape transfer, editing system; specific scenes of material can be redone by insert edits direct from telecine through color corrector or other processing equipment to tape without complete retransfer of the reel of film; supports all current analog and digital VTRs.

Circle (397) on Reply Card

Satellite weather data

By WeatherTrac Industries

• **WeatherTrac:** PC-based weather imaging system; uses NOAA, GOES/WEFAX, HF-FM NAFAX data as well as European and Russian satellite data; information received via satellite, displayed through menu-driven image analysis tools; 64-level gray scale, 256 colors on VGA system.

Circle (410) on Reply Card

Tuning tools

By Voltronics

• **TT-100, 200, 500, 600:** series of tuning tools including plastic with hardened steel blades or high-strength ceramic tips; TT-100 and TT-200 are high-temperature plastic with pocket clip and reduced-diameter end holding blades; TT-500 and TT-600 have rotatable tops fitting into the palm and ceramic tips for uses where metal would affect tuning accuracy.

Circle (407) on Reply Card

Cleaning solvents

By Tech-Sa-Port

• **DisClene, SafeClene:** for use in preventive maintenance programs with computer peripherals, electronic equipment; DisClene, 99.7% isopropyl alcohol; SafeClene, a non-flammable liquid; apply with any approved cleaning wipe or lint-free cloth.

Circle (394) on Reply Card

Delay, editing system

By Time Logic

• **APDU-200:** automatic program delay unit; full range of editing features; accommodates delays from minutes to days, simultaneous multiple feed playback with independent delays per channel; perpetual schedule concept avoids re-entry of repeated events into program log; capable of driving 15 devices (VTRs, switchers); VTR activity schedule determines equipment requirements for specific projects; for network multiple time zone delays.

Circle (399) on Reply Card

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AMPEX

BE-030-BCAM

Continued from page 92

ment is turned off when the system is not being used. In addition, extended HPA warming and cooling procedures are used to further extend the tube life.

Another key to maximum filament life is careful use of the in-line attenuators. (See Figure 1.) The attenuators, located after the modulators, allow a gradual power increase to reach proper carrier level. This procedure is followed with NPR's assistance 15 to 30 minutes before each transmission.

Some uplinks operate by remote control and are not able to adjust the HPA output power. In these cases, NPR allows ±2dB level variance from ideal carrier level. If the affiliate uplink is unable to achieve this requirement, someone must travel to the uplink and adjust the power level manually before transmission.

Other equipment could be added to this system. Without a waveguide switch and dummy load, it's difficult to perform any troubleshooting. In addition, the HPA lacks a wattmeter to measure RF output. Because the HPA beam current reading is not sufficiently linear, determining actual power output is difficult. Additional equipment and other refinements are likely to follow as the system grows.

Greater appreciation

The BSU uplink/downlink project was exhausting as well as exhilarating. It was particularly time-consuming and demanding, having to be completed on time in spite of other pressing duties. The usual problems of deadlines, budget concerns and general impatience were compounded by the close observation of the project, which was located in the center of campus, by university administrators.

After fully experiencing the many complexities of this project, those involved will never again see an uplink in quite the same way. It's not likely that they'll ever take the earth station for granted, and you can bet they'll remember the importance of careful planning and system operation.

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Shattuck, Blan. "Interference to Your Satellite Earth Terminal and What to Do About It," *NPR Engineering Update*.

Smalling, Elmer III. "Satellite Technology," **Broadcast Engineering**, monthly column, November 1985 and December 1989.

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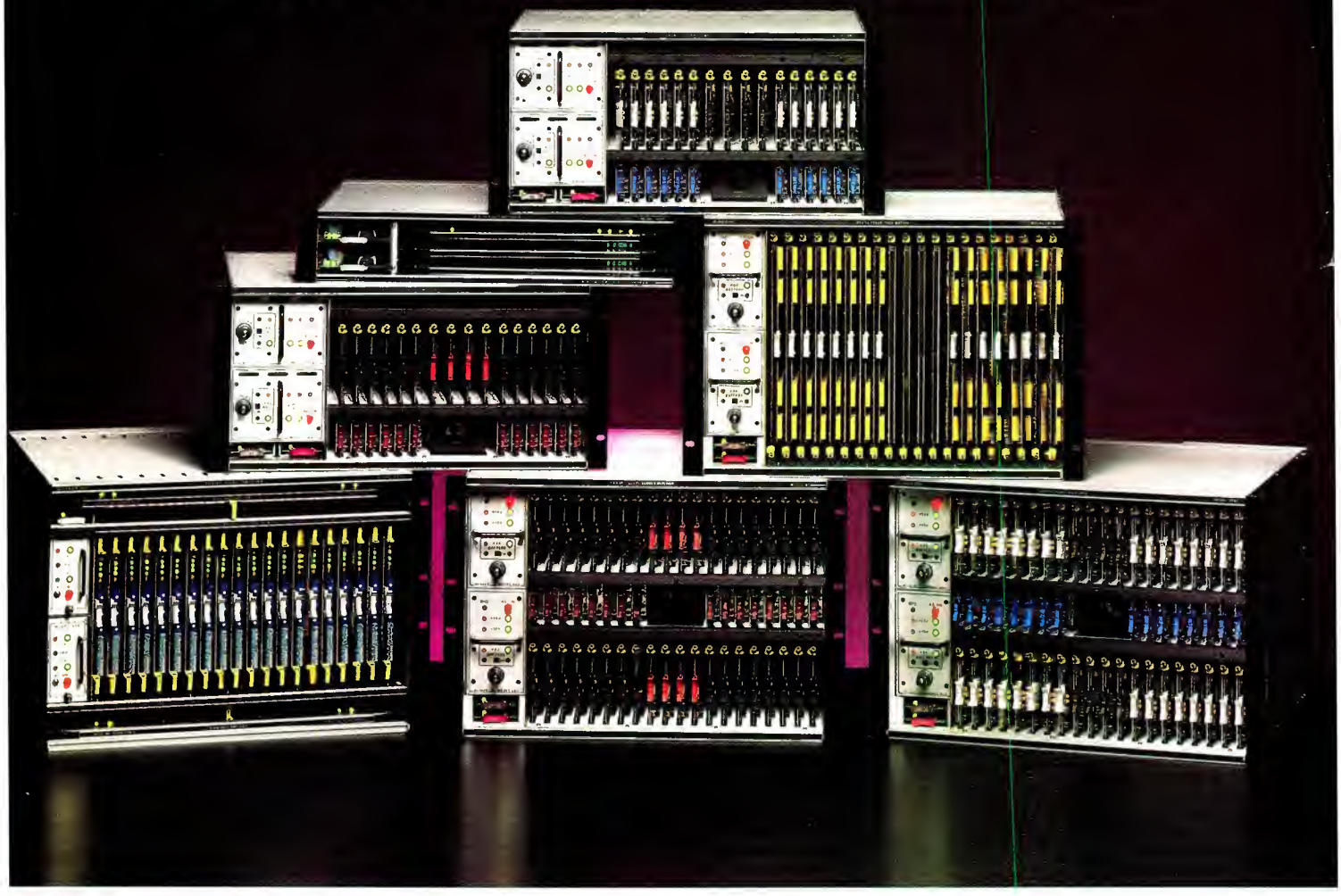

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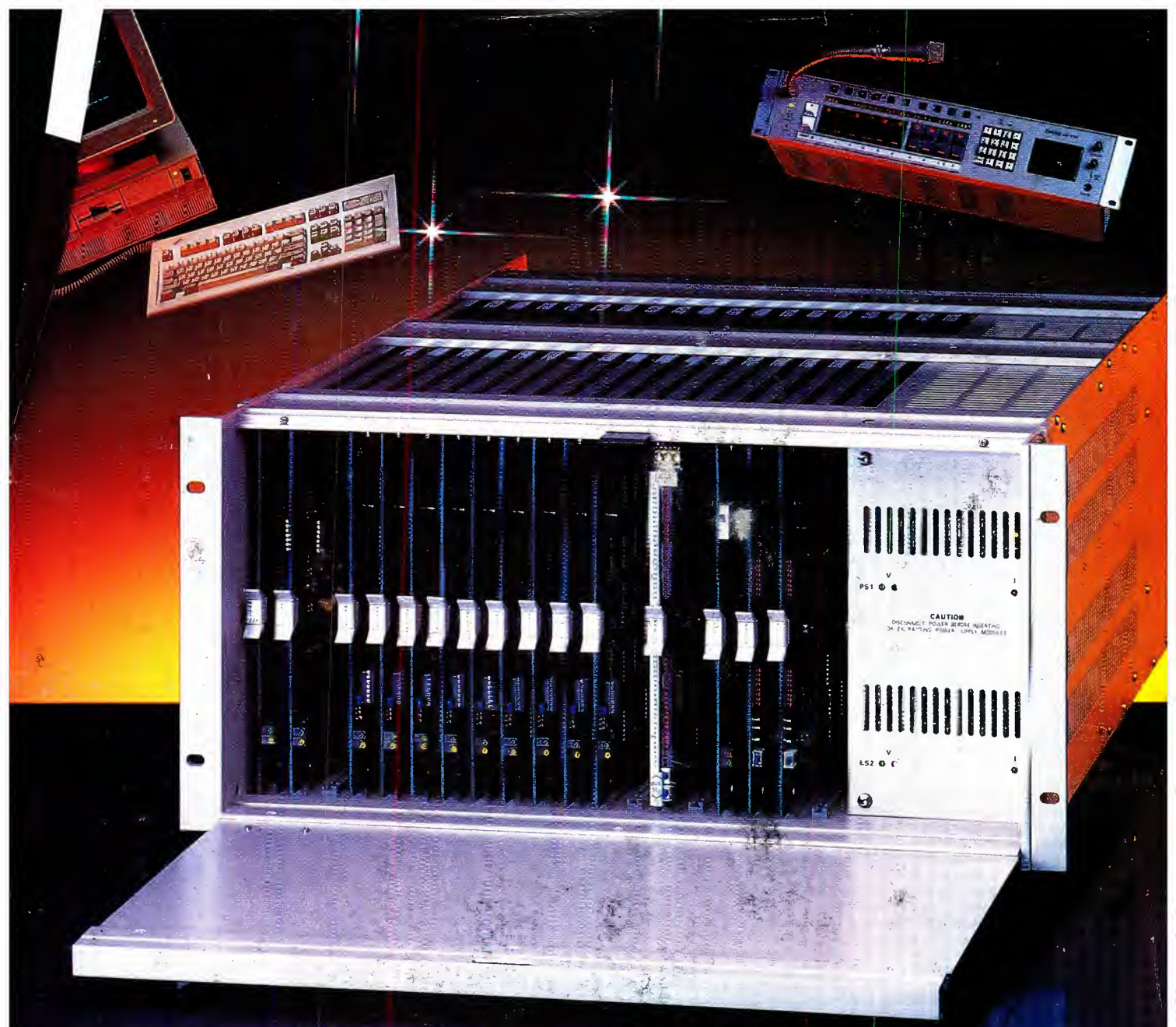

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