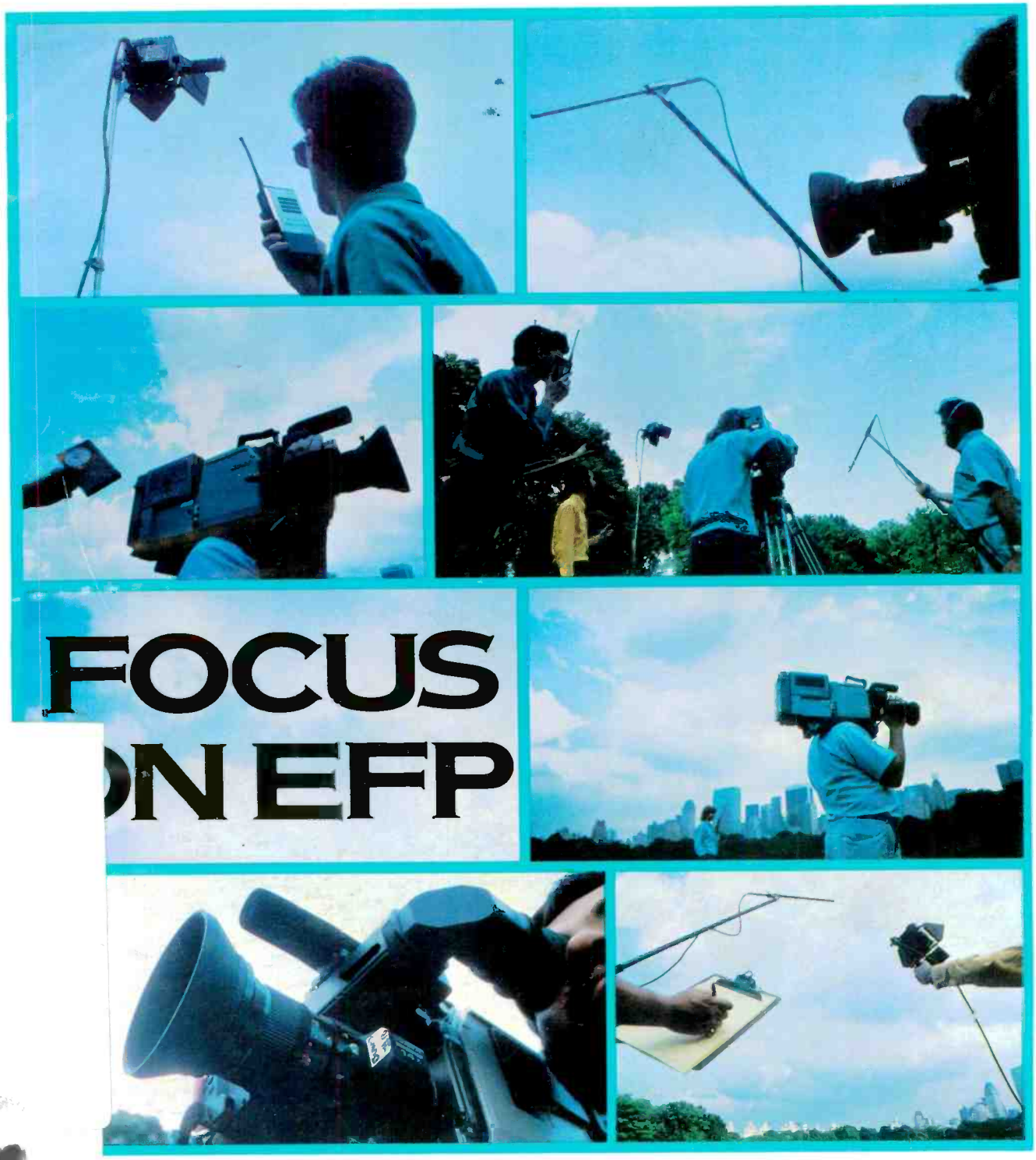
JULY 1984 $3.00

BM/E

BROADCAST MANAGEMENT/ENGINEERING

PROGRAMMING & PRODUCTION
LOCAL CABLE ORIGINATION



FOCUS ON EFP

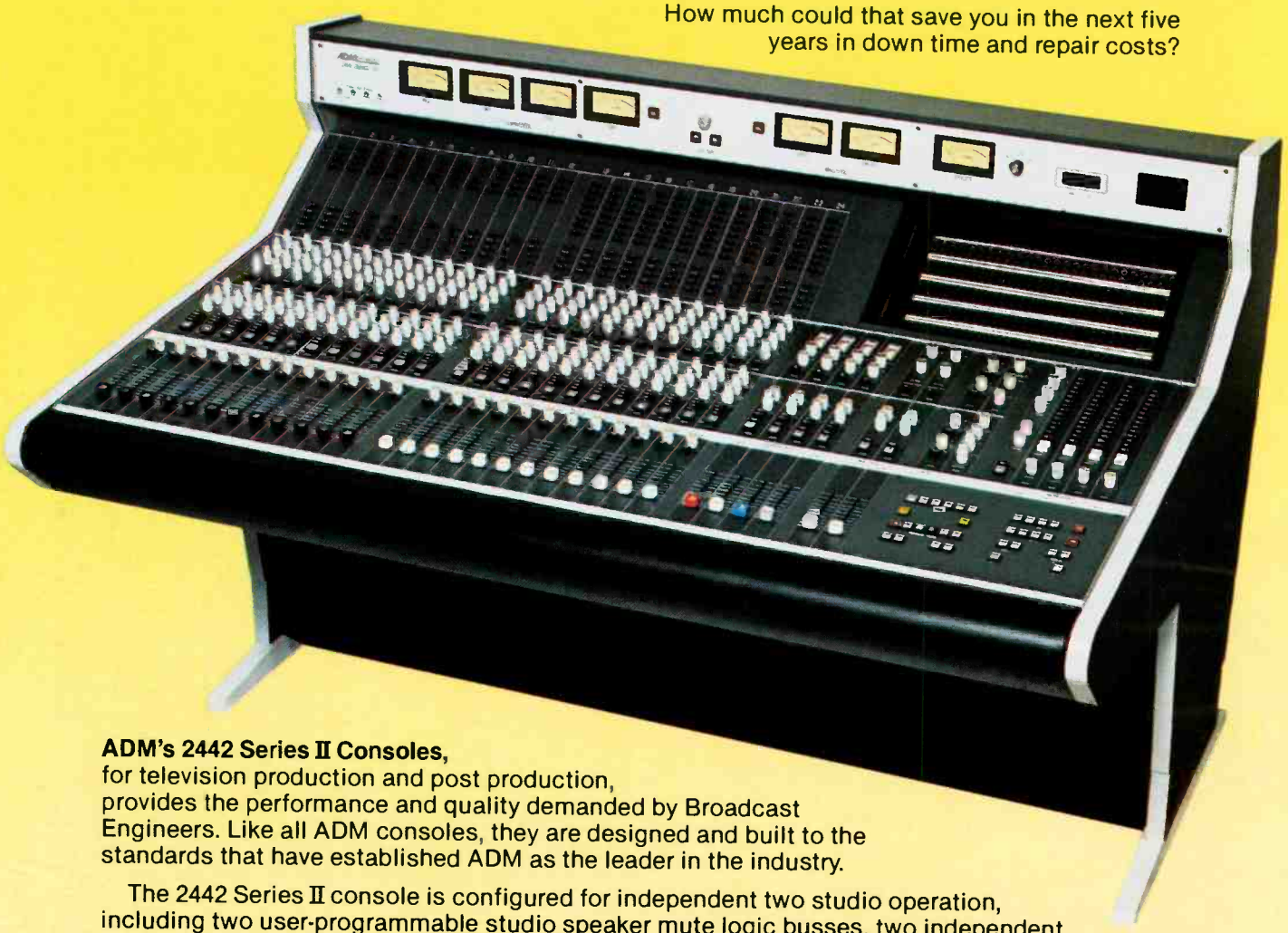
Also in this issue: Audio Carts and Cart Automation ■ Color Frame Editing ■ Placing Mics for Stereo

Can You Really Afford Less Than the Best?

ADM guarantees all our equipment for five years, including parts and labor. That's more than twice as long as anyone else in the industry.

Thousands of hours in testing and actual use convinced us we could safely guarantee ADM equipment for five years.

How much could that save you in the next five years in down time and repair costs?



ADM's 2442 Series II Consoles,
for television production and post production, provides the performance and quality demanded by Broadcast Engineers. Like all ADM consoles, they are designed and built to the standards that have established ADM as the leader in the industry.

The 2442 Series II console is configured for independent two studio operation, including two user-programmable studio speaker mute logic busses, two independent studio monitor matrices, two talkback outputs and two on-air indicators.

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BIG NEWS.
SMALL PACKAGE.

Announcing Thomson Betacam.™ The smallest, lightest ½" camera/recorder ever. All in one neat package. With superior signal-to-noise performance. Designed with *both* ENG and EFP operators in mind. For on-the-spot news gathering or complicated field production, now there's a system just right for you. And your budget. Because Thomson Betacam also carries the lowest price tag.

Available in one- or three-tube camera models, Thomson Betacam utilizes the newest electronics and manufacturing techniques. A ⅔" 'Mixed Field' Saticon tube design that virtually eliminates beam defocusing. A VTR featuring a rugged new recording format with greater chrominance bandwidth and signal-to-noise ratio. Built-in Dolby® noise reduction for high-quality audio. And a cassette player with TBC as standard, providing full broadcast quality output. Plus, the playback unit can be interfaced with U-Matic® and one-inch editing systems. This makes Thomson Betacam the ideal complement to your existing production equipment.

It's the smallest, lightest, most precise, camera/recorder system.

It's easy to operate. And it's energy efficient. Thomson Betacam is setting new standards for performance and flexibility in a fully integrated camera/VTR system. All of it at a very affordable price.

Get the whole story. Call or write Thomson-CSF Broadcast, Inc., 37 Brownhouse Rd., Stamford, CT 06902. Tel (203)965-7000. TWX (710)474-3346. Telex 6819035. Answer Back 6819035 TCSB UW.

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ALL IN ONE.

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Circle 100 on Reader Service Card

SONY TRINITRONS HAVE BEEN
YOUR PICTURES CAN LOOK

1 An Aperture Grille, which doesn't warp, instead of a shadow mask, which does—for high color purity.

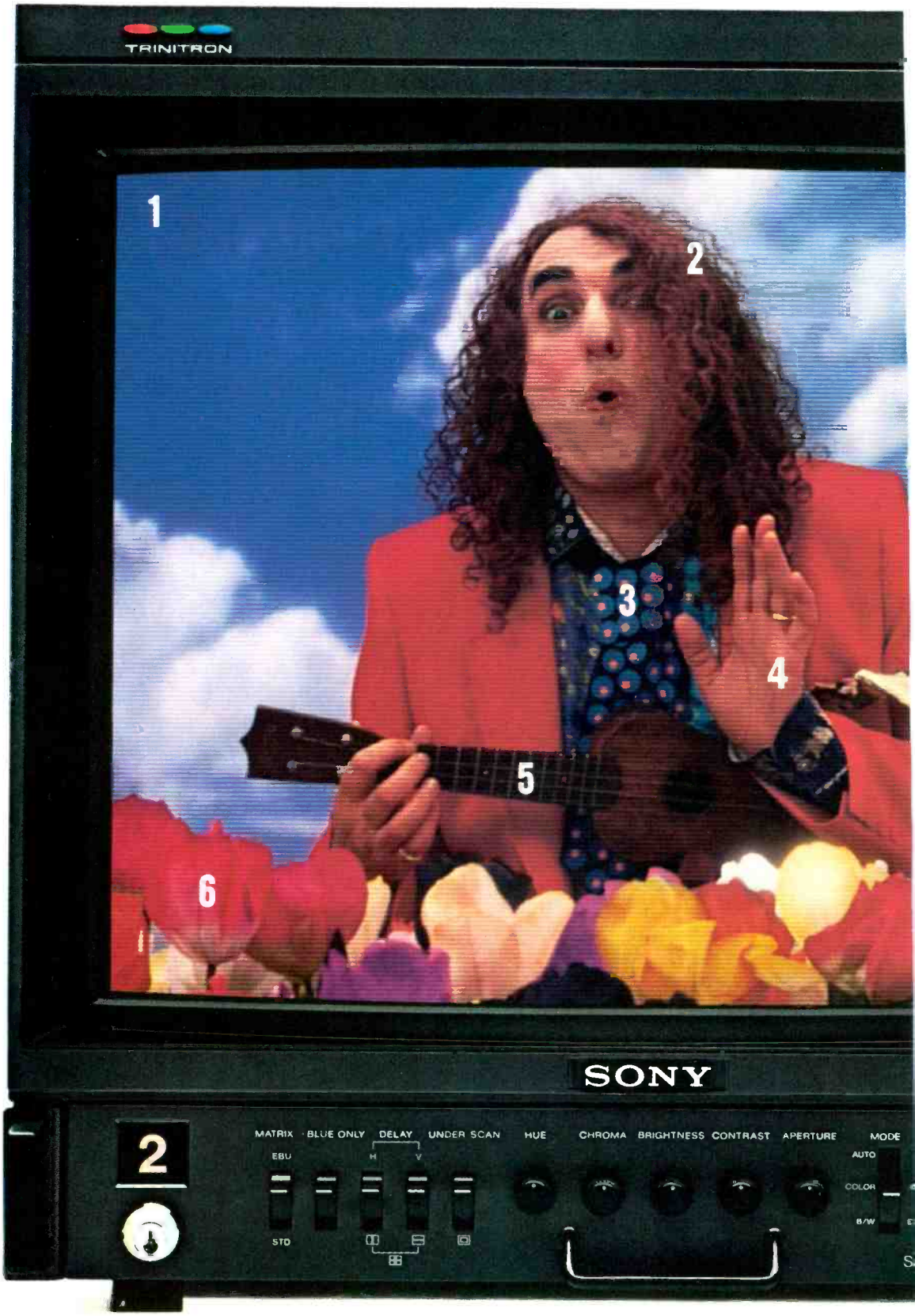
2 Nine-hundred TV lines for the highest resolution of any master control CRT—so details are sharper, and noise is never hidden.

3 Advanced comb filter—to achieve excellent luminance/chrominance separation with minimum artifacts.

4 ±.5 mm convergence within center circle—to prevent outlines from appearing around images.

5 One-percent linearity in center lines—to ensure perfectly proportional images.

6 Current feedback circuitry—to reduce color temperature drift to 1% over 500 hours.



DRAMATICALLY IMPROVED SO THEIR ABSOLUTE WORST.

If this were live, and you were critically evaluating your video signal, you would be looking blissfully at one of the most revolting pictures you ever saw.

You would, that is, if you were viewing a new Sony BVM-1900 or BVM-1201 Broadcast Trinitron®.

The new BVM Master Control Monitors have been completely re-engineered to reproduce your signal precisely the way it was fed into them.

If Tiny Tim's hair was covered with snow, or his ukulele was making too much noise, you'd know it. Because these Trinitrons offer the highest resolution available—900 TV lines.

This degree of resolution has been made possible through Sony's extensive research and development in high-definition TV.

However, the real reason they're the state of the art in broadcast CRTs is that they give you the highest resolution without ever compromising color purity or brightness.

That's because instead of using a shadow mask, which suffers from the disadvantage of being spherical (therefore causing it to warp from heat), Sony uses an exclusive Aperture Grille. It's cylindrical, and is rigidly held straight at the top and bottom, enabling it to resist thermal or mechanical bending and ensuring white uniformity.

And thanks to another exclusive Sony feature, Automatic Beam Control, when Mr. Tim goes tiptoeing through the tulips, they won't turn into pansies right before your eyes. Because the monitor reads its own signal and instantly corrects for color drift.

Plus, all phosphors used in BVM Broadcast Trinitrons now match the industry's U.S. standards.

For more information on the one piece of test equipment you shouldn't be without, the one with mixed video capability, that's ready to accept computer graphics, and you don't have to be Tiny Tim to afford, contact Sony Broadcast today.

In New York/New Jersey call Sony at (201) 833-5350; in the Northeast/Mid-Atlantic (201) 833-5375; in the Midwest (312) 773-6045; in the Southeast (404) 451-7671; in the Southwest (214) 659-3600; in the West (213) 841-8711.

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Sound Advice

ITC announces a revolutionary departure from the traditional triple deck cartridge machine. The Delta III's advanced modular design gives you three independently removable decks. This means that you can remove a deck for easy maintenance and still stay on the air.

That's great news for you and your listeners because the Delta III's superior sound will spoil everyone who hears it. You won't want to settle for less, and neither will they.

The Delta III is part of the Delta series, ITC's new generation of cartridge machines. Mechanically, electronically and physically superior to previous models, the Delta Series is fast becoming the new standard of the industry.

That's something you need to know. Because you wouldn't want to miss the revolution.

The Delta III offers:

- three independently removable decks
- rugged modular design
- crystal-referenced servo motor
- toroidal power transformer
- non-magnetic stainless steel shaft
- now more affordable!

Don't Miss The Delta Revolution

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Circle 102 on Reader Service Card

BM/E
BROADCAST MANAGEMENT/ENGINEERING
JULY 1984 VOLUME 20/NUMBER 7

FEATURES

DEPARTMENTS

Swiss Audio: Technical Evolution

On adding time-saving production features to a proven audio recorder design.

The updated PR99 MKII, now offering a microprocessor controlled real time counter, address locate, zero locate, auto repeat, and variable speed control, can improve your audio production efficiency. And, as before, it's built to meet strict Studer standards for long-term reliability.

Welcome to real time. The PR99 MKII's real time counter gives a plus or minus readout in hours, minutes and seconds from −9.59.59 to +29.59.59. Counter error is less than 0.5%, and the microprocessor automatically recomputes the time displayed on the LED counter when you change tape speeds.

Fast find modes. Press the address locate button and the PR99 MKII fast winds to your pre-selected address, which may be entered from the keyboard or transferred from the counter reading. Press zero locate and it fast winds to the zero counter reading. In the repeat mode, the PR99 plays from the lower memory point (zero or negative address) to the higher point, rewinds to lower point, and re-activates play mode for a continuously repeating cycle.

Pick up the tempo? When activated by a latching pushbutton, the front-panel vari-speed control adjusts the nominal tape speed across a −33% to +50% range. The adjustment potentiometer is spread in the center range for fine tuning of pitch.

Future perfect. The PR99 MKII also offers a serial data port for direct access to all microprocessor controlled functions.

Much gained, nothing lost. The new MKII version retains all features of its highly regarded predecessor, including a die-cast aluminum chassis and headblock, balanced and floating "+4" inputs and outputs, self-sync, input mode switching, and front panel microphone inputs.

European endurance. Designed and built in Switzerland and West Germany, the PR99 MKII is a product of precision manufacturing and meticulous assembly. Every part inside is made to last.

To discover more about the world's most versatile and dependable budget-priced recorder, please contact: Studer Revox America, Inc., 1425 Elm Hill Pike, Nashville, TN 37210; (615) 254-5651.

STUDER REVOX

PR99 MKII with optional carrying case and monitor panel. Roll-around console also available.

EDITORIAL

Taming the Deadly Spectrum

Currently under review by the Environmental Protection Agency (E.P.A.) is a proposal to lower the 10 mW/cm² ANSI/NIOSH voluntary standard for the power density in the area around a broadcast antenna. The new proposed level may be as low as 1 mW/cm², and the agency will use federal enforcement capabilities instead of voluntary compliance. The reason: another round of scientific evidence indicating that the kind of radiation emitted by a broadcast antenna may have serious harmful effects on the human body.

It has been almost five years since *BM/E* first broke the news to the industry that nonionizing electromagnetic radiation—the kind used to transmit broadcast signals—was being increasingly suspected as a cause of serious human health problems (see "The Deadly Spectrum?" August 1979). At that time, the whole question of limiting the amount of radiation to which the public should be exposed was under close investigation by several federal agencies, especially the E.P.A.

On the medical side, there was a growing body of evidence that there really might be problems associated with 10 mW/cm² doses of this kind of radiation—particularly in the FM and TV bands where the wavelength of the radiated power can be more readily absorbed by the human body. And despite some controversial medical evidence to the contrary, many were beginning to suspect that subjecting the human body to large concentrations of broadcast radiation might be a little like what a hot dog experiences in a microwave oven. It was only a matter of time before regulatory action was sought, and most hoped it would come from the federal level rather than local communities each vying with the other to set stricter guidelines.

At first it seems a bitter pill to swallow—that an outside agency will force broadcasters to watch their power levels a lot more closely, and that some may have to even cut back on their current ERP to meet the new standards. Some stations may even be forced to relocate their antennas, or take other drastic measures.

But the issue is one of the fundamental rights of the citizenry to life and the pursuit of happiness—neither of which is possible while being bombarded by a continuous stream of potentially harmful broadcast radiation. Limiting power levels to acceptable standards falls under the category of plain old responsibility, and we commend the E.P.A. for its decision to make this responsibility part of our national program for a safe environment. We urge broadcasters to support the E.P.A.'s efforts.

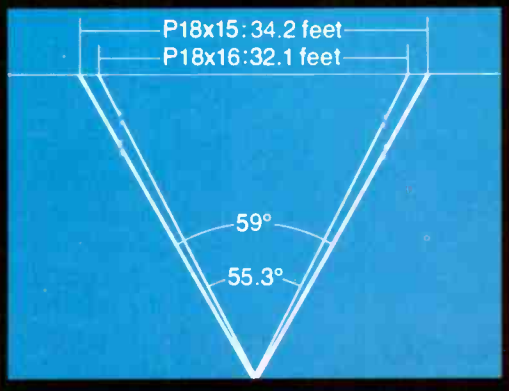
New Standards

The Widest Angle, The Highest Performance

Canon engineers have done it again, advancing the optical state-of-the-art so far forward that new standards must be considered.

The Canon P18 x 15 BIE offers the widest angle of any broadcast television zoom lens: 59°, plus incredible edge-to-edge sharpness, fidelity and sensitivity throughout its 18X range.

Every one of these superb lenses will be supplied with both 1.5X and 2X built-in extenders and a pattern projector. Options include manual, semi-servo or full servo operation.



The Canon P18 x 15 is the most versatile studio lens ever made, setting new standards for years to come.

P18 x 15 BIE F2.1 for 30mm Cameras*
KEY SPECIFICATIONS

■ Focal length:	15-270mm
■ Max. Relative Aperture:	1:2.1 (15-218mm) 1:2.7 at 270mm
■ Angular Field of View:	59° x 45.8° at 15mm 3.6° x 2.7° at 270mm
■ Minimum Object Distance:	0.6 meter (2 feet)

*Also available: PV18 x 11 BIE F1.6 for 25mm Cameras

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Midwest puts

Ikegami HK-322 Automatic Color Camera Makes Midwest Picture Perfect

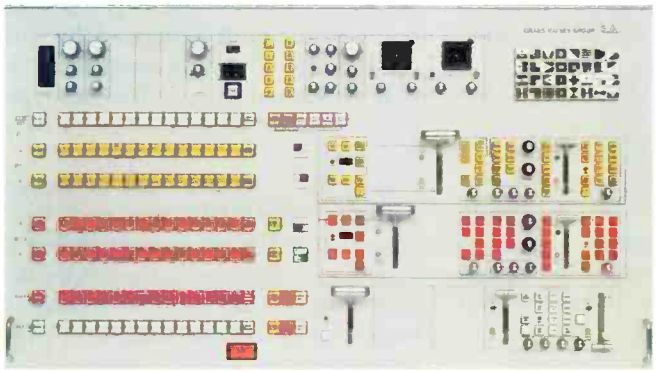
The Midwest M-40 Series is the most advanced family of mobile teleproduction units available today. Up to 47 feet of unparalleled technical and creative capability. Field-proven Ikegami cameras are chosen as the basic building block of the system. The HK-322 Fully Automatic Color Camera is in keeping with Midwest's "no compromise" design philosophy: Quality, Reliability and Versatility.

The HK-322 sets the standard for picture resolution, signal-to-noise ratio and registration accuracy. Full computer set-up takes much of the hassle out of preparing for remote telecasts. A Midwest M-40 Series mobile unit equipped with Ikegami color cameras is the current benchmark for quality in the television industry.

So, if you're in the market for a world class mobile unit, contact Midwest. We will design a system specifically to your requirements.

Because, at Midwest, we only put in the best parts, like the Ikegami HK-322.

in all the best parts



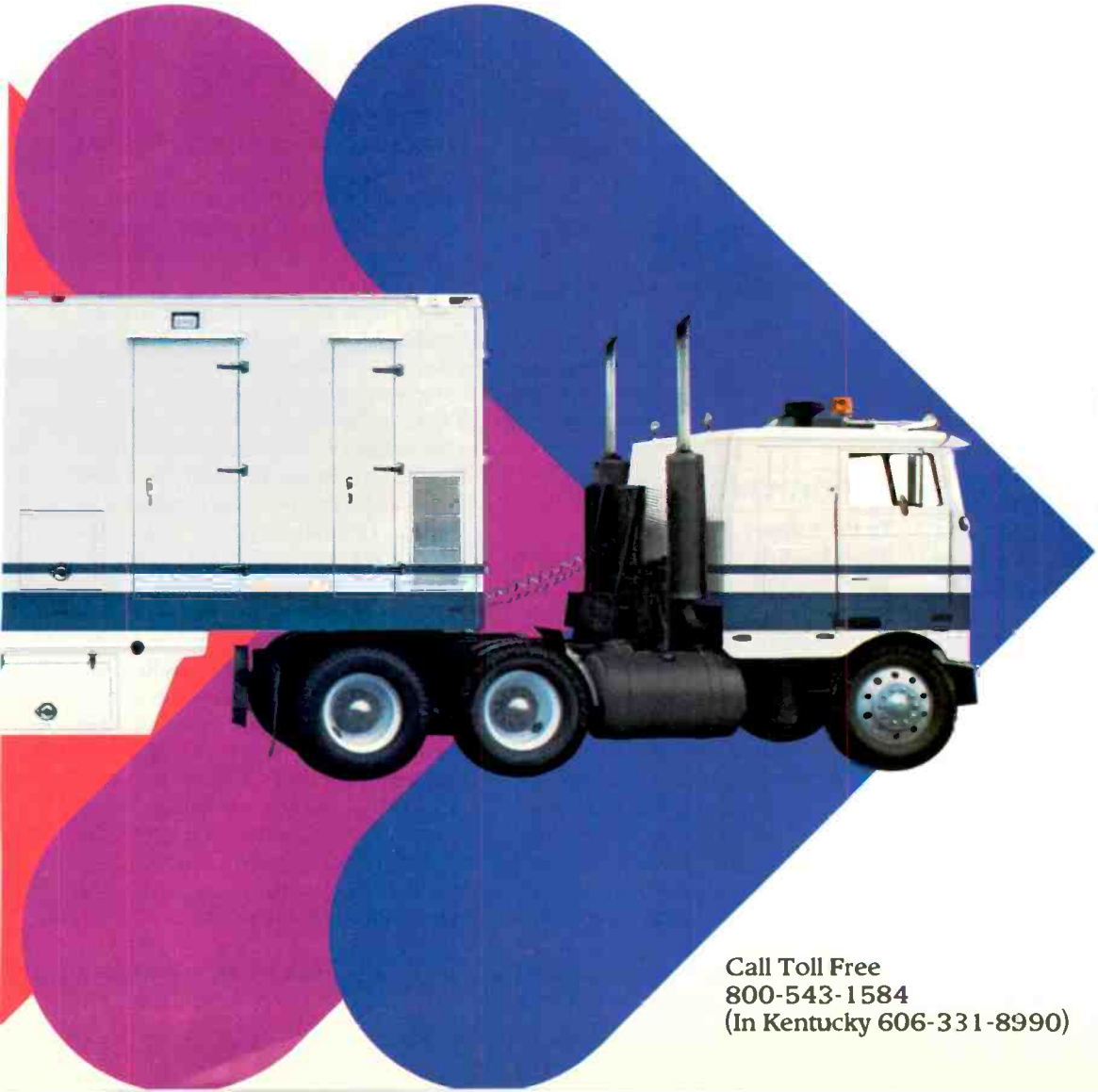
Grass Valley 1680 Production Switcher...Key To Midwest Mobile Unit

At Midwest, we design our units with the flexibility to handle the most complex creative requirements with ease and still produce the highest quality results. The heart of Midwest's M-40 Series teleproduction units, and the key to their tremendous versatility, is the Grass Valley 1680 Production Switcher.

As the successor to the famed 1600 Series, Grass Valley's new 1680 has a lot to live up to. But thanks to a host of design innovations, the 1680 meets the challenge and has almost twice as much production power as the 1600. With up to 24 Inputs and 3 Mix Effects Systems, it's a big hit with Directors. Editors like it for its control flexibility, Engineers for its reliability and Managers for its value. Since the 1680 is a basic component of Midwest's M-40 Series, they all like our mobile units for the same reasons.

So, when you're ready for that large mobile unit, come to Midwest. We can create one designed for your specific needs that will give you the best possible results.

Because, at Midwest we only put in the best parts, like the Grass Valley 1680.



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Lexington, KY 606-277-4994	Tampa, FL 813-885-9308

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LETTERS

TELCO RULES

To the Editor:

I am writing in regard to the March *BM/E* Great Idea Notebook. I am surprised that you would print an idea that is in violation of FCC rules Part 68 governing the interconnection of customer-provided equipment (CPE) to the switched telephone network. Mr. Gaboury's idea includes the direct connection of unregistered components and, from a technical standpoint, provides no means of controlling excessive transmission levels as specified by part 68. The operating telephone company would probably be within its rights to suspend service until such arrangements were removed from their equipment.

Richard Walsh, Engineer
WHCN
Hartford, CT

FUNDING THE FUTURE

To the Editor:

I am writing to make you and *BM/E's* readers aware of the financial crisis now facing the broadcast technicians training program at Matawan Regional High School. Originally oriented toward production, the curriculum was changed in 1982 after our industrial contacts pointed out that the industry was in dire need of technicians. It is the only high school program of its kind in the nation.

Students work in a $150,000 television studio in the high school, designed and installed by a nationally known firm and connected directly to a cable that feeds to over 10,000 homes. They are urged to pursue their training on a college level, and receive five college credits for completing the high school-level program.

Several weeks ago I was told that the district could no longer support the program, and that I should try to find other funding sources. We are seeking funding in several areas and on different levels. Full funding of the program would run in the area of $40,000 to $50,000, covering all expenses. Partial funding, covering basic supplies and maintenance, would run about $10,000 to $15,000. Any amount of support, regardless of how small, could cover the costs of texts and supplies. Also useful would be donations of test equipment such as vectorscopes, waveform monitors, and TV monitors, and of other equipment, including ENG cameras and recorders and U-Matic tapes.

Any help you or your readers can give us in locating funding or supplies would be greatly appreciated.

Charles Burke
Instructor and Studio Consultant
Matawan Regional High School
Aberdeen, NJ

DIRE PREDICTIONS

To the Editor:

Warm greetings from Marquette, MI and WHWL-FM. *Broadcast Management/Engineering* and its complimentary subscription to keep me better informed about industry direction and equipment.

May I make a recommendation? As manager of a religious station, it was difficult to be enthusiastic about the March 1984 cover. I would encourage avoiding the use of tarot cards, crystal balls, and related paraphernalia that might encourage further investigation by your readers. I'm sure that was not your intent, but I feel the less visible these tools of fortune telling and prediction, the better.

Could I encourage you to attempt to convey the same message without these devices for next year's edition? Thank you.

Stuart F. Schaeffer
Manager
WHWL-FM
Marquette, MI

FORWARD THINKING

To the Editor:

While reading your production facility report on Video Post and Transfer of Dallas (March 1984), I came upon a prominently featured home-brew item—a device that generates film edge numbers during film-to-tape transfers. The attending quote from Mr. (Neil) Feldman related that he could find no such device anyplace in Los Angeles. While client demand for this service has been low, and hence advertising less than prominent, there are two facilities in Los Angeles which do offer this service and have done so for several years.

At Image Transform we have had a means of burning in film feet and frame numbers since 1979, and edge numbers since 1982, both generated by our unique color-correction computer. The firm of Ruxton, Ltd., in Burbank, has offered both of these services for over two years.

A further enhancement at Image Transform is SMPTE time code synchronized to film movement so that it counts up or down depending on the direction of film travel. This facility is used for synchronizing a one-inch VTR to the telecine for frame-accurate background plates for Ultimatte work or other special applications. While this is not unique any more, Image Transform was one of the first to offer this facility.

Mr. Feldman and your readers can rest assured that forward-thinking engineering continues to thrive in Los Angeles.

David Schnuelle
Engineering
Image Transform, Inc.
N. Hollywood, CA

SCA UPDATE

To the Editor:

I have just received *BM/E's* May 1984 issue, containing the article on the uses of broadcast subcarriers. I found the article outstanding. It provides a valuable in-depth review and analysis of the entire SCA industry.

Our firm represents the company mentioned in your article which was previously known as Reach, Inc. Its name was officially changed on June 4, 1984, to SpanTel Corp. We thought your readers would be interested to hear that in its meeting of April 26, 1984, the FCC preempted state regulation of paging. Theoretically, this means that the state regulation reflected in the table you published no longer exists. As a practical matter, however, the effects of such preemption may not be implemented locally for several months, until the Commission's decision is upheld in the courts and state agencies have had the opportunity to revise their procedures. Also, the FCC's decision does not effect post-entry regulation. States may no longer control who may offer paging services but they can still regulate a paging company's tariffs and rates once it is in the market.

Jack W. Whitley
Blum, Nash & Railsback
Washington, DC

One of the world's smallest digital still stores is also one of the largest.

Introducing "Snapshot" from MCI/Quantel. Only 12¼ inches high by 19 inches—including removable cartridge Winchester disk drive!

Snapshot is not only the smallest of MCI/Quantel's DLS 6000 series units—it's one of the smallest digital still stores in the world.

Snapshot lets you capture pictures from live asynchronous feeds, store up to 400 of them with titles, and replay them on demand. You can prepare and edit sequences or stacks of sequences. And you can search by title.

Need more? You can increase Snapshot's storage to 1,600 pictures. Or you can upgrade it to a DLS 6020 with on-air cuts and dissolves. Or upgrade it further to a DLS 6030, the most powerful still store available with production effects that bring an exciting look to your stills.

If that's not enough, you can integrate up to seven Snapshots—or other DLS 6000 series units—as workstations into our Central Lending Library (CLL). Now you can store over 10,000 stills at each workstation and have simultaneous access to 100,000 more from the CLL. Plus unlimited off-line storage on disc cartridges or videotape.

You can even include MCI/Quantel's Paint Box as one of the workstations. So you can create the finest electronic graphics ever seen in television and have them instantly available for on-air use as well as library storage.

So whether you want a small system or a big system, Snapshot is the place to start.

Call your local MCI/Quantel office for more details. Or get in touch with us directly at 415/856-6226. Micro Consultants, Inc., P.O. Box 50810, Palo Alto, California 94303.

MCI/QUANTEL

The digital video people.

'83 Radio Advertising Jumps $500 Million

According to the Radio Advertising Bureau, radio advertisers spent more than $5 billion on spot, local, and network ads in 1983—a hefty $500 million increase over 1982 levels. All figures given by the RAB are estimates, as the FCC no longer provides precise figures to the bureau.

Total dollar figures were up in all three RAB categories, though the largest gains were made at the network level. In 1983, $253.5 million was spent on network advertising, up from $217.5 million in 1982. The total spot investment in radio in 1983 was $1.023 billion; the total in 1982 was $909.4 million. Expenditures at the local level also were up significantly. In 1983, advertisers spent $3.739 billion on local ads, compared to $3.665 in 1982.

RAB research personnel said it was too early to project any figures or trends for 1984.

Eight Stations Finish FM Antenna Project

After four years of planning, testing, and work, the Empire State Building Master FM Antenna Project is complete. Eight stations have installed new Harris FM-25K transmitters, along with transmission lines, patch panels, and diplexers, on top of New York City's most famous building.

John Lyons, chief engineer at WRKS-FM, headed the project since its beginnings in 1980. He coordinated the 12 FM stations using the building's master antenna and oversaw the design of the new transmission system. Although the old antenna stayed up, "everything in between" had to be replaced, he says. Power levels increased 50 percent, from 5.4 to 7.8 kW, adding one to 1.5 miles to the stations' 30-mile coverage of the metropolitan area. The total cost ran over $1 million.

The eight participating stations are: WHTZ-FM, WKTU-FM, WLTW-FM, WNCN-FM, WNEW-FM, WQXR-AM/FM, WRFM-FM, and WRKS-FM. Though they and the other four stations might be competitive elsewhere, John Lyons observed, the engineering staffs worked together well.

Editel Links Facilities In Computer Graphics Network

There aren't too many TV stations that would not like to have a computer graphics package designed by Robert Abel or another of the country's leading graphics designers; unfortunately, there are few who can afford their work, and fewer who can cost-justify installation of the kind of computer graphics system necessary to generate this kind of imagery. Now, however, the Editel Group has set up an inter-city transmission system linking its New York, Chicago, and Los Angeles post-production facilities which can offer the high-tech images at a fraction of the price.

Named the Three-City Computer Graphics Network, this system allows all Editel editors and engineers to tap each other's knowledge and talents, and to use equipment at any of the three facilities. The Los Angeles facility sports a Computer Image System IV and Scanimate. Editel-New York recently acquired an MCI/Quantel Mirage. And Chicago will also soon be announcing a new graphics system.

In describing the Graphics Network, Editel president Doyle Kaniff notes that staff members will be able to use "visual storyboard conferencing" to consult with each other on "image production and technical questions." The Network, he adds, is a natural extension of Editel's introduction last year of an 800 number service for client access to the Editel staff.

Alfie Schloss and Judy Zahn "pull up" Editel-Los Angeles for the New York facility's Dubner CBG . . .

. . . While in L.A., Terrace Craig, Ed Kramer, and Roy Weinstock (l-r) work on that facility's Computer Images System IV.

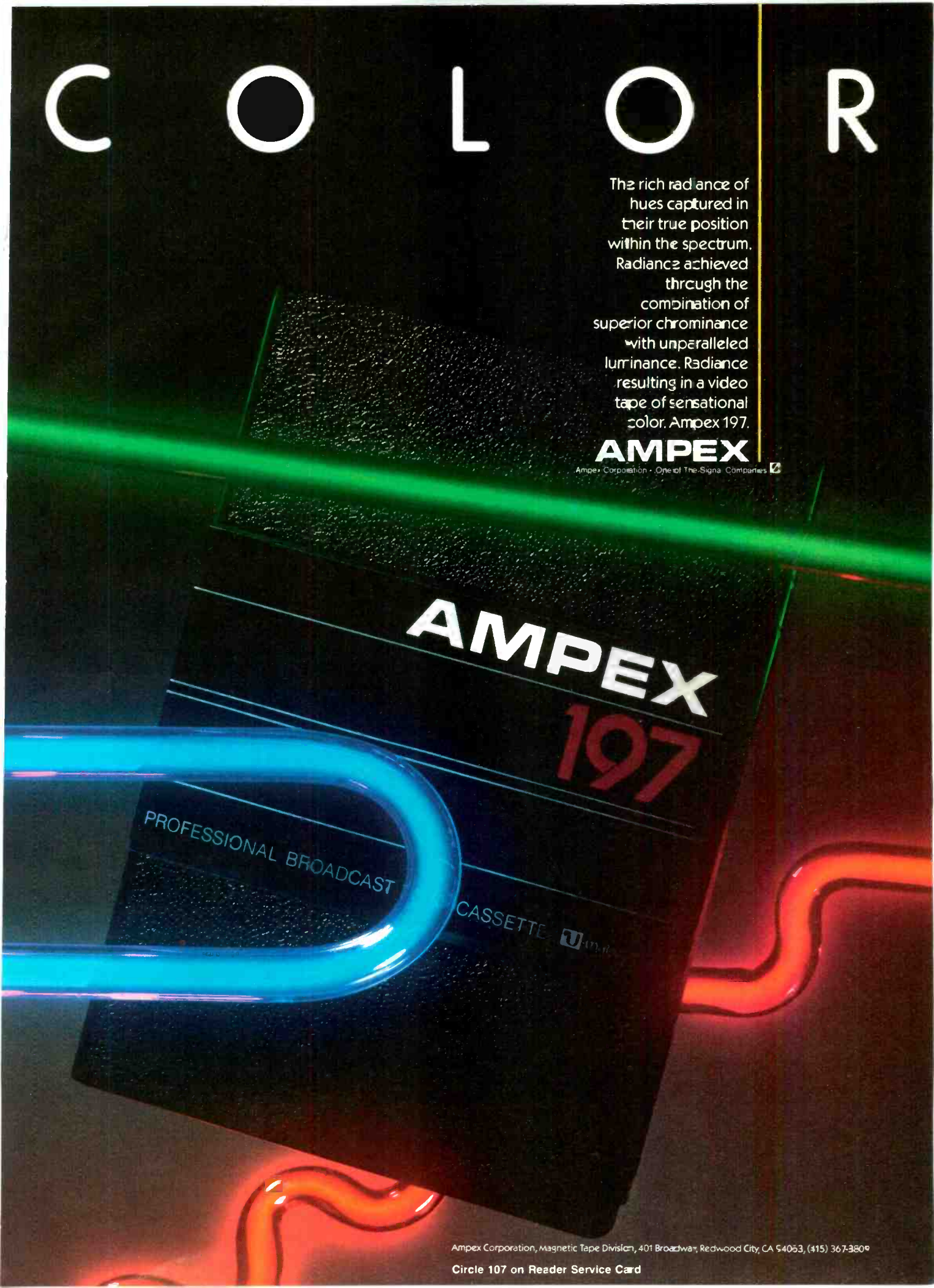
Main Channel Radio Teletext System Offered

A system for broadcasting free computer software and data to radio listeners using an AM or FM station's main channel—not SCA channels—has been developed by Microperipheral Corp. of Redmond, WA. Learfield Communications, a satellite distribution and programming company based in Jefferson City, MO, will deliver the teletext programming.

130 stations have participated in a test of the system although no startup date has been set. Learfield, which produces the Brownfield Network, currently distributes to 420 stations and says it is in negotiation with state networks representing 1500 AM and FM stations. These stations would have the right of first refusal for their markets. Learfield says it will offer spot barters to provide stations with an incentive to come on board.

Microperipheral also reports it is holding discussions with "large" advertisers concerning national ads to be carried both in the teletext message and by stations.

The Digital Broadcasting Network, as it is called, will be beamed to radio stations and taped or aired live in seconds-long programs. Because network material runs at a 4800 baud rate, listeners who own home computers will have to buy a demodulator, which Microperipheral will sell for about $70. The demodulator hooks up to a standard AM or FM receiver and allows the computer to handle the high-speed transmission. Noncomputer listeners in the station's audience will hear a quiet tone, according to the company.



Ampex Corporation, Magnetic Tape Division, 401 Broadway, Redwood City, CA 94063, (415) 367-3800

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Microperipheral's president, Michael Darland, says that several transmissions will take up, at most, 30 seconds of each day's broadcasting. This high transmission speed, he feels, will prove a substantial advantage over many other teletext operations.

Games, computer programs, and information, much of it software from the public domain, will make up the "programming." Microperipheral reportedly has a data base containing over 200 Mbytes of software for most computers and also plans on supplying information such as a daily stock market report.

In addition, listeners will be able to use the demodulator to gain interactive capability through the telephone. Microperipheral has arranged databases in eight states that will allow listeners to pull out news, regional information, and more free software. The company hopes eventually to make 250 such centers.

Mr. Darland says the network will be supported by ads and advertiser-supplied software. He anticipates that computer-related advertisers and other major companies will become interested in the network once it proves itself as a "laser" for reaching specific audiences. Later on, he says, stations will be able to drop local ads in the teletext material.

George A. Sperry, Jr., VP/GM of TVSC, in front of a row of Ampex VPR-2s at the company's Pittsburgh headquarters. TVSC, a subsidiary of Group W Productions, provides tape duplication and distribution via satellite and tape and operates a total of 158 VTRs in all tape formats.

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GI, Dolby Ink Deal for Digital Audio System

General Instrument will adopt a new digital audio system recently developed by Dolby Laboratories for satellite and cable TV audio applications. Under the terms of the new licensing agreement, GI will build subscriber decoders and Dolby Labs will manufacture professional encoders for the new process. The encoders will be used either at the uplink satellite earth station or at the cable television system headend.

The new digital audio system developed by Dolby is, as indicated by the agreement, an encode/decode transmission technology; Dolby refers to it as ADM (Advanced Delta-Modulation). According to Dolby, this advanced ADM system outperforms simple ADM systems, and provides very high audio quality at very low bit rates, thus requiring less bandwidth than PCM (pulse code modulation) systems. The system, the company says, is particularly useful for electronic delivery systems such as cable TV, satellite-delivered programming, and DBS, because only minimal error correction is needed, resulting in a much cheaper home decoder system than more conventional digital systems such as PCM.

One of the fundamental aspects of the system, according to Dolby, is the less costly, less complex decoder. To achieve this, the company has increased the cost and complexity of the encoder. Also significant is the choice of ADM over PCM. This technology, says the company, permits a lower bit rate, which can make for a more efficient use of channel space by reducing the bandwidth required for transmission. Ultimately, then, the overall cost of transmission is greatly reduced.

Another important aspect of the Dolby technology is the use of the "sliding band" technique to modify the signal prior to digitizing by ADM to improve S/N, optimizing noise reduction as the signal frequency content varies while avoiding the headroom limitations and low frequency noise problems associated with fixed pre- and deemphasis systems. Unlike companded PCM, which, according to Dolby, can exhibit noise modulation effects (swishing) with all high-level signals, an ADM signal can introduce noise modulation effects only with high slope signals. The high-frequency nature of high-slope signals means any noise modulation "hiss" components are effectively hidden (masked) by the signal itself.

The technical specifications of this new process are, according to Dolby, comparable to those of the compact disc—the only digital audio format commonly available to consumers. But compact disc is expensive and, therefore, not accessible to the average consumer. The new ADM process, says the company, will put digital audio within reach of most everyone.

GTE Sends Up First Dual-Band Satellite

GTE's Spacenet Corp. has put the first dual-band satellite into orbit and plans to send up two more soon. The combined C- and Ku-band satellite already has a video customer, the American Christian Television System's Satel-

FINALLY, AN "UNDER $10,000" NEWS CAMERA WHOSE BIGGEST SELLING POINT ISN'T THAT IT COSTS UNDER $10,000.

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The new Sony BVP-150, however, is another story. Its MF diode gun Saticon™ tube delivers performance that rivals cameras costing twice its $8,900* price. Like 650 lines of resolution at encoded output and a S/N ratio of 57 dB. Not to mention how it achieves a new height in depth of modulation for cameras in this class.

There's also the BVP-150's considerable range of automatics to consider. Along with the fact that it can generate composite output for recording on ¾" or 1", as well as component outputs for direct recording on Betacam.™ And, in either case, it's legally airable. Because, unlike many cameras in this class, the BVP-150 is equipped with an RS-170A sync generator and a true I and Q encoder.

But to get the whole picture, you should call: in NY/NJ, (201) 833-5350; in the Northeast/Mid-Atlantic, (201) 833-5375; in the Midwest, (312) 773-6045; in the Southeast, (404) 451-7671; in the Southwest, (214) 659-3600; in the West, (213) 841-8711.

And find out about the new BVP-150.

The "under $10,000" news camera that gives you something even better than a low price: high performance.

SONY Broadcast

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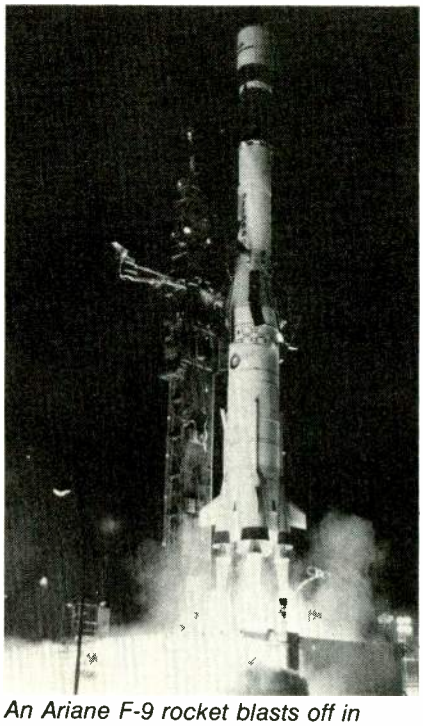
lite Network, in addition to GTE's Sprint and other telecommunications companies.

The satellite, named Spacenet I, sports 24 transponders, 18 of which operate on the C band at 4/6 GHz with 8.5 and 16 W of power, and six of which use the Ku band at 12/14 GHz with 16 W. The Ku band covers the continental U.S., while the C band reaches all 50 states.

GTE also plans to orbit two Ku-band satellites, GSTAR type, operating at up to 27 W. All of the satellites are being built by RCA Astro-Electronics.

The three dual-band satellites, plus a spare, are costing about $300 million, GTE reports. Once all five satellites are up, the electronics and telecommunications company says it will be able to offer a broader range of satellite bandwidths and powers than are now available anywhere. GTE currently shares the Comstar satellites with AT&T.

Besides the dual-band novelty, Spacenet I's launch, by Arianespace of France, was the first in history to involve only commercial companies.



An Ariane F-9 rocket blasts off in Kourou, French Guiana carrying the first C and Ku satellite built by RCA. The American Christian Television System's Satellite Network will be renting space on the bird.

STC Gets Channels for Eastern DBS Bird

Satellite Television Corp.'s requests for DBS channel assignments have been approved by the FCC despite opposition from other segments of the industry (*BM/E*, May 1984, p. 14). The Comsat subsidiary received six DBS channel assignments for the eastern U.S., permission to locate its two eastern DBS satellites together, and a reservation for six channels in the west.

The FCC stopped short of assigning specific channels in the west because, it said, STC had not come far enough along in its arrangements concerning that satellite, which will broadcast on six channels. STC would not say when it would be ready to contract for the third satellite, but points out that the bird will be a "copy" of the two that have already been developed. RCA is building the eastern satellites, due for orbit in 1986, at a cost of $112 million.

The FCC also has given STC permission to construct an earth station in Las Vegas and has allotted guard bands for tracking and control of the birds.

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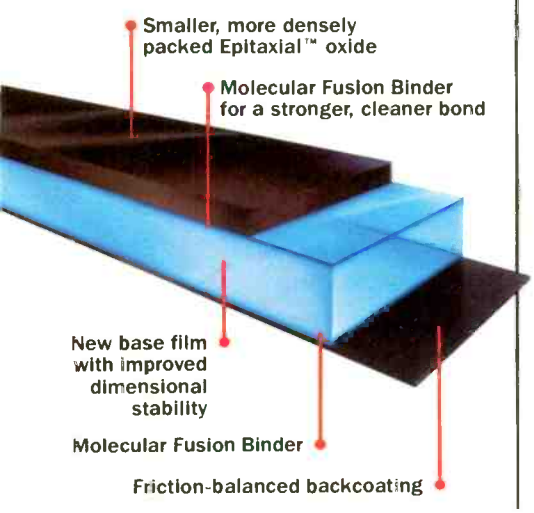

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NEWS BRIEFS

The FCC **Field Operations Bureau** now has power to issue Apparent Liability and Forfeiture notices. The Mass Media Bureau has issued these "sanctions" for technical violations but has given this authority to all FCC field offices and bureaus.

Market research by Frost & Sullivan, Inc. predicts **DBS subscribers** in the U.S. and Canada will grow to 10.4 million by 1990 and then jump up to about 48 million subscribers in the four years after that. 1994 revenues are estimated at $764 million and programming costs are $3.05 billion. Frost & Sullivan also says that due to the small size of the DBS market in the next few years, **Satellite Television Corp.** might scrap its low-power DBS service and wait until its high-power satellites are up (see News this issue).

The Federal Trade Commission has suggested that the FCC could sell **orbital slots** as a way of settling who should get them . . . . A new company named Cygnus Satellite Corp. has raised the subject of **privately-owned international satellites**. Cygnus applied to the FCC for permission to put up a high-power satellite capable of DBS transmissions to small antennas in both North America and Europe.

The French government has come out with a plan to cable 128 cities by 1990 using **fiberoptics**. The state-owned phone and communications system, PTT, will control the system and own a controlling interest in it.

Sen. Bob Packwood (R-OR) failed to get his **Freedom of Expression Act** approved by the Commerce Committee, which he chairs.

The FCC has exempted "Donahue" news interviews from **equal opportunity requirements**, citing their weekly regularity and "Mr. Donahue's skill as a regular journalist" . . . . For its morning drive time, **WLS AM/FM** of Chicago did a remote broadcast from Orlando, FL. The station gives away a trip to Disneyworld every year and this year sent along a DJ and news team.

The FCC has reduced **AM signal intensity requirements** for community business areas to 5 mV/m and will no longer require field measurements for directional AM stations' covering license application . . . . An NRBA survey on **AM stereo** finds that 87.6 percent of respondents (26.4 percent of AMers) are not broadcasting in stereo and do not have stereo equipment on order. Almost half of this group has not added stereo capability.

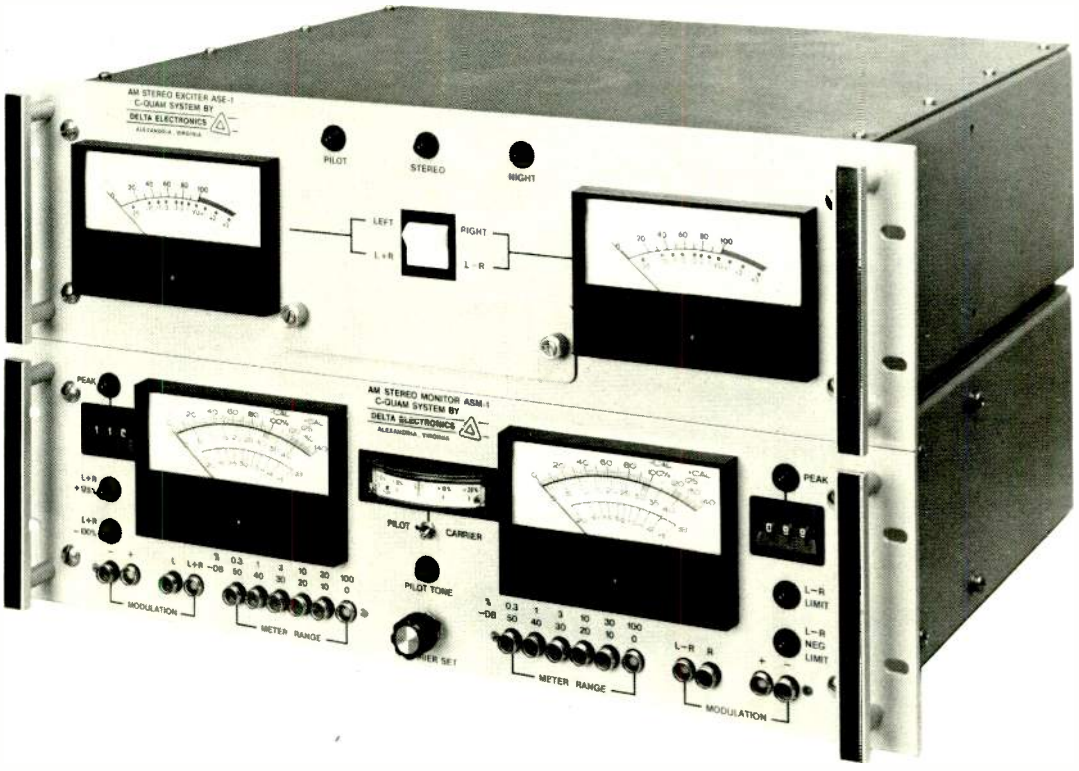
Polaroid has come out with an **8 mm camcorder** manufactured by Toshiba. Delivery is expected in October.

Gulf Broadcasting Co. has agreed to buy **KTXA-TV**, Dallas, and **KTXH-TV** in Houston from two groups of investors for a reported minimum of $125 million.

The **Daytime Broadcasters Association** will merge with the NAB, which has agreed to set up a daytimers committee and put out a newsletter for daytime and AM broadcasters.

The NAB has filled four new seats added to its board of directors specifically for **women and minorities**. On the radio board are Willie Davis of KACE (FM) and Sally Hawkins, WILM, and on the television board are Robert Munoz of KCIK and Donna Zapata of WHAS-TV. The boards will now have 33 and 17 directors respectively.

AM Stereo Without Compromise



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FCC Type Accepted

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The proliferation of receivers from GM's Delco Electronics, Inc., MacIntosh Labs, Sherwood Electronics, Chrysler Corporation, Concord Electronics, Samsung Electronics and others not yet announced, is creating a sizeable C-Quam audience. With the outstanding performance of this equipment, you can be sure that the audience will *stay* tuned to your Delta C-Quam AM Stereo transmission system.

For additional information, contact Bob Bousman at (703) 354-3350.

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Cable Pinpoints Community Needs With Local Origination

Serving local viewers is one of the most important ways a broadcast station creates an identity. Local news, local sports, and community affairs programming set a station apart from the national norm of network and syndicated offerings, while giving viewers the perspective they need on local issues.

In an aggressive broadcast market like Detroit, with its full complement of network affiliates, independents, and public stations, it would seem that local programming needs would be well taken care of, leaving little room for the offerings of a cable company. Not so, according to Candace MacGillivery, program director for Continental Cablevision's system serving the Detroit suburbs of Southfield/Lathrup Village and Oak Park.

"We're doing things that [the broadcast stations] can't justify doing," MacGillivery asserts. "They can't justify going to a local high school—they serve the entire market—but it's a perfect application for our programming effort. We don't really infringe on one another."

It is just that sort of "superlocal" programming that finds its way onto Continental's local origination channel, CTV 11. The channel, which is partially supported by advertising, focuses on the Southfield and Oak Park suburbs served by Continental, rather than the entire Detroit market. Despite

The van's control area contains the Crosspoint Latch switcher, Sony VTRs, and 3M character generator.

Continental Cablevision's staff-built van has greatly expanded the system's LO capabilities.

(or perhaps because of) its more limited production resources, the cable system is able to put time and energy into the most local of local activities—events too local for the TV stations.

By bringing subscribers events in their communities which they can't get elsewhere, the cable system reinforces its position in their homes. For example, Continental produced an extensive sports package during the fall and winter, covering football, hockey, and basketball at the area high schools with the aid of its remote van. When Oak Park High School made it to the state playoffs as division champs, Continental's van followed the team outside of its franchise area to cover the playoff games. The channel also features concerts by the local symphony orchestra and public service programs created in conjunction with local organizations.

Direct feedback

"We firmly believe in local origination programming," MacGillivery explains. Without exact ratings figures she can't make definite statements about audience size, but the amount of direct feedback Continental receives would indicate the channel is well-watched. "During the sports season, and just after it ended, we got five to 10 calls and letters a week," says MacGillivery. "The positive response was really gratifying."

Part of what gives Continental the freedom to do such extensive LO work is its remote van, a small but comfortable remote facility that allows the system to produce both sports and entertainment remotes. According to Alan Blau, production supervisor for the franchise, "Probably the most unique thing about our LO van is that it was built totally by Continental staff people." Rather than contracting an outside firm, the usual cable system practice, employees of the cable company built the entire van in-house, including all design, carpentry, and electronics work. Based on a regulation Chevrolet van with a Step-Cube box, the van houses three Sharp XC-700 cameras with multicore cable and CCUs, two Sony VO-5850 ¾-inch VTRs, a DPS Phaser II TBC/frame synchronizer, Crosspoint Latch 6112 production switcher with eight inputs and two M/Es, and a Broadcast Electronics audio cart machine.

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The DART 384 is user-friendly. It is designed for easy installation and maintenance. The indicators are **really** useful for accurate antenna pointing and isolating problems. If you need help, Comtech and Allied are ready to respond quickly.

The DART 384 Terminal consists of Comtech's high-performance 3.8 meter antenna, low-noise amplifier, antenna-mounted down converter and demodulator shelf with 8-channel program capacity. Channels can consist of a mixture of audio channels and one voice cue channel.

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Control room at Continental Cablevision. Studio, seen through window at right, is often used for local shows.

the switcher come in particularly handy during the sports season, Blau relates. "We used it heavily when we shot boxing a couple of years ago. We were able to display each boxer in a square wipe in opposite corners and fill the rest of the screen with a view of the stadium." The switcher also has a downstream keyer, useful in adding graphics and titles from the van's 3M 3016 CG.

In addition to the production equipment, the van is designed to provide a comfortable working environment for the remote crew. It is, in Blau's words, "nicely appointed" and has plenty of workspace. Although it lacks its own generator, it draws under 20 A and can operate anywhere on regular 110 V house current. The two video technicians who did the studio and van installations still work in the system.

Van goes Vegas

One of the truck's biggest jobs, and an excellent example of Continental's commitment to the community, was a recent benefit performance for local Providence Hospital. Entertainer Fred Travalena, the actor, singer, and impressionist, brought his Las Vegas revue to Detroit's Ford Auditorium to raise funds for the hospital's new, multimillion-dollar neonatal center. "It was a thrill for us to get involved in a real Vegas-type production," recalls MacGillivery. "We taped the show, did interviews with hospital personnel, put it all together and added a little plea for funds at the end." The finished tape played on CTV 11 and was also made available to the hospital.

The production itself brought problems beyond the usual scope of the cable van. Because of the hall's poor acoustics, Blau, who served as director on the shoot, had to guard against feedback and echo. His solution was to double-mic the show, supplementing the house audio feed with separate audio from the van's Electro-Voice and Audio-Technica mics.

"We ended up mixing the house feed and our own a lot of times to end up with a very rich-sounding tape," Blau adds. Because of the tight time frame involved, the show was taped without a rehearsal for the technical crew. While the crew set up the Sharp cameras, director Blau watched Travalena's rehearsal to get an idea of how the show would run. "If you look at the tape, you wouldn't know it," he says.

Not all of the system's LO work takes place in the field however. As part of its public service commitment, Continental worked with the local chapter of the Optimists, a national organization, to produce and hold its annual oratorical contest for young people in Continental Cablevision's studios. "Originally the contest was going to be staged at a local restaurant," says MacGillivery, "but we suggested they move it here. It added a different perspective to the competition," bringing it on tape to a wider audience and giving the youngsters the experience of "being on TV."

Creating visibility

Continental is very aware of the importance of its local origination work, not only to subscribers but also to its own marketing efforts. The Southfield and Oak Park franchise serves more than 23,000 homes, out of 43,000 passed by cable; basic penetration, according to MacGillivery, is "edging toward 60 percent."

"Going out [on remote shoots] helps us with our visibility in the community," she explains. "We come into [subscribers'] homes, and they have to make a conscious decision each month to continue service. In this market, they have eight TV stations to choose from already. If we can help bolster our image, that's another reason for local origination." In addition to the LO, the system has an active public access program and trains volunteer producers.

"This kind of commitment to serving the community is typical of Continental Cablevision," MacGillivery asserts. "The local broadcaster can't justify getting involved in just one community's activities."

Blau has his own perspective on Continental's success with LO. "It takes resources and it takes people to make it work," he says. "So far we've been blessed with both." **BM/E**


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On-camera talent like the SM83 because its electronics provide for a dip in the mid-range, giving both male and female voices a smoother, more natural sound. And unlike its Japanese counterpart, the SM83 unplugs from the battery pack for easy storage.

Sound engineers appreciate the SM83 because its tailored frequency response requires less equalization. They like its low-frequency rolloff too, which quiets on-air rumbling and mechanical and clothing noise.

Set directors are impressed with the SM83's neat appearance on camera. The cord exits from the side and disappears from view, running down behind a tie, shirt or blouse.

Production assistants enjoy the SM83's mounting versatility. It comes with a single clip that works either vertically or horizontally, a double clip that holds two mics, and a universal mount that can be sewed, pinned or taped to clothing.

Repair technicians love the SM83's easy maintenance. The cartridge is easily accessible by unscrewing the end cap. And cable replacement requires only a screwdriver and tweezers; no soldering is necessary.

Field crews are also big fans of the SM83 because its electronic pack is powered by a standard 9-volt battery or by a mixer's phantom supply.

For more information on the Shure SM83, the little mic with big advantages, call or write Shure Brothers Inc., 222 Hartrey Ave., Evanston, IL 60204. (312) 866-2553.

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Radio Magazine is New Wave in Children's Programming

What *do* children want? It's a question Freud could have asked, one often debated by parents, educators, and programmers. One man with some very definite ideas on the subject is George Morency, president of Family Radio Programming, Inc., and producer of *New Waves,* a two-hour magazine for nine- to 15-year-old listeners—*and* their parents.

New Waves is not one of those shows that spring full-grown from the heads of their creators. Rather, it evolved out of extensive research Morency conducted into the listening habits and interests of children in the targeted age group. The three-year development phase took Morency to five markets, where he conducted focus groups, gathering information on children's reactions to different kinds of materials and different program lengths. The research, and much of the program production, was funded by Markle Foundation, which is, in Morency's words, "interested in quality programming for kids and their families, and interested in radio as a viable medium." (The foundation was also instrumental in the early development of *Sesame Street.*) The resulting format uses popular music as a major element, interspersed with a variety of short-form news, information, comedy, and dramatic features.

Many of these features are prerecorded by the freelancers who prepare them. The bulk of the production, however, takes place in the Manhattan studios of Greene Street Recording on a Studer A80 two-track ATR and a Trident 24-track board with Valley People automation. "We do at least 60 to 70 percent of the show in the studio," Morency states. "The whole format is laid down there. We walk in with our prerecorded features, but the advice column, the music, and all comedy bits are done in the studio." The talent works from script, but is encouraged to ad-lib, resulting in a rough tape that is later edited, but not so heavily as to sound "slicked out."

At Greene Street Recording, engineer Joe Arnold looks on as Morency (left) and Siegel discuss the show.

The personality-oriented format revolves largely around the two cohosts, Fred Newman and Susan Berkley, each of whom creates several characters. Newman, in particular, has an enormous repetoire of sound effects and impersonations. According to Miles Siegel, VP of Family Radio Programming and in charge of engineering the show, audio effects and processing are used mainly to aid Newman's characterizations. "Sometimes we'll help him with EQ or reverb or the Harmonizer to accentuate the illusion," Siegel explains. "Or, we'll give him two mics to add to his characterizations. He does a great Barry Manilow, so we bathe him in reverb and piano."

Room ambience

Outside of that, however, Siegel uses little processing or effects in the show, except to give the proper ambient feel to the production. "We try not to sound like one of those tight-miked DJs in a studio," he says. "We're interested in room ambience and trying to be conversational—it's a little like film sound, although not anywhere near as open." As needed, he will use the Eventide Harmonizer or EMT plate reverb or even some light compression, but the sound is achieved primarily by acoustic means; for example, setting up on the wooden floor of the "live" side of the studio. This also allows characters to walk in or move around realistically.

Cohost Berkley is responsible for presenting the songs, which are selected by Morency with Berkley's input. Three of the six songs per hour are current hits, two are recurrents, and the sixth is usually a novelty song relating to one of the features. "For instance," Morency relates, "we have a regular computer and video game feature. When we did an installment on the use of computers in the Olympics, we followed it with Sergio Mendes' song 'Olympia.' " According to Siegel, song positions one and three in each hour are left open until the last minute to allow selections to be as up-to-date and appropriate as possible. The com-

The Trident board allows a view through window of the recording studio. Speakers are by Electro-Voice.

pany has recorded a large library of song intros and outros, allowing Siegel to drop in the songs the day before pressing (the rest of the show, including the other music, is produced four to five weeks in advance). The drop-ins are "virtually unnoticeable," Siegel says. All music is recorded off disc, preferably from EPs obtained from the record companies.

Other features include science updates, film, video, and music reviews, fashions, hobbies, health, books, and celebrity interviews. The last are produced by Jimmy Fink, the well-known DJ, who produces *The Continuous History of Rock and Roll* for *Rolling Stone* (it is distributed by ABC). Another *New Waves* contributor is Judith Walcutt, a veteran producer of children's shows (see *BM/E,* February 1983, p.27)

Relevant news

Besides the "soft" news features, *New Waves* also includes hard news tailored for children's needs. "One of the things we discovered about presenting hard news to kids was that they may be aware of topics that are ongoing, but they don't necessarily follow all the developments on a daily basis like their parents would," Morency comments. "We try to present the news in such a way that they see how this can affect or does affect their lives." In this way, the show is able to deal with serious issues such as unemployment or the threat of nuclear war without either losing the children's interest or overwhelming them. The news is produced by Youth News, a San Francisco outfit that has a long-term contract with Family Radio Programming, and is edited in New York by Siegel and Morency.

The hard news, like many of the other features, is produced by freelancers located around the country, allowing the show to keep a national perspective. Morency acts as an assignment editor for features, developing ideas and assigning writers, often weeks in advance. The features may come in as fully produced spots, as raw tape requiring editing, or as scripts to be produced in the studio. All studio material is recorded on Greene Street's Studer reel-to-reel deck at 15 ips to maximize signal-to-noise performance (the preproduced features are also recorded at 15 ips). Because of the careful production, no noise reduction is used.

Family Radio Programming's own small post-production studio is used to edit any unfinished features, as well as to put together the final version of the show before pressing. It consists of an Ampex 440 editing ATR, which Morency has found "extremely reliable," a Revox reel-to-reel deck, Technics turntable, and a small consumer-style Nakamichi mixer. If necessary, Siegel and Morency will return to the recording studio to do timed inserts requiring several ATRs. The show is then pressed into discs for distribution at Truetone Records in New Jersey.

Radio drama

A special feature of *New Waves* is a dramatic serial, with a five-minute installment scheduled each hour. The serials, which are based on classic literature, are produced by National Radio Theater in Chicago according to a formula worked out in conjunction with Family Radio Programming. At press time, the series that had just concluded was "The Treasure of the Midas Nebula," an adaptation of Robert Louis Stevenson's *Treasure Island* set in outer space. The story was brought up-to-date with a young female protagonist in addition to the original young male protagonist, and space pirate Long Jane Silver was supplemented with a robot character. Each episode included a tag reminding listeners of the original novel. In production at press time was a new series based on Verne's *Journey to the Center of the Earth.*

New Waves has been adding to its list of stations since its mid-February debut, but with less rapidity than Morency had hoped for. "Station clearances haven't gone as quickly as we'd have liked," he admits, "but that's often the result of introducing innovative programming. We've had excellent reports from a number of the markets that have been with us, and some have reported good response from the first day of broadcast." About 30 commercial stations have cleared the program. They take it on a barter basis, under which they receive four commercial minutes per hour and the producers retain four.

Success may not be as quick as Morency would like, but it's hard to believe that it won't arrive eventually. The combination of innovation, technical excellence, awareness of audience, and just plain caring that goes into *New Waves* is special. **BM/E**

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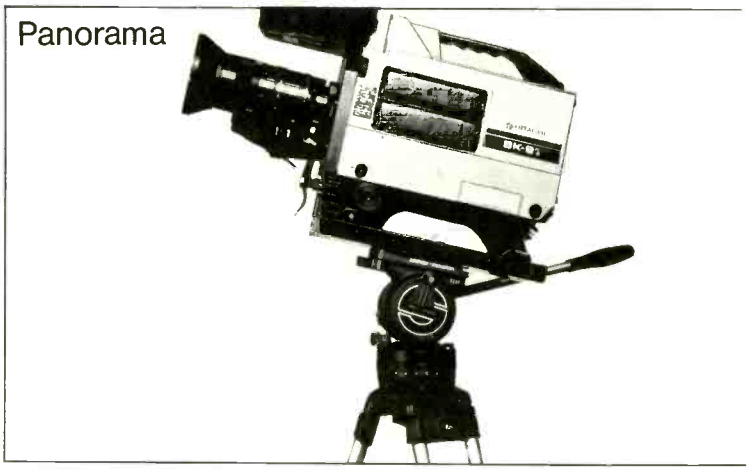

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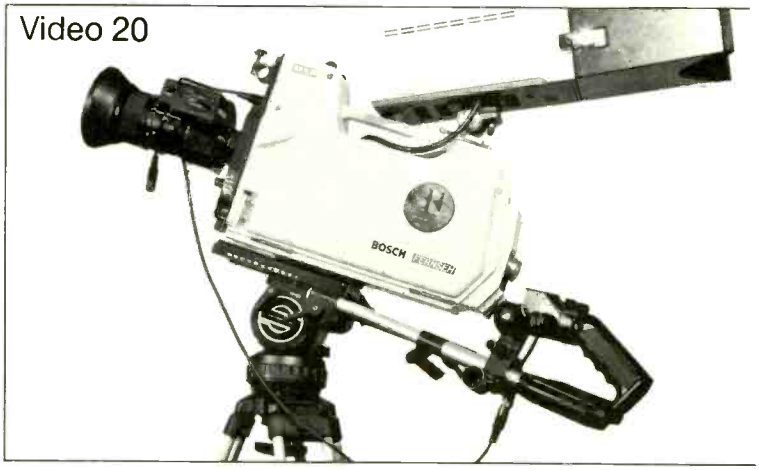
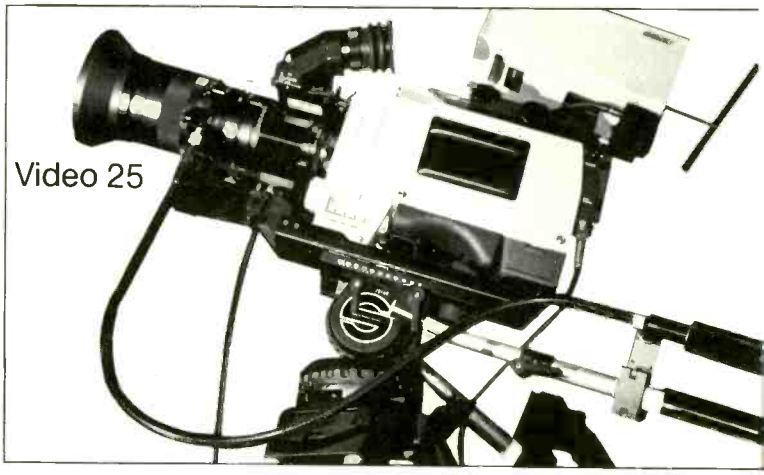




Small Format Camera/Recorders for EFP: WHICH SHOULD YOU BUY?

By Michael Greenhouse,
Associate Editor

Many TV stations and production houses are facing the decision about which small-format system to buy for EFP work. Several systems have been out long enough to gather feedback from users that can help in forming your own decisions.

There are now close to a dozen manufacturers offering small-format recording systems suitable for EFP applications. Only two of these systems—Betacam and M-format—are in widespread use at the moment (though neither has been available for more than two years). Already, these half-inch camera/recorders are having a major impact on field production. Their versatility, light weight, and image quality (which is superior to ¾-inch) are beginning to reshape EFP, much like ¾-inch did just a few years ago.

As of NAB '84, manufacturers of the different formats had settled into a kind of hand-to-hand combat for customers which some in the industry have called "the format wars." The rush to line up buyers is as much a battle to have one of the seven formats become a de facto standard as it is to actually make sales. But there is no doubt that sales are extremely important, since each system not only includes the actual recorder/camera but also a host of other gear to support it—including editing decks and recorders, and on-air playback systems such as the Betacart and MVP-100.

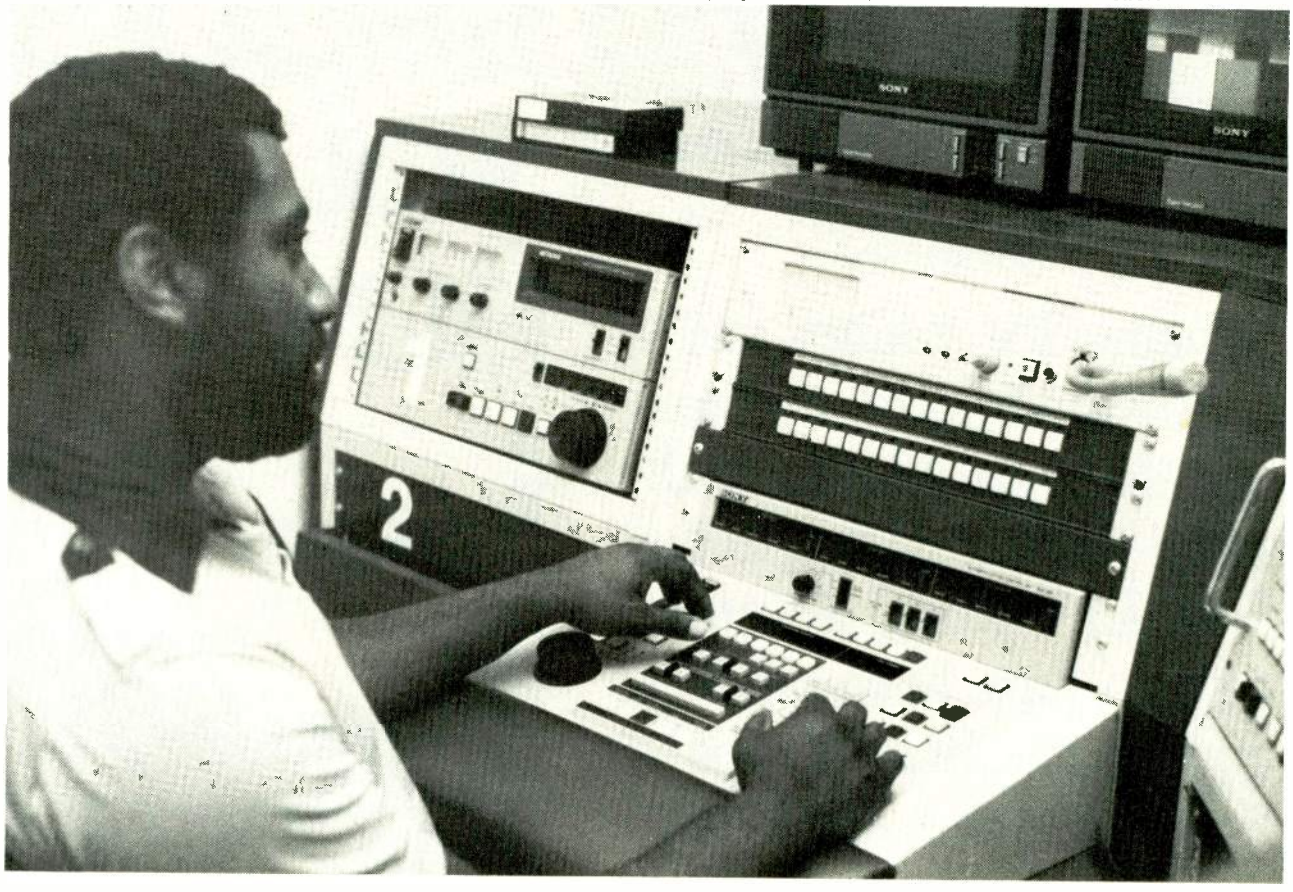
What are the hardware choices available to the station or production house looking to convert current ¾-inch operations? The two systems in widespread use are, of course, based on the half-inch VHS and Beta consumer recorders, but are modified to give them far greater bandwidth and recording fidelity. The Sony Betacam system, of which there were some 300 recorder/camera systems in the field as of March 1984 (with about 600 editing, recording, and playback decks), is manufactured and marketed directly by Sony as the BVP-1, with a single three-stripe tube camera, and the BVP-3, with three ⅔-inch Saticon tubes. Betacam is also marketed under license from Sony by Thomson-CSF, under model numbers BC-613 and MC-611. Thomson is also now manufacturing its own version of the Betacam—the MC-1623 and MC-1624—which it introduced at NAB '84.

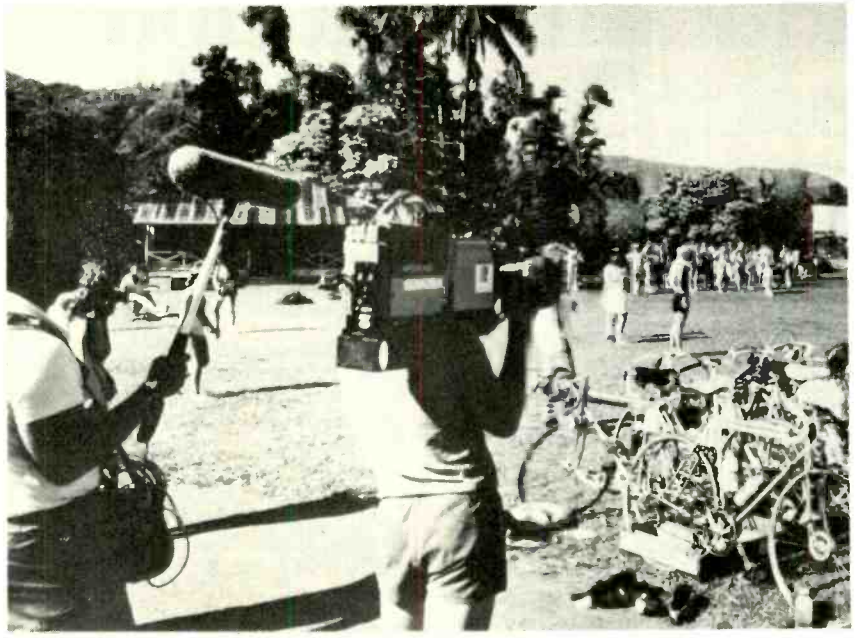
In the M-format camp, one of the leading proponents is Panasonic. As of June '84, it has 325 Recam recorder/cameras in the field, as well as 310 recorder/editors. For its part, RCA—co-developer of the M-format recording system, which it calls Chromatrack—has approximately 100 Hawkeye camera/recorders and 150 recording and editing decks in place. Ampex also offers the ARC, an M-format recorder/camera, under license from Matsushita; sales figures are not currently available.

In addition to the half-inch systems, there are, of course, the two incompatible quarter-inch formats, the Bosch Quartercam, and the Hitachi SR-3 camera/recorder. The Bosch system, based on the Lineplex format, will see its first deliveries shortly—to ABC for use in the Summer Olympics. Philips also has a quarter-inch system compatible with the Bosch Lineplex format, the LDK 54; first deliveries will not begin until 1985. The Hitachi SR-3 camera/recorder quarter-inch format boasts 30 systems already in use at NTV in Japan; delivery in the U.S. is scheduled for the end of 1984.

The incompatibility between the Bosch and Hitachi formats may change some time soon, because a tentative compromise format has been reached by a SMPTE Working Group in which Bosch and Hitachi have been participating. Part of the compromise involves lengthening the recording time of the cassettes to 20 minutes (the

Wendell Johnson, of KRIV-TV, Houston, edits a segment shot with Sony Betacam. The half-inch material is edited onto ¾-inch U-Matic tape for broadcasting using a BVW-10 Betacam playback deck, and a BVE-800 controller.





Eight Betacams were used to shoot the Kauai Loves You Triathalon, a 45-minute program recently aired on CBS' Sport Saturday. *One-man crews shot the three-day event from the beach, on boats, and aboard helicopters.*

Hitachi cassette is, currently, much shorter). According to one report, the other half of the compromise involves Bosch's acceptance of the Hitachi recording format, though this has not been confirmed.

There are several other systems which should be considered by those facing a recorder/camera purchase. Ikegami, for example, recently introduced the HL-95 Unicam, a camera which can accept any professional onboard VCR with the use of an interface panel (though most are eyeing it in conjunction with a Bosch Lineplex recorder). When the CA-95 adapter is added, the camera can be used as a standalone, and additional adapters can be added for multicore or triax cable.

NEC, too, offers a camera, the SP-3, which can accept a recorder and thus become a one-piece system. The three-chip CCD camera will accommodate a Betacam recorder directly, and will also accept both M-format and Hitachi quarter-inch recorders with an adapter.

Another approach to recorder/cameras is Frezzolini's On-Cam, a JVC VHS-C recorder that has been placed in a metal case specially constructed by Frezzolini and outfitted with BNC and XLR connectors so that it can be used with professional cameras. The recorder can be configured as a one-piece, or it can be separated from the camera, which is what ABC did for its coverage of the Winter Olympics. To do the point-of-view shots that were shown prior to several events such as the luge, bobsled, downhill and cross-country skiing, and hockey, for example, ABC turned to the On-Cam, married to a small Hitachi CCD camera. (According to Phil Godfrey of ABC's engineering lab, the half-inch material shot with the system was bumped up to one-inch using a half-inch deck and a TBC.) ABC plans to use On-Cams at the L.A. Summer Olympics.

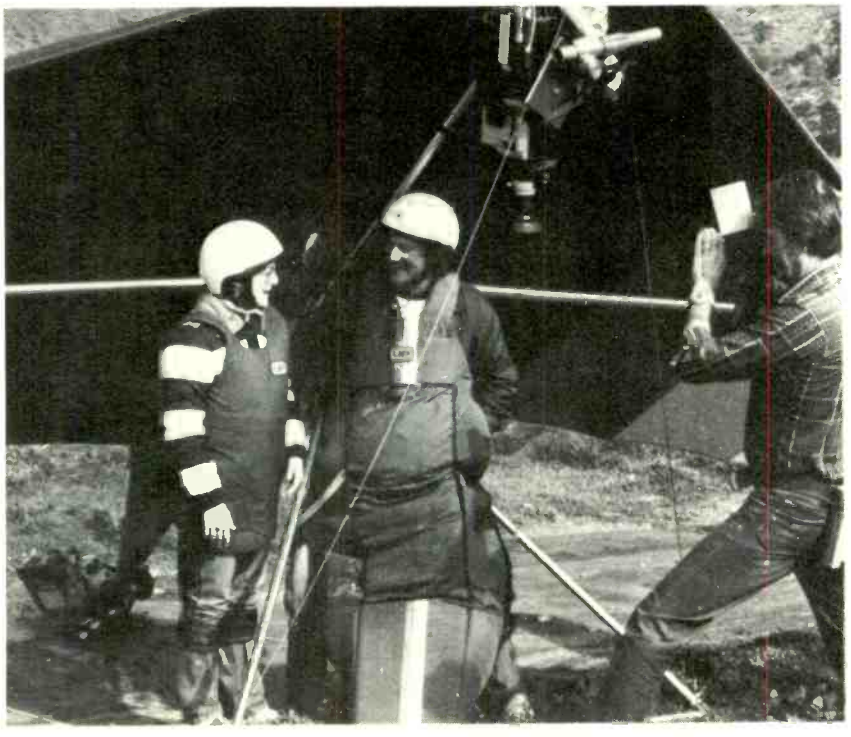
Still undetermined in all the controversy surrounding small-format systems is what impact, if any, the new 8 mm consumer recording format will have on the professional market. Most agree that it is not unlikely that Matsushita, which is marketing home versions of the recorder in the U.S. through Kodak, is already at work modifying the format for greater bandwidth—as it did with the VHS format. But specific marketing plans are still cloaked in secrecy.

User reports

When evaluating this type of equipment, what kinds of questions should you be asking? What is being done with those systems now in the field, and are the applications suitable for your operation? Has small format really reduced crew size and operating costs? How are they performing? Are they reliable?

Some of the answers are provided by WNEV-TV, Boston—one of the first stations in the country to go on-line with half-inch equipment (see *BM/E*, December 1982). WNEV has had 11 Panasonic Recams for 17 months. The recorder/cameras have replaced the station's U-Matic gear to the extent that "all of our local programming is now entirely M-format, shot with Recam,"

Two Betacams were recently attached to a hang glider to capture Gail Trowell's first flight for the NBC show Fantasy.



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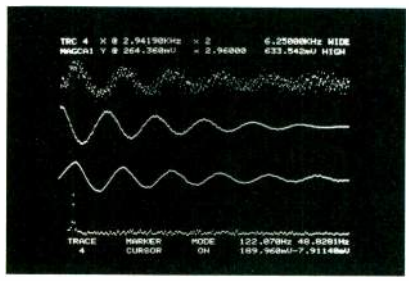

For system test applications the fully programmable Data 6000 can acquire waveforms, measure time domain waveforms with over 40 pre-programmed scalar measurements, compute and measure spectra, and transfer the resultant measurements or data points to your computer. In the above figure the Data 6000 performs summation averaging on a noisy signal, convolves the result with a user defined filter, and displays the FFT of the processed waveform on trace four.

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The Data 6000 shown at left with a popular minicomputer; the IBM PC.

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according to VP of engineering and operations Karl Renwanz. "Generally they're used as single-camera, magazine-format, gathering devices."

How does Renwanz feel about the recorder/cameras? "The advantage of the one-piece," he says, "is you do not have a cable, so you have increased mobility. Plus there's a great weight advantage over U-Matic—probably 20 pounds. But in my opinion the most significant thing about this system is the reliability of the unit itself—it exceeds anything else we've ever seen for field shooting.

"I mean reliability in terms of failures due to wires breaking off of pins, and cables not being properly strain-released. The typical U-Matic connection problems are gone."

Renwanz says the station has saved quite a bit of money because of the Recam's reliability, and he feels so strongly about avoiding problems that he insists his photographers keep the Recam in its one-piece configuration at all times. This has led to conflicts, because the photographers would like to occasionally separate the package to reduce the weight they have to carry on their shoulders. Renwanz refuses to give in, however.

Renwanz does not overlook the one-piece's obvious advantage of mobility, though to him that is secondary to reliability. He points to one show in particular, the Iris Award-winning *Conquering the Cape*, for which the one-piece was invaluable. For this one-hour show about a long-distance race, WNEV sent out eight Recam camera units. "We were on trucks, on bikes, on everything," explains Renwanz, "trying to cover this event, with the fewest number of people and maximum number of cameras. Now I'm not saying we couldn't have done this two-piece, but . . . ."

For post-production, WNEV generally uses Panasonic AU-300 recorders to edit half-inch to half-inch. And it almost always airs the half-inch tape directly. As Renwanz explains, "When we play our segments back into magazine-format shows, we play them directly off half-inch recorders."

KHOU-TV goes all half-inch

At KHOU-TV, Houston, the only cameras are Sony Betacams. The station has 16, to be exact, and it has had them for 13 months. The recorder/cameras have been well received. Don Benskin, the chief photographer, feels Betacam is "the state-of-the-art camera." And director of engineering Art Biggs says, "It's far superior to ¾-inch, and if it's not as good as one-inch, it's very difficult to tell on the air."

The station has 10 Betacam editing setups, some with ¾-inch playback capability, "since all of our file tapes from a couple of years back are on ¾," explains Biggs. Editors can intermix half-inch and ¾-inch edits when necessary, though according to Biggs, 95

WNEV-TV photographer Bill Barrier with one of the station's 11 Panasonic Recams.

WNEV-TV's component half-inch edit suite features three Recam editing decks and a Shintron 390 switcher. Here, Bill Barrier and producer Robin Young edit a special.

Barry Minnerly, of Rebo Associates, in the Swiss Alps with the Recam during production of The Olympic Viewer's Guide.

percent of what they do is half-inch to half-inch. With short segments, the station plays Betacam tape directly onto air. But on hour-long shows, the staff makes a composite on one-inch because of the 20-minute length limit on the Betacam cassettes. The station is building a new editing suite, which will contain a Sony BVE-3000 editor.

KHOU has always used one-person crews for all its projects, and still does now. Recently, a "crew" accompanied a group of high school gymnasts to China for two weeks and produced a five-part series. According to Benskin, the photographer had no technical problems, and the pictures looked "excellent."

One-person crews are also used to produce two- or three-part special series every week. According to Benskin, the series could be on just about anything related to Houston, including single life, the local economy, or sex in the office.

Benskin reports that there are a number of things about the camera that he and the other photographers like very much, and a few things they dislike. He says the Betacam "white balances very quickly," and it will "take just about any white source—it doesn't need 100 percent white." He also says the camera doesn't lose white balance from one day to the next, and that Betacam "has excellent gain. You could shoot it with 9 dB gain and you won't even notice it for noise level. But if you go up to 18 dB it'll get noisy."

Benskin is also pleased with the Betacam's viewfinder, which he says is very clear, and which informs the photographer on the filter he is using, the gain, the footage he has used, and the battery strength. He is not especially happy with the "short, stubby mic on top of the viewfinder." But his biggest complaint is that "Sony has not produced a long-lasting battery." Since the batteries must run both the recorder and camera, they tend to drain too quickly, he says.

On location with Rebo

Barry Rebo, president of Rebo Associates in New York City, has owned two Recams since January, 1983. He was one of the first Recam owners in New York, and has travelled extensively with the gear—doing primarily field production—ever since. As he says, "We cut loose ¾-inch production and settled in on half-inch as a higher quality alternative that's comparable to one-inch." The equipment, he says, is dependable, and makes "terrific pictures."

Rebo prefers to use the Recam as a two-piece system, with an ideal crew size of three people, though if the job permits he will sometimes use two, and if he has to he will expand to an "EFP, four-person" crew. He frequently uses a camera-control station, or "paint box," where an engineer watches on a monitor and controls the camera.

Rebo frequently serves as cameraman on his projects. This was the case last September, when he shot the *Olympic Viewer's Guide* in Switzerland. The project was a series of 30-second segments that used slow motion and single frame to demonstrate different Olympic disciplines. Using the Swiss national team, the series consists of both winter and summer events, though the majority are summer events. The segments will be syndicated with the backing of 7-11 Stores.

Editing at Rebo's facility is done interformat, half-inch to one-inch, using a Videomedia 6000E editor, the AU-300s, and a Sony one-inch machine. He has experienced no problems with the Recam in post-production, nor in production. But he does feel that the recorder/camera has one drawback: the "anxiety" in the marketplace because of the Betacam and M-format conflict.

WSVN-TV "pretty enthused"

This Miami-based station has three Betacams in operation, and three more

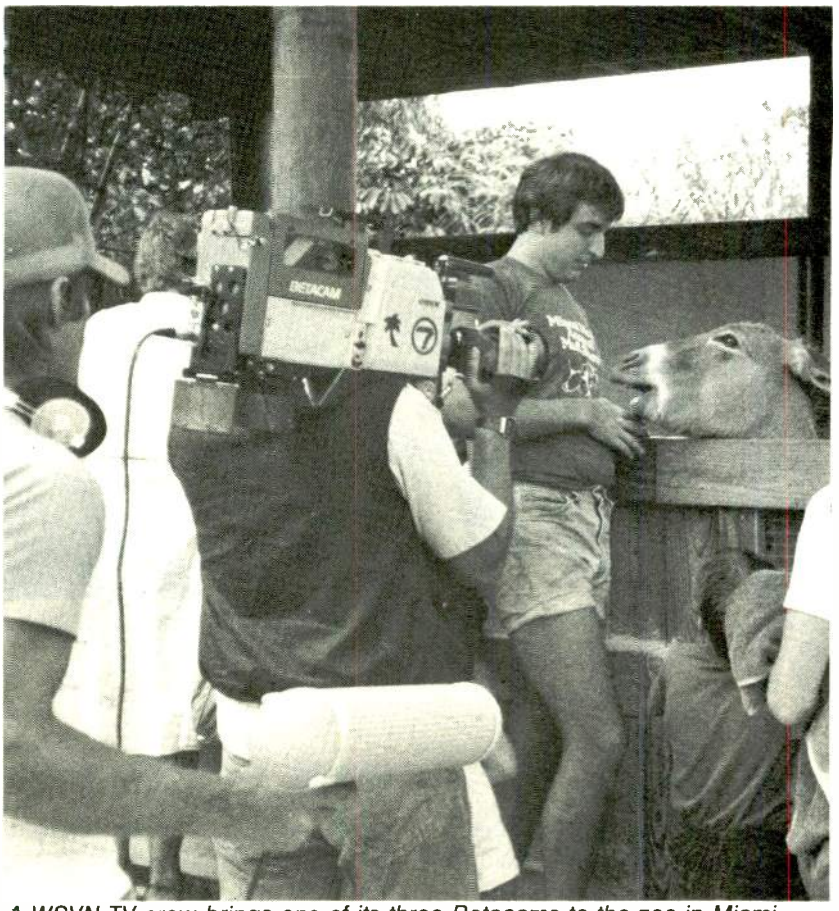
were purchased at the '84 NAB. The new Betacams will replace three RCA TK-76s. The station, it would seem, is a satisfied Betacam customer; news director David Choate confirms it: "We're pretty enthused."

It was a field production completed in late 1983 that made Choate a true believer. A three-man crew went to 10 cities across the country to shoot a series on privacy, with George Orwell's *1984* providing the thematic background. At the same time, the crew shot a special series on the tenth anniversary of the oil embargo.

As Choate says, "We went out with gear that was untried, at least by us, and it couldn't have been better." The trip was made more adventurous by the fact that the Betacam had no playback in the field. The crew tried, unsuccessfully, to find playback equipment in some of the cities they were in; they ended up with no choice but to trust the quality of the material they shot. Fortunately, when they got back to Miami, it passed with distinction.

Choate singles out picture quality, portability, and camera design as the most outstanding characteristics of Betacam. In terms of design, he points out that a cameraman can look through the viewfinder and hear the audio through a speaker next to his ear.

He says that the picture quality is "better than ¾-inch." But the station, at least in terms of post-production, is still ¾-inch oriented. Two of its six editing rooms are ¾-inch, and all Betacam material is edited to ¾-inch, then played back on the air in ¾-inch.



A WSVN-TV crew brings one of its three Betacams to the zoo in Miami. The station is waiting for three more Betacams it bought at the '84 NAB.

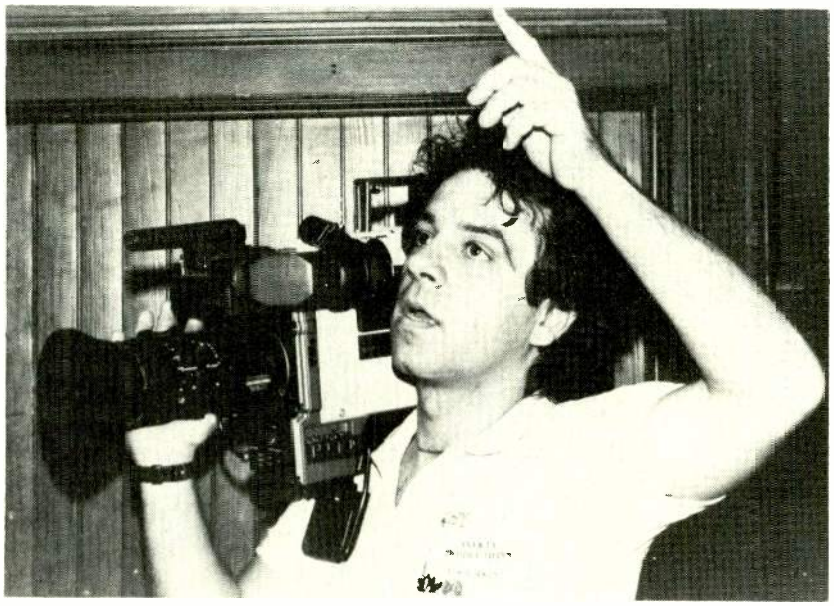
KPRC-TV eyes Texas

In Houston, KPRC-TV has had a Panasonic Recam for over a year. According to chief engineer Ed Schafer, the station has been "testing" it for eventual ENG work and has been producing a weekly 30-minute program, *Eyes of Texas*. The show, which is a kind of travelogue about various areas of Texas, is shot and edited by a two-person crew. How has the Recam tested out? "It looks good," says Schafer. "The half-inch format is great."

Editing is done half-inch to half-inch using the station's Convergence editor. Material is then bumped up to one-inch for broadcast. Schafer says he initially had a few problems relating to time code in post-production. At one point there was trouble reading the code, which the Recam generates internally. Schafer says there was either something wrong with the time code head in the Panasonic, or the level was too low to be read by the Convergence.

Another minor problem had to do with a limitation of the station's particular recorder/camera. The station's Recam does not have playback in the camera. One day the crew was out shooting and a head clogged. Unfortunately, they didn't find out until they got back to the station and played the tapes back.

A KPRC-TV crew on location for its on-going Eyes of Texas *series.*



George Avgerakis, VP and creative director of Avekta Productions, with a Betacam. The company rents Betacams from New York facility Electric Films.

Avekta documentary

In 1981, this New York City production company made the first of a three-part documentary on Alzheimer's disease using ¾-inch. Part two was produced in 1982, also with ¾-inch. According to VP and creative director George Avgerakis, both segments were sensitive, and production itself was, at times, a delicate affair. But the third segment, produced in 1983, was by far the most intimate and emotionally charged, and for that production Avekta turned to the Betacam.

The segment focused on 20 families dealing with the last stages of the disease. The crew did most of the shooting in private homes and nursing homes, in which there was a great deal of stress, and needed to be as unobtrusive as possible—which meant using as little equipment and people as could be gotten away with. Avekta was able to use a three-person crew (one less than the year before), and very few lights. Two of the crew members, George Avgerakis and his photographer, were cabled together at all times, however, which could have caused maneuverability problems. The light weight and compactness of the Betacam overcame this limitation, says Avgerakis. And the result, he says, was greater intimacy with superior quality—a combination that would have been very difficult to achieve with ¾-inch, or even one-inch. As he says, "I don't think we could have done such a sensitive project with ¾-inch because the detail isn't there in low light, and one-inch isn't portable."

Avekta does not own any Betacams—it rents them from Electric Films, in New York. Electric Films provides another service to the company as well—it takes the half-inch material Avekta shoots and makes burn-in dubs on ¾-inch. Avekta then takes the ¾-inch tape and edits ¾-inch to ¾-inch.

Avekta is also producing computer animation with a Via Video system, and recording the output onto a Betacam recorder. Some clients take the half-inch master for editing; others have it bumped up to one-inch.

Another New York City production company, Troika, also rents Betacams because, says producer Alan Weiss, "the quality is breathtaking." On one recent project, the Colgate Women's Games (a track and field meet), two Betacams were used along with five ENG cameras that recorded on one-inch. They were chosen—essentially to do isos—because "the quality of Betacam would integrate best with one-inch tapes," says Weiss, who was the show's producer. Also, the gear's portability was important at the Games.

Portability was also an important factor for another recent Troika project, a half-hour pilot called *Staying Healthy*. The show is about physical fitness, and some sections were shot in an operating room. According to Weiss, it was important to be able to move to the operating room easily, and the one-piece was ideal for that.

As these experiences of broadcasters and production companies using small-format equipment indicate, the response is almost universally enthusiastic when it comes to EFP. ENG is, of course, another issue—as is on-air operations using small-format cart systems. But if these stations and facilities are any indication, small-format recording is about to have a highly successful career in the field. **BM/E**

Betacam was used to shoot Staying Healthy, *a pilot produced by Troika Productions, New York.*

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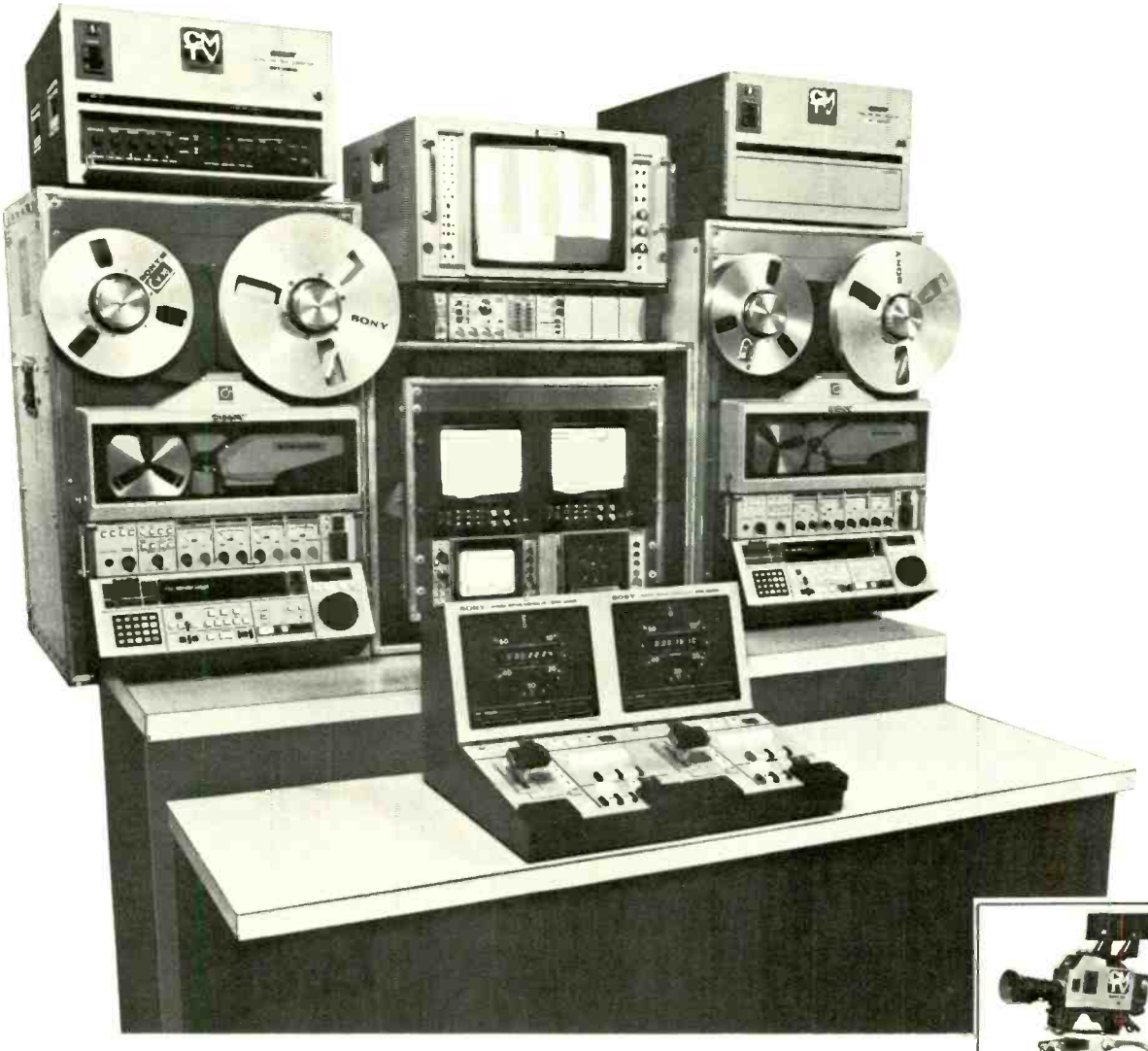

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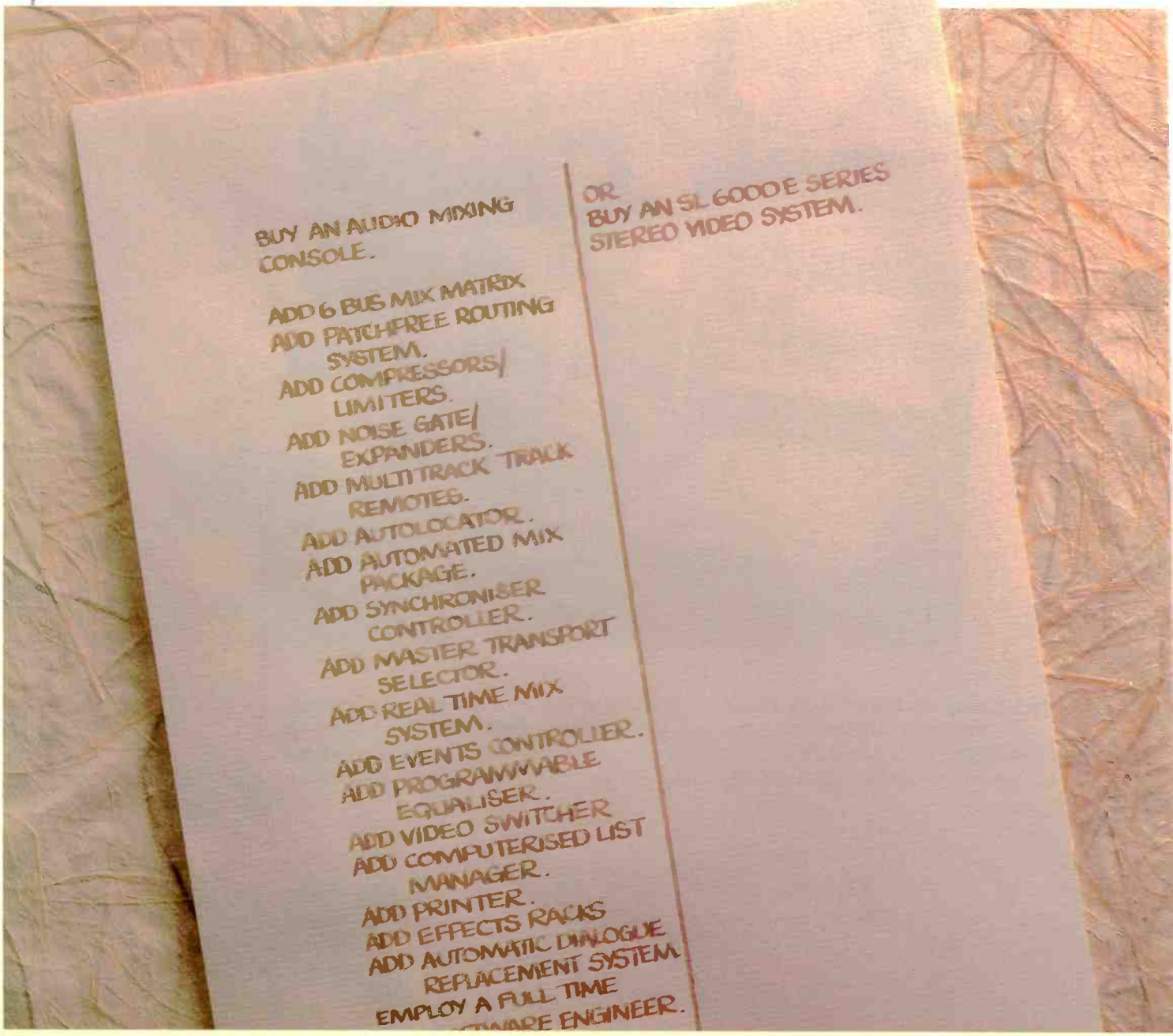
Circle 142 on Reader Service Card

Buying an audio post-production system. The long and the short of it.



In the competitive world of ideo production, providing the ight facilities is one of the first equirements for success.

Getting it right can prove lifficult, however. Especially in he area of audio post- roduction.

For people expect the same ophisticated standards of sound hat they hear from the recording ndustry. But they usually expect t in a fraction of the time.

Which means a post-production studio, if it is to neet these demands, must not only give first-rate stereo ound, it must be streamlined to give it as quickly and efficiently as possible.

Unfortunately, because the video business is still young, much of the equipment on offer is new and unproven. With different suppliers working to differing standards.

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So, at best, assembling your audio facilities will be complicated, time consuming and not entirely satisfactory. At the worst, it will be very costly and potentially catastrophic.

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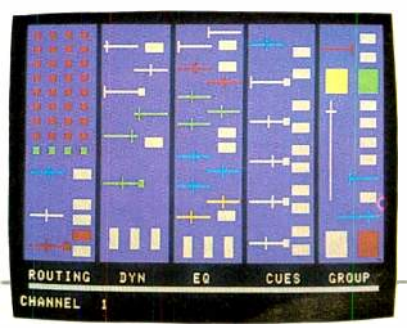

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So if you're in the market for an audio post-production system, you can fall into the trap of trying to assemble one piece by piece.

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Circle 125 on Reader Service Card

the past, present and future of AUDIO CARTS AND CART AUTOMATION

By Glenn Calderone

The recent NAB Show revealed that manufacturers of audio carts, cart decks, and cart automation are more convinced than ever of their viability. There were new developments everywhere.

Glenn Calderone *is an independent writer and TV/Radio engineer residing in Fountain Valley, CA.*

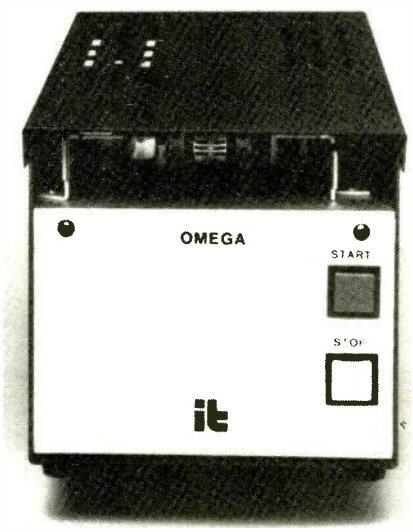
"HELP WANTED: Board operator. Must work 24 hour shifts, no days off. Must cue spots, music, news and weather, take net feeds—no dead air or other mistakes allowed. Robots only need apply."

This robot worker is your radio automation system. Like other robots, he comes in different sizes and models. His mechanical arms and hands are relay contacts, and his brain is either hard-wired logic or a microcomputer. One of the first jobs he was taught was to push the button on a cart machine.

Where would radio automation be today without the self-cuing endless loop of audio tape? The audio cart is king. Or is it?

The audio cassette is challenging the cart in random-access music and spot announcement applications. Not far behind are two new contenders, laser disc and magnetic disk systems. Let's first take a look at the current state of the cart, and then examine the latest in alternatives for random-access audio sources suitable for automation.

Today's audio cart evolved from the original Fidelipac cartridge of the late



ITC's Omega stereo reproducer. The AA-sized machine was shown in prototype form at NAB '84.

1950s. The National Association of Broadcasters' 1975 revised standard describes the basic size and shape, tape speed, and track parameters. This was meant to ensure complete compatibility—every cartridge would play on every other playback deck. That was before such things as encoded noise reduction and matrix stereo.

Carts come in three sizes: small, medium, and large, known also as A, B, or C. If they meet the latest NAB standards, they officially become AA, BB, and CC carts. The Type C cart holds 1500 feet of tape and plays for 40 minutes at the standard 7.5 ips tape speed. You don't see these too much in broadcasting, but you can find them in background music applications, using two mono tracks in sequence and slowing the tape to 3.75 ips: 160 minutes of elevator music. Type B carts are good for 20 minutes of program material and are fairly scarce today.

Old problems, new solutions

According to NAB standards, the cart's performance should equal reel-to-reel tape, since everything except the package is the same. The tape used in today's carts is certainly the best you can buy—high-output, low-noise oxides, the same performance as studio mastering tape. But audio cart critics (and this includes many users) are quick to point out that when you put tape in an endless loop, you create endless problems. First, you get friction, because the adjacent layers of tape move at different speeds and rub on both sides at once. Tape turns and twists around the center hub, and then is expected to cross the heads perfectly straight. Any azimuth or height error can show up as stereo phase error or poor response.

The accepted treatment for layer-to-layer friction is a dry tape lubricant (like graphite) coating the backside of the tape. Although it looks similar to the back coating on studio mastering tape, this coating is very slippery. It also comes off, making an eventual mess of the inside of the cart, and your deck.

To keep friction at a minimum, most cart manufacturers employ generous amounts of slippery plastic (Teflon or Delrin) in their guides, hubs, and other moving parts inside the cart itself.

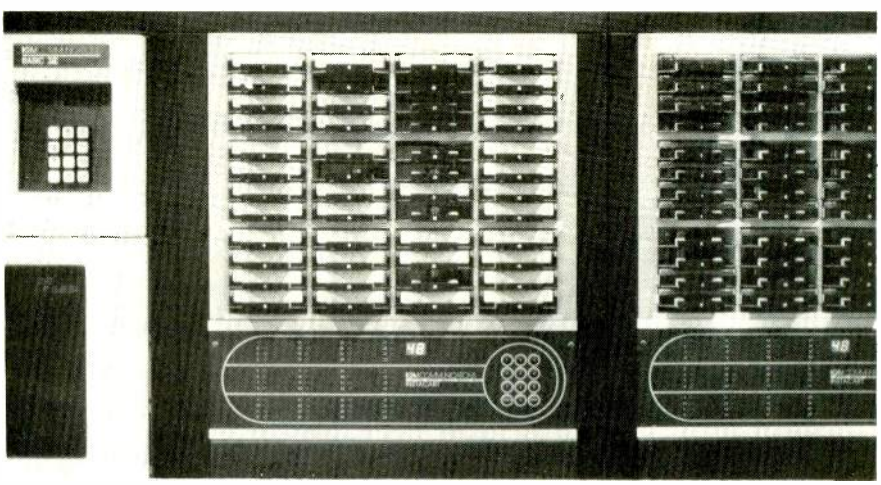
According to the NAB standard, head-to-tape contact is to be provided by pressure pads built into the cartridge. The Audiopak AA-4 cart by Capitol Magnetics, for example, is built to this standard. By using a very "hot" tape formula with improved binder materials, the company claims a cartridge worthy of comparison to digital audio discs. Indeed, at its recent NAB convention demo suite, visitors were invited to make a real-time A/B comparison between a digital CAD and the AA-4 cart on Pacific Recorders' Tomcat cart deck.

Fidelipac's Master Cart DX series also follows the AA cart standard, using its hottest (most sensitive) oxide formula. The company claims this tape can stand up to 10,000 plays without signal degradation. Optimistic estimates of overall cart life,which depend on the cart deck and other factors, vary from 1000 to about 5000 plays.

Not happy with the standard NAB design, some cart makers have chosen to modify the housing mechanism to attack tape tension (and stability) problems. The 3M Co.'s Scotchcart uses a built-in tension control, simulating the tension arms on high-quality reel-to-reel decks. No pressure pads are used, and an adjustable cam is provided to optimize the size of the loop. Marathon Products' Gold Equalizer cartridge also provides dynamic tension adjustments from inside the cart, optimizing the head-to-tape contact with its patented equalizing device.

Keeping in phase

Phase errors in stereo become a problem when they are large enough to be

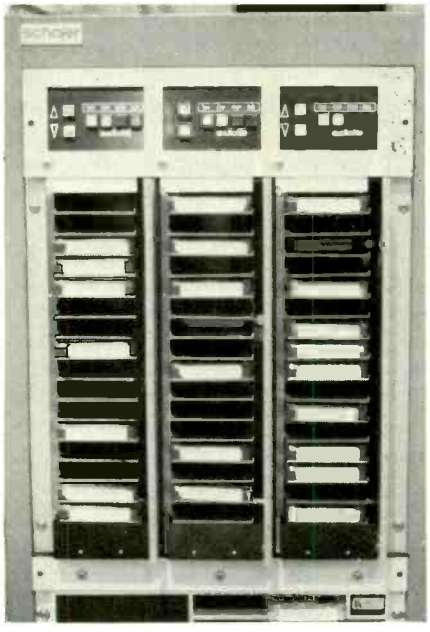


IGM's updated Instacart. The multideck now has a microprocessor-controlled front panel, and optional multiple audio inputs.

heard, especially when stereo broadcasters (AM as well as FM) have mono listeners. Three approaches to this problem surface in the world of broadcast carts. First is the mechanical alignment of the tape and heads. Starting with the cartridge, Marathon Products makes AZMI-LOK carts with an adjustable tape guide. The idea here is to align your carts to the decks you're using to minimize the azimuth error.

Phase correction can be done electronically after the audio signal has left the heads. One cart-deck maker using this approach is Ramko Research. Its PhaseMaster cart decks record left-channel audio on the cue track, and during playback compares its instantaneous time base error (which results in phase error). Variable delay of either the left or right channel (whichever is leading) is inserted as required to maintain real-time in-phase correction. Compatibility with mono and stereo carts recorded on other decks is assured, but without the phase-compensating feature.

Howe Audio's 2100 Phase Chaser is a standalone system used to correct phase errors in any tape playback system. It can be fed by any stereo source, be it reel-to-reel, cassette, or cart. Using analog time-delay circuitry and cross-correlation, the Howe Phase Chaser analyzes phase errors in the L and R program lines. Normal fluctuations in phase due to music content are ignored, while errors due to tape alignment are corrected.



This multideck machine from Schafer can be interfaced with Schafer's 7000 series automation system.

The third approach currently used to combat phase shift is the L+R, L−R matrix. This is cheating, since L and R stereo are not even recorded on tape. Rather, sum (L+R) and difference (L−R) signals are derived from the stereo input, and recorded on two audio tracks. In a strict sense, this approach makes the cart system a non-NAB format, since the NAB standard calls for L and R stereo on the tape. These two signals are recovered and matrixed to stereo again after playback (inside the cart deck's electronics). Phase errors in the record-playback chain have little effect on the stereo image or its mono-summed resultant.

Fidelipac introduced at NAB '84 a new series of cart decks, the Dynamax CTR 100, which encode and decode matrix. The machines incorporate circuitry for recording stereo in matrix, and also automatically "sense" matrix tapes with optical recognition codes known as the Cart Scan system. The system also enables intermixing of cartridges recorded at elevated, hot levels, with carts not recorded at hot levels. It also permits intermixing of mono and stereo carts.

There are four machines in the series: record/play mono and record/play stereo, both B-sized; and play-only mono and play-only stereo, both A-sized. The A-sized machines will fit three across in a 19-inch rack.

The machines also feature variable-speed playback, and a real-time digital tape counter. The tape counter gives you an auto locate function, and it also brings SMPTE time code into play: A cart machine can be slaved to a VTR, for instance. The machines, which will be available September 1, are priced as follows: mono play is $1900; stereo play is $2060; mono record/play is $3135; and stereo record/play is $3465.

The Tomcat cartridge deck, made by Pacific Recorders & Engineering, also offers the matrix encoding and decoding option, along with 15-ips operation. (Broadcasters have been slow to speed up their carts, while the motion picture industry has for years relied on 15-ips decks for its sound effects dubbing.)

At NAB '84, Pacific Recorders introduced a new, lower-priced cart machine that is pin-for-pin compatible with the Tomcat series. Called the Micromax, the deck sells for $1445—almost $1000 less than the Tomcat reproducer. Micromax is a very compact, electrically efficient machine that runs extremely cool—so much so that it doesn't need ventilation. It is 3.5 inches high, and has a servo-controlled pinch mechanism for precise pinch roller positioning with no need for a solenoid.

According to Jack Williams of Pacific Recorders, booth visitors at NAB

The Boss, from Alpha Automation. The 19-inch monitor and keyboard are central to this control room automation system.

commented on how fast the machine starts after pushing the start button; it takes about 30 ms, compared to a more typical 1/10 second. This fast start time suits the machine to TV applications, such as inserting sound effects with computer control, which requires very tight cues.

For users of older ITC decks, Straight Wire Audio sells retrofit playback circuit cards incorporating matrix decoding and improved audio circuitry for lower noise, distortion, and frequency response.

ITC showed a prototype of a new cart deck at NAB '84, the Omega. Aimed at the medium- and small-market AM station that wants to go stereo, the Omega is a stereo-only, playback-only reproducer. It features an A-sized cart; solenoid design; a low hum-field power transformer; a newly designed motor (though the company is unsure of what sort of motor it will be at this time); and 150 Hz secondary tone detection.

The Omega will be available in late fall. It will be priced at $1050.

Another new cart deck introduced at this past NAB was the Micro HS series, from Sonifex. The series is actually four machines; the HS100 mono player; the HS200 stereo player; the HS100R/P mono player/recorder; and the HS200R/P stereo player/recorder. The player weighs 11 pounds; the recorders weigh 4.25 pounds. All four units take AA-sized cartridges.

The Micro HS machines have three cue tone capability. Switches are provided to defeat primary cue and give fast forward from the secondary cue, and to provide loop recording. Secondary and tertiary cues may be overrecorded during play mode.

The drive system is a d.c. servo motor belt driving a flywheel assembly. The machine has a normal and fast forward mode together with muting in fast forward and stop. Also, full remote facilities are provided together with interlock for fast forward and record.

No cart deck maker includes either Dolby or dbx noise reduction built in, and a spot check of Los Angeles-area radio stations shows no fondness for either system. Compared to other audio sources being broadcast, the modern cart deck is fairly quiet—manufacturers claim 50 to 64 dB signal-to-noise ratios for stereo. How measurements are taken (e.g., unweighted versus "A" weighting filter) affects the specification as much as the head design, electronics, and tape formula. There is a trend in cart player design—brushless dc motors, ceramic capstans, IC opamp audio paths, digital cue-tone sensing, optical cart sensing.

Gotham Audio's Systex Digital Audio Storage System, shown here in a studio production setup.

Multideck and automation

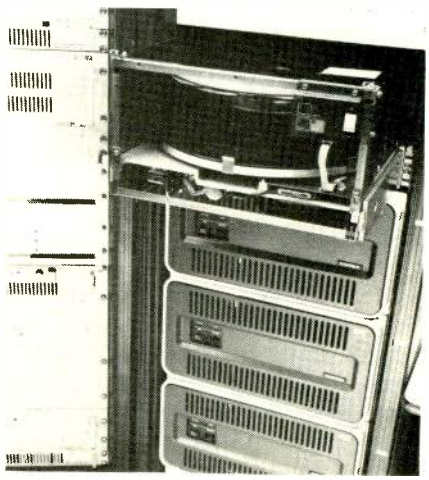
Besides the continuing improvements in hardware, several companies are making the cart machine behave better and more economically in the automation environment. For random access of assorted spot announcements, multiple decks are handy. Broadcast Electronics has long been making double- and triple-deck decks, and also offers a five-deck machine, the model 5500B.

Broadcast Electronics' newest cart machine, introduced at this year's NAB, is the three-deck, AA-sized 5400 series. This new unit is very compact—three may be mounted side by side in a 19-inch rack—yet access to electronics and mechanical assemblies has been made easy with plug-in PC cards and decks. The 5400 uses a quiet, direct-drive hysterisis synchronous motor for increased torque, minimum wow and flutter, long-term speed reliability, and cool operation. No fans are required. The 5400 also features the Broadcast Electronics Phase Lock IV head assembly, which ensures optimum adjustment for stereo phasing. The machine, available with a companion recorder, costs $3100 to $3900, depending on options.

If you move beyond five-deck machines, you get into either the Instacart or the Gocart approach.

Instacart by IGM is a system of microprocessor-controlled banks of 12 cart decks for rapid random access. Each group of 12 shares a single capstan and drive motor. The system can be specified with up to 48 decks.

IGM had an updated Instacart at this year's NAB. The system, which sells for about $17,000 (plus options), has a



The Systex audio storage system.

number of new standard features: a microprocessor-controlled front panel; audio preamps, data, and program amplifiers, all with NE5534 ICs; audio mute at the end of the 150-Hz tone—each tray; preamp equalization and level controls—each tray; individual, modular power supplies; and RS422 serial interface for computer control. Optional multiple audio inputs from each bank of 12 cartridges are also available.

IGM also introduced a new Instacart for sound sweetening and post-production. This Instacart, which also sells for about $17,000, allows you to access up to 48 sound effects manually with a pushbutton switch, on computer command (it is automation controllable), or by the command of a video editing system. The machine has been designed to operate 24 hours a day, seven days a week.

Schafer (formerly Cetec-Schafer) offers a similar system with up to 30 compact playback decks custom made by Kowa (Japan) and interfaced with Schafer's 7000 series automation system.

The Gocart system is IGM's carousel approach to rapid random access. Only one set of heads and a capstan are used per system, with carts arranged in a set of slots carousel-style. Automation control selects and positions the desired cart and plays it on cue. Two systems allow back-to-back plays.

The latest automation system, recently introduced at NAB '84, is the Boss 8400 from Alpha Automation. The Boss is conceived as an integrated control room automation system for audio and audio for video. It consists of a 19-inch rackmounted 16-bit microcomputer, a 13-inch RGB color monitor with software-controlled composite video switching, a keyboard, 5-¼-inch disc drives, 192K memory, and five RS-232C ports. The Boss will interface to mixing console automation, programmable equalization and digital reverberation systems, Musical Instrument Digital Interface (MIDI), track select, the integration of paperwork, and a local area network to tie together multiple control-room installations and the front office.

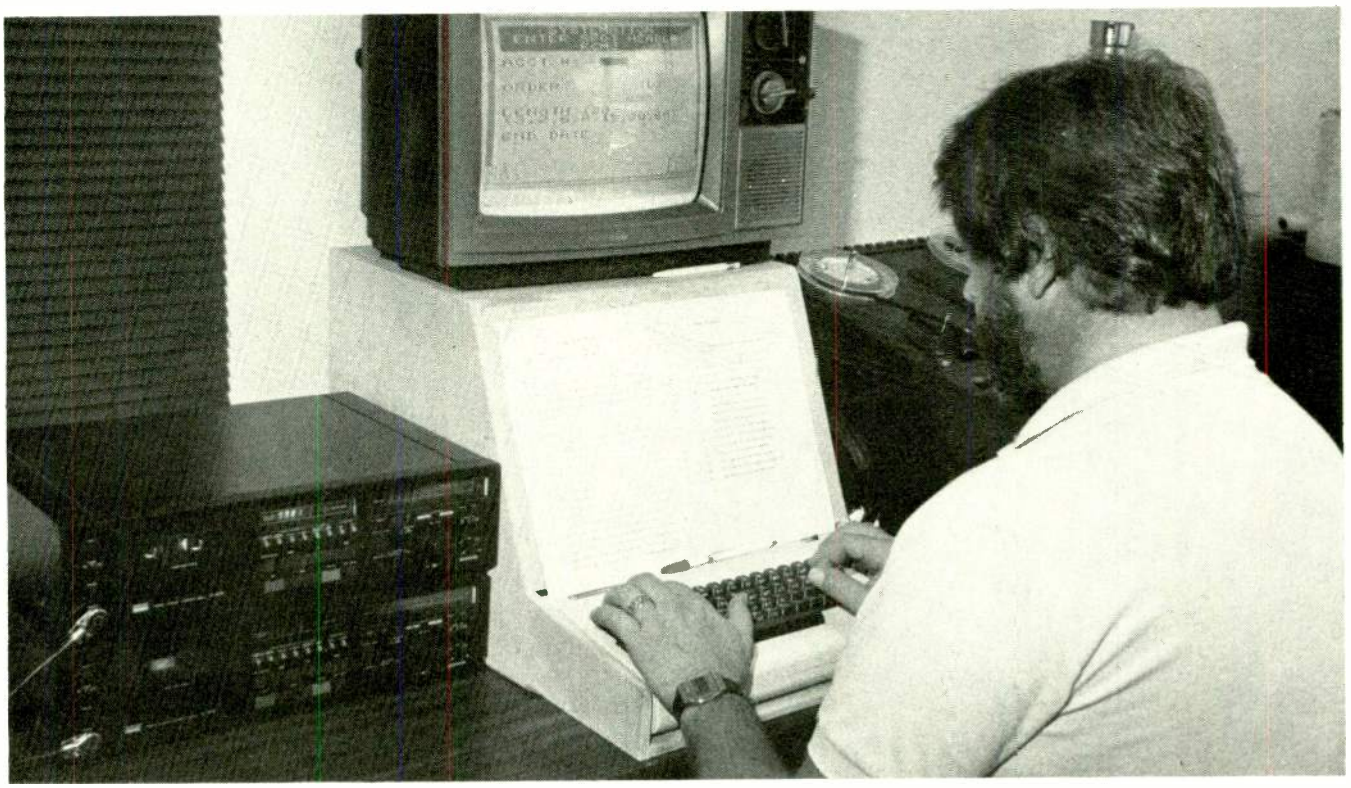
The Boss offers a number of automated production tool features. It has edit decision list software, which calculates up to 999 user-defined events and executes the preset sequence, allowing you to work out long routines before the session. It also has a programmable cue menu, as well as special-effects cue, which automatically runs through a series of user-defined steps for sound-effects insertion.

The future: computers and digital audio

An entire radio station run by computer: Traffic, billing, logging (both program and transmitter), and even the air conditioning can be integrated onto one microprocessor system. It is happening now. The only thing not digital is the audio. But look out—it is from the digital roots of the computer that the challenge to the audio cart emerges. Three areas of interest to the broadcaster are the compact audio disc, magnetic digital audio storage, and computer-controlled audio cassette automation.

Many stations have already experimented with CD players, both for their digital-quality sound and their "new is better" effect on the public. Shown for the first time at NAB '84, Schafer is taking orders for its ultimate random-access audio device, a new CD player/changer with built-in automation interface. The machine will hold 100 compact discs and be able to play any of 1500 selections with a maximum 13-second access time. Two units together could go nonstop for six days without ever repeating a song—even longer if you include news breaks and commercials.

The question is, "where's the software?" Can you find six days worth of music on compact discs suitable for one program format? Not yet, but wait—Schafer is working on packaging current music (a lá syndication) on discs with the AOR, MOR, and country station in mind. This system is designed to replace carted (and reel-to-reel) music,



Transferring audio from reel-to-reel to cassette for automated playback on Systemation. The system provides two computers—one for recording spots, another for playback.

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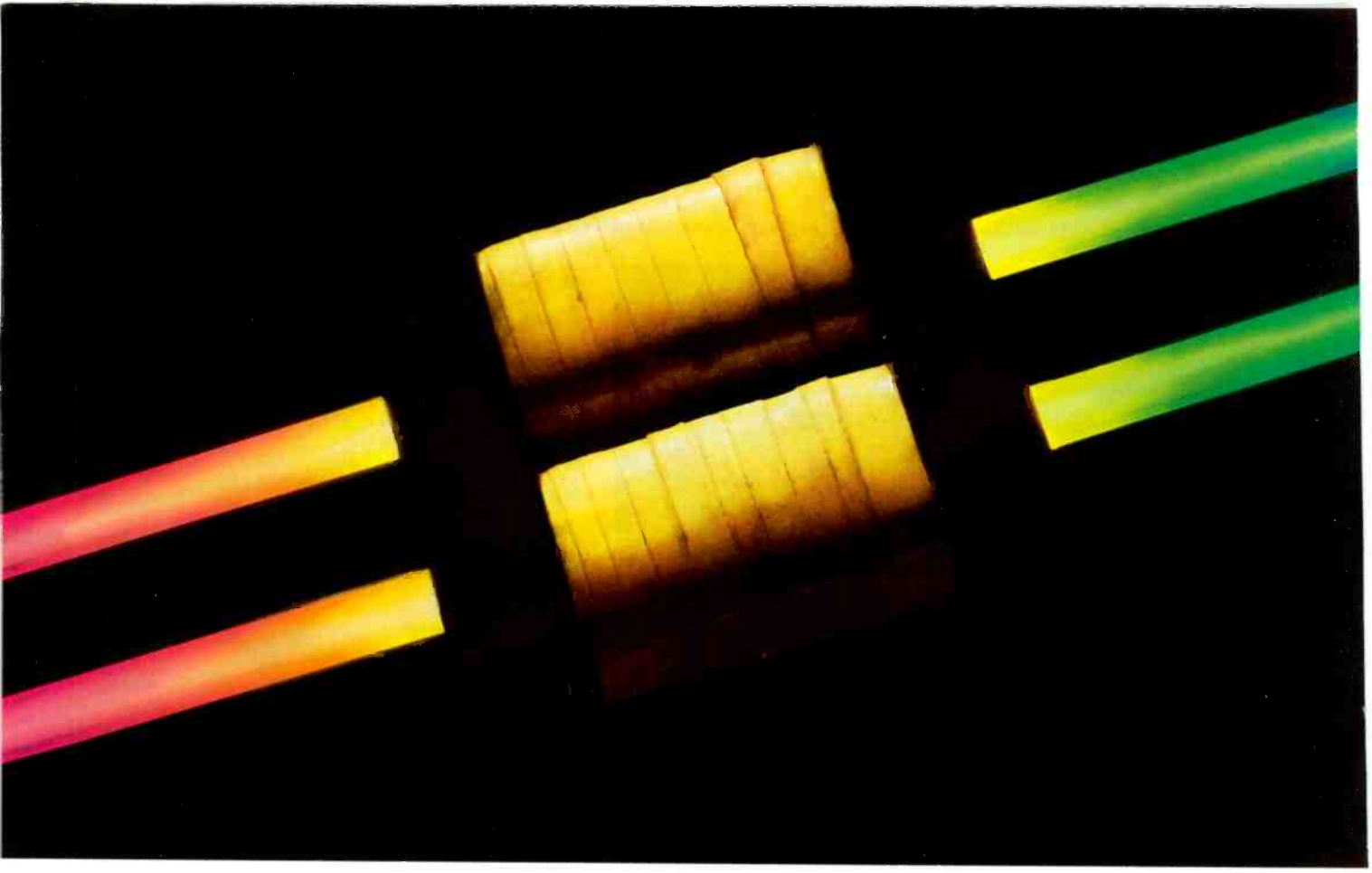

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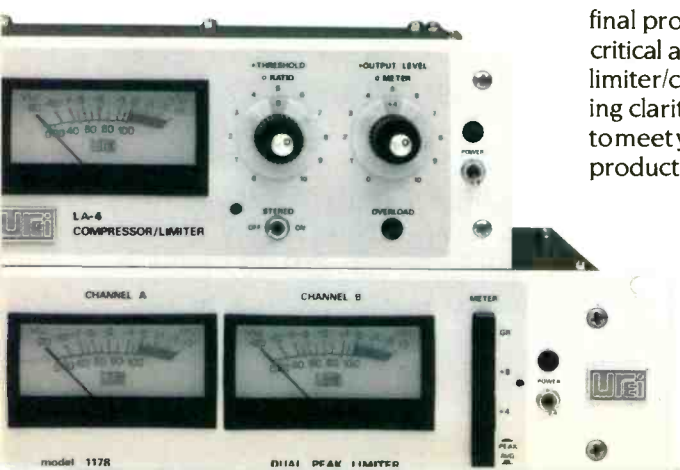

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KCMJ's automation system, audio processing and STL make a compact package.

14-inch Winchester disk drives and 16-bit, 48 kHz sampling, you can record and play back (access time: 80 milliseconds) up to 50 mono minutes of hi-fi audio—for stereo the time is halved. Gotham's 6800-based microprocessor controller will handle up to 60 disk drives at once, for 50 hours of digital audio. Dynamic range is greater than 88 dB with a 20 kHz bandwidth. Digital recording doesn't come cheap—the basic unit starts at about $125,000 with one disk drive. If this sounds expensive compared to your IBM PC or Apple II, just keep in mind that the storage capacity of one Winchester hard disk drive equals about 1500 double-sided 5.25-inch floppies.

Coming later this year to compete with the Systex system will be a Japanese entry, NTI America's DAS-2. For about $80,000, NTI will be selling 3 hours of storage, 12-bit A/D conversion at a lower (20.5 kHz) sampling rate, 9 kHz bandwidth, 72 dB dynamic range and a S/N ratio of 60 dB. One feature of digital audio storage is the ability to alter the clock rate when converting back to analog. This gives you the option of expanding or compressing your audio to fill a given time slot without affecting pitch.

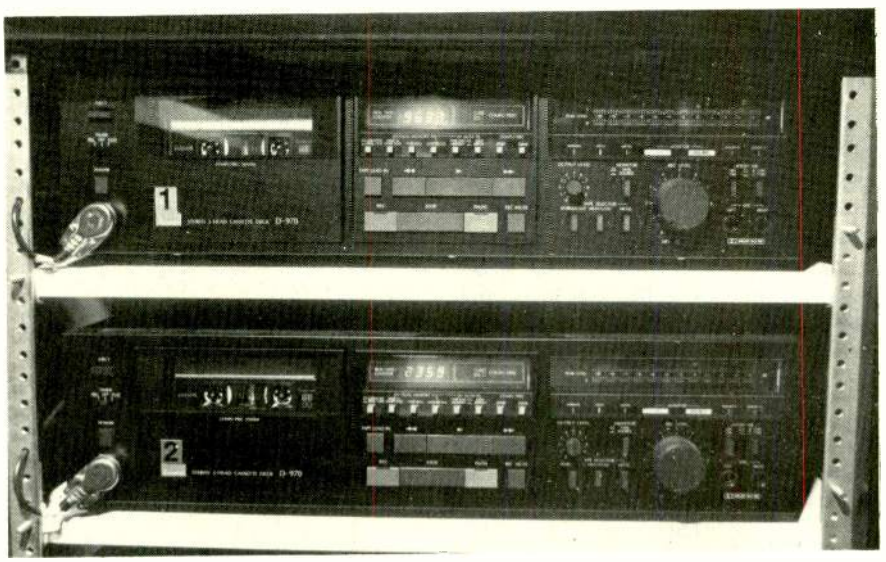
The most cost-effective random-accesss audio playback system would seem to be based on cassettes, and that's exactly what Systemation does. Steve Bellinger, Sr. of station WDZ (Decatur, IL) has made and sold 100 cassette automation systems so far in his first year. To make cassettes do the job of carts, his system sectors cassettes into spot lengths (usually 30 seconds on each) and puts a tone burst of ASCII data on the left audio channel before each spot. The control system is based on a low-cost VIC-20 personal computer and Systemation's own EPROMS customized for each user. Any length commercial, news reports, or music program can be recorded on the cassette and played back in any order. A system for satellite-programming automation starts at about $18,000. One setup like this is in use in Palm Springs, CA on the FM side of KCMJ. All spots, weather reports, and liners are pretaped, and the computer data is updated every 24 hours. Intro and outro cassettes are both up- and down-tempo, and with accurate timing, the result is a very live sound.

Two things about cassette decks come to mind: fidelity and reliability. Systemation interfaces to Sansui's D-970, the TASCAM 234, Teac 800, or the Revox 710—all decks boasting response and S/N ratios worthy of FM broadcasting. Dynamic range of cassettes is lower than the audio cart, but today's stations are trying to be heard, and after multiband processing, an Optimod plus composite clipping at the transmitter, could you tell the difference? As far as deck or tape failures, Bellinger says they are usually traced to dirty tape paths—clean them once a week and go. His first Sanyo cassette deck used on the air has logged 120,000 plays without failure.

The data encoded before each cassette sector includes the spot identification and last air date—the computer knows when not to play a spot, and the tape need not be pulled until most of the 76 sections have become invalid. Automatic logging takes place after a spot is played, with a real-time clock built into the system. The software handles errors by identifying and logging them and going on to the next event.

Remote control of recording and insertion allows for live-assist and one-person remotes via telco lines; weather and news can be phoned in with no one at the station. The equipment handles back-timed fill to network and can be programmed for complete music automation. A $57,000 system can hold 720 songs on line and play unattended.

Speaking of microcomputers, Mid America Automation has developed a VIC-64 system with software (in PROM) and interface to automate radio stations at the lowest possible cost. Its package sells for $4900 with printer and disk drives optional. It is set up for satellite, syndication, or whatever format you desire (custom programming upon request) and controls your choice of cart, cassette, or reel-to-reel tape players.



Sansui's D-970 consumer deck, one of nine on-line in KCMJ's FM Systemation setup.

The computer is our radio station robot, and it is learning to do more than just play carts. It's only a matter of time (and money) before the entire station is digitized and in some kind of memory. But for now the cart is very much alive and kicking, the backbone of radio automation. **BM/E**

NTSC Color Frame Editing— Back to Basics

Two problems typically encountered while editing NTSC tape are the familiar horizontal "shift" in picture centering and the "stretch" that widens horizontal color blanking. Both can be corrected with a better understanding of color frame editing.

By Richard A. Stephens

The need for color framing actually arises out of the inherent structure of the NTSC system itself. In film editing, the picture may be cut between any two frames, and a splice may be made to any other frame as aesthetic considerations dictate. With video editing, however, differences in the synchronizing information (sync and burst) between frames preclude editing in such a manner. Here, a four-field or two-frame sequence exists in the sync-to-burst relationship, and edits may only be made between specified frames if discontinuities are to be avoided. A review of a few NTSC fundamentals will show why this is so.

For many reasons, the frequency of the color subcarrier was chosen to be an odd multiple (455) of one-half the horizontal scanning frequency:

Equation 1:

$$\text{F Subcarrier} = \left(\frac{455}{2}\right) \times \text{(F Horizontal)}$$

Equation 2:

$$3.579545\ \text{MHz} = \left(\frac{455}{2}\right) \times (15{,}734.264\ \text{MHz})$$

Richard A. Stephens is chief engineer for the *Old Time Gospel Hour*, Lynchburg, VA.

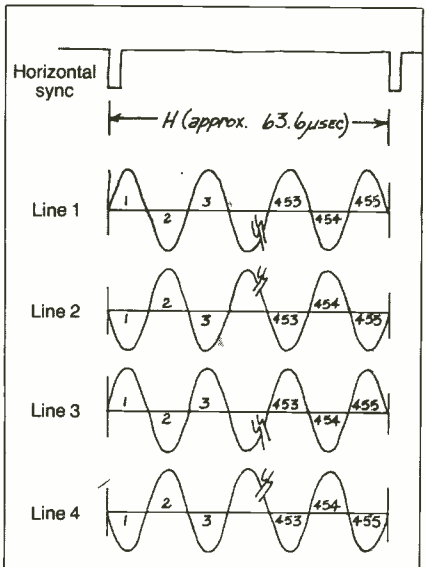


Figure 1.
The phase of subcarrier shown over a period of several successive horizontal lines in the same field.

This means that exactly 455 (an odd number) half cycles of subcarrier will be generated in the time required to produce each horizontal line (approximately every 63.6 μs). This occurs line after line, field after field, frame after frame, ad infinitum. Since there is an odd number (455) of half cycles in each horizontal line, each line begins and ends with a half cycle of the same phase, whether positive or negative. This causes the phase of subcarrier to be reversed at the beginning of each successive line, and all the odd-numbered successive lines begin with the same phase, as do all the even-numbered successive lines.

Each complete television frame is composed of two fields, or 525 consecutive horizontal lines. If we take any given TV frame and call it the A frame, then the first line of the next frame, which we can call the B frame, will be an even-numbered consecutive line: line "526," if you will. The phase of subcarrier at the beginning of this line, being even, will be reversed to that at the beginning of line number one of the A frame. The point is this: the phase of subcarrier (and burst) reverses at the beginning of the first line of video on successive frames. This is also true for any other given point on a particular line of a given field: the phase of subcarrier at this same point will be reversed exactly one frame, or 525 lines, later. The phase of subcarrier at the beginning of line one of the next, or third, frame will again be reversed and will match the phase of the first, or A, frame. This third frame will be called an A frame since its subcarrier (or burst) phase matches the first frame.

Video editing

With this understanding of how the four-field sequence is generated, how does it apply to videotape editing? Assume that Figure 2 represents a segment of videotape we wish to edit. Let's say we want to make an insert edit between points X and Y, replacing the original, or base, material with four frames of video from a camera source.

The whole process of color framing works to accomplish one thing: The A-to-B (A/B) frame sequence (the

sync-to-burst relationship) of the inserted material must be in step with that of the base material.

Figures 3 and 4 represent a properly color-framed edit and an improperly color-framed edit, respectively. Note that Figure 4 shows two disruptions in the A/B sequence: one at point X and another at point Y. When this tape is played, the picture will experience a jump in picture centering at *both* edit points of approximately 140 ns, the period of one half cycle of subcarrier. Horizontal blanking will also be stretched for the duration of the edit. More will be said about this shortly. For assemble edits the new video must

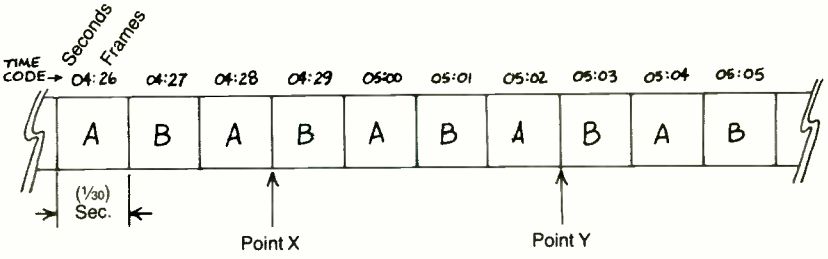


Figure 2.
The four-field or two-frame video sequence generated in the NTSC system.

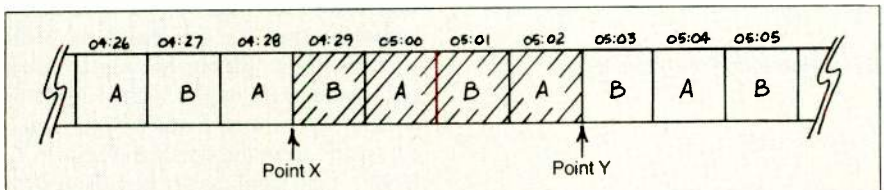


Figure 3.
A representation of a properly color framed insert edit. The inserted video is the shaded area. Notice the entire tape has a continuous A/B frame sequence.

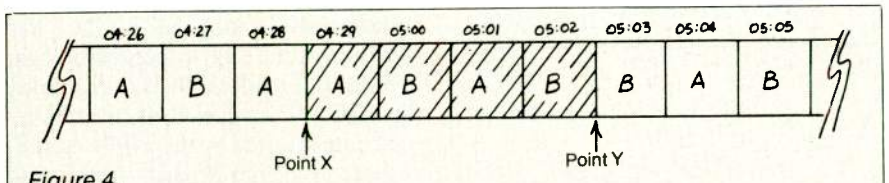


Figure 4.
A representation of an improperly color framed insert edit. Notice that the A/B sequence of the inserted video (shaded area) is out-of-step with the base material.

still be in step with the base material, but only the video entrance is a point of concern since the A/B sequence will proceed normally from this point on.

Figures 5A and 5B illustrate how color framing is properly achieved by the record or editor VTR. The top line illustrates the A/B frame sequence progressing at the output of a camera encoder, and the sequence of the house reference signal (color black or sync and subcarrier) driving the encoder. Figure 5A illustrates how the record VTR will lock up if its color framer switch was set correctly. The A/B sequence of the tape to be edited will match the camera output; when the edit goes in (shaded area), a properly color-framed edit will occur. If the record VTR color framer switch had been incorrectly set (Figure 5B), the VTR would have locked up improperly, being out of step with the camera and reference signal. An improperly color-framed edit would have occurred as illustrated.

The proper setting of the record VTR color framer switch is usually determined by making a trial test edit during color bars at the head of a tape where the video content is stationary and shifts can easily be seen.

The half-cycle shift

Present-day digital time base correctors construct new H and V blanking intervals from the reference signal input. New sync and burst signals are added to the video output since they fall within the reconstructed blanking periods. The new blanking intervals effectively create a "frame" into which the time base corrected video is horizontally and vertically centered. This can best be visualized by observing a pulse-cross monitor display (refer to Figure 6). The exact location of corrected video within this frame is dependent upon, among other things, comparisons made by the TBC between tape sync and burst and reference sync and burst.

Assume that the videotape in Figure 4 containing the improperly color-framed edit is being played back. Everything runs along smoothly until, at point X, the demodulator suddenly outputs two A frames back to back. The TBC is expecting to see tape burst coming in at the correct phase, that is, in proper A/B frame sequence—matching house reference burst (see Figure 7). Instead, tape burst comes in 180 degrees out of phase. The same thing would happen if the demodulator were to output two B frames back to back. If the TBC were to take no further action, the inverted burst would normally result in a 180-degree chroma phase error at the TBC output since the TBC continuously replaces tape sync and burst with sync and burst derived from the reference signal input. The TBC handles this error, however, with an interesting bit of sleight of hand: It simply

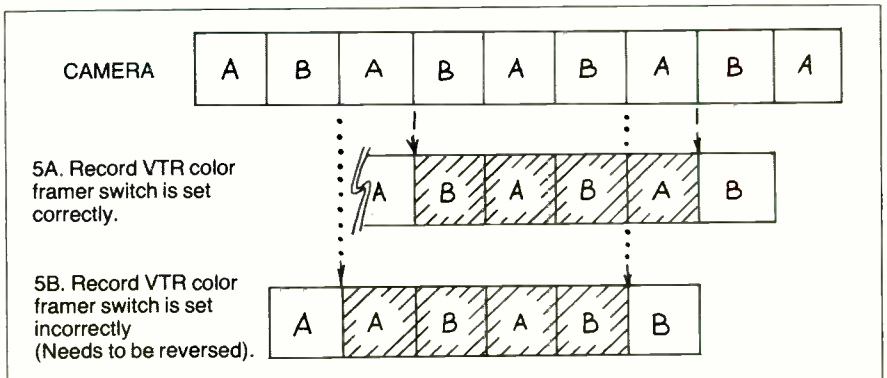


Figure 5.
The effect that the record (editor) VTR color framer switch has on VTR lock-up.

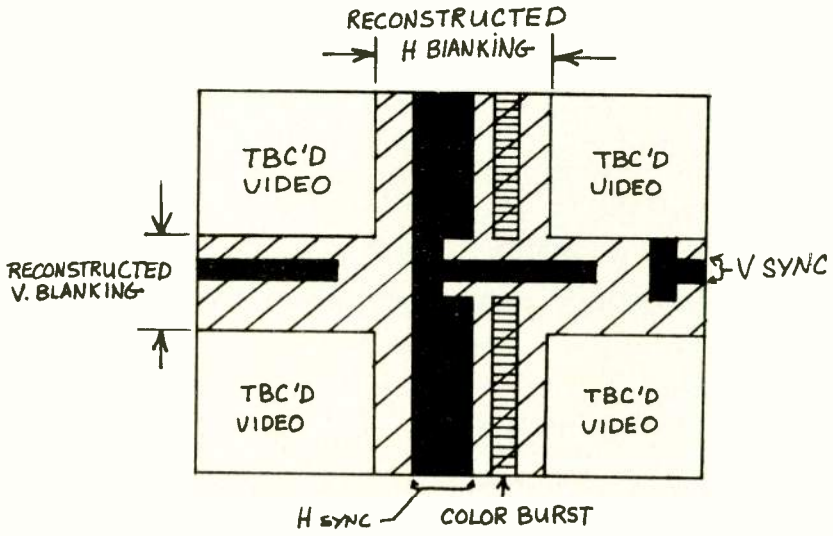


Figure 6.
A pulse-cross monitor display showing reconstructed H and V intervals.

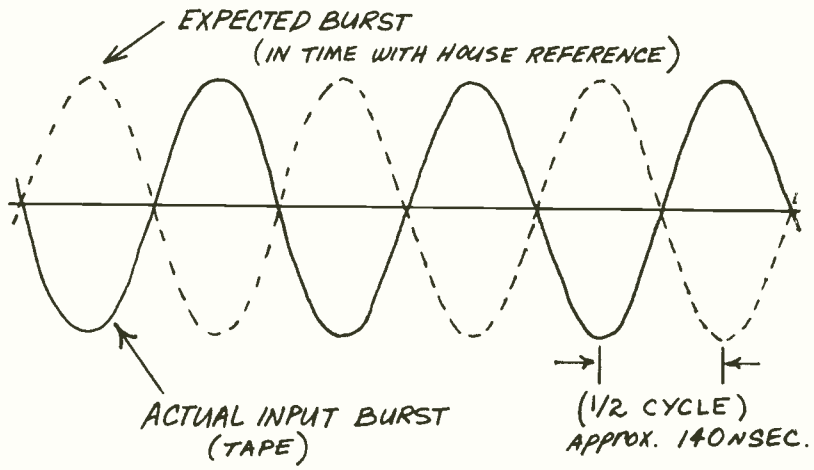


Figure 7.
The 180-degree phase difference between reference burst and tape burst during a non-color framed edit.

"slides" the entire TBC'd signal horizontally by advancing or delaying it in time one half cycle of subcarrier (140 ns) within the frame of reference video. If tape video (sync, burst, and picture information) were either advanced or retarded in time by one half cycle of subcarrier, proper chroma phase would be restored at the output of the TBC. So when non-color-framed edits are played through a TBC, color errors will be "corrected," but we wind up with a half-cycle shift in picture centering. This is why record VTR color framers should be used and properly set for editing sessions. Without them, the editor VTR only has a fifty-fifty chance of locking up properly each time the VTR is rolled.

If a non-color-framed edit had been done on a camera cut, the shift properly would not have been noticeable; if similar material had been involved, however, as in matched cuts or animation sequences, the results would have been disastrous.

Blanking stretch

Figures 8A, 8B, and 8C illustrate how horizontal blanking parameters may be altered by improper color framing. Figure 8A represents the original camera output as it was fed to the VTR for recording. Figure 8B represents a half-cycle shift to the right (delayed) during playback of a non-color-framed edit made from the signal in Figure 8A. Notice that front porch has decreased 140 ns from 1.5 μs to 1.36 μs. Sync-to-blanking-end has increased to 9.54 μs.

A half-cycle shift left (advanced) would have made front porch 1.64 μs and sync-to-blanking end 9.26 μs. The direction of the shift either left or right is usually a random decision made by the TBC. As long as horizontal blanking being inserted by the TBC or a subsequent proc amp is narrow enough to permit the full shift to be visible, *total* blanking width will not change (10.9 μs). However, if reinserted blanking was so wide that it would have permitted only the original specs of 1.5 and 9.4 μs to go through, then a half-cycle shift to the right would have caused 0.14 μs of video on the front porch to be lost. Total blanking width would now be 11.04 μs (Figure 8C). Succeeding generations of the tape may only compound the problem, making blanking even wider.

Random VTR lockup

One unfortunate characteristic of

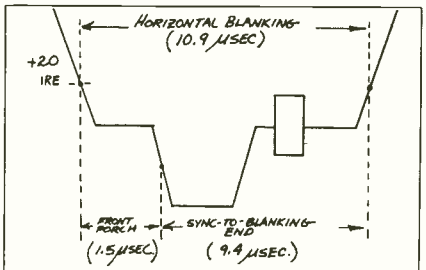


Figure 8A.
Camera output video (horizontal blanking interval) fed to the VTR for recording.

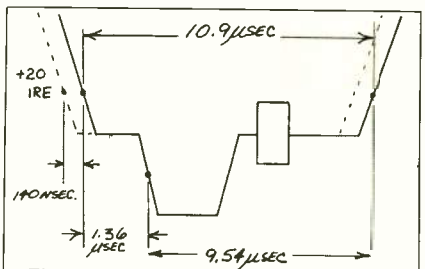


Figure 8B.
The change in horizontal blanking parameters due to a half-cycle shift to the right during playback of a non-color framed edit.

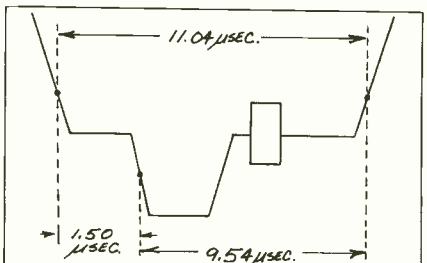


Figure 8C.
Stretched horizontal parameters when re-inserted blanking will only permit original specs to pass.

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most VTRs is that unless color framing circuitry is also activated on the *playback* machine, this VTR will also only have a fifty-fifty chance of locking up on the correct color frame. That is, the A/B sequence produced at the demodulator output of the playback VTR only has an even chance of being in step with the reference signal feeding the VTR and TBC. If the playback sequence is out of step, a half-cycle shift in picture centering will occur at the TBC output just as if the TBC had been presented with a non-color-framed edit. Again, unless the playback VTR is also assisted by color framing circuitry, the probability of proper lockup is only 50 percent *each time* the VTR is rolled. For this reason, *both* the record and playback VTRs must use color framing in an editing session. If the playback VTR is allowed to be subject to half-cycle shifts, matched cuts and animation work cannot be achieved. H blanking may be stretched in the process as well. Some production/syndication facilities routinely run playback color framers for just this reason. Playback color framers should also be used for dubbing tapes and even playback for normal air if the increase in lockup time can be tolerated.

In some editing systems, color framing of the playback VTR is handled by a computer. In others, an internal color framer switch on the VTR must be activated and a choice made to its proper setting, either A or B.

When editing with one or more playback VTRs, the same basic rule applies as before: The A to B frame sequence of all inserted or assembled material must be in step with that of the base material. This means the demod output of *each* VTR must be in step with the reference signal. When this has been accomplished, dissolves, cuts, etc. may be made between playback tapes without shifts or blanking stretch.

Editing sessions frequently require the use of intermaster tapes that may be several generations down. Under these conditions it is extremely important to make sure that record and playback color framers are correctly used at *each step* of program integration and dubbing. Once a shift has been recorded in, it becomes extremely difficult if not impossible to match-cut it with the original footage, and one may well have to live with the results.

Setting up

The single most important factor in setting up a color frame editing system is to know how your equipment operates. This point can hardly be overemphasized. Some VTRs achieve color framing using encoded control track pulses in one form or another. Some time code systems achieve color framing by keeping track of odd and even frame numbers. Some systems may even use either, depending on the operating mode of the VTR.

Remember that the color framing should not be confused with the "framing" used on ¾-inch equipment, which only prevents two odd or even fields from being recorded back to back.

Most of the information you will need to know about how your recorders actually achieve color framing (for both record and playback VTRs) will be found by studying the manufacturer's technical manuals. Also, take the time to become versed on related subjects such as time base correction and subcarrier-to-H sync phase (SCH phase, or timing).

In addition to reading, a good bit of experimentation with your equipment will also be required so your system can be operated in a consistent, reliable manner. **BM/E**

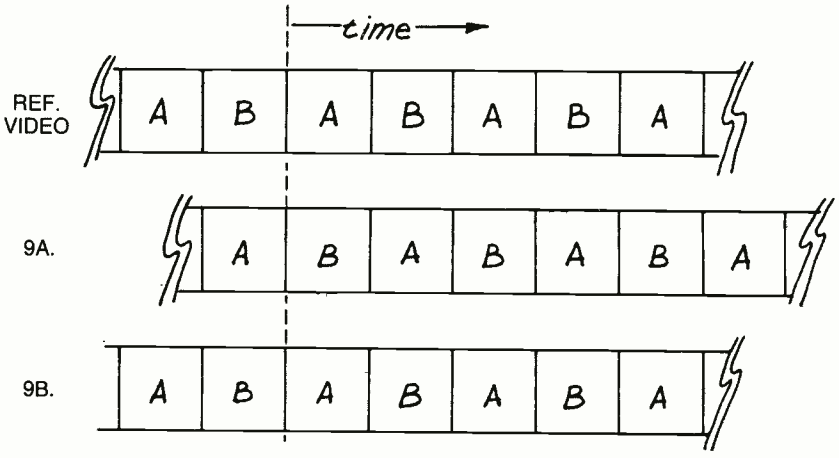

Figure 9.
A representation of random playback VTR lock-up with respect to the reference signal driving the TBC.

Figure 9A.
Video from the demodulator when the VTR locked-up on the wrong color frame (out-of-step with the reference). A half-cycle shift will occur at the TBC output.

Fig. 9B.
Demodulator output when the VTR is locked-up on the correct color frame. No shift will occur at the TBC output.

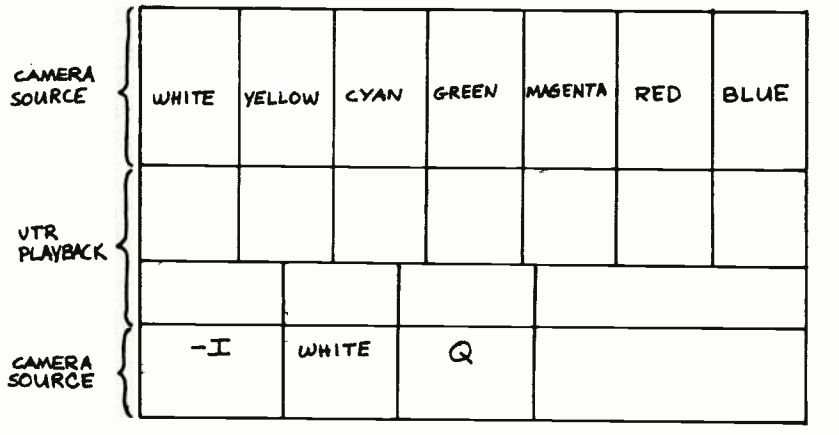

Figure 10.
A visual method for checking digital time base corrector centering utilizing a split-screen between VTR playback and a camera bar source.

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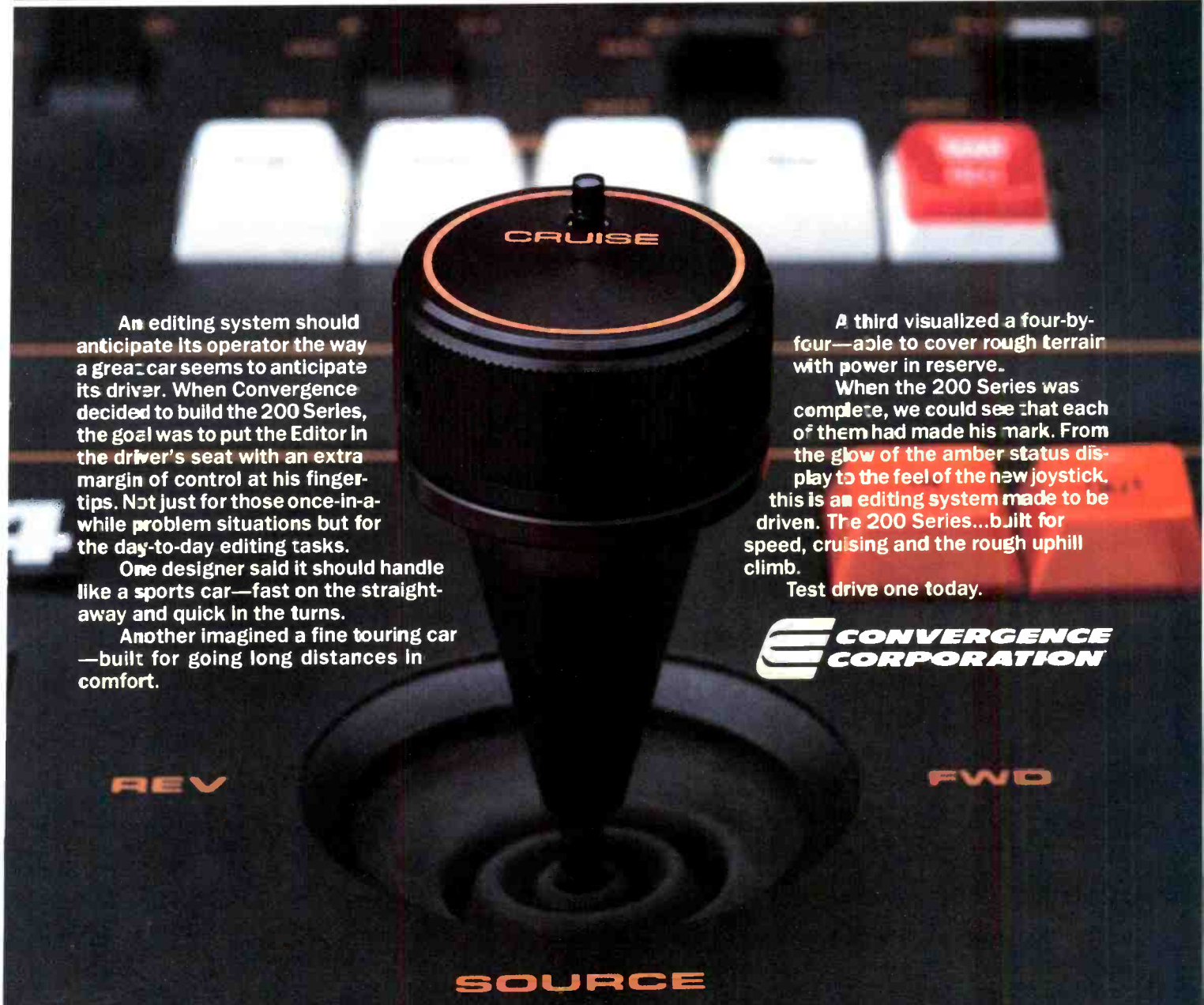
200 SERIES



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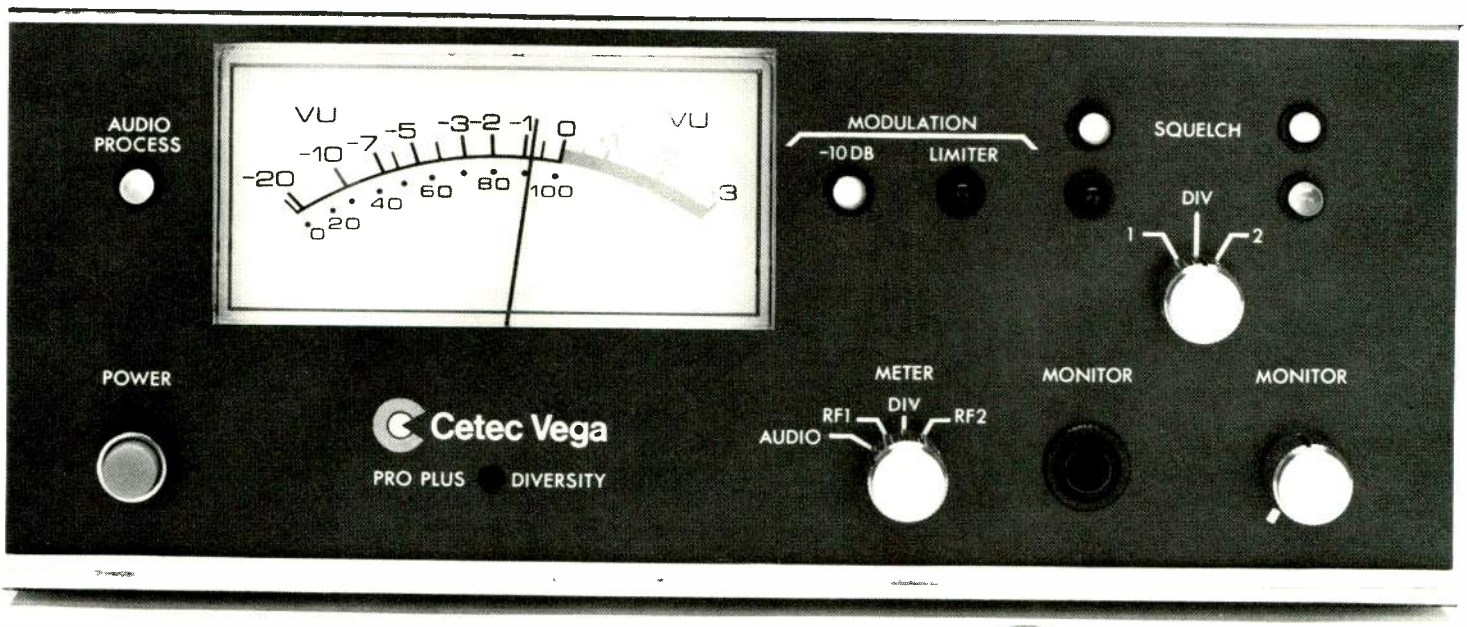

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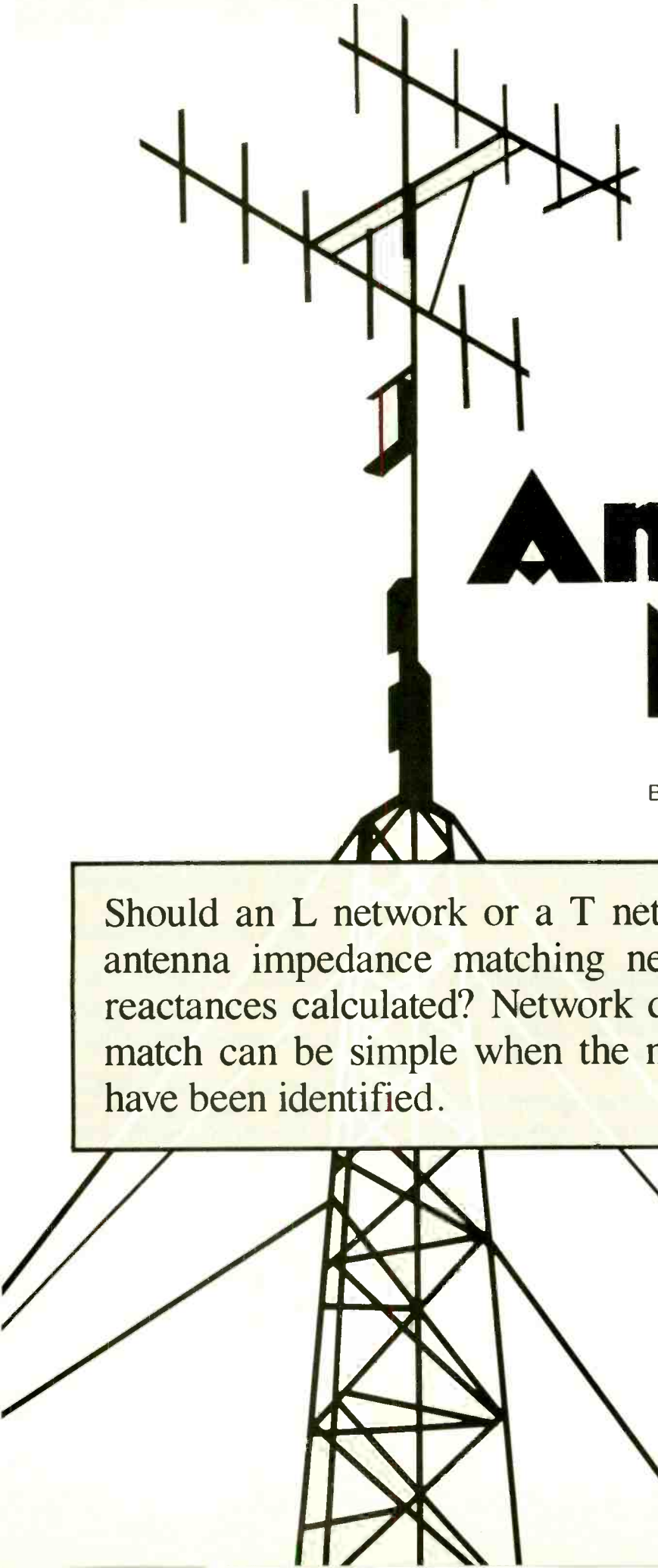

The Antenna Match

By Howard W. Davidson

Should an L network or a T network be used for the antenna impedance matching network? How are the reactances calculated? Network design for the antenna match can be simple when the methods and formulas have been identified.

Howard W. Davidson *is a senior systems engineer at Telcom, Inc., a telecommunications engineering organization located in Vienna, VA. He has also been a broadcast station chief engineer.*

In the fixed frequency AM broadcasting service an antenna impedance matching network, or coupler, is commonly used to match the complex impedance of the tower to the characteristic impedance of its transmission line. Knowing the station tower and line impedances, and given the appropriate formulas, it is possible to calculate the reactance values for a suitable matching network. These formulas with some of the rules for their use are presented herein.

The basic network usually consists of reactive elements connected in an L or T configuration and sized electrically to provide the impedance transformation. Either configuration will provide the impedance transformation, but only the T network permits variation of the circuit phase shift. This is useful where the towers of a multitower directional array must have a finite phase relationship to provide the desired pattern.

When a T network is used with a single, omnidirectional tower, the phase shift may be selected arbitarily. However, for minimum power loss, the network reactances should be kept as electrically small as possible. This is done by avoiding very low or very high values of phase shift.

The phase shift of an L network is not selectable but determined solely by the impedance transformation ratio. This is entirely satisfactory in the case of the single, omnidirectional tower, since phase is not a factor in the radiation characteristics of the tower.

Low pass networks have a positive phase shift (phase retarded) and high pass networks have a negative phase shift (phase advanced). The equations for calculating the ohmic values of the network reactances take this into account. In these equations phase shift is usually denoted by the Greek letter β.

The equations for the low pass and high pass networks, both L and T, are given here and keyed to Figures 1 and 2. Figure 1 illustrates the basic circuit of an L network in terms of reactance; Figure 2, the T network in the same terms. For a low pass T network, use positive values of β; for a high pass T network, use negative values.

1) Low Pass L Network

$$X_2 = R_2 \frac{R_1}{R_2} - 1^{1/2}$$

$$X_3 = -R_1 \frac{R_1}{R_2} - 1^{1/2}$$

2) High Pass L Network

$$X_2 = -\frac{R_2}{\frac{R_1}{R_2} - 1}^{1/2}$$

$$X_3 = \frac{R_1}{\frac{R_1}{R_2} - 1}$$

3) T Network

$$X_1 = -\frac{R_1\cos\beta - (R_1R_2)^{1/2}}{\sin\beta}$$

$$X_2 = -\frac{R_2\cos\beta - (R_1R_2)^{1/2}}{\sin\beta}$$

$$X_3 = -\frac{(R_1R_2)^{1/2}}{\sin\beta}$$

Where:

X_1 = *reactance of series arm, R_1 branch*

X_2 = *reactance of series arm, R_2 branch*

X_3 = *reactance of shunt arm*

R_1 = *resistive component of terminating impedance having the larger resistance*

R_2 = *resistive component of terminating impedance having the smaller resistance*

β = *phase shift*

Resistances and reactances should be expressed in ohms; the phase shift in degrees. When the solution to any of the three equations is a positive number, the required reactance is inductive (X_l); when negative, it is capacitive (X_c).

Also, as a point of interest, the formula used to determine the phase shift of an L network is:

$$\cos\beta = \frac{(R_1R_2)^{1/2}}{R_1}.$$

$$\text{or } \beta = \cos^{-1}\frac{(R_1R_2)^{1/2}}{R_1}.$$

If the L network is phase retarding (low pass), β is a positive angle; if phase advancing (high pass), β is a negative angle. The cosine of β is the same for either case.

The following equations will give the network component values in μH of inductance or μF of capacitance for the frequency of interest:

$$L = \frac{159.2X_l}{F}$$

$$\text{and } C = \frac{159.2}{FX_c}$$

where:

L = *inductance in microhenries (μH)*

C = *capacitance in microfarads (μF)*

X_l = *inductive reactance in ohms*

X_c = *capacitive reactance in ohms*

F = *frequency in kilohertz (kHz)*

Theoretically an exact impedance match can be achieved at carrier frequency. The sideband frequencies will be slightly mismatched, however, because the tower impedance changes as

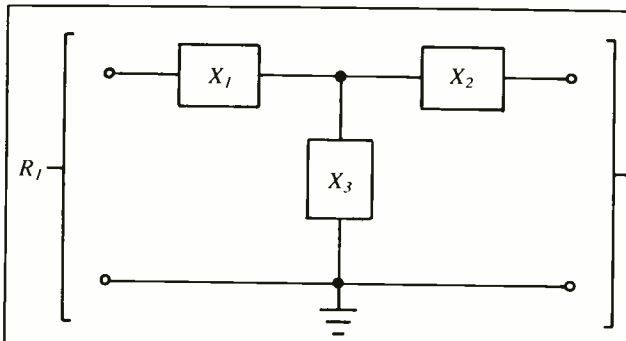

Fig. 1. Schematic of L network.

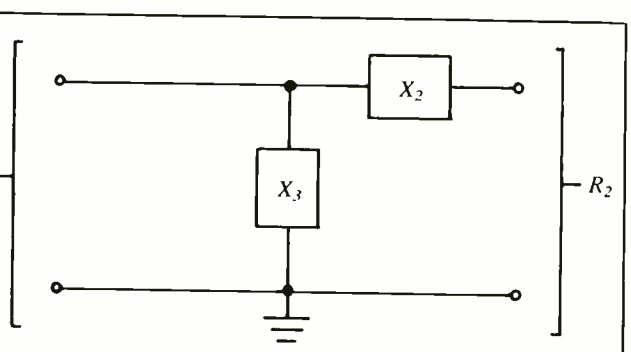

Fig. 2. Schematic of T network.

TABLE 1

β	25°	50°	75°	100°	125°	150°	175°
X_1	−239.5	−53.0	49.4	149.4	292.0	612.8	3859.3
X_2	146.3	98.0	97.6	117.7	165.9	301.1	1801.9
X_3	−253.7	−140.0	−111.0	−108.9	−130.9	−214.5	−1230.4

the frequency changes.

If an L network is used, it must be interposed between the transmission line and antenna so that the larger terminating resistance (R_1) is connected to the junction of X_2 and X_3. If the resistive component of the antenna impedance, as measured from tower base to ground, is greater than the transmission line characteristic impedance, then the antenna radiation resistance becomes R_1 and the antenna is connected to the junction of X_2 and X_3. If the reverse is true, the transmission line characteristic impedance becomes R_1 and the center conductor of the line is connected to the junction. Where R_1 is equal to R_2, an L network cannot be used.

In the case of the T network, it is interposed so that the greater terminating resistance (R_1) is connected to the X_1 arm and the lesser (R_2) is connected to the X_2 arm. The reverse interposition will result in an impedance mismatch.

In the special case where R_1 and R_2 are equal, X_1 and X_2 will be equal, and R_1 can be connected to either end. R_2, of course, is connected to the opposite end of the network.

The antenna impedance will seldom be purely resistive. Usually the impedance will have a reactive component that must be taken into account because the coupler only transforms the resistive component of the antenna impedance. This is done by providing a conjugate reactance in series with the tower.

If the antenna is connected to the X_2 arm of the L network, the sum of the antenna reactance and the reactance supplied for the X_2 arm of the network must together equal the calculated value for X_2. This is true for either L network equation, low pass or high pass.

The same situation exists for the T network, but here the antenna could be connected to either the X_1 arm or the X_2 arm, depending on the relative values of the antenna radiation resistance and the transmission line characteristic impedance. With either connection the antenna reactance must be compensated for, as in the case of the L network.

If an L network is used and the antenna is connected to the junction of X_2 and X_3, a reactance equal to the antenna reactance but of opposite polarity must be interposed between the junction and the antenna to cancel the antenna reactance. The network now assumes a T configuration, but electrically it is the equivalent of an L network.

Usually a tapped inductor is put in series with any network fixed capacitor. This circuit arrangement simply provides a convenient means for tuning the capacitor to the required negative reactance. The reason is that tapped inductors are relatively less expensive than variable capacitors.

Now, having sorted out some of the factors to be considered with regard to the antenna match, let's look at a couple of typical tower impedance matching problems. We can call them Case 1 and Case 2.

For Case 1, let's consider a typical small station with a quarter-wave tower (90 degrees) having a measured base impedance of $\dot{Z} = 38 + j28$ ohms. The coaxial transmission line associated with it has a characteristic impedance of 50 ohms, which can be equated to 50 ohms of resistance (in terms of current flow when matched). The station frequency is 1230 kHz. For simplicity, and L network will be used.

Then, for Equations 1 or 2:

R_1 = *50 ohms (line characteristic impedance)*

TABLE 2

β	25°	50°	75°	100°	125°	150°	175°
X_1	130.5	317.0	419.4	519.4	662.0	982.8	4229.3
X_2	146.3	98.0	97.6	117.7	165.9	301.1	1801.9
X_3	−253.7	−140.0	−111.0	−108.9	−130.9	−214.5	−1230.4

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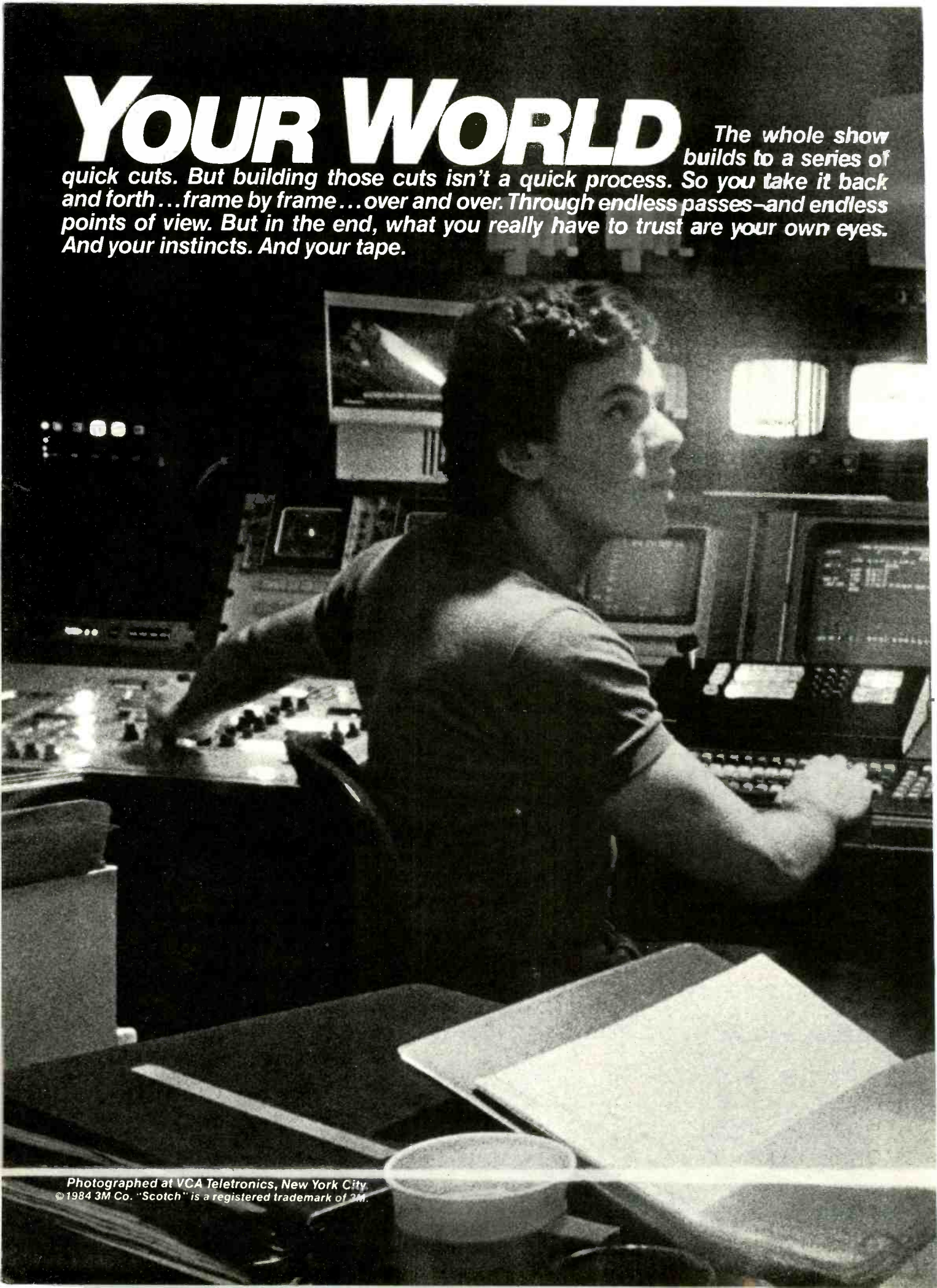

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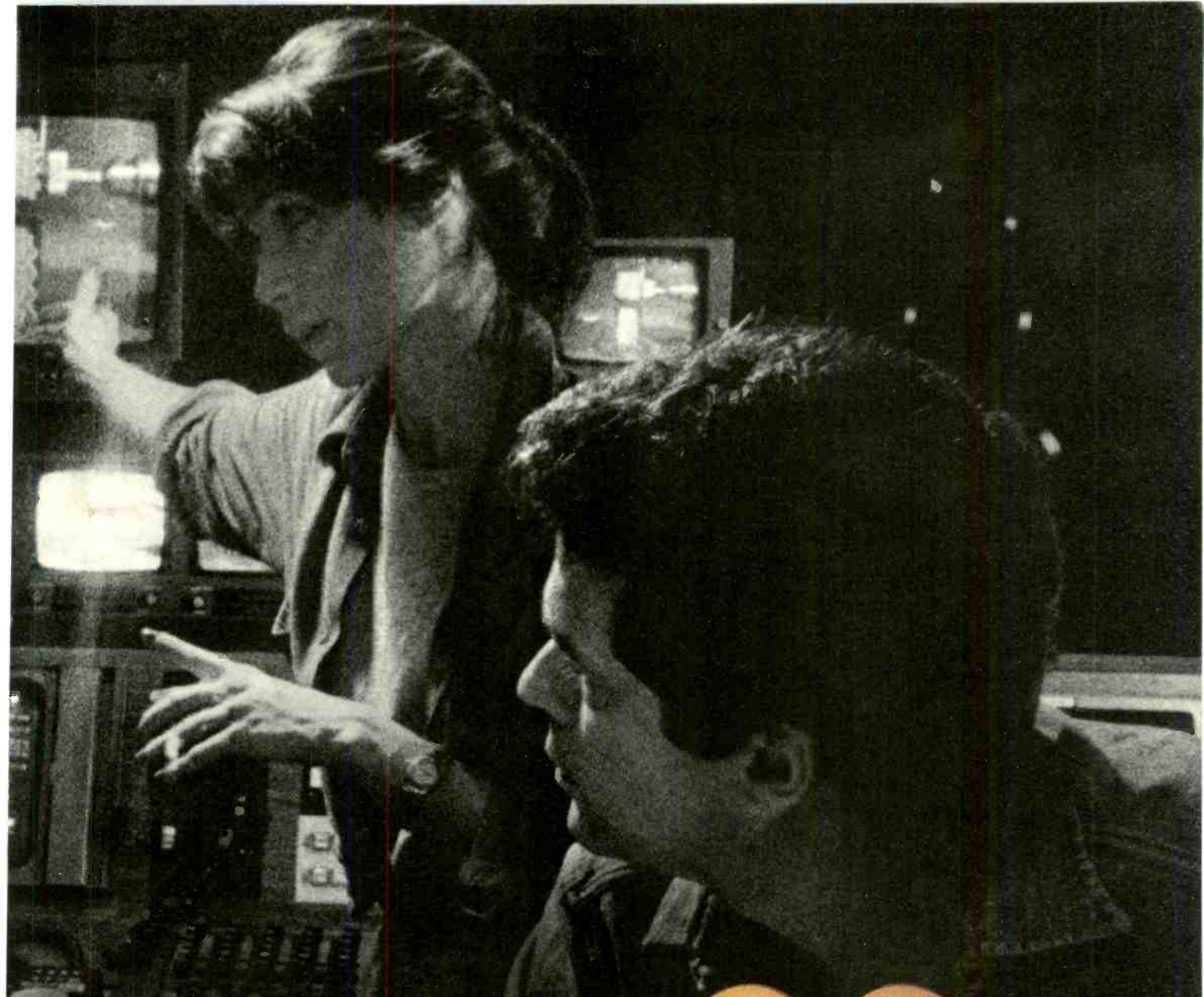

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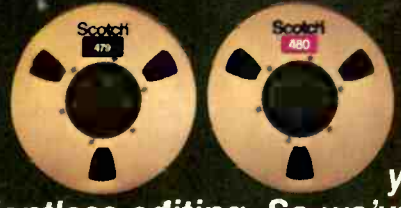

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TABLE 3

β	25°	50°	75°	100°	125°	150°	175°
X_1	23.1	56.1	74.2	91.9	117.1	173.8	747.9
X_2	25.9	17.3	17.3	20.8	29.3	53.2	318.6
X_3	.0007	.0013	.0016	.0016	.0014	.0008	.00014

R_2 = *38 ohms (antenna radiation resistance)*

The low pass L network equation yields a value for X_2 of +j21.4 ohms, and a value for X_3 of −j89.0 ohms. Since the transmission line represents R_1, it is connected to the junction of X_2 and X_3. The antenna connects to the X_2 arm. The antenna reactance, which is +j28 ohms, must be reduced to +j21.4 ohms to meet the X_2 requirement. This requires a negative reactance at X_2 of −j6.6 ohms.

At 1230 kHz, the −j6.6 ohms of X_2 translates into a capacitor of .02 μF. This is an awkward size, difficult to tune because of its low reactance. A high pass network might avoid this problem and therefore be a better choice. The −j89.0 ohms of the X_3 arm, however, can easily be taken care of by using a 0.001 μF capacitor (−j129.4 ohms) in series with a 10 μH tapped inductor adjusted for 5.2 μH (+j40.4 ohms).

The high pass L network requires a reactance of −j21.4 ohms for X_2, and +j89.0 ohms for X_3. The reactance of X_2 will have to be increased by −j28 ohms to compensate for the +j28 ohms of antenna reactance. The net reactance required at X_2, then, is −j49.4 ohms, or a capacity of 0.0026 μF.

A 0.002 μF capacitor (−j64.7 ohms) in series with a small tapped inductor set to 1.98 μH (+j86.3 ohms) would do the job. For a little greater adjustment range, a .0015 μF (−j86.3 ohms) capacitor could be used with a 10 μH tapped inductor set to 4.77 μH (+j36.9 ohms). The shunt arm, X_3, requires an inductance of about 15 μH tapped at 11.52 μH to supply the required +89.0 ohms at 1230 kHz.

The phase shift for the low pass L network as described is +29.3 degrees. For the high pass L network, the phase shift is −29.3 degrees.

For Case 2, a large station having an optimum-height tower of 0.52 wavelength (190 degrees) will be taken as an example. The tower base impedance is estimated to be $\dot{Z}$ = 230 − j370 ohms. A coaxial transmission line with a characteristic impedance of 50 ohms will be used.

Since a T network will provide the greatest flexibility in selecting components for the impedance match, it is chosen here.

Let's assume an operating frequency of 900 kHz. Then, for Equation 3:

R_1 = *230 ohms (antenna radiation resistance)*

R_2 = *50 ohms (line characteristic impedance)*

Solving for X_1, X_2, and X_3, and using various values of positive β to provide a choice of low pass network reactances, gives the results tabulated in Table 1. Reactance values shown are inductive unless preceded by a minus sign, in which case they are capacitive.

A programmable calculator is immensely helpful in making these calculations. Once programmed, it takes only a moment to calculate the X_1, X_2, and X_3 reactance values for any selected β.

Since the antenna radiation resistance is taken for R_1, the antenna must be connected to the X_1 arm. It then becomes necessary to adjust the values of X_1 to compensate for the negative reactance (−j370 ohms) of the antenna. The new value for X_1 are given in Table 2. X_2 and X_3 do not change.

The corresponding component values at 900 kHz for the reactances of Table 2 are shown in Table 3. Positive numbers for X_1, X_2, and X_3 are converted to μH of inductance and negative numbers are converted to μF of capacitance.

From an inspection of Table 1 it would appear that phase angles between 50 and 100 degrees would be most suitable for the low pass T network of Case 2. In this region, therefore, network power losses will be at a minimum.

Commercial inductors are readily available with inductances of 7 μH to 150 μH, and RF current capacities up to 60 A. Mica transmitter capacitors are commonly available in sizes from 0.0002 μF to 0.02 μF and assorted current/voltage ratings.

Actual component values used will differ from those shown in Table 3. Inductances should be increased to permit tapping for an exact match reactance. Fixed capacitors should be smaller to increase their negative reactance and thus permit use of a tapped inductor for tuning. Variable capacitors, if chosen, should have a greater maximum capacity than required for the match reactance.

Similar tables can be constructed for high pass T networks to determine the component values required to match a given antenna impedance to its transmission line characteristic impedance. It is only necessary to use negative angles for β.

It is hoped that the information contained herein will be of help in understanding some of the factors that affect the design of an antenna impedance matching network. There are other solutions, of course, and other factors to be taken into account, but the formulas presented here will quickly define the usable reactance values for the most commonly used antenna matching networks. **BM/E**

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PLACING MICS FOR STEREO

By Larry Glenn

Increased demand for audio quality plus the advent of TV stereo has brought new importance to one of the basics—how to set up the microphones.

Larry Glenn *is audio production specialist at the Media Development Center of the University of Wisconsin—Eau Claire.*

Arrival of stereo audio for television plus a general interest in high quality audio for broadcast provides reasons to review how to originate stereo through microphone placement. The availability of two audio channels on videotape recorders makes it possible to do remote video production including stereo sound with only two microphones. The same production techniques can be used together with a digital audio processor and a VTR for digital audio, or with the new hi-fi audio format on half-inch VCRs for audio quality surpassing standard reel-to-reel tape recorders (*BM/E*, January 1984, p. 21). Moreover, stereo audio for broadcast TV will include noise reduction, dramatically increasing the audio signal-to-noise ratio.

Minimal techniques

Two microphones placed to produce differences in loudness and/or time from separate loudspeakers can produce an excellent stereo image. In fact, using more than two microphones in separate locations and reproducing them through the same two loudspeakers may result in a less realistic image because of interactions between the time and loudness clues each microphone will contribute. There may be other reasons to use more microphones, but a good stereo image is not usually one of them. As advances in audio technology have lowered distortion and noise, a growing number of audiophiles have applauded the realism of sound recorded with a minimum number of well-placed microphones. One independent recording engineer who has gained recognition for his use of these techniques is Russell Borud. His recordings have been used as a standard for subjective evaluation by reviewers of audio equipment. Since 1979 he has been the instructor of a series of workshops sponsored by the University of Wisconsin, Eau Claire, in natural stereo techniques for recording music. Most of the information which follows comes out of these workshops.

Deciding on a microphone technique to use in a specific situation involves more than deciding which technique yields the most realistic result. How realistic an illusion can be is partly subjective, but there are also practical considerations such as time constraints, equipment availability, and mono compatability. For television, keeping microphones out of the picture may also be a concern.

Crossed-cardiod

The crossed-cardiod technique uses two cardiod microphones angled at 90 degrees to each other, with the center of the sound source between them. The drawing illustrates the direction to which the front of the microphone points. This, however, is misleading. Actually, the front capsules must be mounted with one directly above the other. This is called a coincident microphone mounting. The distance from either microphone capsule to a location on the stage will then be the same; therefore there will not be any time differences.

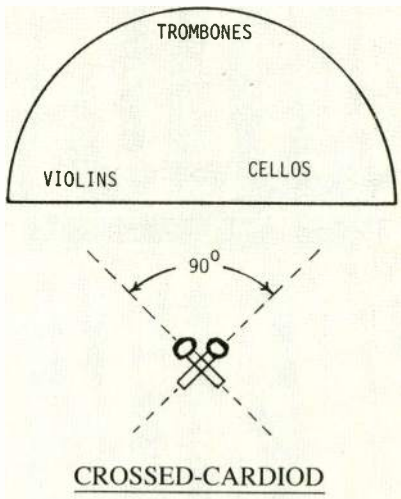


Figure 1
The crossed-cardiod method is very good at preventing pick-up of unwanted sound, yet is very flexible.

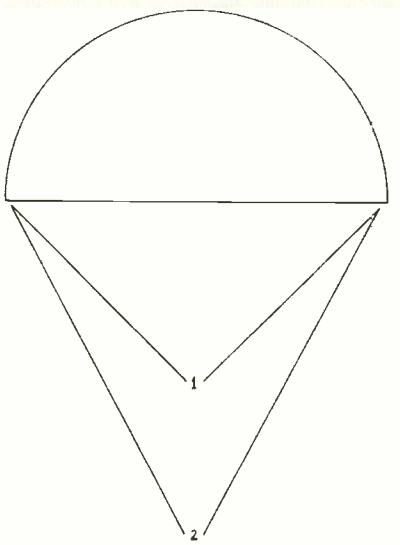


Figure 2
Distance from the sound source, in this case a concert stage, determines how wide the image is.

The name cardiod comes from the heart-shaped sensitivity pattern of the microphone. It is least sensitive to sound sources behind the capsule and most sensitive to sound sources directly in front of it. In the illustration, the left microphone points toward the violins, but the right microphone is pointed 90 degrees away from them. The result is a difference in loudness. Played over loudspeakers the left microphone is reproduced over the left channel speaker and the right microphone over the right channel speaker. The best stereo image is received by a listener who is the same distance from each speaker as the speakers are apart from each other. Since the violins are louder over the left speaker, they appear to the listener to be on the left side. The trombones, 45 degrees off-axis of both microphones, will be heard with equal loudness over each speaker and appear in the center. Every instrument in the orchestra will be in a different location, producing a whole range of locational cues with just two microphones and two audio channels.

It is important to note that the stereo image being developed is for a person listening over a stereo speaker system. Listening with headphones produces a different image with exaggerated separation. Since listeners are usually using speakers, it is best to evaluate microphone placements using speakers.

Audio perspective

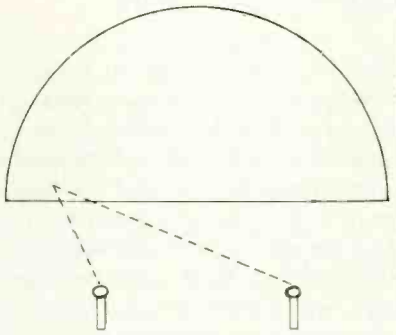
Before describing other mic placements it is necessary to review other factors. For example, where the mics are placed in relationship to the sound source affects the image. The most obvious factor here is distance. If they are close to the sound source, the image will seem close to the listener. This forms the perspective which we are creating for an audience. One of the most significant factors here is the ratio of direct-to-reverberant sound.

Anytime a microphone is used indoors, some sound is always picked up that does not follow the direct path from the source to the microphone.

Some sound has bounced off a wall, or some other object, and reaches the microphone by an indirect path, after the direct sound. Since sound spreads out in all directions, there are many different paths it can take that will eventually lead back to the microphone. The total of all indirect sound picked up is called the reverberant sound. Both the sensitivity pattern of the microphone and the distance to the sound source affects the direct/reverberant ratio. Direct sound tells the listener the direction to the sound source. The direct/reverberant ratio tells the listener how far away the sound source is. The character of the reverberance gives the listener an idea of how large the room is. The longer it takes to hear the first echo and the longer it takes for reverberant sound to die away, the larger the room will seem.

The last main factor in perspective is the width of the image. From the view of the listener, or from a pair of microphones, the angle in the drawing formed by the extreme sides of the orchestra is greater from position 1 than from position 2. This determines how wide the image is. To the same listener, or the same pair of microphones, position 2 will present a narrower image, due to the narrower angle. Changing the angle between the microphones will also produce a different impression of width. For example, the standard arrangement of a crossed-cardiod pair has an angle of 90 degrees between them. But changing this angle will change the image width. A wider angle will produce a narrower image, since the sound source occupies a smaller portion of the included angle.

There are always factors which affect the listener's perception that the engineer cannot control. For example, if the listener is further away from the distance between speakers, the apparent image width will be narrower. If the listener is not centrally placed, the image will depend to a great degree on the directionality of the individual speakers. Finally, a speaker is also a sound source. When placed in a room there are direct/reverberant effects from the speaker, which depend on the room and where the speaker is placed. A person using headphones is directly between two small speakers, so close that there is no listening room reverberance. The engineer must make some assumptions about how the audience will listen, just as it may be necessary to make assumptions about how sound monitored over headphones will sound over speakers. Experience is the best guide.



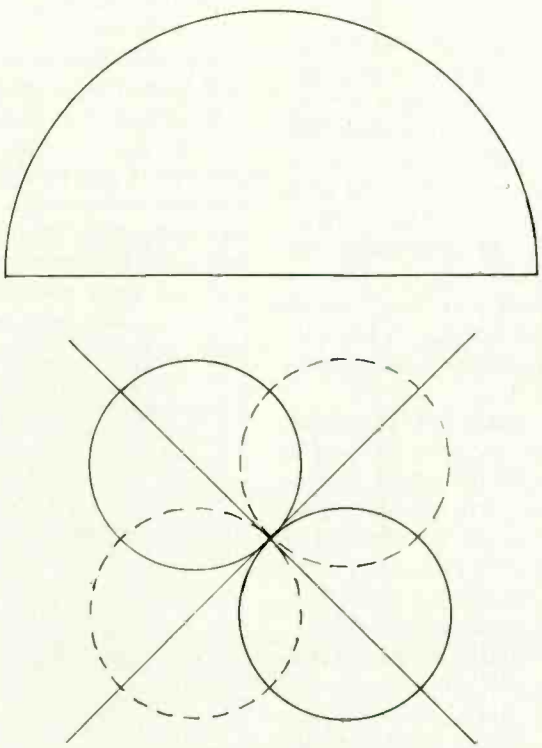
SPLIT PAIR

Figure 3
In the split-pair arrangement omnidirectional microphones with a common sensitivity pattern are used, mounted, or hung separately.

Audio/video perspective

There is a special consideration in perspective which relates to combined audio and visual images. A distant microphone placement will probably seem distracting when combined with an intimate camera shot. The director may use this for a special effect because of the mismatched perspectives. But to create a realistic image, he would try to make the two consistent. However, this is an area in which camera techniques cannot be completely consistent with audio perspective. Changes in camera angle and apparent distance are used both to hold the viewer's interest and to make details visually apparent. It would be difficult to maintain an audio perspective which differed with every camera change. It may also be too distracting to hear a constantly changing perspective. However, it can add to the realism for some changes to be consistent.

Today, a typical combination of stereo sound with television is a simulcast of an orchestra concert over TV and FM stations. The orchestra can be a very static image. TV tries to hold visual attention, in one way, by changing from long shots to close shots. Changing from a distant to a close audio perspective every time would be distracting to the TV audience and destroy the image to the radio audience. When a piece of music ends and the audience applauds, however, matching perspectives through a cross-fade to a



CROSSED "FIGURE 8" MICROPHONES

Figure 4
A very accurate stereo image can be achieved with the crossed-figure eight, if placed carefully. It must be further from the sound source than other techniques.

more distant stereo pair of microphones could complement a camera zooming out to include the applauding audience in its view. The tasteful mixing-in of a microphone close to a soloist can be acceptable to both TV and radio audiences.

Split pair technique

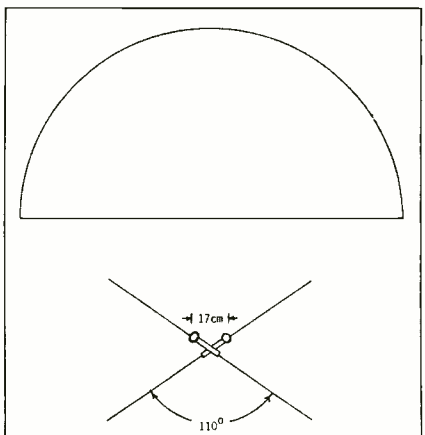
Returning to microphone placement techniques, a very common technique for stereo recording is split pair. Two omnidirectional microphones, which are separated from each other, are placed in front of the sound source at approximately equal distances. The distance from any one sound source to each microphone will be different, unless the source is in the middle of the stage. This produces a time difference between the two channels which the ears use to discriminate which side the source is on. Ideally, an omni microphone will not produce the level differences which show up in the crossed-cardiod technique as a result of sensitivity patterns. Level differences will then only be due to differences in distance. A characteristic of this technique is the "hole in the middle" effect, where the listener tends to hear sound as though it comes from two separate speakers. Of course it does; but we are trying to create the illusion that it does not. The result is that image placement is not very clear, and a moving source can seem to shift dramatically between the channels. Directional microphones are sometimes used as a spaced pair, but they make these effects more noticeable. In comparison, the crossed-cardiod technique is almost opposite, and produces an image which may seem too central. Crossed-hypercardiods produce a more even effect in this respect.

The spaced arrangement can create problems. Depending upon the specific distances from an individual source, certain frequencies will appear in phase to one microphone and out of phase to the other. Even if they are never electrically combined, they acoustically combine when reproduced by speakers. In order to minimize frequency response discrepancies due to phase cancellation, Russ Borud uses a 12-12 rule-of-thumb—always place the microphones more than 12 feet or less than 12 inches apart. Although it has problems, this is a simple technique which can produce a pleasing stereo effect. Using omnis makes it easy to have plenty of reverberant sound without moving further from the sound source.

Crossed-figure eight

Microphones with "figure eight" sensitivity patterns are no longer as common as they were many years ago. A figure eight is the natural pattern produced by a ribbon microphone opened at front and back. It is most sensitive at the front and at the back, while sensitivity at the side is even lower than that of a cardiod at its back. A crossed-figure eight arrangement has similarities to crossed-cardiod, mounting one capsule directly above the other and at 90 degrees to it. Although the figure eight microphone accepts sound from both front and back, its combined pickup covers a smaller total angle surrounding it than does a cardiod. From the same location it will have a higher ratio of direct-to-reverberant sound. A crossed-figure eight pair would have to be further from the performers for the same direct/reverberant ratio. The signal produced by the sound picked up at the rear of a figure eight is out of phase with the signal produced by pickup at the front. Sound reproduced over speakers comes from the front of the listener. For stereo, therefore, it is best to place the pair far enough away so that all performers are within the 90 degree angle between the front of the microphones. Performers not in this area may be reproduced in an incorrect relationship to the rest of the group.

The image is less centered and more evenly spread than with crossed-cardiods. It can produce a particularly accurate stereo image. However, it is less compatible when heard in mono, where the left and right are combined over the same speaker. Direct sound will be in phase on left and right microphones. Indirect sound picked up by the two microphones can be out of phase due to different paths. Only stereo can reproduce these out-of-phase components (the left minus right signal). A crossed-figure eight pair produces more left minus right information than a crossed-cardiod pair.



ORTF Cardiod Microphones

Figure 5
The ORTF method requires mounting that can separate capsules by 17 cm. Two cardiod mics are used.

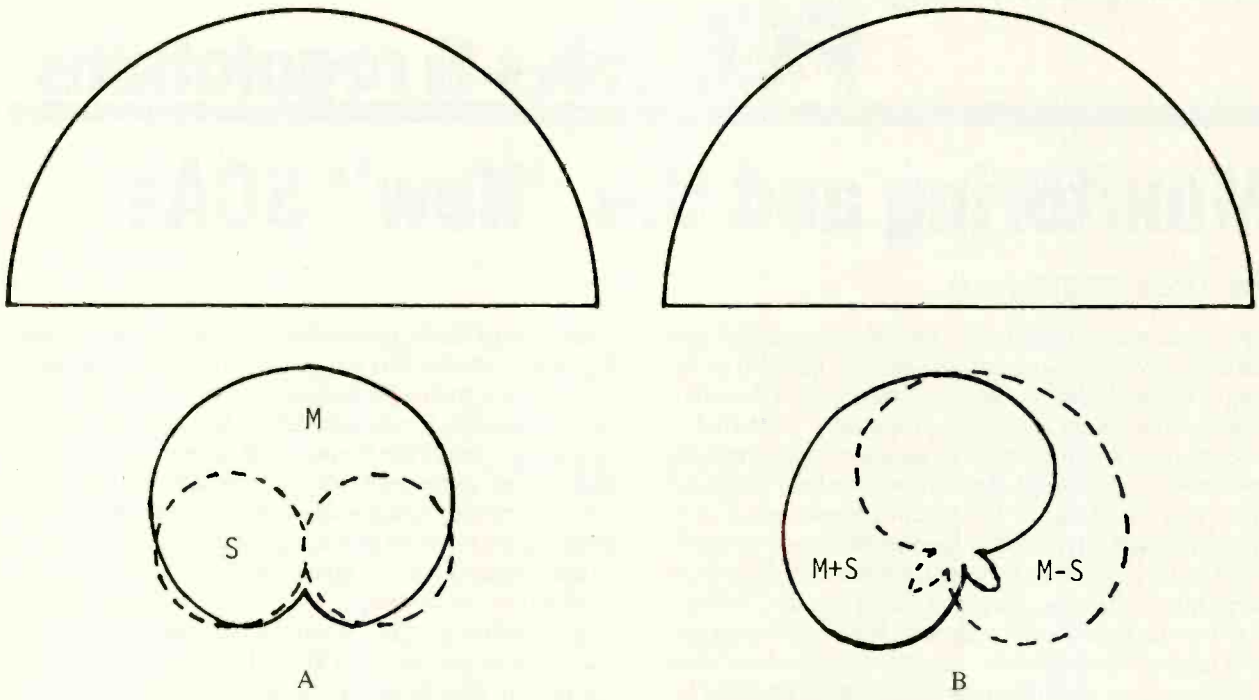
ORTF method

This technique takes its name from the French national radio and television agency. It produces a combination of time difference and loudness difference cues because it uses cardiod microphones placed 17 cm apart. This is called a near-coincident technique, because the microphones are close but not exactly coincident and their axes are angled at 110 degrees. The effect creates an image less centered and with more impression of space than coincident placements. John Eargle, a noted authority on microphones, described a similar technique used by the Dutch broadcasting agency (NOS) using cardiods spaced apart by 30 cm and angled at 90 degrees. A preference of one technique over another reminds us of the subjectiveness involved.

M,S (mid, side)

The M,S (mid, side) technique uses two microphones but requires a transformer matrix or a mixer to derive sum and difference signals. It is also a coincident technique, with one capsule directly above the other. A cardiod (M) microphone is traditionally used, facing straight toward the performers, and a figure eight (S) microphone faces left and right, as in the first illustration. Assuming the in-phase end (front) of the S microphone faces left, combining the two (M + S) into one channel produces a signal equivalent to that of a left directional microphone. The difference signal can be obtained by reversing the phase of the figure eight and combining it with the cardiod into a second channel (M − S). This produces the same effect as a right directional microphone.

Why go to all this trouble? By varying the mix of M and S, we can change the equivalent patterns and the equivalent angle between them. This changes image width and direct/reverberent ratio without moving the microphones. The exact resulting patterns and the equivalent angle between them depend on the amount of the S signal added. Mounting or hanging microphones can take a lot of time. If they do not sound correctly placed the first time, (assum-



M,S

Figure 6

Pairing cardiod and figure eight mics can achieve multiple patterns with the M,S technique, but requires a transformer matrix or mixer.

ing there is time to make a test and then move them), the work is not over. With M,S if you can make a good guess the first time, you can make a range of image and overall balance changes by changing a pot or two. Unless the setup is for a live broadcast, you can even dispense with the accessory equipment, record M and S directly, and derive the stereo signals in post-production.

With this versatile technique, omni or even bipolar patterns can be used for the M signal, offering an even greater range of equivalent patterns. Since the accuracy of the derived pattern depends on phase, the two microphones need to have accurate patterns over a wide frequency range. Care must be taken to maintain a consistent phase relationship between the signals before deriving the final patterns.

The third microphone

All of these techniques can produce good, natural, stereo images with two microphones. They depend, however, on the existence of a good overall acoustic balance. The performers have to maintain a good relative balance themselves, just as they should for any live audience. But, as there are different perspectives from different seats in the hall, there can be "unnatural" situations. Electrified instruments, sound reinforcement, soloists, and spoken commentary are all situations which may not have a good natural balance. This is where the "third" microphone comes in, placed to increase the loudness of a relatively quiet source. It will always require a mixer and needs to be fed to both channels. A panpot provides the simplest means for placing it into a stereo image. The key is to add it carefully. After setting left and right microphone levels, bring the fader up for this microphone slowly, and only as far as needed to make it heard. The more that is added, the closer to mono the two channels will become. After you hear it, try lowering the fader a little and see if it still does the job. This will prevent using more than necessary. Sometimes a second coincident stereo pair of microphones is used instead of a single microphone, but the same care must be taken not to use too much.

A few things should be pointed out about choosing microphones. First of all, "stereo" microphones are available which have two microphone capsules, one above the other. Not only can all techniques requiring this be used, but the more expensive microphones allow the rotating of one capsule to change their angle and individual remote control of their patterns. Though more versatile, they will not produce a better image if you can securely mount one microphone capsule directly above another. Several manufacturers make useful mounting adapters for holding two separate microphones close together. Make sure they do not touch, or there could be mechanical vibration noises. The two microphones should be similar, though, or the image will not be even and stable.

Although a smooth frequency response is generally desirable, the stereo image depends at least as much on the pattern accuracy over a range of frequencies. No microphone is perfect in this respect, but an expensive one with variable patterns is not necessarily better than a less expensive one with one accurate pattern.

One last thing to be aware of is that high frequencies lose their energy faster than low frequencies as the sound source becomes more distant. Placing a stereo pair for a good overall balance will put it considerably further from the source than with close microphone techniques. Microphones intended to be used in this way (sometimes called "far-field" microphones) often have a slight boost in the mid-to-high frequencies to compensate for this loss. **BM/E**

Monitoring and the "New" SCAs

Harry Cole, FCC Counsel

Strange as it may seem in the Age of Deregulation, one question more and more broadcasters are likely to be facing in the near future is that of monitoring. Not the monitoring of their main channel transmissions. That kind of monitoring is a well-established aspect of most broadcast operations. Even though the Commission has, within the past year, eased up on the specific requirements governing modulation monitors, for example, there are probably few surprises to be expected in that area. In one other burgeoning area of broadcasting, however, the Commission and the industry are only now beginning to grapple with monitoring problems—and that area involves transmissions by broadcast stations which are not intended for reception by the general public.

Now, at first you might think that such transmissions are relatively scarce. But think about it: For years FM stations have been providing nonbroadcast transmissions through their subsidiary communications authorizations (SCAs). The FCC's action of one year ago, opening up SCA operation for myriad new, "high-tech" uses, has provided a spur to an area of broadcasting once reserved primarily for background music and specialized programming (*e.g.*, foreign language, commodities information, and so forth). Similarly, television licensees have for several years been able to transmit closed captioning and, more recently, teletext messages utilizing their vertical blanking intervals. Also, there was the Commission's action earlier this year creating stereo television and, in the process, establishing two SCA equivalents for television, the so-called "second audio program" (SAP) and the "professional channel." Once it gets rolling, the SAP (as envisioned by the Commission) will be the functional equivalent of the SCA, with the same potential uses (albeit with somewhat different characteristics, such as a generally wider service area attributable to the greater operating power enjoyed by most television stations).

One of the most attractive features of these various alternative uses of "extra" portions of a broadcast station's signal is that they can be utilized as profit centers without a good deal of expense or effort. Add to the profit motive the factor that, as the available technology becomes increasingly sophisticated, any threat to the integrity of the main channel operation is reduced to near zero, and the whole concept becomes a no-lose situation. As a result, it is likely that significant numbers of broadcasters will be finding themselves drawn to nonbroadcast services in the near term, if only to inject a little more profit into their operations.

Taking responsibility

What does all this have to do with monitoring? Well, it all goes back to one of the basic tenets of FCC law, *i.e.*, that a broadcast licensee must control the use of the frequency he or she is authorized to utilize. In other words, the FCC feels that if it has given someone the exclusive right to use a particular frequency, that someone must be held responsible for material which is transmitted on that frequency, unless the frequency is being used for common carrier purposes (such as some forms of paging). And the first step in acquitting oneself of that responsibility obviously has to be providing oneself with the capacity to know exactly what is going out over the airwaves—in other words, monitoring.

Back in the old days, when the only nonbroadcast service game in town was FM SCA, the standard approach to monitoring was simply for the broadcaster to obtain from the SCA operator a receiver capable of picking up the SCA signal. The broadcaster then made arrangements for someone (frequently, just someone around the office) to listen to the SCA from time to time to spot-check the programming. Of course, spot-checking a background music service is not particularly difficult—you just have to make sure that the service is coming across the air. Spot-checking a foreign language service is a little trickier, since you have to have a program monitor who can understand the language and who is somewhat familiar with the Commission's rules—but even that is far from an insurmountable problem. The important thing is that, from the point of view of equipment, it has always been relatively easy to monitor SCA transmissions by using an ordinary SCA receiver.

However, as is usually the case, advancing technology has complicated things. The use of subsidiary communications authorizations for such things as paging and high-speed data transmission has made it virtually impossible to rely on the "ordinary receiver/spot-check" approach. With new systems capable of transmitting, for example, the equivalent of four or more pages of newspaper text in 90 seconds, it is obvious that the question of monitoring has to be rethought. In the first place, information moving at those speeds simply cannot be effectively read and understood on a real-time basis. Second, it is frequently the case that these kinds of data transmissions include coding signatures and other symbols not part of the actual message being transmitted, but nonetheless necessary to ensure that the message is received and interpreted properly by the receiving unit. And, perhaps most fundamentally, unlike audio services which can, with the aid of a simple receiver, be directly heard and directly understood without the necessity of relying on any additional information from the SCA operator, non-audio services are generally encoded by the data operator, partly because of the nature of data transmission and partly in order to protect such services from piracy by non-subscribers. As a result, the broadcaster in such cases is almost totally at the mercy of the SCA operator. It's somewhat like having a

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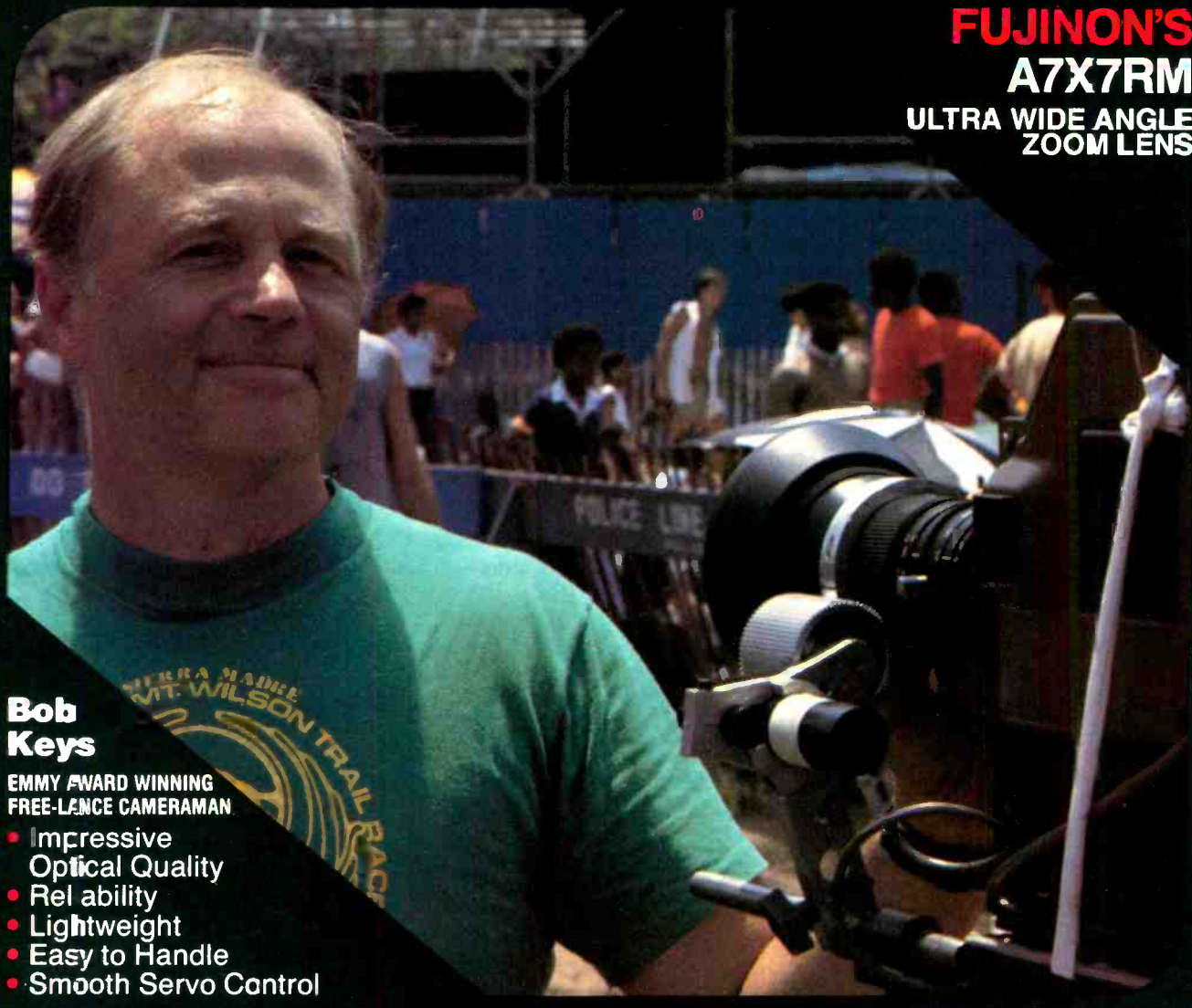

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foreign language service where the only person capable of translating the language is the SCA operator. No matter how extensive the broadcaster's monitoring effort may be, without the good-faith cooperation of the SCA operator that effort becomes an empty exercise.

The FCC's position

All this is well and good, you might say, but where does the FCC stand? That, unfortunately, is one of the difficulties. The Commission, for all its eagerness to encourage the broadest possible use of the radio spectrum, does not appear to have focused on this nuts and bolts problem. This appears to be partly because of its continuing desire *not* to interfere with a broadcaster's ability to run his or her own operation free of unnecessary government interference. Thus, for the same reason that the FCC stopped specifying the kinds of modulation monitors broadcasters had to use, it is not inclined to start specifying the precise kind of hardware broadcasters must use to monitor nonbroadcast transmissions. The Commission's failure to focus may also be attributable to the fact that this is a very new, still developing area in which not all the potential problems are immediately apparent. Whatever the reason(s), it appears safe to say that the Commission does not know exactly what to tell broadcasters when they ask about this. Our own informal inquiries to FCC staffers have been met with interest and acknowledgements that problems do exist, although no specific answers have been provided.

The bottom line—for now, at least—is that the Commission is continuing to hold broadcast licensees responsible for the content of their transmissions, whether or not those transmissions are part of the main broadcast signal, the vertical blanking interval, the SCA, the SAP, or whatever. Because of this responsibility, the FCC also expects licensees to assure themselves of some adequate means of monitoring all such transmissions. It is, therefore, incumbent on the licensee to take some reasonable steps toward assuring himself or herself of that ability.

Exactly what the Commission may ultimately deem to be "reasonable steps" or "adequate means of monitoring" is at best speculative right now. As noted above, at least some of the currently available nonbroadcast, data-related services simply do not permit the kind of real-time monitoring which is possible with standard audio services. Thus, the broadcaster should consider alternatives. In some cases it is likely that the SCA operator will offer the broadcaster a receiver capable of receiving all SCA transmissions. This may prove adequate, depending on the nature of the receiver and the manner in which it receives and displays the information transmitted. However, in some such cases each individual SCA receiver may be capable of being turned on and off by the SCA operator in much the same way that many pay-television operators can encode their transmissions to "turn off" decoders of subscribers who have not paid their bills. As far as such operations are concerned, the broadcaster would not necessarily be sure that the receiver is in fact receiving all elements of the datastream being transmitted. In that event the FCC might not be satisfied with the monitoring capability. As an alternative, the broadcaster might insist on being given, by the SCA operator, the capability of recording portions of the datastream off the air, with the understanding that the SCA operator would then translate those portions for the broadcaster. This approach is also not without its faults, since it places the ultimate responsibility for the translation itself on the SCA operator, not the broadcaster, a situation which the Commission might view as akin to the fox guarding the hen house. However, as a practical matter, many (if not most) data SCA operators are likely to be extremely reluctant to provide broadcasters with the decoding algorithm (the computer program) and a general-purpose computer so that broadcasters can perform their own audits of programming at their own convenience. That kind of information is the functional equivalent of the combination to the bank vault, and thus it is of primary importance for the security and integrity of the data transmission operation. A data SCA operator's reluctance to let broadcasters in on these secrets is understandable.

Unlike many questions of this sort, presently there are no easy answers to the monitoring problem. It comes down to a matter of negotiation. In other words, the relatively undefined nature of the broadcaster's precise monitoring obligation leaves fairly wide open the broadcaster's, and the data operator's, bargaining ground. Thus, to an extent, a broadcaster's ability to secure adequate monitoring capability will depend on his or her ability to convince the other side in the negotiation that such capability is an absolute must. However, the broadcaster should be mindful that, as far as the FCC is concerned, the licensee can and must retain control over the content of all non-commoncarrier transmissions broadcast over the licensed facilities. That absolute requirement *cannot* be bargained away. Thus, if the other side balks at providing any reasonable monitoring capability, it might be appropriate to remind them that they have chosen to utilize a technology using a broadcast frequency and, as a result, they must acknowledge and accommodate the fundamental rules applicable to the use of such frequencies.

Cover your bases

As noted above, the FCC itself, as of this writing, does not appear to have developed any concrete ideas on how it expects its broadcast licensees to monitor the various nonbroadcast services which have been made possible by the Commission's deregulatory efforts. Because of this, broadcasters may be well advised to seek expert technical and legal counsel before proceeding to sign any contracts. At this point, in view of the relative lack of guidance available from the FCC, it is important that broadcasters make sure they can demonstrate that they have considered the question of monitoring and that they have taken some reasonable steps to assure themselves of that capability. Whether the means which any broadcaster is able to secure through the negotiation process will be sufficient if subjected to FCC scrutiny at some later date is, of course, the basic, and right now unanswerable, question. But it certainly cannot hurt to focus on the problem and to try to reach a result which will be immune to FCC criticism. And even if the result you reach is ultimately subject to such criticism, it will almost certainly be helpful if you can demonstrate that you did, in fact, make a diligent, good faith effort to satisfy your obligations as a licensee. Since it is not apparently in a position to give specific guidance in these matters, the Commission is hardly in a position to ask more of its licensees. **BM/E**

[Assistance with respect to technical aspects of this article was provided by Eric Small of Modulation Sciences, Inc., a company involved in the development of SCA-related equipment.]

Improving Cart Deck Quality

By Bruce Mattson, Special Projects Engineer, WRKT, Cocoa, FL

Many new technologies have entry costs that put them out of reach of the majority of smaller market stations. This puts a lot of radio stations in trouble, and they start to lose their edge with the competition, thus reducing their revenue even further. The solution is to update your equipment. Often you can use manufacturer-supplied modifications which bring older units closer to the state-of-the-art. But there are times when you start modifying on your own, and find something that works so well, and can be done so cheaply, that you have to sit down and write about it.

That is the case with my modification of the ITC SP single- and tri-deck playback electronics, and the RP playback electronics. The best part is that the tri-deck modifications cost $35. The single SP and RP series machines cost much less. Similar modifications can also be made to the Centurion 80 and Spotmaster 605 series decks.

I began this project about a year ago with the idea of trying to stabilize the level and equalization adjustments of the ITC SP tri-deck machine. To do this, I removed all the one-turn pots supplied with the units and replaced them with 10 k ohm 10-turn pots. After recalibrating the cards, I found that the calibration remained set for up to six months with only a 0.5 percent variance. I then began to study the frequency response of the machines, and tried to determine how to improve it to the current state-of-the-art specifications. First I looked at the dielectric coefficient characteristic of the various capacitors and tried several different types with some interesting results including capacitor ratings (μF) that have an error factor from 50 to 100 percent. Some of the capacitors I tested had error factors greater than 105 percent. The importance of this fact did not dawn on me until much later, however.

About a month ago, one of the cards in my tri-deck had a problem because a 5 μF capacitor which decouples the equalization circuit into the gain circuit failed. I didn't have a 5 μF capacitor available, so I installed a 15 μF capacitor in its place. I then connected the unit up to a real time analyzer and an oscilloscope for calibration checkout. The results I obtained were totally unexpected: the high end frequency response had flattened out, and the low end response was up as well.

This development required further study. Checking the circuit schematic,

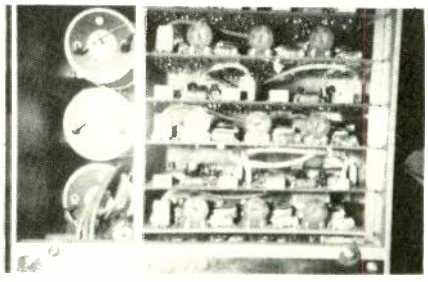

Figure 1. Installation of 10 k ohm 10-turn pots in place of one-turn pots.

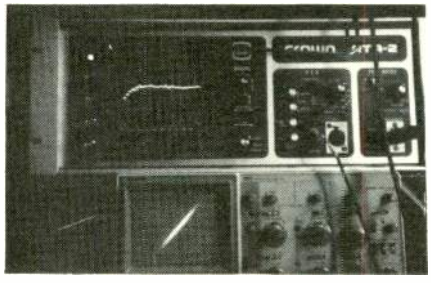

Figure 2. Following replacement of 5 μF capacitors, front end response was improved dramatically.

I found two other 5 μF capacitors in the circuit. One was the input capacitor to the equalization circuit directly off the playback head. I changed it to a 10 μF capacitor and noted that the front end response came up to such a point that at 50 Hz there was only a 0.5 dB variation. The last capacitor to be changed was the input capacitor to the level amp.

After making these improvements, I had to understand why they worked. So I went back to basics, using the capacitive reactance formula:

$$XC = \frac{1}{2 \quad FC}$$

Note that the reactance of a 5 μF capacitor at 50 Hz is 636 ohms. This reactance in itself does not seem too great; however, when you consider that you are dealing with very small voltages coming from the playback head, this reactance becomes very significant. Also note the reactance difference at 15 kHz between 5 μF and 15 μF capacitance. This difference is significant as well. Observe the reactance response curve for both capacitances and note the reactance curve for the 15 μF capacitor is much flatter than that of the 5 μF. This flatter reactance curve, which is a result of the 15 μF capacitor, directly translates into improved frequency response.

Why, then, do I use a 10 μF capacitor as the input coupling capacitor off the playback head instead of a 15 μF capacitor? The reason is that the 10 μF capacitor, which reduced by half (318 ohms) the reactance at 50 Hz, was sufficient to give a totally flat response. I also felt that if I increased the capacitance further, the overall head loading could be changed enough to cancel the improvement in frequency response.

To confirm the fact that these changes were valid, noise measurements were made. The overall noise figure is slightly greater than that specified by ITC, but is still within acceptable limits. This noise figure can be reduced by changing the old electrolytic capacitors for the more current lines.

Here is the simple procedure for updating your SP and RP series cart machines.

1 Install the current playback head kit provided by ITC.

2 Remove the one-turn pots on the playback card that are used for level and equalization (four for stereo machines, two for mono).

3 Install the 10K ohm turn pots on the playback card for level and equalization control.

4 Remove the 5 μF capacitors indicated in the description above and replace with the proper value capacitors (six for stereo, three for mono).

5 Complete phase alignment and frequency response sweep calibration.

Since the modifications meet or exceed the original specifications filed by the manufacturers, no further FCC filing is required. **BM/E**

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broadcast EQUIPMENT

Si-Tex Beams in the Weather

A compact, six-color radar system has been introduced by Si-Tex Marine Electronics. The Sea-Tex CR-1011 presents colors on a television-type screen for a continuous display of weather intensity.

The unit can discriminate and display varying intensities of frontal systems, severe weather, or ordinary rain. Variable bearing and range markers, with digital readouts, simplify sector and distance readings. Eight different range scales, from one-half to 64 nautical miles can be selected.

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New Mixing Consoles from Biamp

The 24 series and the 28 series consoles are the latest additions to Biamp Systems' family of pro audio products.

The 24 series, with four-submaster mixing in stereo and mono, is available in eight-, 12-, 16-, and 24-channel versions. The 28 series, with eight-submaster mixing, is available with 12, 16, 24, and 32 channels.

Both consoles feature three-band EQ with sweepable midrange; stereo monitors selectable for live or recording situations; channel solo switch; mic-in/line-in/tape-in/direct-out connections; and internal, or optional external power supply.

For More Information
Circle 251 on Reader Service Card

Sonar Now Erases Video

Sonar Radio recently unveiled its VP-2001 Videoraser, a pulsing bulk eraser for the broadcast and industrial markets.

The VP-2001, which is designed to erase all grades of ¾-inch and one-inch tape, is a handheld unit that features a pulsing transformer with a magnetic flux in excess of 2000 gauss. The price is $165.

For More Information
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Fiberoptics from Artel

Artel Communications has announced its new laser-based fiberoptic system, which simultaneously transmits video and two wideband subcarriers for audio and data on a single optical fiber. The SL3000 transmits information over distances up to 20 miles.

The system consists of one to three T/R3000 transmitter/receiver pairs for video, and T/R3111 and T/R3114 subcarrier modules for audio or TTL data. Also included is the A3400 automatic protection switch logic card, which processes the on-line alarms and controls the one-to-one protection switch. If a working channel is disabled, for instance, the A3400 card will automatically switch to a protection channel, thus eliminating down time.

For More Information
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Marconi Detects Microwaves

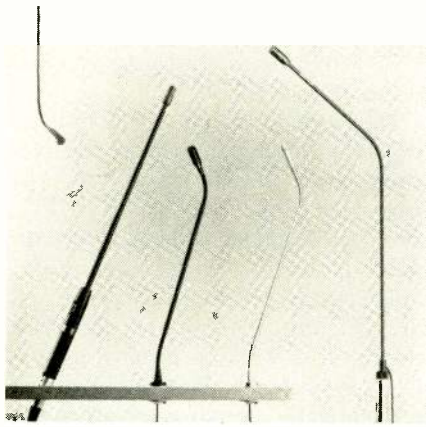
Marconi has introduced a new microwave detector, the 6514, for use with the 6500 Automatic Amplitude Analyzer. The new detector covers the band from 26.5 to 40GHz in a waveguide mount, the UG599/U flange.

The detector's square law correction and temperature compensation can be corrected within the software of the 6500 Analyzer. This feature enhances accuracy over its dynamic range of −45 to +10 dBm. Also, the durability of the 6514 has been enhanced by careful mounting of the diode and high overload protection (+23 dBm peak). The detector is priced at $1100.

For More Information
Circle 254 on Reader Service Card

New Mic Series From Audio-Technica

Five ultra-low-profile back electret condenser microphones—the AT837, AT855, AT857, and AT859—are the initial members of an new UniPoint series from Audio-Technica. The five new models, which have cardioid pickup patterns, may be used at considerable distances from the sound source. This feature, along with their slim,



unobtrusive shapes, makes them particularly good for pickup of lecturers and entertainers from a podium or floor stand, and for pickup of choirs and similar sound sources as well.

All of the mics may be operated from a variety of power sources: a 30 V dc source; single-ended without a power module; or with any 9-52 V dc phantom power source. Also, the AT853 and AT859 may be used with a self-contained 1.5 V battery.

For More Information
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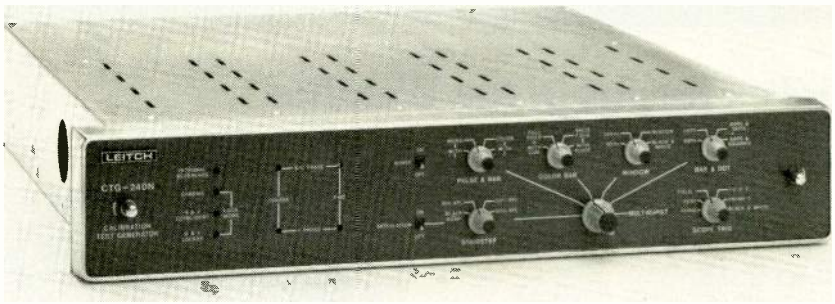
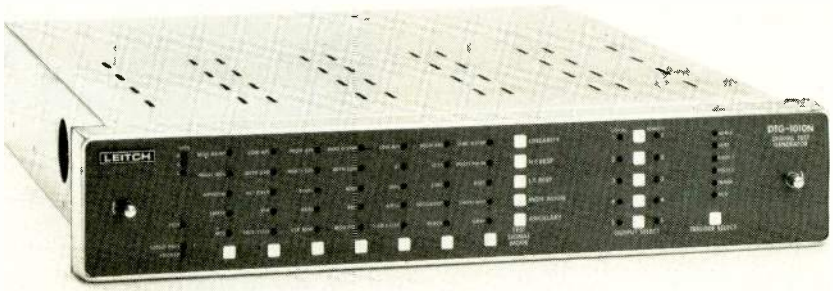
New Leitch Test Signal Generators





Leitch has introduced two new test generators, the DTG-1010N NTSC digital test generator, and the CTG-240N NTSC calibration test generator. The DTG-1010N is the successor to the company's DTG-1000N, and it offers several new features, including two new test signals: modulated pedestal for chroma noise measurements; and sync without setup, for transmitter power calibration.

The CTG-240N is designed to serve as a standalone source of most commonly used video test signals, NTSC system pulses, subcarrier, and oscilloscope trigger signals. The unit features modular construction, multiple output facilities, front-panel selector switches and status indicators, as well as easy access to internal controls.

For More Information
Circle 256 on Reader Service Card

Digital Color from Video Color Research

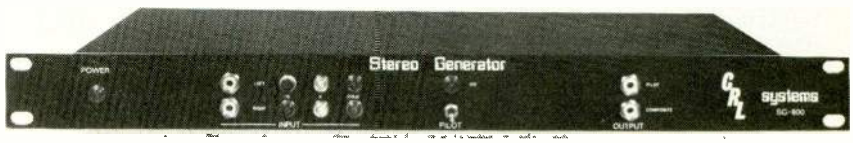
The CR-5000 Chromatizer is a digital special effects generator that can insert color into any video image, with over 4000 colors available. The Chromatizer can work with a single black-and-white or color camera, or with a studio system. It has a 24-color outliner, and an independently controlled color background generator.

The Chromatizer will genlock to any tape machine and color-phase correct the VTR image. Two keyer inputs correspond to two keyer clipping controls on the frontpanel, which allows titles and graphics to be keyed over or under the processed image. Solarization, tinting, outlining, and color mapping are also possible with the CR-5000. Logos, titles, and art work can be colorized in seconds. Computer graphics and character-generated material can also be fed in directly and colorized. The suggested retail price is $6995.

For More Information
Circle 257 on Reader Service Card

CRL Introduces Digital Stereo Generator

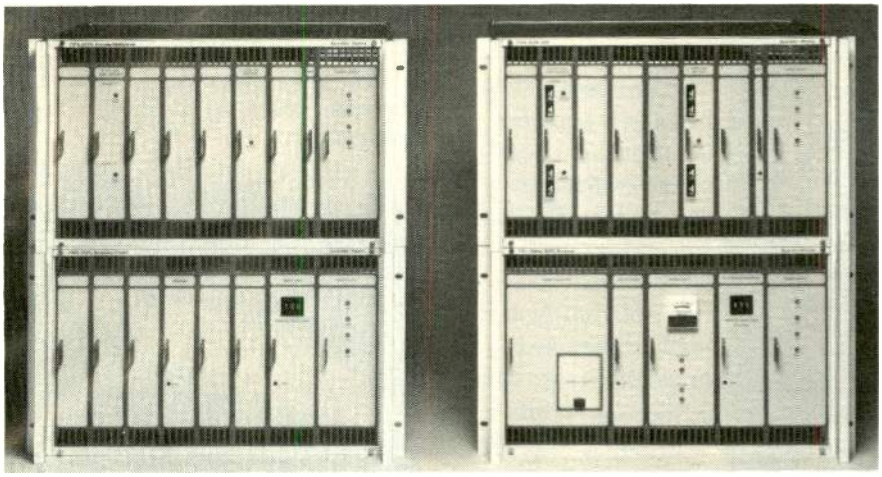
Circuit Research Labs has announced the SG-800 digital stereo generator. The unit has been designed with a minimum of internal alignment points, and excellent thermal stability. Specifica-



tions include: separation better than 60 dB; THD and IM less than .009 percent; and signal-to-noise ratio better than 80 dB.

For More Information
Circle 258 on Reader Service Card

New Satellite Technology and DAs from S-A



Scientific-Atlanta has unveiled a transportable C-band earth station, designed as a completely equipped facility for remote satellite transmission. Based on a 42-foot drop-deck trailer, the system uses a folding 4.5-meter spun aluminum antenna with motorized drives for rapid deployment. The system also comes with an 18-foot aluminum shelter, and a 60kw diesel generator for backup power.

The Model 7622 is a new RF matrix which increases the flexibility of a multi-antenna, multi-receiver satellite earth station. The matrix replaces the power dividers and coaxial relays to connect up to four receivers with two dual polarization antennas.

New for the radio industry is the DAT-800 digital audio terminal, which provides multiple satellite access capability for point-to-point and point-to-multipoint network applications. The DAT-800 has a 15 kHz stereo remote satellite link, which provides in excess of 80 dB dynamic range, as well as 24 dBm peak level and less than 0.3 percent total harmonic distortion.

Also new from Scientific-Atlanta are the Model 6501 and 6502 distribution amplifiers. The amplifiers are designed for such diverse applications as bridgerless systems for subscribers, and conventional line extender applications. The dual hybrid reverse amplifiers provide 30 dB of gain for institutional mid/high-split systems and local area network.

For More Information
Circle 259 on Reader Service Card

Harris Dishes Up New Antennas

New from Harris is the only nine-meter dish that meets the FCC's two-degree satellite spacing requirements. Among transmit/receive C-band antennas, the new Model 5251 is the smallest dish the FCC will routinely license for a perma-

nent 24-hour uplink, and the largest antenna not requiring environmental impact study or approval. The 5251 offers options such as a variety of receive-only, transmit-receive, and frequency-reuse feeds for all C-band applications.

Harris also introduced the Model 5346 6.1-meter Delta Gain Ku-band antenna. The dish, designed for full domestic orbital arc coverage, provides 54.8 dB gain at 12 GHz, and 56.1 dB gain at 14 GHz.

For More Information
Circle 260 on Reader Service Card

Aurora Expands Its Capabilities

The Aurora/100 videographics and animation system has a number of notable new hardware and software features. Now, any object or area in a picture can be tilted on any axis using a graphical interface. Signatures, streaks, and write-ons can be animated in real time. Also, all the animation modes of the system can now be recorded one frame at a time on the Sony BVH-2500 VTR. Metallic letters and dimensional logos are now possible with multicolored fonts.

New software on the system allows the operator to composite foregrounds and backgrounds automatically in the preview channel during recall of a sequence of graphics. A new hardware option provides Y, R-Y, and B-Y analog component outputs in addition to the standard RGB component outputs from the Aurora/100. This permits direct connection to the Sony BVW-40 Betacam recorder, as well as other component equipment.

There is also a new designer's workstation for the system. Features in-

clude a tiltable work surface that can be adjusted to either conventional desk height or drafting table height, an adjustable chair, and an artist's tablet that is flush with the table surface. The workstation also includes a work space for a second person.

For More Information
Circle 261 on Reader Service Card

Orban Offers Optimod-FM 8100B

Orban Associates, Inc., has brought out the Optimod-FM Model 8100B audio processor, designed especially for loud signals.

The new system consists of the 8100A/XT six-band Limiter Accessory Chassis integrated into the 8100A/1 Optimod-FM. The six-band limiter, which Orban says is more appropriate for a louder sound, was derived from the Optimod-AM and is cascaded with the company's multiband clipping system.

A retrofit kit is available to upgrade existing Orban units. The 8100B lists for $6595 and has four to six weeks delivery.

For More Information
Circle 262 on Reader Service Card

Communications Poly Services Offers SCA Gear

New from Communications Poly Services are an SCA converter, tuner, and demultiplexer. The SCA-A subcarrier converter will enable the reception of a single SCA station through any AM car radio when it is inserted between the standard antenna and car radio.

The SCA-T subcarrier tuner is designed to receive SCA transmissions when only a low-level audio signal is required. When used for personal/educational services, the audio output may be applied to the auxiliary input jack of the customer's existing stereo system. When the SCA-T is connected to a modem or AFSK demodulator, it

may be used for the reception of data transmissions.

The SCA-3A is a complete SCA demultiplexer that can be added to any FM receiver for reception of SCA programming. It is available for either 67 kHz or 92 kHz FM subscribers.

For More Information
Circle 263 on Reader Service Card

New M-Format Studio VCR From Panasonic

The AU-300B is the latest version of the M-format half-inch editor/recorder/playback unit Panasonic first introduced over two years ago. The new studio deck is equipped with a built-in time base corrector and Dolby C noise reduction, two features the original deck, the AU-300A, did not have.

Installed via four plug-in modules, the M-format TBC stabilizes Y/IQ component video signals to improve luminance and chrominance signals.

Bandwidth is 3.8 MHz (0, -3 dB) luminance, and 1.0 MHz (0, 3 dB) chrominance. Signal-to-noise ratio is 50 dB luminance and 52 dB chrominance. The AU-300B has a bidirectional search dial that moves the standard VHS tape at 20 times normal speed. Vertical design makes rack-mounting and front access to plug-in circuit boards very easy. Microprocessor control allows smooth tape transport and direct mode operation. The deck uses a six-head video cylinder with four record and two flying erase heads. It has complete insert and assembly editing capability, as well as full dub capability with direct Y/IQ input and vertical interval head switching. It can handle two audio tracks, plus time code control tracks. Special features include built-in dropout compensator, split audio and video edits, built-in audio limiter, and dial search with jogging capability.

For More Information
Circle 264 on Reader Service Card

New Stereo Audio-Video Delay Compensator

Lexicon's Model 1300 stereo digital audio delay synchronizer optimizes audio synchronization with video signals. It precisely compensates for video delay, holding lip sync regardless of what digital video processors are in use, and compensates for satellite transmission delays. It decodes the hysteresis frame offset information from any video synchronizer for frame-accurate synchronization, and gives the user complete compatibility in any broadcast setup.

The Model 1300's engineering provides transparent audio processing and conforms to the 16-bit standard. Its microprocessor-controlled, removable delay configuration control module can be software or hardware configured to conform to any delay/sync decoding scheme. The initial standard decoding options include a pulse-width, wild feed genlock, and serial data. Digit switches on the front panel can set a delay offset value displayed in either milliseconds, or frame units.

System specs include 20 kHz bandwidth, ¼ 0.025 harmonic distortion. Stereo delay is from 0 to 340, 680, 1365, or 2048 ms. Mono delay is from 0 to 680, 1365, 2731, or 4096 ms. Input/output levels are 24 dBm max.

For More Information
Circle 265 on Reader Service Card

New Test Pattern Generator

The Model 19 is Visual Information Institute's cost-effective solution to the problem of routine maintenance and repair of television equipment. It is designed for use in performance evaluation, repair, and routine maintenance of TV display devices, modulator/demodulator systems, recorders, transmission links, switches, and other processing equipment. The Model 19 is especially suited to maintenance of monochrome security TV equipment. Test patterns include: bars (crosshatch), used to verify display linearity; video (a combination test pattern which includes five resolution bursts, plus black reference, plus grey scale), used to evaluate low frequency response; flat field, used to detect flyback ringing or other signal distortions; and centering, used to establish size and centering of a display. The Model 19 operates at the 525/60 scan rate, per EIA standards RS-170, and RS-330A. The unit is housed in a lightweight aluminum cabinet for bench-top use, and optional rack-mount tabs are available for installation into a standard 19-inch rack. The list price is $1950, though it is being offered, for a limited time, at an introductory price of $1250.

For More Information
Circle 266 on Reader Service Card

New Color Monitor from Elector USA

A color televison monitor, the CTVM 4, has been announced by Elector USA, Inc. It sports a new feature, automatic kinescope biasing, which automatically stabilizes CRT color temperature and black level stability. Elector reports that the new model adjusts itself for changes in color temperature, black level, tube aging, and leakage.

Black level stability is one percent at the CRT cathode; optical stability is one percent long-term and two percent short-term. Warm-up time for the new monitor is 30 seconds. It also features a built-in safe area display, cross hatch, and white field generators.

The CTVM 4 ranges in price from $5000 to $6800.

For More Information
Circle 267 on Reader Service Card

Elector Introduces Barcovision II

Barcovision II large screen projectors are now available from Elector USA, Inc. The new generation of projectors is said to feature a brighter picture and better resolution and convergence circuitry than its predecessor.

Resolution is 475 lines video, 875 RGB, and brightness is 440 lumens. The projector uses any flat, curved, or rear projection screen and accepts composite video, NTSC, PAL or SECAM, and RGB and TTL inputs. Barcovision projectors can be also used on a tabletop or ceiling mounted, with front or rear projection, and come with a 40-foot cable for remote control.

Barcovision II projectors are priced from $8800 to $9500, with immediate delivery.

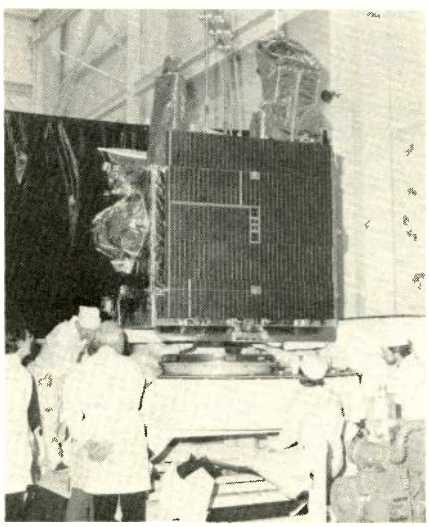
For More Information
Circle 268 on Reader Service Card

BUSINESS BRIEFS

ADDA recently delivered its two-hundredth ESP still store, to Forward Communications, Wausau, WI. At about the same time, ADDA delivered its first ESP II, to Multi-Media Broadcasting, Cincinnati, OH . . . . Six **Sony** Betacams were recently delivered to **WTCN-TV,** Minneapolis, MN, bringing the station's total number of Betacams to 21. WTCN's ENG operation is now completely ½-inch. **Magnetic Image,** Mill Valley, CA, recently acquired a Betacam recorder and field player. Also, **Broadcast Equipment Rental Company,** Burbank, CA, recently purchased three Betacam systems.

New York facility Unitel Video is expanding to the West Coast. On or about September 1 of this year, Unitel will open a new post house on the Paramount lot. Unitel also announced it will provide mobile and post-production facilities to the European Broadcasting Union for its coverage of the upcoming Republican and Democratic conventions. . . .**Synthetic Imagery,** New York, has added an EECO IVES editing system to its post-production facilities . . . . VPA Monitor Awards for engineering excellence have been given to **MCI/Quantel** for the Mirage, and Solid State Logic for its SSL6000 audio console.

American Microlink will provide live transmission services to On-TV/Los Angeles, Bonneville Telecommunications, VideoStar Connections, Gannett Broadcasting, and Nippon Television for events that include the national conventions and Summer Olympics . . . . **Bosch FGS-4000s** have been installed recently at Z-Axis, Denver, CO; EmCom, Minneapolis; The Post Group, Los Angeles; and Optimus, in Chicago.



Spacenet I, the first of four dual-band satellites (C-band and Ku-band) built for GTE Spacenet by RCA Astro-Electronics. The satellite was recently launched aboard an Ariane launch vehicle at the Arianespace facilities in Kourou, French Guiana.

Video West, Salt Lake City, has added a Quantel DPE-5000SP to its 35-foot mobile production truck . . . . A Dallas/Fort Worth media services directory has been published and will be available to all media (at no cost) covering the Republican National Convention in Dallas from: Directory, c/o Lee Duncan, 6305 N. O'Connor Rd., No. 100, Irving, TX 75039.

Line One Video, New York, recently installed a Newsmatte, from Ultimatte Corp. . . . **Compucon** has announced two new services. The first is an annual analysis of the relative market strengths of transmission technologies that include satellite, optical fiber, and microwave radio. The study is called The Technology Race for Long-Haul Telecommunications. The other service, called **CARD,** reports to the microwave industry on equipment being used in the following areas: private microwave, common carrier, licensed earth stations, land mobile, and CARS/STL . . . . The name of Zenith Radio Corporation has been changed to **Zenith Electronics Corporation.**

Realtime Video, San Francisco, has added 2800 feet to its facility, to accommodate new half- and one-inch edit suites, offices, and a conference area . . . . **VCA Teletronics,** New York, recently added a Quantel Paint Box, as well as some new audio gear: a Lexicon digital echo, a Lexicon digital delay line, and a Scamp signal processing rack . . . . **Carob Video,** a New York post-production facility, has merged with New York production house Video Planning . . . . **United Western Studios** and **Burbank Studios** have both purchased a Mitsubishi X-800 digital 32-track audio recorder . . . . **Television Technology Corp.'s** Wilkinson radio division has announced that it is reintroducing its complete line of antenna tuning units for AM towers . . . . **TCS Productions** has added a new C-band transportable uplink system to its teleproduction package. The uplink was built and outfitted by Scientific-Atlanta.

AT&T Bell Labs has demonstrated a technique which uses fiberoptics to transmit holograms under water, around corners, and even through solid objects. The technique can be used to observe events such as the effect of vibrational stress on inaccessible objects. . . . **Cimarron Productions,** Clearwater Florida, is a seven-month-old company that has already done a documentary, shoots for corporations and ad agencies, and a remote for **WATF-TV**. . . . **Ross Video** has sold a number of production switchers lately. Clients include: KOAA-TV, Pueblo, CO; WRSP-TV, Springfield, IL; and Nexus Productions, New York. . . . **Coast to Coast Video** has purchased four Philips LDK 6 cameras for its 45-foot truck.

There are a number of personnel changes this month. At **Toshiba American** J. Paul Michie has been promoted to executive VP. . . . At **Conrac,** Donald Putnam is now chairman of the board, as well as CEO; Paul Graf is now president, the position Putnam previously held; and Joseph O'Donnell has been named VP. . . . At **BASF,** Larry Rallo was promoted to marketing manager of consumer and professional products, and John Ziemba will become national sales director. . . . **Micro Communications Inc.** has appointed Jerome Pozgay chief engineer. . . . **Schneider** has named Bob Jones national sales and marketing manager for broadcast TV lenses. . . . Jon Teschner is now marketing manager, ESP Systems, at **Adda,** and Ralph Nichols is the company's new VP, engineering.

At **Ampex,** Michael Wilke has been promoted to product manager for one-inch and two-inch videotape for the magnetic tape division, and Paul Krueger has been appointed manager of market support for the company's audio-video systems division. . . . James Farrell and Erenst Heisser have been appointed regional sales managers of **3M's** magnetic audio/video products division. . . . At **Sachtler,** Gordon Tubbs has been named national sales manager.

SAY HELLO TO TOMORROW

McCurdy Radio's CS9400 Digitally Controlled Intercom

An advanced microprocessor system designed for today and tomorrow's complex communication requirements. The McCurdy CS9400 intercom offers unsurpassed quality and unique features:

- Totally balanced solid state switching
- Single pair control wiring
- Redundant single station architecture for ultimate reliability
- Alpha-numeric displays
- Assignment of keys locally or at central location
- Disc-based interface for storage
- Unique caller identification and reply system
- Ease of future expansion and reconfiguration
- Wide range of control panels and software options

The McCurdy CS9400 intercom system is already in use at major network and production facilities. The system offers total user flexibility as well as meeting complex production reconfiguration with ease.

The technology of tomorrow is here today with the McCurdy digitally controlled intercom system. Communicate with the best from the company known for its innovative design, dependable long life performance and solid customer service. So "Say hello to tomorrow" today!

McCurdy

McCurdy Radio Industries

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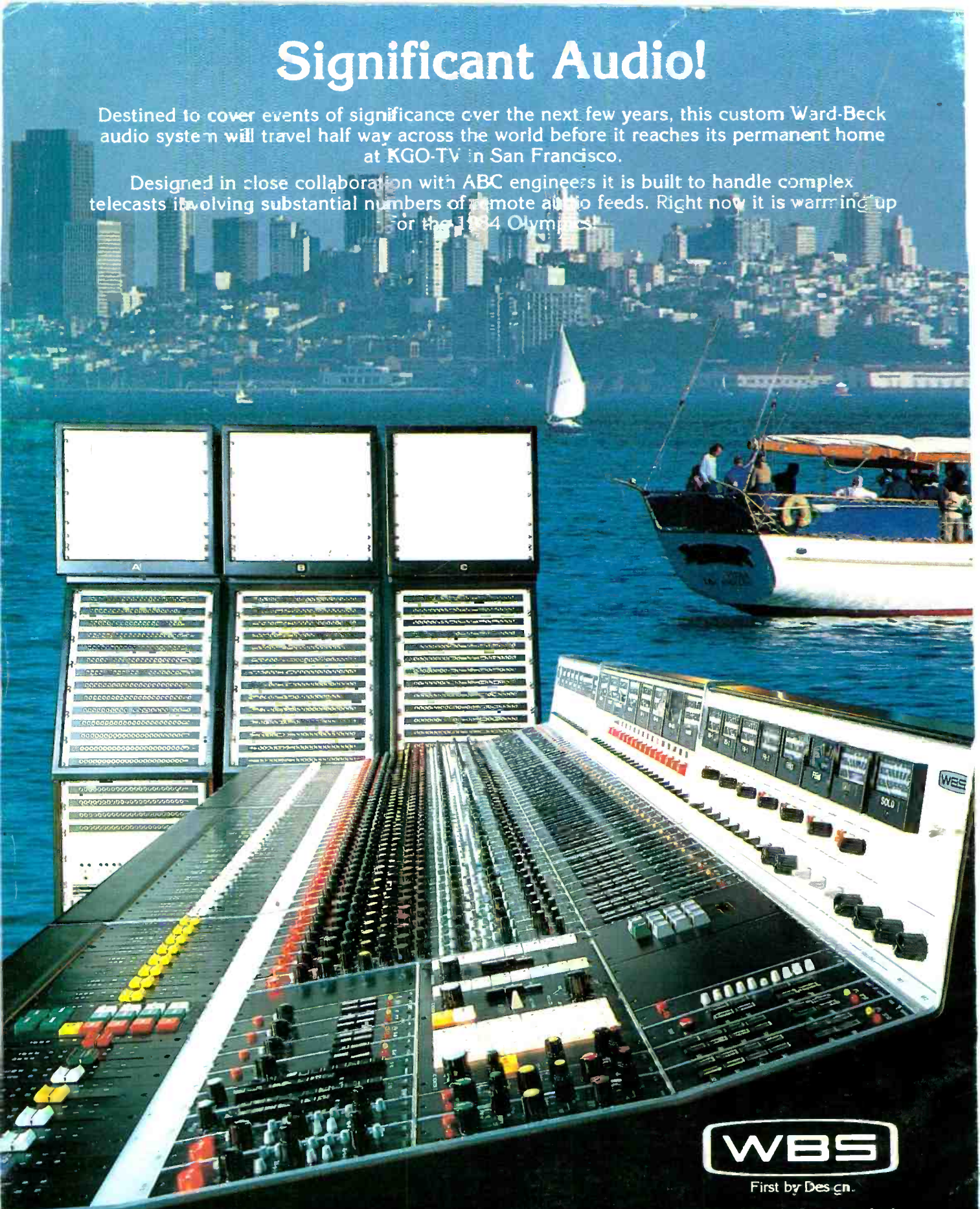
1051 Clinton Street, Buffalo, New York 14206 Tel: (212)772-0719

Circle 141 on Reader Service Card

Significant Audio!

Destined to cover events of significance over the next few years, this custom Ward-Beck audio system will travel half way across the world before it reaches its permanent home at KGO-TV in San Francisco.

Designed in close collaboration with ABC engineers it is built to handle complex telecasts involving substantial numbers of remote audio feeds. Right now it is warming up for the 1984 Olympics.



WBS

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