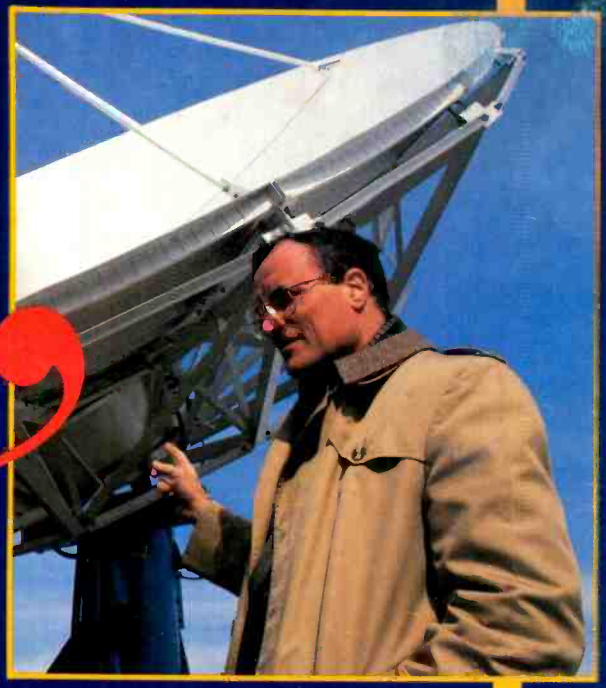
APRIL 1988 $3.00

BM/E

BROADCAST MANAGEMENT/ENGINEERING

"It boggles my mind that a group could ask a director of engineering to do the kind of work necessary for this position and at the same time do justice to the day-to-day running of a TV station."



Joe Gianquinto
VP Broadcast Operations and Technical Services
Group W

Group Engineering Under Attack? p. 38

"Absolutely the most affordable fully professional recorder on the market."

A bold statement. But no exaggeration.

Here's why . . . No 2-track machine available today—at *any* price—offers the same level of advanced technology, plus Studer audio performance and renowned Studer quality. Only the A807.

With the A807, Studer defines a new price point. If you don't believe us, check out the competition . . . It won't take you long, because there isn't any.

Broadcast, post production, or studio—in whatever audio environment you operate—make it your business to check out the Studer A807. Start with price . . .

High Tech, Low Price

Anyone who thinks "Studer" always means "expensive," please take note. With the A807, your dollars actually buy *more* now than they did five years ago—more technology to help you do your job better and faster.

Agile and Easy to Use

The Studer A807 is a fast, full-featured machine for making quick work of your production tasks.

Features include: • tape shuttle wheel • reverse play • right hand edit • tape dump • varispeed • multifunction tape timer and autolocator with programmable "soft keys" • digital setting of audio alignment parameters for 3 tape speeds and 2 tape types • phantom powered mic inputs on portable version • RS 232 port • optional 1/4 track playback head • a variety of portable and console configurations, including a 4 channel ½" version.

Studer Audio Performance and Reliability

Advanced phase compensated audio-electronics and Dolby HX Pro™ ensure that this compact Studer delivers full-sized Studer sonics.

A massive, die-cast chassis and headblock, rugged AC spooling motors and new brushless DC capstan motor, remind you that the A807 is built with the same quality and precision that have been synonymous with the Studer name for four decades.

So—if "affordable" is not the first word that comes to mind when you think of Studer—think again.

Ask us about the A807. The most affordable fully professional recorder on the market.

Portable version of the A807 with wood side panels

Timer-autolocator-control panel

Available from Studer Revox Full-Line Dealers. Or contact us directly: Los Angeles (818) 780-4234 / New York (212) 255-4462 / Chicago (312) 526-1660 / San Francisco (415) 930-9866 / Nashville (615) 254-5651

STUDER REVOX

STUDER REVOX AMERICA INC.
1425 Elm Hill Pike • Nashville, TN 37210

Circle 100 on Reader Service Card Page 75

DYNAMAX CTR12 and CTR14 shown

The DYNAMAX® CTR10 Series

Why it's number one

Our competitively priced CTR10 Series comes complete with features that cost extra in other machines. Like automatic fast forward, three cue tones, built-in audio switcher and multiple machine mixing capability.

In the last 15 months of production, Fidelipac delivered over 2000 CTR10 Series cartridge machines, making the CTR10 Series the most popular cartridge machines in the world today.

Operators work faster and smarter with the CTR10's rapid audio search, programmable repeat play lockouts, flashing "played" indicators, front panel 1 kHz defeat and audio status monitors.

Engineers love the CTR10's easy-to-service straightforward design. Gold-plated, fully removable solder-masked circuit boards. Built-in diagnostics. 15-volt RF-immune simple CMOS logic. Full function remote control. They also love our 2-year warranty and our super service.

And your listeners will love the sound.

There are many more reasons why the CTR10 Series is number one. Get them all. Call Fidelipac or your authorized DYNAMAX distributor.

DYNAMAX®
BROADCAST PRODUCTS BY FIDELIPAC®

Fidelipac Corporation ☐ P.O. Box 808 ☐ Moorestown, NJ 08057 U.S.A. ☐ FAX: 609-235-7779 ☐ TELEX: 710-897-0254 ☐ 609-235-3900 ☐ Toll Free 800-HOT TAPE

DYNAMAX products are designed and manufactured in the U.S.A.

Circle 101 on Reader Service Card Page 75

The sho
'round th

Recently, we really stuck our necks out. We claimed that the Sony BVP-360 could outshoot anything on three legs or a pedestal.

Well, it did. And you bought it. In fact, hundreds have been bought worldwide.

Most people marvelled at its balance of sophisticated features and thoughtful ergonomics. Still more were floored by its outstanding picture quality.

Now, BVP-360 cameras are shooting in TV stations, production houses and mobile trucks from as far west as California to as far east as Kyoto. From the deep south of the U.S. to the deeper south of Australia. In Illinois, Ohio and New York as well as Britain, Italy and France. We could go on and on.

Do owners have good things to say about the BVP-360? They could go on and on too. Contact your Sony Broadcast representative for names of BVP-360 customers in your area. Or call Sony at 800-635-SONY.

SONY®

Broadcast Products

There's a
studio camera ca
earning a reputa
pictures that oth
For ammu
tube. A result of

t heard
e world.

;un in town. A highly automated, cutting edge
the Sony BVP-360. In shootouts, it's fast
as a giant killer. Because it makes razor-sharp
ımeras can't seem to beat.
on, it uses the remarkable Sony 2/3" Mixed Field
y's industry-leading research in High Definition

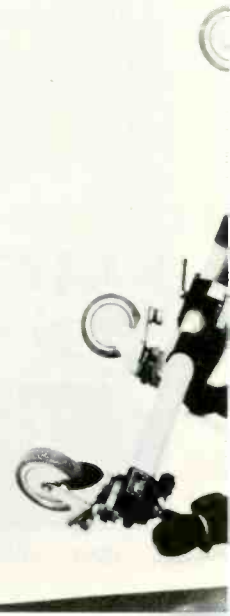
Video Systems. A tube that delivers superior resolution, registration, and signal-to-noise ratios for the best picture quality in history.

For a look at the BVP-360, or better, a thorough evaluation, or better yet, an all-out shootout, contact your Sony Broadcast representative.

THE SONY STANDARD

SONY
Broadcast Products

Bang.



BM/E
BROADCAST MANAGEMENT/ENGINEERING

EDITOR-IN-CHIEF
Robert Rivlin

EDITOR
Tim Wetmore

SENIOR EDITOR
Eva J. Blinder

SENIOR EDITOR
Beth Jacques

ASSOCIATE EDITOR
Ron Marans

PRODUCTION EDITOR
Michael D. Espindle

ART DIRECTOR
Andra Douglas

ASSOCIATE ART DIRECTOR
Raymond Wong

PRODUCTION DIRECTOR
Nick Tartaglia

ASSISTANT PRODUCTION MANAGER
Margot Suydam

FCC COUNSEL
Bechtel & Cole

GROUP PUBLISHER
Kevin J. Condon

VICE PRESIDENT, PUBLISHING SERVICES
Djuna Z. Schaub

ASSOCIATE PUBLISHER
Patrick J. Moloney

CONTROLLER
Joseph M. Pannullo

EXECUTIVE ASSISTANT
Sharon Porges

OFFICE MANAGER
Donald Cooke

RECEPTIONIST
Allan Conyer

Act III Publishing

PRESIDENT
Paul David Schaeffer
SENIOR VICE PRESIDENT,
TECHNICAL DIVISION
Kevin J. Condon
SENIOR VICE PRESIDENT,
CORPORATE DEVELOPMENT & PLANNING
Martha Lorini
VICE PRESIDENT,
FINANCE & ADMINISTRATION
Bronna A. Butler

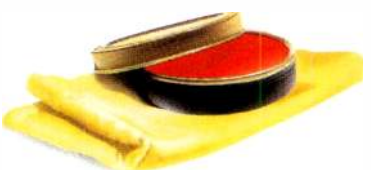
Act III Publishing
295 Madison Ave., New York, NY 10017
(212) 685-5320, Telex 64-4001
Also publishers of:
World Broadcast News
Corporate Video Decisions

ABP BPA

BM/E BROADCAST MANAGEMENT ENGINEERING (ISSN 0005-3201) is published monthly by NBB Acquisitions, Inc. BM/E is circulated without charge to those responsible for station operation and for specifying and authorizing the purchase of equipment used in broadcast facilities in the U.S. and Canada. These facilities include AM, FM and TV broadcast stations, CATV systems, ETV stations, networks and studios, audio and video recording studios, teleproduction facilities, consultants, etc. Subscription prices to others $36.00 one year, $50.00 two years. Foreign $50.00 one year, $75.00 two years. Air Mail rates on request.

Second class postage paid New York, N.Y. and additional mailing offices.
POSTMASTER: send address changes to BM/E Broadcast Management/Engineering, P.O. Box 6056, Duluth, MN 55806.

ON THE HEELS OF THE CURRENT BUDGET CRUNCH, JVC VALUE HELPS POLISH YOUR IMAGE WITHOUT SELLING YOUR SOLE.

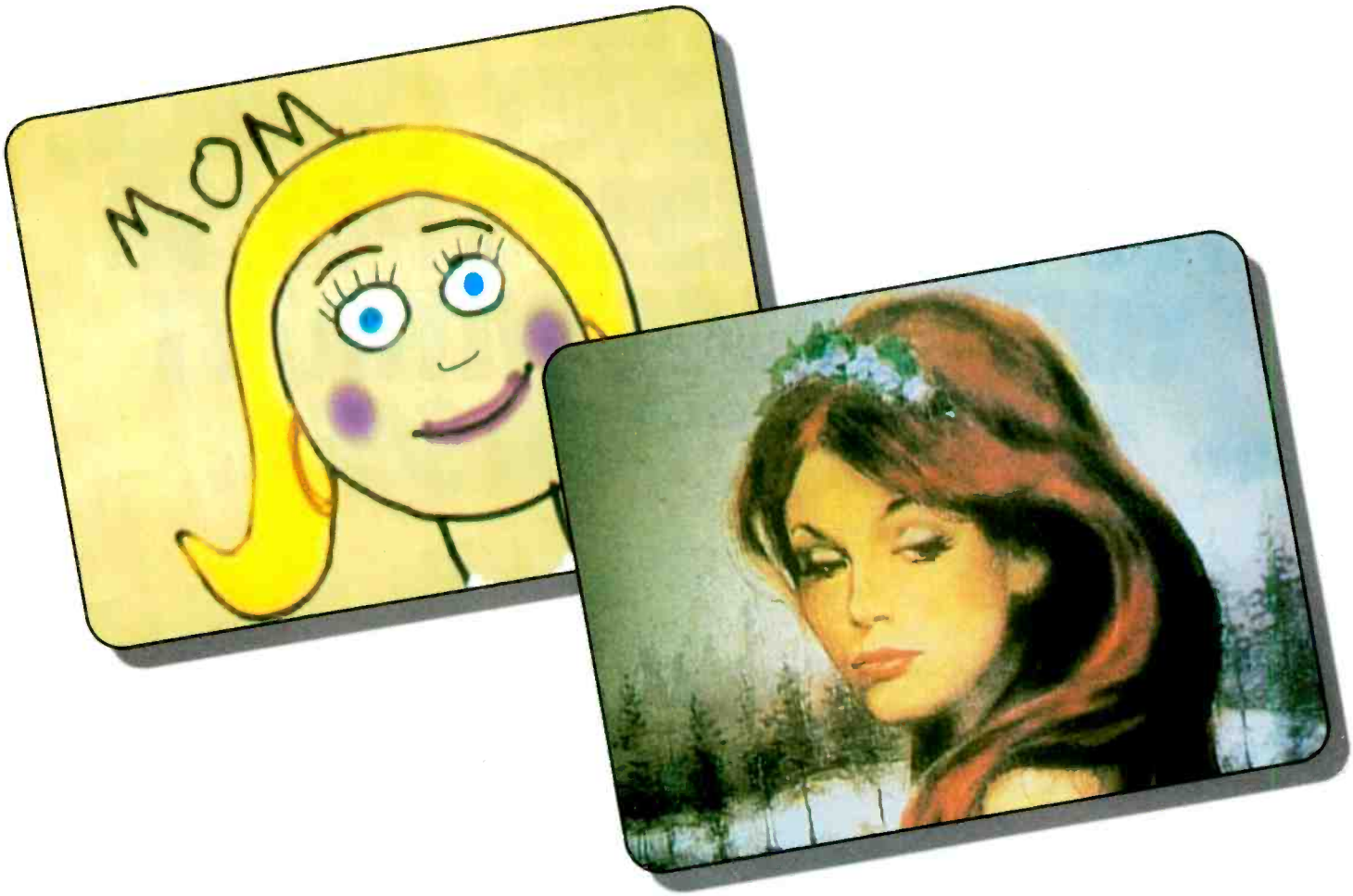


JVC®

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

Circle 103 on Reader Service Card Page 75

Choose the best...



No matter how easy it is to choose good work, the bottom line is still the same: Your graphics reflect your artistic talent. And talent shouldn't be hampered by the limitations of your graphics equipment. Dubner graphics systems, from the DPS-1 Painter to the awesome Graphics Factory, put your talent on line without limits.

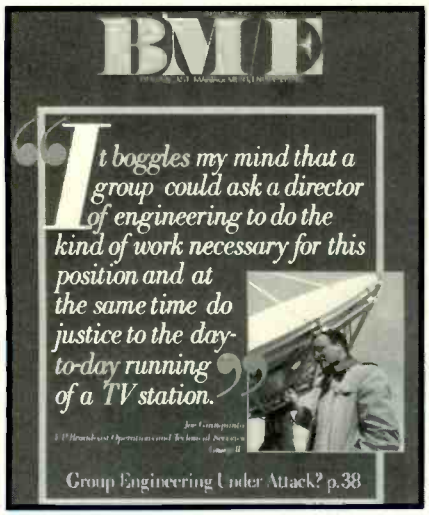
Dubner Paint systems use digital composite format to input and output directly to digital D-2 tape machines. The new DSS-4 Digital Composite Still Store with D-2 connector option talks directly to D-2 DTRs. Graphics Factory input options will include D-1 and D-2 to continue the quest for transparent video storage.

Choose the best for your best. Choose Dubner.

DUBNER

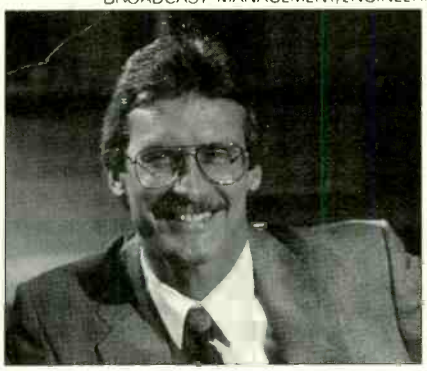
Sales Offices: New York (201) 845-7988
District of Columbia (301) 622-6313
Atlanta (404) 493-1255
Chicago (219) 264-0931
Minneapolis (612) 483-2594
Dallas/Fort Worth (817) 483-7447
Los Angeles (818) 999-2303
San Francisco (415) 968-6680

Dubner Computer Systems, Inc.
6 Forest Ave., Paramus, NJ 07652-5124
Tel 201-845-8900 Telex 62755706
A Grass Valley Group Company



BM/E
BROADCAST MANAGEMENT/ENGINEERING

APRIL 1988 VOLUME 24/NUMBER 4

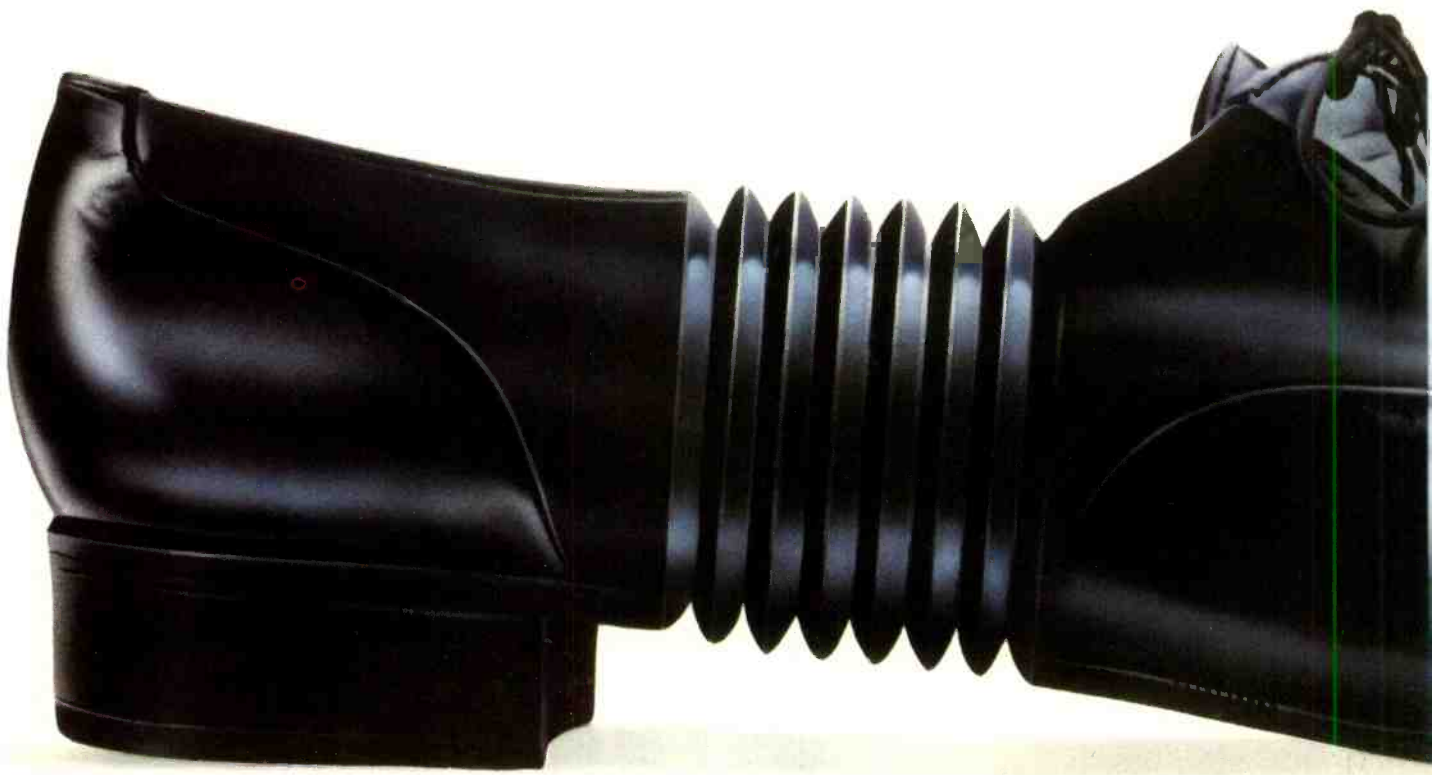

40


70

Features

Departments

MII.
ONE SIZE FITS ALL.



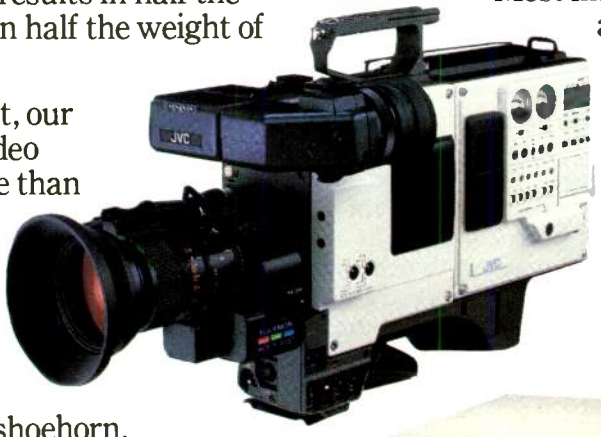
FINALLY! THE UNIVERSAL FORMAT THAT TAKES YOU FROM ACTION, TO EDITING, TO OVER-THE-AIR WITHOUT MISSING A STEP.

At JVC, we know what it's like to be in your shoes. Every day you have to tap dance between a barrage of equipment and format changes.

Fortunately, MII can make your job a whole lot easier. It's the first truly universal format that answers the needs of people in the field, in the studio and in production — while delivering broadcast quality results. And MII delivers these results in half the space and with less than half the weight of 1" C systems.

As you might expect, our new MII component video recording systems more than live up to the JVC reputation for value. In fact, to pack any more value or features into our economical MII units would probably take a shoehorn.

For example, you'll find features to choose from like four audio tracks, a time base corrector, an integral longitudinal and vertical time code, time/date generator with presettable user bits, automatic backspace editing and Dolby-C noise reduction...to name just a few.



Plus, by combining the CTCM (Chrome Time-Compressed Multiplex) recording system with high-density metal particle tape, JVC's MII format can deliver up to 90 minutes of broadcast quality recording/playback time in VHS-sized ½" cassettes. All without worrying about format switches or losing quality during editing — even several generations down the line.

Most importantly, *only* JVC gives you a choice. This means you can select a less sophisticated MII system, say for ENG/EFP, and a more advanced MII system for studio work. Also, since each unit is completely compatible with each other, you can virtually build your own system, feature for feature. And upgrade at any time.

JVC's MII. The affordable, universal format you've been waiting for.

For literature or demonstration, call toll free: 1-800-JVC-5825.
JVC Professional Products Company,
41 Slater Drive, Elmwood Park, NJ 07407.

JVC®

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

Invasion of the Bean Counters

"Perhaps rather than bemoaning the fate of engineering management it's time to reevaluate what contribution engineering can make to station profitability."

Some three of four years ago, we began hearing the nightmarish stories about the bean counters: "Engineering decisions aren't being made by engineers any more...the bean counters are taking over the capital purchase decision-making process...we have financial executives (gasp!) demanding to know how the addition of a new transmitter or production switcher will improve our station's bottom line."

One corporate management type, owner of a newly-formed group of stations, even went to far as to say that when his station group presents its annual capital budget request, "No engineer, or anyone with an engineering background, is present. Our questions about engineering-related issues, if any of us think to ask them, get postponed or go unanswered altogether."

Now, as revealed in our cover story "Group Engineering Under Attack?" in this issue, it appears that some station groups are scrutinizing the role being played by their VPs and directors of engineering to determine whether the corporate engineering function can be served by chief engineers at local stations.

At first it is tempting to cluck one's tongue, complain bitterly about how the bean counters are treating engineers, and to assume that no one not intimately involved with engineering could possibly have valid points to make about how a station is engineered.

Upon reflection, however, one begins to wonder whether the bean counters may not have a valid point or two. Though not, of course, due to decisions made by engineering, the profit picture at radio and TV stations is not all that good these days; indeed, for the first time in many years, there are a fair number of stations that are running in the red.

In this environment, is it any wonder that new demands are being placed on technical and engineering management to cost-justify its budgets, and to help increase profitability by cutting down on expenditures? Perhaps rather than bemoaning the fate of engineering management it's time to reevaluate what contribution engineering can make to station profitability and, rather than smirking about corporate management's lack of understanding of engineering issues, to develop the language and attitudes that will help explain technology to the uninitiated.

Robert Rivlin
Editor-in-Chief

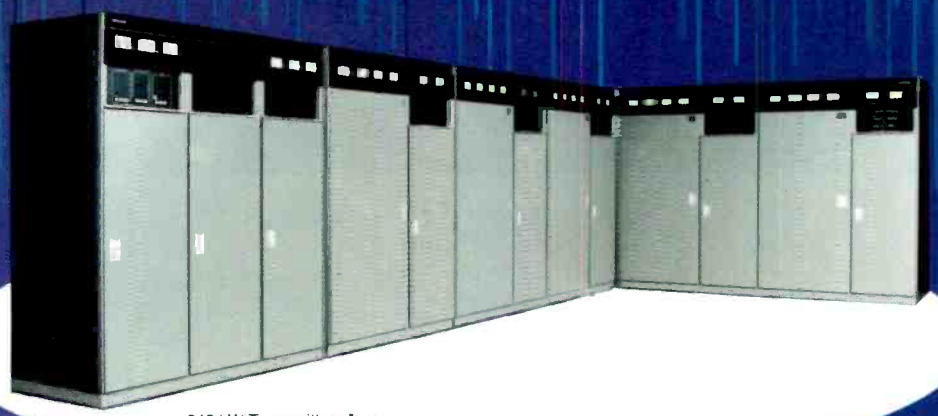
THE FUTURE OF UHF TELEVISION HAS ARRIVED ...

KLYSTRODES

The future of UHF Television Transmitters is again brought to you by **COMARK**. After extensive research, product development and testing, the world's first Klystrode TV transmitter will be on the air this summer. From the very first moment that the Georgia Public Telecommunications Commission turns on its new Comark 120 kW Klystrode UHF Transmitter, they can look forward to **slashing their energy bills by $50,000 or more a year ... year after year!** Once again Comark has used groundbreaking technology to deliver tremendous bottom line savings for its customers, while the competition watched from the sidelines.

Best of all, these transmitters are in production now! Call your regional sales office for a firm price and delivery quotation.

Comark. Technology you can bank on.



240 kW Transmitter shown.

COMARK

Southeastern Sales Office
Byron E. Fincher
P.O. Box 179
Cropwell, AL 35054
(205) 525-5660

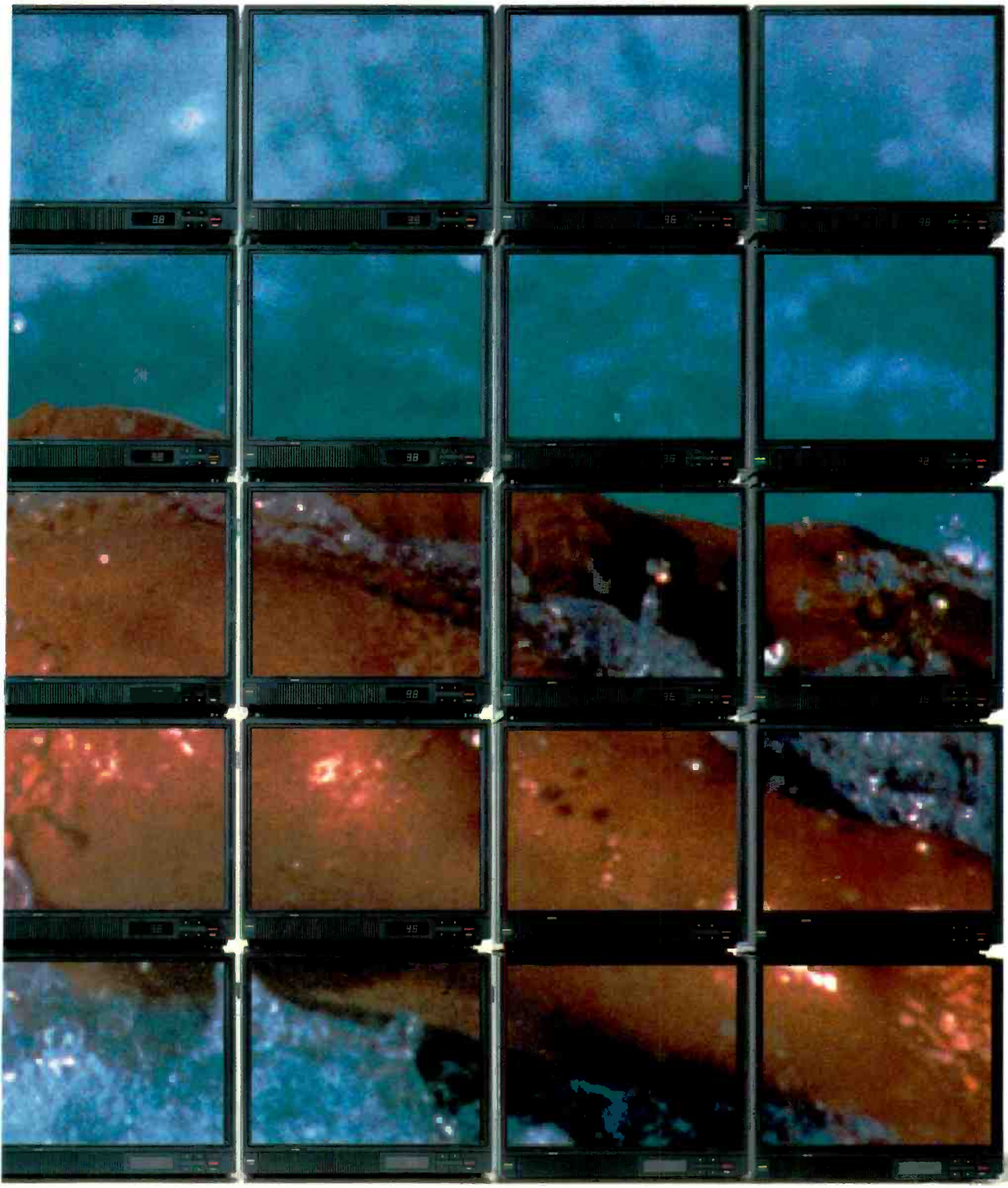
Northeastern Sales Office
Richard E. Fiore, Jr.
P.O. Box 616
Southwick, MA 01077
(413) 569-6908

Western Sales Office
Marty Jackson
P.O. Box 66507
Scotts Valley, CA 95066
(408) 438-4273

COMARK COMMUNICATIONS, INC.
A Thomson-CSF Company

P.O. Box 506, Route 309 & Advance Lane
Colmar, PA 18915 • (215) 822-0777 • Telex: 846075

Seoul Commitment.



NBC needed to pick a routing switching and machine control system for their coverage of the 1988 Summer Olympic Games in Seoul, Korea. The winner: 3M.

We've been a major player in the broadcast equipment business for the past 25 years. To find out more about the system we're supplying to NBC, or about any of the other video switching or control systems we've provided to major networks, call 1-800-328-1008.

Broadcast and Related Products Department/3M

3M

Feedback: Letters to the Editor

Alabama Jammer

I could not help but laugh while reading Harry Cole's article in the December issue of *BM/E* ("Paying the Piper," p. 66). As far as I'm concerned the FCC is still out to lunch. If regulation is getting better it is very hard to tell.

A good example is a community in southeast Alabama that has been struggling for over a year to get the FCC to even respond to their numerous complaints about a local FM station. The station's transmitter was, and still is, on the same frequency as one of the local TV station's audio subcarrier. The result was lack of reception of the TV station's signal for residents within several miles of the tower. The residents do comment, however, on how well the FM station's signal comes in on their TV sets.

To make a long story short, after many calls and letters to the FCC and to the FM station, nothing was resolved. A community meeting about the matter also brought no resolution to the problem. The only response from the FCC was "no response." Maybe that's becasue the FM station in question is a National Public Radio affiliate.

I could give you many more examples, but will refrain. Try not to give too much credit where none is due. The FCC may be meeting their quota by busting nickel-and-dime offenders, but regulation is far from back.

Tim Beasly
Information Services
Alabama Cooperative Extension Service

Harry Cole responds:
Suggesting that we may have given the FCC too much credit for its enforcement activities, our reader asserts that the commision may be "busting nickel-and-dime offenders, but regulation is far from back." While we would be in frequent agreement with our correspondents general observation that the FCC is, at least in some cases, "out to lunch," we feel it only fair to check into the particular situation to see what both sides of the story may be. We will report back in a future FCC Rules and Regulations column.

Contra Bandwidth

After receiving the December issue of *BM/E*, and after reading the article "New Formats for News (p.40)," I noticed that there was a mistake in the format comparison chart. You stated that the bandwidth for VHS and S-VHS are 1 MHz and 1.6 MHz., respectively. This is not the specification for the luminance bandwidth but the deviation of the FM carrier. The specification for Y bandwidth on VHS format is 3 MHz or 240 horizontal lines of resolution. The S-VHS specification for Y bandwidth is 5MHz or 400 horizontal lines of resolution.

David C. Luberda
Midwest Field Engineer
Panasonic Industrial Company

Wright Stuff

I would like to express my appreciation regarding the complimentary way in which you wrote your article about my engineering contributions and other engineering accomplishments here at Turner Broadcasting ("CNN Center is the Wright Place," *BM/E*, January 1988, p. 28).

The article reflects upon engineering here at TSBI, but it also reflects the intelligence and expertise of an outstanding publication.

Once again, thanks for such a nice article.

E. B. Wright
VP—Engineering
Turner Broadcast System, Inc.

Psychoacoustic Kudos

From the February, 1988, issue of *Syn-Aud-Con Newsletter*, p.25: "A good basic set of articles on psychoacoustics was in *BM/E (Broadcast Management/Engineering* Magazine starting in the February 1987 issue. The illustrations are exceptionally well done, and all the key parameters are introduced, correctly explained, and illustrated. The author, Paul B. Christensen, is chief engineer of WIVY-FM, part of Gilmore Broadcasting Corp., Jacksonville, FL. Here is an easy-to-read writer on the basics of an interesting subject, outlining in an easy-to-understand way the complexities to be covered. Recommended reading for those of you serious about understanding how to go about seeking measurements that relate to what we hear."

Let Us Know

Do you have any questions, comments, or criticisms concerning what you read in *BM/E*? Any bulletins or issues you want to open up to other engineering management readers? Feedback: Letters to the Editor is your forum. Write to: Feedback—BM/E Magazine, 295 Madison Avenue, 19th Floor, New York, NY 10017.

the SOURCE

for Ikegami Microwave Equipment

MIDWEST

As the nation's largest Ikegami dealer, Midwest offers you immediate delivery and dependable service on the full line of Ikegami products, including the PP-70 Portable Microwave.

Available in the 7 & 13 GHz frequency bands, the PP-70 is a compact high performance portable microwave link. This lightweight, battery operated unit (3 hours on a standard 4AH battery) is designed for convenient cable-free transmission of television video and audio signals. ENG and EFP production crews will find the PP-70 an operator-friendly addition to their production unit. The PP-70 is the only portable microwave unit with built-in features such as two audio channels (mike or line level), audio/video test signals, low battery indicators, LED bar graph/audible beeper for system path alignment, and LED SHF output indicator. Call your nearest Midwest office for a demonstration.

For all your RF Equipment needs, rely on the recognized leader. Midwest . . . the Source.

MIDWEST
Communications Corp.

One Sperti Drive/Edgewood, KY USA 41017
(606) 331-8990

Circle 107 on Reader Service Card Page 75

Julie Barnathan at the helm for the 1988 Winter Olympics in Calgary. Photo: Donna Roizen.

Julie Barnathan: Cutting Edge Olympics

The U.S. Winter Olympic team did not, by most accounts, offer an outstanding account of itself at this year's Winter Games in Calgary. Nevertheless, Jules (Julie) Barnathan and his ABC/Cap Cities engineers made an outstanding showing at the event. As Barnathan's reputation would lead one to expect, the coverage was efficient and at the cutting edge of broadcasting. This was due this year, in part, not only to the seamless cooperation between ABC and the Canadian host broadcast team but to history and planning of these kinds of events.

ABC and Barnathan have been bringing the Olympics to U.S. viewers since the network's first telecast of the event in 1964. Each time, Barnathan strove to bring the best coverage, using the latest equipment available. This dedication sometimes manifests itself with Barnathan encouraging a manufacturer to meet special needs, or by using prototypes of the newest equipment, just out of the research stage.

He has been a pioneer of slow- and stop-motion equipment, from the original use of specially-built monochrome equipment to introducing the first prototypes of the Ampex HS100 disk recorders in 1968. At the 1984 Summer Games, he was the first to use the new Sony Super Slo-Mo system.

This year's interesting coverage included "point-of-view" shots intended to simulate what it would feel like to be in the boots of one of the competing skiers, or bobsledders, as well as other competitors. This, combined with outstanding use of special effects, computer graphics, unique videotape recorders, in-depth sound coverage, customized vehicles, and camera mounts, brought a very professional look to the games.

Barnathan's dedication to the employment of modern, and even experimental, equipment that can be used to great practical purpose has allowed the ABC engineering team to present so many Olympiads in such innovative ways that ABC coverage of the winter event seems almost obligatory. The latest television technology, the most advanced engineering design and installation concepts—this and much more has allowed Barnathan and his ABC engineers to bring the public the excitement of winter competition.

BTS, Thomson to Cooperate in Development

Europe's two electronic media heavyweights, BTS (the old Bosch and Philips) and Thomson Video Equipment of France have signed an agreement of cooperation. This announcement heralds a joint-development strategy—and perhaps someday more than development—of many technologies. The new method is already in operation.

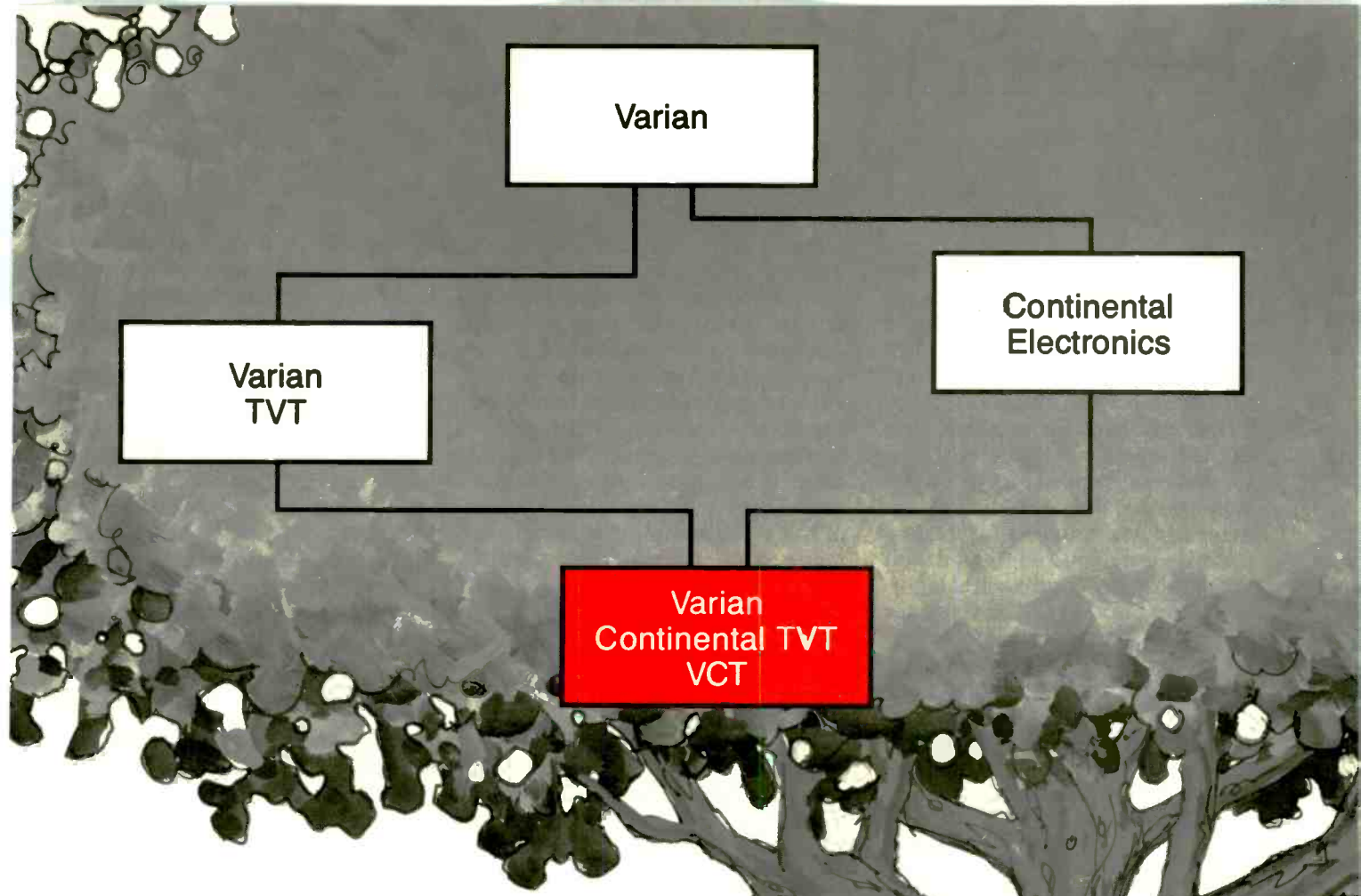
Digital technologies and high-definition (HDTV) for broadcasting are the first endeavors that the two companies are looking into. The move is most probably a reaction to the desperate need for the Europeans to stay competitive with other parts of the world threatening to virtually "take over" control of electronic technology.

Those who remeber the merger of Philips and Bosch in 1986 will recall the acronym ETS (European Television Systems) as the original name for the new company. Now that the three biggest players in that area are playing together, maybe it will finally provide a continent-wide operation. This, then, can someday be seen as the the broadcast equipment part of the Eureka, the comprehensive European plan for unity in technology.

With the development efforts, one can infer cooperation in marketing and sales. Although American broadcasters are not typically concerned with the comings and goings of foreign manufacturers, this developement produces a giant that few are able to ingore. The long- and short-range consequences are completely up for conjecture, but many guess that the least we will see is the first signs of a de facto standard for advanced televison.

NAB's AM Antenna Improvement

Devising methods to improve AM technology is perhaps the major impetus behind the NAB's plans to carry out its ambitious restora-

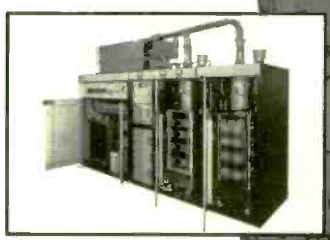


VCT - a direct line to video ancestry

Varian Continental TVT - VCT - markets and provides 24 hour a day technical support for Varian UHF-TV transmitters in the U.S. Our television heritage is strong because the VCT family tree consists of Continental's radio broadcast experience, state-of-the-art TV technology and transmitters built with quality English craftsmanship.

We're located near the Dallas-Ft. Worth International Airport. Our transmitters are specially designed for reliable, quality performance because they're purpose built for UHF-TV stations. That's VCT's commitment from its strong heritage.

For more information, contact:



varian VA
tvt limited

Products, sales, service and quality

P.O. Box 270879 Dallas, Texas 75227
Telephone: 214-381-7161 Fax: 214-381-4949

Circle 108 on Reader Service Card Page 75

tion project announced last month. Among the most visible developments from the Science and Technology division has been the advances in the exploration of new concepts for antennas.

The upshot of the research may be new ideas to enable AM stations to supress skywave radiation with no diminution in groundwave coverage. Other benefits are expected to be development of antenna technologies that may provide cost savings for AM stations that are constructing or altering their towers and ground systems. NAB had been pursuing two projects simultaneously: one from Richard Biby and one from Ogden Prestholdt.

The Biby project, originally scheduled for construction in Loudoun County, MD, encountered some delays though, and is now slated for construction in late 1988 or early 1989 at the same site as the Prestholdt project in Beltsville, MD.

The Presholdt experiment is well underway, with construction right around the corner in spring. Howard University, Washington, DC, is supplying the site and cooperating in many aspects of the project due to the educational value of an experimental AM antenna. Construction should be underway during the spring of 1988.

PBS to Start GI's Scrambling System this Month

General Instrument's VideoCipher II scrambling system, the de facto standard for encoding systems in cable, is breaking into the broadcast world. As part of an executive committee move to set policies to guide satellite distribution of its services, The Public Broadcasting Service will adopt GI's VC II for certain transmissions. The scrambling technology will deliver stereo programming, private communications, and user-financed services by satellite.

The effect on the engineering plant will be that a place must be found to integrate the new VC II decoder since no scrambled programming can be received without it. Despite this requirement, the price of the decoder is not excessive and the adjustment for such reception in the plant is not expected to present any real obstacles. And, it should be emphasized, this will only apply to stereo and other special signals. This use of the video scrambling system is believed to be the first use of scrambling for special services by a broadcast organization, and may make some waves or set trends—or both.

Home dish users who do not have the VC II decoders will still be able to pick up unscrambled transmissions of PBS's national program service schedule. That service provides some of PBS's biggest shows such as *Sesame Street* and *Masterpiece Theater*.

FMX Update

FMX refuses to die. Everytime there is discussion about the technology, about the fallout of companies, or the consolidation of the efforts including the NAB, new information arises. Such activity is seen by those in FM radio as a good sign that FM stereo improvement attempts are not dead. How does FMX, in whatever form it is now taking, address those concerns?

The "noise penalty" that comes along with improvements in stereo broadcasting has long been a technical obstacle that many involved with FM stations have tried to solve. It seemed as though one couldn't achieve the necessary enhancement and noise reduction until FMX technology came along. FMX removes the noise penalty, and, as a result, provides significantly improved stereo separation and virtually eliminates multipath distortions (provided the signal is received on a new FMX receiver).

To implement FMX, the station must replace its current stereo generator with an FMX generator at a cost of $3000 to $5000. The station should also perform a proof-of-performance check that addresses the station's particular transmission characteristics to determine how the transmitters own tuning and circuitry will affect the new type of transmission.

There were a few important leaps made late last year and early this year. Sponsored by Broadcast Technology Partners, the technical parameters for FMX are now in place. In addition, the technology is currently being field tested on two stations in Hartford, CT. Broadcast Technology Partners has its laboratories in Greenwich, CT.

Three broadcast equipment manufacturers showed FMX products at NAB: Orban, CRL, and Inovonics. Additionally, RE and Kikusui are advertising test equipment products for delivery to their customers integrated circuit and receiver manufacturers. Sprague and Sanyo are expected to offer FMX IC chips in the near future, if they are not already doing so by the time you read this.

On the other side of the signal, the Winter Consumer Electronics Show had ten prototype receivers on display. Alpine, Clarion, Concord, Denon, Fisher, Kenwood, Luxman, Magnum-Dynalab, NAD, Sansui, and Sanyo were all represented in this category.

Call for SMPTE Papers

Preparations are already being made for this year's Society of Motion Picture and Television Engineers Confererence and Exhibit. The 130th SMPTE show's theme is "Innovations in Imaging and Sound" and will be held this year at the Jacob Javits Center in New York, October 15 to 19. As usual, technical papers will be delivered on individual subjects, each centered on the overall theme as an integral part of the proceedings.

The theme is a good spring board, but someone has to sit down and write the papers, so Ed Burns, the program chairman, has put the call out for papers. He

Our bold new technology has created a shotgun 55% lighter, 55% hotter, and 28% shorter,* yet with 100% of the sound you need!

Model 4071
Line + Gradient Condenser Microphone
(shown with AT8415 Shock Mount)

Model 4073
Line + Gradient Condenser Microphone

These two new Audio-Technica studio condenser microphones represent a small revolution in shotgun design...inside and out. Meet the Model AT4071 (just 15½" long) and the AT4073 (a mere 9"). They may look like other shotguns (although somewhat shorter than most), but the resemblance stops as soon as you plug them in.

New Coaxial Tube Design

First, both 40-Series microphones perform far "longer" than their actual size. In effect, the ingenious coaxial interference tubes perform as though the microphones were half again as long. Our unique tube design goes far beyond the normal phase cancellation that occurs in a simple resistance-damped tube. There is actually a tube-within-a-tube, creating a separate, acoustically longer path for the lowest frequencies. Low frequency directivity (normally a simple function of tube length) is maintained, yet the microphone size is reduced to a far more practical length.

The Result: Far More Versatile

This shorter length for a given acceptance angle is a practical benefit in the studio and the field. It's easier to avoid shadows and to stay well out of the frame. Cancellation from the back is also impressive, making exact mike placement less critical. And their very light weight (far less than the others) will be appreciated by every user. As a bonus, the nested internal construction makes the 40-Series shotguns unusually resistant to accidental damage.

Clean Transformerless Output

Listen carefully to the 40-Series sound. The transformerless output insures fast, distortion-free response to transients. You'll hear crisp, natural dynamics over an extended frequency range, even under high SPL conditions. Output is extremely high, making the 40-Series hotter than any other shotgun available. A built-in high-pass filter is included, of course.

Quiet in Every Way

The low noise of these new microphones is impressive. Self-noise is almost immeasurable at about 12dB for the AT4071, and just 14dB for the shorter AT4073. Equally important, the rejection of wind and handling noise is outstanding. Coupled with excellent sensitivity, the 40-Series design allows you to take full advantage of the finest digital and analog studio electronics.

Compatible and Competitively Priced

Finally, both can be powered from any 12-48V phantom power supply. They come complete with foam windscreen, stand clamp, and case. Yet, with all their advances and performance superiorities, the new A-T 40-Series microphones are priced competitively with the best known shotguns.

The significant performance advances of these new 40-Series microphones demand a trial in your most difficult environment. Heft them. Hear them. Compare them in every way. This bold new technology has raised the standards for shotgun performance!

audio-technica®
1221 Commerce Drive, Stow, OH 44224
(216) 686-2600

*Model AT4071 compared with Sennheiser MKH816P48-U. For complete shotgun comparison, call or write.

is soliciting technical works by engineers, researchers, and executives in the industries that fall under SMPTE's umbrella—but they need not be formal members of the society. Television papers will cover video recording, electronic production and post, digital systems, image processing, videographics and special effects, audio, test and measurment, signal routing and distribution, extended- and high-definition TV, and other related topics.

The procedure for submitting ideas is specific. The author must send his name, company affiliation (if any), address, telephone number, and a 100-word abstract of the proposed paper by June 15, 1988. Author forms, which are available from SMPTE, must also be filed by that date.

If the subject is suitable for presentation, the author will be notified that he or she must send a completed manuscript and a 500 to 700 word synopsis. The deadline is August 19. These manuscripts will be "preprinted" for sale at the conference and will be considered for publication in *SMPTE Journal*. The presentations are normally 25 to 30 minutes long and may be supported by audio and visual aids.

Radio Hall of Fame Established

In May, 1988, the Empire State Building will have another tourist attraction. The pioneers and present heros of the radio industry will be recognized in the new Radio Hall of Fame.

The Hall will be founded by the Emerson Radio Corp. in conjunction with its 75th anniversary. "After three quarters of a century in the business, we wanted to give something back to radio, not only honoring those who have worked and are working in this vital industry, but making sure that future generations know about its history," says William W. Lane, chairman of the company.

The initial induction will have more than 15 honorees from such categories as entertainment, news, sports, and technology. A special presentation for lifetime work on behalf of the venerable broadcast medium will also be made.

The technology category will include inventors and engineers who have made a lasting impact on radio from its inception, through the development of FM and further to the many changes of today. Says senior VP Marino Andriani, "We want to honor everyone involved in bringing radio to where it was—and is."

A Blue Ribbon selection panel will be voting on the inductees. The panel incudes Walter Mondale; Howard Cosell; Dick Clark; John Gambling, WOR Radio personality; Robert Pittmann,

Circle 110 on Reader Service Card Page 75

"IF OUR NEW TRANSMITTER LASTS AS LONG AS THE FIRST ONE, WE'LL BE BACK IN 2015."

John and June Conner and Grandson Kyle
Conner Family Broadcasting
Beardstown, Illinois

In the farmlands of western Illinois, people value the things that last. That's why John Conner called Harris when the AM transmitter at WRMS finally gave out. After 28 years on the air.

It had seen a lot of history. New faces. New owners. Even its original manufacturer, Gates Radio, had a new name — Harris.

Over the years, Harris experts had kept WRMS' transmitter in top condition. "They were always there when we needed them," says Conner.

So, when the old transmitter finally wore out, an urgent call went out to Harris, 71 miles away in Quincy. Yes — a new transmitter was available. Immediately.

"The next day," remembers Conner, "it was on our pickup. And by the following morning, we were up and broadcasting."

From major networks to small-town broadcasting, Harris understands what commitment and customer support are all about.

"That's why," says June Conner with a smile, "when Kyle buys our next transmitter — many years from now — he'll be calling Harris."

Find out how Harris is leading broadcast manufacturing into a new century. Call TOLL FREE:

1-800-4-HARRIS
Extension 3009

HARRIS

Circle 111 on Reader Service Card Page 75

MTV founder; John Hall, president of the American Federation of Theatrical and Radio Artist (AFTRA); *TV/Radio Age Magazine* editor Jack Loftus; Evelyn McVeigh, professor of communications at New York University; Pierre Sutton, president of Inner City Broadcasting; and Russell Ward, retired Washington, DC, correspondent for NBC Radio.

Kahn Develops DAT Technology

Leonard Kahn, known most widely for his recent impact in the AM stereo side of the broadcast business, has recently developed what he considers to be a solution to the DAT copycode controversy. Kahn has worked in conjunction with major record labels as well as with CD and DAT machine manufacturers in developing three patents currently applied for.

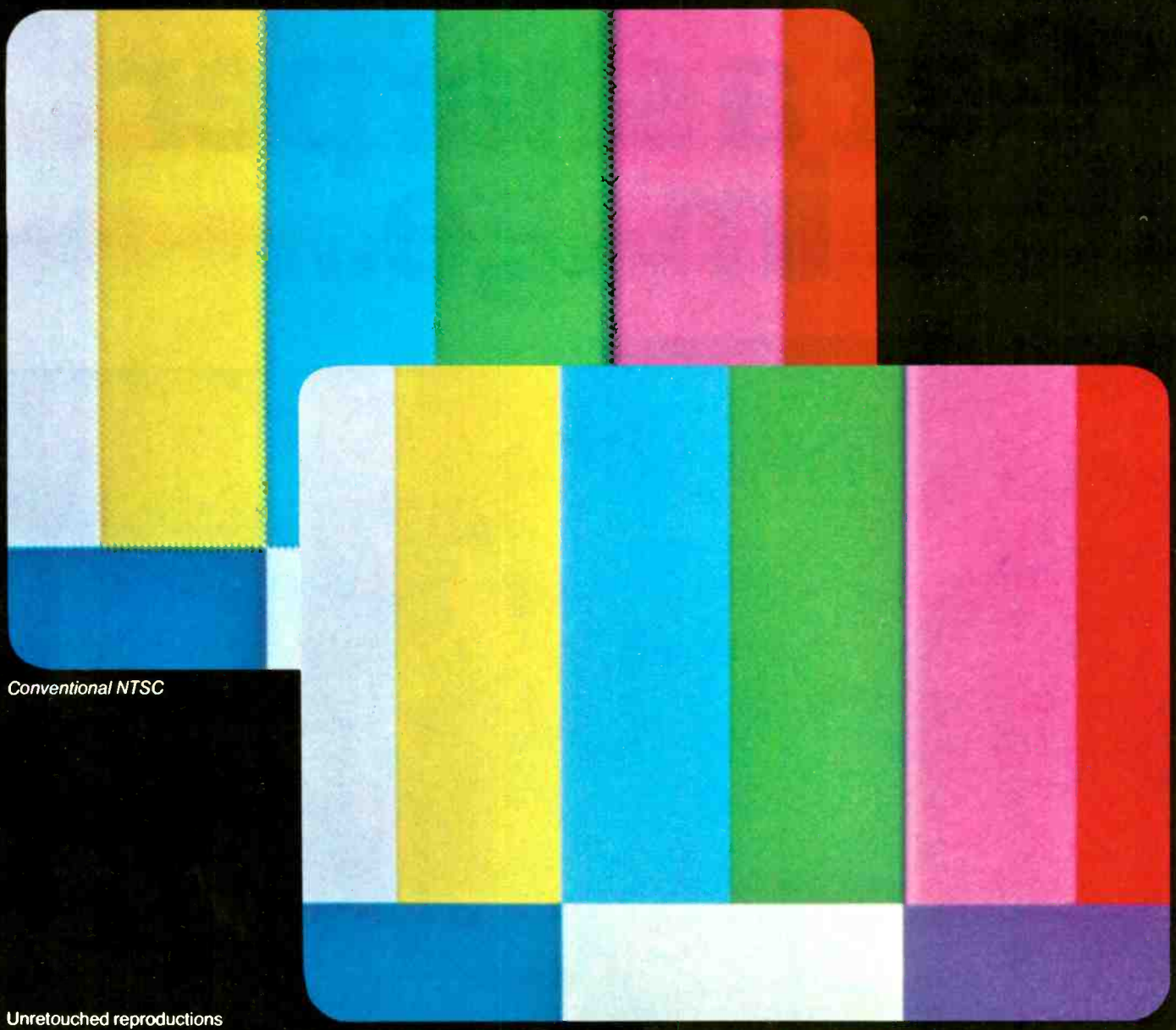
The Kahn technology creates an inaudible signal to be added to the recorded material so that when someone attempts to copy a CD, the signal shuts off the record mechanism in the DAT machine. The new chip adds rather than makes a hole in the spectrum as was the case with the CBS copycode. The CBS spoiler chip was deemed by many to produce audible artifacts that degraded the sound of the original recorded material. This would naturally have made professional (i.e. broadcast, recording studio) use of such material not acceptable and likely would have been noticed by much of the general public as well. "The signal that shuts off the record mechanism," says Kahn, "will likely go through a defeat switch for professional units since that is not the type of use about which the recording industry is most worried."

In addition to the inaudible signal, there would be audible artifacts on recorded material that would preclude the use of DAT machines that are not equipped with the protection technology. This new technology has been deemed by some to be a possible solution since the Federal Government has, in this age of deregulation, taken itself out of this kind of legislation, leaving it to members of the hardware and recording industries to work it out.

Correction/clarification

In the February 1988 issue of *BM/E*, in the Business Briefs photo box, Harvey Dubner, president of Dubner Computer Systems, was incorrectly identified as Harry Dubner. We regret the error.

Owing to late changes in booth assignments, some companies received inaccurate listings in *BM/E's* March issue. Information presented was up-to-date at press time. We regret any confusion this may have caused in Las Vegas.



Conventional NTSC

Unretouched reproductions of actual monitor displays.

Faroudja NTSC Encoder and Decoder

IMPROVE YOUR NTSC

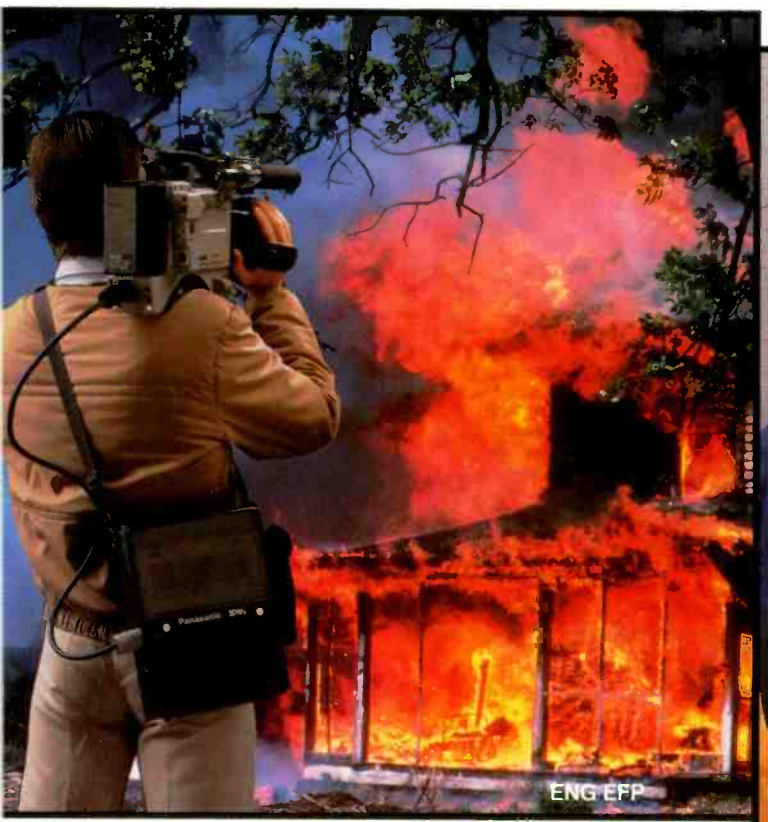
Faroudja Laboratories improved NTSC is fully compatible with the present system. Faroudja technology is licensed to Conrac, Fortel, Ikegami, JVC, Sony, etc...

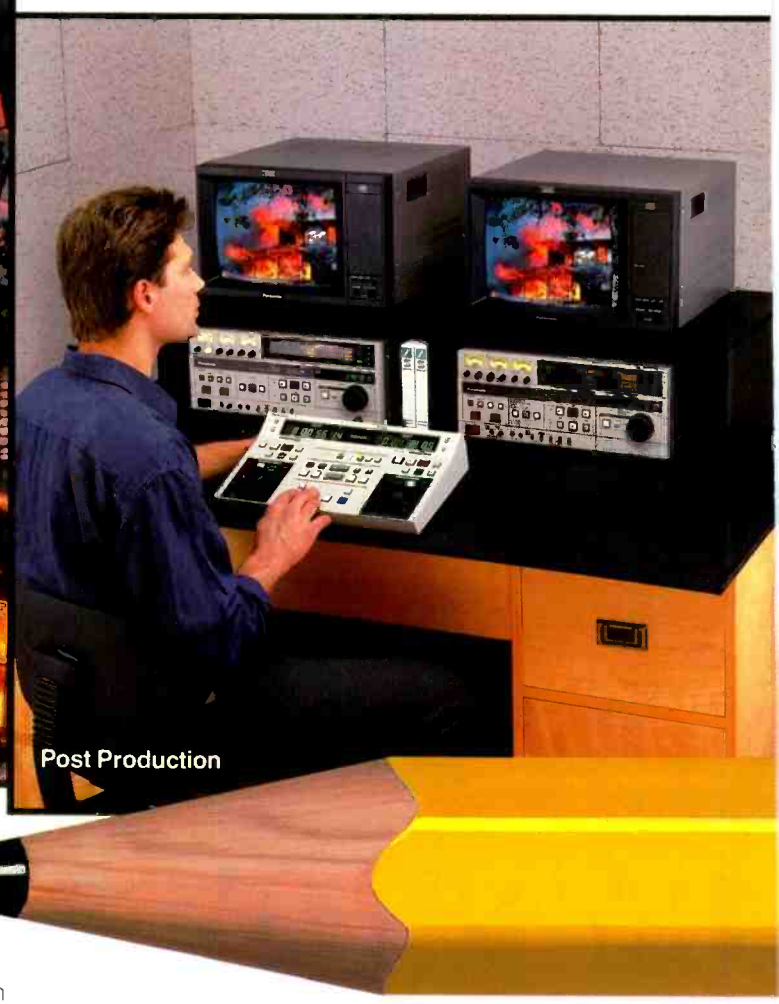
FAROUDJA Laboratories

Faroudja Laboratories Inc.
946 Benicia Avenue
Sunnyvale, California 94086
Telephone 408/245-1492
Telex 278559 MUHA UR
Fax 408/245-3363

Circle 113 on Reader Service Card Page 75

Get a sharper image...





The SVHS format behind the Panasonic® Pro Series will change the way you look at half-inch recording systems. Because it delivers over 400 lines of horizontal resolution. At an affordable cost. So you can get a sharper image even as you sharpen your pencil.

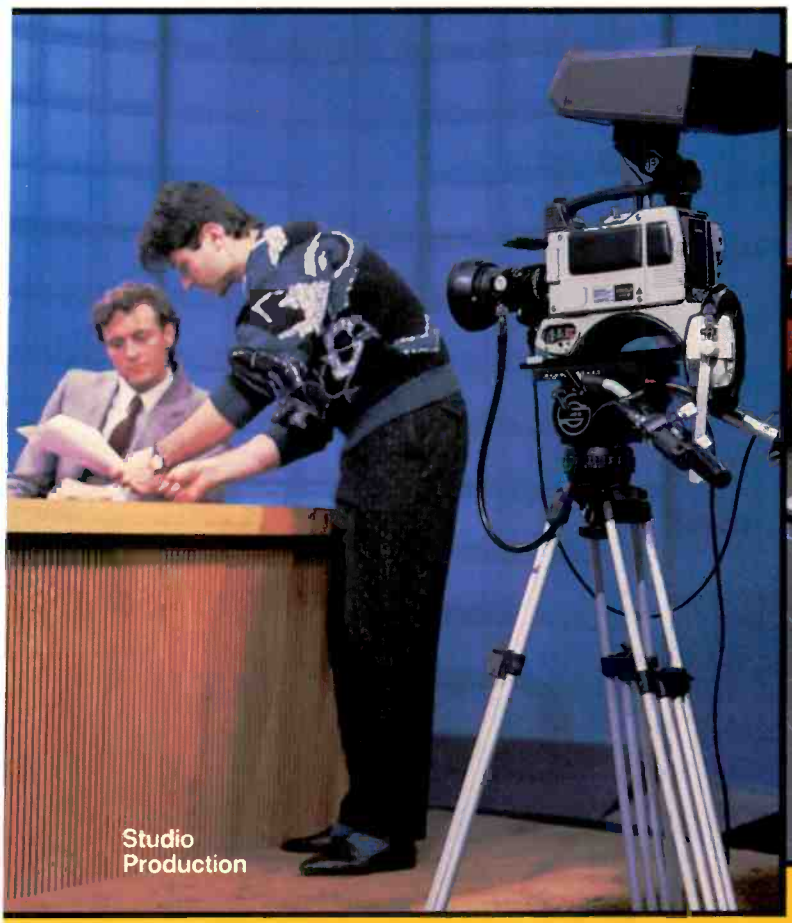
In the field, the Panasonic Pro Series offers you a host of benefits existing formats fall short on. Like two hours of recording time on a single cassette with Hi-Fi audio capability. In a highly portable package. To capture more action and sound on fewer tapes. Which means you'll have less to carry in the field and on your budget. And the Pro Series easily interfaces with a variety of existing component or composite cameras and VCRs. So you can easily integrate the Pro Series in your present field operations.

For editing and post-production applications, the Pro Series takes full advantage of the SVHS format as well. With easy to use features and high performance capabilities. Such as digital framing servo circuitry to provide highly stable edits. And time code input/output facilities for frame accurate editing. The Pro Series editing VCR also features 7-pin dub capability to maintain component signal integrity throughout the system.

For studio production, Pro Series components are designed with flexible operations in mind. With VCRs and monitors outfitted for total systems application. And cameras designed for use both in the field and in the studio. To help minimize your investment without limiting your capabilities.

For duplication, Pro Series monitors and VCRs provide you with the convenience and versatility of half-inch cassettes. And the performance of SVHS. When duplicating, you can maintain excellent picture quality thru component or composite signal transfer. And dub Hi-Fi audio simultaneously with the video signal. There's even a Pro Series cassette changer to help increase the efficiency of your duplicating system.

even as you sharpen your pencil.



Whether it be a small or large operation.

For video network applications, the Pro Series produces high quality images on both large projection systems and small screen monitors. With features like auto repeat playback for unsupervised presentations. And the system is upwardly compatible with standard VHS. So you can continue to use your existing library of recordings without any type of conversion.

Pro Series VCRs also incorporate a number of features designed for network automation. Such as video sensor recording. So you can transmit video programs to your network locations during off-peak hours. And save on both transmission and personnel cost. You can even interface Pro Series VCRs with computers for interactive training programs.

So whether you're looking for high performance field recording, post-production, studio, duplication or networking systems. The Panasonic Pro Series can sharpen your image while you sharpen your pencil.

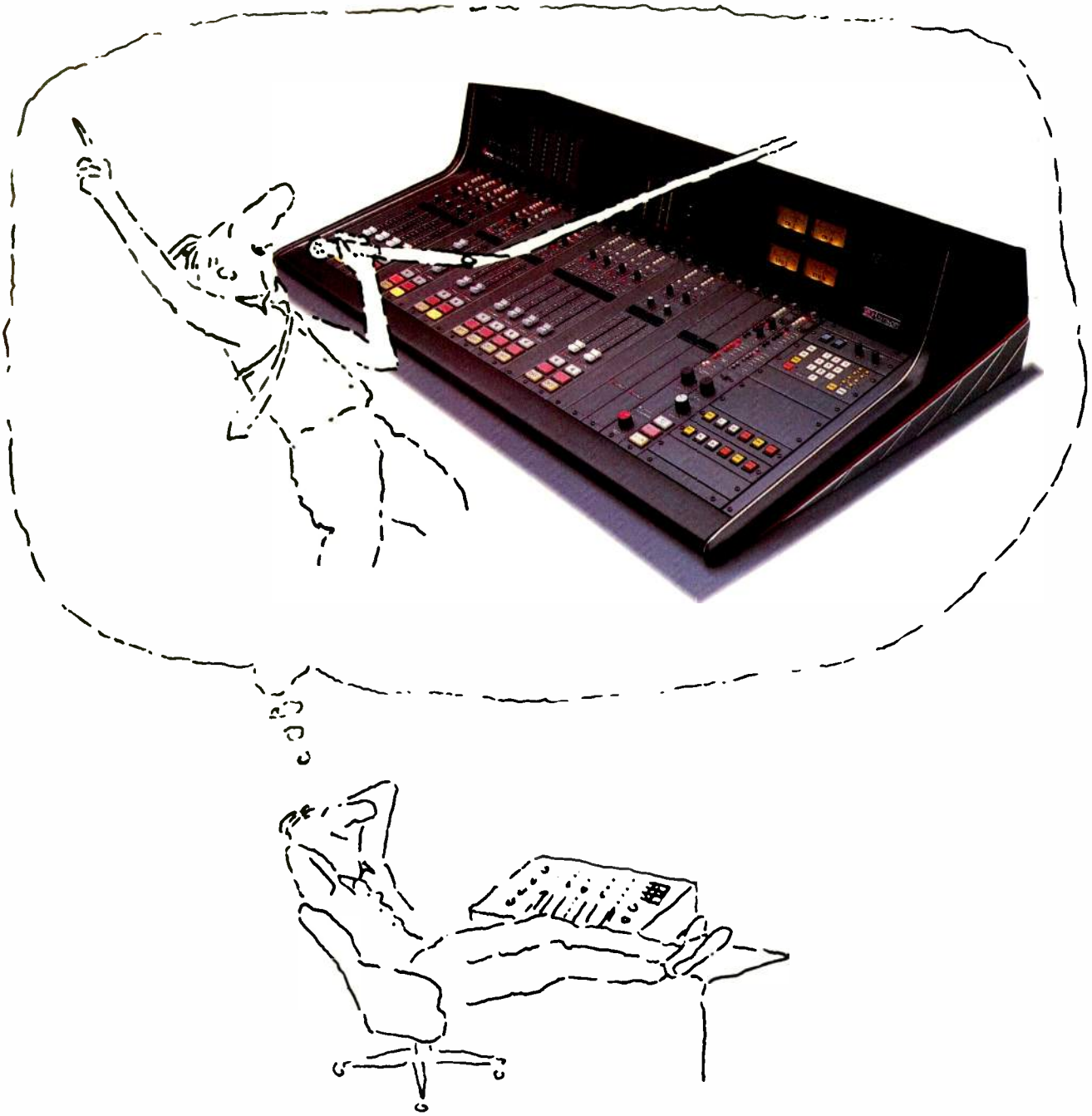
For more information, call Panasonic Industrial Company at 1-800-553-7222. Or contact your local Panasonic Professional/Industrial Video dealer.

S-VHS

Panasonic

Professional/Industrial Video

Circle 114 on Reader Service Card Page 75



IMAGINE

Now experience the new AIR 790.

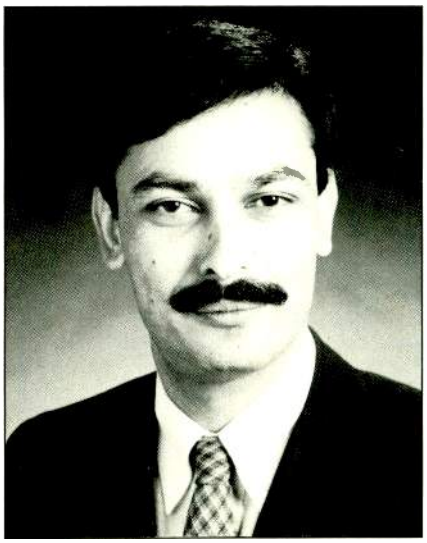
You can dream about a board that really sounds good, *or* you can use the new Harrison AIR-790. The new AIR-790 has the same program-origination quality signal electronics as Harrison's latest and best recording and production consoles, while retaining the elegant ease of operation and proven reliability which have made Harrison America's #1 console manufacturer. Multiple stereo and mono outputs mean you're ready when the need for a remote feed or telephone mix-minus arises. Technologically advanced features and facilities, the lowest noise-floor in the industry, and ease of service *keep* you on the air and sounding great. The new AIR-790. Some dreams *can* come true.

AIR 790

HARRISON SYSTEMS, INC. • P.O. Box 290157 • Nashville, Tennessee 37229 • (615) 834-1184 • Telex 555133 • Fax 615-834-1365 • In California, call (818) 763-2349 Harrison

Junaid Sheikh Retires ...NBC Summer Olympics Plans

By Robert Rivlin



Junaid Sheikh.

I first met Junaid Sheikh at the SMPTE show in 1980. He was working for Ampex at the time, assisting on the project to transform the eight-bit digital art/paint system written by Alvy Ray Smith at the New York Institute of Technology into the 16-bit, 256-color system that eventually became the Ampex Video Art (AVA) product.

Several years later, in 1984, I met up with Junaid at the SMPTE Winter Conference in Montreal. He had left Ampex in 1982 to become one of the founders and VP of marketing for Abekas Video Systems. Abekas had already introduced the A42 digital still store and the A52 digital effects unit.

"If you were us, what would you work on next," Junaid asked. It was a rhetorical question. Bubbling with excitement, Junaid confided that Abekas was developing a digital disk recorder that would lay down 50 or 100 seconds of digitized video, and permit the frames to be played back in any sequence at any speed.

Junaid pointed to the Cherry Coke commercial produced by Charlex. "What if instead of running dozens of VTRs in sync to achieve the multilayered effect," he asked, "they could simply use the digital disk recorder Then they could perform the image compositing and multilayering digitally, reading out a frame at a time, processing it digitally with a special effects device or other digital equipment, and then rerecord it again on the disk—without ever having to suffer the signal degredation caused by analog NTSC?"

The A62 was demonstrated in prototype in a hotel suite at NAB that year. I got to the suite just in time to see ABC's Julie Barnathan and Roger Goodman on their way out. "They loved it," Junaid told me. But equally important to him was the response of the dozens of post-production facility people who had come up to the suite. It was Junaid's belief that it was facility usage of the A62 that would make it a successful machine. And it was at post-production facilities, indeed, that Abekas, and Junaid himself, made the most friends.

The A62 wasn't, of course, the last successful product from the company. Subsequent years saw the introduction of 4:2:2 versions of the 52 and 62, a 3D effects system, and, at the most recent SMPTE, the A72 software-based character generator. But the A62 remains to this day one of the more amazing product marketing success stories for both Abekas itself and the industry as a whole. It was therefore with some surprise that I learned of Junaid's recent decision to retire from Abekas.

Junaid explained his decision in a telephone conversation. "I'm taking a sabbatical," he said. "I need time to spend with my wife and children, and to see what I want to do next. I've given myself a year off."

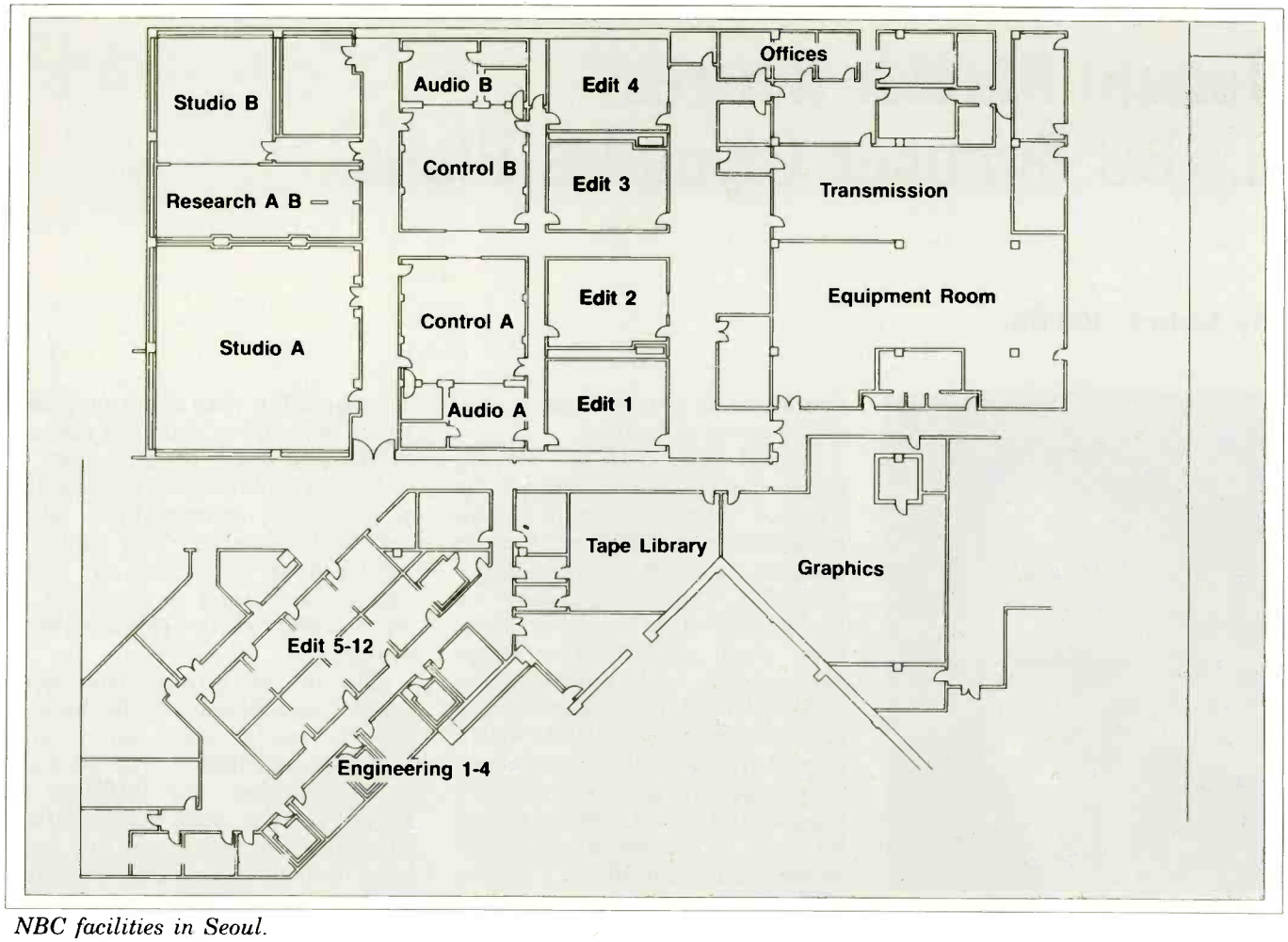
Can he, or anyone who has spent a significant time in the industry, really leave for good? Probably not. Indeed, Junaid will be at NAB this year, fulfilling a fantasy that he could one day go to the show as a free agent and not have to spend time demonstrating products in a booth.

More significant, perhaps, is his involvement with a venture capital group—the same one that originally funded Abekas. Though not necessarily looking to develop broadcast properties, Junaid notes that it is one of the few groups that are willing to entertain proposals from broadcast equipment manufacturers.

Thus we bid farewell to Junaid Sheikh of Abekas, and wish him well. And yet it is a farewell mixed with an almost bankable feeling that we will see him again soon. Men of the calibre of Junaid Sheikh cannot be allowed to simply slip quietly away.

Summer Olympics Plans

No sooner was coverage of the Winter Olympics over than the industry began focusing on the massive plans being made by NBC for coverage of the Summer Games from Seoul, Korea. Assuming that there are no political problems to spoil America's involvement, these Games should give the net-



NBC facilities in Seoul.

work an opportunity to reclaim some of the prestige it lost when the U.S. boycotted the Moscow event a number of years ago.

As announced at NAB last year, the bulk of the design work on the NBC facilities is being carried out by the U.K.'s Dynamic Technology Ltd. (DTL), which has contracted to both lay out and install the two studios and related control rooms, four large editing suites, and 11 small editing suites that will form the heart of NBC's technical operation.

The facility has the ability to accept 26 inputs being supplied on the international feeds by the Korean Broadcasting System (KBS), plus 21 NBC unilateral inputs, all remotely controlled by a Graham-Patten UTEC switcher and frame synchronizers. Audio is stereo throughout, with inputs fed through Tektronix 118 synchronizers.

The two identical studio control rooms (one for a two-camera, the other for a three-camera setup) each contain a Grass Valley Group 300 switcher, SSL 6000 36-input audio console, and one of the 20 Quantel Cypher graphics systems being used by NBC for the games. The control rooms also have access to up to eight channels of GVG Kaleidoscope digital effects. There will also be an elaborate graphics center, housing several Quantel Paintboxes a Quantel Harry, and a Quantel DLS still store. All together, the Quantel order is worth $3 million.

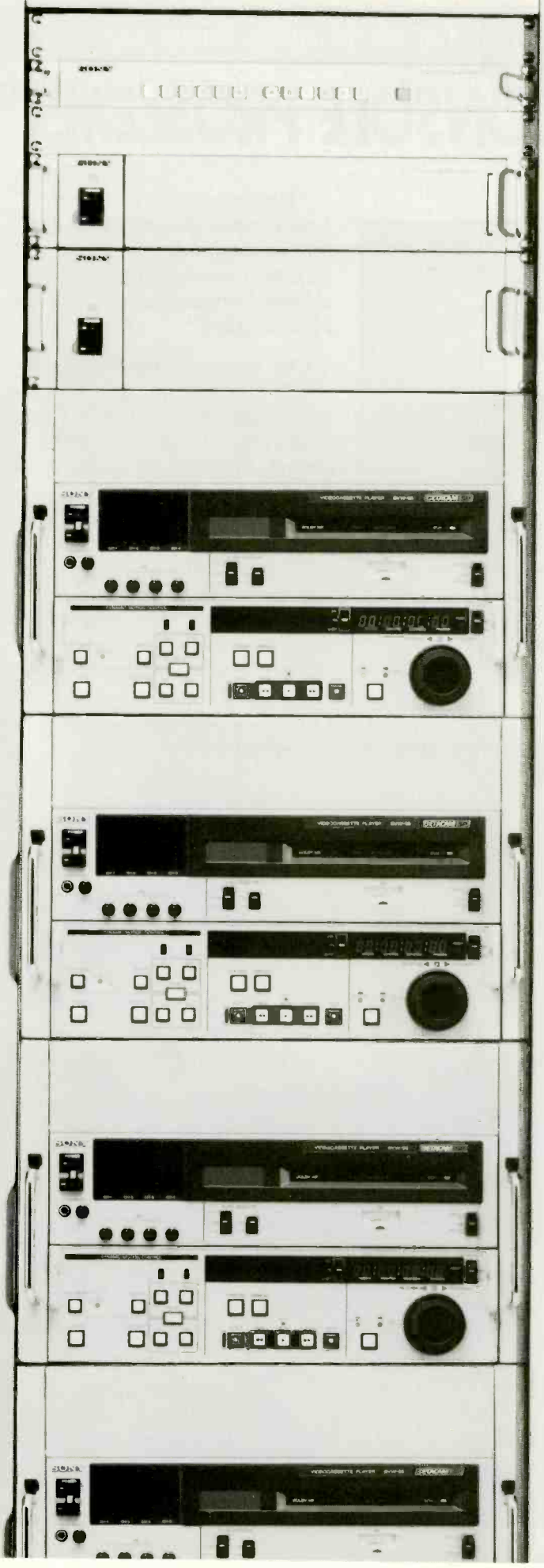
The NBC broadcasts will also mark the first on-air use of the Grass Valley Kadenza, used for digital compositing of the graphics. NBC is using the prototype unit displayed by GVG at SMPTE.

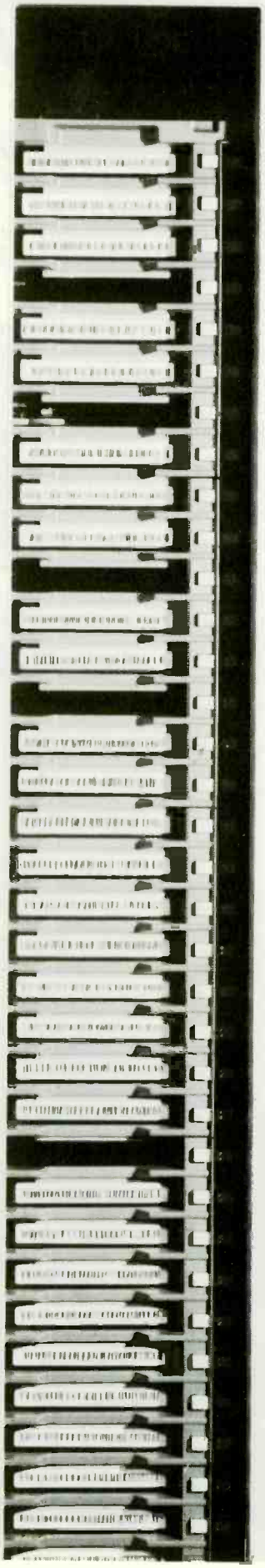
Perhaps the most interesting feature of NBC's proposed coverage is the extensive use being made of component analog technology—specifically MII. Not only will much of the videotaped acquisition be in the MII format, but also much of the post-production. Large edit suites utilize a Grass Valley Model 52 editor interfaced with seven MII decks and a GVG 300 switcher, and a 24-channel Ward Beck console. The smaller edit suites use the GVG 51 to control four MII decks, a Model 100 switcher, and a Graham-Patten audio mixer.

3M videotape will be used throughout NBC's operation. In addition to all the NBC activity, KBS itself has obviousky been busy gearing up for the games. Ampex has received an order for $2.5 million in VTRs from the Koreans—including 50 VPR-6s with TBC-6s and two VPR-3s with TBCs. This raises to a total of 100 the number of Ampex VTRs that will be on hand in Seoul; the KBS center will also have two ADOs available.

SONY

BETACART BVC-10





24-hour cash machine.

Face it. If your station doesn't have a rock-solid, economical way to deliver station breaks, you could go broke.

Enter the Sony Betacart® system. With a single stroke, it has redefined the video cart system from temperamental mechanical monster to perpetual profit machine.

Today, the Betacart system is the most accepted state-of-the-art system for commercial presentation. With proven, easy-to-use software packages for spot delivery *and* news. Ultra-reliable, side-loading mechanics. And multiple backup and self-diagnostic systems.

And now, by incorporating Betacam SP® technology, the Betacart system delivers even higher quality video and versatile 4-channel audio.

It's one of those rare purchases you can make for your station that pays for itself many times over. And will continue to do so. Because Sony is constantly developing new applications to make Betacart products even more versatile.

For more information on the top cart system for improving your bottom line, contact your Sony Broadcast representative. Or call Sony at 800-635-SONY.

SONY

Broadcast Products

We put our heads together to give you a smaller one!

Fast set-up and breath-taking smoothness of action. These are two major benefits Vinten's new Vision 5 head offers.

Vision 5 is the smallest and lightest head in the remarkable Vision family. It shares the same unique, patented technology.

For use with the smaller ENG and new generation CCD cameras, the quality of movement will astonish you.

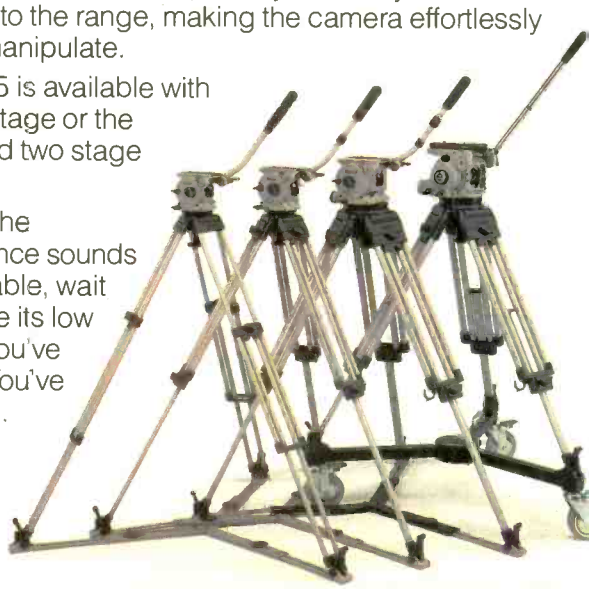
This is because unlike any other type of head Vision 5 is perfectly balanced at any increment of tilt through 160 degrees of movement.

Circle 117 on Reader Service Card Page 75

Achieved with the unique, adjustable system common to the range, making the camera effortlessly easy to manipulate.

Vision 5 is available with a single stage or the acclaimed two stage tripod.

And if the performance sounds unbelievable, wait till you see its low price. If you've got five. You've got Vision.



Vinten

Vinten Equipment Inc.
275-C Marcus Boulevard Hauppauge
New York 11788-2001 Telephone (516) 273-9750
Telex 640470 Telefax (516) 273-9759

Vinten Equipment Inc.
8115-B Clybourn Avenue Sun Valley
California 91352-4022 Telephone (818) 767-0306
Telex 182686 Telefax (818) 767-0772

X-Ray Lithography Shoots for Billion-Transistor Chips

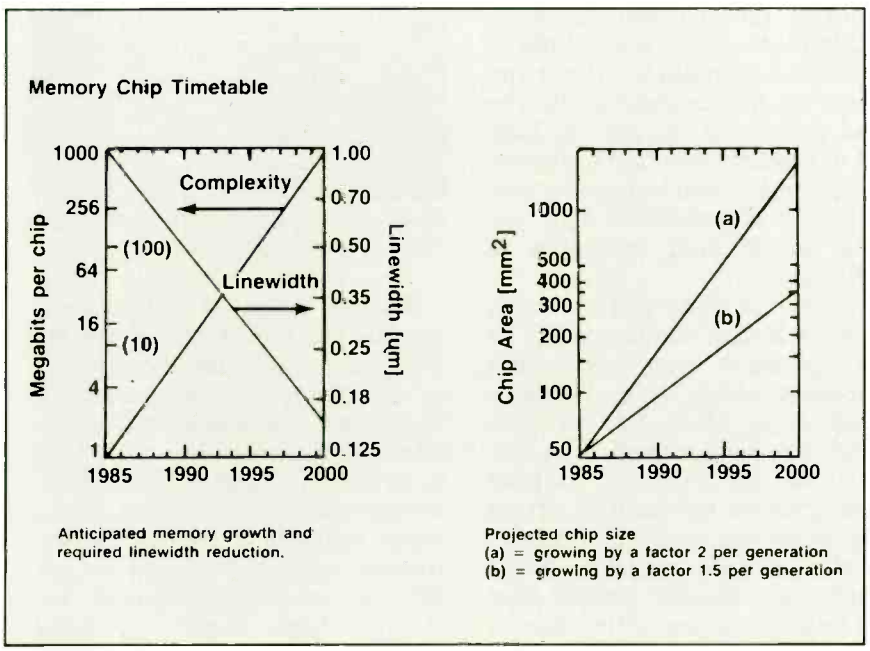
By Eva J. Blinder

The broadcast industry, like so many others, has hitched its technological wagon in large degree to the continuing advances in computer technology. "Smart" cameras, computer graphics, integrated station automation systems, and more depend on the power contained in state-of-the-art microchips. Advances in these systems and others often depend on advances in chip technology.

So far, it's been a happy connection. Chip manufacturers have realized significant increases in circuit density each year since they first started etching silicon. Each year sees the introduction of new chips that pack more and tinier transistor circuits onto the same size wafer. With each advance, broadcast equipment becomes smarter, more automatic and more reliable.

The improvement cannot go on forever, unfortunately. Scientists involved in the development and manufacture of microchips predict that the decreases in the size of microcircuits—the key factor in producing more capable microprocessors and memory chips—are leveling off and can be expected to peak by the turn of the century or earlier. Unless new methods of chip manufacture are developed, processing power may soon reach a stagnating plateau.

One of the most promising new technologies for chip manufacture, x-ray lithography, is presently the subject of intense research in this country, as well as in Germany and Japan. X-rays promise to deliver the fine detail and high density the semiconductor industry is demanding. But serious barriers may hamper the practical application of x-ray lithography unless scientists can find a way around its drawbacks.



Timetable for memory chip production. (All diagrams developed by A. Heuberger, Fraunhofer-Institut fur Mikrostrukturtechnik, Berlin, Germany and Technische Universitat Berlin, Germany.)

At present, microchips are manufactured using a process called optical lithography. Large-scale diagrams of the desired circuits are developed, often using computer-aided design (CAD) programs. These drawings are then scaled down and form the pattern for the "mask." Light waves passing through the mask etch the circuits onto the surface of a silicon wafer, creating the chip.

Current optical lithography technology can create details as small as one micrometer on a microchip. Chips produced by this method may contain as many as a million tiny circuits. To make circuits this small, chip makers have had to resort to shorter and shorter wavelengths of light, since the the wavelength must be shorter than the circuit to be etched. For chips this detailed, the wavelength of light in the visible spectrum is too large, and therefore ultraviolet light is used to etch the circuits.

If chip makers are to develop a billion-transistor chip, however, detail size must be reduced to as little as 0.1 micrometer, beyond the capability of ultraviolet light. X-rays, with a wavelength shorter than that of ultraviolet, are capable of producing such fine detail. But their use poses formidable technological obstacles.

The first of these obstacles is pattern generation—in other words, creating the mask though which the x-rays will pass before they reach the silicon substrate. Optical lithography typically uses a relatively thick transparent material, such as glass, as the mask substrate, with the pattern created by a thin layer of light-blocking material (chrome is often used). Because of the different absorption properties of x-rays, this architecture is impractical. It appears likely that a successful

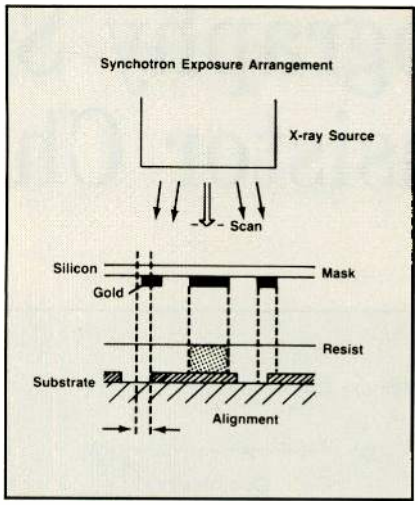
mask for x-ray lithography will consist of a thin layer of some x-ray-transparent foil with a thicker absorbent layer of another material.

A number of substances are under consideration for x-ray masks, including silicon, silicon nitride, boron nitride, and silicon carbide. Each has advantages and disadvantages. Boron nitride, for example, is particularly susceptible to chemical degradation. Silicon and silicon carbide appear to be the most promising and are the subject of considerable R&D activity. Electroplated gold is a strong contender for the absorber layer because of its high resistance to radiation.

Whichever materials are used, creation of the "mother mask" is an expensive, time consuming process involving several complicated steps. Once this is completed, the mother mask is used to make a number of working masks, which are used in actual chip manufacturing. Fabrication of the working masks, fortunately, is a simpler process that can be achieved using the same x-ray-producing equipment used to etch the chips.

X-ray specs

Another obstacle to x-ray lithography is the source of the x-rays themselves. X-ray tubes, while offering high sensitivity, are inappropriate for semiconductor manufacture because of their poor intensity and poor focus. Plasma sources hold more promise, but must be carefully controlled to achieve the necessary resolution. They also produce high levels of electromagnetic radiation.



Exposure arrangement for x-ray lithography using synchotron radiation.

Storage rings, or synchotrons, provide the best x-ray source for lithography. Developed originally as an offshoot of atom smashers, they share one of their major disadvantages: huge size, easily up to 50 feet in diameter. Their price is consonant with their size, in the many millions of dollars. Nevertheless, synchotron radiation offers important advantages, including high depth of focus without geometrical distortion and high intensity (allowing shorter exposure times.)

Work is proceeding rapidly on developing synchotrons that would be suitable for making semiconductors. A 50-foot diameter, $40-million-dollar synchotron such as the one at Brookhaven National Laboratory in Upton, NY, is impractical for semiconductor work because of its size and cost. (One reason the size is such an issue—in addition to the cost of real estate—is that semiconductors must be fabricated in a clean room environment.)

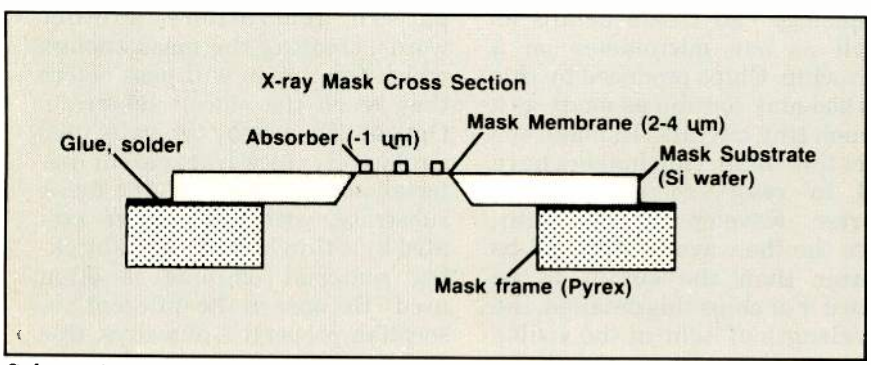
A possible solution is already under development in West Germany: the COSY compact storage ring, which is two meters wide and five meters long. The COSY uses a pair of superconducting magnets to bend the x-rays around an racetrack-shaped orbit. Other countries are also researching "small" synchotrons; in the U.S., for example, IBM is having a 20-foot prototype synchotron constructed at its East Fishkill, NY, chip factory.

With research on x-ray lithography still at such an early stage, is the industry in danger of a standstill in chip technology? No, because many experts believe that optical lithography still has not reached its limit. While the development curve has slowed for optical lithography, there is still room for improvement in the interim before x-ray lithography becomes fully practical. In fact, many in the chip business believe optical lithography can be capable of resolution as fine as 0.5 micrometer—a considerable advance over today's technology, though not up to the 0.1-micrometer potential of x-ray lithography.

Cash in the chips

And what will these billion-transistor chips do, anyway? That's up to the imaginations of equipment designers. For one thing, such a chip would be considerably faster than its current counterparts, allowing more powerful manipulations in shorter times than ever before possible. It could offer sheer storage as well; a 65 Mbyte memory chip has been described as quite possible with x-ray lithography. And it could be vastly smarter than today's chips, allowing advances in artificial intelligence. For broadcasters, high-speed, high-density chips could lead to undreamed-of advances in station automation and post-production technology.

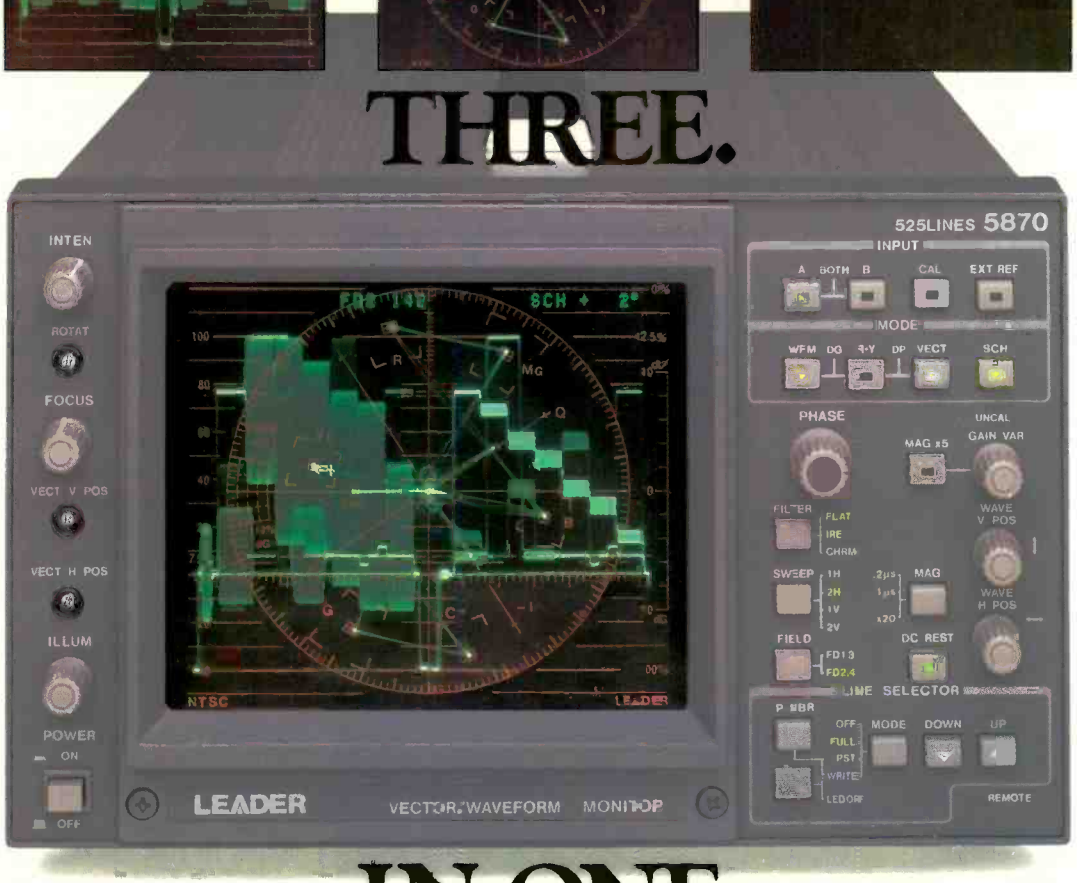
And who knows—maybe when you walk into the station one Monday morning in the year 2000, the computer really *will* have made your coffee.



Schematic cross-section through an x-ray mask.

LEADER

THREE.



IN ONE.

And only in the 5870 Vector/Waveform Monitor.

Only the 5870 gives you a unique numerical readout of SCH phase. *And* waveforms from 2 channels, plus vector information - appearing at the same time or separately. All this in one half-rack!

No compromises.

This unsurpassed unit performs like three superb instruments in one.

2-channel NTSC waveform monitor: Features simultaneous or separate display of both channels, and dual filter display, plus a CRT readout of SCH phase, full 525-line select capability with a CRT readout of the line and field selected, memory preset and recall of nine lines. Add to this the unit's remote control capability and extra-bright CRT, and you have a terrific waveform monitor.

Full-fledged NTSC vectorscope: Boxes for error limits of ±2.5° and ±2.5 IRE units; ±1° differential phase and ±1% differential gain; internal Z-axis blanking for line selection and continuous phase adjustment. The 5870 is a great vectorscope, too!

Designed to go anywhere.

Operating from any 11-20 Vdc or 85-264 Vac (48-440 Hz) power source, this 12-lb, half-rack unit is ideal anywhere that size and weight are critical.

Call toll-free

1 800 645-5104

In NY State

516 231-6900

Ask for our full-line Catalog, an evaluation unit, and the address of your nearest Leader Distributor.

Leader Instruments Corporation
380 Oser Avenue, Hauppauge, New York 11788
Regional Offices:
Chicago, Dallas, Los Angeles, Boston, Atlanta
In Canada call Omnitronix Ltd. 416 828-6221

LEADER
FOR PROFESSIONALS WHO KNOW THE DIFFERENCE

Circle 118 on Reader Service Card Page 75 for demonstration

Circle 119 on Reader Service Card Page 75 for Information

Group Engineering: Under Attack?

By Michael A. Rivlin

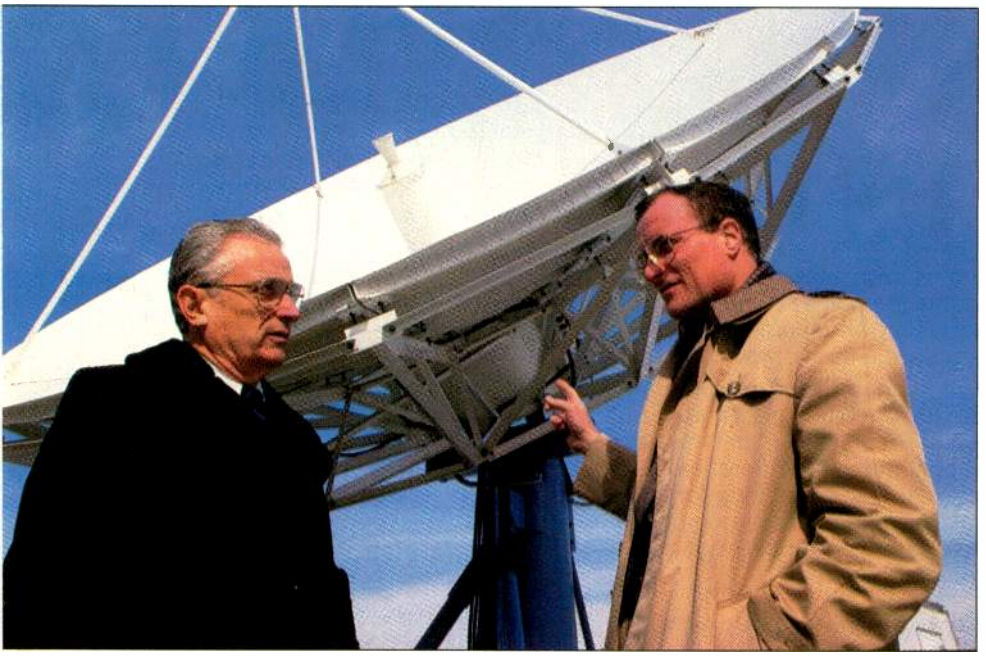
Corporate ally, advisor, friend for his CEs, the group engineer often finds that the better he does his job, the more invisible he becomes.

In the upcoming year, Belo Broadcasting's Frank Davis will have to do some expert juggling of his schedule in order to continue giving his CEs the prestige of belonging to a broadcasting group, and helping make a broadcasting group out of a disparate collection of stations. In January, Belo moved Davis from corporate headquarters in Dallas, where he'd functioned as VP of engineering for the past 10 years, to its Houston property, KHOU, where he will also function as chief engineer.

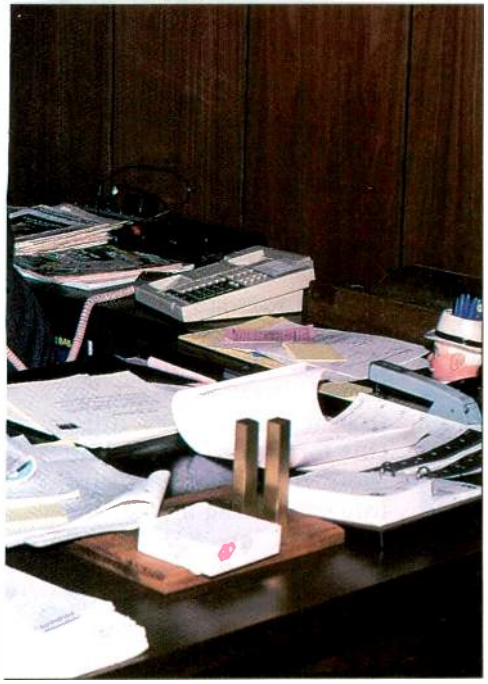
According to Davis, Belo couldn't justify having an individual spend his time working exclusively as VP of engineering. "They were particularly interested in cost-cutting at the corporate level," he explains.

Optimistic about finding the time to be able to continue providing operating guidance and guidance on major equipment acquisitions, Davis nonetheless has already found that his added responsibilities have made it hard for him to visit or telephone the engineers nearly as much as he had previously.

"The stations have always been autonomous," says Davis, "but they have had the benefit—and they might disagree with that choice of words—of corporate guidance and operating philosophies and station design and purchasing decisions." According to Davis, without as much of that guidance, the group will suffer.



Joe Gianquinto, VP broadcast operations and technical services, Group W (right), with George St. Andre, engineering manager, WBZ-TV, Boston.



Otis Freeman, director of engineering, Tribune Broadcasting.

According to virtually all group engineers with whom we spoke, no one could successfully wear the hats of both a group engineer and a station engineer and successfully perform both jobs, at least without a staff.

"It boggles my mind," comments Joe Gianquinto, VP of broadcast operations and technical services for Group W Broadcasting's television group, "that a group could ask a director of engineering to do the kind of work necessary for this position and at the same time do justice to the day-to-day running of a TV station. To me, it seems a Herculean task...to say the least."

Position eliminated

While Belo will still have a group engineer, though perhaps a less effectual one, some groups have eliminated the position altogether. According to Jim Terrell, president of Gaylord Broadcasting, the position of group engineer was never refilled after the last individual retired because the company couldn't cost-justify the position, whose duties included evaluating properties Gaylord was considering for acquisition, developing new sites and facilities, and improving existing facilities. At Gaylord, says Terrell, engineering exists to serve programming, and programming is an autonomous function of each station.

One of the broadcasting group's chief engineers, asked how Gaylord functions without an engineering director, comments: "For anyone who works in a group that does not have a director of engineering, this is a politically sensitive area. Every chief would rather have a group engineer."

The station engineer characterizes Gaylord as a collection of widely scattered stations with little in common, in which chief engineers talk infrequently with one another except to coordinate group buys. Describing the group engineer's importance to Gaylord, the chief engineer says what he misses most is representation at upper corporate management.

At Gaylord, he explains, when a GM presents his station's capital budget to Terrell, no one with a detailed knowledge of engineering participates in the discussion. "Most general managers in this group are ex-sales managers," says the chief engineer. "When the GM presents the budget and there's a question about engineering, I haven't the slightest idea what happens."

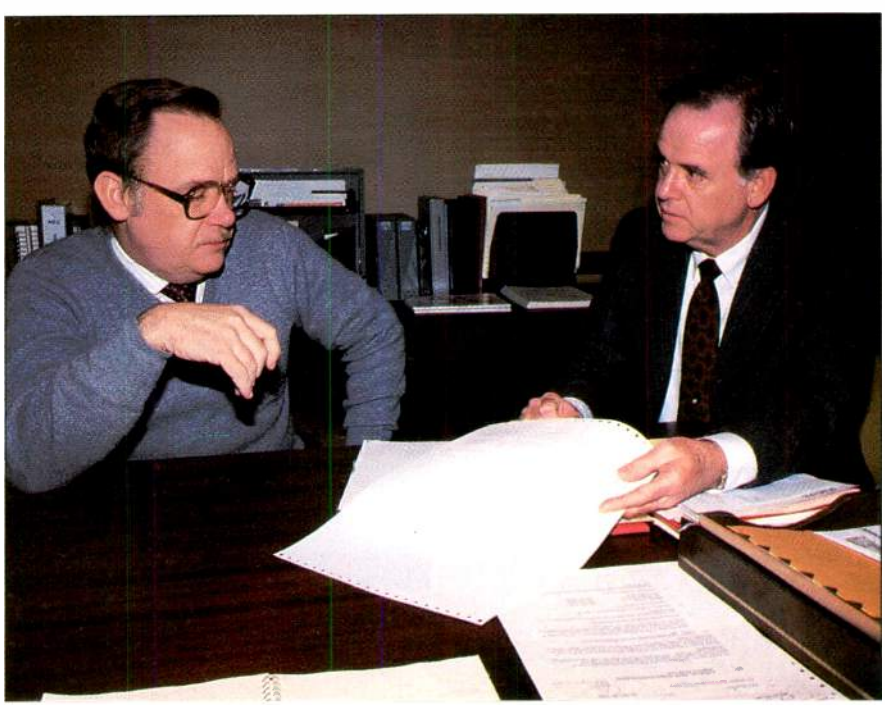
For Jules Cohen, dean of Washington consultants, loss of the group engineer is a serious matter, and like a mother watching over her brood—in this case all the broadcasting groups for whom he's consulted—he's sounded the alarm. Although he is aware of only one broadcasting group (Gaylord) which has eliminated the position, his antenna—some say the most powerful in the broadcasting industry—have alerted him to the potential vulnerability of the position.

"I have a concern," says Cohen, "that as the income of television groups decline, or as they incur substantial debt either as the result of a takeover or a defense against a takeover, they look to engineering to make savings in operating costs.

"I think the director of engineering has an extremely important function. There should always be someone at the corporate level who understands engineering."

"There is no higher authority than Cohen, in Washington or anywhere else," says VP of engineering for Cox Enterprises broadcast division John Swanson. "He has been in this business well over 30 years, consulted for every major group, and knows the problems of a major group trying to do without a director of engineering. So when he speaks, he's speaking for the whole consulting engineer-

John F. Swanson, VP engineering, Cox Enterprises (right), with CE Herb Gilbert, WSB-TV, Atlanta.



ing community, and he just knows it doesn't work without one."

An invisible role

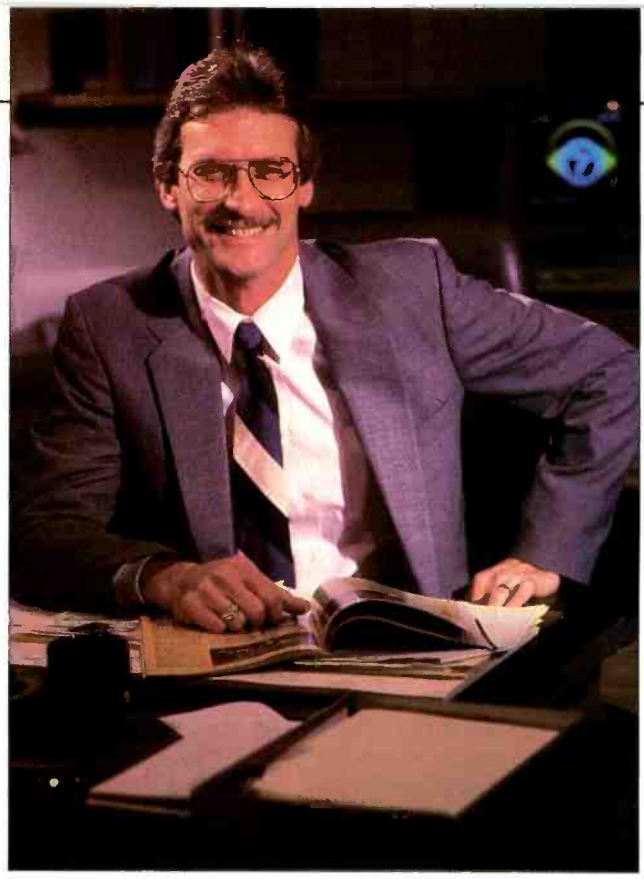
Perhaps some of these alarming developments can be attributed to the very nature of the role played by the group engineering director. "If I were to disappear today, my absence would not be noted for a very long time," observes Duffy Sasser, VP of operations and technical services for the NBC O&O stations.

Though Sasser is given to self-effacing remarks—the work of most television and radio group engineers would be missed rather quickly—there is a note of truth in his wry observation. Frequently, when a group engineering director does his job best, the true importance of his work might go unnoticed for years.

Like the sort of pure, undirected science research practiced in think tanks, the work of the group engineering director is concerned with the long-range. He's as likely to spend his morning musing about the future of HDTV as he is looking at transmitter specs. Free from the station engineer's nightmare of dead air time, or the GM's tension as he opens the overnights, the engineering director is free to plan broadcasting's future.

However, in this world of plummeting television revenues, anything that doesn't have an immediate impact on the overnights is likely to be overlooked.

"This is a very difficult job in a business that is so responsive to the market," says Sasser. "Our fates and fortunes literally turn on what happens in the evening's programming. The long-term impact of how much money you put in your transmitter plant is very hard to define."



Sim Kolliner, director of engineering at Cox's WHIO-TV, in Dayton, OH.

Corporate allies

The job of group engineering director is a jacket-and-tie affair, usually far removed from day-to-day operations. Even 30 years as a station engineering director wouldn't necessarily qualify someone to assume the job, which entails objectively viewing engineering budgets and needs, interpreting engineering language for the group's executives, and helping station engineers talk to the corporation about engineering—in short, representing the chief engineer's interests at corporate headquarters.

"A problem many CEs have," observes Sasser, "is that it's often very difficult for them to translate their vision of the future into something a business manager or a general manager can understand. Stereo is nice; but how do you translate its value into revenue?"

Thus a group engineer not only talks for his station engineers, but over time also enhances their position by showing them the corporate ropes... helping dispel the image of the guy in overalls, a monkeywrench in his back pocket.

More than most, Belo Broadcasting's Frank Davis sees the need for dispensing that type of corporate guidance, a role he assigned himself in large part because of what the broadcasting group found to be unacceptable operating philosophies in some newly acquired properties.

Belo acquired Corinthian Broadcasting's four stations in 1983. "The Corinthian stations had a more-or-less bottom line op-

Frank Davis, VP/director of engineering, Belo Broadcasting (left), with CE Beaven Els, WFAA-TV, Dallas.

KSRP REWARDS YOUR FORESIGHT

KLYSTRON SERVICE REPLACEMENT PROGRAM

VARIAN MICROWAVE EQUIPMENT DIVISION

KSRP. Varian helps you plan for the inevitable in an intelligent and cost effective way. ***DISCOUNT.*** Purchase your spare HPA Klystron now at a substantial discount. Varian offers special pricing to *satcom* earth station owners and operators. Order up to the number of KHPA sockets in your station. ***STORE FREE.*** Save here, too. We'll store your Klystron at no charge in the Varian service depot nearest you. When you need your tube, it's close by, ready to ship. ***TUNE IN ADVANCE.*** We custom tune your "pre-purchased" Klystron to your frequencies. There is no extra charge for this service. ***24 HOURS.*** We understand urgency, that every moment is vital. We pledge that your pretuned Klystron will be on its way within 24 hours. ***WARRANTY.*** 36 months for C-band and 12 months for Ku-band tubes—doesn't start until the day we ship your tube. ***ASSISTANCE.*** Qualified Varian service technicians are available to provide on-site installation assistance and routine maintenance service. ***FINANCING.*** We offer several financing plans. Choose the one best suited to your cash flow. ***KSRP.*** It's Varian's plan to reward your foresight.

Varian leads the way...again.

varian

Headquarters: 3200 Patrick Henry Drive, Santa Clara, CA 95054, 1-800-338-VMED • **Asia/Pacific:** 140 Cecil Street #06-01A, PIL Building, Singapore, 65-225-0011 • **Europe/Mid-East/Africa:** Jan Rebelstraat 21, 1069 CA, Amsterdam, 31-20-10-47-05

Circle 120 on Reader Service Card Page 75

erating philosophy," says Davis, "whereas the Belo operating philosophy had been just the opposite." WFAA, for example, had been a market leader for years, and Belo sought to achieve that same success for its new acquisitions, in part by changing their overall operating philosophies.

One aspect of the change that Davis has worked hardest to communicate is the importance of cooperation between engineering and other departments in the station.

The typical chief engineer, he observes, is a maintenance supervisor who's risen up through the ranks and who doesn't necessarily have experience in management or in dealing with other executives within the television station. "That's where I see my efforts as being important," says Davis. "To bring those engineering managers into the fold of the overall operation."

Engineering management trend

Like Davis, Group W's Gianquinto has also worked to enhance the status of his group's engineering managers (and subsequently improving station operation). It was a feat he accomplished by literally redefining their jobs.

Following his recommendation, four of five Group W stations have elevated the position of engineering manager position to that of director of operations and engineering.

Gianquinto has also been working with his engineering managers, giving them advice on how to deal with their fellow department heads and station management, skills that are important in their new positions but which he found lacking. Gianquinto explains that as a result of his efforts, the engineers now have jurisdiction over more of the station's daily operations and have become part of an overall team effort.

"The stations are beginning to realize," says Gianquinto, "what an important part of the overall operation the engineering manager plays.

"The new trend in engineering management is towards individuals skilled in both engineering and operations—those who can sit with news directors and promotion managers and help to create systems and solve station problems. Engineers are now key players on the management team."

"The new trend in engineering management is an individual skilled in both engineering and operations who can sit with news directors and promotion managers and help to create systems and solve station problems."-Joe Gianquinto, Group W

Less is more

As is true throughout every area of broadcasting—with the exception of programming—in engineering decentralization is the operational philosophy. So long as stations adhere to FCC standards, engineering directors believe that in the day-to-day control of a group's properties, less is more. And it is no surprise that most group engineering directors would rather portray their relationships with the individual station engineering heads as as consultants and diplomats to autonomous subsidiaries.

Others seem almost ambivalent about the direction they've supplied their stations, boasting about imparting group standards and operating philosophies one moment, disavowing them the next, perhaps in order to avoid ruffling any station engineer's feathers.

For example, among his proudest achievements, Cox's Swanson counts the establishment of an annual "FCC-like" audit compliance program administered by an outside consultant.

The results, says Swanson, have improved dramatically. "I think our stations are much better now in terms of compliance with regulations, mainly because of this program."

And with responsibility for 20 stations, handling an almost continuous stream of land acquisition and building projects with two currently underway, the engineering director describes his active involvement in the day-to-day activities of his stations as "atypical."

Yet pointing to the differences in the Cox subsidiaries, Swanson is capable of saying, "We're as decentralized as you can possibly get when it comes to engineering." Like his peers, he boasts of being his own one-man staff, his limited influence, his role of silent observer. "I'm much more of an in-house consultant than I am a direct decision maker for the subsidiaries," he suggested.

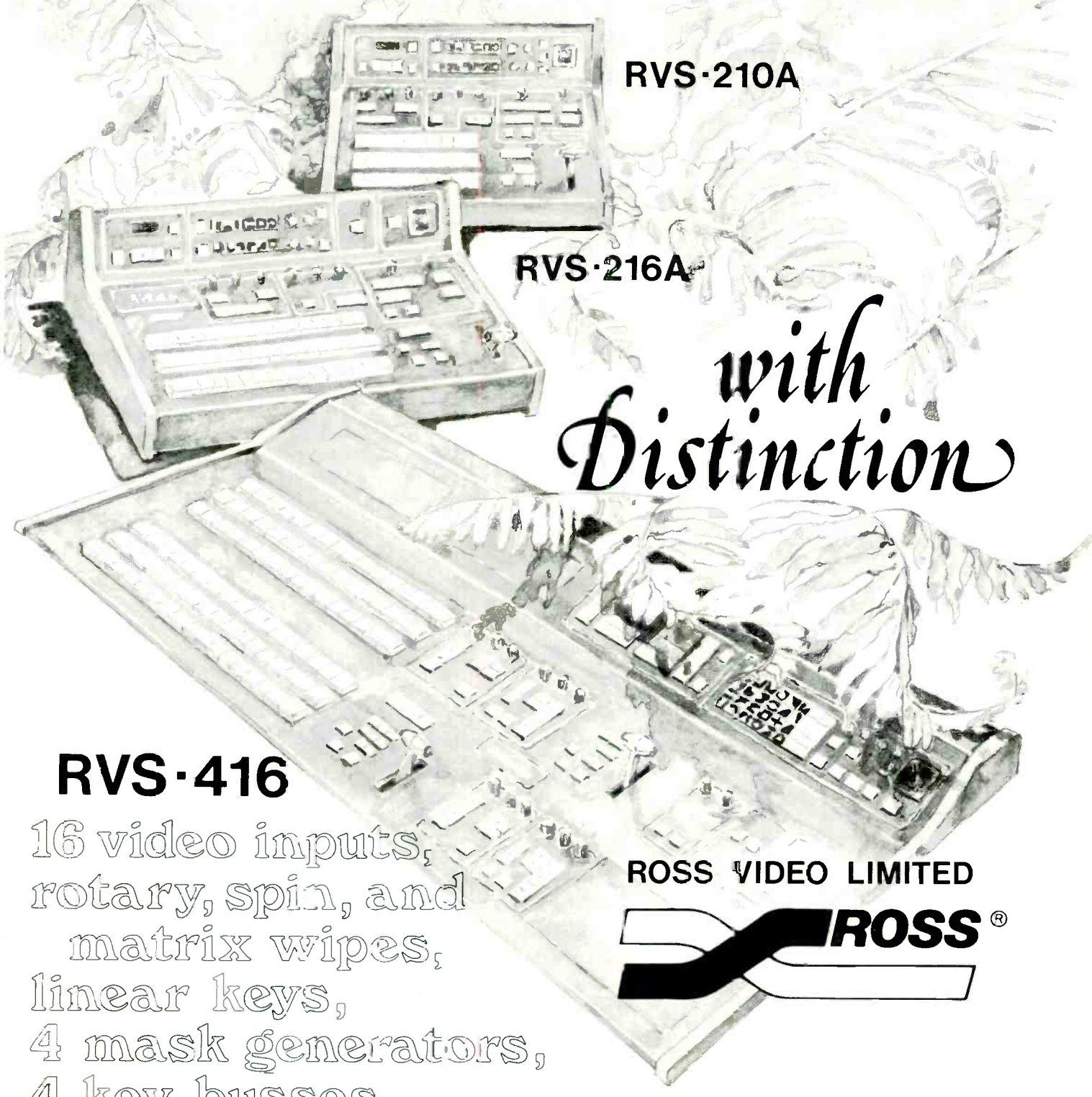
Communication is key

The two most visible aspects of a group engineering director's job are those which do put him in day-to-day contact with his group's stations, and pit him directly against the broadcasting industry's trend to decentralization—namely, providing technical advice and counsel, and helping formulate capital budgets and coordinate group purchases. Both rely on effective communication.

"Communication is the key," confirms Sim A. Kolliner, director of engineering at Cox's WHIO-TV, describing how John Swanson did his job for Cox so effectively.

However different one station

Natural Evolution...



RVS·210A

RVS·216A

with Distinction

RVS·416

16 video inputs,
rotary, spin, and
matrix wipes,
linear keys,
4 mask generators,
4 key busses,
key interchange...

ROSS VIDEO LIMITED

ROSS®

NAB BOOTH
3377

Ross Video Limited, PO Box 220, 500 John St., Iroquois, Ont. Canada K0E 1K0 613-652-4886 Telex 05-811579
Ross Video Inc., PO Box 880, Ogdensburg, New York, USA 13669-0880

Circle 121 on Reader Service Card Page 75

and market is from another, making short- and long-term engineering information available depends on the ability to communicate with station engineering directors. And facilitating communication among the group's engineers, and between engineering director and group executive, is central to the group engineer's success.

Sometimes the communication is by telephone or electronic mail. Sometimes it involves old-fashioned visiting. It's here that Otis Freeman, Tribune Broadcasting's director of engineering, does some of his best work.

He modestly described his role in the construction of a new tower at KTLA as that of a consultant, though the responsibilities he describes included: reviewing the details of the project with the chief engineer; examining and signing off on the specs; flying out to the station where a 40-year old tower was to be replaced with a higher mast supporting a circularly polarized antenna; helping negotiate problems with the U.S. Forest Service which owned the land; and then negotiating the tower price as the rep from Kline Iron & Steel sat across from him in his office while the KTLA chief engineer listened on the telephone.

"I don't try to run their day-to-day operation," Freeman insisted. "These fellows are very competent. If they need me, I'm always there. I like to be thought of as being a consultant to these chief engineers, and as a friend."

Swanson is also on call 24 hours a day for all the Cox television and radio engineering directors. "There's not a chief in the group that doesn't have my home number," he says, indicating that they haven't hesitated to use it when problems arise. "It gives the engineers at a corporate level someone they can talk to when they have a problem. That doesn't sound like a lot until you're at a transmitter site at 1:59 a.m. and don't know the name of a broadcasting supply company to get something you need. I know most of them."

All this time spent communicating apparently pays off. "I can talk to John Swanson more easily than I can my general manager," says Kolliner, "because he is more familiar with the corporate structure than my general manager."

Forming budgets objectively

Communication is also central to the pivotal role played by the group engineering director in providing objective help to each station's chief engineer as he develops the capital budget; objective interpretation, criticism, and defense of the engineering budget at corporate headquarters; and, importantly, coordinating group purchases.

Some only see the budget once it's been prepared and submitted by to the general manager. But others are actively involved in helping station engineers plan their budgets.

Swanson visits each Cox television and radio subsidiary to discuss its business plans and capital equipment requests. He won't leave until he's convinced the station really needs the equipment, and until he's gained a full understanding of just why they need it.

In this world of plummeting broadcast revenues, anything that doesn't have an immediate impact on the overnights is likely to be overlooked.

"With 19 stations, that takes a lot of time," he observes.

"In the Cox organization, corporate does not dictate to the stations what equipment they will buy,"

Kolliner at WHIO says he's free to make his own decisions based upon his own needs, with Swanson's "input and approval." In a situation where several pieces of equipment are all acceptable, Kolliner indicates the decision may be based upon the realities of a group buy. "But it's not going to be jammed down our throats."

Swanson stresses that his role is primarily that of an advisor; rarely referee. The engineering director says he isn't shy about making his opinion known, but if the station is able to offer a good rationale about its decision, he won't intercede unless he believes a mistake is about to be made. "If I think it's an improper brand, or a brand I've heard there's been trouble with, then we usually have some negotiating to do," he notes.

The decision to standardize an equipment purchase and take advantage of a discount is frequently outweighed by other factors. As a small group, for example, there are large categories of equipment for which Belo is unable to achieve any discount through group purchases. And purchasing equipment for which he could obtain a group discount makes little sense to Davis if it forces a station to take equipment whose unfamiliar design will make it difficult to maintain.

Davis indicates that for equipment without history, or at least much history, he preferred to make a corporate purchasing decision and to standardize throughout the system. However, the only unified equipment policy Davis has made is use of Betacam-format news cameras group-wide. Behind his decision was far more than obtaining a discount on a group purchase; stations in Dallas and Houston frequently exchange newstape. "I think that the decision on newstape format probably should be a corporate level decision in any group," says Davis.

Belo's Houston and Dallas stations also both employ Harris transmitters, which allow them to share spare parts on an emergency basis. "I can get spare parts between Dallas and Houston for a Harris transmitter faster than I can get them from the manufacturer in Illinois," says Davis.

For the NBC O&Os, Sasser also finds himself balancing the poten-

On April 9, 1988, Harris Video Systems will put the video broadcast industry where it belongs!

Harris Corporation is a $2.1 billion leader in image and information processing technology. At this year's NAB in Las Vegas, the company will put the video broadcast industry where it belongs — in front of a new advanced video workstation system, HarrisVws™.

If you're looking for speed, power, productivity, image storage capacity, flexibility and ease of use, you need to see HarrisVws, the most advanced video workstation system yet. Don't miss this exciting new product at the Harris Video Systems booth, No. 503.

So be there when Harris Video Systems puts the industry where it belongs. We have a seat reserved for you. For information call 1-800-4-HARRIS (In Canada call 1-800-344-2444), extension 3623.

HARRIS

Harris Video Systems
960 Linda Vista Avenue
Mountain View, CA 94043

tial group purchasing discount against the advantages of having a station maintain continuity in its equipment inventory and of having a diverse list of vendors. While he's just as keen as the next group engineer to save a buck, Sasser says he's learned from long experience as mediator and arbitrator that getting stations to agree on one brand is often counterproductive.

Sasser also indicates that wherever possible he prefers having more than one brand of equipment. Regardless of any possible cost savings, says Sasser, "We don't normally exclusively go with one brand of anything. We don't want to get totally tied into one vendor, because we're at its mercy. It puts more pressure on the vendors to remain competitive, and it keeps us fully informed about what's on the market."

For example, while six of the seven O&Os have adopted MII tape format, the Miami station is using Betacam. Miami was well into a Betacam conversion, he explains. "We did a full analysis, and they'll stay Betacam."

Like the other engineering directors, Freeman negotiates a yearly tape contract, so that the Tribune stations buy from the same manufacturer. However, as is true for other engineering directors, his negotiating a good price on ten truckloads of videotape is balanced by a far more long-range aspect of the job.

Thus, Freeman is charged with the responsibility for tracking and evaluating emerging technologies, anticipating Tribune Broadcasting's long-range needs for equipment in light of news and programming trends, and developing long-range plans accordingly. Time he's spent in Washington presiding over the NAB Engineering Group, and his membership on the ATSC and HDTV Task Force, have helped make Tribune not just a participant in the new technologies but also an active supporter.

Under Freeman's guidance, Tribune's chief engineers are monitoring the development of the next generation of multi-event robotic carts which he says will "revolutionize the way you run your station."

According to Davis, Belo couldn't justify having an individual spend his time working exclusively as VP of engineering.

Differences in style

Although there are some duties performed almost universally by all group engineers—lending technical advice, developing and approving capital budgets, and coordinating group purchases—the job is defined in part by the skills and background of the individual.

Freeman, for example, has 30 years of day-to-day engineering experience at Tribune's WPIX, during which he pioneered the first genlock system, perfected clear remote sports feeds, and oversaw construction of the 35-story TV antenna tower sitting atop the World Trade Center. The background prepared him well for some of his most prominent duties at Tribune: evaluating properties the broadcaster is considering acquiring.

Sandwiched in among Duffy Sasser's 25 years in the technical side of broadcasting were three years in law school. As an attorney, Sasser's represented the O&Os during two strikes, and negotiated three master labor contracts, including NBC's recent contract with NABET.

"I'm not sure if a lot of the union people were enamored of me for that, but I've been a gadfly for a lot of the staffing changes at NBC," says Sasser, who notes that he was responsible in part for one-man electronic journalism staffing, the elimination of staffing ratios in videotape, and the changes of staffing requirements from "per contract" to "as required."

In the end, what will make the position of engineering director safe at all but the most myopic of groups is its positive contribution to a broadcaster's bottom line. Without a group engineer, says Swanson, there's no way a group can maximize its purchasing power. "If you don't have some centralized person putting together your major group purchases, you're just not going to get your maximum discount."

According to Swanson, a broadcasting group with just three or four stations will find that the engineering director's contributions far outweighs the cost of his salary. "In the long run, people in my position can save many times their salary and expense in just one year through group negotiations."

John Swanson visits each Cox television and radio subsidiary to discuss its business plans and capital equipment requests. He won't leave until he's convinced the station really needs the equipment, and until he's gained a full understanding of just why they need it.

The position is clearly of such importance, believes Freeman, that eliminating it is simply unthinkable. "There are a lot of things on the horizon that are detrimental to the future of broadcasting that I think we have to keep on top of," he says. "There'll always be a director of engineering to look after them." **BM/E**

Get in sync with Videotek's versatile team of timing devices.

No matter what your application, Videotek has a range of feature-rich timing devices to suit it—and your budget.

Take our new **VDP-8000 Frame Store/Synchronizer** with independent Freeze Field capability. Or our two blackburst generators—each with individual horizontal and subcarrier timing correction for up to six sources. The **Times Six Plus** model offers manual or automatic operation and automatically compensates for cable length and equipment drift.

Our new drift-free **VSG-201 digital sync generator** with six isolated blackburst outputs, audio test tone and "textbook" SMPTE color bar outputs can drive the whole show. And all units feature front-panel gen lock input loss/presence indicators.

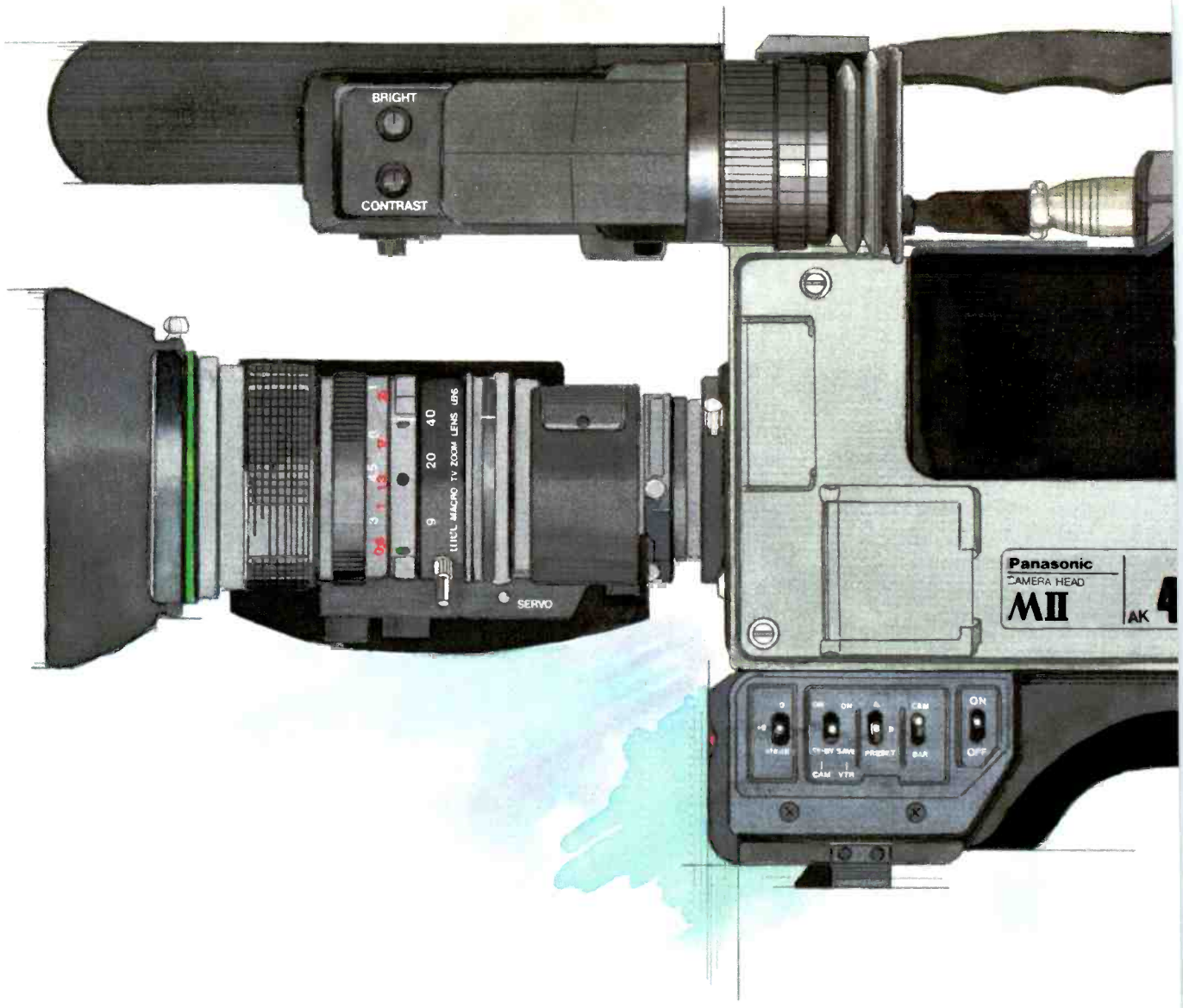
Don't waste any time! See your Videotek dealer for details!

VIDEOTEK INC.
Designed for real needs.
Priced for real budgets.

243 Shoemaker Road, Pottstown
Pennsylvania 19464 • (215) 327-2292
TWX 710-653-0125 • FAX (215) 327-2295

Circle 123 on Reader Service Card Page 75

Panasonic introduces the a field camera/recorder

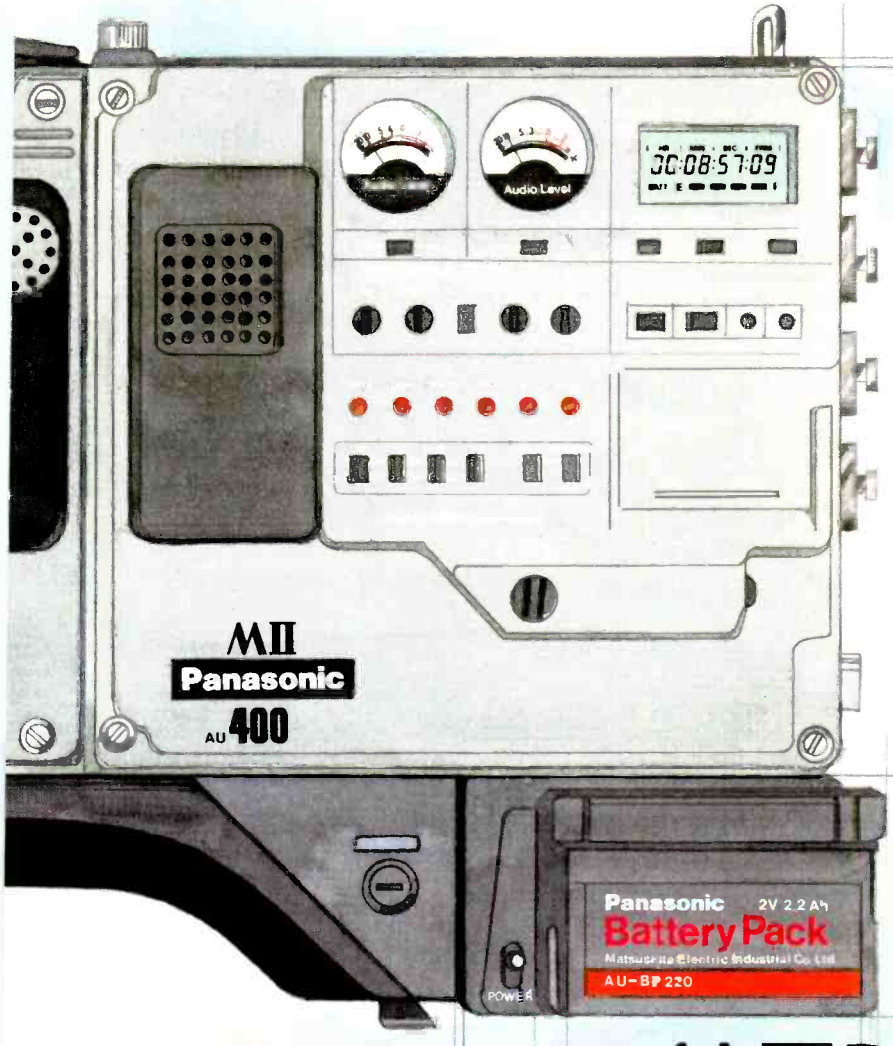


Panasonic
MII

Official Video Equipment Of
The 1988 Olympic Games

Title 36 United States Code Section 380

ideal M II combination: that's available now.



Finally, a broadcast-quality camera/recorder (AK-400/AU-400) advanced enough to be called M II. But even better, it's compatible with your current format.

- 3 frame interline transfer CCD's for reliability and stability; no smear, no burn, no lag.
- 650 horizontal TV lines of resolution.
- Camera and recorder may be used together or separated to use with your current field camera or field recorder.
- An electronic variable shutter selectable at 1/125, 1/250, 1/500, 1/1000 for blur-free high-speed shots.
- Lightweight—under 15 pounds (excluding lens and battery).
- 60db nominal signal-to-noise ratio.
- Extens ve character display in viewfinder indicating warning and status of AK-400 camera and AU-400 recorder.
- 10 and 20 minute cassette recording time.
- Built-in SMPTE time code generator.
- Equally capable for all your ENG, EFP and studio production needs.

M II Panasonic
Broadcast Systems Company

Call our field offices now:

Northeast: One Panasonic Way, Secaucus, NJ 07094; (201) 348-7671.

Washington, D.C.; (703) 759-6900.

Southeast: 1854 Shackleford Court, Suite 250, Norcross, GA 30093; (404) 925-6772.

Midwest: 425 E. Algonquin Road, Arlington Heights, IL 60005; (312) 981-7325/(317) 852-3715.

Southwest: 4500 Amon Carter Blvd., Fort Worth, TX 76155; (817) 685-1132.

Western: 6550 Katella Avenue, Cypress, CA 90630; (714) 895-7209. Northwest: (408) 866-7974.

Circle 124 on Reader Service Card Page 75

FIELD PRODUCTION

A special job demanding specialized products.

For your audio needs: a growing line of compact, easy-to-use FP amps and mixers.

Shure FP products are built specifically for ENG, EFP, film, and video work. They're not general audio products that "might" work on remotes. And no one offers as wide a selection with this kind of built-in ruggedness and reliability.

FP32

FP42

For Stereo Remotes. The FP32 Stereo Mixer is comparable in size and features to our famous FP31. Its stereo capability, light weight, easy-to-use controls and convenient shoulder harness make it the first choice of field crews. Our FP42 Stereo Mixer simplifies mic cueing, so important in situations like sports remotes. Plus it enables you to easily mix down stereo in your post production booth. It offers all the features of the popular M267 plus stereo capability and a stereo headphone amp.

FP31

FP16

The Industry Standards. The FP31 is Shure's original field production mixer. Thousands bet their audio on it worldwide. The FP16, a one-by-six distribution amp with transformer balancing and link jacks, outperforms all competition. It's also ideal as a portable press bridge.

FP11

FP12

For Long Yardage Situations. The FP11 Mic-to-Line Amp provides freedom from noise in long line situations, with up to 84 dB of gain in 15 6-dB steps. It converts any mic to line level and includes an invaluable limiter circuit. The FP12 Headphone Bridging Amp is a must for shotgun and boom operators. It keeps them on target without need for a return line. It's ideal for multiple headphone feeds, troubleshooting, and as an intercom.

FP51

The new FP51 gated compressor/mixer rides gain automatically. Once you set the compression level, the FP51 adjusts automatically to changing signal levels in critical remote-to-studio feeds to maximize signal output. As a result, your broadcast is quieter, smoother, better balanced and more natural sounding.

For more information on the entire FP line, call or write Shure Brothers Inc., 222 Hartrey Avenue, Evanston, IL 60202-3696. (312) 866-2553.

SHURE®

THE SOUND OF THE PROFESSIONALS...WORLDWIDE®

Circle 125 on Reader Service Card Page 75

Fiber Optic Arena

Viewers of University of Tennessee football and basketball games are the beneficiaries of an advanced fiber optic transmission system.

By David L. Bower

As witnessed by the recent Olympics, sports programming often provides the impetus for some highly innovative engineering. Innovations are not always concerned, however, with visible techniques such as POV helmet shots. At the University of Tenessee, we have developed an innovative fiber optics interconnect system that allows us to remotely control and monitor camera locations in both our football stadium and basketball arena and a state-of-the-art control center that operates the system.

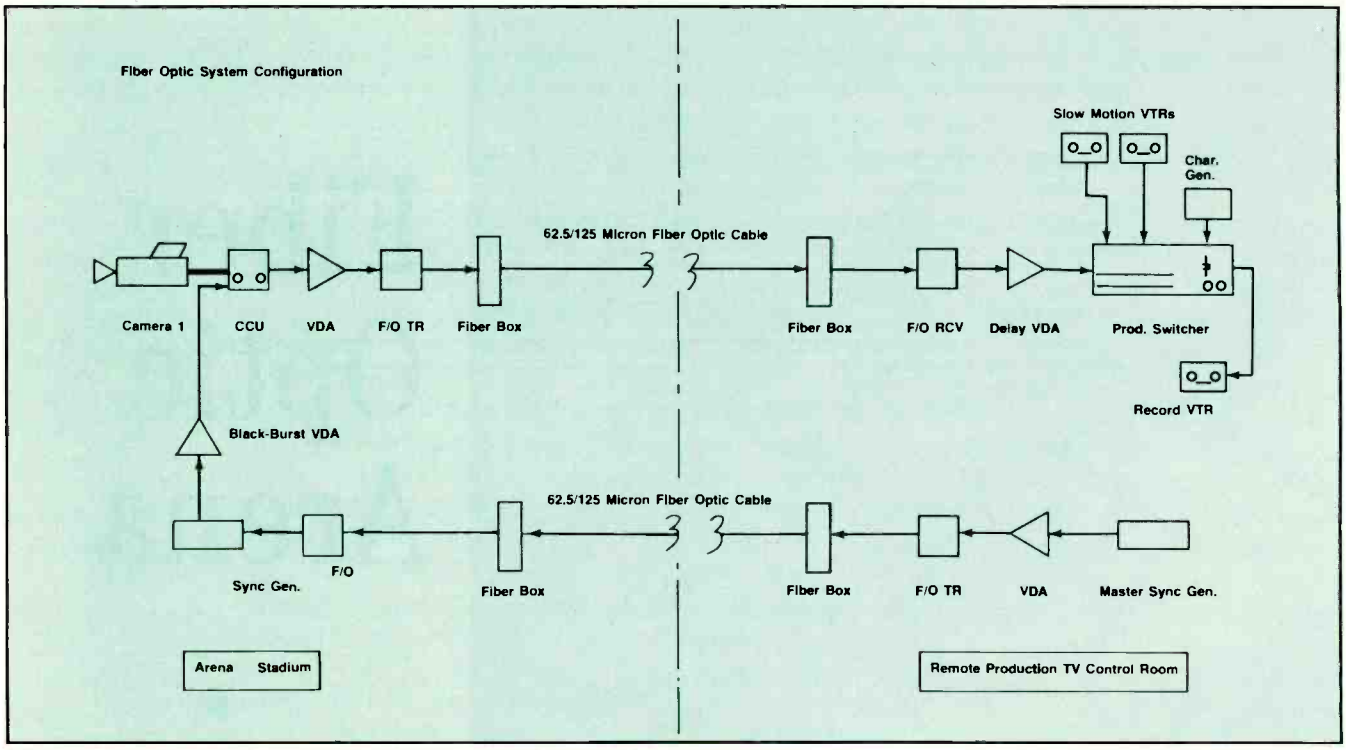


Figure 1: *Simplified arena-to-control room design scheme.*

Viewers of the games over WATE-TV, Knoxville, several other local stations, and throughout the South over the Up-South satellite network see the results of one of the country's most advanced fiber optics systems, although most of them are completely unaware of anything but the high-quality pictures we put out.

UT has been doing internal television production for athletics since 1970. The first effort consisted of two Norelco PM-40z monochrome cameras with remote production equipment located at the former basketball arena. The production was switched at the remote location and distributed over a telco coaxial cable to the University's distribution center for recording on two-inch quadruplex machines. The recorded material was played back on a delayed basis on a local station.

The following year, the University designed and constructed its own remote truck for production of home basketball games. Again, the two-inch tape was played back on a local station.

In 1978, this institution explored the possibility of color recording for football games using an RCA TK-760 camera with customized JVC CR-4400LU editing equipment. One 20-minute tape was used for each quarter. Using creative editing on site, only game action and other supporting cutaway shots were recorded. This game footage was incorporated into a one-hour coach's show that was produced shortly after the completion of the game.

For cost-effectiveness it seemed logical to explore the possibility of integrating this production center with the football stadium and a new basketball arena.

The system evolved in later years to include multiple cameras, slow-mo replay, and a field camera microwave feed. All of these sources were integrated with switching equipment to permit real-time back-space edited master tapes to be inserted in the coach's show.

The system growth resulted in three large Anvil remote production racks (on wheels), with the accompanying proliferation of support hardware. When fully envolved, a large rental truck with liftgate was required to transport the equipment. The resultant configuration resembled a "poor man's" mobile truck.

Capability expansion

After several years, UT increased its production requirements to include Chyron graphics, more cameras, and other enhancements. This resulted in the rental of a standard mobile television production vehicle. In the meantime, UT was upgrading its own studio production facilities with a new Grass Valley 1680 switcher, ADM 1642 audio console, Chyron graphics, and other support equipment. For cost-effectiveness it seemed logical to explore the possibility of integrating this production center with the football stadium and a new basketball arena (both facilities are within 1500 feet of this center). At the same time, UT was upgrading its cam-

pus distribution center with a fiber optic network. In addition, a new library fiber optic system was being installed for 85 internal feeds. This installation served as a catalyst to investigate the possibility of integrating the stadium and arena using fiber optic cable transmission techniques.

The plan involved a camera control room constructed in the stadium using a fiber optic cable link with the production center. The equipment would be portable; for use in the basketball arena at the conclusion of the regular football season. As envisioned, each of the five available cameras would be fed from the stadium using Grass Valley Wavelink transmission equipment meeting RS-250B specifications. An additional Wavelink would feed SMPTE color bars as a reference. Each system would include subcarrier audio feeds initially for the various microphones that would be used. Tally, intercom, and IFB would be provided over copper cable. A later plan would incorporate these functions using multiplex techniques directly on the fiber optic cable. A blackburst reference signal would feed from the control center to the camera control racks using more economical Grass Valley EZ-Link equipment.

Two additional EZ-Link systems were planned for return feeds. One feed was planned for a program monitor return, and the second feed was intended for the stadium's 80-monitor CCTV system.

■

A project schedule was developed to ensure that the system would be installed and functional for the first football game in early September.

■

Connecting the football stadium

After considering the design criteria and equipment requirements, a decision was made in early July (1987) to install a fiber optic system to permit cameras and related hardware in the stadium to be controlled at a remote location. The stadium and control room in the communications building are across the street from each other. A project schedule was developed to ensure that the system would be installed and functional for the first football game in early September. Figure 1 depicts a simplified version of the original design scheme in its final implementation for recording Saturday home football games. Figure 2 is an "exploded" version with the pathways from the arena to the control room detailed. Away games are recorded using conventional videotape techniques with ENG cameras and/or network-type trucks.

The home game camera complement consists of two press box cameras (one for tight shots, the other for loose shots), two handheld field cameras, and one end zone camera. Crowd audio from the press box and field position is available for transmission over the fiber optic cable. The remote fiber optic TV control room across the street functions much as a conventional mobile truck for athletic events. Using this system, all remote cameras can be switched with the Grass Valley switcher.

The ADM console is used to mix the remote audio sources at the

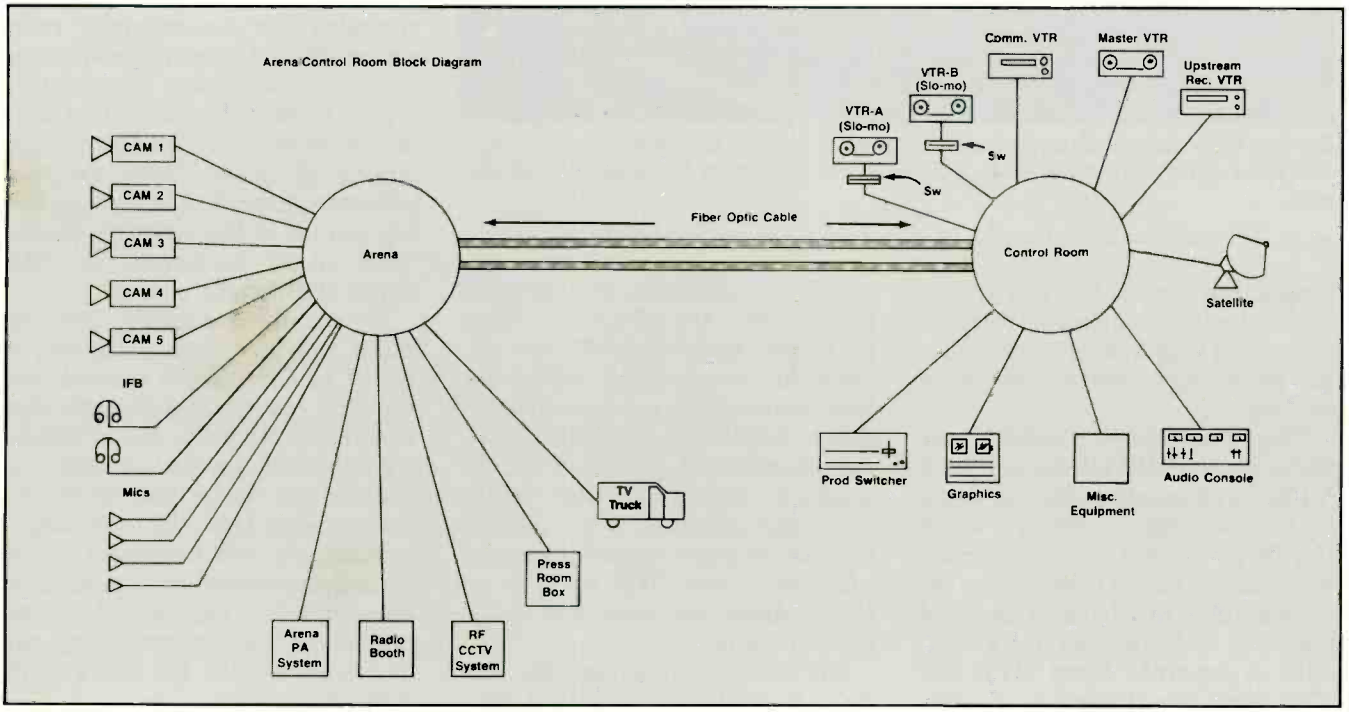
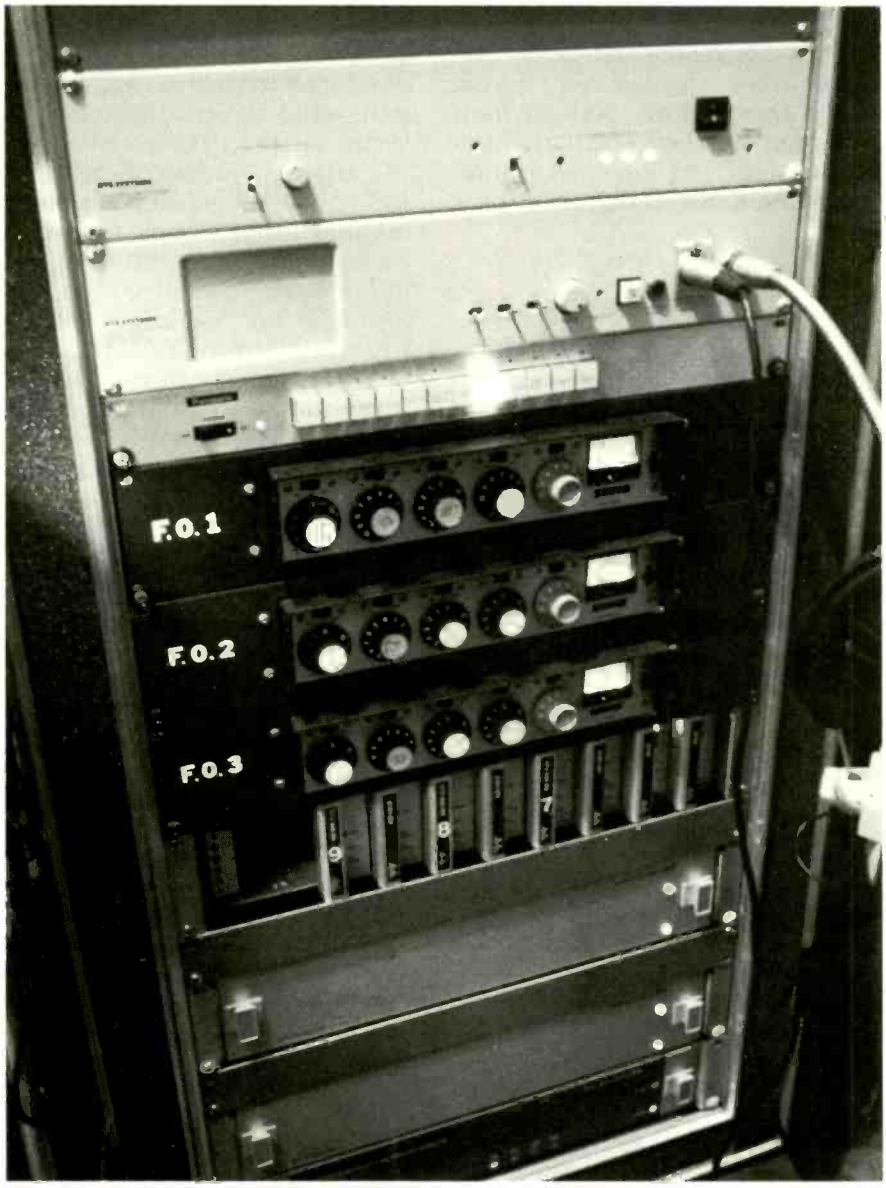


Figure 2: *Full arena-to-control room block diagram.*



Remote fiber optic and communication rack. The RTS hardware is at the top. The fiber optic equipment and sync generator are in the lower portion of the rack.

production center. Chyron graphics can be inserted downstream. A clean feed (upstream) is available for recording material for later editing.

The production center uses three Sony BVH-1100A one inch VTRs in an existing editing room as a production resource. Two of the three machines are equipped with seperate ISO switchers for slow-motion playback. The third machine is for master recording, with a separate Sony BVH-500 VTR available if needed. In addition, twenty-four 3/4-inch, VHS, and Beta machines are provided for master recording. A Sony BVU-820 and VO-5850 are utilized for commercial rolls, etc. Two frame syncs are available for other production requirements. All operational positions at the stadium and production center are interconnected with a common RTS two-channel intercom network. Three IFB stations at the stadium are connected to the control center.

On Sunday mornings, the stadium is used as a "remote studio" for production of a *Big Orange Show* for later distribution by C-Band satellite uplink. Three live announcers with IFB and other support functions are connected to the remote control center.

When network or other production trucks are used for home game coverage, "clean feeds" are obtained directly from the vehicle at the stadium and transmitted by fiber optic cable to the control center. Limited coverage is provided by UT when remote trucks are used. As a service, the University can provide (if requested) return feeds from its multiple satellite TVRO system to a remote truck using fiber optic cable.

System timing

In a system this complex, careful consideration must be given to timing of the remote cameras and other production sources that are utilized. The production control room sync generator (RS-170A) is the master reference utilized. The one-inch tape room is referenced to a gen-locked generator. Conversely, the stadium camera control units are locked by a common gen lock sync generator. The input reference for this generator, as mentioned earlier, is by fiber optic cable using EZ-Link equipment. Source ID generators are provided for the one-inch room and stadium to prevent confusion. The control center is provided with a frame of Grass Valley 8504 active video delay DAs for precise timing. A Grass Valley external reference proc amp is provided on the output of the switcher to prevent minor horizontal or color shifts that might occur.

As installed initially, the stadium gen lock sync generator is timed to the remote control center. The remote cameras are then timed to this source. Minor timing adjustments can be performed at the control center end using the active delay DAs. As installed, it is normally not necessary to retime the cameras at the stadium once adjusted. The very slight adjustments that are necessary can be handled with the 8504 units remotely.

Using a fiber optic patch panel,

DATATEK

A BLEND OF PRIDE, CRAFTSMANSHIP AND TECHNOLOGY

Datatek's D-4325 Video/Stereo Audio Switcher Features:

- Program line quality video and audio performance
- Two Video and two full performance audio outputs per channel
- HDTV (30 MHz) compatible; high audio output level capability
- Video cable equalizing and vertical interval video switching
- Only two rack units utilize optimum space
- Local or remote control panels provide unsurpassed flexibility—remote control over coax line
- RS-232/422 control standard
- Wire per crosspoint and binary parallel port control available
- All control arrangements are fully operable in parallel
- Expansion provisions are included

25 x 1
Video/Stereo Audio Switcher

For a descriptive brochure and further information call or write:

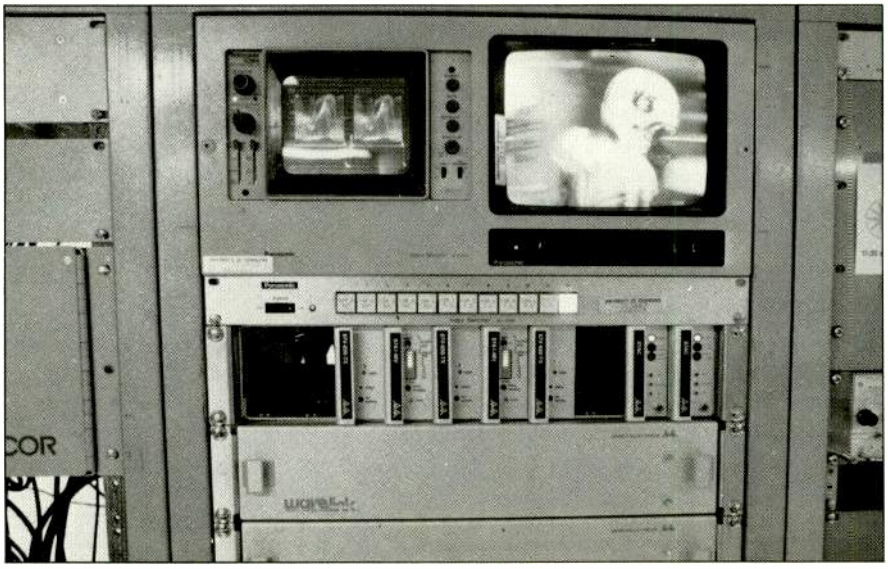
DATATEK CORP.

1121 Bristol Road, Mountainside, NJ 07092 • 1-800-882-9100 • 201-654-8100 • FAX 201-232-6381 • TELEX 833-541

Circle 126 on Reader Service Card Page 75

the football stadium system is reconfigured at the end of the season for basketball production. Intercom and IFB functions are also reconfigured. The camera control racks and fiber optic rack are moved from the stadium to a similar control room at the basketball arena. For basketball, two top cameras, two hand-held floor cameras, and one overhead (grid) camera are provided. The audio feeds for basketball are more sophisticated than for football, with multiple microphones for floor and hoop coverage. An arena RF closed-circuit system is also fed (upstream) fiber optic cable from the production center.

A clean feed (upstream) fiber optic cable feeds a multiple outlet box in the arena press room for use by other broadcasters. An interconnect box is provided for a remote production and/or uplink vehicles. As with the football stadium installation, the system is re-timed.



Fiber optic equipment configuration at the production center in the communications building. The Siecor fiber optic management box/patch panel is just out of frame at the left.

System installation

The first phase of the fiber optic plant was installed in August between the football stadium and the communications building. The second phase was installed in November between the basketball arena and the same area in the communications building.

The fiber optic system uses 12 fibers for the stadium and 18 fibers for the arena (the additional fibers are for a future projection gondola at the arena). Tally, intercom, and IFB are again provided by copper cable (a future upgrade using multiplex techniques on fiber is anticipated). The fiber optic cable system terminates in a management box on each end. The control center management box is designed to permit patching of either the arena or stadium to the production equipment. Direct patching between the arena and the stadium is also possible. The cable utilized is multimode graded index 62.5/125 micron type. SMA-906 connectors are used.

Because of the short distance, more economical 830 nanometer equipment is utilized. A longer distance would, perhaps, require 1300 nanometer equipment. A Laser Precision AM-3500 fiber optic power meter is used to determine the installed loss budget on each fiber path. In addition, the SMA-906 connectors are rotated for maximum power transfer with this meter. All camera sources transmitted on the Wavelink equipment and typical video signal-to-noise measurements exceed RS-250B specifications (67dB S/N).

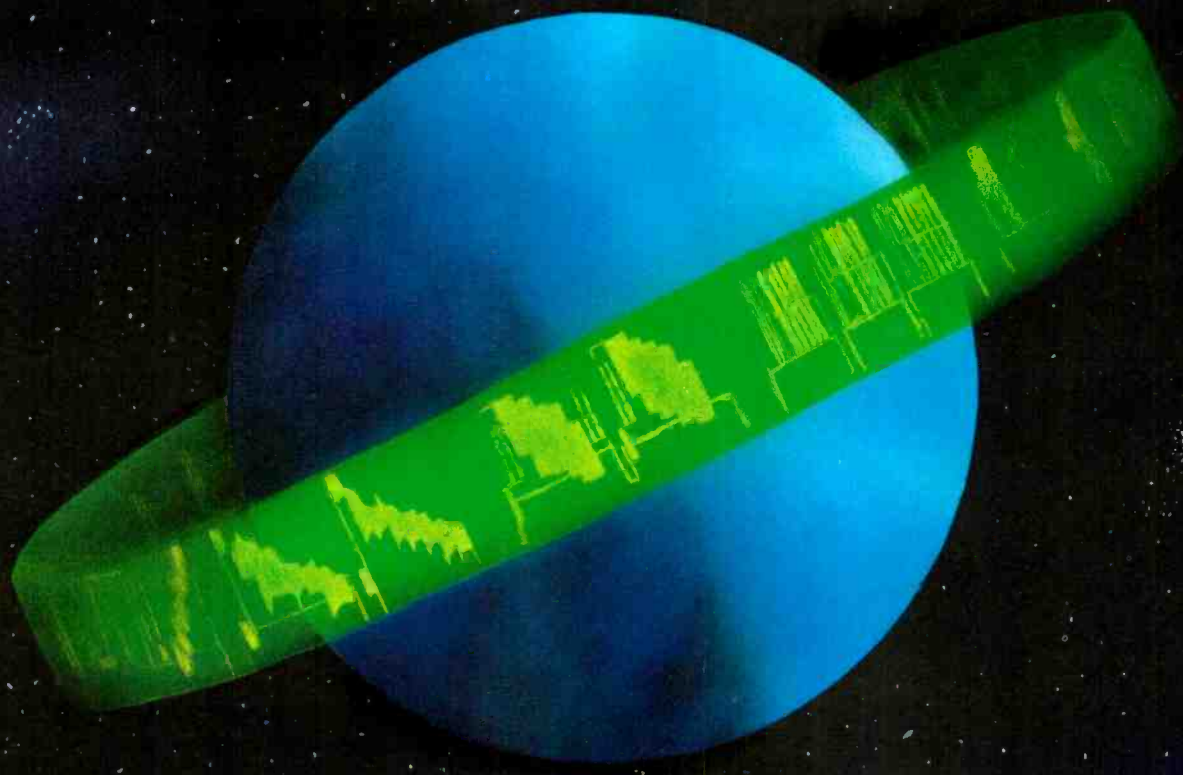
To date, the system has proved to be a very cost-effective method for providing remote television productions for University of Tennessee athletic events. Since existing cameras and production equipment are utilized, only the purchase of the fiber optic distribution plant is necessary. Crosstalk, ground loop hum problems, and other interference anomalies encountered with coaxial cable systems are simply not present. It is pleasant surprise to be able to increase the audio console gain on a remote microphone and listen to the extremely clean feed obtained. Propagation delay changes encountered with coaxial cable systems due to temperature variations have not been observed with the fiber optic cable utilized. As a result, timing changes are minimal. The minimal noise has resulted in a seemingly transparent system that permits the University to "squeeze" the maximum potential from its existing equipment. **BM/E**

About the author:
David L. Bower is engineering director for the Center for Educational Video and Photography at The University of Tennessee in Knoxville.

For more information on products and companies mentioned in this story, please use the Reader Service Card:

ADM (1642) 250
Chyron 251
Grass Valley Group (1680, Wavelink, EZ-Link, 8504) . 252
Laser Precision (AM-3500) 253
RTS 254
Sony (BVH-1100A, BVH-500, BVU-820, VO-5850) 255

Everything that Goes Around...



...Comes Around

From here on in, it's a multi-format world — and your test signal generators will have to be able to keep up with all of them sooner or later, from NTSC composite to HDTV.

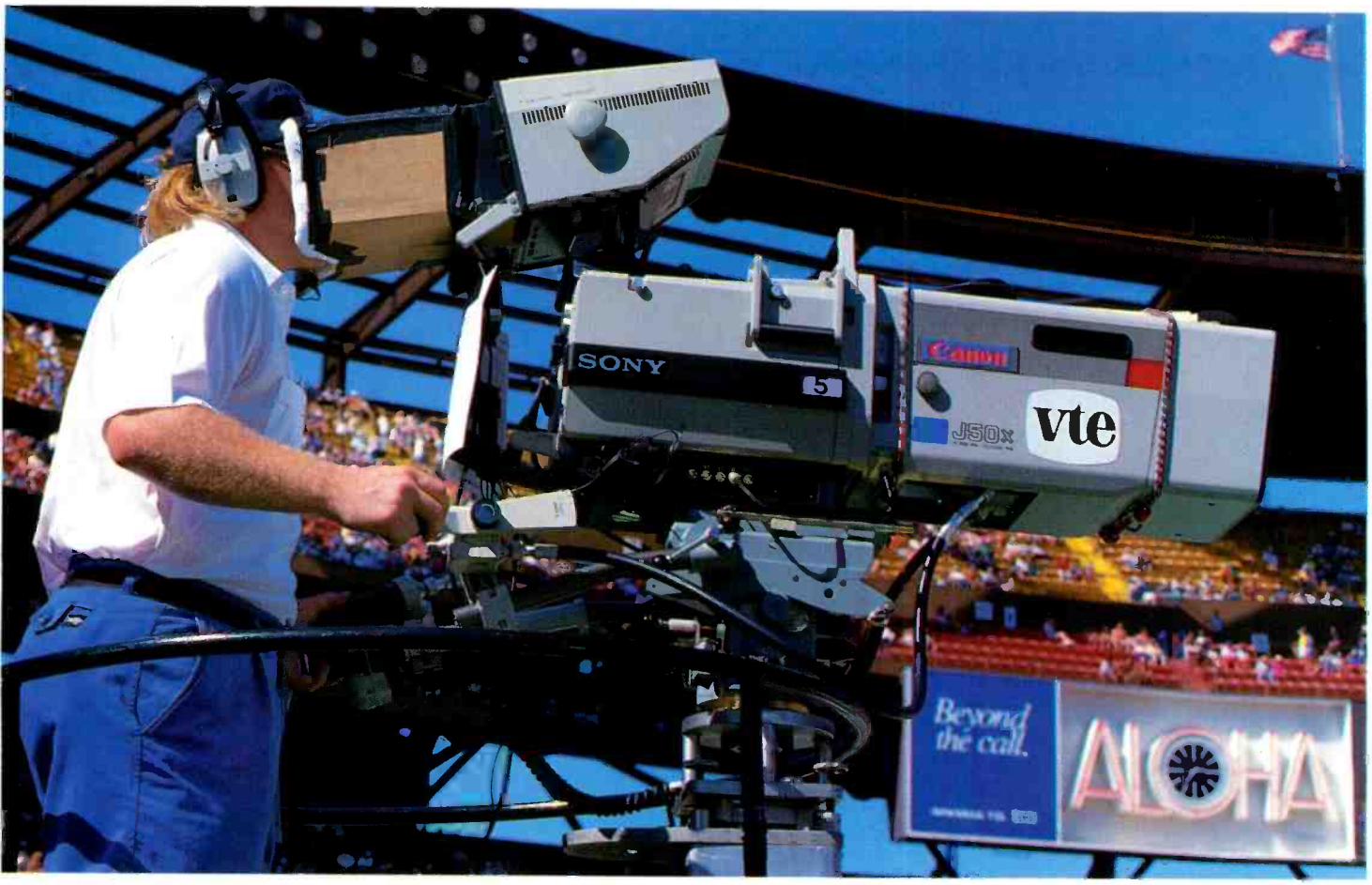
Why replace one test instrument after another when MAGNI's 2015 can meet the requirements of every format, and more, today? PC-based for flexibility, the 2015 comes with test files covering six existing television standards; optional software files expand your choices with additional signals, even correct PAL and SECAM. And if MAGNI doesn't already have the signals you need, the Signal Master Software™ provided with the 2015 allows you to do it yourself, modifying existing signals or building them from scratch through our user-friendly program.

MAGNI and the 2015 will put you a step ahead of today's rapidly evolving video formats. Ask us how!

MAGNI

MAGNI SYSTEMS, INC.
9500 SW Gemini Drive
Beaverton, OR 97005 USA
(503) 626-8400
(800) 237-5964
FAX (503) 626-6225
TLX 650-2769743MCI

Circle 127 on Reader Service Card Page 75


SONY
5
Canon
J50x
vte
Beyond the call.
ALOHA


abc sports
Canon
J50x

Canon Answers the Needs of the Broadcast Industry Once Again.

Introducing the Canon J50X9.5BIE.

Canon answers the demanding requirements of electronic field production with the sensational new J50X9.5BIE. The perfect lens for outdoor events like the Super Bowl and the Calgary Olympics where the J50X was put into action. Featuring a 50X zoom ratio, f1.4 maximum aperture, and an effective focal length of 9.5 to 950mm, thanks to its built-in 1.5X and 2X extenders. Any way you look at it, the J50X9.5 gives you incredible reach. Yet, it's great indoors too, with a minimum object distance of 7.2 feet and macrofocusing to 20 inches. Plus the usual high M.T.F., minimized distortion and chromatic aberration you've come to expect from Canon broadcast lenses.

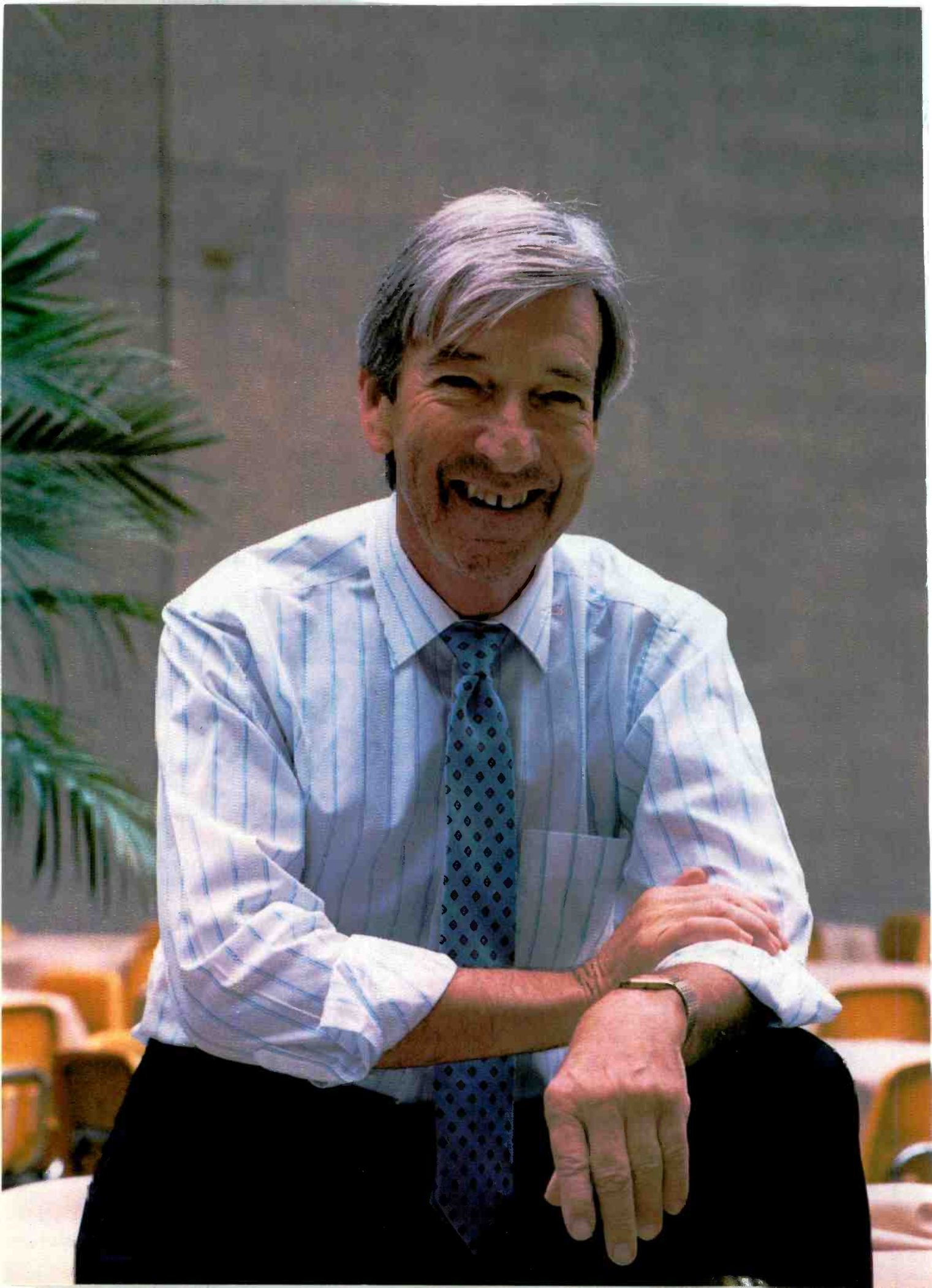
An optional rotary shutter provides a choice of 1/1,000th, 1/500th and 1/250th sec. high shutter speeds and will interface with most major manufacturer's cameras.

The J50X9.5BIE is designed for outstanding performance on both 2/3" tube and CCD cameras. And with a weight of just 36 lbs., these credentials are even more impressive. Simply stated, the J50X represents the most advanced design in optical technology available to the broadcast industry today. There is no better lens to meet the tough professional standards of electronic field production. So the next time you need a broadcast lens with the reach of a 50X zoom and unsurpassed optical quality, choose Canon. Because no other lens measures up.

Canon

Canon USA, Inc., Head Office: One Jericho Plaza, Jericho, NY 11753 (516) 933-6300. Dallas Office: 3200 Regent Blvd., Irving, TX 75063 (214) 830-9600
Chicago Office: 100 Park Blvd., Itasca, IL 60143 (312) 250-6200. West Coast Office: 123 Paularino Avenue East, Costa Mesa, CA 92626 (714) 979-6000
Canon Canada, Inc., 6390 Dixie Road, Mississauga, Ontario L5T1P7, Canada (416) 678-2730

Circle 128 on Reader Service Card Page 75



Profile: Paul Schafer

At 63, the father of radio automation is still giving birth to new ideas.

By Ric Gentry

It was the early 1950s, the Golden Age of radio. Bob Hope was still on the air. Soap operas such as "One Man's Family" and dramas such as "Bank Beat" and "Frank Lovejoy" were popular. Production usually consisted of a producer, a director, and an engineer in a control room, and live announcers and orchestras or talent in the studio below. Engineers still usually built their own equipment—consoles, transmitters, nearly everything. Television had yet to make an impact on mass news or entertainment.

It was also a time of technological ferment for radio. New inventions were influencing the FCC to revise many of its regulations. One of these was the ruling on the remote control of unattended transmitters. In those days, if the transmitter and the studio were at the same location, one person could take care of both. If, as was just as often the case, the transmitter was located elsewhere, the FCC required that a person monitor the transmitter at its site, even though there was nothing else to keep him busy there.

As of 1951, Paul Schafer was working at NBC in Los Angeles as an engineer. As the FCC relaxed its rule, Schafer began to consider a design for a remote control system to faciliatate unattended transmission. Working out of his garage, he accepted three payments of $500 each to build a system for the owner of radio station KROW on Oakland—one payment to start, another on delivery, and a final one if the system performed satisfactorily for a week.

"All we have to do is go to the NAB convention and see how many people are there to get a sense of how the industry has grown."

"It was a system that had a studio connected to the transmitter over two telephone lines," Schafer recalls. "It was a simple system, with old mechanical stepping switches like the telephone company used. You would dial from the studio, and the steppers at each end would advance so many pulses and connect you to the control circuits. Then you could meter a circuit, and while metering it, raise or lower, turn it on or off, and so on."

Schafer Electronics formed

Schafer found that he enjoyed working on his own, and in 1953 established Schafer Electronics with a total capitalization of $1000—a third of the original amount having gone to a fellow engineer at NBC who assisted with the design of the remote system, and who preferred $500 to Schafer's offer of half ownership in his new company.

"The business began to grow in an interesting way," Schafer says. "I enjoyed traveling. I enjoyed working at different radio sta-

tions, making installations, talking to broadcasters, to the point where I resigned from NBC, which was a job that nobody resigned from in those days. But I was much happier being in business for myself and serving the broadcast industry that way."

In addition, Schafer was able to undercut his only remote control competitor (who was backlogged with orders for over a year) at almost a third of the price, with deliveries within a matter of weeks. Many of Schafer's original models are still in operation. He also moved out of his garage to a storefront, then to a much larger facility in Burbank.

Then, in 1956, something else got Schafer's attention. Dexter Haymond, the owner and manager of KGEE in Bakerfield, CA, approached Schafer to build a device that would play music interspersed with announcements and commercials automatically, so that Haymond could provide programming throughout the night over his 250 watt station whether or not Haymond or anyone else was there to operate it.

Schafer went to the drawing board. He came back with a device that utilized a Concertone (later an Ampex 350) audio tape machine rigged up to two Seeburg jukeboxes. Often referred to as the Cue Dot (because of the cueing mark it made on reel-to-reel tape), it was the true beginning of automation in radio.

It was also the beginning of the industry legend of Paul Schafer, commonly considered "The Father of Automation" in radio.

Throughout the 1950s and 1960s, Schafer Electronics was on the cutting edge of virtually every major advance in automated radio technology.

By 1968, Schafer Electronics had become a multimillion dollar enterprise. But its founder decided to sell his interest in the company to Cetec, and ostensibly to "retire." The irrepressible Schafer never did retire, of course, and immediatedly established Schafer International in La Jolla, working international sales for Schafer Electronics.

But even at that time, Schafer told anyone who would listen what an ideal automation system should do. "I thought it ought to be a computer system," he says. "It ought to have complete random access. It ought to store everything a station could play. And it ought to have as a part of it a traffic and accounting system. But for 20 years it didn't happen".

Schafer continued to press for it, however. He was traveling to radio stations throughout the world, frequently in Mexico, making recommendations, suggesting improvements, and vending them parts and equipment. As a highly respected middleman between buyer and supplier, he kept in contact with all the manufacturers in the U.S.

Staying in touch

So Schafer never lost touch with the industry. In fact, he was in the optimal position at all times to observe what it needed, where it was going, what the trends were. Finally, he tried to persuade manufacturers with what could be done

Automation on the Road

"Automation in the 1950s was so new that people really couldn't envision it," says Schafer. "When I first introduced automation to the broadcast industry, I used trailers and then motor homes, with complete automatic radio stations in them, to take around as demos. We'd pull up in front of a radio station, get the manager out there, and we'd show him how good a radio station could sound even if it had 100,000 miles on it. We drove all over the country."

Schafer recalls an incident that owes as much to his tenacity as to the quality of his product to prove successful.

"I had an appointment with the chief engineer of a radio station in Detroit," he says. "He wasn't there, so I said I would like to talk with the owner." The owner wasn't there either, but Schafer was told that he'd be rolling up in his blue Cadillac within a half an hour and that perhaps Schafer could catch him in the parking lot. When the man finally arrived, Schafer approached him and explained that he wanted to demonstrate for him a complete automatic radio station. "The man said, 'I don't want any automation. Who the hell asked you to come?'

"As the GM, Garnet Sparks, had business to do in the station, Schafer asked him to first complete what he had to do, and that he'd be waiting for Sparks when he came back out. Later, Sparks tried to get to his Cadillac to no avail.

"I said to him, 'I've been waiting three hours. You come in, sit down, give me 10 minutes!' " Sparks entered the motor home, "belligerent, almost." Schafer told him to put on the headphones and listen to *his* station, "and tell me if it doesn't sound better than yours."

"And he sat there, and he listened. And he listened some more. And he was very quiet. Then he asked a couple of questions. He finally turned around and asked, 'You mean my station could sound as good as this?' "

They went to lunch, and Schafer sold Sparks two automation systems that day, and one more a few months later.

Eventually Schafer had three motorhomes on the road and even a Greyhound-sized bus. Later he purchased a single-engine Comanche 250 aircraft, and for three years, from 1959 through 1961, he flew throughout the U.S. and Canada and clocked over 1500 hours in the cockpit.

with the new digital technology to produce the comprehensive automation system he had idealized as early as 1968.

"I saw what could be done with digital," Schafer remarks. "I investigated it. I did research. And I went around to the different manufacturers, most of them my friends, trying to talk them into doing something. But none of them would do it. So I thought, 'Well, I'll have to do it myself.' "

The result, after two years of intense R&D and $200,000 out of his own pocket, is the Schafer Digital System. It is everything and more of what Schafer had originally envisioned.

The system incorporates from eight to 16 Sony Betamax videocassette recorders that play digital audio recorded with two digital processors. From 80 to 160 hours of music, commercials, IDs, and other events can be stored on the VCRs and automatically downloaded to a hard disc to allow instant access in any order desired.

The Schafer System is also computer controlled by an IBM-compatible NEC Powermate II with a 20-megabyte hard disk and special cards.

"It's a system that not only provides digital quality," Schafer says, "but equally as important, it's the first system in which you can store everything in the radio station. You can store the entire library of music, of commericials, the entire library of jingles, the station IDs. Everything you can play on the air can be stored in this system, and you can play it on the air in any sequence you want."

The Schafer Digital System was introduced at Radio '87 in September, but his first investigation into the system led him to Japan two years ago. "I got interested in going there because of the new video technology," he explains. "I spent weeks in Japan, and I negotiated with Sony, Mitsubishi, and other companies. I told them I wanted a special transport to do a very particular job. I wanted to be able to record digitally with the quality of at least a compact disc.

"The more I spoke with the engineers in Japan, the more I zeroed in on what I came to realize was the best way to do it. Rather that 8mm or VHS, the best way was using the Sony Betamax, which is a top-of-the-line, professional VCR, together with the Sony digital audio processor.

"The Beta transport was chosen because it has the best ability of tape handling. We can search at high speed, but without the head in contact with the tape. Compare it with R-DAT, compare it with hard disc, compare it with the other things that are coming—it still comes out ahead.

"For one thing," Schafer continues, "R-DAT cassettes are limited to two hours, thereby precluding the design of a cost-effective system to store the complete music library, or making possible the virtually unlimited 'walk away' time possible with the Betamax decks. With R-DAT there is also the question of viability from one recorder to another, and also a question about tape life. I think R-DAT is a viable system and will serve the industry in many ways, especially for the recording of news. But it is not right for this system."

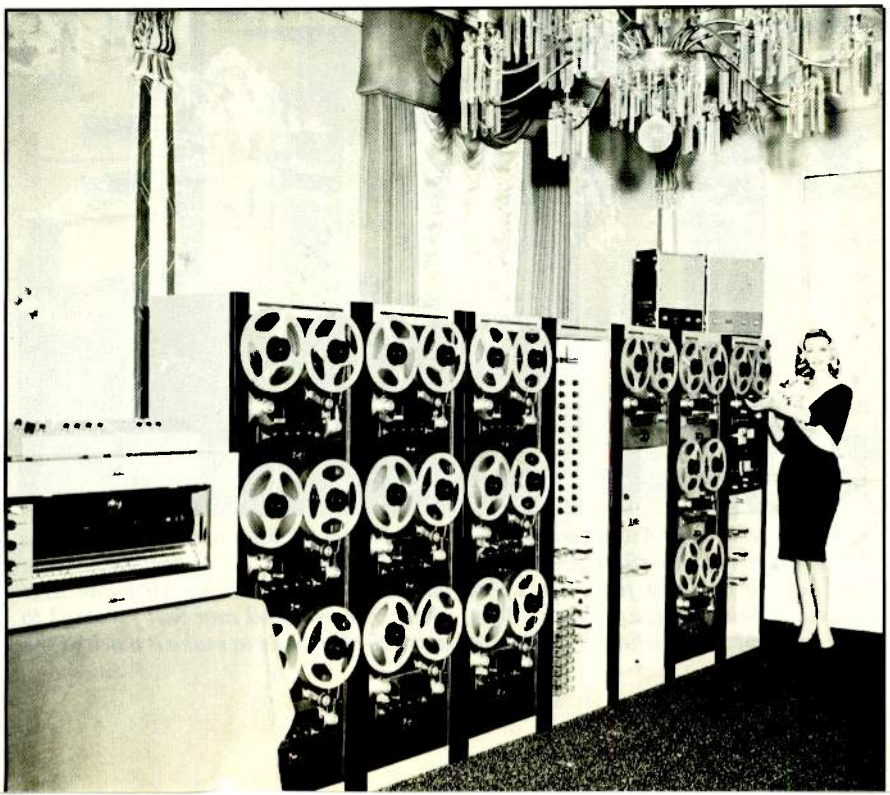
Schafer's first digital system was delivered to Drake Chenault, a music syndication company in Albuquerque, NM. Schafer will have at least two systems in operation at this year's NAB. (He has not missed a single NAB since it first commenced in 1953.)

Early radio interest

Schafer was born in Hammond, IN, in 1925. His career in the broadcast industry began when he was 16 years old at local, 100 watt radion station WJOB.

"I was interested in tinkering with radio," he says, "everything from a crystal set to taking radios apart and putting them back together. So I took a job repairing radios, without really much experience, at a sporting goods store in Hammond. And it just so happened that the radio station was upstairs from the sporting goods store. After visiting the station I became intrigued and took my first job in radio there. I haven't been away from the industry since then, and that's over 45 years".

With the exception of correspondence courses and service in the Army Signal Corps, all of Schafer's radio education came through experience. He later



Circa 1960, the Model 1200 automation system on display at the Mark Hopkins Hotel in San Francisco.

moved to station WOWO in Ft. Wayne and few other local stations before traveling to Los Angeles in 1950. Schafer variously held positions as an announcer, sportscaster, manager, and sales-

Schafer demonstrates the first Model 8000 system at the 1970 NAB show.

man. His primary interest, of course, was engineering.

"The role of the engineer evolved as radio evolved," Schafer remarks. "During the war years you had to have either a first- or third-class license. Technically you turned the transmitter on, you turned it off. You made minimal adjustments. You maintained equipment. And you were most generally the guy who played the records.

"There was no such thing as tape. It was the late 1940s before we saw wire recorders or tapes recorders. So in those days, anything recorded at a radio station was on a great big lathe, that cut a record. Very soft, made of acetate, then you put it on a turntable and played it back".

According to the FCC, all prerecorded programming at that time had to be prefaced as such, with the announcer stating that the proceeding entertainment was either "transcribed" of "prerecorded." Eventually new equipment was developed to diversify and improve the quality of such programming, and recorded music became increasingly accepted, the networks included.

"When radio stations started regularly playing records," Schafer says, "then the control room became a much smaller place with three or four turntables. It become more and more and assembly. It went on that way until the mid-1950s, when tape recorders became more prominent. But there was no such thing as automatic, and there was no such thing as unattended programming."

Model 60 introduction

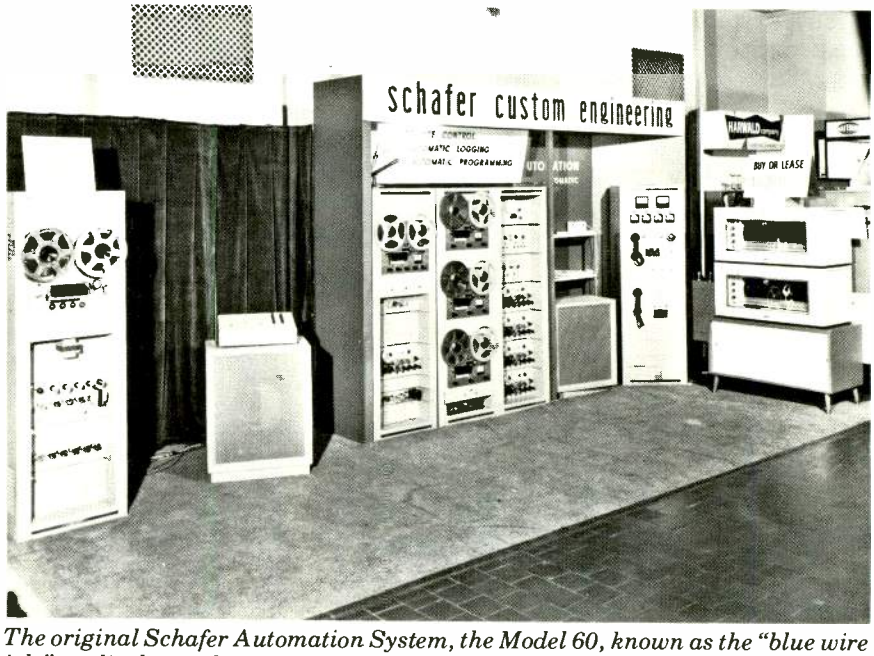
With the introduction of tape machines in the mid-1950s, Schafer altered the nature of radio broadcasting forever with his Model 60, the automation system first installed at KGEE in Bakersfield, employing the orginal Concertone audio tape machine and Seeburg jukeboxes.

"We always called the first Model 60 the 'blue wire job' because every wire in it was blue," Schafer says. "I bought some surplus blue wire and later found out how advantageous it was to color-code wires." Only a few of the Concertones were produced before Schafer replaced them with the Ampex 350 and then the 351.

What caused the next change in the use of automation was an idea which was simultaneously and indepedently developed by two, very successful broadcasters, "one, the late Gordon McLendon, and the other the late Todd Storz. They each came to me," Schafer says, "with great anticipation of what else could be done with automation, but they said that playing music off a jukebox wasn't practical. So we went to recording music on reel-to-reel tapes."

Subsequent Model 60s consisted of three or four reel-to-reel tape recorders that could be interfaced to provide a commercial every 15 minutes.

"But there wasn't a good auto-



The original Schafer Automation System, the Model 60, known as the "blue wire job," on display at the 1959 NAB convention. Concert One reel-to-reel decks were wired to two Seeburg juke boxes that played 45 rpm records. Also, the first spotter machine, with an Ampex deck, which ran re-wind and fast forward to locate commercials. Schafer: "It took at least 100 clip leads to make it work at the convention."

mation system for recording commercials", Schafer adds. "The Cue Dot was one of the first things we started to use. The Cue Dot came about because first we would record on tape the order in which the commercials were to be played. There might also be station breaks, announcements, and so on. But unless we wanted to re-record the entire tape every day, we had to put something in-between those items for the commercial breaks, and that was a Cue Dot."

Originally the Cue Dot was but a small section of adhering aluminum. Later Schafer simply removed the acetate itself in order to leave a clear spot on the tape. Eventually Schafer Electronics acquired a patent on a "spotter," a device which counted the blank spaces in the tape and provided random access to any commercial on the tape within 60 seconds.

The concept of the spotter was first broached to Schafer by Jim Harford of KDB, Santa Barbara. Harford had purchased Schafer's very second Model 60, and was one of the owners and the chief engineer at KDB.

"One day Jim said to me, 'Paul, we need something to play commericals in any order!' I said, 'You design it and I'll buy it!' He did and I brought it.

"It was an Ampex that had 100 windows on the tape, 100 spots. It used mechancial steppers because we didn't have counters like we do now. It knew immediately in which direction to go to get to the next spot it wanted. And it would go off at high speed until it got to that spot. It would go forward and back three times before it finally zeroed in. Within a minute it would cue in to any spot on the tape. With 100 spots, you could play it in any order you wanted."

Top 40 automation

A number of stations also used the spotter for broadcasting Top 40 music. "I remember a time when ABC was anticipating a strike," Schafer says, "and on three days notice we installed a system at KGO in San Francisco and another at KABC-FM in Los Angeles. They put Top 40 on those spotters and they ran for many, many months without any maintenance or anything else. They ran a radio station for 24 hours a day just with spotters."

After designing the spotter, Schafer asked Harford to join his company. Harford sold his interest in KDB and then served as Schafer's director of engineering from 1957 to 1968.

"After visiting the station I became intrigued and took my first job in radio there. I haven't been away from the industry since then, and that's over 45 years."

In 1958, Schafer introduced the 10-input Model 1200 automation system. "We needed something that was more flexible than the 60," Schafer recalls, "where we could set up a typical quarter- or half-hour rotation pattern. We did that with the 1200, which was set up on rotary switches."

Within 18 months, the 1200 was superceded by the Model 800, still the most popular automation system ever built, hundreds of which are still in operation throughout the world. "The 1200 was not quite as smooth in operating as the 800."

Schafer manufactured the 800 virtually without change until he sold his company in 1968. The only significant alteration was the replacement of tubes by transistors. "That was a natural evolution," Schafer says, "but both the 800 and the 800T, as the transister model was called, worked the same."

As automation was popularized through systems such as The Model 800, it had an impact that remains undiminished. "It was interesting," Schafer comments. "Automation began to save money, to allow people to put an FM station on the air without having a big staff. Then it went through a phase of being for many, I think, a tool of control to aspire to perfection on the radio station, to eliminate human error.

"Before automation, you'd put a disc jockey or an announcer in a room and he spent most of his time waiting for the record to end. Little of his time could be used in a creative way. With automation, he can work a shift that is 100 percent creative, whether it's live-assist or creating that which will go into the system."

It can also be argued that if automation decreased the personnel necessary to run a radio station, it also influenced the growth of the number of radio stations themselves. In the early 1940s there were approximately 1000 stations in the U.S.

Today there are over 10,000, nearly all of them managed and run more efficiently due to automation, but more people are consequently working in the industry.

"All we have to do is go to the NAB convention and see how many people are there to get a sense of how the industry has grown," Schafer says. "And each job can be made more valuable (because of automation), so the earning power per job is greater. Automation does the mundane, routine things which a machine can best do and saves the people for something a little more important." **BM/E**

About the author:
Ric Gentry is a television producer and writer living in the Los Angeles area.

There and Back With My Ikegami HL-79

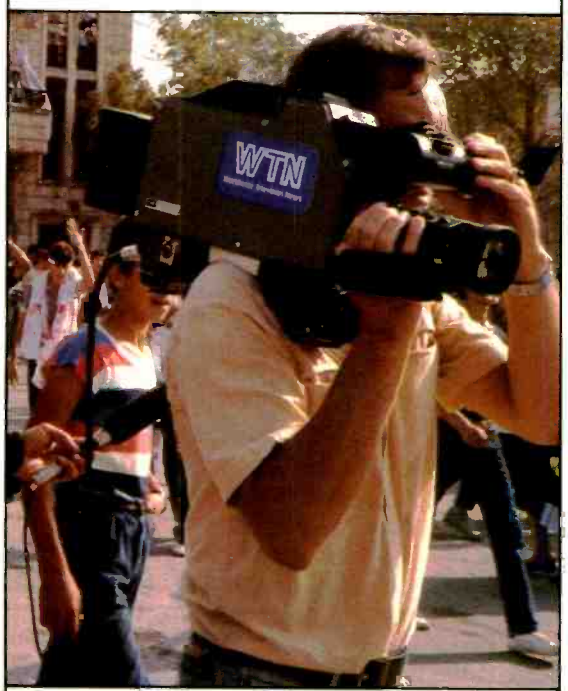
By Ken Jobson, WTN Camerman

As a hardened cameraman of many years, I consider myself fortunate that UPITN/WTN has provided for my professional use, an Ikegami HL-79 video camera which produces quality images often under the most adverse conditions, is electronically reliable, robustly constructed and designed in such a way that it relates to the operator's body. The camera after all, is only a device which facilitates the recording of images seen by the human eye and therefore becomes an (electronic) extention of the human body.

I have very strong emotional feelings about all of 'my' electronic cameras — all Ikegami's.

Using Ikegami cameras has given me tremendous professional satisfaction and, I hope, established my reputation as a cameraman who will go to extreme lengths in order to capture 'the shot'. My Iky's have been taken from me at gunpoint, survived several car crashes, travelled in helicopters, tanks, armored cars, innumerable jeeps, fire engines, on camels, rowing boats to battleships, have been stolen, have boiled in midday sun in the Sudanese desert and chilled on the ski slopes of Lebanon, have witnessed the most appalling degrees of human inspired destruction, a fighter falling to the ground one meter in front of the camera as he was hit in the stomach by a sniper's bullet, glamorous fashion models on the catwalk, the Prince who loves playing polo, a famous parrot now alas no longer with us reknowned for his voluntary impressions of incoming shelling, hundreds of correspondent standuppers, the happiness at weddings and the sorrow of bereaved relatives, the innocent child at play and another innocent child staring into infinity from his hospital bed wondering why that phosphorous bomb exploded in his house. My Iky's have never let me down on any of these shoots. But one incident, which demonstrates the remarkable characteristics of Ikegami cameras, will remain firmly in my mind forever.

Location: Main street in Bhamdoun (pronounced without the 'B') an attractive mountain town in central Lebanon on a sunny afternoon. We had just finished taping the totally deserted street (or so we thought) and locked up shop fronts, when the distinct crackle of automatic gunfire could be heard breaking the eery silence. It took perhaps five to ten seconds for us to realize those bullets were coming at us. As my soundman and I both took independent evasive action, the Ikegami HL-79 and video recorder both fell from our shoulders onto the pavement. The Iky laying on its side (and as I realized minutes later, my finger had touched the roll button as it fell out of my hand) was now happily recording the sound of incoming bullets hitting the surrounding shop fronts. Our cries in Arabic that we were press and the gunmans order in English "Get out, get out,' were followed by another burst of gunfire. Carefully, I crawled across the pavement and uprighted the still rolling Iky, pointing it in the direction of its crew who were to be seen crouching behind a sand heap for shelter. Minutes later, thinking our ordeal was over, I bent down to press the stop button, when an M-16 bullet tore through my right neck muscle. It was only the sudden feeling of wetness down my back that made me aware that something was seriously wrong. I was hit. Once again I flung myself down behind the gravel pile, as the gunman fired at least another twenty bullets at us. The firing then ceased, and I was put into the back of a car and taken to an Israeli medical unit, who treated the wound, gave me a pain killer injection and hot coffee. Later at the American University Hospital in Beirut, doctors gave me a local anesthetic, cleaned the wound internally (very painful), x-rayed, took blood pressure, etc.



The bullet which miraculously missed my spinal cord by two millimeters has left two holes three inches apart in the back of my neck. Subsequent viewing of the video reveals twenty five recorded gun shots at us before I was hit. Plus approximately twenty shots as I lay bleeding. I was very happy not to be going home as a waybill number. And today while the memories linger; my work as it must, goes on.

Ikegami Celebrates 10,000 HL-79's Sold Worldwide With Their Latest Direct Dockable Versions —and welcomes your memorable HL-79 stories.

Since its introduction, the HL-79 series cameras have been sold to over 10,000 users worldwide making it the most popular camera of all time. The latest, the HL-791 (shown above) is the direct dockable version of the HL-79. Totally flexible, the camera can be used as a stand-alone, one piece with on-board VCR (Beta or MII), or a remote using multicore or triax. It is versatility at its best. Features include selectable gain, SMPTE color bar generator, high S/N ratio, and much more.

For more information call your regional Ikegami office.

If you have a fascinating HL-79 story to tell, please send it to our Maywood, N.J. office. We may use it in an upcoming ad.

Ikegami®

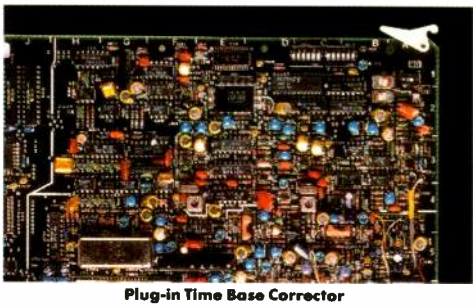
Ikegami Electronics (USA), Inc. 37 Brook Avenue, Maywood, NJ 07607
East Coast: (201) 368-9171 West Coast: (213) 534-0050 Southeast: (813) 884-2046 Southwest: (214) 869-2363 Midwest: (312) 834-9774 Hawaii: (808) 946-5955

Circle 129 on Reader Service Card Page 75

This is what makes the new Sony editing VTR so good.

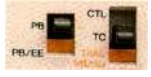
This is what makes it great.

U-matic



Plug-in Time Base Corrector

TBC Remote Control



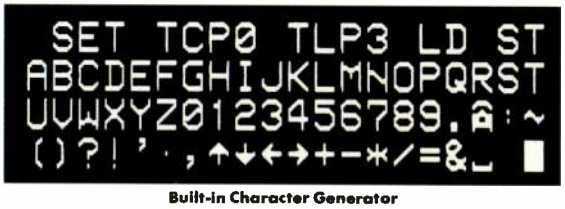
Dolby* C Noise Reduction

Front-panel Presets

Expanded Dial Operation

Status Display

SP Technology



Built-in Character Generator

Plug-in Time Code

Self-Diagnostics

It's rare to find an editing VTR that comes with everything you want yet still goes with everything you have.

Enter the BVU-950.

It has the resolution, the sound quality, and the advanced editing features you've been wanting, yet it's still compatible with the entire U-matic line of players and recorders. You can even hook it up to other broadcast equipment using an RS-422 interface.

To learn more about this remarkable addition to the U-matic line, please write to Sony, P.O. Box 6185, Department BVU-2, Union, NJ 07083.

Introducing the BVU-950.

SONY

Professional Video

Circle 130 on Reader Service Card Page 75

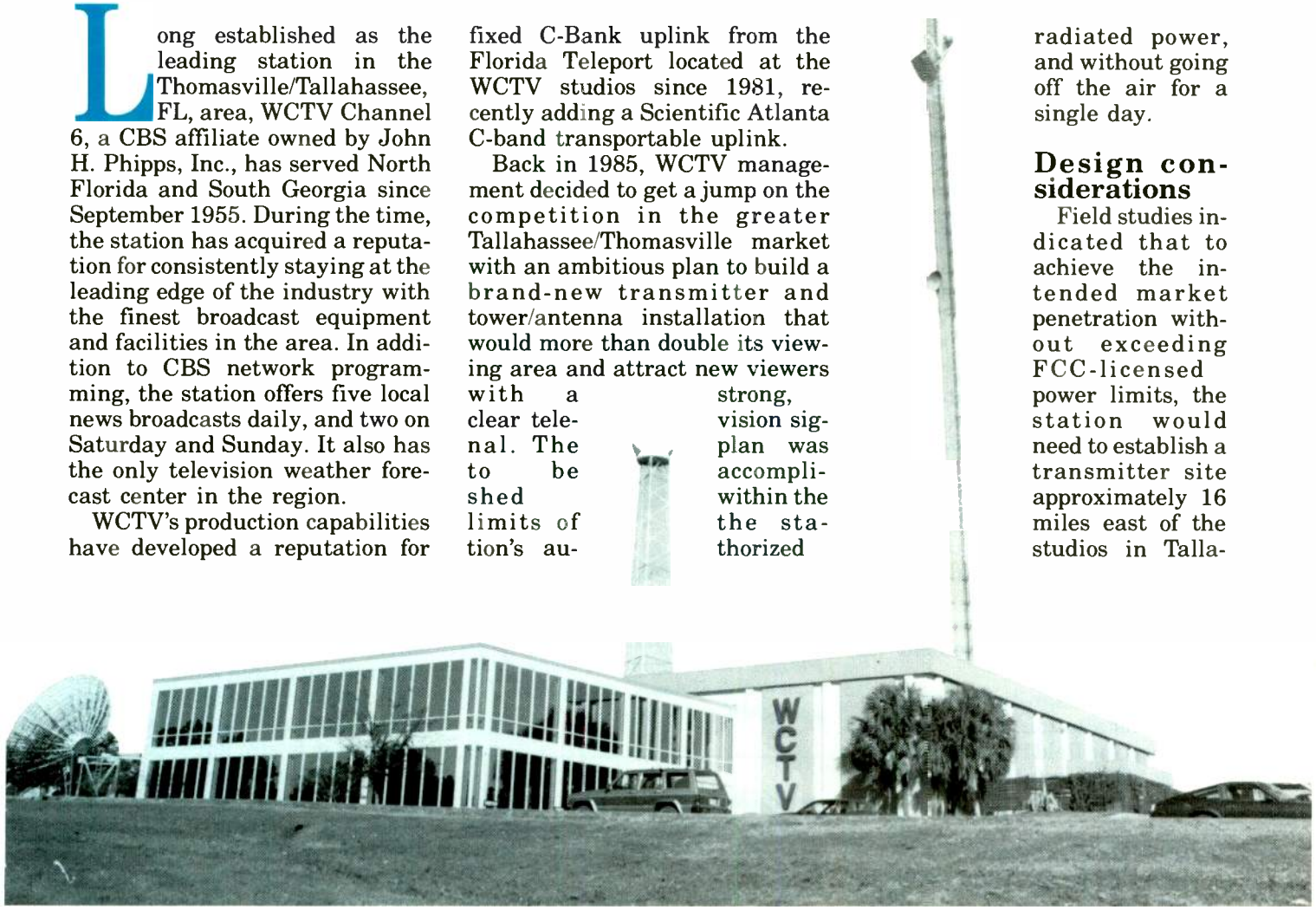
Tallahassee's Channel 6 Reaches Out

By Robert Morgan

Long established as the leading station in the Thomasville/Tallahassee, FL, area, WCTV Channel 6, a CBS affiliate owned by John H. Phipps, Inc., has served North Florida and South Georgia since September 1955. During the time, the station has acquired a reputation for consistently staying at the leading edge of the industry with the finest broadcast equipment and facilities in the area. In addition to CBS network programming, the station offers five local news broadcasts daily, and two on Saturday and Sunday. It also has the only television weather forecast center in the region.

WCTV's production capabilities have developed a reputation for excellence and dependability, doing more commercial production locally than many stations in larger markets. In addition to doing numerous major events (such as the *Bob Hope Birthday Party Specials*, the station's well equipped 45-foot mobile production unit, "The Shooting Star," is one of the four mobile units selected by NBC to cover the Olympic Games from Seoul, Korea. Phipps has also been operating a fixed C-Bank uplink from the Florida Teleport located at the WCTV studios since 1981, recently adding a Scientific Atlanta C-band transportable uplink.

Back in 1985, WCTV management decided to get a jump on the competition in the greater Tallahassee/Thomasville market with an ambitious plan to build a brand-new transmitter and tower/antenna installation that would more than double its viewing area and attract new viewers with a strong, clear television signal. The plan was to be accomplished within the limits of the station's authorized radiated power, and without going off the air for a single day.



Dual 30 kW transmitters, a new tower, and circularly polarized signal emission have enabled WCTV to nearly double its coverage area.

Design considerations

Field studies indicated that to achieve the intended market penetration without exceeding FCC-licensed power limits, the station would need to establish a transmitter site approximately 16 miles east of the studios in Tallahassee, 1000 feet north of the Georgia border, straddling the border of both states.

Engineering further determined that given the flatness of the terrain, the only way to double the reach would be to construct a brand new tower/antenna that would be twice as high as the existing tower/antenna, and would use a circular polarized signal to provide the best television picture possible.

At the time, existing facilities made use of a single Harris 30 kW transmitter with 20 kW power output into a 1000-foot tower and standard antenna with a gain of 5, to achieve our licensed ERP of 100 kW. To compensate for line loss and the increased power required for circular polarized operation, WCTV would now need two 30 kW transmitters in dual configuration, operating at two thirds of their rated power for a combined output of 42 kW into a tower/antenna that would provide at least a gain of 3 to yield the desired ERP.

The original Harris transmitter was installed in 1975, so it was relatively young as transmitters go. The question was whether it would be worthwhile to join it in operation with a new transmitter in dual configuration, or to leave it in place until switchover to a new dual-transmitter system, eventually selling off the Harris transmitter. The downside was that the latter choice would initially cost more. However, it meant that engineering would not have to marry an older transmitter to a new one, and thus would avoid all the difficulties that might arise out of such a situation. And, it would make it easier to continue operations in normal fashion up to the moment of switchover.

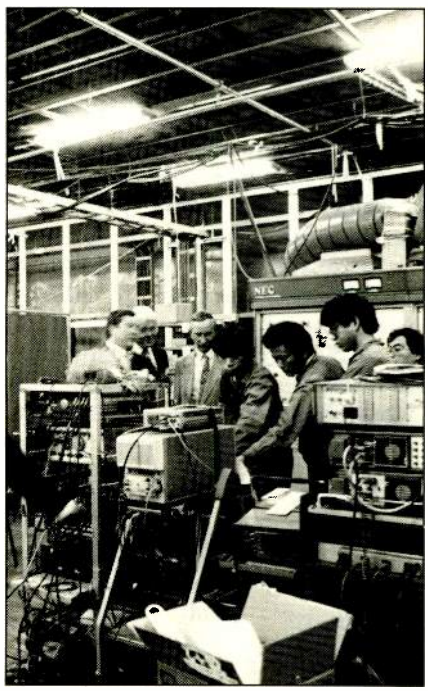
Given the magnitude of the proposed installation, the staff researched the field thoroughly. The choice for transmitter equipment finally arrived at NEC.

The NEC system

As far as engineering management was concerned, the NEC PCN-1430AL low-band VHF transmitters had everything: quality, simplicity in design for easy maintenance, and an outstanding performance record. Engineering was most impressed by the dual NEC transmitter installation that was inspected at WTVM in Columbus, GA.

The transmitters are all solid-state aural, with high efficiency all solid-state visual amplifiers operated in linear class AB. Just one vaccuum tube (Eimac or RCA) is required in the final stage grounded-grid power amplifier.

Generally speaking, overall maintenance and service have been greatly simplified by the design and forethought incorporated into the system. Seperate independent regulators for each visual solid-state module, solid-state amplifiers air-cooled with temperature interlock, and extender cable on-air operation and servicing all exemplify the smart design.



Testing out the equipment at the NEC plant in Fuchu City, Japan. From left: Dennis Boyle, president of John H. Phipps, Inc., Frank Fitzhenry, president of R & H Assoc., and Robert Morgan, chief engineer, WCTV.

The NEC transmitters are, of course, ready for BTSC multichannel TV sound, and can be used with any stereo generator. However, until recently there was very little CBS network programming to warrant stereo transmission.

The full package

The WCTV system is a complete transmitter and antenna package, including an Opto-X switchless output combiner from Dielectric,which allows switching from one transmitter to the other, and back to both transmitters—while on the air, without getting off the air. The combiner is controlled by the NEC HA-700 auto/remote program controller that will automatically turn one transmitter off, and allow the other to continue operation (at half the station's normal power). For the microwave studio-to-transmitter link an NEC 7 GHz microwave system was selected in hot standby configuration using four audio channels. An MRC-2 system by Moseley is used for remote control. In addition, a Dielectric/RCA TDM-7A6 circular polarized antenna and transmission line completed the package.

NEC's Chicago office was helpful, providing information support and the specifications we needed. When the Japanese engineers had completed their tests on the transmitter and qualified it, we went to Tokyo for actual inspection at NEC's Fuchu City plant.

Circular polarized antennas generally require a significant increase in input power since you lose some gain by circular polarizing your signal. So, even though the Dielectric/RCA TDM 7A6 seven-element antenna would theoretically yield a gain of seven (if it were horizontally polarized), it is rated at a little over three because it is circularly polarized.

Although this technology has been available for quite some time, it is not commonly found in the U.S. In the first place, it requires a greater power output, which makes it more expensive. Moreover, people do not rush to change their existing installations unless major elements of their system (i.e. transmitters or antennas) need replacement. Management thought the superior performance and deeper market penetration were well worth the extra investment in transmitter and tower/antenna equipment.

WCTV is now radiating a far stronger and clearer signal that

cuts down on ghosting and reflections, and works much better inside tall, metal buildings, or mobile homes. Even with a rabbit-ear antenna, the circular polarized signal is stronger and clearer.

Reception, on the whole, for our viewing area was greatly improved. Our viewers, including those we are reaching in our increased viewing area, should receive clearer, better pictures regardless of whether they're on cable or have an outside or set-top antenna.

The tower

The station's new tower is 1928 feet tall. Combined with the 72-foot circular polarized antenna, it is an even 2000 feet tall.

In broadcasting, one of the most important factors in coverage is tower height. Obviously, the taller the tower, the greater the distance from the station the picture can be received by the viewer. Ideally one would like to have an average-sized tower/antenna perched on top of a very high mountain, surrounded by a vast flat area without any obstructions. To meet the engineering objectives for WCTV, it was necessary to construct a new tower twice as tall as the previous tower, a challenging task in any circumstances. In this particular case, almost 300 acres of ground would need to be cleared before the new tower/antenna installation could be built at the desired site.

This greater tower height has increased the WCTV viewing area by over 50 percent from 12,000 square miles to 20,000 square miles, making WCTV available to almost 62,000 more homes. Station estimates show that even at half-power (should one transmitter fail for any reason), WCTV would still be covering a larger area than was covered with the old transmitter and the 1000-foot tower antenna. In fact, as a result of the effectiveness of the installation, WCTV has also been added to the Albany, GA, cable system.

The increased tower height, combined with the circular polarized antenna, and the new dual VHF NEC transmitting system also yielded improved reception in twelve other counties.

Claude Pichard, director of creative services at WCTV: "With NEC's DVE System 10 we've gone from an average market 'look' to a big market 'look.' You're limited only by your own ability. Not the machine's."

Throwing the switch

Generally speaking, the station intends to be on the air as much as possible. There are generators at the transmitter and studio sites, so that in the event of power failure (not an unlikely situation in Florida) the station is back on the air in a matter of minutes, whereas the other stations in the market are likely to be off the air for a considerable length of time if there is power failure.

The switchover from the old transmitter site to the new transmitter and tower/antenna installation required careful planning and meticulous testing of all systems, to make sure it took place without a hitch. When all construction was completed, the new dual transmitting system, fully installed and operational, and every other related system in place, engineering went through another extended checkout procedure.

In the spring of 1987, WCTV inaugurated its new transmitter plan and tower/antenna. Since switchover to the new operation, there has been no transmitter downtime, nor has the station been off the air due to the failure of transmitter systems or the associated components, which is rather unusual for systems of such magnitude, especially in the first few months of operation.

WCTV has received numerous call from old and new viewers who are appreciative of our improved signal and the quality of the pictures they have been receiving. Engineering is especially pleased with the results knowing that the project was well done, and everything in our new transmitting facilities is performing as expected. **BM/E**

For more information on products and companies mentioned in this story, please use the Reader Service Card:

Dielectric (Opto-X, TDN-7A6)	256
Eimac	257
Moseley (MRC-2)	258
NEC (30 kW, HA 700, 7 GHz microwave)	259

SX-2000D™

Multi-layered effects... in one pass!

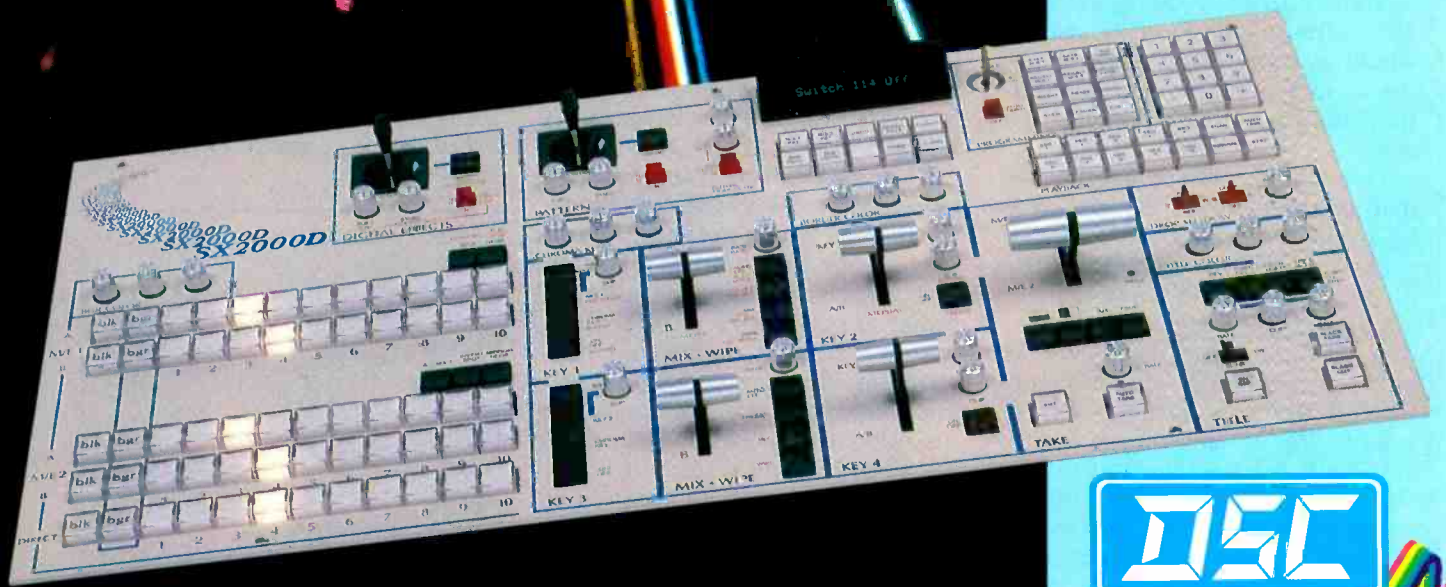
Take another look...not just a switcher...not only digital video effects...the SX-2000D is a Programmable Effects System with DSC's digital video effects completely integrated with 2 M/E and 5 Keying Amps.

Its one pass control of multi-layered effects offers greater creativity, higher quality and lower production cost.

Now you have easy access to all M/Es, keying and digital effects for fast moving on-air productions ...and one pass multi-layered effects in post production.

And check these features...
• all control panel functions are digitized for auto event programming and editor control • audio-follow option • playback mode for rapid sequence review.

Write for details, or for faster service...call us.



DSC
A member of The Chyron Group

Digital Services Corporation, 3622 NE 4th St., Gainesville, FL 32609 904-377-8013.
New York: 914-761-7928. Mid West: 317-738-3219. Minneapolis: 612-758-3036. West Coast: 619-485-1156.
Texas: 214-894-6303. Southeast: 912-888-2142. Canada: 416-475-7575

Circle 131 on Reader Service Card Page

New Ideas in Production Switching

By Craig Birkmaier

The production switcher, or "switcher" for short, got its name because in early systems it could only switch or dissolve between inputs. As the technology evolved, keying and wipes were added, and the term *special effects generator* came into use.

Today, the modern "production switching system" not only integrates material from digital effects devices and graphics systems with camera and VTR inputs, but it is increasingly called upon to communicate with external devices such as the editor and digital effects system, and provide control over audio sources.

Most switchers today also include a memory system that allows: a) frequently used effects to be recalled at the touch of a button; b) the programming of production sequences against a time line, integrating effects from multiple sources with the editing time line; and c) the programming of setup parameters and "localized" memory functions that simplify installation and automate many routine tasks at the system control panel.

The switcher marketplace

The group of manufacturers that build these specialized production switching systems has changed constantly over the years. Have you ever punched the buttons on a Sarkes Tarzian, American Data, RCA, Riker, or International Nuclear production switcher?

The production switcher has evolved from special effects device to control center for all image compositing.

Today the industry is dominated by one manufacturer, the Grass Valley Group. GVG earned this position by providing a product that "works out of the box" to a market that still expected a technician to come with the box. In addition, GVG helped to pioneer or perfect many of the features that we mow take for granted on a switcher. Today, GVG offers the widest line of production switching systems in the industry with their 1680, 100, 200, and 300 Series analog production switching systems and Kadenza Digital Layering System.

Another industry innovator that is still in the "thick of it" is Ampex, who acquired Duca Richardson in the late 1970s. Ampex developed many of the keying concepts used in switchers today, including automatic external key assignment and key memory. Ampex is currently breaking new ground with its Vista Series of compact switchers that dramatically reduce the size of the control panel through the use of an integrated graphics and text display.

Although the future of the company is in doubt (it withdrew from the NAB show this year), Central Dynamics (CDL), provided much of the leadership to the industry in the 1960s and 1970s with the development of the first multilevel mix/effect systems. This major step made it possible to build a two- or three-level effect on a single mix/effect system (M/E); the same effect on the traditional, single-level, A/B mix/effects system could tie up an entire three M/E switcher.

CDL introduced the Strata Seven production switching system at the 1987 NAB. This system allows up to seven video inputs to

be layered, and includes the ability to integrate the system with an editor.

Also new at the 1987 NAB was the 9600 Series from Intergroup Video Systems. This multilevel, two M/E system provides all the hooks that are required to integrate a large system today: linear keying, aux buses and a programmable external key matrix, and an effects memory system.

Completing the field of large production switchers available on this continent are the new Ross Video 416 and the BTS RME.

The new Ross 416, introduced at last fall's SMPTE and shown as a production unit at the recent NAB show, offers two multilevel effect systems and a variety of key enhancements including a linear key border generator.

The RME series from BTS was developed in Germany and offers a method of operation using split faders, still popular in Europe, but which has found little acceptance in the U.S.

Another company with the potential to market large switching systems in this country is Abekas/Cox. Cox, a British switcher manufacturer, became part of the Abekas family several years ago, but to this date the only product made available in this country has been the T-8, a small system that competes favorably with the GVG 100.

Smaller switchers

There are a number of companies vying for your business in the small production switcher market. From across the Pacific come a variety of small switchers with names such as Sony, JVC, Panasonic, and For-A. Most of these units were designed for small studio work or field production and don't offer system integration features such as an editor interface or linear keying. The Sony SEG 2550 does offer an editor interface and "snap shot"-style memory system. For-A produces several units available for composite or component video processing; they include an editor inter-

The Key to Keying

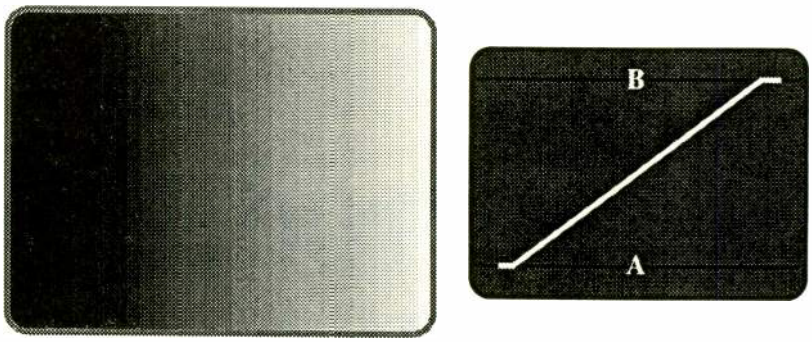


Figure 1: The video mixer is a proportional device that blends two pictures together based on the level of the control signal. If the control signal is at 0, only source A is allowed through to the output; a 100, only source B is output. At any value in between, a proportional mix of the two sources is output. The ramp signal changes from 0 to 100 at horizontal line rate (a rise time of 63.55 us).

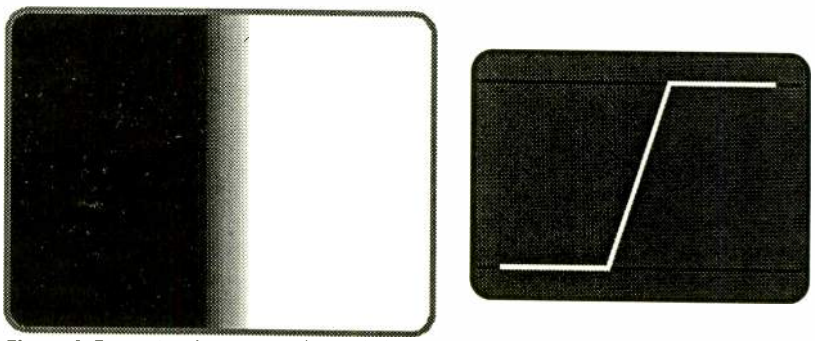


Figure 2: To create wipe patterns in a switcher, a waveform generator produces the control signal. Here a simple vertical split screen with soft edge is created by providing a ramp with a short risetime. Edge softness is adjusted by increasing or decreasing the risetime of the ramp signal. For a soft-bordered wipe, two ramps, offset in time, would create transitions from A to matte and from matte to B.

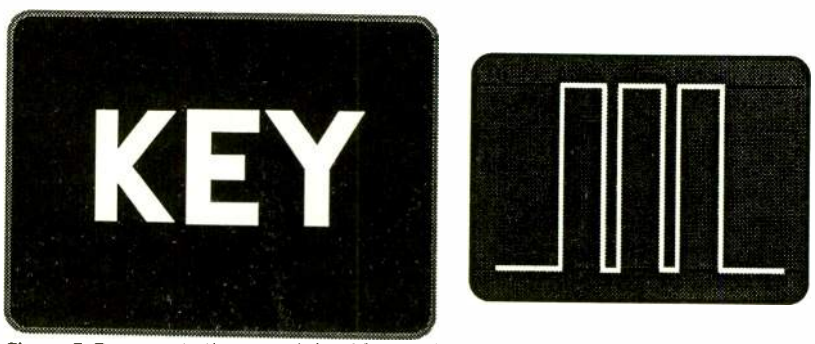


Figure 3: To generate the control signal for a self key, the color is removed from the signal, then it is processed to create the control signal. The clip level determines the video level of the key source that will become 100 in the control signal, allowing the key to be inserted. Keyers typically have a lot of gain: as the gain is increased, the portion of the key signal that falls between 0 and 100 decreases, making the keyer more selective. This also decreases the control signal risetime, producing sharper edges.

Figure 4: When "all" of a picture must be inserted into another picture, as is the case with a digital effects system or a character generator that produces its own edge enhancements, the external device must tell the video mixer where to insert the video. These devices typically have a "TTL" level key signal (either 0 or 100 with very fast risetimes). This type of key signal only produces sharp edges.

Figure 5: By precisely setting the black level of the external key signal to 0 and the white level to 100, the external key can take over control of the video mixer. Black in the key signal becomes the background and white becomes the foreground. Control signal levels in-between become a mix of background and foreground. The intermediate portion of the key above will be a mix of background and key video: the key video could be black creating a shadow, or a color causing a glowing effect.

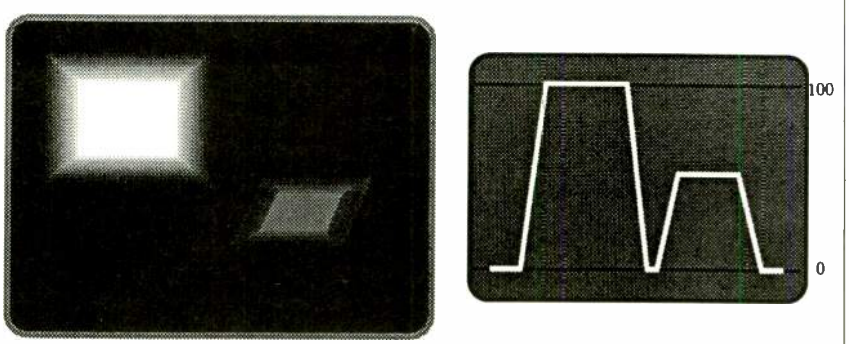


Figure 6: When a digital effects system goes the extra mile and provides a linear key output, a number of exciting effects are possible: The edges of the compressed images can be softened, or soft color borders can be added; and shadows can be cast on the background. The important factor to remember for any linear key is that the control signal should be softened or antialiased, but the video fill must not be similarly processed; it must extend just past the edge of the softened effect.

Note: Diagrams above illustrating how the production switcher control process works simulate signals used to control a video mixer, which have many similarities to a monochrome and are illustrated as if they were converted into "video level" signals and displayed on a black-and-white monitor.

face, and a memory system option is available.

On this side of the ocean, several companies produce small switchers, including: Shintron, Crosspoint Latch, and Echo Lab. While their products have been innovative in many ways, their main benefit has been a lower price.

Crosspoint Latch offers a wide range of products in the price range of $3,000 to $12,000. Perhaps its most significant product to date has been the 8200 Excalibur, a system that combines a small analog production switcher with a dual TBC. The TBC offers horizontal digital effects, such as a "slide over," that are an integral part of the switcher control panel. In addition, the Excalibur can be interfaced to an editing system through a standard GPI interface or optional serial interface.

Echo lab has led the way in small switchers with the innovative use of microprocessors to control its systems. Unfortunately, some of its earlier products were "slightly ahead of their time" with respect to the user interface. A unique feature from Echo lab is "Time Tracker," which employs a time code reader in the switcher memory system. This allows switcher memory events to be triggered at a time code programmed by the operator. Time Tracker also records operator actions against a time base, allowing those actions to be replayed as a memory event.

Shintron, an early pioneer in small switchers, has moved primarily into the field of component production switching for use with Betacam, MII, and Super VHS tape formats.

At the recent NAB, another well-established video equipment manufacturer entered the field of production switching systems. Videotek, known for video monitors, test and measurement equipment, and small routing switchers, introduced Prodigy, a compact production switching system that includes a multilevel effects system, audio-follow-video system, effects memory, and se-

rial editor interface in the standard package.

The package offers everything the user needs to integrate a small A/B roll editing system, complete with digital effects and graphics, and includes many features found only on large production systems.

Perhaps the most significant trend, in looking at the industry today, is the move toward specialization of products to cover specific applications. One can choose between: composite, analog component, or digital inputs (and, in some cases, combinations of inputs); systems optimized for live production or post-production; and systems that can handle anywhere from three to 17 layers of video simultaneously.

Perhaps the most significant trend in looking at the industry today is the move toward specialization of products.

Image composition

The major task for the production switching system is to assemble the pieces of various pictures required to create a composite image with the right "look." Two factors are important here: 1) the ability to create the right control signals for the video mixers to cut the pieces out correctly; 2) the ability to put all of the pieces together seamlessly so that the composite looks natural.

The video mixer is an amplifier that allows two inputs to be blended in any proportion, or allows only one or the other input to pass through at any given point in time. Time is the critical element here, as the system creates effects between inputs at the video scan rate, changing the video output as the image is scanned across each line. If a hole is cut in one image, the video that is "cut out" to fill the hole must match precisely or it will generate noticable edge effects, such as black lines at the trailing edge of a key.

The actual voltage swing of the control signal will vary from one manufacturer to another, but the principal of the signal is the same. At one voltage limit (0), 100 percent of input A passes through the amplifier; at the opposite limit (100), 100 percent of the other input (B) passes through the amplifier. At any level in-between, a mix occurs between the two inputs.

An important concept in discussing video effects is rise time, the amount of time it takes the signal to change from one level to the other. Slow rise times cause a gradual mix to occur at the transition from one input to the other. Fast rise times cause a sharp transition between inputs.

It is important to note that control signals contain no subcarrier frequencies. During transitions with very fast rise times, the subcarrier from each video input must be mixed. When two signals that have highly saturated colors are mixed rapidly, alias effects will be created in the mixer. This extra information creates the crawling effect seen on some wipe borders and keys when two saturated colors are mixed.

A ramp signal such as that shown in Figure 1 tells a great deal about the video mixing process. At 0, only input A makes it through the mixer; at 100, only input B. The ramp signal has a rise time that is equal to the horizontal line rate (63.55 us). Thus, on each line, a complete mix occurs from black to white (input A to input B). To create the traditional video dissolve effect, the level of the control signal remains constant for the entire field, changing gradually over successive fields to mix between inputs.

In Figure 2, we see how changing the rise time of the ramp signal creates a basic effect, the vertical split screen. The rise time of the ramp determines the amount of softness or "edge width" on the wipe. In order to wipe between two inputs, the position of the ramp in successive fields changes, causing the transition to move across the screen. A very fast rise time creates the traditional hard-edged wipe.

Bordered wipes

To create wipe borders, a second mixer is required. The first creates a transition between A and a color matte input; the second mixer creates the transition between the A-matte composite and the B input. The timing differential of the two ramps determines the width of the border, and the rise time of each ramp determines the softness of the transition on the leading and trailing edges of the border.

In Figure 3 we see how the keying process works. In most cases, the switcher uses a key processor circuit to derive the control signal that is used in the video mixer. (The key processor can also be bypassed to allow an external key signal to directly control the video mixer for linear keying—more on that later in the article.)

The first task for the key processor is to filter out the subcarrier information so that it can work with the luminance information that contains the detail for keying. This filtering process introduces a delay that must be compensated for in the video fill signal so that the video fill lines up with the hole that is created by the key signal.

When keying off a camera orVTR, there is often video information such as highlights or shadows that are not to appear in the key. In order to remove this information, the keyer must operate at a high gain level so that it can select a particular video level from the key input signal.

With most keyers today one can adjust the clip and gain of the input. The clip adjusts the reference level of the amplifier so that the video information necessary to create the key hole corresponds to 100 in the control signal (fully inserting the key video fill). The gain control creates a window around the clip level, allowing in-

formation from the key input that is above or below the clip level to be passed through the mixer.

Digital effects integration

In some cases, rather than selecting a range of video levels from one picture to insert into another, it is necessary to insert the entire video image in a portion of the other picture. As an example, a digital video effect system compresses a picture to less than full screen size. If one self-keys off the video signal from the digital effects system, it may not key in the entire picture. Thus, the digital effects system provides an external key output that defines where the compressed image is to be inserted (see Figure 4). In the same way, a character generator can provide a "wide key" output that tells the video mixer where to insert the characters as well as any edging effects created by the character generator.

Typically these signals are created digitally, and have very fast rise times. The signal is either at 0 (background video) or 100 (insert video). The switcher must be capable of using the external key signal to cut the hole, and the video signal to fill it. A handy feature found on many switchers is the ability to program the switcher to automatically select the external key signal associated with a video input when that input is selected as a key source.

Linear keying

There is a great deal of confusion in the industry today about the meaning of the term linear keying. Some manufacturers use the term for any keyer that allows the control of both the clip and gain of the key signal. More accurately, a linear keyer allows the gain of the key circuit to be adjusted to 1 or even below 1 (a form of white clipping of the incoming signal). At this level, the highest level in the key signal corresponds to 100 in the control signal, and the lowest level corresponds to 0. This allows the external device to precisely control the video mixer—not only to insert the key video, but to create effects that the switcher cannot duplicate.

For example, in Figure 5 a character generator produces a linear key output to cast a shadow on the background. The level of the key signal is 100 where the characters are to be fully inserted; the level of the key signal for the shadow is 50, which causes a 50/50 mix between foreground and background. The video fill signal from the character generator contains the character information over a black background. Thus, in the area of the shadow, the mix occurs between the background video and black, giving the appearance of a shadow. To create a glow behind the characters, the character generator could create a linear key signal that is slightly larger around the edges of the characters with a ramped transition from character to background. The video output of the character generator would have the characters over a color field. When inserted by the switcher, there would be a mix of color and background around the edges of the characters, creating a color glow.

This same technique is used by some digital effect systems to provide advanced effects such as those in Figure 6. Here the key signal that corresponds to the compressed image has ramped edges. This creates a soft-edged effect identical to a soft wipe edge. The other key information is created by the digital effect system to cast a shadow on the background. The level of the shadow information determines the percentage mix or "shadow depth." As with the compressed image, the edges of the shadow are ramped to create a more realistic effect.

The Ampex Vista switcher uses linear key techniques for the integration of ADO digital effects in the system. Vista provides an effects loop, where the output of the multilevel effects system feeds the ADO, which is then inserted into program video using the linear key technique. The Vista control panel can be used to control the ADO, making it possible to create digital effects from the switcher in a manner very similar to selecting a wipe pattern.

Videotek's Prodigy uses the linear key technique to add versatility to the background transition level in the system. Instead of selecting a traditional wipe pattern, a pattern number that selects the external linear key signal is entered. The key signal from an external pattern generator or digital effect system can now control the background transition. The Prodigy system is equipped with an additional serial port that allows it to interface with an external device such as a digital effect system and control the external device directly from the switcher control panel.

Switcher memory

As the central integration point for a production system, the switcher must be involved in coordinating activities at the system level. Today the production switching system shares these responsibilities with the editing system controller. The editing system controls source machines, maintains a list of events, and triggers activities along a timeline that is usually associated with the timecode of the record VTR. The switcher must communicate with the editor so that the editor can initiate audio and video transitions and trigger special effects created by the switcher.

Allowing an external device to control the video mixer significantly increases the effects possibilities available through the switcher

The control of audio is a feature that became part of production switching systems by default. There are a multitude of full-featured, inexpensive audio mixers available, but very few allow control of an audio transition by an editing system. To bridge this gap, switcher manufacturers started including a simple audio mixer as an option to their sys-

tems.

These mixers usually include two audio buses that correspond to the switcher's video input buses, and a mixer that can be controlled by the editor through the same interface as the switcher. The customer's manually operated audio console is connected to an input on the audio bus. This allows the editor to control audio transitions between source machines or use the audio console for more elaborate audio effects.

The editor has a standard list of video effects that it can control directly from its keyboard, but it cannot control the vast majority of features available on the production switching system. This is where switcher memory becomes invaluable. GVG started the ball rolling in the 1970s with its E-MEM effects memory system option for the 1600 Series, and later the standard E-MEM system in the 300 Series. This system allowed the operator to store a snapshot of a M/E or the entire switcher control panel in a memory register. The panel could be instantly recalled to this configuration at the touch of a button, or an editor could recall the setup through the serial interface.

The real power of the system, however, came from an technique which GVG calls an "effects dissolve." Each snapshot contains the switch settings and the analog settings for each analog control on the panel, with the exception of lever arms. The computer calculates the in-between values of two analog settings for a control, allowing a smooth transition from one setting to the other, at a rate specified in frames. Better yet, it can do this for every analog control on the panel simultaneously, a task that no operator, or group of operators, can equal in real time. Finally, groups of effect registers can be programmed in a sequence, complete with delays (wait periods) before the next event in the sequence. This feature allows the effects creation capability of the switcher to be precisely programmed to create complex multi-layered effects.

These effects are now available on some smaller, less expensive switchers such as the Videotek Prodigy, which creates smooth effects transitions that can be linked in sequences.

Ampex added another important element of switcher memory systems with a localized memory feature for keying. The Ampex system stores the clip and gain settings for a key input automatically as adjustments are made on the panel. If that key source is selected again in the future, the last settings used will be recalled. In addition, since Ampex uses keypad entry to select key inputs, it allowed a second key memory to be saved using a different number.

Another application of localized memory is for wipe patterns. Wipes have a number of modifiers that can create different effects: edge softness or colored borders, aspect, and position to name a few. The GVG 200 provides four "user registers in which the operator can store a modified pattern for latter recall."

The Videotek Prodigy uses keypad entry for selection of wipe patterns. A pattern can be modified and then "learned" back into its standard pattern number, or a second or third set of defaults can be learned into unused pattern numbers. This is especially handy with editing systems, since the editor only recalls the basic pattern number, not any pattern modifiers. Since the modifiers are learned as part of the basic wipepattern, they are recalled when the editor calls up the pattern number.

Prodigy also includes a unique memory feature, "Instant Replay." The operator initiates the process by learning an IR event: the system stores every operator action against a time line, including movements of the lever arm, auto transitions, and event memory recalls. When an IR event is recalled, it plays back against the same time line.

Another feature made possible through a switcher memory system is the programming of installation parameters and some sys-

tem alignment parameters. These include features such as the assignment of external key inputs to follow specific video inputs; the selection of operating modes such as NTSC or PAL operation; and the enabling or disabling of features. Also included in many systems are setup modes to help automate system timing or set alignment parameters, and self-diagnostics.

In conclusion, although the production switcher began as a simple switching/mixing device, modern innovations such as switcher memory and linear keying have transformed it into a full-fledged production/post-production control device. **BM/E**

Author's note: The author wishes to thank David Wood of The Grass Valley Group and Robert Bachus of ProTech Designs for technical assistance in preparing this article.

About the author:
Craig Birkmaier is the president of Professional Products & Promotions, Gainesville, FL. His company was instrumental in the design of the Videotek Prodigy switcher.

For more information on products and companies mentioned in this story, please use the Reader Service Card:

Abekas (T-8)	270
Ampex (Vista)	271
BTS (RME)	272
CDL (Strata Seven)	273
Crosspoint Latch (8200 Excalibur)	274
Echo Lab (SE/3)	275
For-A	276
Grass Valley Group (1680, 100, 200, 300, Kadenza)	277
Intergroup (9600)	278
Ross (416)	279
Shintron	280
Sony (SEG 2550)	281
Videotek (Prodigy)	282

Its features are that sounds good.

Sony is pleased to announce a merger. Analog recorders that combine the advanced features you need with the quality sonics you crave: the remarkable APR-5000 series.

Whether you need a recorder with a genius for post-production or one for high-quality studio mastering, there's an APR-5000 that fits.

Their 16-bit microprocessor controlled transports handle tape smartly, yet gently. And "intelligent" head assemblies make changing head formats a snap.

And when it comes to sound quality, transformerless design and 400 kHz bias enhance high-end performance. While optional "wide profile" heads create extended low frequency response at 30 ips.

So, if you've been waiting for a precision analog recorder that finally breaks the sound barrier, don't wait. Contact your Sony Professional Audio representative. Or call Sony at 800-635-SONY. SONY®

Professional Audio

Circle 135 on Reader Service Card Page 75

n't the only thing

Touchscreen control for The Post Group's effects routing system was designed and programmed entirely in-house.

The Post Group's Menu for Routing Switcher Success

The Post Group's unique routing switcher needs called for unique engineering answers—but with some universal lessons.

By Eva J. Blinder

Behind the scenes at any post-production or graphics house is a world few clients ever see, or even know about. Beyond those gleaming consoles and vivid monitors, the true heart and guts of a facility lies in its distribution system. The glitz and glamour of graphics and effects is built on a foundation of wiring runs and routing systems. A huge collection of high-priced, high-powered effects and graphics devices is of little use if they can't be made accessible when and where they're needed.

Today, routing and distribution system manufacturers supply an enormous range of equipment, ranging from simple patching to extensive computer-controlled routers that can be customized to fit almost any need. Despite the excellent selection of commercial systems, however, the days of build-it-yourself routing systems are not over for those with special

needs. Designing a routing system from the ground up is not for everyone. But for those installations with requirements not met by commercial systems, the dedicated engineer can benefit from similar design tools and materials to tailor-make a topflight system.

At The Post Group, continued expansion of capabilities had overburdened the existing routing system, and engineering management decided to go all the way with a new system built and designed in-house. According to director of engineering Andy Delle, an in-house solution was necessary because of the facility's size and special needs.

Effects work

"Our main business here at The Post Group is effects work, and we have nine channels of ADO," Delle remarks. "Ampex provides a networking system for the ADO, but it only handles up to nine channels. Plus, we have 12 on-line edit bays. We have to have any combination of ADO available to any bay at any time. It's not uncommon for the configurations to change 10 times a day."

Like many facilities, The Post Group had originally handled its signal routing needs with standard patch panels. "That's when we had fewer ADOs," Delle says. "This is our second computerized routing system. The first, which I also designed, was built about three years ago and outgrown two years ago."

The new system, which went into operation at the beginning of this year after about a year of development work, is bigger and more flexible than the one it replaced. It controls the distribution of signals from all The Post Group's digital effects equipment, as well as the Chyron character generators and Abekas digital disk recorders. Designed by Delle down to the circuit board level, the system was built in-house under his direction.

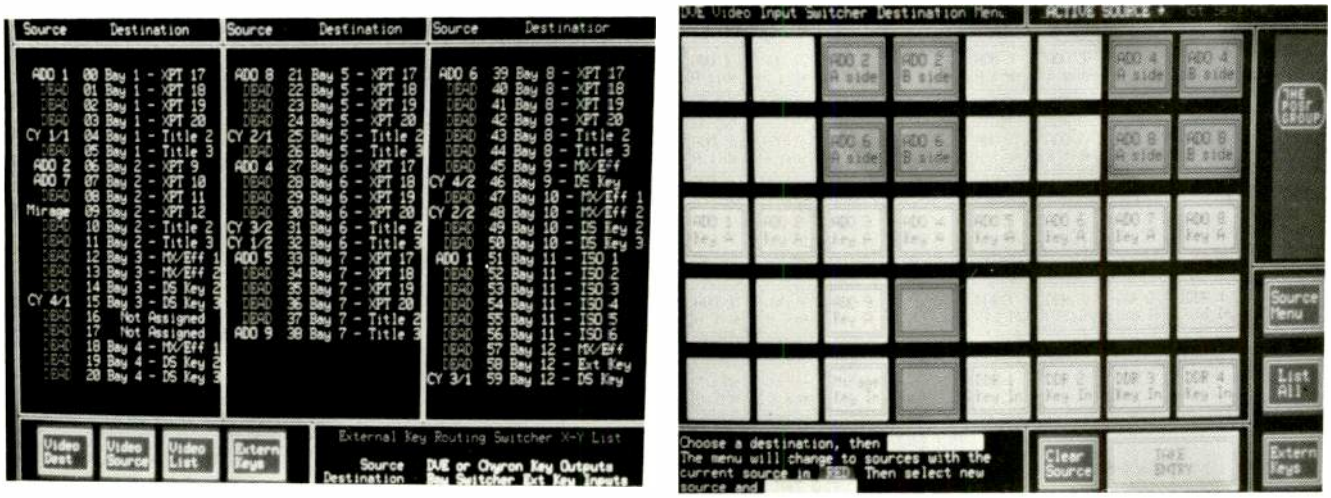
Delle comments, "Having built custom switching systems at other facilities, I've found that the main problem with building any type of routing switcher is that you're building the same thing many times over. This system required 32 circuit boards. The only practical way to do something that extensive is to use printed circuit boards and have them custom-made." Delle designed the circuits in-house using the IBM-compatible CAD package VersaCad. Once the circuits were designed and the artwork laid out, the boards themselves were manufactured at Trend Circuits in San Jose, CA.

Factory quality

"One thing I stress here is that I like things to be factory quality," he asserts. "We try to do everything with CAD systems; all our metal work is sent out to machine shops." That credo was applied as well to the software for the system, which was written in C and assembly language. "All software on the system is written from ground up," Delle adds. The software was developed on an IBM AT personal computer, then loaded over to the Standard bus computer the system runs on, where it was debugged and loaded onto PROMs. (For maximum speed and reliability, the system runs entirely on EPROMs.) Delle, who has formal training in FORTRAN and AGOL, wrote the software.

"The whole system is synchronized to the house sync reference and all switching takes place during vertical interval," he continues. "Things like that have to be written in assembly language due to the speed required."

Delle designed the system to deliver the flexibility demanded by The Post Group's complex setup. The ADO consists of three basic components: the signal system, which is rack-mounted in the machine room; the control panel processor (CPP), which includes a CRT screen and disk drive and is the main operator interface; and the keyboard. In most installations, the CPP is co-located with the keyboard, which connects via



According to CE Andy Delle, the staff has quickly mastered the touchscreen system.

a three-foot cable. At The Post Group, however, Delle decided that control would be maximized if the CPPs were located remotely from the keyboards, with only the keyboards themselves in the edit bays.

"Each edit bay has a keyboard and a standard black and white video monitor," Delle says. "The control panel processors are all in the central machine room."

The switching system consists of two levels. The first level routes video from the CPPs back to the edit bay, and is configured so that each edit bay has a choice of any of the nine CPPs. The second level sends up to four channels of ADO into each CPP.

Computer control

One of the system parameters Delle decided to change from the old switching system was the central computer control. The original system had been running on an Apple II personal computer.

"An application like this is really not the place for a PC," Delle comments. One of his first decisions was to base the new system on a Standard bus industrial-grade computer from Microsys, a type of computer widely used in the process control industry and noted for reliability. Five CPUs divide the processing tasks of the system.

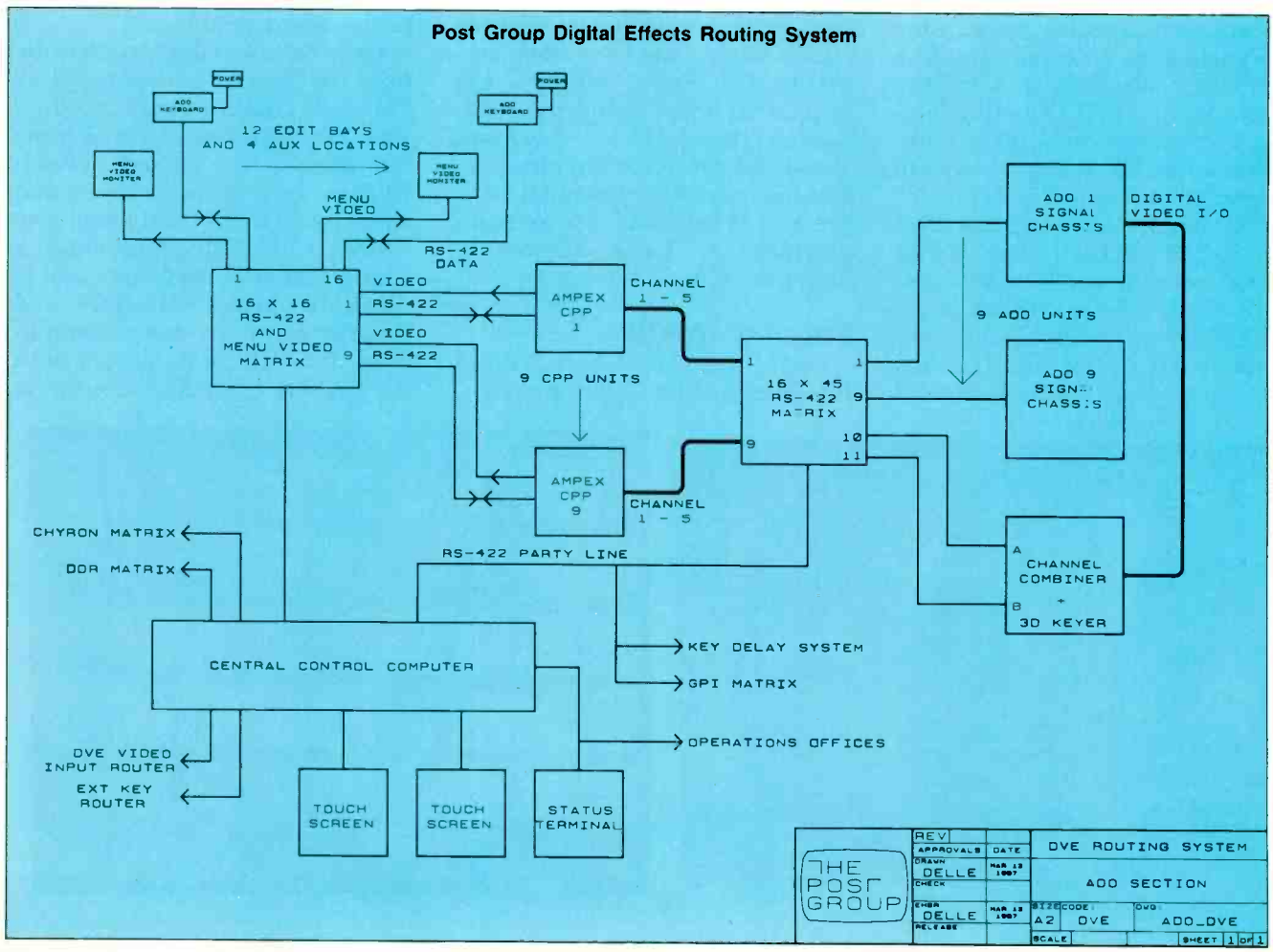
Besides the control system, the other major design decision concerned the operator interface.

"We wanted to get away from the keyboard, so we opted for a touchscreen," says Delle. "The nice thing about touchscreens is that you can have unlimited menus. In effect, you can have the same key do hundreds of different things." The two touchscreens for system control are located in the machine room, along with the computers and CPPs, mounted in vertical equipment racks at operator height. They support the IBM EGA display standard and are accessible to all the facility's tape operators. Delle calls the touchscreen interface "virtually foolproof."

"There aren't too many people who would have a need for a system this extensive," he adds. "It could all be built with custom-built patch bays, but with 50 or 60 employees it gets a little confusing."

System configuration

The system consists of three major elements. The first consists of several RS-422-based switching matrices that carry the main signal and communications information for the ADO-edit bay connec-



The Post Group's digital effects routing system.

tion. One matrix routes the ADO keyboards to the control panel processors. It also includes a utility-grade video switcher that routes the video page from the CPP to a monitor in the edit bay, so the ADO operators get the same feedback they would if the CPP were at hand. A similar matrix does exactly the same job for the facility's Chyron CGs, also with a utility-grade switcher to send the video pages.

"An application like this is really not the place for a PC,' " says Delle.

Another matrix switches five output channels (four ADO channels plus one Concentrator channel) from each of the nine CPPs. It is fed by nine four-channel ADOs and two channels of Ampex's Infinity package. It is this matrix that determines which ADO goes to which CPP, including specific channel designations. Another function of this matrix is to monitor all communication between the CPP and ADO units.

"A problem with ADO is that their network scheme requires you to acquire or disacquire an ADO. With our old system, we often ran into the problem of an ADO operator trying to acquire an ADO that was already acquired by another edit bay. We didn't have any control over that, and we had a lot of lockups," Delle explains. "The new system monitors all communication between the CPP and the ADO signal unit, so if an ADO is acquired the system will not switch it. Also, you can't be knocked off-line accidentally." Ampex cooperated with The Post Group (which is an ADO beta test site) by supplying the CPP protocols, which the system uses to interpret whether or not a specific ADO is acquired.

Additionally, this level links the ADO control system with the central computer, providing a means to interface with the control system facility-wide. For example, an operator at one ADO can download effects from another ADO.

The second portion of the system handles all video routing in and out of the edit bays. The Post Group's staff did not build this portion since appropriate, high-quality equipment was readily available from commercial manufacturers. Video inputs to all digital video effects devices, including the Quantel Mirage, are handled by a Dynair System 21 routing switcher with 50 inputs and 40 outputs, modified for direct interface to the touchscreen-controlled computer.

Another video routing switcher, a 20-in by 60-out American Data 900, handles all external key inputs, including the 20 external key inputs from the ADOs, the Mirage, and the 10 channels of Chyron. This switcher also "knows" all the delay paths throughout the facility and switches in delay signals as needed to keep everything zero timed.

"Each edit bay has a CMX 3400 editing system, and the switcher automatically routes the ADO to that CMX computer for GPI control," Delle says.

The third major portion of the system is another routing matrix that handles all the Abekas digital disk recorders. (At present, The Post Group has three A62s and is awaiting delivery on an A64.)

In addition to the three sections of the digital effects routing system, The Post Group has a Utah Scientific 100x100 routing switcher that handles all other routing tasks for the facility.

System capacity is impressive. According to Delle, the ADO keyboard matrix will handle up to 16 CPPs and 16 edit bays, giving the facility a comfortable margin for expansion. The Chyron keyboard matrix has the same capacity: 16 channels of Chyron and 16 edit

bays. The Abekas keyboard matrix will handle up to eight DDRs and 16 edit bays, while the CPP matrix will handle up to nine Ampex CPPs, each with five channels, and up to 16 channels of ADO.

For the cabling itself, Delle's staff used a Belden 8723-equivalent computer cable from Inmac, with Belden 9231-equivalent cables from another maker for the line video wiring. Each keyboard has its own co-located power supply, so the matrixes are concerned only with data, not with power.

Sharing the wealth

With the effects routing system in place, Delle is already using some of the same techniques for other jobs. For example, The Post Group recently built a dubbing facility that used a similar touchscreen controller for tape machine control. The touchscreens for both systems are Sony 1302 computer monitors with touch-sensitive membranes applied by Personal Touch, a San Jose company. All software was written by The Post Group. The screen in the dub room has been on-line for five months with no problems, Delle says.

The days of build-it-yourself routing systems are not over.

"I haven't really tallied up the cost of the system yet," he adds. "I'm not sure I want to, either." The expense of the system, however, has already paid off in increased utility of The Post Group's equipment complement. Their solution is not for every facility, of course. But it exemplifies the kind of acheivements that are possible with quality, creative engineering expertise. **BM/E**

Resistor Color Code System

By Ronald F. Balonis

From the feedback we been recieving on the past few PCs in Engineering columns, it is a fact: PCs are almost everywhere performing the tasks in broadcast engineering, at home and at work, of a very smart engineering assistant.

This month's program, RES.BAS, puts the Resistor Color Code Systems in your PC, at your finger tips.

The color code system

The color code system of electrical component identification came about because it's actually the best and most permanent way to label small components by function. Due to the sizes, shape, or composition of small electronic components, it's not always practical to print a numerical value or identification code on the resistor. The stripes of color on electrical components, therefore, hold a great deal of information.

Although, it's not an absolute necessity to know the basic color code system by heart, it does make debugging equipment at the component level a lot easier. And, it's more efficient than having to refer to a chart, or even to a computer for that matter.

But even with knowing that, you still may need to refer to a chart because of variations in the codes used on different components. Once upon a time the kinds of resistors were few and the code then was rather simple and uncomplicated. You could remember all of it. But, now there are many kinds of resistors: carbon-composition, carbon film, metal-film, and wirewound. And there are variations to remember. That's what makes it a useful engineering task for a PC. RES.BAS is specifically for the resistor color codes.

Markings on the components, too, are fairly common, the differences being that the color markings are either bands, dots, or a combination of each and that they must be read in a particular order or sequence. RES.BAS recognizes the following color code systems: Color Band System—4 bands [1], 5 bands [2] and 4 bands, and body [3]; Dot-Band System—[4]; Miniature Resistor Code—[5]; Dash Band System—[6]; Body Dot System—[7]; Body-end-dot System—[8]; and, Body-End Band System—[9]. Those choices should cover most all resistors found in broadcast equipment.

```
                    ------------------------------
                ---| Resistor Color Code Systems  |---
                    ------------------------------

< 1 > =     [Band][Band][Band][Band]
< 2 > = [Band][Band][Band][Band][Band]
< 3 > = [Band][Band][Band][Band][Body]
< 4 > =   [Band][Dot][Dot][Dot][Band]
< 5 > =       [Band][Dot][Band]
< 6 > =      [Band] [Dash][Dash]
< 7 > =       [Dot] [Dot] [Dot]
< 8 > =     [End][Body][Dot][End]
< 9 > =     [End][Body][Band][End]
< 10 > =     QUIT

Select A Color Code System :? 3




                    ------------------------------
                ---| Resistor Color Code Systems  |---
                    ------------------------------

                    ------------------------------
                ---|[Band][Band][Band][Band][Body]|---
                    ------------------------------


Enter the  5  colors, reading LEFT to RIGHT.
Colors are: BLK/BRN/RED/ORG/YEL/GRN/BLU/VIO/GRY/WHT/GLD/SIL/NON/

COLOR # 1  <XXX> :? BRN
COLOR # 2  <XXX> :? BLK
COLOR # 3  <XXX> :? RED
COLOR # 4  <XXX> :? RED
COLOR # 5  <XXX> :? BLU

Resistance (ohms) =  1000
Tolerance  (+/-%) =  2
Failure Rate/1khr =  DNA   <ENTER>?
```

Figure 1: *demonstration screen for RES.BAS*

Using the program

RES.BAS signs on the computer with a listing display of the resistor codes it recognizes and prompts for the selection number. Select the one that looks like (or is closest to) the resistor you have. The computer then displays its second screen, showing the selected resistor code system and the three letter color words it accepts. At the prompt, enter the colors one by one (use upper case) reading the resistor from left to right.

If the resistor code system and the colors are valid, it displays the resistor's value. If not, it displays **Error**, which means that one of the colors was invalid for its position in the code sequence. Either

```
0   'RES.BAS ----Resistor Code systems---
10 'By Ronald F. Balonis  2/6/88
15 '
20 DIM TBLE$(13,4),CODE$(10,1),BND(5)
25 I=0:II=0:J=0:K=0:CODE$="":KOLR$="":RESTORE
30 '---------------RESISTOR CODE TABLE
31 '  COLOR 1/2 M  T  F  COLOR 1/2 M  T  F
32 DATA BLK, 0, 0, X, X,   BRN, 1, 1, 1,1.0
33 DATA RED, 2, 2, 2,.1,   ORG, 3, 3, 3,.01
34 DATA YEL, 4, 4, 4,.001, GRN, 5, 5, X, X
35 DATA BLU, 6, 6, X, X,   VIO, 7, 7, X, X
36 DATA GRY, 8, 8, X, X,   WHT, 9, 9, X, X
37 DATA GLD,-9,-1, 5, X,   SIL,-9,-2,10, X
38 DATA NON,-9,-2,20, X
40 FOR I=1 TO 13:'--LOAD THE CODE TABLE
41  READ A$: KOLR$=KOLR$+A$+"/"
42   FOR II=1 TO 4
43    READ B$:IF B$="X" THEN B$="**Error**"
44    TBLE$(I,II)=B$
45   NEXT II
46 NEXT I
49 '
50 DATA " Resistor Color Code Systems  "
51 DATA "   [Band][Band][Band][Band]   ",12MT
52 DATA "[Band][Band][Band][Band][Band]",12MTF
53 DATA "[Band][Band][Band][Band][Body]",12MTF
54 DATA "  [Band][Dot][Dot][Dot][Band] ",21MXT
55 DATA "       [Band][Dot][Band]      ",12M
56 DATA "      [Band] [Dash]|Dash]     ",12M
57 DATA "       [Dot] [Dot] |Dot]      ",12M
58 DATA "     [End][Body][Dot][End]    ",T1M2
59 DATA "     [End][Body][Band][End]   ",T1M2
60 DATA "     QUIT                     ",0000
70 '
100 CLS:I=0:'---SIGN ON THE PROGRAM AND
105 READ CODE$(0,0):GOSUB 500:'--PRINT A RESISTOR
110 FOR I=1 TO 10:'---SHOW CODE SYSTEMS
115  READ CODE$(I,0),CODE$(I,1)
120  PRINT"<";I;"> = ";CODE$(I,0)
125 NEXT I:PRINT
150 '
200 PRINT"Select A Color Code System :";
205  INPUT J: IF J<1 OR J >10 THEN RUN
210   IF J=10 THEN STOP
220 '
250 CLS:I=0:GOSUB 500:'---MAKE RESISTOR
260 I=J:GOSUB 500:PRINT:II=LEN(CODE$(J,1))
270 '
300 PRINT"Enter the ";II;" colors, reading LEFT to RIGHT."
305 PRINT"Colors are: ";KOLR$:PRINT
350 FOR I=1 TO II
355  BEEP:BND$=""
360   PRINT "COLOR #";I;" <XXX> :";:INPUT BND$
365   IF BND$="" THEN RUN
370    K=INSTR(KOLR$,BND$+"/"):IF K=0 THEN LOCATE 12+I,1:GOTO 355
375    BND(I)=INT(K/4)+1
380 NEXT I:PRINT
390 '
400 T=3:F=4:'------COMPUTE THE RESISTOR
405 R=VAL(TBLE$(BND(INSTR(CODE$(J,1),"1")),1))*10
410 R=R+VAL(TBLE$(BND(INSTR(CODE$(J,1),"2")),1))
415 R=R*10^VAL(TBLE$(BND(INSTR(CODE$(J,1),"M")),2))
420 PRINT "Resistance (ohms) = ";
425 IF R<0 THEN PRINT  "**ERROR**" ELSE PRINT R
430 '
435  K=INSTR(CODE$(J,1),"T")
440  IF K>0 THEN T$=TBLE$(BND(K),T) ELSE T$="20"
445   PRINT "Tolerance  (+/-%) =  ";T$
450 '
455  K=INSTR(CODE$(SEL,1),"F")
460  IF K>0 THEN F$=TBLE$(BND(K),F) ELSE F$="DNA"
465   PRINT "Failure Rate/1khr =  ";F$;
470   PRINT "   <ENTER>";:INPUT J:RUN:'-TO RESTART
490 '
500 '------------------PRINT A RESISTOR
505 PRINT TAB(20) "     ------------------------------"
510 PRINT TAB(20) " ---|";CODE$(I,0);"|---"
515 PRINT TAB(20) "     ------------------------------"
520 PRINT:RETURN:'-------END OF PROGRAM
```

Figure 2: *RES.BAS, a resistor color code translation program.*

a wrong color code system was selected, a wrong color read/entered, or maybe the componenet is not a resistor. At this point, Enter restarts the program at the sign-on screen (see Figure 1). The demo uses one of the newer type of "flameproof" resistors: 5 colors—4 bands and body. It's code system #3 in RES.BAS. You should step thru the demo to proof out your copy of the program.

The program starts by dimensioning the arrays and allocating the variables. The resistor code table is in lines 31 to 37 and the color codes system's in lines 50-59, as Data statements (see Figure 2). Lines 40 to 46 load the Table array, and as the sign-on screen displays, the Code array gets loaded. Lines 100 to 210 sign-on and prompt for a color code system, 1 to 9 or 10 to QUIT. Lines 200 to 380 show the resistor selected, the colors, and prompts for the colors. An Enter at any of them restarts the program. Finally lines 400 to 470 calculate the resistor by using the code system sequence to read the color code table and displays the value.

General programming tips

RES.BAS was written to run in GWBASIC for an IBM compatible computer. Basic computer languages are all similar, but not exactly the same. Slight differences in the way they interpret things can require some modification for a program to work on another 'Basic' or another kind of computer.

Incompatibility problems can show up as almost any kind of error. From just syntax to erroneous calculations or peculiar operation. It's always best to start from a known point with a program. Regardless of the Basic or the computer, it's always best to key a program listing in so that it's identical character for character to the printed version. Then make the changes according to the errors the computer finds.

About the author:
Ronald Balonis is chief engineer at WILK-AM, Wilkes-Barre, PA.

The Dangers of RF

By Harry Cole, FCC Counsel

In the good old days, it appears that not much thought was given to the biological effects of nonionizing radio frequency radiation. Some tales, perhaps apocryphal, have it that an experimental 500 kilowatt AM transmitter once caused the lights in a chicken coop to stay on even when switched off and also caused cows in a nearby pasture to glow. In general, however, neither the government nor the public at large has historically expressed too much worry about what long-term exposure to radio frequency radiation might do to people.

More recently, the effects of such long-term exposure have been the subject of studies which apparently suggest that there may be some correlation between nonionizing radiation and a variety of physical disorders. The precise nature of the problem (if problem there be) is still far from clear, although it may have something to do with the interaction of radiation with the electrical system of human cells. The radiation may impair the workings of the biological electrical mechanisms in a way which promotes disease or damages the cells themselves.

Increasing concern about the possibly hazardous effects of radiation in turn led to an FCC rulemaking proceeding which, some three years ago, resulted in the requirement that anyone applying for virtually any new broadcast authorization, or renewal of any outstanding license, would have to certify that the proposed operation would be consistent with the "Radio Frequency Protection Guides" adopted in 1982 by the American National Standards Institute (ANSI). The FCC got involved in this area as a result of the National Environmental Policy Act (NEPA), which requires that federal agencies take appropriate steps in their regulatory activities to minimize any adverse environmental effects which might arise from those activities. To the extent that the licensing of a powerful RF generator in a populated area might have some such effect, the FCC is obligated under the NEPA to maintain safe levels of radiation exposure.

For the first time, many engineers will have to familiarize themselves with the relevant standards.

Of course, nonionizing radiation is present in a wide variety of nonbroadcast forms—consider, for example, a cordless or cellular telephone, a cathode ray tube in a computer, a satellite uplink antenna farm, or even high-voltage power lines. However, by virtue of their relatively high power, broadcast stations (including some auxiliary operations) do tend to stick out as a significant (and possibly, but not necessarily, dangerous) source of radiation affecting not only technical workers such as staff engineers who have to service the transmitter, but also the public at large. Accordingly, the Commission singled out broadcasting, along with several other high-power services, for obvious reasons.

Little impact thus far

The requirement that broadcast operations comply with ANSI standards has thus far not had much impact on broadcasters for a couple of reasons. First, ANSI standards are not particularly onerous. The FCC indicated that it expects that "the vast majority of license renewal and facility modification applications will comply with the ANSI standard." Second, most existing broadcast licensees have probably not had occasion to file many, if any, applications in the last three years which would have triggered the certification requirement. The fun, however, may only just be beginning.

The types of stations which are most likely to cause some kind of problem are those whose antennas are: (a) located in or very near to populated area; (b) relatively low (*i.e.*, close to the ground or, in the case of building-mounted antennas, close to the nearest floor on which people live or work); and (c) somewhat older. One expert has indicated that, for the most part, AM stations should have little or no problem meeting the standard. FM and TV stations, however, are more likely to run some risk, depending on their facilities.

In particular, because of the attenuation characteristics of radiation, an antenna mounted 600 feet or more above ground level is much more likely to comply with ANSI standards than is an antenna mounted only 200 feet above ground. While many stations certainly enjoy antenna heights in excess of 300 feet, there are probably a fair number of stations with antennas which are not all that high and which happen to be located, either by original design or by virtue of a population shifts over a period of time, right in the middle of population center. Think, for example, of how many stations have their antennas on the top of what is (or once was) the tallest building in the center of town, or in the middle of a field which has since been subdivided for condominium devel-

opment, or in the middle of a college campus.

Also, while newer antennas are being designed which disperse the radiation laterally (thus creating a kind of umbrella effect for the area immediately surrounding the antenna site), how many stations are there with 10-year old antennas?

The development of antennas specifically designed to minimize downward radiation is a fairly recent occurrence. In some older antennas the downward radiation characteristics tended to shoot radiation straight down, flooding the area in the vicinity of the base of the supporting structure.

Further complicating the question are tower structures holding multiple antennas. While no single station may be in violation of the standards, it is at least conceivable that the combined effect of all the antennas might, in some instances, cause a violation. If this comes to light at renewal time, the FCC would hold all the licensees jointly responsible for resolving any RF exposure problems.

For the most part, AM stations should have little or no problem meeting the standard. FMand TV stations, however, are more likely to run some risk, depending on their facilities.

Renewal applications

The question of compliance with the ANSI standards is likely to be a particular source of concern, if not consternation, in the immediate future because routine broadcast renewal applications are now being filed for the first time since the FCC adopted the ANSI standards in 1985. As indicated above, certificates of compliance with those standards are required to be filed with renewal applications, even though the main renewal application form itself has now been reduced to five "yes/no" questions. Thus, perhaps for the first time, many engineers will have to familiarize themselves with the relevant standards and will have to determine whether, in fact, their facilities are in compliance. While it has been estimated that the ANSI standards will affect no more than 20 per cent of the broadcast industry, 100 per cent of the industry will have to take the steps neces-

sary to make the required certification. Because of that, station owners comfortably nestled in the friendly warmth of deregulation may find themselves jolted somewhat by the news that maybe they will have to replace significant elements of their transmission system.

And, at the risk of being alarmist, we note that this might only be the beginning. When it adopted the ANSI standards three years ago, the Commission recognized that new, more restrictive exposure guidelines either had already been adopted or were being developed by other groups, such as the International Radiation Protection Association, the National Council on Radiation Protection and Measurements, the American Conference of Governmental Industrial Hygienists, the National Institute for Occupational Safety and Health, and the Environmental Protection Agency. Appropriately cautious, the FCC chose to adopt only the ANSI standards at that time; however, it clearly held open the possibility that it might "revisit" the issue in the future.

On the bright side, though, is the fact that the existence of these standards may provide some measure of comfort against private lawsuits which might be filed against a station by individuals who, for example, believe that their health has been adversely affected by RF exposure. While the vagueries of civil litigation can never be predicted with any certainty, the fact that a licensee is operating within established Federal guidelines could prove to be a persuasive argument in defending against such a suit. Thus, far from being a nuisance, the FCC's guidelines could provide a shield of sorts in some circumstances.

If you have questions about the ANSI standards or how to determine whether or not your station is in compliance with them, you should contact your consulting engineer. While such a determination has to be made prior to the submission of your next renewal application, you might be well-advised to get started on the project sooner rather than later, just in case you encounter any unforeseen problems.

RF (Real Facts)

Here are some additional notes on recent FCC activities.

- An FM station in Southern California has been ordered to forfeit $4,100 for: failing to make daily tower light observations for three weeks while its automatic light indicator wasn't working; failing to conduct weekly EBS transmission tests for more than three months; making 22 incorrect log entries over a one-month period; increasing its antenna height without authorization; and failing to maintain station logs for a four-month period.
- The FCC has, on its own motion, proposed to designate a standard computer algorithm for use in computerized propagation calculations in the FM and TV services. **BM/E**

Image Video Has New Routing Switcher

New from Image Video, Ltd., is the Model 9520 video routing switcher. The unit is a full-featured 20 X 10 switcher with advanced integrated circuitry and optional remote, panel, or RS-232/422 control designed to fit into one rack unit. The switcher has been designed for mobile, editing suite, post-production, and any other "tight space" applications.

Circle #201 on Reader Service Card p. 75

New CRTs for Rank Brimar

Three new telecine cathode ray tubes are now available from Rank Brimar. Designed for film-to-tape transfer applications including negative film scanning, these new models compliment the company's existing 18 cm tubes. All are designed for use with the Rank Cintel MkIII machine. One is capable of RC Scan Track techniques, and the other is designed for Digiscan.

Circle #202 on Reader Service Card p. 75

JVC Intros 3-Chip Series

ENG professionals will be glad to see JVC Professional Products' new line of solid-state cameras for S-VHS and MII. The KY-15U has the size, weight, and versatility advantages that one would expect from the new chip cameras. It can also be fashioned into a camcorder using JVC's BR-S410U recorder. With an optional adapter, it can handle MII portable. Output is available in component, S-VHS, composite, and RGB. The line also boast a compliment of standards and 500-line resolution with low S/N ratio.

Circle #203 on Reader Service Card p. 75

API Has New Equalizer

Although API continues to manufacture the modular line, the need for outboard units allowing up to four devices in a one 3/4-inch space is now addressed with the 5502 equalizer. The new 5502 has the added features of four fre-

quency bands and 14 new frequency points. The self-powered device also has a version for disc mastering in 1 dB steps and .1 dB of accuracy. Fitting into Sony consoles, the new model has been designed for easy upgrading.
Circle #204 on Reader Service Card p. 75

Fluke Oscilloscope

The Philips PM 3350, a high-speed digital storage oscilloscope has been introduced by John Fluke Mfg. It features a maximum sampling speed of 100 Msamples/s, maintained on dual channels simultaneously. The digitizing speed is quite impressive for a unit running under $4000. In digital mode, with triggering up to 100 MHz, the oscilloscope has a cursor able to take a wide range of measurements for traces on screen. Easy input and output are among the strong points of the new unit.
Circle #205 on Reader Service Card p. 75

Otari Announces New Recorders

Bringing ¼-inch ATRs into the present, Otari has come out with a line of less expensive, more compact models. The MX-55 series has both full-track and two-track and NAB and DIN stereo. There is a desktop version without time code as well. With the standards and accessories the recorders give the audio professional all the tools he or she needs. The first machine, the MX-55-N, will be released in late spring with a list price of $3695.
Circle #206 on Reader Service Card p. 75

TDK Soups up S-VHS Tape

To go along with the new Super VHS-C camcorders that are currently coming on line and to generally support the new format, TDK has developed the Super VHS XP videocassette. The format may be thought of as primarily a consumer enterprise, but the camcorders are opening up new doors.
Circle #207 on Reader Service Card p. 75

New Avcom Satellite Audio Receiver

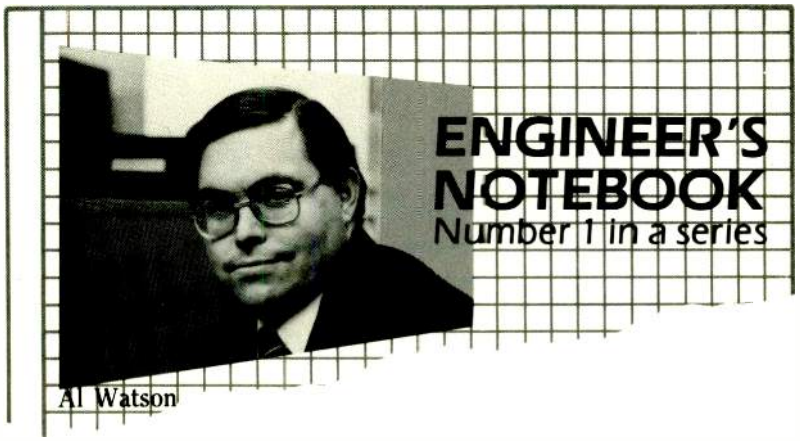
AVCOM of Virginia has improved its SCS-200 tunable satellite audio receiver. Intended for use by news, communications, and religious networks, the receiver uses audio subcarriers on a video transponder for satellite transmissions to radio broadcasters, supermarket networks, data services, and so on. The unit is a complete microwave downconverter, frequency agile SCS demodulator, and audio processor. It is fully compatible with United Video's Satellite Communications System. Continuous tuning over an entire transponder is optional.
Circle #208 on Reader Service Card p. 75

Hedco Has New Switchers

The TWS100 video switcher and the TWS200 audio switcher are suited for smaller switching applications. The 12 X 1 piece features video only or stereo audio only in addition to audio-follow-video formats. One front panel, which can be detached or looped through, controls the separate video and audio selections. This allows the user to customize the unit according to the necessary options. It is also suitable for HDTV.
Circle #209 on Reader Service Card p. 75

Harrison Systems Intros New Console Generation

With the Harrison 7 series in wide use, the manufacturer has introduced a new general production mixing deck, the PRO-790. Standard features include three mainframe sizes ranging from 12 to 28 inputs, two main stereo outputs, two separately-derived main mono outputs, two auxiliary sends with trims, Harrison's PFL solo cueing, and Penney & Giles 3000-series 104 mm linear faders. With the new fader package any module can be programmed to reset the count timing, plus the ability to mute indicated speakers is



N/DYM™ Technology Comes to Broadcast Microphones

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

Those familiar with the benefits enjoyed by musicians through the new neodymium-magnet microphones have no doubt predicted that the new technology would soon be available in broadcast microphones. And now, with the advent of the Electro-Voice RE45N/D hand-held shotgun microphone, the prediction has come true.

The advantages N/DYM™ technology brings to broadcasting are significant. Above all, it gives us a microphone with the high output previously available only from condenser mics—but without the problems of dead batteries, noises caused by poor ground connections in phantom-powering, humidity damage, static electricity, and poor rf rejection.

The Alnico magnets used in most dynamic mics yield a sensitivity of 6 dB less than would be possible if the steel parts of the magnetic structure could be completely saturated with the field. Increasing the Alnico magnet size does not work since the added size interferes with the acoustic design of the mic. Neodymium magnets, however, are so powerful that the magnet can be far smaller and still provide the "lost" 6 dB of sensitivity.

N/DYM Technology extends far beyond a mere substitution of magnetic material. To maximize the new opportunities, Electro-Voice engineers found that the ideal neodymium magnet shape is one with a thin, wafer-like configuration.

This permitted using a voice coil and attached dome of far larger diameter while reducing the surround—yielding important added advantages for broadcast engineers: a smoother, more evenly contoured pickup pattern with extended high- and low-frequency response and better rejection of unwanted noise from the sides.

For more information, please write to us for the specification sheet and brochure on the RE45N/D—the broadcast industry's first N/DYM dynamic shotgun microphone.

600 Cecil Street • Buchanan, MI 49107 • 616/695-6831
In Canada:
Electro-Voice Div., Gulton Industries (Canada) Ltd.
P.O. Box 520 • Gananoque, Ont. K7G2V1 • 613/382-2141

Electro-Voice®
a MARK IV company

BROADCAST/PRODUCTION MICROPHONES
Quality-made in the U.S.A. since 1927

Advertisement

Circle 146 on Reader Service Card p. 75

by CMOS switching.
Circle #210 on Reader Service Card p. 75

Pomona Test Probe with Extension

A new adjustable test probe capable of extending its tip to three inches beyond the end of the probe barrel has been introduced by Pamona Electronics. This makes remotely-located test points accessible without the fear shorting the adjacent components. The stainless steel tip can penetrate containments or conformal coatings and can be locked at the desired length. The accessory is offered as a 48-inch patch cord in seven models with different end connectors.
Circle #211 on Reader Service Card p. 75

Ampex Has Low-Print Audio Tape

The magnetic tape division of Ampex has announced the introduction of Ampex 478, a new low-print audio mastering tape. It incorporates a new design for radio broadcast; film and video post-production houses; and recording houses where low-print mixdown is desired. The new formula reduces print through the creation of "echoes" due to the unintentional transfer of the recording to other layers of the tape during storage). A new high-speed backcoating process provides backing needed for flangeless use.*Circle #212 on Reader Service Card p. 75*

Advertisers Index

Manufacturer	Page No.	Circle No.
Alpha Audio	82	132
Audio Technica, U.S.	21	109
Avcom of Virginia	95	140
Belar Electronics	98	144
Canon USA, Inc.	58-59	128
Champion Motor Coach, Inc.	95	141
Comark Communications	13	106
Continental Electronics	93	139
Datatek Corp.	55	126
Digital Services Corp.	72	131
Dubner Computer Systems, Inc.	8	104
Electro-voice, Inc.	99	146
Express Tower Co.	89	136
Faroudja Laboratories	25	113
Fidelipac Corp.	3	101
Harris Broadcast Group	23	111
Harrison Systems	28	115
Harris Video Systems	45	122
Ikegami Electronics	66-67	129
JVC Industries, Inc.	7	103
JVC Industries, Inc.	10-11	105
Leader Instruments	37	118, 119
Logitek Electronic Systems Corp.	100	147
Magni Systems, Inc.	57	127
MCL, Inc.	6	102
Nec America, Inc.	Cov. III	150
Orion Research, Inc.	31	116
Otari Corporation	92	138
Panasonic Broadcast Systems	48-49	124
Panasonic Industrial Co.	26-27	114
Periphex Inc.	101	149
Ross Video Ltd.	43	121
Shure Brothers	50	125
Sigma Electronics	22	110
Sony Broadcast Products, Inc.	2-3	
Sony Broadcast Products, Inc.	32-33	
Sony Pro Audio	24	112
Sony Pro Audio	84-85	135
Sony Pro Video	68	130
Specialty Vehicles, Inc.	100	148
Studer Revox America, Inc.	Cov. II	100
Telemetrics, Inc.	97	143
Television Equipment Associates, Inc.	82	133
Telex Communications	83	134
Telex Communications	90	137
Telex Communications	98	145
3M/Broadcast	14-15	
Varian TVT Ltd.	19	108
Varian Microwave Equipment Div.	41	120
Videotek	47	123
Vinton Equipment, Inc.	34	117
Ward-Beck Systems Ltd.	Cov. IV	
Yamashita Engineering Manufacture, Inc.	96	142

SALES OFFICES

295 Madison Avenue, New York, NY 10017 Telex: 64-4001

Eastern States
295 Madison Avenue
New York, New York 10017
212-685-5320
Telex: 64-4001
Michael Dahle
Gene Kinsella

Western States
21777 Ventura Blvd. Suite 237
Woodland Hills, CA 91364
(818) 888-5288
Jay B. Lewin
Robert D. McLean

Europe/United Kingdom
33A Station Road
North Harrow
Middlesex HA2 7SU England
(01) 427 9000
Telex: 21289
Ric Bessford

Japan/Far East
2-14-20, Minami-Aoyama,
Minato-Ku, Tokyo 107 Japan
(03) 405 5118
Telex: 2427388
Fax: (03) 401-5864
K. Yamamoto
Y. Yozaki

Business Briefs

An equipment order in "the region of $3 million" has been filed by **NBC** for delivery of 20 Cypher systems, several Paintboxes, Digital Library Systems (DLS), and Harry editing systems from **Quantel**. The new equipment will be used in conjunction with existing NBC Quantel equipment to provide graphic support for this summer's **Olympic Games in Seoul**, Korea. NBC's familiarity with both the Cypher and Harry systems was cited as an impetus for the purchase.

Western Union's **Westar** satellite system is being purchased by **Hughes Aircraft Co.** it was recently announced. The in-principle agreement, reached earlier this year, calls for the three Westar birds in orbit and a yet-to-be-launched satellite, along with all communications and tracking equipment, to be operated by the Hughes Communications wing of GM Hughes Electronics. FCC approval of the deal is pending.

Matsushita Electronics Corp. has announced its intention to open a wholly-owned subsidiary in the U.S. to manufacture and sell CRTs for color televisions and monitors. The new plant will be established in Troy, OH, with initial production centering on 29- and 33-inch CRTs. First-year production quota is set at 400,000 tubes; the plant should employ about 400 workers.

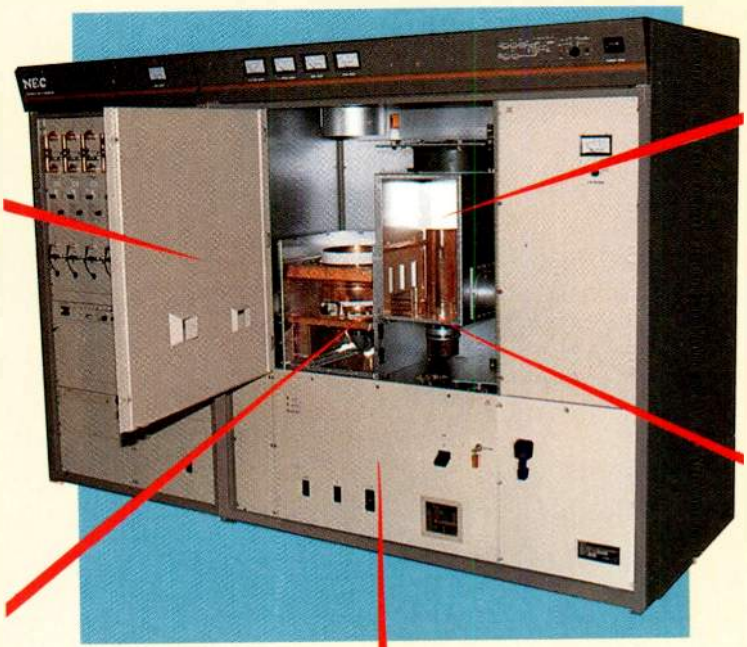
Group W station **WBZ-TV**, Boston, has just received four new **BTS LDK-6** cameras. According to engineering manager George St. Andre, the selection was based on performance quality and certain considerations involved in a group purchase since "three other Westinghouse stations had gone that route already." (for an in-depth view at group broadcasting, see this month's cover story. "*Group Engineering: Under Attack*," on page 38.)...**Fidelipac** has completed shipment, two weeks ahead of schedule, of 216 Dynamax CTR10 cart machines to the U.S. Navy Communications Electronics Command for use on shipboard information, training, and entertainment systems... **Lake Systems** has been selected by **PC Connections**, a well-known software mail-order house, to design, engineer, and construct a new video production center at its Newport, NH, headquarters.

The promotion list this month includes: Gary Tursby as president and COO of **Townsend Broadcast**...Lawrence R. Kaplan as VP of Tek's **Information Display Group**...Roy Varda is the new manager of network sales for **Panasonic Broadcast Systems Co.**

Post houses turn to component formats: Unreel Productions, Inc., Costa Mesa, CA, the first full-fledged component editing facility in Orange County, has logged some recent equipment acquisitions. A full complement of **Sony Betacam** BVW-10, -15, and -40 VTRs and a **Grass Valley** 100 component switcher round out the equipment list at Unreel. "We feel that component is the way of the future," says Don Hoffman, Unreel's VP. "You maintain incredible image integrity throughout the entire process." Other equipment in Unreel's edit bays include **Abekas** recorders, **DVE** effects, and a **Dubner** graphics system, all configured for component.

Framerunner, a production house in New York, also boasts a new all-component suite, based around the **Sony BVW-75 Betacam SP** recorder. According to president Tom Emmenegger, "We researched the technical papers...and the conclusion seemed obvious: digital video will eventually become the standard, and between here and there is analog component."...Betacam SP seems to be the format of choice at **Pacific Video Resources (PVR)'s** newest total component suite as well. A top-of-the-line **CMX 3600** computerized videotape editing system, enhanced with a new CMX component preview switcher, tops off PVR's equipment list.

WE'RE AS GOOD AS THEIR WORD.



"The NEC transmitter has superior reliability and stability. Breakdown is not a problem."
Bob Morgan, Chief Engineer
WCTV-TV
Tallahassee, FL

"It's got reliability and stability. There've simply been 'no bugs' with the transmitter since we started. We're very satisfied, very happy."
Lacy Worrel, Chief Engineer
WMAZ-TV
Macon, GA

"We were looking for modern technology, and we liked NEC's approach. We have had no problems at all with our transmitter. Power consumption has gone way down from our older transmitter. The transmitter's very stable."
Don Luchsinger, Chief Engineer
KVOS-TV
Bellingham, WA

"Its reliability is phenomenal. There are no moving parts in the cavity, and breakdown has not been a problem. This transmitter's been perfect. We've been amazed."
Jim Lockerd, Chief Engineer
KSWO-TV
Lawton, OK

"We've had very, very, very few breakdowns with this system. It's been almost trouble-free. It's that reliable."
David Williams, Chief Engineer
WTVM-TV
Columbus, GA

If you want a clear picture of just how good an NEC VHF transmitter is, take a look at what people who use them are saying. They're talking about reliability. Stability. Excellence in design. Low cost operation. And there's no comparison when it comes to maintenance. They require very little attention.

They're also saying that NEC people are always there when needed. With suggestions. Ideas. Answers to questions. Replacement parts. Or whatever it takes to keep a transmitter running smoothly.

What they're telling us is what we'd like to tell you. If you need a transmitter that's built to be reliable year after year, that's known for stability, and that's not power hungry, take a look at what NEC is offering. Better yet, take a user's word for it.

Here's why there's no comparison:
- 100% solid state to 10 kW; one tube to 50 kW
- Power ranges from 1 to 60 kW (parallel running) Band I, to 100 kW (parallel running) Band III
- 30% reduction in exciter parts for 50% increase in MTBF (to 30,000 hours)
- Ready for stereo without modification

PCU-900 Series UHF Transmitters also available. Power sizes 10 kW to 240 kW (parallel running).

- Regulated power supplies throughout transmitter (including filament of final tube)
- No finger stock in cavity
- Only two controls on cavity
- Over 20,000 hours on final tube
- All solid state aural and visual drivers

Emergency parts are available 24 hours a day, 365 days a year in Wood Dale, IL, 30 minutes from O'Hare Airport. Simply call 1-800-323-6656.

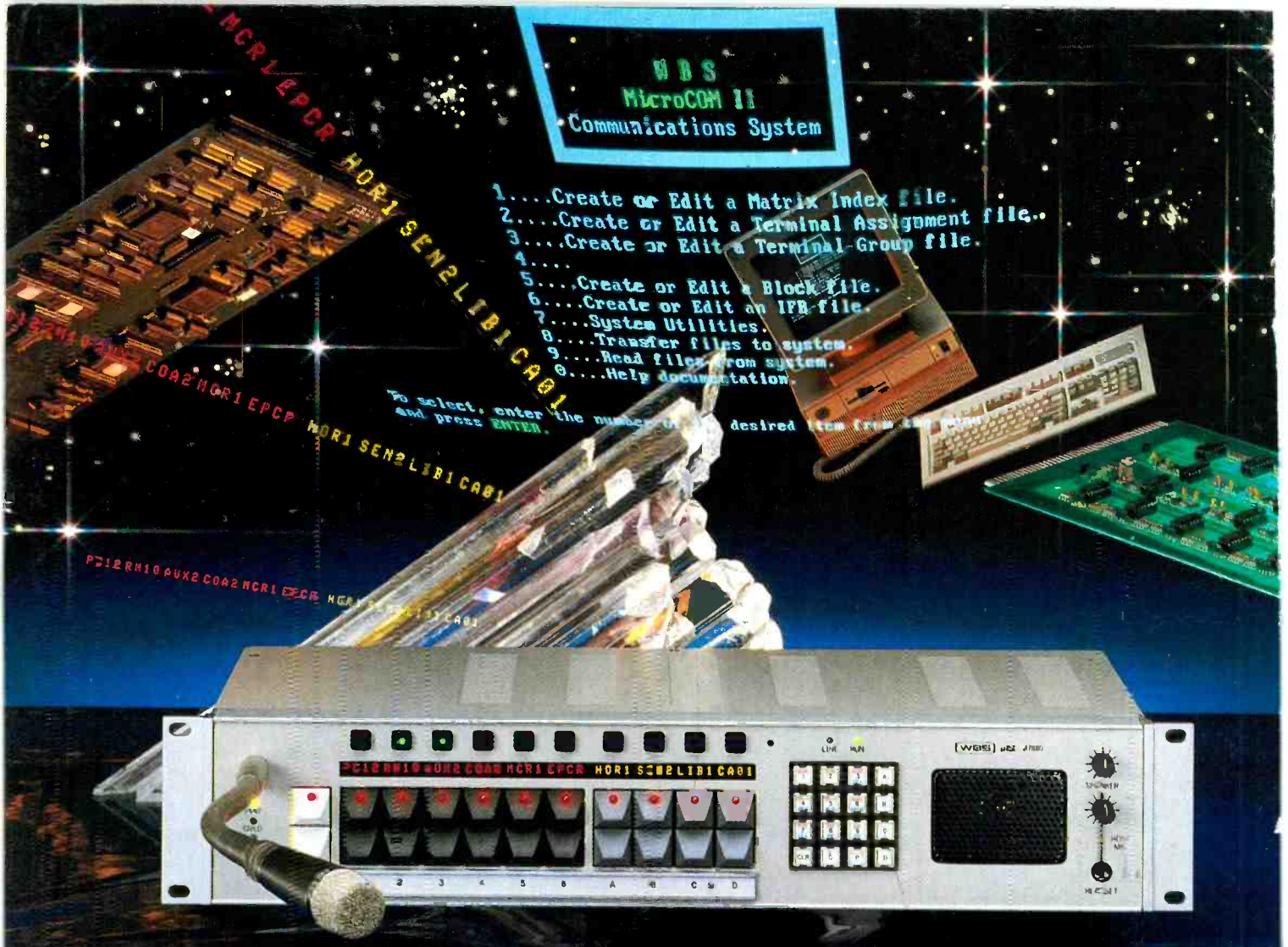
For more information about NEC transmitters, contact NEC America, Inc., Broadcast Equipment Division, 1255 Michael Drive, Wood Dale, IL 60191. Phone: 312/860-7600.

NEC

C&C
Computers and Communications

650-106

Circle 150 on Reader Service Card Page 75



MicroCOM II ... Clearly the industry's most advanced Communications System ...

With its superior design and advanced PC based software, MicroCOM II moves communications technology a whole generation forward, outperforming all the rest by a significant margin.

While some of its qualities are readily apparent, the full scope of its capabilities are best appreciated in actual operation . . .

* Dot matrix alpha-numeric multi-colored readouts identify functions
* All keys are programmable from both the PC and the terminals
* Unique tactile switches enhance simple rapid operation
* Reconfigurating does not interrupt system communications
* Menu-driven program is simple to operate
* On-line system operation is totally independent of the computer
* Ultra high speed microcontrollers provide faster response
* Matrix is expandable to 960 x 960 and beyond
* Self-initializing system operates without power backups.

But this is just the tip of the iceberg . . . talk to us . . . we'll be glad to reveal the additional power of features still beneath the surface!

WBS

WARD-BECK SYSTEMS

Ward-Beck Systems Ltd., 841 Progress Avenue, Scarborough, Ontario, Canada M1H 2X4.
Tel (416) 438-6550. Fax: (416) 438-3865. Tlx: 065-25399.