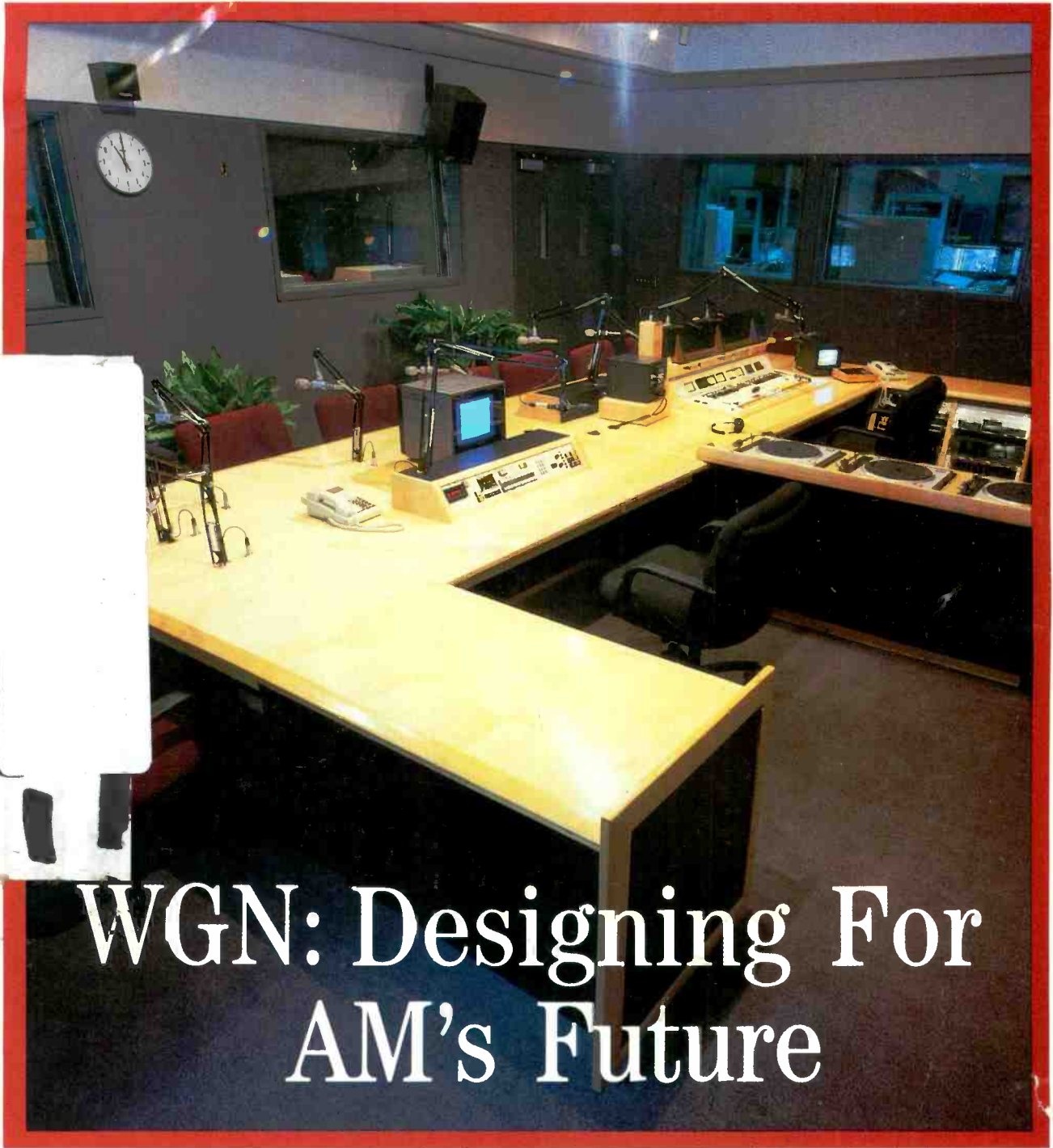


SEPTEMBER 1986

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BROADCAST MANAGEMENT/ENGINEERING



WGN: Designing For AM's Future

Also in this issue:

- Digital Video
- Remote Transmitter Diagnostics
- FMX
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Studer Audio: Digital Playback Systems



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Track Time Remaining



Disc Time Remaining

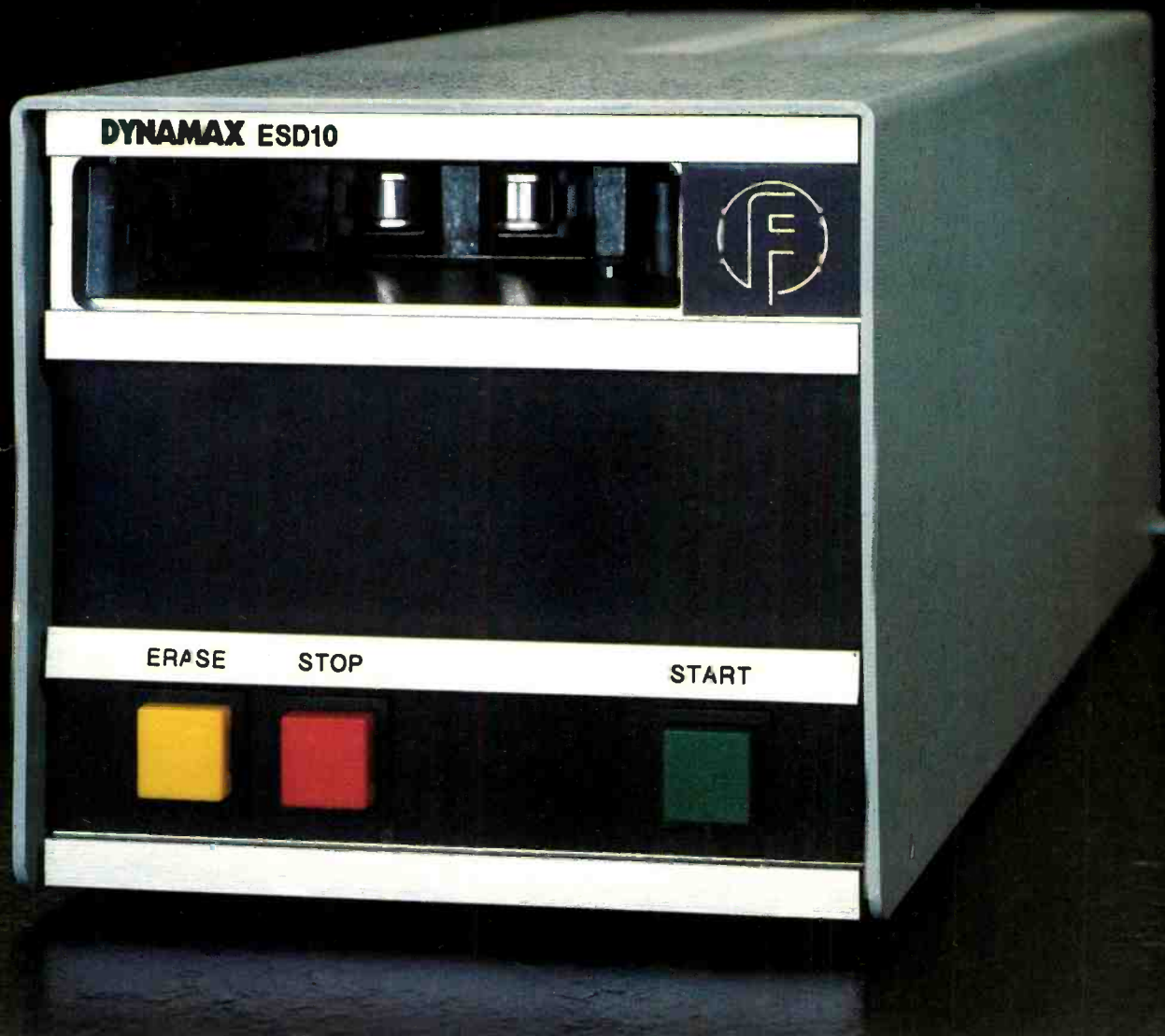


Track Time Elapsed



Disc Time Elapsed

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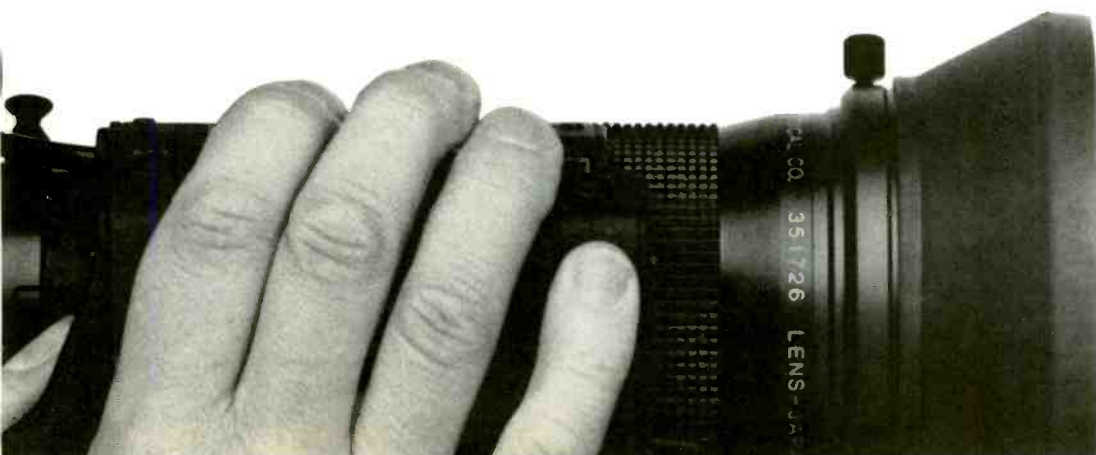
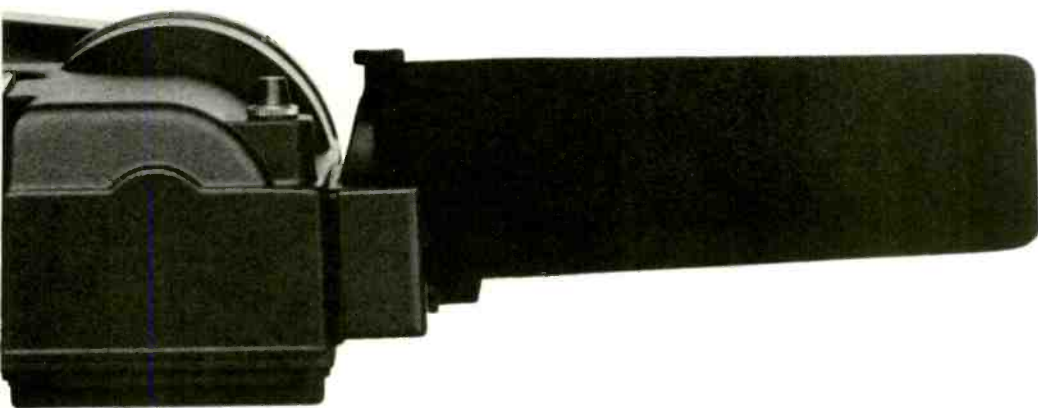
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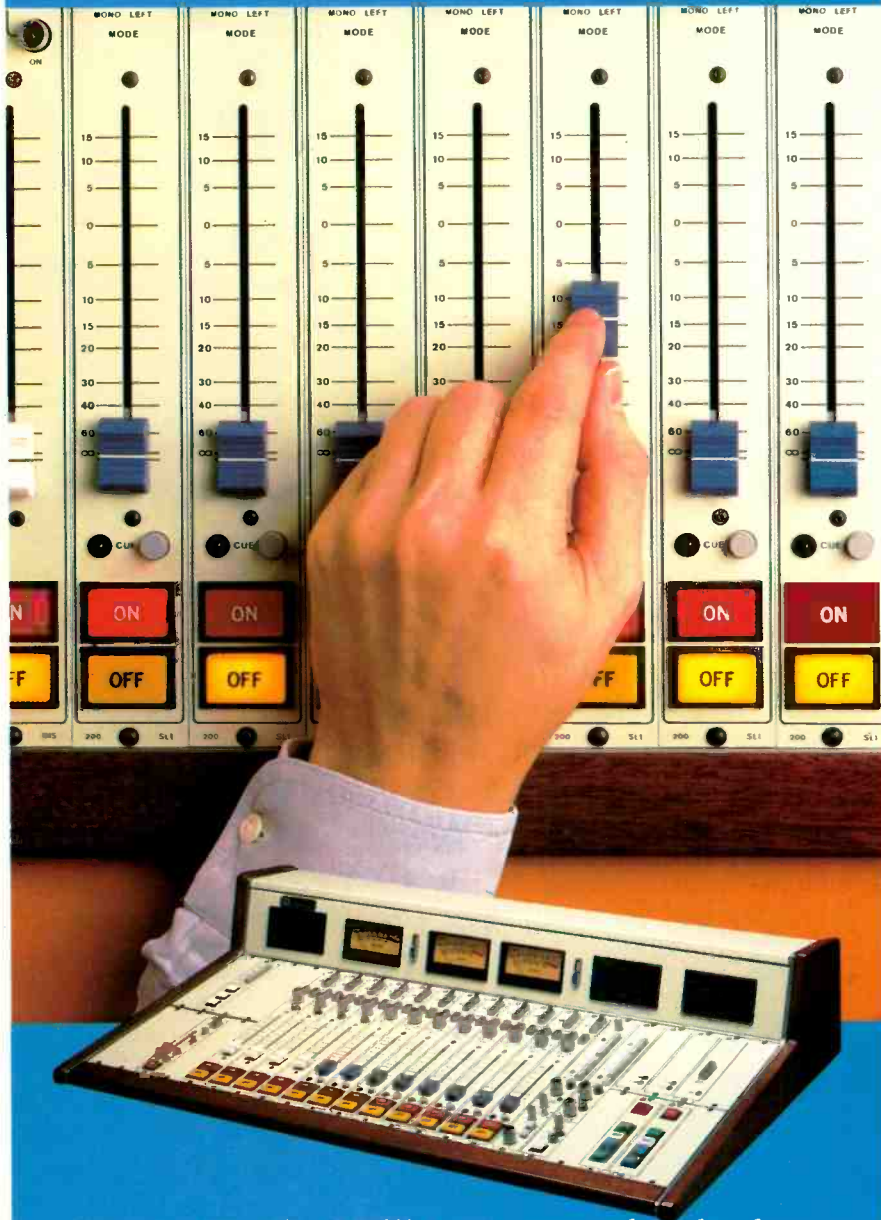
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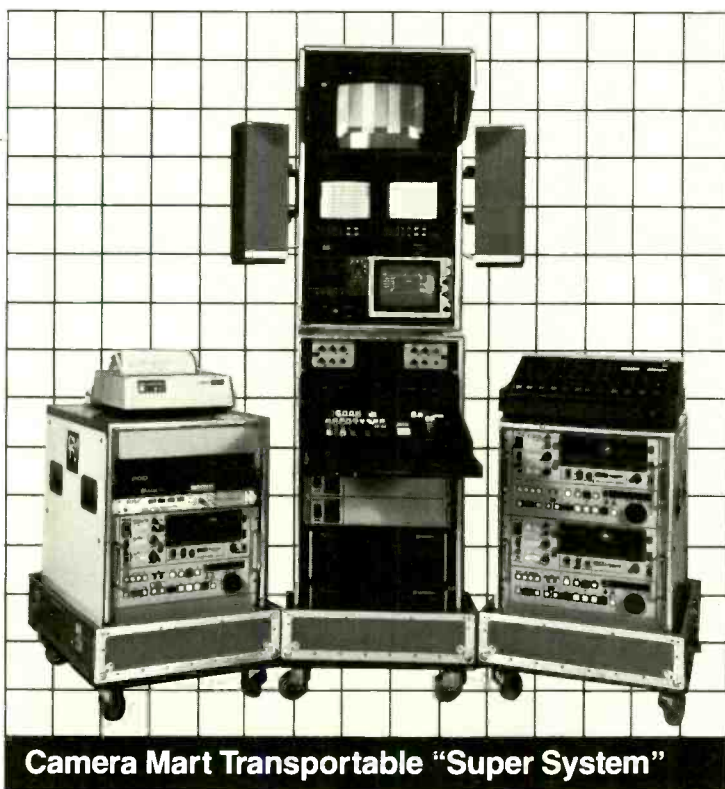
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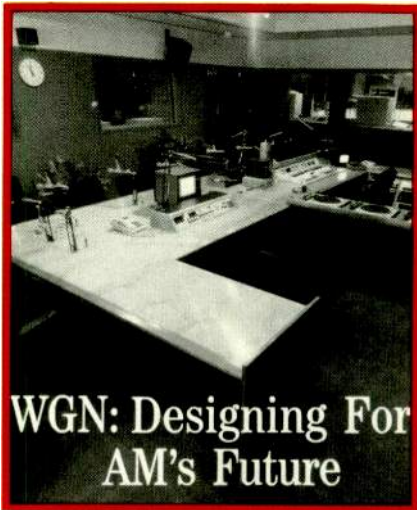
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WGN: Designing For AM's Future

SEPTEMBER 1986 VOLUME 22/NUMBER 9

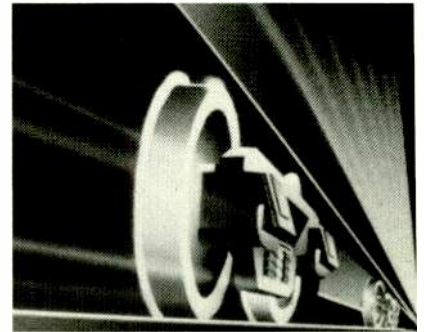
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WGN-AM in Chicago demonstrates why it is the standard-bearer for both radio programming and facility design. Photograph by Dave Tonge.

Can AM Radio Be Saved?

“AMers need to take their fate firmly in their own hands and just choose the technology they believe will work best for them.”

AM radio, like all other businesses, is subject to the mutability of our modern economy. Unlike many other businesses, AM radio is vulnerable to the vicissitudes of the “fashion-conscious” entertainment markets. And the question now being posed is, can AM radio be saved? The answer is, quite simply, yes. This, of course, prompts the next question: How?

The answer, quite simply, is by taking charge. It is generally agreed that universal acceptance of an AM stereo standard will benefit the industry. AM, and the industry at large, has pointed an accusatory finger at the FCC for not enforcing a pertinent regulation or at least passing something similar to the protection that multichannel television sound subsequently received. Although we believe this to be a factor underlying the current problems plaguing AM, the overriding difficulty is trepidation on the part of the industry. The answer then, to the question “How?” is that AMers need to take their fate firmly in their own hands and just choose the technology they believe will work best for them. I can already hear the voices, as they echo down the empty halls of AM stations, claiming that it’s a naive perception of how the industry works; but then there are always excuses for those who wish to remain inactive.

There are those, of course, who are powering the AM radio business forward (see our cover story on WGN). And it doesn’t have to be only the major stations that can make the difference. One other important way that even small AM leaders can earn their stripes is through programming. In answering the question before it gets asked: through imagination, that’s how. Be creative. I hear the same voices beginning to rumble that it’s costly not only in programming, personnel, and equipment, but in the turnaround time it takes to get the ratings numbers back. The only response is that there really isn’t another choice. That is unless the AM stations want to become merely a repeater for the few networks and major independents.

We at *BM/E* believe in AM radio, and that’s why we committed to a year-long series on AM Improvement while highlighting a few unique AM stations out there who are making the sacrifices necessary to improve the fate of the medium. We took our chance. Take yours. Make it work. Long live AM!



Tim Wetmore
Editor



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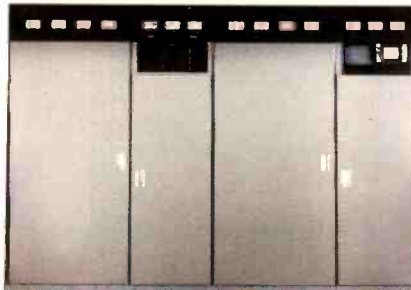
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FCC Rules against Kahn

Results from the latest "go-round" on AM stereo have acquitted Motorola's C-Quam system in splatter complaints filed by Kahn Communications.

In April, Kahn submitted spectrum analyzer photos and claimed that the C-Quam system could not comply with occupied bandwidth rules "under all conditions of program modulation." He cited failure to comply based on test conditions using a single test tone higher than 7.5 kHz modulation and percentages higher than 50 percent and asked the FCC to take action in the form of revoking Motorola's type acceptance for the C-Quam system.

After field tests of 23 stations, Dr. Thomas Stanley, the commission's chief engineer, wrote that no interference or bandwidth problems were found. He stated, "We believe that the field measurements show clearly that it is possible to operate the C-Quam type of stereo exciter in compliance with the Commission's rules."

But Leonard Kahn is not giving up. He intends to take the matter before the entire Commission and is pursuing the subject with a number of questions.

Specifically, he wants the Commission to answer why his complaint against Motorola was



WKRC-AM, Cincinnati, OH, gets promotional mileage from its new remote van, a modified Winnebago. The station bought the vehicle empty, added large windows to make a see-in on-air booth, and equipped it in-house, according to CE John Stoller, Jr. Inside is a Broadcast Electronics four-channel 4M50 board, and the van has its own generator, two-way radio, and cellular phone. Remotes are done via a Marti RPT15 transmitter or phone lines, with music played from the station via remote control.

The van spins into gear for parades, with a rooftop loudspeaker playing the station from the air or the back of the van, external source, or equalized phone line.

A Telex wireless mic setup and several frequencies let on-air talent leave the van: some have even sat on top of it during parades.

handled differently than the complaint filed against the Harris Corp., which led to revocation of Harris' AM stereo type acceptance. He also asks why the FCC used subjective field tests instead of scientific laboratory tests in this instance; why

the FCC alerted a number of stations prior to testing them; and why laboratory data supporting C-Quam exciter's type acceptance, if such data exists, has not been made public by the FCC.

Kahn is hoping that the full Commission will reject the staff opinion as stated by Stanley's letter, much as they rejected the staff's initial recommendation that the Magnavox AM stereo become the standard and opted for the "marketplace" decision instead.

NAB Announces Call for Papers

A call for papers has been announced for the Forty-first annual Broadcast Engineering Conference, which will be held in conjunction with the 1987 NAB convention in Dallas from March 27 to 31.

Deadline for one-page abstracts is Oct. 10, 1986, and the NAB's Engineering Conference Committee has set Feb. 13, 1987, as the deadline for full papers. In addition, the committee will accept suggestions and ideas for technical sessions, panels, and workshops.

According to NAB staff engineer Ed Williams, the topics of the papers help the planning committees determine the focus of the various engineering sessions and workshops.

"Papers are important to the NAB," Williams said. "They force people to think on an idea, sit down and write it, and that person basically becomes an expert on the topic."

To date, Williams said he has received one paper, one abstract, and a few suggestions for panels and workshops, however, he said, the committee is willing to work with people who may be unfocused on an idea to assemble a full presentation by March.

To submit an abstract or to obtain more information, contact the Engineering Conference Committee, Science and Technology Dept., NAB, 1771 N St. NW, Washington, DC 20036; (202) 429-5346.

FCC Approves Complex Must-Carry

It took nearly three years, but the FCC finally and unanimously adopted new must carry rules that incorporate the industry/cable compromise plus some congressional recommendations. The NAB is pleased with the new rules, which follow a complicated formula and have a sunset provision in five years. Public stations were especially

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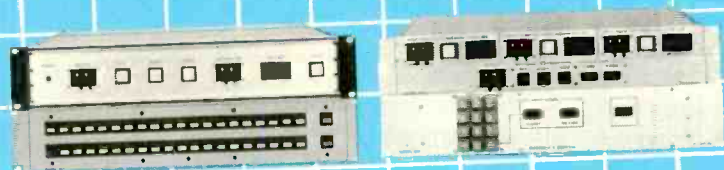


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concerned about must carry legislation, since it seemed they had the most to lose. Now, in addition to a redefinition of what qualifies a station for carriage on a cable system, there is a clarification of the A/B switches favored by the cable industry.

Cable operators are now required to educate subscribers in the use of A/B switches, which are to be installed at no extra cost. They must offer to supply

the switches for each separate cable installment and inform subscribers of a possible need for a TV antenna to pull in TV stations.

The must-carry rules will expire in 1991. Cable systems with 20 channels or less are exempt from the rules, those with 21-26 channels must devote seven of them to qualified broadcast signals, those with more than 27 must devote 25 percent of their

channel capacity to the same. Cable systems with up to 53 useable channels must carry one qualified public station or translator; those with 54 or more must carry two.

In order to qualify for carriage, a station must be licensed within 50 miles of the cable community and request carriage in writing. A commercial station qualifies when it has a two percent average share of total viewing hours and a net weekly circulation of five percent in noncable homes in the cable system's county. New stations get a one-year grace period. At least one public station must be carried, no matter what its viewing standard is.

AM Stereo Doomed?

While Kahn and Motorola continue to battle it out, there are some signs that AM stereo may become a moot point unless the standards war is resolved soon. Pioneer has ceased manufacturing its C-Quam AM stereo radio, and Sony has discontinued two of its AM stereo radios, although a newer "boom box" AM stereo radio is still being marketed. And audio processing equipment manufacturer, Texar Inc., has filed a petition for rulemaking with the FCC asking that the marketplace approach be abandoned and an AM stereo standard be adopted once and for all.

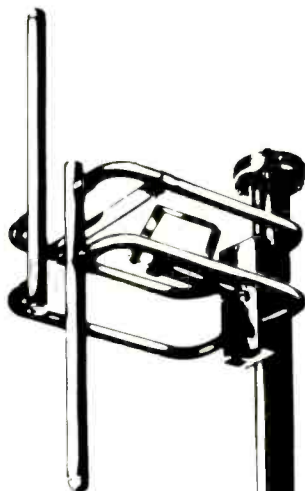
With only the two standards remaining, however, such a decision might be in violation of the antitrust laws, which would probably preclude any drastic ruling by the Commission on AM stereo.

Satellite Beethoven

With satellite music formats gaining popularity among radio stations, it had to happen eventually. WMFT, a classical music station in Chicago, has begun offering the Beethoven Satellite Network, a 24-hour classical format. It's a live, fully packaged format delivered through Westar IV and originating from WMFT, which has a library of some 40,000 records.

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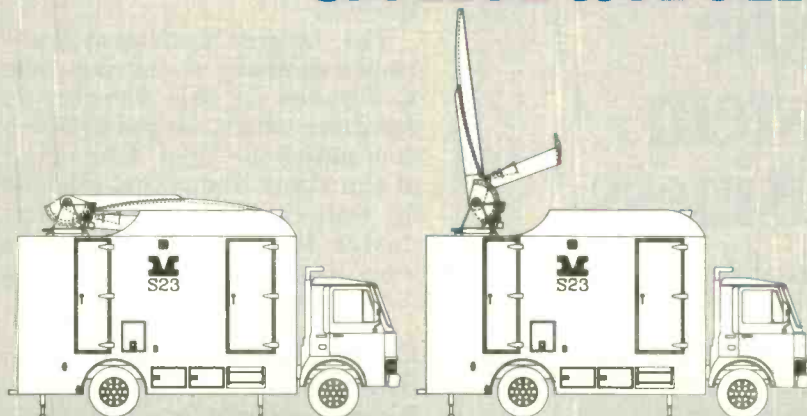
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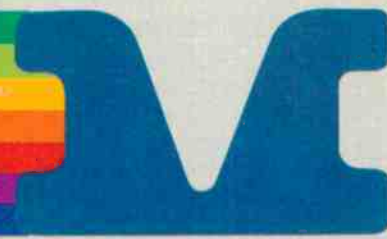


At the 1986 NAB Show in Dallas, Midwest ushered in the **SECOND GENERATION** of Mobile Satellite News Systems, the S-18... featuring the new Vertex 1.8M, Dual Reflector, Off-set Ku Antenna, specifically designed for this new service.

At the 1986 RTNDA Show in Salt Lake City, yet another Midwest innovation, the S-23, was introduced, featuring a 2.6M version of the Vertex Antenna, with 50 dbi Gain and 35db of Cross Polar Isolation.

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library is one reason classical radio stations may be inclined to accept the satellite network. Other reasons are the need for knowledgeable air personalities and the fact that satellite delivery is especially appropriate for digital music sources.

CCIR Endorses Digital TV

The CCIR has given its stamp of approval to new recommendations on digital video interfaces

and recording digital TV on magnetic tape, paving the way for digital production studios. Digital studio equipment can thus be interconnected by means of a single digital video interface signal, and a single format to record, edit, and exchange programs can be implemented.

The digital TV recommendations are based on Recommendation 601, adopted by the CCIR in 1982. These encoding standards

stipulate the use of digital component signals at a sampling rate of 13.5 MHz for luminance and 6.75 MHz for each of the two color difference signals. Unlike PAL, SECAM, or NTSC composite signals, digital encoding allows benefits such as unimpaired post-processing capability; special effects, and sophisticated picture manipulation performed on recorded signals as if they were "live."

Radio Ratings Firms to Test

In an effort to encourage competition in radio ratings, an NAB task force has selected three firms to test market radio audience measurement systems this fall. The three were selected out of a total of eight, and each will receive \$5000 "seed" money to underwrite their market testing. The companies chosen are Audits & Surveys, a custom-market survey company; McNair Anderson, an Australian company that conducts audience measurements in that country; and Birch Radio, the second largest radio measurement company in the U.S.

The largest and most well-known company measuring radio audiences in this country is Arbitron, which has pretty much dominated the field. One or all of the three companies selected for tests could provide an alternative for radio broadcasters who are not satisfied with Arbitron's research.

Closed Captioning Software

It's now possible for stations and video production facilities to close caption or subtitle programs using a standard IBM PC. The Caption Center, a service of WGBH-TV, public television station in Boston, MA, is licensing a new software package called "CC Writer." The software combines text editing and time code manipulation capabilities and allows captions to be precisely synched to a program or re-synched if the program is edited.

Captions produced by CC Writer can be decoded by stan-



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standard industry decoders. The software can also work with a Chyron VP-1 character generator to create subtitles. The Caption Center has been using the program to create closed captioning for PBS, CBS, HBO, and other producers.

SMPTE Forms HDTV Group

An ad hoc group to document the specifications for the current

1125-line, 60-field high definition TV system has been formed by SMPTE in response to requests from the Advanced Television System Committee and the CBC and CTV in Canada.

The group will define several aspects of the HDTV system, include colorimetry, optical/electronic conversion, scanning parameters, blanking waveforms, and other details as well as studio level interfaces in both

analog and digital and the timing reference signal. The group will aim to ensure both the compatibility of equipment and ease of program interchange for the HDTV system.

New NPR Transponder

The Corp. for Public Broadcasting (CPB) recently put up the money for the purchase of a transponder on Westar IV for National Public Radio. CPB had been leasing a transponder from Western Union for NPR's use but decided that purchasing one for the public radio system would help hold down cost increases and provide a means of bringing in additional revenue for the firm.

Under the arrangement, CPB established a trust to hold title to the transponder, which it will lease to NPR. Stations will establish a transponder replacement fund for use in the next decade when the transponder reaches the end of its lifespan. NPR's satellite interconnection system, which includes uplink and downlink earth stations, has been operating since 1979.

WNYC Shows Satellite "Whodunit"

New York City's municipally owned WNYC-TV recently experimented with a novel use of satellite technology that combined live drama in three international venues with video art for a philosophical murder mystery produced by video artist Douglas Davis.

Davis used a video monitor set specially created for the broadcast as he synchronized live action in Amsterdam and New York with taped segments from Venice to tell the story, which was also simulcast on WNYC-FM and several other public radio stations. The broadcast was carried live in this country and was available to public stations and ran live on Holland's VPRO. RAI, Italy's TV network, decided to run the broadcast as a taped show later.

On the video screen background, a murder that takes place in Venice on one screen

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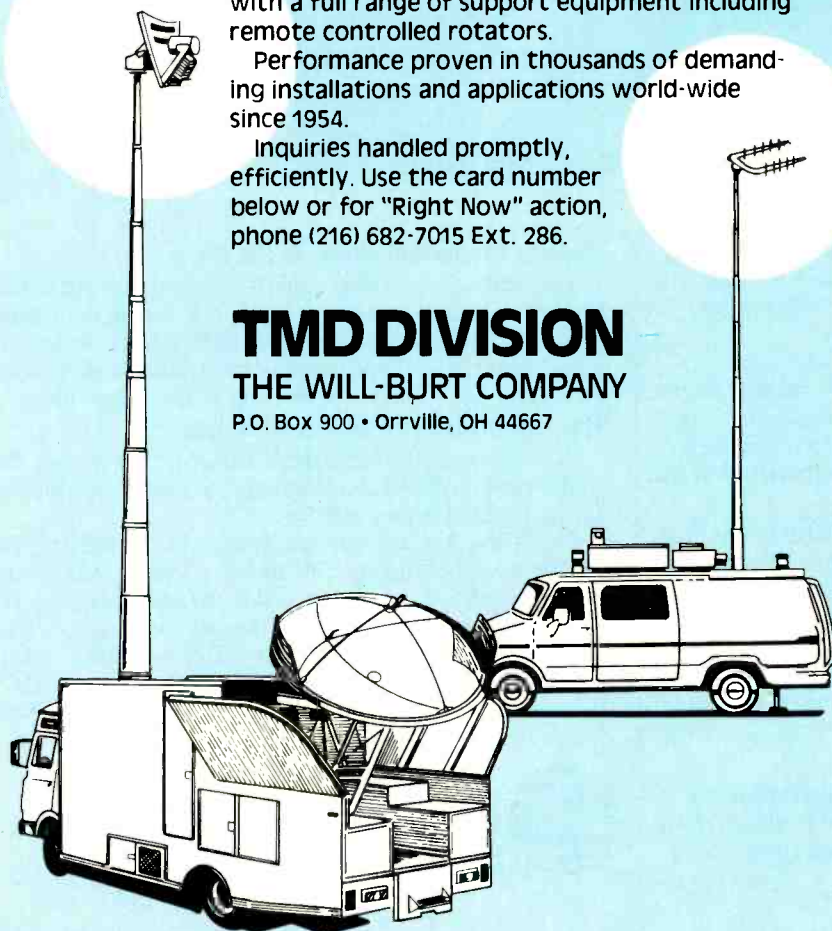
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kills an actress in Amsterdam on the next screen. Davis, live in the New York studio, asked for the audience's help in determining the culprit. The broadcast also included taped telephone conversations synchronized to live action and dual dialog, in Italian and English. Technically, the broadcast went without a hitch, although there were some artistic problems including coordinating taped segments to

improvised live action and long silent sequences where the radio host was forced to ad-lib.

WNYC-FM followed the broadcast, which was appropriately called *Menage à Trois*, with a live call-in show to solve the murder mystery and bring out its philosophical interpretations. It wasn't the first time Davis has used satellite technology in a performance. In 1981 he created *Double Entendre*, a two-

person, two-city event using live and taped performances and had previously performed in the first live international broadcasts by artists produced by West Germany in 1977.

Thomson Acquires Comark

The trend toward more mergers and corporate takeovers isn't limited to stations and networks these days. Now the trading is touching broadcast equipment suppliers. In the most recent move, France's Thomson-CSF, in an effort to gain a stronger hold on the U.S. broadcast market, has acquired all outstanding shares of Comark Communications.

Thomson-CSF's international sales of TV and FM equipment totals \$115 million annually. Comark will add its UHF-TV transmitter sales in this country to that international slice of the pie. Comark has some 20 percent of the UHF-TV transmitter market in this country with annual sales of \$10 million.

The Thomson/Comark union is the latest in what may become a trend by European manufacturers to increase their U.S. market share. Earlier this year, Philips and Studer, both European companies, formed a joint venture to market both companies' professional CD players to the U.S. broadcast market where Studer had already enjoyed some success.

Kodak Opens Film and Video Center

Eastman Kodak has opened a \$3-million film and video technology center in Hollywood, built around an historic building the company once occupied in 1927.

It will coexist with Kodak's warehouse and distribution center for Eastman motion picture film and videotape and is designed to be a staging ground for delivering and supporting new imaging technology.

The new center will house Kodak's sales and technical staff and contain state-of-the-art analytical, densitometry, and

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sensitometry film labs, plus a videotape testing facility. There is also a motion picture screening room that allows side-by-side screening of two 16 mm or 35 mm film prints and for 70 mm film and video projection. The building also contains video conferencing capability and will be used for educational seminars on the film and video industry.

Video Production Trade Show Possibility

The International Teleproduction Society (ITS) has decided that what the video production industry needs is another trade exposition, one of its very own.

The ITS bases its conclusion on a benchmark study done by Market Tech Associates of the video facilities industry, which was completed with financing from major hardware and tape manufacturers.

Anticipating equipment expenditures for this year to ex-

ceed \$200 million in video and audio production, post-production, and duplication fields, the ITS says that there is a "ground swell" of support for a convention focusing exclusively on the equipment and needs of this industry, according to ITS president Tom Angell. He adds that the NAB has become so large and diversified that it's more difficult for those in the video facilities industry to appraise the equipment that interests them specifically.

EditDroid Cuts Major Release

The Patriot, an action/adventure film produced by Crown International Pictures, has become the first theatrical release to be completely edited on the videodisc-based EditDroid system.

According to producers, 35mm negatives were brought to Foto-Kem, a post-production house located in Burbank, CA, where

they were developed and transferred to tape on the facility's Rank Cintel unit. Copies were brought to Pacific Video, Hollywood, CA, and transferred onto videodiscs, which were sent back to Foto-Kem. There, editor Rick Westover went to work on a Droid Works' EditDroid machine. Once the edit was complete, a computer cutlist was generated from the EditDroid, and a film workprint was constructed.

Westover claims the EditDroid provided him not only with a quick alternative to cut-and-splice editing, but it also offered flexibility unavailable with conventional editing techniques.

"I could actually present director Frank Harris with several different versions of a scene, giving him the ability to evaluate and compare them easily," he said. "If I had my choice, I'd never edit a film conventionally again."

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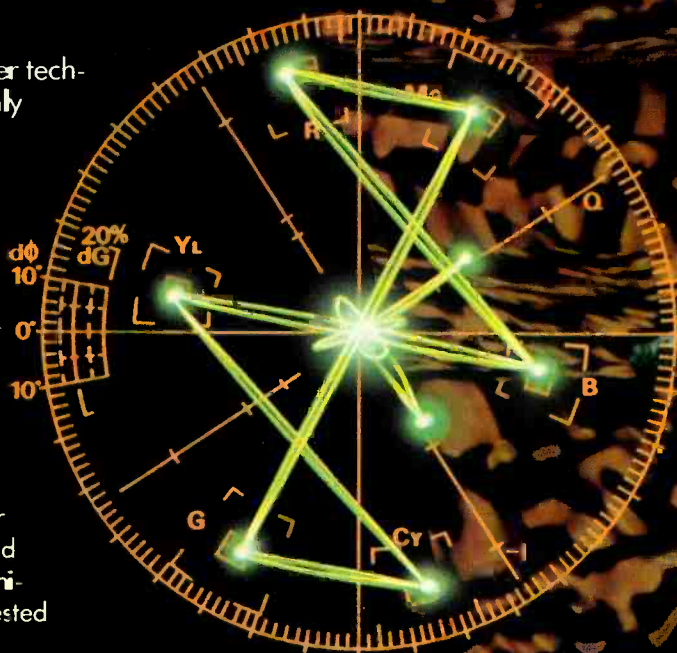
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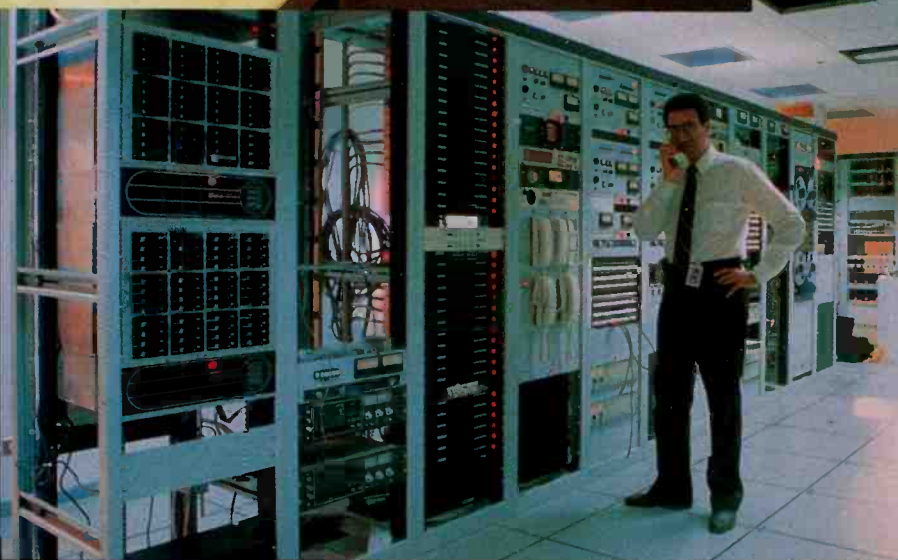
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▲ CE Jim Carollo prepares to switch operations over to the new studios from the phone and communications center at the island of equipment that is the heart of the spacious master control.



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A \$3-million move to a new facility and a high-visibility space-age showcase studio pave the way to high ratings and a bright future for one forward-thinking AM station.



Designing for AM's Future

By Judith Gross

AM radio is dead. Everybody knows that. Then why hasn't somebody told Chicago's WGN?

It's not enough that the Tribune-owned AM station is the top-rated Chicago station and is so much a part of the community that its motto is "We Are Chicago." The station just completed a move to new studios to the tune of more than \$3 million and is working on a showcase studio unique enough that passers-by might have a hard time believing it is radio—AM radio, at that.

WGN has never succumbed to the "death of AM" philosophy and, in fact, has designed its new facility with a realistic yet optimistic eye towards its future—a future that speaks well for AM radio in general.

Every facet of the design reflects WGN's philosophy: It is possible to stay fresh, innovative, and exciting (the current plight of AM radio notwithstanding) if a station keeps pace with technology and makes the needs of its listeners its main priority.

One look at WGN's new studios reveals what the station is all about. Community involvement is



Studio B resembles the combo side of Studio A. At right are racks with Gentner intercom, Fidelipac Dynamax cart machines, Tascam cassette deck, Studer CD player, and Crown power amps. To the left of the board is a control turret with Electro-Voice mic-line mixer and Technics turntables.

an important concern, so, in addition to providing a showcase in the heart of the city, the station's new equipment supports a large number of remote broadcasts, sometimes as many as four per day. Sports is very big on the station, which carries Cubs baseball and Bears football games, requiring on-air and production areas for sportscasters throughout the new

facility. News is also a priority, with WGN having no less than five complete newscenters as well as additional news positions included in several of the other studios. The rest of the facility is designed to give WGN flexibility and to allow a frantic pace of activity to continue on a daily basis.

The decision to move into new surroundings came about when WGN's parent organization, The Tribune Co., reorganized and decided to make the AM station a profit center separate from WGN-TV, which had shared the same building for many years, according to Kenton Morris, director of operations.

"Even though we're number one in radio, the feeling was that in the same building we would always be number two, behind TV," Morris explains.

WGN looked at several sites before deciding on the familiar Tribune Tower, which had been its home for three decades until the 1960s. The choice was made purely on the site's merits, not because of Tribune's ownership. Morris says the high visibility of the Michigan Avenue address was a deciding factor.

AM Studio Design

"It puts us in the center of the community, and you can't buy that kind of advertising," Morris notes, adding, "It's hard to be in the center of town and be ignored."

It will be even harder for Chicago to ignore WGN once the centerpiece of its move—a bullet-proof plexiglass showcase studio right on the avenue—is completed in the fall.

Showcase radio

It's a sure bet that after next month if a Chicago pedestrian with a portable radio or a passing motorist is anywhere near Michigan Avenue and Pioneer Court, the urge will be to tune to 720 AM. In full view will be WGN's showcase studio, an information center with a high-tech look that will double as the station's on-air booth.

Picture a backdrop of 45 translucent light panels programmed to change patterns and colors from a PC. An exterior electronic message board will flash time, temperature, and stock prices. There will be a color radar weather map and another map

with flashing traffic patterns of the nearby vicinity fed from an Illinois Dept. of Transportation (IDOT) computer system. Pedestrians will be able to communicate with station personnel through a video camera and PZM mic mounted on the window.

For on-air, the showpiece of the studio is a bilevel, elevated console, designed and built by Pacific Recorders & Engineering, that will accommodate traffic, weather, news, on-air talent, and up to two guests simultaneously, plus an engineer to run the show if necessary.

The horseshoe-shaped console parallels the shape of the showcase studio, which is a three-walled glass corner on the ground level of the building. On the side most visible to onlookers are positions for a meteorologist, traffic reporter, and, if needed, an engineer running a Pacific Recorders BMX III Series 26. On the next level are positions for news and guest spots, a second guest, and talent running a BMX II Series 14 if an engineer is not at the controls. Anybody looking in might

think they had stepped up to a space-age movie set.

Morris says that information is the key; it's the main reason the showcase exists. "If it's raining, we're a weather station. If traffic is bad, we're a traffic station. We want to give our listeners what they need and show people that we're doing it," Morris says.

WGN has been using the IDOT traffic sensors in computer print-out form and will just adapt the system to a map. The idea for the color weather radar came about because of the station's proximity to its TV counterpart.

"The color radar is the same as WGN-TV uses," explains Jim Carollo, CE. "Our weather person developed his methods based on TV tools, so he wanted to continue to use it." The meteorologist uses an Alden Electronics color radar weather system to generate the graphics and help forecast the weather.

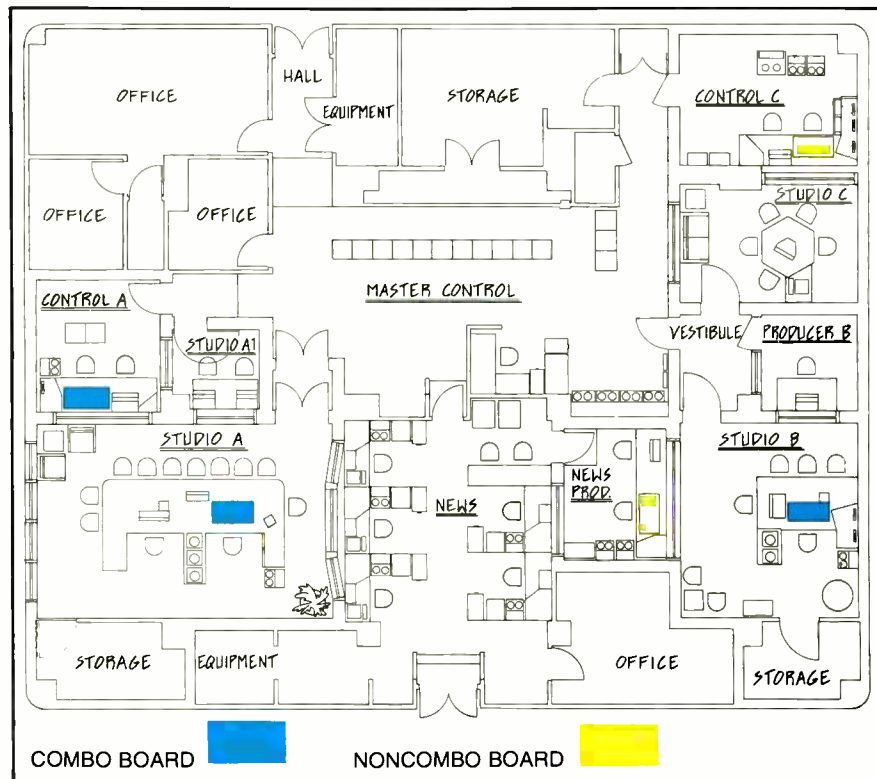
The showcase may garner the most attention, but the heart and soul of the new facility will be three main studios, a newsroom, and support and production studios with master control and engineering at the center.

Function dictates design

In designing its new studios, WGN had to take stock of all the on- and off-air activities that are currently scheduled and try to anticipate its future needs. Remotes, news, sports, and numerous call-in shows all helped dictate what was needed and how equipment would fit into the overall station design.

Master control and engineering is at the center of all studios and production, reflecting the involvement of the engineering staff with every aspect of station operations, according to Carollo. All of the studios and production rooms lead into or are accessible from the spacious room. Carollo says master control was designed to accommodate the heavy trafficking of talent, producers, engineers, sports and news announcers, and other station staff throughout each broadcast day.

At the center of master control



VOA Associates designed WGN's studios and offices. Function dictates form, and master control/engineering is the hub from which all studios and control rooms enter and exit.

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Audio Engineering & Production

AM Studio Design

is a huge island-like rack containing all communications, satellite, STL, DA, and support equipment, and is really the heart of the radio station.

Previously owned equipment includes WGN's two 48-position IGM Instacarts, which engineers preload for talent to call up by remote control. Carollo says the station is looking ahead to the use of possible digital storage systems, which will come under serious consideration "when the cost comes down."

WGN also put its Motorola two-way radio base station, its Harris 9160 and 9130 remote control systems, and its Mosley PCM 505 STL into master control.

New equipment includes a Logitek distribution system, with a DA for each input to the router—an entire rack of 100 amplifiers. Carollo says the station also built a talk-back system for communications, as well as a remote processing system with four stereo remote handling systems and two utilities for airing and recording remotes. For other processing, WGN has put in an Aphex Compellor and a Dominator.

Master control also has a tape recording center with Ampex 800 ATRs, which the station previously owned, brand-new Fidelipac Dynamax cart machines, and new Tascam cassette decks. The tape dubbing area in master control al-

lows for recording of feeds and shows without having to tie up one of the production studios.

With so much riding on the smoothness of WGN's technical operations, station engineers play a key role, probably more so than in most radio stations. An engineering station has been built into master control, with an engineer on duty 24 hours a day.

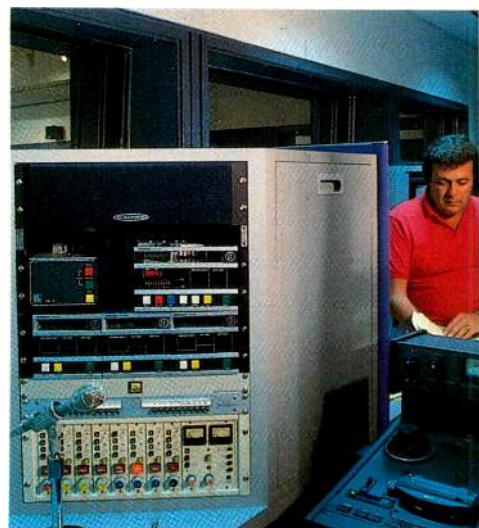
Maximum flexibility

In designing its on-air and production studios, WGN aimed for versatility to support the large number of activities that happen simultaneously.

There are three studios, the newscenter, control rooms for two of the studios, a production screening room for the other, and a news production room. WGN likes to be able to control its on-air combo, from the talent position, or noncombo, from the engineering position, and it has equipped the studios accordingly.

"Studio design reflects the idea that talent will operate the equipment more and more and that engineering, with a greater complexity of equipment to oversee, will concentrate less on operating the equipment," Carollo explains.

The overall interior design and layout was done by VOA Associates, working closely with station management to integrate form



News director Dave Ellsworth prepares the news from the on-air position II, in the five-station newsroom. Each station has a complete setup, including Newsmixer, Gentner Telemix, and intercom. Newsroom cabinetry is by Ram Broadcast Systems.

and function. Spaciousness, a scarce commodity in most radio stations, was built into the studios, not only for aesthetic appeal, but out of necessity. It added to the rooms' acoustics, and with so much going on at once, it provided ample space for people and fast-paced activity.

WGN went into the design phase with a clear idea of its equipment needs. Helping to meet those needs were two companies: Pacific Recorders & Engineering built the consoles in the three main studios, two control rooms, news production and the showcase studio; Ram Broadcast Systems built and wired the newsroom cabinetry.

Studio A is the largest and main on-air room. On one side is a row of windows looking onto an outer hallway with a wall of bullet-proof windows facing Pioneer Court. On the other side are "bay" windows leading into the newsroom. In front, with a clear line of site to talent positions, are Control A and A1. In the center of the studio is one of the biggest consoles installed in a radio station, a rounded-edged maple console, 18-feet long, which supports two talent positions and ten guest positions.



"I always thought they built these boards for engineers, but this is great," observes on-air personality Floyd Brown (foreground) as director of operations Kenton Morris helps him learn to operate the Pacific Recorders BMX II board in Studio A for his Sunday combo show.

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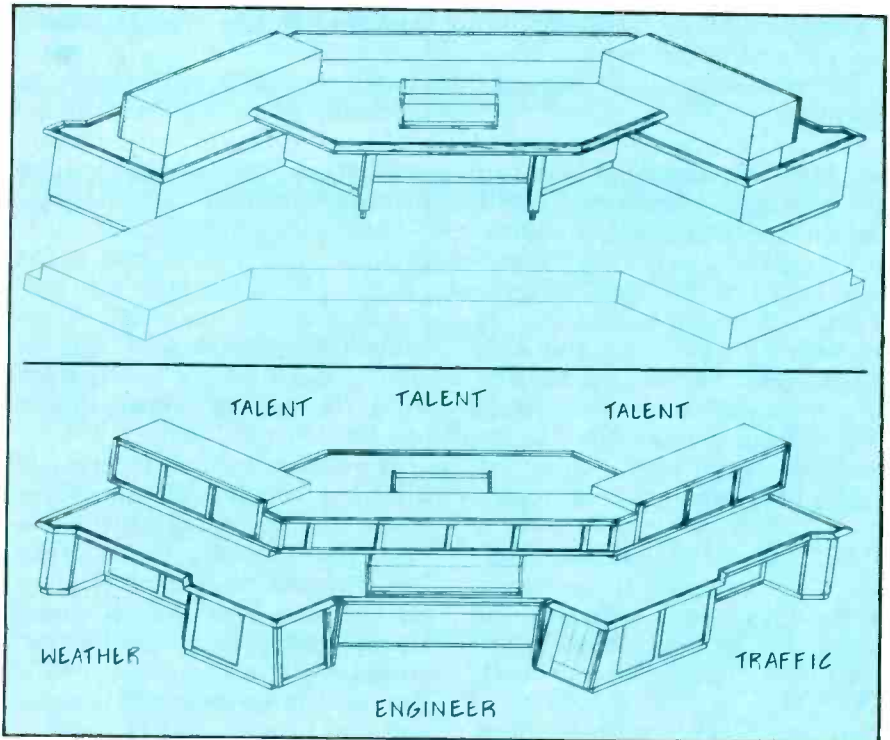
Circle 121 on Reader Service Card



One talent mic is combo, one noncombo, and of the ten guest mics, five are combo and five noncombo. Combo positions are run through the BMX II series 26 at the right-hand position, noncombo through the BMX III series 26 in Control A. One of the combo mics doubles as a news position, and has a control turret with Electro-Voice mic line mixer.

The studio also has Techniques SP-10 turntables, a Studer CD player, an Otari 50-50 MKII-3 reel-to-reel, and one record and four playback Fidelipac Dynamax machines. This equipment is placed low, on either side of the talent positions. Carollo says the console was deliberately designed that way to ensure line of site to Control A, A1, and the newsroom. The low lines of Studio A are repeated in the other studios, with the exception of the newsroom. The low-placed equipment is another example of form merging with function.

Control A has an engineering and a producer position. Other equipment includes a rack-mounted Studer 810 reel-to-reel. Studio A1, next door, acts mostly as a producer's screening room for call-ins or can accommodate farm reports or sports updates. Because nearly all of WGN's programs contain call-ins, producer's screening areas became an important con-



The bilevel, space-age console built by Pacific Recorders for WGN's showcase studio is shaped to fit into the corner room, a former Fannie May candy store. Looking out to passers-by are positions for weathercaster, traffic reporter, and engineer running a BMX III for noncombo. On the upper level in back are positions for news and two guests, plus talent running a combo show through a BMX II.

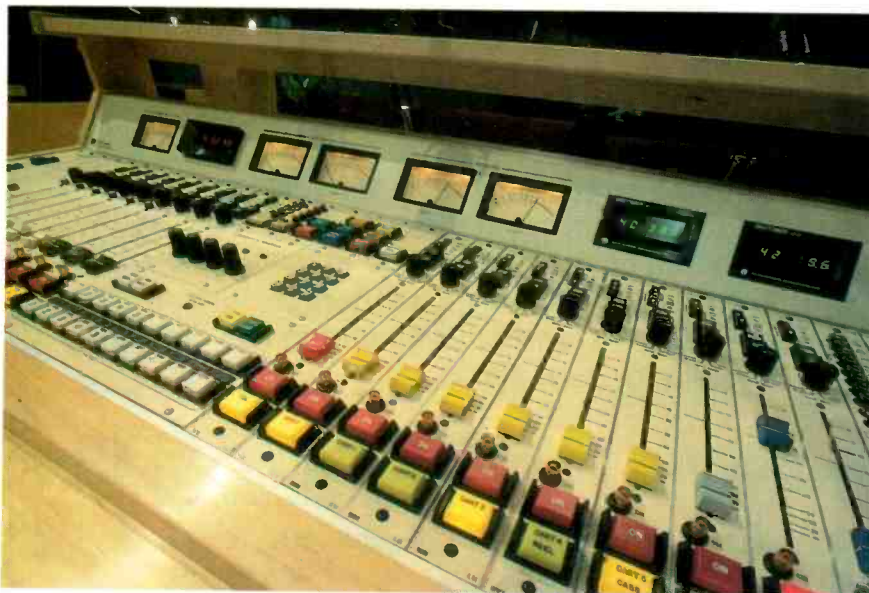
sideration, and were included in the control room designs.

Looking into Studio A through the "bay" windows is the newsroom with a total of five newscenters. Each station has a Pacific Recorders Newsmixer and a Gentner Telemix, which allows

for telephone interviews with a Telco mix-minus. Each station also has a new Otari 50-50 MK III-2 ATR, Dynamax cart machines, and Marantz 221 cassette decks, because, Carollo says, they are the same ones that news reporters use in the field. Of the five stations, news position II can go directly on air through Studio A, and the others can be routed through that news position to go on-air from the newsroom as well.

To the delight of news personnel on staff, the news department also has its own production studio with a BMX III Series 22 board, four Dynamax cart machines, two Otari 50-50 MK III-2 ATRs, and two Marantz cassette decks. This will also allow for production without the need to tie up one of the other production rooms.

Studio B is combo only and almost resembles Studio A cut in half, with a scaled-down version of its maple console. There are five positions, one with a Newsmixer and one for talent with a BMX II Series 26. Off to the side is a producer's screening room. Studio B



The Pacific Recorders BMX II combo boards have been fitted at the center with a phone module from Gentner because call-ins are so much a part of WGN's programming.

also has an Otari 50-50 MKII-3 reel and one record and four playback Fidelipac Dynamax machines.

Studio C is a production studio, which will be used for WGN's two live roundtable shows each night and for major production and recording. Morris says that the station hopes to do more outside production, perhaps eventually as a separate profit center. But with the full load the station already has, it's hard to imagine WGN ever having enough time to accommodate that wish.

The two live shows are engineered from Control C, with a BMX III Series 22, but they originate from a maple table in the shape of a hexagon with five mic positions in Studio C. Also in Control C is a Studer A80 four-track ATR.

"A four-track machine is new for us," Carollo notes. "In the past we just did basic cut-and-splice. Now we can do more elaborate pro-

ductions." But he says the station had no desire to have a larger multitrack facility. "The board in this studio had to double for on-air and production, and some multitrack boards don't lend themselves to that," Carollo says.

Other equipment in Control C includes two record and three playback Fidelipac Dynamax machines and two Studer 810 reel-to-reels. For reverb and special effects, WGN bought two Lexicon PCM 70s; one for Control A and one for Control C.

In addition to the flexibility of allowing combo and noncombo shows and of giving shows separate caller screening rooms, WGN has designed its studios to allow for the smoothest flow of operations. Studio A is the main on-air, weekday drive-time room, while Studio B is for overnight, weekend, and prerecording of shows.

It's possible to switch from A combo to noncombo, or from B to A, or A combo to B, according to

Carollo. He explains that this means no studio will be in use 24 hours a day and gives his staff a "safety valve"—time for maintenance opportunities. Time to keep the equipment in working order is insurance against ever having to squeeze a complex show, such as weekday morning drive where everything happens at once, into a studio that won't accommodate it.

Maintaining the flow

With three studios, a newsroom, a showcase, and a flurry of on-air and production duties to tend to all at once, the key factor in pulling it all together is communications. WGN's new facility has both video and audio communications. Yes, video in a radio station.

Yet there is not much equipment that is more crucial to WGN's success than its phone system. It's the station's strongest link to its listeners, and is in use nearly 24 hours a day, mostly for

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remotes and call-ins.

Gentner Engineering was responsible for both the custom-designed phone system and intercom. The phone equipment is basically an upgrade of an in-house system built four years ago. There are five lines for mass call-ins, plus private lines. The original system was built with Studer hybrids and is mechanically controlled with relays.

Gentner suggested replacing the mechanical relays with microprocessor control. Carollo says the new system simplifies operations so that now instead of three banks of buttons for conferencing there are only two banks, and switching to put calls on the air is now a "one-button operation." The old system did not allow for studio lock-outs, Carollo says, but the new system gives the studio that is on the air total control. He says the audio quality has improved as well.

One of the most important new features designed into the phone system, according to Carollo, is a "phone cue." Ideal for use when talent is running a combo show with no producer available to screen calls, the phone cue lets talent switch the call off air with the push of a button.

Because the telephone is so important, WGN decided to modify its on-air boards to make phone equipment more accessible. Pacific Recorders and Gentner cooperated on a phone module that replaced center modules on the BMX II boards. It includes a touch-tone keypad built right into the surface of the board and duplicates the color and design of the board.

The intercom system, also by Gentner, consists of two IC 20s. One system is for talent in all studios, including sports and news, and is routed back to central engineering. The second system connects all operational positions: producers, master control, engineering, and remotes. A separate talk-back system built in-house covers each studio separately and connects all positions within the studio block.

There is also an IFB system into

which private lines are tied. Carollo says the entire system is used to its capacity on days when there are several remotes taking place simultaneously.

Audio routing is done through a Utah Scientific 50 x 30 stereo router, and the station also has a new Utah Scientific earth station router. But perhaps the most unusual form of communications for any radio station is the internal video system WGN has put together. At the center is a Utah Scientific 20 x 20 video router and five black-and-white video cameras and monitors, one in each studio. Each studio also has a Radio Shack computer that is used as a character generator.

What is a video system doing in an AM radio station? It mostly serves to help communications between studios. For example, if the producer screening calls for on-air has someone on the line, the name and subject of the caller can be keyed into the character generator, and it appears on the talent's monitor. Without interrupting the flow of the show, the on-air talent can go right to the call and address the caller by name. WGN also has a video camera mounted to the window of the showcase so passers-by can communicate with talent on the video monitors. The video routing system also allows a variety of video sources to be fed into the station if needed, to monitor TV programs.

Looking to the future

With all the forward-thinking work that went into WGN's new home, it's hard to imagine anyone standing in the midst of the state-of-the-art equipment and space-age showcase and taking seriously the proclamation that AM has no future. At first look, it seems that WGN has more than enough equipment to keep a personality/talk AM stereo station on the air, and Carollo is quick to point out that no sooner is additional equipment put into the hands of engineers, programmers, and talent, than new creative uses are discovered and the studios are again operating to their capacity.

While WGN's \$3-million move,

ratings successes, and the support of its parent company may not be typical of most struggling AM stations these days, there are some valuable lessons for both small and large stations. First, it's obvious that it is not just all the new equipment that has given WGN its direction. Station management and programming knows what needs to be done to get ratings, and almost every answer to that question means more community involvement with listeners and fulfilling important listener needs. Engineering becomes a crucial part of the overall plan in providing the technology and support that allows WGN to maximize its commitment to the community through remote broadcasts and call-ins and to be up-to-date with the most modern information-gathering methods.

In creating such a facility, equipment and design decisions become a simple matter if the station knows what it wants to do.

But there are two other intangibles that can benefit any AM station, and both are reflected in the design of the new studios. One is the ability to take a leadership role, to innovate. Instead of lamenting AM's problems and trying to imitate other stations, WGN strikes out on its own and, as the Michigan Avenue showcase proves, is not afraid of the unusual and the exciting.

The second is the way all aspects of the station, management, programming, engineering, and talent work together. That's why the studios are interconnected, with engineering at the hub within easy access of the entire operation, and why WGN's technical design supports a wide range of creative efforts. The bottom line is that WGN's philosophy pays off, in the form of ratings. The station pulled in an 11.4 share in the spring Arbitrons, making WGN Chicago's number one station. Those numbers, plus all the hard work, planning, and expense spent on WGN's new home are reasons why, when CE Carollo is asked what he thinks when someone says "AM radio is dead," he just laughs.

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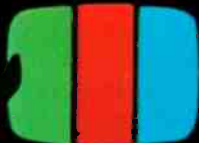
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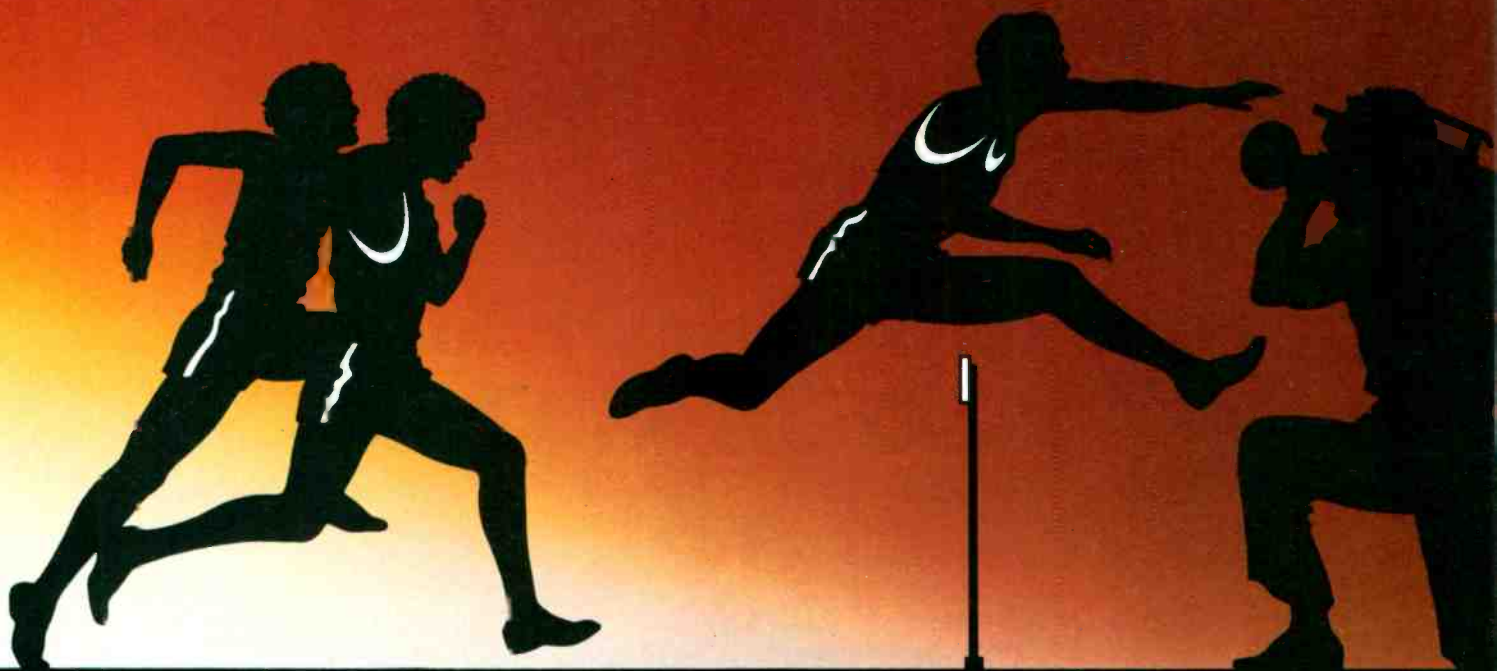
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RADIO '86
NEW ORLEANS

Radio '86 Show Preview

By Judith Gross

With the merging this year of the NAB and NRBA into one organization, many radio broadcasters are wondering what to expect from the management-programming-sales-engineering convention to take place September 10 to 13 in New Orleans.

The NAB's Office of Science and Technology has doubled the amount of engineering sessions and is hoping to draw more station engineers this year, and as a result, more equipment exhibitors. There was speculation that next month's SBE convention would steal some exhibitors away, but the latest count of exhibitors is approximately 100.

There will be some 80 workshops and seminars, as well as the usual array of stellar guests. *Megatrends* author John Naisbitt is the speaker at the Radio Awards Luncheon, and air personality Gary Owens will receive the 1986 Radio Award. There will be entertainment by Pete Fountain and Joe Cocker.

One repeat event that went over well with exhibitors at last year's show is the Exhibit Hall Lunch. Last year, a marching band led attendees into the exhibit hall where free food and drinks were served. It generated interest in the exhibits, and will be repeated this year as well, along with an Exhibit Hall Coffee Break.

Hot topics

Many of the most intriguing new trends will be

An increased focus on engineering topics will be the highlight of this month's gathering in New Orleans.



Radio '86 Preview

the subject of engineering sessions. The rest of the activity will be in evidence at the equipment booths.

Digital is still attracting tremendous interest. Expect some digital memory systems, more CD software, and the new CD jukeboxes, or multiple disc changers.

Software developers, for programming and busi-

ness, will be in attendance, and there will be a good showing from several major cart machine manufacturers, console makers, and other mainstays of the industry. If the NAB is successful in drawing more engineers, enthusiasm for this annual meeting may actually increase, and this could put the radio convention on surer footing in the years to come.

BM/E

Highlights of Engineering Sessions

The day before the convention actually begins, the NAB is sponsoring a one-day seminar on **RF Radiation Regulations**. It will cover current regulations, proposed new regulations, and compliance.

The session on **AM Improvement** will debut some important new developments. One is the release of the technical report on AM overmodulation done by Harrison Klein of Hammett and Edison Consulting Engineers. Splatter has turned out to be quite a widespread problem.

The **NRSC subgroup** working on voluntary preemphasis standards is also expected to have a draft standard ready for discussion.

Other AM improvement topics will be the focus of two in depth sessions. Topics include the NAB new technology AM antenna project, a report on the IEEE's efforts concerning RF lighting devices and electrical interference, and a **Town Meeting** with Jim McKinney, FCC mass media bureau chief, and Al Sykes, assistant secretary for communications and information to president Reagan. Both will be there to discuss AM improvement.

Practical technical assistance is the focus of the remainder of the engineering sessions.

Steve Kramer of Sellmeyer and Kramer will explain **How to Use a Smith Chart**, the chart that helps with impedance matching and broadbanding. A panel of experts will talk about **Grounding**, and another will address **Lightning**.

A session on **FM Upgrades** will cover everything from how to avoid being downgraded to the new FMX system, and there will be a separate panel on **FM Antennas**.

The Radio Show would not be complete without at least a mention of AM stereo. The session is called **Using AM Stereo** and will cover new ideas and debut an all-new NAB slide presentation.

On studio and audio topics, there will be sessions on **Studio Design**, addressing acoustic concerns, and **New Studio Technology**, which will cover telephone interfaces, digital editing, and CD players.

Finally, a session that many engineers will welcome is one on **Communicating with PDs and Managers** for an overall sharpening of communications skills.

Radio '86 Agenda

Wednesday, September 10

12:00-8:00 p.m. Registration
6:00-8:00 p.m. Welcome Reception

Thursday, September 11

7:30 a.m. Registration
9:00-10:15 a.m. Opening General Session
10:15 a.m. Exhibits Open
11:00-12:45 p.m. Making AM Work
Negative Political Advertising
Basic Financial Management for Programmers
Selling Local Store Chains
Program Consultants
All About RF Regulations
12:15-1:45 p.m. Exhibit Hall Lunch
1:45-3:00 p.m. Budgeting for a Better Bottom Line
New Business Development
News & Personality on a Music Station
For Engineers: Communications with GMs and PDs
Making Advertising Pay
Spanish Format
3:15-4:30 p.m. Marketing: The Wave of the Future
AM Improvement Report
Advanced Management for Programmers
Rep Roundtable Satellite Opportunities

Classical/Fine Arts Format
4:45-6:00 p.m. Megarate Dollars
Using Publications and Charts for Better Programming
How to Use Research in Programming
Why Do Advertisers Choose Radio
New Studio Technology
CHR Format
6:30-8:30 Reception

Friday, September 12

7:30 a.m. Registration
7:30-8:45 a.m. Traits of Effective Small Market Managers
You Can Still Lose Your License
From Programmer to Manager
Sale Survival: Returning to the Basics
Design for Tomorrow's Radio Studio
8:00 a.m. Exhibits Open
9:00-10:15 a.m. In-House Sales Training
FCC/Broadcaster's Town Meeting
New Format Experimentation
Surviving in Tough Times
Computers for In-House Research
Urban/Black Format
10:15-11:00 a.m. Exhibit Coffee Break
11:00-12:15 p.m. RAB General Session
FM Antennas
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Audio Engineering & Production

Radio '86 Preview

Country Format
12:30-2:15 p.m. **Radio Awards Luncheon**
2:30-3:45 p.m. Traits of Effective Major Market Managers
Dealing with Four Books Small Market Programming
Challenging Sales
FM Upgrades/FMX System
Layman's Guide to Research
3:00-5:15 p.m. **New Orleans Station Tours**
4:00-6:00 p.m. **Syndication Showcase and Champagne Party**

Saturday, September 13

8:00 a.m. **Registration**
8:00-9:15 a.m. Traits of Effective Medium Market Managers
Responsible Programming
The FCC Is Alive and Well
Technical Grounding
Programming for Social Change
9:00 a.m. **Exhibits Open**
9:30-10:45 a.m. **Show Prep**
Creating a Business Plan
Lobbying
Using AM Stereo
Looking out for Libel
Nostalgia/Big Band Format

11:00-12:15 p.m. **The Future Is Tomorrow**
Sales Training and Consultants
Promotion

Radio: The Mind Connection
Directional Antenna Workshop
AOR Format Room

12:15-1:30 p.m. **New Orleans Theme Lunch**

1:30-2:45 p.m. **PD Role Playing**
Creative Sales Compensation and Sales Incentives
Ratings and Radio
Station Acquisitions for Minorities
The Technical Hazards of Lightning
News/Talk Format Room

3:00-4:15 p.m. **Creative Advertising and Marketing**
Political Advertising
Selling 3564

Network Presidents Panel
How to Use a Smith Chart
AC Format Room

4:30-5:45 p.m. **AM Success Stories**
Small Market PD
Station Acquisitions

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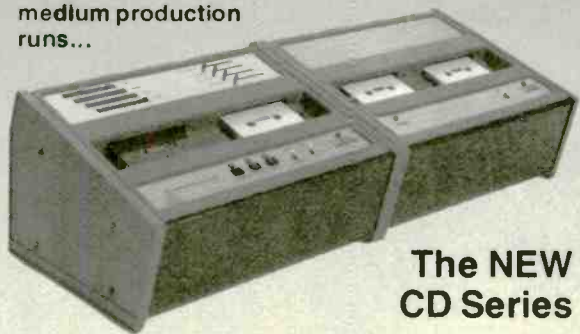
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FMX

A new transmission system improves FM stereo reception, but will enough stations get into the act?

By Judith Gross

Any time a new technology for radio comes along, especially one that involves some consumer action, skeptics abound. Engineers become enthusiastic, but general managers are apprehensive, and program directors worry about losing ratings.

FMX, the latest improvement to emerge for FM stations, actually seems to offer some measurable improvements, not just in signal transmission, but in increased coverage area for stereo and even greater dynamic range. The one consideration for many stations, however, is that FMX is an encoding/decoding system and will require a widespread consumer acceptance of new receivers in order to reap its benefits.

The FMX system was developed by the CBS Technology Center from a joint CBS/NAB design. It uses a unique companding encoding system with adaptive expansion on the decoding end to reduce noise in FM's stereo signal. At this year's NAB, there were four manufacturers ready to market FMX generators, but so far only one company, NAD, has come forth with an FMX receiver. Two companies—Sprague Semiconductor and Sanyo—have recently committed themselves to the manufacture of the IC chip needed to decode the FMX signal, however, and that is likely to spur development of more receivers.

Companding to reduce noise

When FM went from mono to stereo sound, there was a tradeoff in the S/N ratio that was caused by

a combination of factors. The signal power had to be spread out among components of a more complex signal, and the wider bandwidth resulted in a stereo S/N that is much less than the mono S/N.

The EIA's National Quadrophonic Radio Committee has calculated the S/N ratio degradation under test conditions to be as high as 26 dB, but that figure is reduced somewhat for actual program material. For one thing, interleaving, when the peak amplitude of the sum of the main and subchannels of certain audio signals is actually less than the sum of the peak amplitudes of each channel, helps the ear, a 20 dB noise penalty for stereo is generally accurate. The loss of S/N ratio carries with it a

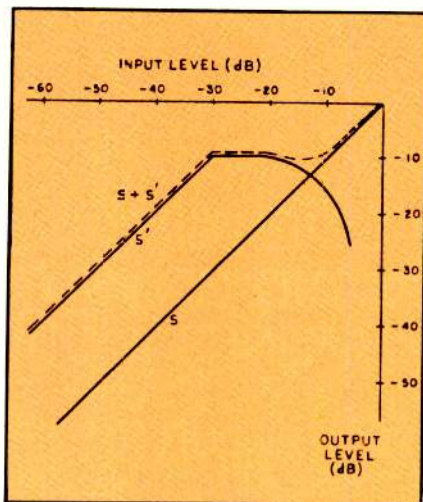


Figure 2: At low signal levels, the compressed signal is linear, but at a 20-dB-higher gain than the uncompressed L-R channel. At midlevels, the slope flattens, and it drops off entirely at high levels in the CBS Technology design.

loss in stereo coverage area, and there is also a loss in mono coverage, although to a lesser extent.

Stereo reception can be cut down to as much as one quarter of the station's coverage area in mono. FM stations have been handling the problem in various ways, ranging from processing that boosts the high frequencies and masks noise to giving up on the "fringe" listening area for stereo coverage entirely.

Noise reduction by companding is a technique that has met with success in tape and vinyl recording and was an important part of the MTS system approved by the BTSC, with its dbx-developed signal companding. The benefits result from first compressing the dynamic range of an audio signal prior to transmission and then expanding the signal back during reception. Usually, companding techniques rely on a fixed compression ratio, for example a 2:1 or 3:1 ratio, but this is not the case with the FMX system.

In developing a noise reduction/companding system for FM radio, compatibility is an important consideration. Not only must the improved signal be compatible with mono reception, but it must also ensure against degradation of the stereo signal in existing receivers.

The CBS Technology FMX system provides a unique companding alternative. In addition to the L+R mono and L-R stereo signals, it generates a second L-R signal (S') in quadrature (90 degrees out of phase) with the original L-R. This second stereo subcarrier is transmitted at the same frequency as the S signal

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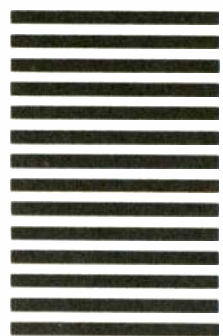
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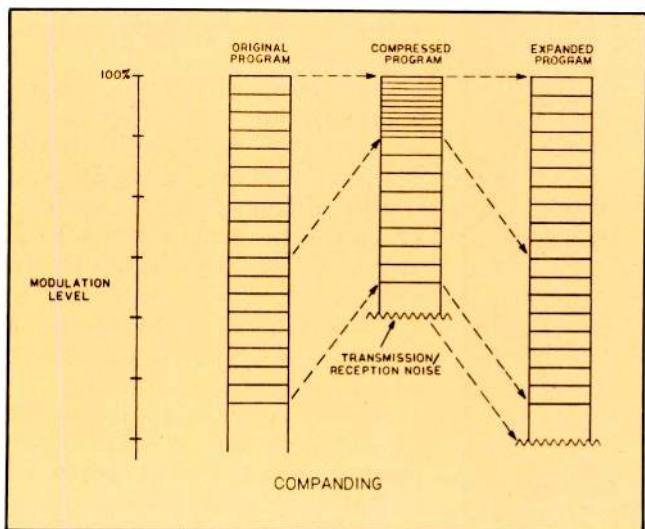


Figure 1: In the FMX system, the dynamic range of the audio signal is compressed at low levels during transmission and expanded in the receiver to achieve noise reduction.

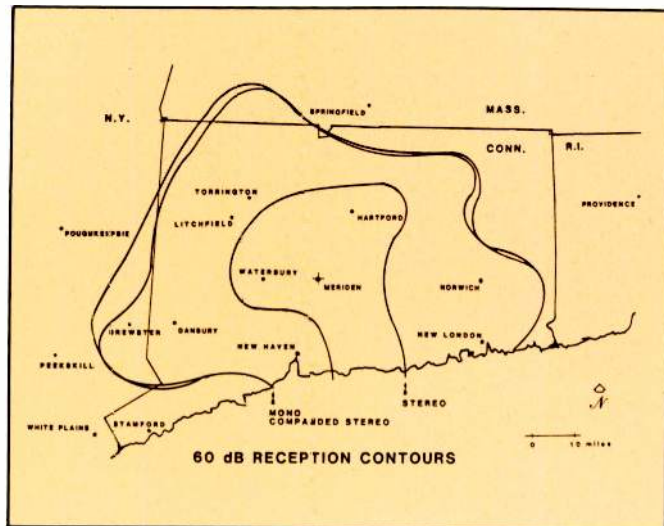


Figure 3: With the FMX system in use at WPKT, there was a vast improvement in stereo coverage at 60 dB reception, and even the mono coverage showed improved contours.

and has a 10 kHz pilot for identification, but the audio is compressed on the low end and has a 20 dB boost in gain over the S signal. The S and S' have a linear relationship, 20 dB apart. But as the signal approaches 100 percent modulation, the FMX "shuts itself off," leveling the S' back to the original S in order to avoid the overall modulation penalty that would result were it allowed to continue.

The companding is applied during lower levels, where it's needed the most, and gradually returns to the level of the S signal at the high end, where noise reduction is not needed (see Figure 1). The S and M signals set the modulation limits for the system so it is never more than 100 percent. Because the S' is transmitted in quadrature with the S, there is no chance of stereo receivers without the special FMX encoding picking up the FMX signal. The noise reduction benefits occur during expansion on the receiving end.

Adaptive expansion

With such a unique form of companding in effect on the encoding end, a different type of expansion must be used during decoding. The FMX system uses "adaptive expansion" to ensure accurate decoding (see Figure 2).

The expander uses a tracking reference signal, and, in this case,

it is the original S—the L-R stereo signal—itsself that provides the reference. The signal going into the expander consists of the sum of the compressed and uncompressed L-R signals (S and S'). The VCA uses the level difference between the two as its control signal, and the circuit functions as a servo amplifier, restoring the compressed signal to the original signal. For signals below the compression threshold, the expander operates in a linear fashion to avoid decoding errors. The 10 kHz pilot on the FMX signal ensures automatic switching in the decoder.

CBS Technology has been testing prototypes of the FMX system for more than a year. A system has been in use at WPKT—Connecticut Public Radio, and the benefits have been impressive. Reception measurements, and the resulting contours plotted, show that with FMX, the station's stereo coverage area extends nearly as far as its mono coverage (see Figure 3).

For nondirectional stations, a three-fold improvement is predicted, but, according to Emil Torick, VP of audio technology for CBS Inc., the directional nature of WPKT's signal and the boundary of Long Island Sound actually resulted in a greater improvement. The coverage benefit to a particular FM station depends on the S/N ratio of the original signal. The

greater the original S/N, the greater the improvement. Torick estimates a 4:1 improvement at about 60 dB S/N and 3:1 at 50 dB S/N.

As might be expected, FMX also results in an increase in the signal's dynamic range. Most FM stations have a dynamic range somewhere between 60 to 80 dB; generally around 70 dB. The FMX system can improve that by about 20 dB, which means that, theoretically, a station's dynamic range can approach that of the digital music sources that are becoming an important part of many stations' music libraries.

But Torick feels that one additional benefit may become even more important than the others: the effect FMX has on a station's contour shadows. In addition to merely expanding the stereo coverage area out to the mono coverage, FMX apparently can flatten out some of the dips and curves present in the stereo and the mono coverage area. Such was the case at WPKT, particularly in the outer southwestern reaches of the reception area.

Variables

The FMX system, as developed by CBS Technology, leaves room for a variety of approaches by manufacturers interested in marketing an FMX generator. The amount of fixed gain for the com-

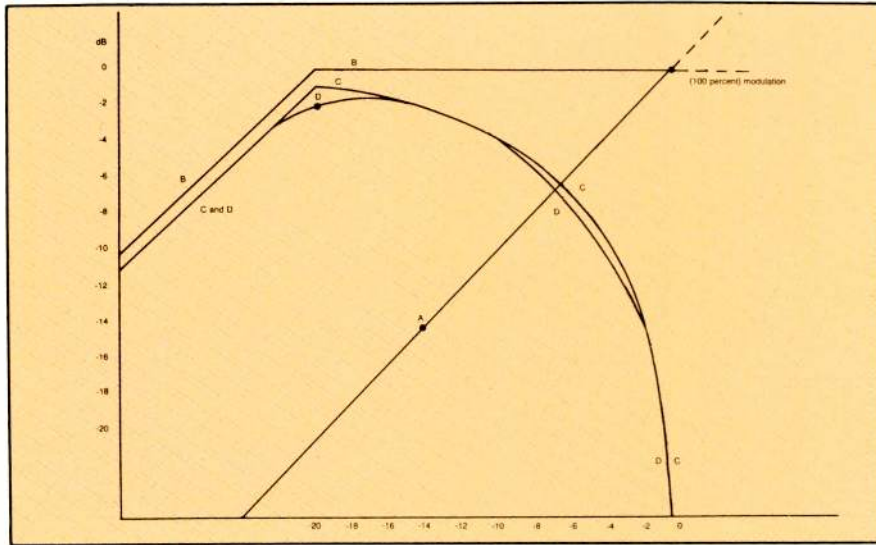


Figure 4: "A" is the normal stereo subcarrier, "B" is the same L-R information with the 20 dB FMX gain and flattop compression characteristic. Subtracting "A" from "B" results in "C," which modulates the FMX subcarrier in the CBS design. Inovonics' feedforward pulse-width modulation results in "D," a softer compression curve.

pressed FMX signal is 20 dB, but it will be up to individual manufacturers to determine the time constants of the compression and the final shape of the re-entrant characteristic curve. It will also be up to them to determine how the FMX system will be integrated with processing that they might include in their FM generator.

One other issue that has arisen is how to deal with actual program material that has peaks causing overmodulation when the S and S' amplitude levels together exceed 100 percent. Possible solutions include baseband clipping, or peak limiting, or altering the compression characteristic in some way.

Circuit Research Labs helped in CBS's development of the FMX prototype by providing a digitally synthesized S' channel. The company is currently analyzing test data collected from a PCM recording on a Delco 2000 in the field under medium multipath conditions. It will be these test results that determine if CRL does go forth on product development.

"We announced that we would go into FMX if there were no compatibility problems and if it would benefit broadcasters," says Ron Jones, chairman of the board.

If CRL does go forth with FMX, Jones says, the product will be an FM stereo generator with switch-

able FMX that will have selectable preemphasis and 15 kHz low-pass filters to be compatible with other manufacturers' processing. CRL anticipates that an FMX product could be introduced at next year's NAB.

One of the things CRL will be looking at is the problem of overmodulation caused by peaks. Changing the compression threshold is a solution.

Orban's Optimod FMX model 8150A is still in the development stage, and Bob Orban stresses that more field tests are needed to see how the system reacts to the use of processing.

One of Orban's concerns was that the addition of the FMX signal in the original CBS prototype results in overmodulation, as high as 126 percent with some program material. That would mean that overall modulation would need to be reduced to avoid such problems where they exist. But Orban addresses the problem by making the knee threshold (start of re-entrant curve) and the compression-ratio-re-entrant part of the curve program-dependent.

"It looks at the relationship between sum and difference signals, both their phase and amplitude, and decides how large the Q channel (FMX signal) can be to achieve the maximum noise reduction

without overmodulation," Orban explains.

The Optimod FMX generator is a standalone stereo generator with an FMX compressor that is designed to plug directly into Orban's FM processing and is optimized for the Optimod-FM 8100 and older 8000 models. But Orban says it can also be interfaced to other manufacturers' processing as long as there's an effective low-pass filter and peak limiting.

Orban is continuing to test the system to see how it works in the presence of processing and to determine any multipath problems that might exist. A product will be available late this year or early next year, with pricing in the \$3000 range.

Aphex is also interested in marketing an FMX product. The company was contemplating entering the FM stereo generator field and decided after researching the market that any new offering should be prepared for the future by incorporating the FMX system.

"We felt that in order to be high performance we had to offer FMX. It will be an option to our FM stereo generator," says Marvin Ceasar, president. He says there will be a product available later this year that will be priced about \$2000 without FMX, \$3000 with it.

Ceasar says that the development of two previous Aphex products, the Compellor and Dominator, helped pave the way for the type of companding noise reduction system used in FMX. Aphex will not incorporate any additional processing other than the companding into its FMX generator.

The problem of potential overmodulation resulting from program material will be solved through peak limiting, not the baseband clipping the CBS FMX prototype uses. Aphex is planning a product with low distortion and high separation, and it will be watching the receiver market to see whether FMX will catch on.

A slightly different approach to FMX is represented in a design by Inovonics, Inc. President Jim Wood says the company became



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FMX Broadcasting

interested in marketing a generator to FM stations primarily because of FMX, which would enable Inovonics to "get in on the ground floor" of the new technology.

The company uses feedforward pulse-width modulation, which Wood calls a "quasi-digital approach" to FMX encoding that dictates the compression boost instead of accomplishing this with a VCA or analog approach. There is also a softer curve for the re-entrant characteristic, a softer knee rather than a well-defined break (see Figure 4).

There will be two Inovonics FM generators available. One is a standalone unit with processing and AGC control that goes into a three-band compressor/limiter with user-control built-in and, finally, to a stereo generator with digitally synthesized pilot and subcarrier and segmented sine wave sampling. FMX is part of the system, and there's an optional

SCA plug-in card. Pricing will be around \$4500, with an additional \$400 for the SCA option.

The second Inovonics product will be stereo generator, with FMX option and no processing, that can interface to existing processing units. It will cost around \$1000 without FMX; under \$2000 with the FMX plug-in card.

Inovonics has handled the potential for overmodulation from program peaks with the re-entrant compression curve. It predicts where a problem with subcarrier summing might exist. Also, it begins the compression below the knee, which is also used in the CBS system, and a more gradual curve is used to guard against overmodulation, Wood says. The company is doing on-air tests and is aiming for October product availability.

Limitations

Just as the FMX system works

best when the station's S/N ratio is great to begin with, so is the system more suited to certain types of FM stations.

A station that uses heavy processing or boosts the highs to get a certain sound is already masking a good deal of the noise present in the stereo signal and probably won't hear dramatic benefits from the addition of FMX, which seems to act best on low- and mid-range audio.

There has also been a great deal of discussion about a possible increase in multipath distortion as a result of FMX. In cities with tall buildings and in mountainous areas, multipath distortion can cause distortion and degradation of the signal, especially when multipath reflections combine out of phase. In tests of bipath reflections, the NRQC found that a two percent distortion in an FM signal could be ten times that much—20 percent—for the same station in



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stereo. For multipath conditions, it would probably be intensified, and the feeling is that FMX could increase the distortion even more.

Torick says tests are still being conducted to quantify the situation. FMX's effects will be easier to determine once more stations convert to it and once there are more receivers available.

There are two reasons for optimism, however, according to

Torick. One is the fact that higher signals are generally more likely to cause multipath distortion, and the FMX system acts only on lower signals. The other is the fact that multipath distortion, if it occurs, would be noticeable mostly on non-FMX receivers. Once the marketplace converted to FMX receivers, multipath distortion could actually be reduced.

A final compatibility problem

with FMX could crop up with very old FM receivers, those built primarily before 1975 and before the widespread use of phase-locked loop detectors. If a receiver without such a detector is not exactly in phase, it's possible that the FMX subcarrier, the S', could be picked up by the radio and sound like additional noise or degrade the stereo separation. With such older, synchronous detector receivers, if they are out of phase, the 10 kHz pilot on the FMX signal could modulate the stereo signal during quiet passages.

Stations wanted

The next step in FMX's development and acceptance will be two-fold. First, testing in actual on-air conditions is crucial to settle the question of multipath distortion and to see how a station's processing and format responds to the system.

WPKT—Connecticut Public Broadcasting has tested the CBS prototype for more than a year, and it has noted increased stereo coverage and improved reception contours. The system seems to do what it promises.

WLTW in New York also ran some limited tests using a CBS prototype. And other stations are clamoring to test the system.

The second step will be the availability of FMX receivers. There have been several commitments from IC chip companies to provide chips to receiver manufacturers, with large-scale production slated for next year. Adding to the note of optimism is the fact that CRL has supplied research laboratory generators, in cooperation with CBS, for receiver manufacturing alignment in production.

With generators for broadcasters available late this year or at the start of next, it looks as if FM stations can expect to see FMX beginning to catch on toward the middle and later part of 1987. Working in its favor is the fact that there is only one accepted standard among manufacturers. As several industry sources pointed out, "it probably won't be another AM stereo." **BM/E**

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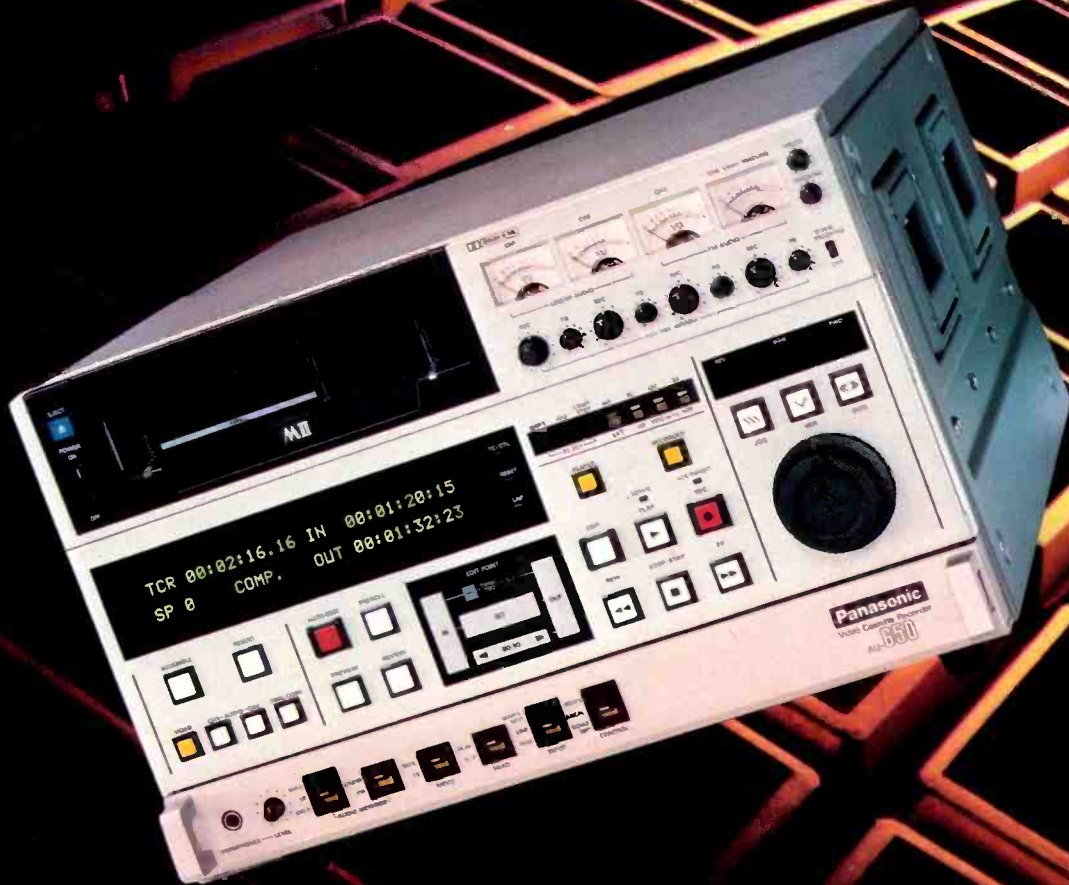
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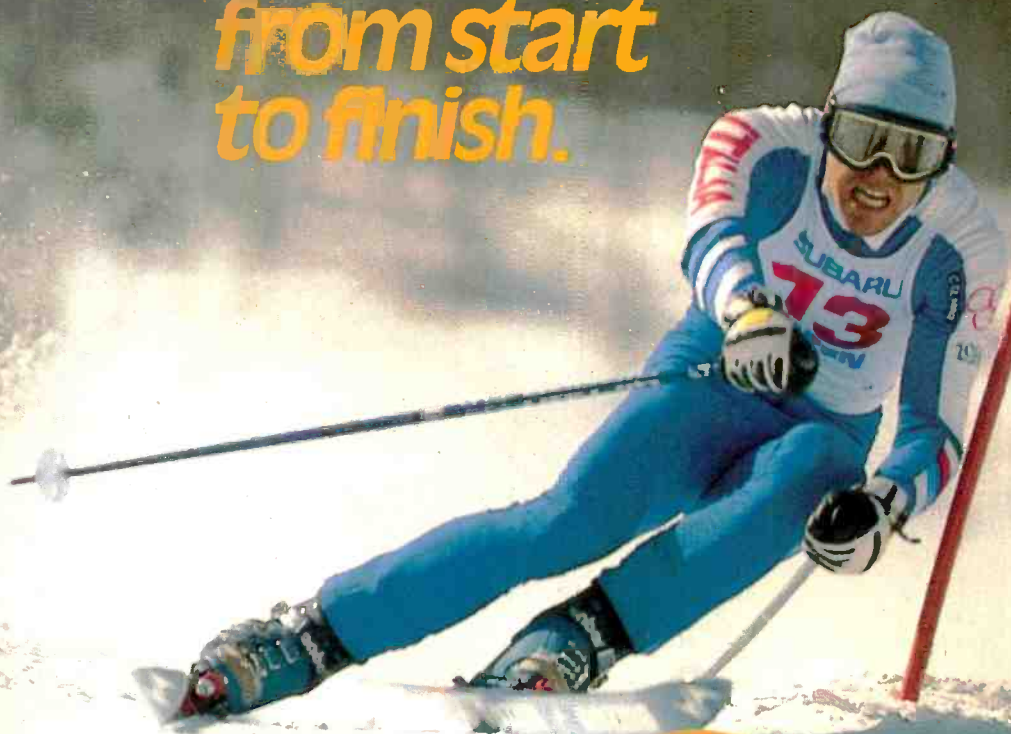
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Digital Video: Blue Sky Comes Down to Earth

By Eva J. Blinder

Digital video, which has played an important supporting role in television and teleproduction for several years, stands in the wings ready to step into stardom. The imminent availability of commercial digital videotape recorders means that for the first time, long-form programming can remain in the digital domain from the initial production all the way through processing and post-production. The need to transfer between analog and digital has been entirely eliminated.

At least, that's the ideal. Although that ideal is no longer purely blue sky, it's still a ways in the future, especially for television stations.

After all, why should a broadcast television station—required to transmit in NTSC, no matter what form the signals in its studio take—assume the enormous cost of an all-digital plant when the currently available analog component and one-inch formats provide such excellent quality? Digital video is a natural in applications such as graphics, where multiple generations severely degrade analog formats. But do standard station production and on-air operations justify such a radical departure?

For television stations, the answer seems to be a highly qualified

Once an engineer's dream, the digital VTR will be in commercial use in a few short months. It will be years, however, before television feels the full effect of this new technology.

I think it will be the next mastering machine. I really see it as a replacement for Type C mastering."

At this stage, however, Renwanz has no plans to replace any of WNEV's more than 150 tape machines—of five different formats—with DVR-1000s. The key to D-1 penetration into the broadcast environment, he feels, will be price.

"I have heard that a number of the older and more prestigious teleproduction houses are placing orders for this equipment, which will impact their ability to do multigeneration work," Renwanz comments. "Broadcasters will probably follow suit after a price drop."

The recently introduced "super" half-inch formats, Matsushita's M-II and Sony's Beta SP, probably will further delay broadcaster acceptance of D-1, Renwanz suggests. "There's no big reason to spend four times [the price of analog component] to get a digital mastering machine," he feels, although he believes "the

impact [of digital component recording] will be pretty big in a few years.

"All of us hope for a single format" for the television studio, Renwanz adds. "We think component digital is the answer. At WNEV we are not pleased with the composite digital idea. We would



The industry most likely to reap immediate benefits from the new D-1 digital technology is teleproduction. At New York's Windsor Total Video, a technician operates a digital color correction machine.

and tentative "yes."

Costing it out

"In a practical sense, my opinion of D-1 is that it's going to be around 1990 before it hits television stations," says Karl Renwanz, vice president of engineering and operations at WNEV-TV in Boston. "But

Digital Video

like to stay with component analog [for now] and push the manufacturers to go with component digital."

Renwanz foresees the price of digital dropping over time until it progressively becomes cost-effective for mastering and even for ENG/ EFP applications. When that happens, he predicts, "it will really permeate the broadcast environment." His key criteria for purchase? "I won't buy it until it's lightweight and cost-effective," he says.

What about the future of NTSC in the studio? "I do think that the days of NTSC straight record machines are numbered," Renwanz states. "With component analog formats already available that look much superior to their predecessors, I think most broadcast facilities will go that way in the next few years." The reliability of current one-inch and 3/4-inch recorders will ensure them a place in television studios for years to come, he adds.

First forays

WHAS-TV in Louisville, KY, will shift a major station subsystem into the digital domain when it installs the Ampex ACR-225 digital composite spot player it recently ordered. The actual delivery date for the machine has not yet been set, but Steve Steinberg, vice president

and director of broadcast services, hopes arrival will be "much sooner" than the 18 to 24 months currently predicted.

The spot player will not be WHAS's first foray into digital, however. The station's impressive graphics department, headed by Cathy Galvin, already has an Ampex ESS-3 digital still store, which incorporates a hard disk that digitally records still images. Unlike the ESS-3, the ACR-225 will interact minimally with video production equipment, constituting a digital island in a plant that otherwise will remain primarily analog.

The composite nature of the ACR-225 and its incompatibility with the new SMPTE-developed D-1 format causes Steinberg no anxiety.

"We needed a new spot player to replace our aging ACR-25," he explains. "It was our decision that the 225 would fit our needs better than any other machine presently on the market because it operates in the digital domain. There's been lots of controversy over Ampex's decision to go this [composite] route, but the [RCA] TCR and ACR have been the backbone of this industry for a long time. Carts come in and are dubbed over to the cart machine. The format doesn't matter—it could be SECAM for what anybody cares.

But [the ACR-225] has the ability for stereo. One of our priorities was to move our commercial playback into the digital area...because of the increase in quality."

As far as regular studio operations are concerned, Steinberg adds, "I see no reason to run out and buy a D-1 for station playback as opposed to C-format until the abilities of the digital machine can match current C-format machines" at a comparable price. He expresses doubt about the Sony DVR-1000's ability to match the abilities of Type C recorders for three times forward and full-speed reverse pictures and feels they don't yet include all the features broadcasters have come to rely on. "I really don't know, whether they're equal," he admits, "but to give up the bells and whistles just to be digital" isn't worth it yet.

(A Sony DVR-1000 product manager notes that physical limitations hold the deck's broadcastable slow motion to plus or minus one-third normal speed, with improvement to plus or minus one-half play speed expected in the future. He added, "As far as fast shuttle is concerned, it is more advantageous on the component end because you can see the color reproduction up to times 40.")

Despite his reservations, Steinberg believes that the all-digital studio of the future, with no need to transfer signals back and forth between formats, will bring significant advantages to television. He expects to see dual-format, NTSC/D-1 production equipment in the near future: "As products come on the market with the capability to take digital and NTSC, tape recorders, studio cameras, film islands, and anything that produces or carries video will start to have a dual spigot on it," he predicts.

At this point, however, the applications for a digital VTR are limited. "At the moment, it's not affecting television stations because it offers no more than what is currently available with NTSC—and in some cases less—for more money," Steinberg asserts. "Digital has great signal-handling capabilities, but as long as you've got to go to NTSC you have some loss. There's no overpowering need to do



WNEV-TV, Boston, MA, has editing suites that reflect the station's commitment to component analog and digital. VP of engineering Karl Renwanz says he'd "like to stay with component analog and push the manufacturers to go with component digital."



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it that way yet, and it's more expensive. It's not like the stampede to ENG—there's no need to convert an entire television station."

Enormous changes

Converting an entire television facility is exactly what NBC Television plans to do sometime in the next few years, when it moves its operation away from its long-time Rockefeller Center home to a brand-new facility. Even though the location of the new NBC headquarters has yet to be selected, the net's engineering staff has made some very definite pronouncements on video recording technologies. At a luncheon speech at February's SMPTE Television Conference last February, Michael J. Sherlock, executive vice president, Operations and Technical Services, told the assembled engineers that the recently standardized D-1 format would figure largely in the new facility. Just three months later, at the NAB convention, Sherlock joined

with other NBC executives to announce the network's selection of Matsushita's M-II as the "universal tape format" for all NBC operations.

According to Sherlock, the two announcements "could appear to be contradictory but actually are complementary." He explains, "We see, in the long run, component digital as the future of television technology. But getting there is a long road." Switching to component digital presently requires two major shifts: from analog to digital and from composite to component.

"Going to M-II is an immediate change that takes care of one of those transitions by allowing us to build component islands," Sherlock adds. "In the same vein, in terms of graphics we are developing our capabilities in the digital domain and getting used to using digital hardware and software. We see M-II and the digital graphics equipment as getting us closer to component digital."

"We have set up a target of the mid-1990s as a time when we see ourselves literally dominated by component digital. Our ability to do that is made easier by the upcoming move, and, therefore, we've said to ourselves, 'Let's do it.' We view it as an opportunity."

Sherlock sees a place for D-1 format machines in the new plant from the beginning, "at least on a developmental level." For a while, though, the network will stick with analog component.

"We see M-II as a terrific way to get at least the current quality of one-inch at a tremendously reduced price level" at all operational stages, Sherlock adds. "We see M-II as being at the minimum a five-year format and probably a format for many reasons that will last for 15 years. Only from a developmental point of view" is component analog a stepping stone to digital. He notes: "There is no question in our minds that [M-II] is where we should be right now. It just so happens that that will help us get into component digital."

Clear need

The need for a digital tape recorder is more clear-cut in teleproduction, where the nature of both the work and the competition make digital almost irresistible. Especially for companies involved in graphics and sophisticated post-production, digital is solid insurance against the generational loss inevitable with NTSC and other analog tape formats. Seeking relief from such signal degradation, many teleproduction houses have turned to disk-based digital recorders: Abekas has delivered over 50 A62 digital disk recorders, while the number of Quantel Harry units is increasing steadily.

Such units, however, are severely limited in storage capacity: 100 seconds for the A62, 84 for Harry. Digital tape recording instantly provides a dramatic increase in program length.

One leading production facility, Windsor Total Video, located in New York City, has ordered not one but three Sony DVR-1000 digital VTRs. Bob Henderson, chief executive officer at Windsor Total Video,



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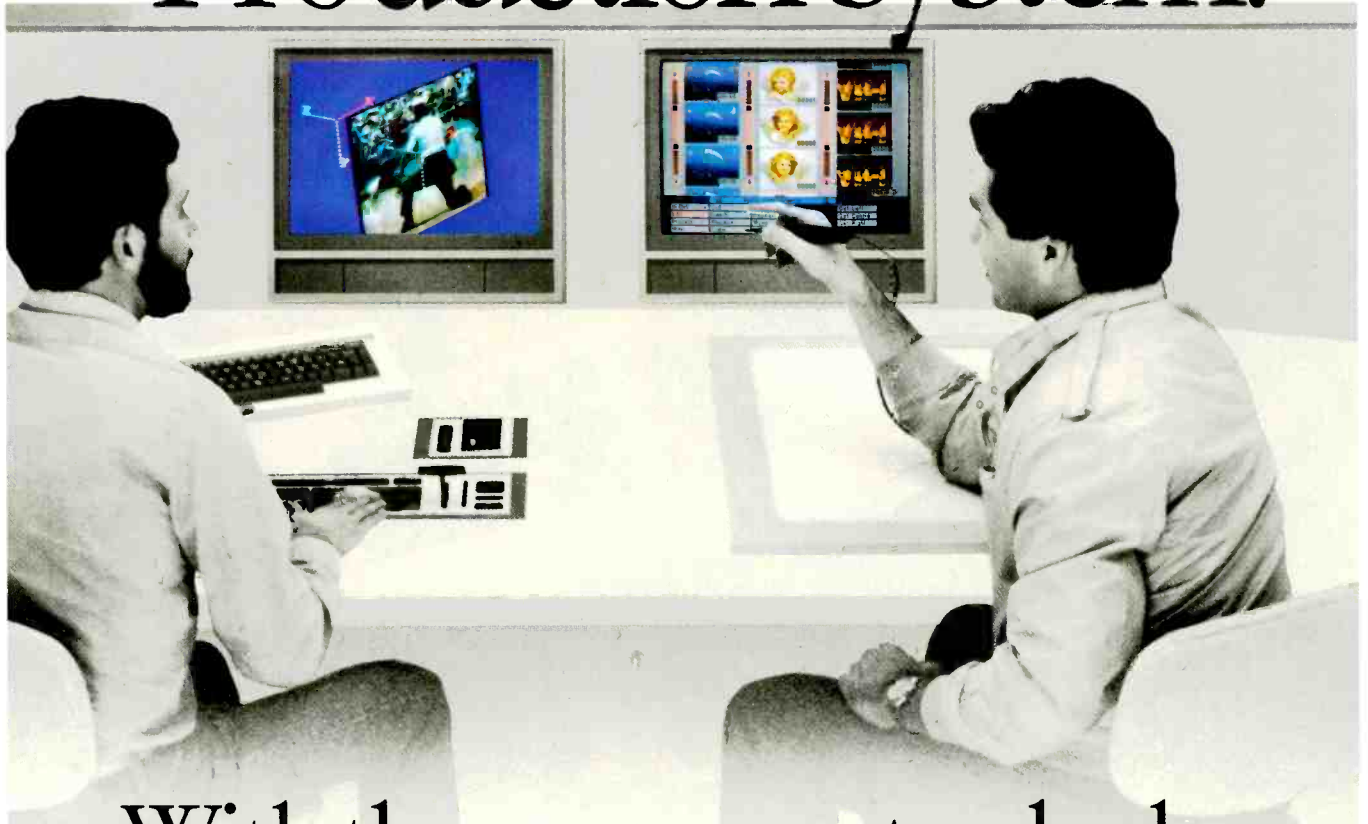
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calls the D-1 format "probably the most significant change that has occurred in the teleproduction industry for the past couple of years."

Greeting the DVR-1000s at Windsor will be two previous digital recording devices, an Ampex ESS-2 still store and an Abekas A62, both using hard computer disks as storage mediums and both used at Windsor primarily for graphics applications. The hard disk recorders, Henderson says, "are remarkable in that we can go multiple generations without deterioration of the signal." The enormous increase in record time afforded by the DVTR will provide additional advantages.

Henderson feels that digital tape recording is a necessity in his business; so much so that he has ordered the DVR-1000s despite some concerns over their ability to interface with other studio equipment.

"It's a very big concern," he states, noting that even when standardization exists, equipment from

one manufacturer often is not interchangeable with that from another.

Still, the benefits to his 20-year-old company far outweigh the risks. "On occasion you can be a pioneer," Henderson says. "We're taking the risk because in our kind of industry we've got to stay right on top of the changes that are occurring" despite the dangers of such a stance. He cites an experience of several years ago when his engineers convinced him to buy a new, expensive TBC. "On the day it was shipped, we got a flyer from the same manufacturer announcing a new model," he recalls.

Trepidation aside, Henderson plans to use the digital decks in Windsor's three main departments: editing, animation, and graphics. For video quality, the D-1 format clearly surpasses any analog format now available, he asserts.

"I absolutely see it being used as a studio recorder [for nongraphics applications] because you can do multiple generations," he adds.

"You can bring things together to create a master that looks like an original. There's absolutely no question that there's a big difference in the first-generation picture between a DVR and Type C, and generation loss is much more obvious [with Type C]."

Henderson feels confident that component digital will eventually replace analog formats as the dominant medium for teleproduction, perhaps in as little as two to five years. But he doesn't see analog disappearing.

"Analog will be pushed to the background and used for other types of jobs," he explains. "We rarely throw out equipment. Equipment that's been obsoleted is moved down the line to do some other job that it can do quite well. I don't think there's any question [that the all-digital studio is coming]. It will happen.

"I'd like to see it be a gradual change," he continues. "If it's a sudden change, we may find ourselves

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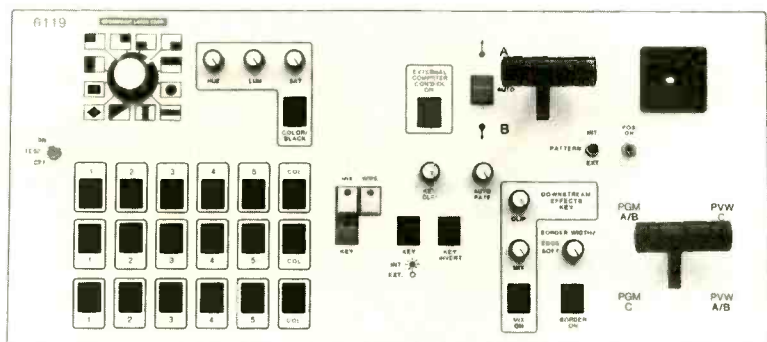
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Digital in the limelight

When the first Sony DVR-1000 is delivered next year, it will go to Limelight, a new teleproduction facility now under construction in Miami, FL. Chief engineer Marcos Obadia explains that the unit will be used primarily for special effects work and integrated into an all-digital environment.

"This particular room is a special room that will have some Quantel equipment for special effects, the digital VTR, digital motion control, and some other little tricks," Obadia says. "It's not a conventional edit suite. We will still have two edit suites with four one-inch machines. But this room will please a lot of people because of its capability to go multiple generations with a very clean signal."

Digital was clearly a priority in designing Limelight, which is scheduled to go on-line this fall. The

70,000-square-foot facility will feature three sound stages, three intended for motion picture production and three for television. According to Obadia, "We'll have some really impressive pictures come out of here. The only limitation will be the client's budget."

He asserts, "Any production company today that's thinking of digital effects has got to be in the digital domain." The truly all-digital environment, however, depends on the introduction of digital routing and control equipment as much as on the availability of digital recorders. "It's still far in the future," Obadia admits.

His all-digital suite, however, will keep the signal in digital as long as possible, with the DVR-1000 directly interfaced to the Quantel digital effects gear.

Format of the future?

From the vantage point of present-day television technology, the switch to component digital

seems inevitable. But it is hardly ready to emerge as the primary format for studio signals. Despite the progress of digital recording, NTSC continues to dominate broadcasting as it will for years, offering a variety of tape formats and a full range of proven and familiar equipment. Manufacturers and engineers are far from writing off composite analog video, despite its well-publicized artifacts and limitations.

In fact, recent advances in processing equipment address some of NTSC's most glaring weaknesses. Digital video effects equipment must operate internally in a component mode, and therefore NTSC inputs must be decoded upon input and reencoded at the output.

At last May's NAB convention, Faroudja Labs introduced a new NTSC encoder and decoder that incorporate comb filters to allow the signal to be broken apart into components and put together again with no noticeable degradation. This technology was successfully demonstrated at the Ultimate booth, where a foreground and background, both on one-inch tape, were matted together.

Whatever happens, stations and facilities are unlikely to throw out serviceable equipment, even for the outstanding signal quality of digital. Component digital recorders can be expected to proliferate at teleproduction houses, but unless the price of digital drops precipitously, television stations are more likely to replace aging studio and field decks with component analog gear, which offers true portability along with economy and excellent signal quality. That gradual switch to component analog, however, will itself ease the transition to D-1 by fostering a component environment in what has been a nearly all-component industry.

Until then, broadcasters will have to make the best of a plethora of recording formats. The longevity of television's original videotape format, two-inch quad, is a good indication of the resiliency of technology even in an industry that thrives on change. Ultimately, broadcasters will always look for the equipment that best suits the job at hand, whatever its format. **BM/E**

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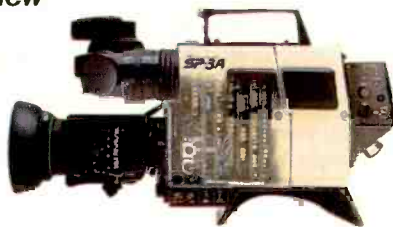
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Designing for Digital: The DVR-1000

The first production DVTR marks the practical realization of the D-1 component digital format.

By Curtis Chan

The development of today's component digital television tape recorder goes back to 1980, when the CCIR drafted its Recommendation 601 to define the universal characteristics of a component digital video signal format. The format specified Y, R-Y, and B-Y signal components, to be formed separately and encoded using the internationally agreed-upon sampling rates based upon a 4:2:2 ratio.

In 1982, the basic parameters of the 4:2:2 standard were adopted by the CCIR Plenary Assembly. The following year, CCIR Study Group 11 adopted specifications for the digital video parallel interface for standardized interconnection of digital video equipment, moving the dream still closer to reality.

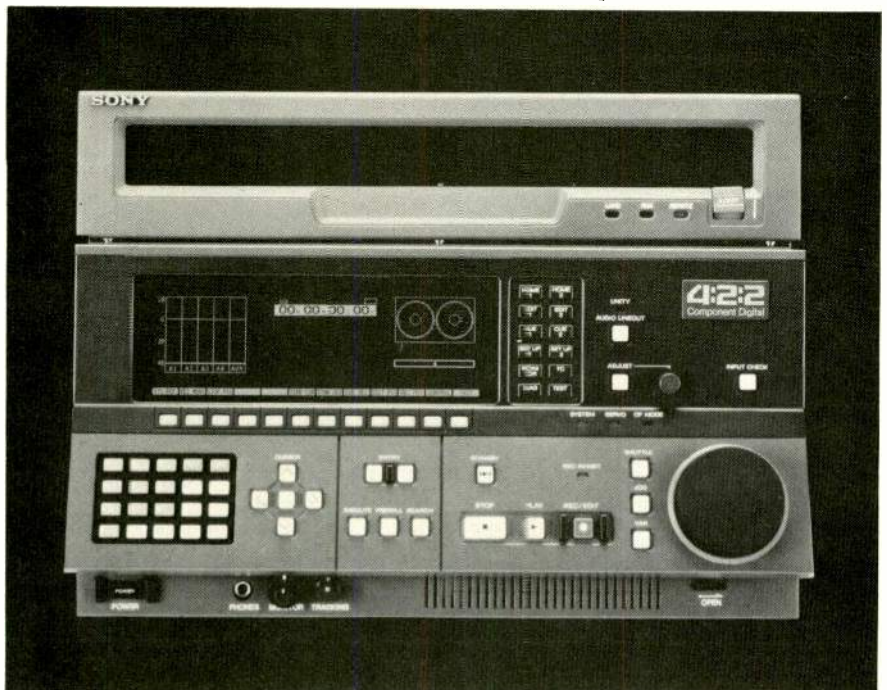
Editor's Note:

Due to the current controversy over digital standards and formats, and in view of the exceptional amount of attention the first available digital VTR experienced at the recent NAB convention, we at *BM/E* have decided to print a tutorial on the technology and design process that went into producing the DVR-1000. The author, Curtis Chan, is product manager, component digital recording for Sony Broadcast Products Co.

Recently, the fundamental parameters for the first standardized broadcast-quality videotape recording format, known as D-1, were approved by the SMPTE, working in close cooperation with the MAGNUM Special Group of the EBU and the CCIR. Although some details of the SMPTE/EBU D-1 format still have to be discussed, the main format param-

eters have been standardized and will conform to the 4:2:2 (13.5:6.75:6.75 MHz) sampling procedure of CCIR recommendation 601. This new standard offers major benefits to television production in terms of performance, reliability, and flexibility.

The true usefulness of any standard, however, can only be judged by its acceptance in the market-



The front panel of the DVR-1000 tape transport includes many system controls. Soft keys allow multiple menu setups from a single universal display.

place. Earlier this year the industry got a look at the first commercially produced component digital tape recorder conforming to the 4:2:2 standard. The Sony digital VTR, slated for production in 1987, consists of two items: the DVR-1000 tape transport and the DVPC-1000 digital signal processor. How was the D-1 format standard incorporated into this new product?

The principal parameters of the 4:2:2 DVTR are governed by the tape format specifications, which allow for virtually transparent recording, reproduction, and transferring of the video/audio signal. The tape format contains the 4:2:2-based video track, control track, SMPTE time code track, analog cue track, and four digital audio channels. Tables 1 and 2 show the video and audio

specifications inherent in the DVR/DVPC-1000.

Format benefits

A range of benefits derived from the 4:2:2 component digital standard are reflected in the DVR-1000.

First, the 4:2:2 specification allows a standardized format for 525-line and 625-line systems, so the same product can be used in this country and overseas. Up to 20 generations are possible without significant signal degradation, while digital signal processing and I/O ensure no generation loss on transfers of video/audio signals. A recognizable picture is possible even in 40 times high shuttle speed. The 4:2:2-based sampling rates ensure the highest picture quality.

In addition, the D-1 standard al-

lows real full- or still-frame operation and eliminates the need for color framing. The four digital audio tracks have full editing capabilities, along with analog cue and time code track. The cassette-protected tape is designed to improve program longevity.

DVR/DVPC-1000 features

In designing the DVR-1000 tape transport and DVPC-1000 signal processor, Sony took advantage of the D-1 format to build a system with great flexibility of use. The system can be utilized in both 525/60 and 625/50 studio or broadcasting environments—an inherent strength of D-1. In addition, the DVR-1000 will accommodate both the M and L cassettes designed for the D-1 format, which hold, respectively, 34 and 76 minutes of programming. (Maximum program length will increase to 94 minutes with the expected introduction of a 13 μ m tape in the future.)

This ability to accommodate two cassette sizes is made possible by a unique reel-motor shift mechanism. It does not allow for the S cassette at this time, however, due to technical constraints in the tape transport design.

The DVR-1000 front panel controls many functions of the system. An RS-422 machine control port is available for remote control applications. (In addition, future I/Os may allow for bidirectional communications for system diagnostics and user data input.) Soft keys on the front panel of the DVR-1000 allow the use of multiple menu setups from one universal display. One such menu, for example, allows the system to run its diagnostic routines. The internal diagnostic system provides warnings against incorrect machine use as well as hardware failure down to a functional unit level.

The DVR/DVPC-1000 is capable of supporting many I/O connections, permitting the system to send and receive video, RGB, Y, R-Y, B-Y, or Betacam signals. The digital I/O supports the recommended parallel digital video interface standard EBU Tech.

Table 1—Video Specifications

	Luminance (Y)	Color Difference (R-Y,B-Y)
Sampling Frequency	13.5 MHz	6.7 MHz
Bandwidth	5.75 MHz (+/- 0.1 dB depending on sampling filters)	2.75 MHz (-1 dB depending on sampling filters)
Quantization	8 bits/sample	8 bits/sample
S/N Ratio	56 dB	56 dB
No. Active Samples/Line	720	360
No. Active Lines/Field	300 (625/50)	300 (625/50)

Table 2—Audio Specifications (4 digital channels)

Sampling Frequency	48 kHz
Bandwidth	20 Hz–20 kHz (+/- 0.5 dB depending on sampling filter)
Quantization	16 bits/sample linear (standard mode) Up to 20 bits/sample linear (hi-fi mode)
Dynamic Range	> 90 dB
Edit Resolution	1 video frame

The DVR/DVPC-1000 presently uses the 16 bit/sample mode for analog signal inputs. In addition, the track format allows for an additional longitudinal analog cue track for monitoring, time code track, and the control track.

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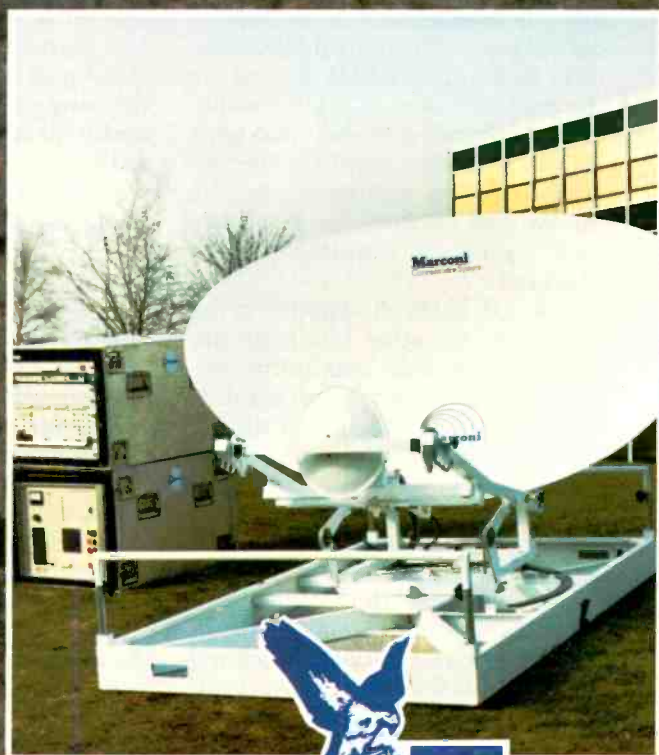
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TV Engineering & Production

Sony DVR-1000

3246-E. On the audio side, four independent analog and digital I/Os are provided, as well as two stereo digital pairs. The digital ports conform to the AES/EBU protocol for the transmission of digital audio signals. Audio cue and time code inputs are also provided on the DVR-1000. In addition, various inputs and outputs for reference and waveform monitoring are provided.

The DVR/DVPC-1000's error correction circuitry has been designed to provide maximum correction against burst and random errors in both video and audio. Using two-dimensional Reed-Solomon code for error correction and adaptive two-dimensional code for concealment, as well as sophisticated interleave and shuffling schemes, the DVTR can allow for a concealment rate of better than 45 samples per second for video. In the shuttle mode, color reproduction is possible up to 40 times play speed and broadcastable pictures within plus or

minus one-quarter play speed.

The audio correction system is similar to that for video, but with 100 percent data redundancy, resulting in better than one sample per minute concealment rate. The audio processing is augmented with such features as sound-on-sound editing, channel crossfades, and channel mixing capabilities.

Record and reproduction

In designing the recording and reproduction system of the DVR/DVPC-1000, engineers faced certain challenges posed by the signal format itself. Unlike the Type C format, in which one track represents one field, the D-1 format segments its data tracks so that 12 tracks (625/50) or 10 tracks (525/60) must be traced to reproduce one field.

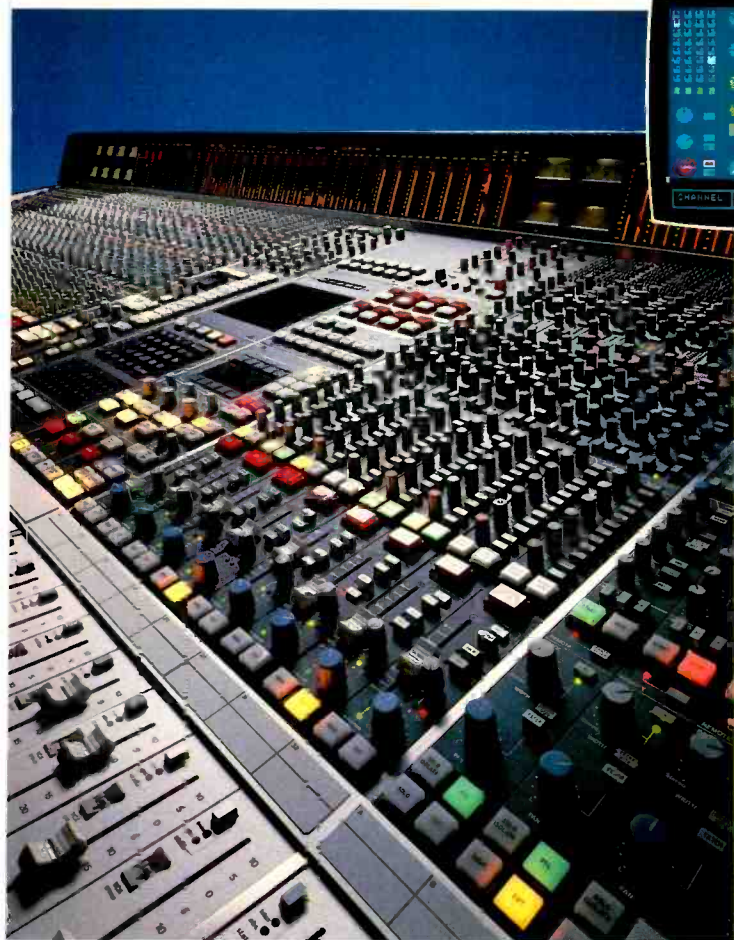
Although narrower tracks by themselves do make tracking more difficult, the real challenge comes from the fact that the physical displacement of each field is larger, calling upon the heads to

make complex track jumps for stunt motion (i.e., still frame, slow-mo, jog, shuttle, etc.). This physical challenge is compounded by a smaller scanner, dictating a shorter arm length for the bimorph head element. This, in turn, makes the larger displacement required by the DVTR format more difficult to achieve.

Much thought has also gone into the design of the scanner and processing electronics to maintain head-to-tape contact at a writing speed of 36 meters per second (approximately 81 mph).

To maximize the record/replay attributes of the DVR-1000, the record and replay processing was implemented into integrated circuits (per channel) and mounted onto the rotating part of the drum. The different ICs used include record erasure amplifier, record drive amplifier, advance replay head amplifier/confidence replay head amplifier, and replay equalizer.

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where both the record and replay electronics are built into the rotating part of the drum, helps to acquire the best possible S/N ratio,

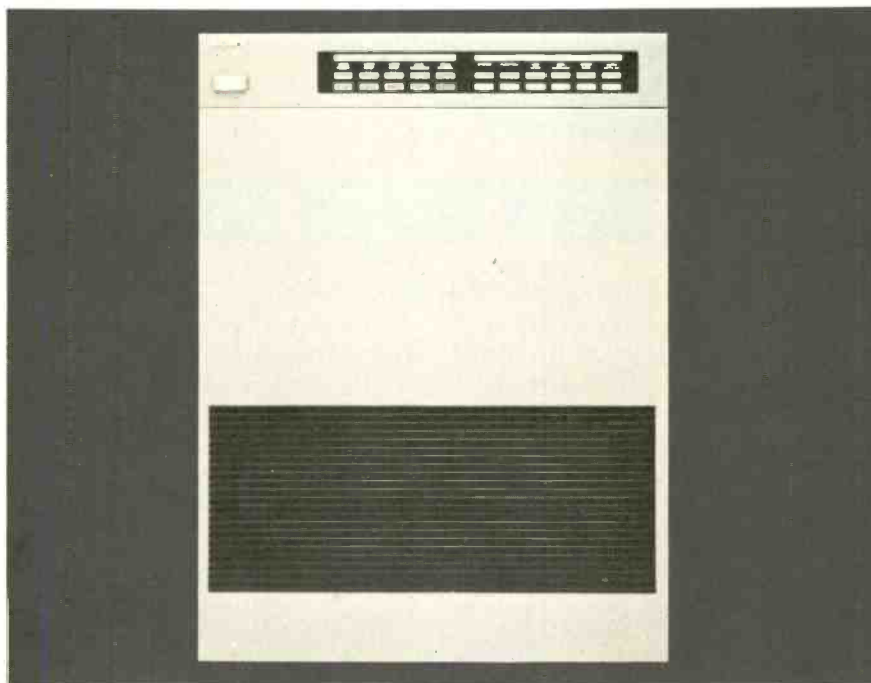
reduce record/replay crosstalk, and enable confidence playback. The uniform characteristics of an IC approach combined with an

AGC loop in the replay equalizer help to maximize data recovery in both normal play and stunt modes.

One area where the DVR/DVPC-1000 departs from the recommendations of the D-1 format is in incorporating a single time code channel, rather than time-multiplexed dual time code channels. Much thought went into this decision.

First, it was felt that the jury is still out on the need for more than one time code channel in complex editing situations. The DVTR, furthermore, is the only broadcast device in which a dual time code system is specified. Implementation of dual time code channels, therefore, would require placement of time code converters at all production points, including editors, causing additional expense for broadcasters and production houses and making equipment connections difficult without the appropriate interface box.

As of last NAB, no hardware was available to prove the abso-



The DVPC-1000 signal processor contains much of the system's electronics.

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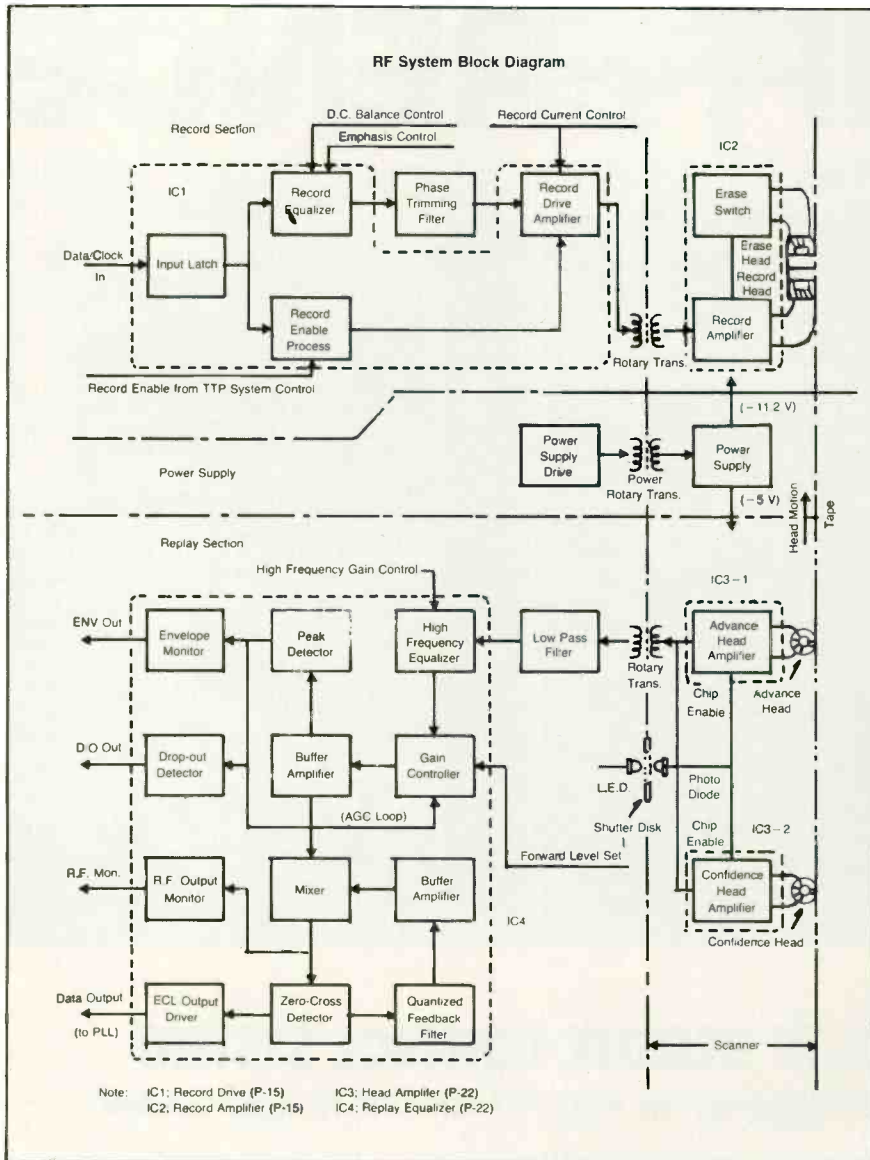
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Sony DVR-1000



RF system block diagram for the DVR/DVPC-1000. The IC approach helps the system meet the challenges of stunt motion.

lute need for full bidirectional conversion. Equipment manufacturers and end users wishing to interface to the DVTR would bear the additional cost of purchasing dual time code options. Ultimately, it was felt that the benefits of the second time code channel were not clear enough at this time when compared to the projected cost of implementation.

The DVTR's dual time code format can be implemented readily if the market demands it. The importance of launching this new technology and the necessity of equipment interface compatibility, however, convinced Sony to re-

main with the standard time code format.

Sony's 17-man-year commitment to the standardization of the 4:2:2 format has paved the way to the delivery of the first production machine in 1987. The DVR/DVPC-1000 4:2:2 DVTR, with undetectable generation loss, no shifts in editing, and enhanced audio capabilities, will find application in many diverse broadcast marketplaces. With the support of 4:2:2-based manufacturers and end users, digital video technology will become a reachable reality and have its landmark in broadcasting.

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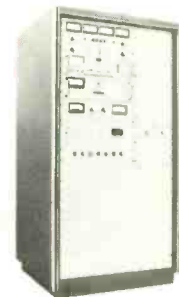


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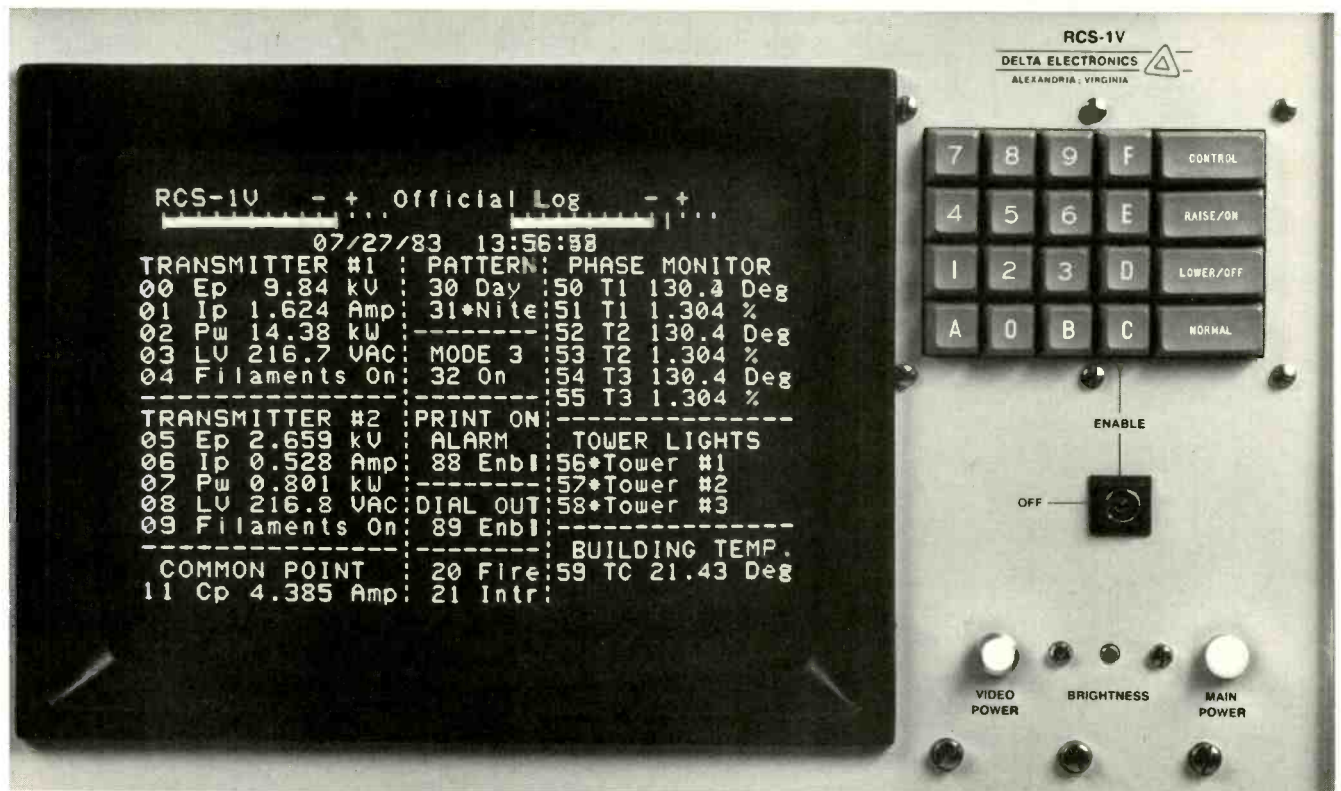
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Transmitters 1 to 50 kW AM and to 60 kW FM. FM antennas, studio & RF equipment. ©1986 Continental Electronics/6213



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Engineer Lloyd Prezant of New York FM station WYNY stands to the right of an eye-level Harris RF status panel. The panel gives at-a-glance diagnosis of the status of the RF flow of the station's two Harris 25K transmitters.

Transmitters Get Smart!

By Brian McKernan

It's three in the morning on Christmas day. Icy winter winds rattle the windows of the chief engineer's bedroom as he and his wife are awakened by a frantic call from the snowbound board operator back at the station. He's new, which is why he's working this shift. It also means he's inexperienced, and all he knows right now is that he's off the air. The chief engineer—a little woozy from the Christmas party that wrapped up hours earlier—knows that taking his life in his hands trekking to the studio or transmitter hut is about the last thing he wants to do right now.

Instead, he tells the board oper-

ator to calm down and sit tight. Then he turns to his bedside personal computer, switches it on, and gets an immediate and comprehensive display of the transmitter's operating parameters just prior to the crash. In seconds, he scans the data, finds the cause of the problem, types in a few instructions, and the station is back on the air. Several minutes after that he's back in dreamland as the blizzard continues to rage outside.

Sound too good to be true? It's possible with today's technology. The microprocessor revolution that has given us computerized cameras and automated cart equipment in the studio has

Diagnostic systems are increasingly popular as more microprocessors find their way into transmitters and remote controls.

finally begun to invade the transmitter room, resulting in some significant changes in the way broadcast signals are monitored and controlled. These innovations are occurring in the area of microprocessor-based diagnostic systems, which offer a new degree of accuracy in evaluating transmitter performance, and are making life easier for broadcast engineers everywhere.

Design strategies

Essentially, diagnostics refers to the monitoring of transmitter operating parameters and other status conditions through the use of computer technology. Simply

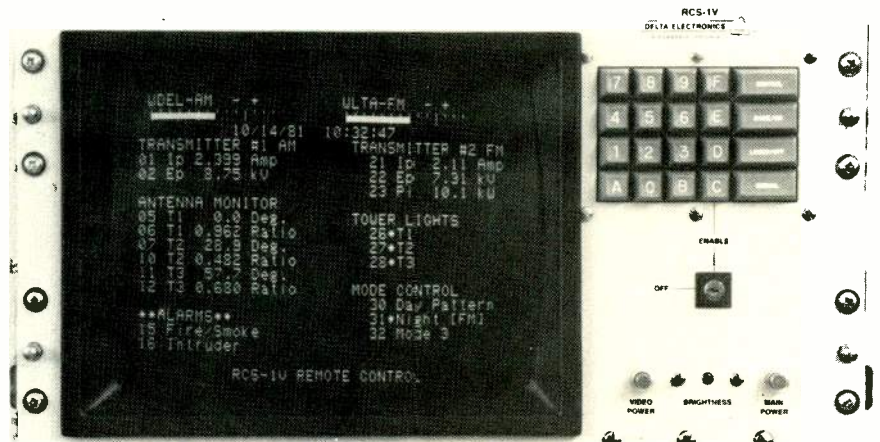
Transmitter Diagnostics

stated, sensors within the transmitter relay their findings to a microprocessor, which can deliver more and faster reports on the status of the system than has ever been possible. The number, placement, and design of these sensors of course depends on the particular transmitter involved. Although automatic fault detection has been around for some time, today's microprocessor technology is taking this capability to new heights of sophistication.

In addition to the traditional types of meter readings, a great number of other operating parameters can be monitored, and that information can be displayed, stored, printed, or sent via modem to any location. Inherently user-friendly, diagnostic systems relay information that is—to a great degree—understandable to a nontechnical person. The operator can be alerted to a malfunction and its approximate location, and he can relay that information to the engineer. More advanced systems will even alert the engineer himself, with a synthesized-voice telephone call. Although diagnostics are clearly the way of the future, broadcasting has been slower in implementing this technology than have other industries.

"When it comes to transmitters, people are still looking for the cheap version," says Perry Priestley, product specialist for transmitters at BTS/Philips. "It's sometimes hard to convince buyers that the more diagnostics you have, the less you must spend on specialists or extra engineers. But it's true."

Manufacturers vary on how they have incorporated diagnostics into their products. In general, television transmitter design avoids putting microprocessors inside the transmitter cabinet because of the powerful RF forces involved. Philips's design approach for its TV transmitters, for example, employs CMOS logic to monitor performance and also to perform various housekeeping chores, such as controlling the stop/start sequence. LEDs on the transmitter's control and status indication assembly glow green



Delta Electronics' RCS-1V brings to the studio a display of all monitored transmitter parameters. The keypad provides for command entry, control operations, and system programming.

for normal operation, and additional LEDs on each modular board indicate if those are working. NEC's television transmitters also use IC's to handle their diagnostics, with mimic panels and LEDs to indicate malfunctioning transmitter stages. Microprocessor-based remote controls, however, are common in television.

"Broadcasting is cautious in adopting new ideas in transmitter technology," says David M. Russell, program manager of Continental Electronics. "When it comes to studio facilities, the reverse is true. There's been a gradual evolution over the last twenty years in add-on boxes for monitoring transmitter performance. Now we're coming to the point where these subsystems are built right into the transmitter. Microprocessors can take on control and reporting, including automatic fault detection. With the shortage of full-time engineers, this is a big help to broadcasters."

Continental's entry into the smart transmitter trend is its 817A 60kW FM. The unit's controls/display panel features an eight-line plasma readout, which provides seven screens of data on operating parameters and will identify and display any failures or malfunctions within the system. Chief engineer Charles Staples of KSCS-FM and WBAP-AM in Fort Worth, TX, describes the display as "excellent," and says, "I wish all of our transmitters had a display like that."

Engineers like displays such as the 817A's, but is that feature agnostic? There is a wide divergence of opinion as to what true diagnostics is.

Viewpoints

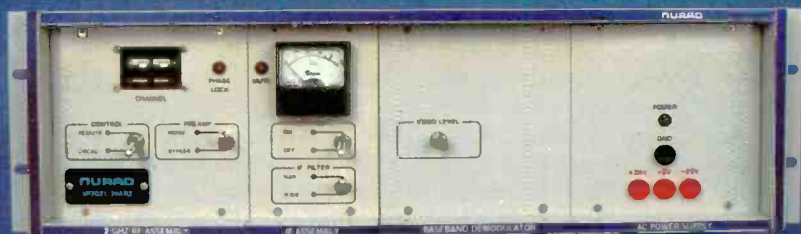
"The word *diagnostic* is probably being misconstrued in this industry," says Russell. "I prefer the term *status monitoring and reporting*. The new transmitters give you more information than you've ever gotten before. True diagnostics would be the ability to determine the exact location and reason for a malfunction in a piece of equipment. Performance tests are another aspect. This would require test equipment built into the transmitter. An astute engineer could put it all together right now. All that prevents this is the time, money, and desire to do it."

"Unless you have information on what led up to a given failure, you don't have real diagnostics," states Kenneth Sides, Continental's engineering manager for FM products. "The so-called snapshot feature is more in my line of thinking." Also known as anticipatory logging, this feature records and stores in memory a "snapshot" of transmitter performance milliseconds before a malfunction occurs.

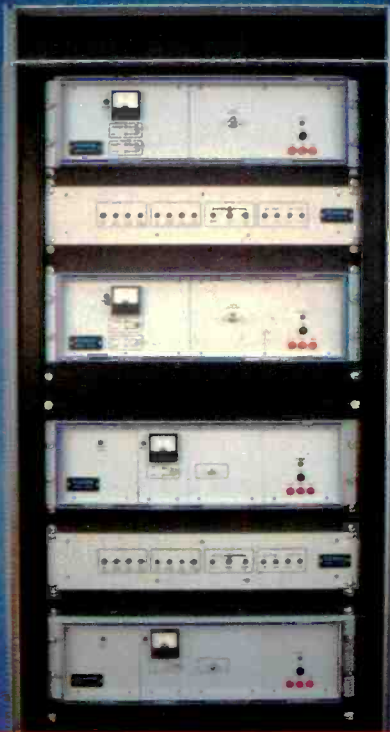
Don Thomas, director of engineering at Horizon International, agrees, and adds: "Also important is knowing the long-term history of a system. Running it through the proper software would enable an engineer to do trend analysis.

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He could then predict, for instance, tube life by comparing the manufacturer's specifications with the tube's performance history."

Broadcast Electronics' Microprocessor Video Diagnostic System (MVDS) is an in-transmitter device that features anticipatory logging. Designed for use with their "A" series of FM transmitters, the MVDS's CRT displays parameter information as a tabular chart or as a bar graph, which research has shown is an effective way of communicating information quickly. Malfunctions and their approximate location are flagged—in English—in reverse video.

"A nontechnical person can read this information over the phone," explains Douglas E. Staats, VP of engineering of Octagon, a consultant engineering firm in Anchorage, AK. "KUHB, in the remote Pribilof islands of the Bering Sea, uses the MVDS, and

it's come in handy a few times in helping to diagnose some problems they had."

At present, the MVDS's video display is not remoteable, "but if your transmitter and studio are co-located," says Staats, "you can run coaxial cable for additional video monitors, which is what was done at KMXT, in Kodiak. The MVDS offers more comprehensive monitoring than you'd get with traditional remote-control meter readings. Another nice thing is that it doesn't increase the complexity of the system. The MVDS is four boards and a CRT, and the transmitter can operate handily without it." The MVDS can, however, also function as a transmitter controller, with the primary controller acting as backup.

"I like to think of control and diagnostics as being separate, but there is definitely a merging. The microprocessor can do both," comments Kevin Clymer, a software development engineer for Broad-

cast Electronics. "We will one day look at control and diagnostics as one thing, although intervention and correction is not the function of today's diagnostic systems. What they do now is provide a comprehensive report on transmitter performance."

Remote Control

The emergence of diagnostics in broadcasting is forging some new trends in the marketplace. Several transmitter manufacturers are now—for the first time—introducing their own remote controls. "Transmitter makers are getting into making remote controllers because it's not that hard to do anymore," observes Clymer. "It's mostly a matter of hardware and software and the result of the computerization of control systems. Most transmitters will eventually come with the option of being remotely controlled with a companion unit to what's in the transmitter." Once a diagnostic

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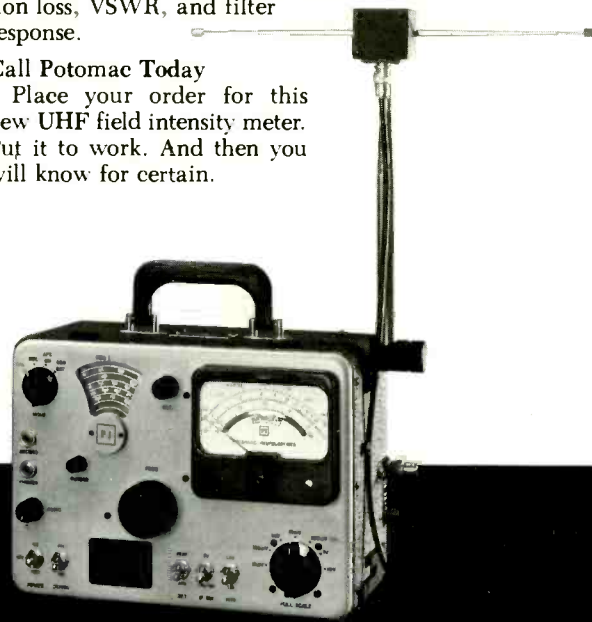
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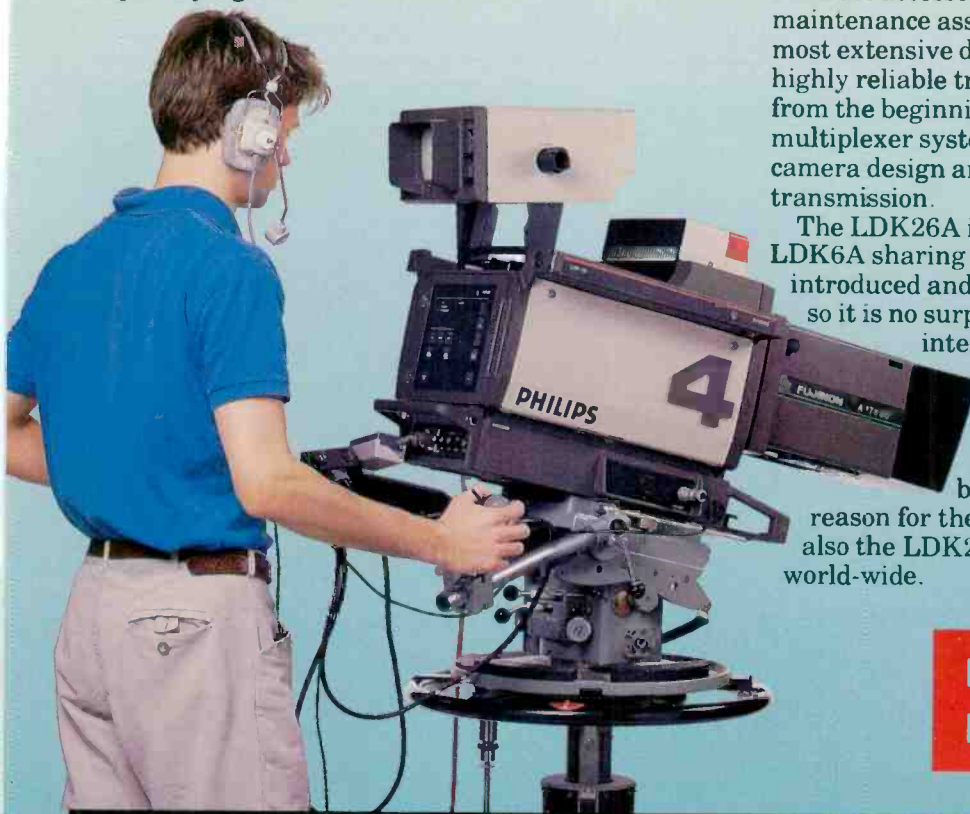
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The LDK26A is the 2/3-inch (18mm) version of the LDK6A sharing most of the technical advances introduced and now widely respected in the LDK6, so it is no surprise that the features of distributed intelligence, microprocessor control, total automatic set-up, digital zone correction, extensive diagnostics and full performance triax are found in the LDK26A. They are the building blocks for *total computer control*, the reason for the success of the LDK6A – and now also the LDK26A – with over 500 cameras sold world-wide.



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computer is built right into the transmitter, it's an easy next step to link it with a sister computer for remote-control purposes.

Several manufacturers have taken this approach. Transmitter manufacturer QEI has recently entered the remote control arena by offering their ARC-27 as a companion to an optional diagnostic center, available on all their FM transmitters.

Both units feature an LCD that continuously shows basic operating parameters, and can—with a key and built-in keypad—also display over 60 additional readings. Like other smart transmitters, there are also optional external inputs for such user-determined items as fire and intruder alarms. The ARC-27 will alert the board operator to violations of tolerances with two levels of alert, the second level sounding an audible alarm. In both cases, an LCD will display the name of the malfunction in English.

New choices

As stated earlier, the presence of computers in transmitters is ushering in some profound changes in the way broadcast signals are monitored and controlled. Memory chips can store information on how the system has performed, updating it periodically, and allowing an engineer to retrieve it at will for trend analysis. Operating data can be sent via a modem. A computer printer can dash off very accurate and comprehensive logs at whatever intervals station management or engineering desires. QEI offers factory computer definition of faults and will review your transmitter's operating parameters at no charge for the lifetime of the transmitter. All you do is call them up and dump your data.

Most significant of all is that the ubiquitous RS-232 port also allows for remote control from anywhere, as in the scenario depicted in the beginning of this article. "A

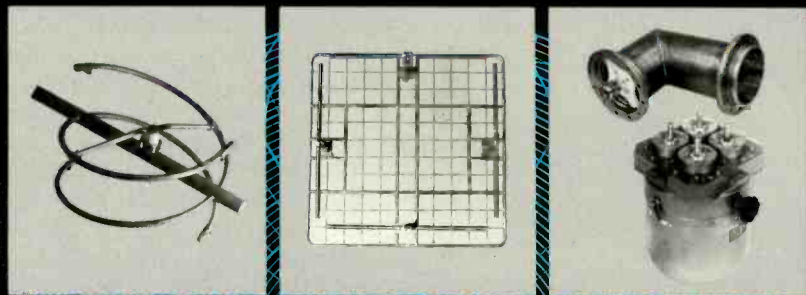
remote PC is the control device that the 817A was designed for use with," remarks Continental's Sides, "it's still too new for the industry to grasp what this really means."

"The change in FCC regulations in November 1984 on remote control had a lot to do with this," says Broadcast Electronics' Clymer. "They had to adapt their policies because of changes in technology," he says.

Another benefit of the change in the remote-control rules is the ability to use dial-up phone lines as an STL/TSL. With the breakup of the Bell system, dedicated lines have become even more expensive. "There are two breeds of engineers," says W. D. "Bear" Brewer, sales engineer for Moseley Associates, Inc. "The younger guys like the dial-ups, the older guys like constant communication between transmitter and remote control. They like having something that will give an imme-

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 **Hitachi**

RF Engineering

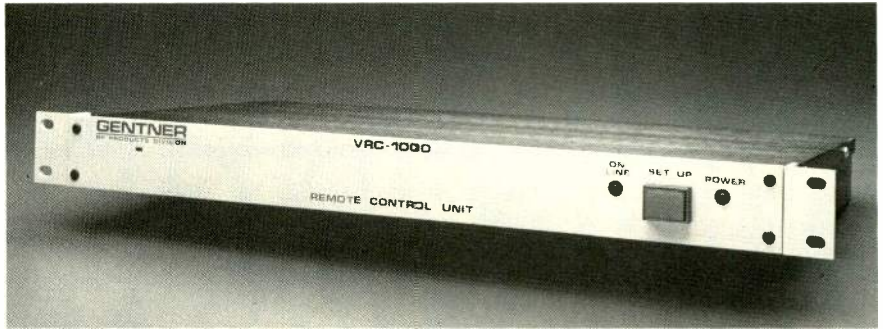
Transmitter Diagnostics

diate yelp if the transmitter goes out."

What does Moseley, a leading maker of remote controls for broadcasting, think about the trend in transmitter manufacturers offering their own remote controls and in the use of PCs as remotes? Brewer had this response: "We're not worried. We've been doing this for 25 years. There's more to a remote control than sticking a microprocessor in it. We have things going on in-house to make even better remote controls. Things such as software cannot be developed overnight. Our concern is what we're going to do in the future and not whether someone is creeping up on us."

Problems and solutions

One of the most futuristic aspects of microprocessor remote controls is already here: synthesized speech. Examples of these include the Gentner VRC-1000 and the Delta RCS-1V with Telephone



Transmitter remote control from any dial-up telephone is provided by the Gentner VRC-1000. The unit reports in a synthesized voice, is accessed with Touch Tone codes, and initiates alarm calls.

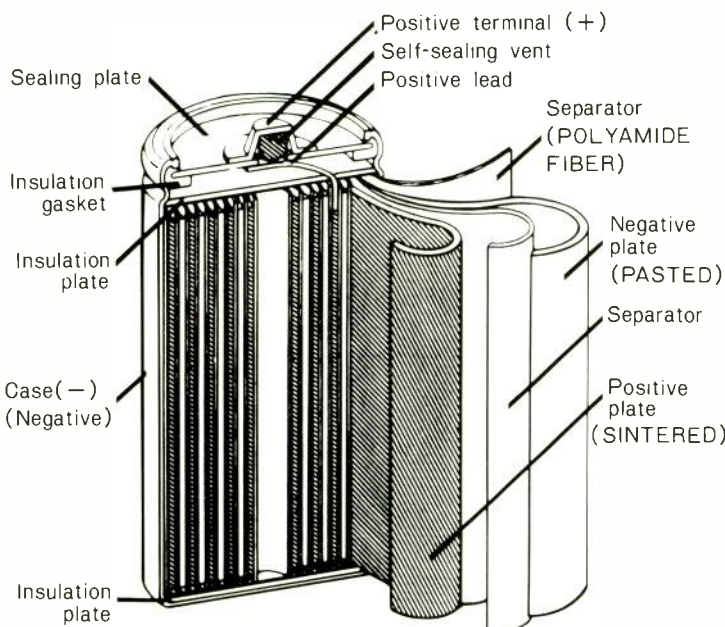
Access option. Both of these units not only permit remote control from any Touch Tone phone, but both "read" operating parameters over the phone to you in a synthesized voice. Proper interrogation with Touch Tone passwords is necessary to access the information and to perform remote control operations. Both of these units will also call out to raise an alarm, dialing several numbers in turn until they get an answer.

Chief engineer Bob Bell and transmitter supervisor Carroll De Groff of stations WSBT-AM and WNSN-FM, in South Bend, IN, use the Delta RCS-1V to control the main and backup transmitters for both stations. "We haven't gotten the Touch Tone option," comments Bell. "I didn't think we'd need it. But if we had it, I could have saved myself a few trips to the transmitter."

The RCS-1V has a built-in CRT

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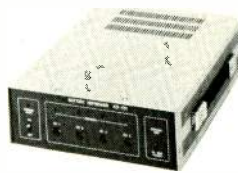
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RF Engineering

Transmitter Diagnostics

that displays a maximum of three screens of status information. An Autolog Printing option will automatically print out one or all of the screens. "We print the first page—the logging page—of the operating log once an hour so we can see how our transmitters are performing," says De Groff. "I like the RCS-1V. If the CRT flags a problem, I can read the log and see

when it developed.

"This system would be a lot more diagnostic for our FM transmitter," De Groff continues, "if we had more remote metering of the low stages, such as screen voltage on the final and exciter power output. But that's not the fault of the RCS 1-V, it's the fault of the transmitter. Older transmitters don't have provisions for monitoring all

the parameters you'd like to. You could do it, but it would be a lot of work to bring these data connections to the outside world."

Harold Hallikainen, of Hallikainen & Friends, agrees: "I would like to see the transmitter manufacturers bring more information out of their transmitters. Basically the stuff brought out now is only enough to determine your output power. You've really got to go digging around to connect the proper interfaces for more than that. Transmitter manufacturers should, on a barrier strip, provide more connections for collecting information on other parameters, such as final grid current and final screen current."

"The whole key to computer diagnostics of a transmitter is getting enough status information back to make the right decisions," states Paul Christensen, chief engineer at WIVY-FM in Jacksonville, FL. "Telemetry is fine, but you want to know which relays are in what position. Most remote-control systems today don't have nearly enough status-reporting capacity."

Christensen's choice of new equipment for WIVY aims to solve this problem. The station will soon take delivery on a Harris FM-35K transmitter, which features the ColorStat mimic panel to chart signal flow and the StatusPlus keypad-accessed metering system that reports on 50 different parameters and can log the date and time of seven of them in the event of an overload. In addition, the FM 35K has expansion capacity designed into it.

"Then, when we get the Hallikainen DRC-190 remote control, I'll be able to use its PC modem interface to monitor and control the transmitter in emergencies from my Commodore 128 computer at home," Christensen reports. "The DRC 190 comes standard with eight kilobytes of RAM, and it's expandable up to 64K. Its program, which is written in BASIC, generates logs, monitors all parameters, provides alarms, and will perform control functions. Of course, you couldn't write one software package that

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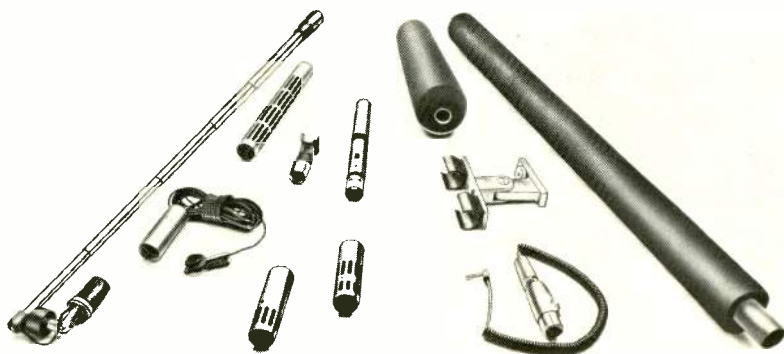
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would fit any two radio stations. Each individual station has to write its own program, but Hallikainen will help.

"Some engineers have done a lot of design work and have created programs to do decision making and control of transmitters. If such a system were reliable enough, we could all get rid of our pagers! You kind of wonder where its leading to. Some engineers feel their jobs could be phased out by advanced technology. But things can still malfunction. What it does is take pressure off the engineer," Christensen says.

"Whereas we once needed three to four people to babysit each of our nine transmitters, those same people now work as technicians and in maintenance," says Kip Campbell, director of engineering at the University of North Carolina Center for Public Television. "As a result, our quality has improved." North Carolina Public Television is one of many small

broadcasting networks that have realized this benefit after linking their transmitters to a central computer for control and diagnostics. "Our nine transmitters, spread throughout the state, are all linked to a Moseley MRC-2 Microprocessor Remote Control and its optional automatic control unit, the ACU-1," Campbell explains.

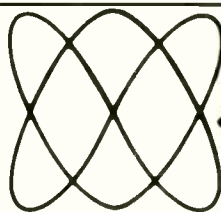
The ACU-1 uses a Hewlett-Packard 9816 scientific computer, which is programmed in a BASIC-like language. "The needs of each of our transmitters is unique in terms of controlling their power and proper stop/start sequence. Moseley provides a basic program, which I have modified for our requirements. Our system could fully take care of itself. It also interfaces with a Rohde & Schwarz Video Analyzer, which looks at our video signals and diagnoses them thoroughly. It passes this information to the MRC-2 as 16 channels of data. This is a

relatively new thing; the ability of remote control to also tell you what's wrong. For a large system like ours, I don't know how else we'd do it," says Campbell.

The trend for the future seems clear: an increasing role for computers to extensively monitor, diagnose, and control broadcast signals. "The key will be the marketplace, as always, and what the FCC allows," remarks Moseley's Brewer. Remaining questions concerning transmitter fail safe, the EBS system, and controlling from authorized locations remain to be settled. "The rules are vague right now. We can't go by what's written, we have to go by what FCC assistant chief John Reiser says," states Hallikainen.

"If you saw the movie *2001: A Space Odyssey*, you may remember seeing HAL the computer talking to the astronauts and predicting possible component failure," recalls Brewer. "That's not beyond our dreams." **BM/E**

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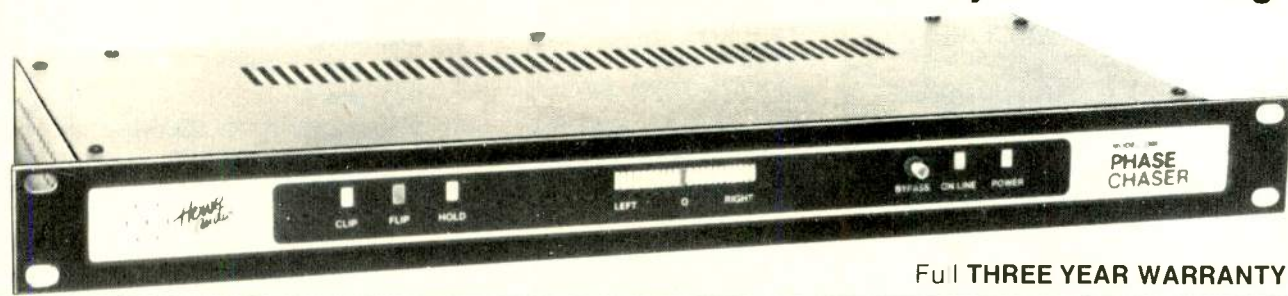


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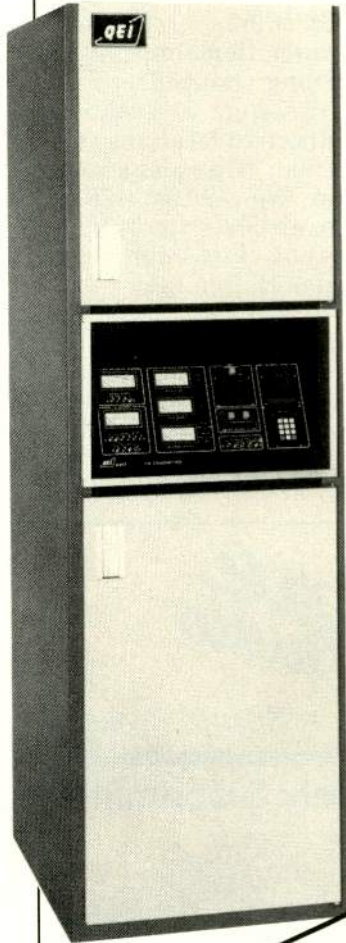


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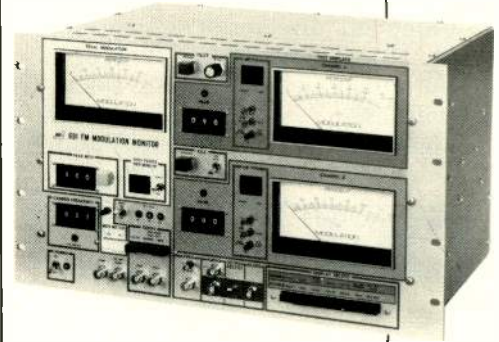
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Building a Remote Transmitter Site

When KLRN-TV built a new remote site, it put security, cost-effective air handling, and lightning protection on top of the list.

By Gene Doren

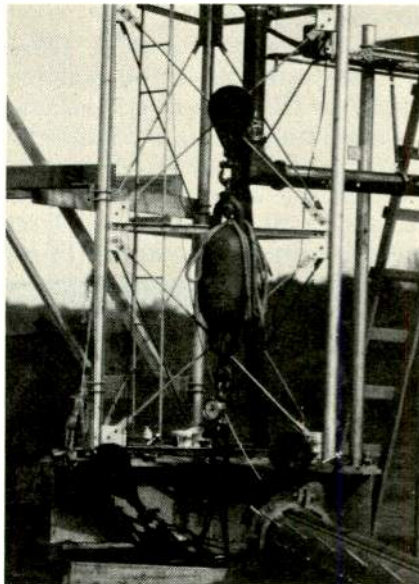
Southwest Texas Public Broadcasting's KLRN-TV station was able to introduce a number of original ideas and build upon past experience in conceiving the most functional and cost-effective design for its new VHF television remote transmitter site about nine miles southeast of San Antonio, TX.

A new tower, antenna, building, transmitter, and remote-control system were called for. The 960-foot tower, five feet on each face, was a Model 90 from Advance Industries. The antenna was from RCA, the transmitter from Harris, and remote control system from Moseley.

The task of the engineers at KLRN was to house this equipment safely and for cost-effective operation. A number of security measures were incorporated into the design, and triple-filtered ambient air was used for inexpensive transmitter power amplifier cooling.

Site selection

Twenty years ago, a transmitter site for KLRN-TV, Channel 9, was selected 30 miles north of its city of license, San Antonio, TX. This decision was brought about so that the station could cover both the capital of Texas in Austin some 45 miles north and the expanding San Antonio market.



Before the antenna was hoisted, the rigging was placed under a test stress.

Although the plan had worked to a degree for 20 years, in the end, the decision was made to build a sister station, KLRU-TV, in Austin to reach more of the area's expanding population. Once this was completed, attention was returned to the KLRN site at its original location in New Braunfels. The decision was made move this facility into its primary market area of San Antonio. With the two sites, Southwest Texas Public Broadcasting was able to reach more than 200,000 extra viewers.

Building design

The project started with the building design (see Figure 1). In remote sites, the security and integrity of the plant are of primary importance. At KLRN, all doors are made of steel, and no windows were put in. The building was constructed of standard cement cinder block on a slab foundation. Some interior walls are of 2 × 4 stud and half-inch wall board with R-28 Styrofoam insulation between the two.

This rather basic construction is intended to combat the vandalism experienced at other sites, which can run from spray-can graffiti to axes used on wooden doors, pry irons on ventilators, copper strapping stolen out of the ground, and outright theft of equipment and materials.

Outside security consists of an eight-foot industrial-wire fence topped with razor wire. There are double gates at the front and the rear of the compound. The commercial power meter was set outside the compound operating from a toroidal transformer at the pow-

About the Author:

Doren is vice president of engineering at Southwest Texas Public Broadcasting, which he joined four years ago with plans to build the KLRN plant, which has now been in operation since 1984.



Building exterior showing security fencing, diesel generator area, and the transmitter exhaust duct.

er entrance to the building to keep the number of compound keys issued to a minimum.

All intake and exhaust vents are covered with iron gratings to prevent entrance into the building. The flat roof, of five-inch concrete, was poured over Styrofoam insulation on corrugated sheet iron supported on steel "I" beams. The roof was pitched 14 inches for drainage and covered with a light reflective fiberglass roofing material to reflect heat. From past leakage experience, it was decided that nothing should protrude through the roof.

One reason for the choice of concrete was protection against ice. Although icing problems are rare in the San Antonio area, a block of ice falling 1000 feet from the tower onto a wooden roof would do considerable damage to the building and the equipment within. The risk was not worth taking.

Tower installation

Safety is the primary requirement here. Remembering the catastrophic incident in the erection of an 1800-foot tower at a Houston station some years ago when five men were killed and \$1.5 million damage was done by a falling antenna, a number of precautions were taken. These included documenting the installation procedure. A KLRN representative was on the ground and another on the tower during all phases of its con-

struction. Notes and photographs were taken, especially during the antenna installation.

The antenna, an RCA TWA-12A traveling-wave unit, weighed just over 12,000 pounds. As a safety measure before it was hoisted to the top of the tower, all rigging was placed under 10,000 pounds stress for 30 minutes by applying stress to the tower with the lifting

hoist. Rigging was in place and looped through the top of the lifting hoist on the gin pull and down to the pin at the base of the tower.

To prevent cracking of the transmission line, elbow units with heavy brass-brazed reinforced corners were used both at the elbow complex in the transmission line just below the antenna atop the tower as well as at the elbow section leading off the tower to the building.

A 50 kW air-cooled dummy load is suspended from the ceiling in the rear transmitter room. This saves the cost of two additional elbows into the load as well as lifting the load from the floor, preventing floor dirt from accumulating on the load and providing close coupling from the RF patch panel and increased floor space, as well as preventing people from stacking boxes or other material on top of the load or its exhaust fans.

Air handling

The transmitter, a new single Harris TV-35H unit, required 3000 cubic feet of air per minute

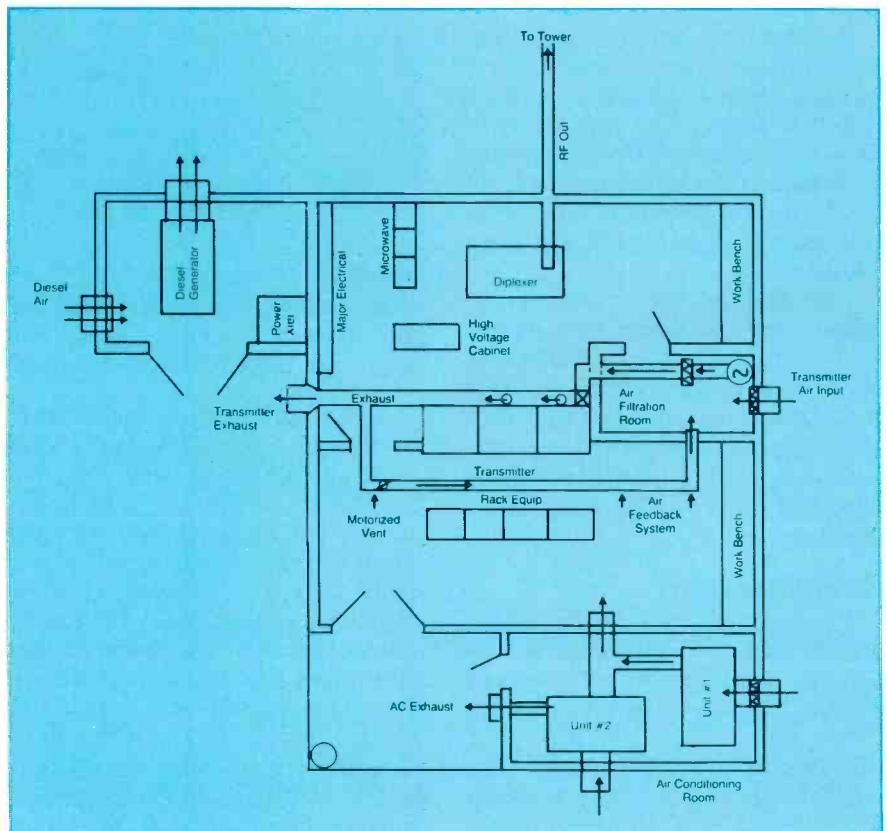


Figure 1: Plan of the KLRN site showing air flows and equipment positioning.

Remote Transmitter

Here, a force fan drives this filtered air through a second filtration system mounted in the transmitter air-intake plenum. An eye-level manometer across this last basket filter permits easy monitoring of the flow condition.

Using this arrangement, triple-filtered ambient outside air cools the transmitter. The heated exhaust air from the aural and visual power amplifier cavities is directed first through four-foot "stacks" to streamline its flow before it is bent to a heavily insulated horizontal duct leading to the outside.

The streamlining increases the air flow through the cavities and also reduces the electrical load, leading to a reduction in operation costs for the transmitter blowers. The duct insulation prevents re-radiation of heat into the air-conditioned building. All exhausts, including that for the auxiliary power plant, are placed opposite the intakes in the site design. The

diesel plant exhaust stack is further directed high above the roof line to carry fumes away.

Colder is not necessarily better for transmitter operation. In fact, it has been shown that a temperature around 59 degrees F is best for cooling high-power tetrodes. The KLRN building was therefore designed to return a small quantity of the heated air by way of a temperature-activated vent to the air intake room, maintaining a minimum 59 degrees F intake to the transmitter.

In a separate block room at the front of the building, there are two 10-ton air conditioners. These units are normally operated in alternation, but can run singly in the event of one unit's failing. Both units' intakes and exhausts are isolated from those of the air-handling systems of the transmitter and of the diesel generator.

Remote-control system

The Moseley MRC-2 system was

chosen for the site because of its computer-based operation and extreme flexibility not only in monitoring the transmitter, but also building security, diesel generator control, and strobe light monitoring. All outside doors and several inside doors of the plant are wired to the MRC-2, with illegal entry automatically logged and an alarm sounded at the studio. The building and exhaust stack temperatures are also monitored and logged with an alarm at the studio.

Electrical system

Severe electrical disturbances are common in this part of the country. Much thought was therefore given to the design of the KLRN site electrical system to allow grounding of the building and tower and prevent equipment damage.

The transmitter and rack equipment is operated from a common surge suppression and ground in-

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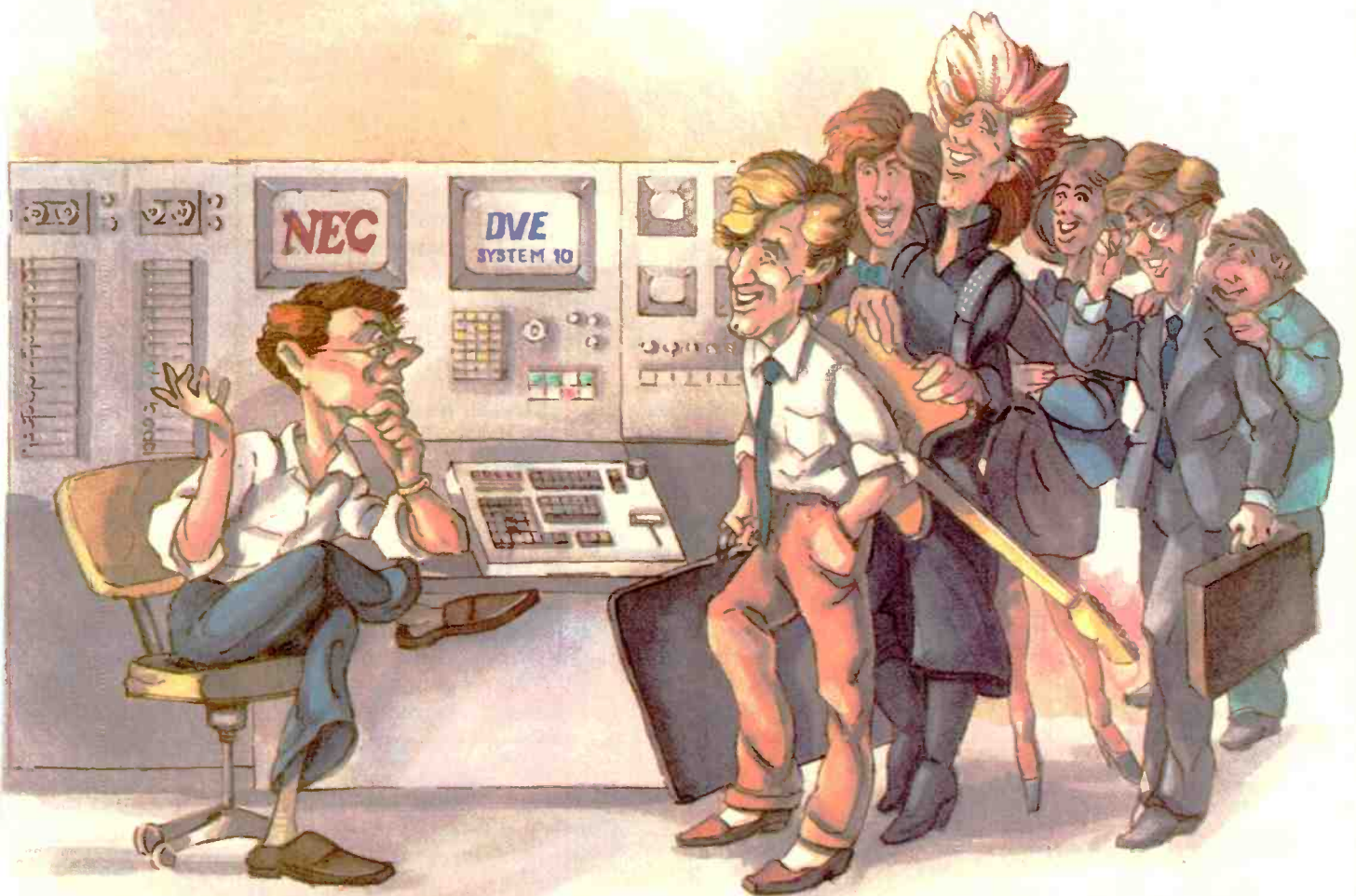
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KLRN-TV's antenna and tower at New Braunfels, TX.

interrupt system manufactured by Lightning Elimination Associates. Noncritical loads such as transmitter blowers, air conditioning units, and building lights were wired ahead of the suppressor to lighten its load. All the equipment racks, however, are on the downstream side of the suppressor, on individual breakers. There is an exhaust fan at the top of each rack.

Copper straps also protect the tower. It is bonded to eight 50-foot-long four-inch straps buried to a depth of two feet. The perimeter of the grounding array is connected with a further length of four-inch copper strap, and each radial is terminated with a 12-foot ground stake (see Figure 2). Upon completion, all above-ground copper was painted a dark gray.

The building itself has a six-

inch copper strap laid under its slab and brought up through the concrete to the transmitter, diplexer, equipment racks, air conditioners, and diesel generator. The transmission line is also grounded through six-inch copper strap, carefully installed to lead away from the building to the buried tower array. Waveguide entry points to the building are protected in the same way. In all cases, the strapping was installed with gentle bends to direct energy efficiently from a lightning strike into the earth and away from the building.

It had originally been the intention to tie the building strap to the base of the tower with six-inch copper. In the event, a long run of # 6 copper wire was used because it was felt to present a higher impedance to lightning strikes from the tower. This high energy would tend to dissipate in the tower grounding system rather than the building system. **BM/E**

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Creating the proper station image, in view of the onslaught of new technology in the world of video graphics and animation, can be like staring down the track at a runaway train. What do I need? How much should I pay? Who provides the hardware and software to service my particular needs? Straightforward questions that might be asked by anyone attempting to advance a station's competitive edge through the use of an electronic design department. Yet, due to the wide range of choices and the expense involved, the answers come less easily than do the questions.

Still, asking the right questions is the proper place to begin the trip into the domain of electronic art. A good first question would be, "What is the range of systems available?" This implies that a budget has been set for the purchase of design equipment and also that something more than a minimum capability is required to compete in the market.

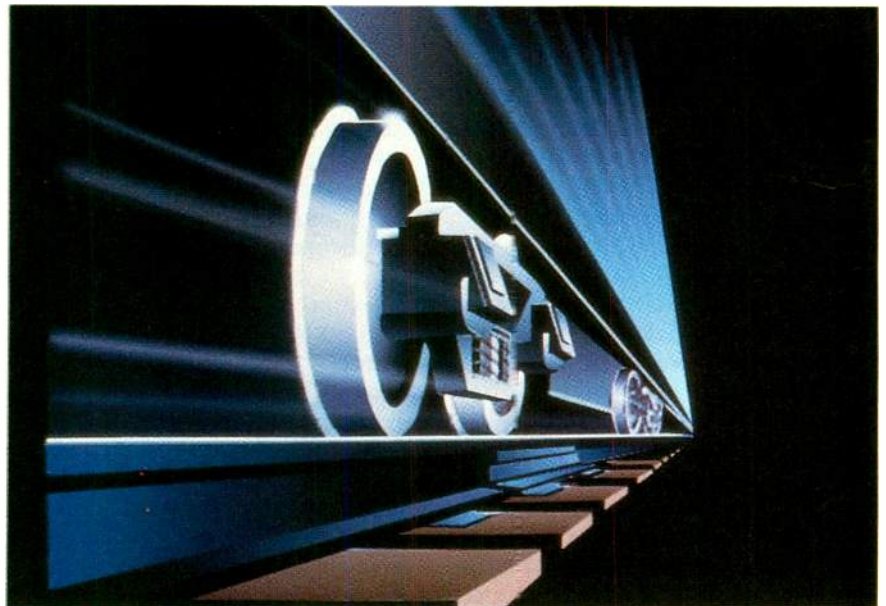
A "minimum" capability could have different meanings depending upon the market in which the station is competing. In general, though, a high-quality still store and a paint system are quickly becoming necessities. For stations that can afford it, or for the larger (top 25) markets, some type of animation capability should also be considered in addition to digital effects devices. David Wells, art director at KIRO-TV, Seattle, WA, maintains, "You should have a good switcher with three memory banks and a good character generator, like a Chyron IV or Vidifont V, and something often overlooked when equipment is chosen is that the devices purchased should be from the same manufacturer or at least work flawlessly within your chosen system."

Another point Wells makes regards an important factor other than equipment. "Critical to a good on-air look is people. You must have a good design director

The Right Look?

Giving station IDs, logos, news, and local programs the right visual touch can have amazing impact with the viewing audience. The right look starts with the use of modern computer graphics equipment. Assembling the system is where the adventure begins.

By Tim Wetmore



Created on the Ampex AVA-3 by John Hewit, graphic artist at WABC-TV in New York, this image shows sophisticated use of lighting and perspective.

and artists who are qualified and well trained to operate the equipment they will be using as well as being capable of making the right design decisions. Artists should be hired and trained to do design work."

These sentiments are echoed by Jerry Cappa, formerly art director at WABC-TV in New York and now a marketing specialist with

Ampex, who adds, "Secondarily, after a still store and a paint system, an animation system should be considered under certain conditions. Due to the time it takes to do animation, the system chosen should fit the operation, especially with 3D and modeling capability, because these operations require a lot of thought or the look you achieve will not be satisfactory."

Broadcast Management

Electronic Graphics



The house was captured from live video and input to the Quantel Harry for animation and editing. It was created at Artronics NW by Steve Manke of Quenzer Driscoll & Dawson and shows one of Harry's menus.

Entry level

By now, most stations have a good still store of some kind or should be in the process of getting one. Expanding into the fully electronic design process is where things get complicated, and it is the point at which those planning the purchase (the general manager, art director, and chief engineer) usually begin to look toward the Broadcast Designers Association (BDA) convention, which was recently held this year in Dallas, TX. With the broadcast industry mirroring the advancements made by manufacturers and the BDA, the trend is to move away from the long history of living in the "mechanical" world and to begin operating in the electronic domain.

Many designers first saw electronic design at the 1978 BDA convention with the introduction of AVA-1. In addition, the BDA (which had its first convention in 1977) has continued to focus attention on the small markets since they are often the most innovative, due to necessity. What this means is that the BDA has helped potential entrants into the electronic design world get educated about the equipment in question, guiding them in their choices on

when and where to start and how to decipher the bulk of available information.

This activity has led manufacturers and purchasers of equipment toward faster devices with higher resolution, more flexibility, and better storage media.

Recorders, still stores, and library systems are among the cornerstones of building an electronic design system. Currently, they come in many forms, such as Quantel's Digital Library System, which offers keying and other functions beyond simple frame storage. Ampex's ESS-3 is another electronic graphic still store that offers graphics capability beyond simple information storage. Abekas has made a step forward with a quality disk recorder, the A-62, that opens new vistas for storage and speed of recall.

Thomson Broadcast sells the GraphicStore, which is a paint and still store unit combined to operate and form a system with the company's Vidifont Graphics V composition and manipulation product.

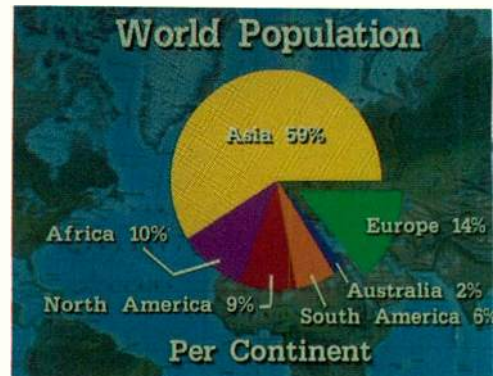
Harris' IRIS II still stores are designed to interface with the Aurora AU 200 Series of video graphics systems based on the IBM PC. Clearly, the building block of a

quality still store provides a base on which to construct an entire system, recalling Wells' remarks regarding system integration as one of the most essential elements in creating an electronic design system. For starters, then, a flexible system that offers possibilities for adding on more sophisticated gear in the future is the route to take. And a station can get started with a good beginning storage/graphics system for around \$36,000.

Paint jobs

Adding to the capabilities of the station's design department with a paint system really puts the station in serious contention for sophisticated imagery that can easily be carried through to all the station's promotion (both print and on-air) as well as enhancing the appearance of news and local programs. Once again, art directors are looking to the BDA convention for information on state-of-the-art paint systems. Here, as elsewhere, there are variations on the paint theme and a full range of prices and capabilities. At the June 1986 BDA convention, the exhibitors displayed most of the major paint systems currently available to broadcasters. Among them: Ampex, Alias, Aurora, Colorgraphics, and Quantel.

Each of these companies offers a paint system compatible with its "still store" (some of them are so advanced they function as graphic



The background of this picture was digitized, and the chart was automatically generated by business graphics software on the Colorgraphics Systems' ArtStar 3D. Eric Weaver, Colorgraphics art director, created this two-dimensional image.

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Electronic Graphics

units in themselves) either as a separate unit or incorporated within the same box and delineated through software functioning. Separate devices, of course, provide the user with the ability to add on each unit through a scheduled purchasing program. This is not possible with a totally integrated system due to the restrictions of a complete system purchase. The latter method, however, allows for flexibility through software update. Obviously, the purchaser must tailor the system to fit the needs of the station.

Quantel, using the Digital Library System as a still store/effects unit, constructs what it calls the Digital Production System by adding the Cypher, Harry (with matting, keying, and combining), and the Encore, which provides for manipulation and digital effects. Artronics has one of Quantel's first and most advanced systems providing a broad stroke of image manipulation

"Adding to the capabilities of the station's design department with a paint system really puts the station in serious contention."

functions. On all Quantel paint systems, various hardware and software, such as the new Pro IV digital paint programs, can be added for upgrading. A new entry in the video graphics arena is Rank Cintel, who this year introduced the Art File slide file with graphics workstation for retouching old shots and for creating new images. This is an electronic combination of the old and new methods of image creation/manipulation.

Aurora markets its AU 200 Series, a 32-bit full-color paint system, in two forms: the 220 and 280, which range in features with prices from \$80,000 to \$140,000. The series capabilities include compositing and matting, a

vector-based font library, slide and hard copy output, and a 3D option. An eight-bit paint system, Chyron's Chameleon incorporates a high-resolution graphics/efx generator as the company expands its base beyond character generation. Yet, its new Scribe is a super-quality text generation device.

The well-documented features offered by the Ampex ESS-3 and AVA-3 still store/graphics paint system have recently been joined with the 3D modeling and animation facility provided by Cubicomp's Picturemaker. This software-based configuration, now sold through Ampex to broadcasters, permits the Picturemaker to round out the complete design station, allowing image recording/

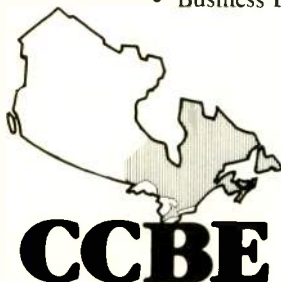
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New dimensions

Animation, of course, is the next and highest level of a video graphics system and brings the prices up to the \$100,000 range and beyond. These are the types of systems the station should plan for when they begin their first purchases whether or not the original forays are complete systems. A unique approach to the assembling of a total graphics package comes from Colorgraphics. Rather than have various integrated products offered separately in the fashion of Ampex or Quantel, Colorgraphics combines character generation, paint, and 3D capabilities in one box. All updates and modifications come in the form of computer programs since the Artstar is software based.

All codes operating Artstar are stored on a Winchester disk, and the system also uses a bit slice pro-

"Critical to a good on-air look is people. You must have a good design director and artists who are qualified and well trained to operate the equipment."

cessor. The system is somewhat of a hybrid in that it is software based but, with the use of the Maximizer, it provides the speed of hardware-based units through the use of micro codes. A real-time frame grab is incorporated as is direct control of a VTR without the need for a separate controller.

Whether hardware or software based and whether or not new disk recording technology is added to the system, one thing is certain. Modern broadcasting is headed, if indeed it has not already arrived,

down the track of the all-digital, all-electronic design department. Broadcasters need to look for the integration of graphic and animation systems into the already complex maze of existing equipment and plan the architecture of the video graphic development they need. The BDA has proved to be a leader in providing software, hardware, and creative information for those concerned with the design considerations of a station.

The association's seminars and its officers are valuable in helping to analyze all the information currently available. And, since the organization is made up of members of the industry, the BDA can help with long-range questions. Ultimately, however, the buying committee at the station is responsible and would do well to remember that purchasing plans as well as equipment plans need to be considered in deciding what it will take to compete in a market with the right on-air look. **BM/E**

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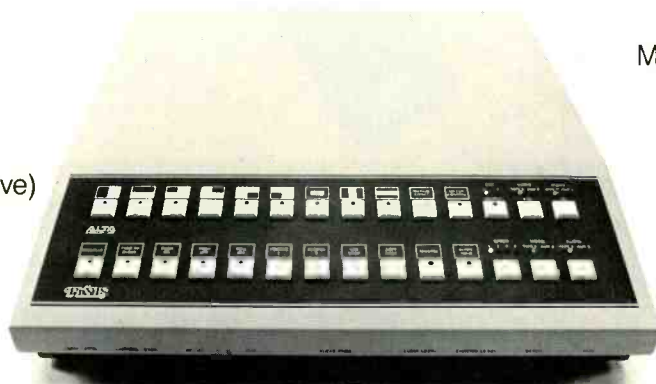
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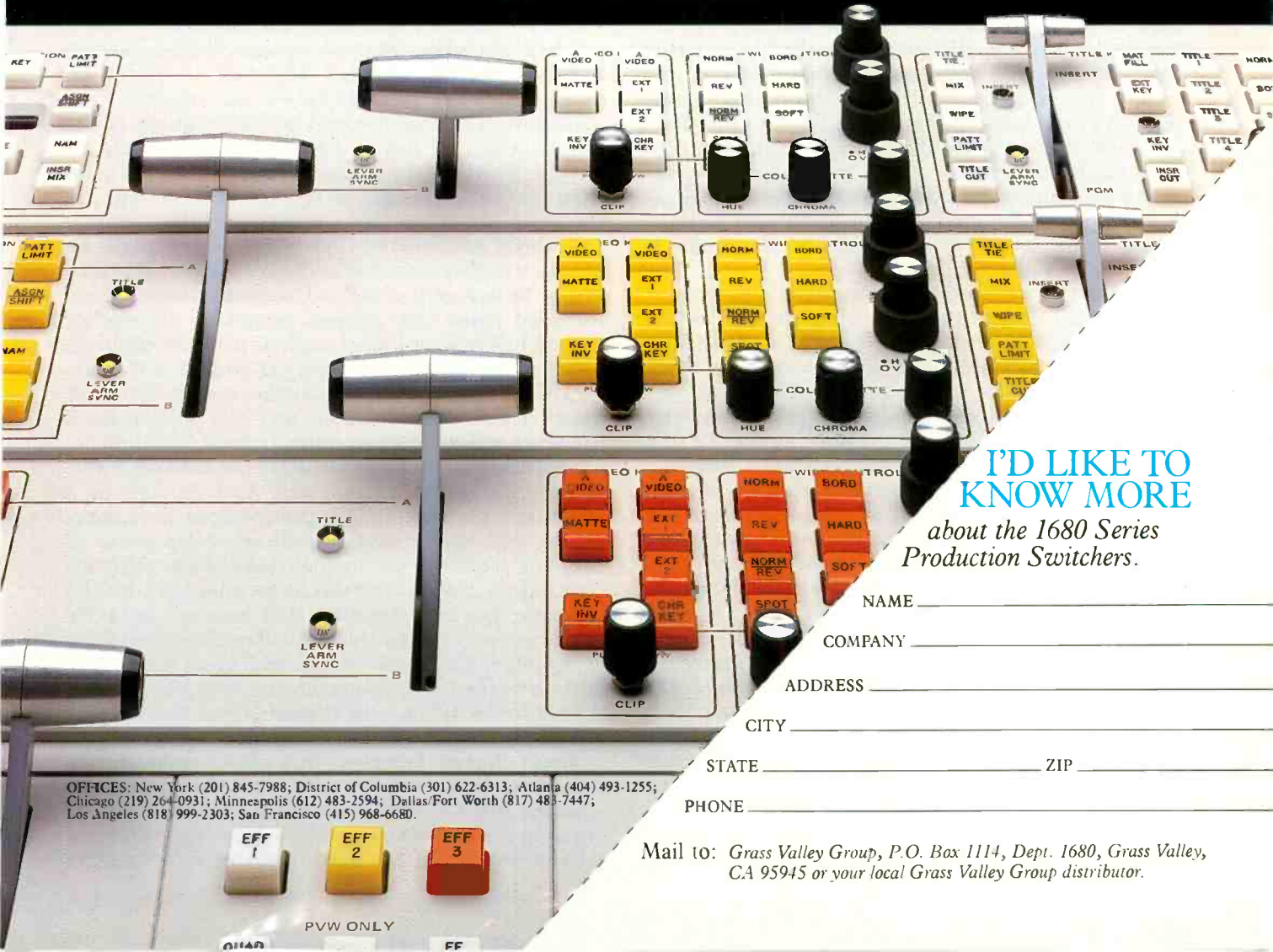
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On the Deregulation Trail

By Harry Cole, FCC Counsel

In 1986, the Commission unleashed a series of deregulatory moves. The following is a laundry list of the latest victims of the FCC's deregulation juggernaut:

AM-FM duplication

Back in the early days of FM, when nobody owned FM receivers and the FM medium was utilized largely for such uncommercial programming as classical music, the Commission thought it would be a good idea to encourage FM use by permitting commonly owned, colocated AM and FM stations to broadcast the same programming on both stations for up to 50 percent of the time. Such duplication of programming was clearly inefficient use of valuable spectrum space since two full broadcast channels would be used to provide the same identical programming during periods of duplication. However, the Commission's idea was that program duplication would be desirable for broadcasters (whose programming costs would be reduced) and would promote consumer acceptance of the FM medium. The 50 percent duplication level was viewed as an acceptable compromise of these various interests.

Now, ten years later, the Commission has decided that it really doesn't need *any* program duplication rules. The FCC has concluded that FM is now a fully competitive and viable service, and thus, it does not need any promotional assistance. But that, you might think, would weigh in favor of prohibiting any and all program duplication. Think again. As this Commission sees it, no rules are good rules, irrespective of the rationales advanced in support of such rules by past Commissions. Instead, all regulation is to be weighed in the balance of the marketplace, and, to the extent that marketplace forces render any particular rule unnecessary, you can kiss that regulation good-bye.

According to the Commission's marketplace analysis, program duplication is not necessarily economically beneficial (since its primary effect is merely to fragment the licensee's existing audience). Further, duplication can actually promote spectrum efficiency because it will permit AM-FM licensees whose AM stations are suffering to weather more easily the current adverse economic conditions. This, in turn, will enhance spectrum efficiency (so the argument goes) because it will allow the AM station to stay on the

air, rather than discontinue service and thus preclude any use of the frequency. (This argument, of course, runs somewhat counter to the claim, noted earlier in this paragraph, that duplication may not be economically beneficial—if no economic benefits are to be expected of duplication, then how will duplication discourage the shut-down of AM stations? Such conundrums, however, should not get in the way of progress). In any event, the Commission is confident that restrictions on program duplication are unnecessary.

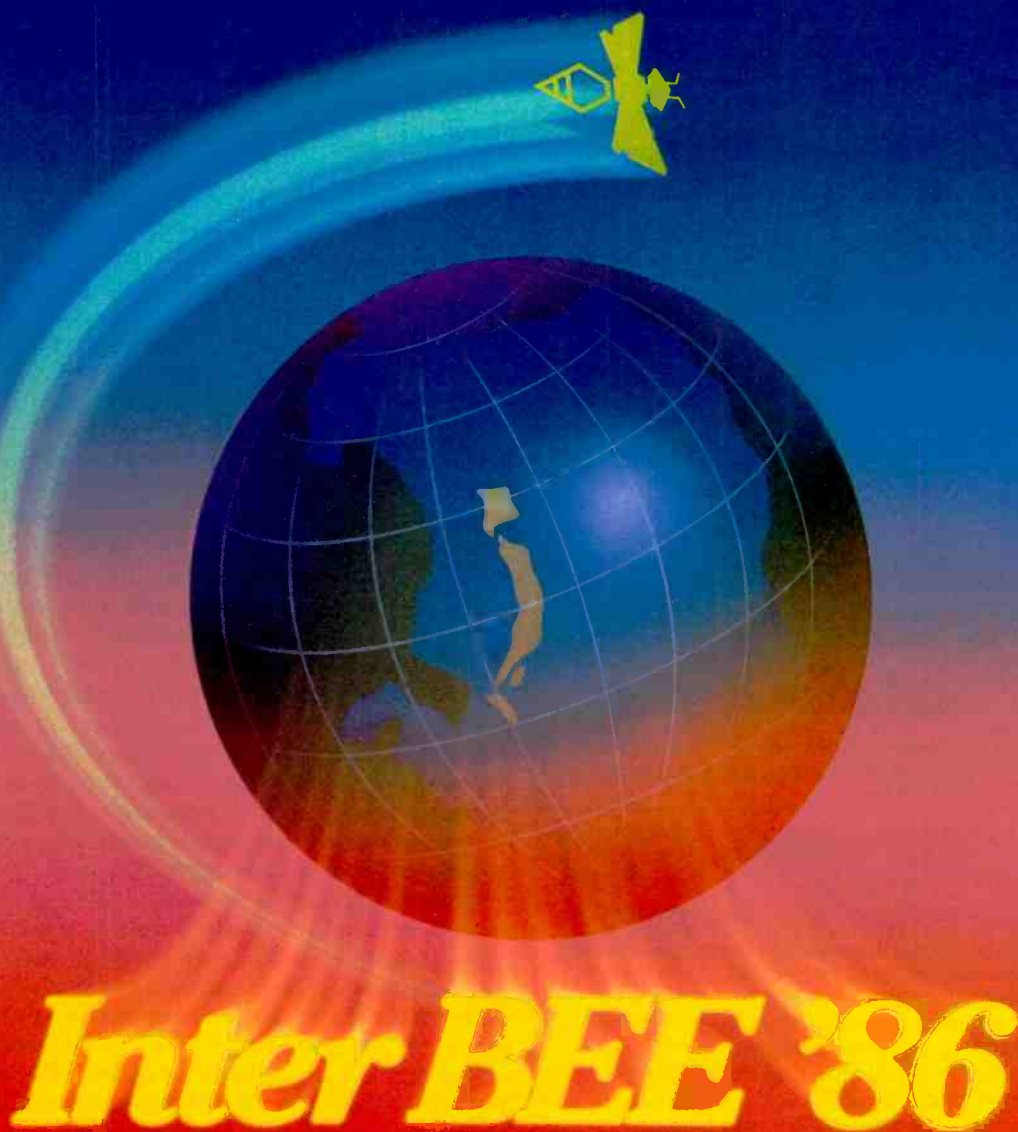
Network clipping

Back in the old days, the Commission used to take seriously the notion that a broadcast licensee is some kind of "public trustee" who labors under an overriding public interest duty to act properly. This approach, of course, is based on the language of the Communications Act as it has been consistently interpreted by the Commission and the courts for more than 50 years. In light of that general notion, the Commission had adopted a number of rules and policies aimed at assuring that broadcasters might be held to a higher standard of conduct than might otherwise be expected of normal business people. These included rules and policies aimed at preventing certain business practices, such as network clipping.

Network clipping, reportedly prevalent in the early 1970s, involves the unauthorized deletion of network-fed programming and the substitution therefore of local programming. In brief, a station being paid by a network to run all of the network's programming would delete, say, just enough of a program's closing credits, promotional announcements, and maybe even a network commercial or two, and would insert in their place local commercials. Thus, the station would be paid both by the network, for programming that was not actually broadcast, and also by the local advertiser. This form of "double billing" was viewed with great horror and disdain by the Commission when it first encountered it back in the 1970s, and at least one or two stations lost their licenses because of clipping practices.

Times change, however. In a recent decision, the FCC has eliminated from its rules the prohibition against clipping. The Commission still believes that clipping is a deplorable practice. However, the Commission is unwilling to continue to be the enforcer of

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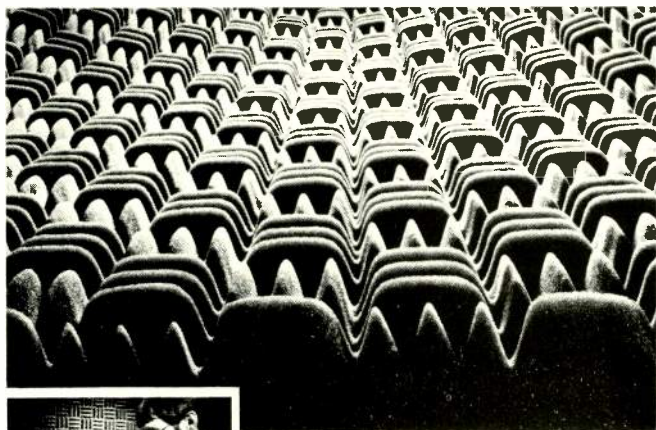
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FCC Rules & Regulations

any anticlipping measures. In the FCC's view, the public—including particularly the networks and the advertising community—is better equipped to monitor for possible clipping and to take appropriate action (presumably in the civil courts) if clipping is found.

What this argument overlooks, of course, is the substantial deterrent effect that the possible loss of license can have on a broadcast licensee whose entire business depends on that license. If enforcement is left to the civil courts (where charges of fraud can be raised and litigated), a licensee's exposure, if caught red-handed, certainly would not be as threatening as the possible loss of its license.

FM and AM technical rules

Meanwhile, back in the realm of the technical, the Commission has also proposed to streamline, somewhat, the standards for classifying FM stations and for allocating commercial FM channels. Right now, stations are classified according to minimum and maximum antenna heights and powers available to them. The Commission's proposal would scrap that approach and replace it with a classification scheme based on a formula reflecting the maximum distance to the expected 1 mV/m contour of each class. This approach would conform to the way stations are in fact licensed even now. Even though the rules specify certain maximum heights and powers, an applicant can, in most instances, propose a height or power exceeding the applicable maximum if it is willing to lower the other element (i.e., power or height) of its proposal to a level that would produce signal coverage equivalent to that which could be obtained by a proposal specifying the maximum permitted values. The Commission's proposed approach would simply short-cut the process by laying out exactly what extent of service any particular class of FM station can propose, irrespective of the precise combination of power and height that any applicant might choose.

Also on the FM front, the Commission is looking at the possibility of allowing any class of station to operate on any commercial FM channel. For the first 20 years or so of FM regulation, Class A stations could operate only on the 20 channels reserved for Class A use, and Class B and C stations could operate only on the rest of the channels. Then, as a result of BC Docket No. 80-90, Class A stations were permitted on all commercial FM channels. Now, the Commission has proposed allowing any class of station to operate on the 20 channels previously reserved for Class A stations. The most likely beneficiaries of this change would be Class A licensees.

On the AM front, the Commission is looking into ways—both technical and nontechnical—to help the AM industry survive its present downswing. While no specific proposals have yet been advanced, the Mass Media Bureau has prepared and released a report on the status of the AM broadcast rules in which it addresses a wide variety of topics. Further, the staff has specifically requested further comments and/or suggestions from any interested parties. If you

tube talk

would like a copy of the report—which runs more than 100 pages—you should contact International Transcription Services, Inc., 2100 M Street, N.W., Washington, D.C. 20036 (202) 857-3800.

New fee schedule

The free ride enjoyed by the communications industry will soon be at an end. On April 7, the president signed into law an act that requires the Commission, within a year, to assess and collect charges for the services it performs. The FCC used to have a schedule of fees associated with each of its various activities; that schedule was invalidated by a federal court of appeals a decade ago, and the Commission has been out of the fees business since then. The new fee schedule, which was adopted by congress, was designed to satisfy the objections raised by the court when the earlier fee schedule was thrown out in the mid-1970s.

Among the more interesting of the fees are a \$6,000 "hearing charge" and various charges for new and major change construction permits. The hearing charge is obviously based on the substantial expense of maintaining administrative law judges and a separate branch of hearing attorneys, not to mention the internal appellate system necessary for the hearing process. The steepness of the charge may also be attributable to a desire by the Commission to discourage all but the most serious applicants. After all, with the costs of preparing and filing an application as low as they presently are, applicants are encouraged to file as many as possible—even if none of them are granted—and the possibility (if not the likelihood) of lucrative settlements presents sufficient incentive. As a result, the number of applicants overall has skyrocketed in recent years, clogging the Commission's files. By putting a high price-tag on the right to prosecute a competing application, the congress and the Commission are, in effect, raising the ante in the broadcast application game, possibly in the hope that the less serious applicants will be more reluctant to play the game when confronted by an unavoidable up-front \$6,000 cost.

The new and major change charges vary, depending on the service. FM applications will cost \$1,800. Understandably, AM applications, with their more elaborate engineering, will cost more—\$2,000. Less understandably, television applications, which would appear to be among the easiest to process, will cost \$2,250.

Although already signed into law, the fee structure has not yet taken effect. As a practical matter, the new fee system will not be implemented for several months, at least, in order to allow the FCC time to adopt procedures for the assessment and collection of fees. You probably don't need to worry about missing out on the announcement when fees are finally required to be filed. In light of the revenues likely to be produced by such fees, the Commission will almost certainly be sure to notify all applicants of their obligation to ante up as soon as the fees do become effective.

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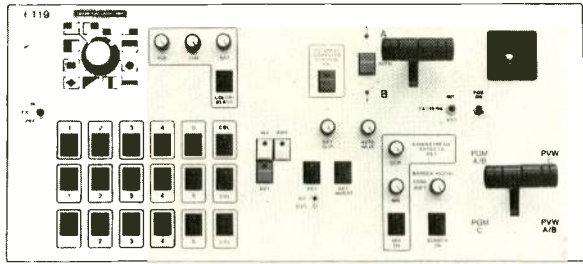
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Crosspoint Debuts Full-Control Switcher

Crosspoint Latch Corp. has announced a new switcher, the 6119, that features an option allowing smooth frame-accurate effects directly from the keyboard of most editors. While under external control, the 6119 with the PCE1002150 computer control option will perform full-frame accurate wipes and dissolves. An optional 6055 parallel-to-serial converter allows the 6119 to interface with Convergence editors.

The switcher features five inputs, three buses, full colorizer, fade to black, soft, hard, or bordered edges, 12 wipe patterns, joystick positioner, two levels of keying, test mode for easy systems timing, and a blanking processor. The 6119 switcher, with the featured control option, is priced at \$2850. The 6055 Converter unit sells for \$800.

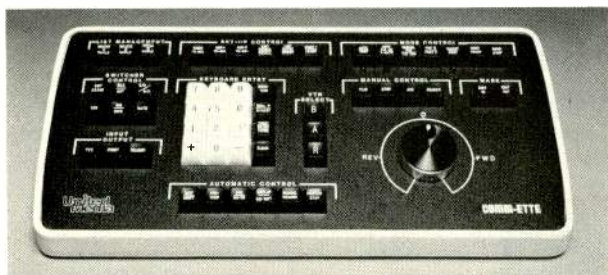
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New Nurad Ku Antenna

A new Ku-band antenna has been introduced by Nurad, Inc., Baltimore, MD. The unit is designed for SNG operations and features an offset feed for low sidelobes and high directivity. In addition, the six-foot-diameter antenna sports a honeycomb-reinforced, silver-coated fiberglass reflector that is both lightweight and highly reflective.

Receiving in the 11.7 to 12.2 GHz bandwidths and transmitting in the 14 to 14.5 bandwidths, the new unit is orthogonal linear polarized.

Circle 251 on Reader Service Card



Computerized Editor from United Media

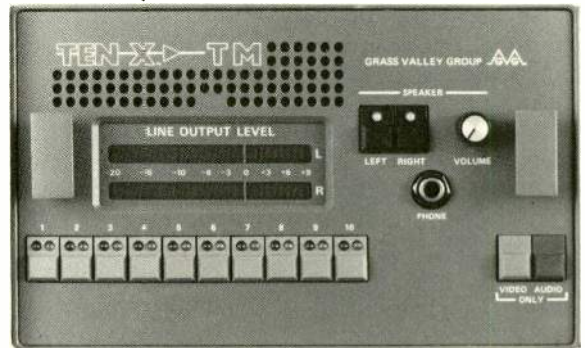
A new A/B roll computerized video editor, the Comm-ette, has been recently announced by

United Media. Designed to allow gradual system upgrades from control-track to SMPTE/EBU time code and from two- to three-machine editing with full switcher control, the machine can be further upgraded to control eight-machine editing.

In the basic configuration, Comm-ette provides 250-event memory, list management, list input/output, disk control, and auto assembly, and there are built-in interfaces for one-inch, 3/4-inch, and half-inch tape formats.

The Comm-ette unit, with standard 8-inch floppy disk controller, lists for \$6500.

Circle 252 on Reader Service Card



Routing Switcher New from Grass Valley

The TEN-XTM is a new 10 x 1 routing switcher from the Grass Valley Group that incorporates all the features of the TEN-XT switcher and adds VU peak monitoring and a built-in audio speaker/monitor for stereo monitoring.

The speaker/monitor combination can be switched to give audio from left, right, or both channels, and a second touch of the setting button mutes the output while retaining the previous volume level. In addition, all GVG TEN-XL options can be used, including serial interface, tally relay matrix, dual power supplies, and remote control panels.

The TEN-XTM, designed to be placed in a half-rack frame next to waveform and vector displays, has a list price of \$2100.

Circle 253 on Reader Service Card

New Test Products from Sound Technology

Sound Technology has recently debuted two new test and measurement products.

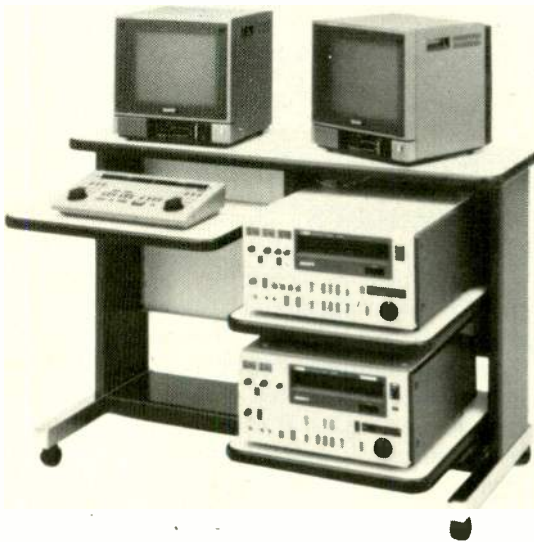
The 1530A MTS stereo analyzer/monitor is specifically designed to optimize troubleshooting, verification, and alignment of the AM, FM, or MTS signal path. The 1530A measures two-channel level, swept frequency responses, and performs wave and IND analysis as well.

The unit's CRT displays alphanumeric and graphic test results, which can be microwaved back to a master control room monitor for real-time studio engineering and analysis. An optional two-channel oscillator is also available for transmitter-site work.

The 1530A analyzer sells for \$5850, and the optional oscillator is \$1250.

In addition, Sound Technology has unveiled Audio Test Software for use with its 1500A of 1510A Audio Test Systems. The new menu-driven software allows measurement of two-channel AC volts, azimuth, THD, frequency response, weighted and flat noise, maximum operating levels, and channel separation. Test results can be stored, printed out, or read to screen, and the program's graphics capability can interface with many popular software packages. The software retails for \$295.

Circle 254 on Reader Service Card



Winsted Offers New Cabinets

Three new VTR/editing consoles/cabinets are being introduced by Winsted Corp., Minneapolis, MN. The Compact Editing Console is an economical counterstation for half- and 3/4-inch front-loading VCRs that can be set up for standard two machine editing or for A/B roll. VCR and monitor shelves adjust vertically in one-inch increments.

Two models of Locking Security Cabinets designed to keep VTRs, controllers, and other valuable equipment locked up and secure are also new from Winsted. Model 96035 features a pull-out shelf for easy access to top-loading machines. An added rack unit at the top of the cabinet accommodates installation of sequential switches, controls, and other equipment.

Model 96033 includes a high-tensile steel mounting kit as well. Both cabinets are con-

structed of 14-gauge steel with 12-gauge hinged locking security doors. A rear access opening accommodates cabling and power cords.

Circle 255 on Reader Service Card

JVC Debuts Digital Audio System

JVC has introduced a new digital audio mastering system that features two-channel PCM recording, editing, and playing for recording studios, broadcast stations, and video production houses. The system is designed to make digital recordings, edit originals for CD masters, produce masters for high-fidelity video, produce programming with A/V synch, and make masters for CD-ROMs.

The two-channel PCM VP-900 Processor has been designed to keep input/output quality differences at a minimum. The unit features 16-bit linear quantization; JVC's own Bi-Parity recording format, which includes advanced error correction/detection functions; and balanced input and output circuits.

The DS-DM900 is the system's mixer. Its features include DSP chips, an RS-232C interface, 8-column status displays, and three equalization patterns.

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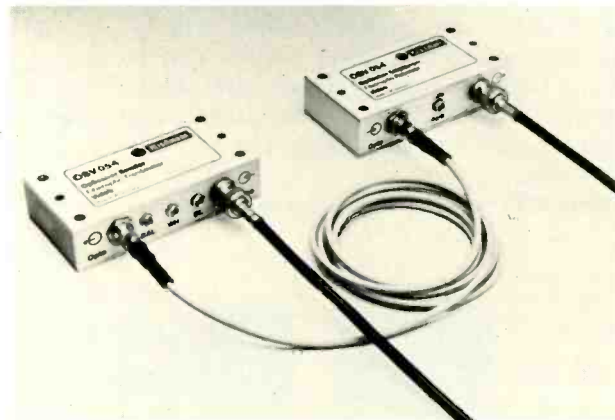
Circle 179 on Reader Service Card

New Equipment

Optional peripheral equipment for JVC's Digital Audio Mastering System include separate time code, remote control, digital interface, and A/V synch units.

The system editor, the AE-900V, is a high-performance unit featuring a separate control console. It offers three edit modes: manual, auto scanning, and address editing. Other editing features include cut-in/out point confirmation, variable-gradient crossfade, and an auto-location function.

Circle 256 on Reader Service Card



New Fiberoptic System for Broadcasters

The OXV 054, an 8 MHz fiberoptic system, is being offered by Richard Hirschmann of America, Inc. Designed for the professional broadcaster, the system guarantees interference-free transmission of color video to a distance of 4500 feet over fiberoptic cable. The system features compact transmitter and receiver and integral calibration controls for RGB balance, black, and white.

The system can interface with broadcast equipment with BNC connections and is available on rack-mountable PCB cards.

Circle 257 on Reader Service Card

Electro-Voice Announces New Mixer

Electro-Voice's new 8108 eight-input, four-output mixer provides a good deal of signal routing flexibility in a compact, rack-mount package. The mixer is specially designed for fixed installations and provides direct channel assignment to four independent mono outputs.

Transformer-isolated inputs and outputs cut down on RF interference, and the 8108's overall gain of 90 dB is high enough to give hiss-free operation when receiving low-level input signals.

Other features include 48 V phantom power, output solo, two-band EQ, continuously variable gain controls, and clip indicators on each input. List price is \$1275.

Circle 258 on Reader Service Card

The 1988 XV Winter Olympics' host broadcaster, **CTV Television**, Calgary, AB, has awarded a \$2.5 million contract to **Ampex's** Audio Video Systems Division to design and build the CTV international broadcast center. The agreement, which also includes a leasing contract for over \$5 million worth of Ampex equipment, provides for eight additional production studios and editing suites for rental to international broadcasters covering the Olympics.

The 1986 **Monitor Awards**, held at The New York State Theater of Lincoln Center in New York, featured a special Pioneer Awards presentation. In recognition of the thirtieth anniversary of videotape and recording, Pioneer Awards—the organization's most prestigious prizes—were given to **Ampex** and **3M**....Other Monitor Award recipients included **Abekas Video Systems, Inc.**, culling a special engineering excellence prize for its A-62 disk recorder; **M.J. Zink** president Steve Zink, awarded recognition for camera achievement for his work on *Hill of Fire*; and **Wechsler Group's** Steven Wechsler, given the best editor in children's programming commendation.

Cranston/Csuri Productions, Inc., is another company that is getting its share of awards. The Columbus, OH-based production house has racked up an impressive list of prizes for its experimental computer graphics: A CLIO award in computer animation for two 30-second TRW spots, a BPME gold medallion for graphics work at New York's WCBS-TV, and a BDA gold award of excellence for a *PM Magazine* ad....San Francisco's **Video Arts, Inc.**, now features a brand-new component Betacam editing suite.

Devlin Productions, New York, was recently chosen by the Combined Effort production company to host its production of a 30-second commercial spot for the Governor's Highway Safety Office of Iowa. The drunk-driving PSA utilized Devlin's Rank Cintel Mark III for scene-to-scene color correction.



"Life Sounds," a trade show extravaganza for the Bose Corp., was recently produced at Vizviz, Inc., Brookline, MA. The presentation incorporates digital audio, Quantel Paintbox effects, and animation graphics produced by designer Glenn Robbins and editor Billy Stuart on Vizviz's brand-new Abekas A-62 Digital Disc Recorder.

A brand-new Silicon Graphics IRIS workstation should enhance any computer animation projects done at Pittsburgh, PA's **PMI, Inc.** PMI is the first production company in the Pittsburgh area to offer audio, video, and computer-generated imagery and animation under one roof.

Convergence Corp. is holding four-day training workshops covering A/B roll, post-production prepping, time code, and auto-assembly. Held once a month, scheduled through December, the \$300 course will be held at the company's headquarters in Irvine, CA. On-site training courses are also available. Contact Lorraine Pinney at (714) 250-1641 for more information....An ADO training seminar is being added to Los Angeles-based **Weynard Associates'** list of hands-on professional training courses. The one-weekend, \$450 workshop will deal with 2D and 3D animation, source effects, motion types, and CMX and ADO GPI. The course will be held at both New York and Los Angeles locations; more information can be obtained by contacting the company at (818) 992-4481.

TEAC joins the ranks of

Matsushita, Sony, and Willi Studer AG in the adoption of the DASH (Digital Audio Stationary Head) format for its new line of digital master recorders, which are slated for a spring 1987 introduction....In support of its new M-II videotape format, **Matsushita Electric Corp.** has created the Panasonic Broadcast Systems Co., which will be dedicated to the sales, service, and development of the company's broadcast systems....A new company, **Broadcast Television Systems GmbH**, has been founded recently as a result of a joint venture between Robert Bosch GmbH and N. V. Philips' Gloeilampenfabrieken.

Fuji Photo Film U.S.A. has relocated its headquarters. The new address is Taxter Corporate Park, 555 Taxter Rd., Elmsford, NY 10523; (914) 789-9100**Integrated Technologies, Inc.**, has relocated its sales and marketing headquarters from Greensboro, NC, to Falls Church, VA....**For-A Corp.** has also moved its headquarters to a larger facility in Nonantum Office Park, Newton, MA 02160; phone number is still (617) 244-3223.

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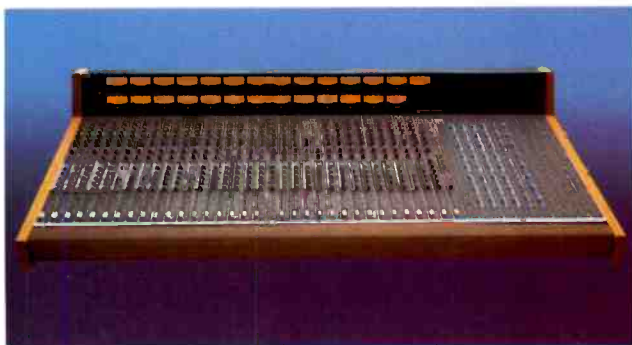
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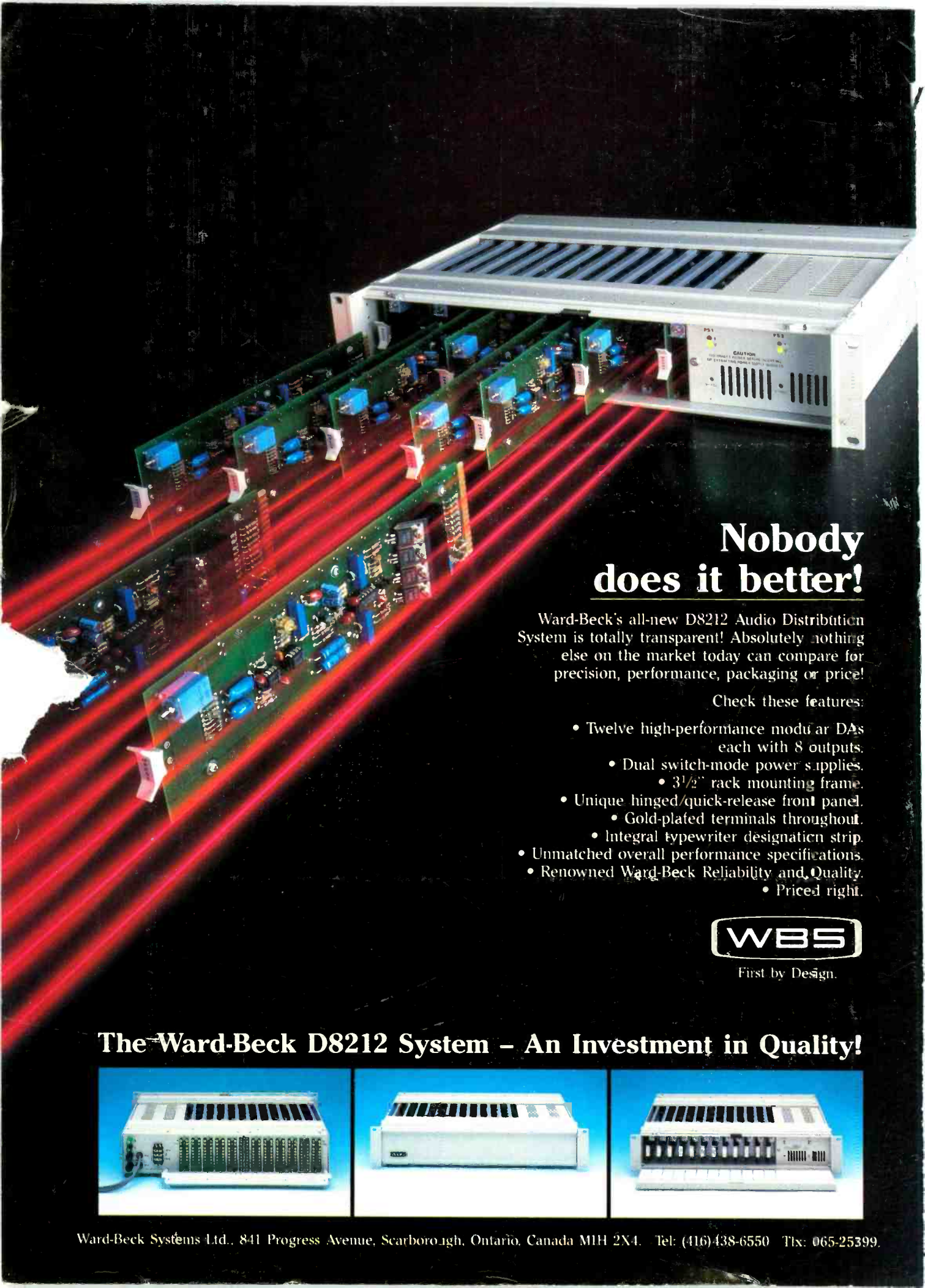
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