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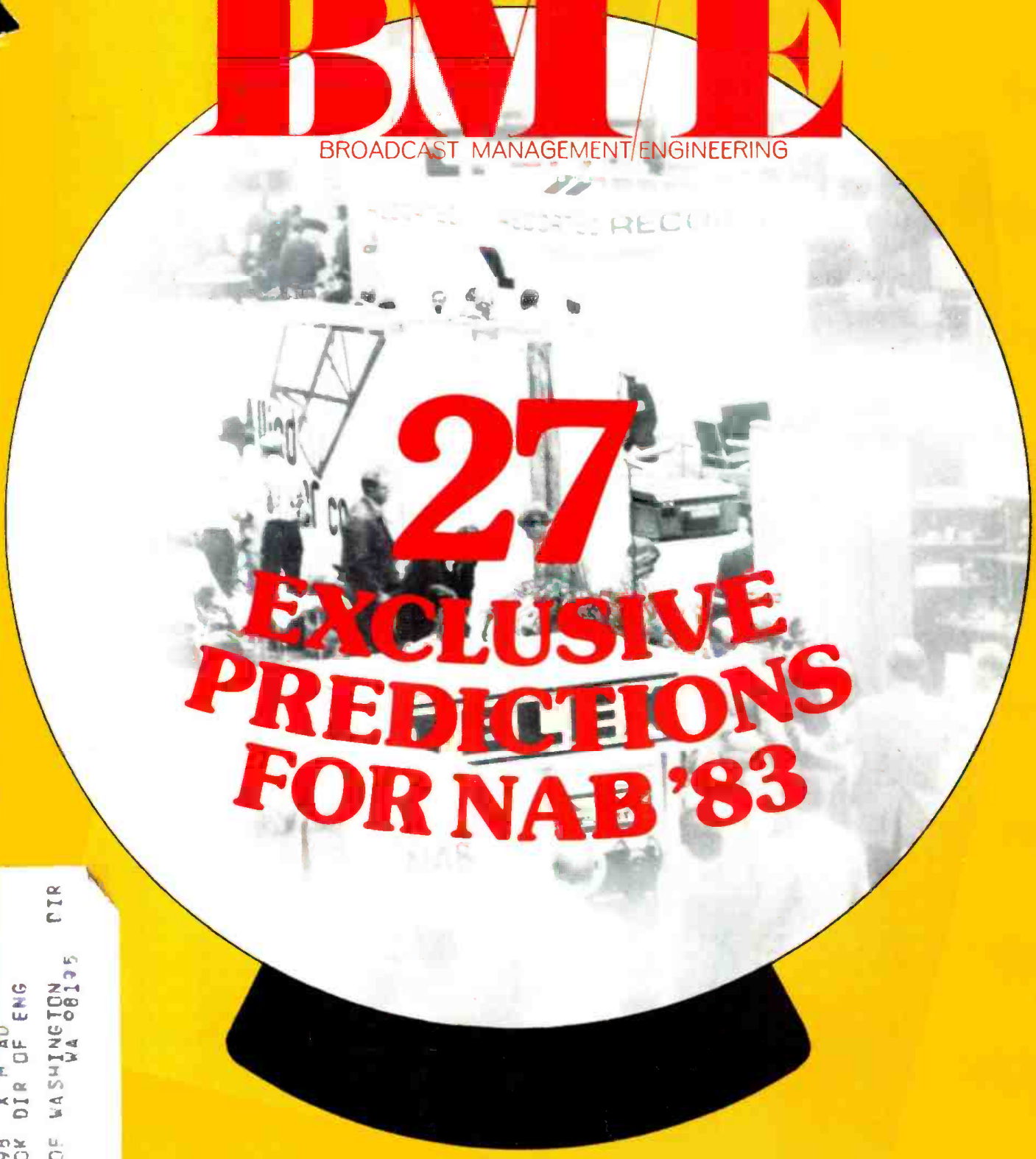
BROADCAST MANAGEMENT/ENGINEERING



27 EXCLUSIVE PREDICTIONS FOR NAB '83

ALSO IN THIS ISSUE:

Special Report: Post-Production

Microwave at WNBC-TV

Facilities Design and Engineering—Choosing a Transmitter

ADM takes AM/FM versatility to new levels

We are proud to announce a major new development in our ST Series II AM/FM stereo consoles. These popular, highly versatile consoles are now available in four basic main frame sizes with 10, 16, 20 or 24 inputs. Each can be initially equipped with your choice of a variety of input, output and signal processing modules. Each has built-in capacity for future expandability.

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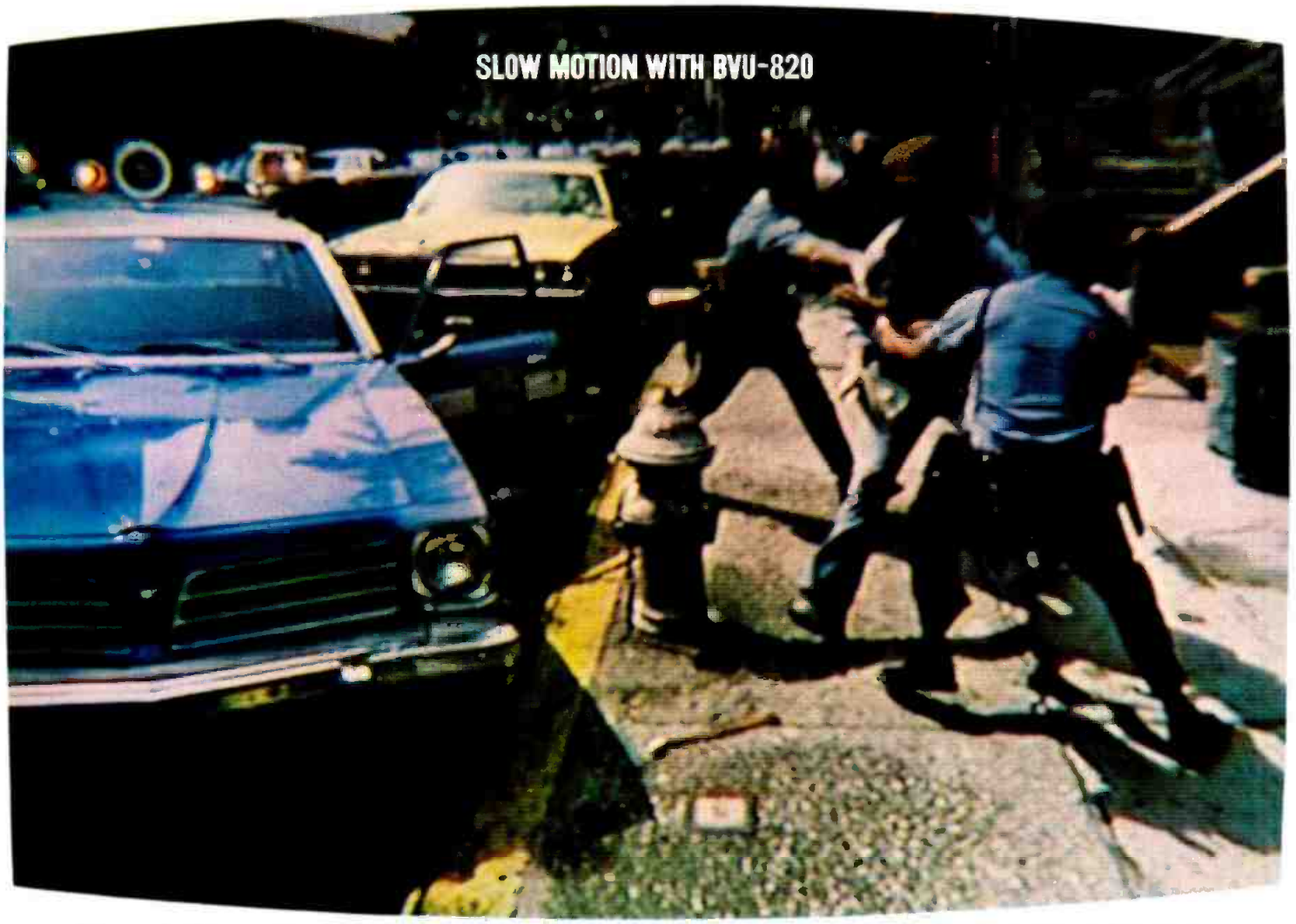

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Without it, the BVU-820 is capable of up to 10x play speed—fully viewable.

With it, it's capable of up to 40x play speed fully viewable, and full play speed in reverse to 3x forward with broadcast quality.

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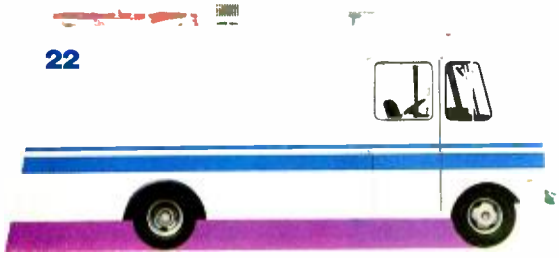

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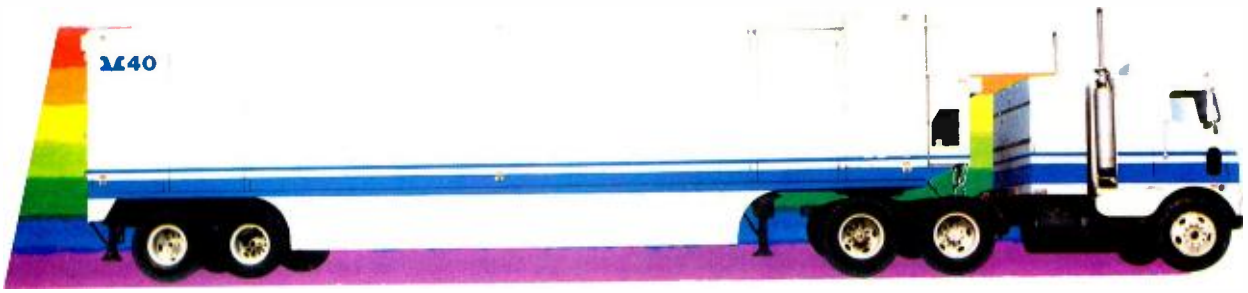

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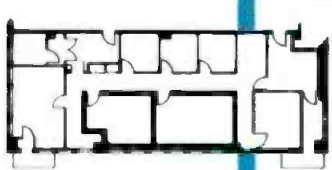
BM/E
BROADCAST MANAGEMENT/ENGINEERING

FEBRUARY 1983 VOLUME 19/NUMBER 2

SPECIAL REPORT: NEW ALTERNATIVES IN POST-PRODUCTION

27



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NAB Preview

The Performance of a World-Class Studio Console.

With a Four Year Warranty & a Price That Makes Sense.

You're looking at our DC-38-8S. Built tough & engineered to perform like big, expensive boards you'll find in world-class recording studios. Its flexibility and features give you the ultimate broadcast production and on-air board.

Its price keeps you (and your accountant) smiling.

D.C. CONTROL— WE INTRODUCED IT FIRST!

While a lot of imitators are still playing catch-up, we're moving ahead: by subtly improving upon a design we pioneered in 1975; by maintaining our reputation for reliability; by realistic and affordable pricing. We figure we're still way ahead. Which means you can be too.

The Ramko DC-38 Series consoles are known to be highly interference free because we don't let RF and scratchy pots and switches attack the audio. All audio functions, from switching through attenuation are done via D.C. control.

NOT ONLY QUIET. CLEANER AND MORE ACCURATE.

All inputs/outputs have the benefits of solid-state, transformerless design. We discarded the problems that come with bulky, unforgiving and expensive transformers. Like distortion due to impedance mismatching and compromised frequency response. Not to mention hum that sticks to a transformer like a magnet.

We give you a solid-state, L.E.D. metering for much greater accuracy. A cleaner, tighter sound can be yours too because the slower responding, mechanical V.U. meter belongs to another era—not on a Ramko console.

FEATURES FOR THE REAL WORLD.

There's a dual cue mode that works by normal "potting-down" or by pushing a button so you don't have to change the mixer setting. All the pushbuttons are super-quiet. They route audio through error-free, solid-state logic without program-killing pops, clicks or momentary feedback associated with loud, clanking, short-lived mechanical switches.

Our exclusive electronic patch panels make selection of input gain extraordinarily flexible. From mic through line levels, and anywhere in between on each and every input. You have over four million combinations to accommodate any channel.

THE SECRET TO A FOUR YEAR WARRANTY WITH PARTS AND LABOR.

In the DC-38 you get three power supplies. L.E.D.s and lamps with an 11 year life expectancy. Pushbuttons spec'd at 20 million operations. Wear-resistant, crud-forgiving conductive plastic mixer pots that also take the heaviest of hands. In addition, all the critical electronic circuitry is burned-in so it doesn't burn-out.

And, no console made is easier to service.

THERE'S MORE.

Like over a dozen specific models in addition to our DC-38-8S. With spec's that compare to the ones on your left. Mono-Stereo, 5 inputs to 12, dual. Optional solid-state clock/timers and remote machine control interface.

We also have a free, two-week trial. So you can put our claims, and our reputation to the test.

Give us a call, now. Collect. Discover the performance and versatility of a world-class broadcast studio board.

Discover the pricing that's also made Ramko's radio equipment reputation red-hot.

DC-38 Series' Numbers

Output:	+21dBm max.
Signal-To-Noise Ratio:	−70dB
Frequency Response:	+0, −2dB 20Hz to 20kHz
Distortion:	0.3% or less
Crosstalk:	−70dB @ 1kHz
Inputs:	Up to 4 per mixer, balanced bridging
Price:	Single channel 5 mixer mono (SC-5R) thru dual channel 8 mixer stereo (DC-8Ms). $1808* to $3509.*
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	Dual channel 12 mixer, slide atten., remote control. Mono $6432.* Stereo $7998.*

*Prices subject to change without notice.

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EDITORIAL

Using Technology

AT ONE TIME almost any piece of equipment a clever engineer put together could be sold. Broadcasters in particular were eager buyers. And there was progress.

The television industry could not have progressed as it did if it were not for the development of the videotape recorder, slow-motion recorders, tape editors and character generators, to name but a few important products. Radio broadcasters, with their growing appetite for more and more loudness, ate up audio processing equipment. And digital special effects devices have provided both new sights and new sounds.

Today, however, introduction of a new product—even one offering improved performance and extraordinary features—does not automatically lead to market success. Instead of "What will it do for me?" buyers need to ask, "How will it fit into my system?" If the answer is negative, the "better mousetrap" probably will not sell. The result of technological overkill is often a solution in search of a problem.

A number of astute broadcasters have been warning for some time now that the industry has reached a new threshold. They have been advocating a systems approach to the use of new technology, whether it be for a single, small-market station or an entire network.

New and powerful tools made possible by sophisticated use of technology today present broadcasters with a dilemma: is the improvement in performance worth the cost of implementing it? This point brings to mind comments made by Boris Townsend of Britain's Independent Broadcasting Authority at the International Broadcasting Conference in Brighton, UK two years ago.

"Are you spending your technical budgets wisely?" he asked. While Townsend eagerly awaited a digital VTR and looked forward to high definition television, he suggested that engineering funds could be better spent trying to reduce the cost of program production rather than in improving picture quality. He declared that the cost of scenery and graphics is four times more expensive in producing a program than engineering facilities, and he asked, "Why isn't engineering innovation going full blast in the area of electronic scenery, direct electronic graphics and automatic lighting, where it would have four or five times the effect?"

Along these lines, a recent issue of the IEEE's magazine, *Spectrum*, quoted venture capitalist Jack Melchor: "We're coming to a revelation in this country that applications are more important than technology, and it's been slow in coming."

We are inclined to agree. We need perhaps less supply push and more demand pull. How do we steer this course? For this coming year we will steer toward articulating what our broadcasting industry truly needs in equipment and systems. In doing so, we hope that hardware manufacturers come to concentrate, as Jack Melchor says, on applications rather than technology.

A DIGITAL EFFECTS SYSTEM SO ADVANCED, EVEN WE DON'T KNOW ALL IT CAN DO.

Maybe we'd better explain.

We do know the limits of our new E-FLEX DVE® system.

It's just that those limits are so theoretical, they have almost no impact on what E-FLEX can do in the studio.

And what it can do in the studio is virtually limitless.

To start with, E-FLEX has some of the most sophisticated effects ever offered in a digital video system. Like a new, two-channel reciprocal function. Our mosaic and posterization effects. Multi-move, so you can put up to 16 copies of a moving image on the same screen. And a trajectory function that lets you control the movement of an image along a curved path.

But E-FLEX is so advanced, you can also combine our "basic" effects in new, unheard-of ways. And this is where the theoretical limits come in. There are so many possible combinations, no one will ever know what they all look like.

That makes E-FLEX the most potent creative video tool ever. Every time you turn it on, you can create an effect no one has ever dreamed of. And when you've got what you want, you can store it permanently on a bubble memory cartridge that never wears out.

Yet while E-FLEX's capabilities may approach infinity, the price doesn't. It'll fit comfortably into your studio budget.

And that's all the more reason to call for a demonstration tape today. Because once you've seen a little of what E-FLEX can do, nothing will stop you from discovering the rest on your own.

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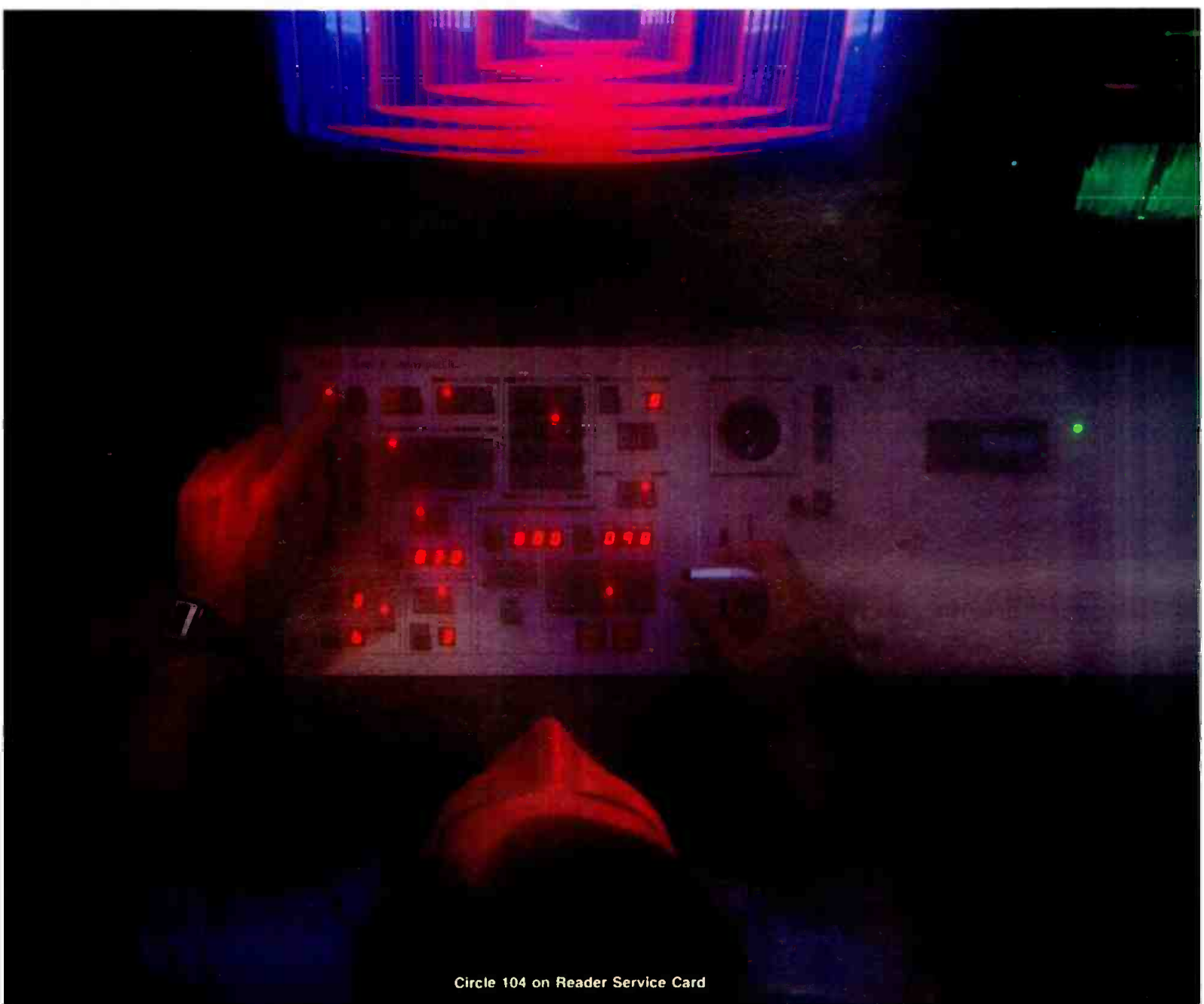

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LETTERS

DBS BATTLES

To the Editor:
In the Broadcast Industry News section of your December issue, you reported that STC had recently challenged an FCC authorization to USTV for a quasi-DBS service. Almost as an afterthought (albeit accurately), you noted that the STC filing was in support of a petition of the United States Satellite Broadcasting Co. USSB took on GTE and USTV on this issue back in September in a detailed petition to the Commission, setting forth the technical, legal, and regulatory flaws in that grant of authority, but it took more than a month for STC to chime in to support our position.

We welcome their support—and we give them full credit for being the first applicant to the FCC for a direct broadcasting satellite system. But why do they always get top billing? We pay our taxes and brush our teeth. USSB is advancing the state of the art with its broadcasting satellite system, which was recently given a go-ahead by the FCC. There are now eight approved DBS systems, but to read the papers, you'd think STC had the only game in town.

While I'm up on this soap box, let me mention another battle that USSB is trying to win and will be of vital concern to *BM/E* readers. We're working for establishment of a single transmission standard for DBS systems so that compatible receivers can be used.

Everybody in the industry knows that competing technical standards have held back the growth of new services: quad sound, videotape recording, AM stereo, and teletext. How many people will buy a $300 DBS receiver to pick up *three* channels, compared with the number that would make such an investment if they could pick up *30?*

The IEEE has come out in support of a single transmission standard and the EIA thinks it's a good idea, too. How about it, *BM/E*? Will you help all the prospective system operators, programmers, equipment manufacturers, those individuals who will find employment in the new jobs to be created by this nascent element of broadcasting, *and* the American viewing public by editorializing on this subject?

Richard G. Gould, President
Telecommunications Systems
(Consulting engineers to USSB)

FOR AUDIO PROCESSING

To the Editor:
Your article, "Audio Processing: Recipe for Better Sound," [August 1982] brought a letter from a CE in Toledo arguing against "dense" modulation. There were two assertions in the letter that I feel must be challenged.

First, let's look at his statement, "The fact is that almost all adults 25+ will listen longer to less processing." The fact is: That is not a fact, but an assumption. Facts are proven. Please show some supporting evidence! Meanwhile, I will rely on the ratings evidence of winners in competitive markets. Show me a majority of lightly processed winners in the top 100 mar-

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LETTERS

kets. I'd even pay attention to a 10 percent ratio of light-to-heavy winners, if you limit it to stations who have format competitors. The concept of ear fatigue must have originated with a CE somewhere who wanted to stop a PD from meddling with "his" radio station.

This brings us to the other assertion in the letter: "Audio processing...in the hands of the program director, has turned broadcasting into a braying contest...." Do you hear him saying, "Keep your hands off my equipment?" Since when is the chief engineer in charge of the color, the flavor, the *signature* of the station? Is he in danger of losing his job if the ratings fall? The program director is the one with his job on the line when the book comes in! The PD is supposed to have the right jocks on, play the right music, run the right promotions, air the right information, and *have the right sound*. It is the PD's responsibility to target an audience and mold the station toward that audience. The processing of the station can have a profound effect on the audience and their perception of the station. Audience size is the ultimate responsibility of the PD and he must accept and exercise the power to make the final decisions on all matters that can affect his success.

It is the responsibility of the CE to present all the alternatives to the PD so he can make proper decisions. A PD who is not getting help from his chief should take the problem to his general manager. But first, try to get the CE on your side. Show interest in his work. Read the manual on the Optimod before you start messing with it, and ask questions. When the chief notifies you he's taking the station down at midnight Monday morning to do a proof, plan to come in too, just to carry his tool box around for him and feed the tones and screw the covers back on the equipment. There's no better way to get to know him and pick his brain. It's also a pretty harmless time to try turning some knobs on the processing to find out how your ear reacts to your tweaking. Under the caring direction of a good engineer, the PD can learn the things he needs to know to make an intelligent decision about what the station needs to compete for an audience, which is the goal.

In review, challenge assumptions and obtain the facts. Recognize where ultimate responsibility lies and work toward helping the person responsible to make correct decisions. Recognize the true goals of the company and your role in achieving them.

Roger Mundy
Program Manager
KBRQ-AM/FM
Denver, CO

Superior video results. Automatically. Or not.

The choice is yours. The Hitachi FP-22 and the Hitachi FP-21 are both professional, high-quality portable color cameras that provide superior video performance and operational simplicity.

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The FP-22 and the FP-21 both feature Hitachi's Automatic Beam Optimizer circuit. Both are built to take a beating, with rugged construction that withstands rough handling and environmental extremes.

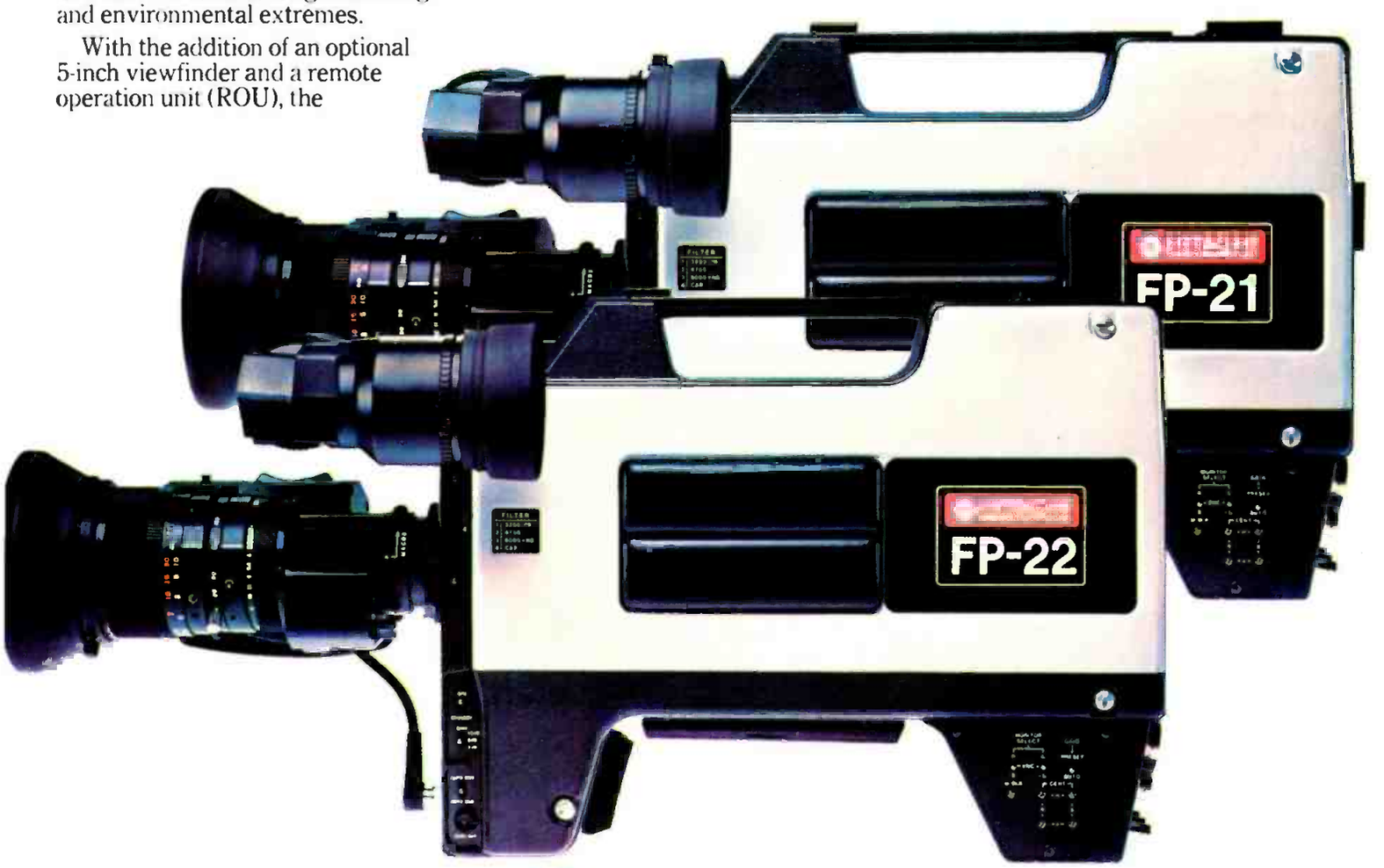
With the addition of an optional 5-inch viewfinder and a remote operation unit (ROU), the FP-22 and the FP-21 become high-quality studio cameras. Each has low-power consumption and RGB outputs for chroma key. Additionally, a two-line image enhancer is included.

Auto set-up makes it simple.

The big difference between the two is the 'Auto Set-Up' function found only in the FP-22. This computerized capability makes registration set-up simple and convenient, by eliminating troublesome centering adjustments, white balance and black balance. The previous set-up information is digitally processed and held in memory—even when the power is turned off—an unheard-of feature for this comparatively low-priced camera.

If you desire the ultimate in automatic registration control, the FP-22 is the only camera you should consider. For those who presently need only the capabilities of the FP-21, the unit can be upgraded to FP-22 standards later.

Whichever way you go, you can be assured that the high standards of quality and uncompromising performance for which Hitachi has become famous, will deliver superior color video results. Automatically. Or not.



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More Features For Your Money

VPR-3 gives you a tremendous array of exclusive features designed to deliver more value for your money and help you get the job done better and faster. Our ultimate VTR's uncompromising features include: gentle air-guided and vacuum-controlled tape handling, tape acceleration to 500 inches per second shuttle in just one second with one-hour reels, "fail-safe" dynamic braking, fast (four fields maximum) synchronous lockup, flexibility to operate with three-hour to one-minute "spot" reels without adjustment, superior built-in audio features, automatic audio and video record optimization, simpler operation using a fluorescent system status display and soft-key-driven menus, as well as extensive and usable diagnostics.

The Ultimate Type "C" VTR

VPR-3. The ultimate one-inch Type "C" VTR. It's all you ever wanted. In a single machine. For details, call Ampex in New York/New Jersey 201/825-9600; Los Angeles 213/240-5000; San Francisco 408/255-4800; Chicago 312/593-6000; Washington, D.C. 301/530-8800; Dallas 214/960-1162; Atlanta 404/451-7112. Sales, spares and service worldwide.

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SETTING THE FASHION IN BROADCAST VIDEO

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Broadcasting to Prosper Despite Slow '83 Recovery

Broadcasting will continue to grow faster than the rest of the economy in 1983, according to speakers at the recent Tenth Annual Conference on the Outlook for the Media, sponsored in New York by Paine Webber Mitchell Hutchins, Inc. National broadcast ad sales—including network TV, spot TV, and radio—will top $13 billion in 1983, an 11 percent rise over last year, according to Robert J. Coen, vice president of McCann-Erickson. The increase will be unevenly distributed among the broadcast media, Coen cautioned, with TV net revenues growing a healthy 12 to 14 percent, in contrast to six to eight percent for spot TV and radio. National advertising as a whole will increase 9.9 percent.

"I continue to see advertising growth outpace economic growth," said Coen, who predicted overall advertising revenue will increase 9.2 percent this year, compared to a 9 percent GNP increase.

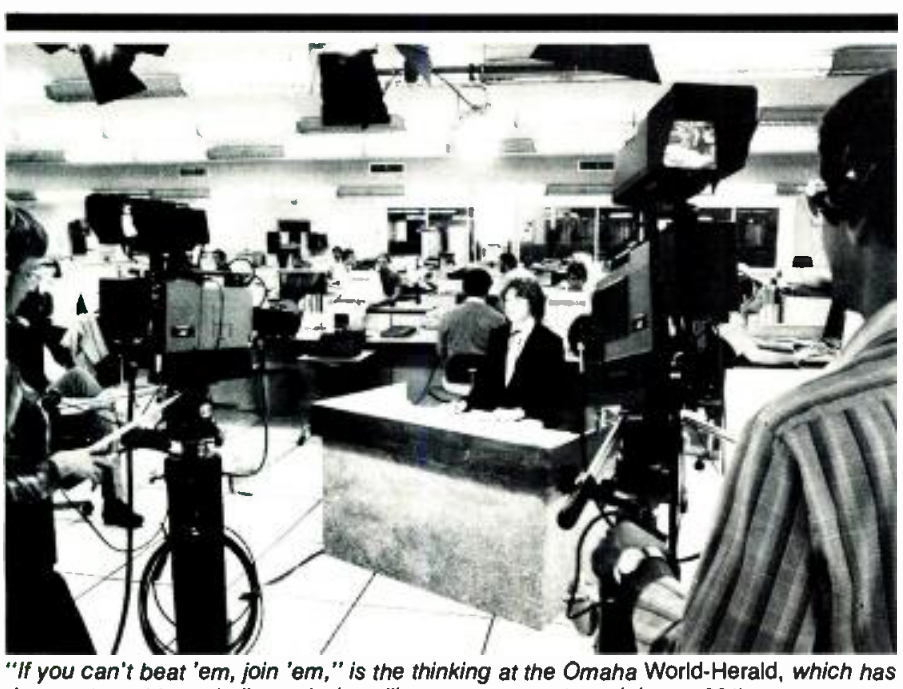
Ken Caffrey, senior VP and executive director of Ogilvy & Mather, stressed that advertisers are spending carefully and demanding accountability. Advertisers are approaching cable with caution, Caffrey noted, saying the cable networks will have to deliver audience more consistently before they experience real growth.

Despite dropping audience shares, the TV networks will continue their ad dominance, Coen and Caffrey agreed. J. William Wardell, group senior VP of Doyle Dane Bernbach, said he saw no real alternative to network advertising at this time.

Network share erosion will slow by the middle of the decade as cable penetration levels off, predicted David F. Poltrack, CBS Broadcasting Corp. VP of research. Poltrack believes the nets may regain some of their lost audience later in the decade. Caffrey suggested that dropping network shares may precipitate a swing back toward radio for national advertising.

Edward Bleier, executive VP of Warner Brothers Television Distribution, echoed the general belief in the predominance of the nets. Bleier suggested that the recent Copyright Royalty Tribunal fee hike for imported distant signals might lead cable operators to feed fewer distant independent stations, resulting in lower competition for the networks and local independents.

Turning to the problems of radio, Doubleday Broadcasting's Gary Stevens commented, "Everything isn't exactly coming up roses . . . but the problems we're having are quite controllable." Stevens blamed rising operating costs for shrinking margins. Cable is not bleeding radio revenues, Stevens contended, since radio's "mobility factor" gives it an edge over the stationary TV. He admitted, however, that 1983 will be "a tough year."



"If you can't beat 'em, join 'em," is the thinking at the Omaha World-Herald, *which has risen to the cable TV challenge by installing a newsroom that originates 88 live newscasts a week. The five-minute inserts reach local cable subscribers over Satellite NewsChannel and are produced with four JVC KY-2700 cameras and a staff of five newscasters and five production people.*

Fogarty, Rivera Blast FCC on PTL Ruling

Two members of the FCC scathingly denounced the Commission's actions in its investigation of alleged fraud and misrepresentation by PTL, licensee of WJAN-TV, Canton, OH.

In that case, the majority voted to "forward relevant information" about PTL to the Justice Department for further investigation. At the same time, the FCC approved PTL's request to assign WJAN's license to a hand-picked successor, David Livingstone Missionary Foundation, Inc., and authorized the Mass Media Bureau to renew the station's license after the transfer. PTL is affiliated with the PTL Television Network, producer of the satellite-distributed religious program *The PTL Club*.

In their biting, eight-page dissent, Fogarty and Rivera called the action "contrary to our established broadcast licensing law and policy, wholly unexplained on any public record, and prejudicial to the credibility of this Commission's enforcement responsibilities and the integrity of its formal broadcast deregulation agenda." They warned that "termination of enforcement action [against PTL] can only undermine the integrity of our processes and lead other licensees to compliance only on the margin."

The case falls clearly into the FCC's jurisdiction, the dissenters argued; in cutting short its usual procedures, they said, the majority was "clearly signifying it lacks the courage of whatever convictions have led it to this malodorous result."

Commissioner Anne Jones also dissented for similar reasons, but criticized the Fogarty-Rivera paper as "intemperate." She agreed, however, that to allow a licensee under investigation "to avoid a determination of his lack of qualification simply by turning over his license to a successor of his own choosing significantly undermines the deterrent value of the Commission's enforcement processes."

The Commission's action was detailed in an unusually terse, half-page press release that failed to outline the majority's reasoning. Commissioner Stephen A. Sharp, however, issued a separate statement defending the decision, claiming the majority acted

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"reasonably and in good faith, and consistently with the provisions of the Communications Act." Sharp accused the dissenters of "innuendo and mischaracterization."

FCC Acts to Promote Minority Ownership

Several recent FCC actions have underscored the Commission's commitment to furthering minority involvement in telecommunications.

The Commission adopted several new policies originally proposed by its Advisory Committee on Alternative Financing for Minorities in Telecommunications, headed by commissioner Henry Rivera. One of the policies calls for the grant of tax certificates to cable system operators who sell their systems to minority group members. Congressional approval is required.

At the same time, the Commission redefined "minority ownership" to include companies in which minority persons own as little as 20 percent interest. The previous definition required 50 percent of the company to be owned by minorities. Future plans at the Commission call for the speeding up of distress sale processing and the granting of tax breaks for the sale of interest in minority-owned companies.

In a separate action, the FCC granted a license for a new FM station in Hart, MI, to a minority applicant over a competing application by local residents, despite Hart's lack of minority population. Over strong objections by FCC chairman Mark Fowler, the commission ruled "it would be contrary to Commission policy to restrict enhancement according to the racial and ethnic composition of the proposed community of license of service area." Waters Broadcasting Corp., headed by Nancy Waters, a black woman, won the Hart license.

State and RKO to Benefit From WOR-TV's NJ Move

New Jersey will gain its own VHF station and RKO General will strengthen its grip on broadcasting as a result of the FCC's approval of a move to the Garden State for RKO's WOR-TV.

The move was okayed under the provisions of legislation mandating an automatic five-year license renewal for any VHF station willing to relocate to a state with no VHF outlets. With the WOR-TV transfer, Delaware remains the only VHF-less state.

The FCC's decision no doubt caused relief at RKO, which has already lost one television station (WNAC-TV, Boston, now WNEV-TV) and is in danger of losing its other broadcast licenses because of alleged misconduct. In granting the five-year license, the Commission dismissed as moot RKO's standing renewal application for WOR-TV, as well as a competing application for the station from Multi-State Communications, Inc. Neither applicant's qualifications were relevant in the proceeding, the FCC said, because of the explicitness of the law's provisions. WOR-TV will be licensed to the New Jersey community of Secaucus.

Another contested television license, that of WABC-TV, the ABC network's New York O&O, was also renewed, with the FCC denying petitions from the New Jersey Coalition for Fair Broadcasting and the governor and legislature of New Jersey that asserted ABC had failed to meet its obligations to New Jersey.

The Commission disagreed with the petitioners, saying the station had kept its promises of physical presence in the state and New Jersey-oriented programming. The renewal, however, came with the condition that the FCC itself, rather than its staff, will review the

Model 5104 16 in/4/2/1

Model 5104 24 in/4/2/1

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The 5100 Series is a complete range of TV and broadcast audio consoles, from 16 in/4 sub-group to 48 in/8 sub-group, with optional multitrack facilities. A wide selection of standard facilities and options are available. Choose mono or stereo input modules, 2 or 4 band EQ, 4 or 8 Aux sends, limiter/noise gate and continuously variable high and low pass filters on every input, VCA sub-grouping or NECAM computerized audio editing and mixing, to mention a few. The audio performance and the mechanical engineering is in the best Neve tradition. Prices start at less than $40,000.

When you choose a Neve 5100 Series Audio Console for your broadcast facility in 1983, you need not worry about being outpaced by new technologies. The 5100 Series is the absolute state-of-the-art in audio console technology, yet already proven in many North American installations and around the world. Take a close look at the others. Can you afford to choose outdated technology? After all, it's your reputation.

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license when it next comes up for renewal, in 1984, as a result of several instances of deceptive programming. The station had been cited for broadcasting letters and telephone calls supposedly from viewers, but in fact from staff members.

Gathering 'Round the TV Leads Leisure Activities

Television watching rated as the most popular leisure-time activity in a recent study of the leisure habits in the U.S. Of the adults surveyed by Research and Forecasts, a New York opinion organization, 72 percent reported daily viewing. Average daily viewing time was almost three hours, out of an average four and a half leisure hours a day. Reading newspapers was second, with 70 percent.

The study, commissioned by United Media Enterprises, a subsidiary of broadcast owner Scripps-Howard, shows high levels of television viewing positively correlated with other family activities. Seventy-nine percent of those surveyed said that spending time with the family was "very important," and those classified as heavy TV viewers actually spent more time reading to young children and supervising homework than did light viewers. Couples who were heavy viewers usually watched together.

Television, however, may not be the central focus of attention even when it's on. A whopping 44 percent said they often did not concentrate on the screen; just 41 percent reported close attention.

An unrelated report, this one released by the Television Information Office of the NAB, exonerates television from the charge that it is responsible for low scholastic test scores, blaming instead socioeconomic factors. The report, which reviewed results from several major studies, claims there is little evidence that TV in any way damages children's ability to learn.

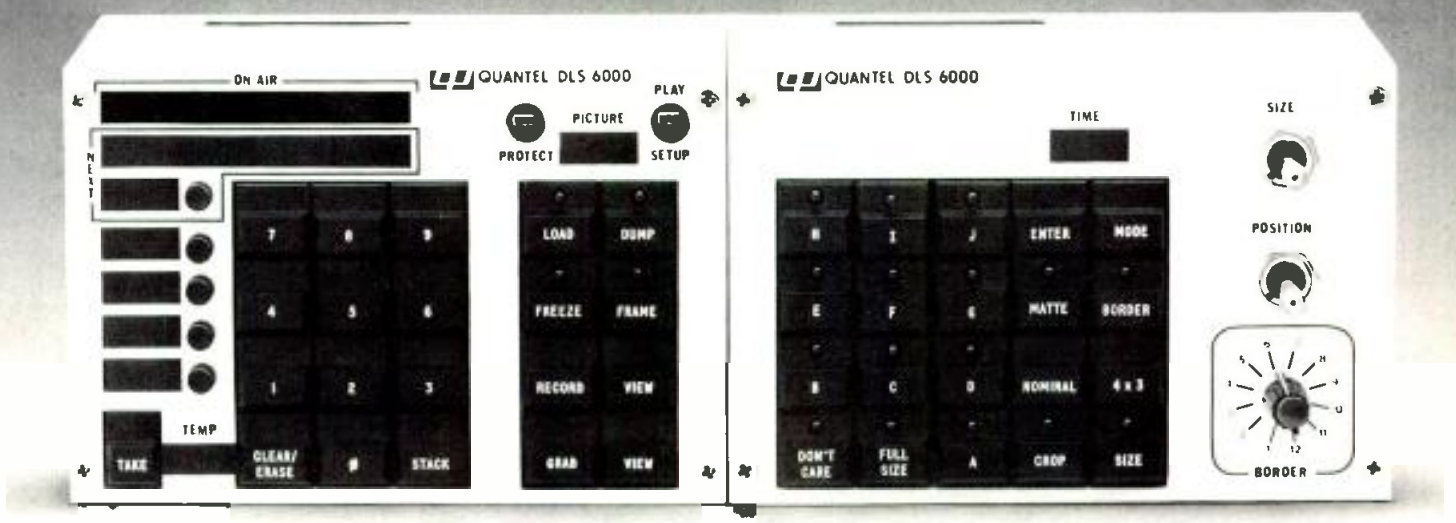
Colorgraphics Acquires Integrated Technologies

Colorgraphics Systems, manufacturer of computerized weather graphics equipment, finalized its acquisition of newsroom computer company Integrated Technologies late last year. Colorgraphics has a large market share of the weather graphics system market, and its purchase of Integrated Technologies has positioned the company well for a substantial part of the business of computerizing television station news, weather, and sports broadcasts.

According to Terry Kelly, president of Colorgraphics, "Most of the station managers and engineers interviewed in surveys and at the RTNDA were sure that within five years the majority of television stations will be completely computerized in the news/weather/sports department." Seeing this as the wave of the future, the company acquired IT, which has custom computerized newsroom system installations in several radio and TV stations, including KCBS in San Francisco and WRC in Washington, D.C.

The equipment involved will interface the systems to coordinate all newstype activities through a central processor. The company already plans the introduction of a framestore with a video digitizer, which will operate an automated sports scoreboard including animation. Scores can be changed live on air, with the computer generating the information with any font or animation desired. Schools, names, and titles can be entered into the computer along with priorities and timing for display of the related scores and animation effects.

The Quantel DLS 6030.



Every other way to store stills is obsolete.

Introducing the state-of-the-art in electronic still-storage—the Quantel DLS 6030 digital library system.

Obviously it stores still pictures. Up to 800 on each small Winchester disk drive. And with the quality that is a hallmark of Quantel. But the DLS 6030 goes far beyond still-storage.

It is the only electronic still-store with production effects capabilities. So now you can compress still pictures to any size. Crop them to remove unwanted material. Position them anywhere you want. Put borders around them. And dissolve from one shot to the next.

You can even build up totally new pictures—composites or montages—from existing material.

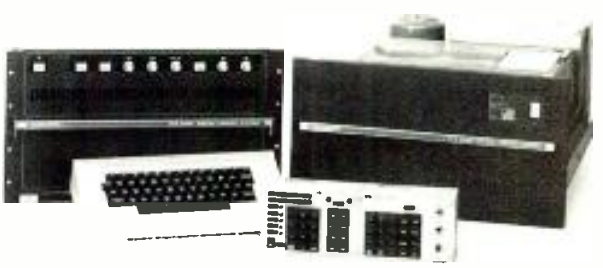
And you can always retain your "originals" in their pristine state.

The DLS 6030 lets you browse through its disk library to select the pictures you need, and gives you unprecedented facilities for on-air editing, previewing, and presentation.

Off-loading? You can dump all the pictures—*in digital form*—onto standard videotape. Then reload at the remote site via any VTR. The transfer is digital, so there's no generation loss.

Because Quantel's technology is leading-edge, the DLS 6030 is small—about one-quarter the size of still-stores using older technology—and draws far less power. So it's ideal for mobile operations as well as the studio.

There's nothing else like it. See for yourself. Call your local MCI/Quantel representative. Or get in touch with us directly at 415/856-6226. Micro Consultants, Inc., P.O. Box 50810, Palo Alto, California 94303.



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NEWS BRIEFS

FCC commissioner James H. Quello told a recent conference at WPBT-TV, Miami, that the **public broadcasting advertising experiment** will probably not be extended . . . . FCC chairman Mark Fowler predicted a Commission **rulemaking on ownership policies,** "specifically the 7-7-7 rule," in an address to the American Advertising Federation . . . . The **Radio Marti bill,** which failed in the Senate in the closing weeks of last year, is expected to be reintroduced in the 98th Congress.

The Audio Engineering Society has elected **Raymond E. Cooke** president for 1983-84. Cooke is managing director and founder of KEF Electronics Ltd., a British firm . . . . Minnesota Public Radio claimed a broadcast first with its December 24 transmission of "A Festival of Nine Lessons and Carols" from Kings College Chapel, Cambridge, England. The **live stereo transatlantic broadcast** was digitally encoded with Sony equipment. **Roone Arledge,** president of ABC News And Sports, will receive the Gold Medal Award from the International Radio and Television Society March 9.

Under the terms of a recent contract, Mutual Broadcasting will design, install, operate, and maintain a **satellite uplinking service** for the Associated Press at Mutual's Bren Mar, VA, uplink facilities . . . . Satellite Television Corp. has purchased 39 acres of land near Las Vegas for its planned **DBS broadcast center** . . . . A recently published study from Knowledge Industry Publications predicts that worldwide consumer spending on the **new video media** will reach $13 billion in 1985, from a 1982 level of $7 billion.

Time, Inc., and Matsushita will work together to develop consumer hardware for **cable teletext** under a recent agreement. Mass production of the first product, a low-cost terminal, is slated for late next year . . . . Cable entrepreneur Ted Turner has announced that his Cable News Network will open **permanent news bureaus** this year in Detroit, Miami, Moscow, and Beirut. CNN already maintains bureaus in seven U.S. cities, as well as London, Rome, Cairo, Jerusalem, Tokyo, and Peking.

Sponsored by the Organization of Country Radio Broadcasters (OCRB), the fourteenth annual **Country Radio Seminar** will take place February 17 to 19 at Nashville's Opryland Hotel. For more information, call OCRB at (615) 327-4488 . . . . The Broadcasters Promotion Association is **requesting entries** for its 1983 International Gold Medallion Awards Competition from both TV and radio stations. The entrance fee is $45 for BPA members and $75 for nonmembers; deadline for entry is March 1. For more information, contact Dr. Hayes Anderson, Department of Telecommunications and Film, San Diego State University, San Diego, CA 92182, (714) 265-6575.

Phillips Publishing, Inc., will sponsor "**Pay Radio and Cable Audio:** Programming and Profits" March 14 and 15 at the Marbury House in Washington, DC. To find out more, talk to seminar coordinator Diane Pontisso at (301) 986-0666 . . . . The fifth annual **Satellite Communications Users Conference** will occur August 22 through 24 at Stouffer's Riverfront Towers in St. Louis. To register, call Cheryl Carpinello at (303) 694-1522 . . . . RTNDA's thirty-eighth annual **International Conference** will fill Caesar's Palace in Las Vegas September 22 through 24 . . . . Information Gatekeepers will hold its seventh **International Fiber Optics & Communications Exposition** (FOC 83) October 10 through 14 at Bally's Park Place Casino, Atlantic City. Paul Fitzerald, exposition marketing manager, (617) 739-2022, has details.

BUSINESS BRIEFS

Angenieux has announced the expansion of its worldwide sales and marketing team for both Opticam and Angenieux of America.

IGM Communications has announced its new System Design Service which will design, manufacture, program, and install custom software and hardware control systems . . . . **Tektronix** is offering an oscilloscope trade-in program for working 200, 300, 400, and 500 Series scopes . . . . **VideoStar** has signed its first contracts with ABC and CBS to provide satellite uplink facilities.

American Satellite and Television is building a mobile uplink transmitter that will be leased to the television networks and independent producers for events in Florida and other southeastern locations . . . . **Harris Corporation** has established a new operation in Montreal to manufacture high-frequency radio communication equipment for the international market . . . . **CMX** training center in California has completed its fifth year of operation with a combined enrollment that passed the two thousand mark. **Orrox** reached an agreement with **Satcom,** making Satcom a wholly owned subsidiary of the parent company.

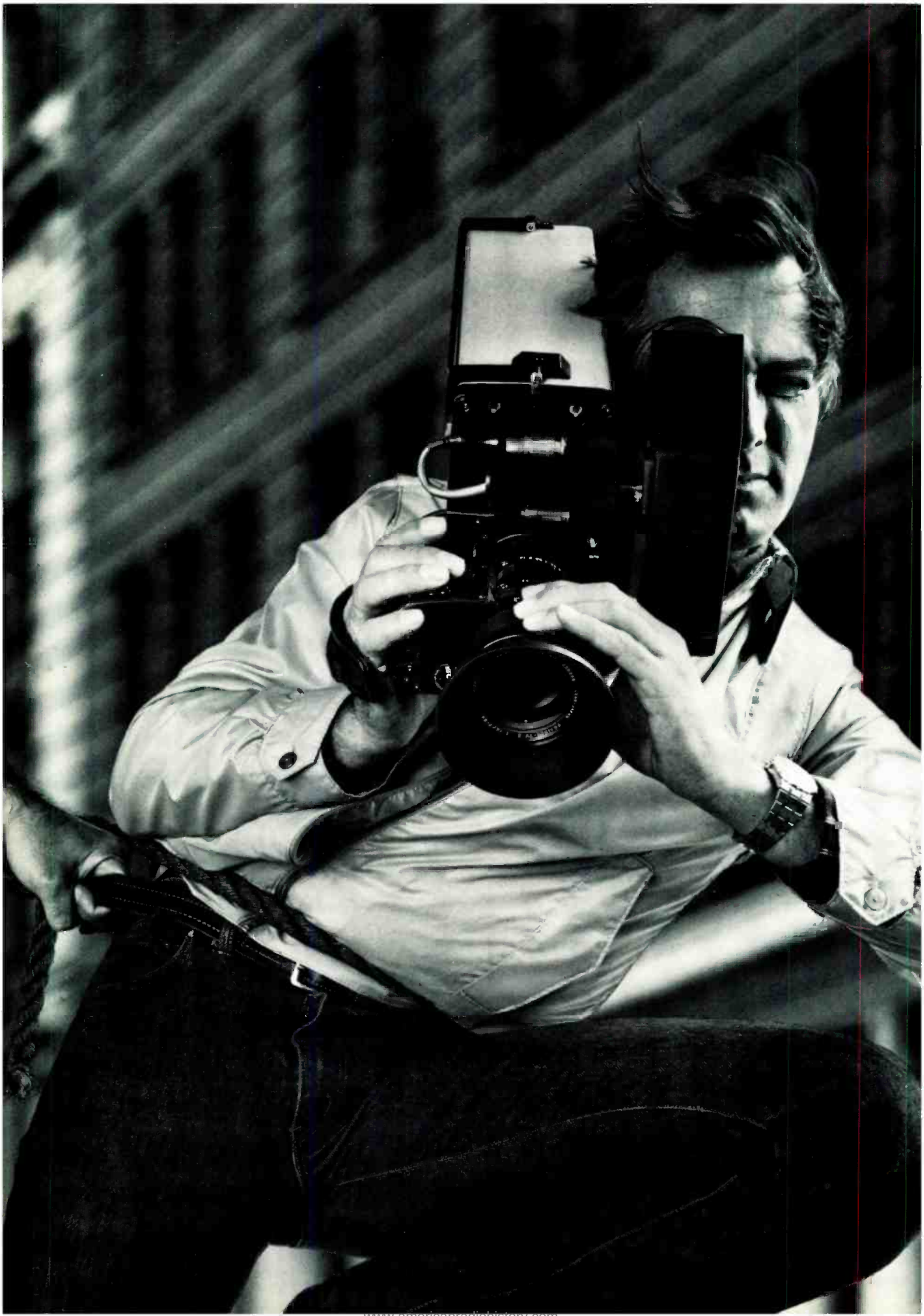
William Chambers has been appointed to the position of VP Marketing and Strategic Planning for **Altec Lansing** . . . . the new national sales manager at ADDA Corporation is Walter Werdmuller, now responsible for products marketed through independent sales representatives . . . . the Broadcast and Related Products department of **3M** has a new manager in Jack B. Hanks, succeeding William Madden, who has moved on to become general manager of the Industrial Mineral Products Division.

Conrac has named Phillip Bonnice to the position of product marketing manager . . . . Dean Dixon, the new VP satellite systems sales and marketing for **Anixter-Mark,** will be responsible for satellite antenna marketing. M. Morizono has been named deputy president of Sony Corporation.

Mitsubishi Electronics America Inc. has announced the appointment of Yoshito Yamaguchi as president of the Compton, CA-based firm . . . . **Satellite Television Corporation** has a new executive VP in Michael Alpert, who will be responsible for all operating elements of STC . . . . **Neve's** Tore Nordahl was appointed deputy chairman, taking charge of special assignments for the British parent. Barry Roche, as executive VP, will take charge of daily concerns of the North American operation.

Financial developments include **Chyron's** announcing an increase in sales from 1981 to 1982 of over $3 million . . . . financial highlights from Harris show sales for 1982 were up 11 percent over 1981, but net income went down 27 percent . . . . the purchase of **Singer Education Systems** by **Telex Communications** was announced recently. **Stoner Communications,** a leading designer of HF/VHF transceivers, has acquired the **McKay Dymek** company of Claremont, CA.

Videomedia has expanded into a larger facility at 211 Weddell Drive, Sunnyvale, CA . . . . **Basys, Inc.** has moved to new offices located at 2685 Marine Way, Mountain View, CA . . . . new production facilities have been built for **Image Resources;** they are expanding their old building to include a 1200-square-foot studio . . . . the new Dallas address of **Victor Duncan** is 6305 N. O'Connor Blvd., Irving, TX.



Harris TC-90. The new ENG/EFP camera built for the way you use them.

Now there's an ENG camera designed for the real world of a news cameraman.

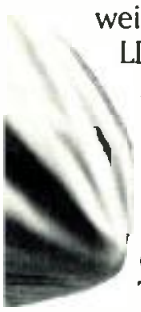
A *super-light* camera you can float on your shoulder hour after hour without fatigue. An ENG camera with *balance* for sure-footed shooting from impossible angles. With *low power consumption* that lets you keep rolling after others quit.

It's the new Harris TC-90.

The lightest, best balanced, least power-hungry, most rugged, low-profile three-tube prism ENG/EFP camera you can buy.

Only 7.9 pounds.

The basic TC-90 body weighs only 7.9 pounds, less lens, viewfinder, and battery. To realize just how light that is, the Ikegami HL-79 body weighs 13 pounds; the Philips LDK-14S is 11.9; and the Hitachi FP-22 weighs in at 11.7.



When you average the weights of the six cameras closest to the Harris TC-90, you'll find ours is 25 percent lighter.

The TC-90 is one of the smallest. But we deliberately made it a bit bigger than it had to be, to add balance and stability. A little longer, to let the cameraman grasp the lens in a natural, comfortable, controlled way. And we carefully shifted extra weight to the tail, so that the weight of the lens is counterbalanced for easy, smooth handling.

No blind-siding to the right.

The height of conventional ENG cameras blocks the sightline to your right. But the TC-90 has a low profile for peripheral viewing no other camera can equal. So you won't miss the action no matter where it happens.

That low-profile TC-90 body is built of graphite Nylon plastic, the same kind of material used for high-stress components in jet aircraft. Its strength-to-weight ratio is ideal for resisting damage from bouncing in the back of the van, from heavy weather, hostile newsmakers, inevitable accidents. The TC-90 housing should never need repair, which saves a lot of shots and a lot of money.

Inside that awesomely strong housing are, among other components, 14 LSI chips. They not only substantially reduce weight, but greatly reduce power consumption. You can keep on shooting with the TC-90 long after a conventional camera's batteries would run down. More than two hours on a fully charged 4-ampere/hour battery.

Built-ins, not add-ons.

Features that make the TC-90 a high-performance ENG/EFP camera are tucked inside, not plugged in or dangling from the outside. TC-90 on-board components include genlock, microphone amplifier, intercom amp, and CCU interface. And they're built into the price, too.

Also built in are the 24-hour Harris Hotline and service network.

Get all the specs on the new Harris TC-90 ENG/EFP camera. Fill in and mail the coupon today. Or phone. Ask for your own hands-on demonstration. You owe yourself a look at the camera somebody should have built for you a long time ago.

☐Please call me to arrange a demonstration of the TC-90, lightest, best-balanced, lowest power consumption ENG/EFP camera.

☐Please send me your latest brochure.

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MOTOROLA AM STEREO. ONE BIG STEP CLOSER TO AN INDUSTRY STANDARD.

The world's largest maker of automobile radios has decided that Motorola has the winning AM stereo system for its 1984 model cars. This might make your decision about what kind of AM stereo your station should broadcast a lot easier.

For more information about the significance of this decision, call Chris Payne at 202/862-1549 or Dick Harasek at 312/576-3591.

MOTOROLA AM STEREO. THE WINNING SYSTEM.

MOTOROLA

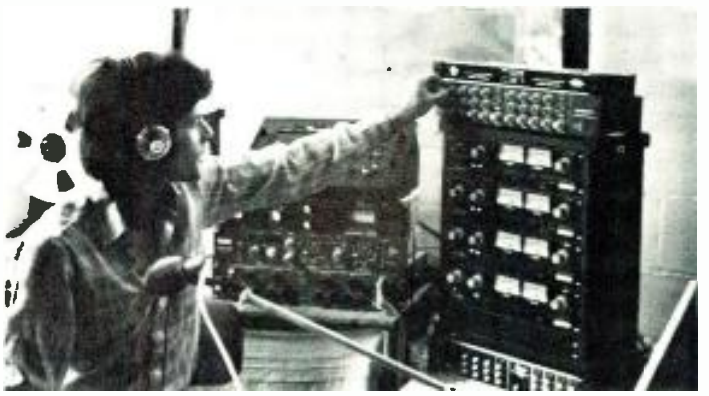
Circle 118 on Reader Service Card

KUOW Programs for Radio's Future: Children

IS IT POSSIBLE to have a radio series in which all the principal actors are children, the main place of action is the Museum of Natural Curiosity where there is a time warp, and in which there are good guys and bad guys?

For over a year, Judith Walcutt, producer at Otherworld Children's Media, Seattle, has been working with children from the ages of six to 16 to produce a six-part series of half-hour programs aimed at involving and entertaining children. Called the McFidgin and Company Children's Radio Project, the shows are geared toward giving children a sense of their regional heritage—the political and historical events which shaped the lives of Native Americans and settlers in the Pacific Northwest.

By the time the project was finished, over 100 radiokids had participated in the taping of the shows. This was no easy task, as the children were involved with everything, including improvising on Walcutt's scripts, conducting interviews with scholars and experts in anthropology and other topics covered in the programs, acting roles in the taped performances, and going on field trips to record sound effects.



Sound engineer David Casper adjusts a Symetrix SE-400 equalizer. On top is a dbx stereo encoder.

Producer Judith Walcutt mixes the recording of sound effects made by David Casper's Chinese zither.

The publicly funded program is distributed via National Public Radio; KUOW-FM, Seattle, aired the first program of the series on Thanksgiving Day, 1981. According to KUOW general manager F. Kim Hodgson, it's "a series which achieves the not-always-compatible goals of significant participation by the children, and high-quality radio programming, both technically and in terms of content."

Learning through the radio

Walcutt, who created the concept in order to give children a fun way of learning, collected a seminal group of children, who began to work on the skits in the basement library of a local elementary school. The skits concentrated on the quest of retrieving an historical artifact (such as "The Return of the Rainwater Basket" in reference to an Indian legend) which was stolen from the museum by the bad character in the script. Going through a time port in the basement of the museum for travel into a zone of historical significance was a device used as a way of teaching the children historical and political lessons without the drudgery that school classes might involve.

It is, of course, a way for the kids to learn about radio as well, and to appreciate its advantages over other media. As Walcutt says, "It is an excellent medium for children which is overlooked. It's not as high-gear as TV, but accommodates their imagination and involves them."

Funding for the project came from the Seattle Arts Commission, the Fremont Arts Council, and to a great extent, the Washington Commission for the Humanities, with assistance from a local retail chain. The Washington Commission for the Humanities gave a large amount of money, as well as offering a gift-matching arrangement in which they would add 1.3 percent to any dollar amount Walcutt raised on her own. The gift-matching offer stands for current and future programs and Walcutt is seeking a major underwriter to develop a national program with the same type of emphasis on learning and enjoying the experience of being on the radio.

Kids and adults coproduce

Each show took one month to complete from the script-writing session through the final post-production phase, with the kids helping in every aspect of the operation. After the scripts were finished, the crew, consisting of Walcutt and the children, went into the KUOW studios to begin taping. All the voice tracks were done there. After the actors read their parts for taping, field trips were scheduled to record live sounds outside or to tape the children in different settings.

Later, the tracks were built and sound effects added at Hummingbird Sound Lab in Seattle on an Otari MX 5050B eight-track ATR.

David Casper, who composed the theme music for the series and acted as

The producers and actors of Other World Children's Media prepare for recording of the program.

sound engineer, set up the equipment required to give the sound and feel of mystery involved in the mythical tales of time travel. Casper ran the eight-track into a Sound Workshop 1280 mixing board, then out to a Lexicon Prime Time digital delay and back into the board, with the final edit rerecorded either on a cassette deck or an Otari half-track machine.

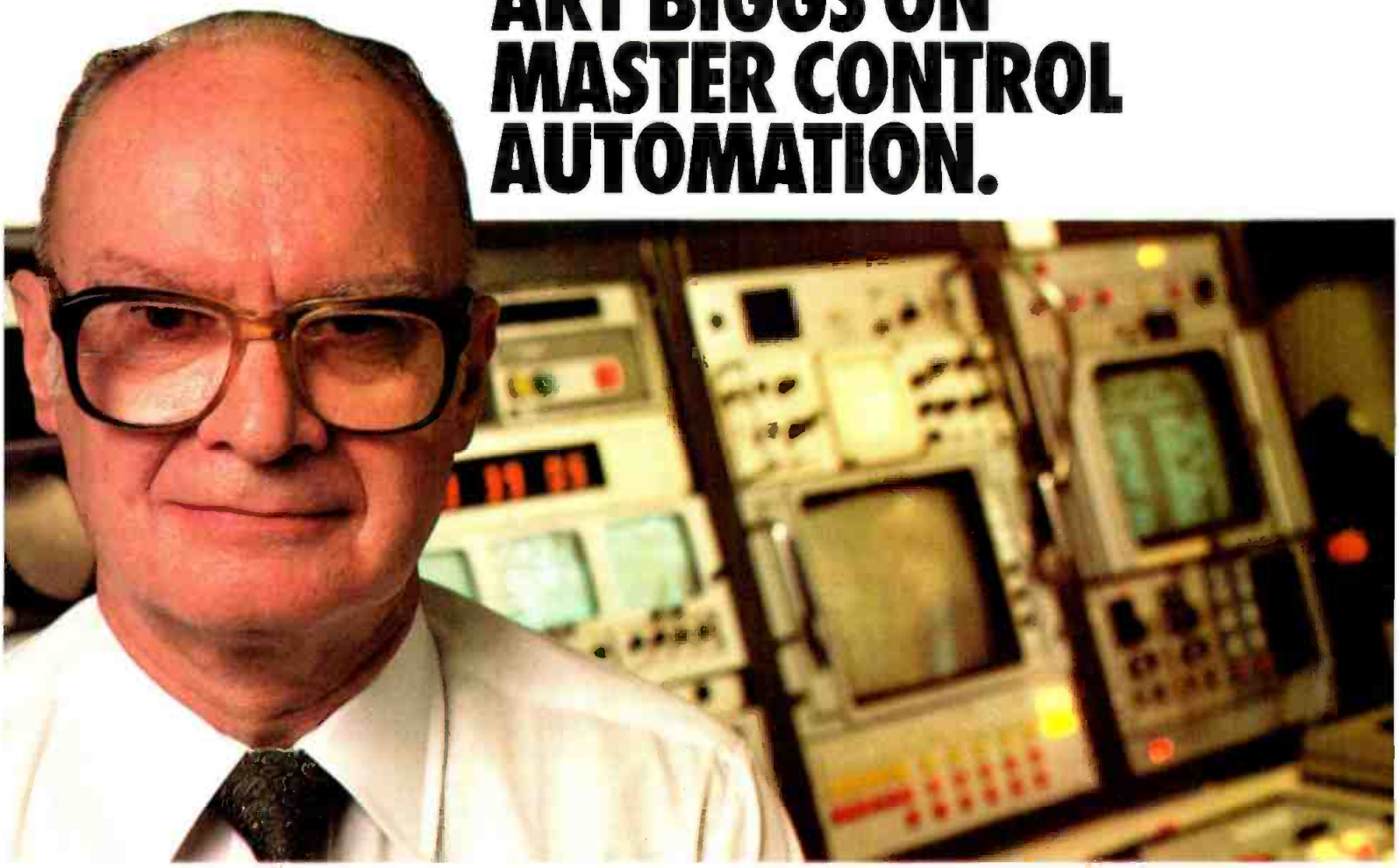
Ambient sound effects were created on the Prime Time by enhancing acoustical signals such as a sitar, Chinese Cheng, kalimba, ocarinas, and bells. The children's voices and outside forays through fallen leaves or streams were also run through the digital delay to create the desired effect. A dbx compressor was used so that some of the less supervised recording didn't come out too hot and to help the sustain of percussive instruments.

The adult part of the central character was recorded separately and added during editing. Interviews, conducted by the children with noted anthropologists and historians, were also recorded in separate sessions from the script readings and combined during the edit. These interviews are presented as talking artifacts as the children tour through the Museum of Natural Curiosity.

With plenty of patience and an equal amount of work, Walcutt was able to gather together 100 radiokids and introduce them not only to the world of their natural heritage, but also to the world of radio broadcasting. All agreed the effort was worth it.

The benefit to the children, of course, was the chance to experience radio, from the beginning of a project through its final broadcast. But the real beneficiary is the industry itself, for the seed of its own future has been sown. Echoing the sentiments of the children, Walcutt exclaims, "I love radio. It's the best medium possible for young, developing minds. You have to participate by using your mind. Radio asks the mind to act." **BM/E**

ART BIGGS ON MASTER CONTROL AUTOMATION.



In the 1950's, two broadcasting engineers in Tulsa built a small, crude, mechanical device to automate station breaks. One of those engineers, Art Biggs, is now Vice President, Engineering, Corinthian Broadcasting—and his interest in master control automation remains strong. The respected, 34-year veteran of the industry works with the engineering staffs of all six Corinthian stations, of which two—WISH-TV, Indianapolis, and KXTV, Sacramento—are now using BIAS Master Control Automation.

EVEN FORMER SKEPTICS LIKE IT

"At first, some of the engineering staff were enthusiastic, some were skeptical. But within three weeks after it was released to them, they did their first total day's operation on the MCA system. And now, even the most skeptical depend upon it."

CREATES TOGETHERNESS

"MCA brings the traffic department and technical department closer together. This makes everything go more smoothly for everyone."

GIVES MORE CONTROL

"I think some engineers are afraid that with MCA, they'll be giving control of their operation to a machine and be a robot, sitting there, watching it. Actually, the exact opposite is true. Even the most vocal of our engineers who opposed the idea have found that MCA frees them from so many nitty-gritty, demanding, split-second, button pushers, that they have more time to learn what all the machine can do and can do even more than they could before. Now, if you take it away from them for some reason, there's a lot of yelling to get it back. They've learned they didn't relinquish control—they gained a tool that gives them greater control."

WHO NEEDS IT?

"How do you know if you need MCA? If the chief engineer is constantly trouble-shooting switching errors or one engineer is a total slave to switcher buttons, MCA can certainly help. It also liberates personnel from many manual chores, such as log-keeping, to make their time more productive."

FOR BIAS OR NON-BIAS SYSTEMS

"All of our stations are on the BIAS traffic system, so by using the BIAS MCA, we're dealing with one manufacturer, one computer, and one system that embraces the master control operation, the traffic operation, the financial operation, word processing, film inventory. One source for everything."

For a free brochure on how BIAS Master Control Automation can interface with your on-air switcher and traffic system, write BIAS Marketing.

BIAS®

BROADCAST DIVISION
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And that's the

Meet the Press–NBC–11/20/47 to present

John Cameron Swayze–NBC–Camel News Caravan 1948 to 1956

Dave Garroway–Garroway at Large 1949, Today Show 1952 to 1961

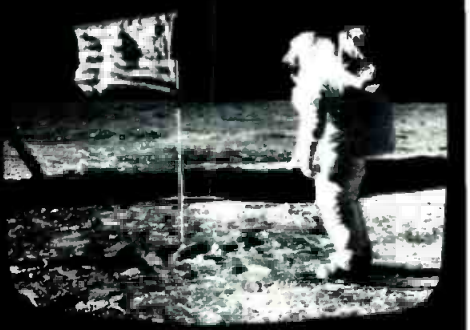
Army vs McCarthy Hearings April 1954

Huntley/Brinkley Report NBC News 10/15/56 to 7/5/70

Kennedy-Nixon Debates–ABC–10/3/60

Vietnam War

60 Minutes News Magazine 7/24/68 to present



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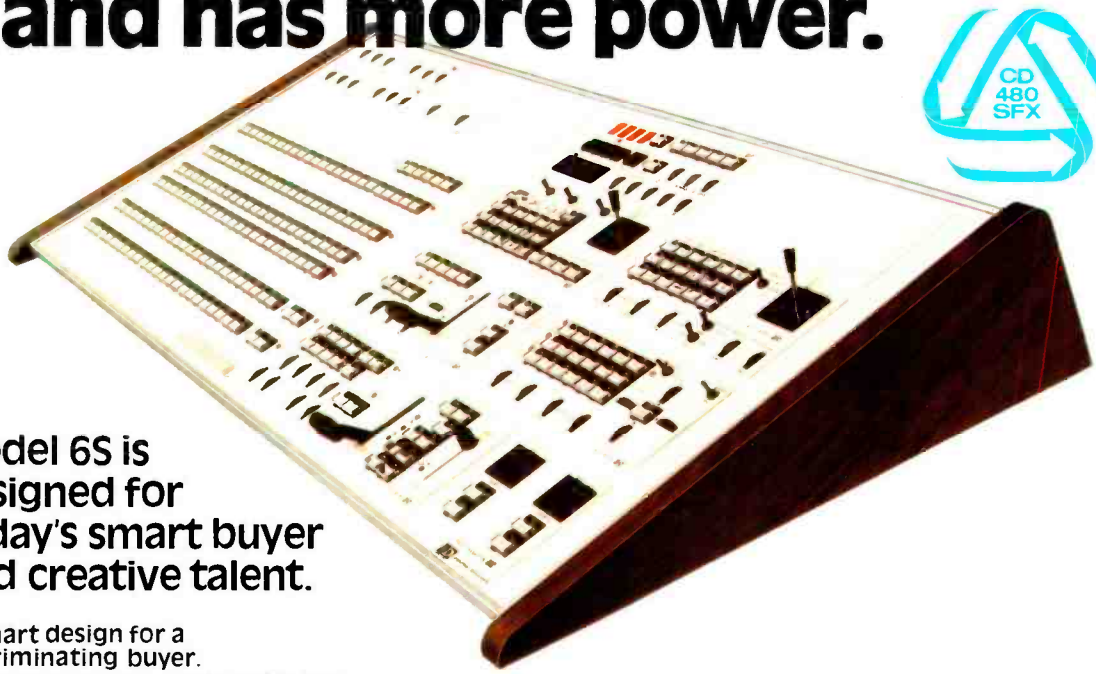

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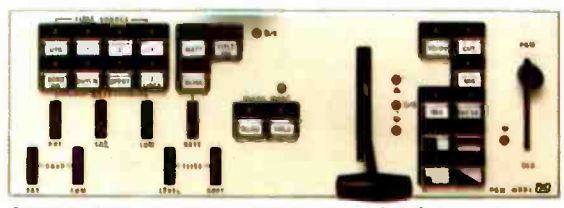

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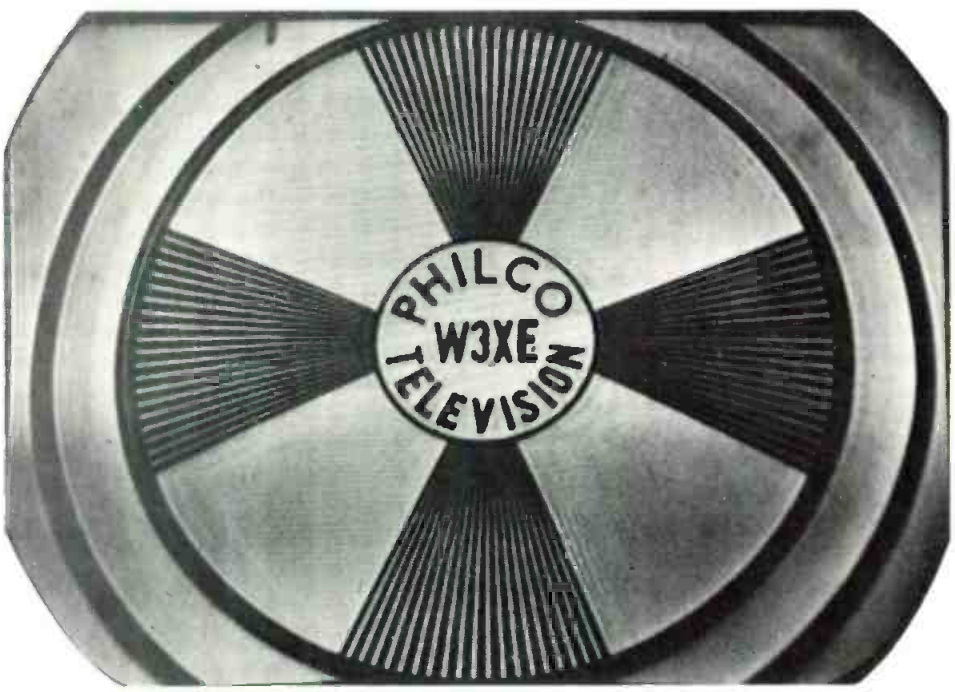
KYW Philadelphia Relives Early Days of TV

THE ARGUMENT over which was the first television station to go on the air continues to this day and is likely never to be resolved. But according to FCC files, KYW-TV3 in Philadelphia was one of the first to receive an FCC commercial license, and in December 1982 celebrated its fiftieth anniversary.

The month-long celebration was begun officially when Mayor William Green kicked off the "Fifty Years of Your Life" programming with awards of recognition to general manager Pat Polillo, and to Edie Adams, who costarred with her husband, the late Ernie Kovacs, in their early comedy shows. A full slate of programs was scheduled to commemorate the long and distinguished history of Channel 3, which began as experimental station W3XE in 1932.

At that time it was housed and operated in the Philco plant at Tioga & C streets in Philadelphia for the purpose of experimenting with the capabilities of the new-found technology. Regular program service was begun in 1939, the same year the station became an NBC affiliate.



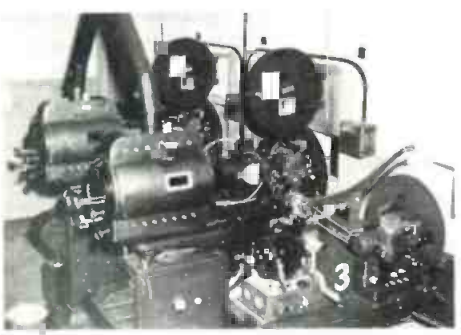
The test pattern of experimental station W3XE in 1932 represents one of the earliest TV broadcasts in the country.

College football coverage

In September 1940, W3XE broadcast the Penn-Maryland football game. It has covered every Penn home game since receiving its commercial license in 1941 and picking up Atlantic Refining Company as sponsor for the games. Atlantic supplied the announcers, spotters, and incidental expenses, while the station furnished installation, equipment, crews, and facilities.

With its commercial license, the station changed its call letters to WPTZ and issued its first rate card in February 1942, calling for a time rate of $60.00 per hour, $30.00 per half hour, and $15.00 for a quarter hour. This allowed for one hour of rehearsal time for each 15 minutes of purchased program time. There were no time classes, charges being the same no matter what time of day the program aired. With the exception of the football games and other outside events, most telecasting was confined to the 7:00 to 10:00 p.m. period.

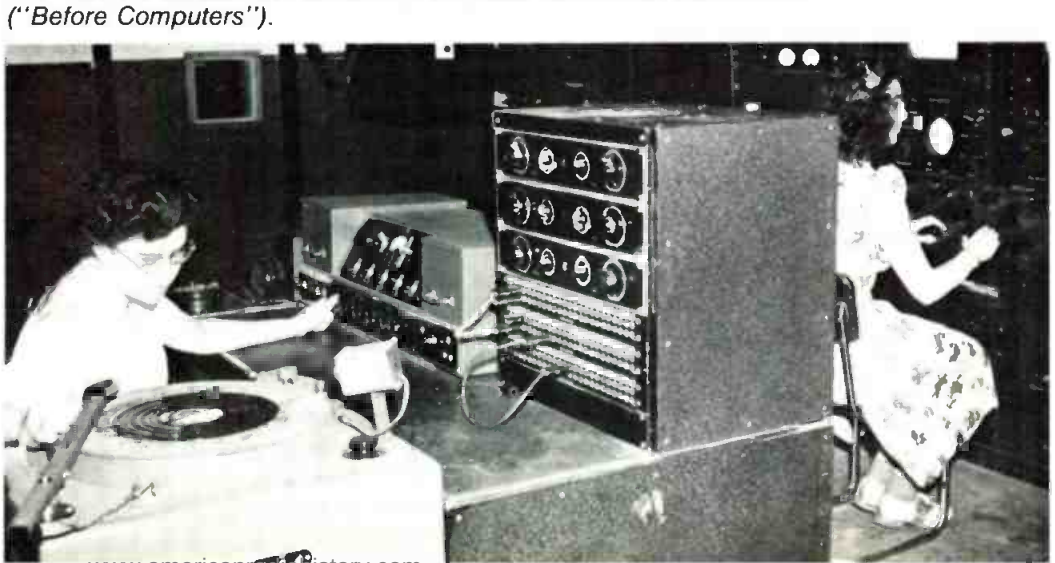
At the time, according to long-time engineer Sam Stewart, "there were only about 200 television sets in the area, and WPTZ, through its parent, Philco, arranged to have TVs installed in places where the local community could see the advantages of television. Receivers were placed in country clubs, restaurants, taverns, store windows, and advertising clubs."



In 1947, Channel 3, then WPTZ, modified for television a 16 mm (#3) and two 35 mm sound projectors.

In 1946, Atlantic signed as formal sponsor of the Penn games, and in 1947 picked up television broadcasts of the Philadelphia Athletics and Phillies baseball games.

The "modern" control room at the main transmitter for Channel 3 in 1947 BC ("Before Computers").



Today, of course, KYW-TV has the latest in modern technology, with sophisticated camera equipment such as RCA TK-44s and 45s for the studio and Sony BVP-300s, RCA TK-76s, and Ikegami HL-77s and 79s for ENG, a Harris transmitter and the best in support equipment. But it was not always as easy as turning on the camera.

Early growing pains

The two original studio cameras at W3XE were hand-built in the Philco lab and did not match in any respect. The older one had a single prime lens, while the viewfinder consisted of a hole cut in the back of the camera housing through which one viewed the image as it appeared on the target of the iconoscope tubes. This was done by an ordinary pocket mirror glued inside the front of the housing.

The newer camera had an optical viewfinder with two lenses, one for the picture tube and one above it for a ground glass which, during focusing, rode on a cam which raised or lowered the glass to correct parallax.

To go along with what was then modern technology, the cables were giant and unwieldy conglomerations which were covered with velour or cotton velvet to keep them quiet when they were pulled across the floor. The studios were in an old factory where actual studio space was about 40 feet by 17 feet, with the control room at one end of it. There was a nine-foot ceiling, from which hung hot and bright photofloods. The floor was covered with the white sheet rubber used in operating rooms.

KYW-TV "People Are Talking" host Maury Povich reminisces with Edie Adams about the Ernie Kovacs shows.

Other lights were attached to camera mounts and to rolling dollies so they could be moved any place deemed necessary to eliminate any shadow.

Under these conditions, of course, there were a great many casualties, people sacrificed to the pioneering days of television. It was not uncommon for performers, actors from local theater productions, to faint during performances. A couple cameramen were also known to keel over now and then. "On one occasion," recalls former cameraman and set designer William Craig Smith, "a group of nurses came to do a program of Christmas carols and, halfway through the performance, began to sink slowly to the floor, one after another, in front of 4000 people in the audience. They were dragged off-camera to the darkest part of the studio until they regained consciousness."

Obviously, the pictures left a great deal to be desired, and the resolution was a little short of perfect. This did, however, allow the set people to get away with certain little tricks. Pictures, lighting fixtures, and even furniture were often painted on the studio walls as prop replacements.

Not only were the shooting and performing difficult at the time, but maintenance had its share of obstacles. The iconoscopes were in short supply and the tubes had to be carefully serviced. They were removed from the camera housings, and locked in a safe.

Problems lend historical value

The station has survived all the catastrophies, the hardships, the stumbling blocks which history and technology have laid in its path. And it has survived it all in style. Some of the prestigious station alumni involved in the maturing of the art are David Brenner, former news anchor Vince Leonard, Edie Adams, Ernie Kovacs, Jessica Savitch, Tom Snyder, and NBC news executive Tom Pettit.

Many firsts can be claimed by KYW as well, in one or another of its incarnations. It was the first TV station in Pennsylvania, showed the first college night football game (Temple versus Kansas), first to air a national political convention (the 1940 GOP convention), and started the first soap opera in 1942, called *Last Year's Nest*, starring Len Valenta, who is now director of a soap opera on CBS. The list goes on.

What is important is not the list, but the effort expended in compiling such credits and, now, the anniversary shows commemorating the early pioneers. During the month of celebration, the memories cascaded down upon the broadcast community as the nostalgic celebration for KYW's half-century of TV broadcasting concluded.

The never-ending argument of who was first continues, but that is ultimately material for the trivia specialists. Television engineers and station managers *are* concerned, however, with looking back over the history of their industry as illustrated by the story of KYW, and looking for the bright future contained in their own call letters. **BM/E**

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SPECIAL REPORT: NEW ALTERNATIVES

PART 1: Mid-Sized Video Editors Take On Special Assignments

NEWS GATHERING AND EDITING have, of necessity, always focused on basics, with the reasoning that speed and content were more important to news viewers than packaging. The speed and flexibility of modern mid-range editing systems, however, are beginning to have their impact on the news department, with many stations finding they can use the capabilities of editors to improve their news specials and documentary work.

At the New York network headquarters of NBC-TV, news editing facilities are being rapidly expanded with small editing systems supplied by Convergence Corp. In addition to several new two-machine rooms designed for machine-to-machine editing of hard news, the network is installing extensive technical facilities for editing documentaries and news specials, including several hybrid rooms with ¾-to-one-inch editing capabilties.

According to Steven Bonica, director of broadcast systems engineering for NBC's Operations and Technical Services division, "I think NBC News has one of the finest videotape facilities in the world for this kind of operation. It's a tremendous resource." Documentaries are edited on "off-line" U-Matic decks in segments so that changes can be made without quality loss, then dubbed up to one-inch for final assembly.

EJ Edit Rooms 18 and 19 are typical "Type B" documentary facilities (in NBC parlance, a "Type A" room is a two-machine news edit bay). Each three-machine Type B room is built around a Convergence ECS-103 editor, interfaced with three Sony BVU-200s (the network is in the process of upgrading to 800s). Two similar Type B rooms, EJs 21 and 22, are used primarily to cut NBC's *Nightly News*, but also produce documentaries. These rooms have Convergence ECS-104 editors with slow-mo capability, each with two BVU-800s and a BVU-820. Pleased with the quality and flexibility of these four rooms, NBC is going ahead with plans to build four more this year.

Since NBC News crews record SMPTE time code in the field, all rooms are designed to edit with field time code. They must also, however, handle a great deal of archival material, which may or may not have time code. To deal with defective time code, each room has a Convergence switcher with a time code defeat panel to disconnect and remove any improper time code. In addition, all source VTRs have time code kill switches. Each room is also equipped with ADDA VW-2 frame synchronizers, which are used as TBCs and to give freeze-frame capability, and Gray CPC-700 time code phase correctors and EECO time code generators.

Bonica says the network has found the Convergence editors to be capable of fast and flexible work, letting them train operators in a reasonable period of time. NBC News's videotape department includes people with film editing backgrounds as well as videotape technicians, and Bonica says both have had good success in learning the Convergence system.

The Convergence editing switcher effects unit (SE-100/ME-110) allows such effects as simple wipes, dissolves, and straight cuts to be performed in the three-machine edit rooms. More sophisticated effects, including digital effects and Chyron graphics, are added during assembly in a one-inch facility.

NBC worked with Di-Tech to design the rooms' audio and video monitoring systems, which incorporate separate switchers for video, audio 1, and audio 2. This setup, Bonica says, allows the editor to break apart or tie together the video and associated audio in any manner desirable. According to Bonica, Di-Tech is now building this feature into its equipment.

Other audio equipment in the EJ edit rooms includes Yamaha M512 audio boards and Orban equalizers. All new edit facilities at the network use PPMs for audio metering; Bonica says NBC finds its operators relate to them better than to VU meters.

Continued on page 40

IN POST-PRODUCTION

PART 2: Audio And Video In Sync For Quality Post-Production

IT WAS NOT ALL THAT LONG AGO that audio post-production in the video environment was not much more sophisticated than selecting which of the two tape tracks to lay the main sound elements onto, with perhaps a little ambiance or music added on the second track. In the wave of creativity that is sweeping the post-production of TV programming these days, however, simple sound tracks are simply not enough. Audiences are demanding more, and producers are supplying it. Hence the need for, and the subsequent development of, the latest generation of sophisticated audio synchronizers.

The new synchronizer systems have brought three major advances for audio, all achieved through the use of SMPTE and other time code systems that positively identify each and every frame of the video image so the sound track transport(s) can be instantly accessed and manipulated electronically: they allow easy, precise, multi-machine operation, with multiple program sources on multitrack decks readily assembled into one; they make it simple to handle the audio signals separately, giving each its own EQ and weight, so that the highly refined audio mixing equipment and skills established in the recording industry can now be used for broadcasting; and the new sync systems provide extraordinarily versatile, precise, and operationally simple editing and processing control. These advances are coupled, of course, with the ability to immediately interface with the image portion of the program through a synchronized videotape recorder.

Earlier techniques upgraded

The broadcaster who has never worked with a synchronizer before may be surprised to learn that the advantages it offers are not all that different from standard editing techniques; the synchronizer simply makes the tasks faster, more efficient, and more accurate.

An example is cue point identification. Central to the new systems is the positive identification of all cue points by the time code number, an actual time reference in hours, minutes, seconds, and frames which the operator sees displayed in front of him at every instant and which is used to address the synchronizer and provide it with instructions. Eliminated, of course, are mechanical timing systems and selection of cue points by gummed tabs or leader tape or crayons.

Another example is multitrack audio to be mixed down a finished mono or stereo track; the process is identical to standard broadcast and recording techniques except for the presence of the program's video image. One channel of the audio tape has time code recorded on it corresponding to the code on the tape, which can be a "work print" on ¾-inch videocassette. The mixdown by the audio editor or engineer proceeds as if there were no video at all—except that the mixer has an instant visual reference to the program material. The sync system tells the mixer at every instant the time code number corresponding to the video frame and the time code number of the point in the audio track. The mixdown can be made to one or two blank tracks on the videotape, to blank tracks on the audio machine, or to a third machine, to which the time code can also be transferred.

More sophisticated applications

Thus far the description of the typical synchronizer's operation is a generally familiar one. But when the operator has complicated adjustments to make, the new systems provide many kinds of help that were not available before.

If the operator wants, for example, to shift an audio track or some section of it slightly, the adjustment can be made first by hand and ear, with the engineer determining exactly where to position the new segment; the system will note the offset between where the piece was originally and its new position as a time code difference, then maintain the correct offset in each subsequent pass. Alternatively, the offset can be created electronically by simply punching in the desired time code numbers.

The same is true for laybacks. When audio tracks are finished and assembled into a single stereo or mono program, the synchronizer system can make a "layback" onto the master edited videotape (from which the videocassette workprint was made). Once audio and video have been cued precisely together, the system will always maintain the same relation whenever master audio and master video are played together.

Assembly edits are equally easy. Each element to be used in sequence gets a cue point which the system uses to roll that element in automatically at the right time. Insert ("punch-in") edits can also be made with the utmost precision by careful assignment of cue numbers to the in and out points. The system makes the shift at the precise point

Continued on page 50

KYW producer Jim Anderson watches as Craig Ruxton operates the station's Datatron Tempo 76 editor. With the Sony BVU-800 decks, the system gives frame-accurate editing.

Continued from page 38

One step up in the NBC News editing hierarchy is EJ 20, what the network terms a "hybrid" edit room. Both raw editing and final assembly can happen here, and the room's final product is always one-inch. Similar in most respects to the three-machine rooms, EJ 20 has an ECS-104 editor with externally controllable ME-110 switcher. Source VTRs are two BVU-800s and a one-inch BVH-1100A; a second BVH-1100A is the record machine. The hybrid room also has a Sony BVT-2000 digital TBC, along with Sony BVX-30 noise-reducing TBCs with color correction capability. Special effects capability is the same as in the three-machine rooms, and any desired digital effects must be added in a larger facility on the CMX 340X.

Two other hybrid rooms, EJ 8 and EJ 9, serve primarily to edit late-breaking hard news, but regularly produce "instant specials" on sudden developments for airing the same night. These rooms, which take feeds from all over the world, incorporate specially designed Di-Tech switchers that allow the operator to dub material from any source to any VTR with the press of a button. This enhancement illustrates the main objectives in designing EJs 8 and 9—speed and versatility, along with high picture quality. The rooms are also more spacious than EJ 20, where the time pressure is usually less intense.

The four new edit rooms to be constructed this year will be similar to hybrid EJs 8 and 9, according to Bonica. Right now the network is evaluating the concept of building the four rooms around a centrally organized equipment pool, with each room able to take direct control of the machinery in the hub. This would be the first time the idea had been applied at NBC in other than a purely architectural form. Some edit rooms, for example, share an equipment room, but equipment is permanently assigned.

With its video plans in place and well under way, the next area of focus for NBC News is audio quality. Bonica says that at present the news operation records audio on the VTRs, giving only two tracks. This will change in the future as the network moves to multitrack audio, extending the capabilities of the VTRs with ATRs for recording at least seven tracks of audio plus time code.

Final details of the audio system have yet to be worked out, but Bonica foresees equipping the edit facilities with multitrack audio players so producers can reedit shows using the VTR and multitrack machine in tandem, mixing down and sweetening during assembly. Bonica hopes to work out the logistics of the audio plan during this year, but does not expect it to be incorporated in the facilities the network builds in 1983.

Small editor, big ideas

Philadelphia's KYW-TV, which celebrated its fiftieth anniversary last December (see this month's Television Programming column, p. 33), combined equipment and techniques in producing "Sweet Nothing," a documentary on America's love of sugar that won a gold medal at the International Film and TV Festival in New York. The show was produced on ¾-inch with the station's Sony BVU-50 recorders and RCA TK-76 cameras and post-produced primarily on a Datatron Tempo 76 editor. By combining the capabilities of the Datatron with creative machine-to-machine work on the station's Ampex VPR-2B one-inch VTRs, producer Jim Anderson was able to create a wide variety of editing effects.

According to Anderson, SMPTE time code—supplied by KYW's Datatron 5152 jam sync generator—allowed the "Sweet Nothing" crew to build A/B rolls even though the Tempo editor lacks switching ability. Anderson built sep-

TELETRONICS; ANOTHER TASTE OF SUITE SUCCESS

Nancy Malchik

It takes more than quality components to build an edit suite. To get the most out of each component, they must work together as a *system*. Teletronics' project engineer Bob Pralle and design engineer Dean Winkler are creating the company's New York City suites with a combination of off-the-shelf hardware and custom hardware and software. Why did they choose the Grass Valley Group 300 production system?

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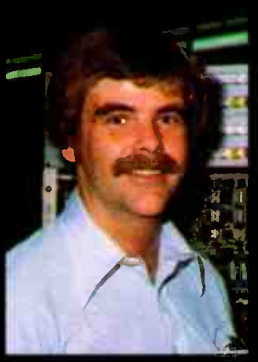
It worked right out of the box. Studio B has not had one minute of downtime due to switcher failure."...Bob Pralle (right)



"The 300 serial interface using SMPTE protocol makes custom communications with the switcher beautiful...

It's the most powerful effects deck I have seen...clients ask for the 300 switcher." ...Dean Winkler (left)

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NBC Sports Kicks Off Sophisticated Edit Room

Editing requirements at NBC Television run the gamut from hard news to complex productions, and NBC hasn't limited its editing expansion to the news department. In addition to its new edit suites for news, NBC recently installed an extensive facility for sports editing. In the words of Michael J. Sherlock, the network's executive vice president, operations and technical services, the new edit room will be "second to none in the United States" when complete.

In Edit 3, a Quantel representative trains operators on the DPE 5000.

Known as Edit 3, the room is built around a CMX 340X editing system with all the bells and whistles, including GPI (general purpose interface) and motion memory. According to Steve Bonica, the GPI feature allows the CMX to operate almost all equipment in the room not interfaced to the switcher.

The production switcher is a Grass Valley Group 300 Series, which Bonica says is the first 300 installation for NBC's East Coast operations, although the network already owns several. The 300 will have E-DISK and Master E-MEM, which takes control of all M/Es with a single automation controller, allowing very complicated effects.

Another innovative aspect of Edit 3 is the MCI/Quantel DPE-5000 digital effects system, a three-channel unit fully interfaced to the production switcher, with custom shapes ordered from Quantel. Additional graphics capability comes from the new Chyron IV, a two-channel unit housed in an adjacent room that looks in on Edit 3 through a window. The room, partially acoustically isolated, has its own input switching, monitors, and communications equipment. Options on the Chyron include MGM (Master Graphics Module, which includes a palette system), Digifex, and a hard disk.

The room has five Sony BVH-2000s plus a BVU-820 U-Matic VTR. When *BM/E* visited Edit 3, an RCA Hawkeye was being evaluated; Bonica notes, however, that the network has not reached a decision about its possible use of half-inch.

A Thomson-CSF system provides two channels of color correction. Time code phase correctors from Gray Engineering correct nonsynchronous and misphased time code on field cassettes when necessary. Video monitors are from Conrac; waveform monitors, vectorscopes, and test signal generators are from Tektronix.

The carefully designed audio system in Edit 3 revolves about a 12-input Neve console and includes a Lexicon 224x digital reverb system and 1200 audio time compressor/expander, Orban parametric equalizers, and dbx noise reduction equipment. The room also has an Ampex MM1200 multitrack ATR, Technics turntable, and UREI speakers and power amps. To achieve NBC's specified ambient noise figures, the tape room was isolated and ceilings and walls acoustically treated.

Ever practical, NBC will put the long-term planning and expertise that went into Edit 3 to additional good use this year, when it builds a similar facility for the news department.

arate A and B rolls and laid down the same time code on each, keeping careful notes on edit points for cuts, wipes, and dissolves. "Since we have two playbacks on the Datatron," Anderson explains, "we can simultaneously roll them with the A roll on one monitor and the B roll on the other, and basically visualize how the A/B roll will work." For certain edit techniques, such as still-framing, Anderson and his crew had to go upstairs to the KYW playback booth, which is equipped with a Quantel frame synchronizer. Some still-framing, however, was done right on ¾-inch.

Most of the show was cut by editors Eric Underwood and Craig Ruxton on the Datatron with Sony BVU-800 VTRs. Some sections, however, including a complicated "speed-up" sequence, were edited machine-to-machine on the VPR-2Bs by Pete Moyer. For the final mix, everything was dubbed up to one-inch, including the ¾-inch material.

Discovering new capabilities

KCEN-TV, the independently owned NBC affiliate on Ch. 6 in Temple, TX, has found the extensive capabilities of its Videomedia Z6000E editing system a boon in specials work. The station put together a year-end news retrospective last December entitled "Newswatch Six: The Year in Review" that summed up the local news of the year. The material for the half-hour special was gathered locally in the three communities the station serves—Temple, Waco, and Killeen, home of Army base Fort Hood. The station has a news office in each city, equipped with Hitachi SK-90s and JVC KY-1900s and KY-2000s.

"One of the neatest things about the Videomedia," according to KCEN chief engineer Lou Stroger, "is its five programmable toggle switches." The toggles can actually start an effect on the station's Vital SqueeZoom even though the SqueeZoom isn't directly interfaced with the editor. "We bought one of the first Z6000Es that was delivered here," Stroger says, "and we didn't realize we had that feature when we bought it. The one we saw at NAB didn't have it, and we only realized it when it was delivered." The toggles allow the director to program an effect off the SqueeZoom to start precisely at any designated point on the tape. "We use SqueeZoom effects for just about everything," Stroger says, noting that many transitions for the special were done on the SqueeZoom.

"Since we have the capability of taking any machine out of the editor and feeding it through our SqueeZoom and back into the editor, we can do virtually anything with it that our SqueeZoom can do," Stroger explains. The Z6000E itself, of course, is capable of two-machine A/B

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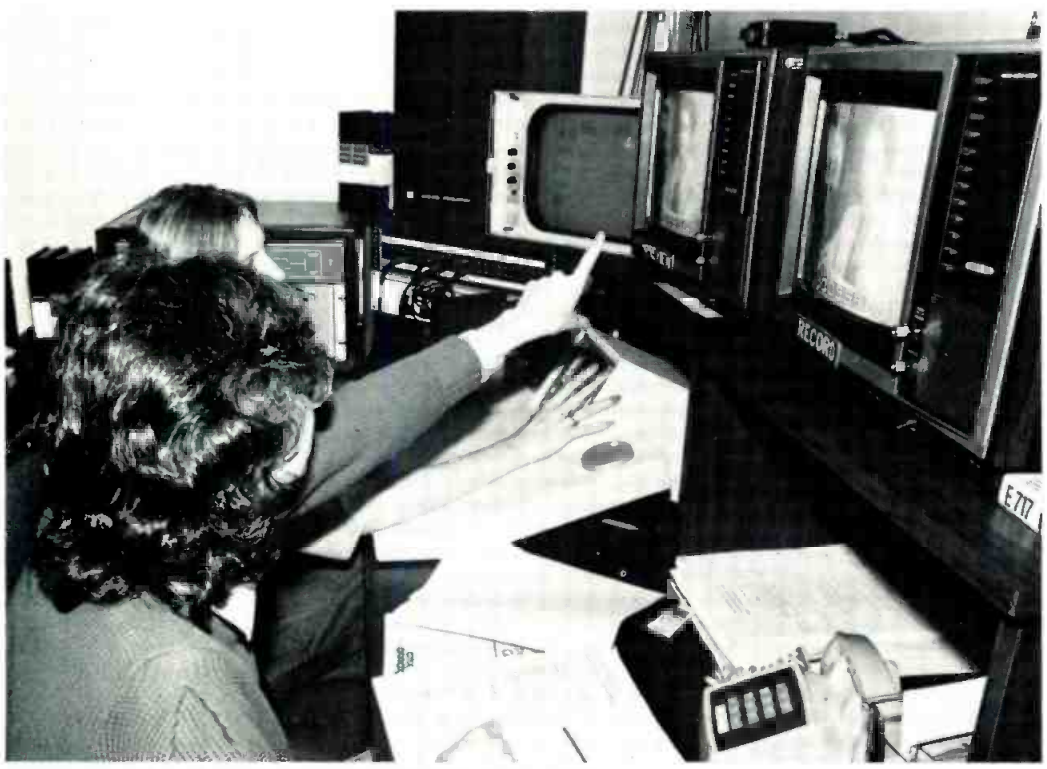
Circle 126 on Reader Service Card

In NBC's EJ 8, equipped with two one-inch VTRs and two U-Matics, staff works on Nightly News. *Room is also used for documentaries, as is its twin, EJ 9.*



Operators edit a show in one of WCVB's three Edge suites.

rolls with any kind of dissolve or effect. The toggles permit KCEN to take inputs from the main switcher, an RCA TS-51 that is interfaced with the SqueeZoom. Once the station's brand-new Vital VX-114 production switcher is installed, however, Stroger says the station will probably interface the Z6000E directly with one bank of the switcher and use the switcher to create effects.

Instead of SMPTE time code, KCEN uses Videomedia's proprietary Micro-Loc for editing. "We've found it to be as accurate as SMPTE code," Stroger asserts. Micro-Loc works by inserting an extra pulse at every one-hundredth control track pulse on the tape. Every time the tape crosses one of those pulses, a counter is set back to an even hundred, insuring frame-accurate edits.

"Daily we find more things we can do with the Z6000E," Stroger boasts. For example, the station's sports producer creates sports montages to music on the system, and KCEN's biweekly public service program for the Chicano community, *Hispanic Journal*, is produced primarily in the field and then post-produced on the Z6000E. Straight news at the station is edited with four Convergence editors, one in each of the news offices and one at the main studio, but any kind of prime-time special is done on the Videomedia.

Getting an Edge

WCVB-TV, the Metromedia-owned ABC affiliate in Boston, produces approximately 60 hours a week of its own programming, including liberal amounts of special and documentary work. One recent special, "Ground Zero: Victory Road," accounted for one of the 16 Emmy awards WCVB captured at the sixth annual Boston/New England Emmy ceremony late last year. To keep its edge in a competitive market, the station relies in part on its extensive editing facilities.

Documentary and special work at the station take place in any of three edit suites built around The Edge, CMX Systems' small but sophisticated editor. Khris West, WCVB's engineering supervisor, says that the three-machine and two four-machine Edge suites, which use Sony BVU-820s and 800s for all record and playback, are "going constantly" for special and other work. The Edge, of course, is not limited to ¾-inch VTRs, but can also interface with one-inch and half-inch machines if desired. (The station also has a 340X system for its most sophisticated productions.)

WCVB installed its first Edge system over two and a half years ago, says West, who calls the editor one of the best around in its class. "The Edge is faster than other editors we've tried," West contends, "and it's much more accurate." The internal memory in The Edge records up to 50 edit decisions; if the decision list is longer than that, the station records it on paper tape, although the system can record the list on floppy disk if preferred.

Because most field tapes that come in for editing have SMPTE time code already burned in, the station has little need to stripe tapes in the edit rooms. All the rooms have Leitch time code readers and generators, as well as Leitch

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New Mid-Sized Systems Enter Editing Market

A number of mid-sized systems have been on the market for some time, including CMX's The Edge, United Media's Commander series, and editors from Convergence, Datatron, Videomedia, and several other companies. At last November's SMPTE conference, however, there were two major new product introductions that have sparked new interest in this approach to editing: the IVES-1 from EECO and the ST-3 from Datatron.

IVES-1, EECO's Intelligent Video Editing System, is a low-priced editor that incorporates several features the company calls unique in its class. One is a prestripe button that commands the internal SMPTE time code generator to stripe the record track with continuous SMPTE code, control track pulses, and video black, eliminating the need for separate time code equipment. In addition, the unit has an internal NTSC sync and video black generator and an input jack for an externally generated color bar signal.

Another unusual feature is Auto-Dub, also a one-button command. Auto-Dub commands the internal AFV routing switcher to perform a direct dub from the play VTR to the record VTR or vice versa, allowing production of workprints or safety copies. The two-machine editor will interface with ¾-inch and half-inch VTRs; video product specialist Karen Mills says that at SMPTE, Ampex, RCA, Thomson-CSF, and Sony all expressed interest in perhaps interfacing IVES-1 with their half-inch analog component recording systems. According to Mills, engineering labs at more than one television network will begin evaluations of IVES-1 this month. The system sells for $5500, with deliveries slated for April.

Datatron's new entry, the ST-3, is a "moderate-priced" system (under $40,000) that bridges the gap between the company's small Tempo system and its full-scale, five-machine Vanguard. The price tag covers a basic three-machine editor with special effects switcher interface, but users are not limited to that configuration. The ST-3 can be upgraded to the full Vanguard system, including Datatron's Smartscan slow-mo controller. In addition, the ST-3 uses the same VTR interfaces as Vanguard and Tempo, so it can function with most one-inch, ¾-inch, half-inch, and quad machines.

IVES-1 from EECO

Datatron's ST-3

Sophisticated features of the ST-3 include list management, a 320-event edit list memory, auto assembly, multiple deck synced roll capability, and HELP, which answers operators' questions on the CRT.

sync generators and color bar generators. WCVB does its field work with Sony BVU-500 recorders and Ikegami HL-79 and HL-83 cameras.

Each room also has a Grass Valley 1600 switcher, which provides a range of wipes and dissolves for specials. If more sophisticated effects are desired, they can be provided by the station's two-channel MCI/Quantel DPE-5000 digital effects system, the extended version with a full range of options. West says, however, that the Quantel is rarely used in specials work.

"If you get into that kind of work," West explains, "you get out of ¾ and go into one-inch editing. Three-quarter-inch special effects editing is very time-consuming and it's an overkill."

Pulling out all the stops

The folks at KUED-TV, the Salt Lake City PBS station, would disagree with that assessment. The station does extensive documentary work with a pair of large CMX editing systems in three- and four-machine configurations—an unusual application for such large-scale systems. Director of engineering Ray Hutchinson says documentaries are the main business of the station's 340X and 34X editors. The station, which is licensed to the University of Utah, recently taped the seven-and-a-half-hour artificial heart implant operation at the university's medical center and is creating an hour-long documentary from the footage. Skaggs Telecommunications provided equipment and support crew for the taping.

Hutchinson says the off-line 34X system, which is interfaced to three Sony BVU-800s, has taken much of the time pressure off the editing staff.

"We existed for two years with only the on-line facility," Hutchinson relates, "and it was backlogged—we were just going day and night on it." Although the station's own documentaries constitute the systems' heaviest use, they have plenty of competition from the state educational system, which also uses the station's facilities.

The usual procedure, according to Hutchinson, is for material to be recorded in the field on one-inch with the station's Ampex VPR-20 or Sony BVH-500 recorders. For the heart implant surgery, the station used Ikegami HL-79 cameras. The master tapes are duplicated to ¾-inch back

at the station, and SMPTE time code is laid down on both masters and workprints with Gray time code equipment.

Producer and director next sit down at the 34X with the workprints and generate an edit decision list on floppy disk. The 34X has no special effects capability, but it can list effects on the floppy disk for incorporation by the 340X. When the decision list is complete, the floppy is plugged into the 340X for final fine-tuning and audio sweetening. An Ampex switcher interfaced with the 340X does the special effects, which include "about every wipe you'd ever dream of," as Hutchinson puts it.

KCEN does regular special work with its Videomedia Z6000-E.

Such an elaborate editing setup is not really so unusual for a public TV station, Hutchinson suggests, and fits well the needs of KUED, which penetrates into "a good part of seven states" via cable and translator systems. Hutchinson says editors at the station regularly make use of the CMX's auto-assemble feature, which does all final assembly automatically. For other kinds of work, when several field cameras have been isolated, a director can edit on the fly, with the computer insuring complete repeatability. The 340 is hooked up to four Ampex VPR-2s.

KUED's setup, with a large-scale editor primarily for documentary work, is still not typical of most stations. The increasing capabilities of smaller systems, however, are bringing more and more flexibility to editing tasks that once were limited to the basics. Turning raw tapes into a polished documentary tests the creativity of news staffs every day. Now, mid-sized editing systems are providing additional ways to extend, rather than limit that creativity.

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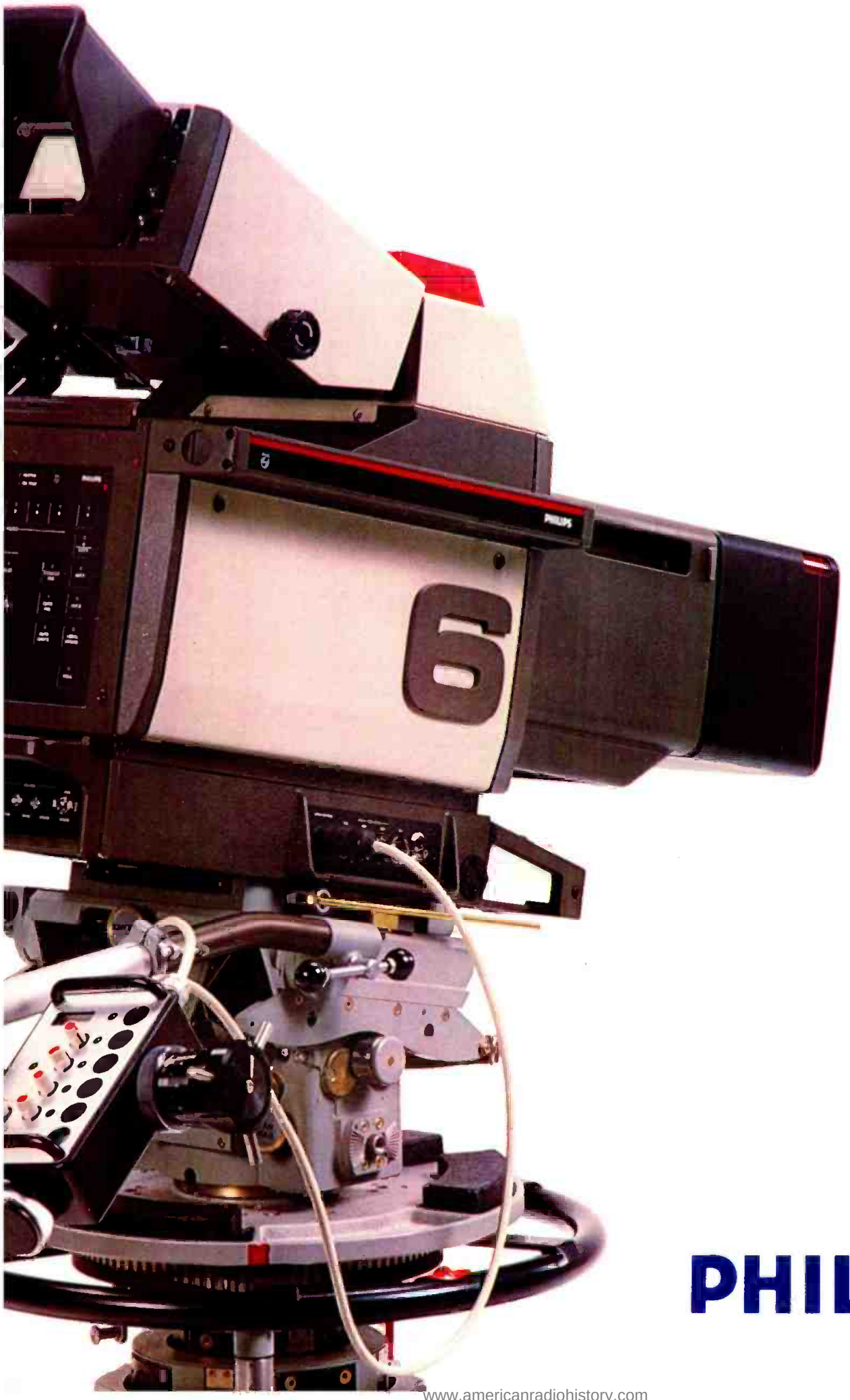

PHILIPS

In audio room at National Video Center, audio engineer Roy Yokelson uses Q-Lock to synchronize (left to right) JVC 3/4-inch VTR, two Ampex ATRS, MCI 24-track ATR (out of sight at right).

Ira Kemp. audio projects specialist at Teletronics, has A-K Q-Lock control box next to console in audio production room.

Continued from page 39

and then brings the insert out again exactly where wanted.

Precise control is also offered over audio processing. Equalization, reverb, special effects, and so on can be added to the audio program exactly on cue, matched to the program by monitoring the video workprint for timing. Small sections of audio can be handled individually, and the time code will allow them to be reassembled exactly where they belong. This facility in the handling of special effects is particularly valuable for producers of video commercials, who so often need crowd noises, voice overs, added ambiance, synthesized music or noise, and other embellishments of the sound track.

Hardware choices

Part of the reason synchronizers are becoming more popular is that there are a lot more system choices available. Adams-Smith, for example, is at this very moment preparing a series of modular sync system units for marketing. The 2600 Series, according to Harry Adams, VP, is to allow broadcasters and production facilities to get into a state-of-the-art synchronizer system with a minimum investment. The units are intended to be used in conjunction with some type of editing controller (other systems incorporate this function to a greater or lesser degree). Some of the modular units include a longitudinal time code generator; longitudinal reader; vertical interval code generator; vertical interval reader; parallel interface display driver; and a display which shows the status of the edit. There are several others available.

The system introduces many refinements in the handling of the codes, such as: automatic switchover to control track pulses if the vertical interval pulses become unreliable, so that the synchronizing pulse of the video frame is used to update the time code readouts if the digital time code data becomes damaged or the transport is moving too slowly or too quickly to allow it to be read; jam sync capability to allow one machine's time code generator to be slaved to another's; and switchover to an internal time code generator when the code on the tape becomes unusable. Also available are provisions for reading longitudinal code to 100 times play speed and communications between modules over a data bus, with microprocessors in each module to handle multiple standards and formats.

Another system, already in widespread use, is the Audio Kinetics Q-Lock. This system is built around a computer and supplies extremely flexible control of up to three machines, with expansion to any number of transports with the addition of modular slave systems. The Q-Lock uses a combination of SMPTE time code during play speeds and "tachocode" pulses from the master machine control track during high-speed operation to maintain continuous operation. It has software for interfaces to many models of machine, including a special interface for film projectors and dubbers, wedding together electronic and sprocket hole sync. The internal time code generator provides 24, 25, or 30 frames-per-second standards, or the drop frame rate which automatically compensates for the difference between the "ideal" 30 fps video rate and the actual 29.97 fps of NTSC.

The AK synchronizer can lock the slave transports to the master deck even while both are in motion, with lock time under four seconds and lock accuracy around 50 microseconds. The system can learn the optimum "park offset" (or lead time from standstill) for each machine connected to it, then apply the information whenever that machine is called up. A display gives an automatic presentation of error messages—the countdown to sync, and so forth. Calculation and entry of offset is manual or automatic.

The system can be readily interfaced to external computer control. There is a memory for ten cue points; cue points can be selected on the fly, or entered through the keyboard. There are many other operational refinements in this sytem, all directed toward making the operator's job easier and more precise. Steve Waldman, president of the firm, claims that the complexity of the design is the key to simplicity in operation.

BTX's "The Shadow" system is another designed to control video, audio, and film transports, in any combination of two, three, or four machines. The system switches automatically to tach pulses in high speed wind and goes back to SMPTE in play. It can insert offsets up to 24 hours in hundredth-frame increments and also has selectable lock-up rates—variable from +30 frames a second to −15 frames a second. A "slow," 18-subframes-a-second rate is also available, giving the system a full range from half-play speed to twice-play speed. Sync accuracy is +50 microseconds; lock time is two to five seconds.

Like the Q-Lock, the Shadow is a complete control system and also has many additional operational refinements, so it is fully up to "new sync" standards.

EECO's Multi-Cue Synchronizer, MQS-100A, is another advanced system capable of holding together two or three audio or video machines or magnetic film transports in

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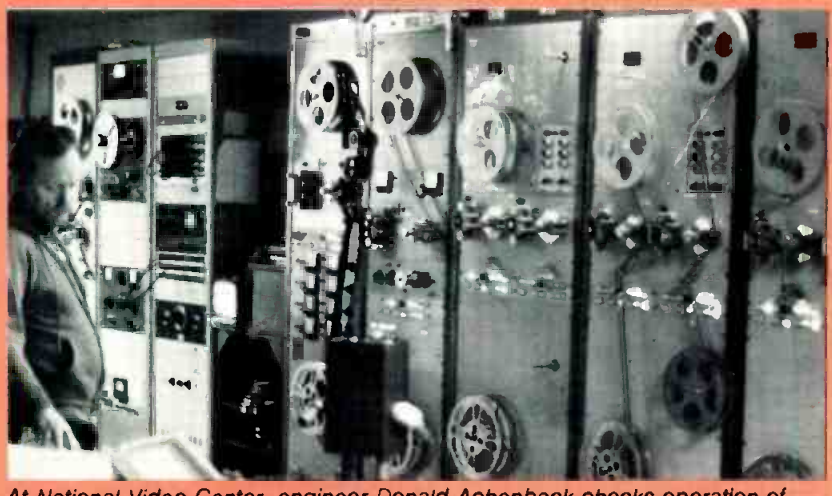
Circle 131 on Reader Service Card

Film, Tape Synergism

Movie post-production of sound has been an important stimulus to the creation of systems that allow a parallel operation in video production. The successful development of such systems, with time code "bits" acting as "electronic sprocket holes" on the tape, has in turn opened the way for movie use of videotape in film production. The two technologies, film and tape, are getting intermingled in the film studios, each doing what it does best from the point of view of the movie producers. In fact, very large production plants are being set up to do both movie and video production (see *BM/E*, January 1983, p. 86).

Some of the larger video production houses have furthered the intermingling of movie and video techniques with a reverse borrowing; they are using sprocket-hole sync for certain kinds of video jobs. National Video Center in New York, in a new multi-million-dollar plant, has a number of production systems set up with electronic sync, but also has a system called "Vidimag," which uses magnetic film under sprocket hole control. Dick Mack, head of audio production, explains what kind of work is given to Vidimag, which was developed a few years ago by veteran system designer and recording professional Robert Fine. "Actually, any post-production job could be done either with electronic sync or Vidimag, but the sprocket hole system is more convenient if a producer of commercials, say, comes in with many separate sound elements, on different recording media, that he wants incorporated into a spot," says Mack.



At National Video Center, engineer Donald Achenback checks operation of Magna-Tech audio "dubbers," synced to videotape on VidiMag at left end of row.

any combination, using SMPTE time code. Cue points can be keyboard-entered or selected on the fly. The cue search function automatically moves all tapes to assigned points, while "sync play" sends all transports ahead from cue points, locked together (the slaves search for the lock if they are out of sync). "Chase" makes the slave duplicate the actions of the master. A time code number can be put in the memory to instruct the system to close a relay or roll a slave when the number is reached. Transport controls are opto-isolated to eliminate ground loop problems.

Studer's Tape-Lock, TLS-2000, is a powerful and versatile system, widely used in Europe, which has won adherents in this country as well. It will lock a slave to a master, with SMPTE code (video/video, video/audio, audio/audio), for duplication of the master's operation. Any offset between the two code numbers, up to 24 hours, can be set. Punch-in edits are facilitated with entry and exit points to 1 ms accuracy, and the transport acts as a loop between the two points. The sync accuracy is about 30 microseconds, so audio editing can be extremely precise. Lock-up time is about three seconds. Accurate parking is available, adjustable for ±5 ms so precise manual editing is possible.

Like most of the other systems described, the Studer TLS-2000 has many capabilities beyond those listed, making it fully capable of carrying out the most elaborate audio post-production jobs.

Systems made by Control Video useful in audio post-production are the Intelligent Controller, the Synchronizer, and Super Sync. The Intelligent Controller, with a synchronizer incorporated in the same chassis, provides complete control of two machines (VTR, ATR, film), with SMPTE and control-track tach pulses usable. Frame-accurate "go to's" and cues allow full editing. Programmable audio phase offsets provide the close resolution for audio mixdown, sweetening, and so on.

The Super Sync sets up a secondary machine for "chasing" a primary machine, with the controls on the primary machine controlling both. Additional Super Syncs can be added for multiple machine operations, all hard-locked to the primary machine. VITC capability is included in the system, needing only the addition of a VITC generator and reader.

Versatile capabilities

All the systems described here are drawing attention because of their power to handle almost any audio post-production job the video industry might face. However, a television station in a medium market has much simpler demands to make in audio post-production than the large post-production facility dealing with national TV commercials. How can you equip yourself at an appropriate cost level?

Advice given by Ira Kemp of Teletronics begins with a simple two-machine synchronizer, a multitrack tape machine with servo control of the capstan, and a good medium-sized console with EQ built in or easily switched in. To make good TV commercials, you need, of course, a studio, an announce booth (for voice overs), and the largest library of sound effects and background music you can get together. Crowd sounds in different kinds of spaces, applause, ambiance, and typical noise backgrounds, are needed for effective audio post-production of TV programs and commercials.

A music synthesizer is handy, but fairly expensive. However, a lot can be done with creative use of toy synthesizers! Special effects devices can add greatly to the repertory, but again on a tight budget you can do without.

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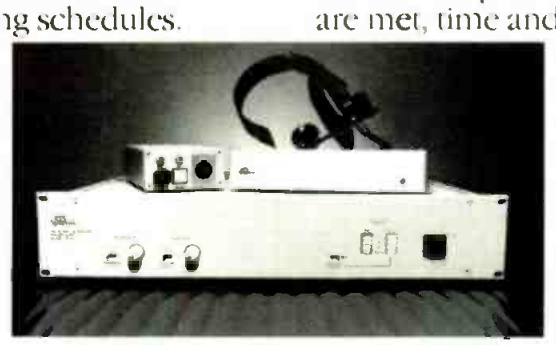

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Useful Synchronizer Terminology

Longitudinal Code: The SMPTE time code or any similar code laid down serially along the edge of the tape.

Vertical Interval Time Code (VITC): A special time code of 90 bits inserted into the vertical interval of the video recording. This allows the time code to be read, on helical machines, when the tape is moving very slowly or standing still. A special VITC reader is needed to recover the code numbers.

Tach or Counter Code: Timing pulses derived from a tachometer on the transport or the tape counter. The pulses can be used for sync to bridge a gap when the SMPTE code is too weak or degraded in form to be effective. Tach pulses are also often used during high-speed wind to avoid the necessity for having wideband amplifiers to read SMPTE code at high speed, and also to allow audio tape to be lifted off the heads, for low wear. Some systems use the tach pulses to restart SMPTE code automatically after a gap, or when returning to play speed.

"Drop Frame" Code: A code which adjusts to the 29.97 frames/second of NTSC color by dropping a frame number at intervals to correct the frame count. Some systems supply switchable generators for 24, 25, 29.97 and 30 frames a second.

Retiming or "Jam-Sync": A process for replacing the time code when it is degraded by dropouts, loss of resolution, inadequate signal level or other weakness. The still readable numbers are used with a time code generator, which may be tied to house sync, to put an entirely fresh code on the tape in the right "position."

Lock Accuracy: Maximum time error in the automatic locking of a machine to a master.

Resolution: The minimum time error in control and editing operations. For lip sync the required resolution is about half a frame. For music to be edited into a continuous performance, the resolution must be much finer, about 50 microseconds.

Machine Interfaces: The interface between the controlled machine and the sync system can be provided by hardware or software. Many sync systems have interfaces ready for a number of the video, audio, and film transports on the market. The sync system maker can supply an interface to order if it is not on the shelf.

Cue Point: Editing and control cue points are expressed in the time code numbers for each point. Cue points can be held in system memory on some systems, with entry "on the fly" (as the tape passes through the cue point) or with the control keyboard. Controlled transports will move to cue points automatically on command.

Code Offset: The difference in count between two taped programs, each with time code, but with the codes displaced with respect to each other when the programs are cued together. Most current sync systems will take note of the offset automatically and maintain it when the two tapes are run together; or the offset can be entered manually from the keyboard.

Parking Point: The count for the point at optimum distance upstream from a cue point to allow full sync to develop before the cue point is reached. It varies from one transport to another.

Parking Offset: Difference in count between two parked transports, each at optimum distance in back of cue point.

Chase Routine: Setting up a slave machine to duplicate exactly every operation of a master.

Error Presentation: A reading showing the countdown to sync for a machine that has been started with an order to move into sync.

Lock Time: The maximum time it takes the system to bring a controlled machine into sync, when the machine has been started within the control "window." Times on the best current systems run from about two seconds to five seconds.

Local Zero: A zero count set for a particular cue point, for simplification of count numbers and for an instant real-time reading on that section.

Cycle or Loop: Automatic play, return to cue, play, return, and so forth, on command.

Auto In-Out Record: Punch-in edits can be precisely timed by entering the cue points of the edited recording and the inserted recording, and using this mode, on many systems.

The synchronizer system will let you give the audio the full treatment from all these sources, making the most from what you have at hand for the creation of many different kinds of commercials.

Much less common, of course, is production of straight video programming in television stations. A special case is WGBH in Boston, where video programs of the Boston Symphony and Boston Pops orchestras are produced for syndication by the station. All original audio recording is on multitrack audio machines, locked to the video with SMPTE code through an earlier Adams-Smith model, the TS-605. The post-production consists largely in making the mixdown and in choosing which of various camera shots to include in the program. Obviously music continuity has to be strictly preserved, and the sync system in this case works in a kind of reverse; it allows the proper camera shots to be coupled with the right sections of the music, which has the dominance in the editing. Skillful musical trained audio editors are needed for the job.

As any audio engineer who has worked with synchronizers can relate, their presence in the broadcast or production plant is hardly a luxury anymore. With audio for video becoming more and more sophisticated, the need for flexible control of audio sources makes the synchronizer an essential element in the facility. **BM/E**

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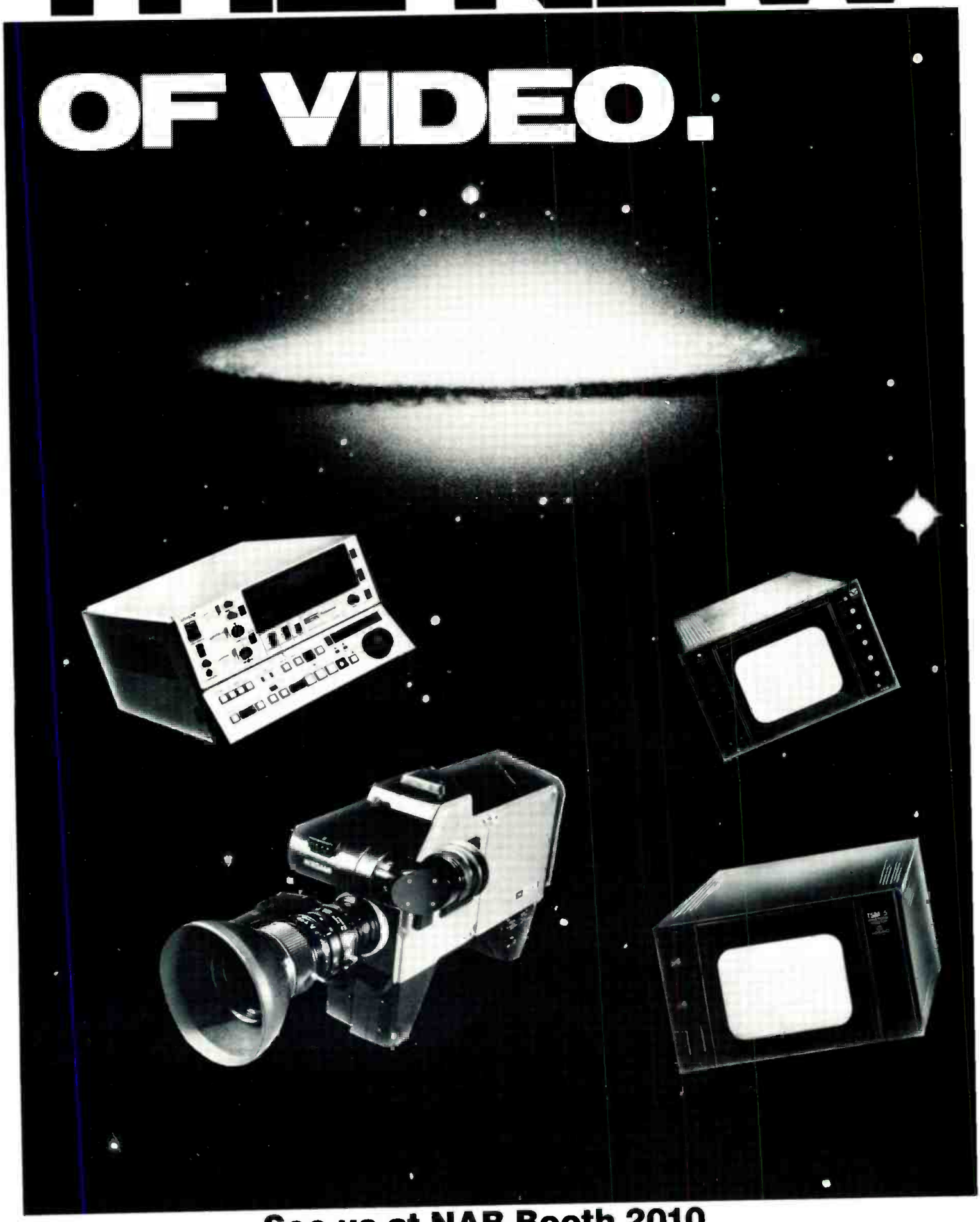

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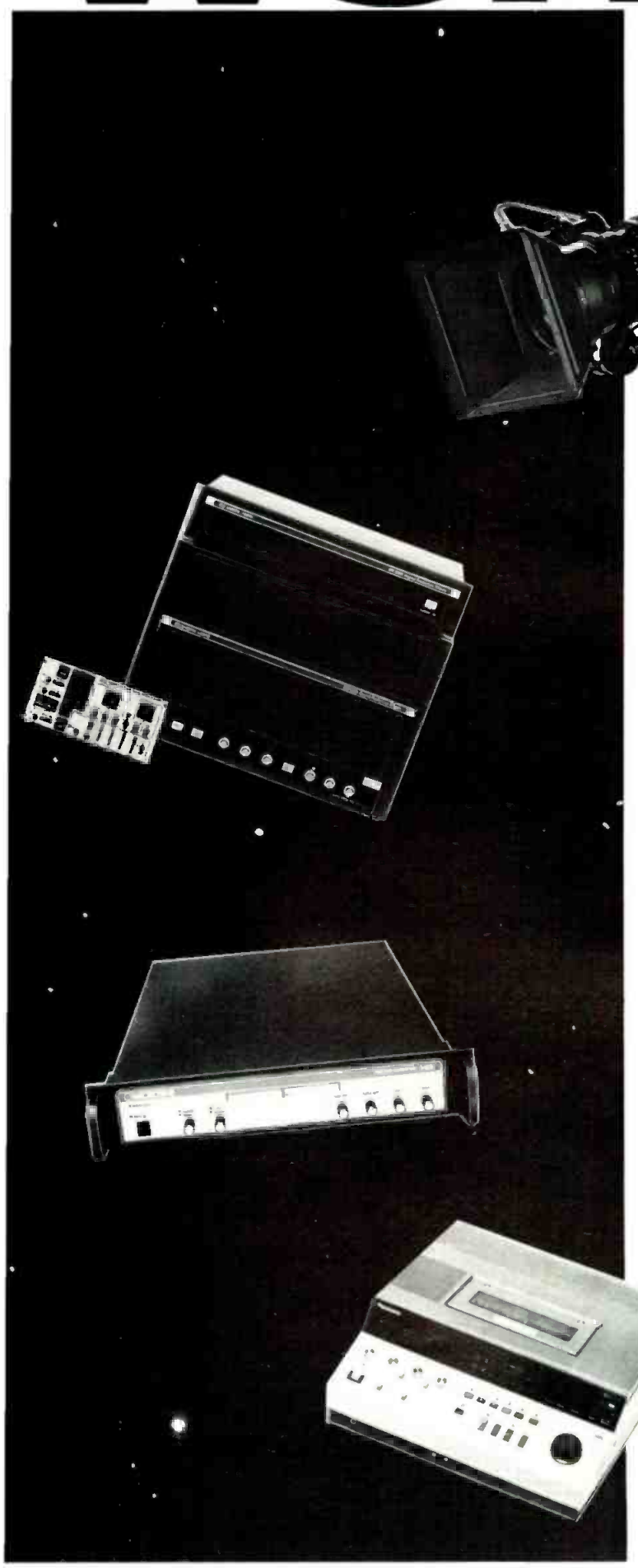

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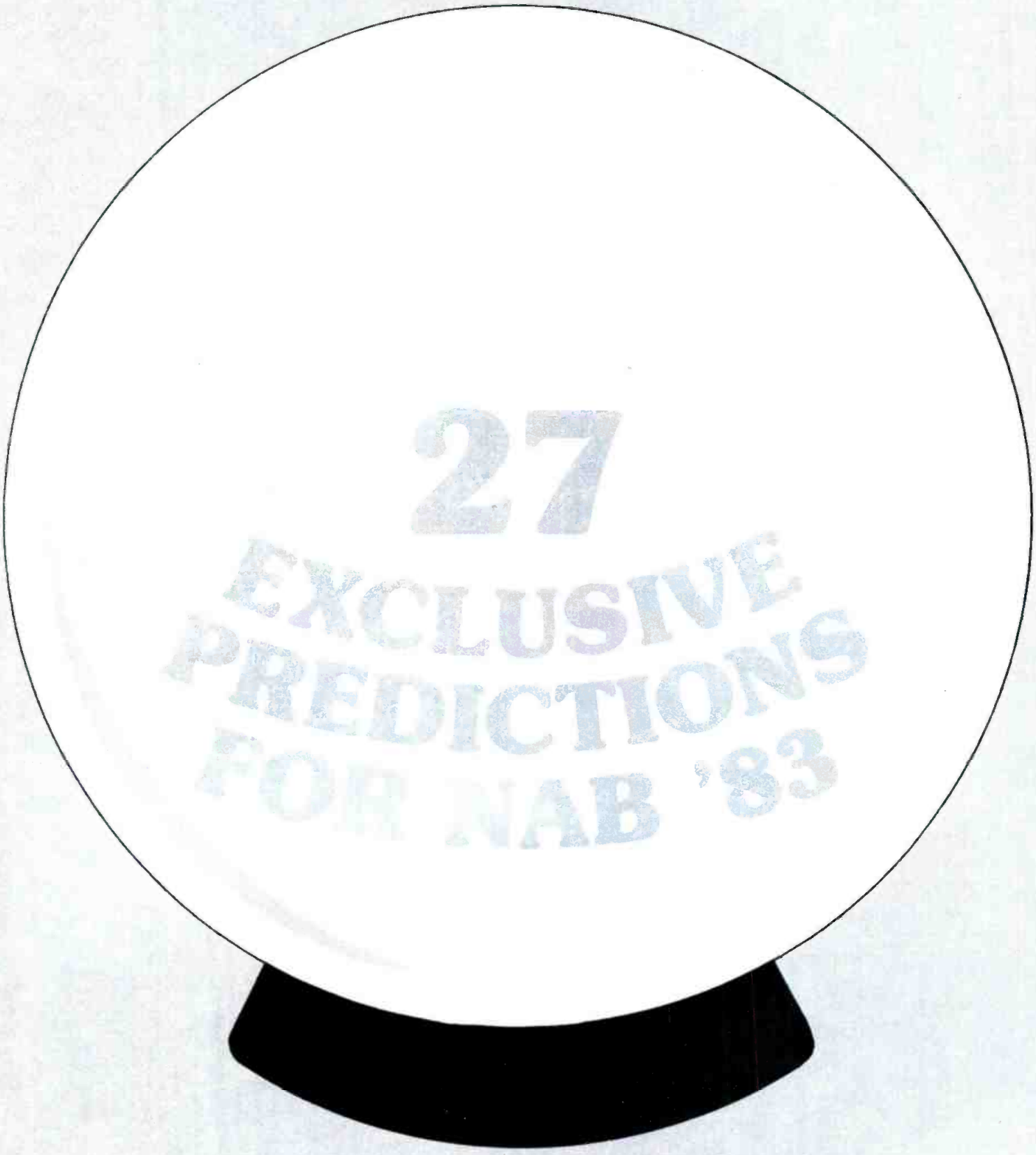

BM/E's editors have looked into their crystal balls and contacted dozens of manufacturers. Now we offer some of the first information in print about what's in the cards for Las Vegas in April.

1. Small-format recorders and recorder/camera combinations will continue to attract the largest crowds. Sony will unveil the long-awaited recorder/player deck to round out the Betacam line, also the three-tube Betacam. Major new announcement: Thomson-CSF will begin marketing a complete version of the Betacam, with one- and three-tube cameras and editing decks. Expect the Fernseh Lineplex quarter-inch system to be up and running. No major new developments in this area from the RCA/Matsushita (Panasonic)/Ampex camp. But expect more developments from "nonstandard" systems—the half-inch VHS-C (with larger companies seeking to jump on the bandwagon with this essentially nonbroadcast format) and the Funai quarter-inch system being pushed by Hitachi.

2. With pressure mounting from the three networks, will the manufacturers go into committee again to try and hammer out differences? Sony says it's willing to compromise on the size and shape of the cassette, as long as it doesn't compromise too far towards increased weight. Also it's willing to compromise on the drum diameter, though not in the direction of lower writing speed.

3. Expect controversy over exactly what constitutes "components" in an analog component system—does a Y,I,Q system really count? Some manufacturers will be taking sides, offering Y, R-Y, B-Y systems as a fait accompli: Microwave Associates may address the transmission problem with a component microwave system. Grass Valley may be moving towards a switcher taking direct component input. Expect that the TBC developed by Fortel for the Panasonic system installed at WNEV-TV will be marketed as a product.

4. Watch for both an increase in sophistication of audio equipment and a heating up of the competition, especially in consoles, as manufacturers aim for both the television and radio markets. Rupert Neve's new 8128 will aim at the high end market with a 32-input, 24-track post-production/recording console. The board is divided into two sections, one for track recording, one for mixdown, with 32 channels available to each. Central assignment outputs are controlled through an on-board microprocessor. Meanwhile, Gregg Laboratories will jump into the mid-range console line based on interviews with jocks and engineers to help in the design. Result: few extra goodies, but plenty of basic, useful features. The 14-channel consoles have Penny & Giles faders and Dixson meters; hinged front panel reveals modular electronics. The consoles are priced at $12,500.

5. Harrison will introduce three new versions of its Series 4 console—variations on the same frame, ranging from small broadcast to complex post-production units. At UREI, look for the Series 1600 consoles, developed further from the prototypes shown at AES. The five-input 1650 and the eight-input 1680 each has three choices of attenuators and features LED clipping indicators, front panel switches from program to audition, and an ac reference to ground. UREI also plans to introduce a new line of preamps, including Model 1101—an outboard turntable preamp matched with the specs of the two consoles.

6. Someone may answer the challenge of the VPR-5, Ampex's miniature one-inch recorder. It won't be Sony, which has no development plans in this area. But someone will probably rise to the occasion. Meanwhile, *do* expect a big push on high-definition television from Sony which *may* bring its 1125-line system to NAB.

7. Next to recorder/cameras, the hottest area in video will be graphics systems. Fernseh may have an on-the-floor demonstration of the FGS-4000 computer art system previewed privately at SMPTE (see *BM/E*, January 1983, p. 56)—a competitor of the MCI/Quantel 3D Mirage system which will also be shown on the floor. New FGS software for shading and coloring is expected, perhaps eventually leading to processing of live video. Expect Ampex to bring the master controller for its ADO system, allowing four channels of A/B inputs to be linked together for four-channel effects.

8. There's not much action in digital art/paint systems this year—Quantel still leads the way with its Paint Box, but watch for the Aurora unit making rapid gains (auto curve tracing, color input, selectable directional edging, 50 percent decrease in frame recall time, real-time animated script, and newly engineered work station design, all at NAB), plus new software options for the Images package from Computer Graphics Lab. Anticipate, though, a flurry of activity in the smaller systems arena—the new graphics tablet from Fernseh, Chyron's graphics module, the Via Video system, and so on. 3M is unofficially said to be working on a "powerful graphics module," perhaps for NAB, presumably an extension of the graphics developed for the D-8800.

9. There will be new variations in ATRs. Otari will be making a big push of its two-track quarter-inch ATR line for broadcasters, including the new 5050 B-II update and the 5050 Mk III-2. B-II is a new

version of 5050B, with completely electronically balanced input/output, electronically balanced mic inputs, and a front panel real-time LED tape counter. Mk III-2 is completely new, and provides microprocessor-controlled transport with dynamic braking feature, packaged in a tabletop console which facilitates editing. B-II is priced at $2295 and Mk III-2 at $2795.

Studer will have a production model of its A710 cassette deck with balanced floating line in/out, designed to interface with +4 dBm balanced systems. The deck was seen last year in prototype. The U.S. version is four-speed front-panel selectable, unlike the two-speed German version, and sells for $6200. Also new is the A800 Mk III multichannel tape machine, with totally transformerless record and reproduce, available in eight-, 16-, or 24-channel versions, all with the same transport.

10. Video effects capability will be coming in smaller and smaller packages. Virtually every company with digital processing equipment can be expected to move to the next generation: those with digital framestores will have low-cost effects processors; those with low-cost effects systems will be adding 3D effects; and so forth. Precision/Echo will debut The Squeezer—video compression in an *affordable* package. Chyron is making headway with its digital effects manipulation of character generator output. Low-cost Digifex from BIAS will have new software.

A MAJOR NEW DEVELOPMENT HERE: Tektronix will break out of its traditional T&M product line with a brand-new frame synchronizer, its first-ever entry into the world of digital production equipment. The unit will feature 10-bit processing (the highest on the market) with two- or four-field memory and comb and/or notch decoding. Said to be completely transparent, and especially designed for satellite and microwave feeds. A digital TBC, remote control panel, and other options will follow shortly; digital audio delay is in the works. The question: since Tektronix-owned Grass Valley is now manufacturing many of the semiconductor elements used in Tektronix equipment, is the next step going to be the introduction of a Grass Valley digital effects processor? Probably not at this NAB, but both NEC and Grass Valley are said to be growing tired of their agreement over the DVE system, which is ready for a major overhaul.

11. Harris Video will make the public debut of its Iris II still store + Chyron character generator system, designed to save having to dedicate a character generator to the slide-captioning process (see *BM/E*, January 1983, p. 12). MCI/Quantel can be expected to introduce its central library system, capable of storing over 100,000 pictures with titles and accommodating up to seven of the DLS-6000s.

12. Among camera systems, expect repeat performances of lines shown at SMPTE—including the new RCA TK-47P and Hitachi portables which interface with full-scale automatic systems. There will be a production model of the Philips LDK-6. CEI/Panavision 310SP also gaining exposure as an EC camera. The real battle shaping up is over lenses, with Fujinon and Canon the main contenders. Last year Fujinon claimed it was consistently ahead of the competition by six to nine months, but lost the lead temporarily to the Canon "Olympian." Who will have the longest lens at this year's show?

13. Audio processing equipment will surprise attendees. Orban will make a big splash with a *stereo* digital programmable parametric equalizer priced under $3000. Orban is also working furiously on a loudness control for its Optimod TV system. Dolby will add to its line of replacement audio modules for one-inch VTRs, currently available to fit the Sony BVH-1000 and 1100 and the Ampex VPR-2. The new module, Model 234, is designed for the BVH-2000, and research and development is under way for a unit to accommodate the VPR-3.

14. Grass Valley will introduce the data option for the fiber optic Wavelink communications system. Complete system will accept modular enhancements for future systems upgrading, and transmits analog signals over two km using LED source and frequency modulation. Data is built on a single plug-in board, fully interchangeable with the audio board.

15. Developments in small production switchers will include ISI's Model 903 (replacement for the 902)—an RS-232 interfaceable two-M/E switcher incorporating fade-to-black with pulse processing. Has 14 standard wipe patterns with hard, soft, or bordered edges, pattern generator. Will be shown interfaced with an Apple II, and priced around $8500. In routing switchers, HEDCO will show two: a single with 16x1 and audio-follow-video capability, and a multiple-bus intermediate routing switcher with 24x24 four-channel or 48x48 one-channel facility.

16. The routing switcher market will heat up considerably with American Data's brand-new entry; microprocessor control, four levels of switching, with configurations to 512x512, are the major features, packaged into an extremely compact system. American Data will also look to crack the master control switcher market with MC-4000 with over/under audio mixing, and single-event preroll for up to 10 VTRs and two film islands. System can be configured up to 32 AFV inputs, and up to eight audio-only inputs.

17. The biggest news in post-production is that Harris will no longer be making the EPIC system. Look for Audio Kinetics to reveal a new keyboard controller for its Q-Lock, intended

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as an intelligent interface for automated consoles and for use in automated post-production facilities. Smaller editing systems capable of performing large-scale tasks will become all the rage (see the Special Report elsewhere in this issue).

18. Communications systems will post major advances in Vegas. Model CS-9400 digitally controlled intercom, to be introduced by McCurdy, is totally programmable from master control panel, self-programmed to four locations with single twisted-pair wiring. It is a completely redundant system with a backup unit, and capable of configurations of 40x40 to 240x240. (The company's other entry is the Model ARS-5020 audio routing switcher, based on a 50x1 switcher card with 20 cards per frame—yielding a 50x20 unit in 8¾ inches of rack space.) Another intercom development will come from RTS: a new 802 microprocessor-assisted master intercom station with up to 12 channels of two-wire, conference line intercom. Unit offers front-panel programmability, using a Z80-type microprocessor for selection and operation of all functions.

19. News in station automation will be made by Vital with SANDI (Serial Access Network Digital Information), a serial machine control system with a general purpose control panel that operates character generators and routing switchers. The system has command and control signals along with general message capabilities. It can transmit information to a master control location such as SAM, and can assign VTRs as well as other remote machines indicating status or tally. Can also be used in dubbing with time-of-day clock and will operate slides and still stores as well as display messages from SAM to control room for timing or loading and unloading instructions.

20. In satellite antennas, look for a special reflector shape as the main feature of the new 6.1-meter Delta Gain antenna from Harris Broadcast, which also has a new feed design that rejects noise and interference. Convertible design and small size make it adaptable to future Ku-band use.

21. Announcement of a major new business venture: In a joint agreement with SIRA, an Italian manufacturer of broadcast products, Shively Labs will come to NAB with a new line of high and low power TV antennas, to be distributed through Shively's U.S. network. The antennas, under the trade name Shively-Sira, will be manufactured primarily in Milan, Italy, but some components will be made in Shively's Maine facilities. BMS will premiere a new gyro-controlled antenna system for helicopters, the GCA-1. The 16 dB directional antenna is mounted in a radome on the belly of the helicopter along with a frequency agile transmitter and receiver. It is controlled by gyro placed on the belly of helicopter, allowing the copter to do 360-degree turns and banks without losing signal. Once at news location, antenna is directed to receive device; copter can then move independently and antenna will always face receive device. Entire system weighs less than 35 pounds.

22. Harris has newly developed, for its AM stereo system, a 28-pin IC demodulator suitable for a car radio, with IF listed at 100 kHz to 1 MHz. Unit has dual-bandwidth PLL, automatic synchronous/envelope switching, and automatic stereo/mono switching.

23. Colorgraphics' complete television computer system will make its first NAB appearance, with Colorgraphics' computer weather systems interfaced with Integrated Technologies' news computers. The company will introduce a framestore with a video digitizer in conjunction with an automated sports scoreboard including animation. This configuration allows on-air manipulation of scores and animated efx, with the computer generating information with any font required, any animation required and any combination of these functions.

24. In battery and power, watch for Anton/Bauer to show a new line of stepped charging systems called "Lifesaver"; the three-step charge methods include charging, equalizing, then low level charging. Company has also totally redesigned all chargers with switching regulated power supplies for use anywhere from Japan to Europe. A new remote camera controller supplies all controls through three-connector mic cable from 1000 feet. Remote unit uses only 50 mA of power, not enough to affect the camera operation.

25. From Matthews Studio Equipment, a sky-high remote control camera system will be fitted onto the end of the Tulip crane for a bird's-eye view of the convention floor without leaving the ground.

26. Leader Instruments will introduce Model LBO-51MV x/y display, basically a vectorscope that hooks to the chroma output of a monitor that allows operation with an external graticule, rather than buying a whole new scope. Intended as a replacement for the Tektronix 602 vectorscope, it lists for $995. Leader Instruments also will have a version of an A-model vectorscope to be shown with a standard graticule.

27. *BM/E*'s editors will provide the most comprehensive coverage of the show, bar none. Watch in March for the NAB Show Issue with listings of every manufacturer and full program information, plus an in-depth analysis of the show. In Las Vegas, look for your copy of the Survival Guide—*BM/E*'s guide to the city plus detailed exhibit floor maps. Then in June, don't miss our Show-in-Print coverage of NAB '83, with detailed reports on every new product development! **BM/E**

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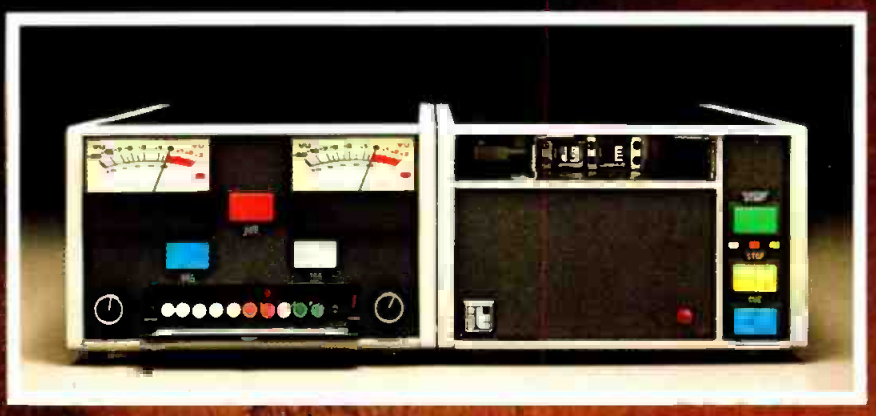

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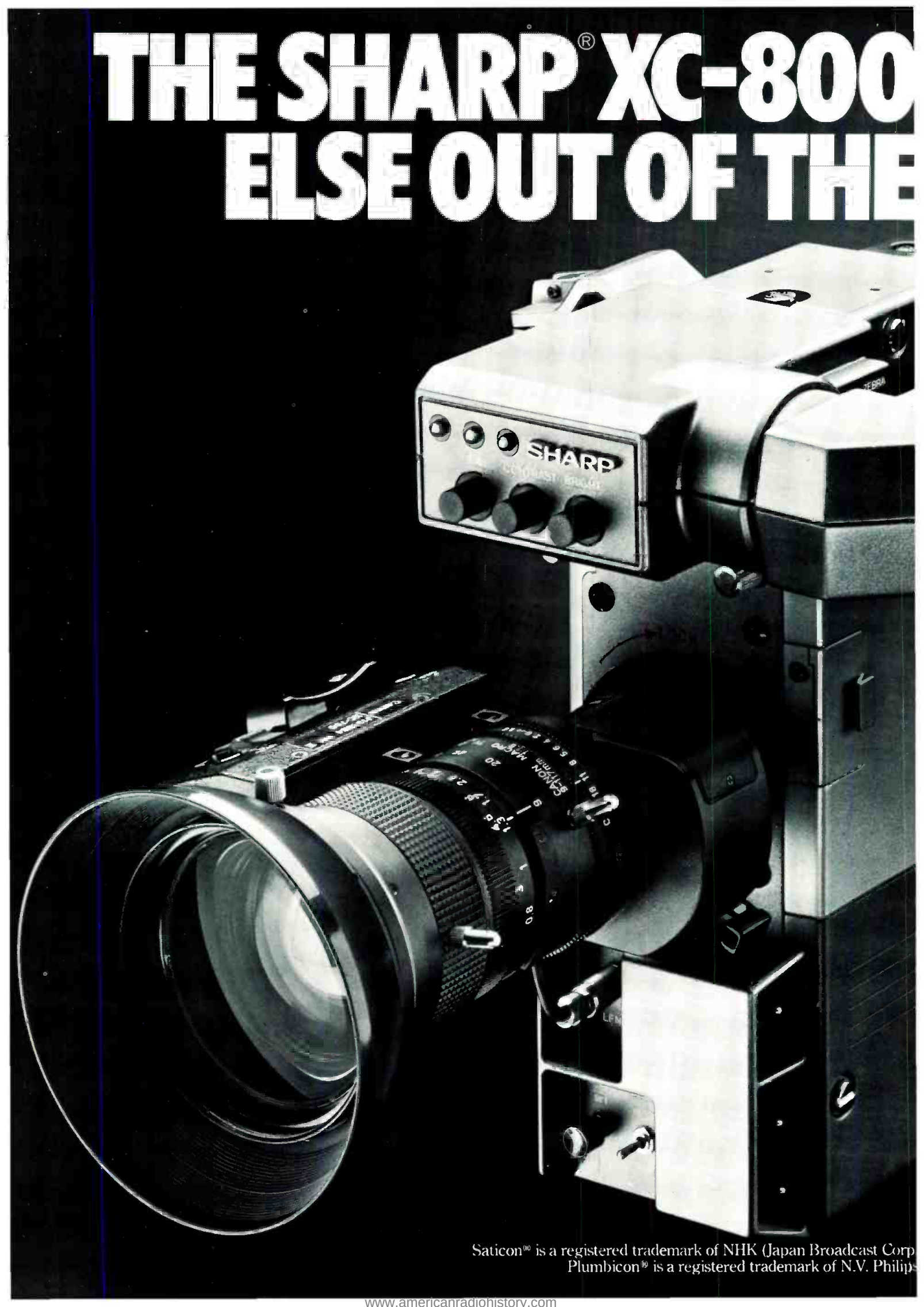

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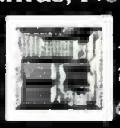

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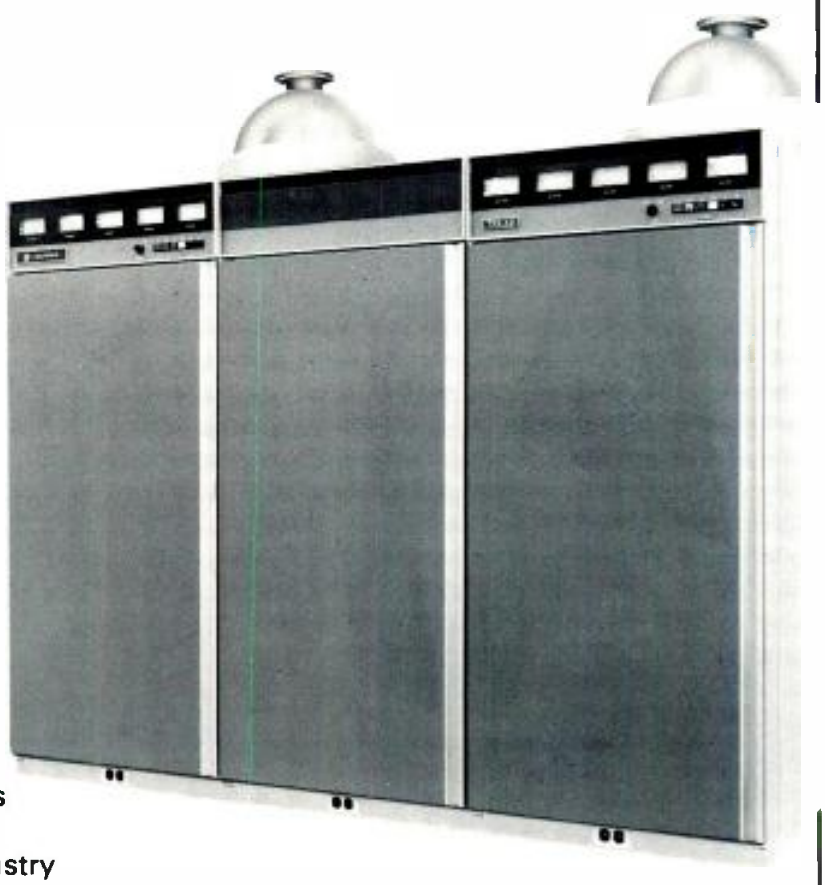

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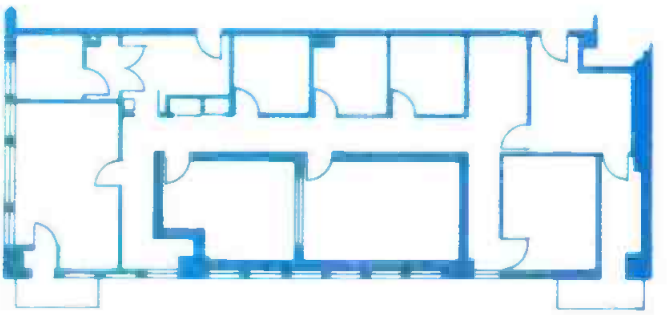
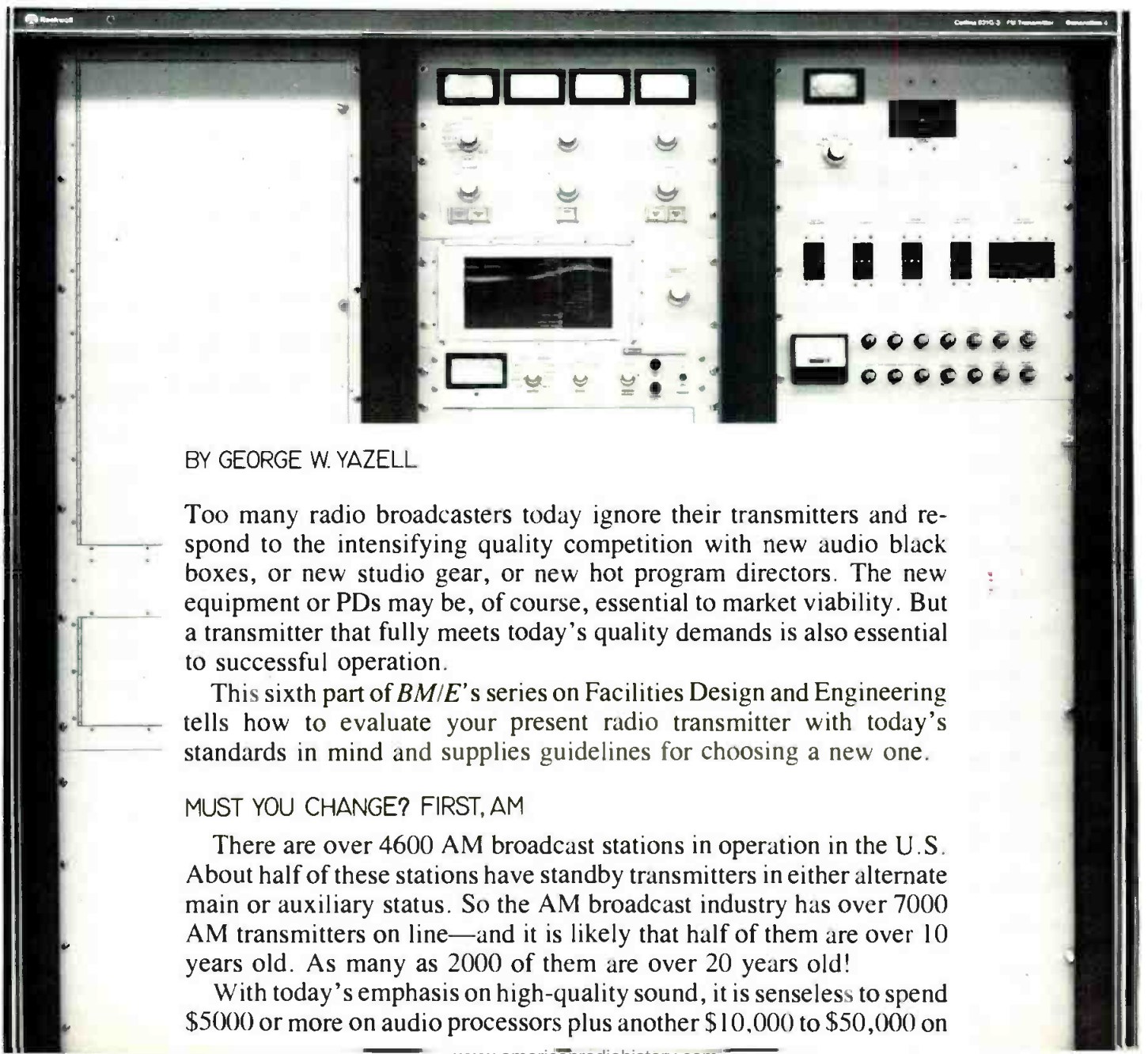


CHOOSING A RADIO TRANSMITTER



BY GEORGE W. YAZELL

Too many radio broadcasters today ignore their transmitters and respond to the intensifying quality competition with new audio black boxes, or new studio gear, or new hot program directors. The new equipment or PDs may be, of course, essential to market viability. But a transmitter that fully meets today's quality demands is also essential to successful operation.

This sixth part of *BM/E*'s series on Facilities Design and Engineering tells how to evaluate your present radio transmitter with today's standards in mind and supplies guidelines for choosing a new one.

MUST YOU CHANGE? FIRST, AM

There are over 4600 AM broadcast stations in operation in the U.S. About half of these stations have standby transmitters in either alternate main or auxiliary status. So the AM broadcast industry has over 7000 AM transmitters on line—and it is likely that half of them are over 10 years old. As many as 2000 of them are over 20 years old!

With today's emphasis on high-quality sound, it is senseless to spend $5000 or more on audio processors plus another $10,000 to $50,000 on

studio technical equipment and to try to squeeze state-of-the-art audio through an aging transmitter. Who is responsible for this technical mismatch?

The leading culprit is the FCC. AM equipment performance specifications have changed little in the last 50 years. AM audio proof-of-performance measurements are still required on only six sine-wave audio frequencies, and then only from the "main microphone terminals to the antenna." These measurements ignore the very real possibility of distortion, noise, and weird frequency response in turntables, tape recorders, automation systems, networks, and all other program sources. Nor are we required to determine the effects on the transmitted signal of a narrow pass band in the antenna system.

In other words, when we get through the FCC's proof-of-performance measurement for AM systems we have no idea how our transmitter and other system components will behave when required to handle the actual material we are going to put on the air, which never consists of pure sine waves.

Equipment manufacturers must accept some of the responsibility as well. Over the past 35 years the FM transmitter market has grown from nothing to almost 5000 stations today. As a result research and development efforts have gone into FM, and into audio automation, data processing, and program source handling. Therefore, FM transmitters are a far cry from the serrasoid modulators, phasitrons, and 55-percent-efficient final amplifiers of the 1940s and 1950s.

While we have new modulation systems and solid-state power amplifiers in AM transmitters, some of the early models in this crop tended to quit working at the slightest provocation. Although radio engineering departments were pleased with the improved sound, they were discouraged by the lack of reliability. The newer solid-state AM transmitters should remedy this situation. The long delay in the coming of AM stereo has also had a depressing effect on AM transmitter developments.

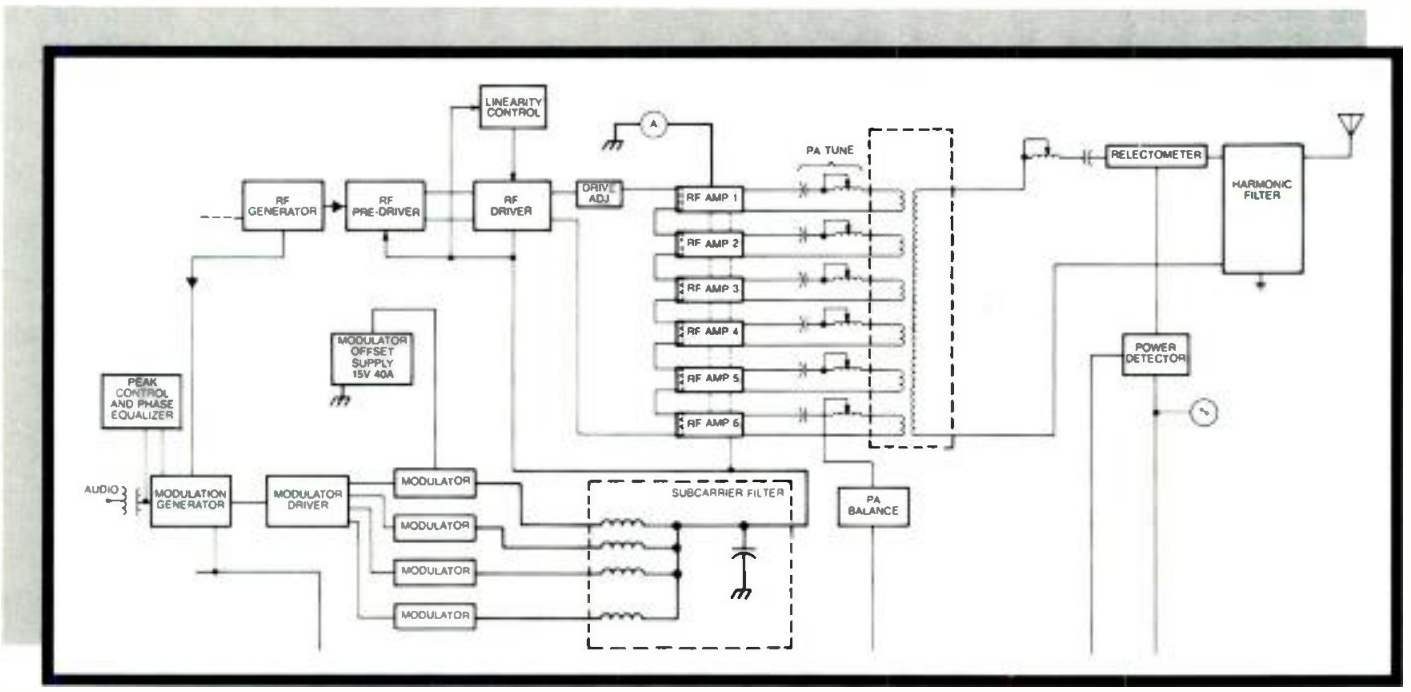
The technical staffs in some AM stations have developed something like affection for the 20-year-old transmitter they have kept in like-new condition for so long. The station manager and the chief engineer must examine their old AM transmitter carefully, to find out if it is penalizing the station in today's competitive radio market. Most of these station executives are aware that the great switch to FM is predicated largely on one thing—better sound quality. But they cannot rate their own sound by listening on earphones plugged into the console, or even by listening to the output of the modulation monitor.

Instead they must take a decent radio receiver, with an excellent speaker—not a small portable or table model—a few miles away and tune in the station. The volume should be comfortably loud and careful listening should go on for an hour or so. The tone controls should be set in midrange; they should not be used to correct response in lows or highs.

Are there any harsh, raspy, or irritating sounds when tuning through the station's signal? Is there any rough or muddled quality in extended music passages? Do the listeners become uneasy after awhile with the sound, even though it seems good at first, the sign of excessive harmonic distortion? These effects will come through even on small portables and table models, leading to "ear fatigue" and lost listeners.

If the station's sound can be enjoyed every minute of a full hour, then the old transmitter is performing well. But if the manager or chief engineer has any reservations about the sound, then the CE should run a few checks to see if the transmitter is at fault—the trouble could start in studio equipment, of course.

It is important to note that many older plate-modulated AM transmitters may meet the usual specifications rea-



Block diagram of RCA BTA-5SS, 5-kilowatt AM transmitter which is solid state throughout, shows paralleling of modulator and amplifier stages, an aid to reliability. Pulse linear modulation also aids reliability as well as providing low distortion.

George W. Yazell, for many years a consulting engineer based in Sherman, IL, is currently Chief Engineer of WSHE-WSRF, Fort Lauderdale, FL.

sonably well, but will sound terrible if called on to handle the densely modulated signals produced in the current loudness war. The modulator stages, including the modulation transformers, were not designed for such unflagging power levels. There are newer plate-modulation systems that perform very well, however, and could fill today's needs adequately.

Tone-burst testing will give a line on the modulator performance and on other important aspects of the transmitter's behavior. The transmitter must be stressed in a way not possible with continuous signals. In fact, it is positively dangerous to send a continuous signal, at high modulation levels, below about 200 Hz in frequency, through many older transmitters.

Start with about 10 cycles of 100 Hz signal, with a duty cycle of about 50 percent. There should be no processing of any kind in the circuit. As modulation goes up, watch on your scope for severe tilt or ringing, signs of trouble that will be audible.

Run up the frequency scale. Near the high end (10 kHz) watch for overshoot. At a middle frequency intentionally overmodulate. What happens to the positive envelope between 95 percent and 120 percent modulation? Clipping should be symmetrical—asymetrical clipping and ringing are more signs that the modulator stage is misbehaving. At 110 percent positive there should be, of course, no clipping at all.

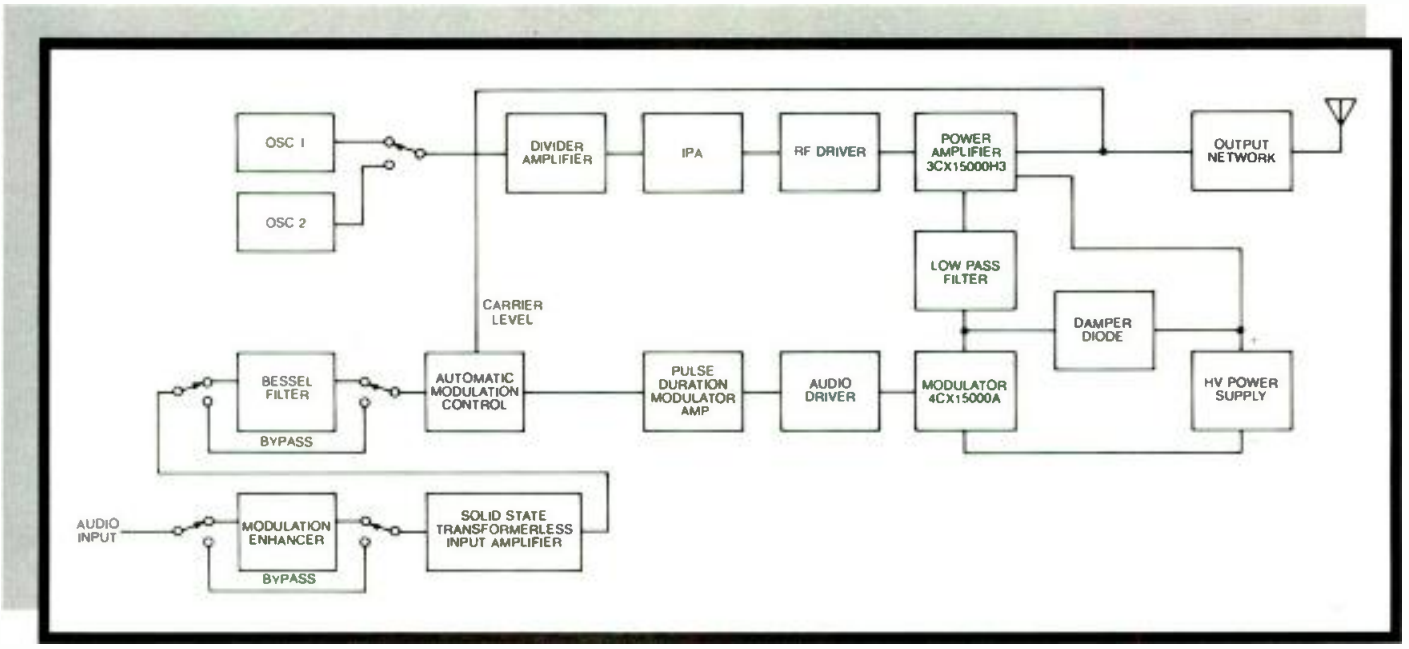
Shut down the carrier at 100 percent modulation. The signal should fall cleanly without spikes or glitches. Sweep the frequency and the duty cycle moderately, and watch for what happens during the off parts of the cycle. Echoes or other substantial signals running through the off period usually mean modulator parasitics—more audible trouble.

The tone burst sweep obviously supplies a frequency response check. It should be smooth at least from 50 Hz to 10 kHz or 12 kHz, and fall-off outside the band should be smooth, again without spikes.

It is important to determine whether or not the impedance of the power company's supply circuit is causing trouble. Monitor the supply voltage during the tests—does the voltage go up and down with modulation? If the problem is a feed over a long line from the power company's final transformer, the solution could be getting your own transformer, right next to the transmitter.

Square-wave testing can be used for many of the same purposes, and also gives a quick view of frequency response at both ends of the spectrum. However, the square wave is much like the regular densely modulated signals and cannot be used at very high modulation levels, at low frequencies.

Checks for harmonic and intermodulation distortion, which have become important because of their acknowledged roles in listener fatigue, have depended largely on readings taken directly from the monitoring equipment. However, the current quality standards have dropped acceptable distortion limits below the distortion in the monitors themselves, in the case of many older monitors. So you need some line on the monitor distortion before you read transmitter distortion. For AM transmitters, figures above about one or two percent are today cause for distress. There are, of course, many misadjustments or minor failures that can raise distortion readings, and the possibility of a simple fix should be explored. But if you decide the transmitter has inherently high distortion, you have added prime weight to the decision to change.



Model MW-10A, Harris 10-kilowatt AM transmitter, uses pulse duration modulation, another current design avoiding faults of the older plate modulation systems. Harris new solid stat units, up to 5 kW, also use the new modulation system.

There is another class of reasons which may be decisive for retirement of the old transmitter. Are spare parts very expensive or nonexistent? (This applies especially to very old tube types.) Is frequent down-time costing a lot of money? Are the power bills heavy, so that the higher efficiency of a new model makes replacement cost-effective?

CHECKING OUT FM

Transmitters for FM are of course much younger, as a class, than the AM transmitters. But if an FM transmitter is more than eight or ten years old, the engineering staff

Performance advantages beyond specifications and statistics.

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Fujinon's new P17x16.5ESM outperforms the competition with better color focus tracking, better corner registration, lower distortion and better MTF. And it maintains the Fujinon tradition of high speed (to help you keep your light levels reasonable) with excellent ramping characteristics. You can maintain the F2.1 maximum aperture from 16.5mm out to 218mm.

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(X1.5)	24.8 to 420
(X2.0)	33.0 to 560

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With all its performance advantages, you'd expect Fujinon's new P17x16.5ESM to cost a lot more than the competition. Unfortunately for the competition, it costs the same. And for 1-inch format, the new R17x12.5 offers equal performance and value advantages. For more information, talk to your Fujinon representative or contact:

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Fujinon's New 17x16.5*

*F & F Productions took the 17X outside and down to Guayaquil, Ecuador for its 14-camera coverage of the 4th World Swimming & Diving Championship. George Orgera (F & F vice president and general manager) picked the 17X because "We knew it would deliver the performance we needed under lighting we couldn't control. Then again, the only lenses we use are Fujinon."

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should consider a careful check. Updating an FM transmitter can be carried out in many cases with one of the new, very-high-grade exciters or stereo generators, or a combination.

Again, an hour's over-the-air ear check is the first move. The manager will note any growing unpleasantness in the sound. The chief engineer can rate the high and low frequency performance—no boom, no tinny quality, bass instruments separately audible. Announcers' voices should be extremely natural.

How does the station sound in comparison with other FM stations in the market? If some other station sounds "louder," has that management sacrificed clarity and pleasantness to get the high modulation?

Checking an FM transmitter is different from checking an AM transmitter in important respects. Since the quality depends heavily on the stereo generator and exciter, checking these systems on the bench will be very significant for the transmitter as a whole. (By the same token, as already noted, substantial upgrading can often be achieved by replacing the generator or exciter or both.)

The bench checks should be for left and right frequency response—with current equipment, wideband performance, really flat 50 Hz to 15 kHz, can be expected. If the frequency response of either unit is substantially below this standard, there is almost certain to be a serious fault or parts breakdown.

Good separation over the whole frequency band is also to be expected in modern equipment, at least 20 to 30 dB up to the top of the range. Again, performance seriously below that standard is a sign of important trouble.

Incidental or synchronous AM noise is one of the most sensitive checks of overall performance in an FM transmitter. This is noise that rises with the signal. To check the transmitter as a whole, one good way is to inject a wideband signal, something like pink noise, and read the AM noise in the signal as delivered to the antenna transmission line. However, the pickup of the sample in the coax line should be by directional coupler, responding only to outgoing RF, if there is any source of RF interference in the area. The extraneous RF, going back down the transmission line, may seriously foul up the test readings.

High incidental AM noise can be produced by many transmitter misadjustments and faults: the tuning of RF stages, the condition of power tubes, and so forth. A reading for the AM noise is given by some FM monitors; the quality of the monitor itself is important in making the reading valid.

If the FM transmitter fails to pass the ear check the station management may want to drive to another city, listen for an FM sound that is pleasing, and then ask the management of that station how they do it. Alternatively the engineering staff, following up on the technical checks, may pinpoint the sound trouble on some misadjustment or parts failure.

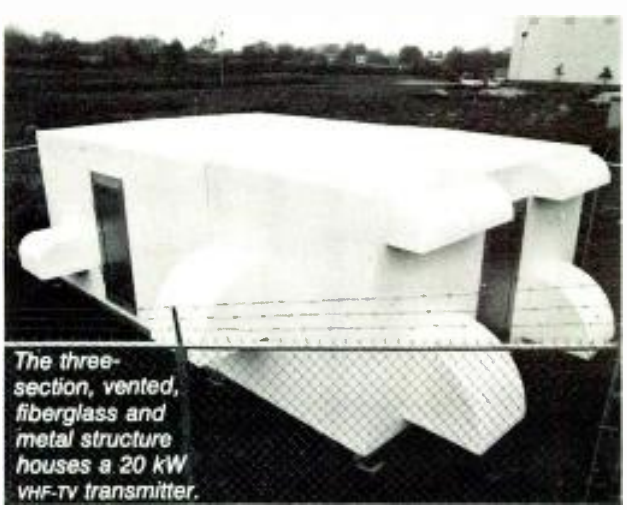
CHOOSING THE TRANSMITTER. AM OR FM

The questions are much the same whether the station is replacing an old transmitter or buying one for a new plant. How can the broadcaster get assurances that the new transmitter he is considering will truly lift his signal quality to the level he wants?

A first screening consists of talking to other broadcasters who are using the transmitter. Then it is desirable to make an arrangement for your own checks on the transmitter in the manufacturer's plant. If there is a problem

Preassembled Transmitter/Building Makes Site Construction Simpler

Alternative and unusual ways of solving the problems of transmission facility design are always evolving. In November 1982, Acrodyne Industries shipped a completely assembled 20 kw VHF TV transmitter system to Lebanon for the Christian Broadcasting Network. The project involved the shipment of one of the largest transmitter systems to be preassembled and shipped in place in a self-contained transmitter building.



The three-section, vented, fiberglass and metal structure houses a 20 kW VHF-TV transmitter.

The transmitter housing consists of three eight by 16-foot structures bolted together to form one 16 by 24-foot building. The subcontracted structures were shipped in three sections to Acrodyne's Pennsylvania headquarters, where the transmitter system was installed and tested.

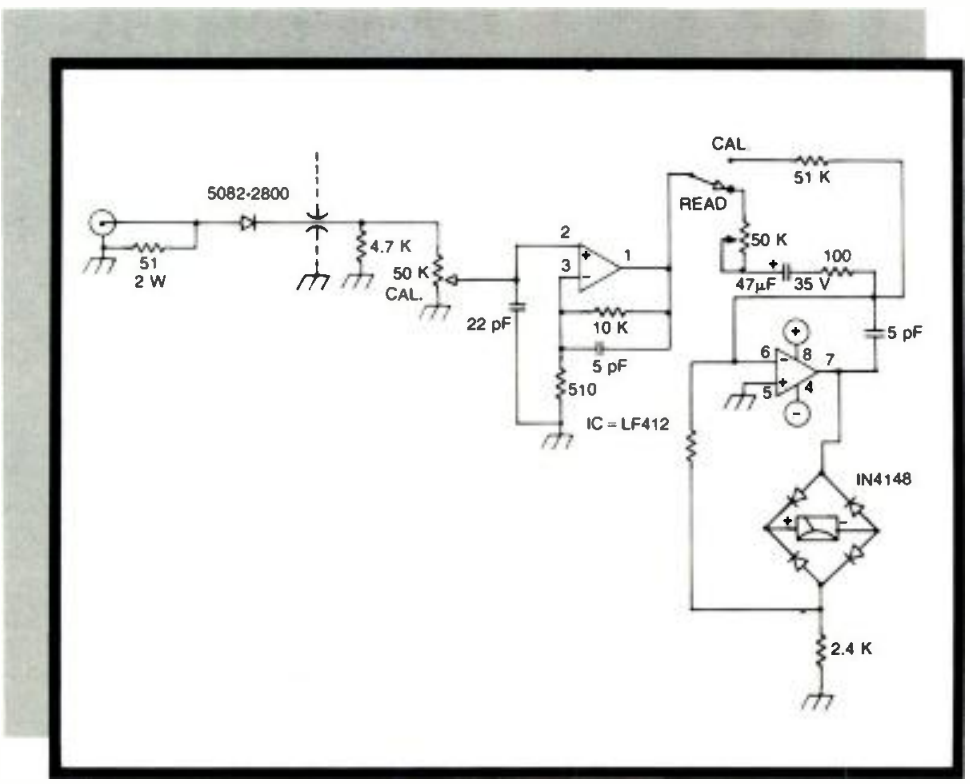
The system includes two Model TT-3500VH transmitters, which operate in a parallel configuration to produce 20 kW. All microwave equipment required to feed the transmitters as well as a complete remote control package is also housed within the temperature controlled building.

The preassembled transmitter system is expected to save engineering site and studies costs, as well as travel and consultation expenses, since all technical parameters are taken into consideration while the building is designed and tested at the United States location. Once the structures are assembled at the new site, final tests are run, and the system is then supplied with power.

Power is supplied by ac on the site, but part of the package is UPS—Uninterrupted Power Source, a set of massive batteries used at night to support the remote control and microwave equipment until the power comes on again in the morning.

and the maker says, "we will fix that," get the specifics written into your purchase order.

Before you actually buy, it is valuable to get competitive bids on comparable transmitters from other manufacturers. When you do buy, get in writing a guarantee that the transmitter is type accepted, and that spare parts and service will be available for a good long period, unless the manufacturer is one you are sure will be there indefinitely. And get any other important promises the salesman made in writing too.



System developed by Modulation Sciences, Inc. for measuring synchronous AM noise in an FM signal uses a calibration setting to adjust to RF level, followed by AM noise reading.

Find out how the manufacturer's own specs were established. Were the tests made into a dummy load? What happens when the transmitter feeds an antenna load? Get a guarantee that the transmitter will meet the specs when feeding a specified antenna system.

A consultant can help in getting the transmitter installed. Many stations lack technical staff capable of making a new transmitter installation. As an alternative to the consultant you can use the turnkey service of the manufacturer in most cases. However, make sure that the installers give the station staff training in the adjustment and maintenance of the transmitter.

Getting the transmitter into the plant, providing power, and handling the heat it generates are the main factors in installation. Connecting the transmitter input to the studios and the transmitter output to the antenna will be described in later articles in this series.

SOME INSTALLATION GUIDELINES

Some of the preparations that seem quite obvious are overlooked again and again. The floor must be checked by a building expert to make sure it will hold the transmitter weight with a good margin. Are the doorways and halls on the way to the transmitter room wide enough to get the transmitter through? Can a truck carrying the transmitter be moved up close to the building door?

Advance planning of the power supply is also sometimes neglected. The local power company should be advised of the power characteristics that will be needed as soon as the transmitter has been chosen, so that the proper phase and voltage will be incorporated in the power supply before the transmitter is delivered. If the power company cannot meet the requirements or makes a heavy extra charge, the station management may want to ask the transmitter manufacturer to change to power characteristics that can be handled.

A transmitter needs full access all around. The space assigned should take into account the swing of the open cabinet doors. The space should also accommodate a large work bench and storage of tools and spare parts.

Preparing to handle the transmitter heat is a top part of the installation job. Although the transmitter can stand more heat than people can, it still must be air-conditioned in the summer to keep internal temperatures below dangerous levels. The manufacturer will supply maximum temperature ratings and will be helpful in suggesting the characteristics of the cooling system needed. The system must not simply recirculate the air in the room, but must dump the heat outside.

In winter you may want to use the transmitter heat to help make the building comfortable. A number of systems are available that take the heat outside in the summer and send it through the building in the winter.

All air brought into the transmitter room by the cooling system or in any other way must be thoroughly filtered to remove the dust and dirt it carries. Dirt in the air is a great enemy of transmitter reliability.

DO NOT FORGET RF CONTROL

The electrical installation must take account of the RF problem, a prevalent side effect of improper transmitter installation. The consulting engineer or the transmitter manufacturer can specify grounding, bypassing and shielding techniques that reduce the radiation of RF to other parts of the plant. If the transmitter installation follows good practice in this respect, and if the antenna towers are at least 100 feet from the studios, there will generally be no serious problem with RF interference. However, if RF levels in the consoles, for example, still prove to be too high, techniques can be used to reduce them at the console.

Never forget that the transmitter is your only link with the outside. Whatever you do in the studios will stay there, unheard, unless the transmitter generates a proper carrier wave to take the programs to the audience. **BM/E**

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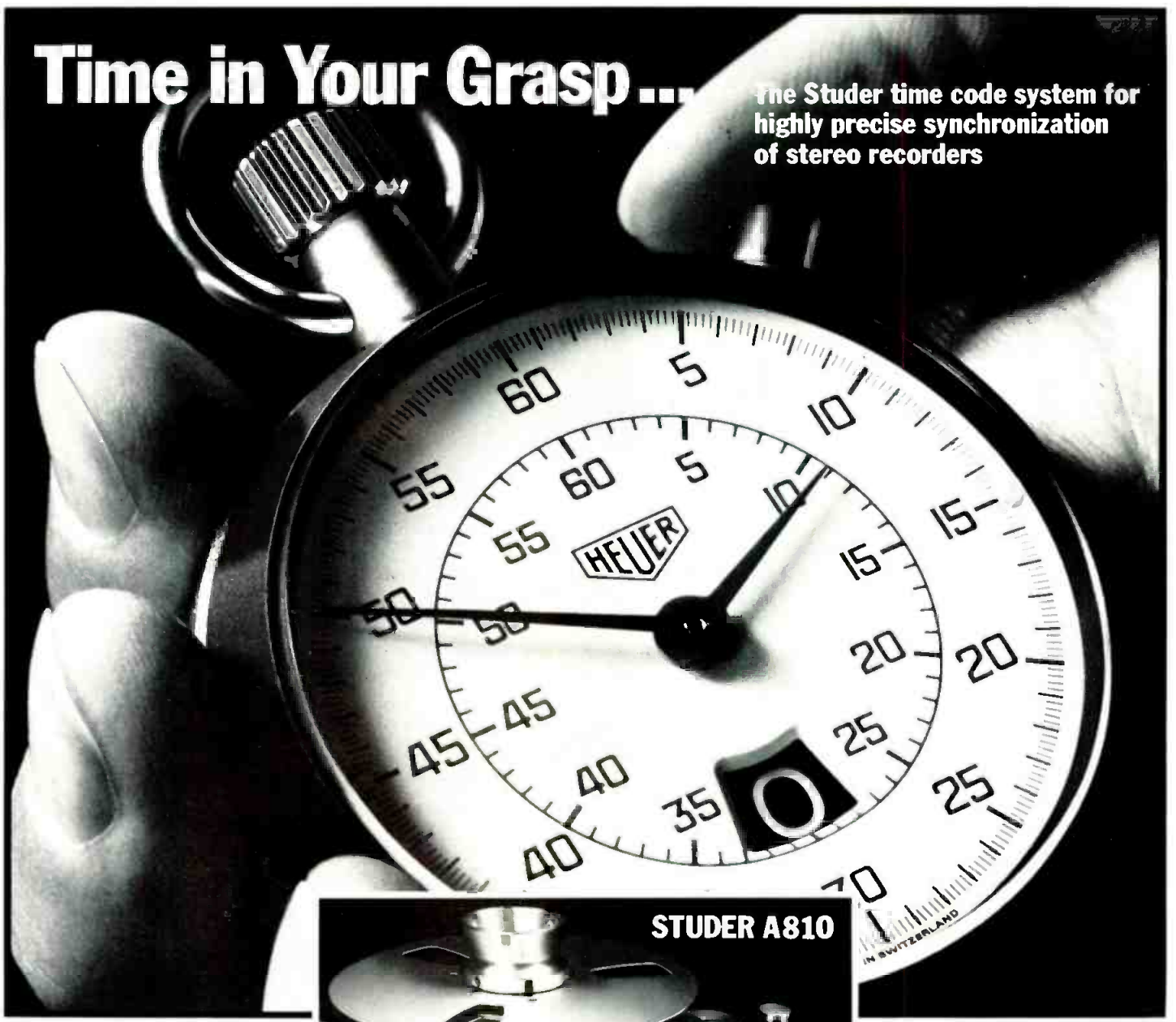

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WNBC-TV Spreads the News With New Microwave System

By Edward Knapp and Lisa Lutton

IT IS NO SECRET that EJ's lively expansion since 1974 has created some growing pains for the industry that fostered it. The transition from film to tape was the first. Then came microwave for live coverage. Now, however, due in some part to the increasing sophistication of viewers who are demanding more and better local news coverage, there is a brand-new problem: stations that acquired equipment just a few years ago when microwave first became available are now finding that it is becoming rapidly obsolete. The situation is somewhat ironic, since it is the progressive organizations, the early supporters of the new EJ technology, who find themselves with outdated equipment as the boom continues.

One such pioneer is WNBC-TV, NBC's flagship station in New York City. It is not unusual for several important news stories to break in this area every day, sometimes simultaneously. An effective central receive site for this news is therefore essential. At the time WNBC's earlier system was conceived, the Empire State Building ("Empire") was the most suitable microwave receive site in the city (indeed, it was used by at least three different stations), and it was home to the original microwave system.

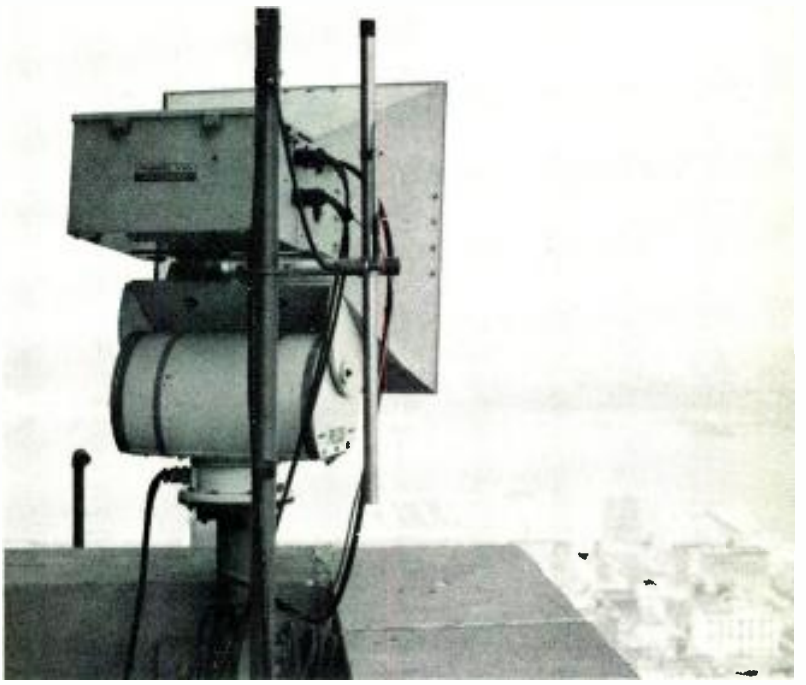
Installed on an eighty-fifth-floor perch at Empire, the old system consisted of a set of four custom-built dual-band (2 GHz and 7 GHz) horn antennas. These antennas provided, respectively, 18 dB gain at 18 degree beamwidth and 29 dB gain at 5.2 degree beamwidth. Each horn was panned and tilted to provide coverage of a 90 degree segment of the newsbeat area.

The system operated the good, old-fashioned way. As news flashed in from around the city, the on-site operator chose the antenna which would best receive the microwave signal. This flexibility allowed the operator to get maximum signal performance under many adverse conditions (and to swear a lot under others). System function was uncomplicated, since signal acquisition, in both the 2 GHz and 7 GHz bands, rested largely on choosing the appropriate antenna and polarization. The system was considered completely adequate for its day, even avant-garde. Then came the revolution.

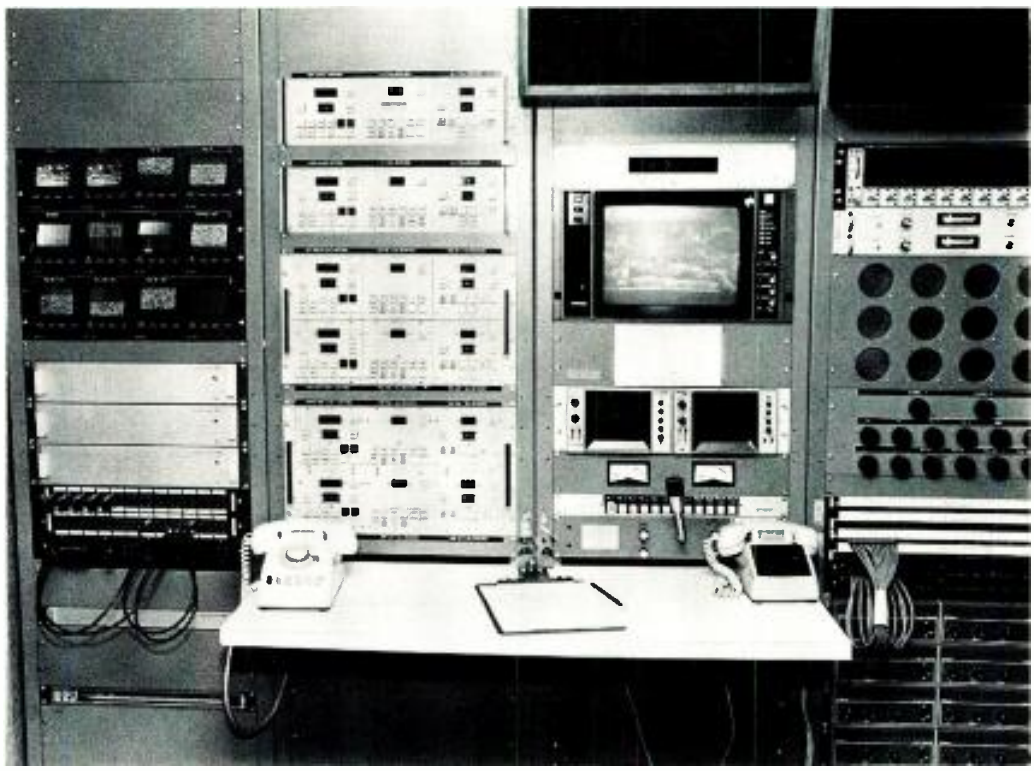
The reappraisal

WNBC-TV is located at the populous intersection of the states of New York, New Jersey, and Connecticut. This

Edward Knapp is director of station operations at WNBC-TV, New York City. **Lisa Lutton** is a technical writer with the systems engineering department of Nurad, Inc.



Above, former quad horn system, and below, new Superquad antenna on New York City's Empire State Building, center of WNBC-TV's microwave network.



Control room at WNBC-TV's headquarters in the RCA Building.

has always challenged news programming to meet the diverse community needs of three states while attempting to maintain a balance of interest for all viewers. When the WNBC-TV news division started the switch to videotape (it had used film almost exclusively before 1980), it opened the live remote broadcasting door to a horde of discerning viewers in the tristate area who were soon demanding more. With video minicams already in use, it seemed at first as if WNBC only needed to add mobile antennas and transmitters to modernize its microwave gear.

It became apparent, however, that the old receive system was becoming more and more limited. The relatively wide acceptance angle of the Empire antennas and high noise in the receivers, along with the city's "canyon" effect, were already creating intermodulation and serious reflection problems. Sensitivity and selectivity of the receivers were also inadequate. As camera crews stalked the tristate area, often 50 miles from the heart of the city, it became harder and harder to do successful live news. The old system's microwave receiving deficiencies were apparent daily. Would a patch-up solution be sufficient? Or was a major curative needed to allow WNBC to expand its news coverage?

A meeting was called at WNBC headquarters. The news division detailed the locations in the tristate area where coverage was essential. Station management met with community leaders to discuss local needs. The engineering division reviewed the available state-of-the-art microwave receiving equipment. In 1980, the three NBC groups conferred and hammered out several conclusions:

- Remote-controlled microwave relay facilities would be needed to improve EJ coverage in New Jersey and Long Island. Live feeds from proposed New Jersey and Long Island news bureaus would also be necessary.
- To provide the best line-of-sight coverage and better bounce shots, New York City microwave reception should be diversified through an additional receive site. (The RCA Building, 15 blocks uptown from the Empire State Building, was already the site of WNBC's studio, and a logical choice.)
- Empire's old equipment would have to be replaced—it was simply inadequate without extensive and costly modification.
- Whatever the configuration of the final system, it would have to be capable of coordination and remote control from a new centralized control area.

Keeping these demands in mind, WNBC/Engineering started formal discussions with organizations that could provide the hardware, the installation services, and the expertise to complete the project. It finally decided on Nurad, Inc. to do the work on a turnkey basis. After successful in-plant demonstrations of the proposed components, Nurad began installation of the new EJ system.

Some of WNBC's requirements found quicker solutions than others. Engineering surveys soon turned up two locations at public broadcasting stations which met management's criteria for the new relay tower sites. These new Warrenville, NJ, and Plainview, Long Island sites, equipped with Nurad microwave gear, were to provide better local coverage of their areas and expand coverage in Connecticut.

At the New Jersey relay site, the installation consisted of a custom-mounted, dual-band 2 and 7 GHz Nurad Superquad 45SQ3 antenna, permitting simultaneous operation in both bands (unlike the older system). It also featured two low-noise preamplifiers to overcome loss. To complement this new antenna, Nurad proposed a pair of the latest 2 and 7 GHz rack-mounted receivers to accommodate all available channels and offsets. Appropriately switched and fed to a 2.5 GHz transmitter (a virtually unknown frequency) and a 12 W power amplifier, the new equipment formed a 20-mile InterCity Relay (ICR) link from the New Jersey site's four-foot Nurad dish to an identical antenna on the roof of the RCA Building.

To improve relays from another segment of the tristate area, a Long Island relay site was also planned. Aside

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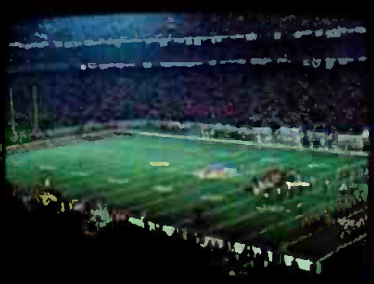

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from having a six-foot Nurad parabolic dish for the slightly longer transmission distance to the RCA Building, this site's gear was virtually identical to New Jersey's.

In addition to the equipment described above, the two sites also had in common rack-mounted color bar/tone generators with built-in ID. And each was capable of being controlled locally, or by a dedicated Nurad MC3 remote control unit back at the RCA studio. These MC3 units were actually the first step toward the control center which was to be further developed at a later stage of the station's metamorphosis.

The proposed Newark, NJ news bureau was to provide a permanent site for live feeds from the field. It was housed in a 32-story office building with a clear roof shot to the RCA Building. The microwave relay consisted of a two-foot parabolic dish and a 13 GHz transmitter on the roof of the new bureau to provide the ICR link. An equipment rack in the bureau office contained input switching of audio and video, a color bar/tone generator with built-in ID, video equalizers, and a system to control the 13 GHz roof transmitter. While the relay sites were controlled by the MC3 units, the news bureau equipment was controlled by an NBC unit at the RCA studio.

To complete improvements in the field, WNBC mobile vans were provided with Nurad 2 GHz Goldenrod transmit antennas and two-foot parabolic dish antennas (7 GHz). These lightweight antennas were attached to folding mast assemblies which allowed maximum flexibility in the field. The frequency-agile mobile transmitters were assisted by 10 W power amplifiers at both 2 and 7 GHz.

Altered reception

The above-mentioned changes clearly provided a much-needed shot in the arm for WNBC's tristate transmissions. But what of EJ reception in the city? To diversify reception and bring WNBC gear up to the state of the art, four dual-band (2 and 7 GHz) Superquad antennas were installed, two at Empire and two at the RCA Building. These high gain (25/37 dB), narrow beamwidth (8/2.5 degree HPBW) antennas would feature CSC^2 (consecant squared) elevation beam shaping and offset feed to eliminate the need for elevation tilting and reduce sidelobes. Identical to the Superquads installed at the relay sites, the new quad-polarized antennas promised higher performance with less interference and multipath problems.

To maintain service and minimize downtime, the four old Empire horns had to be replaced in careful sequence, with no more than one antenna off the air at any time. The installation schedule took on an added note of challenge when WNBC found itself working under a New York City Landmark Preservation Committee deadline. The Empire State Building was slated for a new historical status. Any significant alteration to its facade had to be completed by July 1, 1981. The spring of 1981 found technicians at the Empire State Building working feverishly to replace the old northwest/southeast mounted horns with custom-mounted Superquad antennas. (To further accommodate the new ruling, the antennas were also custom-painted an

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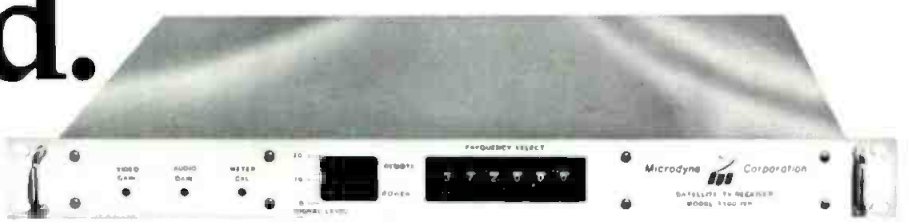

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unobtrusive grey.) The deadline was met and the two new Superquads functioned perfectly. When the two complementary northeast/southwest antennas were in place on the sixty-sixth floor of the RCA Building, and the second pair of old horns were finally removed from Empire, the installation was complete.

New control room

By the end of 1981, WNBC's proposed EJ control room was established to coordinate the wealth of new equipment in the field and in the city. At the heart of this system on the seventh floor of the RCA Building was the MC3 remote control unit, already in use for the two relay sites. The additional MC3s provided control for the new Superquad installations at Empire and RCA. These remote control units featured Z80 microprocessors and failsafe circuitry (latching relays), which could insure a constant EJ signal in the event of a power failure of a communications link.

The new central control room, along with the six new Superquad antennas, the new frequency-agile receivers, the added coverage from the relay sites and news bureau, the updated van equipment, and the diversified reception in the city all combined to give WNBC an impressive EJ potential. What practical impact could the station expect from its new system in newsgathering?

The new system was put to the test as early as the first moments of installation. Technicians at the Empire State Building had the new northwest-facing antenna in place and functioning before the old northeast horn was removed. Comparing how the two pieces of equipment received a microwave TV signal from New Jersey, they saw immediate evidence that the new gear would greatly improve reception from the field—on the old horn, no discernible signal; on the new antenna, an excellent air-quality transmission.

An additional example of the new EJ system's range of capabilities was offered last June. Millicent Fenwick, the popular 72-year-old New Jersey congresswoman, announced her candidacy for the U.S. Senate and ran in her state's June primary. Tristate viewers followed the campaign with avid interest; but reaching Fenwick's headquarters deep in New Jersey's Watchung Mountains proved something of a problem for those covering the race. Because of the distance and terrain, most local TV stations found that they had to use rented telephone lines at considerable expense. WNBC, self-sufficient with its new mobile gear and its waiting New Jersey relay tower, easily provided live coverage of the Fenwick victory.

Not all examples of the new microwave system's capabilities have been as dramatic as those given above, but WNBC has had steady evidence that its decision to upgrade was a good one. In the field and in the city, the station's daily experience has confirmed that its decision to opt for diversified reception and field coverage, centralized EJ control, and state-of-the-art microwave equipment has given it the technological capability to provide improved coverage. **BM/E**

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Measuring Antenna VSWR

By Harrison J. Klein

ONE OF THE COMMON WAYS to evaluate the performance of an FM or TV antenna is to measure its VSWR (Voltage Standing Wave Ratio) over the antenna's desired bandwidth. If it's low, or at least hasn't changed since the antenna was installed, the antenna is probably working properly.

RF engineers have traditionally used the RF sweep method to measure VSWR. It allows the VSWR of the antenna and far end transmission line components (elbows and so forth) to be determined from the ground, even if other reflected power is coming from near-end transmission line components. It has one major problem, however: it is very sensitive to interference. If, for example, an FM antenna is being measured, and there is another FM station on the air from a nearby tower, the traditional RF sweep method will most likely be useless.

This article will describe a modified RF sweep method of VSWR measurement using a spectrum analyzer and tracking generator. It is almost immune to interference, is easier to use than the old method, is probably more accurate, and can usually be performed by station personnel using rented test equipment for under $2000.

Measurement configuration

In Figure 1, a tracking generator (such as the Tektronix TR502 synchronized to its companion spectrum analyzer (such as the Tektronix 7L13) is used to generate an RF sweep across the frequency range of interest. The generator output is fed to a wideband power amplifier (such as the ENI Power Systems 440LA) to boost the RF sweep feeding the antenna above the level of any interference coming in the antenna and down the line. This prevents interference from either overloading the spectrum analyzer or confusing the displayed spectrum.

The output of the amplifier is fed via a nondirectional coupler (such as the Wideband Engineering A73M) to a reducer at the transmission line input. The coupler is similar to an audio bridging transformer; it provides an RF voltage sample which is 30 dB below the actual voltage in the line at that point. The coupler samples the total RF voltage, which is the sum of forward and reflected waves. If the transmission line is short (see below), an extra coil of line would be inserted between coupler and reducer.

The coupler tap is fed to the input of the spectrum analyzer for analysis. A frequency counter connected to the auxiliary tracking generator output is used to adjust accurately the center frequency of the spectrum analyzer.

Theory of measurement

Because the antenna is not a perfect 50 ohm load, some of the power travelling to the antenna will be reflected back down toward the amplifier. At any one frequency, the reflected wave will add or subtract with the forward wave depending on the phase relationship between the two at a particular point on the line, causing the familiar standing wave pattern (see Figure 2). VSWR is defined as $^{E}MAX/^{E}MIN$.

The standing wave pattern will change if the frequency changes. In Figure 3, assume the generator is adjusted to some frequency f, such that the forward and reflected waves are exactly in phase at the coupler. They now add, and we know we are at a maximum voltage point along the line. As the frequency is increased, its wavelength gets smaller, and the total transmission line contains a greater

Harrison Klein is director of radio engineering for Westinghouse Broadcasting and Cable, Inc.

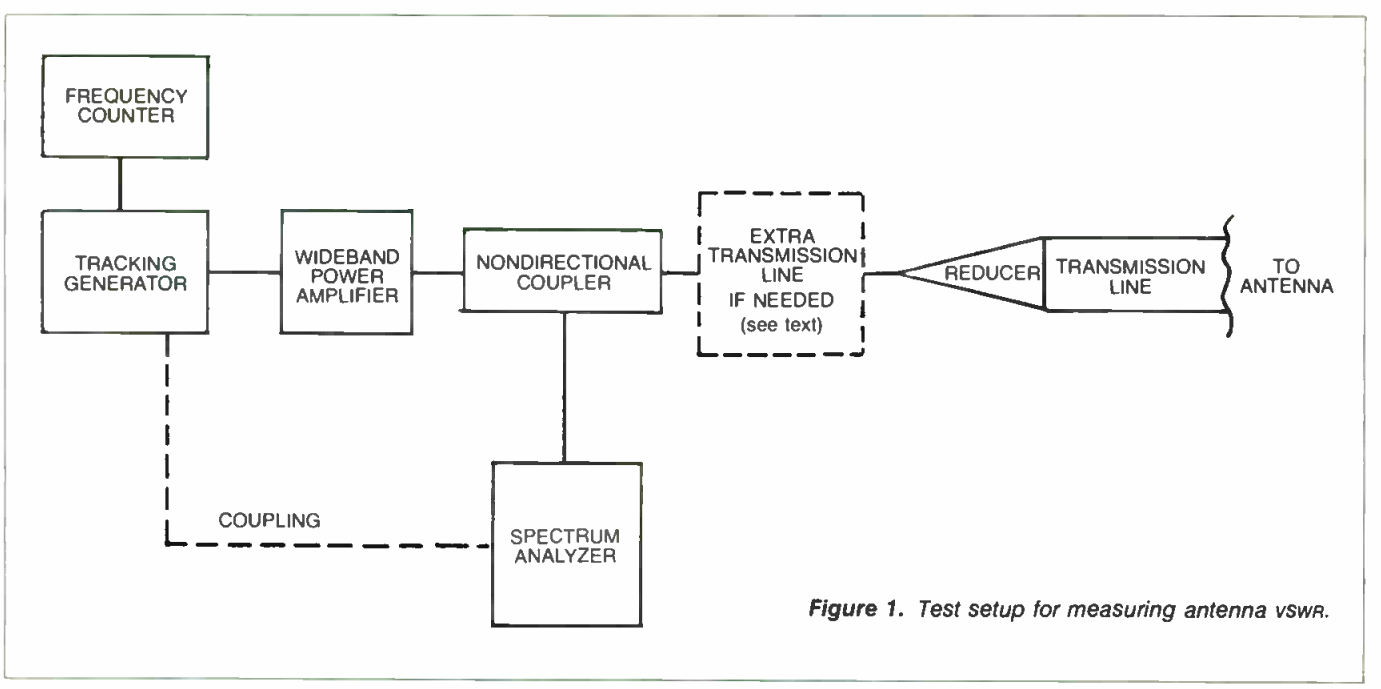


Figure 1. Test setup for measuring antenna VSWR.

number of wavelengths at the higher frequency. At some new frequency $f' = f + \Delta f$, the transmission line will be exactly ¼ wavelength, or 90 degrees, longer than it was at frequency f. This causes a 90-degree delay going up the line and a 90-degree delay going down the line, so that the reflected wave is now 180 degrees out of phase with the forward wave. They now subtract, and we know at this new frequency f′ we are at a minimum voltage point along the line.

If the frequency is swept across a wider frequency range using the tracking generator and spectrum analyzer, the analyzer will display a sine-wave-like trace as the reflected power goes in and out of phase with the forward power.

We need to be able to calculate Δf, the frequency difference between peak and dip. If the line length L is N wavelengths long at frequency f, we want the frequency f′, which increases the line length to N + ¼ wavelengths.

If $\lambda = v/f$ is the wavelength at f, and $\lambda' = v/f'$ is the wavelength at f′, where v is the propagation velocity of the line, then we know L contains N wavelengths λ, and N + ¼ wavelengths λ′. Mathematically,

$$L = N\lambda = (N + 1/4)\lambda'$$

Solving for λ′,

$$\lambda' = \frac{L}{N + 1/4} = \frac{L}{L/\lambda + 1/4}$$

Solving for f′,

$$f' = \frac{v}{\lambda'} = v\left(\frac{L/\lambda + 1/4}{L}\right) = v\left(\frac{1}{\lambda} + \frac{1}{4L}\right) =$$

$$\frac{v}{\lambda} + 1/4\,\frac{v}{L} = f + 1/4\,\frac{v}{L}$$

Figure 3. *Standing wave pattern changes in response to frequency changes.*

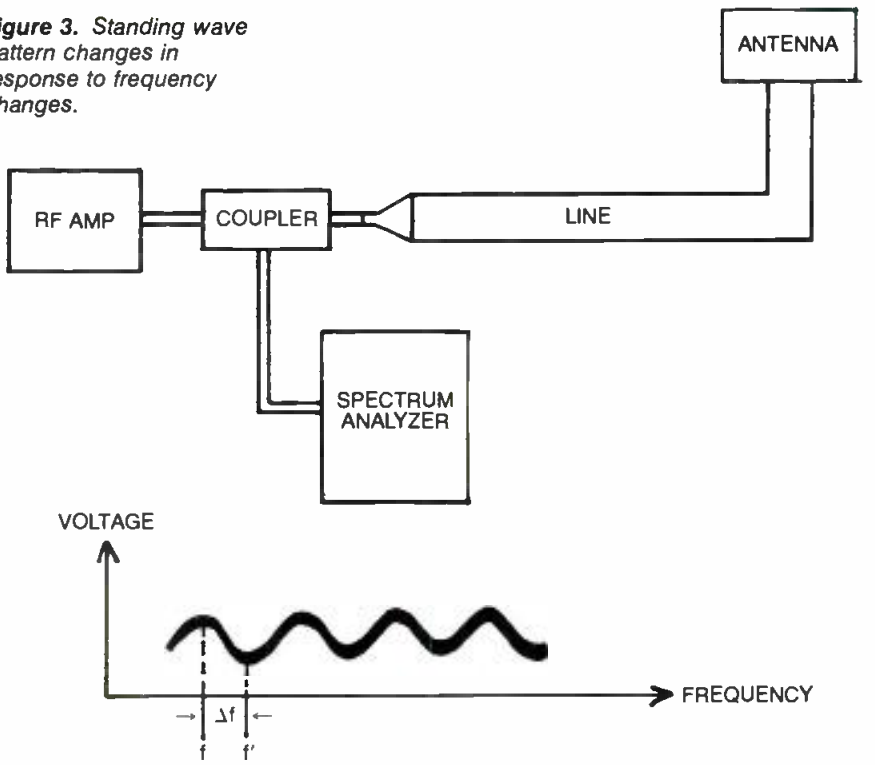
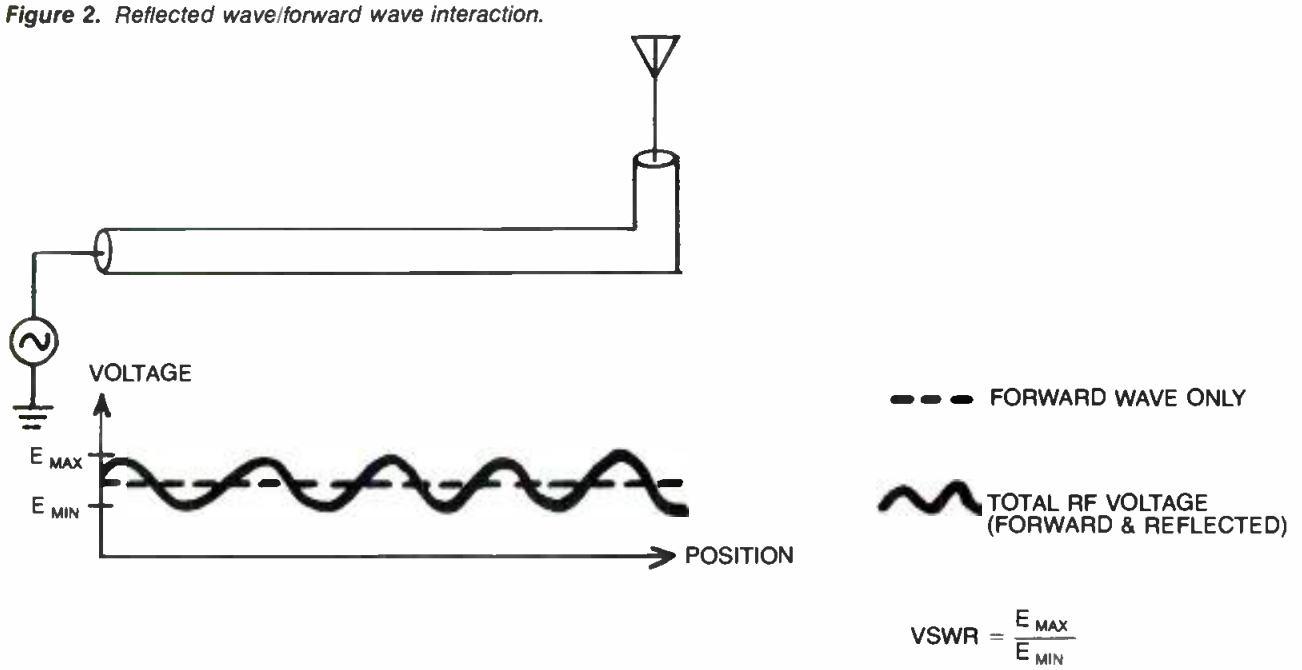
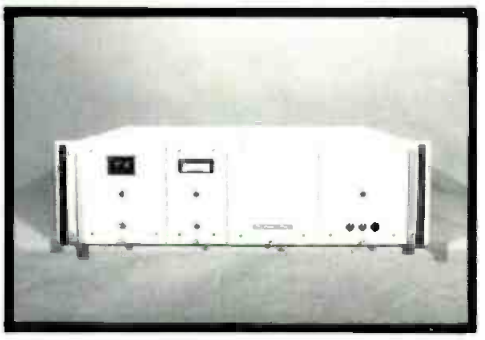


Figure 2. *Reflected wave/forward wave interaction.*



The Model 20PT1 21-channel portable transmitter



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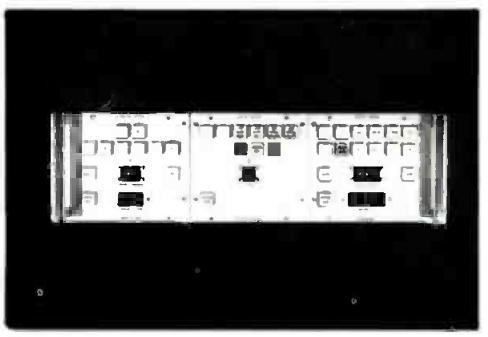

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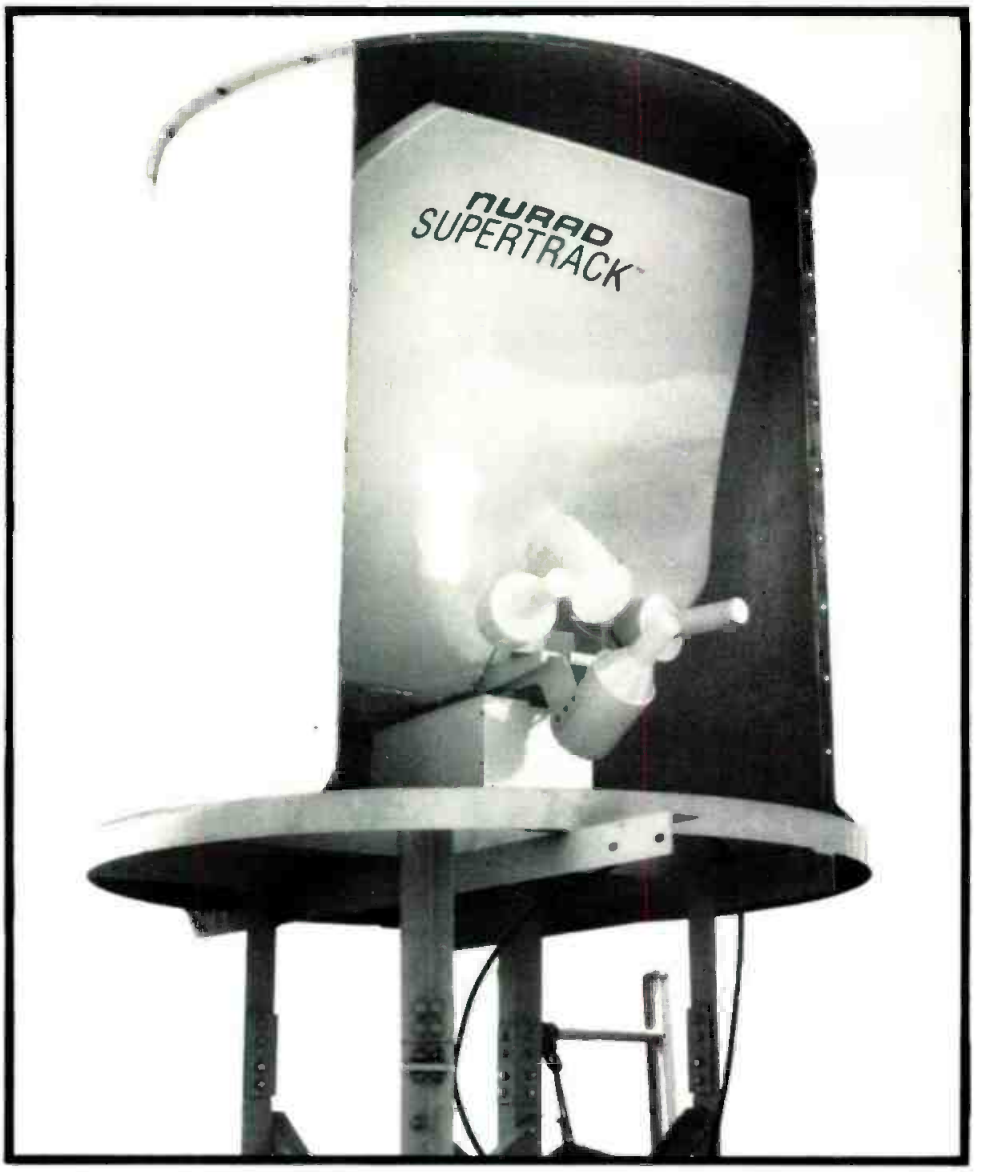

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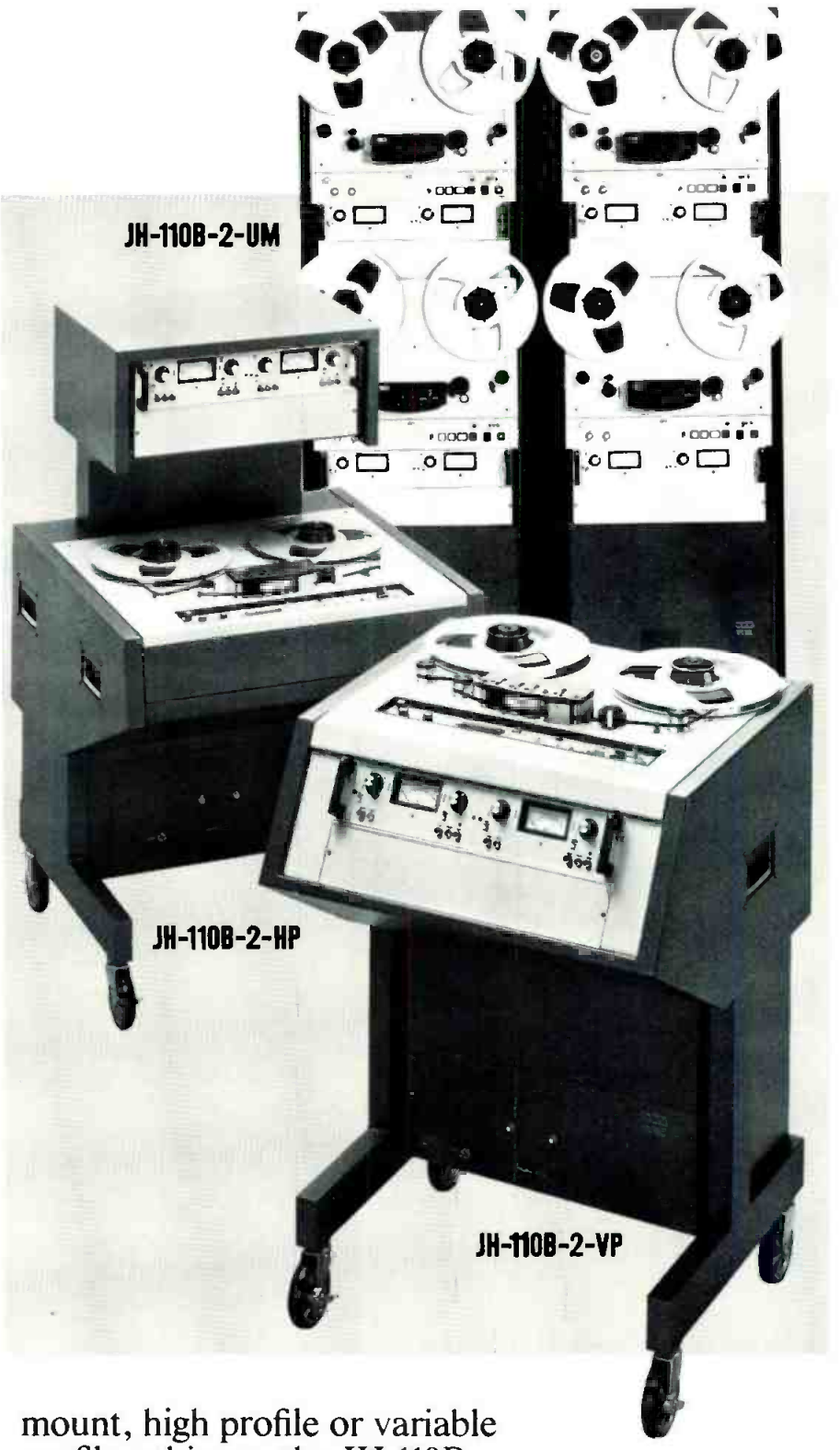

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Thus Δf, the difference between peak and dip, is ¼ v/L, and the frequency difference between peaks would be ½ v/L. For rigid air dielectric line, the frequency difference in MHz between peaks is approximately 500/L (feet). For example, if the transmission line in an antenna system is 1500 feet long, the peaks and dips caused by reflected power from the antenna would be 150 kHz apart (300 kHz between peaks).

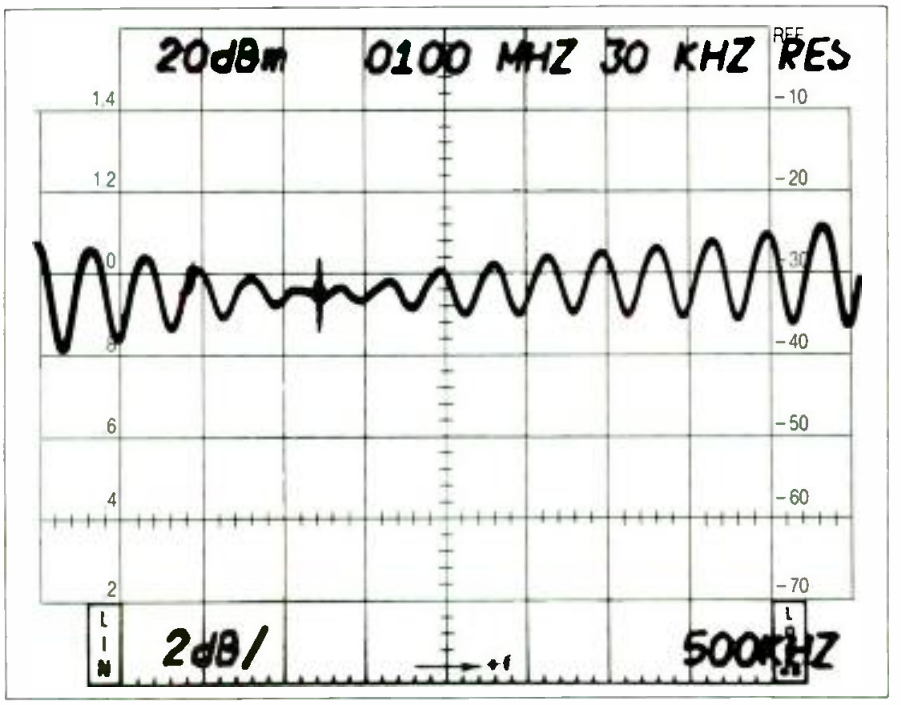

Figure 4. Typical spectrum analyzer display of VSWR test technique.

Calculation of VSWR

This information can now be used to calculate VSWR, using the basic formula VSWR = E_{MAX}/E_{MIN}. As long as the VSWR doesn't change much between f and f′ (a reasonable assumption in the example above since Δf is only 150 kHz) we can use the E_{MAX} value at f and the E_{MIN} value at f′, and calculate VSWR directly.

The spectrum analyzer makes this calculation even easier, since it reads directly in dB. We merely observe the difference in dB between a peak and an adjacent dip, and convert this dB figure into a voltage ratio which is the VSWR at that frequency. For example, a 1 dB difference is a 1.12 VSWR.

A problem can arise in the case of short towers. If the transmission line is only 100 feet long, Δf would then be 2.5 MHz. The requirement that the VSWR change little between f and f′ is not met for this wide a frequency spread. In this case, an extra coil of low power transmission line can be inserted in series with the main line to improve measurement resolution (i.e., reduce Δf). The length of line is not critical, as long as it is sufficient to give the resolution required.

Measurement example

Figure 4 shows the type of spectrum analyzer display that this technique would generate. The center frequency of the display is adjusted to exactly 100.1 MHz, using the frequency counter. The vertical display is 2 dB per division. The frequency span per horizontal division is 500 kHz.

The display indicates that the antenna's minimum VSWR is at 99.3 MHz. At this frequency, the peak and dip of the ripple are about 0.2 dB apart, so the VSWR is 1.02. The "blip" at 99.3 MHz shows the presence of an interfering signal which would have obliterated the traditional RF sweep measurement, but has no effect on the accuracy of this newer method. VSWR at other frequencies can be easily calculated. At the center frequency of 100.1 MHz, the peak and dip are about 1.1 dB apart, for a VSWR of 1.14.

The big advantage of the RF sweep method is that the frequency difference between peaks of the ripple on the spectrum analyzer (the "period" of the ripple) determines where the reflected power is coming from. In Figure 4, ripple with a period of 300 kHz must be a result of reflections from the far end of the transmission line (the antenna and associated elbows), since reflections from anything closer to the tower base would cause peaks to be spaced farther apart. Thus the RF sweep method allows the antenna VSWR to be measured from the ground, as if the line isn't there. **BM/E**

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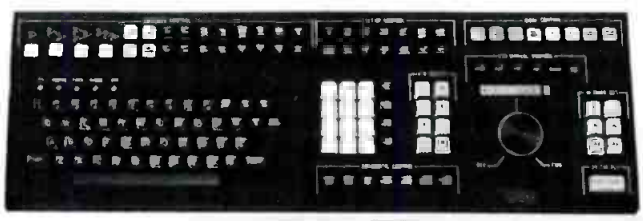

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BM/E

NEWS FEATURE

Videotex Eggs Incubating

VIDEOTEX AND TELETEXT, sometimes described as "the next electronic revolution of the century," paradoxically are at once the center of attention and surrounded by misunderstanding. Ask any person on the street about videotex, and only a tiny fraction would have any real notion of what this new service might be.

On the corporate front, however, plenty of companies are eager to get in on the ground floor of what may be a profitable and sizeable new market. One of the latest to announce a text delivery scheme is the newly formed Satellite Network Delivery Corp. (SND) of New York City, an independent company with financial backing from the Tribune Co. of Chicago. (See *BM/E*, January 1983, p. 18.)

SND plans two initial services, to be operational about a year from now. The first is Business Teletext Network (BTN), which will contract with various information providers to transmit data, text, and graphics digitally over Westar 5. (The second service, Television Satellite (T-Sat), will transmit television commercials digitally over the SND network.) A network of about 150 rented receive-only earth stations will pull the information off the satellite; final distribution will be by television broadcast stations, which will send the material over their vertical intervals to clients' television sets or computers.

Information providers will feed material to the central BTN computer, which will convert the information to page format and feed it to the SND uplink. At the local end, subscribers' TV sets will be equipped with teletext decoders. BTN will sell each of its 100 channels to an information provider, who is then responsible for attracting and servicing subscribers.

Unusual with its digital transmission plan, BTN still is only one of a number of teletext and videotex services making their debut in the U.S., either as experiments or as full-fledged systems. The FCC is expected to authorize broadcast teletext shortly, and NBC and CBS each used the eve of last summer's Videotex '82 International Conference at the New York Hilton to announce their plans to offer national teletext services.

New French company, Videographics Systems of America, has been formed to expand products and services of Antiope, Intelmatique, Videodial and others.

A national service to cable operators already exists. At the Western Cable Show in November, the Keyfax National Teletext Magazine was launched by Satellite Syndicated Services and Keycom Electronic Publishing. The magazine is the same as that developed at WFLD-TV, Chicago by Field Communications. SSS distributes the teletext signal to cable head-ends as part of the WTBS Satellite Service (which does not require FCC approval). Seventy cable operators have ordered 400 decoders so far, for delivery in March, which they will try to sell to subscribers.

Despite this intense activity, outside of the handful of viewers in Chicago, Salt Lake City, and San Francisco, 200 in Coral Gables, and only slightly more in St. Louis and Los Angeles (the sites of earlier teletext tests in the U.S.), practically no one has had any actual contact with videotex. The 1800 attendees at Videotex '82, however, were engrossed in laying out the future of the "revolution."

But precisely where the revolution is headed is unknown, even to the experts plotting it. It could take the form of an electronic newspaper, a home electronic check writer, an electronic post office, a shop-at-home terminal, an information retrieval system plugged into thousands of pages of data, or any combination of those possibilities. Practically nothing has been ruled out as yet, despite the half-billion dollars that have been invested in the concept since teletext was first announced in Britain in 1975. Interest runs high not only among broadcasters, but also among bankers, advertisers, direct-mail marketers, telcos, cable TVers, computer software vendors, and others. At Videotex '82, probably the most impressive aspect was the fact that AT&T, the new American Bell, Inc., and IBM were exhibitors. Another big name, RCA, was also making a bid for a piece of the action.

The exhibit area was certainly dominated by manufacturers from the U.K., France, Canada, and Japan, but U.S. manufacturers are now getting into the fray. Interestingly enough, the Americans are ignoring over-the-air teletext services and are concentrating instead on equipment to tie into corporate communications users and home computer hobbyists (as indicated by the business slant of the SND/BTN delivery service).

Indeed, broadcast teletext per se seems to be a very minor service of the future, despite the CBS and NBC offerings. As a matter of fact, CBS's bigger eggs are not in its teletext service,

known as Extravision, but in the interactive full-service videotex approach that is delivered via telephone lines. In the joint CBS/AT&T demonstration that began in Ridgewood, NJ this fall, both bankers and advertisers are participating.

The banking industry is a very significant force at the moment. Participating in the Videotex '82 conference were spokespersons for the First Bank System of Minneapolis, Chase Manhattan Bank, Chemical Bank, and the consulting firm, Electronic Banking USA. Along with banking, one must offer a complete financial service, an E.F. Hutton representative said.

The First Bank System is conducting a banking-information experiment for farmers in Fargo, ND using telephone wires and French Antiope equipment. First Bank feels specialized information for specialized audiences (in this case, farmers) is an essential ingredient of success. Banking and financial services offered via an interactive network are deemed a key part of the videotex mix by Knight Ridder newspapers, one of the leading investigators.

Prestel was used at Knoxville World's Fair to provide each day's scheduled events.

Big $ ride on public videotex

Despite the current interest in private networks and personal computer owners (approaching two million) reachable by telephone lines, the biggest stakes are riding with a public information-transactional service that will be appealing to TV set owners. Advertisers are convinced that shopping from the home is the wave of the future as lifestyles evolve to prize free time and eschew store shopping. Classified ads may well swing from newspapers to videotex, predicted George B. Murray, VP and director of media of Ogilvy & Mather (Canada). Murray sees teletext penetration (carried predominantly by cable) to grow from the present experiments to seven percent in 1985, 20 percent in 1990 and 30 percent in 1995. Videotex will eventually be larger than that—40 percent in 1995. Cumulative penetration of both will be 60 percent in 1995. By that time 40 percent of all classified ads may be teletext/videotex. One bullish prediction by Michael Aldrich of Rediffusion Computer Ltd. (U.K.) sees the U.S. videotex market at $9 billion in 1990. But the truly interactive capability may be less than most predict. AT&T's VP Charles Marshall told Videotex '82 attendees that only about seven percent of all American homes—one fifth of the total possible market—will have videotex by 1990.

While teletext seems to be taking off in the U.K. (450,000 sets in use in April of this year; 700,000 to be built in 1982), American acceptance on a paid basis is not a sure thing. Knight Ridder hopes to get 5000 subscribers in 1983 paying $25 a month plus the cost of the terminal. Profitability is not expected for four or five years. If results in the 1982-83 time frame are disappointing, K-R will scrub its efforts, said James Batten, Knight Ridder executive. Besides K-R, Time Inc., Times Mirror, CBS-AT&T and Keycom will all be

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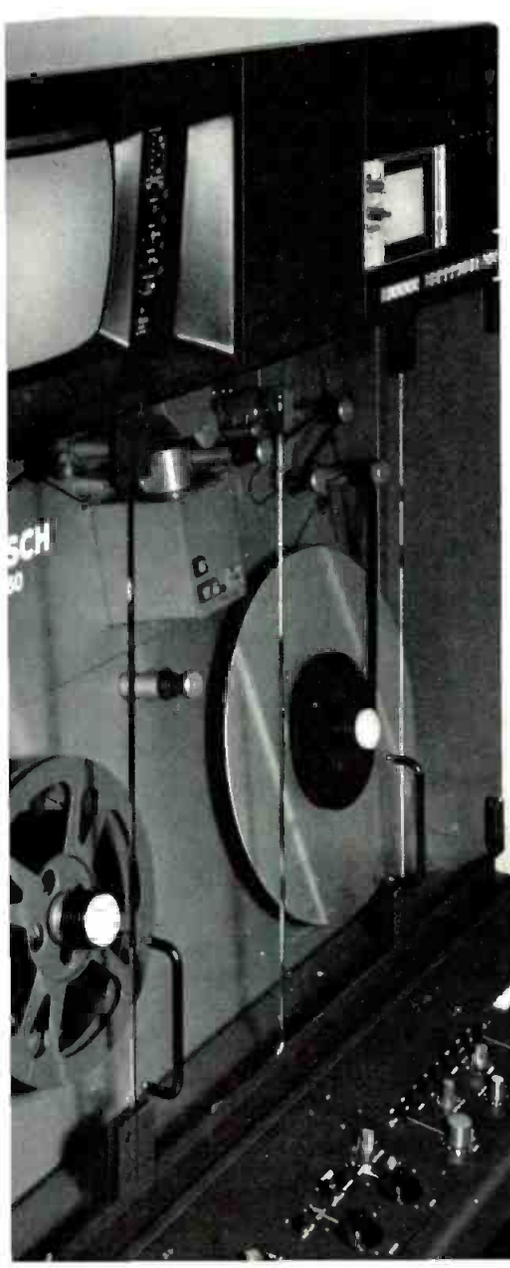

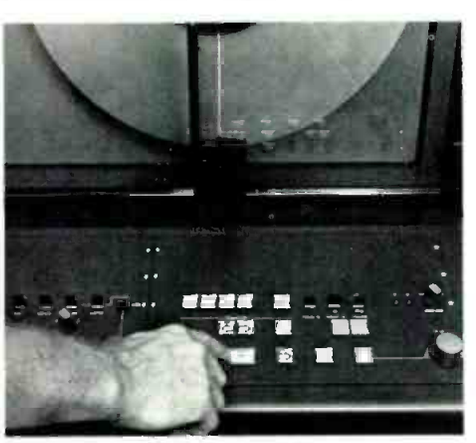

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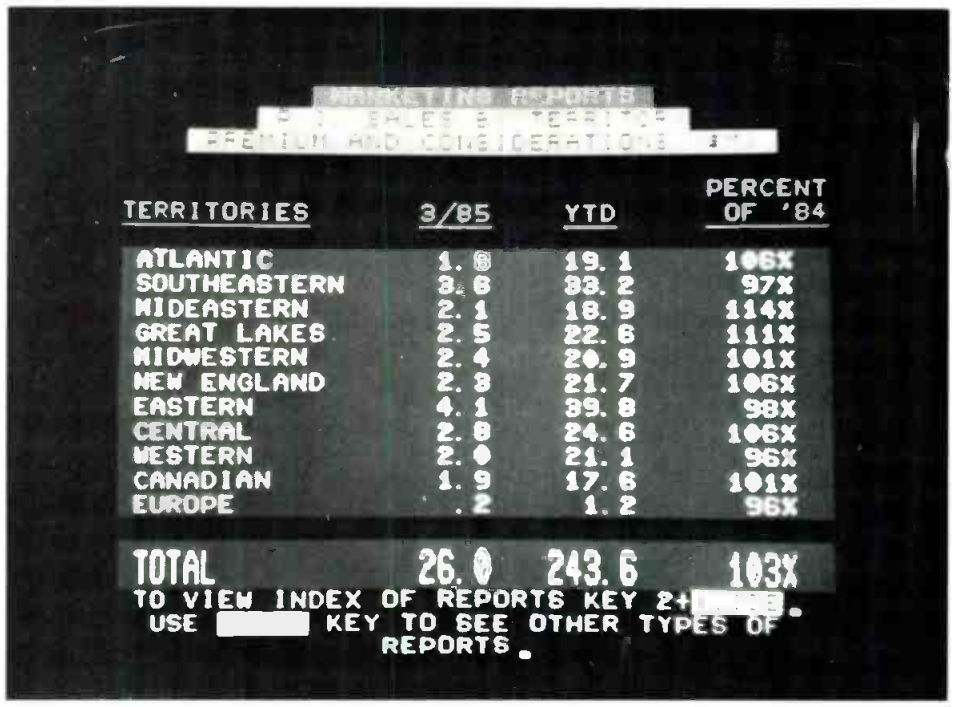
doing field tests in the next few years that will be more conclusive than those to date. Thus the final answer on what will sell won't be available until 1985.

What needs to be found out in the next 24 months is how to best present information (news, bulletin board notices, local events, food and dining, consumer information), the comparative advantages of teletext versus interactive videotex, the ability of interactive systems to handle simultaneous transactions satisfactorily, and the importance of high resolution graphics. Teletext systems are limited to about 100 pages, videotex systems over cable can offer 5000 or 10,000. Some companies, such as Time Inc., feel that cable, with its expanded capacity, is the only way to go. This is the approach taken by Cox Cable with its interactive Indax service. Jerrold announced a similar service called Communicon Videotex at the Videotex '82 conference. But over-the-air teletext is certainly the cheapest delivery system which costs the customer nothing except the cost of the decoder.

Just how important is the cost and quality of the encoder? Most 1982-83 tests will be using the North American Broadcast Teletext Standard, which incorporates the AT&T Presentation Level Protocal for coding and display, an outgrowth of the Canadian Telidon and French Didion systems. This approach provides better graphics than the dynamic redefinable character sets (French) or fixed mosaics (British). Good graphics are considered important to advertisers. But the cost of such equipment is higher. The Times Mirror experiment in southern California will use Norpak Mark III decoders costing



Examples of Videodial management information reports piped to office or home.

The new Saticon II camera tube. Clearly superior to lead oxide.

Compare the unretouched photos below and see for yourself how the new RCA Saticon* II camera tube reduces specular highlight memory, without red trail.

You no longer have to choose between lead oxide's good handling of highlights and Saticon's well known superiority in other critical performance factors. Now it's a whole new ball game.

Computer-aided deposition and advanced material purification technologies have given Saticon II a considerably improved photoconductor. Your benefits: less highlight trail, reduced highlight memory (as much as 75% less than that experienced with earlier Saticon tubes), improved resistance to image burn.

What's more, you still get all of the recognized advantages of Saticon: high resolution, distortion-free colors, very low lag, and extremely long tube life. And Saticon II is backed by a warranty that's second to none. RCA offers full replacement for any failure in normal use for six months, compared with only two months for Plumbicon™.

Your choice is now clear. For more information on the complete Saticon line, contact your RCA distributor or write to RCA Camera Tube Marketing, New Holland Avenue, Lancaster, PA 17603. Or call (800) 233-0155. In Penna., phone collect to (717) 397-7661. Overseas, contact RCA Brussels, Belgium. Sao Paulo, Brazil. Sunbury-on-Thames, Middlesex, England. Paris, France. Munich, W. Germany. Hong Kong. Mexico 16 DF, Mexico.

*Used by permission of trade mark owner.

Good. Plumbicon XQ1427.

Photograph of direct reflection of flood lamps, produced by camera with CTS circuitry. Note highlight memory with red trail.

Better. Saticon II BC4390.

Same subject and conditions as in photograph at left. Note reduced highlight memory without red trail.

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in the range of $1000. Standalone decoders for British systems run $250 or less (the British are paying about $175 extra for teletext-equipped sets).

For reasons of cost, Field Electronic Publishing is one of the major U.S. software suppliers supporting the British approach. In addition, its fixed format permits error checking to be built in and it's an operational system now—as opposed to later after someone tools to make the more complex PLP type chips. This, however, may not be too long in the distance, according to Texas Instruments.

Perhaps all decoders will be inexpensive by the time the perfect chicken is incubated. There are strong hints that they will be. But the technology is not static. The British, for example, are conceding nothing. If better picture resolution is needed, it will be available, they report (it has been demonstrated). Keeping up with this industry, its facts and its opinions, is not easy. Currently it supports at least three expensive newsletters and last year the Videotex Industry Association was formed. It already has 125 corporate members, indicating something will likely hatch.

Private videotext looms as important

Videotex for private corporate communications use is another hot topic just now, aside from home banking services, and experimental direct marketing à la interactive video, a gleam in the eye of large advertising agencies everywhere. (Some 13 agencies representing 80 advertisers are participating in the CBS-AT&T experiment; more than 20 advertisers have been involved with NBC's Los Angeles experiment.) Possibilities for private information networks (as opposed to public systems) were permutating all over at Videotex '82 and the exhibits of IBM, AT&T and the French contingent set the pace.

IBM, which has adopted British Prestel technology, is promoting two services: its Bureau Viewdata Services which can be added to any IBM Terminal Business System (for example, IBM System/7), and Series/1 Videotex System—SVS/1—a new low-cost private system which uses IBM's Series/1 computer.

The Bureau's Viewdata Service permits one to incorporate videotex with any data processing application. Private viewdata systems linked to remote data bases are easily established, says IBM, by using the Bureau Service Network. The remote computers can be accessed from anywhere by a dial.

The new SVS-1 video system permits a company to extend its communications system to sales reps or the office staff. Anyone can access the corporate computer for such information as bulletin board notices, electronic mail messages, catalog sheets, time tables, and so forth. Sales reps can enter orders.

Telemarketing was the theme of the AT&T Long Lines exhibit at Videotex '82 and it announced two specifications for interfacing videotex terminals to networks using packet switching. AT&T expects such networks to be operating by 1983 to 1985. The interfaces (one for terminal users, another for data base providers) are compatible with the 1980 CCITT recommendation X.25 for packet mode operation.

The telephone industry's expectations for this burgeoning industry were underscored by the showing of the Frame Creation Terminal (FCT), a videotex production work station developed by Bell Labs but now turned over to the newly formed American Bell Inc. This new FCT unit featured high-resolution graphics and text, user-defined color palettes (over 65,000 shades) and versatile text commands and editing capability. Input is a graph-

The Ampex ATR-800 is built to last.

Others talk about audio "workhorses". But only Ampex has been manufacturing reliable professional audio recorders since 1947. Recorders that can take everything you can dish out day after day.

The Ampex ATR-800 continues our tradition by offering you unmatched editing ease, complete interfacing capabilities with a variety of peripherals (synchronizers, editors, etc.), a rugged cast transport that maintains tape path alignment, standard built-in features without an accompanying premium price tag, and a full range of accessories for all kinds of applications. And, as with all Ampex audio recorders, you get our worldwide sales and service support to keep your workhorse racing along.

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AMPEX

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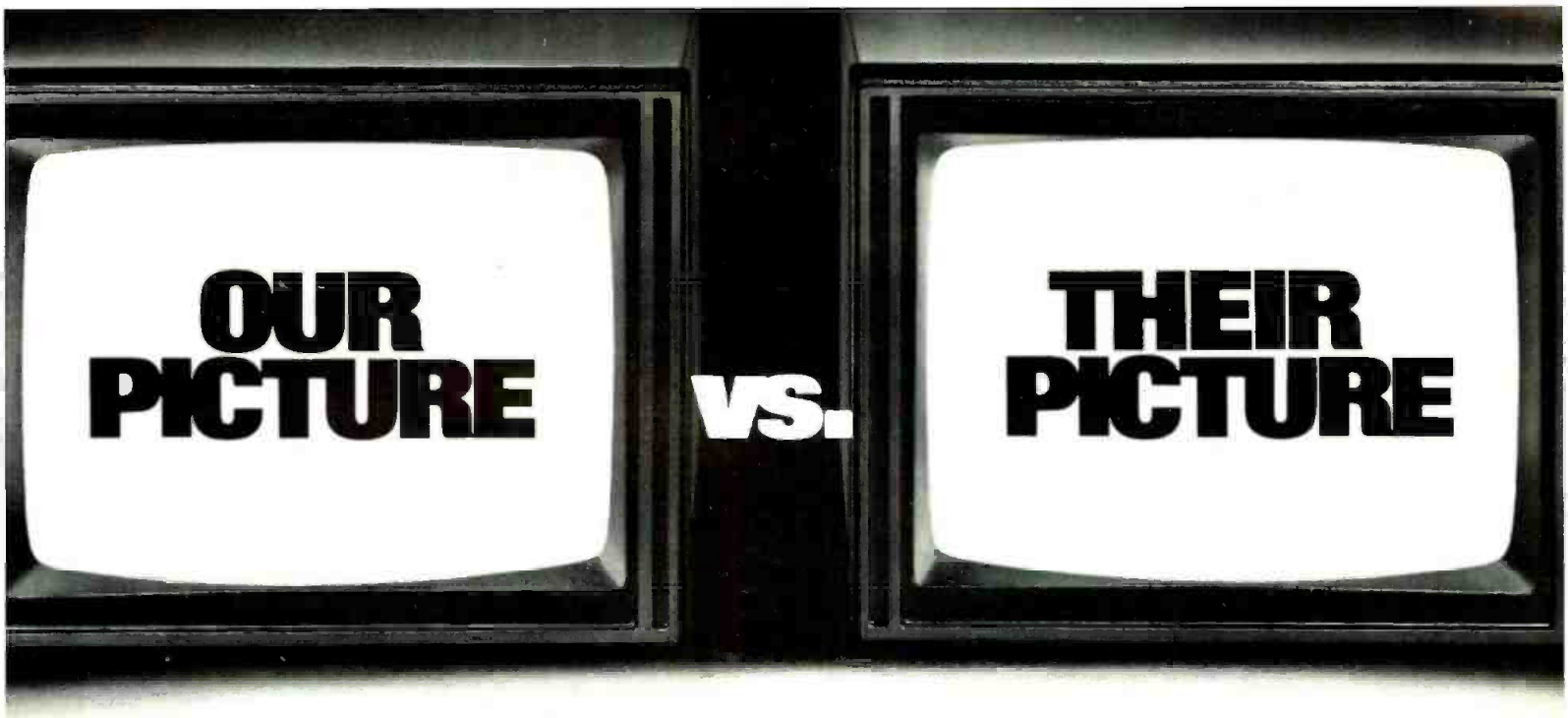
ics pad and stylus.

Some seven companies from France, collaborating in a joint exhibit, underscored the business use of videotex. Intelmatique showed Minitel equipment, a low-cost mass produced terminal used in France for the electronic telephone directory program, and the Smart Card as a means of paying bills via Telstel videotex equipment and telephone or data lines. Videodial Inc., U.S. subsidiary of Telesystems, the largest videotex service company in France, was offering a complete turnkey system including computers, viewing terminals, telecommunications equipment, and software. Among its equipment was the TSV-400, a microcomputer-based system suited for banks, hotels and the like, including up to 120 terminals. The system offers 5000 pages of information with ports for 16 simultaneous on-line calls. A larger system, TSV-10000, has 10,000 pages of storage that can handle 2000 terminals for 200 simultaneous calls. It runs with a time-shared Honeywell DPS mainframe. Telesystems has a number of banking clients in France. A key element in the system is the TSL videotex gateway concentrator, which permits videotex users to connect into remote computers via public packet switching networks. (Gateways can automatically switch calls to desired data bases; concentrators act as dispatchers distinguishing one message from among many.)

Gateway technology, which is essential to banking, shopping and other transactional services, is operating on Prestel in the U.K. and elsewhere and is developed for use in the U.S. by a joint venture being undertaken by British Telecom, Logica and Financial Interstate Services Corp. Prestel applications include both commercial business and home transactions. Among the former are a shipping service by Lloyds of London and a commodities price update service by Intercom Video. According to Logica/BVT, some 15 companies are making Prestel-compatible videotex systems which are now in use by some 200 customers worldwide. Over 100 different types of products are now available, including those tying into personal computers and home television sets.

Though both the French and the British have considerable experience and both have impressive business services in operation, neither can match the graphics of the Canadian Telidon approach. Advertisers consider graphics very important. Consequently CBS, AT&T, Time Inc., Times Mirror, and Knight Ridder have selected the Canadian equipment for their tests. Some eleven Canadian hardware and hardware/software suppliers were at the Videotex '82 Conference. Among these, Norpak was the most prominent, showing a line of equipment (including a graphic computer) suited for business use as well as teletext encoder equipment. Numerous software suppliers at Videotex '82 eyeing the private networks hailed from Canada: Infomart, Genesys, Systemhouse, Cableshare, Novatek, and Tayson. Their services accommodate business computer users, agribusinesses, retail stores, governmental departments, and the like.

Indeed, the potential of business services of videotex has attracted several American software suppliers into the field. Anacorp., which specializes in banking services, was a prominent exhibitor. Business software suppliers at the Videotex '82 Conference from the U.K. included, in addition to Logica, as already mentioned, Aregon, Viewdata and Rediffusion. **BM/E**



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Renewal Expectancy Relief

By Harry Cole
FCC Counsel

As we look back at the unfinished business of 1982 and ahead at the uncertain developments in store in the new year, it appears that the stage has been set for resolution, possibly this year, of a question of central importance to all broadcast licensees: the "renewal expectancy" question. More precisely, this may be the year in which the Commission adopts standards by which all licensees can determine whether or not they can reasonably expect to get their licenses renewed, particularly if their renewal happens to be challenged by a petitioner to deny or by a competing applicant.

Discrimination

The question of renewal expectancy has, of course, existed since the very first licensee filed the very first license renewal application. The Commission even took at least one serious stab at resolving it about 12 years ago, only to be reversed by a federal appellate court. The FCC had, at that time, decided to apply standards broadly favoring renewal of outstanding licenses, even in the face of competing, mutually exclusive applications for new licenses. The court, however, decided that such an approach impermissibly discriminated against new applicants and thus did not assure the competitive spur likely to encourage superior performance by existing broadcasters bent on keeping their licenses. The court's decision threw the renewal expectancy back into limbo, where it has remained.

Since the court's decision in 1972, the Commission has taken a very vague, ad hoc approach in assessing renewal applications. The leading case in the area involves Station WESH-TV, Daytona Beach, FL, the license renewal of which was challenged by a competing applicant more than 10 years ago, and which has been fighting for renewal ever since. In 1973 the FCC granted its renewal, only to have the same federal appellate court, in a caustic opinion, send the case back to the Commission for further clarification of the renewal expectancy doctrine.

The court seemed to think that, despite the guidance it had previously given to the Commission, the Commission was still operating under the belief that, unless there was some major misconduct, renewal applicants invariably deserved license renewals. On remand of the WESH-TV case, the Commission again granted the renewal and denied the challenger but, in so doing, it sought to answer the objections raised by the court. The case went back to the court and, last year, the court finally upheld the renewal.

As things stand in light of the most recent WESH-TV opinion, the Commission must assess a renewal applicant in light of the service which it has provided to the public. "Superior" service, which is obviously to be encouraged, would normally guarantee renewal, regardless of any challengers. "Substantial" service would give the incumbent a solid preference over any challengers, but not quite a guarantee. And "minimal" service, while not disqualifying the incumbent, would not accord it any preference at all, as a result of which the incumbent would be forced to face any challengers on an equal, comparative basis.

Serious programming

The "service" which is in question seems at this point to involve only programming—preferably locally produced nonentertainment programming—directed to the needs and interests of the station's community of license. The actual nature and amount of such programming necessary to reach the "superior," or even the "substantial," points on the program service continuum are, unfortunately, far from clear.

The practical effect of all this can be seen in three decisions reached at the Commission in the latter part of 1982. The first involved the denial of the license of an FM station in Gloucester, MA, and the grant of that license to a competing applicant. The Commission, after reviewing the record, found that the incumbent—an individual who ran the station virtually single-handedly—had offered no locally produced nonentertainment programming aimed at local needs and interests. Thus, he was entitled to no advantage from the "renewal expectancy" concept. Further, even though his operation of the station represented a total integration of ownership into the day-to-day management of the station—a goal which the FCC usually encourages—his poor programming showing in the past diluted almost to nothing any advantages he might otherwise have derived from that integration.

Similarly, even though the licensee owns no other broadcast interests—again a factor usually given great weight by the Commission—the Commission concluded that his poor programming showing substantially undercut this factor as well. The result? Notwithstanding the fact that the license had been regularly renewed previously, and notwithstanding that representatives of the station's audience and community of license came out in solid support of renewal, the incumbent's application for renewal was denied as being comparatively inferior to his challenger's.

The second case involves the November 1982 decision of an FCC administrative law judge denying renewal of a Washington, DC, FM station and granting its license to a competing applicant. Again, although this case was a good deal more complicated than the Gloucester situation, the decision was based in large part on the poor programming of the incumbent. In particular, the judge found that, in the period under consideration, the licensee had offered only very limited nonentertainment programming. Further, while the amount of news programming offered had been above average, any resulting comparative benefits were diminished because little of that programming involved *local* news. Thus, no significant renewal expectancy was accorded to the incumbent.

The third case concerned a similar situation with a challenge to a Peoria, IL FM license. Again, the case was

more complicated than the Gloucester proceeding, but the result was basically the same: in a comparative analysis of the renewal applicant and its challenger, an administrative law judge concluded that, since there was no indication that the incumbent had carried any local nonentertainment programming, it was not entitled to any renewal expectancy. Of course, this case, as well as the Gloucester and Washington cases, is subject to appeal and the results could ultimately be reversed or modified. Nevertheless, there is little doubt but that these decisions reflect the current attitude toward renewal expectancy.

These cases should be a matter of concern for all licensees, since any potential threat to the renewability of a license should be taken seriously. This is especially true in view of the lack of specific standards and guidelines applicable to assessment of past programming efforts.

The Commission has, to its credit, recognized the need to inject some greater degree of certainty into this procedure. It presently has under consideration a rulemaking proceeding (BC Docket No. 81-742) aimed at the development of standards for evaluating, in the context of a comparative renewal challenge, an incumbent licensee's performance. This proceeding could be resolved in 1983, thereby providing broadcasters with at least a reasonable idea of what type of performance is expected of them.

Two other aspects of deregulation might contribute to the misimpressions of broadcasters. These are the elimination of formal ascertainment requirements and the elimination of program logs, again for commercial radio licensees. Some type of ascertainment effort will still be necessary in order for licensees to direct their nonentertainment programming to the needs and interests of the community. Thus, the relaxation of the various record-keeping obligations associated with ascertainment should not be viewed as affecting in any way each licensee's obligation to apprise itself, in some fashion, of the needs and interests of its audience.

Record keeping

Similarly, the elimination of the program logging requirement does not affect the underlying obligation to provide certain types of programming. Nor does it affect the desirability of having some record of that programming available in the event that the licensee is called upon to prove just what sort of programs were, in fact, aired, and when they were aired.

There is a final potential result of deregulation not to be overlooked: historically, challenges to license renewals have not been numerous nor generally successful. It might be easy to assume that a license challenge is something that happens only to the other guy. However, as a result of the Commission's efforts to streamline the application process, it is now cheaper and easier than it has been in a long time to file an application in competition with a renewal: no ascertainment is required, the financial showing in the application is almost nonexistent, no elaborate program plans need be shown in the application, and even the technical portion can be prepared in almost no time. These factors, which may have discouraged potential applicants in the past, no longer stand in the way. And, while the costs in time and money of litigating a comparative renewal proceeding are still substantial, the continually escalating costs of purchasing operating stations may, in the eyes of some, justify taking the license challenge route. **BM/E**

The Transparent TBC

All the bandwidth you need for the new VTRs

Now there's a digital TBC that handles the extended frequency response of the new helical VTRs — without the hassle of 3.58 MHz feedback.

The CVS 516WB has all the features of our CVS 516 — an industry standard for non-segmented heterodyne VTRs — plus new circuitry for virtually transparent performance.

With the CVS 516WB, users of the new generation VTRs, like the Sony BVU-800, the Sony 5850 and the JVC 8500, are free of TBC-imposed limitations on resolution performance, and the "soft" look of yesterday's TBCs.

In addition, standard features of the CVS 516WB include a 16 line window, with Gyrocomp, to correct your worst tapes. And, for better editing, Automatic Vertical Centering eliminates sync reset and throughput delay ambiguity.

The CVS 516WB also features a DOC and chroma noise reduction. Plus a broadcast stable, gen-lock sync generator and a full proc amp with preset level controls.

For details about, and a demonstration of, this new generation TBC, contact your Authorized HVS Distributor, or HVS, today. Be sure to ask for our popular booklet about the advantages of digital time base correction when you call or write: Harris Corporation, Harris Video Systems, 1255 East Arques Avenue, Sunnyvale, CA 94086 (408) 737-2100.

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Why Beyer mics represent a viable alternative to the usual choices in Broadcast.

Beyer MCM Condenser System

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Beyer M 260

Now there's another high-tech German condenser system.

Until recently, film and broadcast engineers thought only Sennheiser and Neumann made high-quality condenser microphone systems. Now the Beyer MCM Series offers the same German excellence in design and construction, the same kinds of accessories (windscreens, pistol grips, shock mounts) and facilities for 12V and 48V "phantom" powering.

And since the MCM Series studio condenser mic is part of a system which combines power modules and different mic capsules (long shotgun, short shotgun, unidirectional, omni-directional and figure eight), you get more microphone potential for dollar output.

Like all Beyer microphones, the MCM Series is a truly professional instrument system suited to the widest range of applications in Broadcast/Film and Video post-production.

With lavalier mics, small is not enough.

Electret condenser lavalier mics like SONY's ECM-50 have proven useful for on-camera miking situations because of their reduced size. And while many of these mics offer good performance in a compact size, the Beyer MCE5 also provides extended frequency response (20 to 20,000 Hz) and durability in an even smaller format (diameter: 7 mm / length: 23 mm).

To optimize its compatibility with a variety of broadcast and film applications, the tiny black MCE5 is available in different configurations for powering interface and includes a system with accessories like windscreens, expansion mounts etc.

At Beyer Dynamic's ultra-modern manufacturing facility in West Germany, we hand-build virtually all of our microphones in the most evolved state of fine German engineering.

There's more than one way to bring out the warmth in an announcer's voice.

Broadcast engineers choose the E-V RE20 for many vocal announcing situations because of its wide frequency response (45-18,000 Hz)* and smooth sound. Beyer Dynamic's M 260 also provides the extended frequency response (50-18,000 Hz) and warmth required for critical vocal applications with one distinct advantage: its reduced size. Its compact and efficient ribbon element captures the warmth traditionally provided by this type of mic. And because it is considerably smaller than a mic with a large moving-coil diaphragm, the M 260 provides a natural, balanced sound image in a portable format that won't obscure copy or take up valuable space in the studio.

The Beyer M 260 has its own custom-designed ribbon element to optimize the mic's performance based on its Broadcast applications.

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TAX TIPS for stations

New Subchapter S Rules

By Mark E. Battersby
Financial Consultant

Congress has, once again, changed the rules governing Subchapter S corporations. This is good news for the thousands of broadcasters who currently do business as small business or Subchapter S corporations as well as for those who have merely been thinking about taking advantage of the many benefits this unique tax status offers.

For tax purposes, a corporation is treated as a separate entity apart from its shareholders. In other words, income earned by the corporation is taxed to it and distributions from the corporation are also taxed to the shareholder. A partnership, on the other hand, is not treated as a taxable entity for income tax purposes; instead, the income of the partnership, whether actually distributed or not, is taxed to the partners, while distributions by the partnership are generally tax-free.

Unfortunately, until now our tax laws required these hybrid business entities to conduct certain aspects of their operations as corporations rather than as partnerships. The new tax law, however, will now permit Subchapter S corporations to treat many of these pass-through items as a partnership. For example:

Capital gains and losses. Gains or losses from the sale of capital assets will pass through to the shareholders as capital gains or losses. No longer will net capital gain be offset by ordinary losses at the corporate level.

Section 1231 gains and losses. The gains and losses on certain property used in your operations will be passed through separately and will be aggregated with the individual shareholder's other Section 1231 gains and losses. Thus, Section 1231 gains will no longer be aggregated with capital gains at the corporate level and passed through as capital gain.

Charitable contributions. The corporate 10 percent limitation will no longer apply to contributions by the Subchapter S corporation. As in the case with partnerships, the contributions will pass through to the shareholders.

Credits. Again, as with partnerships, items involved in the determination of credits, such as the basis of property qualifying for investment tax credits, will pass through to the Subchapter S corporation's shareholders.

Other items. Limitations on the used property investment tax credit and the expensing or immediate write-off of up to $5000 in qualifying depreciable business assets will apply at both the corporate level and at the shareholder level, as in the case of partnerships. Thus, the Subchapter S corporation may choose to expense $5000 of newly acquired assets and pass along a pro rata amount of this deduction to the shareholder based on his ownership interests. The shareholder then adds his pro rata share to other expensed property or equipment resulting from partnerships, other Subchapter S ventures or sole proprietorships, and this total at the shareholder level cannot exceed the $5000 Section 179 limit for any one year.

Tax-exempt interest. Tax-exempt interest will now pass through to the shareholders as such and will increase the shareholder's basis in their Subchapter S stock. Subsequent distributions by a corporation will not result in taxation of the tax-exempt income.

Despite these drastically revised pass-through rules, however, carryovers from years in which the corporation was not a Subchapter S corporation will not be allowed to the corporation while in Subchapter S status. And there are also other disadvantages to be considered.

As the popularity of this unique form

of business organization would suggest, there are quite a few advantages, including:

- Corporate losses are taken as ordinary losses, thereby reducing the personal income of the shareholders.
- A Subchapter S can be used as an effective method of splitting business income with children or other relatives for tax purposes, without taking money out of the business and without encountering the problem of double taxation. This may offer a far simpler, more feasible solution than the family partnership.
- Income already earned by a Subchapter S corporation can be shifted by a gift of stock to another person even though the gift is made near the very end of the corporation's tax year. This is a maneuver that simply cannot be done with partnership income.
- By setting up a Subchapter S corporation with a taxable year which differs from that of its stockholders, it is possible to spread the corporation's income so that it is divided and taxed directly to the shareholder in two of his or her taxable years.
- The profits of a Subchapter S corporation are not subject to double taxation. That is, unlike a regular corporation, profits are not taxed to the corporation when earned and to the shareholder when paid out in the form of dividends.
- Proprietors and partners who prefer to operate as corporations, but don't because of the higher cost, can switch to the corporate form and continue paying the same tax as in their unincorporated form.

The Subchapter S Revision Bill of 1982 eliminates some of the more restrictive requirements for Subchapter S status and increases the permissible number of shareholders from 25 to 35. Even better, the new rules liberalize the provision in current law that terminates Subchapter S status for stations whose so-called "passive" earnings from investments exceeds 20 percent of their gross receipts in any taxable year.

Now the 20 percent passive-earnings limit has been raised to 25 percent and Subchapter S status won't be automatically terminated unless a station's passive earnings from rents, dividends, interest, annuities or sales or exchanges of stock, and so forth, exceed the 25 percent ceiling for three consecutive years. Naturally, in the meantime, such earnings exceeding 25 percent would be subject to the corporate income tax.

In order to qualify initially (and to continue to qualify), the following rules must be adhered to:

- The entity must have only one class of stock.
- It must be a domestic corporation.
- It cannot be a member of an affiliated group eligible to file a consolidated tax return.
- The shareholders must be individuals, estates, or certain kinds of trusts.
- None of the shareholders can be a nonresident alien.
- It must make a proper election, which simply involves filing the proper form.
- As already mentioned, no more than 25 percent of the entity's gross receipts may be "passive" income.
- The corporation cannot have more than 35 shareholders with husbands and wives counting as one.

Whether any broadcasting corporation that normally operates at a profit should choose Subchapter S status in the first place depends upon whether the tax advantage will be derived from having its income taxed directly to the shareholders. In general, if the shareholder's tax rate is about the same as, or less than, the rate of tax imposed on the corporate income, it is usually advisable to make the election. **BM/E**

GREAT IDEA CONTEST

Here's a chance to share your own personal solutions to some of broadcasting's most vexing engineering needs . . . .

Each month, *BM/E* presents two engineering problems and invites you to submit solutions complete with diagrams. *BM/E's* editors will read the entries and select the best for publication—giving readers an opportunity to vote for the idea they consider best by using the ballot area on the Reader Service Card.

We will pay $10 for each entry printed. In addition, the solution in each month's competition receiving the most votes on our Reader Service Card will win $50.00. So put on your thinking cap and submit an answer to either of the problems outlined below . . . and be sure to watch this section for the solutions.

NEW, BIGGER PRIZE: $50.00 FOR EACH CONTEST WINNER!

Problem 15: Antenna Adjustment

Radio stations that change antenna pattern at sunset and sunrise must follow the strict time schedule laid down in the license, including seasonal adjustments. The change can be completely automated with a calendar/clock and a microcomputer. But many prefer simple remote button-pushing to operate the antenna relays. Develop a system to make operator attention as certain as possible, with the correct time displayed, advance warning, and an error signal if the change is ignored.

Solutions to Problem 15 must be received by February 21, 1983, and will be printed in the April, 1983 issue

Problem 16: Cart Ready/ Not Ready Indication

Many older audio cart machines lack a blinking *ready* light that indicates whether a cart in the machine has already played. Design a circuit that indicates, with lights or otherwise, if a cart is ready, playing, or finished playing.

Solutions to Problem 16 must be received by March 21, 1983, and will be printed in the May, 1983 issue

CONTEST RULES

1. **How to Enter:** Submit your ideas on how to solve the problems, together with any schematic diagrams, photographs, or other supporting material. Entries should be roughly 500 words long. Mail the entries to *BM/E's* Great Ideas Contest, 295 Madison Avenue, New York, NY 10017. Use the official entry form or a separate piece of paper with your name, station or facility, address, and telephone number.
2. **Voting and Prizes:** *BM/E's* editors will read all entries and select some for publication; the decision of the editors is final. Those selected for publication will receive a $10 honorarium. Each month, readers will have an opportunity to vote for the solution they consider the best by using the Reader Service Card. *BM/E* will announce the solution receiving the most votes and will award the winner of each month's competition a $50.00 check.
3. **Eligibility:** All station and production facility personnel are eligible to enter solutions based on equipment already built or on ideas of how the problem should be solved. Consultants are welcome to submit ideas if they indicate at which facility the idea is in use. Manufacturers of equipment are not eligible to enter. Those submitting solutions are urged to think through their ideas carefully to be certain ideas conform to FCC specs and are in line with manufacturers' warranty guidelines.

Mail Official Entry Form to:

BM/E's Great Ideas Contest
295 Madison Avenue, New York, NY 10017

Solution to Problem # _____

Your Name: _____

Title: _____

Station or Facility: _____

Address: _____

_____

Telephone: (____) _____

I assert that, to the best of my knowledge, the idea submitted is original with this station or facility, and I hereby give *BM/E* permission to publish the material.

Signed _____

Date _____

Component for component, Standard still offers the best TVRO system for its price in the industry.

Agile 24M-S Satellite Receiver-Slave

There are a lot of firms offering so-called "complete" TVRO systems. Only Standard Communications has a full product line TVRO system backed with competitive pricing, immediate availability, free demonstration program, and the kind of field service/engineering team with more than a dozen years' experience in high technology communications.

Take our proven, reliable Agile 24 stand-alone receiver system. It features loop-through design capable of driving up to 100 slaves at a lower cost per channel

LNBC24

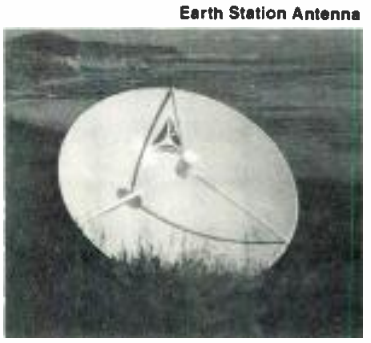
than an equivalent number of masters, dual conversion circuitry that converts the signal down twice, and 16 dB converter gain.

Our LNBC24 Low Noise Amplifier/Block Down Converter features GaAs FET technology, 100°K noise temperature, 1.5 dB noise figure, 55 dB gain. It mounts directly on the earth station antenna permitting use of low cost cable runs to the satellite receiver.

ODC24

Use our ODC24 Outdoor Down Converter with our Agile 24S slave receiver to block downconvert microwave signals from 3.7 to 4.2 GHz to 760 to 1260 MHz. By mounting the ODC24 on the LNA, longer cable runs to the receiver using low cost cable are possible. The ODC24 also features 16 dB conversion gain, and a weather resistant housing and built-in heater for all weather operation.

Earth Station Antenna



Our earth station antennas are unit-molded to assure precision contour for increased gain and minimal RMS surface deviations. Models are offered in 3.7, 4.6 and 5.0 meters with polar, computer-controlled azimuth drive or fixed mounts.

Our MIF 24/60 and MIF 24/80 filters remove interference from telephone microwave transmissions and plug directly into the

Microwave Interference Filters

Agile 24 receiver for 60 MHz and/or 80 MHz filtration of the 70 MHz IF stream.

Standard can put you in the TVRO business or improve the quality of your service right now.

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...the TVRO System people

Circle 167 on Reader Service Card

broadcast EQUIPMENT

Improvement for Quantanews 250

Quanta Corp. has introduced an improved version of its Quantanews computer-assisted news writing and management system. The new system is designed to help in the transition from traditional news writing to computer-oriented news management.

Features of the system include an independent, self-supporting computer in every terminal, permitting individual handling of all newsroom functions. All terminals include a built-in eight-inch floppy disk for personal file management. The design allows single terminal operation with future expansion to as many as 24 terminals, including remote bureaus which have full access to the system via phone lines. The system can be configured for memory storage, printers, newswires, data sources, or character generators. Another feature of the computer is that incoming wire service information is organized, sorted, and stored by category and can be searched by header, word, or word string. The system price begins at $30,000.

Remote Camera Control Panel from Sharp 251

A new remote operations panel designed for use with the Sharp XC-800 camera is the XC-80RPA. The new unit controls, from a distance of up to 1000 feet, functions such as power on/off, auto white balance on/off, auto white/black set, auto iris on/off, auto iris level, manual iris control, and detail

on/off. Along with many other control functions, the unit also provides intercom private/common select and level, tally and tally indicator and program audio level control. Intercom and program audio are mixed so both signals can be heard simultaneously.

Serial data transmission is sent with a single multiconductor cable between the remote panel and the camera. All control functions are sent by serial data derived from an on-board microcomputer. Cables can be interconnected for added length without using coupling adaptors or extensions.

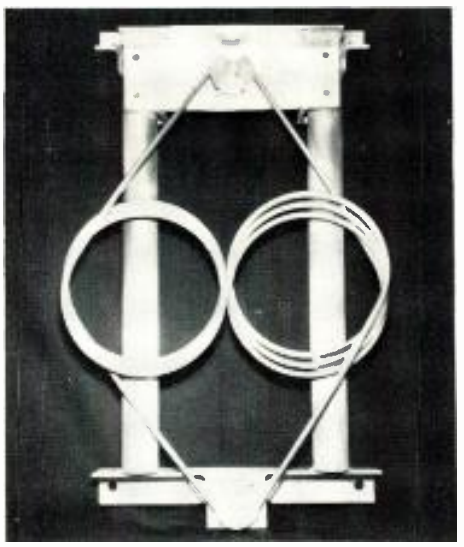
Frequently used controls are larger and more prominent on the panel, with red and blue gain controls color coded for recognition. The XC-80RPA will fit in a standard EIA rack with a height of 3.5 inches. The intercom is a 600 ohm balanced two-wire party line system with controls for talk level, listen level, and side tone cancellation.

Steerable Antenna from Anixter Mark 252

The new design of this five-meter steerable satellite antenna incorporates a hydraulically actuated, single-axis po-

sition control that will allow an operator to switch between satellite signals. Available with either a transmit/receive or TVRO capability, the antenna also features a zero offset polar mount and a repositioning rate of one degree per second. Optional rates of two degrees or .5 degrees are also available.

According to the manufacturer, the antenna can cover the entire geostationary arc with no changes to mount members, and can be positioned within .05 degrees of accuracy. The standard control has seven programmable positions, with one capable of being used as a manual override. The construction of the antenna consists of 24 precision-stamped interchangeable aluminium petals.



Spring Hanger from Micro Communications 253

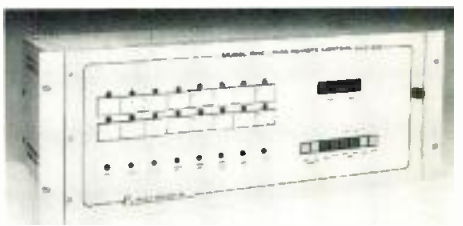
The new, compact Spring Hanger can move up to 24 inches while maintaining the integrity of transmission line on towers as high as 2000 feet in temperatures from −40 to +120 degrees F. The hanger uses constant loading torsion springs to relieve undue stress on the fixed hanger, simultaneously reducing stress on the transmission line at the tower base by keeping the line axis constant with the tower axis. The hanger's design reduces the wind load moment arm to a minimum. Constructed of aluminum and stainless steel, the hangers are corrosion-resistant.

Antenna Technology Radio Receiver 254

Antenna Technology Corp. recently developed the Simulsat 3, a multiple-beam satellite antenna capable of viewing the full geostationary arc and receiving up to 20 satellites simultaneously. The Simulsat 5 is a five-meter version of the antenna. The Simulsat 3 is priced at $8500.00.

Moseley Adds Remote Control to Line 255

The MRC-1600 is a transmitter remote control system with microprocessor-controlled terminals at both ends of the system. The unit features 16 raise and 16 lower commands, as well as 16 LED status indicators and 16 analog telemetry return channels, digitally displayed.



It is intended to improve the performance of a number of radio stations still using analog-based remote control.

The system is user-programmable with alarmed telemetry limits, configurations for two wire, four wire, or subaudible FM subcarrier, or any combination interconnect. The introductory price for the MRC-1600 is $3695.

Real Time Analyzer from NEI 256

The Model 2709B real time analyzer has both a switchable range and decay rate, built-in pink noise generator, and LED display SPL meter. It can be used with standard microphones, eliminating the need for calibrated mics. The unit comes ready to mount in a road/flight case or a control room rack. A full LED matrix is a standard feature as are 27 bands on ISO centers with nine steps of amplitude per band, balanced line input and output with D3F-type connectors, and a front panel-mounted balanced mic input for a calibration mic.

Bogue Electric has Voltage Regulator 257

This complete line of induction voltage regulators (IVR) is designed to provide stepless, automatic ac voltage control. The IVR is a rotatable transformer with the primary winding located on a mova-

ble rotor and the secondary winding on the stator. The windings are connected together electrically, similar to an autotransformer. A linear, electronically controlled servo system varies the position of the rotor with respect to the stator, enabling the fluctuating input line voltage to be regulated to ±0.5 percent of the IVR's nominal voltage.

Following a disturbance, voltage correction begins in approximately 8 ms with the response time of the IVR at 50 volts/second. The IVR is capable of withstanding a 200 percent momentary overload for one minute.

Single and three phase IVRs are available in ratings up to 1000 circuit KVA for regulation ranges up to 100 percent. Other options include 50 and 400 Hz units.

TV Transposers Introduced by Magnetic AB 258

The solid-state transposers in the Series 8000 come in output power classes of 10, 50, and 100 W for VHF, and 2, 10, and 40 W for UHF. These power modules also serve as drivers for valve transmitters at higher frequencies. All active modules can be mounted in a transposer and adjusted with built-in monitors; only filters require tuning to specific channels. The frequency converter operates on +24 V dc with the input and output channels, including off-set, being selected on front panel thumbwheels. This requires no exchange of crystals for startup or changing spare modules.

Input signal levels to activate the transposer can be set within the range of 0.2 mV to 10 mV, with continuous transmission or remote activation by cable. Output power level can be set from −5 dBm to +5 dBm. The noise figure for the VHF input is less than 8 dB, UHF less than 9 dB. Frequency stability is listed at ±350 Hz/year operating on CCIR TV standard.

Miniature Time Code Generator from EECO 259

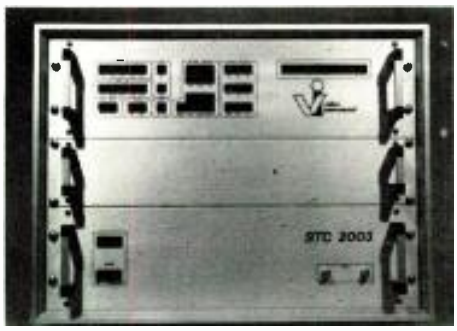
The newly introduced time code generator is designed for ENG/EFP applications. Model PTG-560 weighs one pound and mounts to most portable VTRs. Power consumption is low, with a standard nine-volt battery providing over 1000 hours of operation.

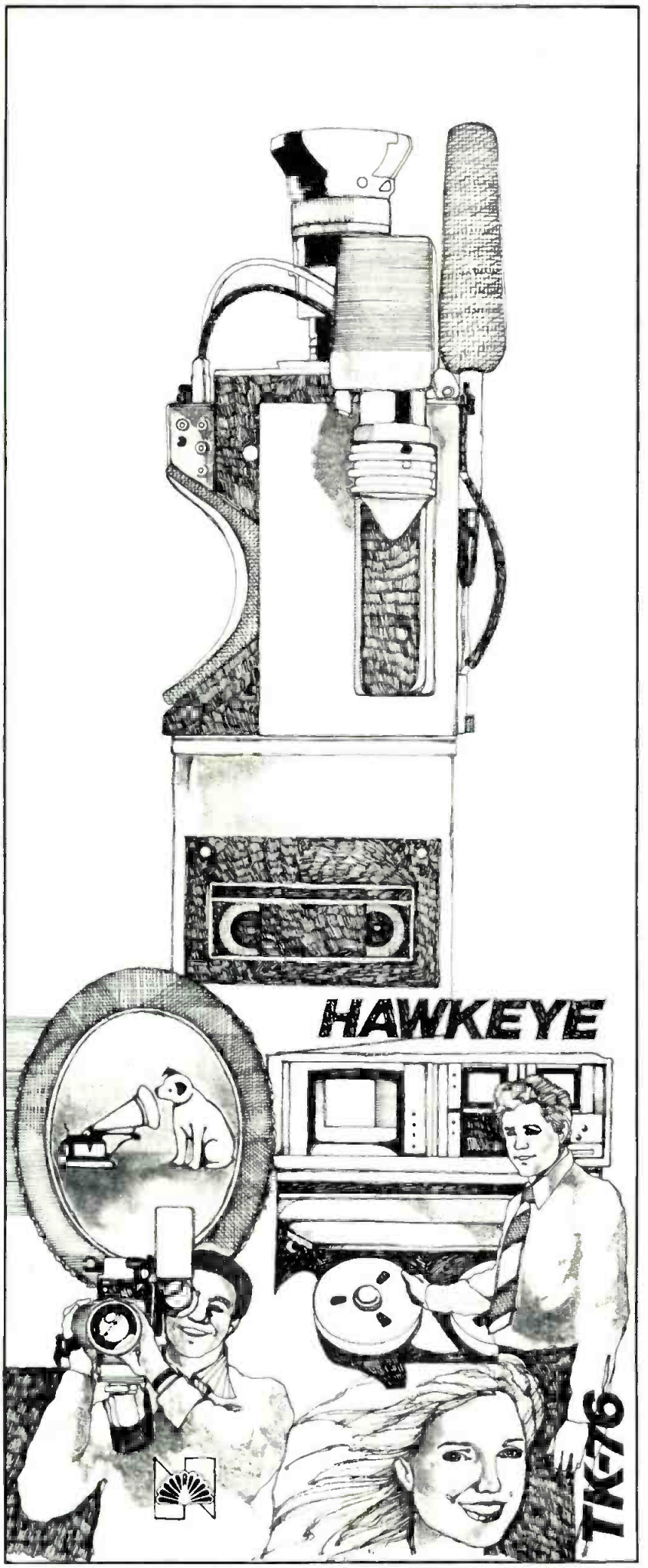
Synchronized to either an internal crystal oscillator or incoming composite video, the unit supplies continuous serial time code and SMPTE/EBU numerical user bit data from panel switches.

Incorporating CMOS/LS TTL logic, all basic time code generator circuitry is contained on a proprietary custom IC chip which, along with the reduced LCD display, permits the small size and low power requirements.

Video International Has Portable Converter 260

The STC 2000 is a digital TV standards converter to be used for conversion between any two of the three major standards: PAL, SECAM, and NTSC.





Setting A New Pace For The Industry We Pioneered!

...RCA Broadcast Systems

Current 3/4-inch video recording system performance falls below the performance of 3 tube, portable cameras. In developing the Hawkeye broadcast quality camera/recording system, RCA engineers closed the performance gap between cameras and recorders. By developing a new method to record chrominance and luminance on standard 1/2-inch VHS cassettes, they were able to improve overall picture quality while reducing weight and the number of moving parts.

Virtually any picture you encounter on your home screen has been touched by RCA engineering. As America's largest supplier of commercial video equipment, we are involved in every step: studio cameras, portable cameras, video recorders, editing equipment, telecine equipment, transmitters and broadcast antennas. As you read this, we are moving ahead with advanced development programs in digital video equipment and the creation of a completely solid state color television camera.

Our commitment is to continue to set the pace for the industry we pioneered. If you are an engineer who is interested in furthering the development of advanced broadcast technology, we invite you to share this adventure with us. For career details, please write to: **RCA Broadcast Systems Division**, Joy K. McCabe, Dept. PR-2, Front & Cooper Sts., Building 3-2, Camden, New Jersey 08102.

Equal Opportunity Employer

Setting The Pace In Broadcast Engineering!

RCA

Features of the new unit include a digital processing system with the memory capacity of two television fields. There is a built-in time base corrector, enabling the unit to convert input pictures with horizontal sync signal frequency fluctuations. The system can also be operated as a frame synchronizer between any two standards.

A one-field still picture can be achieved with the freeze button. A color TV pattern generator for the three standards is built in.

Knox Releases New Video Processor 261

Knox Video has developed the Model K700 Video Corrector, a proc amp/chroma corrector/noise reducer/image enhancer constructed in a 1.75-inch-high rack unit. The unit is intended to provide the user with correction of both luminance and chroma without the use of oscilloscopes.

The front panel permits control of up to 6 dB of noise reduction and continuously variable image enhancement. The automatic wide window genlock proc amp provides regenerated sync, burst, and blanking on the output.

The K700 has an automatic signal bypass in the event of a power failure, and comb filter decoding is used to maintain accurate frequency response. Price of the unit is listed at $2495.

New Vectorscope from Leader 262

In a departure from the standard scope with the NTSC vectors engraved on the face of the instrument, Leader has designed a unit with the phase amplitude targets generated by the CRT so that they are illuminated and as easy to see as the vector points.

Because the target boxes and vectors are both produced electronically, there is, the company claims, no error induced by CRT aging.

Two loop-through inputs are included that can be selected for display by front panel pushbuttons. A test circle pattern is also selectable. A gain control permits continuous adjustment and a phase control allows rotation of the display through a full 360 degrees. A PAL version is also available.

APIS Develops Video Pointer 263

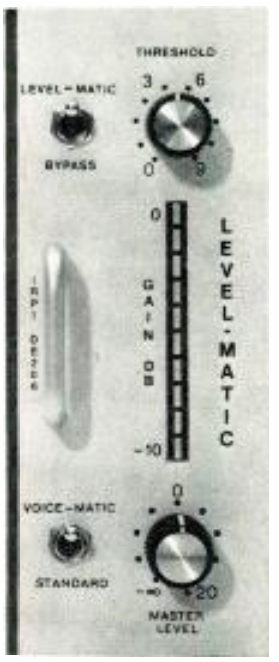
Designed for the television newsroom and other video productions, the APIS I Video Pointer can position arrows and other symbols through use of an x/y controller contained within a membrane control panel.

This unit, claims the manufacturer, allows the station to eliminate the mechanical joystick. In its place are small, medium, and large size selection of eight arrows and eight symbols. Each symbol can be shown with solid, full borderline, or transparent attributes in white or black matte over video. The circuit design allows for locking to unstable video sources.

Industrial Research Develops Mixer 264

The Model DE-4013 Voice-Matic automatic mic mixer was designed for use in multiple microphone sound systems and will accommodate the new Level-Matic master output module. The master output module, the DE-206, makes the DE-4013 totally automatic. It senses signal variations between soft and loud speakers or variations in distance between talker and microphone.

The signal level is automatically controlled for a uniform output level. The DE-206 retrofits all existing DE-4013 mixers and can replace the standard DE-201 master module.



ADVERTISER'S INDEX

The ENG/VCR news team that will take you to the top.

Meet the ideal news team.

The camera is the proven, compact HL-83. The VCR, our new M-format HM-100, or any high performance ¾" U-matic or 1" VTR of your choice. All are totally compatible with the HL-83 by means of the separate Y and I/Q (with optional system adapter) and encoded NTSC video outputs.

The HL-83 is extremely compact and well balanced. It's about the size and weight of competitive one-tube cameras—yet, it's a high performance three-tube, prism optics design. And it uses proven, readily available components. Inside are ⅔" Plumbicon* or Saticon** pickup tubes coupled to advanced Ikegami circuitry that delivers usable pictures in low light with up to 18 dB of gain. Automatic white balance corrects colorimetry over a wide color temperature range with the touch of a single button—there's no need to fumble with filters.

And with the HL-83's low-power requirement (16W), you can keep on shooting for up to 3 hours with an on-board Nicad battery.

The HM-100 VCR captures the image intact with a very respectable luminance/chrominance S/N ratio of better than 47/48 dB. Audio is better than 50 dB. This flexible, lightweight recorder (9.0 lbs) can be carried on a shoulder strap or mounted on-board for use as a one-piece system.

Add the available ML-79/83 Microlink ENG microwave system for go-anywhere flexibility. Or set up for EFP with a full feature multicore base station and a 4.5" viewfinder. There's also provision for future systems capability with the optional system adapter. Ikegami never stands still.

Put together the HL-83 camera system of your choice. Then head straight to the top.

Ikegami

HL-83 Camera Systems

Ikegami Electronics (USA) Inc., 37 Brook Avenue, Maywood, NJ 07607

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