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BME

BROADCAST MANAGEMENT/ENGINEERING

ABC BUILDS UP FOR OLYMPIC COVERAGE

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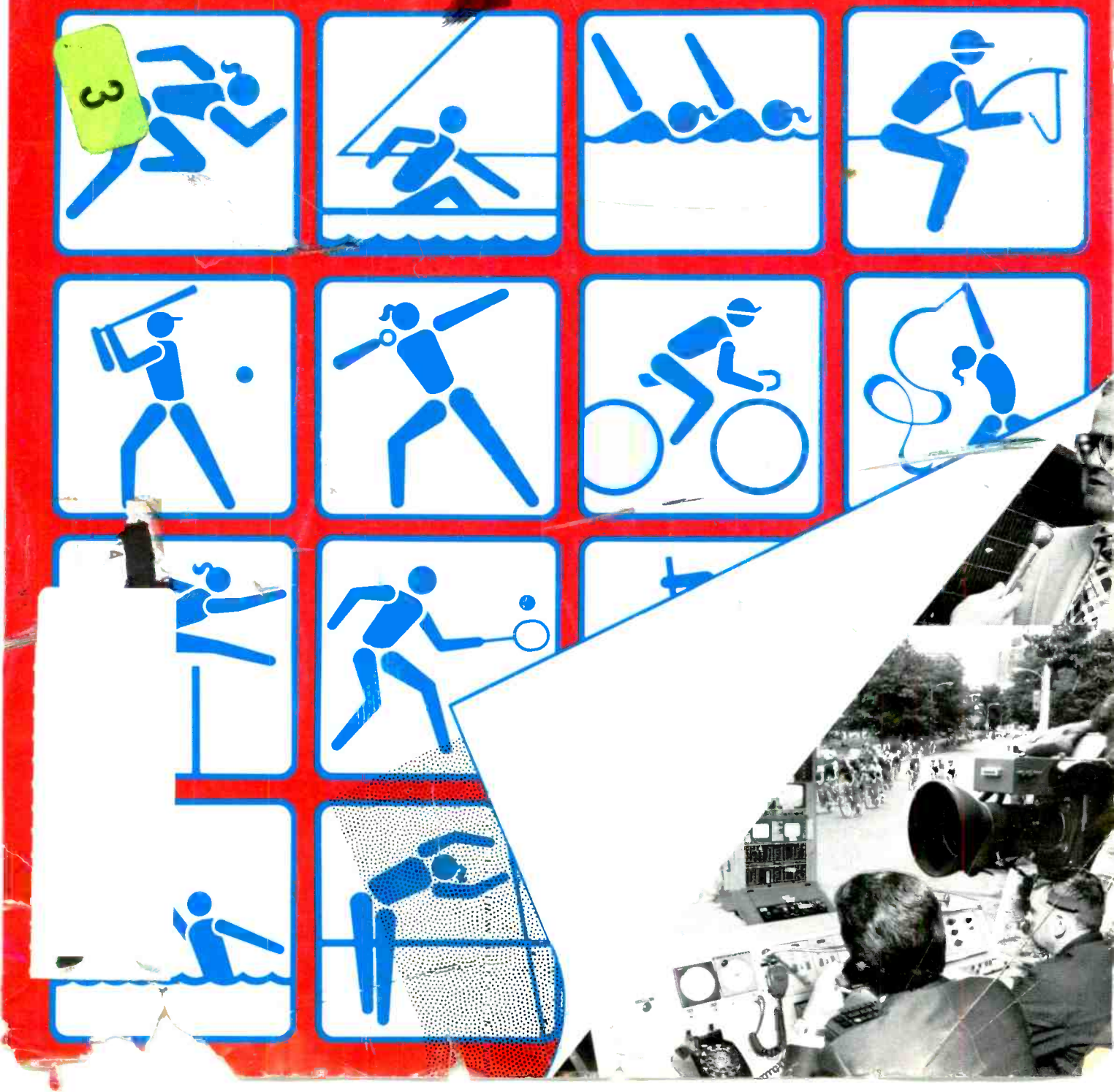

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At ADM Technology we manufacture the most advanced audio consoles available. We incorporate new ideas and quality improvements into every console we build. You can be sure the ADM® console you order today will come through with the latest innovations in audio technology.

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Although it is a compact, basic console it is constantly updated to share the latest in technological advances with the larger ADM consoles.

Engineered to exacting standards and manufactured to the most rigid tolerances, all ADM's are backed by our exclusive 5-year warranty.

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ADDA CORPORATION

Total Picture Transparency and a Clear Price Advantage. The VIP.

ADDA's VIP delivers the best picture resolution available in any digital effects system. Most video effects systems start with a built-in disadvantage. Because of the sacrifices they must make to produce compression they lose a substantial

part of their video. Not so with ADDA's VIP. When the system is in its full screen mode it passes the complete NTSC 5MHz bandwidth.

And you get effects, sequences and control you'd have to pay substantially more for anywhere else. Flips, tumbles, programmable ballistics and trajectory functions—the system does them all.

What makes the VIP so inexpensive is advanced digital technology and a powerful microprocessor—the same things that make it easier to use. The PR-2 remote option panel is amazingly simple. There's an operating menu right on the panel; an interactive prompting display confirms the

Easy to operate controller for pre-set news effects.

mode you're in, states the size and position of the picture, and lets you select the attributes you want within the mode—tilt, pan, rate and so on. The hex keypad can handle more different commands than ordinary keypads; so the operator isn't faced with bewildering clusters of controls. A three-axis joystick gives you simple control of picture size and placement.

The VIP is ideal for news applications and includes frame synchronization and time base correction for heterodyne VTRs—perfect for remotes. News directors will also like picture sizing up to 7/10 with matte background.

Remember, imperfect video effects just won't make it. Look to ADDA's VIP for absolute purity of picture.

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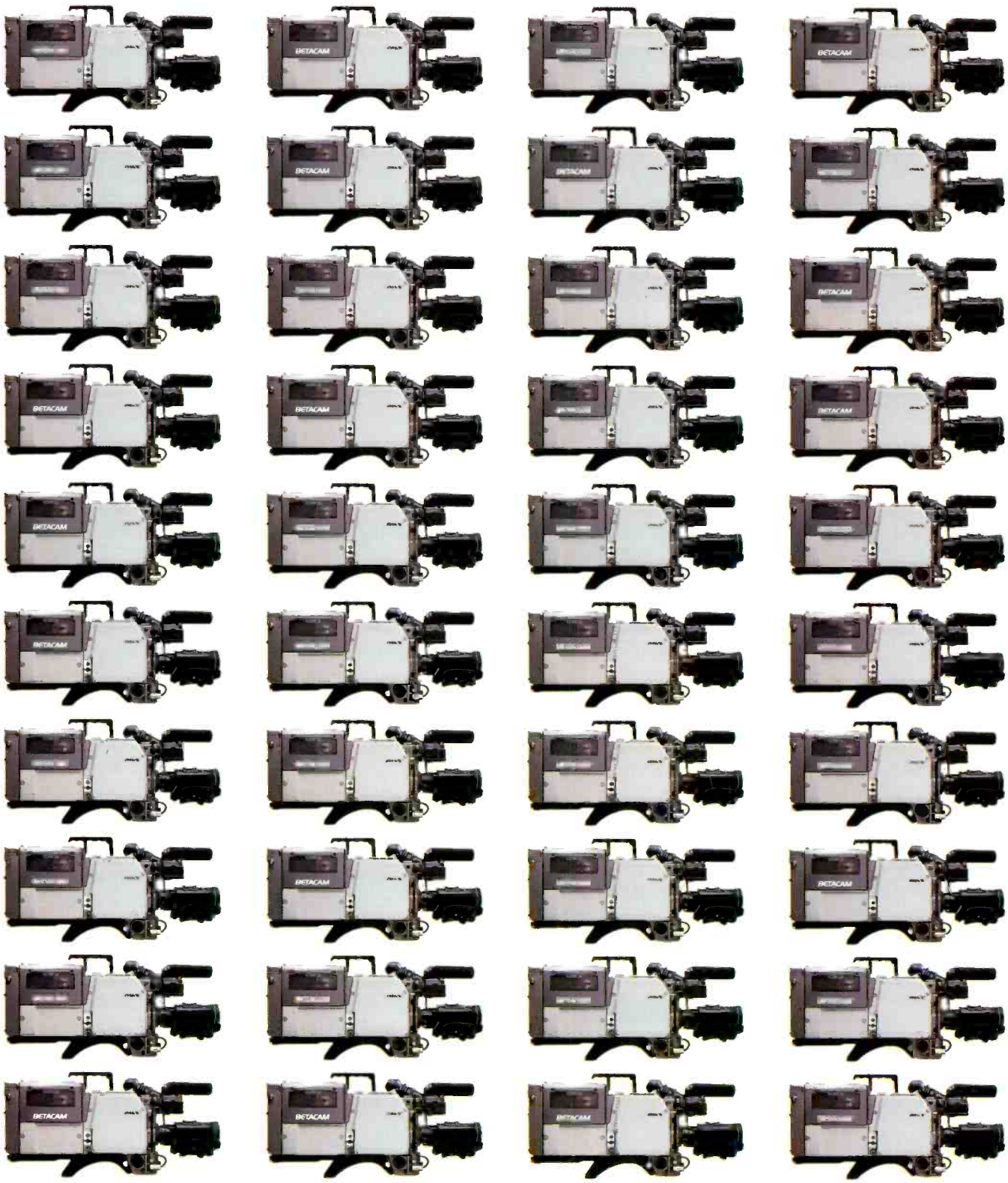
are static

"TO RELIEVE MY CAMERAMEN'S BACKACHES AND MY



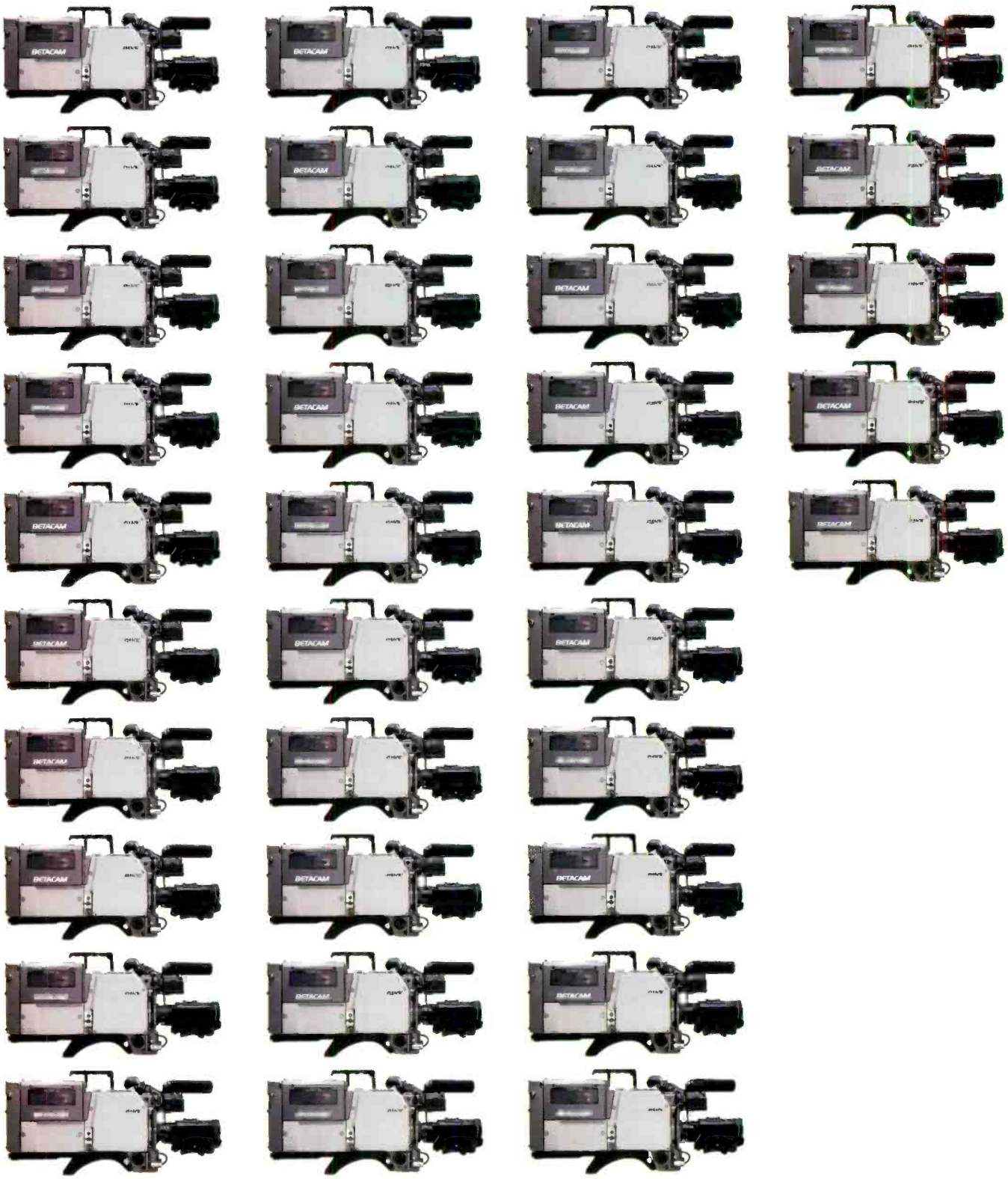
Art Biggs coordinates major engineering purchases for the six Corinthian stations. After careful evaluation of all the ½-inch camera/recorders on the market, he made a multi-million-dollar purchase of the Sony Betacam™ system.

"Betacam has several pluses. The most obvious of them ` size and weight. We have one-man camera crews at all our ›ns. The camera/recorder that they take into the field is right at 54½ pounds. Betacam will reduce this load by more than half—a significant reduction.

"As for quality of playback, you can see the difference with the naked eye. Its superiority is most apparent in scenes of fully saturated colors, particularly reds. It's cleaner. It doesn't have quite as much of the heavy, stringy-type noise we've grown to tolerate over the years.

CONTROLLERS' HEADACHES, I TOOK ALL OF THESE."

—Art Biggs, Vice President, Engineering, Corinthian Broadcasting Corporation



"Another Betacam plus is that it's not a patchwork approach. It's a total Sony system developed from the camera to the recorder to the player.

"Then there's the bottom line. Betacam is at a very attractive price. It would have cost me hundreds of thousands of dollars more to get the same amount of camera/recorders that even approach this kind of quality from someone else.

"I'll definitely be back for more."

For more information on the Sony Be there's a lot more to know, contact Sony Bro New Jersey at (201) 368-5085; in Chicago at in Los Angeles at (213) 841-8711; in Atlanta at (404) 451-7671; or in Dallas at (214) 659-3600.

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3M IS HELPING A LOT OF COMPANIES FILL A ONE-INCH GAP.

For many broadcasters and production companies, wanting a one-inch VTR system is one thing. But finding the money to buy one is quite another. That's where 3M can help. We've put together a financing package that makes our TT-8000 VTR very affordable. And the special combination of enhanced editing features, automatic track following and controlled tape interchange program make the TT-8000 an even more attractive package. For a free brochure, call us toll-free at 1-800-328-1684 (1-800-792-1072 in Minnesota), and find out how we've brought professional quality one-inch VTR within reach.

Professional Audio/Video Equip

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SPECIAL REPORT: SPORTS PRODUCTION

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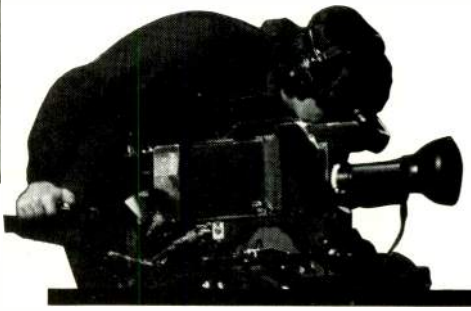

The Who's Farewell
page 91

FEATURES

DEPARTMENTS

COMING IN MAY
SPECIAL REPORT ON MOBILE VEHICLES

INTRODUCING THE NEW PRIMUS™ AUDIO COMPONENTS

CERTIFIED PERFORMANCE

Powerful performance in the palm of your hand.

PRIMUS (Prē-mŭs): an array of compact, performance-engineered audio electronics from Ramko Research.

The new PRIMUS components are unlike any professional audio equipment you've ever used. Never before has so much advanced performance been put into such compact and rugged packages. Rarely have you had available so many features and options to help get the job done. Never have you had a three-year warranty that's backed up by factory certified proof-of-performance.

PRIMUS is a comprehensive range of components that give you the flexibility to configure an audio sysem limited only by your imagination. Whether you choose from tabletop or rack mounting versions, there's hardly an audio job that can't be improved upon.

Here's a partial list of models currently available:

- ☐ Lab standard mono or stereo turntable preamplifiers.
- ☐ Dual and quad input, gain selectable microphone/line amplifier mixers.
- ☐ Audio distribution amps from three (3) stereo/six (6) mono up to eight (8) stereo/sixteen (16) mono outputs. All models feature individual recessed front panel adjustments or optional high resolution, conductive plastic potentiometers.
- ☐ Mic/Line equalizer amplifiers with balanced I/O and up to ±15 db of reciprocal equalization.
- ☐ Expandable audio console mixers with cueing, selectable EQ, metering phones and monitor.
- ☐ Voicegard™ combination limiter/compressor, noise gate with variable threshold and slope ratio; gain reduction metering.
- ☐ Signal processing VCA's with six (6) independently controlled channels. DC remote control with balanced outputs.
- ☐ R/P and playback, stereo and mono NAB cart machines.

Whichever combination of precision PRIMUS audio components you choose, you're guaranteed outstanding specifications. For example, our stereo turntable preamplifier measures:

Signal-to-noise Ratio: −93 dB (A weighted)
Total Harmonic Distortion: Below .0018%
Frequency Response: 10 Hz to 20 kHZ, ±.25 dB
Stereo Separation: −70 dB @ 1 kHz
Output Level: +25 dBm (10 Hz - 20 kHz)

The simplified and modular packaging of PRIMUS allows us to concentrate the quality where it belongs: in state-of-the-art circuitry. High slew-rate integrated circuits and extensive ground planes insure the highest RFI protection. All IC's plug into gold plated sockets. All models feature quick disconnect I/O connectors and require only 1¾ inch standard rack height.

We've taken another important step, too.

When you invest in PRIMUS, you receive a *Certified Performance Gold Card* that instantly puts you in touch with our Technical Assistance Department on a toll-free line. Just call in your registered serial number and you're in touch with the advice you need.

To put PRIMUS audio components to task on a free two-week trial, call toll free (800) 821-2545 or contact your nearest Ramko Research sales representative or distributor. Put the powerful performance of PRIMUS in the palm of your hand.

PRIMUS audio components are an array of compact, performance-engineered rack mounting or tabletop packages.

PRIMUS is a division of Ramko Research, Inc. 11355-A Folsom Blvd., Rancho Cordova, California 95670

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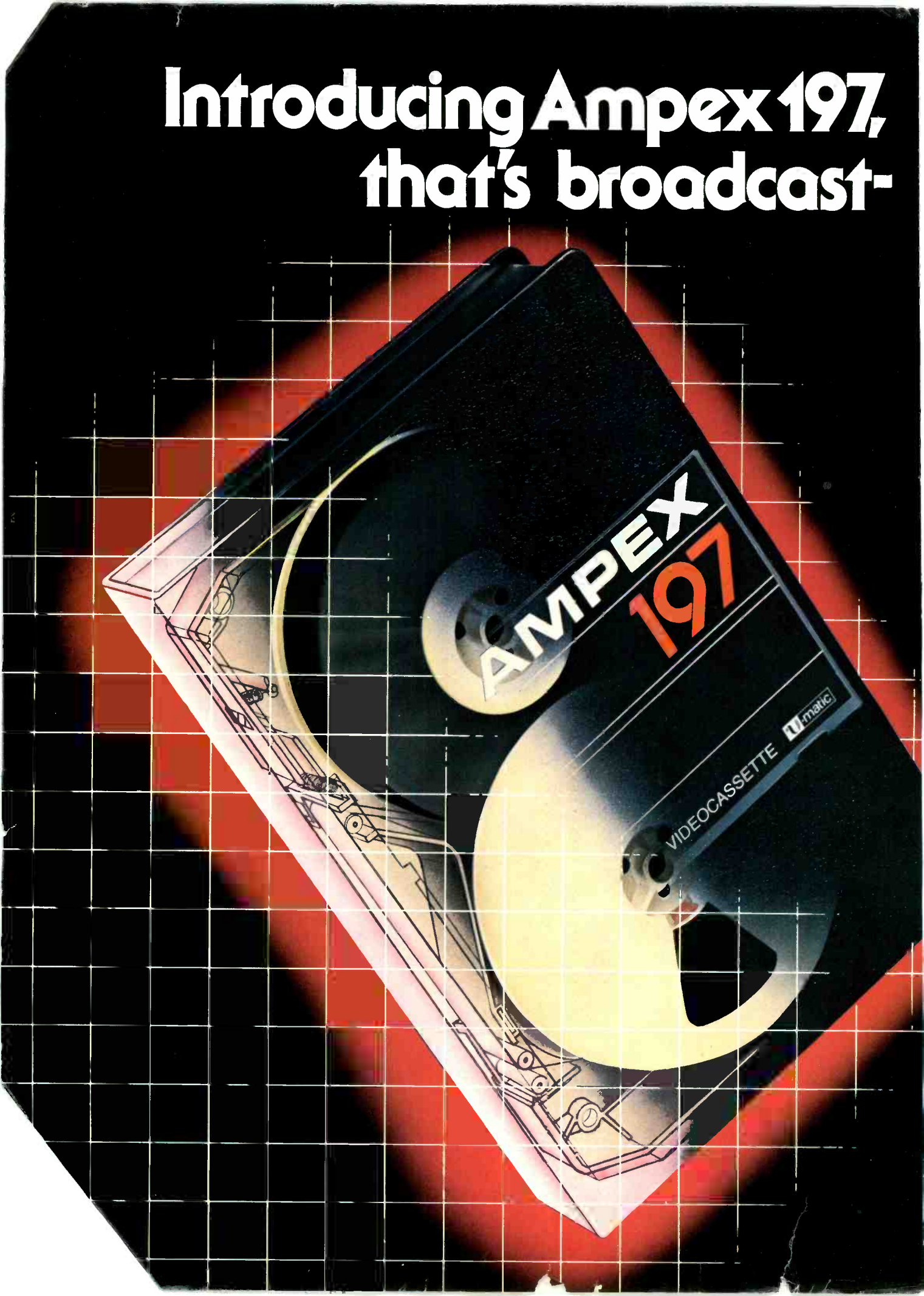
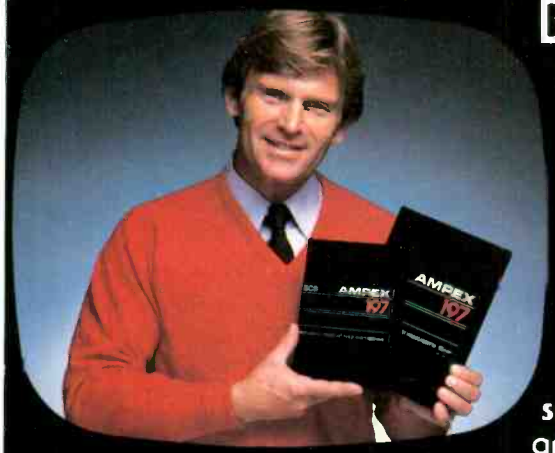
Introducing Ampex 197, that's broadcast-



the new 3/4" videocassette quality in every way.



Broadcast-quality color & sharpness.

The new Ampex 3/4" videocassette has been designed with nothing less than perfection as its goal.

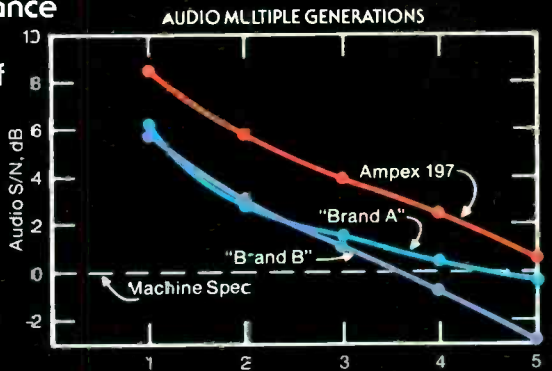
Its superb chrominance and luminance performance makes it ideal to meet the stringent demands of broadcast applications such as electronic news gathering, electronic field production and on-line editing.

And the tape in Ampex 197 has been especially formulated to optimize the performance of the Sony BVU series of recorders.

Broadcast-quality sound.

Ampex award-winning sound has been an industry leader for a quarter of a century. Now Ampex 197 brings this award-winning expertise to video.

Ampex 197 offers superior signal-to-noise and low distortion characteristics. This translates into crisper, cleaner audio performance under heavy editing conditions and multiple generation dubbing. It also delivers excellent stereo fidelity when used for music recording.

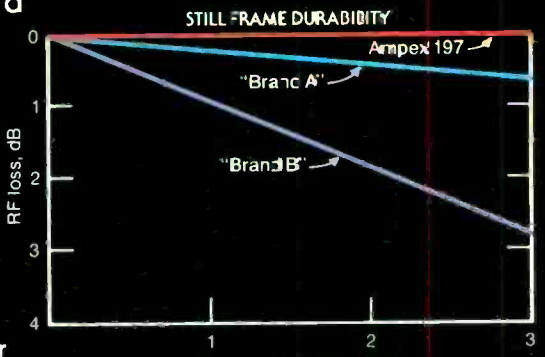


Even after five generations, Ampex 197's audio signal-to-noise ratio exceeds the BVU series machine specifications.

Broadcast-quality reliability.

This new 3/4" videocassette is a blend of the finest broadcast materials and Ampex's unique technical expertise. In blind field testing, Ampex 197 got the highest marks from broadcast professionals for its picture quality, stability, and durability.

In laboratory trials, Ampex 197 held up in the still-frame mode for three full hours and showed no dropout increase or RF loss.



Laboratory tests proved that Ampex 197 held up for three full hours with no RF loss.

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Ampex Corporation • One of The Signal Companies

Quality worth broadcasting.

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EDITORIAL

Video Cart Automation Ready for an Update

WHEN IT COMES to generating revenue based on its technology, a TV station is likely to think of an upgraded transmitter or the latest in production equipment—ENG cameras, digital special effects, electronic graphics, and the like. But while attention is constantly paid to updating these systems, the sad truth is that the single most important piece of equipment with which a station derives income—the quad cart deck used to originate spots—has been woefully neglected.

The first quad cart deck, the TCR-100, was introduced by RCA back in 1969, followed shortly by the Ampex ACR-25 in 1971. Neither system has undergone much change since then. While new work has constantly gone into updating field and studio production and post-production recorders, the technology has passed the quad cart deck by. And not only are the decks outmoded, but most are just plain old. Stations around the country are moving back to manual operations because they will not trust something as important as airing a commercial to a machine that may or may not work when the button is pushed.

Concomitantly, the quad cart deck has probably been the single greatest deterrent to the evolution of station automation. Except for some recent systems designed around U-matic cassettes, automation relies on program and commercial material that originates in quad, and neither broadcasters nor equipment manufacturers want to make a substantial commitment to a new control technology based on quad tape transports.

The solution is plainly the development of a new industry-wide cart or cassette standard that takes into account the latest technological developments. The standard will not be an easy one to define, since there are many interests that must be accommodated. Advertising agencies require absolute uniformity of product, in lengths which reflect current spot production; a positive system for spot identification is also a must. Tape duplicators need a cart or cassette which can be inexpensively handled in large volumes. Networks need absolutely maximum tape quality, particularly for high-priced, high-production-value commercials. Local stations need the complete reliability and ease of operation that allow even inexperienced operators to get the material on correctly. And equipment manufacturers—both of tape machines and also automation controllers—need a standard that makes sense in the design of foolproof, cost-effective hardware.

In situations such as this, the industry must turn to organizations such as SMPTE, whose standards-guiding activities in the past brought about the one-inch Type C revolution. Some, including this magazine, have faulted the SMPTE's committee which failed to reach a standard on half-inch tape formats; but this situation is entirely different. Here the need is obvious and design work is not yet far enough along that a standards-setting procedure will bring two manufacturers into open conflict. It is also probable that the new format will be a version of a one-inch tape format, enabling a committee to get right down to deciding specific details rather than arguing fundamental philosophical points.

We therefore urge SMPTE to establish such a committee with all due haste. Many sides—including stations, networks, agencies, producers, and engineers alike—must be heard from. And we offer *BM/E* as a forum for the open exchange of ideas on this subject.

Get it out of your system.

Television is an electronic medium. Yet TV graphics still involve messy paints, glue, air brushes, razors, and other paraphernalia.

MCI/Quantel's Paint Box can put your TV graphics into the electronic medium.

So you can get all the messy paraphernalia out of your system. Digitally.

The Paint Box lets you do a lot more than you can do with traditional art materials. A lot faster. And with typical Quantel picture quality.

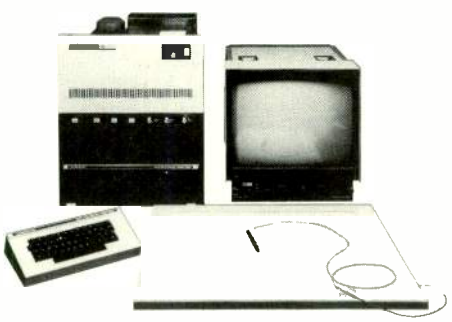
It gives you over 16 million colors. If that's not enough, you can mix your own, just like you'd do with paints.

It's incredibly versatile. You can produce the look of oils, watercolors, chalk, pencil. You can make stencils. Air brush. Cut and paste. Even animate.

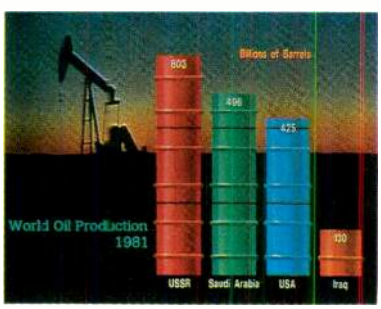
You can grab TV frames off the air, resize them, retouch them, mix them with graphics.

You can set type from a large variety of the highest quality fonts.

And you can interface the Paint Box to Quantel's DLS 6000 Library System for a totally digital still-picture system. It's awesome.



Call your local MCI/Quantel office. They'll be glad to show you a demonstration tape. Or get in touch with us directly at 415/856-6226. Micro Consultants, Inc., P.O. Box 50810, Palo Alto, California 94303.



Graphics like this are easy on the Paint Box.

MCI/QUANTEL
The digital video people.

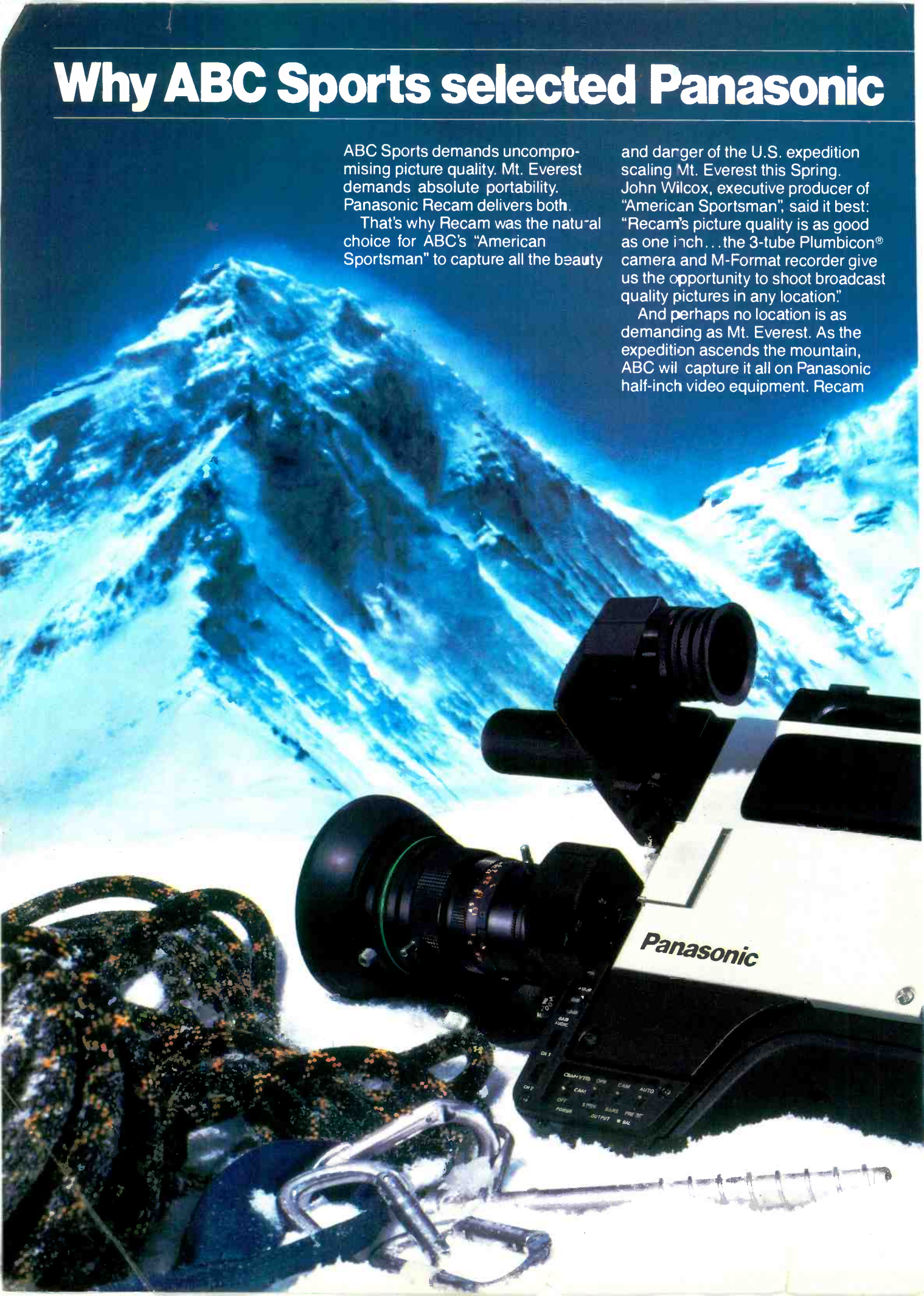
Circle 105 on Reader Service Card

Why ABC Sports selected Panasonic

ABC Sports demands uncompromising picture quality. Mt. Everest demands absolute portability. Panasonic Recam delivers both.

That's why Recam was the natural choice for ABC's "American Sportsman" to capture all the beauty and danger of the U.S. expedition scaling Mt. Everest this Spring. John Wilcox, executive producer of "American Sportsman", said it best: "Recam's picture quality is as good as one inch...the 3-tube Plumbicon® camera and M-Format recorder give us the opportunity to shoot broadcast quality pictures in any location."

And perhaps no location is as demanding as Mt. Everest. As the expedition ascends the mountain, ABC wil capture it all on Panasonic half-inch video equipment. Recam



Recam to climb Mt. Everest.

recorder/cameras will transmit pictures via microwave to a base station specially outfitted with two Panasonic AU-300 source decks, an AU-A70 editing controller, an AS-6100 switcher and another AU-300 for mastering. These high-quality Recam pictures will then be beamed via satellite to the U.S.

But this is just the beginning. Recam's picture quality and portability will be used by ABC Sports for future remote locations whenever the going gets rough.

Look into Recam for yourself and see why it's becoming the choice of demanding professionals whatever their EFP needs.

Panasonic.
AUDIO-VIDEO SYSTEMS DIVISION

Circle 106 on Reader Service Card

Broadcast Groups Form Independent Movie Net

Coming at a time when speculation about a fourth television network is at its peak, an agreement by four group broadcasters to form a weekly movie network is bound to cause talk. Even so, Tribune Co. Broadcasting president and CEO James C. Dowdle has denied that the venture marks the birth of a fourth network.

The groups—Tribune, Taft Broadcasting, Gaylord Broadcasting, and Chris Craft Industries—say they plan to organize their joint venture this month, with the aim of offering two hours a week of prime-time movies to independent stations around the country. Their own holdings, including independent stations in seven of the top 10 markets, cover a reported 36 percent of U.S. TV households. To be viable, however, the network will have to reach at least 60 percent of TV homes, according to Dowdle.

The network will attempt to acquire films that have already aired on pay cable but have not been picked up by the networks. Crawford Rice, executive VP of Gaylord, says the net will try to line up at least 13 films before it begins signing affiliates. Affiliates probably would be permitted to air the films at any time during a week-long license period. The network could go to air by late 1983 or early 1984.

Notably absent from the venture was Metromedia, which has been widely viewed as a likely contender in the fourth network race. Market overlap with the four groups involved is seen by some as a possible reason for Metromedia's absence.

Industry Execs Optimistic, Petry Survey Reveals . . .

From general managers to group and station owners, respondents to a recent survey by rep firm Petry Television agreed that TV's present good times will continue. Conducted over the first six months of 1982, the survey reached almost 200 people through mail questionnaires and in-person interviews, at a cost of $200,000.

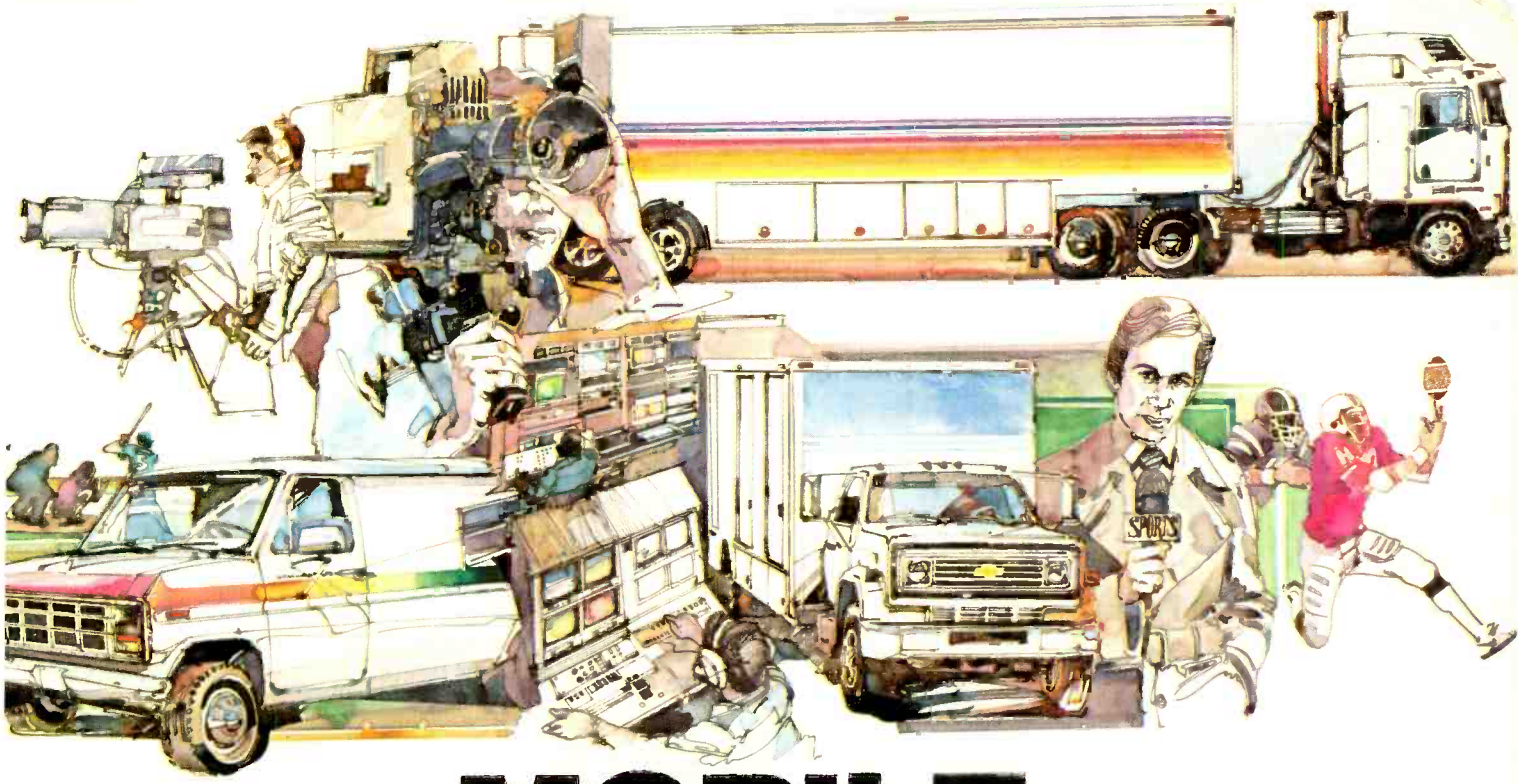
Entitled "The Future of Television: Opportunities and Challenges," the

BM/E's *Rivlin (center) accepts Neal Certificate from ABP President Tom King (left) and judges panel head Prof. H.F. Schulte of Syracuse University's S.I. Newhouse School of Public Communications.*

BM/E Honored for Editorial Excellence

For the fourth time in recent years, *BM/E*'s editors have been cited by the American Business Press (ABP) for the high quality of their editorial efforts. Last year's series of editorials on AM stereo, written by Editorial Director Gerald M. Walker, Editor Robert Rivlin, and Editor Emeritus James A. Lippke, received a Certificate of Merit in ABP's annual Neal Awards competition. The winning editorials were "What is the 'Marketplace'?" (May 1982, p. 8), "*De Facto* AM Stereo" (June 1982, p. 8), and "AM Stereo: Signing On" (October 1982, p. 10).

The award was accepted by Rivlin at a ceremony at ABP's annual winter conference, held March 10 in New York City. A total of 558 entries were submitted in the competition and judged over two days by a 15-member Board of Judges who rated submissions for service to the field served by the publication, journalistic enterprise, and editorial craftsmanship.

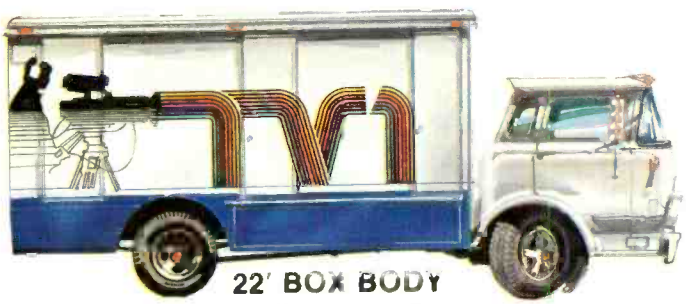


MOBILE TELEVISION UNITS

14' CUBE VAN

$189,000

• **Hitachi 3-FP 22** 3 tube cameras with microprocessor for automatic set-up, 10:1 lens and all equipment for studio or ENG use • **3 O'Connor** Fluid Heads • Tripods, spreaders and dollies • **3 Christie** Reflex 20 batteries and 1 charger • **16001-AN Grass Valley** Production Switcher • **Character Generator System** with **Chyron VP-1** and **Sony SMC 70 Microcomputer** • **Sony** ¾" VTRs 5850/5800 • **HVS516/16L TBC** • **Tektronix** Test Equipment • **Yamaha** 12 Input Audio Board • Fully monitored — B&W and color • Full audio and video patching • On board power and air conditioning



22' BOX BODY

$312,600

• **Hitachi 3-SK91** 3 tube color cameras • 10:1 lens, Plumbicons or Saticons and all equipment for studio or ENG use • **3 O'Connor** Fluid Heads • Tripods, spreaders and dollies • **3 Christie** Reflex 20 batteries with 1 charger • **16001-AN Grass Valley** Production Switcher • **Character Generator System** with **Chyron VP-1** and **Sony SMC 70 Microcomputer** • **Sony** ¾" VTRs 5850/5800 • **Quantel DFS 1750 B** TBC/Synchronizer • **Tektronix** Test Equipment • **Yamaha** 16 Input Audio Board • Fully monitored — B&W and color • Full audio and video patching • On board power and air conditioning

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MOBILE UNITS ENGINEERED AND BUILT TO YOUR REQUIRMENTS

survey updates information gathered in a previous Petry study, issued in 1980. General managers in the sample expected revenue growth to continue strong, predicting an average annual growth rate of 13.5 percent for 1982-85. GMs at independent stations, who reported the highest actual growth figures (19.2 percent), estimated future growth at 14.9 percent, more in line with others' expectations. Most GMs felt the strongest growth would come at the local level; Petry VP and director of marketing Harry Stecker commented, "This is probably the only place in the study where Petry felt the respondents were off-target."

Higher ad rates will not slow sales, the respondents felt, with only 31 percent seeing an adverse impact. A majority of producers, syndicators, and ad agency executives surveyed expected more use of barter. Of the GMs, however, only 18 percent expected to carry more barter, with 29 percent planning to carry less.

Nearly all categories of respondents agreed that network prime time shares would drop to 75 to 77 percent in 1985. Interestingly, the greatest fear of competition from new independent stations was found among current indies. Most respondents—including ABC and NBC affiliates—agreed that CBS would be the leading network in 1985.

The GMs, 78 percent of whom said they plan to carry more locally produced shows, foresaw syndicated programming costs rising 14.5 percent. Petry suggests their figure may be optimistic, with actual increases closer to 17 or 18 percent. When asked about the causes of the price rise, 87 percent of syndicators blamed competitive bidding by stations.

Petry feels cable will not pose a serious threat to television in the next few years, citing its high capital expenditures and weak advertising support. Rising construction costs, high interest rates, and increased demands by municipalities have caused additional pressure. Few GMs expected major impact from STV or MDS systems, which may hurt cable more than broadcast television. A third felt DBS would have a major impact—down from 41 percent in 1979.

Looking at the bottom line, industry executives expect their stations to continue turning healthy profits despite rising costs. GMs, on the average, predicted 15.5 percent profit growth, with group executives hoping for average growth of 11.3 percent; these figures, if realized, "could mean a lot of successful GMs and happy owners," Stecker commented.

VISIT NEC AT NAB. WHERE A LITTLE SLEIGHT-OF-HAND MAKES MORE VIDEO MAGIC THAN EVER BEFORE.

Take the controls of the new NEC E-FLEX Perspective Rotational Accessory. You can add it to your E-FLEX DVE® System to get pictures that compress, enlarge, tumble, spin and split. Images that rotate into perspective. Even pictures that roll or swirl like a whirlpool. Virtually any picture manipulation you can imagine, all with absolute fidelity...and all for a price that's more than magic—it's a miracle. Plus something no other system offers at any price—future add-on flexibility.

See all the new NEC Imagination Machines, including the E-FLEX Perspective Rotational Accessory; portable 7GHz Short Range Microwave Link; and 3 Chip CCD Camera, at the NEC Imagination Theatre, Booth 1415, NAB, Las Vegas, April 10-13.

NEC

IMAGINE WHAT WE'LL DO NEXT

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. . . And Sales Figures Show They've Got the Right Idea

Projected sales figures for the first quarter of 1983 bear out the optimism of the broadcasters surveyed by Petry TV (see previous story). In the middle of the quarter, analysts were predicting that television network sales would rise 10 percent during the period, with national spot and local showing 10 to 14 percent rises.

Increases forecast by the latest TvB Time Sales Survey, sponsored by the Television Bureau of Advertising, indicate that the increases will vary widely from station to station. Top 10 markets expected spot and local gains of 16 percent; at the other end of the spectrum, however, markets 51 through 100 were looking at an average 11 percent rise for spot and nine percent for local.

Observers of radio sales agreed that radio would also do well, but disagreed on exactly how well. Estimates of sales range from single-digit rises to comfortable increases comparable to those for television.

WHAS's nine-meter Harris dish, located near Eastwood, KY, is controlled by a computer that is remotely programmed from the station's facility, 18 miles west in Louisville.

WHAS Installs Uplink for SNC, Teleconferencing

Claiming a first for the Kentucky/southern Indiana market, WHAS, Inc., has installed a motorized transmit/receive earth station that will allow it to speed feeds to Satellite News Channels. The dish has been serving as a downlink since its February installation; full operation was scheduled for April 1, following FCC licensing.

WHAS, which includes WHAS-TV (SNC and CBS affiliate), WHAS-AM, WAMZ-FM, and Louisville Productions, a commercial video production company, says the nine-meter Harris antenna will allow it to uplink its SNC feeds directly to Westar IV. The station has been SNC's associate in Region 11 (Kentucky, Tennessee, and parts of Indiana, Arkansas, Mississippi, and Alabama) since June and has been air-expressing material on videotape until now.

Also taking advantage of the uplink capability, the Louisville Productions division says it will begin offering teleconferencing, regional or national training seminars, and other video communication services.

The aluminum dish is controlled by a Harris 9165 systems controller, which allows real-time remote monitoring and control.

Marketplace Model Applies to Kidvid, Fowler Says

Calling for "an era of true competition among different video technologies," FCC chairman Mark Fowler recently told an audience at the Arizona State University, "I have no enthusiasm for mandated minimums when it comes to children's programs." Setting requirements for children's shows would violate commercial broadcasters' First Amendment rights and would set a precedent in conflict with the FCC's marketplace outlook, Fowler continued.

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  0.25% maximum, 0.15% typical.
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  Output is adjustable from +20 dBm to -60 dBm in four ranges. Also featured are selectable phasing, user-calibratable metering, and 0.2-watt independent headphone amplifier.
- **Diversity or single-channel models.**
  The R-42 provides true dual-receiver diversity, and the R-41 nondiversity receiver has all of the other features of the R-42.
- **High-performance helical-filter front end.**
  Plus all of the other standard features expected in Cetec Vega's professional wireless equipment, famous for quality and reliability.

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While he acknowledged that children's programs are in short supply on commercial TV, Fowler said that public stations were perhaps more suited to filling children's television needs. "I believe it is incumbent on those who care about children's programming, and I include myself among those," Fowler explained, "to advocate a sufficient budget for public broadcasting to help meet the needs of the child audience." Commercial stations may choose to drop children's shows if others are more popular in a given time period, the chairman noted, saying, "I don't believe that the FCC should second-guess those judgments, for we have no way of ourselves arriving at the right answer." Pay cable can also partly alleviate the problem, he said.

Fowler disputed with unspecified children's television advocates, asking, "I am somewhat at a loss to know what it is that advocates of children's programming would have the Commission do." He went on, "I think it's important to place the role of television in its proper perspective. Those whose sole mission in the public policy arena is the advocacy of more and better children's programs—an advocacy I welcome—sometimes lose this perspective." Many other factors influence children as much or more than television, including schools, other media, religion, parents, and family, Fowler asserted.

RCA Sees '85 Liftoff for 40 W Ku-Band Satellite

Moving to take advantage of the burgeoning satellite master antenna television (SMATV) market, RCA Corp. has announced plans to launch a 40 W Ku-band (14 GHz) communications satellite in May 1985. The satellite, first of a planned four-bird system, would carry 16 active transponders and four backups. The entire system, to consist of three orbiting satellites and an on-ground spare, is expected to be complete by 1987. RCA estimates the total cost at over $300,000, including launch expenses.

According to RCA, the satellite would be used to distribute SMATV programming to apartment complexes, hotels, office buildings, which would receive the signals on small TVRO antennas. In addition, it could carry network and syndicated television programming, teleconferences, and voice and data services. Speculation in the press has suggested that potential customers may include NBC, which has indicated interest in the possibility of distributing its fare to affiliates by Ku-band satellite (see the interview with Mike Sherlock, *BM/E*, January 1983, p. 40). HBO is also reported to be a possible customer for a slot on the new system, although the report is unconfirmed.

Current television satellites operate in the C-band, 4-6 GHz. Direct broadcast satellites, which will operate in the 12 GHz band, will broadcast with 200 W power and be capable of reaching the extra-small antennas desirable for direct-to-home service.

In announcing the plan, RCA official Eugene F. Murphy cited a Yankee Group study that predicted domestic satellite service revenues to reach the $2 billion mark by 1985. Murphy is group vice president of RCA and president and CEO of RCA Communications.

NBC Teams With NEC in Mammoth Routing Switcher

A new multimillion-dollar contract has been signed by NBC for the expansion of the network's NEC Model TKA-105

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CG 5020

routing switcher. The unit was, according to NEC, already the largest switcher in the world, with 150 inputs and 270 outputs for a total of 40,000 crosspoints.

The switcher was installed at NBC's Burbank headquarters for use in the studio's on-air operations and teleproduction facility. The studio also functions as the originator of the Pacific coast network feed, a production and post-production house, as well as providing the programming for KNBC in Los Angeles.

The studio needed the flexibility of being able to route the numerous signals from a large number of source devices to anywhere in the complex at any time. The ability to enter anything into the grid and the advantage of many outputs to studios, VTRs, telecines, and switching central were basic requirements of the new system.

With such features as the digitization of all audio signals, one video and four audio channels available at each crosspoint, and automatic self-proofing, the decision was made to go with the expansion of the NEC switcher. This expansion of more than 85 percent will result in a total count of 210 inputs by 360 outputs, offering 75,600 crosspoints.

As a result of the system's complexity and in order to build in capabilities such as outside data interface (permitting computer switching commands) and switcher status feedback loops (allowing the entire system to be operated and controlled by computer), the completion of the expanded unit will not be final until mid-1983.

13 RKO Licenses Face Competing Applicants

Responding to an order by the U.S. Court of Appeals for the District of Columbia Circuit, the FCC has opened RKO General's 13 pending broadcast licenses to competing applications. While the Commission acted unanimously, internal unhappiness was illustrated in a statement by commissioner Stephen A. Sharp, who blasted the court for "impermissibly substituting its judgment for the agency on a matter left by Congress to the agency's discretion."

As Sharp noted, the desirable RKO licenses could attract a horde of applicants before the deadline next month, resulting in a "procedural nightmare" at an understaffed and overburdened FCC. The Commission had originally intended to hold off on the 13 licenses until it finished appeals in the cases of RKO's WNAC-TV (now WNEV-TV), Boston, KHJ-TV, Los Angeles, and WOR-TV, New York. The KHJ case is still pending; RKO's renewal for WOR was approved when the company agreed to move the station to New Jersey (see *BM/E*, February 1983, p. 18).

In his statement, Sharp complained that by its action, the court had eliminated certain options for the FCC, such as renewing the licenses on the condition that RCA sell or transfer quickly to a qualified applicant, or sell to minority applicants under the distress sale policy. He stated, " . . . the court has seriously disrupted the Commission's efforts to discharge its important statutory responsibility to ensure that the 13 broadcasting stations at issue . . . are in the hands of a qualified licensee . . . Such blatant interference is a bad law and bad policy."

The stations at issue are KHJ and KRTH-FM, Los Angeles; KFRC, San Francisco; WAXY-FM, Ft. Lauderdale, FL; WFYR-FM, Chicago; WGMS, Bethesda, MD; WRKO and WROR-FM, Boston; WOR and WRKS-FM, New York; WHBQ and WHBQ-TV, Memphis; and WGMS-FM, Washington, DC.

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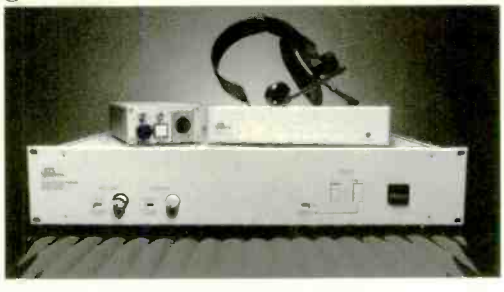

A selection of 30 components make up virtually any custom configuration. It's everything you need and want in a system, but never thought you could get.

All of this performance translates into lower costs, smoother operations, and production schedules that are met, time and time again. The TW INTERCOM SYSTEM, engineered by the company dedicated to providing responsive solutions to communication problems – RTS Systems. So stop complaining! Call or write Marie Hart today for more information.

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NEWS BRIEFS

An RTNDA **salary survey** found the greatest 1982 salary gains in the largest markets for both radio and TV news staffs, with smaller gains or even drops in median salaries in the smallest markets. Nationwide, news directors' median weekly salaries rose 13 percent (to $565) for television and 10 percent (to $275) for radio . . . . At its recent Television Conference in San Francisco, the SMPTE Working Group for Remote Control of Broadcast Television Equipment met with a European Broadcasting Union group working on the same problem and agreed on **two new standards,** on message architecture and interconnection between units . . . . Reiterating its support of **sex-role stereotyping** guidelines, the Canadian Association of Broadcasters has urged Canada's pay television networks to abide by the guidelines . . . . NAB has announced the winners in its **research grant program** for 1983–84, the seventeenth year of the program. Winning topics include the history of free speech and regulation, First Amendment considerations in the Radio Act of 1927, and fairness and equal opportunity in American broadcasting, among others.

In the latest step on Mutual Broadcasting's switch to **stereo satellite distribution,** Pacific time zone affiliates will switch transponders next month. The transponder on Westar 4 will change from 2D to 1D, with complete stereo multicasting capabilities . . . . **John Jay Hooker,** who recently purchased an interest in United Press International owner Media News Corp., has become chairman of the board of UPI, replacing Len R. Small.

United Satellite Television (USTV) predicts it will have **half a million STV subscribers** by fall of 1983. The Ku-band service, to be broadcast first over Anik-C2, then GTE's GSTAR, is slated to begin this year . . . . A Sony executive predicts that the **digital compact disc** may require radio stations "to reevaluate their capabilities to broadcast recorded audio." Rick Plushner, digital audio manager of the company's Professional Audio Products division, told an audience of programmers that the advent of digital audio will challenge radio to raise its audio standards.

June 15 is the deadline for entries in the twenty-sixth annual **CINDY competition** for documentaries, public service, and public affairs programs on film or video. For more information, contact Wayne Weiss, IFPA (Film and Video Communicators), 750 E. Colorado Blvd., Suite 6, Pasadena, CA 91101, (213) 795-7866 . . . . GAF Broadcasting's New York classical outlet, WNCN-FM, has installed a **digital compact disc player** on loan from Denon. The station is testing the player on the air with an eye toward possible purchase.

April 28 is the second annual **National Communications Day,** sponsored by the ITVA and the National Audio Visual Association (NAVA). The day is intended to promote an exchange of ideas among video communications professionals; for more information, contact ITVA executive director Edward Sheehy at (201) 464-6747 . . . . The Chicago Section of SMPTE will hold its eighth annual **all-day meeting** Saturday, May 7, at the Ramada O'Hare Inn. To submit a paper, call Hal Miller, Bell & Howell Video Systems, (312) 291-1150 or Roland Johnson, Eastman Kodak Co., (312) 654-5336 . . . . The Hollywood Section of SMPTE will sponsor an **all-day tutorial seminar** on production lighting techniques Saturday, May 21, at Universal Studios. For information and registration, contact Jack Spring, Eastman Kodak Co., (213) 464-6131, or Howard La Zare, Consolidated Film Industries, (213) 462-3161.

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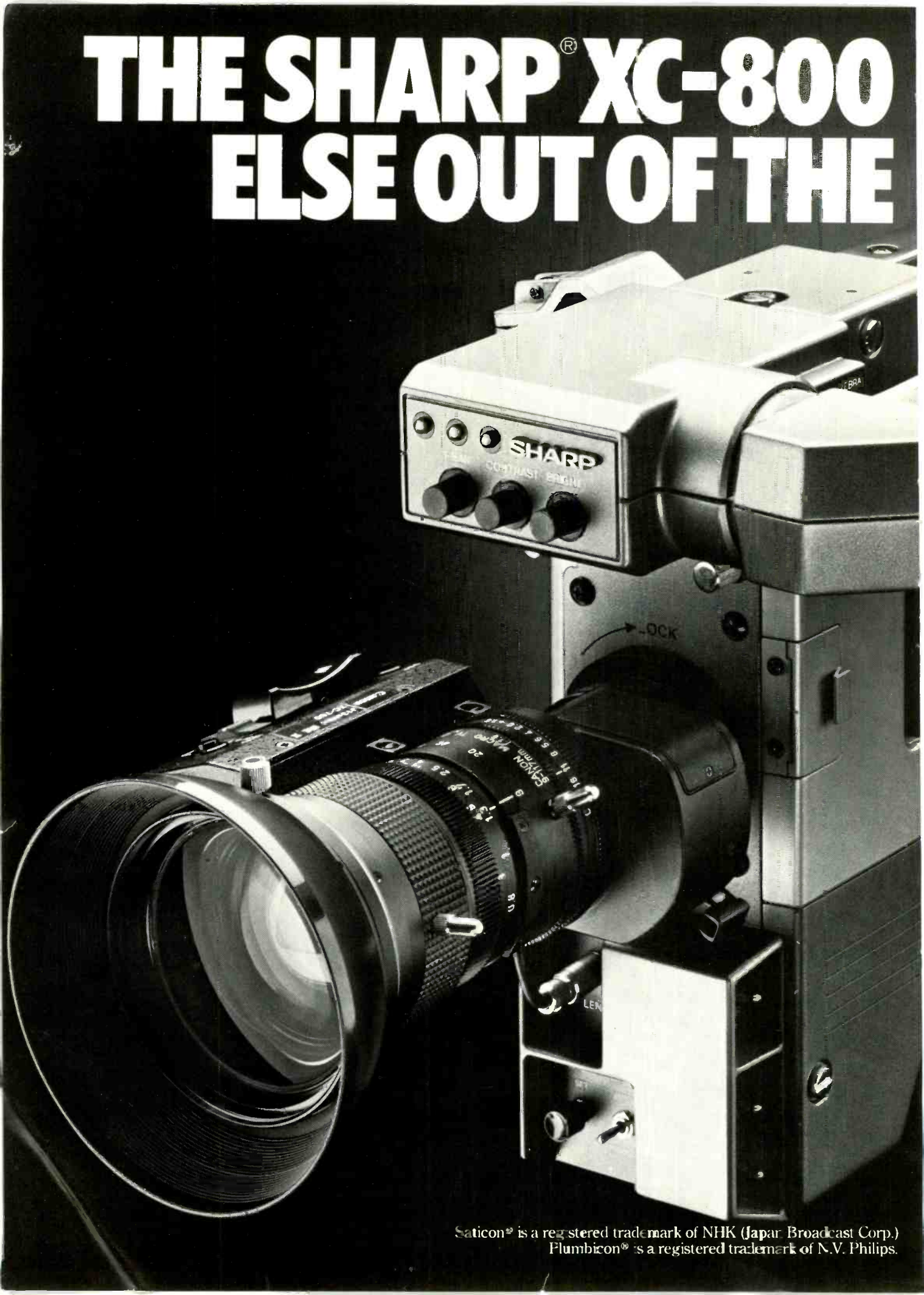

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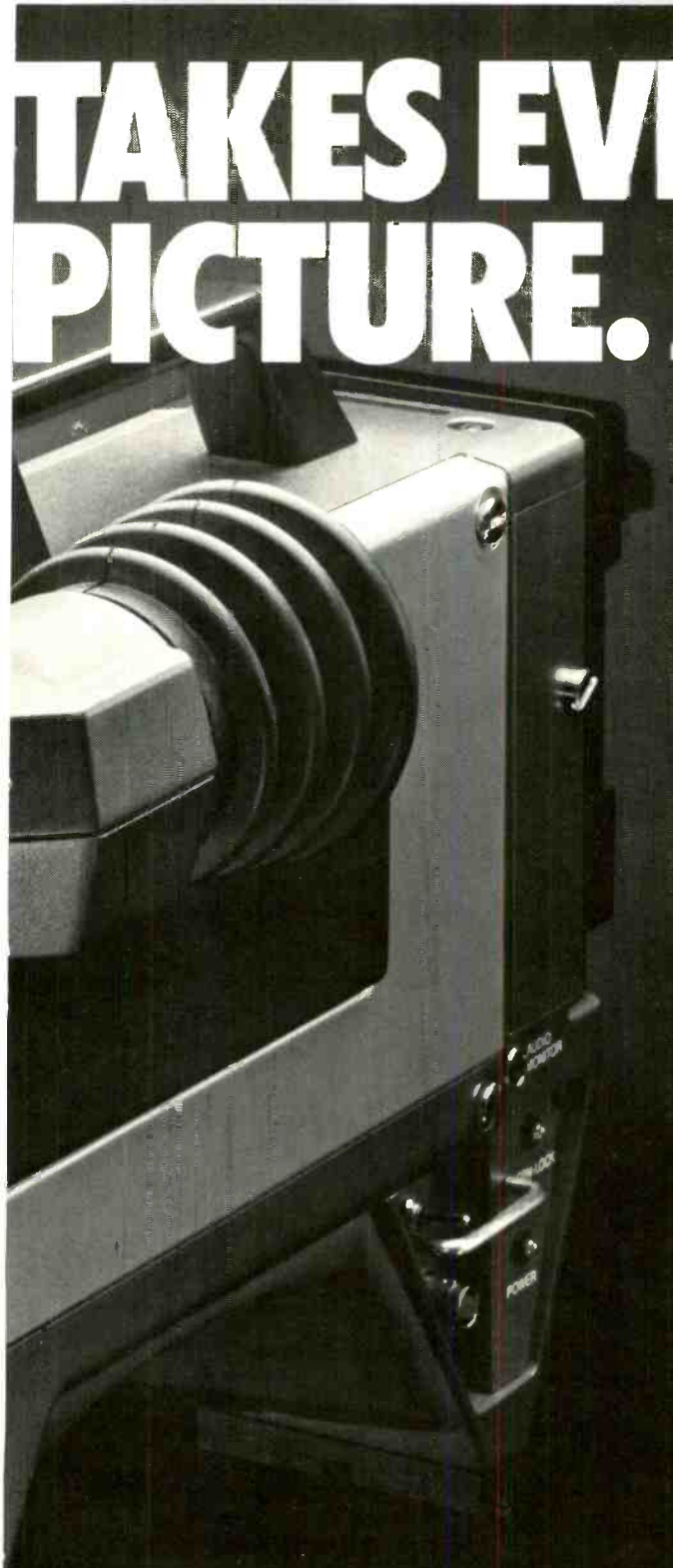

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See and hear Motorola's AM Stereo System at Booth #*411* at the NAB.

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Statewide Networks Benefit From Low-Power Satellite Channel

DESPITE ALL the recent discussion about the benefits of satellite transmission, the cost of a transponder can make going on a satellite seem as distant as the bird itself, at least for a small program provider. Recent technological advances are changing all that, however, as a pair of state networks is busy proving.

The Louisiana Network and the Mississippi Network, serving radio stations in their respective states with live news, farm information, and sports programming, are operated by Interstate Communications, Inc. (INTERCOM) of Baton Rouge, LA. The Louisiana Network, which began operations in 1974 with 12 affiliates, now boasts 55 affiliates; the Mississippi Network, purchased two years ago by INTERCOM, has 65, for a grand total of 120.

INTERCOM's vice president of technology, Rhett McMahon, became interested in putting the nets on the satellite a couple of years ago when prices of uplink and receive equipment dropped, bringing them within the budget of a statewide network. At that time, transmission was by AT&T leased land lines. The rising expense of land lines, of course, was a major incentive to get the networks on the satellite.

Hardware prices were only part of the economic picture, however. The cost of leasing a conventional 19 dBw satellite channel was prohibitive for INTERCOM's small nets, so McMahon began investigating the possibility of using a 10 dBw channel, at that time reserved for uses such as voice, data, and telemetry, which require less exacting audio quality than broadcast program audio. He made contact with Modulation Associates and worked with that manufacturer to develop a method of utilizing a 10 dBw carrier for program transmission.

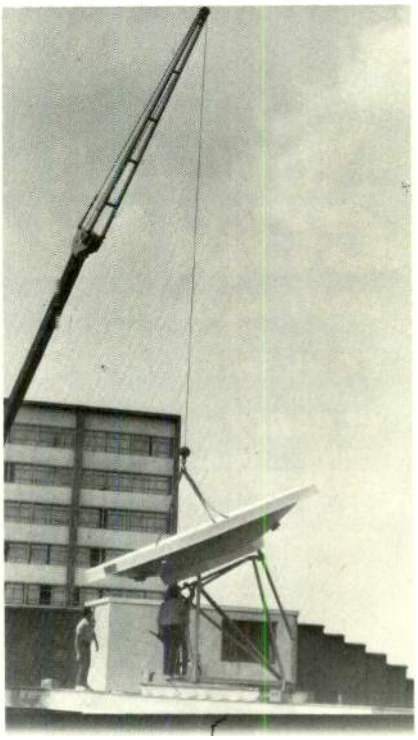
Economic tradeoffs

"There was an economic tradeoff involved between the power of the satellite channel and the cost of the receivers," McMahon explains. "We wanted to provide magnificent quality to our affiliates at a reasonable cost." The lower-power channel would cost less, but would require higher-performance receivers, which would cost more. The small number of receivers the network required, however, made the additional receiver cost less important than the savings on the satellite channel.

Because INTERCOM has more than one affiliate in some markets (some affiliates take only news or only farm information, for example), the system required a total of only 89 downlinks. The 3.8-meter Comtech dishes, with 100-degree LNAs and Modulation Associates receivers, were installed at each location by Satellite Systems Corp. of Virginia Beach, VA. Satellite Systems was also the contractor for the identical five-meter uplinks, one for each state.

The solution to the quality problem was found in a transmission system, designed by McMahon and Modulation Associates, that processes the signal at the uplinks and the downlinks for a significant increase in subjective S/N. The increase—to 65 dB—is obtained by two-to-one compression and 75 μs preemphasis at the uplink, followed by two-to-one expansion and 75 μs deemphasis at the receiver end. McMahon, who says INTERCOM has not ruled out the possibility of broadcasting concerts at some future time, claims that the audio quality is fine for music transmission.

Installation of the Baton Rouge uplink, scheduled for *BM/E*'s press time, marked the achievement of McMahon's dream. The Jackson uplink, installed at the very end of 1982, was already supplying affiliates with INTERCOM's live programming.



A crane lowers INTERCOM's Baton Rouge uplink onto the roof of a three-story building downtown. A support of steel girders enables the dish to resist high winds.

The final link

"It was only toward the latter part of 1982 that the satellite carriers began marketing 10 dBw carriers to broadcasters," McMahon says, remarking that the 10 dBw system was the key factor in INTERCOM's satellite plan. Although McMahon had been working

with Modulation Associates for a couple of years on developing the technology needed to make the 10 dBw carrier suitable for program audio, satellite common carriers had to be convinced that selling space in smaller chunks could be profitable for them. To earn money, they had to be able to slice the transponder space a little thinner.

"Getting the channel from Western Union was the last roadblock," McMahon relates. "We were sitting back with our uplink ready to turn on, waiting to hear from Western Union that it had been finally approved. The moment we got the word, we flipped the switch." INTERCOM leases its 10 dBw, 7.5 kHz channel, located on transponder 2 of Westar 3, directly from Western Union.

Both networks were able to take advantage of satellite transmission from the start, even though only the Jackson uplink had been installed; programs from Baton Rouge went to Jackson by long lines until the second uplink was completed. At press time, 21 earth stations had been installed for the Mississippi Network, and installation was proceeding at the impressive rate of 12 a week.

While both networks have their business and sales offices in Baton Rouge, the Mississippi Network maintains separate news studios in Jackson. Each network's operation has a staff of four, who share reporting, writing, and announcing duties. A roster of stringers helps bring in more news. In addition, much late-breaking news is supplied by the affiliates, typically by dial-up telco lines. McMahon notes that the network has dedicated telco lines from Baton Rouge to New Orleans. The farm directors operate out of the same facilities as the news directors, but have separate offices. The farm, news, and sports services for each state are operated as separate networks, with a different affiliate roster for each.

For its sports programming, the Mississippi Network owns broadcast rights to football and basketball games at both Mississippi State University and the University of Mississippi.

"Our affiliates are delighted with the improvement in fidelity and reliability," McMahon beams. The greater simplicity of the satellite hookup, of course, leaves many fewer opportunities for something to go wrong than with the more complex telco network.

It's inevitable

Although McMahon says he can't give an estimate on the total cost of the system ("Should I count my sleepless nights?" he laughs), he points out that the economic realities of running statewide networks make satellite distribution a question of when, not if.

"If you take a look at Ma Bell's projected tariffs over the next few years, this just looks better and better," McMahon asserts. "The cost of hardware may also be a better and better deal as time goes on. That's trickier to predict, however."

His statement is backed up not only by common sense, but by observation: another statewide network, Georgia Radio News Services, recently announced that it would start distributing programs to its 103 affiliates on a 10 dBw, 7.5 kHz channel subleased from National Public Radio. GRNS, operated by Meredith Broadcasting, hopes to go on the satellite—Westar 4, transponder 2D—on May 1.

The place of satellites in radio broadcasting has been assured for some time. Now, with the availability of affordable, smaller satellite channels, radio networks are no longer the sole province of the big guys. **BM/E**

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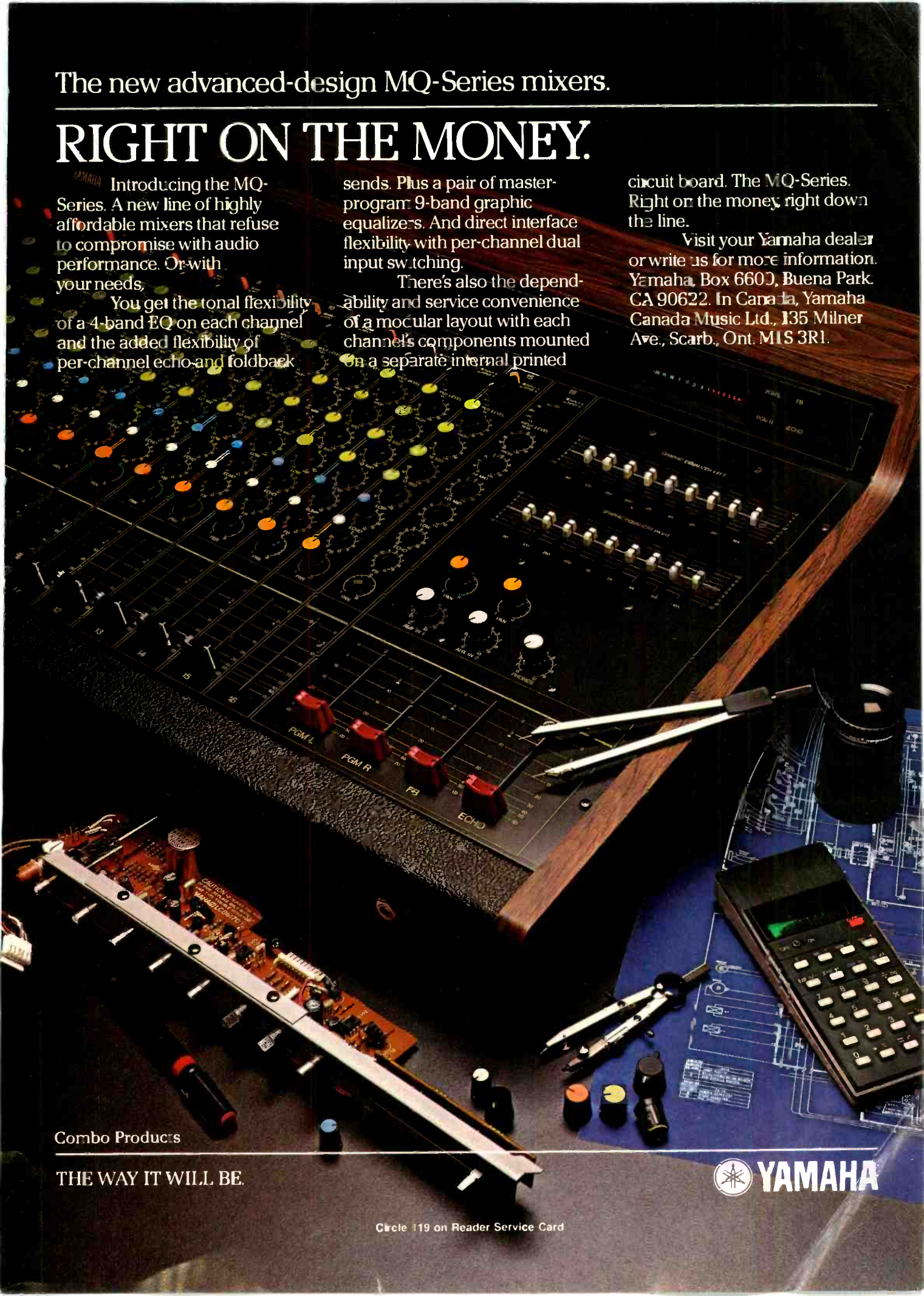

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Post-Producing Audio for "The Scarlet and the Black"

IN A LARGE-SCALE television production such as "The Scarlet and the Black," the recent CBS TV movie about a Vatican priest who saved thousands of lives during World War II, audio is of prime importance—even more so because the filmed production is slated for theatrical release in Europe. The show's producer, Bill McCutchen Productions, turned to veteran sound house Glen Glenn Sound in Hollywood to find the many resources needed for the complex posting job.

Glen Glenn, with a history stretching back to the early days of sound motion pictures, has kept pace with technical innovations in the film industry and its younger counterpart, video. It recently responded to the latest developments in post-production audio by building a massive new 40,000-square-foot facility with complete capability for all kinds of sound effects, dialog replacement, and dubbing work. This new Sound Center was the site of audio posting for "The Scarlet and the Black"—the first project to use it.

"The Scarlet and the Black," produced on film in Rome, required a full complement of Glen Glenn's services, including sound effects assembly on the company's PAP (Post Audio Processing) system. Developed by Glen Glenn over the past decade, PAP started as a videotape sound dubbing project in the early 1970s and is a fine example of the merging of videotape and film technologies.

"That time was a transition period when videotape production was increasing in complexity and its audio requirements were increasing," relates Brad Blake, Glen Glenn's vice president of marketing. "The only sweetening rooms available were at the networks. Glen Glenn had been a film dubbing house for years, and we decided to develop a system to allow videotape producers the same flexibility as film producers in assembling a sound track." The move also reflected the rising number of filmmakers going into videotape projects and demanding the post-production capabilities they took for granted in film—especially multitrack audio and forward and reverse update dubbing techniques.

At that time, according to Blake, no VTR offered reverse play with picture. To make up for this deficiency, Glen Glenn engineers modified a one-inch IVC recorder, used for viewing one-inch workprints, to operate in reverse.

In the Sound Center's Studio 3, audio engineers work at the massive 65x12 Glen Glenn/ADM mixing console.

Videotape "dubbing"

"The environment was identical to a film dubbing room," says Blake. "Some network shows even left the network and came to us." Since then, PAP has been updated several times to incorporate audio and video innovations. It is now regularly used for filmed shows as well.

"Here in Hollywood, we're dropping the term 'sweetening' in favor of 'videotape dubbing,' " Blake reports, "because videotaped shows are now done exactly as filmed shows—complete dubbing takes place. It's a full mixing job, not just sweetening." The videotape rooms are smaller than those used primarily for film dubbing in order to recreate the home environment, according to Blake. "We try to simulate the space in which the product will be enjoyed," he explains.

The new facility has four PAP rooms, all with a similar setup. As described by Blake, the basic PAP system consists of a multitrack ATR, either 16- or 24-track (the company uses Otari MTR-90s and Ampex MM-1200s), as the primary recorder for sound elements; playback machines that serve as sources (MCI JH-110 quarter-inch reel-to-reel decks for the effects and ITC triple-deck cart machines for backgrounds); and a Sony VO-2260 play-only VCR for viewing the workprint. Three of the PAP systems use EECO synchronizers; the most recent, known as PAP-4, instead has a specially designed sync element built by Digital Sound Corp. in Santa Barbara.

In PAP-4, the sync is embodied in the PDP-1103 computer that is the heart of the system. A color CRT gives user-friendly, graphic displays of motion control and command status, in a visual representation of the sheet used by the producer in conventional posting. In fact, says Blake, the display on the terminal is set up exactly the same as is the spotting sheet, making the transition easy for users. All functions are addressed through a keypad with specific function keys for various commands. An automatic, computer-controlled patching system can patch audio anywhere necessary. The computer also allows the operator to set up elaborate,

predetermined audio patches (represented on the screen as a visual patch bay) that are executed with a single button. Audio control is through a VCA-controlled digital panel.

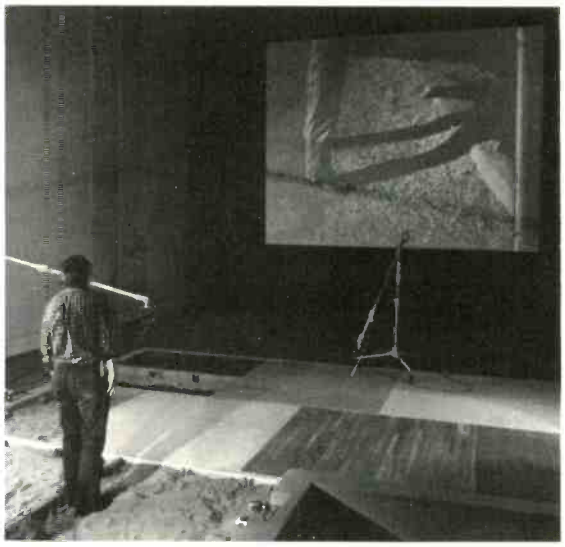
The net effect of the PAP system, Blake explains, is to let clients build effects elements very quickly, eliminating many of the time-consuming steps formerly necessary. He notes, however, that clients tend to use it as a creative tool rather than a time-saver and often end up spending more time than formerly to do an audio dubbing job. The flexibility of the system allows producers to change effects more quickly and easily than they once could, so they spend more time getting effects exactly right.

Dubbing the show

When the edited version of "The Scarlet and the Black" came to Glen Glenn for dubbing, it was first screened by the dialog editor, sound effects editor, and music editor, who made preliminary notes. Then, it was sent to the film lab for a 35 mm, black and white "quick print" and transferred to ¾-inch videocassette on Glen Glenn's Magnatech projection telecine system.

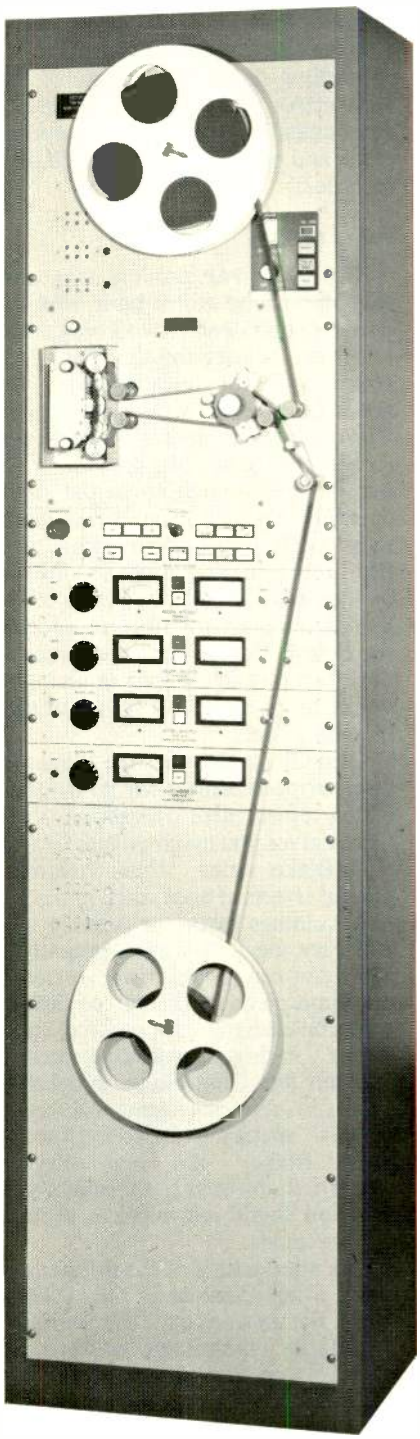
A scratch audio track was laid down on channel one, and time code—related directly to the film footage—laid down on channel two with a Sony BVG-1000 generator. At the same time, the original production track was recorded on channel 14 of the 16-track recorder, with time code on channel 16.

For sound editing, the show next turned to Glen Glenn's proprietary DSC-1100 videocassette spotting system, built by Digital Sound Corp. to Glen Glenn's specs. The DSC-1100 allows the editor to record an edit decision list on floppy disk, using a joystick to operate the VCR.



A Foley dancer records footsteps in the sand pit of one of Glen Glenn's ADR/Foley studios. Extensive Foley work was required for "The Scarlet and the Black."

At this point, the videocassette and 16-track audio cassette went to the PAP suite, where the PAP operator inserted the floppy disk with the edit decisions into the system, loaded a two-inch audio tape onto the multitrack ATR, and mapped out the effects reel, pulling the requested effects out of the library and assigning them to appropriate channels. Once the reel was mapped out, the operator had only to cue up the effects, indicate the source machine (usually the MCI JH-110) and channel destination, and hit the TRANSFER button on the keypad. The system then au-



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Wide-screen film image above the Glen Glenn/ADM board aids operators in dubbing sound in Studio 3. All studios at the Sound Center are compatible between film and videotape.

tomatically patched the source machine through audio VCAs with preset levels into the selected channel of the MTR-90.

Simultaneously, the system backed up the source machine to a point 10 seconds before the event, parked, rolled forward, then synchronized and locked with the multitrack—with the computer controlling the entire operation. After each effect was recorded, the system automatically stopped the source machine and played the effect back on the recorder.

Foley effects

While the PAP process was under way, the sound editor built effects on one of Glen Glenn's two Foley stages. For "The Scarlet and the Black," the complex Foley requirements took about three days' work, according to Blake. For example, two Foley dancers created the sounds of a phalanx of German soldiers marching in the show's opening sequence. They synchronized their footsteps to a projection of the film, recording the effect on one track of the Magnatech three-stripe 35 mm sprocketed magnetic film recorder used for Foley effects. Then they repeated the effect on each of the remaining two tracks to give the full sound of many marching feet.

Glen Glenn also uses the Magnatech three-stripe recorders for its automatic dialog replacement operations. "Multitrack gives you much greater flexibility," Blake states. "You can record several effects at once, such as the footsteps, clothes rustle, or pouring wine, and vary the levels independently. In ADR, you can record three versions of the same piece of dialog, or different actors on each track for separate equalization." Using a sprocketed recording medium lets Glen Glenn synchronize all its film-related systems in a straightforward, mechanical manner, according to Blake. "We keep everything unmarried, however, to enable us to work on sound and pictures separately," he notes.

The interlocking of the different media is a key element in Glen Glenn's setup. For its work on "The Scarlet and the Black," the picture was projected on a 35 mm film projector (for video productions, such as the *Falconcrest* TV series, of course, a video image is used). ADR and Foley effects were built on 35 mm sprocketed magnetic film, and the dialog production track had been edited in the 35 mm fashion on a 35 mm sound editor. In contrast, all sound effects elements—footsteps, explosions, birds, and so on—were built on the Otari MTR-90 16-track ATR using SMPTE time code.

Film/video compatibility

"We basically took what we had developed for videotape, which allowed you to build sound effects the same way for video as we had been for film, but using a nonsprocketed medium and using time code as a reference instead of the sprocket holes," Blake summarizes. "That's why all of the rooms are videotape-capable, can run sprocketed media interlocked with images on videotape." All of the rooms, Blake continues, can handle any form of image programming.

Blake emphasizes that the Sound Center has been designed for full compatibility between videotape and film, allowing shows produced in either medium to be mixed with equal ease and flexibility. Two of the rooms are especially equipped for sound sweetening of videotaped material such as network TV programs, but all rooms are capable of screening video.

With all PAP and dialog work complete—a process that took 20 days, according to Blake—the show went to Studio 3, Glen Glenn's three-mixer dubbing stage, for five days' final mixing work. All elements—the PAP effects track, dialog track, and music track (mixed previously to the black and white workprint; the show had been scored in Europe)—were then assembled from the various source machines onto a Magnatech three-track recorder, using the room's 11 Magnatech dual dubbers—actually 22 sprocket machines that can be set up in a variety of configurations, from one to three channels. (The 16-track source ATR in Studio 3 is an Ampex MM-1200.)

Advanced console

The three-mixer console in Studio 3 deserves special attention. Designed by ADM in conjunction with Glen Glenn, the console has 65 inputs separated into three sections, for music, dialog, and effects. It essentially has eight outputs, four for a four-track master and four submaster outputs for auxiliary recorders. Wings on either side of the board hold the patch bay and accessories such as dip filters, digital delay, and equalization.

According to Blake, the computer associated with the board allows some automation features. Dual floppy disk memory units let the console receive directly some commands generated by PAP, such as fade in and out. They are most frequently used, however, for setting up console control and assignment, functioning as an automatic patching system for the 65-input board.

During dubbing, the external SMPTE time code reference is scanned by the console's computers (full manual override is provided, of course). The room's master computer, separate from the console and its floppy disk unit, has a buffer memory for temporary storage of commands and enables the computers that control the other equipment to "talk" to each other. In addition, each individual mixing strip has a microprocessor to monitor the input from the console and send information to the computer. The monitoring for the studio is an Altec A-4 system.

For the final step, the finished dub was sent to the transfer department, where a 35 mm optical negative was made. Last, Consolidated Film Industries transferred the show to one-inch videotape, with dialog and effects on channel one and music on channel two, for shipment to the network and airing.

The constant borrowing and learning that goes back and forth between the two related worlds of video and film includes the audio end of production as well. Only recently has video been able to take almost full advantage of the lessons of film; it has wasted little time in improving on those lessons and relaying them back to the film world. The symbiosis is complete in "The Scarlet and the Black." **BM/E**

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OLYMPICS COVERAGE TELEVISION-STYLE: ABC'S MASTER PLAN FOR LOS ANGELES

By Robert Rivlin, Editor

While American athletes are proving their prowess on the playing fields at the 1984 Summer Olympics in Los Angeles, ABC Television will have the opportunity to prove the superiority of American television techniques to the world.

LIKE MOST NETWORK executives, Marvin Bader, ABC's VP of Olympic operations for the 1984 summer games, is reluctant to discuss the amount being spent on the production—beyond quoting the $225 million figure which ABC spent to secure exclusive coverage rights for the U.S. Nonetheless Bader estimates that between equipment ABC owns, equipment it is buying especially for the Olympics, and equipment it will rent, the network is bringing "well in excess of $200 million in technology" to its Summer Olympics coverage.

"It's going to be like a three-ring circus out there," observes Julie Barnathan, president of ABC's BO&E division, which will be exclusively responsible for providing that technology—both for ABC's unilateral coverage and also for as many as 129 broadcast organizations from around the world which will be taking ABC's international feeds for their own purposes.

The circus-like quality comes from the sheer magnitude and spectacle of the games. Events are scheduled morning, noon, and night for 16 consecutive days, across a wide swatch of southern California spread out 140 miles from north (Lake Casitas rowing and canoeing events) to south (Coto de Caza modern pentathalon), and 30 miles from west (Pasadena football) to east (Long Beach yachting). As many as 10,000 athletes will be involved in the 22 "disciplines," as the sporting events are called by the Olympics committee.

"But this is the first time the Summer Games have been in the U.S. in 52 years," observes Barnathan. "Back in the 1930s, television hadn't been born yet and radio was just getting under way. Even the nature of the Games themselves was questionable. Today you have an Olympics which is made possible because of television, and we're going to show the world just how good we are."

Backing up Barnathan's claim is the Olympics fact sheet on the equipment that will be used. In the field, based out of 29 large- and medium-sized mobile vehicles and 14 ENG units, will be 124 hard cameras and 56 handhelds. The vans themselves will contain 31 character generators, 83 one-inch VTRs (mostly Ampex VPR-3s and VPR-80s), and 68 ¾-inch VCRs.

Back in town, ABC's facilities at Prospect and Talmadge Streets are being completely renovated into brand-new headquarters for the coordination of 207.5 hours of network television, much of it live. A four-camera studio is being added, together with three separate control rooms. Twelve editing rooms are being set up, most with three one-inch VTRs. The UBC (Unilateral Broadcast Center) will also contain 13 character generators, plus at least two Dubner CBG-2s, an MCI/Quantel Mirage, and the Quantel Paint Box—plus a six-machine playback room.

Across town at Sunset and Gower, ABC is building brand-new facilities for world broadcasters, 1600 of whom are expected to attend. Eight new fully equipped studios will house worldwide coordination of the 1300 hours of live programming ABC will produce for international consumption.

ABC's own staff will number over 2500, including over 1600 engineers, 250 production people, 525 local support personnel, and 150 in management. More than 650 miles of cable will be laid, including both the field operations and the two broadcast centers.

Distributed production

As in any undertaking of this sort, however, the hardware simply provides the tools for creating the images and sounds; at least as important, if not more so, is the production expertise that will put it all to work. Providing the massive coordination required is Jeff Ruhe, director of production for the 1984 Olympics, who began working on the project back in the spring of 1982 when the first production surveys were required to be completed.

Ruhe's overall plan can be described as "distributed production," drawing an analogy to computer science's "distributed processing." Each of the 26 venues will really be a separate production unit, with the producer and director responsible for feeding back an assembled program

Continued on page 44

OLYMPICS COVERAGE RADIO-STYLE: SPORTS ON THE GRAND SCALE!

By Tim Wetmore, Associate Editor

Led by ABC, the networks will be breaking ground and breaking records in radio's coverage of the 1984 Olympics in Los Angeles. Unprecedented engineering and financial maneuverings distinguish what promises to be the most elaborate technological accomplishment in radio sports coverage.

THE NUMBERS ON ABC's planned coverage of the 1984 Summer Olympics are staggering. Field reports from at least 22 venues. Up to 150 people in Los Angeles for radio coverage alone, including about 23 commentators. Two complete crews, one doing the entire, live coverage from the venues, the other doing updates and news items. Elaborate satellite uplinking facilities to facilitate dawn-to-dusk action. All backed up with a huge commitment of capital—starting with a multimillion-dollar deal that ABC paid to secure exclusive radio coverage rights. There can be absolutely no doubt that ABC is serious about the Summer Olympics.

Nothing speaks more directly to that commitment, however, than the network's plans to build a truly first-class broadcast facility in Los Angeles to act as its central coordination point. The building, which was a film studio, has been stripped down to its bare walls and totally rebuilt, including completely new power and audio cables and the acoustic treatment required to meet the specifications of a broadcast studio.

The network is also in the process of building, in New York City, entirely new radio broadcast headquarters (twice the size of the present studios) to handle the complete satellite distribution system which will be fully operative by, and instrumental in, the network's coverage of the 1984 Olympics.

Planning for transportability

The main decision in the planning stage of the Los Angeles facility was whether to engineer the plant as a full-fledged studio operation or to plan a more simple engineering style to act as headquarters for an essentially remote, RPU configuration. If the former were chosen, it would have required adopting permanent-style engineering plans for what would be simply a temporary endeavor. On the other hand, the field production requirements far exceeded the norm, and to be considered a remote coordination area the building would have to be viewed in a special light.

In the end, the latter plan was adopted. Richard Martinez, the director of technical operations for the ABC radio network, who did the technical and electronics design of both the Serajevo, Yugoslavia winter games and the summer games in Los Angeles, kept the entire operation in perspective. "All the preparations are for a two-week remote. Though this effort is completely different in scale and impact from other remotes, it is still just that, and we had to devise our equipment lists accordingly."

In complying with this principle, and considering that ABC's resources, though large, are not limitless, Martinez decided to build the Los Angeles package from the standpoint of portability and versatility. He wanted something which would give him the quality of a permanent radio studio, but which would offer enough mobility and flexibility to accommodate the quick and efficient operation necessary to cover an entire Olympics.

Logistics figured into the plan from the beginning, since efficient equipment transport and setup could determine the success of the entire year's sports and remote coverage. The equipment package was designed for many of 1984's ABC radio coverage plans: first the Serajevo winter games; then back to the U.S. for the Kentucky Derby and the Preakness in May; after that, immediately off to the Republican convention in Dallas; then on to Los Angeles for the summer games; then, eight days after the conclusion of the Olympics, on to the Democratic convention in a city yet to be named.

The portable equipment packages, all contained within specially modified road cases from Calzone and Anvil, are designed to fill out three complete studios with control rooms, and three fully equipped editing rooms, as well as a maintenance and engineering rack area for master control. A complete interconnect frame with cables will arrive ahead of the other equipment, making interfacing and level testing quick and efficient.

The transportable broadcast studios will each contain a Yamaha M1516 32-input by 8-output portable console,

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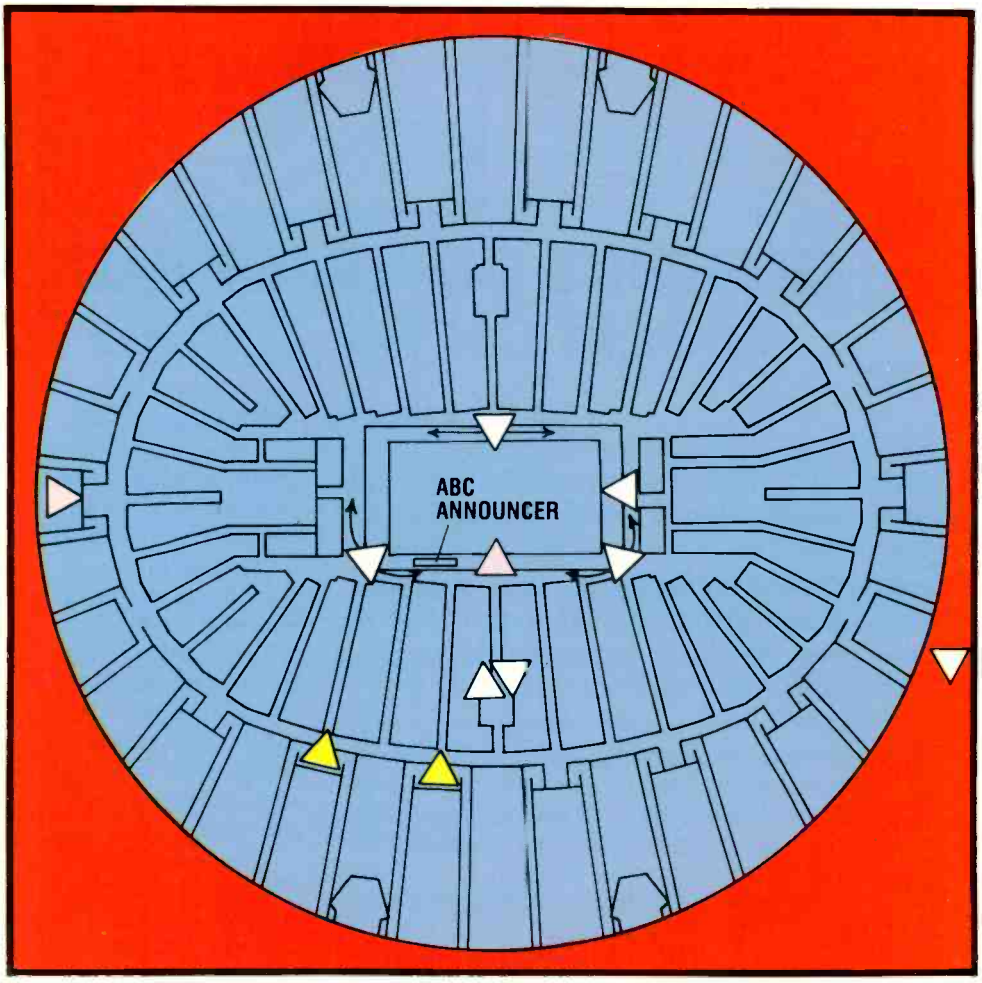

Survey plan for basketball coverage from The Forum. Triangles are camera positions. White cameras are for preliminary games coverage. Blue cameras are added for semifinals and finals. Yellow cameras are for ABC unilateral supplements.

to the UBC and IBC operations. There will, of course, be constant communications back and forth between Roone Arledge and coordinating director Roger Goodman in the center and the various field producers and directors; but essentially the field units are on their own.

"On one level," explains Ruhe, "it's just as if we were going in and setting up each venue as an individual event. For example, we went into the basketball arena with the plan of setting up five to 10 cameras out of our mobile truck, and our coverage will be almost identical to the way ABC used to do the NBA. The only difference is that we had to do the survey last June because the Olympics Committee needs to know exactly which seats have to be removed for our camera positions and which seats will end up with restricted views."

The real difference, of course, is that the basketball games are going on continuously for over two weeks; there are 25 other venues that must also be covered, with as many as 14 events going on at the same time; and ABC is providing coverage not only for its own network but for the world broadcasters as well as part of its obligations as the host country broadcaster.

Divided loyalties

It is the necessity of providing both international and unilateral coverage that proves to be the biggest challenge. ABC, in a sense, has divided loyalties. As host network it must supply a clean picture and natural sound of every event it is contracted for—that is, an unbiased presentation of the athlete introductions with internationally acceptable lower-third identifications, followed by completely unbiased coverage of the race. The idea is that foreign broadcasters will then be able to take the live feed back at IBC, where they can add their own narration, recut the material as desired, and feed it back to their home countries.

"But the American audience is not going to be interested in that kind of coverage," observes Ruhe. "They want to know what's happening with *American* athletes. So we have to give them very Americanized coverage of only those events in which Americans are usually interested. Our audience cares about basketball; it doesn't care much about archery. But from the world's point of view, we have to give them equal billing."

The solution has been to commit vast resources to the basic coverage demanded by the world broadcast obligation; each and every game will be assigned more than enough cameras and support equipment to provide the necessary feeds. On top of this, however, ABC will add its own layer of supplemental unilateral coverage for those events in which it is interested.

The simplest kind of unilateral coverage will come from events where ABC does not have dedicated unilateral cameras. Here, the producer or director will have the op-

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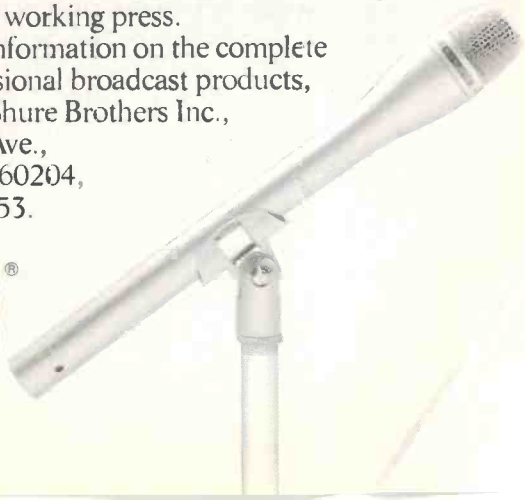

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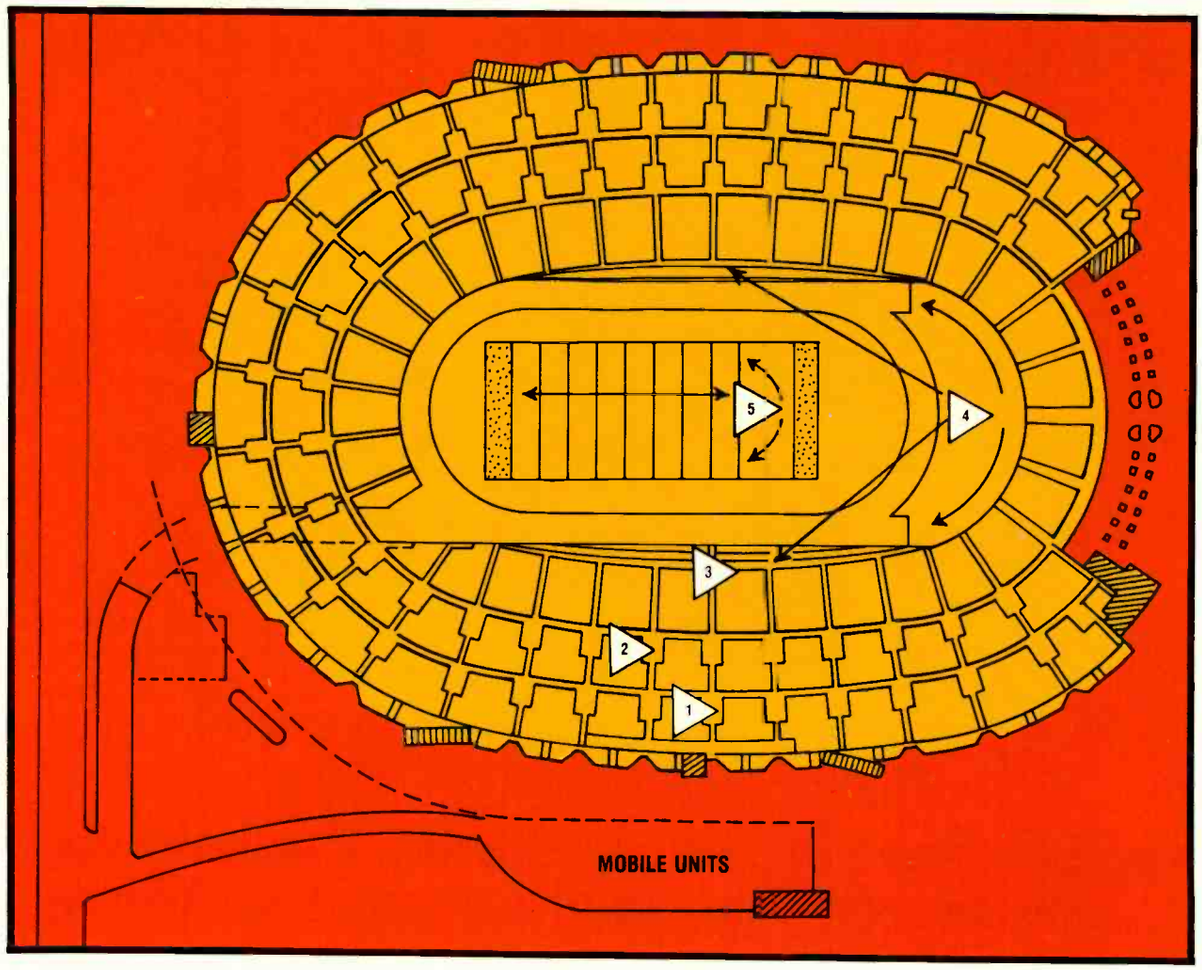

Coverage plan for one of three mobile units at the Coliseum. Camera 4, on a tripod, does mostly low work and will be repositioned depending on the event. Camera 5 is on the field itself with RF signals sent back to the van. Camera 2, also on a tripod, can be patched into the other truck covering field events. Cameras 1 and 3 remain in same position throughout various events.

tion of recording an event in which an American athlete has done well, editing it on-site with additional background material on the athlete, then feeding it back to the broadcast center. A slightly more complex alternative is to have the ABC unilateral director use the same cameras as the world director. Since, after lane introductions in an event such as swimming, the shot would pull back wide to show all the athletes warming up, the camera that provided the introductions could then be sent back to get the American athlete again and stay close on the competitor during the race. In this instance, a separate switcher is needed to cut back and forth between world coverage and unilateral coverage, but the same set of cameras can be used for both.

A real innovation this year is the addition of five "flash units" to the fleet of mobile vehicles. These are separate from the 14 ENG units which will be used to do live and taped pickups of various events around town such as the Olympic Village, cafeteria, nightclubs, on-the-street interviews—much like a regular broadcast ENG operation.

"When we started doing our budget on L.A. we looked at the possibility of doing complete unilateral pickups from any number of events," Ruhe relates. "But we found that the costs were astronomical. We will have full unilaterals from track and field and also gymnastics, and perhaps from boxing. But in other cases, rather than tying up a full-scale unilateral truck and crew dedicated to just one event, we decided to go with these flash units instead."

Equipped with two cameras, two VTRs, a character generator, a switcher, and some audio gear, each flash unit is capable of providing almost instant unilateral coverage when the need arises. If an American begins doing well at a particular event, or if an American team is playing in a sport that would not normally attract American attention, a flash unit can simply be driven to the scene, interconnected with the world coverage truck, and used as the base for a unilateral director and producer. The trucks have the ability to go back live via microwave or through a land line, opening up the special link that is needed for the unilateral program.

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course, in situations where ABC has a separate truck at the venue for providing continuous coverage—as is the case for gymnastics, track and field, boxing, and so forth. At the track and field stadium, for example, no fewer than four trucks will be permanently stationed. One truck will cover track events for the world. Two more trucks will cover the field events that can occur simultaneously. These three trucks, therefore, will provide three individual feeds going back to the IBC. At the same time, however, a fourth truck will provide ABC unilateral coverage and will make up the program from the track and field venue that is fed back to UBC. The unilateral cameras, of course, will be split up among the various track and field events, but the producer will have the opportunity to supplement the world picture with his own unilateral cameras of whatever event is being fed back to the American audience. Plainly, the director will also have a full complement of graphics and special effects at his or her disposal.

Gymnastics, too, will present extremely complex coverage problems. "Gymnastics is going to be literally a six-ring circus," explains Ruhe, "with men's and women's events going on in several different pieces of apparatus at once. We will use two trucks at gymnastics, each covering two of the six events. While half of each truck's coverage is being fed out live, the other half is recording material on tape, ready to feed it back out as soon as the live event is finished."

At an event such as basketball, coverage depends on the importance of the game. The basic plan is for five cameras. But this can go as high as nine cameras if it is an important game involving U.S. players. In that event, two of the cameras would probably be ABC unilateral cameras.

Key role for communications

Back at UBC the jobs of Arledge, Goodman, Bader and others becomes one of coordination—selecting which of the 12 to 14 feeds being received at the center should be put on the air. "Right now our biggest concern is communications," says Barnathan, reflecting the thoughts of many. "Because we're going live for so much of the 207-plus hours, a lot is going to depend on split-second timing. If we're covering an event that isn't working out, or if it ends sooner than expected, we've got to be able to go someplace else—and know where we're going."

Communications is also required to enable events producers working UBC to produce an entire event while working from one of the 12 editing suites. A producer would work with an announcer at the venue to create a short live segment—20 minutes of equestrian activity, for instance—then immediately convert over to working on a five-, 10-, or 15-minute summary of the day's events on tape for later broadcast. Edited material, incidentally, will be rolled in from the tape playback room rather than from the edit suite to free the suite for another assignment.

Part of the solution is the SMR (Specialized Mobile Radio) system from Motorola. The overall system will have four main repeater systems, each with four portable repeaters—a total of 16 repeaters in all. Since each repeater system has five channels (including a microprocessor-controlled control channel for automatically routing incoming signals), this yields a total of 20 communications channels, more than adequate for the job.

The other problem, getting enough frequencies for all the various microwave links, is also being worked on

"Live" Computer Graphics?

One of the more exciting treats Olympics viewers have in store may be virtually instant electronic graphics portraits of the winners, created on an MCI/Quantel Digital Paint Box. At this stage, however, both Roger Goodman and Julie Barnathan are being rather secretive about the project, fearing the idea may be stolen away.

If it does come to pass, one of the chief contenders for the "artist in residence" spot will be noted sports artist Joni Carter, who created the live, on-air computer graphics unveiled to the public during last year's baseball playoffs. At that time, Carter, an illustrator who specializes in working with digital art/paint systems, sat in ABC's Engineering Lab in New York City watching live feeds of the games. Working with an Aurora graphics system specially installed at ABC, she created some 220 individual pieces of electronic art during the playoff series—most in less than three minutes! Though some of the material was started beforehand, then finished and aired during the game, all of the work was done strictly on the Aurora system—with the aid of an MCI/Quantel digital still store, which allowed Carter to grab frames needed as the basis for her electronic paintings and store them when she was finished.

At first the directors in the mobile units out at the stadiums relied on black-and-white versions of the images

which were returned to them from the headquarters operation via standard circuits. The director would then call for Carter's image, and ABC's master control people would insert it into the live telecast. The directors found, after a point, that they were able to rely on Carter to the point that they would simply go to her automatically—a somewhat hair-raising experience for the artist, who had no opportunity to say no.

This was not Carter's first experience with virtually live on-air graphics. She began the electronic part of her career in May 1982, covering the Bay-to-Breakers mar-

actively—with extensive cooperation from the area's frequency coordinating committee. Other broadcasters are temporarily releasing unused channels for ABC's use, and the network has applied for temporary permission to use unlicensed VHF channels 6 and 10 at low power. Microwave is especially important to Barnathan for coverage of events such as the 10,000-kilometer marathon and bicycle racing, where extensive multipoint live pickups are required.

New engineering trends

This approach to microwave and communications marks the culmination of several years' effort by BO&E's engineering lab, under the direction of Phil Godfrey, to provide live coverage from many unique perspectives. Last year Godfrey and crew devised a remotely controlled POV camera that was installed in a race car to provide live POV shots as the car went around the track (see *BM/E*, October 1982, p.42). The same camera, mounted to a motorized hang-glider, was used by John Wilcox of *American Sportsman* to tape condors flying high in the Peruvian Andes (see *BM/E*, June 1982, p.14).

More recently, spectacular coverage of a climbing team's assault on Mt. Everest has been planned—to be climaxed by live coverage of the final ascent using three-tube Panasonic ReCam units down below and a stripped-down, single-tube unit carried by one of the climbers for a POV shot. Camera signals were to have been microwaved back down to a base station established at 23,000 feet, where a transportable earth station would have sent the image back live. Unfortunately, the Chinese government withdrew permission for the earth station installation at the last minute, but the technology to make the shoot work was already in place.

Godfrey points out that this same technology, which has brought ABC to a position of leadership in the engineering of live coverage, will figure strongly in ABC's Olympics coverage. It is also likely that some of the technology for live underwater video coverage will make its

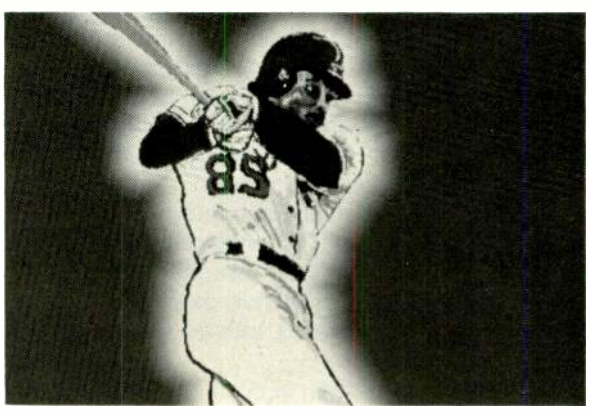
Demonstration of new technology, including remote-control POV camera, which may see Olympics use.

appearance in events such as synchronized swimming, swimming, and diving. Getting clearance from the Olympic Committee for camera placement inside the pools is the main obstacle here.

As important as these engineering plans are for actual event coverage, however, they may become even more significant in the "up close and personal" material already in production under the direction of long-time ABC sports director Chet Forte, who is heading up a special unit devoted just to this material. To be used as features during the Games and also as introductory programming prior to the Olympics, the portraits are designed to make viewers aware of the athletes on a personal level.

"We plan to cover the Olympics as a human event—not just a sports festival," says Barnathan. "That's why it's so important to have close-up technical capability. The safe route is to stay back with the wide shot; but we've got to have the technical capability to get in there close. People will get to know who the athletes are as human beings, not just athletes. They'll know how they live, where they live, about their kids—so they become people and you invite them into your home and you start to root for them."

Barnathan won't reveal yet the specific new plans he



athon for KRON-TV, San Francisco, which had just installed its Aurora system. Extensive preproduction involved presketching crowd scenes and the race course at strategic points, then calling up the sketches and inserting portraits of the leading runners as they entered her preselected scenes. The work was so rapid that, for example, the station was able to air Carter's image of the finish line winner within four minutes after the race was over.

The next step was to take the Aurora system out of the studio, and, with the help of Aurora president Richard Shoup, install it at Dodger Stadium in July 1982. Here Carter created images that were displayed on the stadium's giant Mitsubishi scoreboard, including several animation sequences. This was where she came into contact with ABC's production people.

"This kind of work would be perfect for the Olympics," says Carter, "especially since ABC will have the Quantel Paint Box in full operation by then. Three minutes doesn't seem like a lot of time to create a finished illustration, but with a few weeks' practice and preproduction with a machine like that, almost anything is possible."

As for the future of digital graphics in sports applications, Carter is enormously enthusiastic. "The technology is just becoming available now," she observes, "and everyone's waiting to see what the next guy will do. Digital art systems are also really expensive right now, the ones that make good images for television. But I think their time is coming—maybe they'll become as popular as the Chyron in the tape truck. This is going to become *the* tool of the graphics artist in the '80s, and the images which people make are going to become more and more complex as artists learn to use the systems."

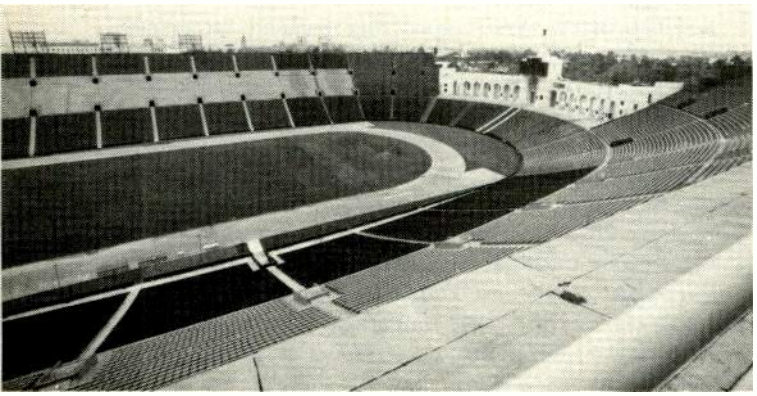
Carter herself has extensive plans. Following the Olympics, if she gets the nod, she'll begin work on a major series of electronic illustrations—a history of civilization in the 1980s, sketched electronically on a digital bit pad.

has, fearing he will be "scooped." But the point-of-view material is logically a big part of those plans—perhaps allowing the audience a view of what the track looks like to an athlete training for the marathon.

Olympic graphics

Another area of some secrecy is the graphics material ABC is assembling to help define the identity of its coverage. Harking back to ABC's coverage of the 1980 Winter Olympics from Lake Placid (see *BM/E*, February 1980, p.29), it seems safe to say that this part of the telecasts will be nothing short of spectacular.

Preparation of the graphics material began almost as soon as the 1980 Olympics were concluded. Under the leadership of coordinating director Roger Goodman, the nine-person Olympics Graphics Unit has been at work almost full time for the past year actually designing the various elements of the presentations. A major new element in 1980 will be the addition of all kinds of electronically generated charts and graphs to document various parts of the athletic performances—similar to computer graphics designed for business applications, but with far greater visual sophistication. Another major element being developed is the specific form in which the various scores and tabulations will be presented—just the right number of lines with just the right character height and spacing in just the right color combinations. Still another feature to watch for will be a full-color interface between the computer providing official timing and the on-air display system, so that official timed results can be viewed simultaneously by the home audience. This was originally premiered back at the 1980 Winter Olympics, but the full-color display has been added since then.



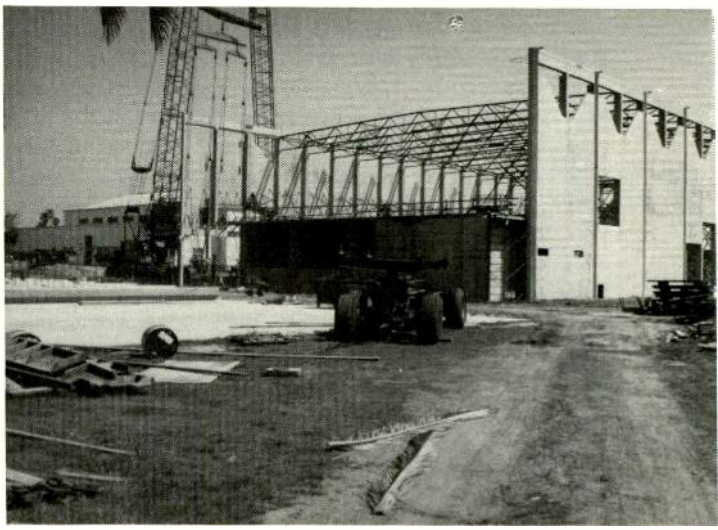
Los Angeles Coliseum, venue for track and field.

Goodman points out an even greater reflection of changing times: While the bumpers and logos used in the 1980 games were created by Image West on its Scanimate system, those for the 1984 coverage are being created in-house at ABC, primarily on a Dubner CBG-2 that has been installed at the Graphics Unit for several months. Work done on the CBG-2 will include animation moves for the Olympics logos, plus key and matte frames for insertion of images such as "up close" segments, athlete portraits, scoreboards, and medal totals. This new Dubner system incorporates a drawing tablet and 4000 colors.

Also added to the Graphic Unit's capabilities in early March was an MCI/Quantel Digital Paint Box, which will also be used in the preparation of the various logos and bumpers. At the Los Angeles site itself, the graphics unit will consist of two to five Dubners, two Quantel DPE-5000 Plus effects generators with the Dimension software package, a Quantel Mirage, plus "innumerable" Chyrons, Quantel DPEs, and so forth.

ABC possibly may use the Paint Box during actual coverage—to provide "instant portraits" of athletes and events (see "Live Computer Graphics," accompanying this article).

Goodman's plan is to supply each producer at each venue with his or her own set of graphics materials—everything the producer will need to create a self-contained show from that event. This will include, on one-inch videotape, all the short animated sequences created on the Dubner for that event, an animated logo for the event, "up close" lead-ins and tags, and so forth, plus a Chyron IV disk containing all the producer's material, graphics emblems, color choices, type fonts, and so on, burned in so they cannot be erased.



New ABC Broadcast Facilities under construction.

"We're creating a set of electronic production books," explains Goodman. "The producers are autonomous units and free to create their own programs. But we are going to give them the materials they will need to make sure the program integrates with the hundreds of others that will be going on."

The final coordination, of course, is Goodman's own, since he will be personally directing most of the prime-time programming during the 16-day event. These duties will, of course, be shared with other directors and producers of the different dayparts since coverage will begin at 10:00 a.m. and run until 5:30 p.m., break until 7:30 for local network news, run until 11:00 p.m., and return from 11:30 until 2:00 a.m.

"The Olympics and TV are really made for each other," concludes Ruhe. "It's just the best event that television does." And, come the start of the games next June, ABC will once again have the chance to prove that it, too, is the winner when it comes to sports production. **BM/E**

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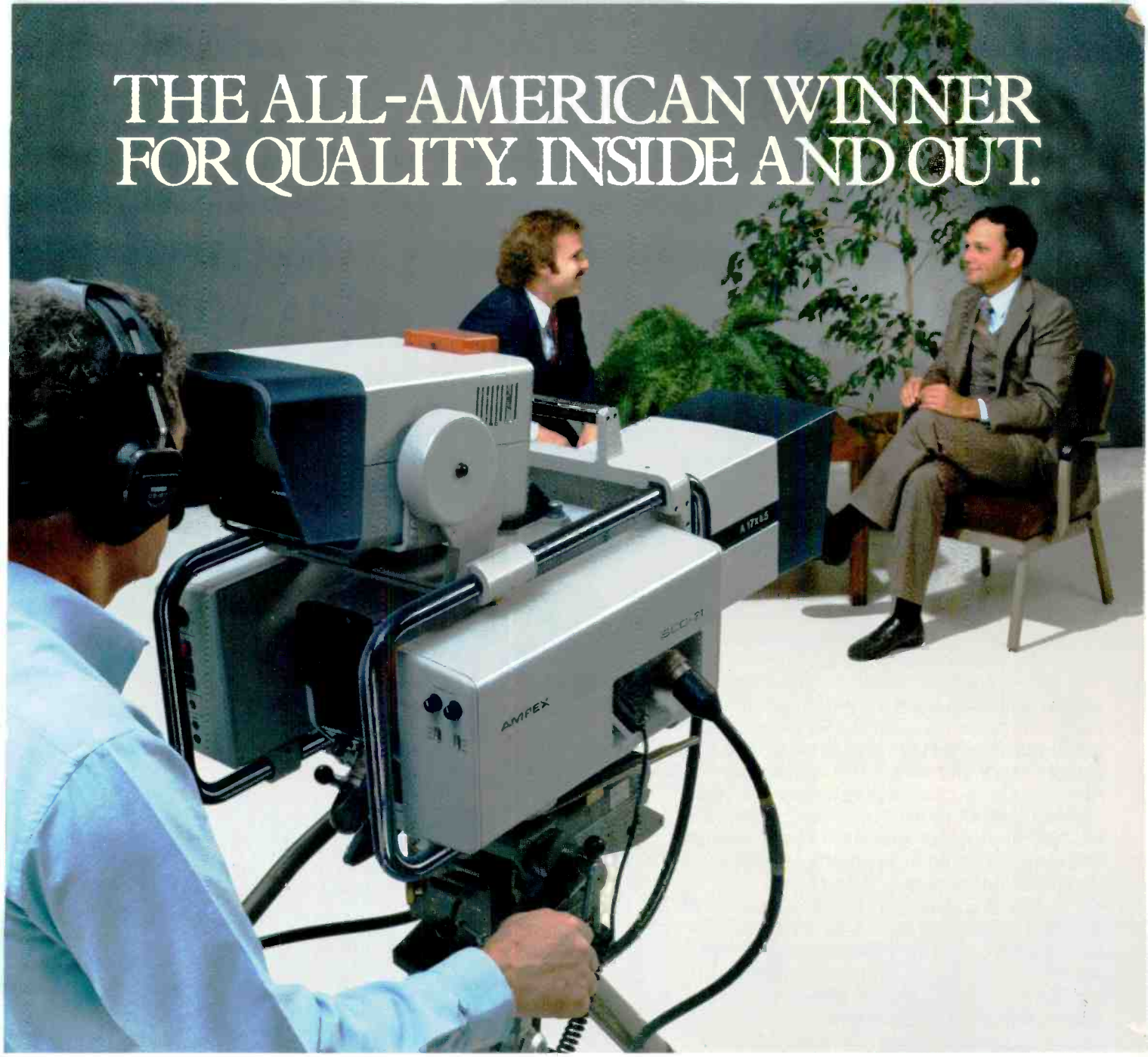

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while the editing rooms will use Neve 10X2 portable mixers. There will also be 12 four-channel portable mixers used throughout the broadcasts at different locations.

Because of the uniqueness of the situation, a good deal of the equipment was custom-made or modified to meet specific demands—such as the 50X50 custom routing switcher, and the specially designed studio racks with the system interconnect.

The tape decks in use, all purchased for, and specifically dedicated to, use for the 1984 Olympics package, will be 13 ITC triple-deck cart recorder/reproducers and seven Technics cassette recorders. Heavier-duty assignments will be handled by 18 Otari 5050B-II reel-to-reel machines with cue speaker, shipping case, and pedestal. Otari worked with Martinez to meet some of the specific production demands, such as a power switch relocation and protection on the lower panel of the pedestal, remodeling and relocation of the editing block, and other small details which become important in a high-pressure situation such as recording a piece of history.

All of this equipment has been integrated into the system so that, after the studio and distribution racks and interconnect cables have been shipped from the Republican convention, the entire studio building can be hooked up with levels tested in a matter of a few hours.

Complex communications

More difficult, however, is organizing the communications system. Considering the extent of communications difficulties and requirements posed by the Los Angeles area, it was necessary for all of the networks involved to deal with the Los Angeles RF coordinating committee with its monthly reviews to keep pace with the constant changes occurring in the area.

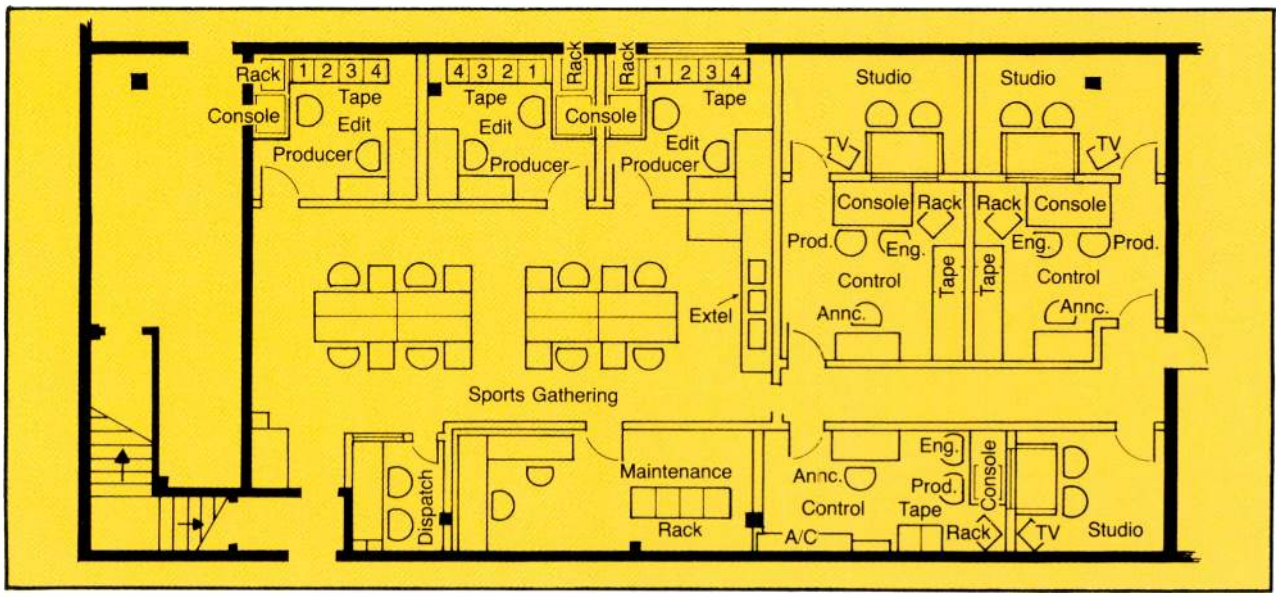
The studio intercommunications will be handled by a customized Ward-Beck MicroCom 48X24 intercom/IFB system. The communications between the venues and the studio will, of course, present a greater challenge, given the RF difficulties of the region and the distances of the different sites from the studios (one as far as 40 miles).

Martinez, having done work in Los Angeles before, was aware of the RF problems: "I decided if we were going to use RF, the relays would have to be small jumps, and as few as possible. We will use Marti equipment for our RF and IFB communications." For the larger communications demands, Martinez chose the Motorola Specialized Mobile Radio system. Motorola will be supplying the network with a five-channel SMR system to be used especially for the Olympics and which may later travel to the Democratic convention. The system, chosen because of the privacy and efficiency provided, consists of four communications channels and one control channel operated by microprocessor to constantly monitor all radio channel conditions. In addition, there will be two portable repeater systems with four repeaters in each, along with 30 mobile units and approximately 20 hand-helds.

Facilities for world broadcasters

As an adjunct to the building design and equipment planning for domestic broadcasting, ABC, as the host network, also has the responsibility of designing a facility to headquarter the international broadcast community. For maximum efficiency and flexibility, a small park of four trailers will be assembled on a wooden platform with a substructure supported by wood and metal legs. This provides a space through which to run cable that will be easily accessible in case repairs or changes are necessary.

On the left side of the platform is the trailer housing the



Newly built ABC Olympic radio broadcast center shows three broadcast studios with video monitors, three edit studios, and maintenance areas.

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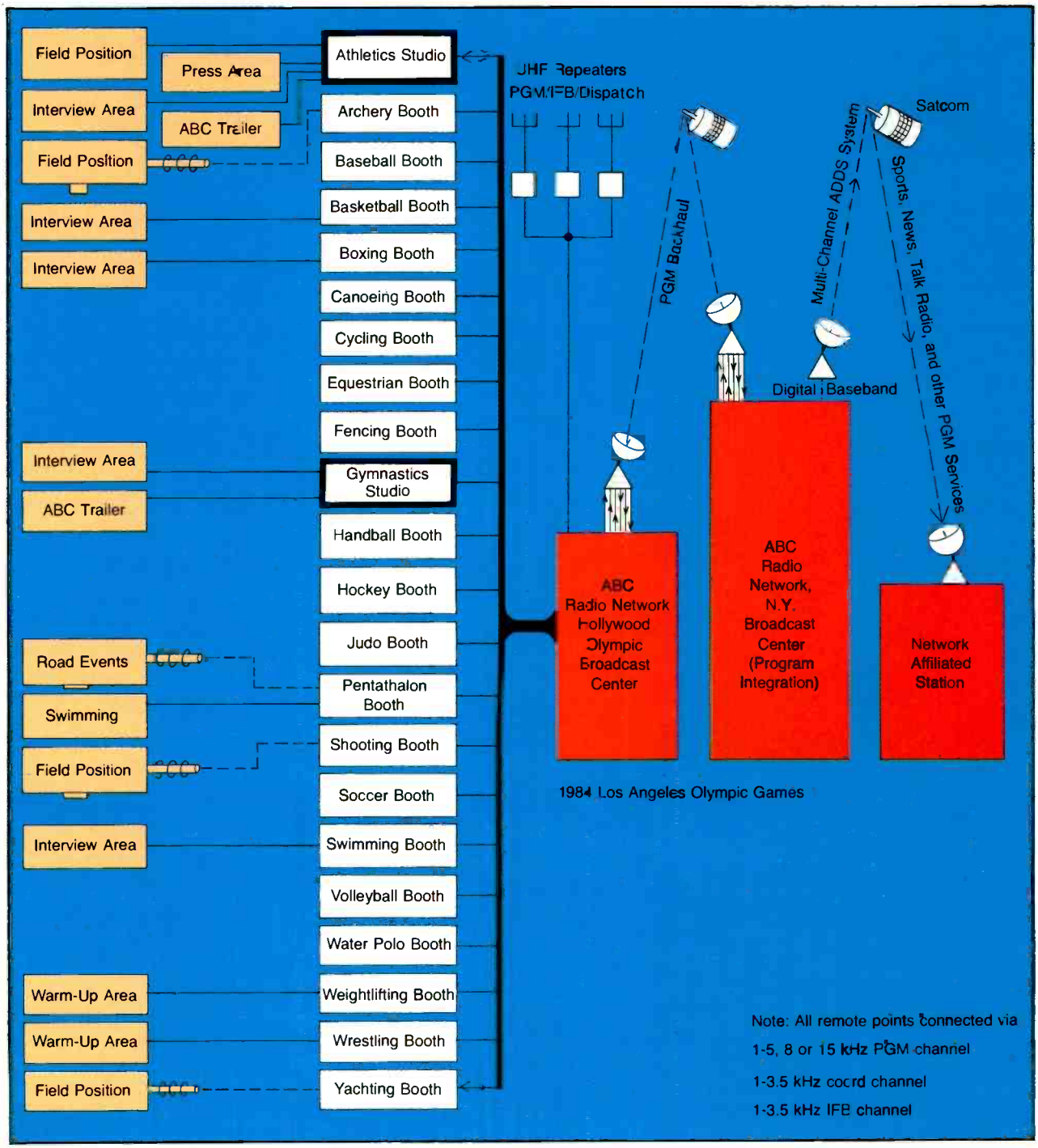
distribution center, consisting of an office, an engineering shop, power, telco interface, and audio distribution rack space. Next door is the largest trailer, the European Broadcasting Union's building, consisting of four complete studio/control rooms accompanied by offices, teletype areas, video feeds, and writing desks. The two smaller trailers house the German ARD/ZDF broadcasting organizations using a studio and control room, edit rooms, video feeds, and large office space.

An added obligation incurred by ABC as the host is that the network must supply, to any international broadcaster who requires it, a full complement of quality equipment to



Los Angeles communications requirements are illustrated with graphics showing signal path from field to network feed.

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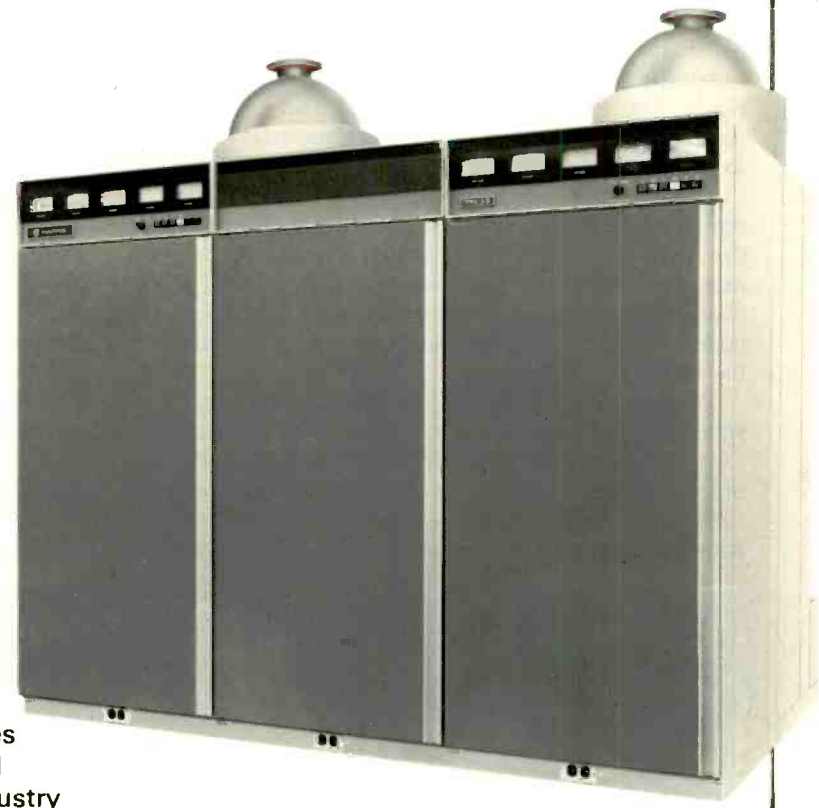

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Production plans

The entire engineering and equipment package, including the design and completion of new facilities, is an accomplishment unequaled in radio sports broadcasting. Yet it is not the only precedent-setting aspect of the upcoming Olympics broadcast.

The several million dollars paid by ABC to obtain exclusive broadcasting rights to the 1984 Olympics in Los Angeles marks the first time in broadcast history that the radio side of broadcasting has purchased such exclusive rights. ABC will have more coverage than ever before, making extensive use of its satellite transmission system to justify it economically.

There will, of course, be other networks at the games, despite ABC's exclusive rights. Mutual, for example, like the other networks, will be reduced to doing three three-minute programs per day, separated by at least three hours. These segments must be broadcast in the form of news items and can be live, direct, or taped material from the venues.

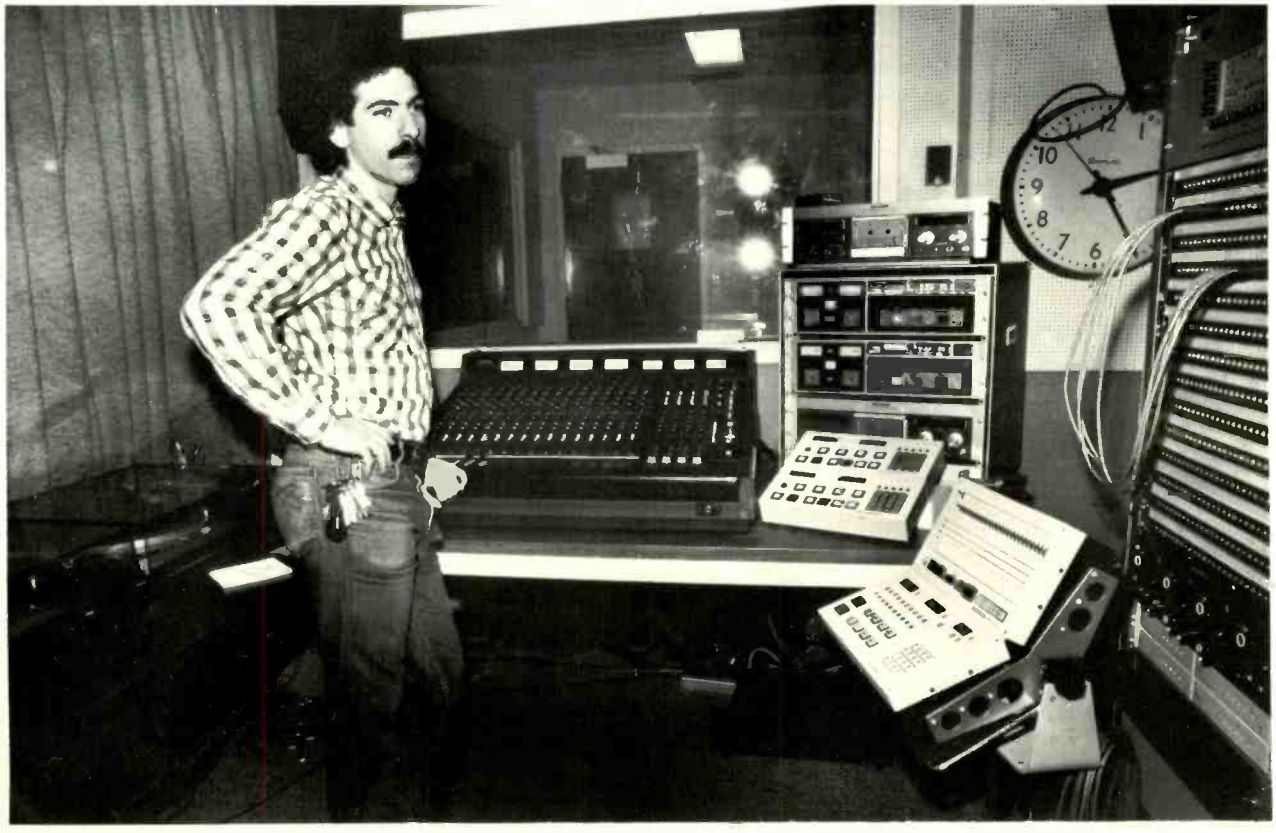
The rest of Mutual's Olympics coverage will be regular sports programming from nonvenue sites such as the Olympic Village, news conferences, or interviews with officers of the International Olympic Committee, and with athletes and coaches—all away from the venues. Broadcast facilities are tentatively planned to include a leased trailer, together with the studios of one of Mutual's local affiliates. In conjunction with the local sports crew and support team, the network will add 14 more people.

Though this type of coverage would be adequate considering the restrictions, Mutual decided not to stop there. One idea that is being reviewed is to originate the popular Larry King talk show from the area (perhaps the Queen Mary) in the 9 p.m. to 2 a.m. Pacific time slot.

To add to the already considerable list of Olympics-related broadcasting, Mutual vice president of sports John Chanin has conceived what appears to be the biggest pre-Olympics broadcast program ever. According to Chanin, "The five-minute programs will begin on July 4, 1983 and continue through July 27, 1984. They will be broadcast twice a day, 14 times per week, and will include former Olympians, athletes, and coaches."

Until the Winter Games in Serajevo, the shows will include seven summer and seven winter-related topics per week, afterward covering solely Summer Olympic activities. Some of the sports luminaries involved in this undertaking include the current U.S. Olympic basketball coach Bobby Knight, gold-medal-winning hockey coach Herb Brooks, boxing great Ray Leonard, and former gold medalist in the decathlon Bob Matthias.

The programs will include commentary from these experts on the conditions and chances of the athletes and teams, as well as taped interviews, conducted by athletes, originating from Mutual's Washington, DC headquarters. Chanin claims that Mutual expects to clear the program



Technics turntables, Otari MPR-90 E-II multitrack, and MPR-10 four-track are part of Olympics studio package.

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with most of its affiliates, perhaps over 400.

The engineering details have not been completely worked out yet, but communications, according to Mutual's Olympics engineer Dave Roycraft, "will be comprised of two-way radios using uncommon frequencies, something off the standard band." There will be land lines back to the local studio which will dedicate some of its equipment and operations to the Olympic effort.

The other networks, though with less activity formally planned, will be there as well. NBC has stated no formal plans concerning its Olympic broadcast other than to say it will be there and, considering the exclusivity restrictions, that it is in the process of developing a way of supporting the three-minute segments with pre-Olympic broadcasts and news wrapups.

With slightly more of his plans in detail, Frank Miller, vice president of CBS radio programming, says the network intends to anchor Brent Mussberger out of KNX-AM, the CBS O&O in Los Angeles, "from the opening to the close of the games. We will concentrate on news updates three times a day and on interviews from the press locations and the Olympic Village." CBS will take six people to the games in addition to using the local staff from KNX. In this way, the network will be taking a local news angle with reporters in the field detailing not only results of the competition, but the impact of the games on the area and its population.

Only 16 months from now, the runner bearing the Olympic flame will ascend the steps and light the ritual fire which symbolizes the training, preparation, and competition shared by the dedicated Olympic athletes. At the same time, the giant Olympic pyre will mark the end of the preparation and building of radio's commitment to the games. New facilities and engineering teams will be in place. The mics and recorders will be turned on. And the competitive effort will be under way, with each network attempting to draw out something extraordinary with whatever resources are available. Let the games begin! **BM/E**

ITC carts, Yamaha console, auto-locators, and nearby patch panel viewed from engineering position.

The travelling studio at ABC consists of a Yamaha console, ITC carts, an Otari auto-locator for MTR-10s, and a rack including Lexicon digital processors.

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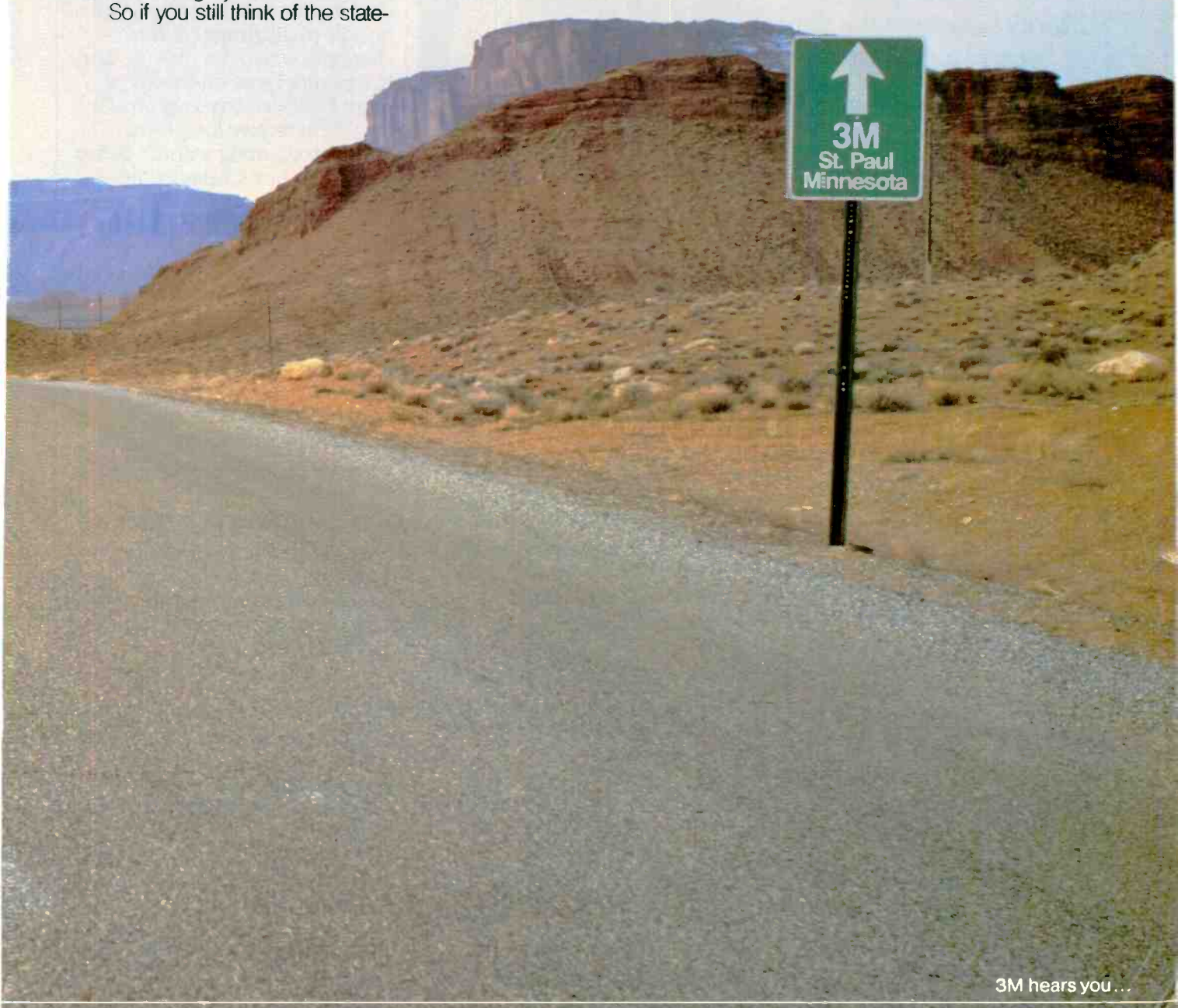

3M hears you...

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A message for radio broadcasters from Scientific-Atlanta

Preparing for the next generation of radio

The age of digital satellite radio transmission is beginning now. Here's how to make sure you're a part of it.

Four radio networks are in the process of converting to digital audio program distribution.

In 1983, the networks will begin offering programs available only via satellite. In less than two years, you will lose almost all land-line distributed programming. You need to prepare for the change today.

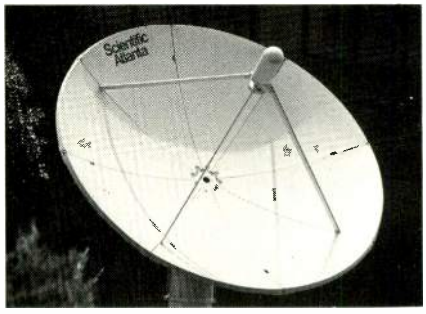
Why the switch to digital audio?

The signal that can be transmitted by digital satellite to your station is crystal clear and dependable. Distribution is genuinely transparent. The use of a digital audio earth station gives you flexibility you've never had before. Because the earth station is yours, you can use it any way you like to pick up a whole new range of programs from any number of sources. You have, for the first time, full control and flexibility.

Why Scientific-Atlanta?

After carefully studying the options, the technical experts at ABC, CBS, NBC, and RKO independently chose Scientific-Atlanta as the best source for both sending and receiving equipment for digital satellite operation.

Scientific-Atlanta is the pioneer in this type of broadcast equipment. We're the largest manufacturer and installer of earth stations.



The familiar Scientific-Atlanta satellite dishes will soon be in use at network affiliated radio stations all over the U.S.

Because of our advanced technology, our system is also the most cost effective. At the same time, it's the one best suited to the current and future needs of the radio broadcast industry.

There's an added benefit. Because these major networks are all using Scientific-Atlanta equipment, you're guaranteed compatability. Several other networks are also evaluating the system for their own use.

Low cost

The cost of a digital satellite receiver is very reasonable when you consider the technology involved, and the vastly increased programming flexibility that comes along with it.

If you own or lease the station, you get the benefits of available tax credits and depreciation allowances.

Scientific-Atlanta and your affiliated network will help arrange the most advantageous payment plan for you.

What kind of programming?

There are network plans for TV simulcasts, music specials, remotes, overnight and weekend specials.

The effect on your network news coverage will be phenomenal. Because each network will be able to distribute multiple channels, you'll be able to carry live events, more on-the-spots, more extended coverage. You'll be able to receive long-form stereo programing without being interrupted by scheduled news broadcasts.

This is the first major advance in radio technology in thirty years, a chance to increase your program selection, the quality of your signal, your coverage of news events, your appeal and saleability to your public and your advertisers. It gives you the freedom to access and broadcast national programming of every description, something you've never had before.

Installation has started

Over 1000 stations have already made the commitment with Scientific-Atlanta and are planning the installation of their earth stations.

Call for details

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KEEPING LIGHTNING AT BAY

Damage from lightning is one of the broadcaster's most common experiences. But protection systems developed in recent years can markedly improve the chances of living safely with lightning.

by Robin Lanier, Senior Editor

EVERY DAY THERE ARE some eight million lightning flashes in the earth's atmosphere, each signalling the swift passage of an enormous quantity of electrical energy. And every day, a fair number of those lightning strokes cause trouble for broadcasters, ranging from exasperating interruptions of operation to massive destruction of equipment.

Lightning has had this meaning for broadcasters since the beginnings of the industry, and lightning damage is still a definite element of the cost of many broadcast operations. However, in the last few years there has been real improvement in the devices and systems intended to protect broadcast plants from lightning. There is no proof that "protection" in this case means guaranteed 100 percent immunity. But the new systems are clearly improving the *chances* of escaping lightning damage.

200,000 amps!

The reasons why lightning protection for the broadcaster is difficult are clear. His equipment is highly vulnerable. His antennas reach up to pull the lightning in. And his electronic units, built to have sensitivity over the range from microamperes to a few amperes, can be instantly destroyed by 20,000 to 200,000 amps, with voltages to match. The universality of solid-state equipment has increased this sensitivity even more.

Moreover, the broadcaster's exposure extends far beyond receiving a direct hit. Lightning striking a power line or communications line far away can send the broadcaster serious trouble over the line in the form of surges of current or transients of high voltage. Or the trouble on the lines can come from energy induced in the lines by lightning that did not even hit, but passed nearby ("nearby" may be 15 miles away).

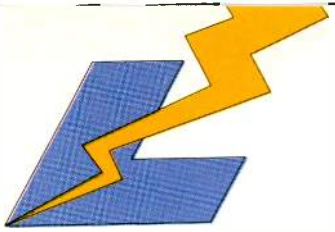
A large variable in the lightning experience for a broadcaster is the location of his plant. As the accompanying map shows, the average incidence of lightning in the U.S. varies from about 90 lightning-days a year in parts of Florida, to as low as five days in the Pacific northwest.

A very tall antenna in flat country multiplies the chances of a lightning strike many times over. If the antenna and transmitter building are on top of a high mountain, lightning hits are likely to be even more frequent. And the high-altitude plant is apt to suffer seriously from a kind of proto-lightning effect, voltages induced in power lines and communications lines by intense electric fields between cloud and earth.

Protection plans

Protecting the plant from lightning comes under two main headings. If some part of the plant (usually the antenna or antenna tower) takes a direct hit, the objective is to get the energy to the ground with the least interruption along the way. More common is the job of keeping out of delicate equipment the surges and transients that come over lines from faraway hits, or that are induced in plant wiring by strikes to the antenna or any other nearby object. This part of the job requires some form of blocker or "eliminator" in the line.

An understanding of the details of the plant's vulnerability, a careful taking into account of the main exposure points, has to precede a lightning protection plan. In most cases the antenna and tower are the natural setting for the majority of direct lightning hits. The grounded tower (FM and TV) is obviously different from the tower insulated from ground (AM). If the grounded tower is, in fact, *very* well grounded, and is a large substantial metal structure, the tower itself may take a lightning stroke without being hurt.



Actually, the flow of electricity in a lightning strike is not from the sky to the ground but from the ground upwards, so that the meaning of "well grounded" will vary widely depending on the character of the soil and other circumstances of the installation. The basic principle is that there must be a considerable area in the ground around the tower through which the lightning current can flow into the tower against extremely little resistance. Since the charge in the cloud induces an opposite charge over an area on the ground, the ground charge has to be drained very efficiently when a stroke hits to avoid high, damaging voltages at high resistance points.

Broadcast engineers are familiar with buried plates, antenna ground radials, and other standard methods for extending the ground plane around the antenna. For high immunity to lightning damage, the ground plane has to have very high conductivity: the antenna designer may want to figure what he needs for the ground plane and then, with lightning in mind, perhaps double that.

Rocky or gravelly dry soil imposes a special burden. Transmitter installations on mountain tops often suffer not only from the altitude but from low soil conductivity.

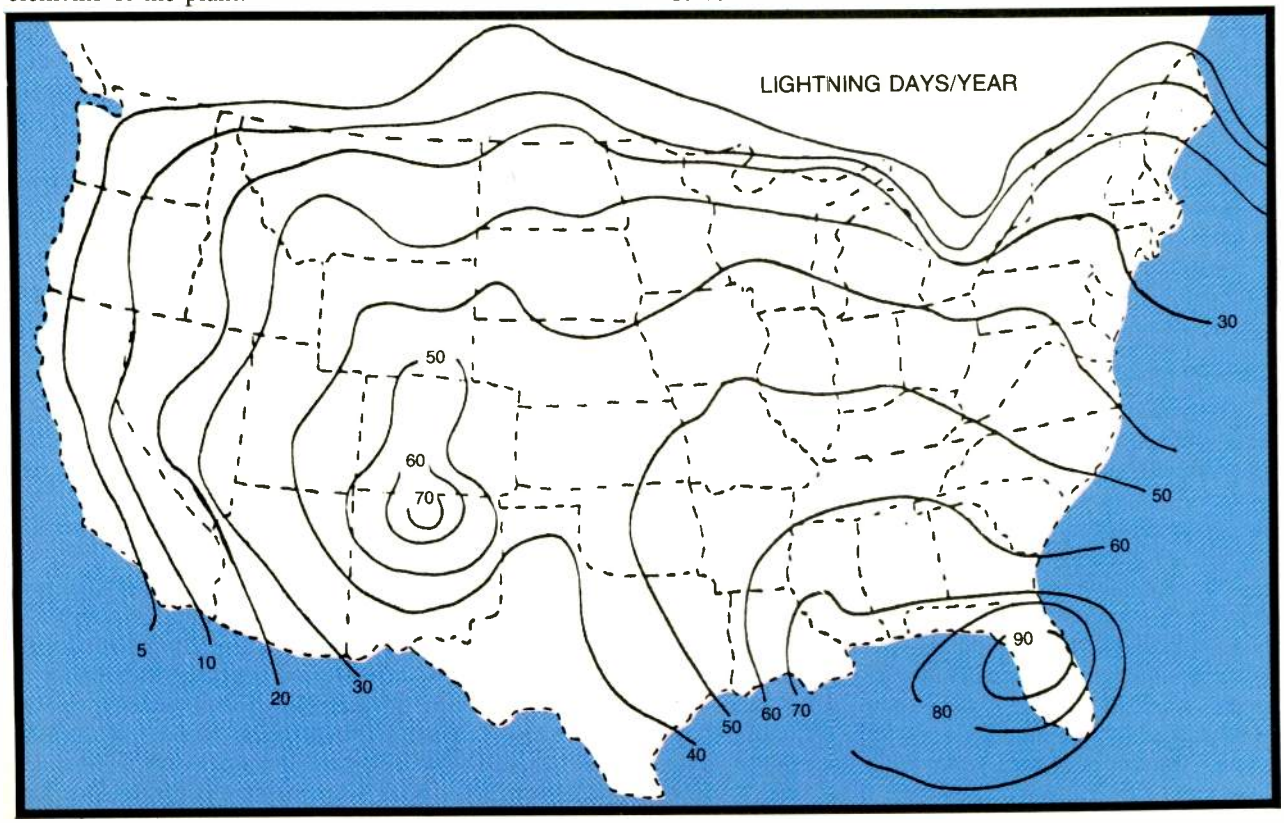
Even at low altitudes, sandy soil may make heroic grounding measures necessary. Ted Miofsky, chief engineer of WSRZ-FM in Sarasota, FL, relates that his predecessor on the job used to sleep at the plant in summer, to be on hand for prompt repair of lightning damage. A part of an effective protection plan there, because of sandy soil, was a well 120 feet deep for grounding, fed by very large grounding straps running from the tower and from other elements of the plant.

Extremely good grounding has to be applied to the tower itself and to any transmission lines that go up the tower. Tom Vaughn of Micro Communications, who installs many microwave and TV antennas, says that he puts transmission line hangers at frequent intervals up the tower, using very heavy metal tightly bonded to the tower. If coax has a plastic sheath, this must be stripped off at about four-foot intervals, and heavy silver braid attached for connection of the outer conductor to the tower. The inner conductor can be grounded to the outer one through a tuning stub. These precautions are essential because the passage of a lightning stroke through the tower is likely to induce a tremendous jolt in the transmission line, which must be carried safely to ground.

Grounding is also needed for other equipment often found on the tower, such as two-way radios, de-icers, beacons, and other similar units. For the Marti two-way radio equipment, for example, the maker has developed a grounding kit which can be added to any unit installed on a high tower. It uses a number of methods for making the outer shield of the cable going up the tower a very low resistance path to ground. This minimizes the development of dangerous voltages between the Marti unit and the tower when heavy induced currents are flowing down the shield.

Surge protection

A separate part of the lightning problem for such tower-mounted electronic units are the surges and transients coming up the power or signal line. A surge eliminator blocks the energy of a wave of very high amperage travelling along the line. The device must respond extremely quickly to protect solid-state equipment, preferably in a few nanoseconds. This kind of speed is one of the main advances of recent years, made possible through the use of solid-state switching in the protection devices themselves.



"Isokeraunic" map shows average incidence of lightning in the various areas of the U.S., as expressed in lightning-days per year.

The surge eliminator has to include a dissipation section into which the excess energy can be dumped. Thus energy capacity and speed are the two main characteristics.

The transient eliminator deals with short spikes of very high voltage. The main action is spilling the excess voltage over to a ground line so it does not reach the protected unit. Again, very high speed is needed to keep solid-state equipment out of trouble. Solid-state switching like that of a Zener diode is the basic method.

A surge eliminator is needed where the power line enters the unit, or, for more assurance, a combined surge-transient device now made by some firms. An appropriate eliminator on the antenna side will also be a good idea. Note that eliminators for power lines at 110 volts are different from those designed for RF lines.

De-icers and beacons are vulnerable mainly through the power lines coming up the tower. Rick Brodhead of RCA, specialist in UHF antennas, points out an additional hazard of losing part of the de-icing capacity (besides losing de-icing). If the antenna is warm on one side and cold on the other, it is likely to bend over, distorting the radiation pattern. He recommends good protection in the de-icer power lines.

AM insulated towers

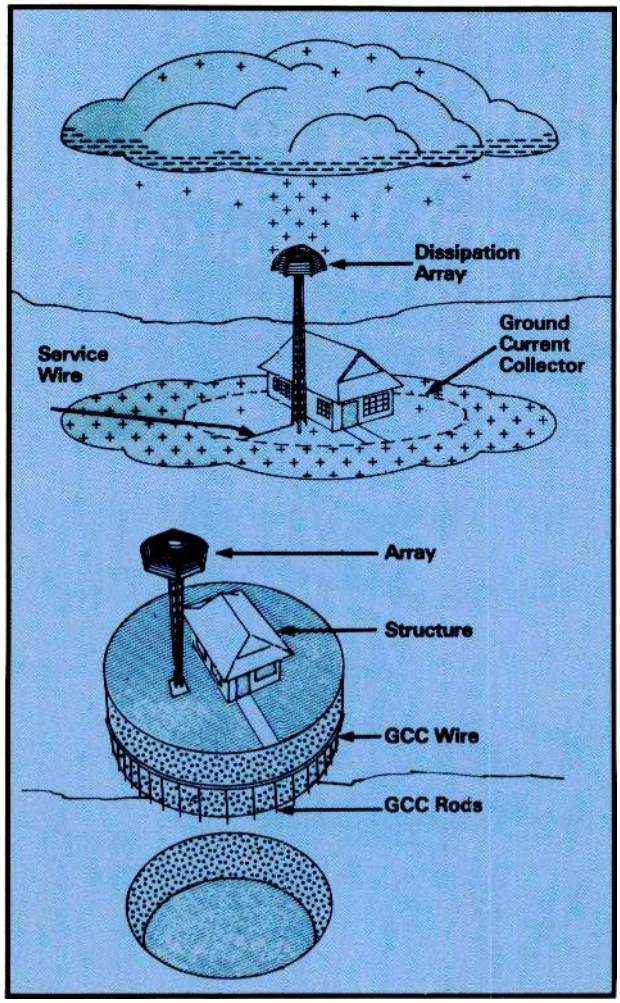
The antenna tower insulated from ground presents the problem of getting the lightning energy across the insulator. Often used is the old "lightning arrester" principle, familiar for generations from the standard lightning rod, based on a gap across which lightning passes easily but which insulates the normal voltages in the system from ground.

This principle has generally been applied to antenna towers in the form of a "ball gap," two highly polished balls on a screw mechanism that allows the air gap between them to be adjusted precisely. The ball gap, still very widely used, has a measure of effectiveness.

But again, a need for higher speed is turning attention to the nanosecond action of solid-state switching and gas devices of advanced design. Ken Stout, chief engineer of WPAT in Clifton, NJ, with an array of four AM towers to direct the signal toward New York City, complains that comparatively slow action in ball gaps has sometimes allowed tremendous lightning voltages to build up and feed into the tuning house next to the antenna array. On at least one recent occasion numerous capacitors, coils, and other components in the elaborate tuning system were blown to smithereens.

WPAT is currently going to a more elaborate lightning arrester system on the towers, using extremely fast gas-tube and solid-state switching. Stout says the change is motivated in part by another hazard that broadcasters now have to consider—the deadly, almost cosmic electromagnetic pulse, or EMP, that can be produced by a large atomic explosion high in the air. This manmade wave of destruction is widely acknowledged to be a possibility of the atomic age. The experts say that one such pulse could knock out all communications systems in the U.S.

The protection needed against lightning is also, in general, the protection against the EMP. The latter simply has to be very fast, very complete. Note that, like lightning, an EMP can send trouble over power and communications lines for long distances and the eliminator devices are thus relevant in a double context. Many makers of such devices are now offering models they say are effective against the EMP; the broadcaster has to consider how strong his shield is against this nuclear-created danger.



Design plan of Lightning Elimination Associates' dissipation array is illustrated by (left) distribution of charges between cloud and array and (right) ground-current collector structure.

A special hazard of insulated towers comes from extensive systems of guy wires. Metal guy wires can pick up damaging voltages from direct lightning hits, from energy induced by strokes in the towers, and often from the high electric fields already noted as a hazard in some locations. John Bruna, chief engineer of KFAB-AM in Omaha, says that high voltages on the guy wires for his three towers caused many outages by bridging or destroying insulators. The solution was a "dissipation choke" (this one from Lightning Elimination Associates) which has high impedance to the RF frequency but a low-resistance path to ground for the induced energy.

The same device solved a severe guy wire problem for KWOA-AM in Worthington, MN. James Wychor, general manager, says that for more than 30 years the station often had trouble with guy wire voltages when a dark cloud was overhead, even in the total absence of lightning. The induced energy, sparking across insulators, could knock the transmitter off the air many times in a minute. The only solution had been a shift to a low, flat-top antenna to escape the "static," reducing coverage substantially. But since the dissipation choke went in, there has been no trouble of the old kind.

We note again the necessity for good analysis of each plant's exposure points, which can be a complex operation. An example may suggest the kind of thing to watch

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A frame synchronizer from Tektronix that sets a new standard of comparison.

Now. Authentic reproduction from any signal source. The Tek 110-S is the frame synchronizer with 10-bit resolution and accuracy. Performance that's every bit Tektronix! You get highest signal quality with correct SCH phase from any source. Resulting in the least signal degradation of any frame synchronizer on the market today.

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Accurate color framing. With the adaptive decoder or optional four-field memory, field 1 to field 3 conversions can be accomplished without introducing 140 nanosecond picture shifts. With four-field memory (one complete color frame), accurate color framing can be obtained without decoder artifacts.

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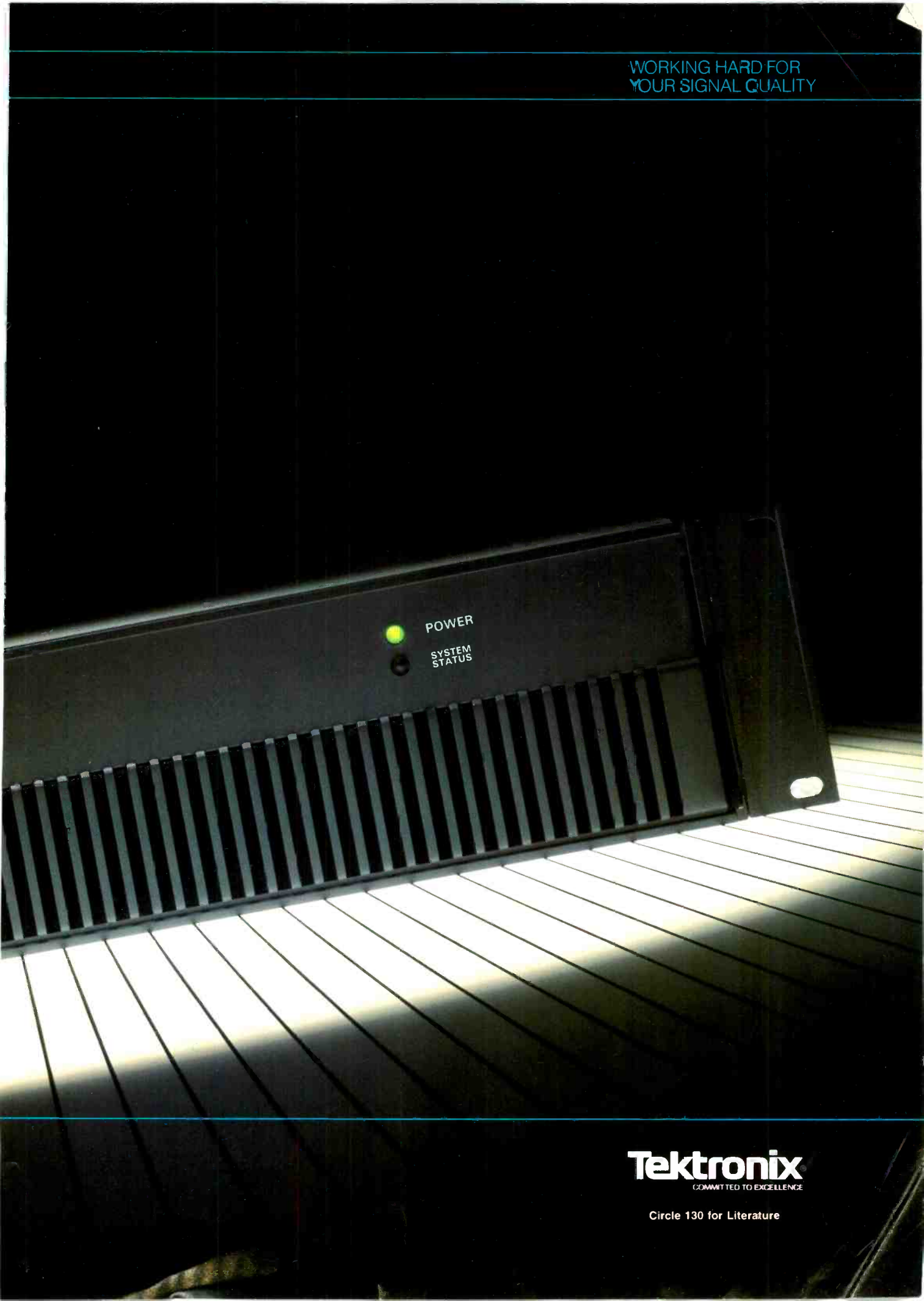

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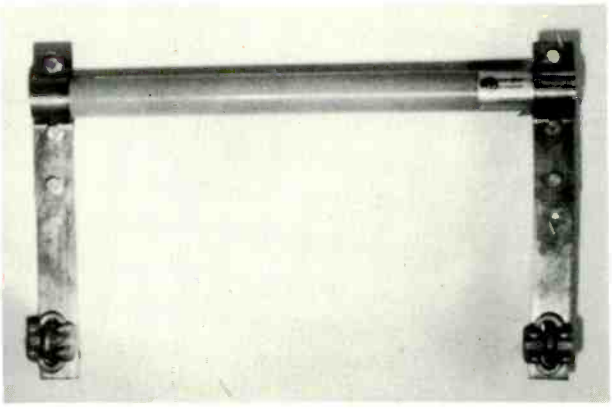
for. Mike Coyle of MCG, manufacturer of several models of eliminator, points out that a communications or transmission line from studio to transmitter building needs excellent protection at both ends. If lightning-produced energy is flowing to ground through an eliminator at the studio end of the line, even a tiny resistance can raise the whole system to 1000 volts or more above-ground for a short period. This voltage is immediately transferred to the far end of the line and unless it is blocked there can damage equipment connected to the line.

Computer power systems

Computer equipment and data equipment using TTL or similar circuits impose a special problem. It is not only that the small solid-state devices are very easily destroyed by high voltages, but also that small voltage errors can cause faulty data responses even without actual damage. So protection from surges and transients, needed both at the input and output of the systems, must be supplemented in some cases by close voltage regulation. And the power voltage must be *continuous in time;* losing even a few cycles may cause improper operation.

Thus the broadcaster must know thoroughly the supply requirements of his computer and data equipment. If it does need extremely close voltage control and continuity, he may want to get an "uninterruptible power supply," or UPS, in which the power is produced locally in an inverter system under close regulator control, with the primary power coming from the commercial supply supplemented by batteries that instantly take over if there is a commercial failure. This immunizes the data equipment from both



Dissipation choke from LEA carries lightning-induced energy around guy wire insulators, but has high impedance to the RF energy.

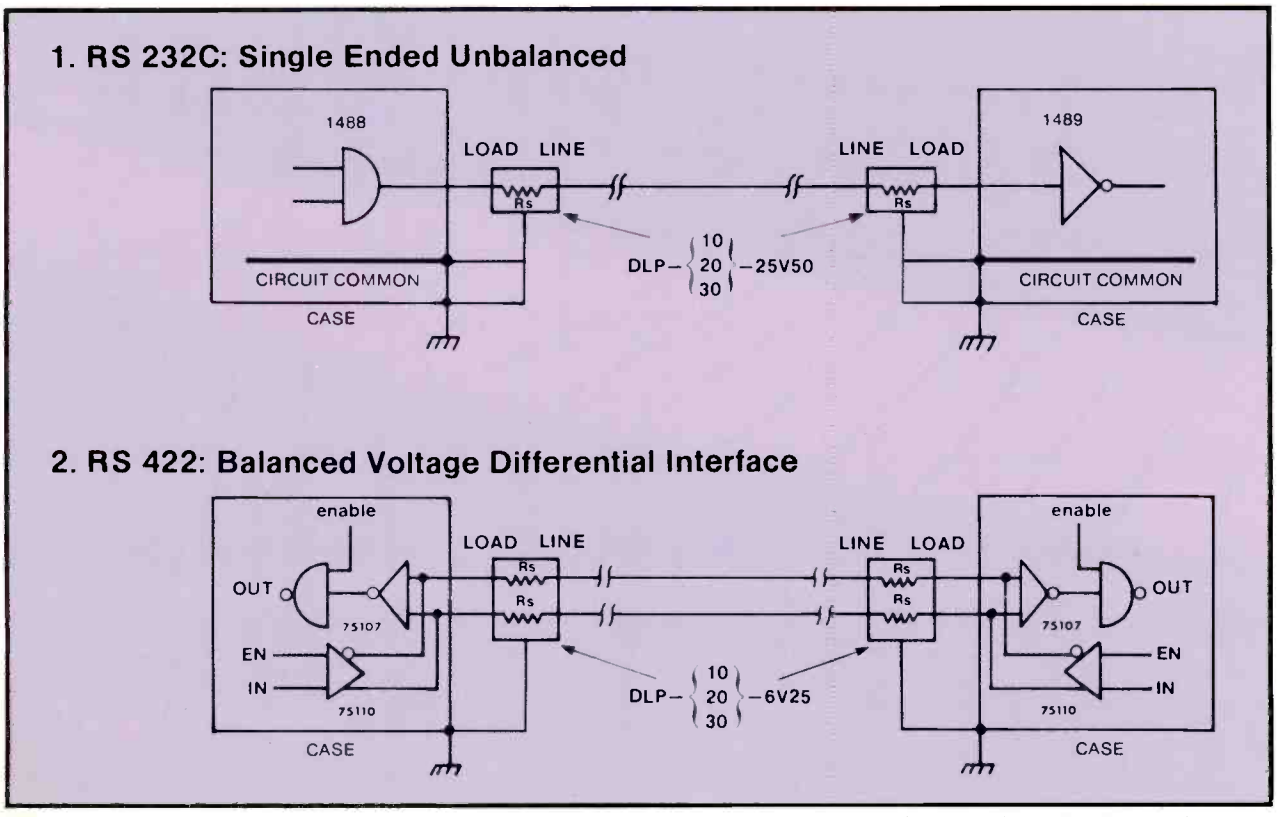
lightning and commercial power failures (and from transients on the line from power company switching, load variations, and other events that often disturb commercial voltage levels).

Several firms make excellent UPS systems. Art Hatlestad at Pacific Power Supply Corporation emphasizes the double value of the equipment—in isolating the data equipment from lightning effects, and from commercial power disturbances.

Data equipment needs protection at the input end as well as at the power end. Induced excess voltage on a signal line can be devastating to a computer. Manufacturers of eliminators often have models intended specifically for signal-level lines carrying RF or data signals.

Satellite antennas

More and more common for broadcasters is also the need to protect satellite dishes. Mark Fehlig, satellite specialist at Harris Corporation, notes that the whole dish and its support are well grounded, so that lightning damage di-



Diagrams show MCG Electronics signal-line protectors in coaxial cable to keep damaging transients out of data-handling equipment.

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Solid support completes the package. The 1910 comes with a worldwide service network and proven technical support, plus the Tektronix reputation for reliability, excellence and long-term value.

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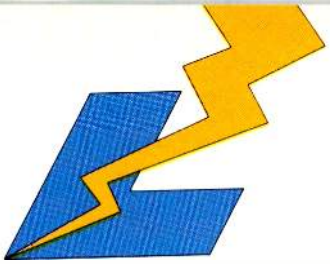

rectly to the dish is not likely. However, a glaring weak point is the LNA, a super-sensitive electronic system in the center of the antenna, connected by long power and signal lines to the studio. Lightning-induced voltages on these lines are a real danger, and eliminators to keep those voltages out of the LNA are most desirable.

Wayne Hetrich of National Public Radio, senior engineer, research and development for NPR's satellite net, says they try to get the dish in the midst of other, taller structures as some protection against lightning. The dish must, of course, have a clear view of the satellite to which it is connected.

Horror story with a good ending

Many of the points made in the foregoing are sharply etched in the experience of station WSRZ-FM of Sarasota, already mentioned for its 120-foot-deep grounding well. Sarasota is in the midst of the highest-intensity lightning belt in the U.S., and chief engineer Ted Miofsky says that opening the door in a major summer storm (there are many every year) is like walking into a continuous display of gigantic fireworks.

Miofsky says that there used to be direct hits on, or very large induced voltages in, virtually every conductor in and around the plant: the tower, the two-stage guy wire system, the power lines, the telephone lines, the transmission lines, and even cabling inside the transmitter building. Heavy surges and transients came in, repeatedly knocking out electronics systems.

There were failures in great variety. In one example, repeated power line surges would blow out the fuses on the main blower cooling the transmitter. As the heat went up, the transmitter automatically shut down. The fuses are inside the transmitter cabinet; it takes at least a few minutes to get in the cabinet and put in new ones.

The campaign that got WSRZ back approximately to normal—very few lightning outages in the last three years—includes a copper screen installed around the entire transmitter building, heavily grounded at many points. The main power supply got one of the new superfast surge eliminators, with a normal rating of 200 amperes. Many individual units in the building also got separate surge and transient eliminators.

The Marti two-way radio, in addition to the special grounding described earlier, got a surge eliminator on the power line at the base of the tower and a larger one right at the top. The guy wire system, which developed very high voltages in trying to take lightning energy to ground, got elaborate grounding with a deep pipe on each section.

The effects of "blink outs," short interruptions of power caused by the recycling of the power company's plant after a lightning hit, were reduced by getting an uninterruptible power supply for the main console.

Also basic in the protection plan has been a "dissipation array" on the antenna, a product of Lightning Elimination Associates of Downey, CA, for which the manufacturer puts forward the unabashed claim that it will *prevent* lightning in a restricted area. More than 500 broadcast stations in the U.S. are using the LEA array, and *BM/E* interviewed a dozen. All testified that they had intense trouble with lightning before the array went in, and have been free of that trouble since.

This experience makes it necessary to face the question, "Can man *prevent* lightning?" The idea of the array is superbly simple, and goes back to the great lightning experimenter, Benjamin Franklin. A sharp metal point connected to one side of a strong electric field in the air will leak off the charge slowly into the air, reducing the potential across the two sides. Franklin apparently first thought that his lightning rod would prevent strikes by reducing the potential between cloud and earth. Later he concluded that a single sharp point could not come close to doing the job, and promoted the lightning rod as a means of getting the lightning energy safely to earth.

The LEA Array uses thousands of points, in umbrella-like or net-like screens made of lines something like barbed wire. In evaluating the array, we found the statistical story to be strongly positive. Among the engineers consulted for this story, most had had the array for at least five years, and one since 1973. Without exception, they had been free of lightning hits since they put the arrays in.

Most consulting engineers are also convinced that the array "works" though some lightning experts in universities and government agencies were not convinced that the array would handle enough energy to make a real difference.

The conclusion: any broadcaster suffering grieviously from lightning hits on his plant ought to give the LEA array at least a try.

This story shows why the lightning-protection devices and systems created by the industry in recent years give the broadcaster greatly increased hope of holding off this ancient enemy. If 100 percent immunity can never be guaranteed, at least the average incidence of lightning trouble is being brought down to more manageable proportions. **BM/E**

Some Manufacturers of Surge and Transient Eliminators

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Lightning Elimination Associates, Santa Fe Springs, CA
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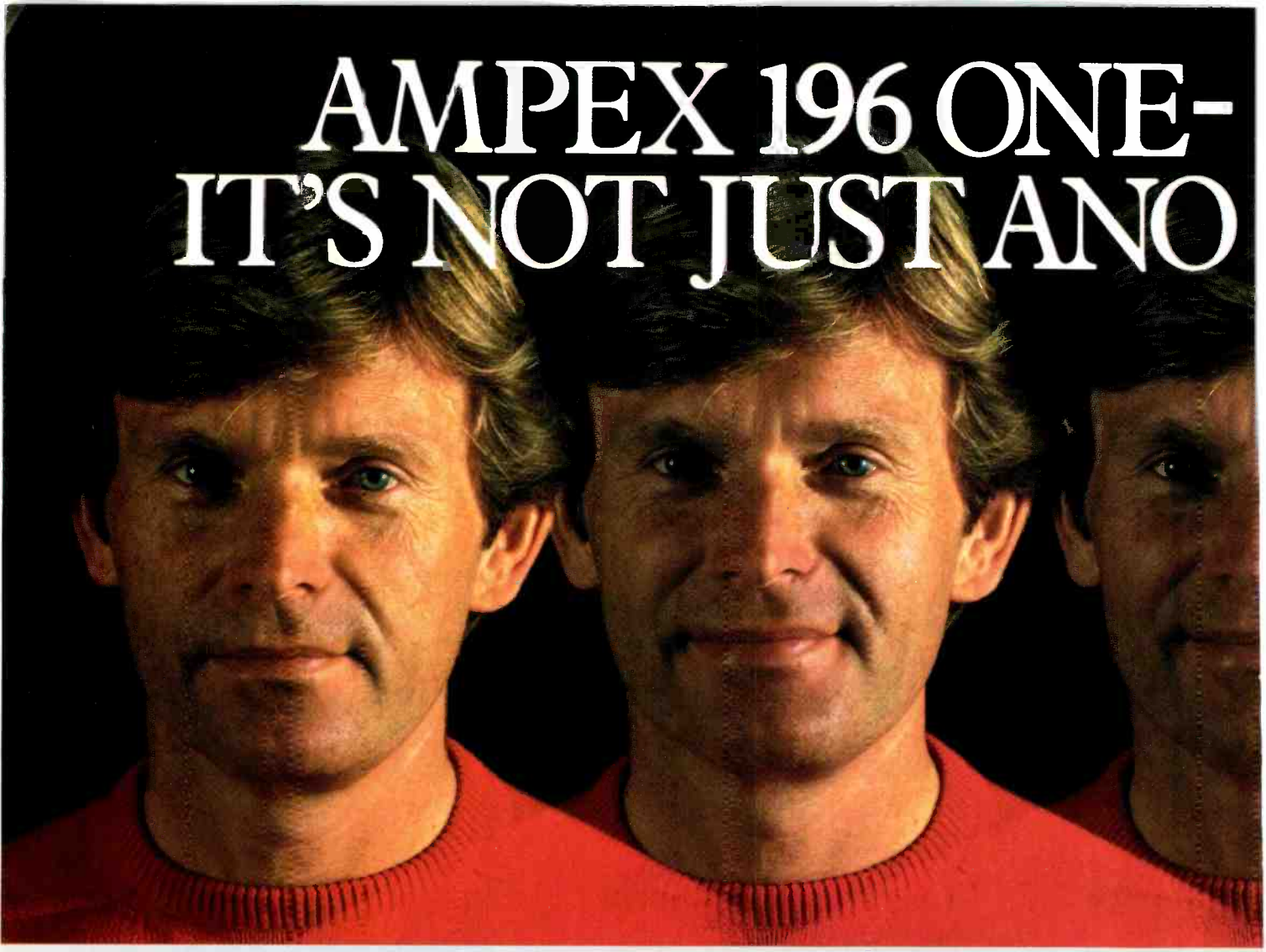

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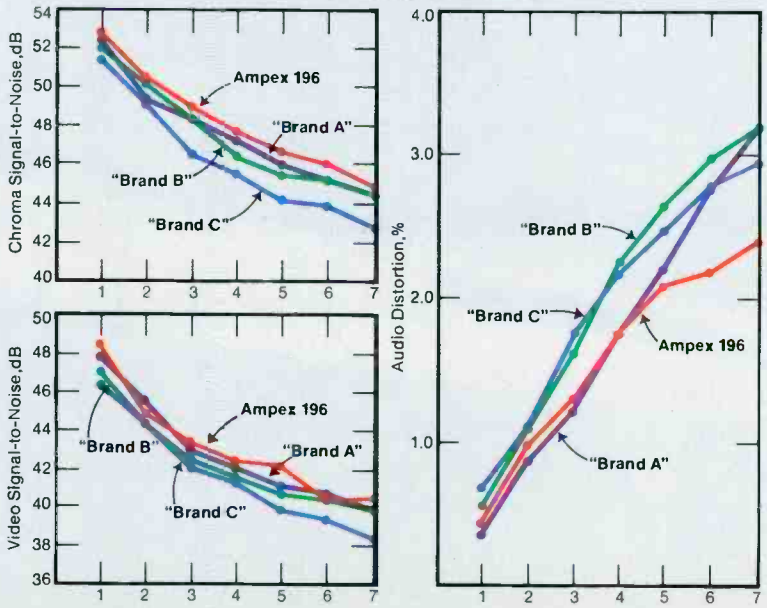

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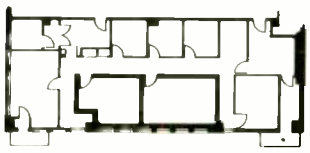


PART 8

GETTING SOUND IDEAS ON ACOUSTICS

Good acoustic performance is an integral part of good station operation. So the broadcaster must have a detailed plan for acoustics, whether building in a new site or rebuilding in an old one. This eighth article in *BM/E*'s series on Facilities Design and Engineering describes the acoustic characteristics needed in radio and television plants, and outlines the main construction and design methods used to assure proper acoustics. Some of the recommendations made here were also made, in much shorter form, in earlier articles in this series. They are retained here for the additional detail and to make this article as complete as possible within itself. —Ed.

IN SELECTING A SITE, the acoustician has two broad objectives: providing acoustical separation between operating spaces; and keeping intrusive noises out of the operating spaces. The acoustician keeps both objectives in mind when he rates a proposed site for the plant.

The broadcaster can begin the process by explaining to the acoustician the operating spaces the plant will need, and developing with him preliminary, rough studio layouts. With a layout that gives initial assurance of good acoustic performance, a proposed site can be rated on the important building factors.

The most important are the slab (floor) construction, the slab-to-slab (floor-to-ceiling) height, column spacing, beam spacing and depth, character of the exterior wall, termination of slab to exterior wall, and the live-load capacity of the floors.

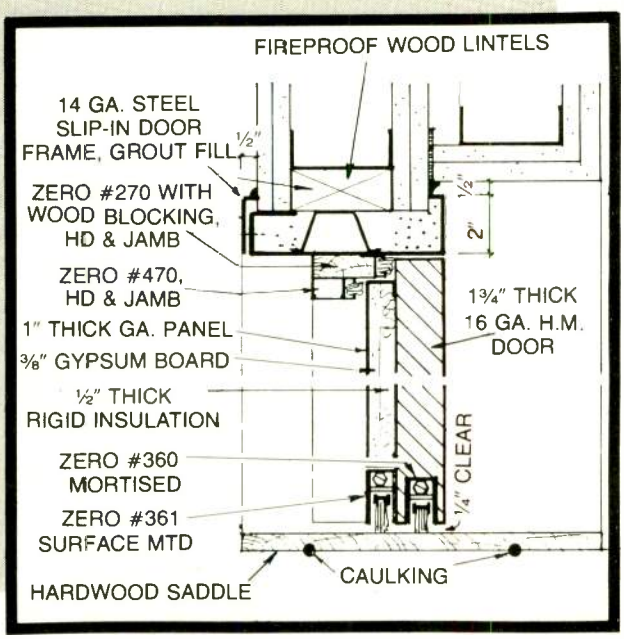
The column spacing and floor construction determine whether or not the planned layout can be fitted in with practical alterations. Can columns be moved, if that is necessary? The floor-to-ceiling height and beam spacing greatly affect the ease—or even the possibility—of installing air ducts. The ducts must be large enough to allow delivery of large quantities of air, moving at 400 to 600 cfm, the basic requirement for handling the heavy heat load in broadcast studios with very little air noise. More detailed aspects of low-noise design in cooling systems will be described later.

The live-load capacity and the construction of the floors are most significant for the acoustic design. If the capacity of the floor to carry weight is low, say much below 75 lbs./square foot, that will limit the design of added walls or isolated floors needed for noise control, and may in fact make adequate noise control impossible.

If the floors, on the other hand, have a live-load capacity of 100 pounds or more, they can handle the weight needed for complete noise control. This substantial construction may, however, make heavy sound isolation, like added separate floors or partitions, unnecessary, because the original floors will strongly attenuate the passage of vibration—structure-borne noise—from one space to another.

The importance of the floor construction above and below to acoustical separation between the contiguous spaces cannot be overemphasized. If the acoustician suspects the floor of being too resilient, he jumps on it heavily and waits for the tactile perception of a wave of vibration travelling back to the impact source location. Should this occur, it reveals that sound flanking—passage of sound under the wall—will occur via the floor slab. A floor construction of wood joists and wood flooring is unsatisfactory for any broadcasting facility, since sound flanking at low frequencies would severely limit simultaneous events in adjacent production spaces, i.e. air studio and production; therefore, this floor construction would be a reason for rejection of a building site.

The simplest and most effective floor is a 6- to 8-inch concrete slab "on grade"—on the ground—which enjoys the damping effect of the earth and can have expansion joints at strategic locations to effectively attentuate flexural wave transmission. In addition, this floor construction



Sectional drawing of a studio door with high transmission loss. The heavy steel panel is the main control element.

This article has been prepared by *BM/E* from material submitted by Robert A. Hansen, founder and head of Robert A. Hansen Associates, Inc., of New York, consultants in acoustics. Over about two decades his firm has been responsible for acoustic design in nearly eighty radio and television studios, spread through virtually every large city in the U.S.

removes the need for any isolating walls or floors. A large slab-on-grade garage or warehouse with heavy concrete floor, 30- to 40-foot spacing of interior columns, and exterior walls consisting of blocks (dense aggregate) represents an effective construction to reduce intrusive exterior noise. The roof construction is generally lightweight; however, unless aircraft or other sources of noise that are elevated above the building are to be considered in the evaluation, the ceiling structure of the broadcast facility can be designed to attenuate intrusive noise transmitted through the roof.

Another vital aspect of the site is the availability of space for heavy machinery. The cooling system will need chillers, pumps, compressors, and fans. Other high-voltage power systems (HVAC), like emergency generators and distribution panels, also need large spaces. Not only must the space be available, but it must also be located so that the noises from the large machines can be controlled. The acoustician must consider carefully how this noise can be controlled in the particular building.

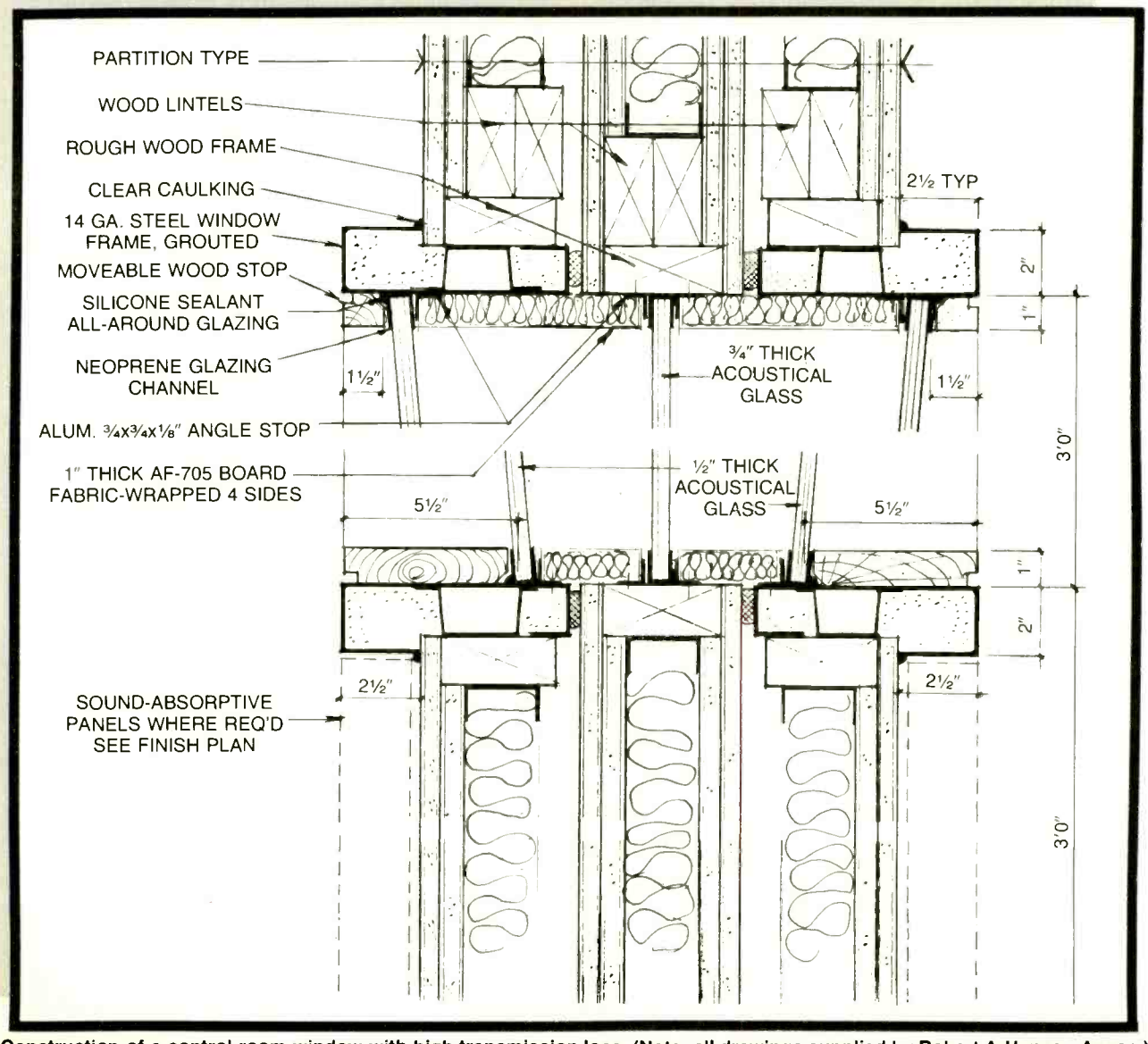
Finding space that works acoustically for large machinery is often difficult, and occasionally impossible. The broadcaster must check this, too, before he signs the lease.

RATING NOISES

The foregoing makes clear that a survey of the noises actually present at a proposed site is an essential part of the site rating. The acoustician will pay close attention to two kinds of noise: air-borne, the human and machine noise that travels through the air toward the site to be protected; and structure-borne, vibration in the walls, ceilings and floors of the building.

There are literally hundreds of possible air-borne noise producers in a large-city setting. A few of the most common are traffic noises, large cooling towers on nearby restaurants and warehouses, fire and police stations, hospital emergency entrances, trains, aircraft overhead. The list could go on and on.

Structure-borne noise usually comes from heavy ma-



Construction of a control room window with high transmission loss. (Note: all drawings supplied by Robert A. Hansen Assoc.)

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WCCO Minneapolis	WLLZ Detroit	KIQQ Los Angeles	KILT Houston	WKYS Washington, DC	WJR Detroit
KRTH Los Angeles	WAPP New York	WCAU Philadelphia	WWWW Detroit	KRLY Houston	KMEZ Dallas
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chinery in the building or near it. A printing press on the floor above or below the site may make it unuseable. The same might apply to a light factory operation with boxes being regularly dumped on the floor.

The acoustician may want to measure the intensity and frequency spectrum of certain noises. In any case he will judge what controls are needed for the noises he finds at the site, and will report to the broadcaster whether or not control is possible in that building, and how much it is likely to cost.

AIR-BORNE NOISE CONTROL

This class of noise is kept low in operating spaces with walls, ceilings and floor that impose losses on sounds coming through from the outside. The effectiveness of an isolating barrier against air-borne sound is measured quite exactly by its transmission loss, the ratio of the sound pressure at the barrier on the side facing the sound source to the sound pressure on the inside.

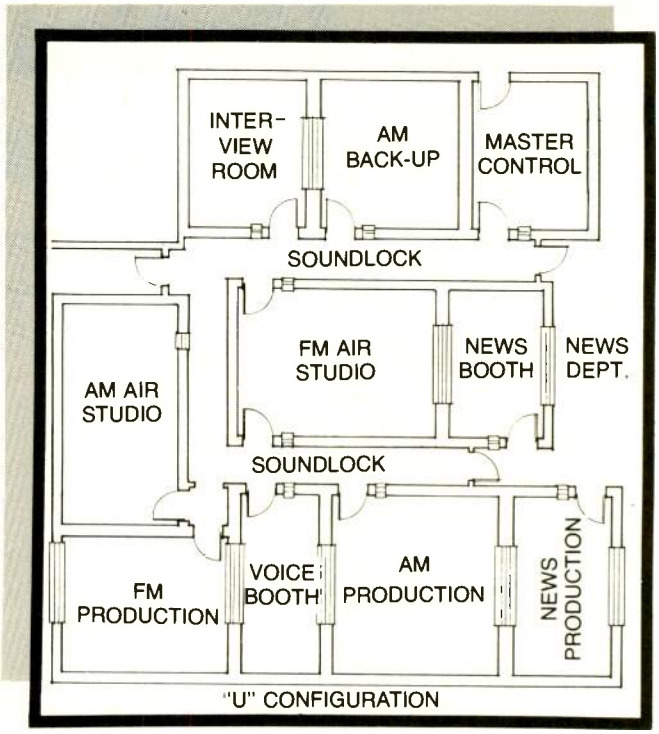
The range of transmission losses useful in broadcast studio design is from about 40 dB to about 60 dB at 125 Hz, one-third octave band. Below 40 dB, common sounds on the outside will be troublesome for the inside operations. Transmission loss much above 60 dB is very expensive indeed and is not needed in any situation likely to be encountered in a broadcast plant. A large majority of studio designs are completely successful with isolation of 50 to 55 dB (see tables of recommended values).

These figures are based on the loss imposed on a signal at 125 Hz, with a bandwidth of one-third octave. If the loss is adequate at this low-bass figure, it will be at least adequate throughout the bass and mid-bass. The barrier becomes more and more effective as we go up the frequency scale, and the high frequencies will be rejected much more strongly, 70 to 80 dB.

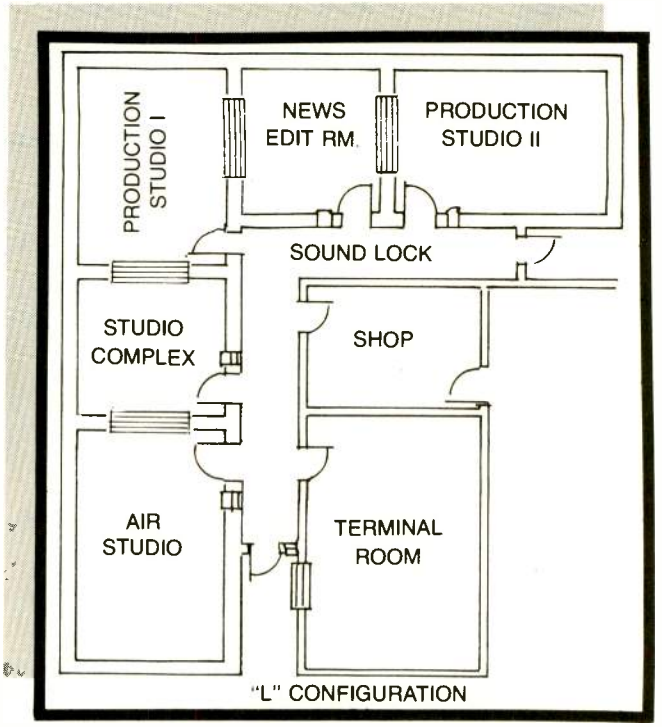
There is a supplemental rating method, the "sound transmission class" or STC, which has been often used in the past. The STC is a single figure of merit derived mathematically from a family of measurements taken at a number of frequencies through the audio spectrum. The use of the 125 Hz measurement is strongly recommended because the STC can give the same figure of merit for walls of quite different acoustic character, which can lead to serious design errors. On the other hand, the 125 Hz measurement has served successfully in literally scores of studio designs.

The layout itself can contribute to noise control with sound locks, noise-free spaces placed between operating spaces and noise sources. The typical layouts in the drawings show the use of sound locks. There is an obvious advantage in keeping noise sources as far as possible from the operating spaces; but there are many cases in which noise sources and operation have to be close together.

Sound locks, in fact, are not essential in every plan. Air-borne sound can be kept under control in a straight-line layout, with all the operating spaces along a common corridor. The corridor can be evaluated for potential sound flanking, and the internal walls can be designed to keep noise from moving from one space to the next.



A typical "U"-shaped studio layout, using sound locks.



An "L" studio makes good use of locks to aid noise control.

WALL CONSTRUCTION

A number of ways of making walls with high transmission loss have been developed. One successful plan uses a "core wall" of metal stud with two layers of gypsum board on each side. "Wythes" can be added on one or both sides to increase transmission loss as needed. Each wythe is made of metal stud with two layers of gypsum board on one side. They are spaced away from the core wall when used. A complete composite, the core wall with one or two wythes, has all the interior spaces filled tightly with mineral wool for sound attentuation.

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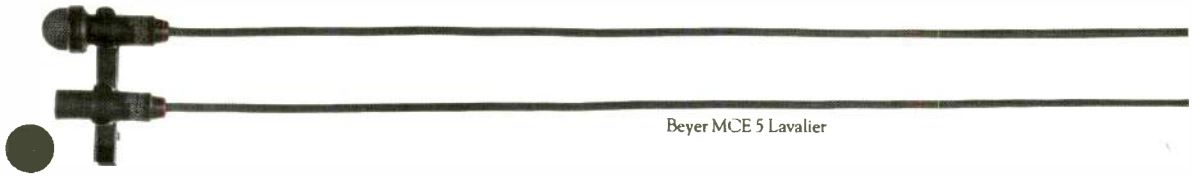

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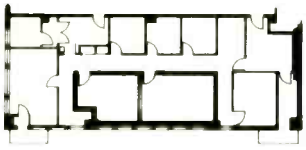

FACILITIES DESIGN AND ENGINEERING

The core wall by itself can supply about 40 dB of loss, enough for some applications. Each wythe adds from 10 dB to 15 dB of attenuation. The inner wythe can be on an isolated floor if maximum attentuation is needed.

Many good isolating walls have been built with the familiar staggered-stud construction, using various kinds of resilient material. However, it is recommended that anyone undertaking the design of such a wall get the advice of an experienced acoustician, because what seem like small details can alter the character of the wall drastically.

As the foregoing suggests, the success of an isolating wall is extremely vulnerable to small changes and errors in construction. Once your wall has been completely specified by an expert, you must monitor construction closely to make sure the specifications are followed *exactly*. Contractors have the habit of making small changes that seem to them of no consequence.

An important part of this is to make sure there are no unsealed holes or slits in the wall, no matter how small. A hole with the diameter of a pencil is not serious because the sound transmission through a circular hole is frequency-dependent and the hole is easily sealed. But a slit opening can seriously compromise the acoustic design. It transmits sound at all frequencies.

A common locus of leaks is the sealing around studio windows. Unless this is done exactly as specified, the window-wall joint will leak heavily, reducing the isolation of the whole wall to as low as 30 dB. A leak through a hole or through a faulty window seal can often be spotted by generating a random noise source on the other side of the wall and listening for audible sound through the openings.

Some sources of leaks that may be overlooked are: large openings where cables are brought through from the adjoining space; back-to-back electrical outlets with free space between; air-conditioning ducts not tightly sealed to the wall. The broadcaster can eliminate small leaks easily by plugging them with "Duxseal," a very dense, rubbery, clay-like material made by Johns Manville that keeps its plasticity indefinitely. Don't get "Ductseal" for this purpose—it is material for sealing the joints in air ducts.

WINDOWS AND DOORS THAT BLOCK SOUND

The construction of studio windows that maintain the isolation built into the wall is a difficult art and has to be carried out with great care. The accompanying drawing shows the details of a studio window construction. The

TABLE I

Transmission loss needed in walls separating radio and television on-air studios from other operating spaces, as measured at 125 Hz, one-third octave bandwidth.

Studio – Dimmer Room	50
Studio – Scene Storage/Set Assembly	50
Studio – Corridor (Pedestrian Only)	40
Studio – Corridor (Pedestrian and Material Transportation)	45
Studio – Studio	50 to 60
Studio – Green Room	40
Studio – Roof (Outdoor Noise Sources)	50
Studio – Soundlock to Adjacent Space	45
Studio – Scene Shop/Wood Shop	60
Studio – Loading Dock	55
Studio – Technical Areas/Master Control Room/Studio CR	45
Studio – News (Bull Pen)	35 to 45
Studio – Exterior Wall	50
Studio – Mechanical Equipment Room	65

TABLE II

Recommended values for RT and ER/ED in television and radio operating spaces.

Television	RT at 125 Hz	RT at 500 Hz	ER/ED at 9 feet 125 Hz	ER/ED at 9 feet 500 Hz
TV Studio	1.1	0.65	0.65	0.25
Video Control Rm.	0.80	0.50	1.10	0.90
Audio Control Rm.	0.50	0.40	0.75	0.50

Radio	RT at 125 Hz	RT at 500 Hz	D	ER/ED at distance shown 125 Hz	ER/ED at distance shown 500 Hz
Stereo Production Control Room	0.6	0.5	8 ft.	10	4
Stereo Production Studio	0.45	0.35	2 ft.	0.6	0.24
On-Air Control Room	0.45	0.25	4 ft.	1.5	0.30
On-Air Studio	0.30	0.25	4 ft.	1.2	0.20
Edit/Production Control Room	0.45	0.25	4 ft.	1.5	0.30
Edit/Production Studio	0.30	0.25	4 ft.	1.2	0.20
Edit Rooms	0.80	0.50	8 ft.	11.5	2.5
Conference Rooms	0.50	0.30	4 ft.	1.0	0.25
TOC Space	0.80	0.70	10 ft.	7.0	2.0

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The computer registration capabilities of this camera system produce pictures of a clarity and resolution previously unheard of.

And you get auto-setup at the push of just one button, and zero reference, too, where the computer sets the green channel and compares blue and red to it with absolute precision.

The SK-110 is not only self-correcting, but self-diagnostic as well. It gives both video screen display and hard copy printout; can be hooked into the CRT for control room monitoring.

There's a high-performance contour corrector; 5 automatic setup modes including quick check; 5 data files; so many other unique features an ad can't begin to tell you about them.

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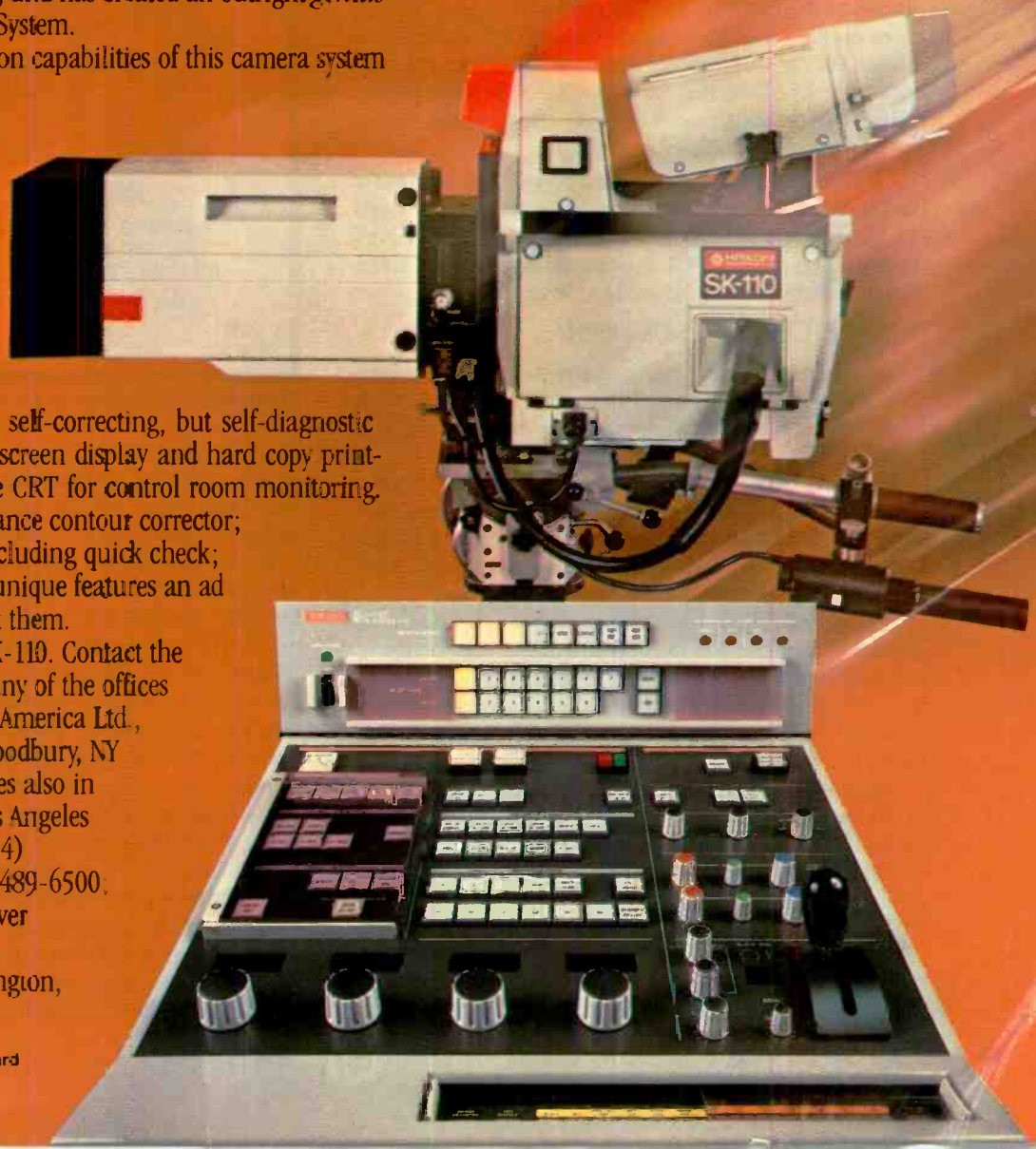

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glass is acoustically isolated from the frame with neoprene glazing channels. A silicone sealant is applied to the joint between the glazing channels and the steel window frames.

The window is built into a three-element wall of the kind already described, with an inner core wall and both an inner and an outer wythe. This requires three sets of lintels across the opening. The steel window frames that hold the glass assembly below the lintels are filled with grout to supply essential damping.

Like the window, the door should have noise reduction almost equal to that of the partition. But the door is an operable element and a single door cannot practically match a fixed partition. Should equal performance in the door be required, then two sound-isolating doors in tandem are needed. Double seals are necessary (see drawing) for at least 35 dB of transmission loss.

HOW MUCH LOSS?

The acoustician will design for transmission loss adjusted to the need, because isolation costs money in proportion to the loss built in. The need will depend in many cases on the broadcast operation itself. For example, an all-talk station, for internal space isolation, can get away with only 45 dB of loss in the walls. A beautiful music station will ordinarily need 45 to 55 dB, along the lines of the figures in the tables.

All all-out rock station will need 55 to 60 dB because of the DJ habit of monitoring the program at deafening levels. A network television studio recently built in New York needed a full 60 dB in one wall because the scene-building shop was on the other side of the wall.

QUIETING COOLING EQUIPMENT

Getting the noise of cooling equipment down to acceptable levels is another part of the control task. The noise levels from this internal source that are acceptable in various operating spaces are shown in the tables.

The first rule is, reduce fan noise right at the fan with a large plenum, a box structure much larger than the duct, lined with sound-absorbing material of varying thickness and densities. The fan feeds air and noise into the plenum, and the plenum feeds quiet air into the duct.

The second rule is, move the air through the duct at velocities from about 400 to 1000 cfm, depending on the location of the duct with respect to critical studio spaces. The duct must be completely lined with sound-absorbing material. A product made especially for this is Owens-Corning Fiberglas Ductliner.

The third basic rule is that the air velocity at the terminal device should be between 250 and 400 cfm, depending on the room acoustics and the proximity of the air terminal to the operating positions.

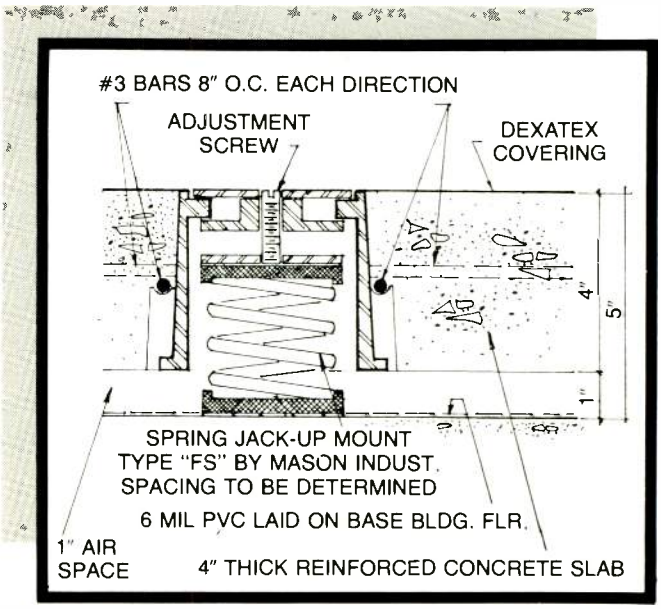
STRUCTURE-BORNE NOISE

Heavy vibration in the building structure can present a difficult control problem. It is desirable, if at all possible, to reduce the vibration right at its source by putting the offending machine on shock mounts that isolate it from the building structure.

However, in many cases this will not be possible. If the building has very noisy hydraulic elevators, fans, chillers, pumps, compressors, or large supply power transformers feeding hum into a wall, the acoustician must often do his best to separate the studios as far as possible from the vibration source.

The two major structure-borne sound transmission paths are:

- Sound flanking of the separating construction, whether a partition or floor slab. Generally, the floor construction represents the major sound flanking path around the separating partition, as noted in the foregoing. However, a partition that is common to both spaces may also perform as a sound flanking path around the separating partition.
- Interconnection of constructional components in the separating partition. This may be the metal studs connecting the layers of gypsum board that are applied on both sides, or the nonisolated door frame connected to the isolated partition.



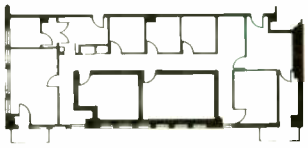
Suspension method for concrete floor isolated from building.

The range of frequencies of structure-borne sound flanking is below 500 Hz. Structure-borne transmission of acoustical energy above 500 Hz is insignificant.

If the acoustician judges that the combination of a heavy vibration source with particular weaknesses in the building structure will make ordinary approaches to control ineffective, he may recommend going to the ultimate isolation design, the room floating inside a room. A number of such completely isolated studios have been built over the last couple of decades and most broadcast engineers are familiar with the principles involved.

The box-in-a-box has been used much less lately because other much less expensive designs like those described here have proved to be effective over a wider range. However, it is still needed occasionally.

The drawings show details of isolated floors and isolated ceilings designed for use in recent installations. It is easy to see why this is an expensive form of building construction. It is money well spent, if it is needed; the isolated studio is immune to both air-borne and structure-borne sound.



FACILITIES DESIGN AND ENGINEERING

The main objective of internal acoustics is the provision of a monitoring sound that allows accurate monitoring and control, so that an excellent sound can be put on the air. Such a sound will also be attractive for the operator, so that his mood will be positive toward the job, a factor affecting his on-air quality strongly.

Long familiar is the effect of the reverberation time, or RT, on the sound quality. Too short, the RT produces a thin, weak sound, powerless and uninteresting. Too long, the RT makes a boomy or muddled sound.

The tables show the values of RT at 125 Hz and at 500 Hz that have been found most attractive for various spaces in radio and television studios. The value of the RT depends on the amount and disposition of sound-absorbing material in the room. Engineering handbooks supply a number of different formulas for calculating the RT from the room dimensions, the area of absorbing material, and other factors. The Fitzroy equation has been most satisfactory in the design of broadcast studios.

A second internal acoustic characteristic that is also essential to good sound quality is a proper ratio between reflected and direct sound, or ER/ED, at the most-used listening position. Again, tables of preferred values are shown in this article. The ER/ED depends on the absorption in the room, the room dimensions, and the positions of the loudspeakers with respect to the listening post. If the ER/ED is too low, the sound will lack presence. If it is too high, the sound will be muddled and lack definition. Again, formulas for adjusting ER/ED are given in standard texts.

A reasonably well-balanced frequency response for the room, free of serious peaks and troughs, is a well-known part of the good sound. In the past, nonparallel walls were often used to reduce the power of room modes, but few such walls have been built in recent years. The reason is that the proper distribution of sound-absorbing material, plus the scattering effect of consoles, sloping windows, racks, tape machines, and other normal objects in the room has served to keep room modes under control.

The room dimensions are important in this too. It has been found that with heights in the range from 8 feet to 9 feet, the best length/width ratios are between 1.2 and 1.5.

PLAN BEFORE YOU START

Whatever the details of your plant, the acoustic design will be far less costly, and is more likely to be successful, if it is worked out fully before any construction starts. For example, the acoustician can save you long-running headaches and large sums of money by steering you away from a building that would be impossible, or impossibly expensive, to convert to good acoustics.

He can also save you the heavy cost of moving partitions, or relocating heavy machinery, or changing the sizes of air ducts, or of making a dozen other after-construction design changes. Foreplanning is an essential element of cost-effective acoustic design. **BM/E**

And that's the

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

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

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

Army vs McCarthy Hearings April 1954

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

Kennedy-Nixon Debates–ABC–10/3/60

Vietnam War

60 Minutes News Magazine 7/24/68 to present

U.S. Lands Men on the Moon July 1969

Garroway was introducing early risers to a show called *Today* and Conrac was introducing its first black and white monitor.

Swayze was anchoring network news, the McCarthy-Army hearings were being held in America's living rooms, and Conrac was introducing the first color monitor.

News and newspeople changed year after year, decade upon decade. All the while, Conrac was earning a position of trust and respect throughout the broadcast community.

Special acknowledgement to CBS, NBC, ABC.

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Senator Estes Kefauver Crime Hearings 1951

Edward R Murrow–CBS–See It Now 4/20/52 to 7/5/55

Coronation of Queen Elizabeth June 1953

Walter Cronkite–CBS Evening News 1962 to 1980

John Kennedy Assassination 11/22/63

Lee Harvey Oswald Killed on Nationwide TV 11/24/63

Watergate 5/17/73 to 8/8/74 (Nixon Resigns)

Iran 11/4/79 to 1/20/81

Space Shuttle on a Model 6142 Conrac Monitor

Today, Conrac is working on the next generation of broadcast monitors. To give you the highest resolution. The truest colors. The best value.

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Video Music Goes Live as

Bids Farewell

By Harold D. Osborne

The rock group's final American concert reached far beyond the confines of Toronto's Maple Leaf Gardens. A complex network of satellites, cable systems, and broadcast stations brought the event into millions of homes as it happened.

THE FIRST LIVE Telstar transmission from Europe to the United States. The image of Neil Armstrong as he stepped out on the surface of the moon. National Educational Television's first *Live at the Met* simulcast. The Who's North American farewell concert from Toronto's Maple Leaf Gardens. What do all these events have in common? They were all witnessed and heard, as they happened, by millions of people spread out over thousands of miles, via technological processes that represented, at the moment of transmission, the state of the telecommunicator's art.

The Who's concert of December 17, 1982 brought together the latest equipment and techniques from a number of disciplines: sound reinforcement, recording and broadcast mixing, multiple-camera video switching, post-production (in what are usually considered incompatible formats), landline and satellite distribution, wide-screen TV projection, and pay-per-view cable television.

Hundreds of technicians in dozens of cities contributed to the effort, but a few companies were central to the event: Showco and the Record Plant (New York) Mobile for audio production, and Glen-Warren Productions of Toronto for video production. Five different systems were used to distribute the live show to the audience. City-TV in Toronto set up an ad hoc network for 16 Canadian over-the-air TV stations, and a second network fed a couple of dozen Canadian FM stations for simulcast. In the U.S., Campus Entertainment Network delivered video and high-quality audio to 40 theaters and clubs around the country, where audiences paying $8 or more per head partied while seeing the event on huge projection TV screens and hearing it over multi-kW sound systems. Twentieth Century-Fox Cable signed up 50 cable TV systems in every state except Alaska for delivery to subscribers who paid $10 each for the privilege of having their individual decoders addressed to unscramble the broadcast. DIR Broadcasting, producers and syndicators of radio shows like the *King Biscuit Flower Hour*, delivered a stereo audio signal to 60 U.S. FM stations.

All of these companies were aided, abetted, organized and/or contracted by World Showvision, AT&T, Telesat, Videonet, Canadian Bell, National Public Radio, Greene, Crowe and Co., CLOS Video Associates, Schlitz Brewing, several hundred local promoters, cable systems, and radio stations, and of course, the dozens of individuals who make up the entity known as The Who.

Glyn Johns, long-time Who engineer/producer, was brought in well before the tour began to supervise all aspects of the audio. He rehearsed with the band in England, setting up mic plots for both PA and recording. Through most of the subsequent tour, it was Johns and Showco president Jack Maxson who mixed the house sound.

On the very first date, at the Capitol Center in Washington, DC, they were joined by David Hewitt and the Record Plant "Black Truck." (For full details on the Record Plant trucks, see *BM/E*, November 1982, p.48.) Hewitt and his crew recorded a rehearsal, some of which was used on a commercial for Schlitz beer, the sponsors of the tour, and some of which ended up on MTV. "We used the occasion to prove ourselves to Glyn," says Hewitt.

All told, the Record Plant recorded about 20 of the concerts, with Johns handling all of the recording mixes. Certain modifications had to be made in the truck to accommodate him. "He didn't like our Hidley monitors," says Hewitt. "He went through a lot of different speakers. We finally built custom speakers for him, based on Altec Big Reds, driven by Brystons. We built a new overbridge, and tuned the room for him."

Johns used very little processing equipment in his mix: to quote David Hewitt, "It was all in the miking." The kick drum mic was sealed and suspended inside the drum (which had both heads on); there was also a snare mic, and at the beginning, the only other drum mics were a stereo pair of U87s placed between and a couple of feet in front of the toms and cymbals. Later on, Johns added a snare-bottom mic and a cymbal mic. Bass and guitar also were miked simply, from a distance. There were no limiters used at all—the only piece of gear called in was an AMS stereo delay line for some vocals and guitar solos.

At New York's Shea Stadium, the truck recorded a concert (a clip of which was used as a trailer to promote the Toronto concert broadcast) and from there, followed the band through the western and southern legs of its tour. "On some of the shows, they were also shooting video," explains Hewitt. "We recorded everything on 24-track with time code, and when they were shooting, we would also put the monitor mix on four-track tape with code. We kept everything, but most of the dates served as rehearsals for the crews for the live concert. The sound plot changed very little. Glyn added some snare bottom and cymbal mics, but that was about it." The Record Plant uses Ampex MM-1200 24-track ATRs in its trucks.

When the Record Plant did a show, all of the signals from the stage went to its Jensen splitter. The truck got a direct feed, while the PA system took its signals off the

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Harold D. Osborne is a New England-based engineer and musician who is a regular contributor to numerous trade and consumer journals.

transformers. There were 32 stage inputs, plus six audience mics. "We were going to mix the live concert in Dolby surround," says Hewitt, "but we ruled it out as being too complicated, and also nobody could pick it up."

"Glyn had never mixed in quad," says Jack Calmes of World Showvision of Dallas, TX, producer of the broadcast, "and he was real nervous about it. It also would have meant doing even more mods on the Record Plant truck. Fox was pushing hard for it—they had about 1000 Dolby-surround decoders out in the field—but I think it was mainly because they were having a party during the concert with 1000 people on their lot. They ended up listening to it in stereo, with a rear-channel simulator."

Inside Glen-Warren's 45-foot Mobile I (known as "the blue van" and described in last year's NAB show report, *BM/E*, July 1982, p.63) is a custom 24X6X2 Ward-Beck audio console, with four premixes and four auxiliary buses on each channel. The Record Plant fed Glen-Warren with two sets of left, right, and mono audio. To feed signal back from Glen-Warren, David Brown of the Record Plant set up a multiline that carried stereo audio, switched video, time code, and vertical drive.

On stage was a Scully four-track audio machine containing prerecorded synthesizer tracks for five of the band's songs, along with a "thump" track feeding drummer Kenny Jones's headphones on stage so that he could keep the band in sync with the tape tracks. The tape signal looped through the Record Plant truck, and also to Glen-Warren's truck, so that director Richie Namm could cue the start of a videotape of visual effects used on the air during the synthesizer solo in "Won't Get Fooled Again."

In addition to the mix from the Record Plant mobile, Glen-Warren took prefader feeds from the audience mics. "A TV broadcast needs more audience than a recording," explains Michael Jones, who handled the audio for Glen-Warren. Another function of the video company's audio equipment was to boost the levels coming from the Record Plant's console and the various distribution systems from studio-standard +4 dBm to broadcast-standard +8. This was to make sure that the telco lines carrying the signal away from the video truck were operating at maximum efficiency.

Also coming from Glen-Warren were two interrupted foldback lines: mono monitor feeds going to two announcers (Doug Pringle of Toronto and Annie Nightingale of the BBC, who were stationed at the back of the hall for a three-minute preshow warmup and backstage after the concert) that could be overridden by director Namm's intercom. An RTS intercom system was brought in (and continually cranked up) to make sure that the signal levels at the announcers' ears were high enough to compete with the sound system.

Other audio signals came from a VTR containing a half-hour preconcert show seen in Canada and by fans at the CEN venues. The show was recorded at City-TV, in "simulated live." Pringle and Nightingale wore the same clothes they did during the actual warmup, so the audience wouldn't suspect the show was on tape.

The audio for the preshow was recorded in Dolby. "The playback machine had its channel A and B audio boards removed," explains Jones, "and replaced with Dolby A boards. Channel C, which is usually the time code track, had the mono audio signal, and we used an external Dolby decoder on that."

Except for the preshow, no noise reduction was used anywhere in the signal path, and no processing was used after the audio left the Record Plant truck save for a little soft limiting to prevent overload of the microwave landlines for which the signal was headed, and also to discourage local FM stations from over-limiting the signal themselves.

Camera operator with one of the 11 HL-79s in the arena.

Video production

Director Namm came aboard The Who's travelling road show at the end of October. "Usually I get a week's notice for this kind of gig," he says. "This time they gave me over a month." His previous experience with live video music included REO Speedwagon, the Charlie Daniels Band, and Frank Sinatra. "On those shows I made some mistakes," he laughs. "This was my opportunity to learn from them."

Namm and the video crew, in an effort to familiarize themselves with the show as much as possible, shot several concerts on the road using five cameras and constantly reviewing the tapes on wide-screen projection televisions. Frank O'Connell of CLOS Video Associates in New Jersey, who was hired by World Showvision to coordinate technical efforts with Fox, explains that some lighting modifications had to be done along the way to accommodate the TV cameras. "It was important that we didn't disturb the theatrical aspects of the lighting," he says.

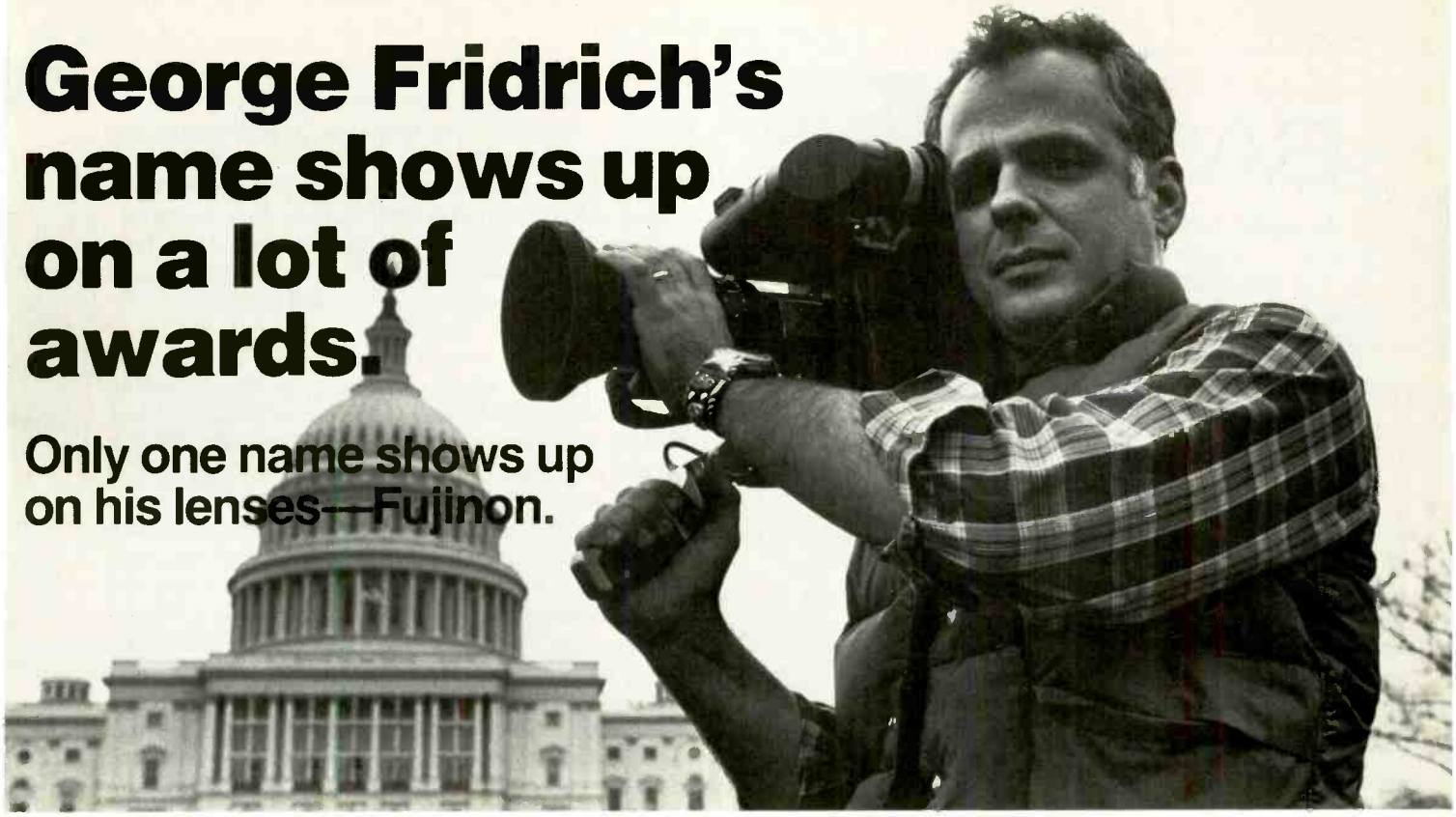
Glen-Warren gathered all its equipment at Maple Leaf Gardens on the Monday prior to the Friday broadcast. For three days, cameras were checked and lines, lights, and the stage installed. A major obstacle was that a hockey game was scheduled for Wednesday evening. "We had to raise the lights to the roof and take down the stage and ramps," says Namm. "We color-coded and marked everything."

In addition to the blue van, Glen-Warren used two other trucks. According to Jack Calmes, a lot of equipment (including one of the trucks) had to be rented for the event. The blue van contained audio and video control, audio distribution, and room for Calmes, Namm, and an assistant director. There was also a two-channel Quantel DPE-5000+ digital effects generator, a Telemation character generator for end-of-show credits, and a still store. Two time code generators were on board, running in sync. "There was no room for failure," says Namm. "We had a dual-trace scope on which we could compare the code with the video and make sure that the sync word was always in the right place. If for some reason one of the generators unlocked, we could switch the other one in instantly."

In the second truck were eight Sony BVH-1100A one-inch video recorders, all being fed with stereo audio, code, and vertical drive. Two of the machines (main and

George Fridrich's name shows up on a lot of awards.

Only one name shows up on his lenses—Fujinon.



Network news cameraman George Fridrich covers the nation's Capital. Assignments also take him across the country. But wherever he goes, his work speaks with authority. The most prestigious awards confirm it.

The White House News Photographers Association named him "newsfilm photographer of the year" for 1982. (They did the same for 1981 and 1979.) And he received first place awards for spot and feature news in 1982 from the National Press Photographers Association.

Obviously, George Fridrich has his choice of lenses. For years, his choice has been Fujinon, exclusively. Here, in his words, are his reasons:

"Fujinon lenses deliver great performance and reliability. I use two of them, I abuse them and they hold up. They get knocked around and still perform often under the worst conditions. The fact is, you just can't go wrong with any Fujinon lens. On top of that, Fujinon's support and service are fantastic."

George's basic lens is a Fujinon 14X zoom with built-in 2X extender. When he can't get in close, the lens will and because its maximum F1.7 aperture stays flatter, farther, George can still get the brighter, higher contrast picture quality he demands. His second lens is Fujinon's exclusive 3.5x6.5 wide angle zoom. With an MOD under one foot, no assignment is ever missed because of tight quarters.

Incidentally, although George didn't receive the White House News Photographers' award for 1980, Pete Hakel (WJLA, Washington) did. He won with Fujinon, too. It's not a coincidence. According to Pete, "90% of the ENG work in D.C. is Fujinon."

Before you make any ENG/EFP lens decision, see how much more you get with Fujinon.

Fujinon provides it all—performance, quality, reliability and service. And to make it even better, Fujinon is also the value leader. For all the facts and figures to prove it, talk to your Fujinon representative or contact:

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backup) recorded the switched video feed going over the air, one handled signal from a separate iso switcher, and one was a dedicated one-camera iso. Since the show was to run longer than 90 minutes, each line had a second deck for overlap. There were also several ¾-inch decks and audio and video distribution equipment feeding the various machines and monitors. The third truck carried two Sony playback VTRs, which provided the preconcert and postconcert shows, titles, graphics, and the animation for "Won't Get Fooled Again."

Inside the arena were 11 Ikegami HL-79 cameras—mostly HL-79As which, according to video engineer Keith Winikoff of Greene, Crowe and Co., have less tendency to "burn in" than the later Model HL-79Ds, a necessary attribute for cameras that were going to be shooting much of the time directly into lights. There were two cameras on cranes, one stationary camera at the back of the house, another mounted on stage, two on a platform in the center of the audience, two hand-helds used on stage and another at the base of the stage, and a Cinema Products Steadicam that wandered through the house. "We wanted to put the Steadicam on an RF link," says Winikoff, "but it proved unreliable, so we wired it with coax instead." Another camera, installed for the first time on Wednesday night after the game, hung from the scoreboard above the stage and was wired with remote-control pan and tilt.

The entire installation took from 11:00 p.m. Wednesday to 8:00 p.m. Thursday. The band's Thursday night concert was also taped, as a "dress rehearsal" for the crews. "It was incredibly neat and tidy," says Michael Jones, "considering we didn't even have time to eat an apple." At 10:00 a.m. on Friday, the previous night's tapes were screened, and suggestions were made for finishing touches for the live broadcast that night. "Actually, the Thursday show was better in terms of performance, the lighting, and the direction," recalls Winikoff. "We wanted to see how we could improve it for the second night, but somehow it didn't gel as well."

Distribution

The completed video and audio mixes left Maple Leaf Gardens via several paths. A link with stereo audio and video went to City-TV, Channel 79 in Toronto, where the audio was summed into mono for broadcast and commercials were inserted. From there, it went up to the Canadian communications satellite Anik-C via an uplink in suburban Toronto's Allen Park, and then down to stations in 16 cities. Some carried the concert live, while others in western time zones recorded it for delayed broadcast. All of the Canadian TV broadcasts were on over-the-air TV and FM broadcast stations, which created a sticky problem during the planning stage: most of the major affiliates of the CBC and CTV (Canada's government and commercial television networks, respectively) are VHF and have a powerful signal with a long reach, which often extends over the U.S. border. For example, the signal from CFTO — Ch. 9 in Toronto, a CTV station that was originally designated to carry the broadcast—spills over into upstate New York. Since Fox was charging all U.S. home audiences for the show, and HBO planned to rebroadcast it over its pay cable system in May, this could have led to a serious conflict. Eventually, the Canadian stations that were signed to carry the concert were carefully chosen so that none of their signals reached a significant audience in the U.S.

For distribution on the southern side of the border, the setup was a bit more complicated. A full signal package (video, left, right, and mono audio) went up to Anik-D via a portable uplink provided by Telesat and the Canadian Teleconference Network and set up in the parking lot of Maple Leaf Gardens. The signal was picked off by a commercial downlink in Buffalo, NY, and then sent up again to AT&T's Westar 4. (It was also used by FM stations in Canada.) The Westar 4 signal was received at Wold Comunications in New York City, where it was then relayed to the various distribution systems. Another portable downlink at the site allowed the engineers to monitor each satellite.

At the same time, a microwave/cable landline carried the signal package from Toronto over the Peace Bridge in Niagara Falls to Wold in New York City. The landline was supposed to be a backup, but ended up as the primary link. Richard Wolfe of Fox explains: "The quality on the landline was better. Part of that was due to the satellite signal having to double-hop, but most of it was because of Canadian regulations on portable uplinks. They operate at a relatively low power and don't saturate the transponders on the satellite, so the signal-to-noise ratio suffers a bit. For political reasons we couldn't bring in an American, higher-power uplink, or else we would have used the satellite signal exclusively."

International treaties prohibit ground stations in the U.S. from receiving signals from Canadian satellites and vice versa, so special authorizations had to be granted to allow the Buffalo downlink to tune into Anik and the portable dish in the parking lot to monitor the U.S. satellites.

Because of the double hop, the satellite signal to New York arrived 0.6 seconds behind the landline signal. Had Wold needed to use video from one source and audio from the other because of some equipment failure, the video and audio would have been out of sync. Fortunately, this problem did not arise. However, as Wolfe says, "We didn't know which circuit we were going to use up until air time." Needless to say, engineers at the concert site and Wold personnel in New York maintained continuous telephone contact with each other.

The half-hour preconcert show with hosts Pringle and Nightingale had been prerecorded at the studios of City-TV. It was carried over the satellite Toronto-New York link for eventual distribution to CEN's clubs and theaters. During the same time period, the landline carried prerecorded music and test and timing signals.

From New York, the program went out over four uplinks. Most American local cable headends have two satellite dishes, one tuned to Satcom 3R, which carries HBO and most of the other popular pay cable services, and the other to either Westar 4 or Westar 5. To cover all eventualities, Fox put video and mono audio on transponders on both Westar 4 and 5. Another transponder on Westar 4 carried video and both stereo and mono audio for CEN's portable downlinks. The CEN receiving dishes were supplied by Videonet of Woodland Hills, CA, which located and arranged to rent privately owned portable dishes in the appropriate cities and supplied top-notch operating personnel at each site.

Yet another Westar 4 transponder, leased for the occasion from National Public Radio's DATE service and accessed by the uplink at New York City's public station WNYC, carried stereo audio for the 60 FM stations signed on by DIR Broadcasting. In those cities where NPR downlinks were not available, DIR arranged for portable

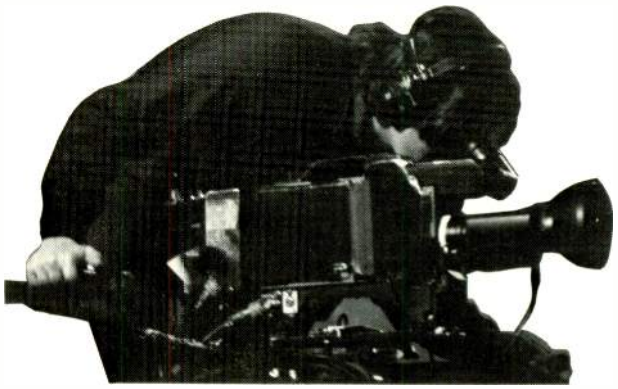
dishes or AT&T landlines to provide the signal. About half of the CEN venues took their audio from the local FM station, while the rest used the stereo signal on the transponder carrying their video. Pay cable systems told their viewers where possible to turn down the sound on their TV sets and turn on their FM radios, since the vast majority of local cable systems lack the capability of broadcasting stereo audio on video channels and few viewers have the equipment to receive it.

To help make all of the setting up of the satellite networks a little easier to deal with, all of the landline and transponder orders were arranged through Fox. "The only way it was going to work was if all of them came out of one office," says Frank O'Connell. "It helped that Wold's Los Angeles office is right down the street. We were still making changes up to a week before the show."

The worldwide network that wasn't

Besides the idea of broadcasting in quad, several other great notions fell by the wayside as December 17 grew closer. One was to beam the concert overseas over Armed Forces Radio and a few foreign pay-per-view networks. "It would have been 4:00 a.m. in Europe and 10:00 a.m. in Australia," says Frank O'Connell, "and it just wouldn't have been worth the expense. We were also thinking of bringing signals *back* from venues overseas to put on the air here. It would have been interesting, switching satellites like that."

In order to prevent pirating of the satellite signal, scrambling it at its origin was considered. The idea was rejected, according to Jack Calmes, because there just



Producers picked Ikegami HL-79A cameras because of their resistance to burn-in.

weren't enough decoder boxes in the field to service all the different outlets. An alternative was dreamed up: the credits at the end of the broadcast announced a prize (unspecified) to viewers who wrote in, telling Fox where they saw the show. "The purpose was to catch folks who paid someone to watch the show illegally," says Calmes—like private satellite-dish owners who charged admission to their living rooms. The results have not been made public yet, but apparently some viewers of pirated signals were indeed dumb enough to write.

Yes, it all worked

On the night of the broadcast, the months of preparation paid off—it went so smoothly that, as David Hewitt puts it, "it was boring." "Everybody worked together," says Michael Jones. "They were all terrific." Peter Kauff of DIR says, "The Who told us that if they could buy the problems off, they would. This isn't a solution for everyone, though." To put it mildly.

There were a few rough spots: an hour prior to showtime, it was discovered that the mono feed on the Toronto-New York landline was distorting. The source of the distortion was traced to the line from the concert site to Toronto's toll-network switcher, and the signal was switched onto a spare telco circuit 10 minutes before air time. At the beginning of the concert, some Canadian audiences experienced a two-minute signal loss because a routing switcher had been inadvertently turned off. One of the engineers monitoring back-feeds discovered it and rectified the problem. Peter Kauff reports that a car crashed into the transmitter tower of an FM station carrying the concert in Florida, putting it off the air.

In sum, to quote Jack Calmes, "It was the most complex and successful distribution of a music event ever."

Post-production

Although they were heavily promoted, the home-cable broadcasts earned Fox little money. Relatively few U.S. cable systems have the sophistication to individually address subscribers' decoders, and so the paid home audience was no more than 200,000. (In a few cases, local systems provided viewers individual disposable traps for unscrambling the signal, but the procedure for distributing these, even within a small system, is cumbersome.) By contrast, the over-the-air Canadian broadcasts reached an audience estimated to be between four and six million. Richard Wolfe says of the live broadcast, "It was more successful technically and artistically than financially."

To recoup its considerable investment, Fox licensed the show for later release in several forms: a two-hour version

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(the live show ran about two hours and 20 minutes) that should now be in release on Laservision and CED videodisc, as well as VHS and Beta cassette, all with Dolby-surround sound and all on the Fox/CBS label; a 90-minute version to be broadcast for the first time on May 17 on Home Box Office; and a 60-minute version for future domestic and foreign broadcast syndication.

Besides the obvious cutting that must be done, an effort is being made in post-production, in Richard Wolfe's words, "to correct Richie Namm's going overboard with the excitement of the event." Namm was faced with the unenviable task of making the live show look good on both large and small TV screens, which is somewhat more difficult than making an audio mix sound right on UREI 813s and Auratones. This reporter watched the show on a 25-inch set, and at times felt things could have been done differently. It is reported, however, that the video mix was extremely effective in CEN's theaters.

Editing a show like this would seem to be a rather conventional, albeit long, process for an up-to-date post-production house, but there was a fly in the ointment: while the show was recorded using the North American NTSC video standard and both audio and video tapes were striped with SMPTE time code, all of the editing decisions and audio mixing were to be done in England.

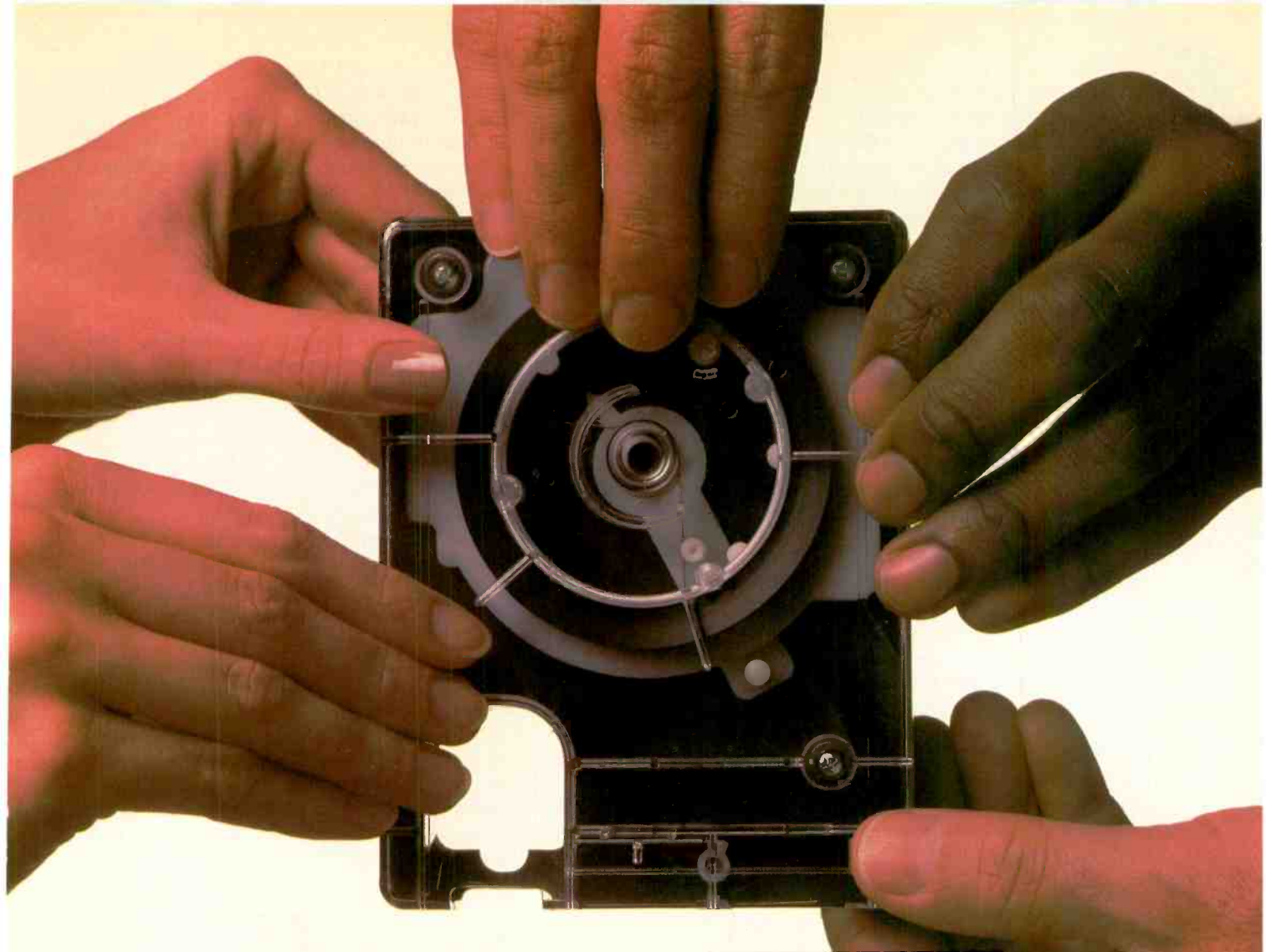
As we write, the various post-production processes are still in progress on two continents, so it is difficult to pin down exactly who is doing what. According to Richard Wolfe, the scenario goes something like this:

From Toronto, the videotapes were taken to Audio Plus Video in New York. There, they were dubbed onto ¾-inch cassettes, using Sony's high-band PAL format, and the cassettes were striped with new EBU time code. The cassettes then went to CETA Video in London, where post-production director Phil Tweedy bumped them up to one-inch PAL, and under the supervision of the band edited them into the 60-, 90-, and 120-minute programs. Tweedy also made up detailed edit lists from the EBU numbers, and struck ¾-inch workprints from his one-inch edits.

In February, Tweedy brought the work cassettes and his edit lists to Complete Post in Los Angeles. There, the edit lists were recalculated for the SMPTE code on the original tapes. This operation was done by hand—due to the differences in frame rates between SMPTE and EBU, there is no way of automatically achieving frame-accurate conversion from one code to the other. Using the new numbers, a second set of off-line edits was prepared. The English and American edits were compared, and final edit numbers were decided upon. During the final assembly from the original one-inch tapes, special effects were added.

Meanwhile, Glyn Johns took the multitrack audio tapes to his studio in London for mixing. John Entwistle, who acted as musical consultant, oversaw the work on a daily basis. Johns set up his control room for the Dolby-surround format, which uses left, right, center, and rear channels. He had access to SMPTE equipment, so no restriping of the code on the audio tapes was necessary—fortunately, since there was no room left on the tapes for another code track.

The tapes were mixed through a Dolby DS-4 surround encoder, which provides a two-channel stereo-compatible signal that can be decoded for four-channel systems. The



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finished audio tape, which consisted of two audio channels and SMPTE code on half-inch, was laid back onto the completed video at Compact Video in Los Angeles.

According to Richard Wolfe, "Ninety-five percent of the finished product is from the second show. Occasionally we filled in shots or tracks from the first night. But even though some of the songs had click tracks, we didn't do any audio crossfading—it just wouldn't have worked."

A unique event?

The first moon walk was an event of almost unprecedented historical significance. There were others to follow, but soon they were declared unnecessary—NASA knew they could do it, which was the important part, but further manned moon excursions would just be too expensive to justify the returns. Everyone involved in broadcasting and taping the Who concert knows now that such a colossal undertaking is possible. The question is, will it be done again?

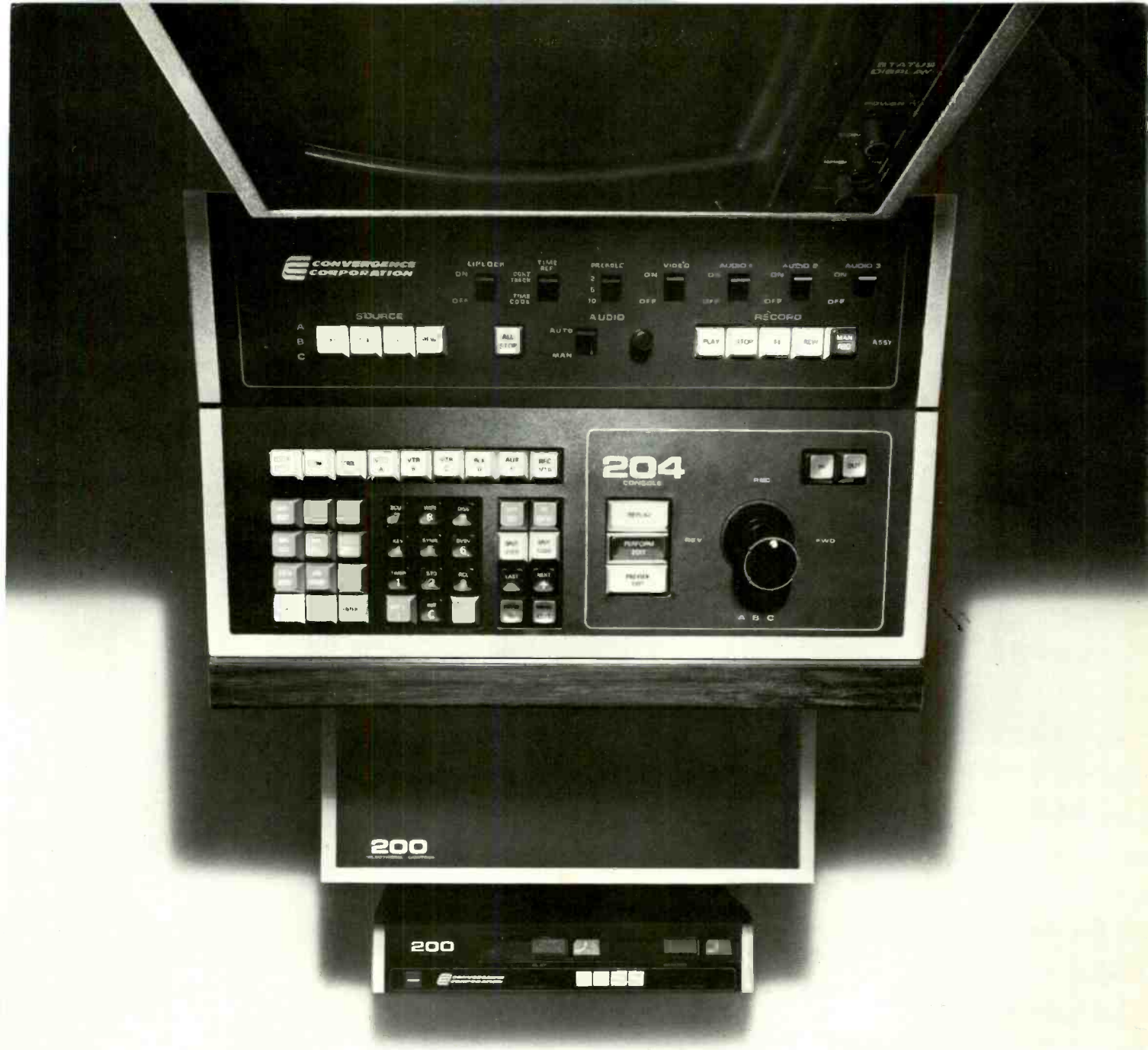
The answer is yes and no. For one thing, pay-per-view cable television is still in its infancy. The relative lack of sophistication of local cable systems makes the potential audience—and therefore the revenues—for such an event rather small in light of the huge expense and complicated logistics involved. This situation will not change quickly. The Who concert was only Fox's second attempt at pay-per-view (the first was a boxing match), and while movies like *The Pirates of Penzance* and other special events have been and will continue to be distributed this way, there appears to be little motivation to do more live music. Says Richard Wolfe, "It was a memorable event, the kind you don't get to do very often."

On the other hand, Jack Calmes sees his company, World Showvision, and Campus Entertainment Network, in which he holds a minority interest, thriving on rock concerts. "We may stay away from small screens entirely," he says. Besides the comparatively lower profits, he feels that home viewing is "not that good for rock." Instead, he sees superstars like Pink Floyd and Supertramp, who travel with huge entourages and mammoth stage and sound setups, taking advantage of satellite distribution to perform for large audiences in many locations at once. "They could do 10 nights in one place," he says, "and we could have 10 or 20 mobile units, with portable satellite dishes, large-screen projectors, and 20,000 W sound systems, moving to theaters in different cities every night."

The mechanism for accomplishing this, he feels, would not be at all difficult to put together. "We only did 40 cities for the Who concert," he says. "There was no reason why we couldn't have done 100."

Calmes is sure that presenting rock concerts this way is the wave of the future. And he isn't exactly resting on the laurels he won for the Who concert. He won't say who is involved, but he reports that six more such shows are already in the works.

For better or worse, his is probably a prophetic vision. As audiences demand more elaborate and expensive shows from their favorite rock acts, and as ticket prices skyrocket while record companies continue to tighten their tour-supporting belts, live video, with the assistance of high-quality audio and the best possible distribution and presentation systems (as well as a hefty dose of sponsorship from well-heeled corporations like Schlitz), will become the next best thing to being there. **BM/E**



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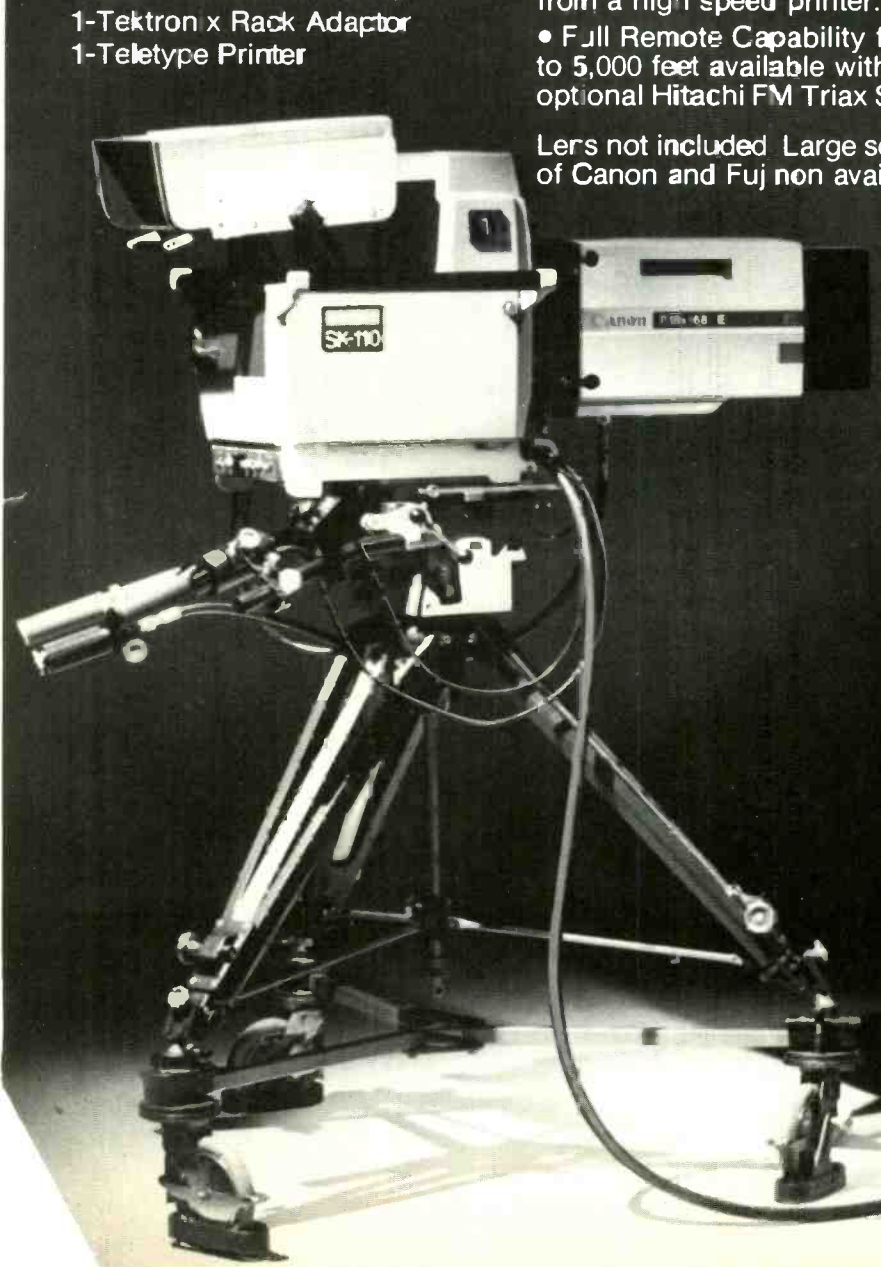

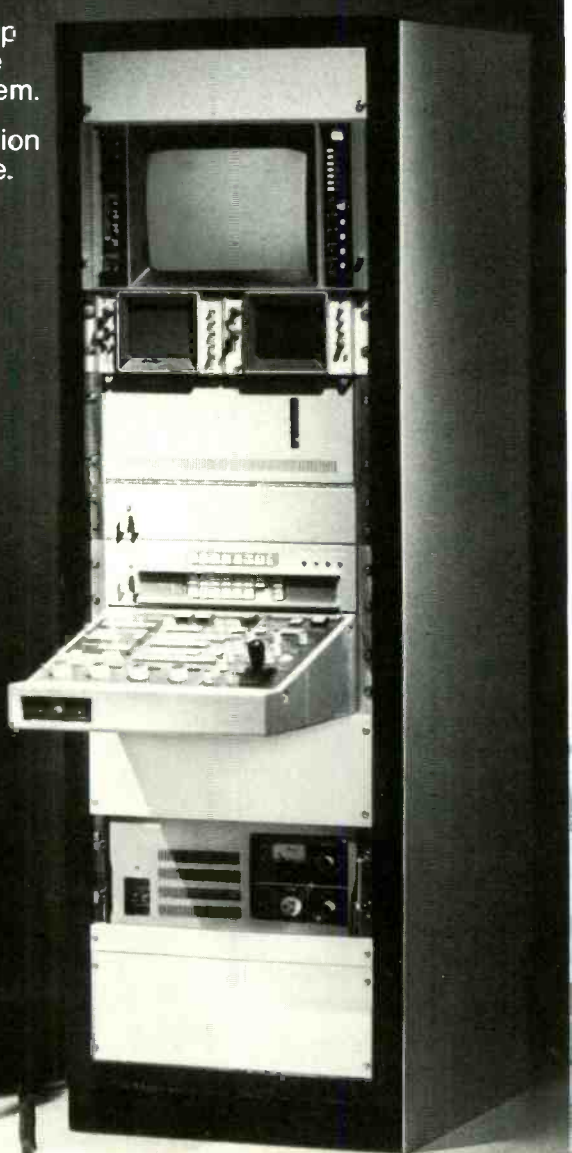

interpreting the FCC rules & regulations

Ownership Rules Inquiry Time

By Harry Cole, FCC Counsel

ONE OF THE MORE arcane nontechnical areas of broadcast regulation has traditionally been the FCC's ownership rules. While everyone probably understands the general outlines of those rules, the details of their applicability can be bewildering. Even more troublesome than the complexity of the multiple ownership rules is that they can, as they presently appear on the books, lead to results which occasionally don't seem to make much sense. The Commission, to its credit, is aware of this. In late January, it began an inquiry into a number of possible changes in its multiple ownership rules, changes aimed at bringing those rules into greater harmony with the realities of today's business conditions.

Before discussing the particular proposed changes, we might do well to review the purpose and scope of the multiple ownership rules. These rules are intended to accomplish two related goals. First, they are designed to promote competition in the economic marketplace of the telecommunications industry and, second, they are constructed to promote "diversity" in the marketplace of ideas. The economic goals are easy to understand—by limiting the number of broadcast properties a particular individual or organization can own, the Commission has tried to create a competitive environment in which it is impossible for one, or just a few, entities to gain monopolistic control. Similarly, the multiplicity of broadcast owners resulting from the limitations on ownership is thought to increase the "diversity of voices" simply because it is assumed that each different licensee will have different views which will ultimately affect the content of the programming provided.

With these goals in mind, the Commission has developed a variety of ownership restrictions on the national, regional and local levels. In brief, the "national" aspect of the multiple ownership rules prohibits an individual entity from owning, operating, controlling or having any interest in more than seven AM, seven FM and seven TV stations (and only five of the TV stations can be VHF). Also, no entity owning, operating, controlling or having any interest in a national television network can have a similar relationship with a cable TV system. On the "regional" level is the FCC's "regional concentra-

FCC

tion of control" rule, which forbids an entity from owning, operating or controlling three or more broadcast stations of any kind where two of the stations are within 100 miles of the third and the primary service contours of any of the stations overlap. Finally, on the "local" level, there are a number of different rules and policies affecting ownership. No single entity can own, operate or control two stations in the same service if their primary contours overlap. The creation of new situations where radio and television licenses in a single community are owned, operated or controlled by a single entity has been prohibited (although radio licensees may, upon an appropriate showing, still obtain UHF licenses). Newspaper publishers are generally prohibited from owning, operating or controlling any kind of broadcast station. Common ownership, operation and control of co-located television stations and cable television systems, is also generally prohibited. (In these last three cases, however, a significant number of situations inconsistent with the rules were "grandfathered" in when the rules were adopted.)

And finally, the Commission has a relatively nonspecific "cross interest policy" which prohibits certain types of interests in two broadcast stations in the same service in the same area. For example, under that policy you could not own an AM station in a market and, at the same time, act as the station manager of another AM station in the same market. The idea, of course, is to encourage arms-length transactions and actual competition between stations which should, technically, be competing, and any interstation relationship which might lead to anticompetitive results could run afoul of the "cross interest policy."

Obviously, general rules such as these are all well and good, but in order for such rules to be applied, the Commission must utilize a variety of specific guidelines. In the context of the multiple ownership rules, for instance, the Commission has had to define exactly what it means by "owning," "operating," or "controlling" a broadcast station. To do so, it has adopted certain "ownership benchmarks," i.e., the particular level of interest necessary to trigger the multiple ownership rules. For larger corporations—those with more than 50 stockholders—such a "cognizable interest" is currently said to exist with respect to officers, directors and owners of one percent or more of the outstanding voting stock. For smaller corporations, any officer, director or stockholder, no matter how few shares

may be involved, is now said to have a "cognizable interest" which will trigger the multiple ownership rules. Needless to say, these are extremely strict guidelines, guidelines which have proved extremely effective in limiting potential ownership interests for many, if not most, in the communications industry. This is, in the current Commission's view, the problem.

As the Commission under Chairman Fowler has evolved, one of the FCC's primary goals has been the elimination of governmental regulation where such regulation is not necessary. And, as the Commission sees it, the extremely stringent guidelines used in applying the multiple ownership rules may represent excessive governmental intrusion into private business judgments. For example, under the current standards, an individual owning a mere one percent of a broadcast licensee's stock would be effectively hamstrung relative to a wide variety of other media-related investment(s) he or she might otherwise choose to make. This could stifle private incentive and investment, and thus interfere with the individual's private business. And that is exactly the kind of governmental intrusion that the Fowler Commission would like to minimize, to the extent that it can do so consistent with the standard goals of encouraging economic competition and "diversity of voices."

In an effort to do just that, the Commission has proposed the modification of a number of its multiple ownership guidelines in order to permit a greater degree of flexibility for individuals. Primary among the proposed changes would be adoption of a "20 percent standard." Under such a standard, an ownership interest of less than 20 percent would not represent a "cognizable interest" sufficient to trigger multiple ownership restrictions, irrespective of the number of other stockholders in the picture. Further, the Commission is considering whether it might be advisable to focus not on blanket guidelines applicable across the board, but rather on "indicia of control" which could be applied on a case-by-case basis.

Such an approach would represent a more reality-based treatment of the ownership area. As a practical matter, it is clear that the current guidelines utilized by the Commission are probably much more stringent than need be. For instance, one of the assumptions apparently underlying present guidelines is that, in any corporation with less than 50 stockholders, *any* stockholder is in a position to control the company, no matter how few shares of stock he or she might own. Common sense and practical experience tell us,

however, that this is not the way things work in the real world. While it is true that, in some circumstances, a minority stockholder may wield significant power in a broadcast licensee, this is far from a common occurrence; indeed, such situations are probably the exception rather than the rule. As a result, it is likely that the current guidelines have an "overkill" effect, inhibiting transactions which would not, in fact, undermine the FCC's interest in maintaining "competition in the marketplace." The proposed shift away from blanket guidelines and toward a case-by-case analysis of individual facts and circumstances is certainly a more realistic approach.

A possible drawback of the proposal is the tendency of the case-by-case analyses to take more time and effort than application of "go/no-go" guidelines. Accordingly, it is possible that the proposed system, if adopted, could add to the FCC's processing burdens somewhat. The extra burden, however, might not be all that substantial, particularly if the Commission is practical in its efforts.

Other related areas are covered by the FCC's inquiry. These include such matters as the extent to which minority group members might have greater access to financing if the current ownership restrictions are eased, and whether or not it is advisable for the Commission to distinguish between closely-held and publicly-held corporations for the purposes of those rules. The FCC is even reviewing its amorphous "cross interest policy": it has asked for comments on the degree to which "indirect interests" should be attributed to individuals relative to multiple ownership matters.

This proceeding is probably only the first of several Commission efforts to relax its multiple ownership rules. Chairman Fowler has made it clear that he considers those rules ripe for review as part of his comprehensive "unregulation" program, and, while the proceeding begun last February is relatively broad, it still leaves untouched a significant number of restrictions. These questions could likely be considered in separate proceedings during the course of the next several years.

In relation to this, it is easy to assume that some relaxation of the multiple ownership rules is in store for the broadcast industry in the not-too-distant future (say, a year or two). And, if Chairman Fowler has his way, the scope of the relaxation may be substantial. If that happens, what effect might it have on the industry as a whole? Some observers have indicated a fear that easing the multiple ownership rules will lead to the undesirable concentration of control of media interests in the hands of a few powerful (and wealthy) owners. But that scenario assumes that, in reducing its restrictions, the FCC would also abandon all of the concerns which led to the formulation of the rules in the first place. Thus far the Commission has not indicated any desire to effect such a wholesale retreat. Rather, it appears at this point that the rule changes presently under consideration have been proposed in order to remove from broadcasters regulatory handicaps not normally imposed on business people. Thus, broadcasters could be accorded much more latitude in their business and investment decisions, subject to whatever concerns the Commission retains relative to assuring some level of competition within the marketplace. If that can indeed be accomplished, the proposed rule relaxations may be a welcome change.

If you have any questions about the Commission's proposals, or if you would like to submit comments on those proposals to the Commission, you may wish to consult with your communications counsel. **BM/E**

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BOSCH

Circle 167 on Reader Service Card

TAX TIPS for stations

Safe Harbor Leasing

By Mark E. Battersby
Financial Consultant

PSST. WANT TO FINANCE your station's new broadcasting equipment at interest rates below the prime? Impossible? Not really. In fact, many stations have done precisely that through a transaction known as "safe harbor leasing."

To illustrate, suppose that John Q. Stationowner needs a new production console in his studio. Since he doesn't have the cash to pay for the production console up front, he ordinarily would go to his banker or finance company and obtain a loan for the amount needed to finance that acquisition. The bank or finance company would ordinarily get a security interest in the console for the amount of the loan and would charge around the prime rate plus one or two percentage points.

Instead of going to the bank or finance company, however, suppose that John were to look into the possibility of leasing the same piece of equipment over a five-year period with the option to buy the console for 10 percent of the original purchase price. Rather than getting a loan at 15 percent, he can lease the equipment with rental payments equal to borrowing money exactly at prime. Instead of paying two or more points over prime, John can lease the equipment at the lower rate because, with a lease, the bank or "lessor" can take advantage of the tax laws and claim the investment tax credit on the equipment that it couldn't claim if it were only loaning the money. The tax savings are then passed on to John Q. in the form of reduced payments.

This method of leasing is called "safe harbor" leasing because the lease, within certain guidelines, will be considered a lease for tax purposes by the Internal Revenue Service.

The benefits of leasing in this manner are twofold. Leases allow a 100 percent write-off of lease payments in the current year. A key additional advantage of a lease is that either party may take the investment tax credit on the asset. Frequently, as with the case under consideration, lessors keep the tax credit in exchange for lower financing costs. A few big businesses who don't need the tax credits choose to "sell" their tax credit for reductions in their financing costs, something they do need.

Unfortunately, as a result of the abuse of these safe harbor tax benefit sales, Congress recently passed the Tax Equity and Fiscal Responsibility Act of 1982. This new law has greatly modified safe harbor leasing by placing limitations on both the lessor and the lessee, not to mention restricting the safe harbor lease itself.

The first limitation on lessors is that the investment tax credit, perhaps the most important benefit of safe harbor leasing, must now be spread evenly over five years instead of being used entirely in the first year. Thus, leasing companies cannot wipe out their tax liability with a few large leases.

The second restriction requires depreciation of the leased asset to be spread over the periods used for minimum tax purposes. Property normally depreciated over three years under the Accelerated Cost Recovery System of depreciation will now be depreciated over five years, five-year property over eight and 10-year property for 15 years.

The third condition is that the lease term is limited to 120 percent of the present class life of the asset or its depreciable life under the safe harbor rules, whichever is longer.

Finally, the fourth stipulation constrains the lessor to reduce his or her tax liability by only 50 percent for any year and does not allow carrying unused tax credits back to a prior year. In addition, a limitation placed on the lessee limits the application of the safe harbor provisions to only 45 percent of the property placed in service in 1982 and 1983.

The new law also prohibits safe harbor leasing between related parties. For example, the president cannot lease property to his corporation under the new safe harbor leasing rules. Similarly, a profitable company cannot lease property under a safe harbor lease to an unprofitable sister company.

These limitations are transitional rules and will apply to leases created between July 1, 1982 and January 1, 1984.

As of January 1, 1984, the transitional rules and safe harbor leasing will give way to a new "finance lease." A finance lease will allow for a fixed 10 percent buyout at the end of the lease term without regard for the value of the leased asset at that time (a key benefit of safe harbor leases).

However, lessors would continue to spread the tax credits on the leased asset over five years and would still be subject to the 50 percent reduction in tax liability limitation. Lessees would also be limited in the extent to which they could take advantage of finance leases.

What it means to John Q. is that he can still enter into a safe harbor lease (and the old law still applies if he entered into an agreement prior to July 1, 1982). However, the limitations may force leasing departments to examine their approach to safe harbor leasing resulting in less savings to the lessee. In fact, many experts estimate that the benefits under last summer's tax law changes will be less than two-thirds of those under the old rules.

In a related arrangement, when it comes to conventional leveraged leasing agreements, the rules are scheduled to be modified on January 1, 1984. Briefly, the new rules that come into play at that time will: permit a purchase price of at least 10 percent of the original cost; allow a three-month period after the property is placed in service to arrange the lease; make limited-use property eligible; and impose certain limitations in the liberalized rules until 1985.

If you think leasing with the safe harbor provisions is still a good idea—or if it is the only avenue open to you—check with your tax advisor before you sign on the dotted line. **BM/E**

Photo Courtesy Rouse Company

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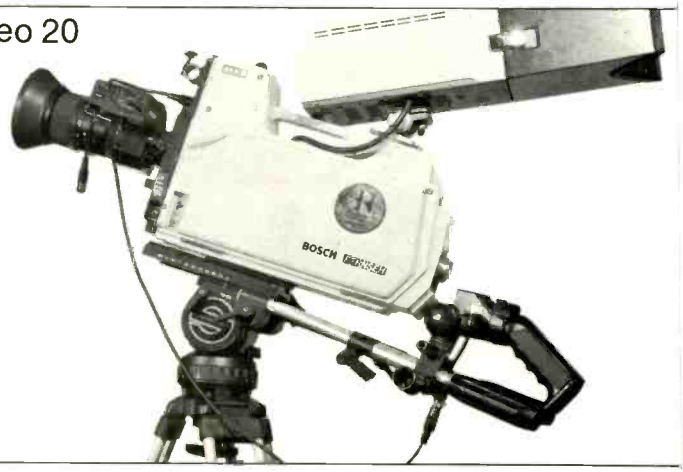
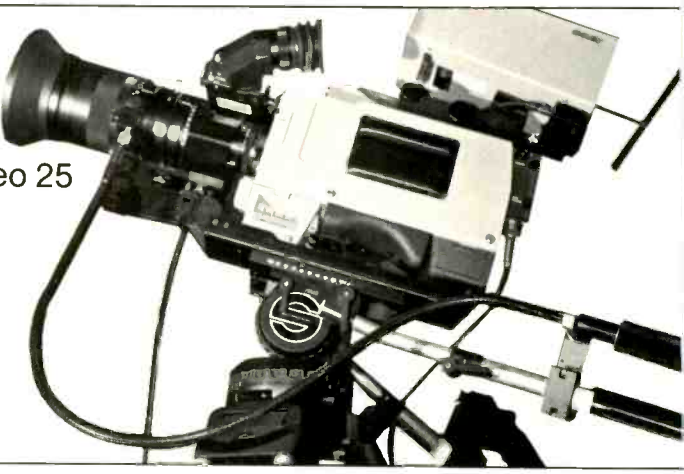
Video 20



Video 25



Video 30

Circle 168 on Reader Service Card

GREAT IDEA CONTEST

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

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

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

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

Problem 17: Preventing Echo in Cart Recording

In a radio production studio the main console at all times feeds the record channel on the cart machine. A second channel on the console is connected for playback from the cart machine. If the pot on this second channel is left open while recording is in progress, the feedback/crosstalk puts an echo in the recording. What is needed is an alarm signal, activated when recording is in progress, that operators are trained to recognize as the signal to turn down the playback pot. It should be inactivated when the pot is down. Alternatively, an automatic switching system could close the playback channel when recording starts.

Solutions to Problem 17 must be received by April 21, 1983, and will be printed in the June, 1983 issue

Problem 18: Automation With Home Computers

Allen W. Marshall III, president and GM of WKEU AM and FM, Griffin, GA, writes: "I don't have a Great Idea Contest solution, but I do have a problem: Has anyone been able to design a home-built automation system using a small, relatively inexpensive computer such as the Apple or TRS-80? Everything that the salesmen pitch me is in the $25,000 range and up. Surely with the price of home computers they can be put to good use at the broadcast station." Can anyone make some suggestions for Mr. Marshall?

Solutions to Problem 18 must be received by May 23, 1983 and will be printed in the July, 1983 issue

CONTEST RULES

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

Mail Official Entry Form to:

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

Solution to Problem # _____

Your Name: _____

Title: _____

Station or Facility: _____

Address: _____

_____

Telephone: (____) _____

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

Signed _____

Date _____

broadcast EQUIPMENT

Neve Offers Small 200 Console Line

The new 542 range of portable consoles comes in six- and eight-channel configurations or in the 12/16-channel (two-group, four-bus) arrangement. The consoles are designed for use in the field and for professional recording or broadcast production applications.

Both systems offer independent powering through the use of an internal rechargeable nicad battery which, when fully charged, typically provides more than four hours of operation. The smaller units can be either rack-mounted or fitted into a case and, like the larger units, can operate with external powering.

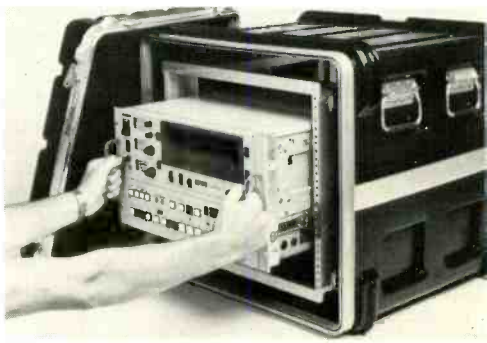
The channel amplifier/equalizer modules are interchangeable, with balanced and floating inputs via transformer. Standard features are variable mic/line input selection, sensitivity settings in 15 dB steps, availability of program and audition output controls, and mic I/P headroom at greater than 40 dB. There is also a prefade listen control by pushbutton.

Main line stereo outputs are derived from the program buses, with the output levels controlled by Penny & Giles faders. Audio from auxiliary outputs is routed through a switch providing mutually exclusive selection of auxiliary audio or talkback from the console microphone to the auxiliary outputs.

Additional capabilities in the larger units include a mono main output, a more comprehensive talkback system, individual switches for microphone phantom powering, and the provision for three stereo/mono playback kits. The systems come in different designs, including the suitcase unit for ENG/EFP, and the 12- and 16-channel table-top or "drop through" consoles.

Thermodyne Has 201 Sliding Rack Cases

The Rack-Pack transportation case is now available with optional sliders so that equipment can pull out more easily for adjustment and repairs. With the lids latched in place, the shock-resistant case functions as a transportation unit, while removing the covers provides the user with an operating rack case. Equipment can be stacked and wired in place.



Wiltron Develops Automated Test System 202

Model 5647 Option P2 Automated Scalar Network Analyzer locates faults in one- to 500-foot long microwave transmission lines. After guiding the operator through simple test procedures provided on a preprogrammed cartridge, the new system displays the faults and plots their return loss in dB and distance down the line in feet.

Operating over the 10 MHz to 18.6 GHz range, the system consists of a 560A scalar network analyzer, a 6647 sweep generator, and an 85 controller.

The automatic determination and display of faults is achieved by digital data processing that implements fast fourier transform techniques. The system measures and locates small reflections beyond large discontinuities, whether tests are made on waveguide or coaxial transmission line. This is done by analyzing the complex waveform that results when reflections from multiple faults combine with the applied signal as the system sweeps over the test frequency range.

Micro Controls Has AM Stereo STL 212

The new PTS-10CD is a three-channel STL system that will interface AM stereo and earth station satellite systems. This new model features left and right audio and has remote control capabilities which, according to the manufacturer, eliminate the need for two single STL systems.

Using phase lock loop and IC technology, the transmitter is contained in a stable, low-noise, high-parity voltage-controlled oscillator. An approximate 0.5-second delay is provided between phase lock and the presence of the carrier so that a valid lock is ensured. The receiver is a double-conversion, crystal-controlled, super heterodyne design, with four sections of Hi-Q cavity filtering circuitry in the preselector inputs.

Frequency response is ±0.2 dB at 40 to 15,000 Hz with S/N of -65 dB or better below 100 percent modulation. De-emphasis is typically 70 to 72 dB with stereo separation at -36 dB.

ATC Research Has Sound Effects System 203

This newly formed company has developed a sound effects insertion system for use in production and post-production of commercials and video presentations. The system, claims the designer, permits TV stations and teleproduction facilities who do their own audio production and editing work to have the auxiliary function of special audio effects for less than $100,000.

The sound effects system consists of a Sound Workshop console or a custom-made ATC board, in conjunction with the BTX Shadow controller, cart machines with modified logic control for effects insertion, JVC VCR, and Otari 5050 reel-to-reel tape machines. The system comes in three designs, with the top of the line a computer-controlled system using customized or user-specified components. The computer program was written specifically for the effects insertion technique and will be operated through an Apple computer.

The carts are used to be compatible with standard broadcast facilities and because they offer multisegmented effects with instant accessibility. The other types of products were chosen for

their adaptability to the constant use of the system as well as providing an economical and reliable component network for the sound effects turnkey package.

Gray Combines Units for VITC 204

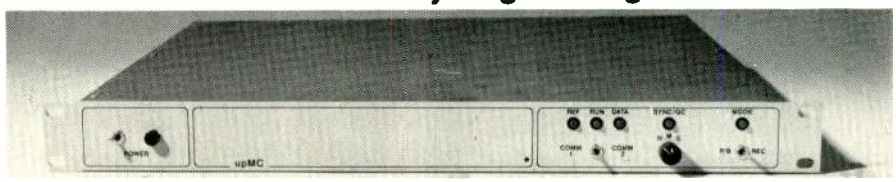
The VIE-224 is a vertical interval encoder and the VID-225 a vertical interval decoder to use with SMPTE VITC.

The VIE-224 converts and displays any SMPTE longitudinal edit code input to VITC output for encoding on any combination of vertical interval lines from 10 through 20 on both fields. The incoming time code is updated before modulating the video to maintain real time. The circuitry provides time base correction which assures only one set of VITC data per video frame regardless of the longitudinal code speed or phase.

Model VID-225 performs a dual function by decoding and displaying both a longitudinal cue track time code and a vertical interval time code present on composite video signal. A new SMPTE longitudinal code is output at a rate proportional to either input. This feature, claims the manufacturer, allows the use of VITC input from freeze-frame to wind speeds to be converted to a code format acceptable by most existing edit controllers.

The units were designed as separate modular devices for greater flexibility in editing packages and for economic reasons. The company's intent was to allow customers the ability to purchase only one VITC encoder for a given dubbing situation when three or more VITC decoders may be needed for the same job. The price of the VIE-224 is $3450 and the VID-225 is $3950.

New Interface From Calaway Engineering 205



The upMC intelligent videotape machine interface will operate compatibly with either Interactive Systems' Superedit or the CMX/Orrox 340 editing systems. One feature of the upMC enables checking tape machine synchronization on three levels: hard, medium, or soft. This front panel selectable capability allows the interface to handle tapes with a wide disparity in the quality of the recorded time code.

The new interface occupies 1.75 inches of rack space and has low power requirements. The unit is currently available at $4750 off the shelf for the Sony BVU-800, BVH-2000, and BVW-10 tape machines, as well as the Ampex VPR-2B and VPR-80.

BROADCAST EQUIPMENT

Broadcast Technology 206 Introduces Communication Station

A director's communication station, the Model PI 2320 program interrupt, is designed especially for remote field use. The unit is self-contained, including a microphone, speaker, and VU meter operating from a choice of D cell batteries, BP 90 nicad, or 120/240 V ac. The nicad battery is trickle-charged from the ac supply and will immediately take over should ac be interrupted.

Output connections are made through parallel terminal strip or XLR connectors. The nine 600 ohm cue outputs offer selection for their own external source through additional XLR connectors and parallel terminal strip. The nine outputs and the intercom may be interrupted by the director individually or simultaneously by momentary lever switches.

A signal generator may be switched into the interrupt bus for system checkout and line identification. The BTI Model HA 1290 headphone amplifier is designed as a companion to the program interrupt and connects directly to the output terminals through telephone wire. The PI 2320 lists for $1500 and the headphone amp is an additional $102.

Timesaver From Peak Audio 207

The Timesaver is a field-installable accessory for older audio tape recorders which provides an accurate readout of tape time. It is a two-part system containing a precision tachometer which is mounted to the tape transport. The tape is threaded around the tachometer and, when in motion, it sends a signal to the electronics unit which counts and displays the tachometer signal.

The system will display time up to four hours in the positive direction and up to one hour in the negative direction on five seven-segment LEDs. Display is in hours, minutes, and seconds.

The unit can be preset to operate at

BROADCAST EQUIPMENT

two different speeds. A signal from the speed switch on the tape transport will select the proper preset for the unit. A front panel reset button is provided to clear the display. In addition, there is a direction and tachometer connection on the rear panel for interface to SMPTE type controllers, allowing older machines to be used for video production and sweetening.

New Philips Color Pattern Generator 208

Philips Test and Measuring Instruments has introduced a new computer-programmable color pattern generator, Model PM5631, available in NTSC and all standard PAL formats. The unit features a library of over 120 line types arranged in 99 standard patterns, with any one of the standard patterns manually selectable from the front panel or remotely accessible under computer control.

Nonstandard patterns, using the available line types, can be defined by program print statements written in BASIC and fed to the generator via its GPIB.

Available line type patterns are color bars, checker boards, gray scales, staircases, ramps, purity signals, color difference signals, luminance signals, VITS, VIRS, and more. Additional line types are available on special order. List price for the PM5631 is $6525 plus $465 for the GPIB interface for remote-control use.

Ideal-Unomat Announces New Lighting 209

Two new lighting units, the LX6000G and LX7000GS, are 1000 W and 2000 W fixtures using quartz halogen lamps and are fan-cooled for continuous operation. The lights use Tempex as a heat-absorbent front safety glass.

Standard on these lights are built-in thermostats to automatically shut off operation when excessive temperatures are reached. There is a swivel for bounce lighting and the units are available in 110 and 220 V.

The lights come with a 12-month warranty and offer a full range of accessories. A daylight filter converts to 5600 K, while the floodlight has a diffusion filter. Other features are barn doors, umbrellas, a universal adapter for use with light stand and tripod, and a bracket for multilight setups.

Studer Reveals Cassette Deck 210

The new A710 microprocessor-controlled audio cassette deck is intended for professional recording and production applications. The unit features balanced and floating line level inputs and outputs.

The line levels, factory set at +4 dBu (0 dBu = 0.775 V) are internally adjustable over a wide range. Maximum output level is +21 dBu into 200 ohms. Input and output calibrate/uncalibrate buttons are provided on the front panel and when switched to the calibrate position, inputs and/or outputs are set to the standard reference level. In the uncalibrate position, the front panel input and output controls may be used to provide an additional 10 dB of gain.

Other standard features of the A710 include XLR connectors, rack-mount flange, and connectors for fader start and remote-control. The tape transport built on a die-cast aluminum alloy chassis is a four-motor design. Two quartz-regulated Hall-effect motors drive the dual capstan while two dc spooling motors, governed by the microprocessor, provide constant speed fast wind and rewind, tape tension control, and electronic braking.

The A710 has a pivoting headblock assembly for azimuth stability and features a three-head design, Dolby B and C noise reduction, programmable start/stop in record or play, headphone volume control, peak-reading bar graph meters, modular electronics, and automatic start-of-oxide cueing. The decks are available from stock with a list price of $2200.

Sound Workshop Modifies Console Line 211

In moving into the broadcast production market, Sound Workshop is offering new input and output modules for its Series 30 and 40 audio consoles.

The stereo input module for the Series 30 is designed to handle preproduced stereo source material and features full stereo capability, including two balanced stereo inputs. Also offered are three-band stereo EQ, stereo group assign, logic switching, and PFL and solo capability.

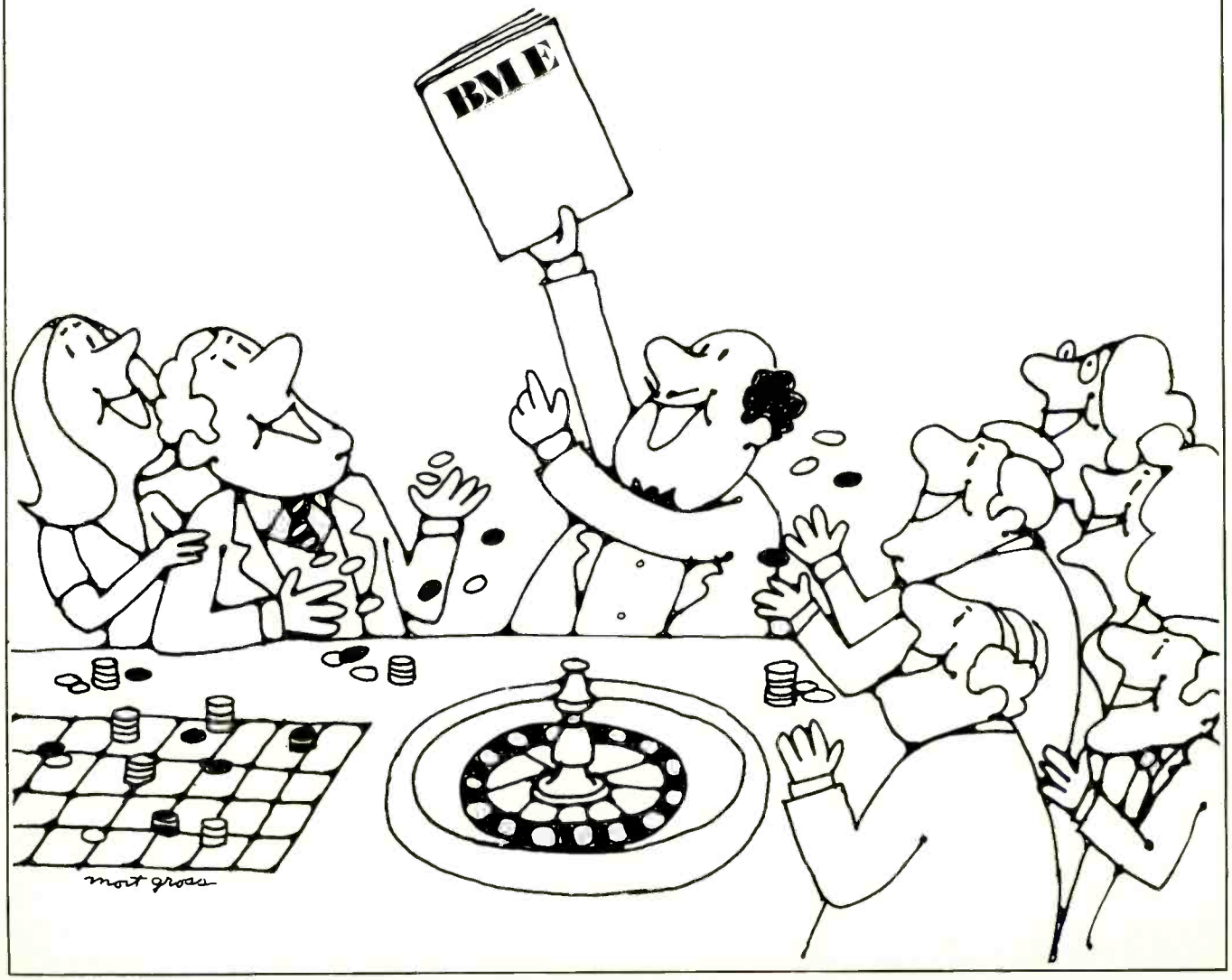
The stereo output/submaster module, also for the Series 30, permits four stereo output groups with provisions for group EQ, sends, PFL, and solo. These new modules can be retrofitted to any existing Series 30 console.

Circle 178 on Reader Service Card

BM/E's June Show-In-Print Issue HITS THE JACKPOT

BM/E brings you unparalleled coverage of NAB's 61st Annual Convention in Las Vegas. You get more than just the Sights and the Sounds — you get the *perspective.* BM/E's editors will bring you a complete rundown not only of what's new in technology but also an analysis of how that technology affects *your* plans, *your* decisions, and *your* business.

COME UP A WINNER WITH BM/E!



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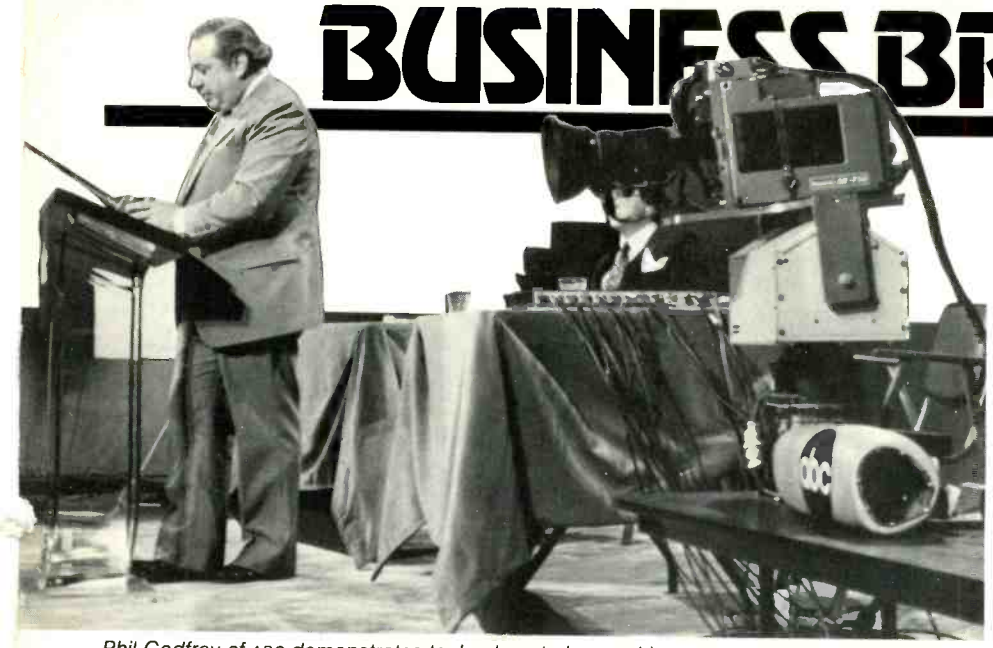

Phil Godfrey of ABC demonstrates technology to be used in ABC-TV's assault on Mt. Everest.

Vital Industries is celebrating its twentieth anniversary in the television broadcast industry, having grown from three employees in an old hangar to its current status as a broadcast equipment manufacturer . . . . Autographics, a division of the **Post Group** in Los Angeles, has taken delivery of its first **Aurora** computer graphics and animation system.

A contract to purchase **Broadcast Electronics** from Orion Pictures was signed by the president of **The Management Group.** Transfer of ownership was to occur within 30 days of the January 31 signing . . . . **Telex Communications** has announced the acquisition of the Singer Audio Visual division of **Singer Company** of Canada.

Grove Corp. has announced its intention to acquire the **Knox Video** product division of **Computer Operations,** and will move the unit to a Maryland facility for shipping of equipment starting March 1, 1983.

Satellite Systems Corp. (SSC) and **Scientific Atlanta** have signed a digital satellite terminal installation contract for SSC to provide installation of 2.8-, 3.0-, and 4.6-meter digital audio terminals for the major networks . . . . **Winegard Company** has formed the Satellite Antenna Specialists of America (SASA), a national network of professional TVRO installers, headquartered at Burlington, Iowa.

American Satellite and Television has been renamed American Communications and Television in an effort to avoid confusion with the privately owned American Satellite Company . . . . **M/A-COM Video Satellite** has revealed that **Centel Supply Company** will stock and distribute its satellite receiving equipment nationally.

Scharff Communications' Video Music Truck was put to work by **RCA Red Seal Digital Records** to record Zubin Mehta and the New York Philharmonic on February 2 . . . . **Sony** has sold its first PCM-3324, 24-track digital multitrack recorder outside Japan. The unit was purchased by **Digital Services,** a Houston-based audio equipment rental firm.

The PTL network has expanded production and post-production efforts with a $3 million purchase of three RCA TR-800 one-inch VTRs, a **Grass Valley** switcher, and a **Chyron** character generator, all purchased from RCA. **WPLG,** Channel 10 in Miami, is employing full-time the **Dubner** CBG-2 video graphics generator for its daily weather show.

Koplar Communications, owner of KPLR-TV in St. Louis, has purchased a nine-meter studio-to-satellite (SSL) video uplink, facilities controller, portable intercity microwave links, and related products from the Broadcast Division of **Harris Corp.**

Ampex has sold to **Crawford Communications** audio and video equipment valued at $1.2 million for installation in its new post-production facility in Atlanta. The equipment includes the VPR-3, -2B, and -80, as well as the VPR-20B portable VTR, the ADO system, ACE editing system, and the AVC-31 production switcher.

United Satellite Communications of New York has ordered $600 million worth of electronic reception equipment from **General Instrument Corp.** for DBS programming.

BGW Systems has appointed **Roger Ponto Assoc.** as independent manufacturer's representative in the Pacific Northwest . . . . **Evans Sales and Marketing** will be **Sound Technology**'s representative firm in the Southeast. **Symco** now represents **Audiotronics** in the east from Virginia north to New York.

Regarding people in the broadcast industry news, James Moneyhun was named senior VP at **Vital Industries,** while Gordon Peters is the new national sales manager . . . . Ernest Heissner has been appointed international market manager for professional business in **3M**'s Magnetic A/V Products division . . . . The new sales manager at **Chyron** is Lawrence Mincer, in charge of low-cost graphics systems . . . . Two major changes at **Blonder-Tongue** include the promotion of Martin Siskel to senior VP responsible for direction of sales of the company's general line; and Daniel Altiere has been promoted to senior VP, taking charge of marketing, systems engineering for the corporation.

Electro-Voice appointed a new VP of marketing, Kenneth Rolnicki, who will oversee E-V's four marketing divisions . . . . At **Beyer Dynamic,** Tony Hawkins has been appointed national sales manager.

Ampex announced the election of Michael Felix to the position of VP by the board of directors. Felix was general manager of the Advanced Technology Division . . . . Donald Kleffman, VP and GM of **Ampex AVSD,** has been assigned to the International Division for worldwide video development.

Joseph Freitag has been elected to VP, strategic planning and business development, for **RCA Communications** . . . . **Hitachi** has hired Les Davis to direct its new, high-profile public relations campaign . . . . The appointment of Robert Farrington as president and chief operating officer was announced by **Stainless, Inc.**

The appointment of Koichi Sadashige to the position of GM, Audio Video Systems was revealed by **Panasonic Industrial** . . . . **General Instruments, RF Systems** has a new national accounts sales manager in Mark Shepard. Geoffrey Roman was appointed to VP of engineering and marketing at **General Instrument** . . . . Irwin Laskey has been named director of sales for **BGW Systems.**

Quad/Eight has released information that Tracy Battle was appointed to the position of director of marketing . . . . Daniel Maase is the new VP engineering at the **ADDA Corp.** Other developments at ADDA include Fred Grab as director market development . . . . **Elcom Bauer** appointed Jim Lucy as VP marketing with worldwide responsibilities for broadcast products.

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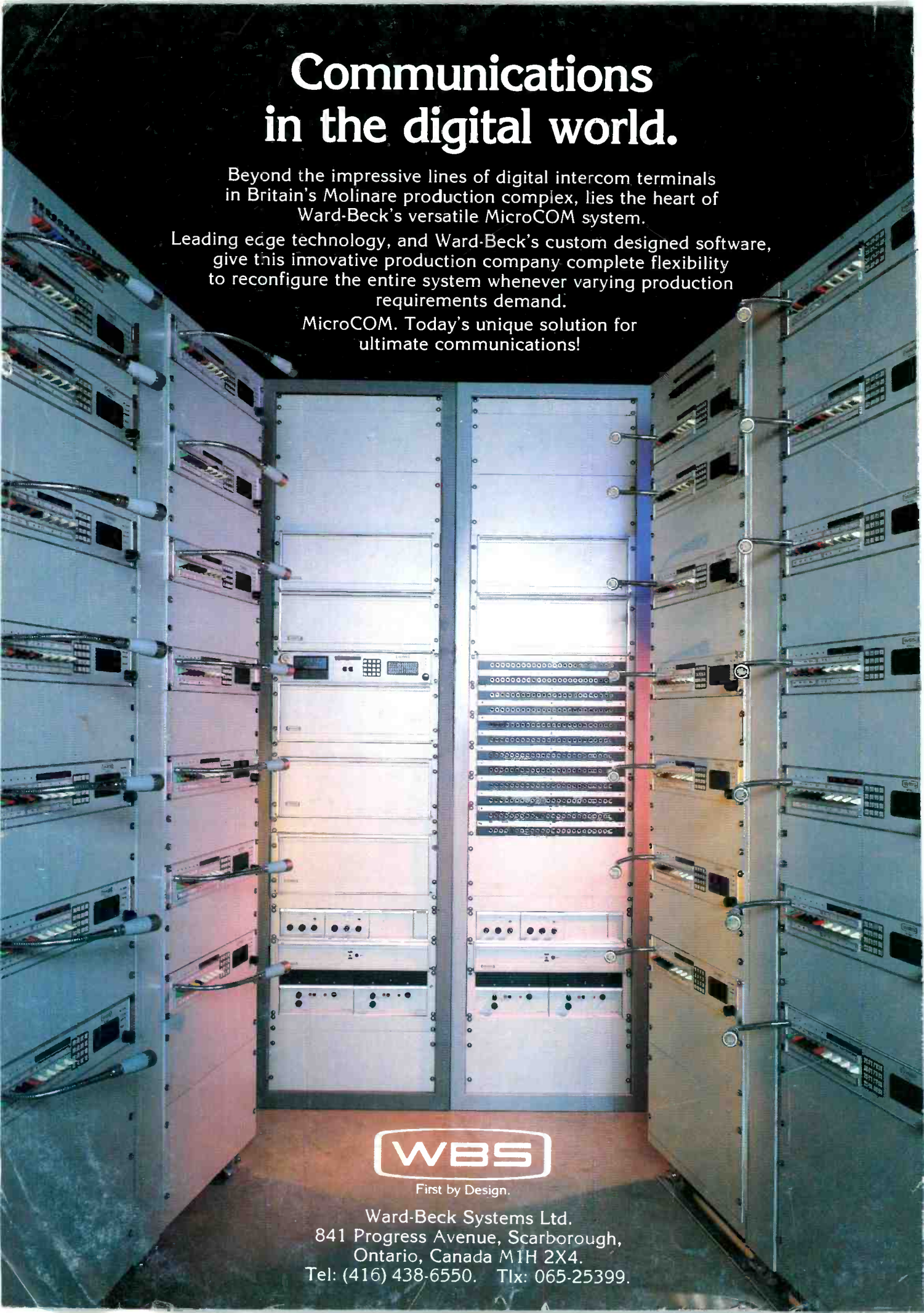

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