BROADCAST ENGINEERING®

January 1987/$3

Broadcasting from the field

Networking the newsroom

TELEVISION SUPERSTATION, AFFILIATE OR INDEPENDENT... ADM MAKES YOUR CHANGE TO STEREO EASY

When you're making the transition to stereo TV, make the move to ADM. In addition to stereo, you can have the traditional ease of operation, reliability and quality available only with ADM consoles.

ADM's top of the line BCS has proven to be a best seller at major networks, affiliates and independents. The console features input pre-selection and bussing, dual cue, group mute and Slidex® VCA control of all main program paths provide superior stereo tracking... making ADM your logical choice.

BCS SERIES

For any broadcaster who needs ADM quality at a price that will be gentle on your equipment budget, the S/TV fills the bill.

With the ADM five year warranty on parts and labor you can buy it and forget it. It will handle your stereo needs now and in the future. Call us, we like to make life easier for our friends.

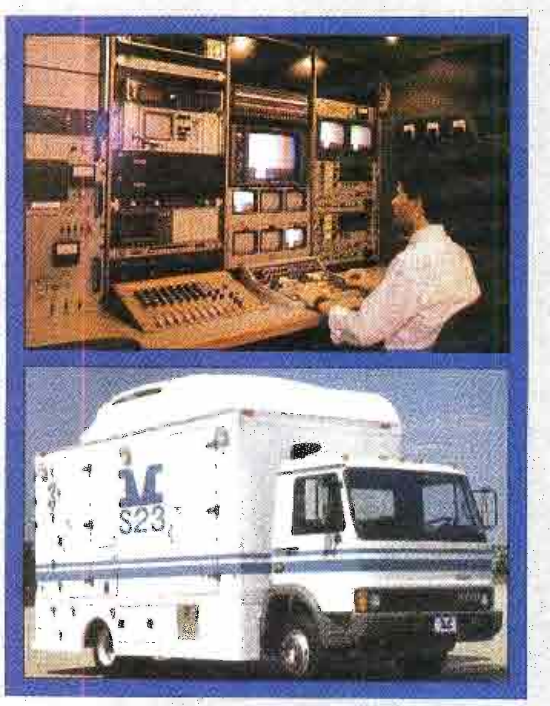
S/TV SERIES

ADM® The Audio Company

ADM Technology, Inc.
1626 E. Big Beaver Road, Troy, Michigan 48084
Phone: (313) 524-2100 • TLX 23-1114

Circle (1) on Reply Card

Cross-Country Communication



With the antenna that works!
In Brownsville,
In Seattle,
In Miami,
Everywhere!

Midwest combines its mobile production unit experience with the latest antenna technology to bring you the S-23, a satellite news vehicle that enables you to uplink a story from virtually anywhere.

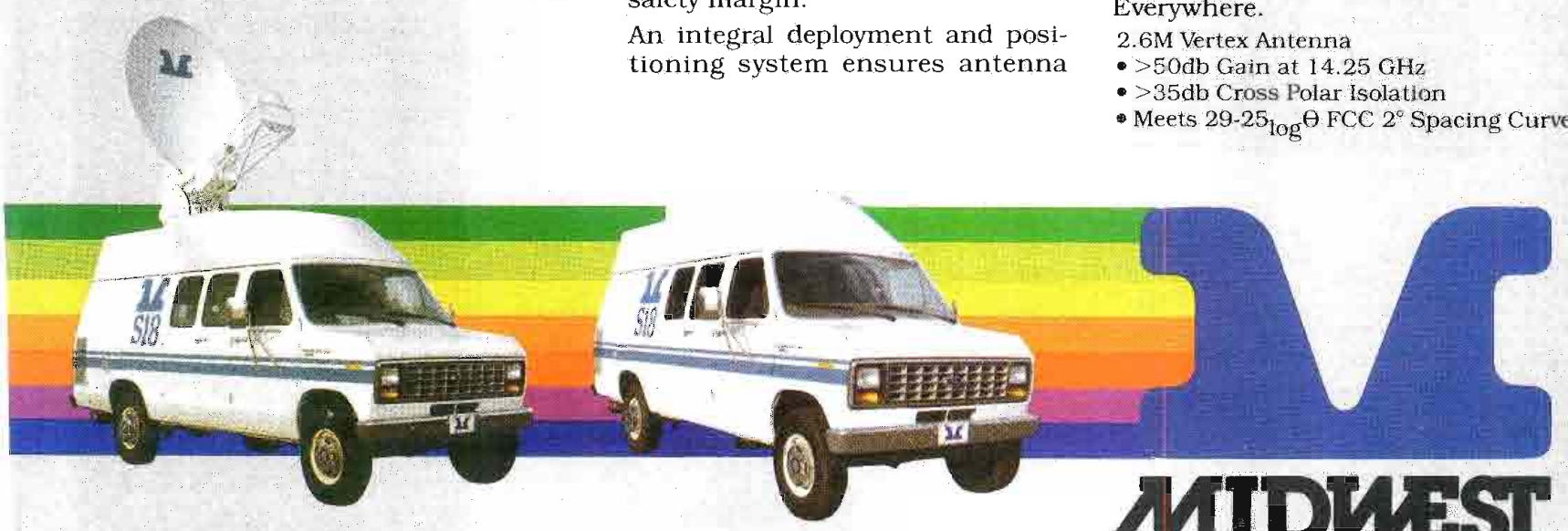
The S-23 incorporates a Vertex 2.6M antenna with 50db gain into a unit that is spacious enough for full production capability, yet has excellent weight distribution and a wide GVW safety margin.

An integral deployment and positioning system ensures antenna accuracy, even in heavy weather. You can choose from a variety of equipment configurations and several domestic and foreign chassis models.

Call for specifications and antenna patterns on the S-23, S-18, S-1 Flyaway or any of our mobile satellite news systems.

The Midwest S-23. The mobile satellite news system that works. Everywhere.

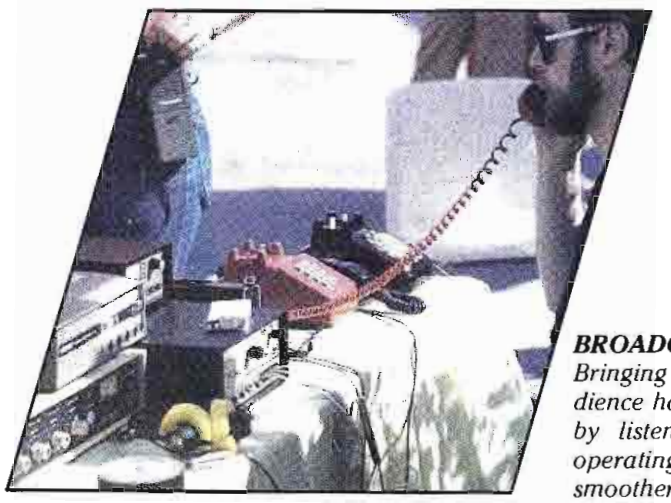
2.6M Vertex Antenna
- >50db Gain at 14.25 GHz
- >35db Cross Polar Isolation
- Meets $29\text{-}25_{\log}\theta$ FCC 2° Spacing Curves



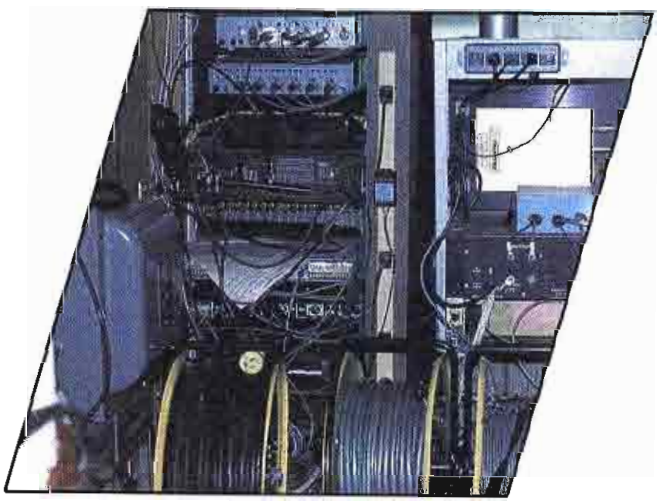
MIDWEST
Communications Corp.
One Sperti Drive
Edgewood, KY 41017
606-331-8990

Circle (3) on Reply Card

Contents



Page 26



Page 52

Page 68

ON THE COVER
The equipment available for outside broadpast activities has improved dramatically within the past 10 years. Today, remote operations are every bit as sophisticated as productions at the studio. Shown on our cover this month is the NBC-TV NT-5 tape truck built for the network by Centro (San Diego). The 45-foot vehicle is used on large remote broadcasts—primarily sports programs—that require sophisticated taping and switching functions. *(Photo courtesy of Centro.)*

BROADCAST engineering

BROADCASTING FROM THE FIELD:
Bringing the world into the living room of the broadcast audience has become commonplace and now is almost expected by listeners and viewers. Suggestions on equipment and operating procedures should help make your operation go smoother.

HITACHI INVENTS THE FIRST 1″ VTR THAT WATCHES ITSELF SO YOU DON'T HAVE TO.

The revolutionary Hitachi HR-230 1″ VTR has the most advanced real-time, self-diagnostic capabilities ever perfected.

In either the record or playback mode, a computer inside the HR-230 monitors 49 different performance parameters second by second. And then stores this information within the memory for recall at a later time—not just with numbers and symbols, but in words.

This means no more errors slip by when your operator is not there. And there's no more need for hit-or-miss spot checking.

The Hitachi HR-230 has a unique quick-threading tape path, incorporating retracting entrance and exit guides, main erase head, as well as a scanner air system that protects tapes.

It recues a 30-second segment in 3.5 seconds. It has a fast/slow motion range that provides real-time reverse and field/frame still motion. Plus programmable time compression up to 20%, with 0.1% accuracy.

A unique, concealed fold-out control panel groups editing functions and separates edit controls from the main control panel.

In short, it's the ultimate 1″ for networks, affiliates or teleproduction companies. Don't consider your next 1″ purchase without looking into it. Contact Hitachi Denshi America, Ltd., Broadcast and Professional Division, 175 Crossways Park West, Woodbury, NY 11797. (516) 921-7200 or (800) 645-7510. Hitachi Denshi, Ltd. (Canada), 65 Melford Drive, Scarborough, Ontario M1B 2G6. (416) 299-5900.

Hitachi

Circle (4) on Reply Card

Kennedy is elected SMPTE president

Carlos Kennedy of Ampex, elected as the 35th president of the Society of Motion Picture and Television Engineers (SMPTE), began serving a 2-year term, on Jan. 1.

The announcement was made at the Oct. 25 honors and awards luncheon, which was held in conjunction with the society's 128th Technical Conference and Equipment Exhibit. Kennedy succeeds Harold J. Eady of Novo Communications, who will serve the SMPTE as past-president.

To provide increased support of the society's international membership, Kennedy will consider supporting local sections outside the United States and Canada as well as an international meeting. Australia is currently the only international section.

As a SMPTE Fellow and the Society's executive vice president, Kennedy has played a leading role in the society's digital standards activities. He is a member of the Advanced Television committee, the Royal Television Society, the International Television Association and the BKST.

In his position as director of long-range planning for the Audio-Video Systems Division of Ampex, he is responsible for the company's development of VTRs, cameras and related accessories for both the professional broadcast as well as the medical technology markets.

NAB supports ID for signals to satellites

The National Association of Broadcasters has given qualified support to an FCC proposal that would require signals sent to all video satellites to contain an automatic code to provide immediate identification of the sending transmitter. The FCC move is in response to increasing interference between satellite operators, as well as last summer's "Captain Midnight" episode that interrupted a Home Box Office satellite transmission.

NAB said the proposed use of a line or lines in the vertical blanking interval should be implemented immediately as a short-term remedy. However, it recommended that an industry group be established to examine and test potential identification systems for a standard and permanent system.

The ID system would include those facilities used by networks, news gathering and contract uplink services. NAB noted that the interference problem is growing as more services use satellite systems. It pointed out that operator error is a contributing factor and more and better training is needed.

dbx uses new technology in analysis system

A new technology with applications for broadcasting and other audio industries was demonstrated by dbx at the Audio Engineering Society convention

Continued on page 161

BROADCAST ENGINEERING

Editorial and advertising correspondence should be addressed to: P.O. Box 12901, Overland Park, KS 66212-9981 (a suburb of Kansas City, MO); (913) 888-4664. Telex: 42-4156 Intertec OLPK. Circulation correspondence should be sent to the above address, under P.O. Box 12937.

EDITORIAL
Jerry Whitaker, *Editorial Director*
Brad Dick, *Radio Technical Editor*
Ned Soseman, *TV Technical Editor*
Carl Bentz, *Special Projects Editor*
Paula Janicke, *Associate Editor*
Dawn Hightower, *Associate Editor*
Dan Torchia, *Group Managing Editor*
Irma Allread, *Group Associate Editor*
Alisa Carter, *Editorial Assistant*
Pat Blanton, *Directory Editor*

ART
Kristi Younger, *Graphic Designer*

EDITORIAL CONSULTANTS
Fred Ampel, *Audio*
Nils Conrad Persson, *Electronics*
Tom Cook, *Video*
Mel Lambert, *Professional Audio*

BUSINESS
Cameron Bishop, *Group Vice President*
Duane N. Hefner, *Publisher*
Stephanie Fagan, *Promotions Manager*
Cynthia Sedler, *Promotions Coordinator*
Dee Unger, *Advertising Supervisor*
Mary Birnbaum, *Advertising Coordinator*

ADMINISTRATION
R. J. Hancock, *President*
John C. Arnst, *Circulation Director*
JoAnn DeSmet, *Circulation Manager*
Kevin Callahan, *Art Director*
Dee Manies, *Reader Correspondent*

TECHNICAL CONSULTANTS
Eric Neil Angevine, *Broadcast Acoustics*
John H. Battison, *Antennas/Radiation*
Blair Benson, *TV Technology*
Dennis Ciapura, *Radio Technology*
Dane E. Ericksen, *Systems Design*
Howard T. Head, *FCC Rules*
Wallace Johnson, *FCC/Bdct. Engineering*
John Kean, *Subcarrier Technology*
Donald L. Markley, *Transmission Facilities*
Harry C. Martin, *Legal*
Robert J. Nissen, *Studio/Communications*
Hugh R. Paul, *International Engineering*
Art Schneider, A.C.E., *Post-production*
Elmer Smalling III, *Cable/Satellite Systems*
Vincent Wasilewski, *Communications Law*

MEMBER ORGANIZATIONS
Acoustical Society of America
Society of Broadcast Engineers

Member,
Association of Business Publishers

Member,
Business Publications
Audit of Circulation

BROADCAST ENGINEERING is edited for corporate management, engineers/technicians and other station management personnel at commercial and educational radio and TV stations, teleproduction studios, recording studios, CATV and CCTV facilities and government agencies. Qualified persons include consulting engineers and dealer/distributors of broadcast equipment.

SUBSCRIPTIONS: BROADCAST ENGINEERING is mailed free to qualified persons within the United States and Canada in occupations described above. Non-qualified persons may subscribe at the following rates: United States and Canada: one year, $25.00. Qualified and non-qualified persons in all other countries: one-year, $39.00 (surface mail); $108.00 (air mail). Back issue rates, $5, except for the Buyers' Guide/Spec Book, which is $20. Rates include postage. Adjustments necessitated by subscription termination at single copy rate. Allow 6-8 weeks for new subscriptions or for change of address. Second class postage paid at Shawnee Mission, KS.

BROADCAST ENGINEERING, Volume 29, No. 1 (USPS 338-J30) is published monthly (except in the fall, when two issues are published) by Intertec Publishing Corporation, 9221 Quivira Road, P.O. Box 12901, Overland Park, KS 66212. Second Class Postage paid at Shawnee Mission, KS and additional mailing offices. POSTMASTER: Send address changes to BROADCAST ENGINEERING, P.O. Box 12983, Overland Park, KS 66212.

ISSN 0007 1794 $2.00 + $0.00

Advertising offices on page 166.

LEADER

Once-in-a-lifetime events don't happen twice!

This 8-lb EFP/ENG Monitor confirms your field productions are perfect, first time, every time!

The LVM-5863A Color/ Audio/Waveform Monitor confidence tests camera and VCR performance anywhere. Shows you the overall production quality immediately…with full color (NTSC) and sound. LVM-5863A lets you be sure all your productions are technically and artistically correct *before* you leave the location. The LVM-5863A confirms white balance, sync and burst levels. Its **2H and 2V waveforms** show both line and field rate signals. A switchable **IRE filter** makes it easy to check peak video. And for accurate verification of setup and black balance, switch on the **4x magnifier**. With all this, the LVM-5863A is easy to use since controls are kept to a minimum.

LVM-5863A

It goes anywhere.

Lightweight and small, the LVM-5863A is easy to hand carry or to mount in trucks, vans or helicopters. Requiring only 12 Vdc, it can use a readily available, self-contained battery (Sony NP-1 or equivalent) or external power sources such as vehicles and EFP battery belts.

Quickly pays for itself.

The LVM-5863A eliminates the risk of time-wasting, cost-increasing, missed or poor-quality shots.

Call toll-free
(800) 645-5104
In NY State
(516) 231-6900

Request an evaluation sample, our latest Test Instrument Catalog with over 100 outstanding products, the name and address of your nearest "Select" Leader Distributor, or additional information.

For professionals who know the difference.

LEADER Instruments Corporation

380 Oser Avenue, Hauppauge, New York 11788
Regional Offices:
Chicago, Dallas, Los Angeles, Boston, Atlanta
In Canada call Omnitronix Ltd. (514) 337-9500

For Product Demonstration Circle (5) on Reply Card

For Product Information Circle (6) on Reply Card

Still hope for AM

World War II officially came to an end in the Pacific in August of 1945. But most military historians will agree that the war's outcome was irrefutably determined some 37 months earlier at the Battle of Midway. Although the two events were separated by three years and appeared to be only casually related, following Midway, there was simply not enough left of the Japanese naval fleet to force a Japanese victory.

And so it is with the ongoing battle over AM stereo. Whether AM stereo lives or dies will be determined within the next 90 to 120 days. If AM stereo, and the AM band as we know it, should perish at some time in the future, its timing will be such that no obvious link to the coming four months will be apparent to most observers.

After more than four years of not having a national technical standard for AM stereo ... after more than four years of watching broadcasters bicker back and forth over which AM stereo system is superior while AM stereo receivers gathered dust in warehouses, the receiver manufacturers are beginning to withdraw from the AM stereo marketplace. Sony has discontinued two-thirds of its AM stereo portable line. Pioneer has vacated the AM stereo market entirely. Others may soon follow. Once the manufacturers have accepted their losses and closed assembly lines, it is unlikely that they will again be enticed into tooling up for a market that no one can guarantee will ever develop.

Without AM stereo receivers, AM stereo cannot survive as a medium. Without stereo, AM as we know it will not survive. Today, AM attracts less than one listener in three. It continues to be the only entertainment and communications medium, *except the telephone*, which serves the listener primarily in monaural. As stereo CD discs and the newer stereo digital tape gain greater acceptance, AM's monaural affliction will become even more of a handicap.

Stereo alone will not guarantee instant success for the AM band, but it is a necessary ingredient. Except for the issues associated with directional antennas, the problems facing broader listener acceptance of AM are threefold: 1) poorer frequency response compared to FM, 2) absence of a uniform technical standard for AM stereo, and 3) the public perception of AM being a less mainstream service.

There is good reason for hope regarding greater AM frequency response. Significant fidelity improvements in both the AM transmission and reception systems will be available in the near future due to recent efforts of the National Radio Standards Committee. The NRSC, a joint effort of the NAB and the EIA, includes representatives of receiver manufacturers, major broadcasters and audio-processing equipment manufacturers. At a Nov. 20 meeting in Denver, the NRSC approved a proposed draft standard for AM frequency response. This, in conjunction with the proposed standard for AM pre-emphasis, defines the first model that receiver manufacturers and broadcasters can both work toward.

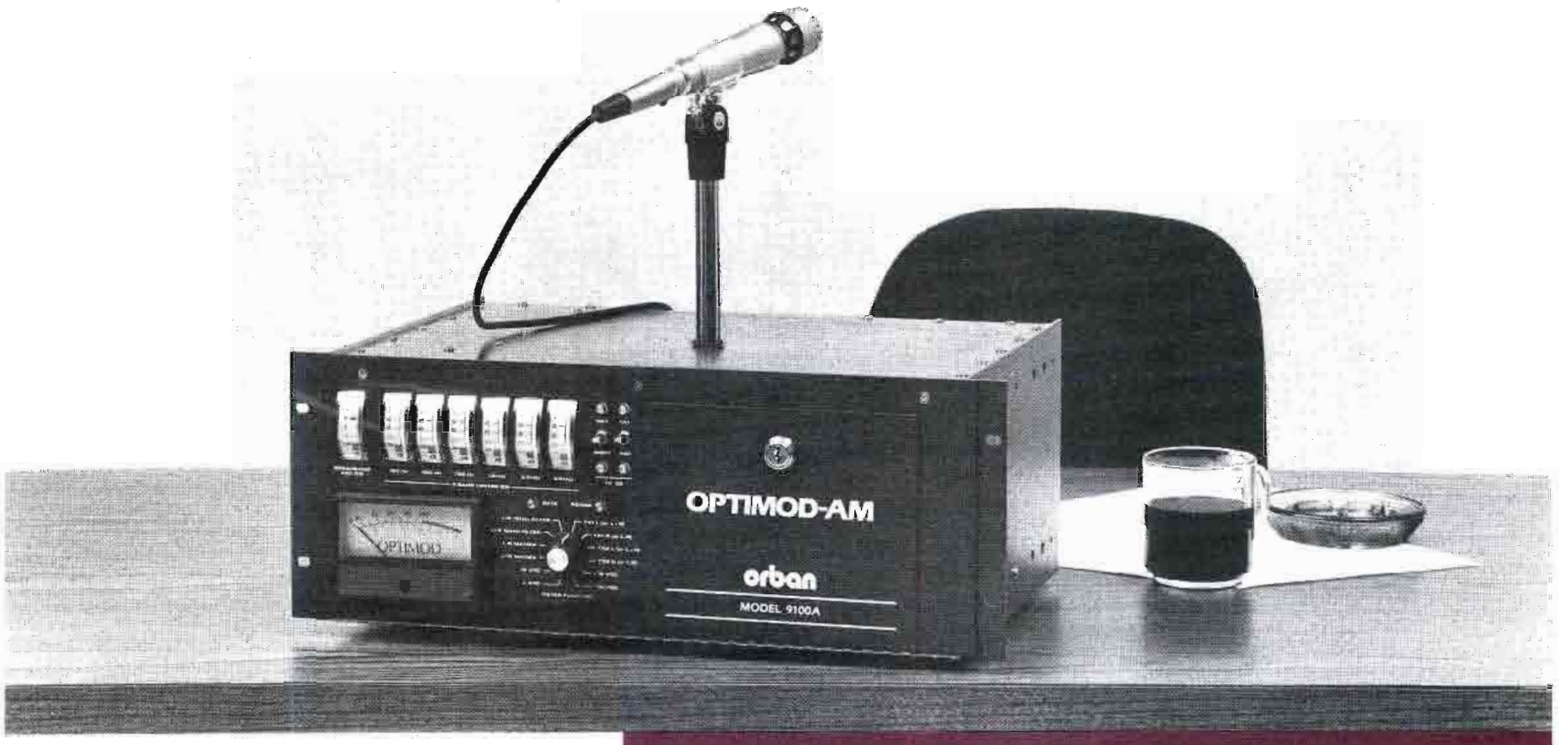
Today, receivers are a much greater response limitation than is the transmission system. The average AM receiver frequency response is *less than 3kHz*. Manufacturers were forced to implement such drastically restricted bandwidth to prevent splatter from pre-emphasis adjacent channel stations. Now, with specific guidelines on bandwidth and pre-emphasis, manufacturers can deliver 10kHz receivers.

Although critics argue that AM will never equal FM's 15kHz frequency response, the relevant question is not which system is numerically greater, but what frequency response is adequate. Few speaker systems without metallic-domed tweeters actually perform to 15kHz. And, few adults possess significant hearing beyond 10kHz. So as far as the average listener will be able to tell, little difference will exist between the fidelity of AM and FM.

Although the issue of public perception is primarily non-technical and is too large to address here, it is safe to say that the technical issues are solvable. The frequency response issue has been solved. The stereo issue also can be solved.

If you are concerned about the withdrawal of AM stereo receivers, make station owners, managers and programmers in your area aware of the present situation. The AM band can still be saved. However, it will take immediate, vigorous action on the part of many people to do it.

Prepared by Glen Clark, president of TEXAR, Monroeville, PA.



OPTIMOD®-AM 9100A: THE CHOICE FOR VOICE

From coast to coast, people are talking through OPTIMOD-AM Model 9100A—and dominating the lucrative adult demographics with full-service news and talk formats in mono or AM stereo. OPTIMOD-AM has literally no competition when it comes to creating crisp, intelligible, authoritative voice quality on the air.

Its six-band limiter with steep-slope crossovers pulls poor-quality actualities or phone calls "out of the mud" *automatically* in real time. And its adjustable, statistically-designed receiver equalizer pre-emphasizes high frequencies to assure comfortably intelligible sound from even the worst of the narrowband radios.

Loud, clean, crisp, and consistent—OPTIMOD-AM's natural, low-fatigue sound captures the adult audience like no other processor. And the choice for voice sounds great on music, too!

Your Orban broadcast products dealer can tell you more about the adult processor that brings out the best in all your program material. Or call us direct in San Francisco.

Orban Associates Inc.
645 Bryant St., San Francisco, CA 94107
Toll Free: (800) 227-4498 In Calif. (415) 957-1067 Telex: 17-1480

orban

Circle (7) on Reply Card

FCC eases transmitter modification rules

By Harry C. Martin

In a rule change that was effective Dec. 12, the FCC relaxed the requirements for prior approval of certain changes in broadcast transmitters. Under the rule changes, any modification of an existing main transmitter is permissible without prior FCC approval. However, equipment performance measurements must be made within 10 days after the modifications are completed. An informal statement or diagram describing the changes must also be retained at the transmitter site for as long as the equipment is in use.

The principal impetus for the rule change was the previous requirement for prior approval of transmitter modifications needed for stereo conversions. This often delayed initiation of stereo service and made the process needlessly complicated. In changing this requirement, the commission indicated that it will be relying on its licensees to ensure that they are operating in accordance with FCC technical standards and are not causing interference. Modifications needed to accommodate AM in addition to television and FM stereo are included in this deregulation.

The commission retained its requirement that a permittee or licensee planning to install and use a main transmitter not included on the commission's "Radio Equipment List" must obtain authority to use such a transmitter by filing an application for a construction permit on FCC Form 301. However, licensees planning to modify a transmitter included on the list, or for which an FCC Form 301 has been submitted and approved, may make modifications as long as they complete equipment testing and maintain records and diagrams under the revised procedures mentioned above.

FCC conducts further review of EEO

In response to suggestions by the Office of Management and Budget, the commission is requesting public comment on further proposed changes in its EEO information collection forms.

Last fall, the commission proposed to amend its rules and procedures regarding equal employment opportunities in the broadcast industry. The new system would have included two new forms: the Broadcast Station Annual Employment Report and the Broadcast EEO Program Report, plus procedures for evaluating broadcast station EEO performance based on the information to be provided in these forms. Under the commission's original proposal, licensees would have continued to file annual reports. The reports would have been modified such that full-time and part-time employees would no longer be reported on separate tables. Also, the formats of the forms would have been rearranged to conform with similar forms used by the Equal Employment Opportunity Commission. In addition, stations with fewer than six, rather than the current five, full-time employees would be exempted from extensive annual reporting.

The commission also proposed to eliminate its 5-point model EEO program requirement, which now is filed with applications for new stations and for assignments. The 10-point model EEO program now required of renewal applicants would have been modified to require narrative descriptions of the duties and responsibilities of employees in certain job categories, as well as the licensee's overall EEO practices.

OMB supports the commission's suggestions for streamlining annual reporting by making its forms consistent with those of the EEOC, but criticized the proposed changes in the 10-point EEO renewal report. OMB in particular criticized the suggested requirement of submission of job descriptions and essay answers, saying that these requirements would be burdensome on small businesses. The OMB also indicated that meaningful evaluation of narrative responses would require more hours from skilled employees than the commission is likely to devote to routine reviews. Thus, OMB believes the commission's proposal may increase the paperwork burden on broadcasters rather than reduce it.

For these reasons, the OMB proposes an alternative Form 396 modeled after the existing 10-point model program form. The alternative form would request that respondents indicate that they follow specific EEO practices in accordance with the rules and would require them to provide some additional information concerning specific activities and the furtherance of their EEO responsibilities. OMB's proposal also would eliminate the questions on job hires and promotions that appeared in the commission's proposed form.

Comments on these proposals are due this month.

FCC refuses to extend deadline for FM upgrades

The commission has refused to extend the March 2 deadline by which Class B and C FM broadcast stations not operating with minimum facilities for their classes must upgrade, or be downgraded to the class matching their actual operating level. In order to avoid downgrading, a station must file an acceptable application for minimum facilities for its class on or before the March 2 deadline.

The request for an extension of the 3-year period came from the National Association of Broadcasters. The commission had set the time limit in Docket 80-90, in which it created three new classes of FM stations and added 689 new FM allotments.

In refusing to delay reclassification of existing FM stations, the commission noted that the primary and overriding public interest goal is to allow new service in areas presently encumbered by existing stations that do not operate at their full potential. The commission recognized that licensees have faced obstacles in meeting the 3-year timetable. However, it noted that many licensees have already upgraded, and that others are prepared to construct after their applications are processed. The commission also stated that three years has been enough time for licensees to act, and that licensees who are downgraded will continue to serve the primary audiences they have chosen to serve up to the point of the downgrade.

Martin is a partner with the legal firm of Reddy, Begley & Martin, Washington, DC.

THE DUBNER FAMILY

YOUR CHOICE FOR COMPATIBLE VIDEO GRAPHICS

CBG-2

TEXTA

20-K

10-K

DPS-1

CBG-2: The head of the family. This Emmy award-winning graphics system combines the power of 3-D modeling with real-time animation playback, NTSC video painting and two channels of multi-featured character generation. A breakthrough product which has spawned a full spectrum of compatible products to meet the needs of every video user.

TEXTA: Bridges the gap between character generators and expensive animation systems. High quality graphics in medium priced single and dual channel configurations. Compatible with the CBG for exchanging advanced animations, graphics, and fonts.

20-K and 10-K: Low cost, full-function, real-time character generators featuring 16 million colors, linear keying, anti-aliased fonts, multiple effects and much, much more. And... animations or graphics created on a CBG or Texta can be played back.

DPS-1: A true NTSC video frame grabber/painting system. Incredibly advanced features for an unbelievably low price. Compatible with the "3rd plane" of the CBG-2LX.

Watch for new additions to the Dubner family: Multi-channel still store, more in the low price "K" series, dual channel options and exciting new products.

The Dubner Family of products. Compatible. Affordable. The Best.

To find out more, contact your local Grass Valley Group representative or call Dubner at our spacious new facility.

DUBNER

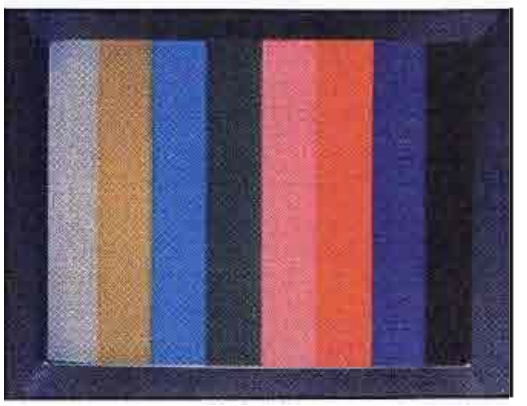
DUBNER COMPUTER SYSTEMS, INC., 6 Forest Avenue, Paramus, N.J. 07652 (201) 845-8900

A Grass Valley Group Company

Circle (8) on Reply Card

Part 1

To be aurally sound



By Carl Bentz, special projects editor

Your listeners deserve the best signal you can provide. If you give them a substandard signal, they may switch to another channel. So, as you enter the adventure of stereo audio for television, consider some things you can do to ensure continuing aural quality.

No doubt you have heard that the FCC recommends relaxing some of the rules on transmission system modifications. Be that as it may, any change in your transmitter should be followed by a thorough check of system operation. No one wants to get into proof-of-performance tests when they are not required, but wouldn't you rather play it safe?

The addition of stereo audio to your TV transmission signals can interact with the visual operation, but for now let's concentrate on the aural side, starting with the studio.

Know your audio chain

No two audio systems will operate exactly the same, even if composed of identical equipment. Therefore, you cannot assume that your new audio system, a duplicate of one just installed across town, will perform like that system. Your system might even have better characteristics, but you can only know for sure after performing a complete aural proof of performance.

Consider the audio console and its published specifications. For our purposes, audio-frequency response, noise and distortion figures are of primary importance. In fact, these parameters will be important to track through all parts of the audio chain.

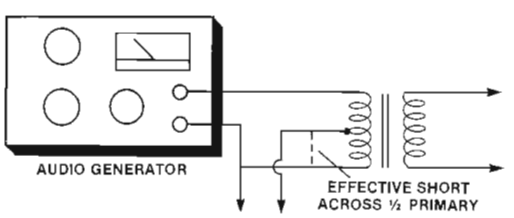


Figure 1. *A mismatch may result from a direct connection to a truly balanced input.*

You will want to verify that the audio console and other devices in the new stereo system stack up to their specifications. Most manufacturers report their specifications conservatively. It could be an enlightening experience to check the equipment just the same. You may be amazed at how much better the numbers are than those published.

Other specifications may prove to be misleading. If a console includes coupling transformers, does that mean that the connections are truly balanced? The accuracy of the transformer center tapping or balancing (if used) will determine how much common mode rejection of hum and noise can be expected. The presence of input and output transformers does not guarantee balance.

I/O connections do not necessarily require transformer-coupling to achieve balance and good common mode rejection. *Floating inputs*, for example, with solid-state devices do not connect directly to ground. Many amplifier circuits use differential op-amp inputs with push-pull output drives. Such systems should be relatively free of significant imbalances.

You may find it necessary to use a transformer to interconnect your audio system to an audio test generator. Any time an additional element is connected, peculiarities of that element will combine with the remainder of the equipment. The bandwidth response and distortion could be affected. Play it safe.

There was a time when we were told that audio circuits had to be impedance-matched for proper operation. It has since been generally agreed that low-output impedances driving high-input impedances is a workable solution (referred to as *bridging*).

To a point, you can bridge a single audio output to a number of high-impedance inputs. The source must develop sufficient signal power to drive all of the load devices. If you remove one of the driven units for maintenance, that should not upset loading of the circuit.

Another popular solution to connect a source to multiple loads is the audio distribution amplifier. For this method, an audio DA forms an interface between the source and the various driven loads. Although reliability of DAs is high, if one DA should develop a problem, all devices driven from the unit will exhibit the problem.

On common ground

Carefully consider the grounding scheme used to interconnect your system components. Multiple ground points or inadvertent grounding of floating inputs can lead to ground loop and unpredictable problems. The development of an RF potential across a ground loop is probably the single most common problem in audio systems, especially those that operate in an RF field.

Grounding may play havoc with testing procedures. For example, if your test measurement indicates noise that is not audible on air, the source may be within the test setup itself. Perhaps an isolation transformer is required between the equipment, but check for multiple grounds first. Look for poor solder connections as well.

Is the equipment shielded against the RF environment? Many consoles have a ground plane designed into the system to reduce RF pickup. Not all equipment includes proper shielding, however. If the noise level varies with the position of the equipment or even the direction it faces, you can expect that RF shielding is the problem.

The quality of the sound your audience receives can be no better than what modulates your aural carrier. And that audio can be no better than the source equipment at the studio.

Editor's note: This information is adapted with permission from *BTSC Stereo: TV Aural Proof of Performance Guide* available from TFT Inc.

A special job demanding specialized products.

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

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

FP32

FP42

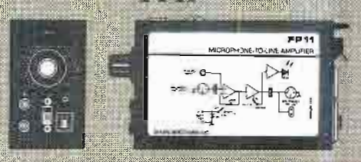
For Stereo Remotes. The FP32 Stereo Mixer is comparable in size and features to our famous FP31. Its stereo capability, light weight, easy-to-use controls and convenient shoulder harness make it the first choice of field crews. Our FP42 Stereo Mixer simplifies mic cueing, so important in situations like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

FP31

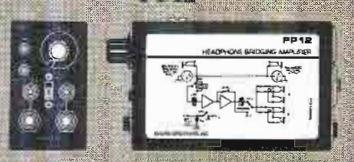
FP16

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

FP11



FP12



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

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

SHURE

Breaking Sound Barriers™

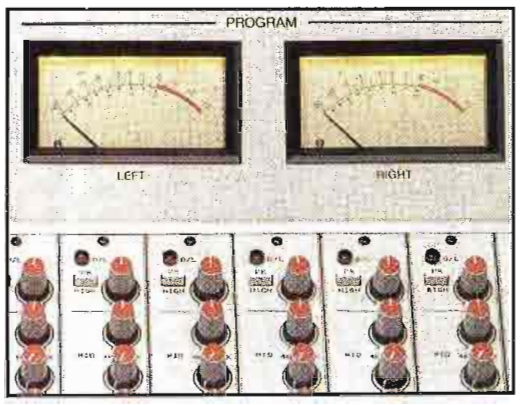
Circle (9) on Reply Card

1/87-BE-FP

Part 6

re:Radio

Learning the basics



By John Battison, P.E.

Although the term MEOV resembles the sound a cat makes, it has nothing to do with cats. Many young engineers may not recognize MEOV (maximum expected operating value), but old-timers will recall its use in describing AM patterns several years ago. The FCC no longer uses MEOV, or as far as is known, even accepts them. However, its concept and transformation into *augmentation* may help you better understand the design, regulation and use of directional antenna systems.

Fudge factor

Before the introduction of the *standard pattern*, when an antenna engineer designed a directional antenna, it was first necessary to generate a theoretical design. This particular design would, on paper, provide the required protection and coverage. This document was then filed with the commission as a part of the licensing process.

Later, when the antenna was built according to this design, it sometimes was not possible to limit sufficiently the radiation to protect a specified contour. If it was impossible to meet the design criteria, the only solution was to file for a modification to the construction permit. Because the CP application procedure was time-consuming and lengthy, an alternative was developed—MEOVs.

Some of the earlier directional antenna designs performed well in theory, with values as low as 2mV/m or 3mV/m radiation on certain azimuths. In some cases, even a theoretical zero radiation on a simple cardioid pattern was predicted.

However, local conditions, such as fences, trees or even the guy wires, often made such low radiation levels impossible to achieve in the field. In these cases, the engineer developed a second antenna pattern for the low-radiation azimuths using a radiation value about 5% of the theoretical value. This pattern was drawn as a dotted line paralleling the main pattern. It was labeled MEOV, to show that this was the maximum value that might be reached after the array was tuned.

At first this practice was used only for critical azimuths where it might be difficult to reduce radiation sufficiently. Later, as more stations were built, some engineers drew MEOVs all the way around the antenna patterns. The practice allowed them flexibility in case there were problems in the final antenna adjustment. The problem with this approach was that there was no hard and fast rule as to what exactly the MEOV was based on. Some engineers used 5%, others used different values.

The MEOV also made it difficult for other engineers to compute the pattern required to protect a station using merely the published antenna design parameters. It became essential to obtain the antenna pattern as shown in the proof. Another factor then entered into the calculations—the commission required that the MEOV be protected; not just the theoretical pattern. It was also not safe just to use 5% as the MEOV because it might have been based on a higher value.

As more and more DAs went on the air, the situation became more confusing and difficult to reconcile. As a result, in 1981, the commission adopted the standard pattern, which made life much easier for the radio engineer. The standard pattern is a uniform set of parameters describing an antenna system.

Now, the engineer can look up the published antenna design parameters and calculate the patterns for all the stations that have to be considered. This is much easier than obtaining a copy of each station's proof, which is filed when the station is licensed.

Converting patterns

To develop the standard patterns, the commission, in effect, applied a *Q* factor to the original theoretical patterns. The Q factor is designed so that it is impossible for the radiation on any DA azimuth to fall below a minimum of about 6mV/m. The process produces a standard pattern that is larger than the theoretical pattern. This creates a disadvantage in that it may be difficult to design an antenna with sufficiently low radiation to fall under the commission's minimum value.

The advantage is that every engineer, with a copy of the FCC rules, can use the equations given and compute exactly the same pattern as the original designer. The engineer can then develop a new pattern knowing it will be compatible with what already exists.

As stated earlier, the commission converted all station patterns to standard patterns. Although this made the patterns consistent, what about those patterns on file that used MEOVs in order to become licensed? Applying the Q factor to these theoretical patterns would not produce the actual antenna patterns.

Augmentation

To solve this problem, the commission developed *augmentation,* which is additional information regarding the antenna's actual performance in the field. Where MEOVs might have been used in years past, stations now use augmentation to describe the antenna pattern. The process accommodates small deviations from the planned pattern, provided that no interference is caused and that the deviation is not excessive.

Next month, we'll see how the augmentation data is applied to an existing pattern.

Reader response

Reader interest in AM antenna networks is more widespread than people realize. In the September "re:Radio" column, I offered to send a copy of the HP65 calculator program that will compute tee-arm and component values for a network. I received 17 requests, including ones from Mexico, England and Canada. If you would like a copy I will make it available on request.

Battison, **BE**'s consultant on antennas and radiation, owns a radio engineering consulting company in Columbus, OH.

Editor's note: For a copy of the calculator program write to John Battison, 890 Clubview Boulevard North, Columbus, OH 43085.

MTS PROCESSING
and
A SUPERIOR GENERATOR FOR LESS

THAN MOST OTHER GENERATORS

The TVS-3002 Limiter/generator combines a state-of-the-art digitally synthesized MTS generator with new generation limiter-AGC circuitry to provide a complete, stand-alone stereo television audio system.

Through the use of unique circuit designs and packaging concepts, this one box system contains all that's needed to get you on the air in stereo **quickly and easily.**

The heart of the TVS-3002 is a time proven digitally synthesized subcarrier modulator that develops a digital approximation of the subcarrier and pilot frequencies. This system greatly relieves the filter requirements following the modulator, significantly improving the stereo separation specification.

To complete the system, the TVS-3002 includes the following additional features:

- L/R or L + R/L − R Inputs
- > 20 dB Leveling AGC Range
- Unique Program Controlled Stereo Sound Field Enhancement circuitry
- CRL's Exclusive Variable Transfer Function Pre-emphasis Limiting
- Factory dbx® Encoding
- Improved dbx® Noise Reduction that reduces noise floor transmission by up to 20 dB over other existing generators
- On-Board Bessel Tone Calibration Generator
- Add the TVS-3002 Multiband Audio Controller for the ultimate in audio control and stereo generation.

Before you spend more and get less, we encourage you to contact CRL for further information and arrange for a demonstration of the NEW GENERATION MTS systems.

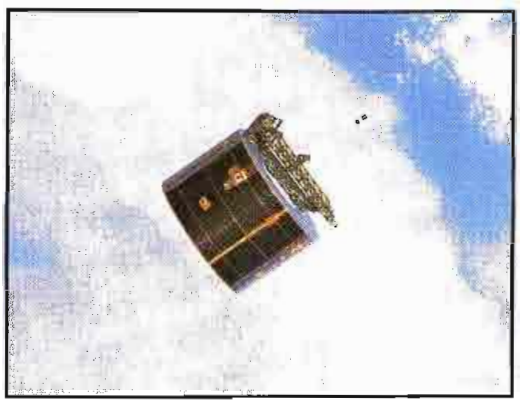
A GENERATION AHEAD

CRL SYSTEMS

CRL Systems
2522 West Geneva Drive
Tempe, Arizona 85282
(800) 535-7648 (602) 438-0888
TELEX: 350464 CRL TMPE. UD.

Circle (10) on Reply Card

Ka frequency gets a head start in new year



By Elmer Smalling III

It seems appropriate that we begin the new year with a discussion of the satellite frequency band that may well dominate the next decade—the Ka-band. The Ka designation relates to a portion of the general *K* frequency band that extends from 10GHz to 40GHz. The letter designations for microwave frequency bands have been developed over the years by radar engineers. There is no real standard, and no absolute band limits have been set.

The K-band

At the lower frequency portion of the so-called K-band is the Ku-band, which extends from 18GHz to 27GHz. The commercial satellite portion of the Ku-band is only 11.7GHz to 12.2GHz, and 14GHz to 14.5GHz. The next higher segment of the K-band has no name so we'll call it *Kq*. Kq extends from 18GHz to 27GHz. The upper half of this segment is used primarily for terrestrial radar because of the large amount of atmospheric attenuation at Kq frequencies (see Figure 1). The very bottom of the Kq segment is used as the Ka-band downlink (17.7GHz to 20.2GHz). The last and highest frequency segment of the K-band is the Ka-band, which extends from 27GHz to 40GHz. The commercial satellite portion of the Ka-band is 27.5GHz to 30GHz for uplinking. The rest of the Ka-band is used primarily for radar and military satellite communications.

The Ka-band is considered to be a *millimeter* band. Wavelengths range from 10mm to 17mm, or half the length of a paper match. Because this wavelength is about seven times smaller than C-band, the antenna also may be much smaller (three to six feet rather than 15 to 20 feet).

Atmospheric losses

As shown in Figure 1, atmospheric losses are such that frequency allocation of the millimeter bands must be carefully planned. Close examination of the attenuation graph will show that between the downlink and uplink portions of the Ka-band, there is a great deal of atmospheric attenuation (−0.3dB/km). If the uplink path through the atmosphere is 50 miles at a northern latitude, the attenuation would be 15dB greater at 22GHz than at 20GHz. This would require a much larger antenna and transmitter.

ACT and ISDN

Satellites that are being developed for the Ka-band are referred to as ACT (advanced communications technology) satellites. ACTs will have computers and data-processing equipment onboard to switch incoming uplink signals from many sources to many destinations. These satellites will handle data traffic at speeds as high as 250Mb/s. This is a radical change from today's satellite systems that handle video as an analog signal.

Employing the concept of ISDN (integrated services data network), these satellites will provide excellent signal-to-noise ratios, with extremely low bit-error rates capable of handling digital video, digital audio and high-speed data. Ka-band ACT satellites will permit inter-satellite communication using laser links operated at very high data rates. "Bird hopping" in order to cover large distances such as London to Hawaii now causes objectionable data and audio delay (44,000 miles/hop, or 0.25 seconds). Using satellite-to-satellite laser data links, this distance can be cut by at least 75%, minimizing delay.

Spacecraft antennas used with ACT systems will have a beam width as small as 0.4%. This very small aperture will enable spot beams that service areas as small as 30 miles in diameter. The ACT antennas will be able to scan many uplinks across the country at data-frame rates allowing true time domain access (TDMA) for a large number of users.

Reduced satellite transmitter power will be possible because of the concentrated signal from the spot-beam antenna configuration on ACTs. Transponder power output levels of 5W to 8W are planned for Ka satellites. Much less uplink power will be required (20W). In fact, the downlink gain will be increased by 20dB for Ka-band satellites.

At present, there are 20 Ka satellites scheduled for launch in North America over the next four years. Although these launches will be delayed because of the reorganization of the NASA and Arianne launch teams, they will be needed by their operators to counter the tremendous growth of the fiber-optic communications industry.

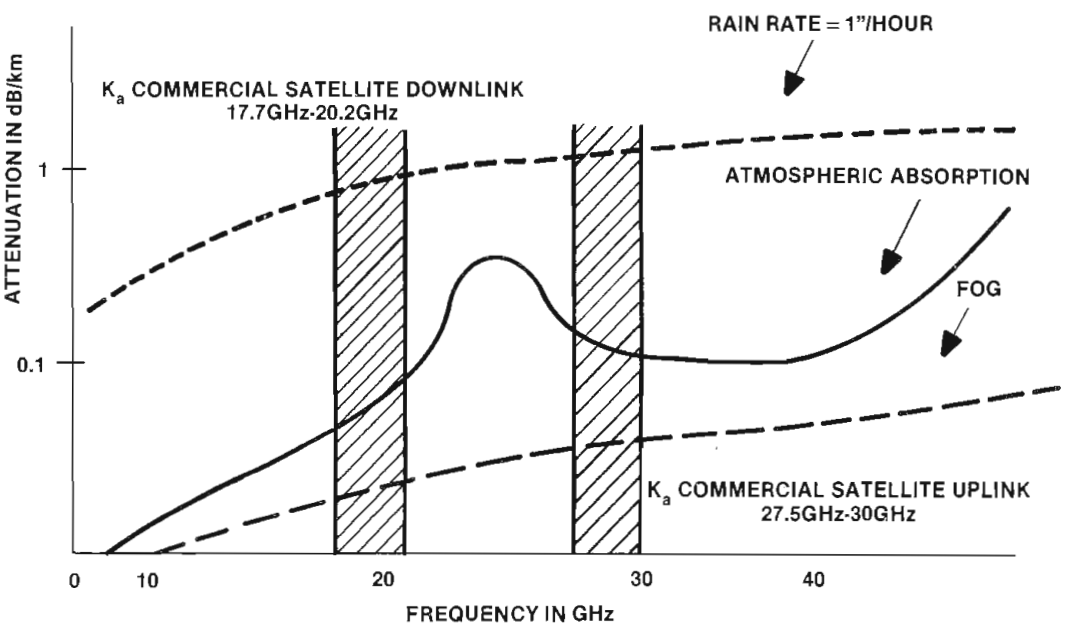
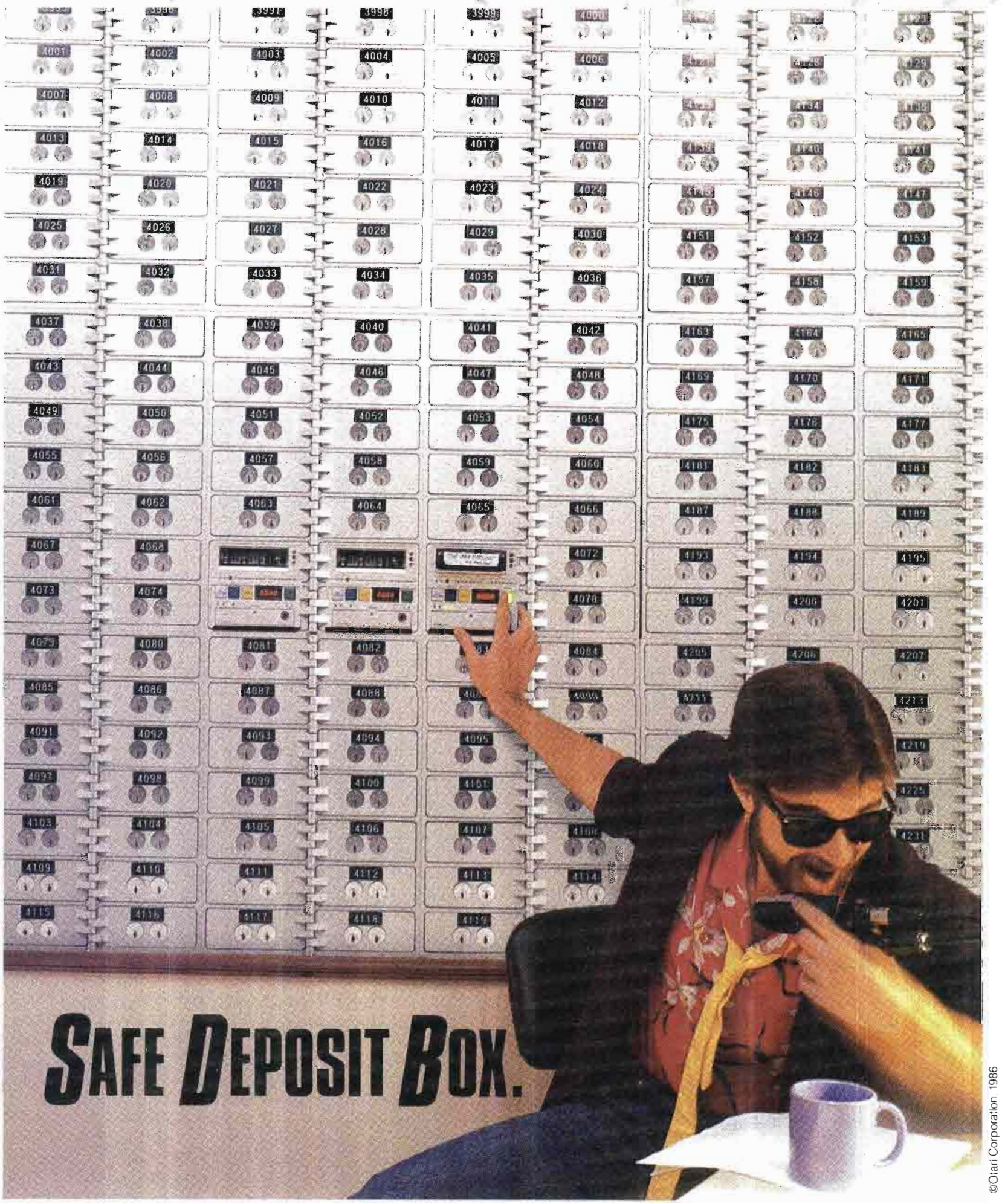


Figure 1. *The atmospheric absorption of the Ka-band.*

Smalling, **BE**'s consultant on cable/satellite systems, is president of Jenel Systems and Design, Dallas.

CTM-10 CARTRIDGE RECORDER



Finally, a cart machine you can bank on. No jams, no repeats and no make goods. Our new CTM-10 cart machine has the same famous reliability that is built into our 5050 BII, plus many new features like Hx-Pro,* so 7.5 ips sounds like 15 ips and your listeners don't tune-out when you shift from CD to cart.

So call us for Technology You Can Trust. Otari Corporation, 2 Davis Drive, Belmont, CA 94002 (415) 592-8311 TWX 9103764890.

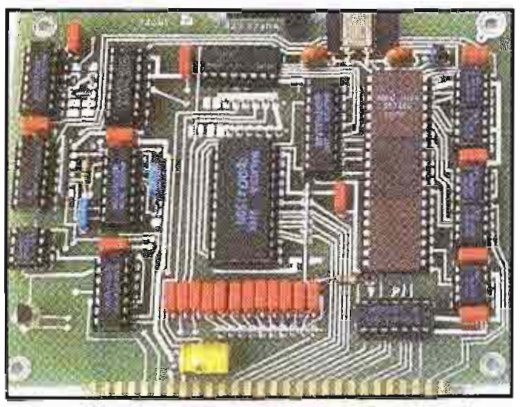
OTARI®

*Trademark Dolby Laboratories Licensing Corporation

Circle (11) on Reply Card

Part 4

Circuits



Inside digital technology

By Gerry Kaufhold II

The importance of understanding digital circuits has increased along with the coming-of-age of personal computers. The responsibilities of some station engineers have grown to include helping non-technical people find solutions for their computer problems. The opportunity exists for these computer-literate broadcast engineers to work closely with those involved in station management, and thereby improve the visibility and stature of all broadcast engineers.

So far, simple digital gates and flip-flops have been discussed in previous "Circuits" columns. These circuits are the building blocks from which microprocessors and digital controllers are created.

Memory organization for digital storage

Because many available digital systems advertise "Megabytes" of storage, and such buzzwords of computer lingo seem unavoidable, the following discussion will define some vital terms that have to do with digital storage (memory).

A single piece of digital information such as a single HI (or 1), or LO (or 0) on a data line is called a *bit*. Four bits are called a *nibble*, and eight bits are called one *byte*.

The position each bit occupies in an 8-bit byte can be labeled from 0 through 7, so that all eight bits of one byte are identified as shown in Figure 1. The right-most four bits of a byte (labeled 0, 1, 2 and 3 in Figure 1) are the *least significant nibble* of the byte. The left-most four bits of a byte (4, 5, 6 and 7 in Figure 1) are the *most significant nibble* of the byte. Usually wherever the notation *LS* is followed by a letter, it means least significant.

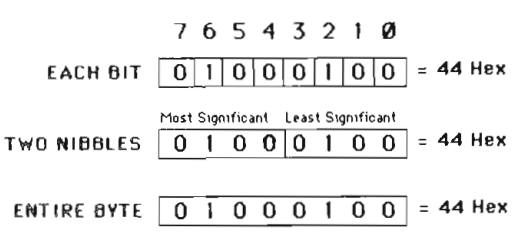


Figure 1. *A single 8-bit byte treated in three ways: 1) each bit treated separately; 2) upper and lower 4-bit nibbles; and 3) 8-bits treated as a single byte.*

Kaufhold is staff engineer at KAET-TV, Tempe, AZ.

Memory address

Many digital memory chips are organized as collections of 8-bit bytes. Each byte can be accessed through its *address*.

If the entire memory chip is thought of as a multiple-compartment printer's drawer, and each compartment in this printer's drawer is numbered with an address, a single byte of stored information can be obtained by accessing the address number of its compartment. Figure 2 shows a memory chip with storage for 10 bytes, and each address described as a binary code.

Three types of digital memory

Once an address has been selected, then one of two operations can be performed. Either an 8-bit byte of data can be *written* (placed into) the memory location, or an 8-bit byte of data can be *read* (taken out of) the memory location.

Three types of memories have dominated memory technology. First is the *READ/WRITE* memory. Data can be written into memory and then read back out. Previously stored data can be changed (overwritten). Although it is not technically correct, these READ/WRITE memory chips have been dubbed *random access memory* or RAM chips. Most digital memory chips can be accessed randomly by selecting an address, but tradition defines the term RAM to mean READ/WRITE memory.

Because the storage cells of most RAM chips are made up of flip-flop circuits which, when power is removed, lose whatever information is stored, RAMs are a *volatile* memory. Two types of non-volatile memory circuits have been developed that remember their programmed data when power is removed.

The *READ-ONLY* memory (ROM) is preprogrammed by the manufacturer to permanently contain only a defined set of data. The ROMs of a video game are an example. Data in these chips can be passively read, but no new data can ever be written into the memory chip.

The third type of memory chip is the *Electrically Programmable Read-Only Memory* or EPROM. EPROMs are used by many manufacturers for prototyping programs that aren't yet complete, or by broadcast engineers who need to develop their own digital memory devices. EPROMs can be loaded with data using an inexpensive EPROM programmer device. An EPROM will hold its program and can only be erased by a strong ultraviolet light from an EPROM eraser. After erasure, it can be programmed again using the EPROM programmer.

Next month we'll examine how a memory chip decodes each address of its memory space.

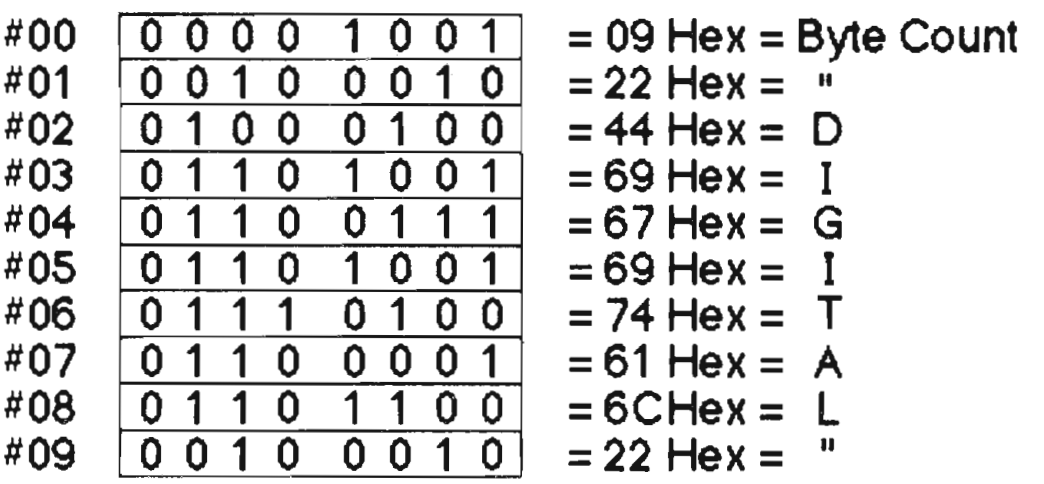
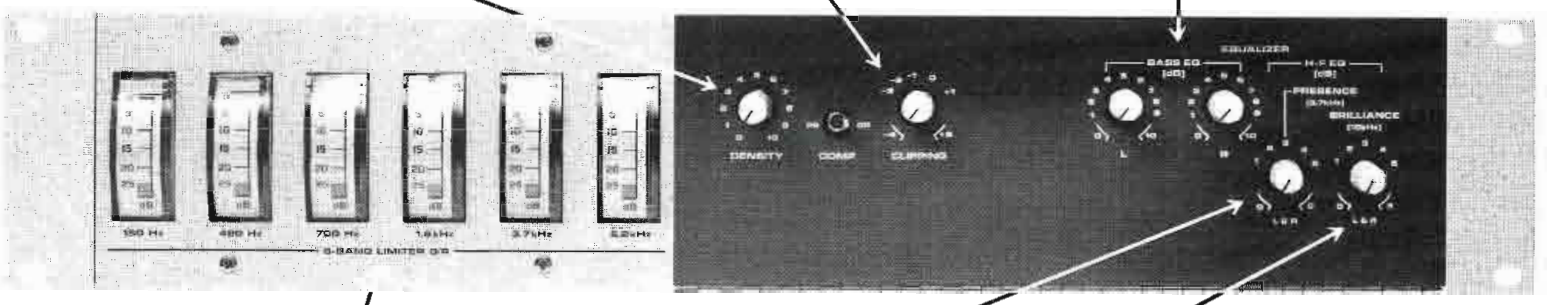


Figure 2. *A 10-byte memory organization containing the text DIGITAL preceded by the number of bytes in the word. Note that 00 is a valid address.* |:-)))|

DENSITY determines the input drive level to the Six-Band Limiter. Lets you have it your way—open and transparent, or solid and dense.

CLIPPING adjusts the drive level into the multiband clippers, determining the loudness/distortion tradeoff.

BASS EQ provides peaking boost at 65Hz, making it easy to get the solid punch you need for many contemporary music formats.



Gain reduction meters for each band: they provide the information you need for accurate setup.

PRESENCE boosts the 3.7kHz band to achieve midrange balances right for your format.

BRILLIANCE boosts the 10kHz band. Use it to increase the sense of "air" and "transparency" in your music.

THE NEW ORBAN 6-BAND FM LIMITER. (WE LISTENED.)

Many FM stations perpetually seek "the perfect sound". OPTIMOD-FM alone does it for many. The OPTIMOD XT Accessory Chassis improved results for some. Still, some seek even more from OPTIMOD-FM.

We listened.

Our *NEW* **8100A/XT2 Six-Band Limiter Accessory Chassis** (which works with any 8100A OPTIMOD-FM) features two new high-frequency equalizer controls: PRESENCE and BRILLIANCE. They complement the original 8100A/XT's bass EQ controls, and give you *twice the flexibility* of the single HF EQ control typical of other add-on multiband processors.

With an XT2, your OPTIMOD-FM system is totally immune to operator gain-riding errors because the dual-band compressor in the main unit is converted into a smooth, slow AGC to ride gain ahead of the XT2. Any reasonable input level operates the XT2 in its "sweet spot," so there's never any need to add external, potentially incompatible compression.

This is good news because the time-constants and other processing parameters in a pure, integrated Orban system have been carefully harmonized to achieve an overall sound that's *loud* and *bright,* yet remarkably *open* and free from audible side-effects.

The XT2 also excels in the most difficult of processing tradeoffs—delivering loudness on music while keeping speech free from clipping distortion. Credit this uniquely capable performance to Orban's patented multiband distortion-cancelled clipping system—which we were able to implement in the XT2 system because the XT's circuitry is fully *integrated* into the processing system, not just tacked onto the front.

The XT2 lets you have it all: natural sound, source-to-source consistency, loudness, clean voice, and adjustability that lets you tailor bass and treble to your taste and format requirements. And thanks to its efficient single-chassis construction and its use of the main 8100A power supply, it lets you have the next step in Optimod processing at an exceptionally reasonable price: $2075 (suggested list).

We listen to our customers. Listen to our new XT2. We think you'll like what you hear.

Orban Associates Inc.
645 Bryant Street, San Francisco, CA 94107
(800) 227-4498 or (415) 957-1067 Telex 17-1480

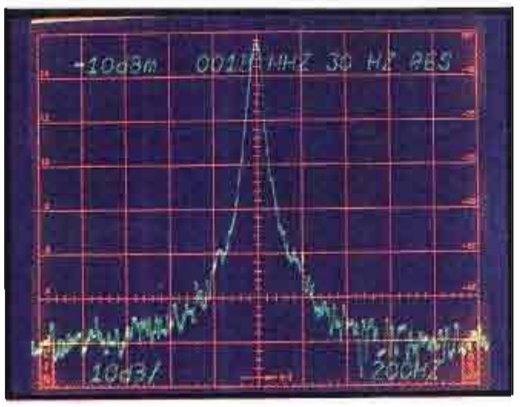
orban

Circle (12) on Reply Card

Troubleshooting

The answers may be at the interface

By Ned Soseman,
TV technical editor



As serial data communications replaces traditional parallel remote control of broadcast equipment, users and managers are becoming increasingly aware of the need for improved diagnostic techniques. This is because the goal in data communications maintenance is to pinpoint and replace defective components as quickly as possible, often leaving repair for later.

The starting point of serial communications troubleshooting is the communications interface. The interface is the point between the terminal or host computer, referred to as the data terminal equipment (DTE) and the line driver, or data communications equipment (DCE) found inside the equipment being controlled, or a modem. The DTE is also referred to as the *controlling*, or *master*, device and the DCE is referred to as the *controlled*, or *slave*, device.

For example, when two VTRs are connected together for machine-to-machine editing, the record VTR is the DTE (controlling or master device), and the play VTR is the DCE (controlled or slave device). In edit systems or station automation systems, the edit controller or automation computer is the DTE, and all VTRs are DCEs. The same VTR serial remote connector will be used regardless of function.

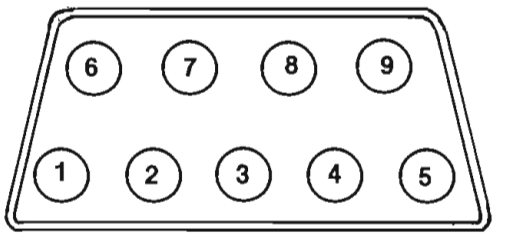
Serial standards

Several physical standards exist for interfacing. A typical broadcast interface uses the Electronic Industries Association's RS-232C or, more recently, SMPTE RS-422 standards as shown in Figures 1 and 2. The SMPTE RS-422 system uses only two wires for signaling in each direction, each balanced to ground. The typical broadcast equipment RS-422 data rate is 38.4K-baud. One driver can transmit over thousands of feet to up to 10 receivers.

In contrast, the older RS-232C uses up to 25 wires, and one driver is required for each receiver. RS-232C data transmission is usually at either 1,200baud (common to modems) or 9.6K-baud, although it may be used at speeds up to approximately 19.6K-baud over short distances of less than 50 feet.

The standards define voltage levels used in data transmission marks and spaces, regardless of whether the signal is generated by DTE and/or DCE equipment, and which pin on the interconnecting cable carries the signal. Standards do not define protocol. It is worthwhile to note that when interconnecting DTE to DCE, a straight one-for-one pin configuration is used. When two DTEs are interfaced, transmit and receive pins are typically reversed on one end of the cable.

Protocol is a formal set of rules and procedures for the exchange of information within a network. It simply defines the order in which things are done, and how that information is encoded. Be aware that some broadcast equipment manufacturers occasionally modify "industry standard" protocol slightly. Even the smallest disparity can create problems when you're trying to interface different brands of equipment.



PIN	MASTER	SLAVE
1	FRAME GROUND	FRAME GROUND
2	RECEIVE A	TRANSMIT A
3	TRANSMIT B	RECEIVE B
4	TRANSMIT COMMON	RECEIVE COMMON
5	SPARE	SPARE
6	RECEIVE COMMON	TRANSMIT COMMON
7	RECEIVE B	TRANSMIT B
8	TRANSMIT A	RECEIVE A
9	FRAME GROUND	FRAME GROUND

Figure 1. *RS-422 standards refer to the physical layout of the connector and pin configuration. The connector is a standard DS-9.*

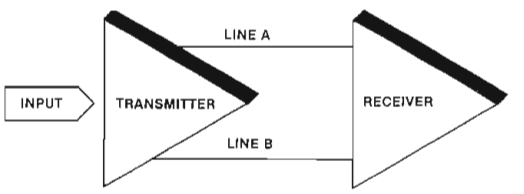


Figure 2. *Block representation of A and B in RS-422 interface. Note that A<B=mark or "1," and A>B= space or "0."*

The first step in troubleshooting any data communications is to obtain as much documentation as possible about communications protocol from each manufacturer of equipment to be interfaced. Some manufacturers hold their proprietary protocol details "close to the vest," which can complicate cross-checking. Expensive data communications test equipment such as digital oscilloscopes and logic analyzers, as discussed in previous "Troubleshooting" columns, are easy to use and can document data communications.

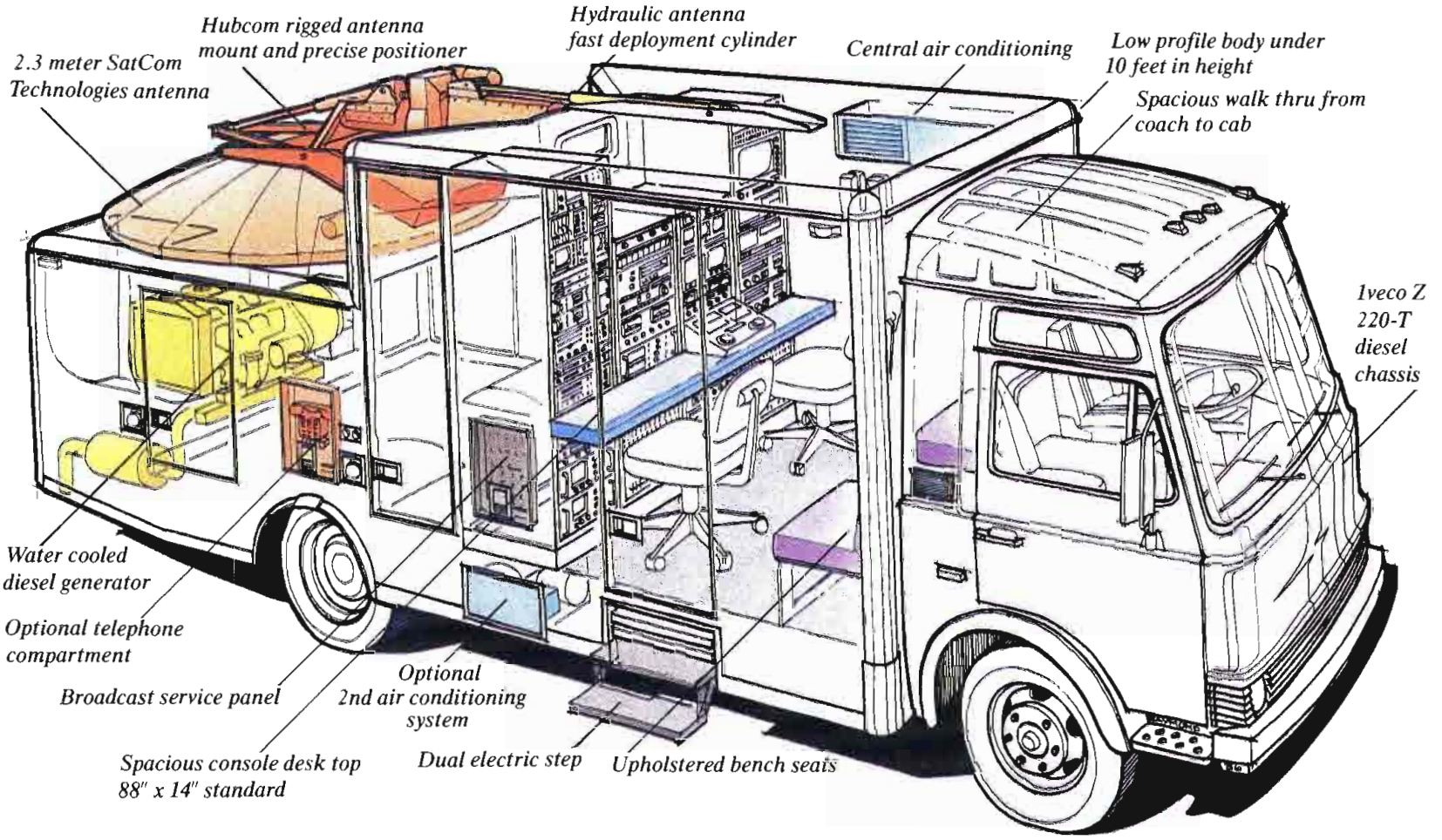
A simple tool that generally costs about the same as a DMM can provide all the information necessary to communicate with manufacturers about their protocol details, and to troubleshoot serial data interface problems. This tool is the *breakout box.*

The breakout box

A breakout box is a device that is inserted in the cable between the DTE and DCE to monitor interface activity by providing a visual indication of signals on the lines. This indication may be with LEDs or, sometimes, with LCDs. As a command or response is transmitted, the breakout box will allow the engineer to see the code on the line. This code can then be translated, by referring to protocol, to a command function.

The *simulation mode* is available on some breakout boxes, and can be used to verify command functions by simulating data commands. It may be used to transmit data commands to equipment to verify that the equipment understands each command, by functioning as expected. Verification can be particularly helpful for new installations that involve a mix of manufacturers' products.

If interface monitoring reveals the absence of a signal that should be present, the breakout box may be used in its simulation mode to determine whether the signal actually is not being generated, or whether a cable or receiving device is shorting it out. This is accomplished by leaving the device that generates the signal connected to the box, while disconnecting the other device and cable. |:-(-))))|



The Latest SNG® Innovations... From The Inventor Of SNG® Vehicles.

HUBCOM. Builder of the first SNG® vehicle in the U.S. HUBCOM. Builder of more SNG® trucks at work in the field than everyone else combined. HUBCOM. Introducing its second generation while others play "catch-up."

Lighter and better balanced. More compact for easier access to tight locations. Lower profiles. Improved antenna systems. And every HUBCOM SNG® vehicle comes equipped with a one year warranty and our 24-hour hotline.

Choose gasoline or diesel power. Choose a low profile or conventional vehicle. But whatever you choose, you'll get the latest SNG® innovations — from the inventor of SNG® vehicles...HUBCOM.

HUBCOM

HUBBARD COMMUNICATIONS, INC.

The last word in technology from the first name in the industry.

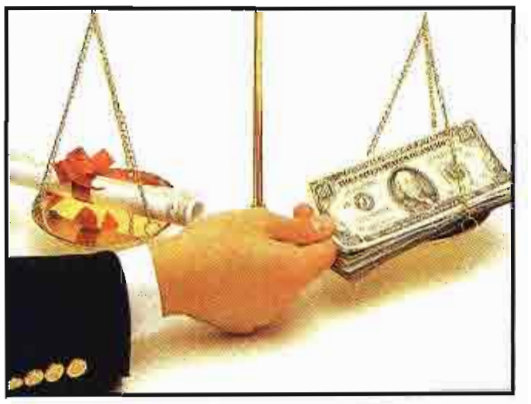
A subsidiary of Hubbard Broadcasting Inc.
12495 34th Street North, St. Petersburg, FL 33702
813/577-7759 TWX: 810-863-0417

Circle (13) on Reply Card

Part 2

Management for engineers

If it's goodbye, make it good



By Brad Dick, radio technical editor

It caught him off guard.

"I'll see you in court," Kate said as she stormed out of Jim's office. "Oh boy," thought Jim. "That was the last thing I expected from her. Oh well, she'll get over it."

If you're a supervisor, the distasteful task of "letting someone go" may someday be necessary. The emotional upheaval of firing someone is bad enough, but try to imagine how you would feel if you, like Jim, were faced with lengthy litigation or a court battle over an employee's termination.

Case background

In last month's "Management" column, we met Kate, a 32-year-old single parent working as a videotape operator. Her work was satisfactory and Jim, her supervisor, had no complaints — until she began arriving late to work. Kate's subsequent termination backfired on the station because of the inefficient way Jim handled it. Let's see how he might have approached the situation differently.

During the first year of Kate's employment, Jim regularly visits with her while she is at work. The talks are informal and Jim encourages Kate to ask questions and to know what is expected.

After six months, Kate receives her first formal employee review. Jim assesses her performance and, together, they outline several goals and expectations for the next year. They both sign the original copy of the review and it is placed in Kate's file. A copy of the review is given to her.

Jim continues the informal discussions with Kate, although they are conducted on a less regular basis. Kate is reviewed once a year up to the time her behavior becomes troublesome.

First warning

One week, Jim notices Kate arriving late for work several times. When it happens again the next week, he calls her to his office. The discussions center on why she is reporting late for work. When no concrete reason—in Jim's opinion—is given, he admonishes her to get to work on time. She agrees. Jim then places his handwritten notes about the meeting in her employee file.

When she is late again, two days in a row, another conference is held. Jim presents her with a letter outlining the station's policy on employee absenteeism. The letter notes that upon Kate's employment with the company, she received and signed for, a copy of this policy. She is warned in the letter that continued tardiness could result in her dismissal.

Another employee, Fred, begins reporting to work late. Jim repeats the conference procedure with him. The notes are placed in Fred's file.

When Jim returns from a vacation, he receives reports that Kate arrived late while he was away. He calls another meeting with her. They review the previous meetings, company policy and the previous letter. Jim presents her with a new letter stating that continued tardiness will result in dismissal. (It is important to note here that Jim has no first-hand knowledge of her arrival times while he was on vacation. The reports came from another department supervisor and Jim believes they are reliable.)

In an effort to keep the station management informed, Jim schedules a meeting with his supervisor. Together they review his records, discuss alternatives and agree that a log of her arrival times should be placed in her file.

During the next month, Jim keeps a log of Kate's arrival and departure times. Because her tardiness continues, Jim decides to terminate Kate. Before he proceeds, he informs his supervisor of his planned actions. They review Kate's performance history and Jim's records. Jim and his supervisor determine that termination is appropriate.

After the termination meeting, Jim makes a written statement of the facts and Kate's performance history. He does *not* place a favorable reference letter in her file.

Detailed records

Before you proceed down that stressful path of firing an employee, review the following checklist. It may help you objectively review your proposed actions.

- Have you thoroughly investigated the facts supporting the decision to terminate the person?
- Does the employee's behavior violate a specific rule? Has the rule been communicated to all employees? Can you prove the rule has been communicated to all employees?
- Has the rule been applied reasonably?
- If company or union disciplinary procedures require prior warnings, have those warnings been given? Have you documented these warnings and have they been presented in writing to the employee?
- Has the company applied the rule in a non-discriminatory manner? Give this careful thought if the employee to be discharged is female or a member of a minority.
- Is the discharge reasonable, in light of the employee's seniority and past disciplinary record?
- Is there any chance your desire to terminate the employee could be the result of a personality clash? Are you acting in an impartial manner? Have your supervisor review the situation before you take action.
- Carefully document all of your actions.

Although employee termination is an unpleasant task, your position as a supervisor or manager may require it. Failure to discipline an unsatisfactory employee may result in lowered staff morale. You, as manager, must maintain an effective team. That means all workers pull their share of the load.

Prevention is the best cure

Prevention is the best policy where employee terminations are involved. Anything you can do to help the employee become an effective worker will benefit not only the station, but also the employee.

A station's most valuable resources are its employees. Equipment can always be replaced. And yes, so can employees, but there remains a great difference.

Editor's note: Information for this article was obtained from "Electronic Media Management," by William E. McCavitt and Peter K. Pringle, Focal Press, Boston, London. |:-)))|

NEW FROM ARRAKIS SYSTEMS

5000 SERIES

The First No-Compromise Modular Radio Console...

...At A Down-To-Earth Price: 16 Channels, Under $10,000.

THE FEATURES YOU WANT—

- 16 Modular Stereo Channels.
- Program, Audition and Mono Mixdown Balanced Outputs.
- Telephone Mix-Minus Buss.
- Full Monitoring Facilities.
- Remote Equipment Start/Stop.
- Remote Module Control.
- Standard Digital Clock and Timer.
- Optional EQ and Effects Modules.

THE DEPENDABILITY YOU NEED—

- DC Controlled – No Audio On Pots.
- Rugged Modular Construction.
- Penny & Giles Slide Faders.
- ITT Schadow Switches.
- NE5532 IC Module Design.
- External Regulated Power Supply.
- Superb Audio Performance Specs.
- Most Important, Arrakis Systems Designed-in Ultra Reliability!

For features, performance, price and reliability,

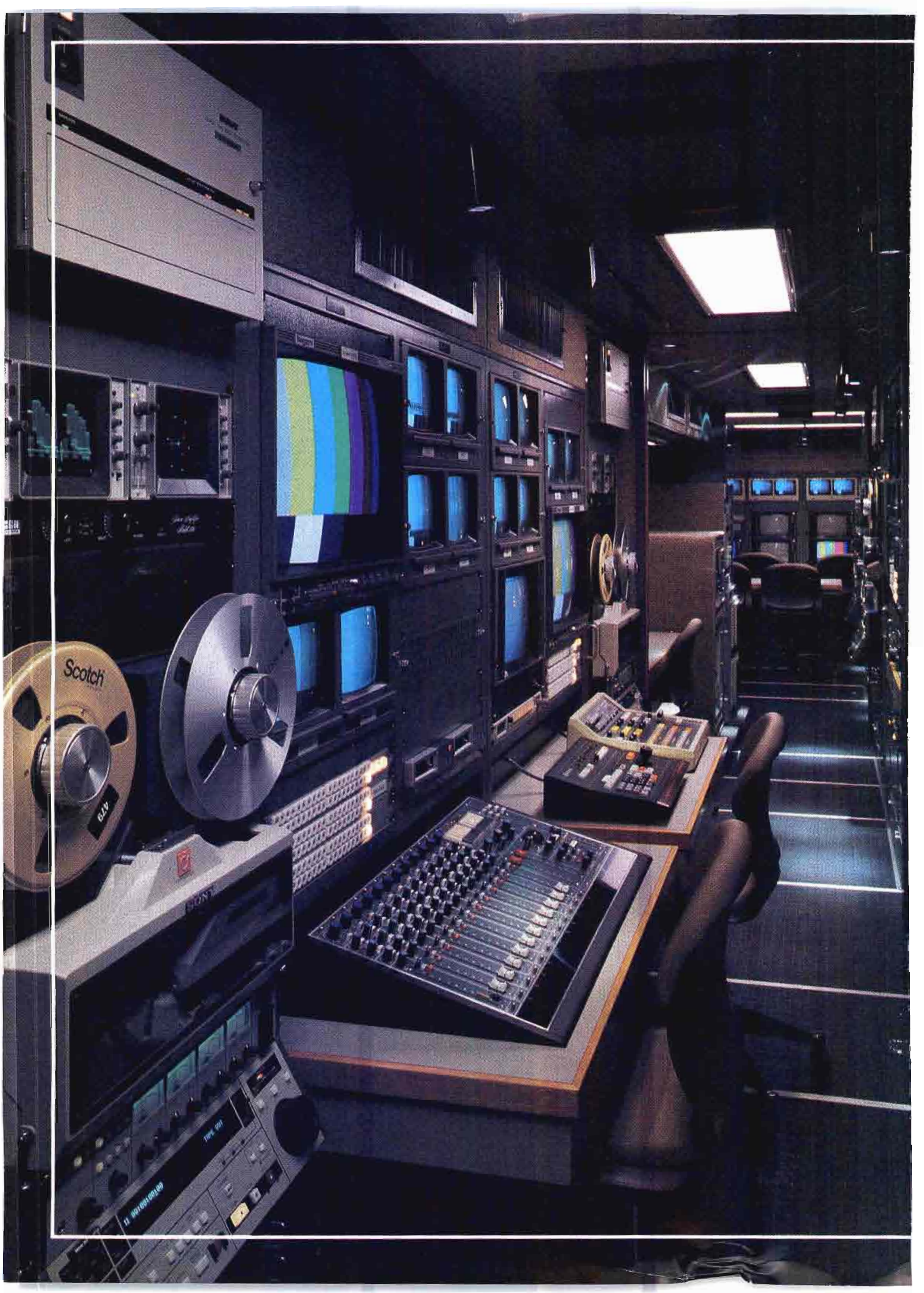
NOBODY BUILDS CONSOLES LIKE ARRAKIS.

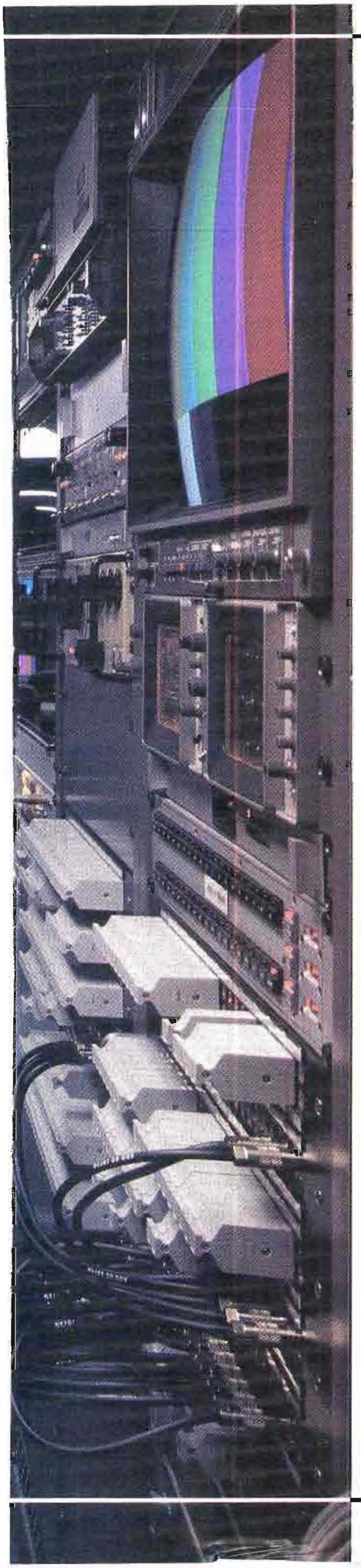
Call (303) 224-2248

Circle (14) on Reply Card

ARRAKIS SYSTEMS INC. 2609 RIVERBEND COURT FORT COLLINS, CO 80525

arrakis SYSTEMS, INC.





Broadcasting from the field

INTRODUCTION

Radio and TV stations have used the remote location broadcast for decades to bring their audiences an added sense of realism and excitement. And although the concept of the *remote*—as it is better known—has not changed substantially in the past 30 years, the means to accomplish the task has seen quantum leaps in performance, ease of operation and reliability.

Today's outside broadcast systems for radio and television can be configured to provide virtually any degree of sophistication required by the station. And as with any other area of broadcasting, the key to a successful RENG system is careful and detailed planning.

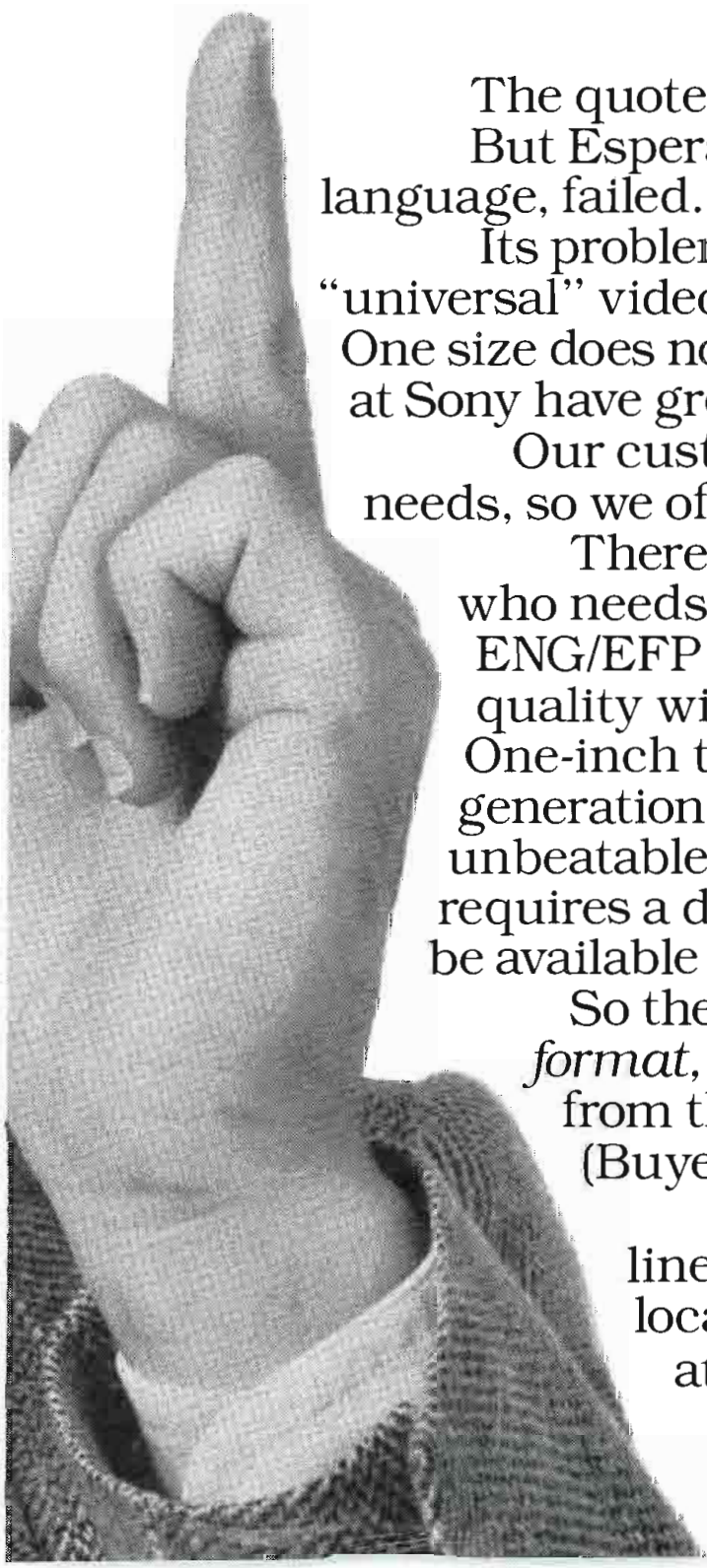
In this special emphasis report, we examine the technology that makes today's ENG (electronic news gathering), EFP (electronic field production) and RENG (radio ENG) operations possible.

This editorial package provides guidelines on how to plan and construct outside broadcast facilities and equipment for radio and TV stations. We also present two case histories of successful OB designs. Outside broadcast activities are too important to be left to chance.

As outside broadcast productions become more important to stations, the equipment available to perform the work improves. Shown is the NBC-TV NT-5 tape truck, used on large remote broadcasts that require elaborate taping and switching functions. The 45-foot trailer has been in service a little more than one year, primarily assigned to the production of sports programs.

This vehicle (built by Centro Corporation) was assembled in a unique way. The trailer and interior equipment center were built separately—in different locations—and then brought together. This allowed completion of the vehicle in just 125 days for both engineering and construction. The custom trailer and the unique inner shell were built to tight tolerances to make possible the marriage of the two units.

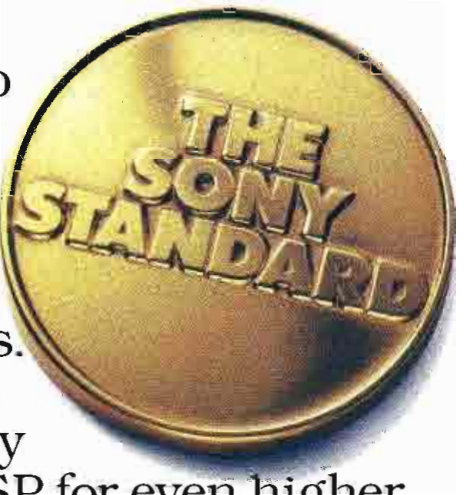
"Unu gradigi taŭgi ĉio!"



The quote above is Esperanto for "one size fits all."

But Esperanto, which was created to be a universal language, failed.

Its problem, which also applies to "universal" video formats, was simple. One size does not fit all; a truth that we at Sony have great respect for.



Our customers have different needs, so we offer a variety of solutions.

There's Betacam® for anyone who needs a compact, high quality ENG/EFP format. And Betacam SP for even higher quality with full compatibility and four audio tracks. One-inch type "C" provides unbeatable multiple generation performance; Broadcast U-Matic,® unbeatable price/performance. And for anyone who requires a digital component format, 4:2:2 digital will be available shortly.

So the next time you hear the words *universal format,* it might be wise to remember these words from the *universal language*: "Kliento atentu!" (Buyer beware!).

For more information on the complete line of Sony Broadcast products, contact your local representative. Or call Sony Broadcast at (201) 833-5231. SONY® BROADCAST

Radio field production

By Brad Dick,
radio technical editor

Radio field production can stretch your patience to the limits, but the rewards of a successful remote are extremely satisfying.

Engineers who have been involved in a lot of remotes are often either gray-headed or bald. These same engineers may also have big smiles on their faces. Although there may be no scientific evidence to support it, these two opposing conditions are a likely result of the stress and satisfaction associated with producing live broadcasts from the field.

Remote broadcasts can be the biggest pain in the back (literally) and the highest high in engineering. Engineers seem to enjoy the opportunity to leave the humdrum life of the studio behind and venture into the outside world. There, whatever can go wrong will and no matter how much planning you do, something exciting (or disastrous) usually happens.

Even so, when you've been through a remote, there is a feeling of exhilaration that is difficult to describe. In some cases, it may be a sense of relief that it's over and nothing terrible happened. But usually there is a feeling of accomplishment and pride in helping produce another successful remote broadcast, something that is unique to our industry.

Changing technology

The industry has come a long way from the old days of heavy, tube-laden amplifiers and cameras. Today, the smaller and lighter remote equipment make the work more enjoyable. It's now

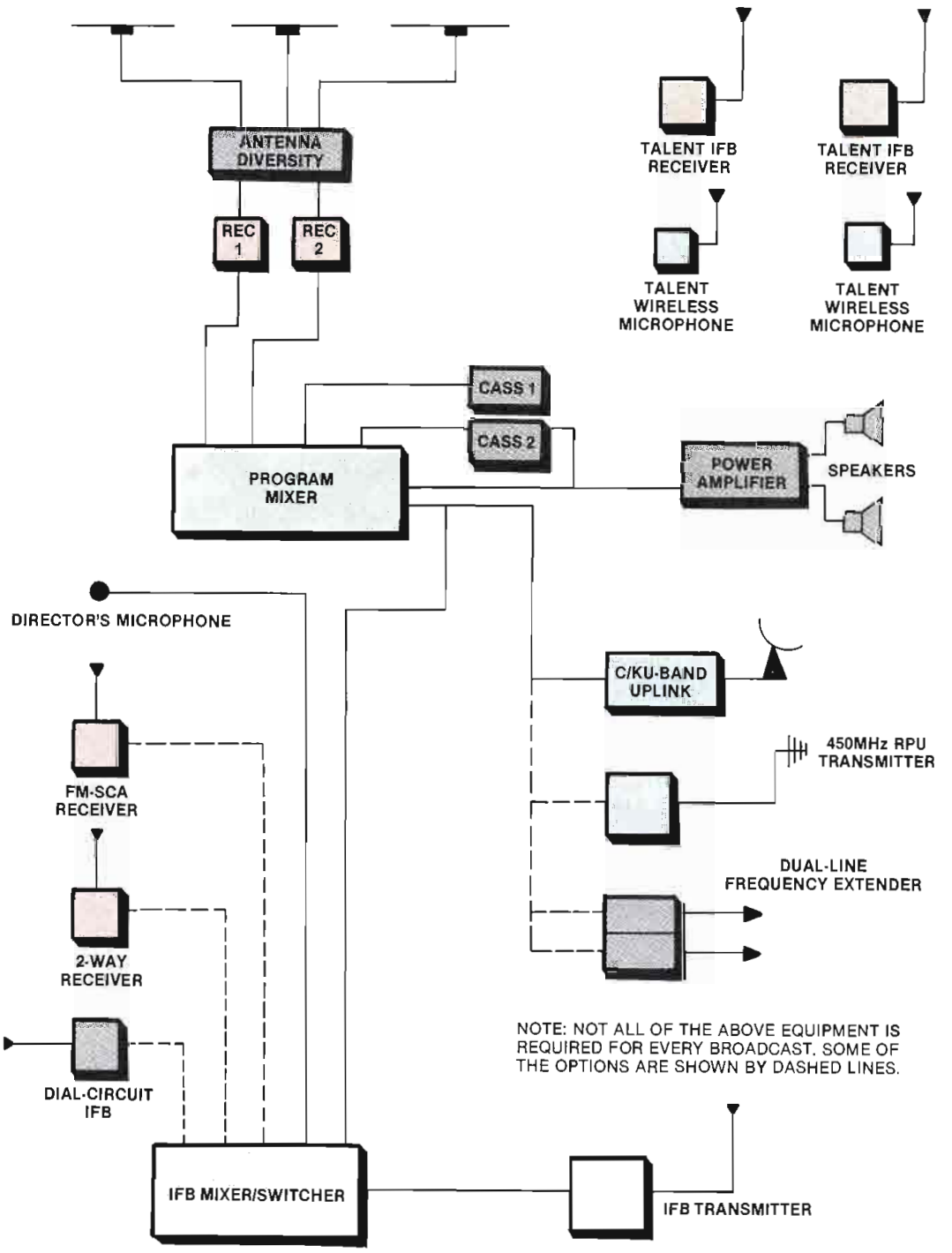
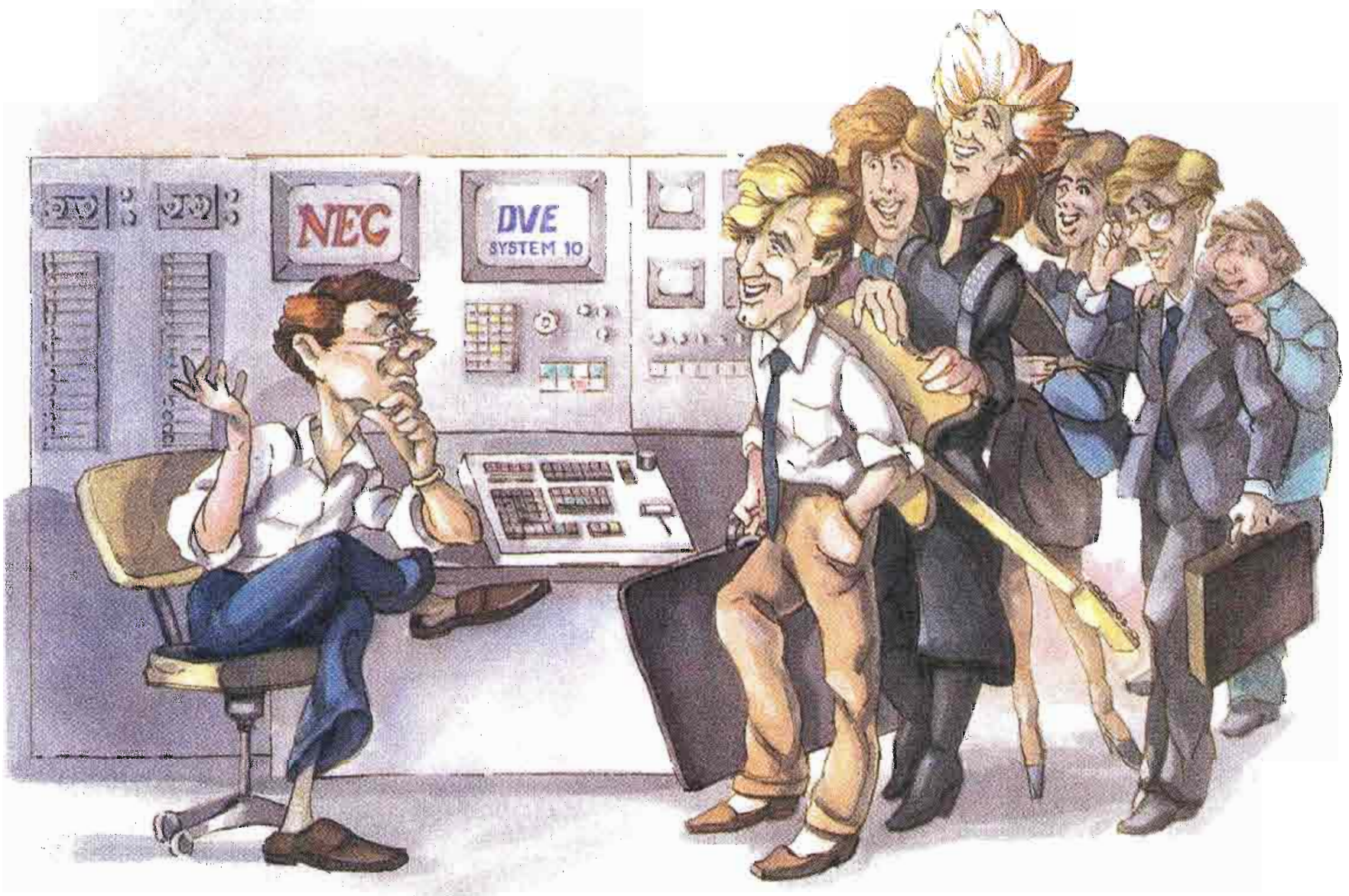


Figure 1. *The example remote broadcast setup and some of the alternatives available for program transmission and IFB communication.*



THE PERFORMER

The DVE® System 10 from NEC is one of the hottest selling digital video effects systems on the market today. For good reason: it performs. To find out for yourself, just spend a little time behind the controls. Get a feel for 3-D rotation, infinite perspective, cube making, tearing, A/B switching, key masking an ease of use that will make you feel like an expert in no time.

The word is that the DVE System 10 is quickly becoming the choice for TV stations, production, and post-production facilities throughout the country.

So take yourself on an adventure in creativity with the system backed up by one of the biggest names in the industry. The DVE System 10 from NEC.

NEC

IMAGINE WHAT WE'LL DO FOR YOU

C&C COMPUTERS AND COMMUNICATIONS • *DVE® is a registered trademark of NEC Corporation.*

NEC America, Inc., Broadcast Equipment Division • 1255 Michael Drive, Wood Dale, IL 60191 • Toll free 1-800-323-6656 • In Illinois phone 312-860-7600

Circle (15) on Reply Card

possible for a sportscaster to carry enough equipment for a broadcast in a single bag or case weighing only a few pounds. Complex radio remotes can be accomplished with the equipment carried in a standard van.

Although the remotes themselves have become easier and the equipment lighter, the primary objective is still to deliver the programming from the remote location back to the studio. There are three distinctly different ways to transport the audio. Telephone lines, both dial and equalized, RF links and satellite transmission are typically available. The particular medium selected often depends more on cost than on each system's relative technical advantages.

The typical remote broadcast

Figure 1 shows the equipment setup for a typical remote broadcast. Although the example may be more or less complex than what your station needs, it will provide the introduction for a closer examination of some important remote broadcast elements. This example provides the talent with wireless microphones. To ensure reliable operation, diversity operation will be used.

Because listener telephone calls will be accepted at the remote site, a wireless interrupted foldback (IFB) system is also needed. In the example, a separate IFB mixer/switcher is used to allow any combination of IFB feeds. The system can operate with FM SCA, dial telephone, or 2-way radio back-haul signals.

Finally, this example remote will rely on satellite transmission for a stereo interconnect. Other possibilities for program transmission could include dual-line telephones or an RF link.

Telephone lines

Radio remotes used to be carried primarily on equalized telephone loops. With the Bell breakup, equalized telephone loops are now more difficult to find. In some cities, equalized loops are almost impossible (or too expensive) to obtain. Even if they are available, the order usually has to be placed many weeks before the broadcast. This situation often forces broadcasters to use dial circuits for signal transmission. The quality available over a standard dial loop is, unfortunately, nothing short of terrible.

The typical frequency response of a dial circuit is approximately 300Hz to 3kHz. The signal-to-noise ratio is also relatively poor. The advent of digital telephone transmission has created other types of problems.

Although digital has come to be synonymous with high-quality audio, the opposite is often true where the telephone is concerned. Digital transmission requires that the audio be band-limited to half of the D/A converter's sampling frequency. Because telephone company *codecs* (coder/decoders) use an 8kHz sampling, the telephone line's audio frequency response is limited to 4kHz. In actual practice, sharp filters (like the one shown in Figure 2) are used to sharply attenuate frequencies above 3.4kHz.

The frequency-limited properties of dial circuits have spawned a new generation of quality-enhancing devices. Through frequency-shifting techniques (heterodyning), it is possible to improve the quality of audio transmitted over dial circuits.

These devices, called frequency extenders, shift all audio frequencies up approximately 250Hz. The result is a corresponding improvement in the low-end frequency response. With this scheme, the frequency response may approach 50Hz to 2,750Hz. Although the result is certainly not *studio quality*, it's better than can be obtained over a standard

IT'S HERE!
THE FIRST GRAPHICS GENERATOR

with MOTION!

CHYRON WITH MOTION
MODEL 4200

for only

$54,400

Introducing CHYRON 4200, the first graphics generator with MOTION.

Create and display multiple effects and text instantly—flip, spin, zoom, split images and more. CHYRON 4200 does it all, while maintaining ultra-high resolution. At a price this low, it's sure to be the FASTEST MOVING graphics generator. Find out about it—call CHYRON today.

CHYRON *TELESYSTEMS / A MEMBER OF THE CHYRON GROUP*

265 Spagnoli Road, Melville, NY 11747 • 516-249-3296 • Telex: 144522 Chyron Melv
West Coast Office: 221 W. Alameda Avenue, Suite 103, Burbank CA 91502 • 818-842-3244

Circle (17) on Reply Card

Figure 2. *Telephone lines pass through narrow filters prior to D/A conversion. The anti-alias filters create severe problems for a station attempting wideband transmission.*

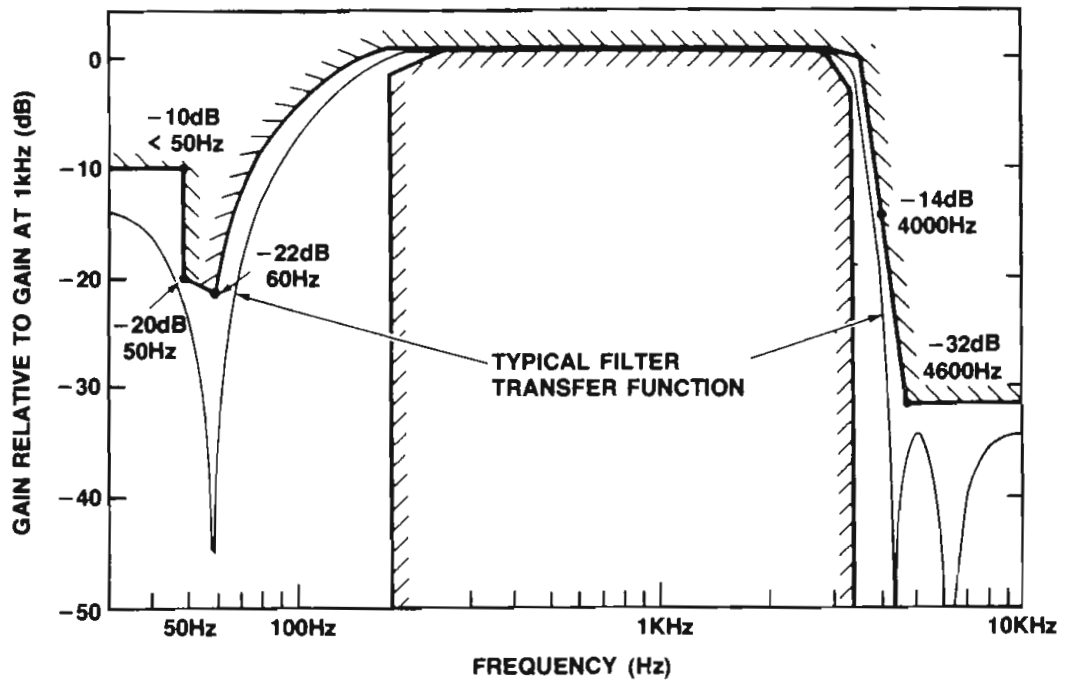


Figure 3. *Two-line frequency extenders divide the audio into separate bands and shift one band up and the other band down in frequency. When recombined in the receiver, a 50Hz to 5kHz response is provided.*

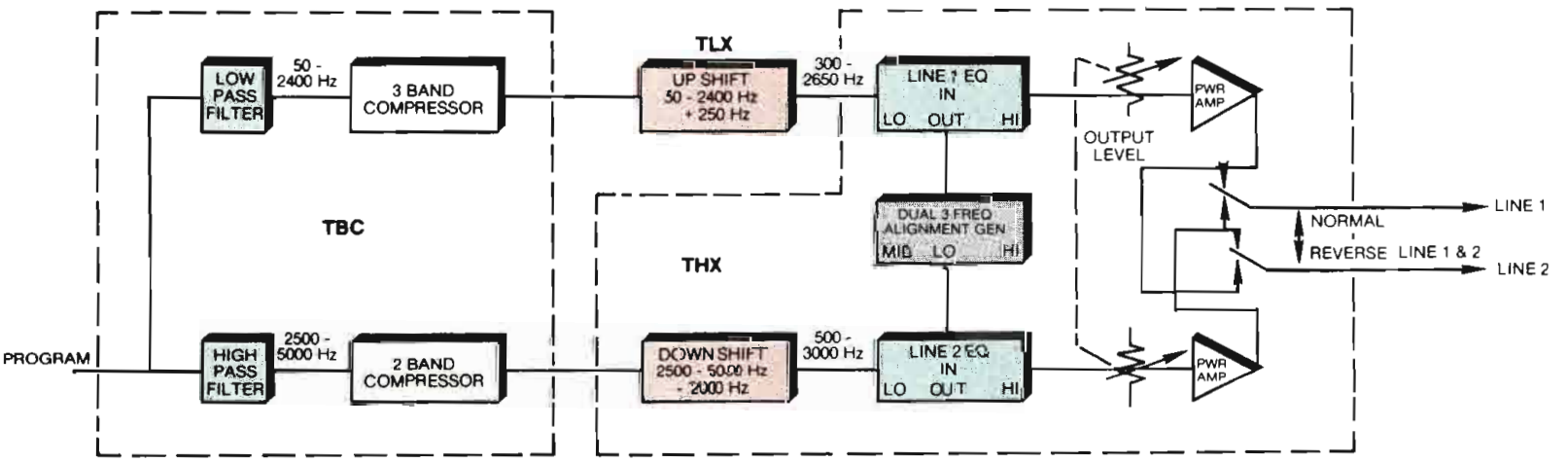
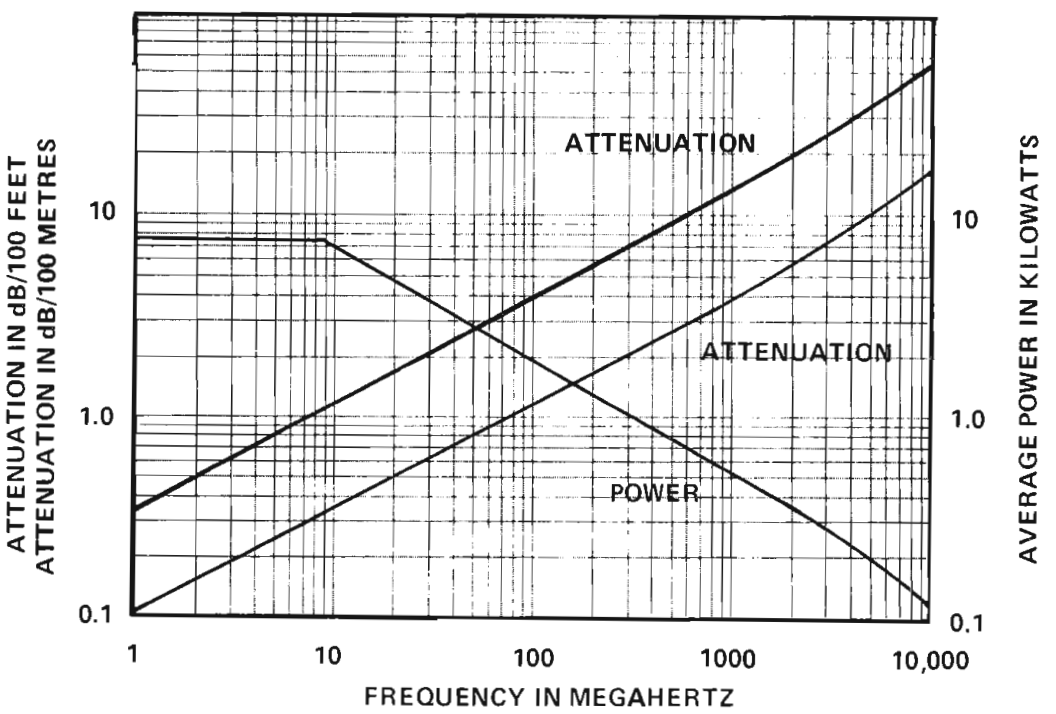


Figure 4. *Typical attenuation and power-handling ratings for ½-inch foam dielectric coax.*



phone line.

The primary benefit can be heard on male voices. A frequency extender helps preserve the apparent quality of the male voice by saving that portion of the lower frequencies that would normally be lost in the telephone transmission process. In general, the frequency extender provides less benefit to female voices because they tend to be higher-pitched.

Despite the benefits obtained from gaining back the lower frequencies, the upper frequencies are still cut off at approximately 3kHz. However, by using two dial circuits and a dual-line frequency extender, it is possible to provide a 5kHz audio path.

A dual-line device, shown in Figure 3, divides the audio into two bands of approximately 50Hz to 2,400Hz and 2,500Hz to 5,000Hz. The lower band is shifted up 250Hz and the upper band is shifted down 2,000Hz. The two separate signals are transmitted over separate dial circuits and recombined later in the receiver. Multiband companding circuits are often used to further improve the audio quality.

The extenders are sometimes contained within remote consoles, forming a self-contained remote package. Also, 2-line extenders provide automatic switching to the non-encoded mode, in case one of the two lines fails. The simplicity of the newer 2-line devices makes their operation easy and straightforward.

RF links

RF links continue to be an attractive alternative for many stations. With the ever-increasing cost of telephone lines, remote pickup (RPU) portable transmitters provide a cost-effective way to transmit programming. RF links also have the advantage of providing higher-quality audio than may be available from dial circuits.

RPU typically refers to transmission in either the 150MHz or 450MHz bands. Although other frequencies are available,

The Abekas A53-D Digital Special Effects System

The innovative tradition of Abekas continues with the A53-D—the most cost-effective, high-quality three-dimensional effects system available today.

In single or dual channel configuration, the A53-D gives you a full array of three-dimensional features. This includes: perspective and 3D rotation, variable rotation axes and 3D locate, field/frame freeze and full manipulation of frozen pictures, variable border and background, crop and aspect change, A/B switching and GPI control, and smooth linear motion and trajectory with variable tension.

The A53-D makes good sense for both live broadcast and post-production applications. For broadcasting, the A53-D offers a simple-to-use control panel with fast access to 24 on-line effects. For post-production, the system's extensive programming features and precise control let you create intricate effects limited only by your imagination.

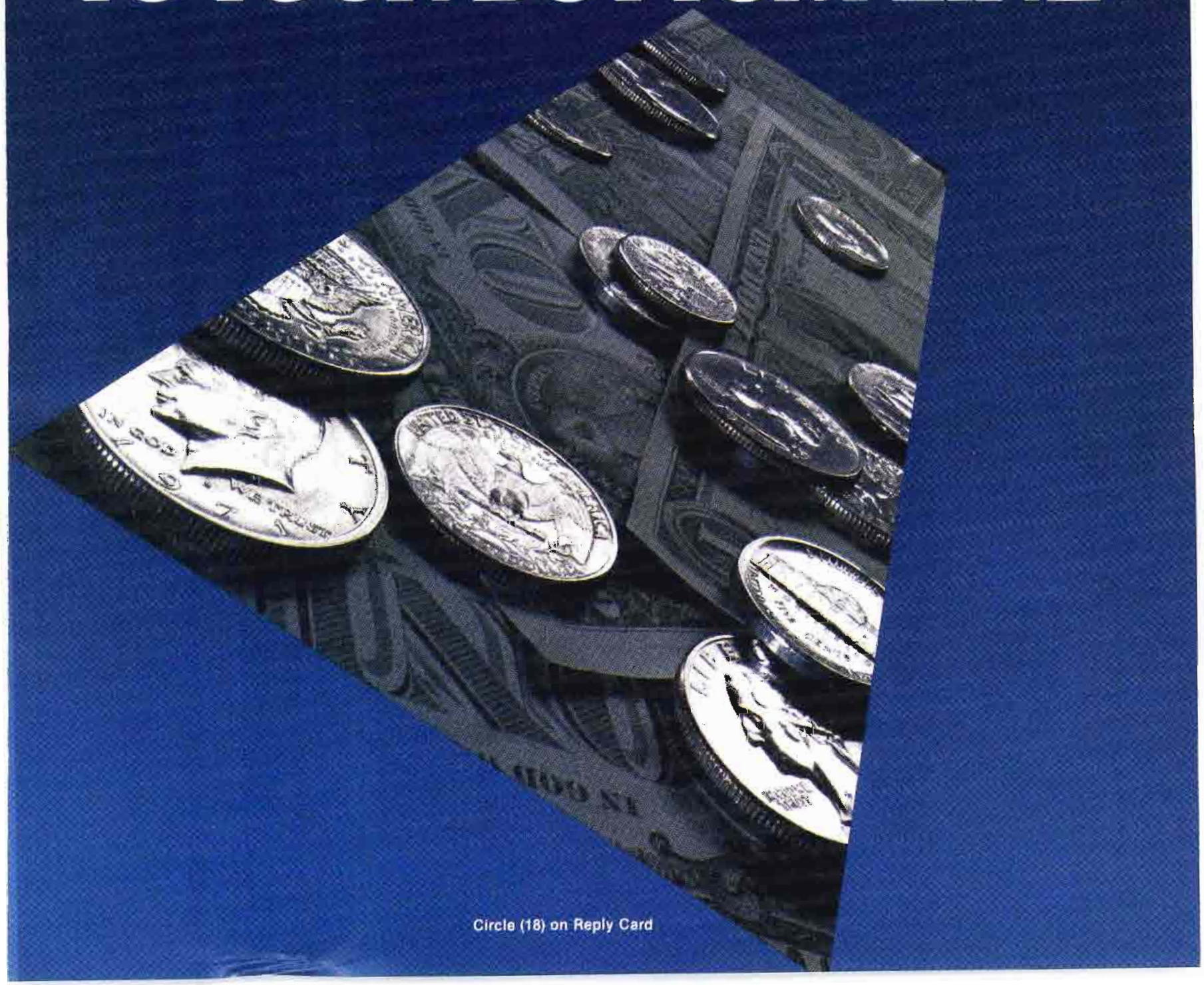
You can digitally interface the A53-D to the highly acclaimed Abekas A62 digital disk recorder. This unique duo gives you the ability to composite unlimited layers of manipulated video without generation loss.

Let the A53-D add a whole new dimension to your bottom line, with unmatched price and performance. For details, contact: Abekas Video Systems, Inc., 101 Galveston Drive, Redwood City, CA 94063. (415) 369-5111.

Abekas
Video Systems, Inc.

Now Anything is Possible

ADD NEW DIMENSION TO YOUR BOTTOM LINE



Circle (18) on Reply Card

they are seldom used. The 150MHz is limited to voice-quality transmission and is usually quite crowded. There are more channels and bandwidth options in the 450MHz band.

Some radio stations are just now beginning to use the 20GHz and 30GHz intercity-relay (ICR) frequencies. The links can be either 1-way or 2-way, as needed by the station. However, the equipment is expensive and path-length- and weather-sensitive. Also, the equipment requires highly directional antennas. This equipment may not be suitable for RPU applications that require transmission from various locations.

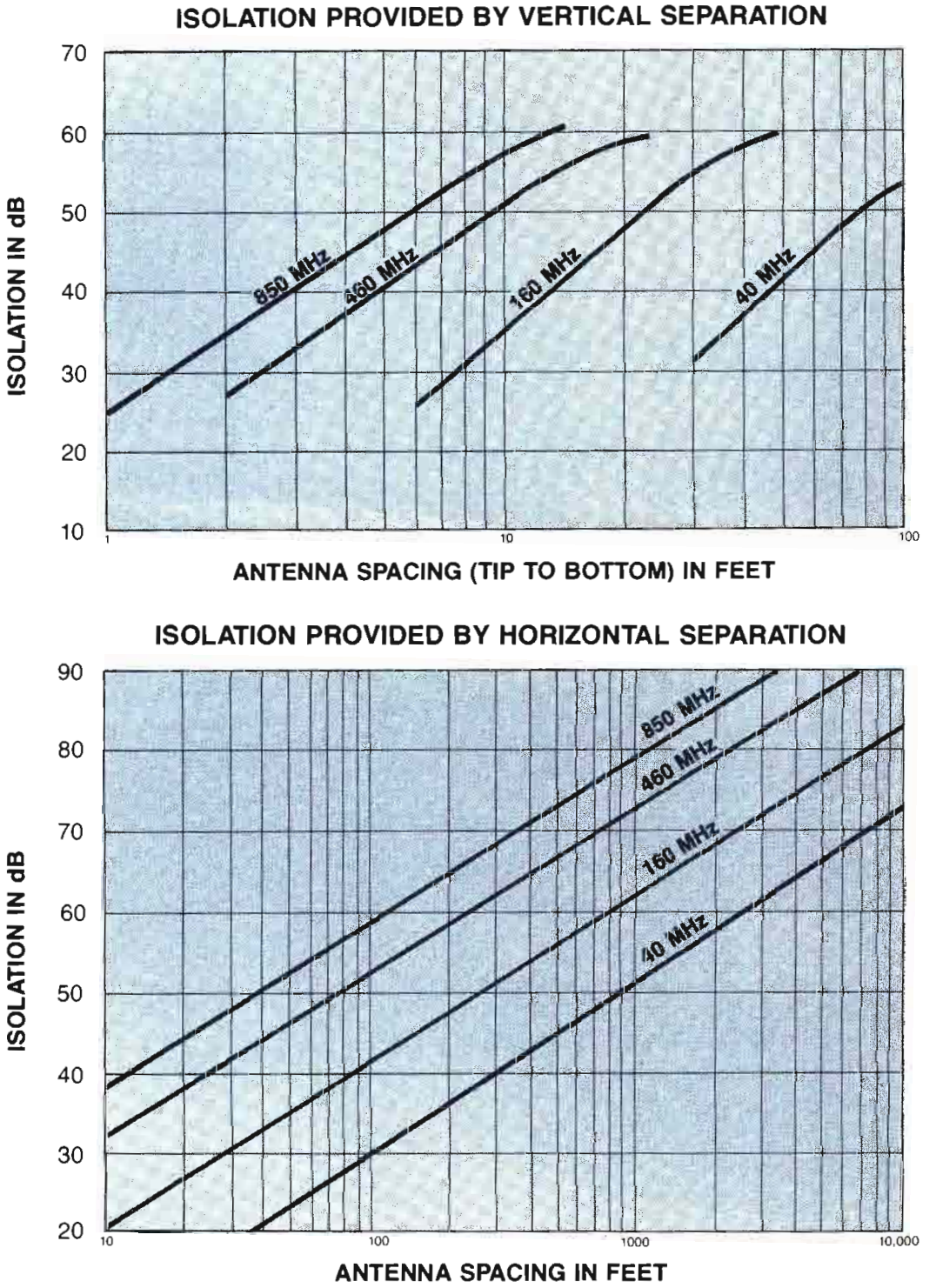
There is a wide variety of RF equipment available for field work. In the 450MHz band, transmitters range from pocket-sized to rack-mounted devices. Power outputs range from a few watts for hand-held transmitters to approximately 50W for portable units. External amplifiers with power ranges up to 100W are also available. These amplifiers are sometimes necessary for that extra push to deliver the signal to the studio.

Frequency coordination

The first important element to consider when designing an RPU system is frequency coordination. After all, if you select a frequency that later turns out to be busy, your system may be useless. Also, it is irresponsible to power up a

Continued on page 36

Figure 5. *Separating the receive antenna from other transmitting antennas will often provide the needed isolation. The tower and other structures can have a significant impact on the actual isolation encountered.*



Courtesy of Celwave R.F.

Yamaha introduces microphones for every instrument we make. And the one we don't make.

Designed to reproduce both vocal and instrumental music, the MZ Series of professional microphones were a long time in the making.

For nearly 100 years, Yamaha has been building musical instruments. Everything from piccolos to grand pianos to synthesizers.

We took this musical heritage and combined it with our expertise in electronics and acoustic engineering. The result is a line of five microphones that, unlike others, go beyond mere transducers.

The diaphragms in the three MZbe models are the first to use beryllium. This rare metal's low specific gravity and exceptional rigidity permit an extended high frequency range for a sound that is both crisp and sweet at the same time.

A specially developed damping and three-point suspension system for long-term stability and durability is used throughout the line. As are gold-plated connectors.

But because of Yamaha's musical experience, the real accomplishment of our new microphones is certainly greater than the sum of the parts. You might even think of them as musical instruments in themselves.

For complete information, write Yamaha International Corporation, Professional Audio Division, P.O. Box 6600, Buena Park, CA 90622. In Canada, Yamaha Canada Music Ltd., 135 Milner Ave., Scarborough, Ont., M1S 3R1.

YAMAHA®

Circle (20) on Reply Card

The Right Stuff!

Ikegami's HK-322 Studio and HK-323 Field/Studio Cameras:

Here to Stay.

Ikegami's HK-323 1" and ⅔" field/studio cameras, alongside the ever popular HK-322 full production camera, gives the broadcast marketplace a choice of two distinct, yet unique cameras, second to none.

The HK-322 with 1" or 1¼" tubes remains the ultimate production camera in the industry, with specialized functions not found on any other camera. These include 6 vector color corrector, scan reversal with memory, negative video, out-of-bands horizontal aperture correction, scene files with extensive memories, dream effect and much more. For complete flexibility, the hand-held HL-79EP is available as the companion camera.

For field/studio operation, the HK-323 1" and ⅔" cameras, recently introduced by Ikegami, are quickly gaining acceptance with the networks as the market leaders in this segment of fully automatic micro-processor controlled, lighter weight broadcast cameras. The HK-323 is available with the optional hand-held companion, the HK-323P, which operates off the same base station.

Once again Ikegami is right where the marketplace expects us to be; with a commitment to excellence and our assurance of the best.

For a demonstration of the Ikegami HK-323 and HK-322, contact us or your local Ikegami dealer.

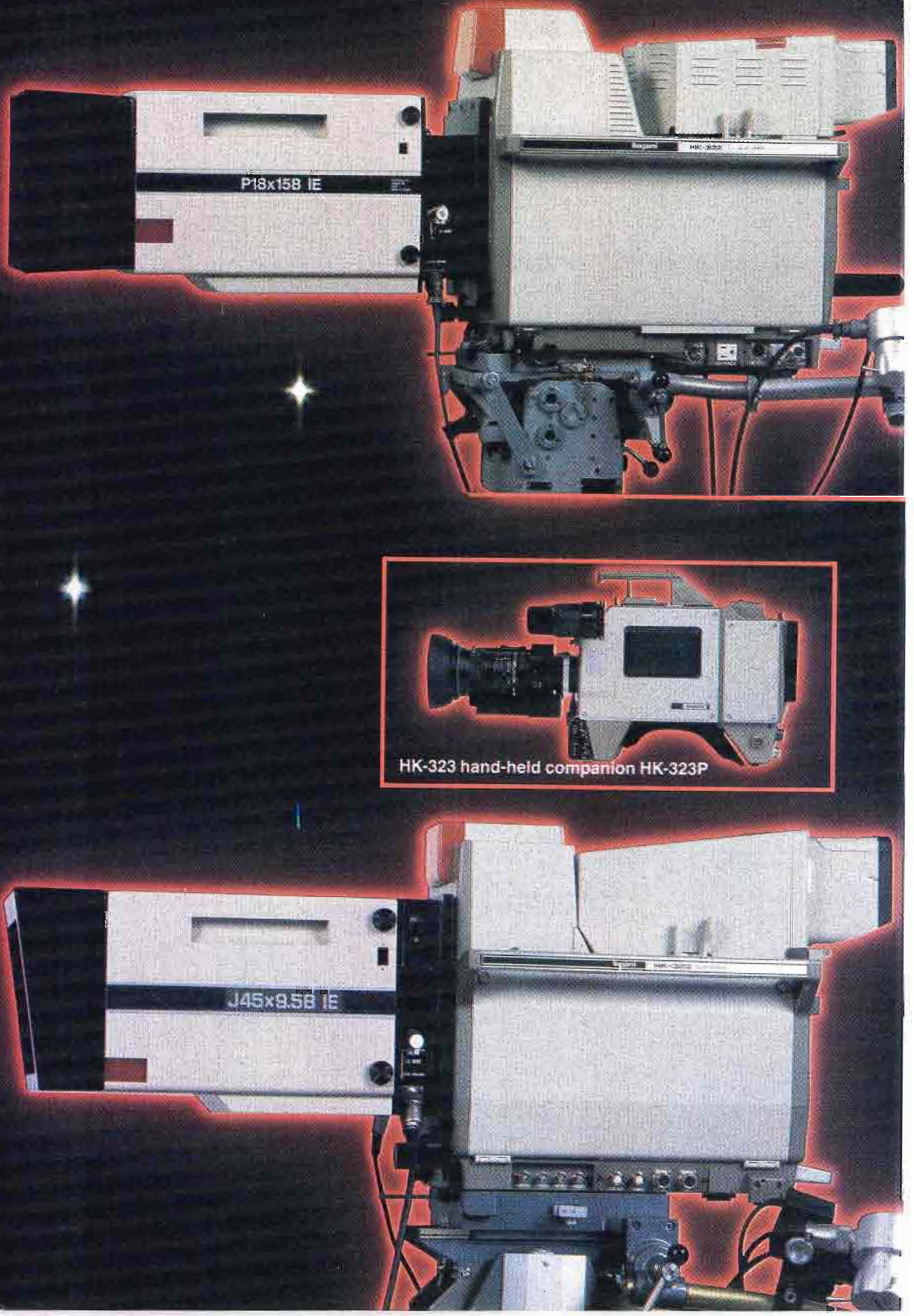
Ikegami

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

East Coast: (201) 368-9171; West Coast: (213) 534-0050; Southeast: (813) 884-2046 Southwest: (214) 233-2844; Midwest: (312) 834-9774; Hawaii: (808) 946-5955

Circle (21) on Reply Card

HK-322 hand-held companion HL-79E



HK-323 hand-held companion HK-323P

Continued from page 32

system without first being sure the channel is clear for use. The last thing you want to hear is another station's traffic on your air signal. The rule here is *cooperation.*

A complete list of SBE frequency coordinators appears on page 138. If you need access to RPU frequencies, contact a coordinator for assistance. They can usually help you identify an open channel. Although there is no FCC rule that you must cooperate with the SBE coordinator, it is in the best interests of all users to do so.

Path engineering

After you have identified a potential usable frequency, it's time to look at some typical paths to see how much gain and loss will be encountered. Although it is not practical to do this for every possible RPU broadcast site, select a couple of potential transmit-and-receive locations for the first evaluation process. In most cases, the difference in mileage between potential broadcast sites will be insignificant to the overall system losses. An exception to this rule applies if a grazing path exists between the transmitter and receiver.

In an RPU system, fade margin can be computed by using the following equation:

$$G_s = G_t + G_{ta} + G_{ra}$$

Where G_s = total system (gain dB)
G_t = transmitter power output (dBm)
G_{ta} = transmit antenna gain (dBi)
G_{ra} = receive antenna gain (dBi)

The values for G_{ta} and G_{ra} are available from your antenna manufacturer's literature. (Note: dBi = dBd + 1.1dB, approximately.) The value for G_t is given by the following formula:

$$G_t = 30 + 10 \log P_o$$

Where G_t = transmitter power output in dBm
P_o = transmitter power output in watts

Next, the system losses are computed:

$$L_s = L_p + L_l + L_c + L_m$$

Where L_s = total system losses (dB)
L_p = path loss (dB)
L_l = transmission line loss (dB)
L_c = connector losses (dB)
L_m = miscellaneous losses (dB)

The values for L_l and L_c can be determined from the manufacturer's literature. Typical loss for ½-inch foam-filled transmission line is shown in Figure 4. A reasonable value for connector loss with components normally used in ½-inch transmission installations is 0.5dB. The value for L_p can be computed from the following formula:

$$L_p = 36.6 + 20 \log F + 20 \log D$$

L_p = the free space attenuation loss between two isotropic radiators (dB)
F = frequency of operation in MHz
D = distance between the antennas in statute miles

$$\text{Fade margin (dB)} = G_s - L_s - R_m$$

Where G_s = total system gain (dB)
L_s = total system losses (dB)
R_m = minimum signal strength required for target S/N (dBm, a negative number)

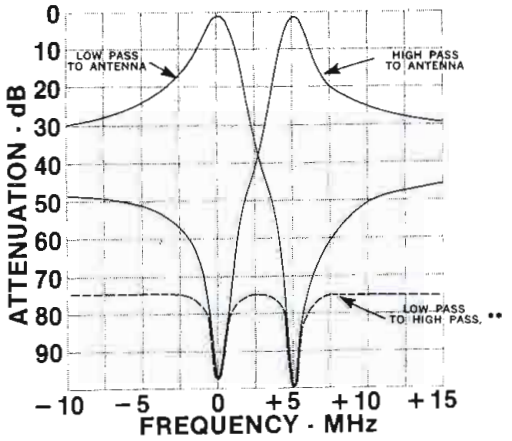
G_s and L_s are determined by the equations previously shown. R_m (receiver sensitivity) is determined from the receiver manufacturer's specifications. If the manufacturer gives a receiver sensitivity figure in microvolts, the following formula can be used to convert to dBm:

$$R_m = 20 \log \frac{V_r \times 10^{-6}}{0.7746}$$

Where R_m = minimum required signal strength (dBm)
V_r = receiver sensitivity (microvolts)

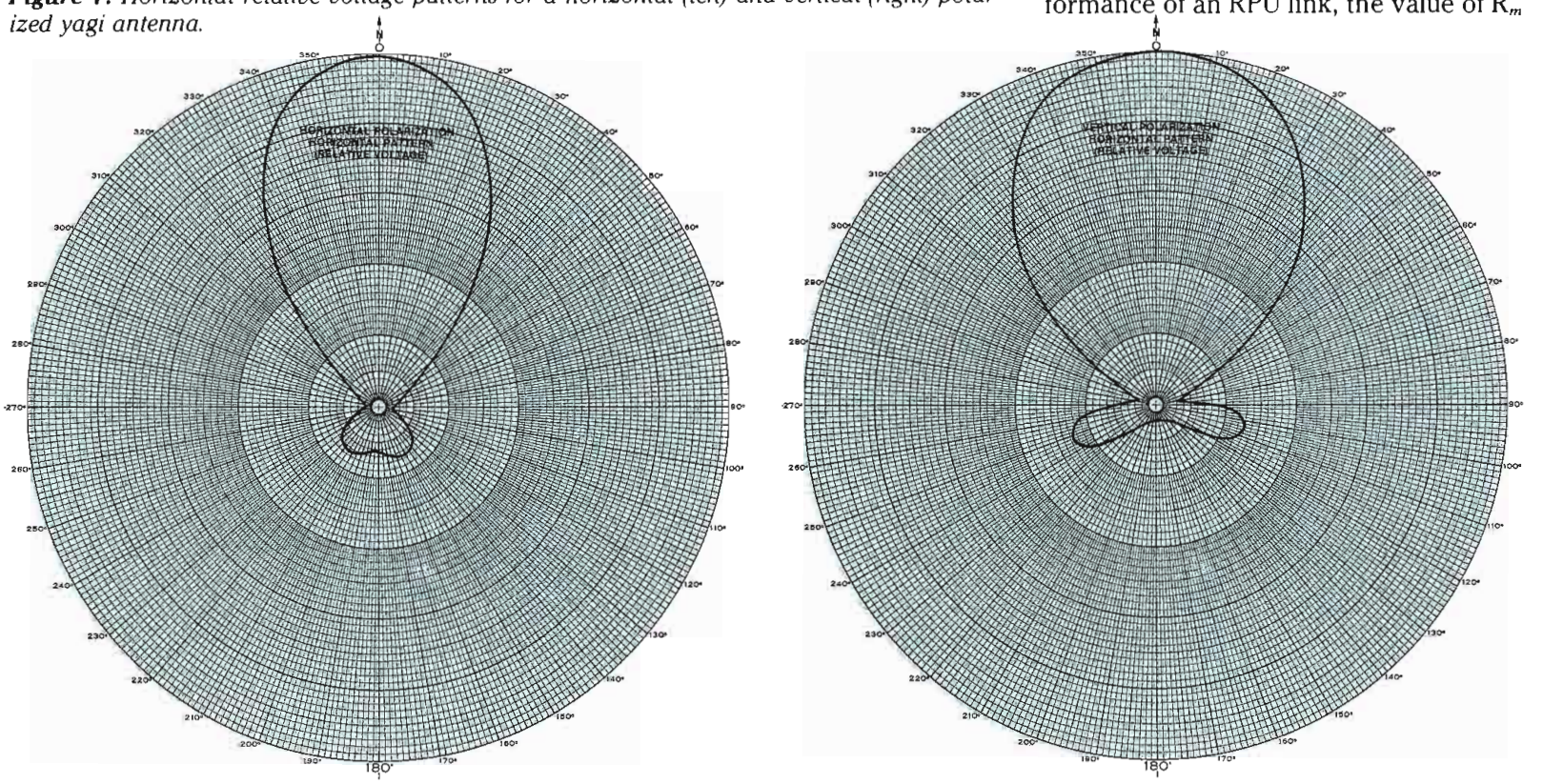
In order to predict accurately the performance of an RPU link, the value of R_m

Figure 6. *Typical bandpass-reject filter frequency response. Properly selected, such a unit will protect the receiver from overload.*



Courtesy of Decibel Products

Figure 7. *Horizontal relative voltage patterns for a horizontal (left) and vertical (right) polarized yagi antenna.*

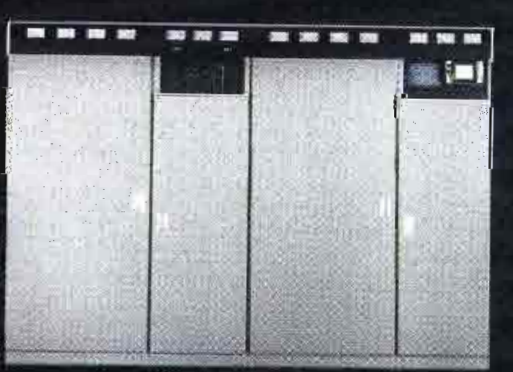


Courtesy of Scala Electronic Corporation

COMARK IS HERE

With a total commitment to the broadcast industry providing:

- The latest in UHF and VHF transmitter technology
- Maintenance service 24 hours a day
- Site Analysis Installation and Field Engineering
- Retrofit evaluation and installation
- Worldwide experience, personalized and responsive to your individual needs



COMARK COMMUNICATIONS, INC.
an affiliate of Thomson-CSF

Route 309 & Advance Lane, Colmar, PA 18915
(215) 822-0777 • Telex: 846075

Circle (22) on Reply Card

must be determined carefully. Many receiver manufacturers specify V_r for 20dB of receiver quieting. This level is a convenient reference point. However, it should not be used for fade margin calculations. For maximum system performance and reliability, the fade margin determination should be based upon the signal level required to provide the minimum acceptable receiver S/N performance.

The recommended fade margin for a 150MHz band RPU system is at least 10dB plus 2dB for each 10 miles of line-of-sight path distance greater than 10 miles. At 450MHz, the fade margin should be increased to a minimum of 15dB plus 3dB for each 10 miles of distance greater than 10 miles.

These fade margins are designed to limit periods of performance degradation of the radio link to 1% or less during worst-case environmental conditions. The fade margin assumes transmit and receive antenna clearance above the ground and all obstructions of 50 feet to 100 feet.

Although it is important to provide an adequate fade margin, needlessly high fade margins should be avoided. Spectrum congestion may result from excessive transmitted power. Variable power output transmitters give the user the capability to adjust for an optimum fade margin, while keeping radiation toward other stations at a minimum.

Antennas

The success or failure of an RF link depends greatly on the antenna system. The difference between a successful RPU system and one that fails to cover the intended area is usually decided by the antenna system. Gain is only one element. Although many RPU installations rely on omnidirectional receive antennas, directional receive antennas can solve (or create) many problems.

Many engineers mistakenly assume that the best location for their RPU receive antenna is as high as possible on their tower. That may not be the case. A receive site that appears to provide good coverage for your field vehicles, from a height standpoint, actually may not be a good site for your RPU receiver.

A high location is usually optimum for both transmission and reception. However, if the site also contains several other stations or services, then the high-level RF may prevent the RPU receiver from operating properly.

Even if the other services are operating in widely separated bands, high RF voltages can desensitize the receiver, which will at least reduce your effective range and may completely block your desired signal. Try to determine what frequencies and power levels might be encountered at the proposed receive antenna location. Armed with this information, the receiver manufacturer may be able to help you determine if the proposed location will cause a problem.

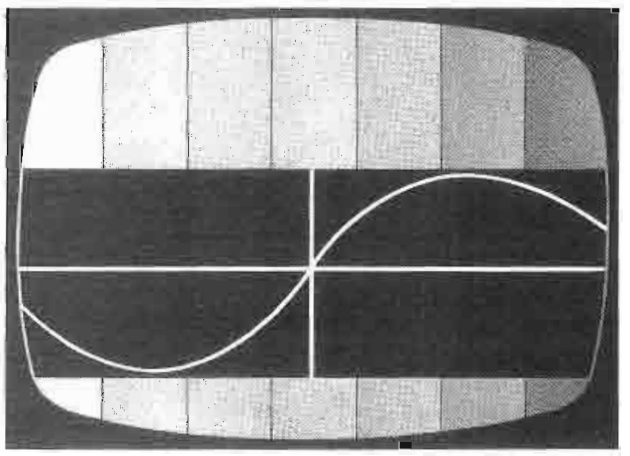
It's sometimes necessary to separate the receiver and transmitter antennas to prevent overloading the receiver. As shown in Figure 5, the amount of isolation provided between antennas is primarily a function of spacing. UHF antennas can generally be placed closer together than can VHF antennas for the same amount of isolation. Vertical separation provides more isolation than horizontal separation. Tower coupling and nearby reflective surfaces can alter the amount of isolation provided in any installation.

If desensitization is a problem and separation cannot cure it, the next alternative may be tuned filters or cavities. A well-designed cavity or filter, located prior to the receiver front-end, will usually reduce the out-of-band signals enough to permit proper operation. Some receiver manufacturers provide internal

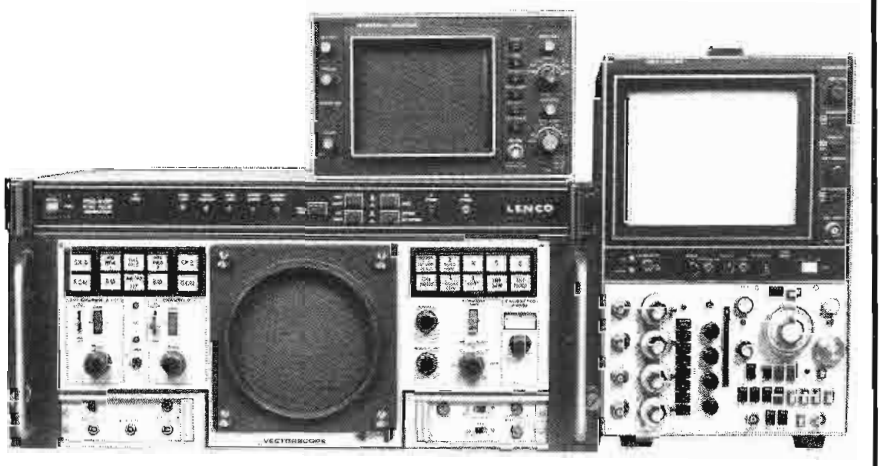
Continued on page 42

SYSTEM TIMING & SC/H PHASING CAN BE

EASY OR DIFFICULT



LENCO VIDEOSCOPE



WAVEFORM, VECTORSCOPE, SYNC GENERATOR & OSCILLOSCOPE

LENCO now provides you PAL and NTSC VIDEOSCOPES. These VIDEOSCOPES transform a complicated task into an easy, convenient one!

Until now detection of timing and SC/H phasing problems has required some very expensive and complex measuring equipment. The equipment was so complex that it required extensive knowledge and training to operate.

Now at a single glance of a standard video monitor, system timing and phasing problems and errors can be quickly detected, and both problems can be easily and accurately corrected without the need of complicated and expensive test equipment.

The VIDEOSCOPE'S "on screen" graphics system and LED readout provide critical sync to subcarrier phase information in a simple to understand, accurate video display — on a standard color or monochrome monitor. SC/H relationship is easily and accurately displayed in degrees by an LED readout — not by complicated test equipment.

Locating time base error, sync to subcarrier jitter, system crosstalk problems as well as referencing network subcarrier may be difficult with other equipment. But not with the LENCO VIDEOSCOPE. It was designed for ease of operation and accuracy!

Take the time and guesswork out of your SC/H and system timing problems! ***Go the easy and efficient way with the LENCO VIDEOSCOPE.***

LENCO

CONTACT: LENCO International Sales Manager

300 N. Maryland • P.O. Box 348 • Jackson, MO 63755 USA • TWX 910/760-1382 • Telephone: 314/243-3147

Circle (24) on Reply Card

The dupe.

The master.

To David Griffin, CEO of Rock Solid Productions, transferring tape to film is standard procedure. Here's what he has to say about Fuji Betacam® videocassettes.

"A few years ago, people thought tape to film transfers were impossible. But my company has built its reputation on it. I attribute a large part of our success to the reliability of the videotape we use. After all, any imperfections in the tape aren't going to disappear on film.

"That's why for the past three years, we've used nothing but Fuji Betacam videocassettes. In fact, we've used Fuji exclusively since we've been in business. Because even though we shoot on tape, our clients expect the quality to be as good as film."

FUJI PROFESSIONAL VIDEOTAPE

Circle (25) on Reply Card

Continued from page 38
filters for their receivers. Even so, this may not be adequate to sufficiently reduce the problem. The key is a bandpass filter with sharp skirts to prevent extraneous signals from desensitizing the receiver.

Figure 6 shows frequency response for a typical RF bandpass-reject filter. Don't select a filter with a too-narrow bandpass. If you do, the received audio quality will be severely limited. Although using filters or cavities is inexpensive, the savings may be insignificant compared with the cost of locating the receiver on another tower or building.

The remote broadcast setup shown here uses several wireless links and a dual-line return link for program transmission. IFB is provided via small beltpack receivers.

Broadcasting from an aircraft poses special problems for the RPU equipment. The equipment shown here is capable of dual-frequency operation, which provides reliable operation for the station's helicopter traffic reports.

Photos by Ben Weiss, KLSI-FM, Kansas City, MO

Antenna types

The easiest RPU receive antenna to use is the omnidirectional type. It is simple to mount and provides circular coverage, which is usually important. Large towers can affect these antennas, so the mounting location on the tower is important. It is usually best to space these antennas away from the tower at an optimum distance. Because that distance varies with frequency, check with the manufacturer before installation.

There may be situations that demand a more complex receive-antenna system. This is especially true if you want to extend the RPU system's range without interference from other transmitters.

The typical RPU directional receive antenna has five elements, providing approximately 10dB of gain over a reference dipole. Radiation patterns for this antenna are shown in Figure 7. Note that the antenna's pattern is different for horizontal and vertical polarizations. It may be important to know this if you run into interference problems. If additional gain is needed, more antennas can be stacked together or larger antennas can be used. Also, 10-element antennas are commonly used.

Simply stacking antennas together is not as easy as it might appear. If they are improperly spaced, the pattern and gain of the assembly can be severely deteriorated. If you plan on using more than one antenna to build an array, be sure you follow the manufacturer's installation instructions.

Of course, the drawback with using a directional receive antenna is that it must be rotated to aim at the RPU transmitter. A remote-control system can be used to properly orient the antenna. The remote control should provide both receiver signal strength and azimuth indications. Operators will soon become familiar with "zeroing in" on the remote site if they have the proper indications on the remote-control system.

Most RPU receivers provide a field strength or AGC signal that can be buffered to drive the remote control. The antenna rotor also has a dc voltage, which can be used to derive a reference-direction signal for the remote control.

There are several advantages to using a movable receive antenna. First, it is easier to eliminate any interference that may be present (assuming it is not located on the same azimuth as the remote pickup site). Second, the rotating antenna—usually an array—can provide additional gain, which will increase the potential range of your system.

Yagi antennas can be operated with either horizontal or vertical polarization. If you experience interference, changing the polarity may reduce the problem. This, in combination with being able to rotate the antenna, should provide

The ITC "Component System"

Listeners Will Love It!

Provide impressive on-air sound for even the most discriminating listener at an unbelievable price/performance relationship.

The Best of Both Worlds

The ITC "Component System" combines the quality of digital source material with ***all*** the operational flexibilities of an all-cart format. Simply record from a compact disc onto a ScotchCart®II broadcast cartridge using a 99B master recorder with ELSA, then play back on a DELTA reproducer!

Separately, These ITC Components are Impressive, Together They're Awesome!

Cartridge, tape and machines have been designed by a single manufacturer to compliment each other like never before and produce uncompromising audio quality.

1. **99B Master Recorder**—Loaded with features
2. **ELSA**—A patented automatic cartridge preparation system
3. **DELTA Reproducer**—Outstanding audio performance in a reliable, mid-priced cartridge machine
4. **ScotchCart®II Broadcast Cartridge**—Capable of frequency response equalling professional reel-to-reel performance

Allow ITC's "Component System" to provide your facility with the operational flexibilities of an all-cart format while you offer your listeners impressive on-air sound they are sure to love.

When newer technology emerges, it will come from International Tapetronics Corporation/3M, "The Leader in Reliability and Service."

Call today to discuss financial options and the unbelievable price/performance benefits of the ITC "Component System." In the U.S., call toll-free **800-447-0414,** or collect from Alaska or Illinois **309-828-1381.** In Canada, call Maruno Electronics, Ltd. **416-255-9108.** In most countries outside the U.S. and Canada, information on ITC equipment can be obtained through local distributors.

International Tapetronics Corporation/3M
2425 South Main Street
P.O. Box 241
Bloomington, Illinois 61702-0241

3M

Circle (26) on Reply Card

interference-free, reliable reception.

Remote site equipment

Most of the information on receive antennas also applies to the transmit side. Usually, smaller antennas are used at the remote site because it's physically difficult to handle large antennas. They have to be installed and removed for every broadcast. Also, pneumatic masts have limited support capacity.

If you are going to the trouble of building a van, go ahead and install a pneumatic mast. Although it's expensive, it's worth it. A 30-foot mast will allow you to shoot over most local obstructions and keep the antenna far above any crowds that gather around your truck.

These masts have two disadvantages. First, either an air compressor or bottled nitrogen must be used to raise them. Compressors add to the vehicle cost and bottled gas must be constantly monitored so you don't run out just before a broadcast.

The second and far more dangerous disadvantage concerns safety. At least one engineer has been killed while using a telescoping mast. It's a good idea to install roof-mounted lights, so you can check the area above the mast before raising it at night. It is also a good idea to install an air-pressure switch and alarm in the mast's air line. Connect the switch to the van's ignition switch. Properly wired, the alarm will sound when someone tries to start the van with the mast in a raised position.

When fully compressed, the mast will extend approximately one foot above the top of the van. Keep this in mind when driving or you might make an expensive mistake. Vans equipped with telescoping masts *cannot* be driven into parking garages. At least one engineer has learned this the hard way.

Don't forget to service the mast. As the mast is telescoped up and down, the leather seals begin to dry out. Dirt collects on the mast surface and causes friction between the mast and the seals. If it is not properly maintained, cold weather can cause it to stick in the extended position or to not fully extend itself. The mast should be cleaned regularly with a soft cloth and oiled according to the manufacturer's recommendations. Special oils are sometimes suggested by the manufacturer.

Automatic relay stations

Although the example remote setup did not require an automatic relay station (ARS), they are sometimes required. If you have been unfortunate enough to discover that a relay system is required for your station, then additional complexity (and cost) comes into play. Special FCC rules apply when using ARS, so be sure you have a copy of them before you begin.

A basic ARS system is shown in Figure 8. This system requires a receiver with special control circuits and a transmitter located at some midpoint in the signal path. Usually, the station will locate the ARS at a high location and relay the programming back to the studio on a second frequency.

The originating (field) frequencies can be in the 150MHz band or the 450MHz band. However, retransmission must be in the 450MHz band. If the originating signal is in the 450MHz band, the relay signal must be separated by at least 4MHz. The FCC also requires that some protection be incorporated into the transmitter control circuit to prevent the transmitter from remaining on the air when no program signal is present.

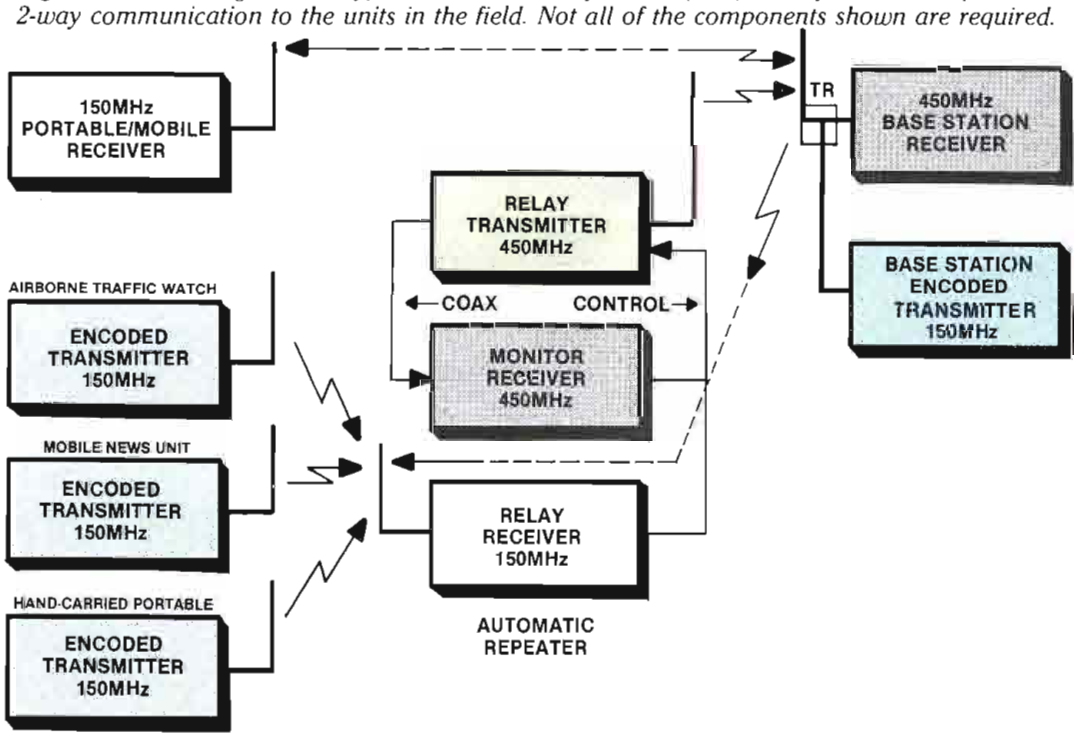
An adaptation of the ARS idea is the mobile repeater. It basically operates the same as an ARS system, but over a much shorter path. The repeater system becomes useful when a wireless microphone is needed to cover an event. News events are the most likely to need mobile-repeater operation. As shown in Figure 9, a hand-carried transmitter is used by the talent or newscaster. The small transmitter's signal is received in the mobile van, fed to the high-power transmitter, which is also located in the van, and finally relayed to the studio on a second frequency.

Wireless microphones

In the example, the disc jockey and guest are provided with wireless microphones operating in the 450MHz band. To minimize multipath dropouts, a diversity reception system is used.

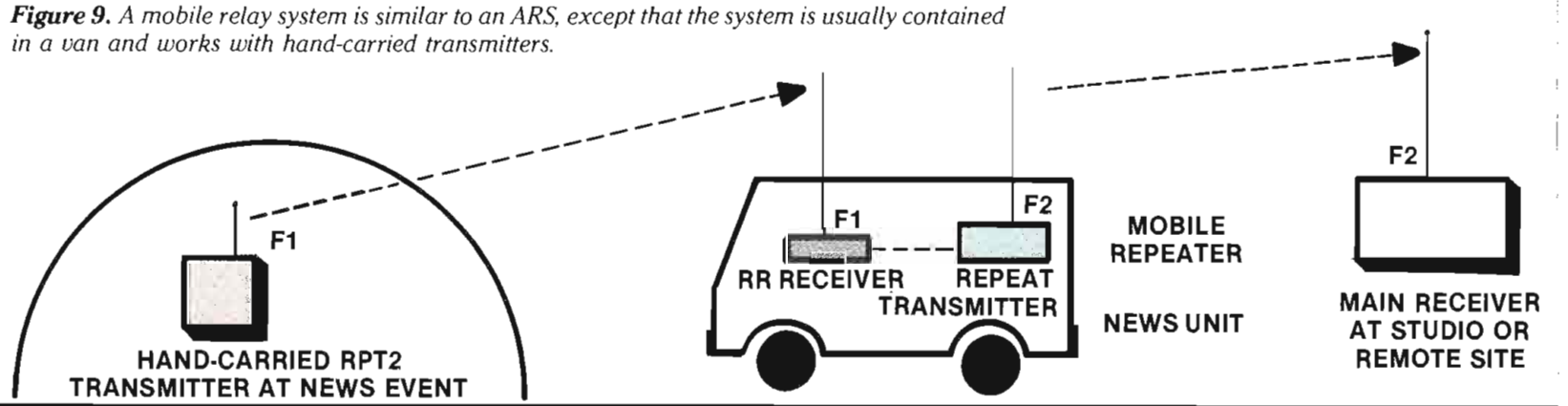
A typical space-diversity receiver system is shown in Figure 10. Three receive antennas are located as near as practical to the microphone area and approximately ½-wavelength apart. Two antennas are vertically polarized and

Figure 8. *Block diagram of a typical automatic relay station (ARS). The system shown provides 2-way communication to the units in the field. Not all of the components shown are required.*



Courtesy of Marti Electronics

Figure 9. *A mobile relay system is similar to an ARS, except that the system is usually contained in a van and works with hand-carried transmitters.*



Courtesy of Marti Electronics

Auditronics announces linear fader console performance at rotary knob prices.

Only one company has the technological know-how and experience to give you big-board linear fader console performance in an economical, easy-to-use rotary knob configuration.

That company is Auditronics, a recognized leader in linear fader broadcast consoles. And the product is our new Stationmaster 1000 Series. This family of state-of-the-art broadcast consoles lets you upgrade your station's performance without revising your equipment layout or blowing your budget.

Take our Stationmaster 1008, for example. It packs more performance into a yard than you ever thought possible.

Its performance begins with superior sonic quality, and continues through advanced ergonomic design with eye-level copyboard, plug-in circuit board construction, illuminated push-button switching, all VCA level controls, simple instant mono to stereo upgrade, and more.

The Stationmaster 1008 is the 8-channel member of our family of rotary knob consoles offering from 6 to 12 mixing positions, and from 18 to 36 inputs.

Learn how the Stationmaster 1000 Series can give you big board console performance at rotary knob prices. Call Auditronics today, toll-free at 800-638-0977 for complete information, or circle reader service number.

auditronics inc.

3750 Old Getwell Road, Memphis, TN 38118 • 901-362-1350

Circle (27) on Reply Card

one is horizontally polarized. The antennas are connected to an equal gain combining network, which feeds the receivers. The reason for using diversity reception techniques lies in the phenomenon known to FM broadcasters as multipath.

All wireless microphones operate on a line-of-sight basis. If the microphone's signal bounces off a reflective surface, such as a building girder, mylar set material or camera, then two or more signals may arrive at the receiver at the same time. These signals can cancel, creating the familiar dropout. By using more than one antenna and a proper combining system, this problem is minimized.

Figure 11 plots field strength vs. distance. As you might expect, the field strength drops as the distance between the receiver and transmitter increases.

How the space between dead points (nulls) is related to frequency is shown in Figure 12. A 400MHz transmitter is subject to this problem at approximately 1-foot intervals. A lower-frequency 40MHz transmitter has a much longer space between nulls, about 12 feet.

The graph shows how important it is to prevent these dropouts through diversity reception. Research shows that for a 10dB RF and audio S/N degradation, a single antenna will be dropout-free more than 90% of the time. Using two antennas provides the same degree of protection 99.3% of the time. Three antennas, the most common system, provides 99.7% reliability.

IFB

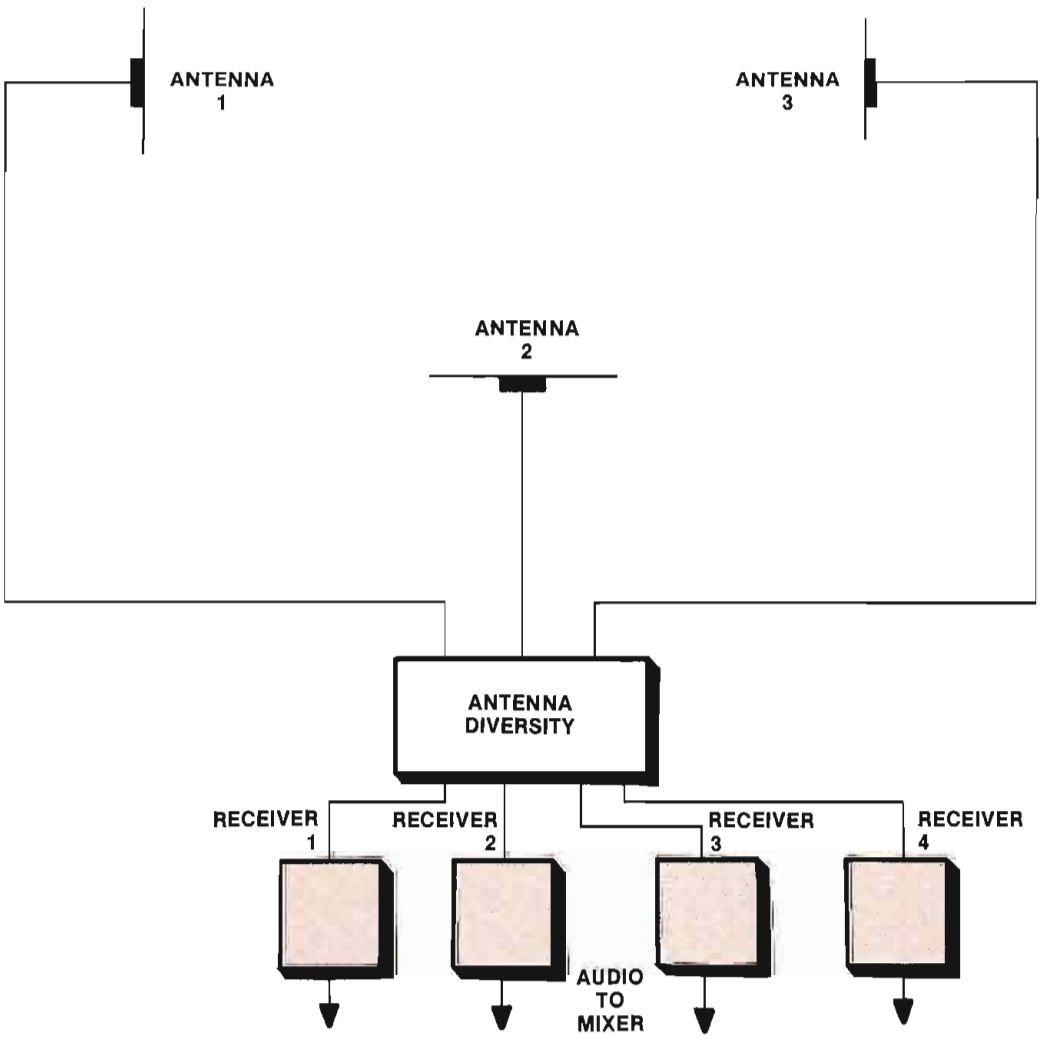
At this point in the example, a working remote broadcast circuit has been assembled using either telephone or RF links back to the studio. Also, the wireless microphone system has been installed using diversity reception. In many cases, that is all that is required. However, stations frequently find it necessary to be able to *talk back* to the talent while they are on the air.

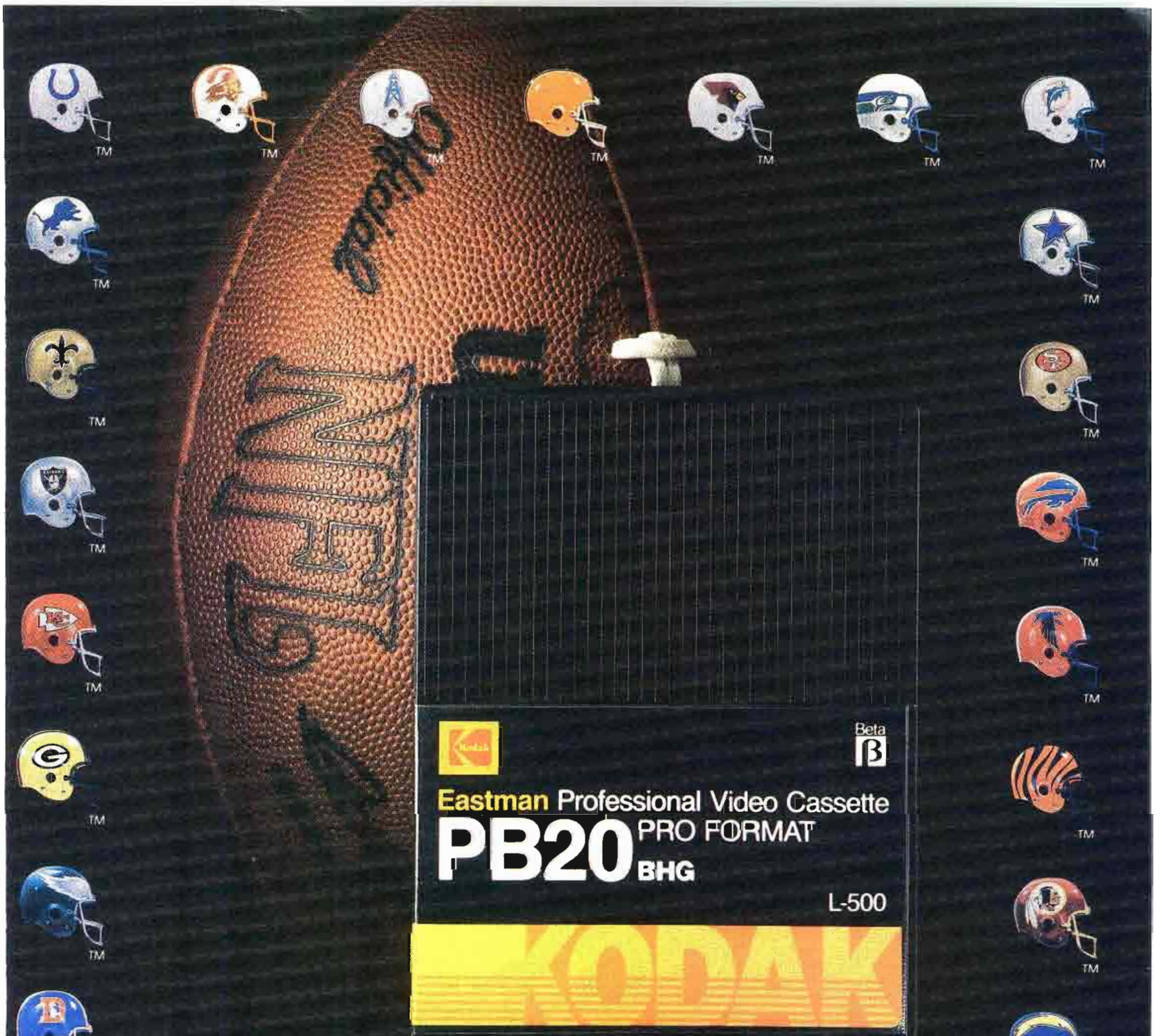
This talkback process—IFB—is also called program interrupt (PI) or cuing system. In any case, the goal is to provide the talent, located away from the studio or control point, with both a program signal and instructions or cues.

IFB can be carried by wire or wireless systems. If it is carried by wire, a separate amplifier provides a program feed back to the talent on a pair of wires. This system requires an additional cable between the talent and mixing position. Although that may not be difficult, a wired-IFB system won't work if wireless talent microphones are used.

A wireless IFB system provides many advantages compared with a wired system. The talent is free to move around, unencumbered by cables. The disadvantage is that extra work and

Figure 10. *A spaced-diversity wireless microphone system relies on three antennas spaced apart and specially combined prior to feeding the receivers.*





PRO CHOICE.

Pro Format EASTMAN Professional Video Cassettes have been selected for use this season by the National Football League.

The pros chose our ½-inch video cassette for the same reasons broadcasters have approved it for network use in Betacam and Betacart equipment—high-quality performance, skilled engineering support, and a name synonymous with dependability and value.

Learn more about Pro Format EASTMAN Professional Video Cassettes by writing Dept. A3068, Eastman Kodak Company, 343 State Street, Rochester, NY 14650. Or call toll free 1 800 44KODAK (1 800 445-6325), Ext 862.

Official video tape of the National Football League

Circle (29) on Reply Card

more equipment (and frequencies) are required to make the system perform properly. And there is always the chance for interference or frequency congestion. This point is especially important when covering major news events where outside news crews may be on the scene.

There are several ways to accomplish a wireless IFB link. A television or FM SCA signal is often the easiest to use. This scheme has the advantage of needing little on-site equipment. The talent simply wears a small receiver and earphone tuned to the station's frequency. If necessary, the IFB equipment can be hidden so it is almost impossible to see by the audience. The IFB audio is controlled at the studio or remote site and the director can override the program at any time to cue the talent.

True wireless IFB systems provide high-quality audio. This is an important aspect to anyone who has to wear the earphone for any length of time. A high-quality system allows the talent to judge the overall quality of the mix. It is also less fatiguing than listening to a 2-way-quality signal.

If a 2-way radio is used to supply the IFB signals, the transmitter must be capable of continuous operation. If not, the talent will be able to hear only the cues, not the complete program. A limited audio-quality IFB system can be inexpensively constructed from a 2-way transmitter, operating at a reduced power level. The reduced power level is required for the transmitter to operate continuously.

If the remote broadcast takes place at a location that can't receive the station's carrier or 2-way signal, a dial circuit can be used to back-haul the IFB.

If a satellite uplink is being used for the program channel, it also can provide back-haul for the IFB. However, because of the 46,000-mile path for the back-haul, a delay of about a half-second will be encountered in the return audio. This delay can confuse speakers because they hear themselves live and then again a half-second later. For this reason, back-haul is often handled over dial circuits when SCA or other local signals are not available.

A systems approach

When you design your remote broadcast system, start with the programming needs. Technology (and money) can solve just about any programming problem. The key is to decide exactly what capabilities you want for the system.

If you want to play records from the remote site, then a monophonic, dial circuit may not be adequate. Likewise, if most of your remotes take place at the local car dealer's showroom and only voice transmission is needed, then a full-blown satellite system is overkill.

After the program requirements have been defined, design the RF portion of the system. Start with the van or portable transmitter and work back to the studio. Look at several potential locations to see what will be needed to get the signal back to the station. Stations, especially in large cities, may find that a single hop is not sufficient. If an ARS is needed, be sure the ARS receiver is properly located. It then becomes the key element in your system.

It is often possible to eliminate the ARS system by connecting the receiver output to equalized telephone lines. Investigate the phone line costs as a part of the project. In some cities the cost of full-time equalized loops will quickly pay for the ARS equipment. In other locations, intra-LATA (local access and transport areas) lines are reasonably priced.

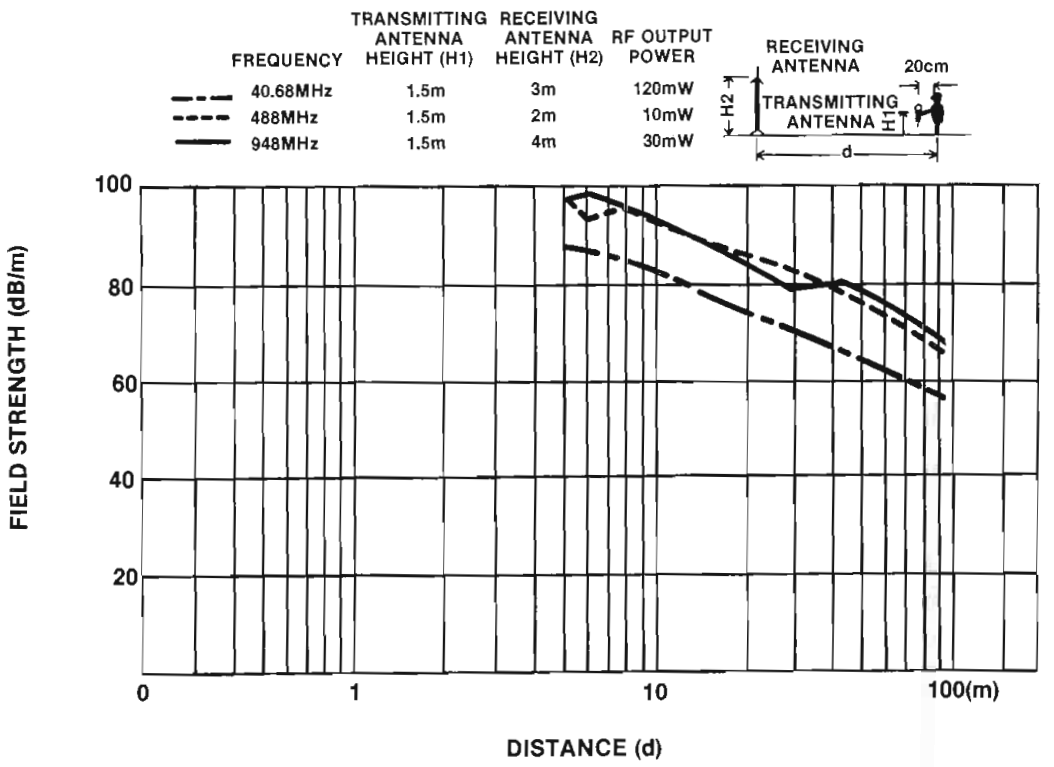
Plan the system on paper first. It is much easier to modify the design at this stage. Consult with the local SBE frequency coordinator, who can provide you with information on RPU traffic and potentially available frequencies. The coordinator may be able to lead you to a local expert on RPU systems.

Carefully budget for the system and allow for some unknowns. For instance, it may be that an extra receiver preamplifier will be needed to obtain the range you need. Not all parameters can be identified before you start.

With thorough background research, you should be able to design a system that meets the unique needs of your station, while providing the flexibility that is always required.

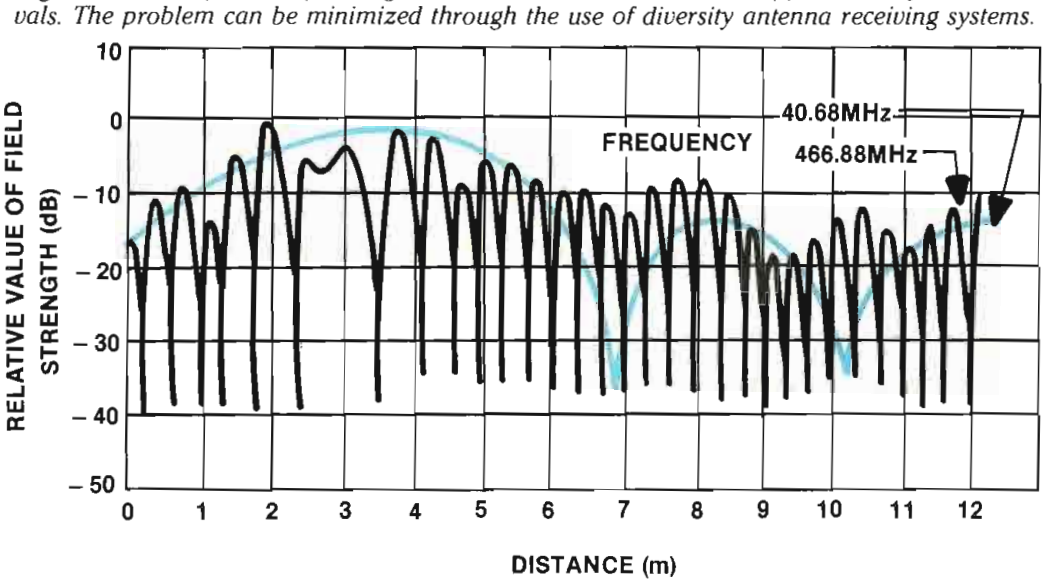
If it works properly, you'll be called a genius. If it doesn't.... |:-Y-)))|

Figure 11. *Typical wireless microphone field strength vs. distance. Note that although the 40MHz microphone had a higher RF output level, its received signal strength is less than either of the two other microphones.*



Courtesy of Sony Electronics

Figure 12. *Microphones operating in the UHF band exhibit nulls at approximately 1-foot intervals. The problem can be minimized through the use of diversity antenna receiving systems.*



Courtesy of Sony Electronics

Trucks are trucks. It's the gear inside that makes the difference.

How can you spot the best Satellite News Vehicle investment if they all look the same on the outside?

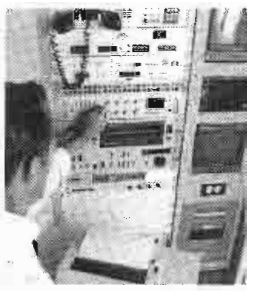
Simple. Look at the equipment inside. If it's Microdyne, you go with one of the most trusted names in satellite communications technology.

QuickLink™ superior components in an SNV.

Most SNV builders take one component from supplier A, another from supplier B and so on.

Our SNV is built to your exact specifications almost entirely with Microdyne equipment. Microdyne will do all the system design, wiring, integration, testing and training of your personnel.

Since key components are all Microdyne, there's minimal delay in making alterations, modifications or changes in years to come. Other SNV makers use somebody else's components, so getting something fixed or replaced can take a long time.



Broadcast-quality electronics built and backed by Microdyne.

Auto-acquisition system makes peaking a piece of cake.

Take the keypad and enter the truck's latitude, longitude and current compass direction.

Punch in the code for your desired satellite, and the rest is automatic. Microdyne's auto-acquisition system does the trickiest, and most critical job in very short order. In any kind of weather.

The antenna controller peaks azimuth and elevation, peaks polarization, and lets you change from one satellite to another immediately with pinpoint accuracy.

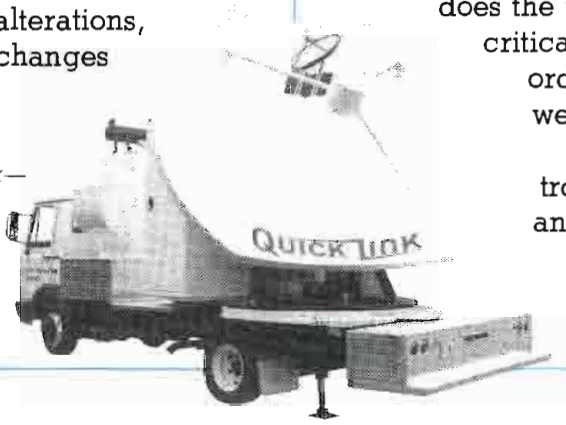
QuickLink: superior from the inside out.

QuickLink can be customized to your exact needs, from antenna size to communication package, video encryption and C-band or Ku-band receivers.

Equip your truck with any type of telephone or data link to receive voice or hard copy instructions or operation commands from the home station.

QuickLink. On the outside, it may look like any other SNV. But on the inside, it's in a class by itself.

For more information, or a demonstration, call Microdyne at (904) 687-4633.



QuickLink— a superior SNV from Microdyne/AFC.

Microdyne Corporation
491 Oak Road • P.O. Box 7213
Ocala, FL 32672 • TWX: 810-858-0307

Circle (31) on Reply Card

The News

The News Tape

Capturing the news is a tough job, and you need a video tape that gets the whole story. From harsh location environment to air, the choice is Ampex 197, 198 and 199 videocassettes. Built to provide the consistent, reliable performance you need to deliver the news.

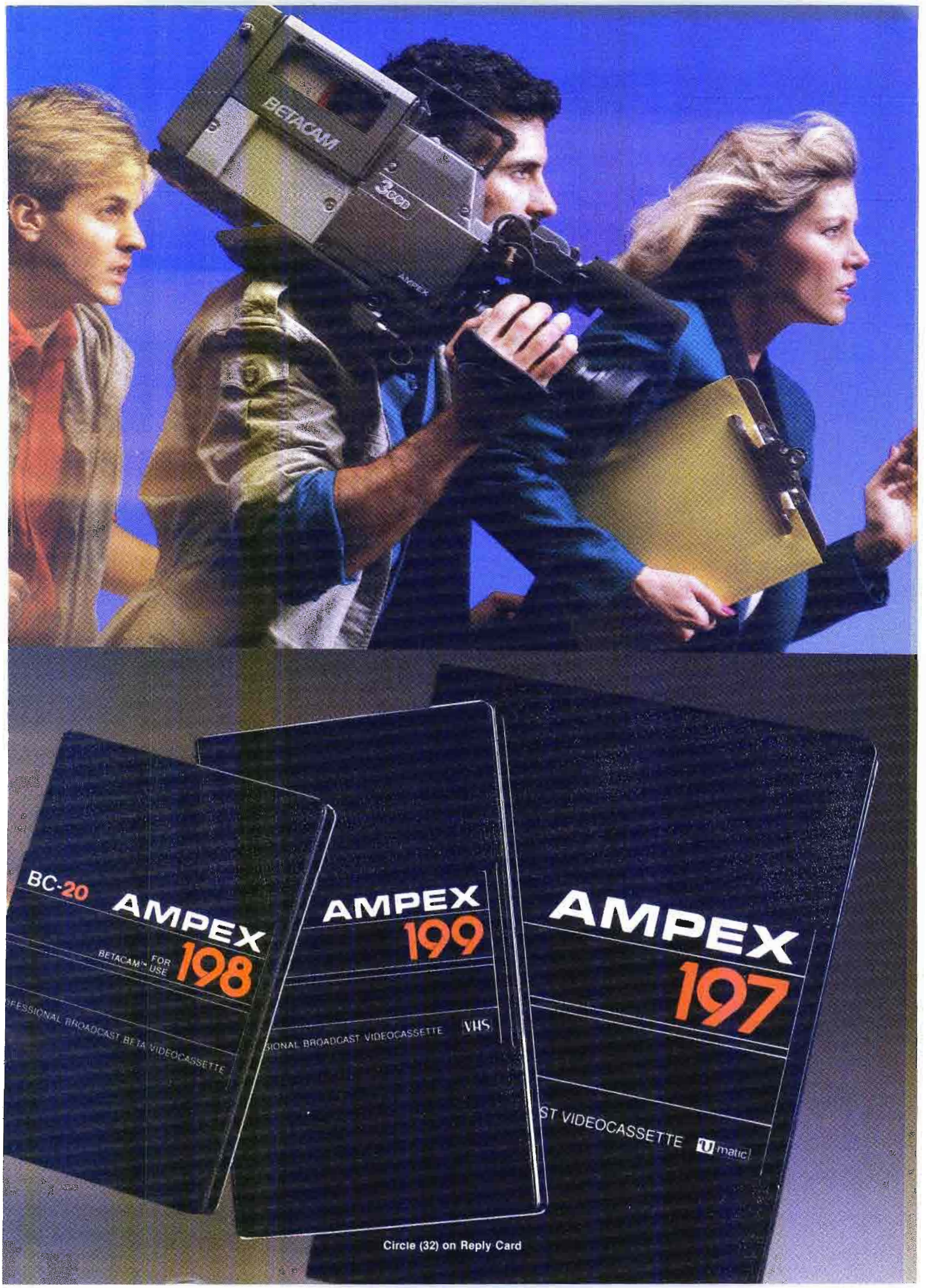
With a rugged, high-impact cassette mechanism made from the toughest ABS materials. So it stands up to the toughest handling. And a cassette shell molded from antistatic plastics to reduce static charge. So dust and debris stay in the field. Not on your video tape.

Plus you get a unique new labelling system that helps you find material fast. Because you don't have time for delays.

So when you choose Ampex 197, 198 and 199 videocassettes, you don't just get video tape. You get the news tape.

AMPEX

Ampex Corporation, Magnetic Tape Division
401 Broadway, Redwood City, CA 94063, 415/367-3928



Circle (32) on Reply Card

An RENG case history

By Mike Armatta

You can pack versatility into an RPU system if it's properly designed.

The completed van is equipped for almost any remote broadcast possibility.

Remote broadcasts have always been a part of the programming at KLOL-FM and KTRH-AM. KLOL relied on remotes for promotional purposes and KTRH used remotes as a necessary part of news coverage. The AM and FM operated independently of one another and relied on telephone circuits for most broadcast circuits. When the AM went to an all-news format, however, it was time to re-examine the commitment to remotes.

System requirements

Coupled with the AM station's format change, the increasing costs of telephone circuits encouraged reassessment of the way remotes were handled. Because the news department required rapid mobility, a mobile van was the logical choice to house the equipment. The van would allow the news department to move quickly to a fast-breaking event and cover it with a variety of equipment. The weekend talk shows also could be accommodated without additional equipment. The new design would allow the FM station to broadcast with more than *voice quality*, by using an RF rather than a telephone link.

A previously customized 1979 van was purchased for the project. The interior was removed, carpet was installed and shelves were constructed near the back. Because the van was meant to be capable of operation from shore or by internal power, a generator was needed. The generator and air conditioner were traded out from a local RV dealer.

The trade-out approach had advantages beyond the obvious financial one. The dealer was familiar with this type of equipment and could provide a clean installation that would meet electrical and mechanical safety considerations.

A 7kW RV generator was installed on the left side behind the driver's seat. Once the unit was boxed in, it became a convenient desk and workbench. A 1-ton air conditioner with heater strip also was installed. The assembly provides both cooling and heating so the staff can operate comfortably.

Additional electrical power-distribution boxes and power cables were needed. Again, for safety considerations, a local electrician was hired to complete the work. Four 110Vac fluorescent lights were installed for interior lighting. Because either generator power or shore power usually would be available, the original 12Vdc lighting was deemed sufficient. Two 500W quartz lights were installed on the van roof near the back and side doors. These lights come in handy when striking the remote after dark.

A 30-foot pneumatic telescoping mast was installed behind the two front seats. The mast allows the transmit yagi to be raised above most nearby obstructions and to be turned manually from inside the van. A small air compressor, Milton fitting and storage tank complete the assembly. The Milton fitting provides an air source for inflating tires and dusting off equipment.

Armatta is a staff engineer at KTRH-AM and KLOL-FM, Houston.

NEW. HERE. NOW.

NEW A14x9ERM

NEW A18x8.5ERM

Offering you higher performance, reliability and value, Fujinon's newest and finest ENG lenses are available now.

The new A18x8.5ERM gets you in closer and takes you out farther. It gives you two focal ranges — 8.5mm to 153mm and 17mm to 306mm — by flipping the built-in 2X extender lever. The F1.7 maximum aperture is flat to 116mm and only drops to F2.3 at the full 153mm tele position. About half an inch longer than ordinary ENG lenses, the new A18x8.5ERM's combination of range, features, and performance are making it the new world standard for electronic news gathering.

The new A14x9ERM, lighter and more compact, outperforms its predecessors and the competition. It's less than 1.4kg with the flexibility of a built-in 2X extender. MOD is 0.8m. And it provides an F1.7 maximum aperture from 9mm to 103mm (F2.0 at 126mm).

Both new lenses offer performance improvements including higher MTF with significant reductions in distortion and longitudinal chromatic aberration. Images are sharper and brighter throughout the zoom ranges. Color and focus tracking are right on. Both lenses also offer macro focusing, weatherized construction, and such Fujinon options as miniaturized, built-in pattern projectors, front-mounted wide and tele adapters, manual and servo hand controls for studio use, and push-button shot boxes for programming multiple focal positions and zoom speed.

They're new. They're here. And they're available now. To learn more about Fujinon's new ENG lenses, you'll get more information or a demonstration by calling the Fujinon location nearest you.

Circle (33) on Reply Card

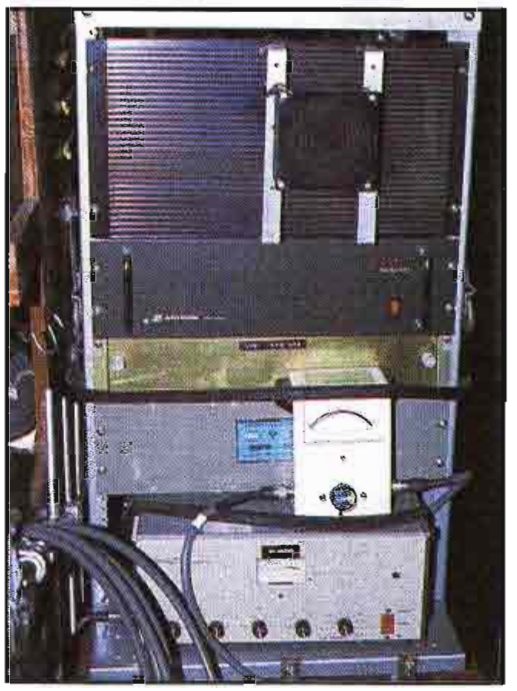
FUJINON INC.	10 High Point Drive, Wayne, N.J. 07470	(201) 633-5600 Telex 6818115
SOUTH	2101 Midway, Suite 350, Carrollton, Texas 75006	(214) 385-8902
MIDWEST	3 N. 125 Springvale, West Chicago, Ill. 60185	(312) 231-7888
WEST	118 Savarona Way, Carson, Calif. 90746	(213) 532-2861 Telex 194978

FUJINON

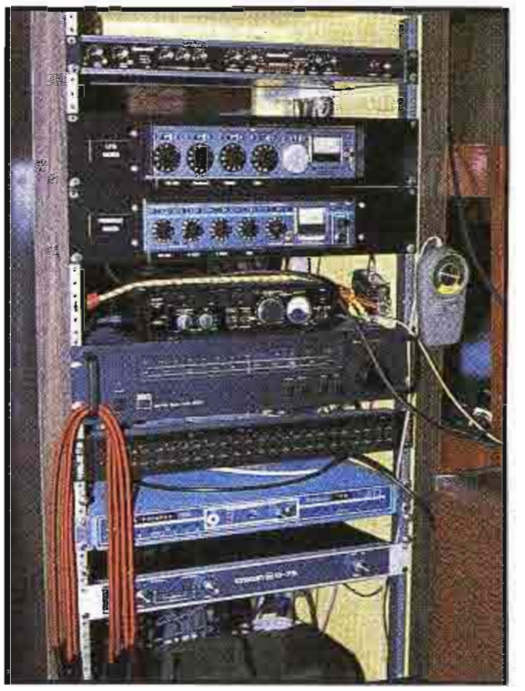
RF system

The van RF rack contains a modified UHF remote pickup transmitter. The modification allows the operator to vary the output RF level. The signal is then fed into a 100W, solid-state, continuous-duty RF amplifier, which feeds a duplexer. The duplexer allows a communications receiver to pick up IFB signals from the same RPU antenna used for transmitting. Operating over a 40-mile path using a 5-element yagi at 30 feet has never required more than approximately 35W into the antenna.

Close-up view of the RPU transmitter, meter and UHF amplifier.



The audio rack contains the audio-processing, distribution and IFB equipment.



An RF power meter in the line between the duplexer and the antenna allows the engineer to monitor the power and VSWR. Because the van is parked in a garage with a low ceiling, the antenna must be removed from the mast after each remote. By monitoring the VSWR, the engineer can detect any problems and replace faulty connectors, preventing failures during a broadcast.

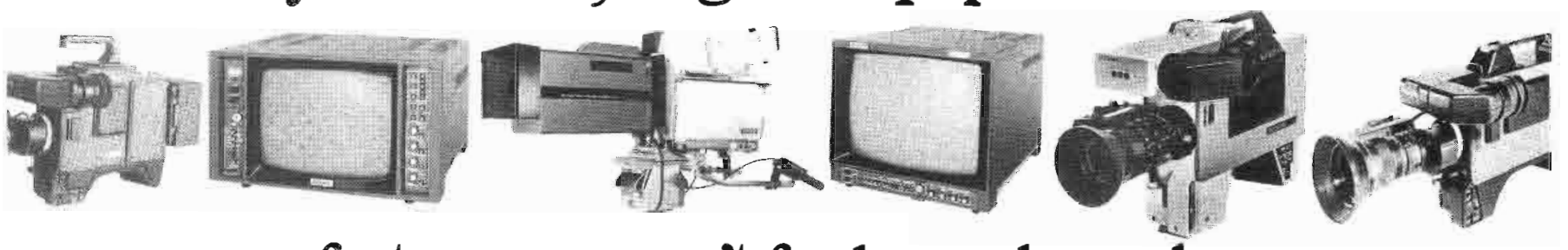
The rack is powered by a 35A power supply. The 12Vdc system is wired so that the entire rack can be operated from the van's 12V system in an emergency. All RF cabling for the RPU and IFB systems uses double-shielded RG/9-type cable. The extra shielding was needed to keep the UHF broadcast signal from desensitizing the UHF 2-way equipment.

Audio system

The audio is mixed on a 4-channel

Continued on page 58

At Landy Associates, Ikegami equipment comes with



a feature you won't find anywhere else.

Take a good look at the world's most professional line of video equipment. Ikegami color TV cameras—from the compact HL-79E to the fully automatic HK-322—and a wide range of color and black and white monitors.

Now look again. What you can't see is something Landy Associates builds into every Ikegami we sell.

Service.

We think that if you're buying the best equipment, you deserve the best after-sale support—from repair work to television systems planning. Which is why it makes sense to buy from the one Ikegami dealer who'll serve you as well as your Ikegami does.

Landy Associates. Call or write today.

Landy Associates, Inc.

REPRESENTING THE FINEST IN BROADCAST, PRODUCTION AND RECORDING EQUIPMENT

1890 E. Marlton Pike, Cherry Hill, NJ 08003, (609) 424-4660 • 330 Bear Hill Rd. Waltham, MA 02154, (617) 890-6325

Send For Our New Free Catalog

Circle (35) on Reply Card

Freeze.

Introducing the fastest, easiest way to get quality prints and slides from video.

Now you can capture the moment, freeze it, and frame it. All with the touch of a button.

With the new FreezeFrame Video Image Recorder from Polaroid.

FreezeFrame produces sharp, instant color prints and color or black and white 35mm slides from virtually any video source. And it delivers a finished picture that is far superior in quality and resolution to direct screen photography or thermal video image recorders.

If you use video, you need FreezeFrame.

FreezeFrame has hundreds of uses for anyone who uses video in their profession. It can be used in broadcast, production and advertising to proof, edit, storyboard or reference. It can be used to pull a print off a just-breaking news story, or for color correcting a proof. It can even help in film-to-video transferring. Medical professionals can use FreezeFrame for diagnostic recording, patient referral or teaching. And it's the easiest way to get slides or prints for presentations or training.

System includes Video Image Recorder, control console, and print film camera/adapter. 35mm camera/adapter optional.

FreezeFrame can improve your image.

FreezeFrame

Frame.

connects easily to video cameras, professional VCR's, laser disc players and computer graphics systems.

You can preview and even improve the video image because FreezeFrame has a full range of image enhancing controls including tint, contrast, color, sharpness, brightness and raster fill. And if you're shooting prints, FreezeFrame uses a new color print film specially developed for use with video imaging.

New FreezeFrame from Polaroid. It's fast, easy, and at $1,899*, very affordable.

To find out how FreezeFrame can help you, call toll-free **800-225-1618**, 9 a.m. to 6 p.m. Eastern Time.

Or fill out and return the coupon. We'll give you the full picture and show you just how easy it can be to capture the moment on FreezeFrame.

Polaroid

For more information, mail this coupon to Polaroid Corp., Dept. 671, P.O. Box 5011, Clifton, NJ 07015.

☐ Please send more information.
☐ I'd like a demonstration. BE 1/1

Name _____
Title _____
Organization _____
Address _____
City _____
State _____ Zip _____
Telephone _____
Video Source _____
Application _____

*Suggested list price. "Polaroid" ® "FreezeFrame" ™ © 1987 Polaroid Corporation

Circle (36) on Reply Card

Continued from page 54
portable mixer with a built-in compressor. An external audio processor also is available. This processor normally provides a small amount of expansion, which helps to clean up the ambient noises typical on a remote broadcast. It proves especially useful on remotes with PA systems. For FM remotes and some talk shows, the expansion allows higher PA levels before feedback occurs. See the system block diagram, Figure 1.

The processor feeds a dual-channel distribution amplifier equipped with transformer inputs and outputs. Half of the DA is used for program distribution, and half is used for IFB distribution. The individually adjustable outputs allow feeding of a variety of equipment, regardless of input sensitivity. A companion LED VU meter and headphone monitor jack are especially helpful when a problem develops.

Some engineers believe that transformers are no longer needed. That may be the case within studios, but the theory falls flat when you're operating in the field. The typical interface problem in remote broadcasts is common-mode hum. This phenomenon occurs when the remote unit is operating on a different power feed than the audio source. Usually the audio source equipment is located inside a building, theater or stadium. In these cases, it is seldom possible to receive an ac-power feed from the same distribution panel that is used by the audio equipment.

In Houston, at the Astrodome and at NASA, common-mode potential differences of 30Vac or more are typical. An electrically balanced input circuit using a bipolar 12V to 15V supply doesn't have a chance of coping with these conditions. In those two locations, the common-mode voltage problem is so bad that even the video feeds require transformer-coupling. To prevent any problems, all of the van's audio inputs and outputs are transformer-isolated.

The program DA output feeds the high-level RPU transmitter input. The internal RPU limiter is used to prevent overmodulation. The audio level is adjusted to use as little limiting as possible. The mixer operates at +4dBm and the RPU limiter threshold is set for +8dBm. This arrangement provides 4dB of limiter headroom and seems to complement the expansion device.

The van is equipped with three reels, each containing different kinds of audio and ac-power cable.

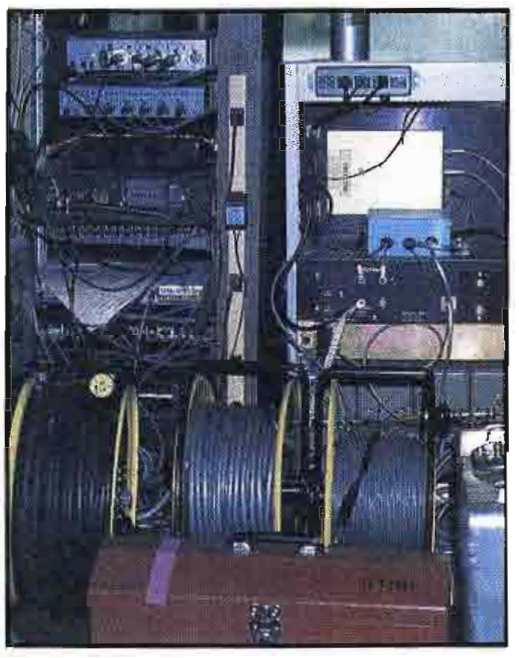
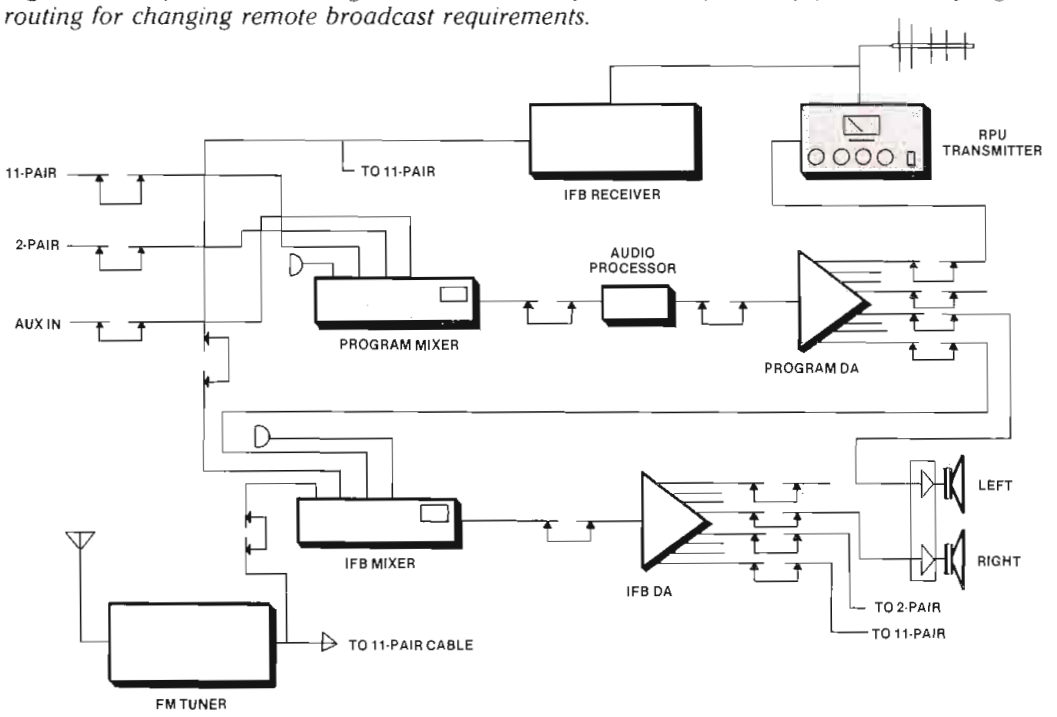


Figure 1. *Simplified block diagram of the audio system. The patchbay provides easy signal routing for changing remote broadcast requirements.*



IFB

Interruptible foldback (IFB) is handled differently for AM remotes than for FM remotes. For AM remotes, which are mainly voice communications, the program signal is relayed from the studio via the IFB transmitter. The transmitter, located on the tower, provides a narrowband, voice-quality IFB signal. When someone from the studio wants to communicate with the talent on location, the air signal is interrupted and the interrupt mic is inserted at normal level. Because of the 2-way system's narrow bandwidth, a different system is used for the FM station's IFB.

The receiver's tape inputs are looped back to the tape output with a pair of phono "Y" connectors. A high- to low-impedance line-matching transformer is connected so that the low-impedance side is connected to the IFB line from the truck. The high-impedance side is connected to the left "Y" cable on the recorder jumper. By plugging the headphones into the receiver's headphone jack and listening to *tape one*, the disc jockey can have complete control over the headset's audio while hearing the IFB in the left ear about 6dB hotter than the program. This is the case even if the DJ is monitoring other FM stations.

The IFB receiver feeds a 4-channel mixer, which is tied to the DA's IFB channel. The mixer also receives an air signal from the AM/FM receiver and a program mix from the main mixer. A microphone input also is included for communicating in case the talent is a long way from the truck. The program feed is used when mix-minus is fed from the studio.

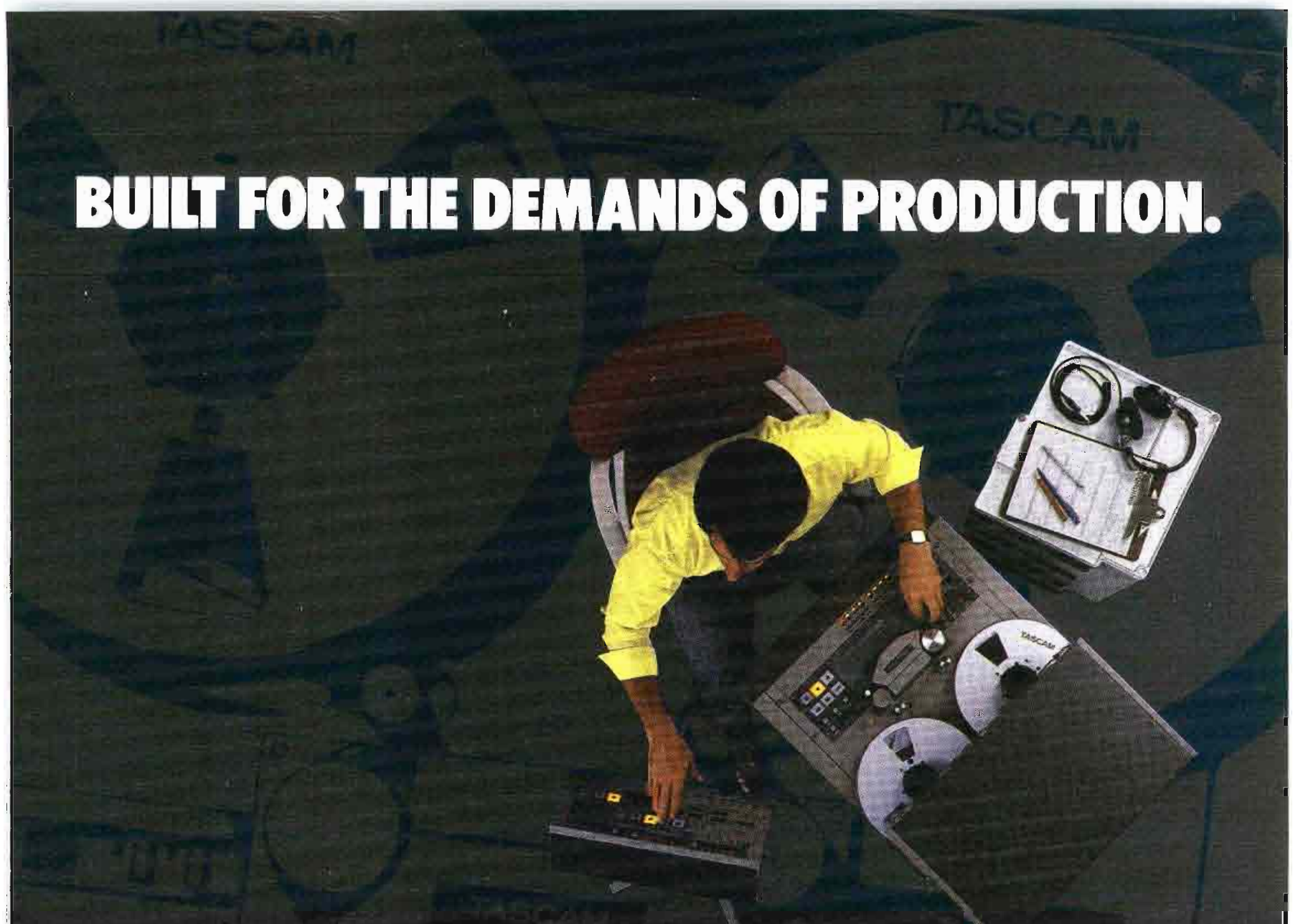
For out-of-town broadcasts, in which an off-the-air signal is not available, all remotes are handled by dial-up telephones. IFB is fed to an autocoupler dialed up by the remote site, as shown in Figure 2.

Outside equipment

Few remotes take place inside the truck. Therefore, several ways are provided to interconnect the van with other facilities. A reel containing 500 feet of 2-pair audio cable with 5-pin XLR connectors works for most of the remotes. One audio pair carries program audio back to the truck. The other pair carries IFB back to the talent.

This setup is most often used on news and FM remotes. Using a line-level microphone prevents crosstalk from the

BUILT FOR THE DEMANDS OF PRODUCTION.



In the production business, quality plus speed equals success.

That's why the TASCAM ATR-60 Series is engineered for those who make their living with recorders. All five share a design philosophy stressing function over flash; an overriding concern for performance without complication; a thoughtful integration of features which respond to the needs of the professional.

—On every ATR-60, the deck plate won't flex. Ever. So you won't be compensating for flex-induced phase or wow and flutter in post production.

—The unique Omega Drive puts less stress on your tape, so the cumulative tension of a thousand start/stop passes won't reach your tape.

—Heads designed and manufactured by TASCAM means Sync frequency response equals Repro, so you don't have to rewind and change modes to make critical audio decisions.

—Sync Lock and the most responsive servo control in the business will keep you working instead of waiting for a machine to lock up.

—Time Code Lock keeps code coming from the Sync head, regardless of the audio monitor mode, so your synchronizer won't get confusing double messages when modes are switched.

—Input Enable/Disable allows you to monitor any source without repatching or changing mixer settings, avoiding a common cause of aborts.

—Long cable runs don't bother a TASCAM ATR-60, since +4 dBm, +8 dBm and even +10 dBm levels are available.

There are five ATR-60 recorders: the ATR-60-2T (IEC Standard) Center Track Time Code; ATR-60-2N/2D Quarter-inch Mastering; ATR-60-2HS Half-inch High Speed Mastering; ATR-60-4HS Half-inch 4-Track High Speed Mastering or Multitrack; and the ATR-60-8 Half-inch Production Quality 8-track.

To see, hear and feel them, visit your nearby TASCAM dealer, or call TASCAM for the name of the dealer nearest you.

Production is a demanding business. And the ATR-60's are built to meet the demand.

Pure Performance

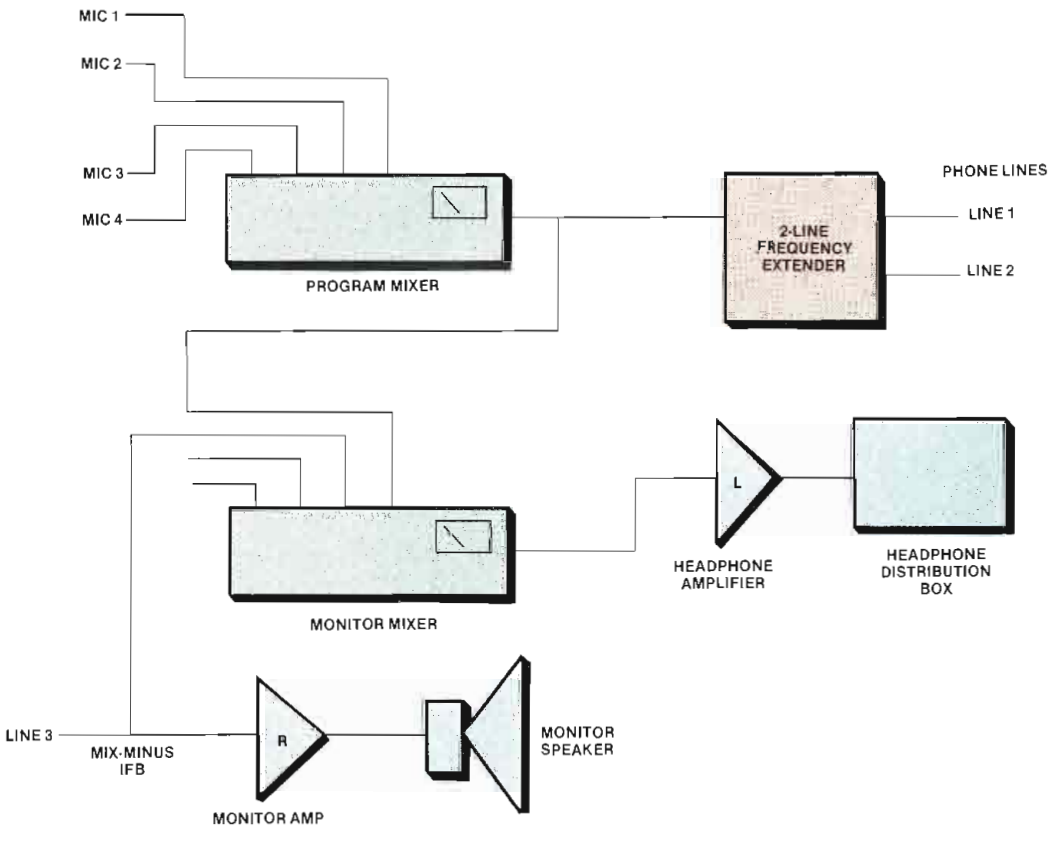
TASCAM

TEAC Professional Division

7733 Telegraph Rd. • Montebello, CA 90640
Telephone: (213) 726-0303

Circle (37) on Reply Card

Figure 2. *When broadcasting from a distance, dial-up telephone lines are used for both program and IFB.*



IFB circuit. A battery-operated headphone amplifier is used for the talent headsets. If more than one microphone is needed, a 4-channel mixer is used to mix the audio before it is fed down the line.

A "grab bag" is used to carry microphones, stands, mixers, cables, headsets, clocks, spare batteries and the multitude of other items necessary for a successful remote. The main equipment is transported in an aluminum equipment case. A smaller tote tray is used when the full case is not needed.

Under normal circumstances, only a microphone, headset amplifier and the headsets are carried in the tote tray. The station uses a model with a small drawer built into the bottom where spare batteries, tape, adapters and test equipment are carried.

Another cable reel with 200 feet of 11-pair audio cable and XLR connectors is available for larger remotes. The cable carries IFB, air signal, PA audio, telephone and mixer/cue speaker power. An additional 300 feet of cable is available.

A third reel contains 200 feet of 12-gauge 3-conductor ac-power cable.

Anything less than a Neve is just a lot of...

Bells and whistles may be all you need for New Year's Eve...or a birthday celebration. But is a desk full of bells and whistles enough for the demanding art and science of broadcast production? You need the Neve difference.

At Neve, the first name in audio mixing control and distribution systems, we offer you all the bells and whistles your creativity demands...as well as the sonic quality, reliability, and ease of operation that sets Neve apart from the rest.

Neve's versatile 51 Series, for example, gives you the full range of advanced facilities you want, plus the virtually unlimited versatility you require...to let your creativity soar. With features that include:

- 16-to-60 inputs
- Custom configurations
- Stereo or mono modules
- A choice of 4 standard consoles
- Up to 8 auxiliary outputs
- Multitrack recording capability
- 4-band Neve Formant Spectrum Equalization

Hear the Neve quality difference for yourself. Find out firsthand how Neve advanced engineering gives you "a touch of the future."

Circle the bingo card for a literature pack. Or call (203) 744-6230 for a demonstration of Neve sound at your location.

- Nothing sounds as good as a Neve... because nothing else is.

Rupert Neve Incorporated
Berkshire Industrial Park
Bethel, Connecticut 06801
Telex 969638
Facsimile (203) 792-7863
(203) 744-6230

Neve Electronics Int'l Ltd.
Cambridge House, Melbourn, Royston
Hertfordshire SG8 6AU, England
ph (0763) 60776 fax (0763) 61886
telex 81381

7533 Sunset Blvd.
Hollywood, California 90046
(213) 874-8124
Facsimile (213) 874-1406

P.O. Box 40188
Nashville, Tennessee 37204
Telex 786569
(615) 385-2727

Neve
A Siemens Company

NOISE

Circle (39) on Reply Card

NEVE-004 WLM 467

This cable will power the electronics in the truck or run from the truck to the remote site with power for the audio equipment. A 50A power connector is used to connect the truck to shore power for maintenance or long-term remotes.

Two separate 2-way transceivers and two mobile/cellular telephones complete the communications package for the van.

Pigtails with bare ends and alligator clips help simplify connections to the power boxes.

For remotes that require a long or difficult cable run, a 1,000-foot spool of 3-pair solid-conductor telephone-type cable is carried. It is inexpensive, and can be sacrificed at the remote.

Communications equipment

Because the van is heavily used by the news department, communication with the outside world is essential. A UHF 2-way radio is used to communicate with the news and engineering departments, through their respective repeaters. Direct channels also are included, allowing communication with hand-held units when the van is outside the repeater's range.

Both the AM and the FM are primary EBS stations for the Houston area. A VHF RPU frequency has been licensed by KTRH for use by the county and city governments to communicate with the media during disaster conditions. The system is called *PIES* (Public Information Emergency System). Because KTRH uses the unit for disaster coverage, a VHF 2-way is mounted in the van. The radio also is equipped with city and county emergency management frequencies and local fire and police frequencies.

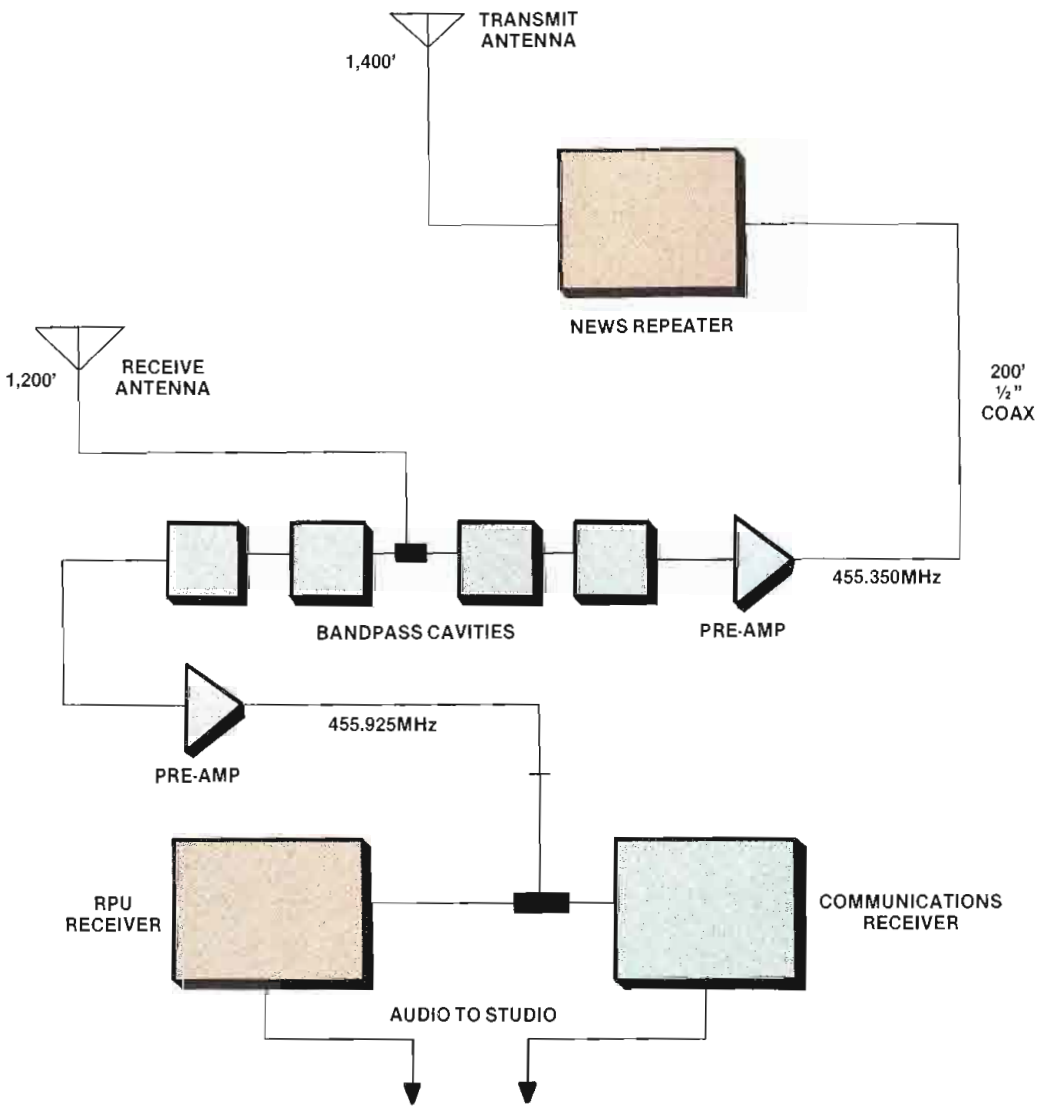
The van carries two mobile phones. The primary unit is a cellular phone, usable only in metropolitan areas. A recent addition to the van, a cellular-to-RJ-11 interface, allows a standard phone to use the cellular radio system. When used with the 11-pair cable, a phone can be provided at the remote site without incurring any installation charges. The cellular phone stores several telephone numbers, allowing all of the station's important numbers to be accessed simply by pressing a couple of buttons.

For remotes outside of Houston, and as a second line, an IMTS (Improved Mobile Telephone Service) unit is carried. This is the old-style mobile phone system that is widely used and available in most areas.

A programmable scanner monitors frequencies not available through the 2-ways. Although most of the common frequencies are already programmed into the scanner, a list of unusual and secondary frequencies is carried with the van. These can be programmed into the scanner whenever they are needed. The scanner is capable of AM reception for emergencies involving aircraft or for monitoring airport traffic.

Two wall-telephones are carried for long-term remotes. These Touch-Tone compatible instruments are mounted on modular wall hangers. If only pulse-service is available, a rotary set replaces one of the tone instruments on the wall mounting. An interface panel is provided at the back of the truck for telephone connections. This panel has both modular and banana jacks for phone line connections. One of these lines is normally connected to the cellular interface.

Figure 3. *Block diagram of the senior road tower repeater installation.*



Senior road facilities

The fixed-support facilities (repeaters/receivers) are located at the senior road tower. The UHF RPU receiver is located on a radio tier at the 1,200-foot level. Several stations in the Houston area have receivers at this location and the site has relatively few RF problems. The omnidirectional receive antenna provides 3dB of gain and is mounted on one of the 2-way stanchions. A 20-foot run of ½-inch coax connects the antenna to the equipment shelter mounted on the same level. The complete system block diagram is shown in Figure 3.

Inside the equipment shelter the signal is split, with each half passing through two custom bandpass filters and a GaAs

LEITCH LISTENS

It's the reason why these three new Leitch test generators are tailored to your needs.

These three new test generators may look alike. But the software inside tells another story. Before they were designed, we sat down with transmitter, studio and transmission people to find out what they needed and wanted.

With these new Leitch 2500 NTSC test generators, you get digital generation for accuracy and stability. The Transmitter and Transmission generators deliver up to 60 signals while the Studio generator provides 56 different signals. All with 10 bit precision.

Upgradeable EPROMs allow you to have the unit adapted to meet new signal requirements. And you get Leitch ease of operation.

If you want further information, just write or call. You'll find we're not only good listeners, we're good providers.

LEITCH

Leitch Video International Inc., 10 Dyas Road, Don Mills, Ontario, Canada M3B 1V5. Tel.: (416) 445-9640 or 1-800-387-0233. Telex: 06 986 241
Leitch Video of America, Inc., 825K Greenbrier Circle, Chesapeake, VA, U.S.A. 23320. Tel.: (804) 424-7920 or 1-800-231-9673. Telex: 710 882 4342

Circle (40) on Reply Card

FET pre-amplifier. One output is connected to a splitter, which feeds the RPU receiver and a communications receiver, each tuned to the same frequency. Both receivers are connected to the studio by separate 15kHz telephone circuits. At the studio, the two circuits are distributed to AM control, all news work stations and FM control.

Dual telephones provide the necessary pulse or tone access to land-based or cellular phone lines.

The communications receiver serves a unique function for the news department. All of the news 2-way units have the capability to transmit on the RPU frequency. They also can receive signals on the IFB frequency. When the news repeater is overloaded or otherwise unusable, reporters can switch to this backup to file reports from the field.

The other output of the cavity/pre-amplifier combination is fed 200 feet up the tower to the news repeater receiver. This special antenna feed was necessary because the repeater receiver would not operate properly in the high-RF environment at the 1,400-foot level. By using the receive antenna located 200 feet lower and the cavity/pre-amplifier combination, the coverage was dramatically increased. Another station had the same problem, so the receiver feed was split again to provide an additional feed.

The IFB transmitter is located on a radio tier at the 800-foot level. The transmitter is a recycled 2-way base station capable of continuous-duty operation at 15W. The transmitter is fed by a 5kHz telco circuit connected to the station's intercom system.

For AM remotes, predelayed audio is normaled to the IFB transmitter through the intercom. This allows the producer or news editor to interrupt the program from their consoles. During FM remotes, only the FM board operator has access to the IFB.

Success

The RPU system has been in use for more than three years, with few problems. Few modifications in the original design have been necessary. Most of the equipment is inexpensive and is available from a number of sources.

The success of the RPU system can be attributed to two important elements: First, station management provided the funds to purchase the needed equipment. Second, the programming and news departments were able to define their needs so engineering could design a system that would meet the station's requirements. In a project such as this one, the only way to success is teamwork among all departments.

Alden Color Radar: All The Extras At No Extra Cost.

A color radar system should include certain features as standard. Because while the base price may look OK, it can be a shock when you put together the options that make it perform the way you want.

That's why you should look at the Alden C2000R. We've just redesigned it to include more features than ever—and kept the price the most competitive around.

Our radar network has expanded. You can access any NWS radar in the country, over 120 of them nationwide. And each has its own customized 4-color background—you don't pay extra for it.

We've also added four built-in range displays, from 25 to 200 miles, so you can focus on your local weather, or display the entire region—at the push of a button.

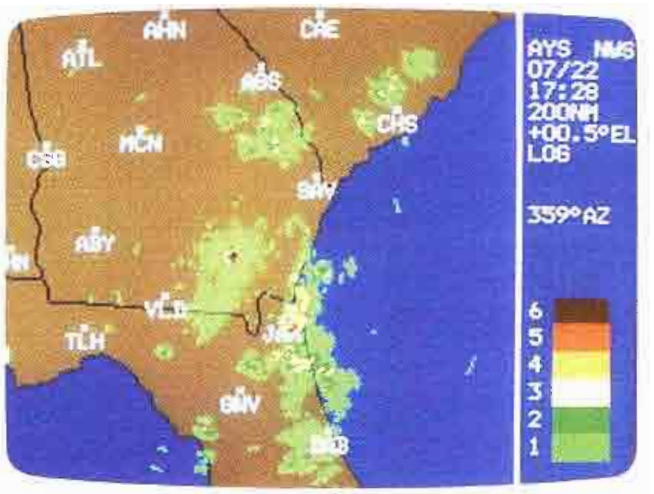
Our image memory has been expanded so you can store up to 16 images with the standard system, or add another 48 frames if you want. You can loop combinations in time-lapse sequences to emphasize the drama of storm movement.

And now you can collect your time-lapse sequences more easily than ever. Our new auto-dialer can be programmed to automatically call the radar at preselected intervals—freeing you up for other important tasks.

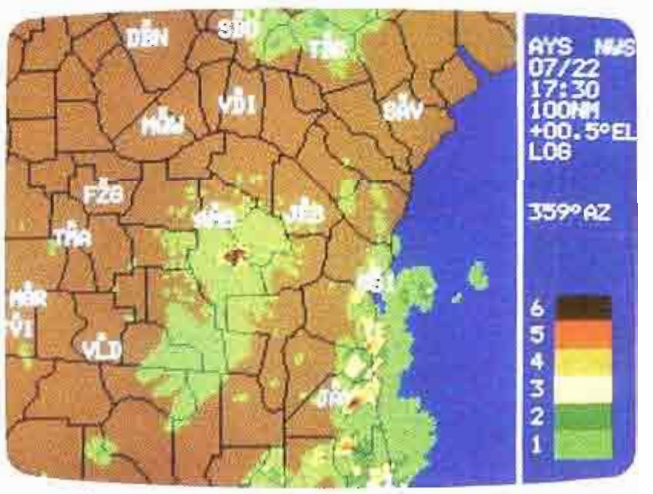
We still include the wide variety of standard features that make Alden the most flexible system you can buy. Zoom, pan and scroll, range rings and sweep line. And NTSC and RGB compatibility that make it usable for broadcast.

In addition to the C2000R radar system, Alden offers the C2000S weather graphics system, which lets you access a variety of private databases. Our "building-block" design lets you add either system to an existing C2000 model at any time in the future, with minimal additional cost.

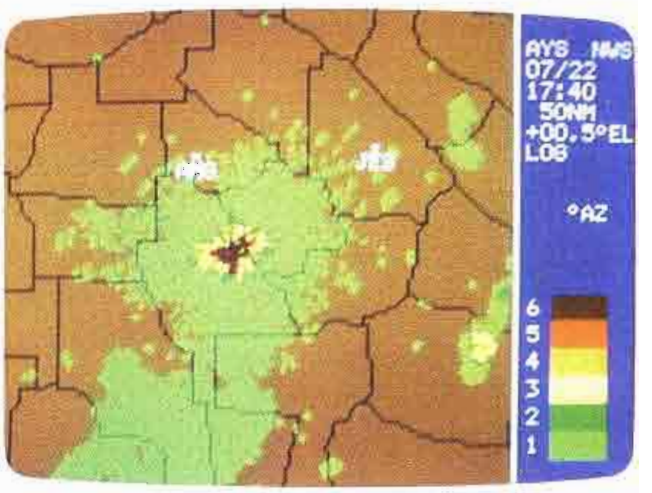
For more information on Alden's weather radar and weather graphics systems, call or write Alden Electronics, 135A Washington Street, Westborough, MA 01581. (617) 366-8851.



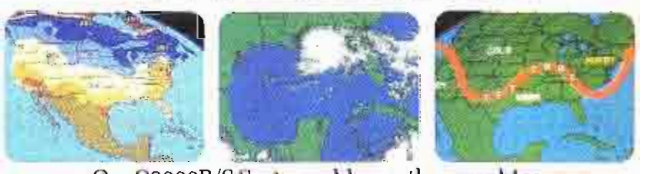
Waycross, GA: 200-nautical mile range.



Same storm, 100-NM range (with county lines).



Close-in, 50-NM range (same storm).


Our C2000R/S System adds weather graphics such as these from major private databases.

Please send information on:

- ☐ C2000R Color Radar System
- ☐ C2000R/S Radar and Color Weather Graphics System
- ☐ C2000M Single Picture (radio version)

Name_____

Company_____

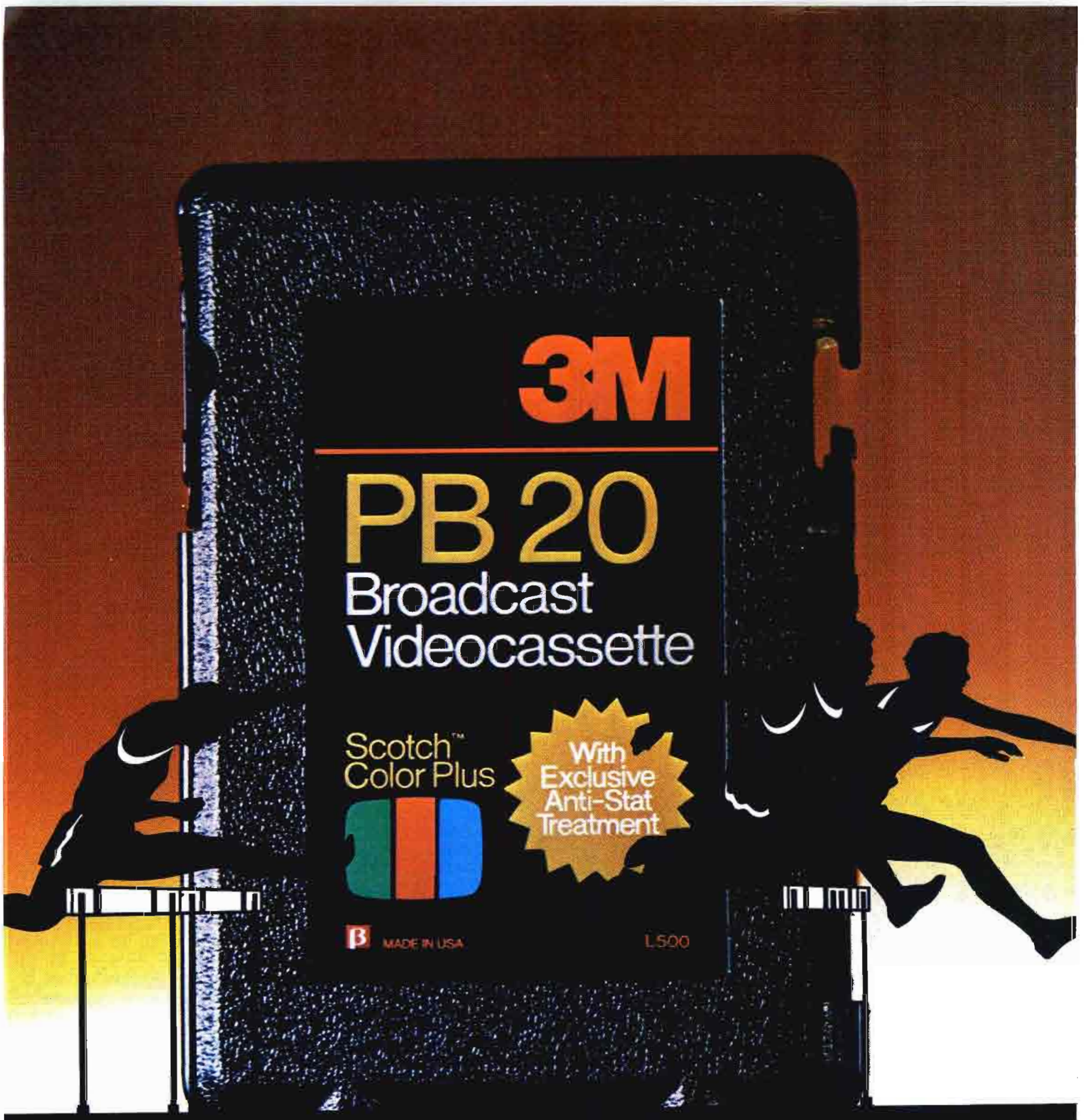
Address_____

City_____ State____ Zip____

Phone_____

ALDEN ELECTRONICS

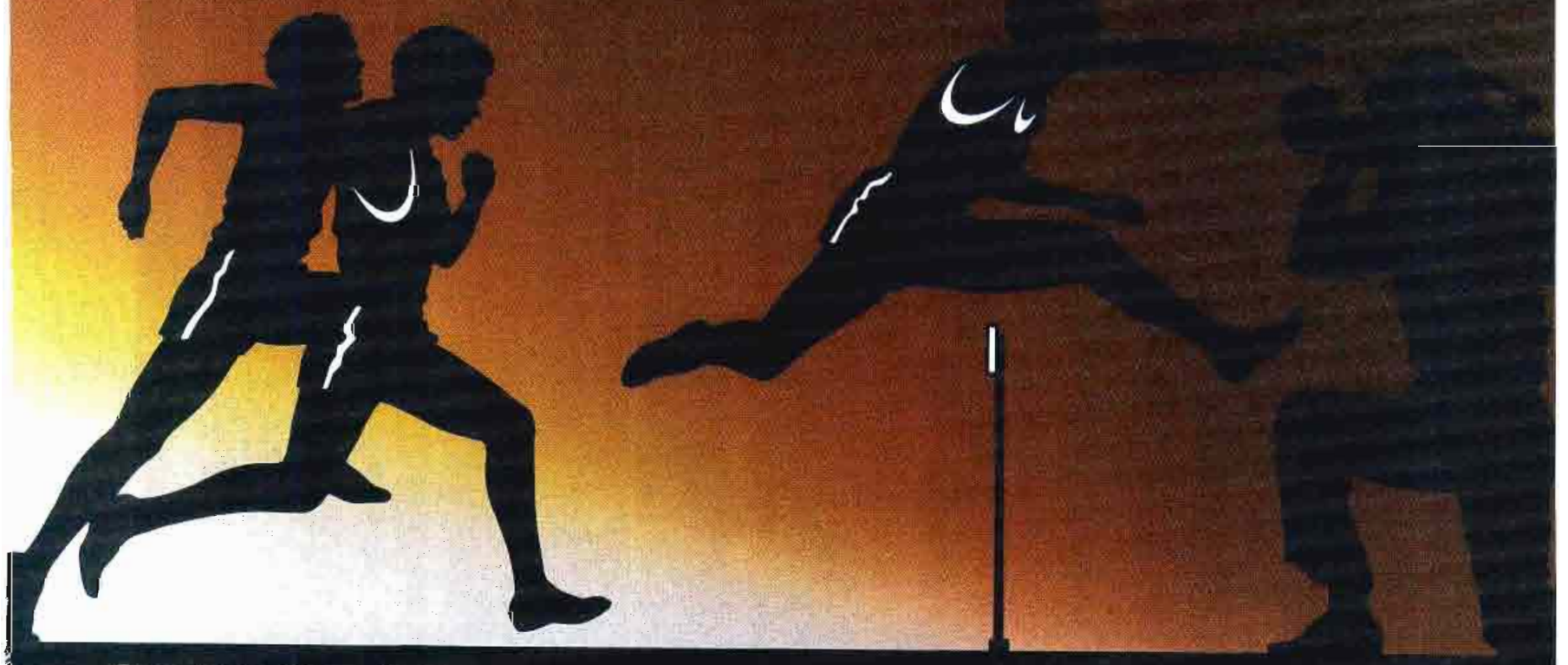
Circle (42) on Reply Card



One Tape for a True Picture.

When you have one chance to get a story, you can't take any chances with your tape. So the tape you take is the 3M ½" Broadcast Videocassette. With our exclusive Anti-Stat™ System–to reduce its static charge and help prevent the dust buildup that causes dropouts. To give you broadcast quality in a ½" format–the true test of a true picture.

TO THOSE WHO HAVE ONE CHANCE TO GET A STORY, ONE TAPE IS TRUE.



One Tape Stands True.

When you have one chance to get a story, we aim to be the one name you take with you. Just as we've been since we invented videotape 30 years ago.

That's why we stand by you–with the largest support force in the field.

And we stand behind you–with some of the most advanced research in the industry. All to keep our standing as–number one in the world of the pro. See your authorized 3M distributor for more information.

NUMBER ONE IN THE WORLD OF THE PRO

3M

Worldwide Sponsor
1988 Olympic Games

Circle (43) on Reply Card

Planning a remote production vehicle

By Ned Soseman,
TV technical editor

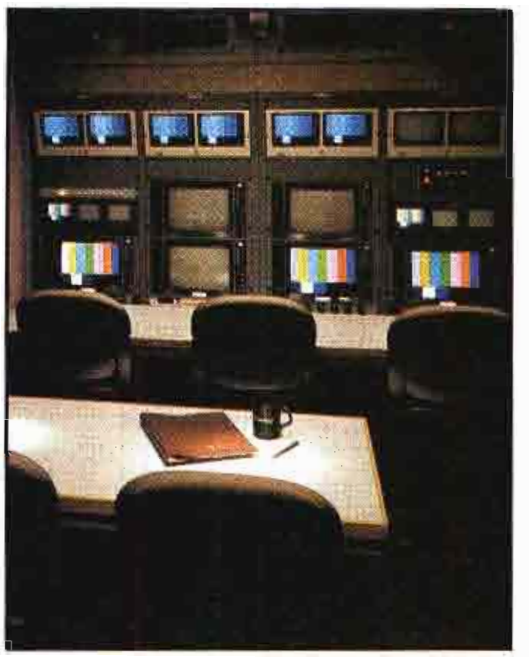
Comprehensive planning for battlefield conditions will support the troops and please the generals.

The remote production vehicle (RPV) is as unique to the broadcast industry as the studio camera. Aside from some broadcasters, and a handful of cable and high-end industrial RPV owners, the government is the only other user of RPVs.

Because of this highly limited market, if you are considering purchasing an RPV, you can avoid buyer's remorse, endless criticism, inconvenience and potential trouble by asking the right questions of your station and market. Approach the RPV issue with as many facts about your specific applications and operations as possible. Compared with other TV plant projects, RPVs can't be planned for expansion. Once the basic chassis is ordered, the RPV's limitations are well defined.

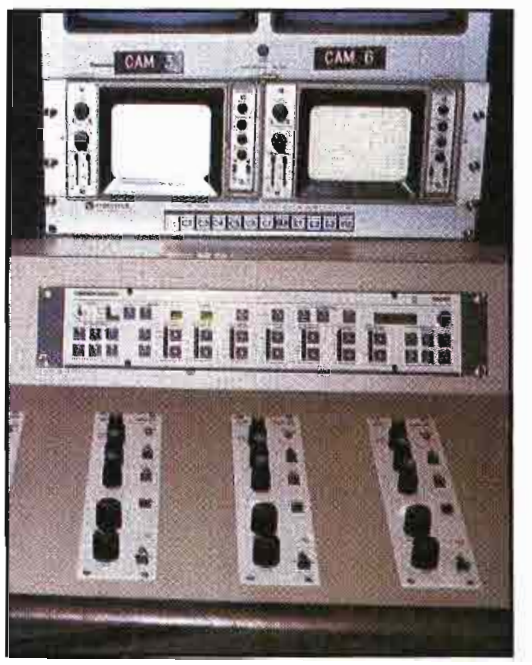
Getting started

The planning can be divided into two stages: planning the applications of an RPV and planning the design. The first step is to clearly define the reasons your station is buying an RPV. Identify all foreseeable potential applications, including the manpower requirements of the vehicle, and determine the geographic area in which it will be driven. The station's general manager, chief engineer, operations manager, production manager and, perhaps, the news department must work together to agree on the answers to these questions.

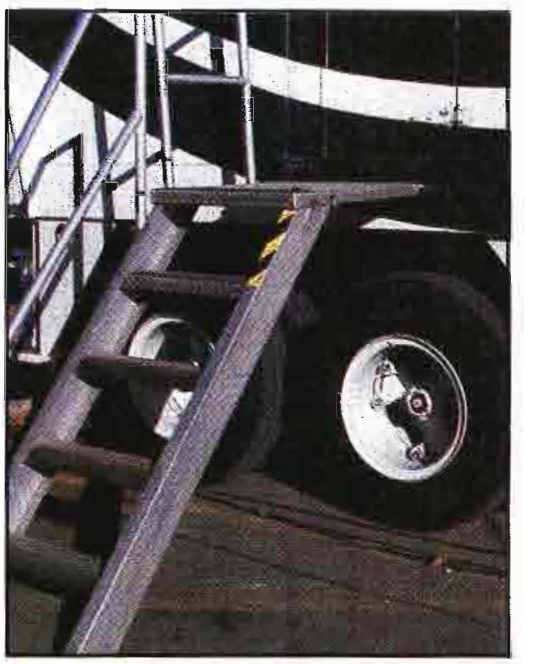


The director's position in NBC's NT-5.

When planning an RPV, be sure to leave space for the coffee pot and ice chest.



Although automatic camera setup has simplified the camera shader's job, manual control of iris and pedestal is still required.



These steps leading into the RPV don't allow for 2-way traffic, but require less storage space than wider steps or a deck would.

The first perfect tape

RAKS®

The RAKS Corporation introduces a new, ultra-high quality, super-tough professional 30 minute BetaCam® tape. Its specially-formulated, ultrafine cobalt oxide gives this new tape truly exceptional performance—high recording density, low chroma noise levels, virtual elimination of drop-outs. And absolute mechanical reliability.

Experience RAKS perfection. Request a test tape:
Contact RAKS Corporation of America,
201 Route 17, Suite 300, Rutherford, NJ 07070 (201) 438-0119

®BetaCam is a registered trademark of the Sony Corp.

Circle (44) on Reply Card

Following the rules on RPVs

Federal Department of Transportation (DOT) regulations apply to all motor carriers with a gross vehicular weight (GVW) in excess of 10,000 pounds. This would include most RPVs, many mobile satellite news and some ENG vehicles.

DOT regulations prohibit drivers from operating these vehicles if they have been on duty for 15 hours or more following eight consecutive hours of rest. The term "on-duty" refers not only to driving, but to any type of work. Also, a driver may not drive for more than 10 hours following eight consecutive hours of rest.

Drivers who travel beyond a 100-air-mile radius of the normal work location are required to maintain a *record of duty status*. This record has replaced the *drivers daily log*. Details of this record are set forth in DOT regulation Title 49 CFR, Section 395.8.

In essence, this regulation states that all drivers are required to record, in duplicate, certain information on a specified grid. The grid may be combined with company forms. Grids are available from many print shops and form suppliers.

Required information includes:

- Date;
- Total miles driven today;
- Truck or tractor number;
- Name of carrier or company;
- Driver's signature and certification (that all information is true and correct);
- 24-hour-period start time (i.e. midnight, 9 a.m.);
- Main office address; and
- Remarks (include information on all stops, including fuel, food and accidents).

The grid contains hours in ¼-hour increments, and driver status. Status includes:

- Time off-duty;
- Sleeping berth time (if applicable);
- Drive time; and
- On-duty, not driving, time.

Each change of duty status must include the name of the city and state where the change of status occurs.

If an inspector finds violations of the record-keeping requirements, a fine of up to $500 may be assessed, and the vehicle or the vehicle operator may be placed "out-of-service" for eight consecutive hours. For a driving time violation, a $1,000 fine may be assessed. In addition, a driving time violation that results in injury or death, or a pattern of violations of either regulation, could cause a $10,000 fine to be assessed.

For further information, contact the Federal Highway Administration in Washington, DC, at 201-366-4000, and reference Title 49, Section 395. State and local regulations may exceed those of the federal government. Contact the highway department in each state your vehicle may cover.

Editor's note: This information was obtained from the National Association of Broadcasters legal department memo No. L-614 and the Federal Highway Administration.

Today's intensive cost accounting demands active upper management participation. However, keep in mind that you're only as good as your last production. Regardless of size, any RPV represents a major investment. Plan your vehicle for maximum benefit, flexibility and safety, with minimum up-front and ongoing costs.

Budgeting

There are several levels of production requirements that will determine the overall scope and subsequent price tag of the project. On-site commercial videotaping will require the least from an RPV; live professional sports coverage will require the most. The first "yes or no" question to answer is whether the unit will be used for remote videotaping or live program feeds.

Remote videotape production can rely on post-production editing back at the station for insertion of graphics, digital effects, cutaway or insert shots, audio sweetening and other effects. This minimizes indispensable on-board capabilities. In contrast, live sports programming requires the RPV to supply a finished production with all the video effects, audio and sweetening at the output of the truck.

Identifying the RPV's use requirements will reveal the requisite budget. Investments can start at about $90,000 for a basic 2-camera "industrial" panel van

The belly boxes on an RPV trailer easily accommodate bulky items such as tripods.

to about $3 million or more for a full network sports RPV unit containing at least five to eight cameras and three or four slow-motion VTRs.

Dealing with several departments and a budget typically means compromises. If requirements include major sports pickups, compromises could be the first nails in the coffin of a project that hasn't been born yet. The unique requirements of sports coverage mandate the use of well-known, brand name equipment and layouts that will be familiar to outside personnel who may work with or lease the RPV. If major sports is not a requirement, then base any compromise on applications flexibility and station philosophy.

The next questions to study concern numbers. How many cameras and VTRs will be required? How many people will occupy the RPV during its operation? Secondary questions should be about the geography and terrain the RPV will cover, as well as the parking spaces that will be available at known field locations. The answers will identify the chassis requirements and, hence the RPV's cost.

Chassis choices

Federal regulations limit the maximum size of truck trailers to 48 feet in overall length, 13'6" maximum height, and 8'6" maximum width. An expandable side may be added to a truck to increase the working width, when parked, to about 12 feet.

A tractor trailer unit offers the advantage of space (a maximum of about 350 square feet of deck space is available without side expansion) and large storage potential in the *belly boxes*. (Belly boxes are the storage areas available beneath the deck of the RPV, usually forward of the rear axle, which are accessed outside the vehicle.) Typically, multimillion-dollar tractor trailer rigs are used almost exclusively for network sports feeds.

Single-unit vehicles

A single-unit vehicle (cab and box on a common chassis) is more maneuverable, easier to drive and park, and less expen-

Broadcast-"Sharp" pictures from a handheld camera... at a price you can carry.

Sharp XC-A1 ENG/EFP Color Video Camera

Leave it to Camera Mart to bring you quality and reliability at a reasonable price. Witness: the new Sharp XC-A1 color video camera.

The Sharp XC-A1 quality starts with an advanced ⅔" compact tube. Three diode gun/mixed field saticons and prism optics combine to give you 750 lines of enhanced resolution.

A high 57 dB signal-to-noise ratio gives you quiet pictures even when you go to 9 dB or 18 dB gain.

The XC-A1 is automatic so all you do is compose and shoot. It has computer-controlled auto-centering, auto-white, auto-black, plus an intelligent auto-iris that can handle intense color fields.

The 1.5" electronic viewfinder keeps you fully informed, and a "user-friendly" character display coaches you for set-up in plain English—then moves out of your view.

All this in a solid, die-cast body that can balance its light weight perfectly on your shoulder...even without being held.

Now at Camera Mart—the Sharp XC-A1 high performance camera...at a price you can carry.

The Camera Mart Inc. 50 YEARS 1936-1986

The more you know about video, the more you can rely on Camera Mart.

The Camera Mart, Inc.
456 West 55th Street, New York 10019 • (212) 757-6977
Telex: 275619/FAX (212) 582-2498
305 Vine St., Liverpool, NY 13088 • (315) 457-3703
Sales • Service • Rental

Circle (45) on Reply Card

sive than tractor trailer units. Common to many local broadcast stations, beyond ENG-type van conversions, is the *cube van.* This is a "cutaway" van chassis with a steel or aluminum cube-shaped box attached to the frame directly behind the driver. The box allows adequate headroom, and its interior is typically 14 feet long and a little more than 7 feet wide, providing approximately 100 square feet of total space including storage.

Drawbacks to single-unit trucks are a 29-foot maximum box length and storage space limitations. Single-unit trucks use a drive shaft to connect the engine to the rear drive wheels. The drive shaft eliminates belly boxes, common to trailers, that extend the width of the truck. Typically, belly boxes in single-unit trucks are only about 3 feet deep. This limits storage space available for cameras, tripods, light kits, cables and other bulky items.

To buy a new, unmodified 14-foot cube van off your local truck dealer's lot will cost about $20,000. In most instances, cube vans are used for 2- or 3-camera productions with one or two on-board VTRs. Cube vans usually contain an on-board ac generator and, in some cases, a microwave mast. Some stations use cube van RPVs as backup ENG vehicles.

Larger, single-unit vehicles such as stretch vans, recreational vehicles and ambulance-type vehicles also may be modified for RPV use. These units are typically used for 2- to 4-camera productions with on-board graphics. A straight truck is available with a box of up to 29 feet, which contains almost 200 square feet of deck space.

Straight trucks (single-unit truck chassis) usually do not carry an on-board generator or a microwave mast. Usually, larger straight trucks are designed for multicamera sports events, which require at least four cameras, slo-mo VTRs, graphics and a variety of audio sources. If shore power is not available, a generator may be rented locally.

Because of the concentration of weight between the front and rear axles, a tandem axle may be necessary. Tandem axles must be ordered when the chassis is manufactured.

RPV builders may add a *tag-along* axle behind the original rear drive axle, or a *pusher* axle in front of the original rear axle. A tag-along axle will improve vehicle stability, but will not improve the load distribution. The pusher axle will improve load distribution and stability while reducing chassis flex. The suspension of the vehicle may be modified by changing the springs and shock absorbers. Electrical or hydraulic stabilizers also may be added.

The chassis size requirement is a direct function of the number of cameras the vehicle is designed to handle. Common to any well-designed RPV is an indispensable, well-documented critical analysis of each specific requirement, detail and decision before construction begins.

A typical RPV power panel. Note the digital readout of voltage and line frequency.

The first step

Regardless of the size and complexity of the RPV you need, as a broadcaster, you must first choose either to modify the vehicle yourself, or to use an outside organization that offers this service. In either case, the design of an RPV is an exercise in variations on a common theme. The key to owning (or leasing) an RPV with which everyone will be reasonably pleased is detail-oriented before-the-fact planning and input from producers and the technicians who will be staffing the vehicle.

Involve station personnel who are experienced in RPV and ENG field operation and familiar with the unique requirements of your station and the geographic area you plan to cover. If, for example, a city that will be served by the RPV has narrow streets, the overall size and maneuverability of the RPV may be unavoidable constraints. If the terrain includes steep hills, then a manual transmission and an adequate engine for the loaded RPV may be required.

Outside manufacturers usually build trucks to a generalized design approach that is based on their own experience and user feedback. Direct and well-documented input from experienced station personnel will help whoever builds the vehicle to customize it for maximum benefit, usefulness and practicality.

Exercising your options

Laying out the interior of an RPV does not allow a great deal of flexibility. "Custom-built" RPVs are available from a variety of sources. However, just how "custom" the RPV turns out to be is up to the buyer. Custom may refer only to the electronics complement and paint job, but it can just as well include a multitude of details that can be specified when ordering or building an RPV. After all, the customer is always right!

RPV builders agree that stations that order a second RPV are much more prepared and specific about details than when they ordered their first. Avoid the trial-and-error syndrome. Use a well-documented system of logical analysis to make each decision. Tailor the RPV to fulfill the unique requirements of your applications and to fit your station's philosophy.

It is a worthwhile investment of time and energy to construct an actual-size cardboard mockup of the RPV's interior, including control panels, rack layouts and monitors. The mockup is a human engineering tool that will readily diminish the "who designed this thing?" syndrome. Perusing the model will solicit valuable before-the-fact input and suggestions from the staff and management. Once the actual RPV is completed, correcting mistakes in design judgment may be physically impossible or cost-prohibitive.

If an error in judgment or a lack of organized input to the builder results in needed changes to a finished RPV, the minimum cost of those changes will be threefold compared with the cost of doing it right the first time. Not only did you pay for the error to be installed the first time, but you will pay to have it removed, and pay again to have it replaced with what should have been there in the first place.

Decisions, decisions

Throughout the decision-making process, keep in mind *worst-case battlefield conditions.* Extremes, such as the hottest and coldest weather, the maximum number of people the vehicle must contain, worst-case moisture, dirt, mud, noise and security must be considered in the vehicle's basic design.

Doors and access to the control area, electronics and storage spaces of the RPV are options that require careful study and planning. Where will the door(s) be placed? Note that any doors will weaken the overall structure. One poorly designed RPV actually collapsed when all the doors were opened at the same time. Chassis flex also will affect the strength of the structure and interact with doors and windows.

Windows in the control and storage areas can open up otherwise cramped quarters and enhance the security of outside panel connections. However, windows will bring several negative effects with them. Outside light may be objectionable. In larger RPVs, windows can weaken the structure of the box, which may create new problems, such as doors that won't open or close properly. Of course, windows also tend to invite other problems and may affect the concentra-

REALWARE

SL 5000 M Series Central Controls

Vital broadcast production facilities cannot be equipped with promises, prototypes or possibilities. Critical technical decisions cannot be based on imagination alone. Major capital planning cannot depend on guesswork and clever turns of phrase.

The facts are simple. Broadcast audio management is faced with pressing technical and creative problems that require practical, long-term solutions. And one company, Solid State Logic, is prepared for your future. Today. With real hardware, proven software, and a world of experience in advanced radio and television sound.

If you are holding out for computerised Instant Reset™, advanced centralised assignment, sensible human engineering, incredible custom flexibility, superior audio performance, simplified multichannel facilities, rational engineering and realistic prices . . . you could find your next trade show visit very frustrating.

Or you could visit the Solid State Logic stand where we'll be happy to show you the SL 5000 M Series, which features all of the above and more.

Solid State Logic Realware. It's more than a concept — it's an accomplishment!

Circle (121) on Reply Card

Solid State Logic

Oxford · New York · Los Angeles

Begbroke, Oxford, England OX5 1RU · (08675) 4353
200 West 57th Street · New York, New York 10019 · (212) 315–1111
6255 Sunset Boulevard · Los Angeles, California 90028 · (213) 463–4444

tion of the crew.

Use floor and subfloor materials that are non-corrosive, such as a combination of aluminum subflooring with a floor of ¾-inch exterior or marine-grade plywood. This will accommodate the water and snow that will be tracked into the vehicle. Use anti-static industrial carpeting on the control area floor; select a dark color to hide coffee, grease and mud stains.

Should the steps leading from the outside into control spaces include an outside deck area to accommodate heavy traffic? Where will the steps be stored?

How will the truck be wired? Will cable access be under the floor or overhead? How easily may cables be added? Will access holes be needed to bring wires inside the truck?

Where will the input/output (I/O) outside panel be located, and what inputs and outputs will be on the panel? Will the I/O panel double as a patchbay, or will a rack-mounted patchbay be necessary as well? Insist on full documentation of all electrical, communications and electronic wiring and interconnection.

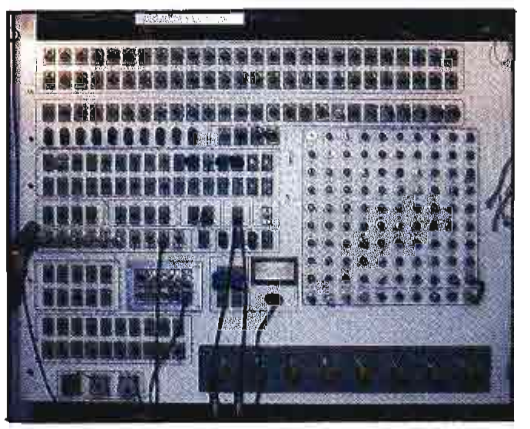
Locate the I/O panel and ac panel low enough to keep cables near the ground and cable strain at a minimum. This will also reduce the possibility of people tripping over cables. Place both panels in an area where they will be the most secure from tampering.

Isolate the RPV's shore power input. Single- and 3-phase power sources must be accommodated. The ac voltages must be metered. Use a regulator with adjustable output on each leg. When computing the RPV's total power requirements, include all electronics, communications, portable ac lighting and the HVAC system. Then, allow a headroom factor of 50% to 100% above that figure.

Carefully evaluate the location for the on-board generator. Some RPV designs locate generators on the curb side, others on the street side. Either location has valid justifications and benefits. Because there will undoubtedly be times when talent and microphones may be close to the RPV, noise and exhaust created by the on-board generator is a primary concern.

The dc power is yet another area that deserves close attention. Adequate dc worklights, both inside and outside the vehicle, are a necessity. A timer on worklight circuits will help avoid depleted batteries. Isolate power for 2-way radio systems and other dc accessories that may be used during setup or after the production is completed so as not to drain the van's primary battery.

Where will the equipment and cables be stowed? Carefully designed space must be planned for packing the RPV with all camera cases, light cases, chairs and other bulky items that must be stowed during travel.



The exterior patch panel for video and audio should be easy to access. Note ground cable with clip.

Among "musts" for any RPV are watertight seals on all access doors and storage compartments. All doors must include "hold-opens" and flush-mounted latches and handles. Use positive self-latching storage cabinets. Coat all exposed wood with polyurethane. Tie down all chairs.

What color will the RPV be painted? Color will affect the heat load on the air-conditioning system. Will the HVAC system use ducts? Mount the air-conditioning unit on top of the cab to help the vehicle's weight distribution ratio.

Speaking of safety

Vehicular safety is a function of driver skill and awareness, fully laden weight including people and fuel, weight distribution between axles and side to side, the center of gravity, tires and suspension. As with any vehicle, increased loading over dry curb weight places a strain on the suspension system and the tires. Do not make assumptions. Consult the manufacturer and know the limits of the chassis and tires.

As important as chassis load is weight distribution. Approximately 30% of the vehicle's weight should be on the front axle. According to RPV builders, improper weight distribution is the single most common problem with RPVs. As the RPV is under construction, periodic weighing of the vehicle's axles will help keep the ratio under control. Make an effort to keep the center of gravity as low as possible.

Isolate and shield all electrical systems. Individual circuit breakers for each rack and system are essential. All equipment, chassis and racks must be properly grounded. Outside, ac connections for shore power and convenience must not only be recessed for protection from the elements, but also weatherproof, secure and easily accessible. Isolation transformers should also be available for video and audio outputs.

Responsibilities

In addition to driver requirements and record keeping (see "Following the Rules on RPVs," page 70) a thorough check of local and state regulations regarding vehicle size, weight and liabilities is another essential step before any purchasing or leasing decisions are made. Research driver licensing requirements and demand that drivers and potential drivers of the RPV be properly licensed.

Know the union jurisdictions in the geographic areas and facilities you plan to cover. Typically, when connecting any power source to an RPV, you should use a qualified electrician from the facility that supplies the power to provide the connection. This will release the RPV operator from liability if the RPV overloads the shore power supply.

Electronics requirements

It is beyond the scope of this article to examine the broad spectrum of electronics hardware available for RPV use. Electronics is the only area of RPV design in which major cost-cutting may be effective, with one exception.

The communications system (closed-circuit, 2-way and telephone) is the apex of the RPV. It is most hazardous to cut costs in this area. Good, efficient communications are paramount. A thorough, detailed analysis of requirements of the RPV communications system should include a hands-on test evaluation of several systems, from electronics to headsets. Design the communications system to be the easiest and quickest electronics to access, unpack, hook up and operate.

Other production electronics, such as cameras, lenses, switchers, mixers and so on, are best specified by the individual station. Suffice to say that newer ½-inch formats should be carefully evaluated for their slow-motion capabilities and picture quality. The reduced cost and size, compared with traditional 1-inch configurations, can easily expand the available space and budget of an RPV.

When it comes to electronics in the field, the key word is redundancy. A small vertical interval routing switcher, for example, can double as a cuts-only switcher if the primary switcher fails. A portable microphone mixer can control audio. Planning for failure can be a life saver when the unthinkable happens at the worst possible time.

Detailed needs assessment, well-informed decision making, interdepartmental cooperation and communication are difficult to accomplish at the early stages. However, communicating detailed, organized requirements to the builder is the most direct and least expensive route to successful RPV use.

The Newest Name In Portable Microwave Equipment Has Supplied Over 5000 Units Worldwide

MICROWAVE RADIO

Super 2MX·2MX·2MR·MRC·Super 7MX·2+7MR
13FA·13CP·40MX·40MR·Superscan·Miniscan
Microscan·Omnipole·Skypod·Navtrack

Microwave Radio Corporation, a new name in the portable microwave market, has purchased the entire electronic news gathering product line from M/A-COM MAC. The team of skilled production, test, and management people that brought you state-of-the-art products from M/A-COM is now an independent company focused on you and your requirements. Over the past 18 years, starting with the first solid state ENG System, we have led the industry by supplying more than 5000 high quality portable receivers and transmitters.

We will exclusively manufacture and service all portable ENG products previously supplied by M/A-COM. Our management mandate is a new "priority to service" unmatched by our competitors.

Priority to Service
Bob

Robert Morrill
President

Call us at (617) 459-7655.
Bob Morrissette for scheduling & spares
Al Doyle for Technical Assistance
Ed Dahn for Sales

MICROWAVE RADIO corporation
847 Rogers Street, Lowell, MA 01852

Circle (47) on Reply Card

Taking to the skies

By Steven D. Hardy

Successfully converting a helicopter for ENG is a matter of planning and experience.

Electronics systems controls from the cockpit are interfaced to the hardware rack in the rear luggage compartment on terminal strips.

Financially, a helicopter can be a heavy burden on any station's budget. An industry average portal-to-portal operating cost of approximately $450 per hour, multiplied by an average of 30 service hours each month, can easily result in a $200,000 annual commitment.

Why a station decides to commit to a helicopter is better left in the boardroom, but the fact remains that many more stations are getting in—and staying in—the helicopter game than are getting out.

Technically, WHIO-TV's helicopter, Chopper 7, was designed and built to provide ENG services for the station's news department. Chopper 7 also provides a highly visible profile for a wide variety of activities. Not only is the helicopter for station assignments, but it is also used to assist police searches for criminals and missing children, and provides emergency transportation when other local helicopters are busy. The promotional and service aspects, and the availability for lease to the public, makes Chopper 7 a well-known and valuable multipurpose tool for the station and the city of Dayton.

After 18,000 hours on WHIO's second Chopper 7, a Bell Jet Ranger IIB, the time had come to change helicopters. When the initial decision was made to change helicopters, the station realized many long hours would be invested in the planning and installation of equipment in the new Bell Jet Ranger IIIB.

Although the news department operates the helicopter, the engineering department is responsible for the technical conversion of the helicopter into an ENG entity, and the installation and maintenance support of on-board broadcast and communication electronics systems.

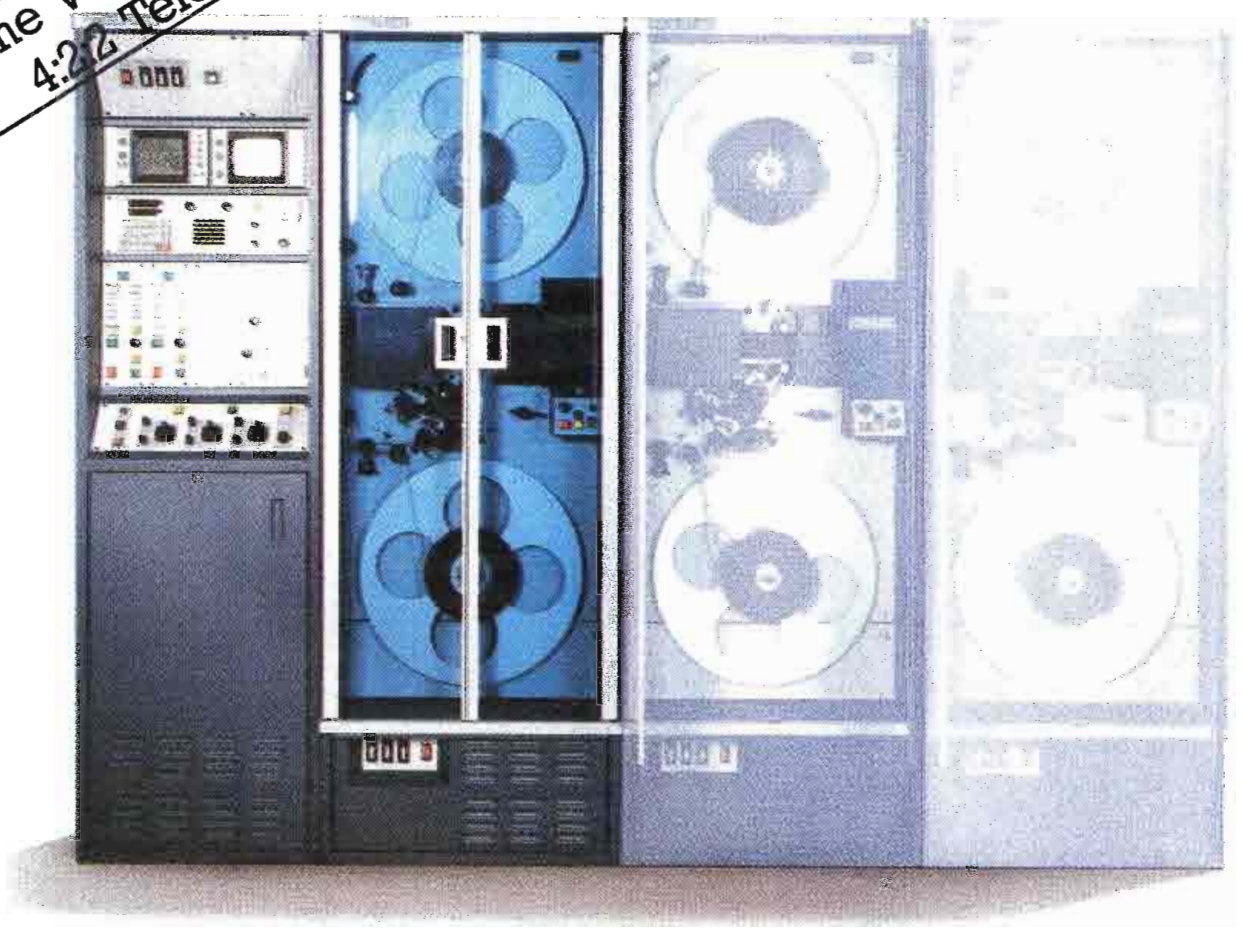
To help with the transition, all wiring lists and equipment requirements were loaded into the station engineering department's personal computer system for instant recall and filing. Shortly after the initial planning stages, detailed *to/from* wiring lists for audio, video, intercom, control and RF information were entered into the computer.

Planning

A previously owned helicopter was located in Atlanta, and WHIO engineers traveled there to check over the aircraft for use of broadcast and communications equipment on-board. An investigation of the console area was also necessary to determine the best layout of remote control and monitoring equipment. The rear baggage area was checked and measured for the placement of most of the

Hardy is RF transmission supervisor at WHIO-TV, Dayton, OH.

'The World's First 4:2:2 Telecine



The no hassle . . . . . broadcast telecine

ADS 1
Advanced Digital Scanner

With ADS 1, Rank Cintel has applied its unique film-scanning experience to the specific needs of the broadcaster.

Developed in close co-operation with the British Broadcasting Corporation (BBC), this CCD multiplexed broadcast-telecine is designed for easy 'on-air' operation and transfer of film to tape prior to transmission.

The incorporation of solid-state imaging technology is an example of Cintel's continuing development philosophy.

Latest component technology, cost-conscious design and modern manufacturing techniques have been exploited, without compromising performance and reliability. The result is a telecine system which is technically advanced while at the same time being economical to operate. That is not all, ADS 1 also features a unique electronic dirt and scratch concealment system. Add all this together . . . . . and you have the ideal broadcast-telecine package.

Take the hassle out of film broadcasting — call us at 914-353-1914.

Rank Cintel Inc. East Coast
New York 10994, U.S.A.
260 North Route 303, West Nyack,
Tel: 914-353 1914 Telex: 726441

Rank Cintel

West Coast
13340 Saticoy Street, North Hollywood,
California 91605, U.S.A.
Tel: 818-765 7265 Telex: 182694 RPI LSA
Fax: 818-765 3315

Rank Precision Industries Inc. 411 East Jarvis Avenue, Des Plaines, Chicago, Illinois 60018, U.S.A. Tel: 312-297 7720 Telex: 646998 Fax: 312-6990581

Circle (48) on Reply Card

heavier electronic equipment, and detailed arrangements concerning mounting and special requirements on-board the helicopter were discussed.

After returning from Atlanta, WHIO engineers began planning wiring arrangements and the placement of the equipment. An aircraft metalworking contractor was hired to fabricate most of the metalwork required for installation of the equipment within the helicopter. The FAA-approved metalworkers also advised the engineers on matters concerning FAA approval of the helicopter.

This proved to be the prudent thing to do, because it ensured aircraft safety and reduced the possibility of problems after the new hardware was in place.

Before and after the decision to change helicopters, many meetings were held to address the needs, planning and installation of equipment in the new aircraft. Involved in these discussions were several station engineers, the chief engineer, the station's news director and the pilot. Ultimately, the pilot is the operator of most of the on-board equipment, and his input was the guiding factor in many of the design decisions.

The control console is conveniently located so that it is within the pilot/operator's reach.

During the sessions, the design of the previous helicopter was discussed, including areas that worked well and areas that needed to be improved. Day-to-day use of the helicopter was the major topic of discussion, with the first priority being the construction of a safe and functional unit while maintaining the highest engineering standards and uniformity.

Throughout the entire planning process, special attention was given to the use of the helicopter during the annual Dayton International Air Show. Traditionally, Chopper 7 is used quite extensively for live and taped coverage of the 2-day air show, and a number of its regular functions are performed simultaneously.

Preparation

The requirement of feeding audio and video to the microwave transmitter from a portable VCR, camera and microwave receiver with on-board monitoring proved to be a challenge. It was difficult to find an audio/video switcher at a reasonable price and size that would accomplish the task.

Building a custom switcher, using coaxial relays for video switching, and employing general-purpose relays to switch the audio were chosen as the most economical and efficient solutions. It was determined that the entire switcher package must be remotely controlled from the front console area by the pilot. The switcher mainframe was located with the other electronics in the rear baggage compartment. This layout kept most audio and video cable lengths to a

Graphics . . . instantly

Slide File/Art File gives the broadcaster's old slides a new adaptability. Instantaneous retouching and graphic work allows miraculous changes and beautiful presentation, and most importantly, time is saved.

Slide File grants you instant access of up to 400 digitally stored stills and the ability to grab a frame from any live video source. Images are stored on Winchester-disk to CCIR 601 standard.

The Rank Cintel Slide File/Art File can also be used in conjunction with Logica's Galley 2000 system, giving you a storage capacity of up to half a million frames.

Graphics

The addition of comprehensive software and a graphics tablet brings to Slide File the capabilities of a full graphics workstation.

Art File

This graphics-enhanced system allows the artist/operator to paint and draw on existing stills, to manipulate the whole, or part of the picture, to compose using cut-and-paste techniques . . . or even to create entire pictures on a blank screen. So now you can rapidly compose or retouch in seconds before going On Air. Rank Cintel's Art File/Slide File provides On Air Graphics . . . . . Instantly.

4:2:2 System

Rank Cintel Inc. East Coast
New York 10994, U.S:A.
260 North Route 303, West Nyack,
Tel: 914-353 1914 Telex: 726441

Rank Cintel

13340 Saticoy Street, North Hollywood,
Californio 91605, U.S.A.
Tel: 818-765 7265 Telex: 182694 RPI LSA
Fax: 818-765 3315

Rank Precision Industries Inc. 411 Eost Jarvis Avenue, Des Plaines, Chicago, Illinois 60018, U.S.A. Tel: 312-297 7720 Telex: 646998 Fax: 312-6990581

Circle (50) on Reply Card

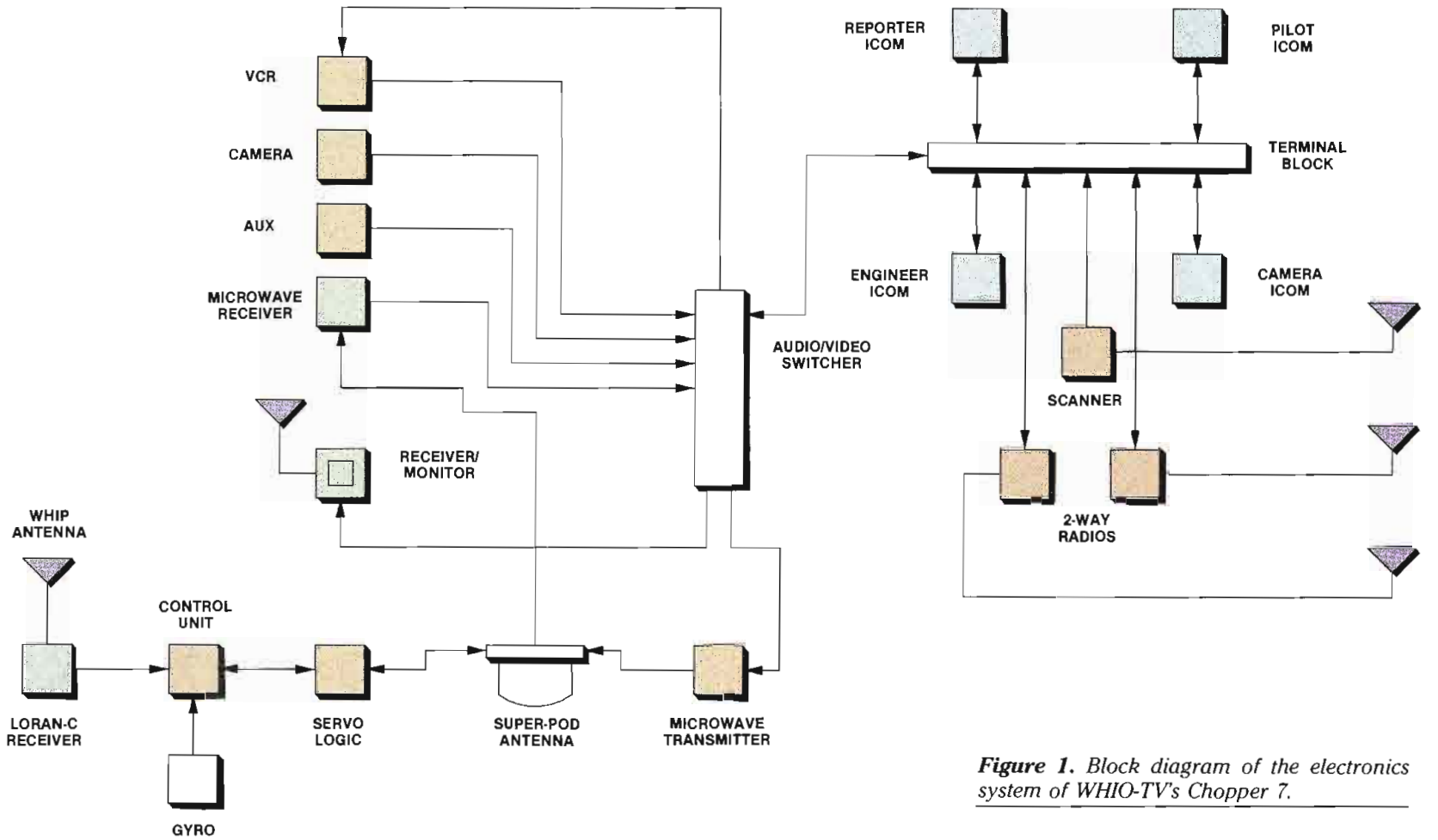


Figure 1. *Block diagram of the electronics system of WHIO-TV's Chopper 7.*

minimum.

When the helicopter was delivered to Dayton, it was taken to an aviation paint shop located at the Dayton airport. During the helicopter's week-long storage for painting and preparation, all of the parts, wire and equipment needed for ENG conversion were staged at the station for the predicted 2- to 3-week transformation of the helicopter.

Wiring bundles were assembled and labeled ahead of time to expedite the transformation process. In order for the helicopter wiring to comply with different codes and laws, WHIO technicians decided to use military-spec Tefzel wiring throughout the helicopter to avoid any problems with FAA approval.

Most of the wire, totaling about one mile, was in a bundle about two inches in diameter running from the front of the console to the rear baggage area. A new auto-tracking antenna system with a Loran C receiver was ordered, along with a new dc-powered color monitor and a police scanner. Other equipment was transferred from the retiring Chopper 7. A block diagram of the new helicopter's electronics system is shown in Figure 1.

The microwave transmitter and receiving system was installed, and a portable ¾-inch VCR was mounted to the back of the co-pilot's seat. The existing intercom system (a standard 4-station aircraft intercom) was kept in place and interfaced with two 2-way radios for communications back to the studios. Power from the helicopter's 28Vdc system was converted to standard 12Vdc using an aviation dc-dc converter.

Installation

After the repainted Jet Ranger arrived, it was rolled into the station garage, where the actual installation of the station's equipment began immediately. The doors were removed and put away to avoid any scratches. The seats were removed and the interior stripped for accessibility and convenience.

To minimize connections and provide the capability to remove equipment for maintenance, all of the heavy electronic equipment was located in the baggage compartment within a small custom rack. Terminal strips were installed on the side of the rack for all interconnect wiring between the cockpit and rack.

An additional console area in the cockpit was built to house remote controls for the microwave transmitter, switching controls for audio and video, remote frequency selection for the 2-way radios, and a 9-inch color monitor. Tally lights were also included to indicate which intercom box is feeding the microwave transmitter. This console package is located to the left of the pilot's flight control console area, within easy reach of the pilot.

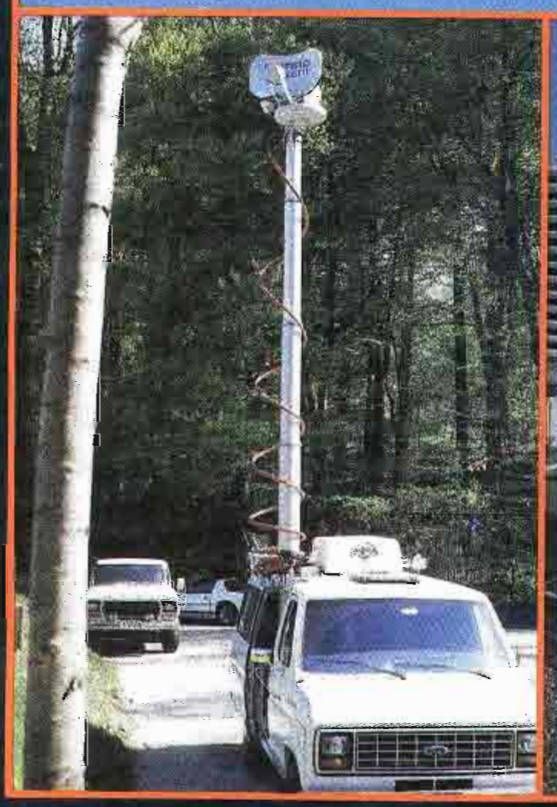
Because there are six inputs to the microwave transmitter, the switcher package provides flexibility, including the capability to relay live shots from a ground unit through the helicopter. The VCR switcher has four inputs and the monitor switcher has three inputs as well as the capability to monitor the input to the microwave transmitter.

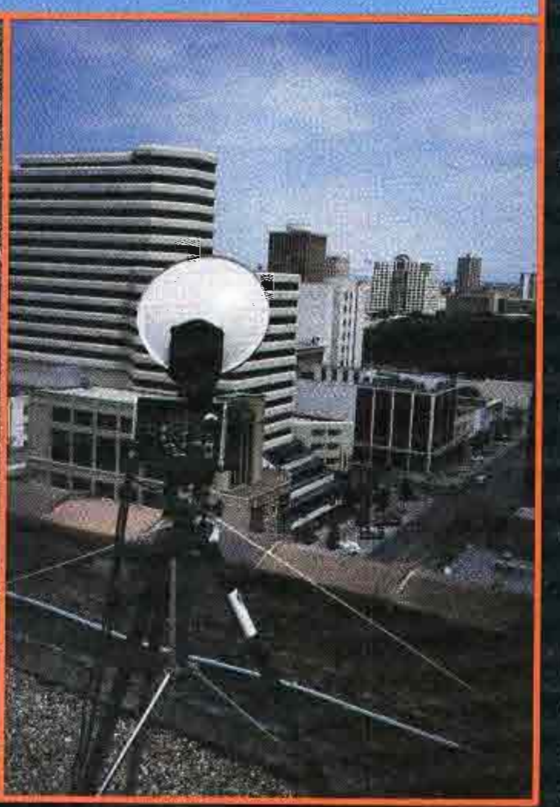
Installation was completed in approximately four weeks. Next, all the equipment and systems were checked out and levels were set. The helicopter was ready to be submitted to the FAA for approval.

Following a successful FAA inspection at the studio, the helicopter was rolled out and put into ENG service. A temporary microwave transmission antenna was installed until a back-ordered antenna system could be delivered.

The new antenna system arrived several weeks later, allowing completion of the final installation. Because all of the cables had been installed previously, the new antenna took only two days to install and check out. With the antenna installation completed, the helicopter was launched for a test flight to examine the new antenna system. All equipment and instruments were found to be operating properly. Chopper 7 was now available for the daily news, ENG and broadcast capabilities for which it had been designed and equipped.

ENG





The world of live on the scene coverage of ongoing news events is everchanging and growing, fueled by advances in technology and an increasing reliance on live coverage by television news departments. Since 1973, Nurad has been a major source of technical solutions to meet the needs created by this dynamic environment. Today Nurad is at the leading edge of microwave ENG technology, offering the broadcaster complete microwave systems capability including:

- **Central ENG receive systems with frequency-agile receivers and digital remote controls**
- **ENG remote transmit systems with mast-mounted power amplifiers and frequency-agile transmitters**
- **Helicopter ENG systems and automatic tracking capability**
- **Portable ENG transmit and receive systems**

For more information about our state-of-the-art microwave ENG systems, call us at (301) 462-1700.

NURAD

A DOVER COMPANY

2165 Druid Park Drive Baltimore, MD 21211 Telephone (301)462-1700 TWX (710)234-1071 FAX (301)462-1742

Circle (51) on Reply Card

Audio transmission on 23GHz

By Mark Timpany

23GHz microwave systems may be the solution to STL and intercity-relay frequency congestion problems.

When WQFM-FM in Milwaukee requested frequency coordination for a path to carry audio from its satellite receiver to the studio, the SBE chapter 28 frequency coordinator suggested using 21.825GHz. It was possible that there would be problems obtaining a clear frequency for the link, but no one expected to have to move into the 23GHz band to find an available channel.

All the existing STL frequencies in Milwaukee are in use. Some of them even have more than one user. In these cases, path separation and highly directional antennas provide the needed safety margin.

Although there are a number of problems and limitations with this frequency band, the allowable bandwidth for this Part 94 microwave assignment permits using PCM digital encoding. The digital encoding/decoding process provides a virtually transparent stereo audio circuit. As far as the microwave system is concerned, the result of encoding is nothing more than a standard video signal. The high quality provided by the PCM transmission system is one of the primary advantages of using this band.

Using the 23GHz band proved to be a good solution for WQFM. Because of the congestion in other cities, this technology may be useful to other stations needing STL and intercity-relay circuits.

Licensing

Anyone eligible for licensing under parts 81, 87 or 90 of the FCC rules can apply for frequencies in the Private Operational Fixed Microwave Service (Part 94 of the rules). For broadcasters, Part 90.75—the Business Radio Service—establishes the licensing eligibility for

Continued on page 86

Timpany is chief engineer for WQFM-FM, Milwaukee.

SECTION III · TECHNICAL INFORMATION

NAME OF ITEM	A	B	C	D
22. FREQUENCY (MHz)				
23. EMISSION				
24. TYPE OF MESSAGE SERVICE				
25. INITIAL BASEBAND CHANNEL LOADING				
26. 5 YR. PROJECTED BASEBAND CHANNEL LOADING				
27. 10 YR. PROJECTED BASEBAND CHANNEL LOADING				
28. PRE-EMPHASIS (*ENTER YES OR NO*)				
TRANSMITTER INFORMATION				
29. TRANSMITTER MAKE				
30. TRANSMITTER MODEL (*TYPE ACCEPTANCE NUMBER*)				
31. FCC USE ONLY				
32. TRANSMITTING OPERATING FREQUENCY TOLERANCE (%)				
33. MAXIMUM TRANSMITTER OUTPUT POWER (WATTS)				
34. MFR'S GUARANTEED TRANSMITTER OUTPUT POWER (WATTS)				
35. TRANSMITTER MEDIAN OUTPUT POWER (WATTS)				
36. TRANSMISSION LINE LOSS (dB)				
37. ANTENNA MAKE				
38. ANTENNA MODEL				
39. FCC USE ONLY				
40. ANTENNA GAIN (dBi)				
41. EFFECTIVE RADIATED POWER (dBm)				
42. BEAM WIOTH (DEGREES)				
43. TYPE ANO SIZE OF ANTENNA				
44. HEIGHT TO CENTER OF FINAL RADIATING ELEMENT (FT)				
45. POLARIZATION				
46. AZIMUTH TO NEXT STATION OR PASSIVE REPEATER NO. 1 (PR 1)				
47. PATH LENGTH TO NEXT STATION OR PR 1 (MILES)				
RECEIVE SITE INFORMATION				
NAME OF ITEM	A	B	C	D
48. RECEIVING STATION'S CALL SIGN				
49. PATH LOSS (dB)				
50. RECEIVING ANTENNA MAKE				
51. RECEIVING ANTENNA MODEL				
52. FCC USE ONLY				
53. RECEIVING ANTENNA GAIN (dBi)				
54. RECEIVER MAKE				
55. RECEIVER MODEL				
56. FCC USE ONLY				
57. MEDIAN RECEIVED SIGNAL LEVEL AT INPUT TO THE RECEIVER (dBm)				
58. LATITUDE N (*DEGREES, MINUTES, SECONDS*)				
59. LONGITUDE W (*DEGREES, MINUTES, SECONDS*)				
60. GROUND ELEVATION AMSL (FT)				
61. HEIGHT TO CENTER OF RECEIVING ANTENNA (FT)				
PASSIVE REPEATER NO. 1 INFORMATION (IF ANY)				
→ ☐ IF YOU HAVE TWO PASSIVE REPEATERS ON THE SAME TRANSMISSION PATH, CHECK THIS BOX AND ANSWER ITEMS 62-72 ON A SEPARATE SHEET OF PAPER FOR THE SECOND PASSIVE REPEATER.				
NAME OF ITEM	A	B	C	D
62. LATITUDE N (*DEGREES, MINUTES, SECONDS*)				
63. LONGITUDE W (*DEGREES, MINUTES, SECONDS*)				
64. GROUND ELEVATION AMSL (FT)				
65. OVERALL HEIGHT OF PR 1 STRUCTURE ABOVE GROUND (FT)				
66. PASSIVE REPEATER MAKE				
67. PASSIVE REPEATER MODEL				
68. OIMENSIONS (FT x FT) OR BEAMWIDTH (FOR DISHES)				
69. HEIGHT ABOVE GROUND TO CENTER OF PR 1 (FT)				
70. POLARIZATION				
71. PATH LENGTH FROM PR 1 TO NEXT STATION (MILES)				
72. AZIMUTH FROM PR 1 TO NEXT STATION (DEGREES)				

NEW

Vega PRO wireless at an affordable price.

Cetec Vega's famous high-quality "PRO" wireless microphones are now available in new, highly affordable versions. Enhance your sound installation with the new PRO 1-B and PRO 1-H systems. Ideal for all of your professional audio applications, these systems are great for broadcasting and entertainment applications, as well as for use in audio-visual systems for industrial seminars, church and school sound systems, etc.

The PRO 1-B system consists of the Model T-37 bodypack transmitter and Model R-31A receiver. The PRO 1-H system consists of the Model T-36 hand-held transmitter and R-31A receiver.

Both systems feature DYNEX®II, Cetec Vega's advanced audio processor for the highest signal-to-noise ratio, widest dynamic range, and most natural sound.

R-31A PRO Receiver

The R-31A PRO receiver features two easy-to-read LED bargraph displays—one for RF signal level and the other for audio level. The receiver is extremely sensitive, highly selective, and very stable. Either line-level or mic-level outputs may be selected through the rear-panel XLR connector. Line-level output is also available from the rear-panel terminal strip. The receiver can be powered by either AC or external DC.

T-37 PRO Bodypack Transmitter

The T-37 PRO bodypack transmitter accepts all positive-biased and most negative-biased electret lavalier mics via an easy-to-use mini 4-pin XLR connector. Conventional panel-mounted mic on/off and recessed power on/off toggle switches are featured. The ultra-rugged case stands up to hard use.

T-36 PRO Hand-Held Transmitter

The T-36 PRO hand-held transmitter uses the popular Electro-Voice BK-1 ("Black Knight") condenser element with an attractive black windscreen. Housed in an attractively contoured black case, it has Cetec Vega's patented internal dipole antenna. An audio gain control and power and audio on/off switches are conveniently located on the bottom.

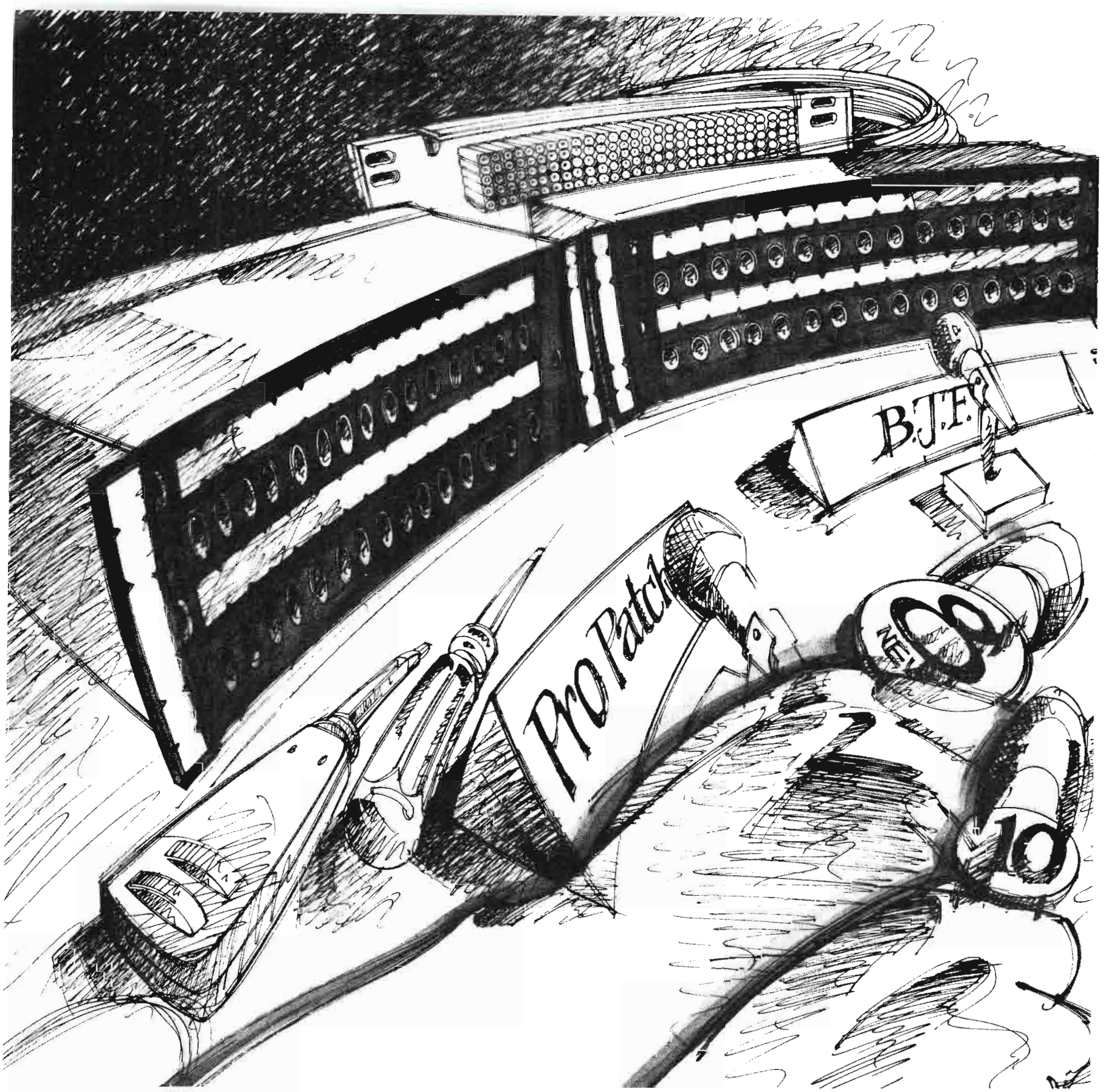
Shouldn't you design your sound system around the high quality and reliability for which Cetec Vega is famous? Contact Cetec Vega today to arrange for a demonstration of the PRO 1-B bodypack or PRO 1-H hand-held wireless microphone system.

Cetec Vega

...the professional's wireless

Division of Cetec Corporation
9900 Baldwin Place
El Monte, California 91731
(818) 442-0782
TWX: 910-587-3539

Circle (52) on Reply Card



NO PATCHING QUESTION IS TOO TOUGH FOR ADC'S "PANEL OF EXPERTS."

MODERATOR: "Thank you, and welcome. First question, please—don't hesitate to give us your best shot."

QUESTION #1: "OK, Panel, I need patchbays that keep my racks neat and tidy, without a lot of cabling clutter. And I need to install them quickly and securely. Any suggestions?"

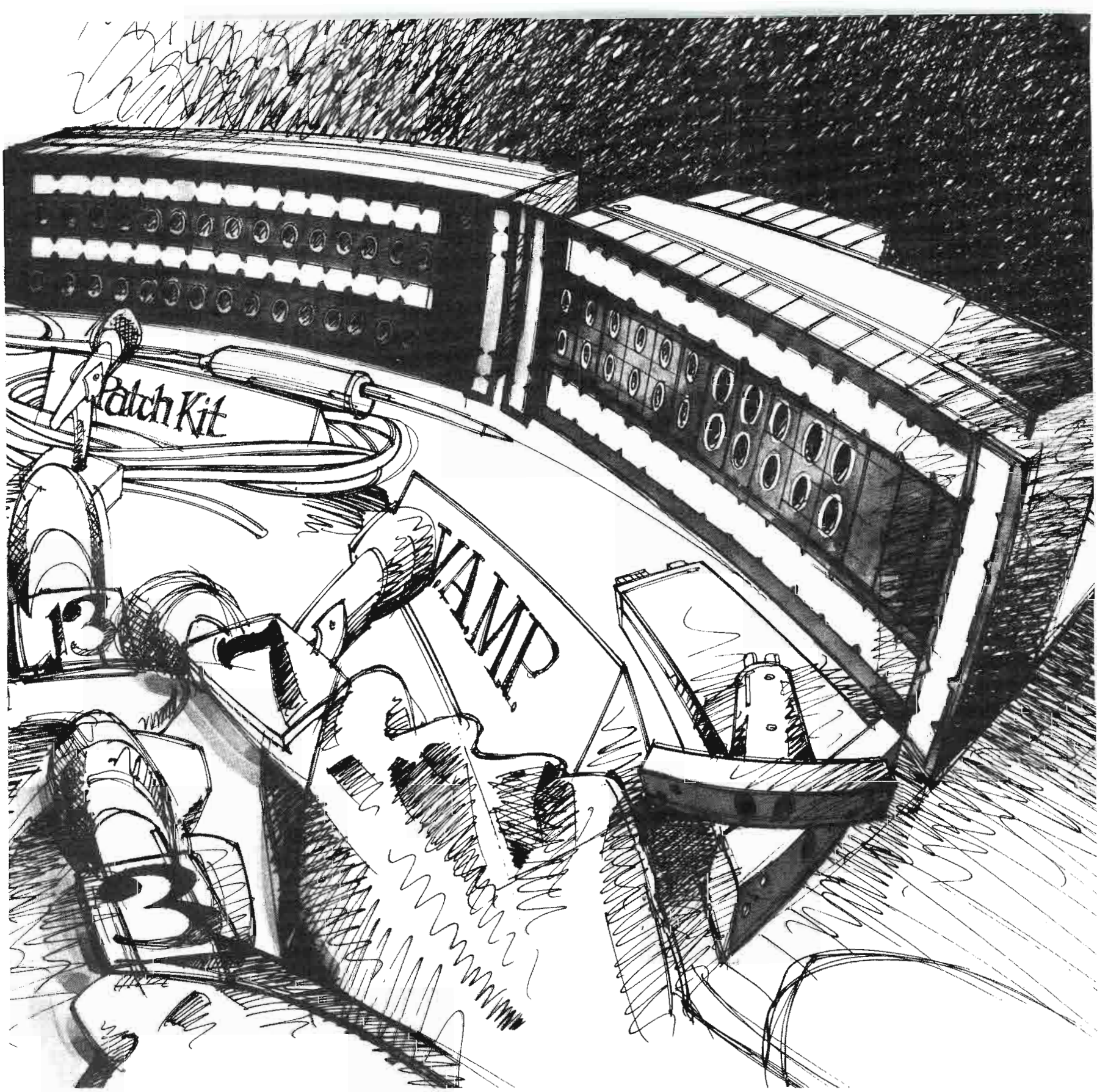
PROPATCH: *"Sure—try ADC ProPatch Mark II patchbays. They're fully enclosed, and all the terminations are QCP punchdowns on the back of the box. Fast installation is one reason we're the panel of experts."*

QUESTION #2: "This one's tougher, Panel. I need to terminate my patchbays in the bottom of the rack, but I want my jacks protected."

BJF: *"No problem. ADC's Broadcast Jackfield (BJF) Mark II series gives you the best of both worlds. They feature Ultra Patch termination panels with QCP punch downs on the end of a harness. So you can terminate your cabling wherever it's most convenient. The patchbay chassis supports the cable harness and covers the jacks."*

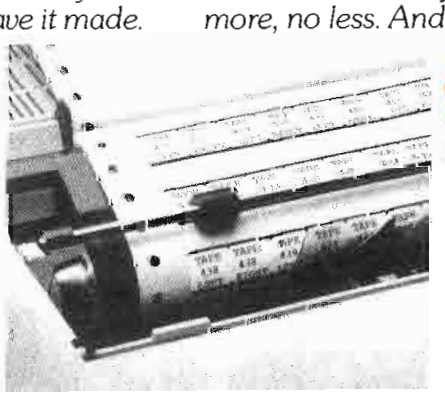
QUESTION #3: "What about when your budget's tight? I need quality patchbays, but I've got a small facility and I can't spend a lot of money."

PATCH KIT: *"Our Patch Kit is*



exactly what you're looking for. It's a Broadcast Jackfield Mark II chassis without the cabling. Just add your own cable and you'll have it made. And you'll save money by doing it yourself."

QUESTION #4:
"Let's see you answer this one, Panel. I have a small off-line suite and I need to patch a few audio circuits AND a few video circuits. If you want me to buy two dozen circuits at a time, forget it."
VAMP: *"Don't buy more patching than you need. Buy an ADC Video/Audio Modular Patchbay (VAMP) instead. Because it's modular, you can install the number of video and/or audio modules you need—no more, no less. And it's expandable."*



QUESTION #5: "I'm convinced, Panel. You're great patchbays. But doing designation strips drives me crazy."
MODERATOR: *"We've got the answer—our Self Adhesive Identification Labeling System (SAILS for short). It's a special computer-printable, adhesive-backed polyester label. SAILS won't discolor, smear or tear, and they're removable. You don't even need special software to print on them. You'll find SAILS on every ADC patchbay. Any more questions?"*

QUESTION #6: "Just one. Where can I buy ADC patchbays in a hurry?"
MODERATOR: *"Call us at (612) 893-3010, and we'll give you the name of your nearest ADC stocking distributor. Like everyone on our panel of experts, he really delivers."*

ADC Telecommunications

ADC Telecommunications, Inc. 4900 West 78th Street
Minneapolis, Minnesota 55435 (612) 893-3010

Circle (53) on Reply Card

Continued from page 82
Part 94 frequencies.

An application for the 23GHz frequencies is made on FCC form 402, shown in Figure 1. This form is probably new to most broadcast engineers. The first part of the form is similar to form 313, the application used for broadcast auxiliary services. Form 402 requires more detailed information on the equipment and paths used than does form 313. Most of the required transmitter information is available from the equipment manufacturer. There are no minimum path-length requirements for these frequencies, so you can apply for almost any broadcast use.

An interference statement must accompany each application. Because of the wide range of potential users, a coordination statement from the SBE is not adequate. NABER does not coordinate these frequencies either. Therefore, to meet the requirements, you must purchase an interference analysis from one of the several companies that maintain a database of licenses and applications for Part 94 frequencies. These companies can assist you in preparing the application. Obtaining the interference statement is the first step toward licensing.

Through a twist of fate, WQFM's application ran into trouble. The city's CATV franchise and the station applied almost simultaneously for the same frequency. For its analysis, the cable franchise used a different database company, which was unaware of WQFM's application. The FCC accepted both applications on the same date.

The commission soon discovered the conflict and informed both parties. WQFM amended its application by requesting another frequency, which resolved any potential interference between the two nearby paths. Since the time of the application, the southeastern Wisconsin SBE frequency coordinating committee has added 23GHz frequencies to its database. This will aid in frequency selection for broadcast users, but the independent interference analysis remains an FCC criterion for license applications.

Turnaround time on WQFM's application was comparable to what might be expected with Part 74, broadcast auxiliary licensing. It took three and a half months to receive the license.

Equipment

A number of manufacturers sell equipment for these frequencies. Typically, the transmitter uses a Gunn diode oscillator connected directly to a small-horn antenna. The Gunn oscillator's power output is quite small. The WQFM transmitter puts out only 66mW. However, antenna gain at these frequencies is easy to obtain. The 1-foot horn antenna has a gain of 33dBi with a beamwidth of only 3.5°. This beamwidth is similar to that of a searchlight.

The transmitter's physical configuration makes installation quite easy. Because the oscillator/antenna (RF head) assembly weighs approximately nine pounds, it presents little loading to the tower. Cabling between the RF head and the control unit, mounted inside the transmitter building, consists of two cables. A multiconductor cable provides power and returns the AGC voltage to the tower-mounted receiver. An RG/6-type cable carries the signal. In the case of the transmitter, this signal is standard baseband video. At the receiver, the cable carries the modulated 140MHz IF signal. (See Figure 2.)

Our World Of Audio DAs Is Growing...

NEW!
Dual Channel/Stereo Audio DA In A Single Module!

DATATEK

- 1 Input, 6 Outputs Per Channel
- Designed For 150 or 600 Ohm Systems
- +27 dBm Output Capability
- 0.05% (or Less) Distortion
- Front Panel LED's Indicate Overloads
- DF-609 Rack Frame Accommodates 10 Modules, A Total Of 120 Outputs

THE D-525 JOINS OUR FAMILY OF COMPATIBLE MODULES:

- D-523 — Maximum Headroom D.A., Wide Dynamic Range
- D-524 — Mic/Line Amplifier, Adjusts and Standardizes Incoming Signal Levels
- D-526 — 8 Output Single Channel D.A.
- D-522 — D.A., Designed For Wide Band SMPTE Time Code Application

Write for details on the complete line of DAs from. . .

DATATEK CORP.

1121 Bristol Road, Mountainside, NJ 07092 • 1-800-882-9100 • 201-654-8100 • TELEX 833 541 DATATEK MTSD •

Circle (55) on Reply Card

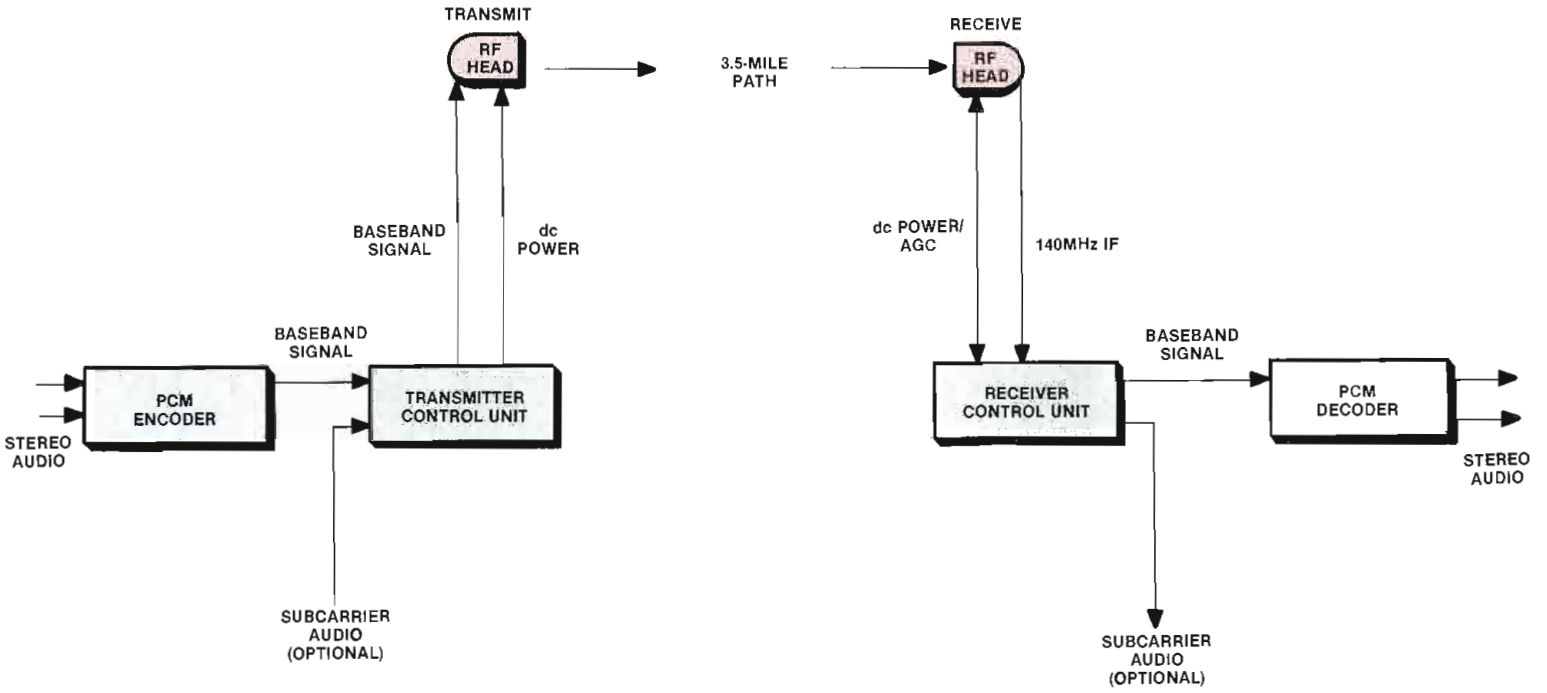


Figure 2. *Block diagram of the 23GHz PCM microwave link. Optional subcarriers can be added as needed.*

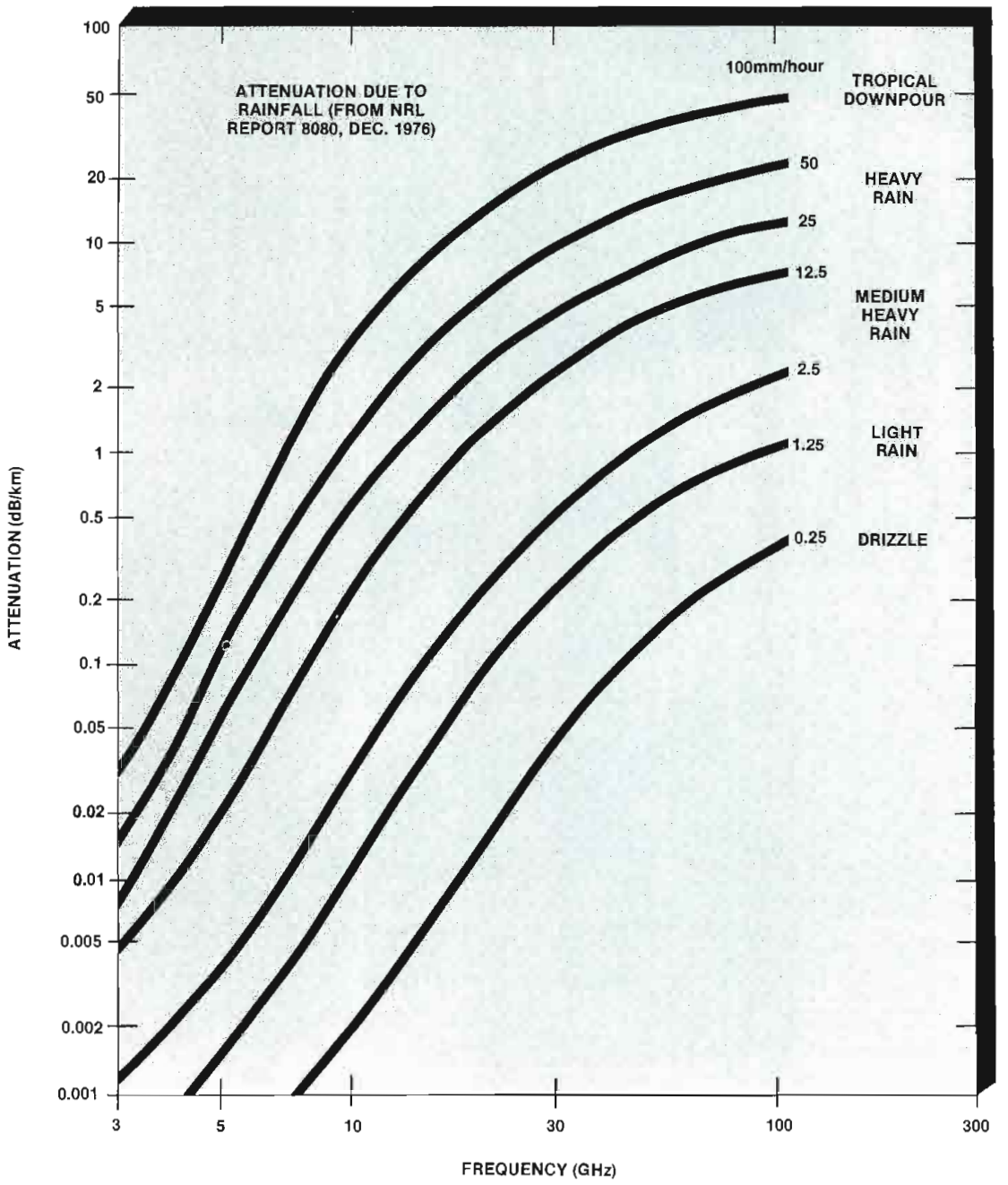


Figure 3. *Generalized atmospheric attenuation guide based on frequency.*

Path considerations

These frequencies require strict line-of-sight operation. Part 94 does allow passive reflectors to reflect the signal over or around any obstacle. However, repeater systems can be used with up to five hops over a maximum length of 25 miles.

Rainfall is critical to how well a 23GHz path will work. Heavy rainfall greatly attenuates these high frequencies. Accordingly, equipment manufacturers' literature usually provides a set of curves based on expected rainfall for your region. The charts plot attenuation vs. frequency and rainfall amount, as shown in Figure 3.

In Milwaukee, with a 3.5-mile path and the smallest antenna (one foot), the probability of an outage is 0.03%. The 0.03% value represents how often the region should produce rainfall sufficient to reduce the path fade margin to zero. However, this seemingly small percentage amounts to almost three hours of path loss in a given year. Using the same path and equipment in Arizona would result in an outage of only one hour per year. In Florida, the path might be unusable for more than 24 hours per year.

For the station's use—satellite-delivered audio—the 0.03% outage probability is acceptable. The same amount of downtime on an STL path would be unacceptable. Larger antennas are usually the solution to increasing the fade margin. A 4-foot antenna on that 3.5-mile path would add more than 20dB to the fade margin. The probability curves become less reliable when applied to paths greater than one mile long.

Capabilities

The bandwidth available on the 23GHz frequencies allows the transmission of color video and several audio subcar-

Hector Munoz,
Distribution Services
Manager

"Our purpose is to keep you on the air.

Our extensive inventory of broadcast tubes, RF transistors and related components ensures delivery of the product to you on time—even if I have to run the package to the airport myself. Last year our company made over 7500 overnight deliveries, so we take emergencies seriously!"

$30 Million Inventory—
98% Same Day Shipment

Technical knowledge to help you save time and money by choosing the right component.

PRODUCTS: Cathode Ray Tubes ▪ Diodes ▪ Klystrons ▪ Monitor Tubes ▪ Plumbicon® Tubes ▪ Receiving Tubes ▪ RF Ceramic Capacitors ▪ RF Transistors ▪ Saticons ▪ Solid State Replacements ▪ Transmitter/Power Tubes ▪ Tube Sockets ▪ Accessories ▪ TV Linear Devices ▪ Vacuum Capacitors ▪ Vidicons ▪ Vistacons

MANUFACTURERS: Acrian ▪ Amperex ▪ Cetron ▪ EEV ▪ Eimac ▪ GE ▪ Hitachi ▪ ITT ▪ Jennings ▪ Machlett ▪ National ▪ Philips ▪ RCA ▪ Raytheon ▪ Thomson CSF ▪ Varian ▪ Westinghouse

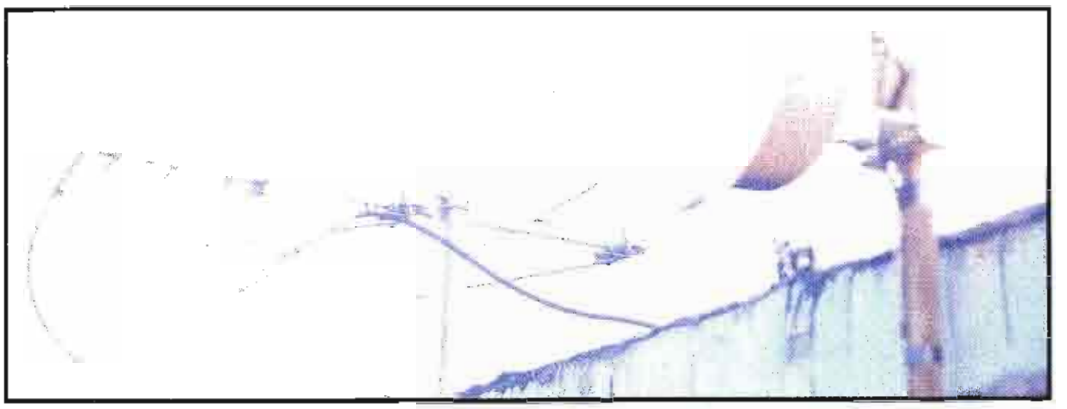
800-323-1770

Circle (56) on Reply Card

Richardson Electronics, Ltd.

Broadcast Division—Calvert Electronics, Inc

Convenient Sales Offices: Franklin Park, IL ▪ Woodland Hills, CA ▪ Belmont, CA ▪ Dallas, TX ▪ Norwell, MA ▪ Rockville Centre, NY ▪ East Rutherford, NJ ▪ Winter Park, FL ▪ Brampton, Ontario, Canada ▪ Lincoln, England ▪ Gennevilliers, France



The yagi antenna, mounted to the 23GHz receiving dish, provides an idea of just how small these types of antennas really are.

riers. Narrowband users (telephone circuits, for example) could load the channel with multiple subcarriers to create numerous voice-grade circuits. TV and CATV users could pass a video channel plus audio and control using only one of these systems. Duplex operation is easily accommodated and capable of providing high-speed, 2-way datalinks or return video feeds.

WQFM traded bandwidth for dynamic range. Stereo audio is first routed through a PCM encoder at the satellite dish. The encoder generates a videolike signal from the digitized stereo-audio signal. The process is reversed at the studio resulting in a transparent, digital stereo audio circuit.

Costs

The system costs are comparable to those for a dual-monaural path at 950MHz. A wide range of PCM encode/decode equipment is available, with accompanying wide-ranging prices. The system provides an installation advantage in that it requires only inexpensive cable. If a particular installation required long coax runs for a 950MHz system, then appreciable savings could be realized. There is no FCC automatic identification requirement that would normally be needed for an intercity-relay link under the current broadcast auxiliary rules.

Reliability

User experience indicates that the charts on link availability are conservative. The University of Wisconsin-Milwaukee TV Service uses a system similar to WQFM's. Their system provides a short-haul video circuit and one audio subcarrier. In the heaviest rainstorm encountered, described by local meteorologists as a 200-year rain, only a slightly perceptible increase in video and subcarrier noise was noted. The subcarrier audio channels are typically quite good with S/N ratios in the mid-60s range. Other users report similar results in a variety of atmospheric conditions.

Some users recommend designing the systems for a minimum 40dB fade margin. The stability of the antenna mounts is quite important, especially with the larger antennas. With the 4-foot dish antennas, the 3dB beamwidth is only 0.8°, so there is no tolerance for tower sway.

The relatively small size of the RF head can solve an installation problem in which aesthetics is a concern. This was the situation at the Minneapolis Metrodome. The authorities objected to large antennas that might be visible from the arena. The small antenna size allowed

SACHTLER HAS MOVED

Our new U.S. Headquarters is located at: 55 North Main St., Freeport, New York 11520.

Our new phone number is: (516) 867-4900.

Our staff is still the same, familiar with your needs and now able to serve you better than ever.

Our new quarters are larger, enabling us to keep on hand a larger stock of Sachtler Camera Support systems that professionals like you demand. In fact, it is your increased demand that has forced us to move, and we thank you for your confidence in Sachtler.

Our New Warranty is still in effect. . .and still the best in the business. **Three full years** for everything in the system, except the leak-proof fluid modules, which are warranteed for five years.

If you haven't yet thought about a Sachtler, isn't it time you did? You get the best equipment, the best service, and the best warranty. Only from Sachtler.

Our New Location and Phone Number:

sachtler®
55 North Main Street
Freeport, New York 11520
Tel: (516) 867-4900

West Coast: 3316 W. Victory Blvd., Suite A
Burbank, California 91505
Tel: (818) 845-4446

Clip and Save.

Circle (58) on Reply Card

WQFM to broadcast from the Metrodome while still meeting the aesthetic requirements. Because the transmitters are small, they also can be used for mobile operations.

Using digital encoding techniques, such as PCM, eliminates the noise caused by rain attenuation that is common to some analog systems. WQFM's fade can be so deep that the receiver almost squelches before noticeable audio degradation occurs.

If you decide to use 23GHz equipment, allow sufficient time for application processing. Also, be sure to rely on an outside

The Gunn diode

The technology behind the new breed of millimeter wavelength equipment began as a discovery by IBM employee John B. Gunn in 1963. By subjecting a sample of gallium arsenide (GaAs) to an electric field, he observed current oscillations near 1GHz. The correct explanation for this phenomenon appeared the following year in the IEEE *Proceedings* in an article by H. Kroemer. Kroemer noted that C. Hilsum had predicted these transferred electron effects in 1962.

The term Gunn diode refers only to the fact that the device has two terminals; it does not have rectifying properties. The Gunn-Hilsum effect takes place in homogeneous semiconductor material. There is no junction involved. Oscillation occurs because the electrons tend to bunch together as they transit across the semiconductor. The process is similar to what happens in a klystron.

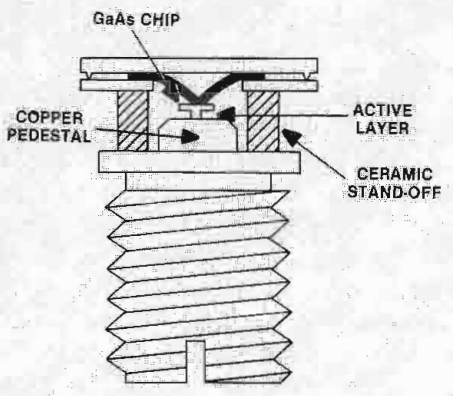
The oscillation frequency is primarily determined by the semiconductor material and its size. Coupling the device to a resonant cavity increases its efficiency and permits small frequency adjustments. The addition of a varactor diode provides frequency modulation and AFC control.

Gunn diodes are often used in the 500MHz-wide amateur radio band at 10GHz. Equipment has been developed for the readily available Gunnplexer. The Gunnplexer is basically the Gunn diode under the trademark of Microwave Associates. The Gunnplexer adds a ferrite circulator and mixer diode providing full duplex operation. In this design, the shift on transmit frequencies at each end of the communications path is equal to the intermediate frequency, commonly 30MHz.

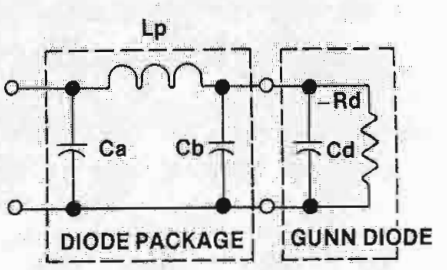
Gunn diodes are being seen regularly as modern replacements for klystron oscillators. Gunn diodes can be designed easily into equipment and require a minimum of external support circuitry. Their power supply requirements are also easy to meet. Because of its low operating efficiency and the need to dissipate heat from a small semiconductor surface, the Gunn diode's output remains in the milliwatt range. The devices are not yet available as replacements for high-power klystron amplifiers.

database form for frequency assignments. The FCC still won't accept NABER or SBE coordination. Finally, be sure your installation uses a stable antenna mount. Although the units can be installed on small poles and other mounts, any sway will affect the reliability.

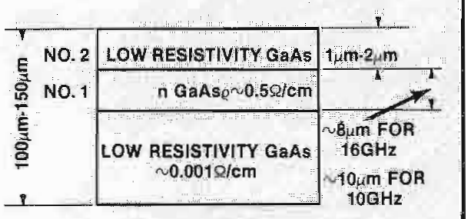
As the lower frequencies become even more crowded, more broadcasters will move into the microwave band. Although it has its limitations, the equipment can provide top-quality audio transmission. If you need to transmit high-quality audio or video over a short path, consider the 23GHz band.



Packaged Gunn diode as presented in literature from Microwave Associates.



Equivalent circuit of a Gunn diode. The parasitic reactances of the diode package are included.



A cross-sectional view of a Gunn diode.

Networking the newsroom

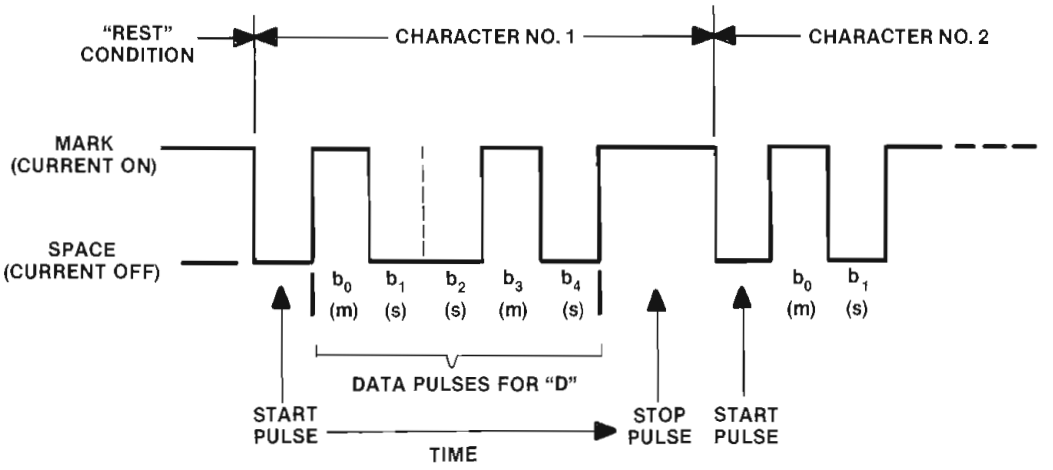
By Carl Bentz, special projects editor

Newsroom computers deal with many complex behind-the-scene tasks of news gathering and presentation.

Until a few years ago, most broadcast stations kept a model 15 Teletype printer stowed away in a closet out of the earshot of live mics. Its purpose was to monitor the news wire and noisily clatter out the latest national and international events. When a local station had a story for the network, special arrangements were needed. Usually, the arrangement was a telephone call to the network to read the story.

Multiple news and weather wires meant dedicated telco lines and printers for each service, but for stations committed to news, the machines were a necessary evil. Several spare ribbons and endless paper supplies were absolute necessities to avoid missing the biggest story of the day. At least one engineer often spent part of the time keeping the mechanical marvels operating.

Today's news machine has come out of the closet to take a primary position within the news center. A computer-based system is the hub of a growing weblike network, receiving a constant stream of data from local, regional, national and international sources. Unlike the old reliable model 15s, however, the new systems operate at high data speeds. They simultaneously allow text processing or editing functions, present the news script on a video monitor and handle communication among multiple terminals, all without paper. The flexibility they give to radio and TV news presentations was only a dream for the rip-and-read newspeople of yesteryear. (Printers are available, if needed.)



Courtesy of ARRL

Figure 1. *The character frame for Baudot code letter D (10010).*

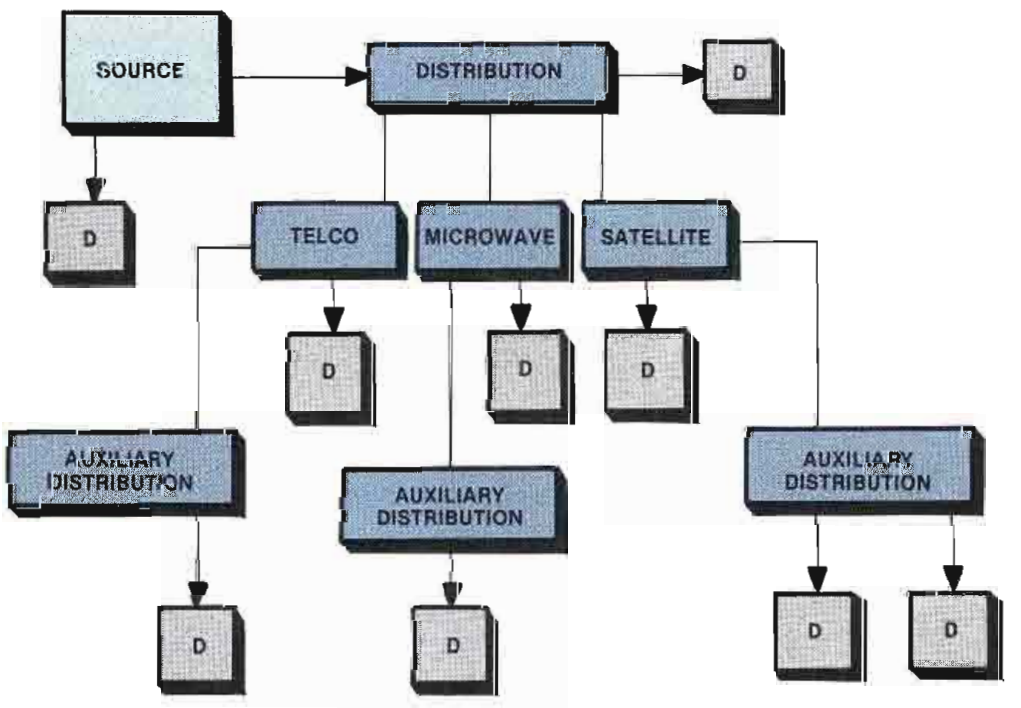


Figure 2. *In a 1-way network, the distribution capability determines the number of destinations (D) served.*

It began with Baudot

Networking with a teletypewriter, usually a 1-way affair, used a form of digital communication. The news service transmitted a serial datastream at 300 baud (about 60 words per minute) to subscribers on dedicated telephone lines. On its way, the information passed through numerous telephone exchanges, making a dc signaling concept impractical. Instead, a signal of *mark* and *space* audio tones was used. A character began with a start pulse and ended with one or two stop pulses. Between the two, combinations of five pulses derived from mark/space tones identified the characters. (See Figure 1.)

The 5-bit *Baudot* code presented a problem. Because a bit is either off (0) or on (1), five bits allowed 32 combinations. Beyond letters, only six additional characters were possible. To include symbols and numbers, two *shift* codes were designated. A 5-bit character of 1s (11111), called *unshift*, set the machine for subsequent letters, while the shift

When You Have to Get it Right the First Time—Reach for HME.

There are very sound reasons why professionals reach for HME when the show goes on.

Dependability. HME knows the vital need in your business for reliable equipment. We think we build the best wireless microphones, as well as the best wireless intercoms and cabled intercoms available anywhere. They're rugged, built from top quality components, and assembled with HME's Pride in Excellence.

Performance. You'll please the most demanding performers with an audio quality that's second to none. Dynamic range and immunity to interference are unsurpassed.

Service after the sale. No one reacts like HME in the event you need assistance. Now we have direct telephone lines to Customer Service—the people with the answers. Should your system ever require repair we'll turn it around faster than anyone in the business.

Call us today for all the details. See why more professional sound engineers rely on HME when performance is on the line.

HME manufactures:
Wireless microphones
Wireless Intercoms
Cabled Intercoms

hme
HM ELECTRONICS, INC.

9675 Business Park Avenue, San Diego, CA 92131, U.S.A.
Phone (619) 578-8300 Telex: 350-771

Circle (60) on Reply Card

command (11011) returned the printer to numbers and symbols until further notice. Other control codes existed in each shift state as well.

Line noise could cause a missed shift command and garbled information. Operators learned to translate between character sets, or requested the message to be resent at a slack time. The same was true of machines with special character sets, such as weather symbols. An *unshift on next space* feature was available on some machines to reduce the translation work.

The concept was simple and connecting the equipment was relatively easy. But making the machine produce the right letters was sometimes a real trick. The interface for many teleprinters was a terminal with a bipolar relay driven by tone decoders. Two frequency-sensitive decoders converted mark/space tones into off/on conditions. The relay switched a 20mA or 60mA current loop according to the mark and space pulses from the decoder, causing the key to strike the paper. Of course, mark/space polarities were occasionally inadvertently reversed producing garbage.

Some machines were equipped with synchronous ac motors and ran the mechanical decoding system with excellent results. Others, driven by dc motors, had synchronization problems. If the mechanism turned at the wrong speed, the message could be garbled irretrievably.

ASCII as a key

Microcomputer systems have relegated model 15s to museums, replacing them with advanced word processors. Baudot has evolved to another code called *ASCII*, the American Standard Code for Information Interchange. First appearing as a 7-bit format, then expanding to eight to handle more characters, ASCII remains in use today for the transmission of nearly all computer data.

The news wire still brings a serial stream of information into a large

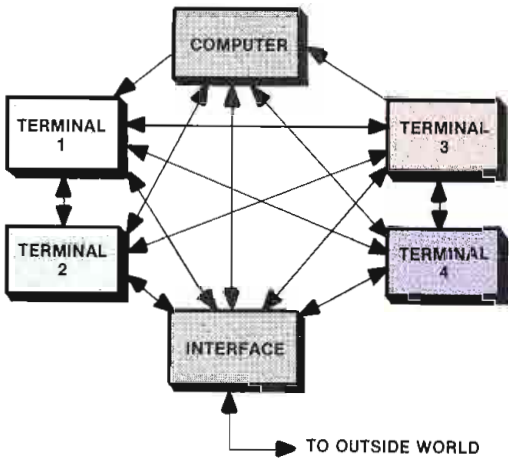


Figure 3. *Interconnect diagram of a point-to-point network.*

memory bank, often at 1,200 baud (about 240 words per minute). But now, without a scrap of paper, the story can be read, edited and provided to the on-air news reporter on a videoprompter screen. Multiple tasking allows the news director to completely rearrange a sequence of stories during the newscast without the talent's knowledge.

If there is sufficient memory capability, the original and edited versions can be archived for future reference. Newsroom automation equipment allows even greater capabilities. Large databases store past news stories with instant recall of the facts by various key indexes. Winchester and optical disk memories provide nearly instantaneous access to history, while streaming data cassettes allow quick access from off-line archives.

Software at heart

The efficiency of newsroom automation depends partly upon the hardware used, but primarily on software. The computer program includes many of the functions typically found in word-processing systems. However, there are many other aspects that make the system easy to use.

News gathering and information management depend heavily upon the networking of multiple computers. Whether the network is limited to terminals within the station or includes remote locations, such as the network news headquarters and regional or state bureau offices, the same concepts apply. The difference will be a matter of complexity.

Most systems now use PC-type terminals linked with a central processing unit (CPU). The terminals may contain resident text-processing software in read-only memory (ROM) or may access that program from the CPU. The reporter may compose a story at the terminal, then direct the CPU to store it in mass memory. Alternatively, a story can be called up from the memory for rewriting. When editing is finished, the story is returned to memory and flagged for the next newscast.

The link between terminals and the CPU is typically serial in nature. Parallel connections could be used, linking all devices with an 8- or 16-wire cable, depending upon the components. The serial approach, however, provides greater compatibility between equipment by avoiding any need for translation from one parallel hardware format to another. If data conversion is necessary, it can be done through software.

The CPU contains the software necessary to receive communications data from one or more wire services simultaneously. In reality, the CPU program may direct the activity of several peripheral microcomputers, one per news service.

Although it would be convenient for all wire services to use standard formats, there are variations among them. As a result, several different types of modems may connect the computers to the services. The modems can be addressable, allowing the wire service to

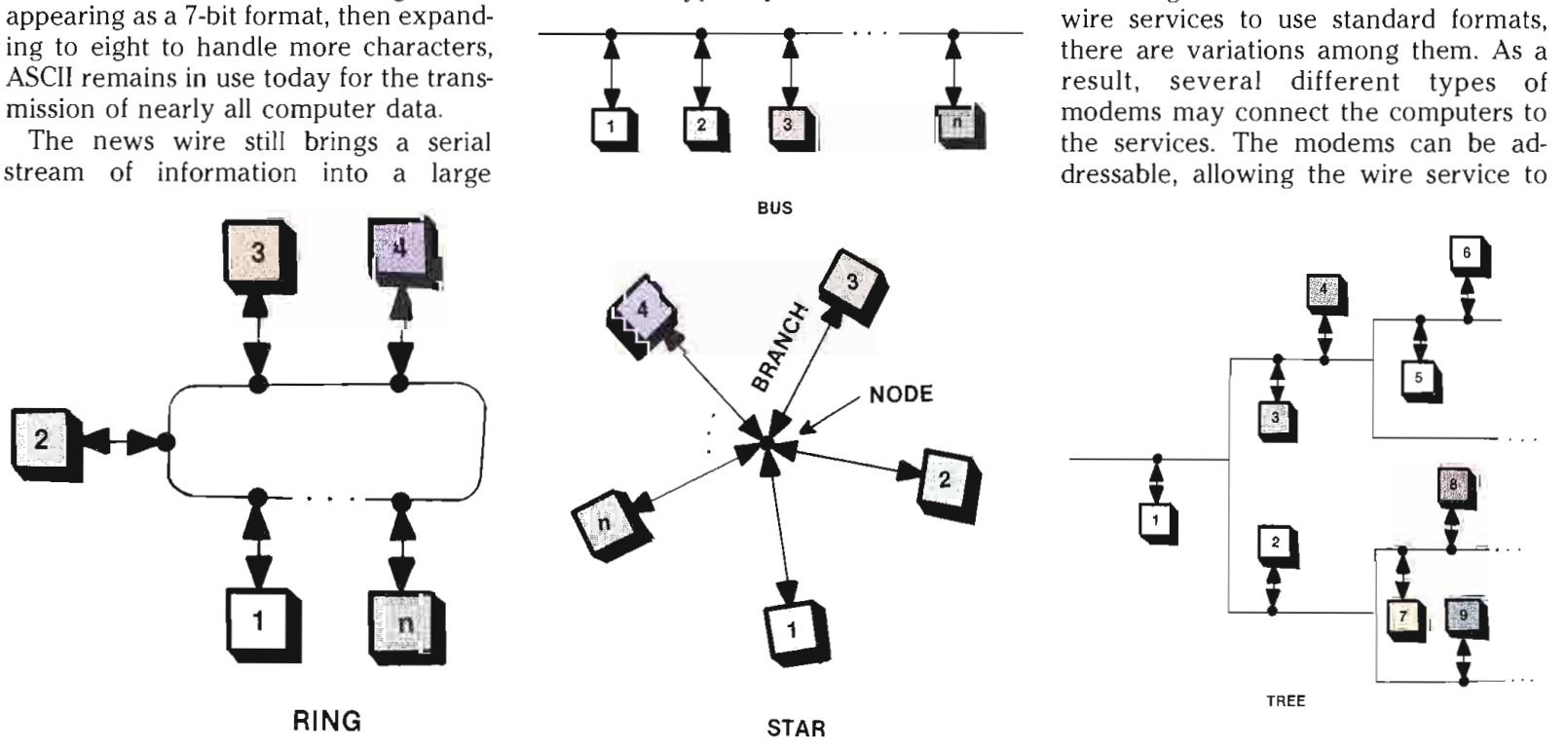


Figure 4. *Possible topologies of local area networks. Shown here are bus, ring, star and tree.*

PAY LESS ATTENTION TO YOUR VIDEO CART MACHINE

Great idea! Now you can do just that with the TCS2000.

The Cart Machine automatically manages, records and plays-to-air all forms of spots and programs, giving you much more uninterrupted time away from programming concerns.

The Cart Machine holds up to 280 carts on-line. Tracks 65,000 carts in the database. With its 1,000 event look ahead feature, you receive a printed list of needed carts and your saturation spot carts never have to leave the machine.

The Cart Machine's comprehensive software system interacts with your traffic system to download your logs and automatically preplans the spot play lists days in advance.

Now other station operations get your undivided attention—with The Cart Machine.

Odetics

We put *smarts* in The Cart Machine.

Odetics, Inc. 1515 S. Manchester Ave., Anaheim, CA 92802-2907.
Call toll free 1-800-243-2001. In California call 800-238-4422 or 714-774-5000.

Circle (61) on Reply Card

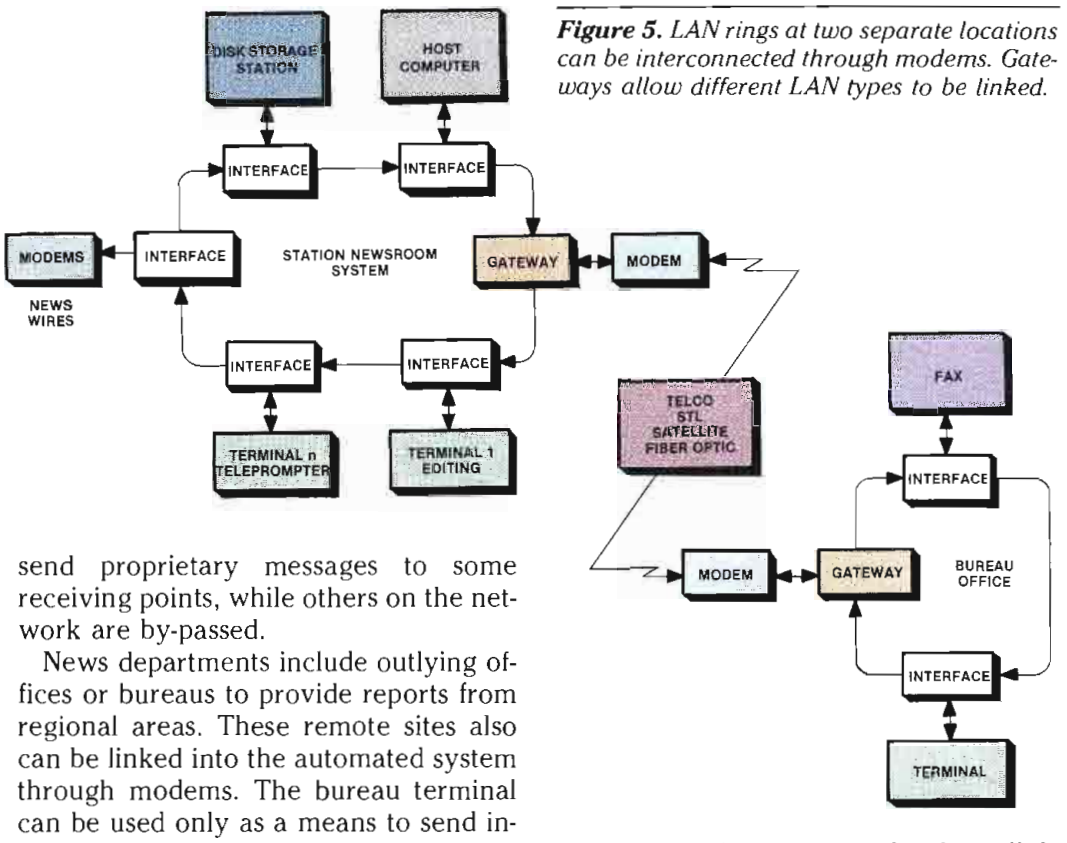


Figure 5. *LAN rings at two separate locations can be interconnected through modems. Gateways allow different LAN types to be linked.*

send proprietary messages to some receiving points, while others on the network are by-passed.

News departments include outlying offices or bureaus to provide reports from regional areas. These remote sites also can be linked into the automated system through modems. The bureau terminal can be used only as a means to send information into the system, but it also may be interactive, receiving messages for the remote location as well.

Basic networks

Technically, a network interconnects two or more devices to accomplish a common goal. The goal is communication and may involve any grade between two extremes—strict 1-way or bidirectional data transfer.

In a 1-way system, a source is linked to numerous destinations. (See Figure 2.) The activity at all destinations follows instructions originating from a source location. Equipment at each destination serves to report the network operation.

At the other end of the range, a totally interactive system assigns each network member an identity and address (see Figure 3). Any member may act as a source or a destination. Activity at any member device, under the guidance of a network controller, results when the device is called, its availability is verified and a job command is issued.

As the device services the command, it may or may not involve other units and the network itself. Upon completion of the task, the device returns to an attention status and the network is free until the next command. All units of the network are prepared for bidirectional communication at all times.

The gathering and presenting of news may involve networks of any type within the overall spectrum. A single newsroom automation system probably will involve several levels of networking, as shown in Figure 4.

Tying the pieces together

It should be clarified that in reference to telco lines, modems (modulator-demodulators) are not used only to link equipment through the telephone. Modems, however, are translating interfaces that exchange electrical tones and dc voltage levels. Another term occasionally used is *codec*, or coder-decoder. The term codec is often used in conjunction with video signals and satellite or fiber-optic links. The idea behind both, however, is the same.

Although a specified connection must exist between the computer terminal and the modem, the medium linking several modems is almost immaterial. It may be a hardwired telephone line, but an STL microwave or satellite channel subcarrier will serve just as well.

What is critical for communicating through modems is the protocol or data structure in use. Like spoken languages among people, the protocol must be intelligible to both ends of a link if the message is to be successfully communicated.

The situation may be compounded by the speed at which information passes through the network. Different types of data may simultaneously follow the same path to different destinations. Another factor to consider is the communications loading (number of users) on the network at any given time. The newsroom computer may need to work with more than one protocol, depending upon the complexity. This task is relegated to the CPU and its peripheral microprocessors.

Within a limited physical area—for example, the newsroom complex—at least two approaches to equipment interconnection are possible. The point-to-point method is common in smaller systems, using an input/output (I/O) port of the CPU for each terminal or peripheral in use. The *local area network* (LAN) is becoming popular in some areas of automation for several reasons. (See Figure 5.)

One if by LAN

A point-to-point system dealing with eight terminals may be easily manageable, but problems may develop with 32 terminals. The management of numerous I/O ports becomes difficult, if not impossible. The CPU can handle only so much, so *combiners* or *concentrators* are used. A concentrator provides I/O ports for several terminals. The concentrator contains its own microprocessor with software to manage the interface between its users and the CPU.

The point-to-point approach also requires individual wired connections at least between each terminal and the CPU. If all terminals are to communicate with one another, additional connections are required between terminals. For such a system, the number of connections (C) between N terminals is $C = N(N-1)/2$. For a system of eight terminals, $C = 28$. In other words there are 28 connections, each of which may fail. If $N = 32$, C expands to 496 connections. As the number of links increases, so does the probability of failure.

If the central unit is working with one terminal, the other seven must wait until the first one is completed. Efficiency is reduced as the seven units twiddle their bits.

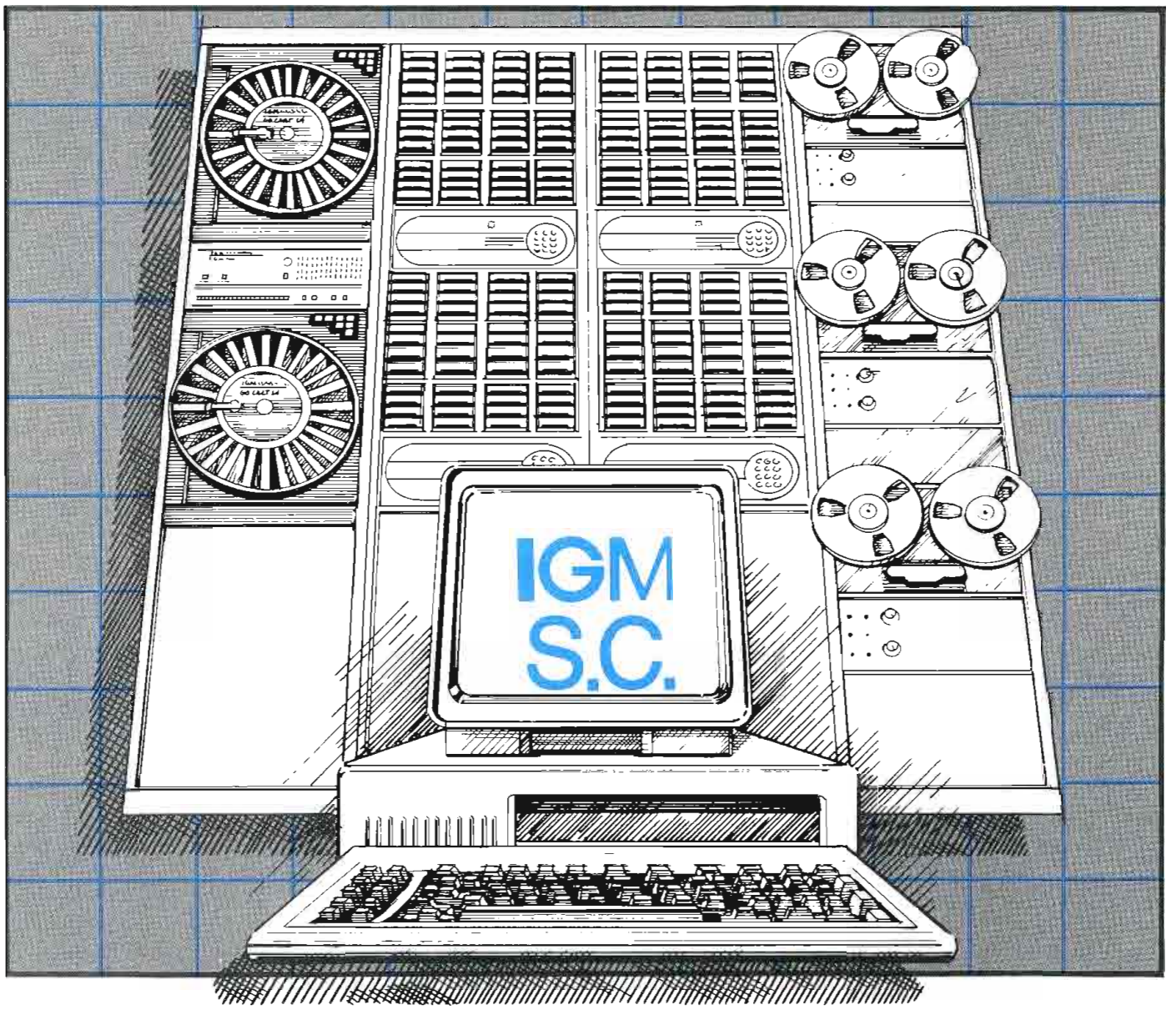
The LAN concept can tie all members into an interactive network ring with only one connection per device. A star configuration is also possible with an increased number of connections (two per device), but the result is still more reliable than that of the point-to-point approach. All transmissions from a source are sent to all members of the group simultaneously. Only the member(s) to be concerned with a message responds.

The number of devices on a LAN is limited by system addressability. Each device must have a unique indentification. A single 8-bit digital byte can take on 256 different states. If more than one byte is used for ID purposes, the possibilities increase in astronomical proportions.

Network traffic requirements vary widely, resulting in a high probability that two or more devices might attempt to transmit messages at exactly the same time. This situation demands *collision detection* and the appropriate recourse. When collision occurs, sources must resend the data, but each begins again after random wait periods. Probability again predicts that network capture on a repeat try will be successful.

Finally, the LAN operates in a *packet switching* mode. In packet switching, data is sent in bursts or packets. Because individual packets are addressed to

Stations looking to automate, look to IGM.



When you are thinking of using a program automation system, a number of questions come to mind. How do I handle network news? How many events of memory do I need to handle any format? How will this work with my billing system? With over 20 years of experience, IGM can help you determine how best to add automation to your operation. The broadcast industry has counted on IGM to build automation systems for all kinds of operations, from small radio stations to network operations.

We can build a program automation system for your station using an IBM-PC or compatible as the brain to control the IGM-SC or IGM-EC automation controllers. Depending on your specific application, you can add the IGM GoCart and Instacart to handle your commercials and announcements or, if you need reel-to-reel machines or other cart machines, we can include the Studer-Revox PR-99 and Fidelipac cart machines in your system.

For information on how you can use automation successfully, call

800-628-2828 Ext. 578

IGM COMMUNICATIONS

282 West Kellogg Road Bellingham, Washington 98226 (206) 733-4567

Circle (62) on Reply Card

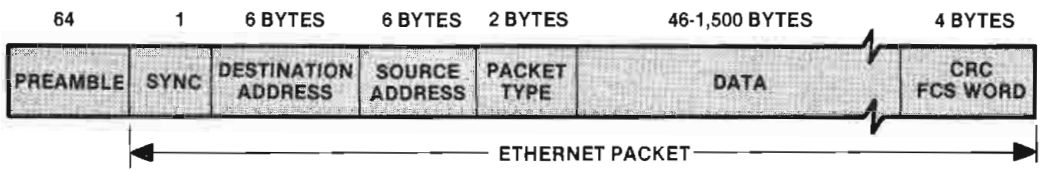


Figure 6. *The Ethernet data packet.*

specific destinations, communication from multiple sources to multiple destinations can occur simultaneously for all practical purposes. No one has to wait for more than a matter of milliseconds.

Pieces of eight

At the packet level, protocol variations become particularly important. Packet systems differ in the composition of each packet or frame. Also, different data packet types may be used for different functions. Typical packets contain address information for source and destination, control bytes, a frame-check sequence (FCS) word and a frame-sequencing number. These sections consist of 8-bit sequences or ASCII characters. The variations in packet make-up cause imcompatibility.

A unique identification is necessary for the beginning of the packet (the *preamble*), as well as for the end (a *cyclic redundancy check*, or CRC). The preamble supplies synchronization information to prepare receiving units for the message to follow. With the terminating CRC, the system verifies that data was received correctly. It does this in the same manner that check digits in bank account numbers apply debits and credits to the proper account.

If the data was received correctly, the CRC send matches the CRC calculated by the receiver from the databits received. An acknowledgment (ACK) is returned to the source to initiate the transmission of the next packet. A message normally contains a number of frames, so the ACK frame contains the FCS word of the last correct frame received or the first frame not received.

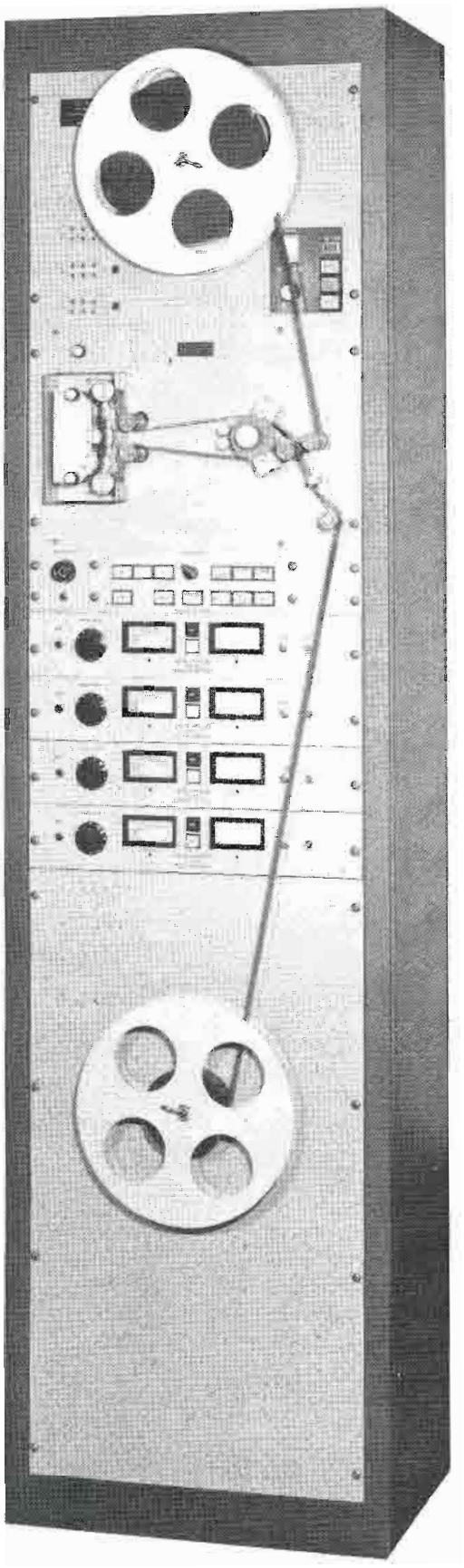
The Xerox *Ethernet* system (see Figures 6 and 7) is one of several networks being used in computer networks and with some broadcast equipment. A 64-bit preamble syncs the network with a series of 1s and 0s, except the last two bits, which must both be 1s. If a receiver sees an incorrect preamble, the packet is rejected.

The packet actually begins with a single sync bit. Then two 6-byte addresses allow numerous discrete source and destination locations. A 2-byte type field is currently reserved for future expansion.

Following a data field, which may vary from 46 to 1,500 8-bit bytes, four final bytes are charged with error-checking and detection. The FCS includes a CRC word, based upon binary calculations on the bits already sent. A calculation by the destination unit over the message field must produce a code to match the bytes of the received signal. With a match, the packet is accepted as valid. Otherwise, a retransmit order (NACK) is issued.

Different methods of coding add to network variation. Ethernet sees an actual end-of-packet code as a lack of 0-1 transitions. Within the packet, such transitions occur in accordance to *Manchester coding*. The Manchester method was developed for disk drive applications.

Collision-detection and handling in Ethernet is a function of the controller/interface at each device. If a carrier sense signal is detected at any network member, a transmission by that device is delayed until the last bit of a frame passes. A minimum of 9.6μs can



MAGNA-TECH
THE SOUND HEARD AROUND THE WORLD

Magnetic Film Recorders and Reproducers for Television and Film Sound Post-Production

HIGH SPEED

Telecine Magnetic Followers
Video Tape-Film Interlock
Electronic Looping
Dubbing Systems
16 and 35mm Electronic Projectors
Total Facility Engineering

WORLDWIDE SALES OFFICES

Paris
Hi-Fidelity Services
4 Rue Semard
75009 Paris, France

Sydney
Magna-Techtronics (Aust.)
PO Box 150
Crows Nest NSW 2064
Australia – Telex 24655

Johannesburg
General Optical Co., Ltd.
15 Hulbert Road
Johannesburg 2001,
South Africa

Rome
Alberto Sciaretta
Via Siria 24
Rome 00179
Telephone 7943618

Brussels
A.R.C.
Rue de Boisde Linthout 45
1200 Brussels Belgium

Hong Kong
Paul Yang and Associates
901 Star House
3 Salisbury Road
Kowloon, Hong Kong

Bombay
Capt. P.K. Vishwanath
234/4 Rama Baug,
Deodhar Road
Bombay 400 019, India

Kehl West Germany
Zenon GMBH
Postfach 1743
Hauptstrasse 128
Kehl am Rhein
Tel: 07851/2991
Telex: 753537

London
Branch & Appleby
42 High Street
Harrow-on-the-Hill
Middlesex HAI 3LL,
England

Kuala Lumpur
Kinematronika Sdn. Bhd.
2852, Jalan Selangor/
Persekutuan,
Federal Hill
Kuala Lumpur, Malaysia

Caracas
Cine Materiales srl
Apartado Postal 61.098
Caracas 106 Venezuela

MAGNA-TECH ELECTRONIC CO., INC.

630 Ninth Avenue, New York, N.Y. 10036

Telephone (212) 586-7240 Telex 126191 Cables "Magtech"

Circle (64) on Reply Card

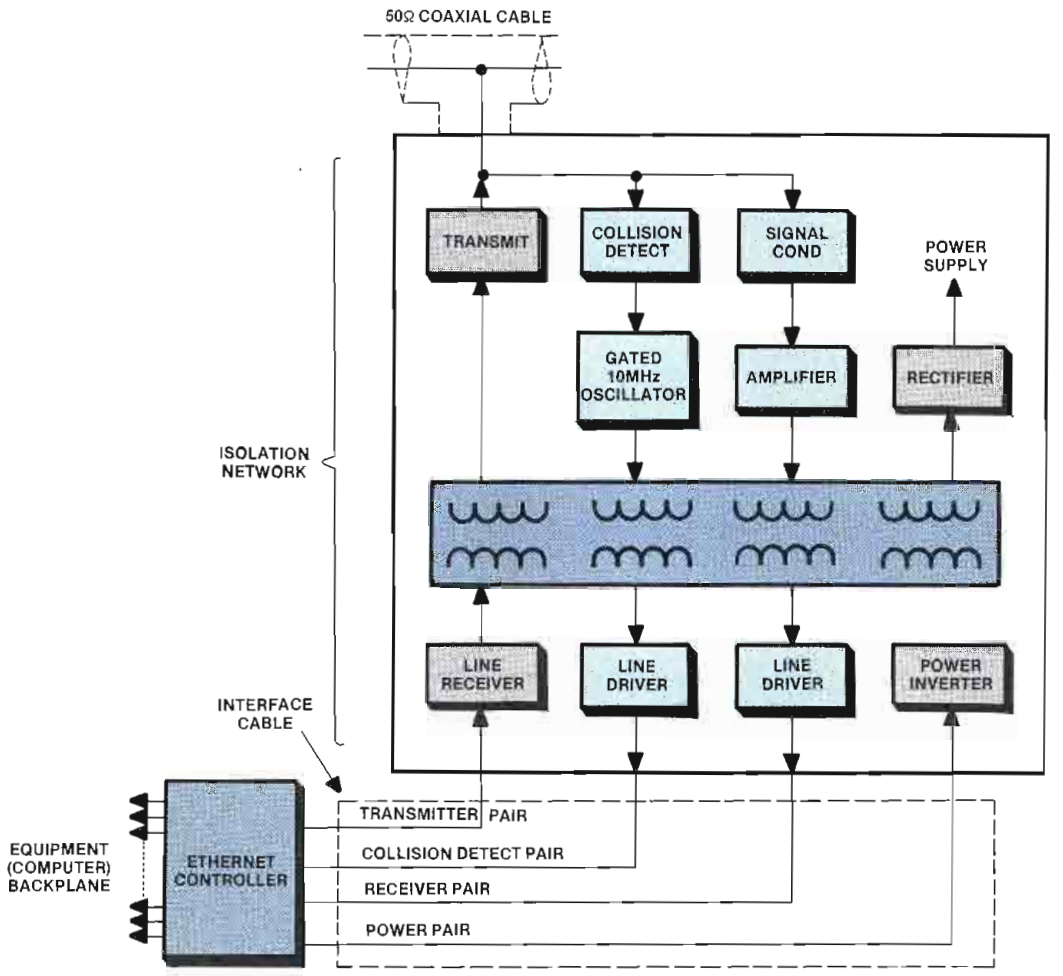


Figure 7. *Ethernet systems use an interface cable and isolation network to link a device to the data network.*

elapse between frames. After that time, contention for the channel exists until a device requests and seizes the channel.

When a collision occurs, the device attempting to transmit will try 15 more times. Each new attempt occurs after a random delay period. Normally, a retry early in the series captures the transmission channel.

Network theory

The names of some other data networks may be familiar from computer use. ARPANET (Advanced Research Projects Agency), the first packet-switched network, played a part in developing the LAN concept. The more complex SNA (IBM Systems Network Architecture) supports an integration of multiple data-processing facilities and interactive access among members of the several networks. DECNET (Digital Equipment Corporation) introduced private LANs among computers rather than hardwired connections. The CCITT X.25, a standard recommended for public packet-switched networks, has been adopted by the United States and many other countries. The ESbus (an EBU/SMPTE standard) is intended for machine control, not high-speed data networking.

Continued on page 106

A STATEMENT OF FACT!

SACA/SHIBASOKU COLOR MONITORS
RE THE WORLD STANDARD TO WHICH
LL OTHER MONITORS ARE COMPARED.

RY ONE AND YOU TOO CAN EXPERIENCE
HE TRUE MEASURE OF PERFORMANCE.

- 20″ and 14″ models available—high resolution delta CRTs.
- I-Q wide band demodulation system
- Complete board interchangeability between models.
- Switchable high performance comb filter and aperture correction.
- Multi-standard capabilities (NTSC, PAL, SECAM) switchable from the front (20″ model). No adjustments necessary because of digital sync circuitry.
- Dynamic focus insures perfect focus on all areas of the CRT. Adjustable from the front panel.
- Special feed back circuits guard against color changes due to variations in temperature.
- Active convergence—50 controls allow precise adjustment on all areas of the CRT.
- Pulse cross with expanded vertical blanking interval.
- Built in cross hatch pattern.
- OPTIONS . . . RGB, YIQ, Y + R-Y, B-Y inputs R-Y, B-Y outputs
- TWO YEAR WARRANTY ON ALL PARTS AND LABOR INCLUDING THE CRT.

ASACA

ASACA/SHIBASOKU CORP. OF AMERICA

12509 Beatrice St., Los Angeles, California 90066 Telephone (800) 423-6347 Sales/Service
In California (213) 827-7144

Circle (66) on Reply Card

Relax! We didn't meddle with a great format. But now that Ampex is delivering Betacam,™ you get a lot of things that make this great format even better, and your job a lot easier.

Our field service people will solve your problems *fast* wherever you are in the world. Reach us in the U.S. via our technical support hotline.

Our spare parts operation makes sure you get the right parts for your needs, and will advise you of any upgrades available.

Besides parts and fast service, Ampex offers pre-packaged repair kits. These simplify maintenance, insure peak performance, and reduce down-time. You can get kits and parts from 14 regional warehouses designed as a worldwide network, close to you wherever you are.

And if you need help in the training department, classes are taught by experienced Ampex instructors at reasonable rates.

It also is comforting to

Ampex gives you

know that when one of those real tough problems that crop up now and then comes along, you can reach right into the heart of Ampex and talk to our product specialists and product managers.

So look into *our* line of CCD and tube-type camcorders, portable recorders/players, and studio editing VTRs. Because now you've got the best of both worlds—a reliable format that makes quality pictures, and a supplier who has a reputation for customer service and product support second-to-none. And while you're looking, you'll want to check on our complete line of NEWS-oriented products, like graphics systems, editors, ADO optical effects, "C" format recorders, and a full line of production switchers.

Atlanta (404) 491-7112 Chicago (312) 593-6000
Dallas (214) 960-1162 Los Angeles (818) 365-8627
New Jersey (201) 825-9600 (In New York (212) 947-8633)
San Francisco (415) 367-2296
Washington, D.C. (301) 530-8800
Canada (416) 821-8840

AMPEX

more Betacam.

Circle (67) on Reply Card

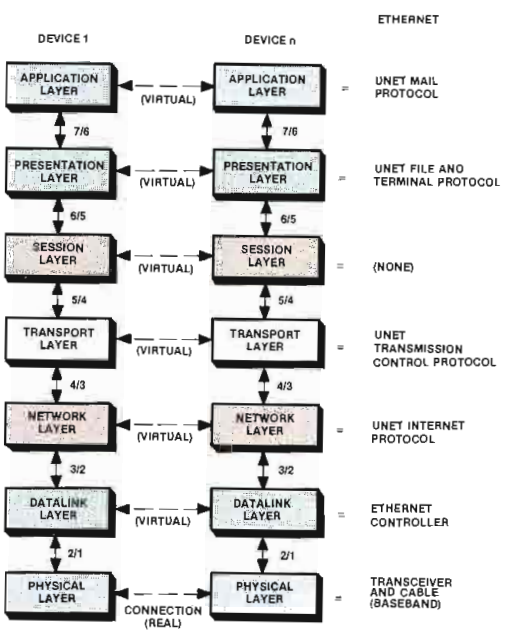


Figure 8. *The ISO theoretical network vs. Ethernet.*

Continued from page 102

A feature of all network types is their correspondence to a model network developed by the International Standards Organization (ISO). This 7-layer architecture model defines the needs of a theoretical communications network. Of the seven levels, the bottom (physical) and top (applications) layers are most easily comprehended. See Figure 8.

The *physical layer* establishes a real connection between two network devices. Included are considerations of connectors, coaxial, twisted-pair and multicore cables or optical fibers, transmitters and receivers, electrical protection components and collision-detection hardware. This layer also ultimately determines if a channel operates full or half-duplex, that is, bidirectional or 1-way, at any given time.

Next, the *datalink layer* assembles the bitstream into frames or frame sequences. Damaged frames are detected here and NACK requests are originated. If all is well, an ACK is sent. ACK and NACK messages may be piggybacked upon other frames to increase speeds.

The *network layer* establishes a virtual circuit and maintains it during transmission. Traffic or flow control from this layer regulates activity on the network, attempting to reduce congestion and inform other layers of the network status. It also maintains priorities of segmented messages, keeping the segments in the proper order.

The *transport layer* multiplexes and demultiplexes data for the next-higher session layer and may multiplex several sessions onto a single network connection. This action relieves congestion during heavy traffic conditions. In monitoring the quality of service, the transport layer is responsible for error detection and error correction. In effect, the transport layer presents an interface to isolate the session layer, above it, from changes in hardware in lower layers.

The *session layer* establishes the connection between two users upon instructions from the next-higher presentation layer and provides buffering between two end-users. Establishing synchronization between end-user tasks, it then determines communications options such as half- or full-duplex and passes approval of those options to the physical layer. It also performs a directory function and provides addressing to be implemented by users or their programs.

The *presentation layer* translates session layer data for the top, or applications, layer. Translation functions include representations of alphanumerics, file formats, data types and character codes as used by dissimilar machines. This layer negotiates a transfer syntax by which application layers may communicate. Such translation and negotiation result because of variations in the equipment that forms the applications layer. This layer is a concern to those involved in manufacturing compatible equipment. If common control and data formats are used by the different equipment manufacturers, compatibility is high.

The *applications layer* allows a human user to access the computer and is responsible for making all other layers transparent to the operator. In essence, it is the programmable part of the computer, while other layers form the operating system. In a broadcast program automation system, this layer also involves specific VCRs, effects systems, still stores or other accessible equipment. Through the applications layer of a newsroom terminal, the entire system becomes a virtual computer to that terminal. The software comprising the applications level is responsible for the personality or intelligence of each terminal or network member.

In network theory, the term *virtual* often appears in reference to connections and devices. In a point-to-point hardwired system, actual connections and actual devices exist. In a network following the ISO theoretical model, virtual connections and devices appear. They are apparent or simulated, but in fact, do not exist as they seem. In the model, there appears to be a direct connection between every layer of any devices on the network (dashed lines). The actual or real connection between any devices occurs only at the lowest physical layer.

To the network, the application layer at any location or node that simulates the expected activity of the network member at that node is a virtual machine. As a result, the real terminal may be replaced by a microprocessor-

The Go Anywhere Aural STL

Go around corners...leap tall buildings...do creative path diversion... without affecting the purity of your sound.

TFT's 8300 Series Aural STL with its unique, innovative IF Repeater approach keeps your on-air audio sounding as it does at the studio...several hops later.

The TFT IF Repeater technique is unique. At relay points, we don't take your aural signal down to audio baseband. We use the 63 MHz IF instead.

Results? How about 55 dB stereo separation even after a few 10, 20, or 25 mile hops? Or ±0.1 dB frequency response from 30 to 15,000 Hz?

Plus, we offer a selectable IF bandwidth (SAW Filter) to minimize adjacent channel interference.

The 8300 Series is available in Composite, or Dual "Hot Standby" Composite configurations.

AM Stereo? Go FM composite to your transmitter and our Stereo Decoder Option will give you left and right signals to drive your AM Stereo Exciter.

If your frequency is one of those listed by the FCC,* we guarantee delivery within 2 weeks after we accept our dealer's order.

All of this backed by a 2 Year Warranty.

Get to the top of the hill, cleanly. Go TFT. Contact your favorite TFT dealer for more details.

*¶ 74.502 of the Rules.

TFT INC

Circle (68) on Reply Card

. . . Where new things are happening!

3090 Oakmead Village Drive, Santa Clara, CA 95051 Phone: (408) 727-7272 TWX: 910-338-0584

based unit for test purposes, when any type of maintenance is needed.

Have token, will transmit

The *token ring* network is a method for improving orderly transfer of data. A token system places an upper limit on waiting time for each device to access the network. A number of local loops to terminals connect to a central distribution panel that operates under the control of a ring monitor. No device on the network may actively transmit information unless it holds the token.

The packet of information in the token ring includes destination and source segments, which include a control byte to indicate asynchronous or synchronous traffic requirements. During periods of high data traffic, the ring monitor may declare a period of only synchronous operation to reduce congestion. In these situations, only single packet transfers are allowed between the call originator and the data destination. Any response to be made to a source must wait until the destination device holds the token.

Token rings are sensitive to the number of nodes connected to the network. More nodes increase the time between access periods for any particular device. Inactive devices or idle nodes must receive and pass along the token, even though they may have no need to access the network. Problems of collision are avoided, because no device can transmit without holding the key and no two devices may have the token simultaneously.

Portals to the outside world

While the LAN system takes care of operations within the station, some means must be provided for the newsroom computer to access or be accessed by outside devices or networks. For example, the news network that is feeding text into the local CPU memory (via modem) is probably not dealing with the same network structure as the local system. The interface between two networks is the *gateway*.

Gateways perform several functions. One is the translation of packet structures from one system to the other. Within an Ethernet system, for example, data may be transmitted at a 10Mb/s rate. The telco data rate with a high-speed modem is 9,600b/s (or baud). For the two to communicate, the gateway provides a buffer. For information leaving the Ethernet LAN, a large buffer must handle the speed discrepancy. For incoming information, only a small buffer is required to assemble the data into acceptable packets.

For an installation that is to link the newsroom system with program automation and the station billing system, gateways would be necessary between each system as well as between outside news bureau terminals, the incoming weather data and other wire services. If each source operates under the same network concept, then the gateways function as interfaces, units that deal with the occasional needs to transfer messages from a device in one network to a device in another system.

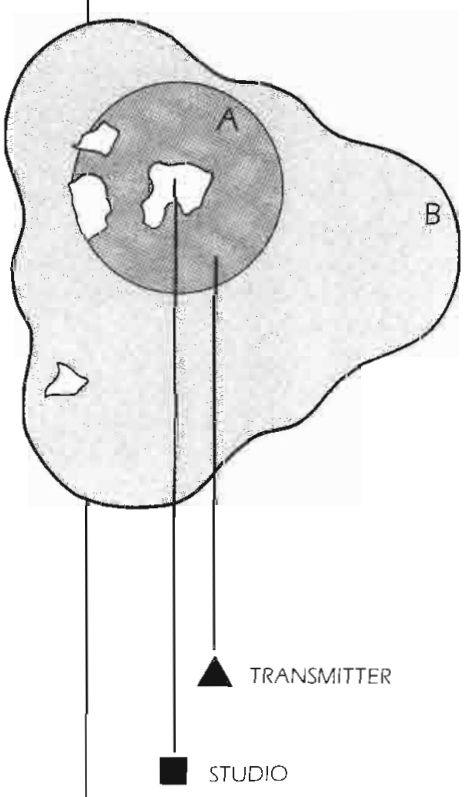
Keys to network choices

To select a network for a particular application requires consideration of several factors. Probably no single system can meet every requirement, but through compromise, a network is selected to best serve the application. The primary consideration is data rate. The data rate will be a function of the maximum number of network nodes and the maximum distance between nodes. The medium (twisted pair, coaxial cable, optical fiber or air) of the physical layer also affects speed because propagation delay time exists.

A CSMA/CD (carrier sense multiple ac-

IF TRANSMITTER FAILURE HAS CAUSED YOU TO LOSE REVENUE, LET US INTRODUCE OUR INEXPENSIVE EMERGENCY TRANSMITTER.

What happens at your station when your FM transmitter goes down? Or your studio transmission link is disrupted? Or a power loss at the transmitter site occurs?



A — Coverage using QEI studio location transmitter

B — Coverage using station's primary transmitter

QEI has an inexpensive solution. Our low-power FM transmitter designed for studio operation can handle all these emergencies and keep you on the air. In many cases you'll retain the majority of your audience simply because your studio is usually located more central to your market than your transmitter site.

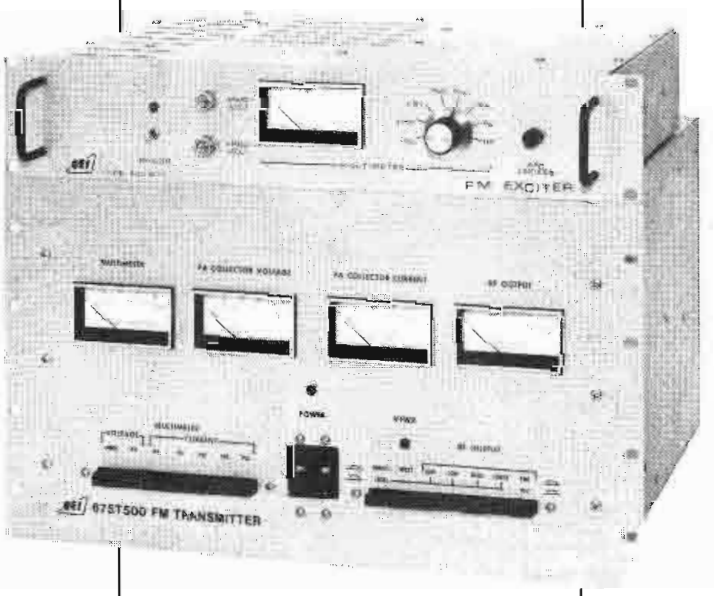
For a small investment your station will gain protection against lost revenues and the embarrassment of discontinued service.

QEI's low-power transmitters are all solid-state and are available in 150w, 300w or 500-watt power output levels. No warm-up is required. They are on the air in less than 10 seconds . . . and have hundreds of thousands of trouble-free hours.

Virtually silent in operation, all our transmitters are available with either our famous 675 synthesized exciter or our all-new model 695 synthesized exciter.

So cover yourself with a QEI low-power FM transmitter located at your studio site . . .

Solve the problems caused by an STL or main transmitter failure . . . and do it on a modest budget.



QEI CORPORATION
One Airport Drive
P.O. Box D
Williamstown, NJ 08094
Phone 609-728-2020
Toll-Free 800-334-9154

QEI CORPORATION

Circle (70) on Reply Card

cess collision detection) system works well when traffic is intermittent and frame arrival is not critical. With increased network traffic, performance of CSMA/CD networks begins to degrade. A frame may collide several times before it reaches its destination, requiring numerous retransmissions. Channel capacity may drop significantly (to as low as 30%) under such conditions.

If peak network loads are large and network access delays are excessive, token-passing systems may be more practical. Only high-priority frame packets are allowed to be passed during heavy traffic periods, while all frames assume equal priority at lower traffic times.

Redundancy and reliability

Newsroom automation is touted as a solution to reams of paper. The complete newscast is retained in non-volatile memory at all times, unless the operator purposely instructed the computer to delete a file. But what happens when power to the computer, a memory or microprocessor chip fails or the Winchester disk crashes? Such failures are becoming less critical, but they still spell potential disaster.

Redundancy is the practical answer to the problem. By duplicating every major portion of a system and providing an interconnection between each of them, it is possible to arrive at high reliability, albeit at an increased cost. In such a system, any information entering the newsroom system is duplicated on the Winchester disk of both computers. Duplicate uninterruptible power supplies are rated to handle the dual computer load if necessary, but normally are responsible for only one of the pair.

The only parts that are not duplicated in such a system are terminal concentrator interfaces. If a total of 64 terminals connected through eight concentrators to the computers, four CCUs to each, and one computer failed, the 32 terminals attached to the surviving CPU would be operable. A 50% survival rate is obviously better than 0%.

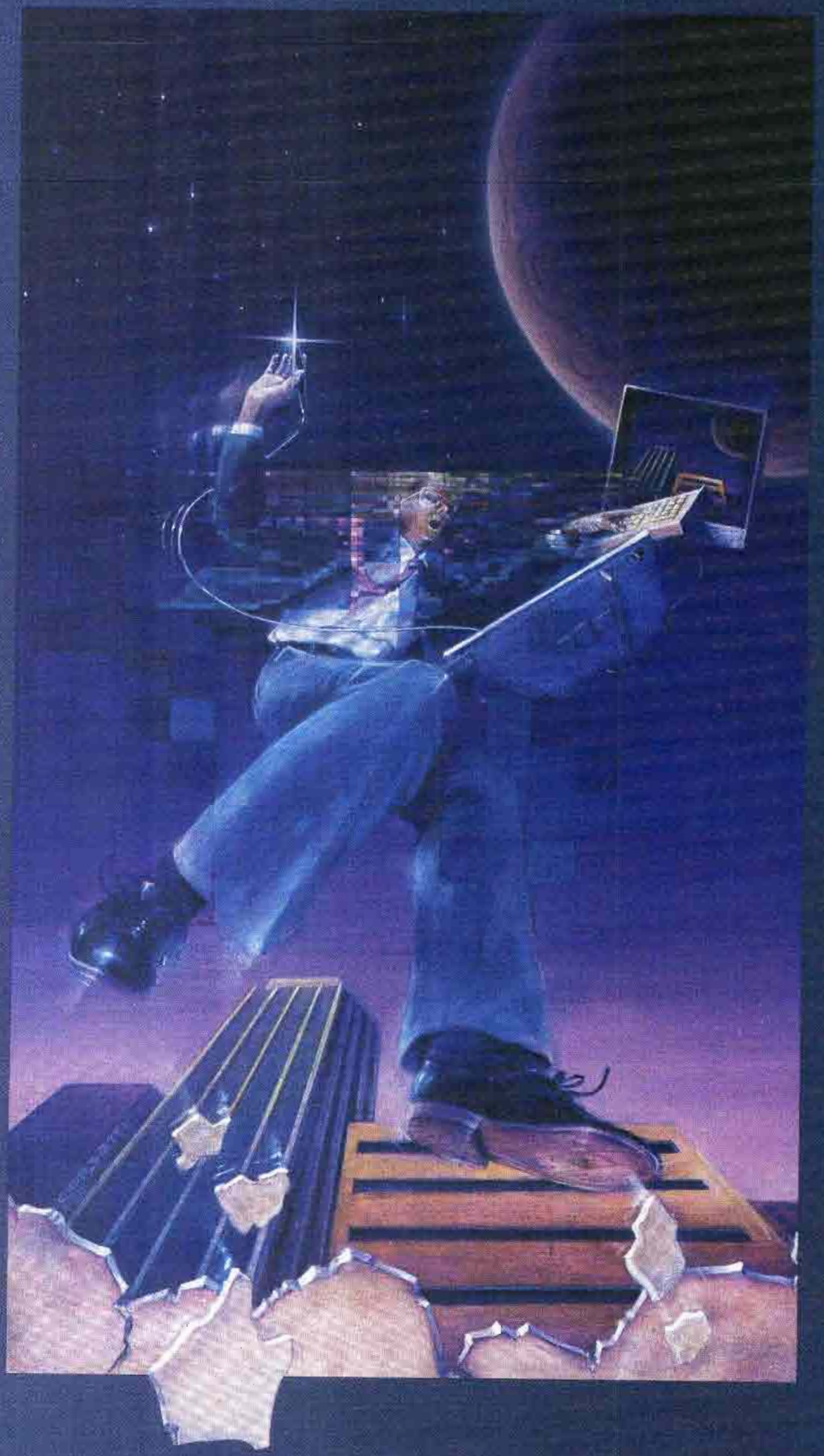
Some network connections automatically provide for reliability. On the Ethernet, a device can fail without causing total network shutdown. Calls to the failed node respond with a *device not available* message. Other network forms, however, may experience a complete halt of activity if any one device fails.

In the final analysis

The dilemma of selecting a newsroom system will ultimately fall to news department management. The selection will be determined by factors of reliability, data capacity, operating speed and operational simplicity. Actual interconnection to station equipment that is not directly involved in news gathering and preparation is limited at this time. Weather data intended for graphic display is linked to electronic graphics equipment and will be called for through a control mechanism other than the news automation.

A trend toward combining automation systems through continued networking exists. Control of tape decks, still libraries and other production equipment from the news computer does make sense. Just as the digital TV production studio has become a reality, total automation of the broadcast facility will eventually occur. To make that progression as smooth as possible, networking concepts will be essential.

The newsroom systems available today may specify the network type that is to be used, thereby limiting the choices. However, adaptability to other types through gateways and interfacing remains an option that you must keep in mind as your facility joins the computer-aided broadcasting age. |:(-)))|



Sit down. Turn on. Take off.

Let Quantapaint set your imagination free.

The Quantapaint Electronic Video Paint System is the shortest distance between your imagination and the finished product. Within *minutes*, you'll be producing exciting visual images with dazzling speed and ease.

We're not exaggerating when we say minutes. Quantapaint features an icon-oriented, on-screen menu that offers one step functions. Touch an icon, select a brush. Touch another icon and select a color, drawing tool, special effect, or pattern. Then press the stylus button and. . .CREATE. It's that simple.

Quantapaint offers 640 x 485 NTSC (768 x 585 PAL) pixel resolution, 256 displayable colors from a palette of 16.7 million colors, airbrushing, fractals, cut and paste, multiplane keying, perspective, mask, software anti-aliasing, smears and blends, mirror imaging, and color palette animation, and much more. New features include color camera capture and cel animation. For a total graphics system, Quantapaint may be directly interfaced with the QCG-500 or Q8 character generators. Prices range from $15,000 to 37,000.

So go ahead. Let your imagination take off. That's exactly what we had in mind. Call or write Quanta Corporation, 2440 So. Progress Drive, Salt Lake City, Utah 84119, (801) 974-0992, TWX 910-925-5684

We liberate the imagination.

QUANTA®

DYNATECH Broadcast Group

Circle (71) on Reply Card

San Francisco to host SMPTE TV conference

By Ned Soseman, TV technical editor

The Society of Motion Picture and Television Engineers will host its 21st annual Television Conference, Feb. 6-7. The conference will be held at the Westin St. Francis Hotel, in downtown San Francisco.

The theme of this year's conference is, "The 21st Conference Looks to the 21st Century." The focus will be on the future of television between now and the year 2000. The technical program will feature high-interest, forward-looking papers covering topics of great importance to TV engineers. Many major TV technology research centers and manufacturing companies have been invited to contribute to the program.

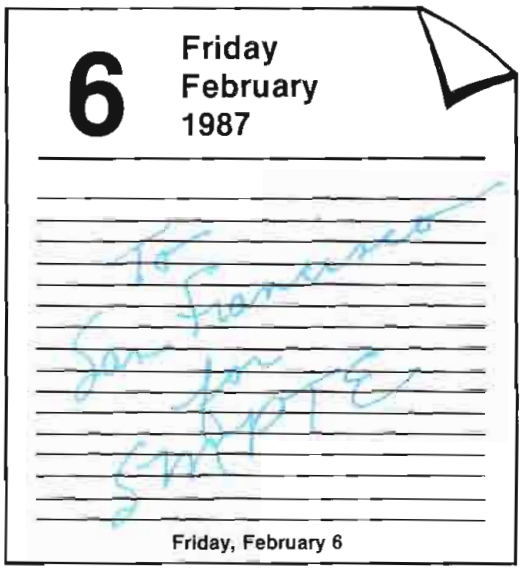
Papers to be presented have been grouped under three categories. Friday morning, Feb. 6, topics will cover: *Videographics: The Next Generation.* Presentations scheduled at the videographics session include authors from Aurora Systems, Cubicomp, Jet Propulsion Labs, Pixar, Pixel and Quantel.

Friday afternoon, *Tape Recording Formats for This Century and the Next* will be discussed. Scheduled to address this issue are representatives from Ampex, Robert Bosch GmbH, CBS, NBC and Sony.

All day Saturday, presentations will focus on a single topic with an international impact: *The Frontiers of Global Television Research.* An impressive number of industry leaders from Canada, France, Japan, the United Kingdom, the United States and West Germany have been invited to present papers on this issue.

The stated objective of the Saturday sessions is to present a broad overview of what leading researchers in this field are doing to advance TV technology into the 21st century. Leaders from the major U.S. networks also will address how they perceive these advancements will affect their engineering operations. The session will be followed by a panel discussion involving all the speakers.

All equipment and devices exhibited will be limited to those directly relating to the technical papers presented, and will be exhibited in an area adjacent to the lecture hall.



In addition to the technical program and equipment exhibit, the conference will include meetings of the society's engineering, executive and administra-

Courtesy of San Francisco Convention and Visitors Bureau

The St. Francis Hotel is on the southeast corner of Geary and Powell Streets, across from Union Square.

tive committees.

On Friday, a reception will be held in the evening, and a luncheon also will be held. Scheduled to speak at the Friday noon luncheon will be Bryce McCrirrick, director of engineering at the British Broadcasting Corporation.

Sessions

Friday Morning, Feb. 6

Video Graphics: The Next Generation

Session Chair: Glen Pensinger
Session Co-Chair: Gary Youngs
Today's Videographic Environments—An Overview, Peter Lowten, Pixel
Trends In Videographics, Richard Shoup, Aurora Systems
The Future of Image Computing, Alvy Ray Smith, Pixar
A paper by Richard Taylor, Quantel, Ltd.
Computer Graphics in Animation, Edwin P. Berlin Jr., Cubicomp Corporation
A paper by Carl Rosendahl, Pacific Data Images
A paper by James Blinn, Jet Propulsion Labs

Friday Afternoon

Tape Recording Formats for This Century and the Next

Session Chair: David Fibush
Session Co-Chair: Gerald Engbretson
Panel Chair: Ken Davies
Development of Component Digital VTRs and the Future Potential of the D-1 Format, Jurgen Heitmann, Robert Bosch GmbH
Current Status of the Professional RDAT (Rotary Digital Audio Tape) Implementation, Peter Dare, Sony Broadcast Products

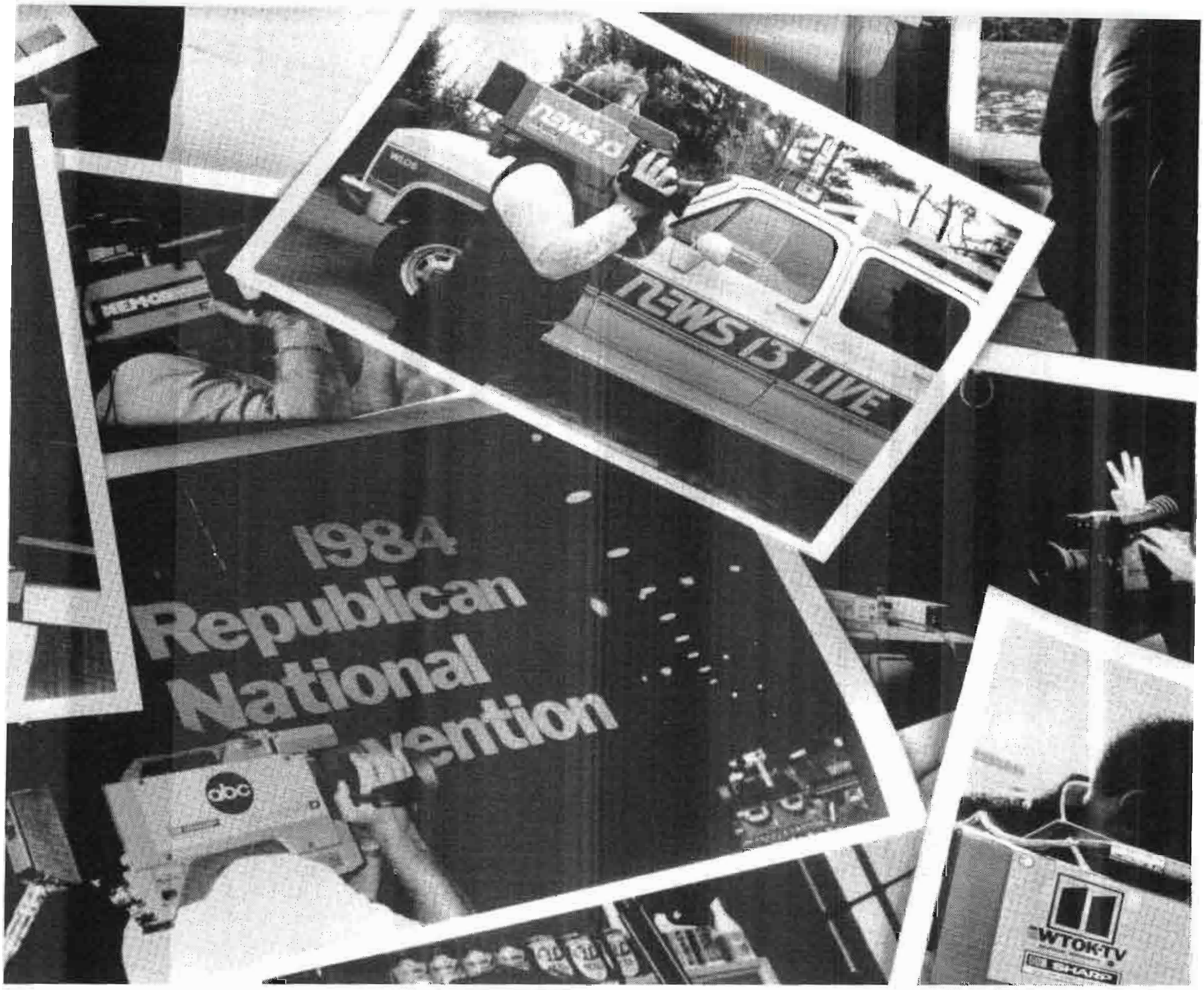
Saturday, Feb. 7, All Day

The Frontiers of Global Television Research

Morning Session
Session Chair: Peter Hammar
Session Co-Chair: Donna Foster-Roizen

Afternoon Session
Session Chair: Peter Lude
Session Co-Chair: Lincoln Endelman
Panel Chair: Joseph Roizen

At press time a complete list of technical papers and presenters was not available. Consult your Fall SMPTE show program when you register.



IT ONLY TOOK TEN YEARS TO GET TO

After ten years of research, design, and field experience, Sharp has developed two new video cameras to meet the demands of the broadcast and professional users: the XC-B10 with Saticon® tubes and the XC-B20P with Plumbicons.®

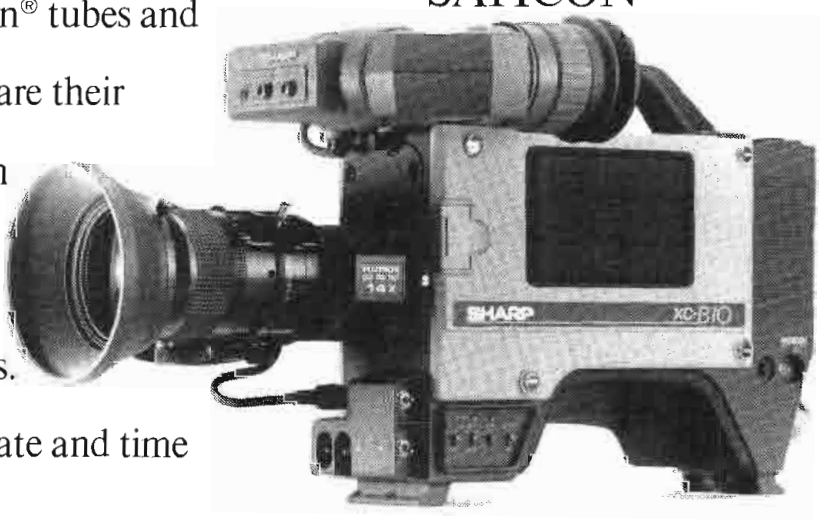
What make both of these cameras so remarkable are their features.

Like Beta and MII component output. So you can connect directly into component recorders without adapters.

And a unique auto contrast circuit to change washed out video into crisp, clean information. Plus auto knee that prevents losing your video in ultra-bright scenes.

We've even put in a unique computer-controlled clock/calendar that gives you the option of burning the date and time into your recordings for editing and archival use.

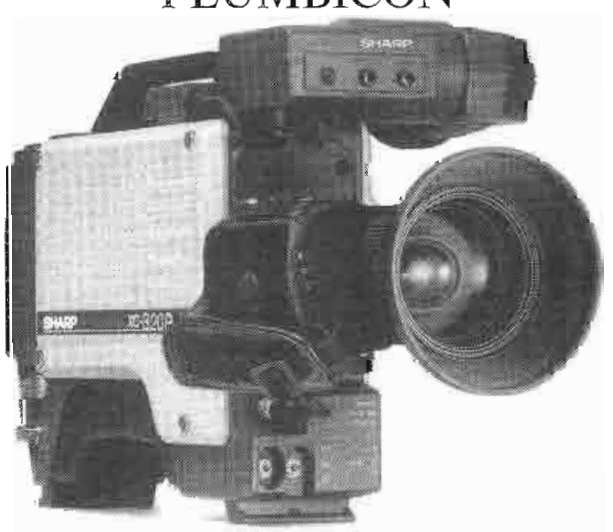
THE NEW XC-B10
SATICON®



For more information or the name of your local Sharp broadcast dealer, call (201) 529-8731 or write Sharp Electronics Corp

AND THOUSANDS OF CAMERAS THESE TWO.

THE NEW XC-B20P PLUMBICON®



The tubes themselves deliver exceptional pictures, thanks to their state-of-the-art low capacitance mixed-field diode gun technology.

And both cameras have information-packed viewfinders, multicore and triax remote units with full system capability, and prism temperature sensing. Not to mention selectable 6-12 or 9-18dB gain and rugged diecast construction with extensive EMI protection.

All in all, the XC-B10 and XC-B20P are truly remarkable cameras. But don't just take our word for it. Contact your local Sharp broadcast dealer and ask for a demonstration.

Then you can see for yourself the kind of technology that's made Sharp one of the fastest growing camera companies in America.

SHARP®

FROM SHARP MINDS COME SHARP PRODUCTS™

Broadcast Group, Sharp Plaza, Mahwah, NJ 07430-2135. © 1986 Sharp Electronics Corporation

Circle (73) on Reply Card

Today's technology, tomorrow's reality

By Ned Soseman, TV technical editor

The mammoth Jacob K. Javits Convention Center in New York was the venue of the 128th SMPTE Technical Conference and Equipment Exhibit, held Oct. 24-29. The mood was a mixture of positive comments, technical debate, good ideas and criticism. SMPTE provided a technical forum for demonstrations, presentations and idea sharing by attendees, participants and exhibitors. A record crowd of 16,812 was on hand, almost 8% more than the 1985 fall attendance record set in Los Angeles.

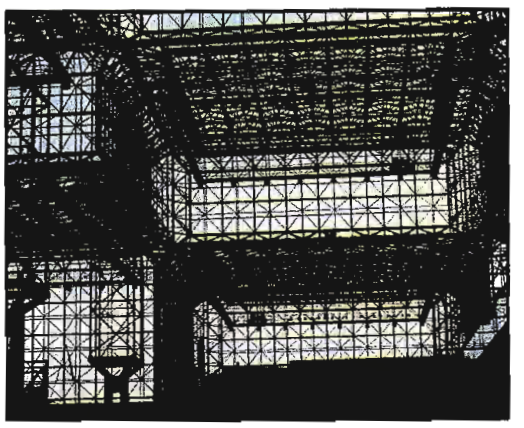
At this convention, on the other hand, many factors contributed to an event that was considered by some to be less than optimum. The cold, wet weather, the World Series, the official dedication of the Statue of Liberty, and the "not quite ready yet" status of the convention center were beyond SMPTE's control. Although SMPTE increased the previously inadequate security provided by Javits Center (see the *Welcome to New York* sidebar), security worries and less-than-friendly union setup crews created an uneasy tension and frustration among exhibitors even before the exhibits opened.

Unlike past years, the conference opened on Saturday morning, and exhibits opened in the midafternoon. Because the meetings and presentations ran on a fixed schedule throughout each day, the exhibition was opened and closed at irregular intervals. Exhibits closed Tuesday afternoon, while technical papers and meetings continued to a Wednesday evening conclusion.

Many of the record 271 exhibitors who paid prices comparable to NAB conventions for their display space felt traffic on the 80,500 square feet of exhibit floor was light. Many attendees found that it was difficult to attend the many topical presentations and still have time to visit the exhibits.

Even with the increased attendance, the technical conference and exhibit attracted about one-half the number of people that attended the Dallas NAB convention in 1986. The difference, however, must be weighed with the benefits of the engineering oriented, non-sales atmosphere of the event.

October was an exciting time to bite the Big Apple. Some visitors felt the Big Apple took a bite out of them.



The all-glass Jacob Javits Convention Center was an impressive facade.

A mint condition VR-1000 was shown at Merlin Engineering's booth. Some attendees didn't know what it was.

SMPTE is a non-profit organization, and to protect that status, business transactions were not allowed on the floor of the exhibit. This allowed engineers to ask questions, instead of having to deal with salespeople trying to close prospects.

Unique to SMPTE is the homogeneous mixture of film and video people. In an age where film and video are becoming bedfellows, the opportunity to explore the other world offered everyone a better insight into "the big picture."

A fascinating opening

The conference was opened by Richard G. Streeter, SMPTE engineering vice president. In his opening remarks, Streeter addressed the question, "Is standardization obsolete?" He reminded the audience that the cornerstone of SMPTE, since the day it was founded, has been standards. He concluded that in the face of economic reasoning by manufacturers and buyers, standardization is still the key to industry well-being.

Following Streeter's remarks, Mark Sanders, recently appointed vice president of marketing and new technology for Ampex, mesmerized the audience of about 500 with a futuristic keynote address. He began by questioning this year's SMPTE theme, *Today's Technology, Tomorrow's Reality?*, asserting that the theme is not a question, but a fact. The question is how do we deal with it?

Sanders remarked that over the past 250 years "waves of innovation" have occurred in cycles of about every 50 years. Since about 1940, we have been in the age of electronics, and we are, in fact, nearing the end of that 50-year period.

Sanders went on to discuss change itself, how it stems from innovation and creativity, and how the industry could best respond to the changes caused by uncontrollably rapid advances in technology. He also discussed how the management of change is a management of paradoxes and explained some Ampex management techniques used to take advantage of change.

He suggested that we, as participants, must not only live with change but learn how to turn it to our advantage. Sanders stated that change must not be ignored or fought, but managed the same way that a surfer handles a wave, or a driver controls a car in a skid. Go in the direction of the force, he said, and use it to direct your activities and plans.

He commented that to manage change successfully requires that risks be taken, and that freedom to innovate be encouraged. Risks, he said, may not always

When You're Tired of Playing Power Protection Games

It's amazing how many companies claim to have the answers to your power-related equipment problems. And no doubt, you've tried some of their products in your desperate attempt to improve operational productivity.

Well if you're tired of playing their games, let Transtector Systems solve your power problems once and for all.

Only Transtector offers you this kind of full-service, problem-solving expertise:

- More than 80 solid-state transient suppressor models
- Applications engineering
- Power line diagnostic equipment
- Intensive educational seminars for you and/or your staff
- 24-hour, toll-free hotline

So pick up your phone (assuming it still works) and call Transtector now to receive a complete package of information on "How To Solve Power Line Problems Without Playing Games."

1-800-635-2537

TRANSTECTOR® SYSTEMS

10701 Airport Drive, Hayden Lake, ID 83835, (208) 772-8515

Circle (74) on Reply Card

At times, exhibitors' booths were swamped with interested attendees.

produce the desired outcome, but experience gained should be the building blocks toward successful culmination of new risks. Walt Disney was singled out as one of the world's great risk takers.

Sanders also gave the audience a look into his company's current research and development work. With projected graphic materials, he shared a new development at Ampex, which he characterized as a classic example of looking at something old and seeing something new.

Sanders showed how, just as technologists were beginning to think that 30-year-old videotape recording techniques had reached their physical limits, one engineer used these limits and some basic laws of physics to produce a fixed head, solid-state method of video head scanning.

Using a fixed head, if a magnetic flux is applied to saturate both the top and bottom of the head, a narrow area of the head still is effective. Using ramp voltages on the saturation coils, this area can be controlled to electronically move the operating portion of the head up and down, and with some clever geometry changes, sideways.

In the future, he said, our industry can contemplate a fundamentally new way of recording that is simpler, yet pushes forward the limits of technology. Sanders stated he did not know when, if, or in what form this new idea may be applied to future products.

Technical papers

About 113 papers on 16 topics were presented by leading film and TV experts and innovators. Most topics dealt with increasing the technical quality and subsequent viewer impact of their respective media, by improving the recording, editing and presentation. Other papers dealt with the marriage of film and video.

Although the majority of the papers and exhibits were presented around the theme of increasing the viewers' experience, HDTV products or demonstrations were noticeably absent. In its place was the marriage of digital 4:2:2 products. Several manufacturers demonstrated integrated 4:2:2 systems, and in-

Welcome to New York

By Jerry Whitaker, editorial director

Question: What would you pay for a breakfast consisting of the following?

- Orange juice (about 6 oz.)
- Coffee with cream
- Oatmeal
- Fruit cup (sounds healthy doesn't it?)

Would you pay $10? Would you pay $18.75? Maybe. Well, what about $27.65 plus an outstretched palm looking for another $5? Unbelievable, but true. Welcome to Fun City!

No one ever accused New York of being cheap, but every visit to New York brings new challenges for convention attendees when the time comes to fill out expense reports, or pay the charge card bills. The breakfast outlined above was room service for one person, at a well-known and popular hotel. (The oatmeal was excellent, by the way.) The room itself cost about $20 for each hour it was occupied.

No one here in the **BE** offices questioned the charge of $27.65 for breakfast. I think the reason is that, compared to several dinners I had, my breakfast looked pretty reasonable.

The Big Apple

New York is a fascinating town. There is no other like it in the world. It is a fun place to visit, provided you have deep pockets. It is an excellent place to transact business, if you're on an expense account. However, it is not the best place to hold a trade show convention. That point was made clear at both SMPTE and the New York Video Expo, this past October.

Both shows were held for the first time in the newly completed Jacob Javits Convention Center. The facilities are spectacular. The entrance atrium is awe inspiring, and the exhibit halls are large. So much for the good news.

Exhibitors were angered—some were enraged—at the labor problems that have become the hallmark of major trade shows in New York. Opinions varied as to whether the labor jurisdictional problems were as bad as Chicago's McCormack Place, which are legendary.

The biggest facility problem, beyond the unfinished construction, was ac power. You would think that a brand new convention center, designed to host major trade shows, would be wired for sufficient electrical power. You could think that, but you would be wrong.

Easily installed ceiling electrical drop service, common to most other convention centers in the country, was not to be found at Javits Center. Instead, a 30-foot grid system for electrical service is buried in the concrete floor. With this design, heavy power cables had to be run across aisles, and some booths had to leave a space open for electricians' access. It also resulted in some large electrical service installation/connection charges.

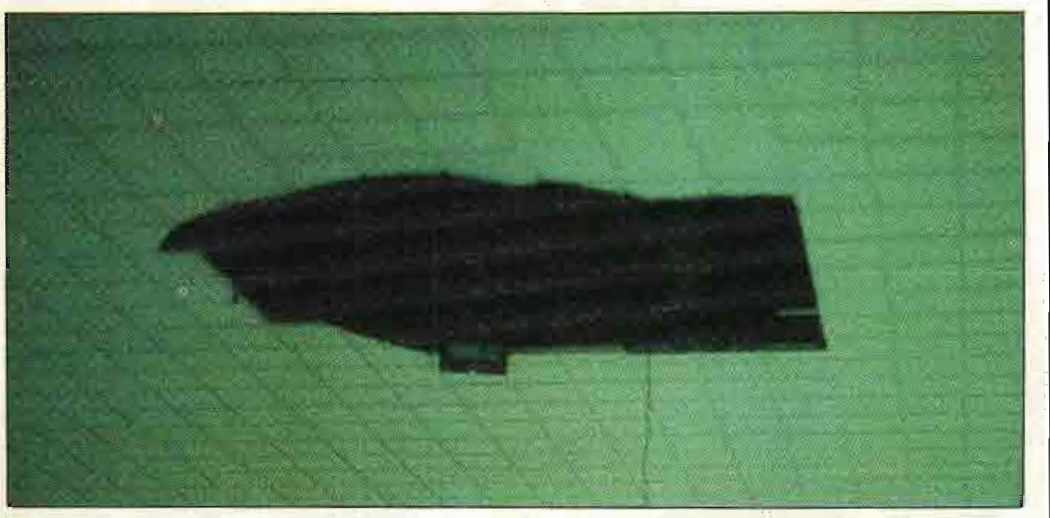
At most other convention centers, the show contractor controls the electricians, and chooses the electrical contractor. Javits Center supplies its own electrical contractor, period.

Exhibitors, for example, who brought in prewired exhibits needing only an electrical outlet with sufficient current, were charged a one hour minimum for two electricians and a convention center supervisor to plug the equipment in. Straight time (which usually ended yesterday) for electricians at Javits Center is, by the way, $60 an hour. Typically, such a task required the three men for at least one hour.

Hitachi setup personnel watched as a union laborer tried to roll one of its new 1-inch machines over an electrical cable. On his second solo attempt, the cable caught the wheels and "oops!" The machine landed face down on the concrete floor.

At an exhibitor-sponsored cocktail party, somebody asked for a pitcher of water. The union bartenders at the party couldn't oblige, because water was not under their jurisdiction.

Many of the complaints and horror stories about the facility and union jurisdictional questions surfaced at an



Many ceiling tiles at Javits Center were missing, sometimes revealing bare wires.

exhibitors' meeting on the third day of the show.

It is uncharacteristic of a SMPTE convention to hear complaints at an exhibitors' meeting. Problems come up at any convention, and SMPTE has, at previous shows, responded quite adequately. They have, in fact, served as a role model for how many exhibitors would like the NAB to run its convention.

This time things were different. Exhibitors voiced the feeling that another Eastern city should be chosen for the East Coast fall SMPTE show, which annually alternates with Los Angeles. One seemingly viable suggestion was Atlanta.

Concerns about New York involved the Javits Center location, which is off the beaten path as far as most New York activities are concerned; labor management, efficiency and jurisdictional problems; and the cost of moving people and equipment in, around and out of the city. Freight-handling rates, for instance, are three times higher than Las Vegas.

Although SMPTE officials were generally pleased with the turnout of attendees at this convention, many exhibitors were not overwhelmed with the numbers that visited their booths.

So, will SMPTE leave New York for Atlanta or elsewhere on future East Coast years? Maybe, but then again, maybe not. New York City is a powerful center of broadcasting and commerce. There is a lot to be said for holding a convention there.

There is a great need, though, for better planning and cooperation from the Javits Center management and labor unions. Attendees and exhibitors may find Fun City too expensive to be cost-effective. Industry estimates place the overall price of exhibiting in New York at about 40% higher than the national average. Gratuities not included.

It must be remembered that at any convention, exhibitors pay the bills. If they can't get a fair shake in one place, they will gravitate to another.

Aside from that, it was a great show, and my expense report was approved!

With low key lighting, differential lag can be a problem. Amperex Plumbicon tubes with built in bias light increase the speed of response of the layer, and lag is virtually eliminated.

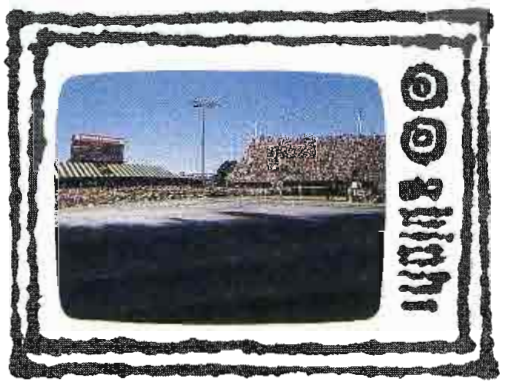
Comet tailing and loss of detail in highlights are minimized by using the Amperex patented Diode Gun or anti-comet tail (ACT) tube. Both solve this problem by providing high beam current to stabilize highlights.

High audio levels can produce the annoying problem of microphonics. Amperex attacked this at its source, and all Amperex Plumbicon tubes have a unique mesh designed to prevent the build-up of mesh vibrations—not just to dampen them.

Six of TV's toughest shots and how

The problem of image retention. By reexamining layer physics and semiconductor properties Amperex developed a new extended red layer. Now you can include brilliant reds in your scene without concern for image retention.

Low output capacitance Amperex Plumbicon tubes help maintain high signal to noise performance. This helps prevent loss of detail and increased video noise in low light areas of high contrast scenes.



Because of special photoconductive layers for each color and an optimized electron optics design, the Amperex Plumbicon tubes provide the highest resolution for each image format. This resolution is measurably higher than earlier tubes.

Amperex Plumbicon® camera tubes handle them.

Ordinary pick up tubes can handle ordinary TV shots. But when you have to contend with low light levels and bright highlights...the glare of reds and the blare of trumpets...you need the extended performance of Amperex Plumbicon® TV Camera Tubes.

Amperex invented and refined the pick up tube technology that makes it possible to handle the 6 toughest shots in TV. Since the original Plumbicon cameras were introduced, your business has become more competitive, more demanding. Camera designs have become more complex. That's why we continued to invest in improving the performance of the Plumbicon tubes. That's why we offer today's range of extended performance Plumbicon tubes.

Today, virtually every TV camera system— domestic or imported—is designed to use the Plumbicon tube. And that makes the handling of the toughest shots in TV very easy. Simply specify Amperex Plumbicon TV camera tubes.

Made in Rhode Island, U.S.A. Delivered to you in twenty-four hours or less.

For more information call or write Imaging Products Group, Amperex Electronic Corporation, Slatersville, Rhode Island 02876. (401) 762-3800. A North American Philips Company. Outside the U.S.A. contact: Philips Electronic Components and Materials Division, 5600 MD Eindhoven, The Netherlands.

Amperex®

Amperex Imaging Products
... we see things your way.

Circle (76) on Reply Card

The exhibition afforded a good opportunity to learn.

deed, system interface (4:2:2, M-II, Betacam, etc.) was one of the most frequently heard buzzwords on the exhibition floor.

SMPTE news

It was announced that M. Carlos Kennedy, SMPTE vice president, was elected president of SMPTE, for a 2-year term that started at the beginning of this month. He succeeds Harold J. Eady. Kennedy is director of long-range product planning for Ampex Corporation. He has been with Ampex for 18 years and was instrumental in the development of the Ampex VPR series 1-inch type C recorders. Maurice L. French, the current SMPTE conference vice president, will succeed Kennedy as executive vice president.

½-inch format wars

Amid the standardization theme of SMPTE was the highly visible battle between Betacam SP and M-II. As production line products are being delivered to users, each manufacturer substantiated its claims with user testimonials as to why its format is better. Perhaps, in the spirit of SMPTE, split-screen, synchronized multigeneration feeds on a high-resolution monitor would have provided a more scientific comparison of production model machines.

NBC's press conference at 30 Rockefeller Plaza gave testimony to the virtues of M-II, and described in some detail the rigorous procedures used to test M-II systems before a purchasing decision was made. To quote NBC executives, "NBC beat the hell out of the stuff." NBC visually compared synchronized M-II and 1-inch pictures on a consumer TV set using a glitch switcher to compare VTR feeds, A/B style.

NBC announced M-II would ultimately replace all its ¾-inch and 2-inch quad VTRs and many 1-inch machines. For Mountain time zone viewers, M-II is a reality, as the Mountain zone delay system consisting of several M-II machines in a few dedicated racks is already on-line. It was clear that NBC and M-II are destined to establish a viable format.

Panasonic also announced that three

STOP! THIEF!

By Ned Soseman,
TV technical editor

Security at the Jacob Javits Convention Center in Manhattan quickly established a poor reputation throughout the video industry following October's Video Expo show, where thieves practically showed up with shopping carts.

Curiously, New York City police are not allowed in the convention center except to answer an emergency in progress call, leaving all security responsibilities to the convention center. Because of poor security, several exhibitors lost more than $100,000 worth of new products, both while the show was in progress, and during hours when it was closed.

SMPTE, alerted to Video Expo's security problems, augmented the security provided by the convention center with its own security people. SMPTE exhibitors sustained no reported losses. Security at the convention center let the following equipment slip out the doors of October's Video Expo Show. If you have any information regarding any of these items, contact your local police and the persons listed below:

STOLEN FROM IKEGAMI:

- *HL-95 camera (no VTR)* *s/n 849 GE 19707*
- *ITC-730 camera* *s/n 6382,*
- *A-16x9 lens* *s/n 0150100443*

Ikegami contact: Greg Stoner; 201-368-9171

STOLEN FROM SHARP:

- *XC-A1 camera* *s/n 311738*
  Canon lens J13x9BA *s/n 56032*
  XCA 15VF viewfinder *s/n 311279*
  Battery bracket
  Anton Bauer battery *s/n L-30*
- *XC-A1 camera* *s/n 312046*
  XCA 15VF *s/n 311623*
  Canon J-13 lens *s/n 56089*
  ac adapter *s/n 311833*
- *XC-A1 camera* *s/n 311884*
  Fujinon A15x9A *s/n 1750000010*
  RGB adapter
  XCA 1RGB *s/n M-10*
  ac adapter *s/n 212176*
  XCA15VF *s/n 311402*
  Shipping case *s/n M-02*
- *XC-B10 (prototype)*
  camera *s/n 0000001*
  1.5-inch viewfinder Fujinon
  A14x9BERM24 *s/n 2853001081*
- *VC-50 VHS*
  camcorder *s/n 00311119*

Sharp contact: Bruce Pollack; 201-529-8731

STOLEN FROM SONY:

- *EVO-110, 8mm camcorder*

STOLEN FROM JVC:

- *KY-210 B with lens*

Scripps Howard broadcasting stations have ordered more than $500,000 worth of M-II products.

Meanwhile at the Sony booth, WNEV-TV (Boston), which recently dropped its exclusive use of the original M format in favor of Beta SP standardization, was exemplified as Sony's testimonial that Beta SP is better. As other manufacturers chose sides, the battle lines were drawn, and it was evident that only the viewer would emerge as the clear winner.

Digital 4:2:2

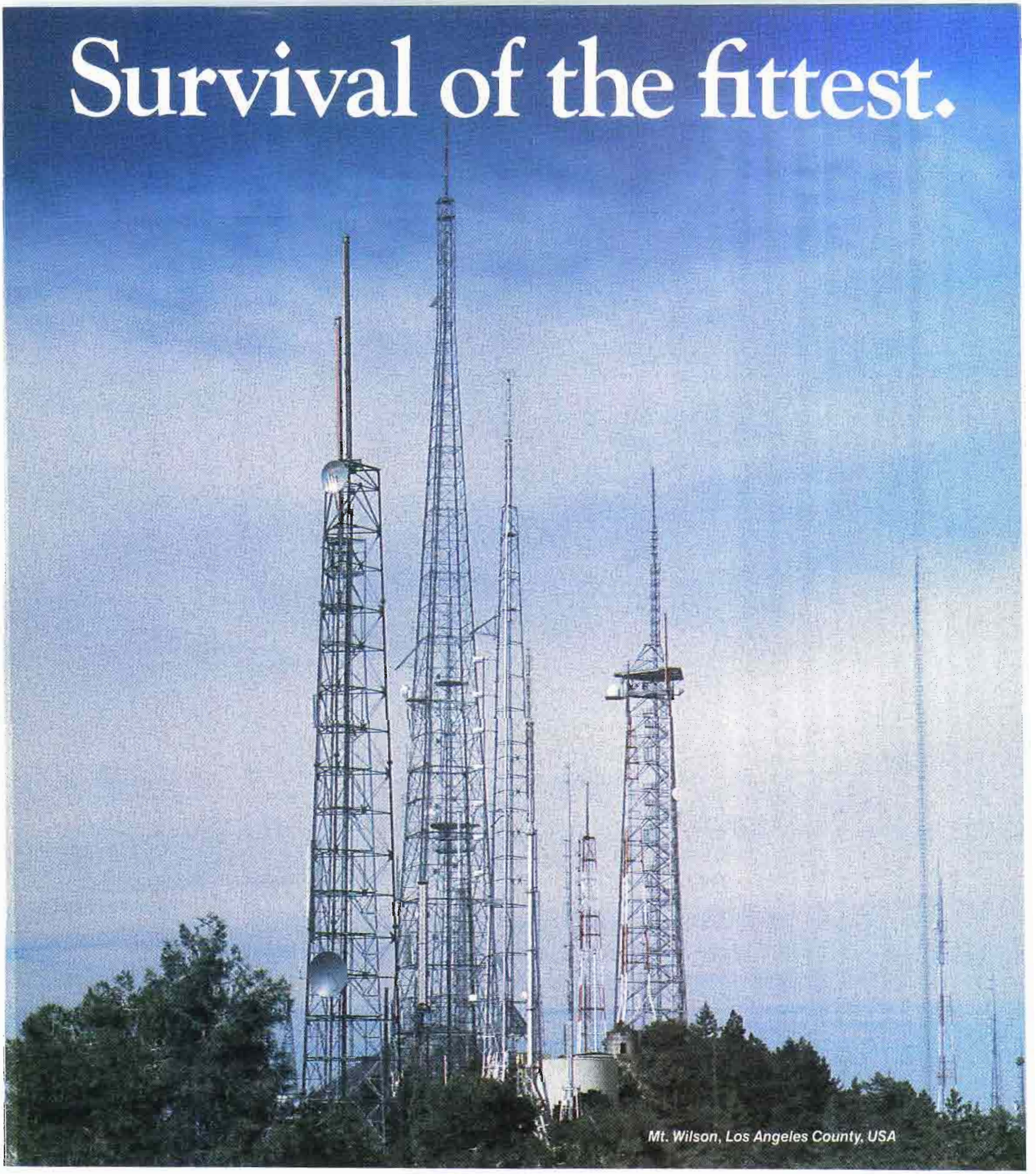
As the ½-inch component formats were duking it out, digital 4:2:2 offered a refreshing change from the traditional bickering. Manufacturers demonstrated that in a world where we can't even agree which side of the road to drive an automobile on, standardization between manufacturers is still possible with planning, coordination and cooperation.

Sony and Quantel hosted a press demonstration of a working 4:2:2 system at the nearby VCA/Teletronics post-production facility. Sony's DVR-1000 was interfaced with Quantel's Harry, and the results were dramatic. The spirit of this year's conference was shown with this success.

Exhibition hits

- **Abekas Video Systems:** A dual-channel A-53. Off-line storage for the A-62.
- **Agfa-Gevaert:** Improved formulation of ½-inch VHS tape, new packaging for ½-inch duplicator cassettes, high-grade bulk ½-inch videotape for custom loading.
- **Alamar Electronics USA:** Auto-Cart: Automated program controller for three to 32 VTRs. Media Manager: video/film library system software for IBM XT or AT or compatible.
- **Alta Group:** PAL version of Cygnus.
- **Amherst Electronic Instruments:** Amicon: New high-performance 32-line TBC / video image processor / machine control system in 1 RPU package.
- **Ampex:** AVC Century: Broadcast and production video switcher. Enhancements for the ACE and AVA graphics. Ampex Betacam products, 10 basic products in 40 versions/configurations with more than 100 lenses and accessories. Minicommand center built around ACE Micro, using ½-inch Betacam products. Dual-channel combiner option for ADO 1000/2000 systems.
- **Anton Bauer:** QR-BETA-5: Camera battery bracket to adapt ProPac snap-on batteries to Sony BVW-105. QR-DX-3000: Camera battery bracket to adapt ProPac snap-on batteries to Sony DXC-3000.
- **Arriflex:** 35mm camera. Quartz fresnel spotlights.
- **Artronics:** VPL: High-resolution video paint system with dual painting buffers, full-frame real-time animation, and still storage of more than 1,200 frames. VGS TURBO xi: A high-power, high-speed version of the VGS 3D.
- **Beyer Dynamic:** MC 736 PV: Short shotgun microphone. MC 737 PV: Long shotgun microphone. MSB 48 N(C) beltpack condenser microphone power supply.
- **BTS Broadcast Television Systems (Philips/Bosch):** The 3-D Illustrator: Full-featured 3-D paint system. Off-line modeling system for FGS-4000. High-resolution output from FGS-4000, up to 4,000 lines.
- **Central Dynamics, Ltd.:** STRATA 7: A video switcher/overlay processor designed for intensive multilayering without adding generations.
- **Cetec Vega:** TRAVELER 1: VHF wireless microphone system with choice of hand-held or bodypack transmitter. REPORTER 1: Less expensive VHF wireless microphone system. 66B: Portable wireless microphone receiver with GaAsFET front-end for high sensitivity.
- **Cine 60:** Hitch-Hiker: Direct replacement snap-on camera batteries with circuit breakers, and air vents to prevent heat build-up.
- **Cipher Digital (Time Code Tech.):** Softouch SOFTPAC: Memory system to enhance SOFTOUCH audio editor.
- **CMX:** CMX-6000: Random access laser disk-based film editor, with modular design for portability and ease of setup. CASS 1E: Edit only version of sound sweetener. Superkit: 3 VTR intelligent interface board compatible with I² chassis for Sony Betacam, Sony BVU, JVC CR-850, M-II, and VPR-80s.
- **Comprehensive Video Supply:** PC-2: Plug-in board for IBM PC and compatibles to convert the PC to broadcast-quality character generator. Enhanced version of Editlister software, as well as a plug-in access board for the Tapemaster library system that allows VTR control from the computer. A new series of soft lights and accessories. Monster: Field-repair and adapter kit.
- **Compu-Prompt:** New micro camera prompting display for hand-held cameras. Updated software features and extended memory systems.
- **Computer Prompting:** Real-time

Survival of the fittest.



Moseley has proved its strength in the broadcast industry by surviving hostile environments like Mt. Wilson.

Since 1959, Moseley has been working to meet your requirements. When you need a reliable STL or Remote Control system, Moseley will work with you to ensure your success.

We're conquering Mt. Wilson every day. Imagine what we can do in your environment!

Distributors and Agents throughout the world

Moseley

Moseley Associates Incorporated
111 Castilian Drive
Santa Barbara, CA
93117-3093

a Flow General Company

Phone 805 968 9621
Telex 658448
Cable: MOSELEY

Circle (80) on Reply Card

closed-captioning system.

- **Datum:** Model 5310 SID (encoder), 5320 SID (reader): 48-bit source ID products, invisible to viewers, using line 20, field 1.
- **Dolby Labs:** Spectral recording system for 1-inch type C.
- **DSC:** SX-2000D programmable, 2 M/E video switcher with downstream, with integrated, on-board DVE. Options are perspective, rotation and RS-422 editor control.
- **Dynair:** Wideband (100MHz) video DAs.
- **Eastman Kodak:** Pro Format II: ½-inch videocassettes for Betacam, Betacart and M format.
- **Elcon:** EA750R (¾-inch), 1200R (1-inch): Focused optical detection systems for evaluation of videotapes for physical damage.
- **Eventide:** MIDI interface for SP-2016, and third-party software.
- **Fairlight Instruments:** Software and hardware options for the CVI digital video effects system.
- **Fortel:** DHP 525: Low-cost, infinite window digital TBC, with field and frame freeze. PAL version of color corrector.
- **Frezzolini:** Frezzimax: Series of camera batteries. UPS-14: Uninterruptible power interface for camera batteries.
- **Fuji Photo:** M401: World's first ½-inch metal videotape for M-II use. H321B: 30-minute Betacam cassette.
- **Hewlett Packard:** Video measurement system.
- **Hitachi:** Z-31A: An improved version of the Z-31 using special low-capacitance diode gun saticons for 800-line resolution. Production models of the SK-97D and SK-970D.
- **Interactive Motion Control:** Video Model Mover: Can be mounted on up to 16 feet of track to provide pan, tilt and roll. Modified Century V16 Periscope lens for the IMC camera lifter.
- **Kintek:** Audio phase meter. Audio correlation meter.
- **Lake Systems:** Three software systems for Lake broadcast automation systems: BROADCASTOPS, MULTIOPS, and PRODUCTIONOPS.
- **Lee International:** Flicker-free 12kW HMI luminaire.
- **Lenco:** Announced formation on Computer Graphics Product Group. P.C. Resident Series EN-10: Externally synced RGB to NTSC encoder. EN-15: RGB to NTSC deriving all sync from PC. PC RGB outputs for recording on standard NTSC VTRs. DC-20: High-resolution NTSC to RGB decoder.
- **Lexicon:** Opus, a hard disk-based digital audio production board. 480L: Audio production digital effects system designed to support future software packages. Digital I/O interface. MIDI control capable. Model 2400: Stereo audio time compressor with RS-422 interface.
- **Magni Systems:** Model 1515: Signal generator for both CAV and composite test signals for M-II, SMPTE and Betacam. Model 2015 uses IBM PC compatible to generate test signals. DV-422: Optional disk-based software to generate 4:2:2 test signals.
- **Matthews Studio Equipment:** Delta Dolly, a compact all-terrain TV camera pedestal.
- **Microtime:** RP-1: 3-D digital video effects system with open architecture for upgradability.
- **NEC:** Component version of System 10 DVE.
- **NCE/Ultrascope:** Cradle gear head.
- **Paco Electronics:** Nicad battery and charger.
- **Paltex:** EDDi: A non-linear, real-time preview, filmstyle off-line editor for VHS or laser disk.
- **Panasonic Broadcast Systems:** AK-400: 650-line resolution, 3-chip CCD camera for ENG/EFP with built-in electronic shutter. Mates with AU-400 M-II format recorder. Joint development with NHK of a high-performance amorphous video head to be used in all M-II format VTRs.
- **Perrott Engineering Labs:** Micro-Mini: 1-pound, 115/230Vac switchable charger for all 12V to 14.4V 4Ah nicad batteries.
- **Philips Test and Measurement Instruments:** Video test and

measurement instrument.

- **Pinnacle Systems:** Debuted as a company. System 2010: Software-based, economical high-performance digital video effects system, with low-power consumption/heat dissipation. System 2020: An upgraded 2010 with hard drive for slide/still frame storage for multilayering in the digital domain.
- **Plastic Reel:** Hard shell tape shipping cases.
- **Quantel:** Quantel and Sony marked the first time users and manufacturers have collaborated to show the working capabilities of a new technology. The Quantel/Sony digital production center was demonstrated using 4:2:2 digital video.
- **Rank Cintel:** Debut of new U.S.-based, wholly owned subsidiary of Rank Cintel Ltd. was marked with the announcement of increased CCD telecine commitment while advancing flying spot state-of-the-art. It also announced its continued commitment to HDTV support.
- **Schneider Corporation of America:** ⅔-inch format ENG lens. 1-inch format studio lens. Gizmo: Electronic zoom rate controller for power zoom lenses.
- **Sharp Electronics:** XC-B10, XC-B20P (Plumbicon): Interformat (Beta, M-II and composite) capable professional broadcast color cameras with burn-in logging. Prototype stereoscopic (3-D) video system and a prototype color video hard copy printer.
- **Solid State Logic:** SL-5000 M: New generation of stereo audio console architecture, in four mainframe depths that accommodate from 8 to 72 mono or stereo channels.
- **Sony:** First Betacam SP production models were shown. Three new shipper cases for U-matic and Beta cassettes. Auto-setup option for BVM-1310 14-inch color monitor. BVM-1900C: Similar to BVM-1900 monitor with component color interface for Betacam Y, R–Y, B–Y signals. MXP-2000: Stereo audio mixing console for on-air and post-production. ECM-44: general application miniature lavalier microphone. Participated in a joint demonstration of 4:2:2 interface with Quantel.
- **Soundmaster International:** Integrated audio editing system with Syncro.
- **Tektronix:** 1735: Dual standard PAL/NTSC waveform monitor. 1705: Satellite spectrum monitor.
- **Telemetrics:** TM-8505 (HL series), TM-8640 (Sony BVP): Remote control for all camera functions, genlock, ext video, intercom, mic audio and camera video using single standard coaxial cable. TM-8600 series: Complete Telemetrics/Canon CCD camera pan and tilt system.
- **Thomson CSF:** Full-definition, anti-aliased fonts for Vidifont Graphics V/Viditext II Integrated Graphics System. Also shown was an audio-visual program presenting the first entirely digital studio in operation in the world.
- **3M:** Model 324: 32-input master control switcher. Series H: 64x64 and 32x32 audio-video routing switchers. Model 422 machine controller (SMPTE 207 and RP-113 protocol) that may stand alone or interface with companion routing switchers.
- **Total Spectrum Manufacturing:** Sportsfocuser: Automatic focusing system designed for broadcast cameras in a fixed position. HS-110P high-speed programmable pan tilt head capable of supporting 250 pounds.
- **Triconcept:** Debuted at SMPTE with Scimitar: Audio post-production editor and console automation system.
- **Vid Video:** Translator I: A universal multimachine remote-control interface. Shuttle I: External shuttle control for Sony type 5, ¾-inch machines.
- **Videotek:** TSM-50: Low-cost, ½-rack width video waveform monitor. ADA-408S: Stereo audio DA capable of multiple balanced and unbalanced configurations. Stereo phase check feature added to APM-2RS audio program monitor.

SBE convention is "Show Me" success

By Brad Dick, radio technical editor

The first SBE national convention in St. Louis, MO, was a Show Me State success. If you failed to attend, then you missed a real treat. The convention provided attendees with the best of convention opportunities. It was large enough to provide all of the exhibits and technical sessions that make a show worthwhile. Yet, it was small enough that you could spend as much time as you needed with the exhibitors, getting your questions answered. In addition, the evenings were free for you to attend an SBE meeting, ham radio reception or just to have fun.

Organized by the St. Louis chapter, this convention marked the SBE's first attempt at holding a national convention. The St. Louis regional conventions are well known for exceptional turnouts and quality organization. The national event even stretched their capacity. Coupled with a high-quality technical conference developed by John Battison, the entire convention/technical conference was a pleasurable experience for the more than 2,200 attendees.

Exhibits

A total of 154 exhibitors, a third more than last year's St. Louis regional show, occupied 260 booths filling the exhibit hall. The hardware displayed included everything from AM stereo equipment to TV transmitters. Several new radio products were introduced at the show. TV engineers found well-equipped exhibits with cameras and other studio hardware.

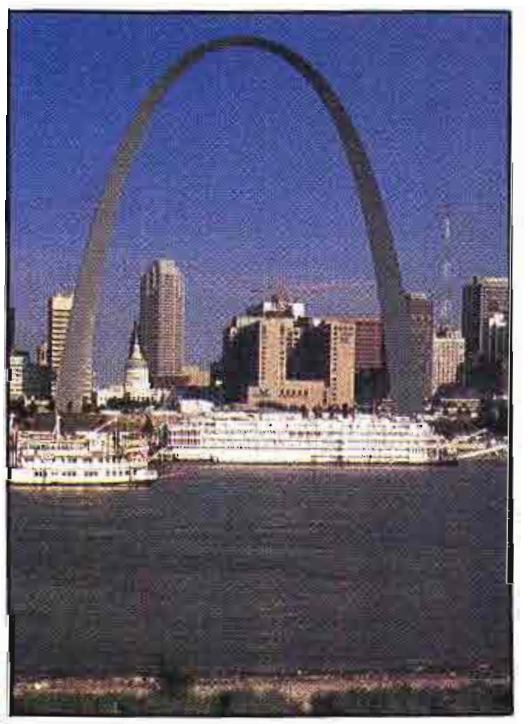
The emphasis was on showing the working engineer what equipment was available. Many of the exhibits provided working equipment so the engineers could try it out themselves. Because of the convention's technical emphasis, many manufacturers took great efforts to provide engineering-level assistance in the booths. Attendees who came to this convention and failed to get their technical questions answered must have been asleep at the arch.

Technical sessions

A major component of the convention was the technical sessions. The sessions spanned three days and were packed with quality presentations and demonstrations. Thanks to Battison's work, the speakers at the sessions were top rate. Many of the speakers represented the best technical experts this industry has to offer. If you thought the sessions were going to be sales pitches—forget it. The speakers knew they were speaking to engineers and came ready to address technical issues.

The technical sessions began on Tuesday, one day before the exhibits opened. The sessions covered topics of interest to both radio and TV engineers. One of the Tuesday highlights was an SBE membership meeting. The meeting was well-attended and, in fact, marked the largest SBE membership meeting ever held. Several important issues were discussed and the open-forum atmosphere was encouraging to all.

The Wednesday sessions, which lasted all day, were broken into separate radio and TV groups. Some of the radio topics included fine-tuning FM transmitters, pulse-modulated transmitters and folded monopole antenna maintenance and installation. Among the TV topics were new klystron technology, videotape formats, TV antenna adjustment with a spectrum analyzer and the always popular topic, stereo TV measurements.



St. Louis was the location for the SBE's first national convention.

Tom Keller, vice president of engineering for the NAB, anchored an afternoon session on new technologies. Keller discussed some of the latest broadcast technologies. He pointed to the advantages of using some of these new technologies, not the least of which might be increased audiences.

FMX, which holds the promise of extending the range of FM stations, was on the minds of many FM broadcasters. Keller emphasized that the NAB is committed to continued research on FMX, despite the pullout by CBS. Current misconceptions have confused the FMX issue and Keller was able to answer the engineers' questions.

HDTV, an often discussed, yet largely misunderstood area, also was addressed by Keller. He demonstrated the visual difference between a standard NTSC-format picture and an HDTV-format picture. Although the differences in visual quality are apparent, much work remains to be done before HDTV can become a reality.

The Thursday sessions again covered topics of interest to both radio and TV engineers. From the size of the audience, RF radiation remains a hot topic. Broadcasters are still not sure exactly what the new regulations mean and how they may affect their stations. The session, led by Paul Wagner, an EPA official, answered the engineers' questions.

Luncheon

The highlight of Wednesday's luncheon was Jim McKinney's speech. McKinney, chief of the FCC Mass Media Bureau, addressed some of today's most pressing technical issues.

McKinney told the engineers that the commission never could keep up with the broadcasters and now it didn't need to. He suggested that although many engineers had for years requested some relief from some of the commission's rules, some of these same engineers now have begun to feel a little uneasy with

Buyer's Guide/Spec Book Update

Compiling a major reference issue such as the **Broadcast Engineering** *Buyer's Guide/Spec Book* is a difficult project that involves a large number of companies and individuals. Because we have received some new, updated data for our *Buyer's Guide* section, and – unfortunately – uncovered some errors or omissions since the book was printed, we are providing this update page for use by our readers. Please tear out this perforated page and insert it into the 1987 *Buyer's Guide/Spec Book*. You will then have all of the latest information from our files.

The reverse side of this page includes commonly used mathematical formulas and tables. Please take the time now to update your *Buyer's Guide/Spec Book.* Thank you!

Address additions/corrections

Hammett & Edison Inc.
Consulting Engineers
Box 86, International Airport
San Francisco, CA 94128
415-342-5200

ITC/3M
800-447-0414

In France:
3M France, Cergy, France

Turner Engineering
325 Division Street
Boonton, NJ 07046

Video Switchers

Manufacturer	**Grass Valley Group**	**Kaltronics**	**Ross Video**
Model/series	**Model 1600-4S**	**CMS-12**	**500 series**
Design application	Master control	Master control	Video production
# of video/stereo audio inputs	24V/24SA + 6SA	12, expands to 20	12-24 video
Integral video black source	Yes	No	Yes
Integral color backgrounds	Yes	No	Yes
Nonsynchronous signal detector	Yes	No	Yes
Key sources	Int & ext	N/A	Internal & external
Chroma keyers	.....	No	Encoded/RGB optional
Downstream keyer feature	.....	No	4 sources optional
Video switching/aux buses	Prgm/preset/aux	Prgm/prvw	4-8/to 10 aux
Mix/effects amplifiers	External equipment	0	1 or 2 multilevel
Pattern generator	No	No	62 patterns
Wipe effects	No	No	Rotary/soft-edge
Spotlight effects	No	No	Integral
Border effects	Analog or digital	No	Analog key border
Shadow effects	No	No	Integral
Effects positions/modulations	No	No	Position/modulation
Quad split feature	No	No	Optional
Re-entry capability	No	No	Single
Automation interface format	M-200 controller	RS-232C	RS-422 optional
Programmable cross-fade	Yes	Possible	X-fade/fade-black
Memory backup battery	Yes	N/A	Yes
System diagnostic software	Yes	N/A	No
Direct digital effects port	Yes	No	Yes
Video electrical path length	<1° deviation	.....	600μs
Visual crosstalk (3.58MHz)	>60dB	55dB	>50dB
Separate electronics bay	Yes	Possible	.....
Audio preview w/audio follow	Yes	Yes	No
Audio metering	L/R/SAP	Right/left	No
Audio level controls	L/R/voice-over	Yes	No
Audio mixer interface	.....	Yes	No
Editing control interface	.....	RS-232	.....
			Series includes 508/ 505/504/514/517/524
Reader Service Number	**602**	**603**	**604**

!GO INCUE

Are you a subscriber to CompuServe, one of the major data communications services available to personal computer users?

GO INCUE takes you to a section with information for audio, video, broadcast, production and post-production. You can have a round table discussion with other engineers and technicians in the BPFORUM. A *PUBLICATIONS* area contains highlights of current issues of **Broadcast Engineering, Video Systems, Recording Engineer/Producer** and other Intertec publications. The *DATA LIBRARY* includes reference material for electronic communications.

Next time you're on CompuServe, !GO INCUE. It's designed for you.

Philips Test & Measuring Instruments

PM5625 Color Video Monitor

Resolution (TVL)	>310
Video bandwidth (MHz)	5
Chroma bandwidth	0.9
Aperture correction	±4dB
Chroma decoder axes	R–Y/B–Y
X-Y outputs	No
Blue gun only	Yes

PM5567 Vectorscope

Control interface	No
Color standards	NTSC/PAL(–M)

PM5565 Waveform Monitor

Vertical response types	Flat/L-P

PM5560M TV Demodulator

Zero-carrier reference	Internal/external
Quadrature detect	Yes
# of video outputs	2-back/1 front

Leitch Video Systems
video signal processors
VPA-330N (-331N)

Video response	±0.1dB to 5MHz
S/N ratio	>60dB
Envelope delay	
Differential phase/gain	

TBC/Synchronizers

Manufacturer	**Scientific-Atlanta/Digital Video Systems**	
Model/series	**DPS-165**	**DPS-170 (DPS-175)**
Function	Synchronizer	TBC (TBC/framestore)
Sampling frequency/bits	14.318MHz/8-bit	14.318MHz/8-bit
Correction window	1 frame/1H hysteresis	16TVL (525TVL)
Video bandwidth	±0.25dB 0 – 4.2MHz	±0.25dB 0 – 4.2MHz
S/N ratio	>57dB lum wtd	>57dB lum wtd
Diff. phase/gain	<±2°/2%	<±2°/2%
Residual error	.....	.....
Coherent 3.58MHz output	Yes	Yes
Advanced sync output	.....	Yes
Component video input	No	No
Component video output	No	No
Velocity compensation	.....	Yes
Heterodyne processing	.....	Or direct
Non-servo capstan VCRs	.....	– 175
Dropout compensation	.....	Yes
Dynamic tracking	.....	Yes
Noise reduction	No	No
Color correction	No	No
Image enhancement	No	No
Hot switch capable	Yes	– 175
Video gain range	±3dB	±3dB
Chroma gain range	±3dB	±3dB
Setup gain range	±10IRE	±10IRE
Hue phase range	±15°	±15°
Subcarrier adjust range	.....	.....
Sync phase adjust range	±9μs, ±0.7°/0.55ns	±9μs, ±0.7°/0.55ns
Reader service number	**605**	**606**

Audio Cartridge Recorders

Manufacturer	**Otari Corporation**
Model/series	**CTM-10**
Other cart sizes	A size
Deck control logic	Microprocessor
Remote-control bus port	Yes
Replay inhibit feature	Selectable
Recording timer	LED min/sec
Secondary/tertiary tones	Yes
Stereo record/play system	CTM-10SR
Stereo phase correction	Not auto
Capstan motor type	dc servo
Capstan drive mechanism	Direct
Play speed(s) (ips)	3.75/7.5/15ips
Fast forward mode	Yes
Sec/Tert cue output form	Solid-state sink
Metering types	VU & peak LEDs
Related monaural model	CTM-10MR
Related play only model	CTM-10
Related multideck model	No
Input connection type	Active bal/10kΩ
Input level	+28dBv max
Output connection type	Active bal/5Ω source
Output level	+26dBv max/200Ω load
AF response (record-play)	±2dB/20-16k
Measured – dB below SOL nWb/m	250nWb/m 7.5ips
S/N ratio (record-play)	53dB
Crosstalk (L to R)	<48dB 1kHz 250nWb/m
Crosstalk (cue to L or R)	<48dB 1kHz 250nWb/m
Distortion (record-play)	<0.8% 1kHz 250nWb/m
Flutter (ANSI S4.3)	<0.15% 7.5 ips DIN
Reader Service Number	**601**

TABLE 1. CONVERSION FACTORS AND CONSTANTS

π	= 3.14	2π	= 6.28
π^2	= 9.87	$(2\pi)^2$	= 39.5
e	= 2.718	$\log \pi$	= 0.497
$\sqrt{2}$	= 1.414	$\ln_e(10)$	= 2.303
$\sqrt{3}$	= 1.732	1 radian	= 57.3°

1 in = 25.4mm = 2.54cm
1 m = 39.36in = 3.28ft
1 km = 0.621mi
1 kg = 2.2 lb
1 l = 1.06 qt
1 oz = 28.35 g
1 hp = 42.4BTU/min = 746W

TABLE 2. FORMULAS

Temperature

$C° = (F° - 32)x(5/9) = (F° - 32)/1.8$

$F° = (C°x(9/5)) + 32 = 1.8C° + 32$

Resistance

In series: $R_{total} = R_1 + R_2 + R_3 + ...$

In parallel:

general $R_{total} = 1/((1/R_1) + (1/R_2) + (1/R_3) + ...)$

for R_1 & R_2 $R_t = R_1xR_2/(R_1 + R_2)$ $R_1 = R_txR_2/(R_2 - R_t)$

(Note: For capacitance in parallel, use series resistance formula.
For capacitance in series, use parallel resistance formula.)

Ohm's Law

dc circuits:

$E = IxR = P/I = (PxR)^{1/2}$ $R = E/I = P/I^2 = E^2/P$

$I = E/R = P/E = (P/R)^{1/2}$ $P = IxE = I^2xR = E^2/R$

ac circuits:

$I = E/Z = (P/(Z\cos\theta))^{1/2} = P/(E\cos\theta)$

$E = IxZ = ((PxZ)/\cos\theta)^{1/2} = P/(I\cos\theta)$

$Z = E/I = P/(I^2\cos\theta) = (E^2\cos\theta)/P$

$P = I^2Z\cos\theta = IE\cos\theta = (E^2\cos\theta)/Z$

$\cos\theta$ = P/IE = (true power)/(apparent power) = pf or power factor

BROADCAST® engineering

the journal of broadcast technology
P.O. Box 12937 • Overland Park, Kansas 66212 • 913-888-4664

ADDRESS CHANGE CARD AND FREE SUBSCRIPTION FORM

Use the card to the right for new subscriptions or change of address. Please fill in the form completely. You need to complete this form ONCE A YEAR to remain on subscription list.

To apply for a BROADCAST ENGINEERING (free) subscription you must answer all questions. **Fill in the form at the right completely.**

For Address Change, you **must** include Company Name, or Station Initials, and complete Street Address in shaded box at right.

TO ENSURE UNINTERRUPTED DELIVERY TO NEW ADDRESS, BE SURE TO AFFIX LABEL FROM COVER IN SPACE PROVIDED AT RIGHT AND ANSWER ALL QUESTIONS.

1. Please check the ONE type of facility or operation that best describes your business classification:

- ☐ 19 Low power TV station
- ☐ 20 TV station
- ☐ 21 AM station
- ☐ 22 FM station
- ☐ 23 AM & FM station
- ☐ 24 TV & AM station
- ☐ 25 TV & FM station
- ☐ 26 TV, AM & FM station
- ☐ 27 CATV facility
- ☐ 28 Non-broadcast TV including closed circuit TV (CCTV)
- ☐ 29 Recording studio
- ☐ 30 Teleproduction facility
- ☐ 31 Microwave, relay station or satellite company
- ☐ 32 Government
- ☐ 33 Consultant (engineering or management)
- ☐ 34 Dealer, distributor or manufacturer
- ☐ Other: Specify _____

2. If you checked 20 through 26 above, which of the following best describes your over-the-air station: (Check only one.)

- ☐ A Commercial
- ☐ B Educational
- ☐ C Religious
- ☐ D Campus low frequency
- ☐ E Community
- ☐ F Municipally owned

3. Check the category that best describes your title: (Check only one.)

Company management – chairman of the board, president, owner, partner, director, vice president, general manager (other than in charge of engineering or station operation management) and other corporate and financial officials

- ☐ A

Technical management & engineering – technical director or manager, chief engineer, other engineering or technical titles

- ☐ B

Operations & station management/production & programming – VP operations, operation manager/director, station manager, production manager, program manager, news director and other operations titles

- ☐ C
- ☐ D Other: Specify _____

4. IMPORTANT: Check the statement that best describes your role in the purchase of major communication equipment components and accessories.

- ☐ Make final decision to buy a specific make or model
- ☐ Recommend make or model to be purchased
- ☐ Have no part in specifying or buying

5. If none of the foregoing businesses or occupational categories fits your situations, please describe specifically your occupation or interest in BROADCAST ENGINEERING magazine

- ☐ _____

You must date and sign in this space...

Required Signature _____ Date _____

THANK YOU. NOW DETACH AND RETURN THIS PORTION.

SJ7

BROADCAST® engineering

the journal of broadcast technology

P.O. Box 12937, Overland Park, KS 66212

***IMPORTANT**

Do you wish to receive or continue receiving your free subscription?
☐ Yes ☐ No

For address change you MUST affix label from cover here. Print new address below and answer ALL questions.

Please print or type:

Name _____

Title _____

Station or Co. _____

Co. Address _____

City _____ State _____ Zip _____

Other (please specify)

Place
First Class
Postage Stamp
Here

BROADCAST engineering

P.O. BOX 12937
OVERLAND PARK, KANSAS 66212-0937

Circulation Department

DETACH AND RETURN ABOVE

BROADCAST engineering is directed to key persons actively involved in planning, managing, and operating broadcast facilities, recording and teleproduction studios, CATV and non-commercial systems. In order to continue receiving **Broadcast Engineering** on a no-cost basis, you are required to verify your free subscription eligibility by filling out and returning this request form without delay. This information is needed for circulation and general marketing profiles. Your cooperation is appreciated.

READER SERVICE CARD For issue of January 1987 — Use until May 1, 1987

After that date, please contact manufacturer directly.

BROADCAST® engineering

1. **IMPORTANT: Do you wish to receive/continue to receive BROADCAST ENGINEERING FREE?**
   ☐ Yes ☐ No

Your signature is required *Date*

Please print or type:

Name _____

Title _____

Organization or firm _____

Street or box _____

City _____ State _____ Zip _____

Phone ( ) _____

SAVE TIME: Use peel-off address label for faster service.

2. **Please check the ONE type of facility or operation that best describes your business classification:**
   19 ☐ Low Power TV Station
   20 ☐ TV Station
   21 ☐ AM Station
   22 ☐ FM Station
   23 ☐ AM & FM Station
   24 ☐ TV & AM Station
   25 ☐ TV & FM Station
   26 ☐ TV, AM & FM Station
   27 ☐ CATV Facility
   28 ☐ Non-Broadcast TV including Closed Circuit TV (CCTV)
   29 ☐ Recording Studio
   30 ☐ Teleproduction Facility
   31 ☐ Microwave, Relay Station or Satellite Company
   32 ☐ Government
   33 ☐ Consultant (Engineering or Management)
   34 ☐ Dealer, Distributor or Manufacturer
   ☐ Other _____ *(Please specify)*
3. **If you checked 20 through 28 above, which of the following best describes your over-the-air station: (Check only one.)**
   A ☐ Commercial B ☐ Educational C ☐ Religious D ☐ Campus Low Frequency E ☐ Community F ☐ Municipally Owned
4. **Check the category that best describes your title: (Check only one.)**
   A ☐ **Company Management** – Chairman of the Board, President, Owner, Partner, Director, Vice President, General Manager (other than in charge of Engineering or Station Operations Management) and other Corporate and Financial Officials
   B ☐ **Technical Management & Engineering** – Technical Director or Manager, Chief Engineer, Other Engineering or Technical Titles
   C ☐ **Operations & Station Management/Production & Programming** – VP Operations, Operation Manager/Director, Station Manager, Production Manager, Program Manager, News Director and other Operations Titles
   D ☐ **Other: Specify** _____
5. **IMPORTANT: Check the statement that best describes your role in the purchase of major communication equipment components and accessories.**
   ☐ Make final decision to buy a specific make or model
   ☐ Recommend make or model to be purchased
   ☐ Have no part in specifying or buying

SEND ME MORE INFORMATION about products or services I have circled.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96
97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128
129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192
193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224
225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256
257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288
289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320
321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352
353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384
385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416
417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448
449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480
481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512
513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544
545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576
577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608

RJ7

FOR FASTER ACTION!!!

I have an immediate interest in the items I've indicated here. Please have a sales person call me.

READER SERVICE CARD For issue of January 1987 — Use until May 1, 1987

After that date, please contact manufacturer directly.

BROADCAST® engineering

1. IMPORTANT. Do you wish to receive/continue to receive BROADCAST ENGINEERING FREE?
   ☐ Yes ☐ No

Your signature is required *Date*

Please print or type:

Name _____

Title _____

Organization or firm _____

Street or box _____

City _____ State _____ Zip _____

Phone ( ) _____

SAVE TIME: Use peel-off address label for faster service.

2. Please check the ONE type of facility or operation that best describes your business classification:
   19 ☐ Low Power TV Station
   20 ☐ TV Station
   21 ☐ AM Station
   22 ☐ FM Station
   23 ☐ AM & FM Station
   24 ☐ TV & AM Station
   25 ☐ TV & FM Station
   26 ☐ TV, AM & FM Station
   27 ☐ CATV Facility
   28 ☐ Non-Broadcast TV including Closed Circuit TV (CCTV)
   29 ☐ Recording Studio
   30 ☐ Teleproduction Facility
   31 ☐ Microwave, Relay Station or Satellite Company
   32 ☐ Government
   33 ☐ Consultant (Engineering or Management)
   34 ☐ Dealer, Distributor or Manufacturer
   ☐ Other _____ *(Please specify)*
3. If you checked 20 through 28 above, which of the following best describes your over-the-air station: (Check only one.)
   A ☐ Commercial B ☐ Educational C ☐ Religious D ☐ Campus Low Frequency E ☐ Community F ☐ Municipally Owned
4. Check the category that best describes your title: (Check only one.)
   A ☐ **Company Management** – Chairman of the Board, President, Owner, Partner, Director, Vice President, General Manager (other than in charge of Engineering or Station Operations Management) and other Corporate and Financial Officials
   B ☐ **Technical Management & Engineering** – Technical Director or Manager, Chief Engineer, Other Engineering or Technical Titles
   C ☐ **Operations & Station Management/Production & Programming** – VP Operations, Operation Manager/Director, Station Manager, Production Manager, Program Manager, News Director and other Operations Titles
   D ☐ **Other: Specify** _____
5. IMPORTANT: Check the statement that best describes your role in the purchase of major communication equipment components and accessories.
   ☐ Make final decision to buy a specific make or model
   ☐ Recommend make or model to be purchased
   ☐ Have no part in specifying or buying

SEND ME MORE INFORMATION about products or services I have circled.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96
97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128
129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192
193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224
225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256
257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288
289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320
321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352
353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384
385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416
417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448
449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480
481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512
513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544
545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576
577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608

RJ7

FOR FASTER ACTION!!!

I have an immediate interest in the items I've indicated here. Please have a sales person call me.

Which one advertisement in this issue was of most interest to you?

Advertiser's Name _____ Circle No. _____

Comments on this issue:

PLACE
FIRST CLASS
POSTAGE
HERE

BROADCAST engineering

P.O. Box 12902
Overland Park, KS 66212-0902

Which one advertisement in this issue was of most interest to you?

Advertiser's Name _____ Circle No. _____

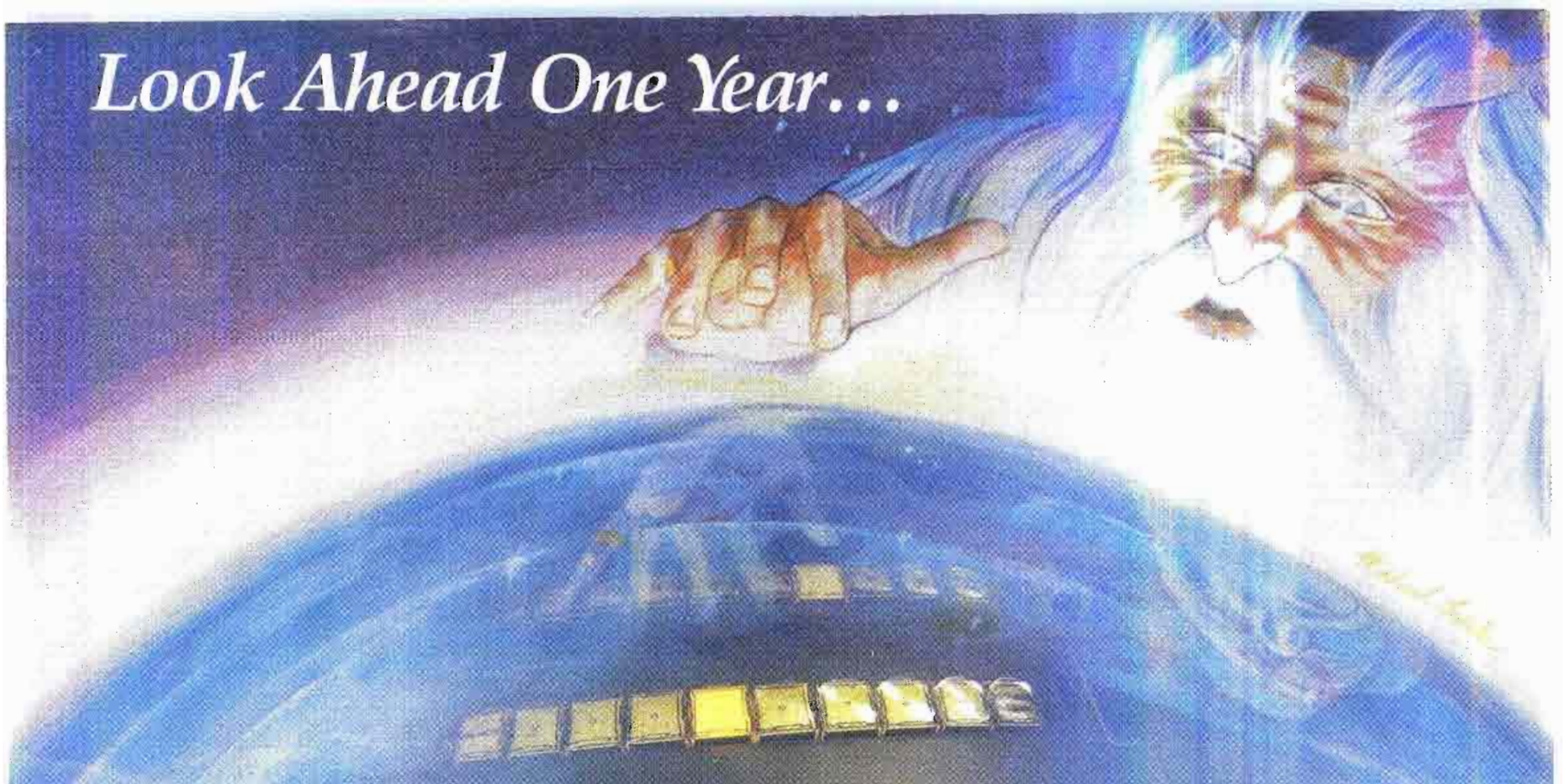
Comments on this issue:

PLACE
FIRST CLASS
POSTAGE
HERE

BROADCAST engineering

P.O. Box 12902
Overland Park, KS 66212-0902

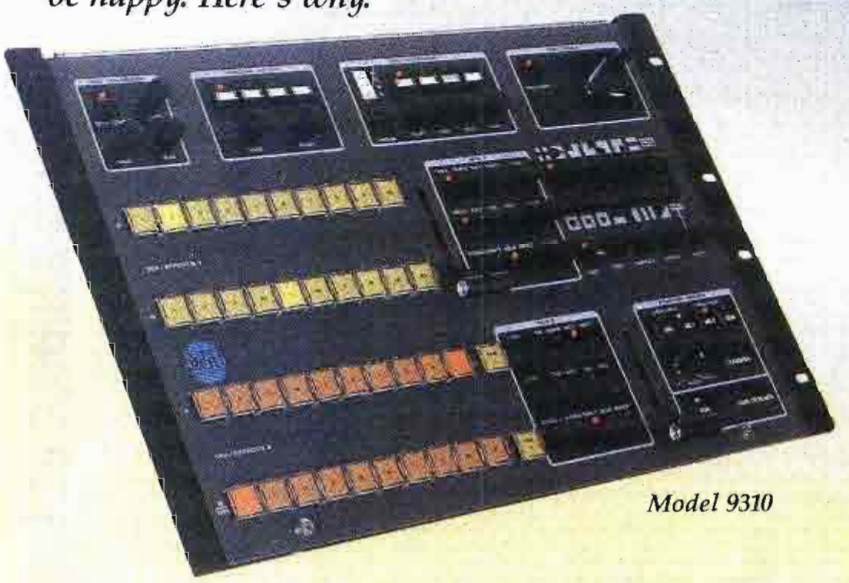
Look Ahead One Year...



Did You Make The Right Decision?

Will you be happy with your production switcher choice one year from now? That depends. Has it been reliable? Are the features really useful? Is it easy to operate? How are you treated by the company that sold it to you?

If it's an Intergroup switcher, chances are you'll be happy. Here's why.



Model 9310

9310-E Unique Features

MIX/EFFECT OUTPUTS FOR DIGITAL EFFECTS
Outputs are provided for inputs to digital effects systems creating feedback effects. M/E 1 and M/E 2 effects inside the digital effects system are also possible. True re-entry capability gives you unlimited creativity.

EXTERNAL INPUTS FOR BLANKING PROCESSOR BLACKBURST
Maintains RS-170A specification at the program output. This is critical for match frame editing.

DISSOLVES BETWEEN EFFECTS
Sophisticated Program/Preview transition allows you to dissolve between the 9310's two M/E systems...a production must.

WIPE TRACK MODE™
Electronically connects the fader handles allowing wipe patterns to be positioned together. Multiple colored border effect can be accurately tracked throughout the transition.

Model 9026

CHROMA-KEY SELECT TRACKING MODE™
Inputs on the chroma-key 4 input source selector automatically follow its video input, reducing the number of steps you take between selecting chroma-keys.

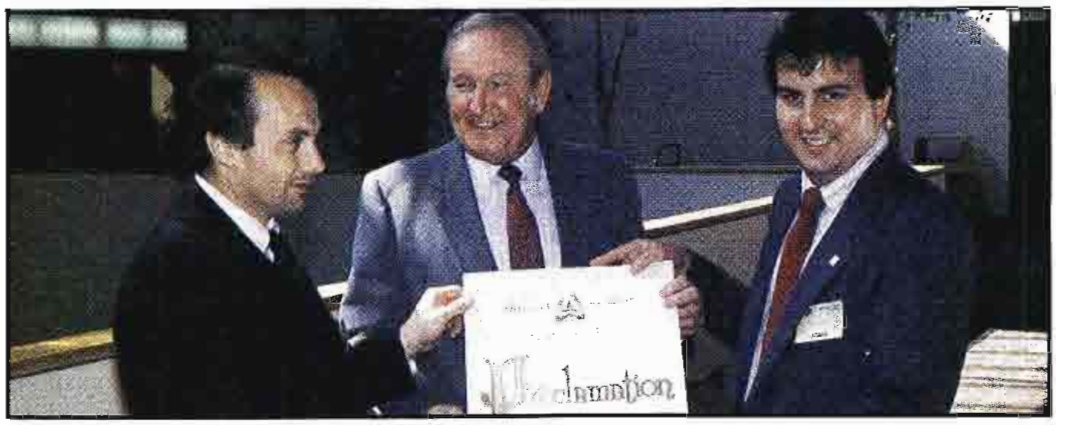
FIVE YEAR WARRANTY
We back our reputation for standout customer service with toll free technical assistance lines and one of the strongest warranties in the industry. Our dealers are worldwide, call for the one nearest you.

INTERGROUP

"Creativity You Can Depend On"

INTERGROUP VIDEO SYSTEMS, INC.
P.O. Box 1495 / Gainesville, FL 32602-9990
(800) 874-7590 / In Florida (904) 335-0901 / TWX 810-825-2307

Circle (83) on Reply Card



The St. Louis mayor's office presented a certificate proclaiming Tuesday, Oct. 14, SBE day. Accepting the proclamation is Richard Rudman, SBE president, Jack Keane, St. Louis mayor's special assistant, and Sam Caputa, St. Louis convention organizer.

their new-found freedom. Where regulation previously provided specific guidelines and procedures for engineers, these regulatory straightjackets no longer exist. Now that, in many cases, specific rules have been abolished, some engineers don't know how to handle this flexibility.

McKinney said that the commission no longer cares about quality. He suggested that the marketplace will ensure that radio stations produce good audio and TV stations good pictures. Microregulation is not the answer.

He also said that the commission was no longer going to tell engineers how to do their jobs. In years past, carefully detailed procedures existed, which told an engineer how to measure many of the audio and video parameters. The regulations were also full of rules requiring detailed logs and records. Today, few records are required. It's now up to the engineer to ensure broadcast quality through whatever means are necessary. A prudent engineer will develop those procedures and keep whatever records are necessary for a safe, properly operating station.

McKinney, an SBE-certified engineer, encouraged the society's members to help the industry develop future procedures, practices and standards, all free from governmental dictates. The SBE can help develop these new practices by looking at past mistakes while also looking at new technology.

Two technological areas were addressed by McKinney: RF radiation hazards and AM improvements. He encouraged the SBE to help avoid mass confusion by encouraging the adoption of a single, uniform national RF standard. Some stations are already aware of problems that can result when a local governmental body decides to regulate this area, usually through ignorance.

He also addressed the AM improvement issue by saying that the commission could not save AM radio, only broadcasters could. He suggested that broadcasters needed to take several steps. First, stations should install AM stereo as soon as possible and use this opportunity to also clean up their audio at the same time.

Second, broadcasters must promote the AM band. Listeners need to be encouraged to switch freely between the AM and FM bands. Only then will the au-

Mary Lou Ennes accepts the SBE Industry Award, the society's highest honor, for her late husband, Harold. At left is Richard Rudman, SBE president. Jim Wulliman, certification chairman, is shown at right.

Tom Keller, vice president, NAB, outlined new technologies for broadcast engineers.

Transmitters, STL and remote pickups were among the items exhibited at the convention.

dience learn to appreciate the audio quality AM can provide.

McKinney said that stations must commit the money necessary to make their stations sound better. Without a monetary investment in the future of AM, little improvement can be expected.

Other news

Several awards were presented at the luncheon. SBE fellowships were presented to Don Strauss, Bill Orr and Charles Morgan. Richard Rudman, SBE president, also presented Mary Lou Ennes with the society's highest honor, the SBE Industry Award. The award was given posthumously to her husband, Harold. Harold Ennes probably wrote more hands-on, practical broadcasting books than anyone else. It was in his honor that the award was developed and he was the first rightful recipient.

Next year

The 1987 SBE national convention will again be held in St. Louis, Nov. 10-12. Based on early responses, the 1987 SBE national convention should be even bigger and better. Plan now to attend. You won't be disappointed.

Jim McKinney, FCC mass media chief, challenged broadcast engineers to adapt to deregulation and use their influence to direct future practices and procedures. |:-)))|

Frequency coordination effort grows nationwide

By Bob Van Buhler

The SBE frequency-coordination program has grown from a local effort to a nationwide system. Today there are 96 coordinators working to maintain databases of local frequency usage. Although most stations participate in the voluntary effort, it is a never-ending chore to keep the information current.

The database provides helpful information to users needing access to remote pickup and STL frequencies. The data help new users identify any available frequencies. If no clear frequency exists, these data can help determine if a shared-use operation is possible. STL paths, if properly designed, can often share the same frequency. For this to happen, it is important to know exactly who is using what frequency in these bands.

However, the coordinator's database is only as accurate as the information provided by other users. If you have not contacted the coordinator in your area, it's time you do. Provide the coordinator with complete information on the frequencies you use, types of modulation, transmitter location and antenna orientation. These factors, along with contact names and telephone numbers, will be entered into the local database. The local coordinator has a tough enough job keeping track of all the activity in these bands. Without the help of users like you, the task is simply impossible.

More road crews are taking advantage of the local SBE coordinators. When these production crews go into a new market, they don't want to cause problems. They also want to produce a program on an interference-free basis. If they know what frequencies are open, chances are, they'll use them. If your station's frequency data is not available to the coordinator, then you have no one to blame but yourself if a production crew mistakenly believes a channel to be clear because it was not listed with the coordinator.

Providing the information to the coordinator is not going to spill any secrets. Let's face it, if someone wants to listen in to your traffic, keeping the SBE coordinator in the dark won't help. However, by keeping the coordinator informed about your plans and needs, there is a much better chance of keeping traffic off of the channels you use. If you need frequencies for full-time or temporary use, your local coordinator can also help. For more information on frequency coordination or to update your data, contact the person listed in Table 1 for your area.

Van Buhler is chief engineer for WBAL-AM and WIYY-FM, Baltimore.

SBE National Frequency Coordinators

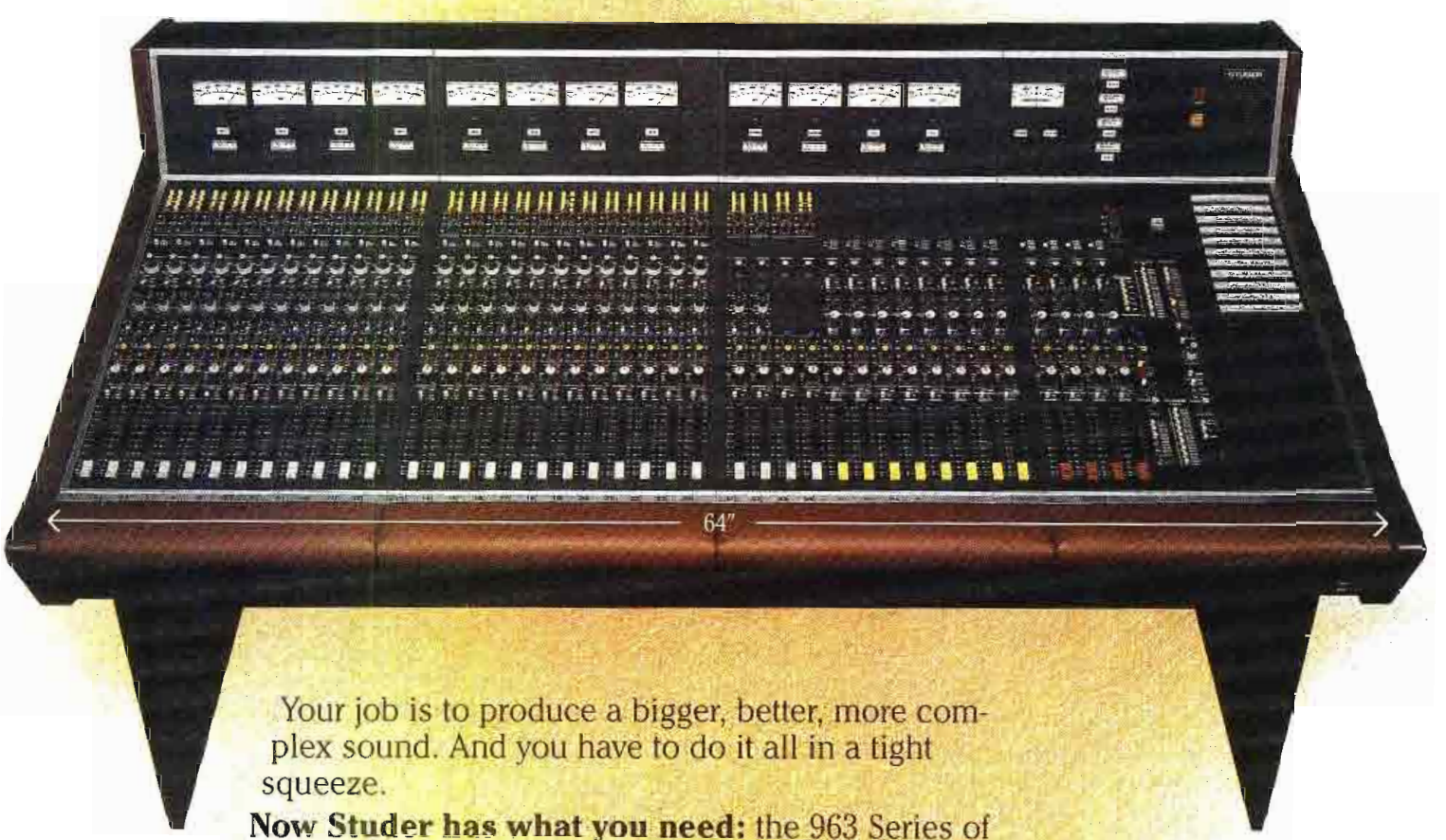
LOCATION	CONTACT	TELEPHONE
AK, Fairbanks	Eric Nichols	(907) 488-2216
AL, Birmingham	Frank Giardina	(205) 933-9274
AR, Central Arkansas	Felix McDonald	(501) 372-7740
AR, West	Kelsey Mikel	(501) 782-6964
AZ, (State)	Jerry Grunig	(602) 257-1234
AZ, (State)	John Shadle	(602) 274-6200
AZ, Tucson	Ralph Turk	(602) 792-2270
AZ, Tucson	Bernie J. Sasek	(602) 792-2270
CA, Fresno	Randy Stover	(209) 226-0341
CA, Los Angeles	Howard Fine	(213) 460-3411
CA, Northern	Paul Brown	(916) 222-4455
CA, Orange County	George Murray	(714) 832-2950
CA, Sacramento	Buz La Bonte	(916) 929-5843
CA, San Diego	Tom Wimberly	(619) 279-3939
CA, San Francisco	Tim Pozar	(415) 788-2022
CT, (State)	Edward Nelson	(203) 243-4756
CO, Denver	Jeff Brothers	(303) 892-6666
CO, Grand Junction	Chuck Hendrickson	(303) 248-1436
DC, Washington	Lyn Heiges	(202) 457-4304
DE, Northern	Larry Wilf	(609) 630-5069
FL, Gainesville	Brian Lietz	(904) 392-5551
FL, Jacksonville	Dale E. Werner	(904) 399-4000
FL, Miami	Henry Seiden	(305) 576-1010
FL, Palm Beach	Jim Johnson	(305) 842-1077
FL, Tampa Bay	Ralph Beaver	(813) 879-1420
FL, Winter Park	Don Anglin	(305) 629-5105
GA, (State)	Ernie Watts	(404) 827-1787
GA, Southeast	Dale E. Werner	(904) 399-4000
HI, (State)	Robert Pallitz	(808) 946-2869
IL, Chicago	Ken Steininger	(312) 943-3321
IL, Quad Cities	Rick Serre	(309) 764-9694
IN, (State)	Charles Sears	(812) 332-3685
IN, South Bend	Jim Lies	(219) 293-5611
IN, Speedway	Tom Allebrandi	(317) 842-5718
KS, Wichita	Don Hogg	(316) 265-5631
KY, Louisville	Bill Bratton	(502) 582-7840
KY, Paducah	James Franklin	(502) 442-8214
LA, New Orleans	Hugh Burney	(504) 529-4444
MA, Boston	Paul Puccio	(617) 787-7063
MD, Baltimore	Chris Bryant	(301) 338-6531
ME, State (R)	John M. Goran	(207) 772-9797
MI, Grand Rapids	Tom Bosscaqr	(616) 451-2551
MI, Southeastern	Russ Harbaugh	(313) 642-6226
MI, Southwestern	Steven Messer	(616) 927-3581
MN, (State)	Peter Thorpe	(612) 251-4422
MO, Kansas City	Joe Snelson	(913) 677-7250
MO, St. Louis	Jeff Andrew	(314) 725-9814
NC, Charlotte (R)	James W. Davis	(919) 682-0318
NC, Charlotte (TV)	Harvey Arnold	(919) 933-2088
NE, Central	Jerry Fuehrer	(308) 743-2494
NE, Omaha	Jim Droege	(402) 228-0780

Table 1. *SBE frequency coordinators.*

Table continues on page 161

Not-So-Big News

The news is out. Studer's new 963 is big on features, performance and reliability. And not-so-big on size.



Your job is to produce a bigger, better, more complex sound. And you have to do it all in a tight squeeze.

Now Studer has what you need: the 963 Series of compact production consoles. A 963 is ideal for video post-production, video editing, broadcast production, EFP vehicles, smaller recording studios–anyplace where quality and reliability are critical but space is at a premium.

Based on a standard 30 mm module width, the 963 is available in configurations from 16 to 40 inputs. A 28 input console, with 28 direct outputs plus 4 stereo subgroups and 2 stereo masters, is barely more than 5 feet long. A 40 input console, is barely more than 6 feet long.

Standard features on the 963 include balanced insert points, direct outputs, a bantam jack patch bay, and external mute interface for video switchers. A wide variety of module options lets you custom configure your 963 for practically any specialized application.

When it comes to audio performance, the 963 goes head-to-head with the bulkiest of the big-name boards. Noise levels are digital compatible in "real world" conditions with many open faders. Studer engineers gave special attention to mix bus design and reference grounding to assure consistently superior specifications regardless of frame size. For extra reliability, solid state switching is used in all critical audio paths.

As with all Studer products, the 963 is manufactured and assembled to the highest standards of Swiss craftsmanship.

For more information, call your nearest Studer representative. Find out how the 963 can give you big console capabilities in a not-so-big package.

STUDER REVOX AMERICA, INC.
1425 Elm Hill Pike, Nashville, TN 37210, (615) 254-5651

Offices: Los Angeles (818) 780-4234/New York (212) 255-4462/Chicago (312) 526-1660
Dallas (214) 943-2239/San Francisco (415) 930-9866

STUDER REVOX

Circle (86) on Reply Card

People

Lawrence Mincer has been appointed vice president of sales of the video products division of Chyron, Melville, NY. He will direct sales of all video products and will manage the video products distribution network of domestic and international dealers.

David Kimm and **Steve G. Romeo** have been appointed positions with JBL Professional, Northridge, CA. Kimm is sales manager for Soundcraft USA. He will be responsible for overseeing sales management and distribution of Soundcraft products in America and Mexico. Romeo is market manager for JBL. He will oversee the sound contracting, motion picture and broadcast markets. He will be responsible for new product development and field support, and act as project manager for the Central Array Design Program, a computer software system.

Gene Ornstead and **William A. Ems** have been appointed positions with Conrac, Covina, CA. Ornstead is director of marketing. He will be responsible for all marketing research, product marketing programs, marketing administration, promotions and advertising, technical customer service and applications. Ems has been appointed to the new post of director of sales. He will supervise all sales programs and activities for monitor and video display system products.

Gary Johns and **Paul Zimmerman** have been named to positions with Sony Communications Products Company, Park Ridge, NJ. Johns is Midwest regional manager for video products. He will be responsible for development and expansion of video product sales. He will supervise regional administrative and order-processing staff, technical supervisors and district managers. He is located at the Chicago office. Zimmerman is marketing manager for display products. He is responsible for developing and implementing advertising, promotions, pricing and marketing plans for industrial monitors and projection systems.

David O. Fairley has been promoted to vice president of commercial engineering with Nurad, Baltimore, MD. His responsibilities include research and development of commercial products for ENG/EJ and telecommunications. Fairley also oversees field service, customer service and systems test operations.

Gary J. Thursby, Frank Svet, Bradley S. Garrett, Robert T. Fluent and **Kenneth W. Okamoto** have been named to positions at Harris Broadcast Division, Quincy, IL. Thursby is vice president of marketing. He will be responsible for business and product strategy, advertising, public relations and market research. Svet is vice president of engineering. Garrett is vice president of manufacturing. Fluent is director of services, resale and parts. He will be responsible for service, resale and parts functions at the Quincy operation. Okamoto is director of human resources.

Debra Knight has been appointed to the new position of manager of government sales for Harris, Quincy, IL. She will be responsible for sales activities toward this growing market.

Knight joined Harris in 1980, and served as field operations management coordinator-domestic radio marketing since 1985.

Grace Gehman has been appointed marketing director for Apogee Electronics, Santa Monica, CA. Her duties will include interfacing with advertising and public relations firms and promoting Apogee products to the professional audio and broadcast fields.

William A. Fink has been appointed vice president-director of marketing for Moseley Associates, Goleta, CA. Fink was formerly director of marketing for CMX.

Jack Letscher has been appointed president of TimeLine, New York. Prior to joining TimeLine, Letscher was vice president of operations at Lexicon.

Aaron Nicholson has been appointed to the newly created position of sales manager of Stabiline voltage control products for The Superior Electric Company, Bristol, CT. He is responsible for U.S. sales for the uninterruptible power supplies, voltage conditioners, automatic voltage regulators and ac voltage monitor systems. Nicholson joined Superior Electric in 1968 as a sales engineer. He was most recently manager of representative sales-Eastern region.

Michael O. Paiva has joined The ALTA Group, San Jose, CA, as director of marketing. Paiva has been associated with the semiconductor industry for the past 10 years.

G. Alfred Dodds, Dru Anne Larimer and **Karen A. Eschete** have been appointed positions with RAKS Corporation of America. Dodds is Western regional manager. He will coordinate operations from the Los Angeles office. Larimer is Midwestern regional manager. She will head operations from the Chicago office. Eschete is Southwestern regional manager. She will oversee operations from the Texas division offices in Houston.

Jody Blanchard has joined A.F. Associates, Northvale, NJ, as product sales executive with direct responsibility for the expanding line of professional video products. Prior to joining AFA, Blanchard was a sales executive with the Sony Corporation.

Richard Schumeyer has been appointed president of Modulation Sciences, Brooklyn, NY. He is the former vice president and general manager.

Leslie Spitzer has been named national sales manager for video products at Mycro-Tek, Wichita, KS. He will be responsible for directing marketing and sales and coordinating sales through a national network of independent sales representatives.

Timothy R. Mungovan has been appointed Western regional sales engineer at Rupert Neve, Hollywood, CA. He was most recently president of Pacific-Hi-Tec.

Richard Patterson has joined Ultimatte Corporation, Reseda, CA, as a communication specialist. He will be responsible for the production of a series of demonstration and tutorial tapes for Ultimatte products as well as technical bulletins describing specific applications for the Ultimatte-5, the Ultimatte-4, the Ultimatte-200, High Definition Ultimatte and Newsmatte-2.

Yves Faroudja has been awarded a fellowship by the Society of Motion Picture and Television Engineers for his work in improving TV imagery.

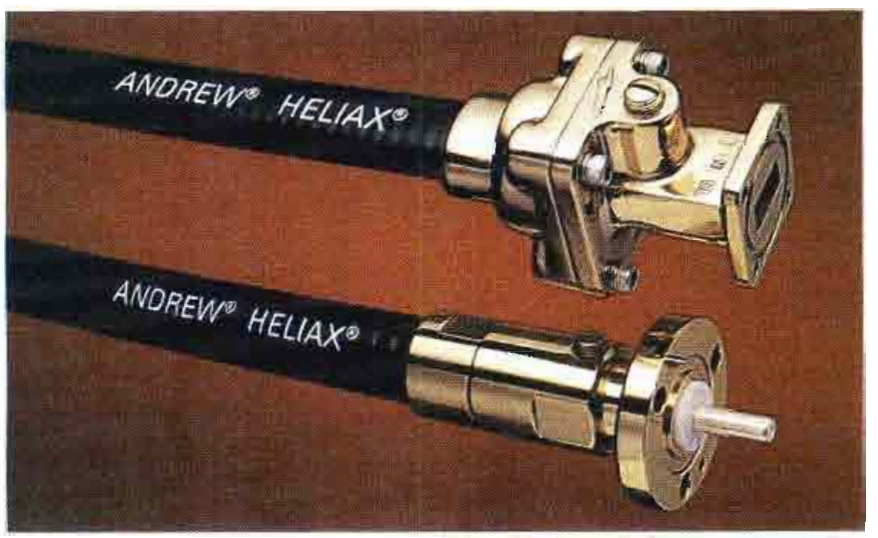
ANDREW

HELIAX®

HELIAX *is* ANDREW

HELIAX products are manufactured exclusively by Andrew Corporation.

HELIAX coaxial cable, waveguide and connectors embody Andrew's fifty years of technological leadership as well as ongoing research and development programs. The HELIAX trademark, like the name Andrew, assures you of top quality performance, the best service and rapid delivery from stock to meet your project needs.



So, the next time you order coaxial cable or waveguide and connectors, go with the world's leader in quality, reliability and performance—specify HELIAX made only by Andrew.

For a copy of Catalog 33 call or write today.

Andrew Corporation
10500 W. 153rd Street, Orland Park,
Illinois 60462
Tel: (312)-349-3300, Telex: 25-3897

ANDREW®

Circle (87) on Reply Card

Panasonic® brings you M-II. The broadcast recording system our competition can't seem to duplicate.

Now you can shoot, edit and broadcast with 1" quality—on ½" cassettes.

When it comes to broadcast systems, it appears our competition has been erased. Because no other format can match the spectacular performance of M-II from Panasonic.

With M-II's metal particle tape system, you can use the same compact 90- or pocket-size 20-minute cassette from ENG/EFP right through editing to on-air broadcast. With 4.5MHz bandwidth (-3dB), 50dB S/N and burst signal insertion for phase alignment and jitter correction, M-II is the single solution to all your broadcast needs.

In fact, each unit in the M-II line offers some pretty uncommon common features like four audio tracks (two linear and two FM), an integral longitudinal and vertical interval time code/time date generator with presettable user bits and Dolby*-C noise reduction. And M-II products utilize a standard edit control interface, so you can upgrade gradually if you like.

AU-650 Studio VCR. This compact, rack-mountable VCR has all the advantages and functions of conventional recorders with the benefit of the M-II format. The AU-650 provides video and audio performance as good as—if not better than—that of 1" VTRs. In a ½" cassette format that lends itself to station automation. It records and plays either 90- or 20-minute cassettes, and provides smooth action, variable slow motion as well as freeze frame. And the AU-650 can perform frame-accurate automatic editing with multi-generation transparency. There's also an internal TBC to assure on-air quality playback.

AU-500 Field Recorder. The AU-500 offers the portability and functions demanded by ENG/EFP users, while providing picture quality comparable to 1"—all on either a 90- or 20-minute cassette. This small, ruggedly designed unit is equipped with confidence field color playback, automatic backspace editing, TBC/DOC connection, search function and warning indicators that alert the operator should recording problems arise and the AU-500 accommodates NTSC composite or various component input signals.

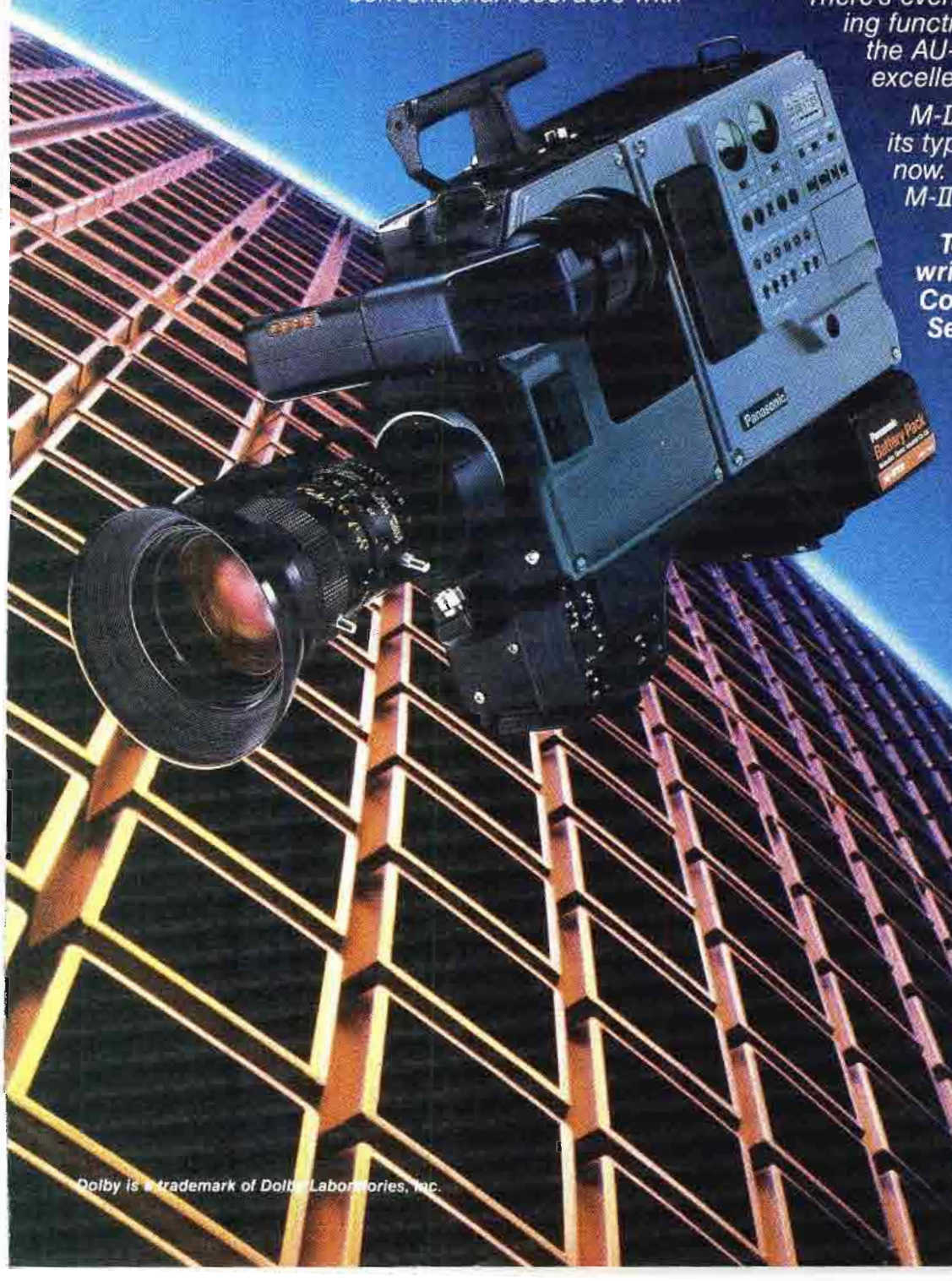
The AU-400 Camera Recorder. This lightweight, compact camera recorder provides ENG users with more than 20 minutes of recording, and a picture quality that rivals that of 1" VTRs. The AU-400 also features B/W video confidence playback through the camera's viewfinder, a chroma confidence indicator and audio confidence output through a speaker. There's even an automatic backspace editing function and warning indicators. And the AU-400's rugged construction provides excellent resistance to dust and moisture.

M-II, it's the only broadcast system of its type in the industry. And it's available now. Two of the best reasons to go with M-II from Panasonic.

To get the complete picture, call or write Panasonic Broadcast Systems Company, One Panasonic Way, Secaucus, NJ 07094. (201) 348-7671.

MII
THE NEW STANDARD FOR BROADCAST.

Circle (88) on Reply Card



*Dolby is a trademark of Dolby Laboratories, Inc.

Panasonic
Broadcast Systems

Business

Sony ships equipment, expands customer service

WNEV-TV, Boston, is the first TV station in the United States to purchase Betacam SP equipment from the Broadcast Products Division of *Sony Communications Products Company*, New York. WNEV plans to convert all on-air operations to Betacam SP. The first shipment of equipment will be delivered in the second quarter of 1987, and will include Betacam SP VTRs, studio editing decks and recorder units. Delivery of the equipment is scheduled over a 2-year period.

Sony's Professional Audio Products Division has announced an expansion of its customer service and support capability. Communications Products customer service, Teaneck, NJ, will combine service for professional video products. The new service organization will enable the pro audio division to offer regional factory service centers and 24-hour, 7-day a week hotlines for emergency technical assistance and parts ordering.

Panasonic expands M-II acceptance

Panasonic Broadcast Systems Company, formed last year to meet the equipment needs of the broadcast industry, is in the process of expanding market acceptance of M-II-format ½-inch video equipment through the development of professional engineering, sales and marketing organizations in the broadcast business.

Under the direction of Tak Urabe, senior vice president, and Anthony R. Pignoni, vice president of sales and marketing, the company markets and sells directly to broadcast call-letter stations, post-production and production facilities. In addition, its existing independent manufacturers rep organization is being expanded to effectively service non-broadcast customers.

In support of these efforts, Panasonic Broadcast Systems established a direct-sales network in October. The company has further strengthened its field offices by expanding its regional sales staff.

Otari, Mitsubishi demonstrate compatibility

Otari, Belmont, CA, and the *Mitsubishi* Pro Audio Group, San Fernando, CA, demonstrated compatible digital tapes at the Los Angeles AES convention in November. Cary Fischer, director of U.S. sales and technical services for Mitsubishi, and John Carey, marketing manager for Otari, demonstrated 37-track PD format compatibility between their multitracks, the X-850 from Mitsubishi and the DTR-900 from Otari.

Otari also has sold a DTR-900 to Masterfonics, Nashville. The recorder will be interfaced with an SSL-4000E console in the company's new multitrack digital remix room.

WGRZ chooses Odetics

WGRZ, NBC's affiliate in Buffalo, NY, has installed a TCS2000 cart machine from *Odetics*, Anaheim, CA. The machine will automate the station's programming.

HHSmith. Your exclusive connection for Neutrik® precision connectors.

Today's sophisticated audio and industrial componentry is only as good as what links it all together. And it never gets as good as Neutrik brand precision engineered connectors, only from HHSmith. Advanced interconnects that receive a level of design attention usually reserved for the finest electronic circuitry.

Take our XLR straight and right angle connectors for example. Alloy gold and silver plated contacts for ease of signal flow. Hard polyester inserts, fiberglass reinforced for extra strength. A chuck type clamp for secure strain relief without damage to insulation. And a high reliability die-cast zinc shell, finished in satin nickel or black chrome.

Or our XLR receptacles with gold or silver plated brass pins, beryllium copper contacts and easy 2-screw mounting.

There's even an X series 3 pin male/female connection system that saves you up to 50% in assembly time. Or our same-size male/female "D" series receptacles with PC board or solder spring selection, and receptacle inserts that lock in and out for repair without shell removal.

All examples of truly precision engineering and craftmanship. The kind that makes itself evident in every Neutrik product, including AC connectors and receptacles, phone jacks, plugs, goosenecks and transformers.

To find out more about the full line of Neutrik products, hook up with a free HHSmith catalog. Write HHSmith, 1913 Atlantic Ave., Manasquan, NJ 08736 or call (201) 223-9400 today.

DIALIGHT CORPORATION

DIALIGHT • KULKA • HHSMITH

A North American Philips Company

® Registered Trademark of Neutrik AG

Circle (89) on Reply Card

Graham-Patten ships equipment

Graham-Patten Systems, Grass Valley, CA, has received several equipment orders. The Up South Corporation has ordered a unified TV equipment control system (UTECS) and several 1200 series remote-controlled video and audio distribution amplifiers to be installed in its uplink facility in Atlanta. ABC has received the first phase of the UTECS, which will be installed in the network's new central switching area in New York.

Graham-Patten is shipping the model 608 edit suite audio mixer to several companies and universities, including Northrup Aerospace, Brigham Young University, The University of Maryland, Morning Star Productions, Color Systems Technology and Magna Techtronics.

Larcan delivers transmitters

KVIE-TV channel 6, Sacramento, CA, has purchased a 60kW TV parallel transmitter with all solid-state aural and microprocessor control from *Larcan,* Ontario, Canada.

Other recent VHF shipments included an all solid-state, 2.5kW TV transmitter purchased by Pulitzer Publishing Company for KWNM, Silver City, NM; a 30kW VHF TV transmitter for WMEB-TV channel 12, Bangor, ME, which will be the second Larcan transmitter placed in service by the Maine Public Broadcasting Network; and seven all solid-state VHF TV transmitters/translators ranging from 250W to 3kW to the Canadian Broadcasting Corporation.

Midwest acquires Bennett

Midwest Communications Corporation, Edgewood, KY, has announced the acquisition of Bennett Engineering, Seattle. Stan Bennett, owner of Bennett Engineering, will remain with Midwest in a management role. This acquisition will bring the number of Midwest domestic offices to 33 and is Midwest's first office on the West Coast.

USIA contracts Conus

Conus Communications, Minneapolis, has been selected by the United States Information Agency to provide domestic news service for WORLDNET, USIA's TV satellite network, which provides daily programming in more than 50 countries. Conus will supply WORLDNET with three daily news services.

DCC sells BIAS system, agrees to merger

Data Communications Corporation, Memphis, TN, has sold a BIAS newsroom automation system to the Gannett Center for Media Studies, Columbia University, New York. BIAS systems also were shipped to WATE-TV, Knoxville, TN, and to Western Systems, Guam.

Data Communications also has agreed in principle to a merger with Jefferson Pilot Data Systems, Charlotte, NC. The merger will allow the companies to provide 1-stop buying of computer services.

Mitsubishi relocates

The *Mitsubishi* Pro-Audio Group is expanding into new premises. All sales and support services for the three Mitsubishi divisions will be housed in the same building, along with a demonstration studio. The new address is Unit 13, Alban Park, Hatfield Road, St. Albans, HERTS.

Mitsubishi also has sold its first SuperStar music recording console to KMH Studios, Stockholm, Sweden.

ITI opens new office

Integrated Technologies will close its Greensboro, NC, office and establish a new corporate facility in Santa Clara, CA. The company hopes to take advantage of the specialized technical and management resources in the area.

Integrated Technologies also has announced shipment and installation of eight graphics systems. Image-Maker systems were shipped to Julie Laboratories, New York; EFX, Boston; Producers Video, Baltimore; Finishing House, Detroit; and Television Associates, Mountain View, CA. News-Maker systems were installed at KDBC-TV, El Paso, TX; and WVIR-TV, Charlottesville, VA. A Weather-Maker system has been installed at the Canadian Broadcasting Corporation, Montreal.

Robert Bosch wins contract

Robert Bosch, Video Equipment Division, Salt Lake City, has announced the award of a contract from the WGBH Educational Foundation, Boston. The contract is for a complete video and audio routing, master control and automation system.

Robert Bosch also has been selected by Korean Broadcasting Services to provide the TAS/TVS-2000 distribution switcher system for use in the worldwide TV broadcast of the 1986 Asian games held in Seoul, Korea.

SSL wins Lucasfilm contract

Solid State Logic, New York, has been chosen by Lucasfilm to provide a new range of film audio consoles and studio computers for the new technical building at George Lucas' Skywalker Ranch near San Francisco. SSL will supply custom-designed SL 5000 M Series film systems for the technical building, plus two computer-assisted consoles for Lucasfilm's sprocket systems complex. The sound design/mix room will be updated with an SL 4000 E Series master studio system with custom film panning. Later in the year, an SL 5000 M Series final mix system will replace the console in Sprocket Systems' Studio.

Panasonic delivers to NBC

Panasonic Broadcast Systems Company, Secaucus, NJ, has completed the initial delivery of M-II format equipment to NBC. The shipment includes quantities of both the AU-650 studio video recorder editor/player and AU-400 camera recorder. The equipment is undergoing final evaluation by NBC as part of the network's acceptance testing process.

Artronics signs Telesis

Artronics, South Plainfield, NJ, has signed Telesis Productions, a full-service video production firm in Rochester, NY, as a beta test site for Artronics' Video Paint Library/VPL video graphics system.

ALTA delivers 500th Pyxis

The ALTA Group, San Jose, CA, has delivered more than 500 Pyxis digital video production systems in its first year of shipments. The 500th unit was delivered to Mid-Coast Television, El Granada, CA, the community access channel of Coast Cable Television serving California's Half Moon Bay area.

Cinema Products relocates

Cinema Products has relocated its operations to 3211 La Cienega Blvd., Los Angeles, CA 90016. The new telephone number is 213-836-7991.

Lenco forms graphics group

Lenco Electronics, Jackson, MO, has formed the Lenco computer graphics products group. The group was formed to provide the graphics industry with encoding and decoding products. Marketing plans for the products are being formulated.

"When the go ahead for new equipment was given, I turned to *Broadcast Engineering* first."

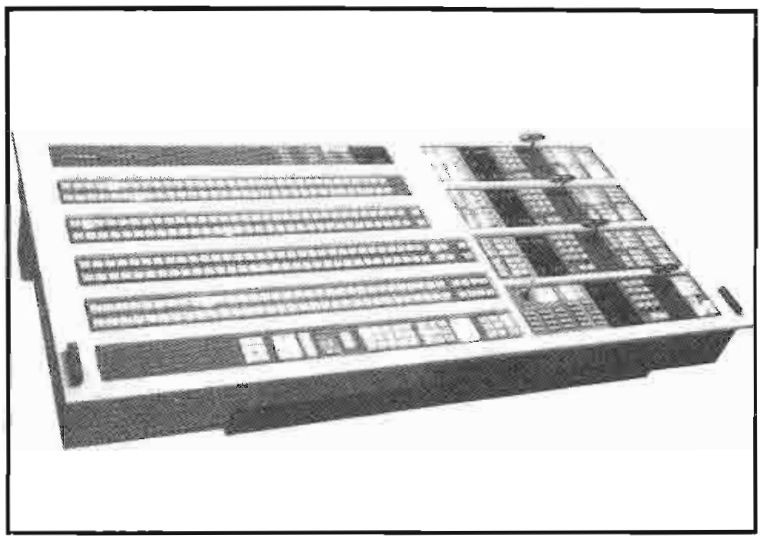
"If you are already a good radio station, I know how you can be a **better** one—use **Broadcast Engineering** as a major source of equipment purchases. BE is **more** than a journal—it's a Bible."

Donald J. Stewart
Chief Engineer
WGHQ/WBPM-FM
Kingston, NY

BROADCAST® ENGINEERING

New products

Switchers, software and combiner



Ampex has announced the following products:

- The AVC Century series of video broadcast and post-production switchers provides extensive keying, key masking and memory capabilities and interfaces with any editing system. The switchers are available in four basic configurations ranging from 2M/Es (mix effects) and 16 video inputs to 3M/Es and 32 inputs.
- The system software version 3.1, free of charge to all ACE and ACE Micro system owners, features: learn, key, pause; advanced trigger display; AVC switcher panel memory control; switcher disable; EDL scroll; and the Graham-Patten audio switcher interface.
- The Mini-Command Center is a full-feature production and post-production system built around the ACE Micro inter-format editor. The center's wide range of interfaces allows customers to integrate non-Ampex studio equipment into the center.
- The SpeedTrace is a computer-added tracing option for the AVA-3 video graphics system. It produces exact wireframe (vector) representations of high-contrast, still-video images that have been scanned into the AVA-3. The system operates in two modes, font scan and symbol scan.
- The ADO Combiner is a 2-channel combiner for ADO 1000 and 2000 digital effects systems.

Circle (350) on Reply Card

Battery brackets

Anton/Bauer Snap-On II quick-release battery brackets designed to adapt Pro Pac Snap-On batteries are available for both the Sony BVW-105 and DXC cameras. The QR-BETA-5 bracket for the BVW-105 features a dual battery mounting system for use on tripods and for hand-held operation.

Circle (351) on Reply Card

Whatever the distance, whatever the obstacles, Newshawk brings back the news.

—NEWSHAWK SNG SYSTEM—

The Marconi Newshawk SNG system enables you to transmit quality pictures from just about anywhere on earth.

Compact, lightweight and robust, Newshawk can be transported by Land Rover, light aircraft, or even as checked baggage on commercial flights, to provide low-cost coverage, worldwide.

The technology is unrivalled, the track record impressive, on both sides of the Atlantic.

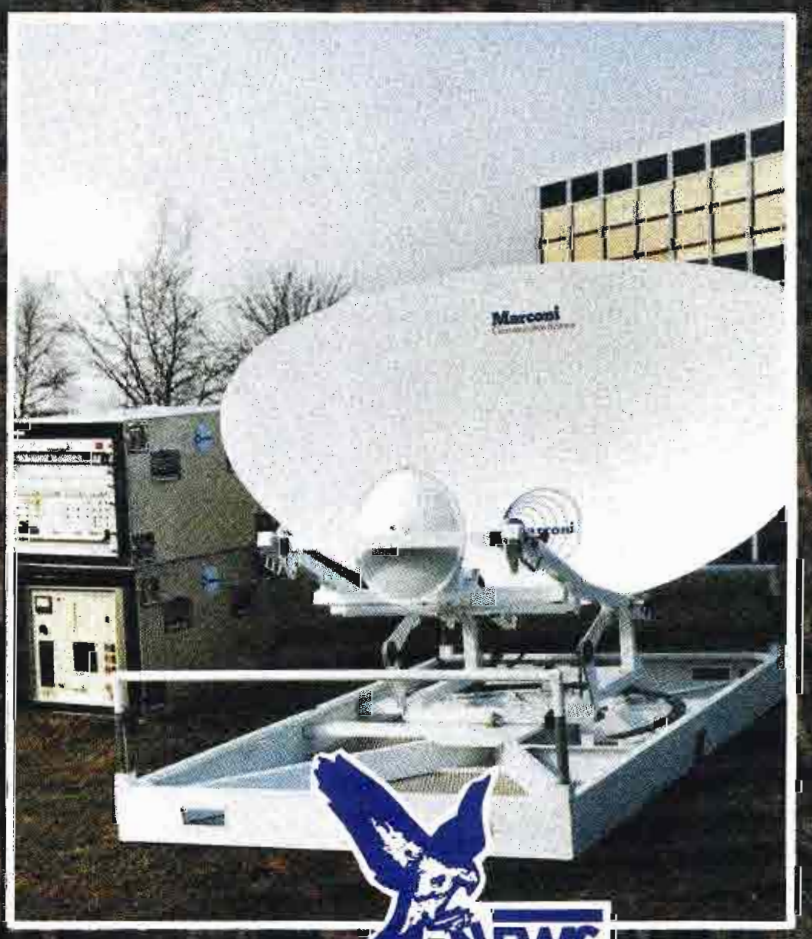
And with a typical deployment time of around 5 minutes, Newshawk enables you to cover news and sporting events live, wherever they happen. And however fast.

For more details contact: Marketing Dept., Space & Broadcast Division, New Street, Chelmsford, England CM1 1PL. National 0245 353221. International 44 245 353221. Telex: 99201. Facsimile (Gp 2/3) 0245 87215

Marconi
Communication Systems

GEC

Circle (93) on Reply Card



Program controller, software

Alamar has announced the following products:

• The Auto-Cart program controller will automate the operation of three to 32 VTRs regardless of format, and also sequences and controls telecines, character generators and switchers. Automation available includes commercial insertion, cart machine replacement, delayed programming, movie playback and timed remote control. The automatic program cuing feature also includes confirmation of content.

• The Media Manager software program catalogs film and videotape programming. The program operates on an IBM XT/AT or compatible computer and can be configured to run as part of a local area network. The ALA-SEARCH feature searches out all references for a specific subject. The date-sensitive Media Checker confirms that tapes are in-house and dubbed prior to on-air time.

Circle (352) on Reply Card

Microphones and power supply

Beyer has introduced the following products:

• The MC 736 PV and MC 737 PV short- and long-shotgun microphones feature pre-amp designs that accept any 12V to 48V phantom power supply, a high-end rise in frequency response, switchable 12dB attenuation and low frequency rolloff. The MC 736 short shotgun has a lobed polar pattern above 2kHz and a cardioid pickup pattern below 2kHz. The MC 737 long shotgun has a lobed pattern.

• The MSB 48 N(C) 1 beltpack condenser mic power supply holds five 9V batteries and delivers up to 500 hours of 45V power to any compatible condenser. It features balanced XLR input and output connections.

• The CV 720 PV condenser power supply for MCM system microphone capsules accepts any phantom power source from 12V to 48V, has a 10dB attenuator and a 12dB/octave LF filter.

Circle (353) on Reply Card

3-D animation work station

Barco-Industries has introduced the Producer, a 3-D animation work station. The system is based on three software modules (model, preview and image) and runs on a Silicon Graphics IRIS 3030 computer. Number crunchers such as the Celerity 1260 series, Bull SPS9 and VAX can be connected through Ethernet. The three software packages can also be purchased separately.

Circle (354) on Reply Card

Transmitter

Elcom Bauer has announced the model 605 FAT, a frequency agile FM transmitter capable of 5,000W power output into loads of up to 1.7:1 in the standard 88MHz-108MHz FM band.

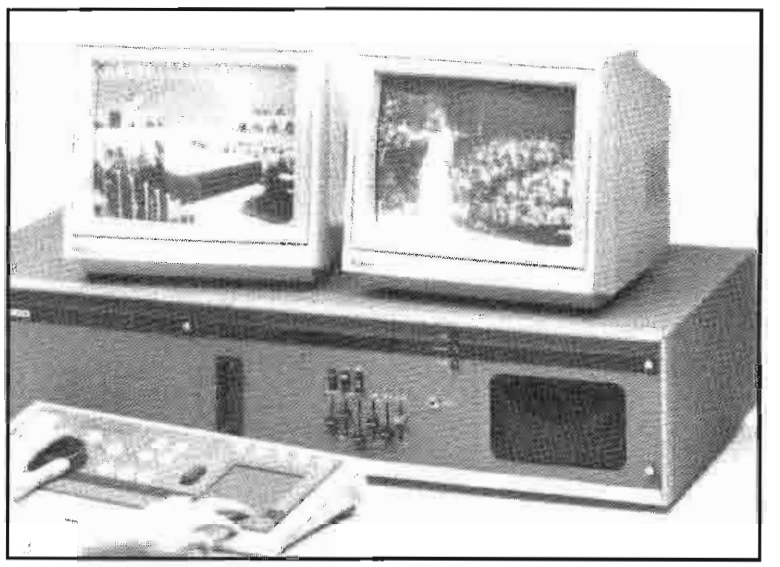
A frequency synthesized exciter, a broadband solid-state IPA module and logging-type tuning controls on the PA amplifier permit quick frequency change. The RF assembly slides out. A high-gain tetrode, the Eimac 4CX3500A, matches a wide range of impedances. Dimensions meet portable container size restrictions and the on-air signal exceeds all FCC and CCIR standards.

Circle (355) on Reply Card

Editing system; interface and sound sweetener

CMX has introduced the following products:

- The CMX 6000 is an off-line, disk-based system that permits editing and re-editing without waiting for recall of material. The editor has separate sound and video editing systems and allows tracks to be interlocked or slipped with a keystroke. The system's key modular components are a tabletop module called the Bridge, two color monitors, the editor's console, a keyboard for logging scenes and takes, picture and sound modules and a line printer.
- The Superkit is a three-VTR, intelligent interface board that is compatible with existing multi-I² chassis and will be available on CMX 330 editing systems. Initial interfaces will be with the Sony Betacam BVW and BVU equipment
- The CASS 1E is an edit-only version of the CASS 1 computer-aided sound sweetener. The unit simultaneously controls up to six audiotape recorders or VTRs, plus 14 general purpose interfaces, and provides hard disk and floppy disk storage.



CMX 6000 editing system

Circle (356) on Reply Card

Software

Cipher Digital has released the BP-3 software for Softouch editing systems manufactured before the delivery of the 4800 SHADOW II synchronizers. The software update also will support Softouch units manufactured by BTX before its assets were acquired by Cipher Digital. The software offers users full control of the new features of the 4800.

Circle (357) on Reply Card

Digital intercom beltpacks

Clear-Com announces the Series 500 intercom beltpacks, available in single- and 2-channel units. The beltpacks have a custom designed digital integrated circuit to control noiseless electronic switching on all audio and signaling circuits, enabling dual action, momentary or latching microphone push-button action and a remote mic kill feature. Other features include: recessed, damage-protected controls; dynamic, carbon or electret microphone compatibility; microphone limiter/compressor; ¼W audio output into 50Ω; and a surface mounting adapter that the beltpack clips into for semi-permanent mounting.

Circle (358) on Reply Card

Camcorder light, batteries

Cool-Lux has introduced the following products:

- The Micro-Lux is a camcorder light that produces 9,000 candle beam power. When powered by a 12V, 6.5Ah battery, it can run for 1¾ hours and consumes 35W. It also can be powered from a vehicle cigarette lighter. The light has a built-in diffusion lens and produces 3,200°K light.
- The Olympic L-13 and L-20 battery belts and the L-6.5 battery pack use cells with thin plates and live plate supports to create greater plate surface. The batteries feature a heavy-duty, 800mA charger matched to the battery's chemistry, absorbed electrolyte cells and 20A fuses. The L-13 and L-20 belts have built-in 5-level voltage monitoring systems and are available in 13A and 20A hour models. Also available is the N-2.5, a nicad developed primarily for use with low-current camcorders.

Circle (359) on Reply Card

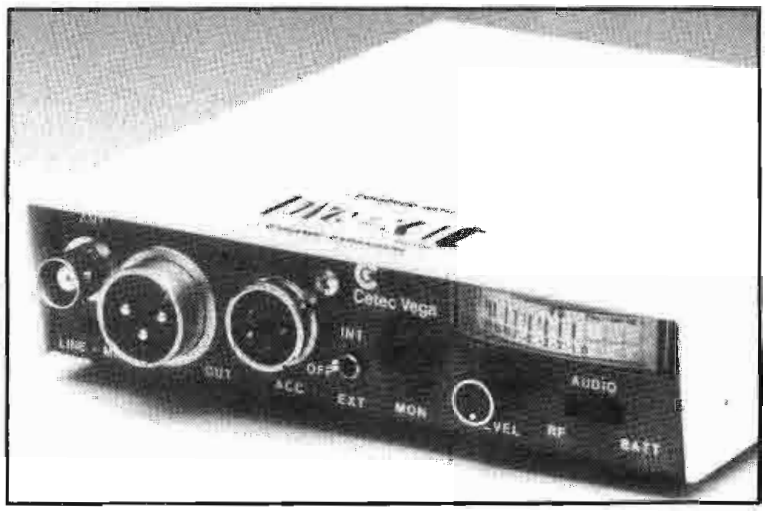
Microphones, receiver

Cetec Vega has introduced the following products:

- The model 66B professional portable wireless microphone receiver is designed around a GaAsFET front-end for high sensitivity and a range of up to 1,200 feet. It incorporates the DYNEX II audio processor, uses four internal 9V alkaline batteries and can be powered from an external source.
- The TRAVELER 1 wireless microphone system features DYNEX II audio processing and comes with either a bodypack transmitter (the 1-B) or a hand-held transmitter (the

1-H). Both use the 66B receiver.

• The REPORTER portable wireless microphone system features the CVX audio processing system and is available as either a bodypack (the 1-B) or hand-held (the 1-H) system. Both models use the model R-26 receiver, which operates on four internal 9V alkaline batteries or from a 12V camera pack. The transmitters operate on one 9V alkaline battery.



Cetec Vega model 66B receiver

Circle (360) on Reply Card

Software, character generator

Comprehensive Video Supply has introduced two products:

• Edit Lister 3.0 is an enhanced version of the Edit Lister videotape editing program. The program has list cleaning for B-Mode (checkerboard) assembly, translation of edit lists between CMX, Convergence, Paltex, Sony and Grass Valley/ISC formats, and expanded notation capabilities. The program is available for the IBM PC and compatible computers, and requires PC-DOS or MS-DOS 2.0 or higher and 256K memory.

• The PC-2 is a plug-in board that turns an IBM PC or compatible computer into a broadcast-quality character generator. The board features 40ns resolution, 26 fonts, 64 colors for characters and background, 16 colors for shadows and edges, multiple fonts and colors per line, a full-feature editor, a 4-speed roll, and two independent crawl lines with four speeds each.

Circle (361) on Reply Card

Broadcast monitor

Conrac has unveiled the newest member of its 2600 family of monitors. The 2660 15-inch, solid-state monochrome monitor features 25MHz video bandwidth and minimum 800 line resolution, with D6500 phosphor standard; ultra-rectangular 15V CRT; dual video inputs; and modular construction and high-voltage supply.

Circle (362) on Reply Card

Communications package

The media services division of *Data Communications Corporation* has announced an addition to the BIAS newsroom automation system. The communications package provides communications between news centers and their remotely located offices by transferring scripts and other news information over telephone lines. News producers at any of the stations can view lists of available stories on their computer systems, make their selections and receive script texts within seconds.

Circle (363) on Reply Card

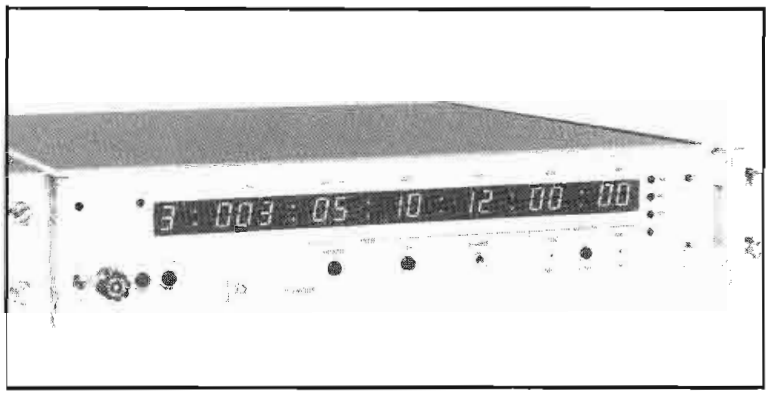
Waveform monitor

Electronic Visuals Limited has announced the EV4042, the latest version of its TV waveform monitor. The monitor incorporates a line finder facility and a new high-voltage stabilized power supply. The line selector enables the display of any of 16 lines from the early part of either field, allowing verification of the correct positioning of test, teletext, time code and other signals within the field blanking interval. Signal stability is enhanced by high-gain dc restorer and precision sync separator circuits. Synchronization is unaffected by sound-in-sync signals and maintains accuracy in the presence of up to 1V of superimposed hum.

Circle (364) on Reply Card

SID encoder/decoder

DATUM, Timing Division-Video Group, has introduced the 5310 SID encoder and 5320 SID reader. The units facilitate transmission of digital information within a standard NTSC composite video signal. The encoder inserts information indicating the originating network, distribution point, time and parity. A rechargeable battery provides four hours of backup power. The reader automatically searches for and extracts SID code from a composite video signal. After the code is detected, extracted and verified, the decoded digital data is automatically output via an RS-232C serial interface. Decoded data is output continuously or during certain flag conditions.



Circle (365) on Reply Card

Videotape

Eastman Kodak has introduced a ½-inch videotape designed for Betacam, Betacart and M formats. The PRO FORMAT II features a low dropout rate and improvements in luminance, chrominance, visual signal-to-noise ratio and RF output.

Circle (366) on Reply Card

Modular spectrum analyzer

Hewlett-Packard has announced the HP 71201A modular spectrum analyzer with microwave preselection. It provides tracking preselection from 2.7GHz to 22GHz, low-pass filtering below 2.9GHz, and a special bypass mode from 0GHz to 22GHz. The analyzer features the HP 70600A preselector module. The analyzer consists of a mainframe, display unit, and three spectrum analyzer modules. A new memory-plus controller board with increased RAM also has been added.

Circle (367) on Reply Card

Video enhancements

Interactive Motion Control has announced the following products:

- The Video Camera Lifter provides up/down movement of a camera mounted on a nodal-point head with pan/tilt/roll and can now be mounted on a 16-foot section of track.
- The Century V16 Periscope Lens has been modified for the camera lifter. It features pan, roll and non-nodal tilt capability. The package consists of a V16 periscope with a modification for camera roll, and three different lenses and an ENG camera mount.
- The Slide Image System acts as a mini-animation stand for 2¼-inch transparencies and 35mm slides and can now be mounted on the video animation compound.
- The Video Model Mover provides pan, tilt and roll movement. It is composed of three rotational gear boxes, two right-angle arms and provides rotation on all three axes. It can be mounted on a video animation compound or on a cart that can be free-standing or can operate on a 16-foot section of precision video track. Each rotational axis will travel at 45° per second and can move at 10 inches per second on the track.

Circle (368) on Reply Card

Software and hardware options

Fairlight Instruments has introduced software and hardware options for its CVI system, a microprocessor-based paint system and digital effects unit. The software supports a title library, consisting of six font typestyles, backspace and insert editing capabilities, foreign language characters, and it also can store up to 100 modified or newly created titles. In addition, one large format font can be defined or modified from

an existing format. A complete alphabet of more than 100 characters and symbols can then be defined and stored on the CVI, or be archived to videotape or floppy disk. Other system areas also have been upgraded to include 36 user-definable brushes and textures, and new color wipes.

Circle (369) on Reply Card

Line 3-D resolution

Integrated Technologies has introduced the Color-Maker I option for its Image-Maker and Ani-Maker computer graphics systems. It offers 8,000 x 8,000 maximum lines of resolution. It permits users to take advantage of the new digital film recorders made by Dunn, Celco and Matrix. Users are free to define their own individual output resolution requirements and may output to film, standard NTSC or high-definition television. The option can be added to all existing and future Ani-Maker and Image-Maker systems.

Circle (370) on Reply Card

Camcorder backpack

KIWI has introduced a camcorder case made to hold all formats. It is vertically designed to convert from a shoulder bag to a backpack and has a side opening with a security tie down strap plus an accessory pocket. The bottom of the case is lined with cellular armor, a honey-combed and shock proof thermoplastic.

Circle (371) on Reply Card

Upgraded camera

JVC Company of America, Professional Video Communications Division, has introduced its PROCAM KY-320B with Plumbicon tubes. It features separate horizontal/vertical pin cushion and trapezoidal distortion correction circuitry, an improved linearity circuit, and an additional electronic rotation circuit that improves registration accuracy. The separate RGB pre-amp circuits and f/1.4 prism optical system improve resolution to more than 650TV lines, and provide a signal-to-noise ratio of 57dB. A prism temperature compensation circuit reduces V-shift variation. The SSC circuit is equipped with an oven temperature control crystal oscillator. An additional VTR trigger switch has been incorporated into the camera head, allowing for the use of all lenses, not just the ENG type.

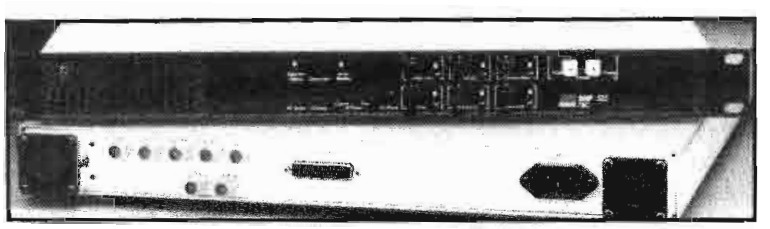
Circle (372) on Reply Card

Time base corrector; video signal processor and color corrector

Fortel has introduced the following products:

- The DHP 525 digital time base corrector offers infinite window correction range making it compatible with most ½-inch and ¾-inch videocassette recorders. The unit features: field and frame freeze, drop-out compensation, high-speed shuttle, horizontal enhancement, luma noise reduction, and interpolation for flicker-free pictures in field freeze. It is packaged in a 1¾-inch chassis with front-panel accessible PC boards.

• TURBO 2 is a digital, infinite window time base corrector. It provides high-performance processing of Y-688 dub or composite signals. Features include: field or frame freeze, dynamic tracking, high-speed shuttle drop-out compensation, noise reduction, and image enhancement circuitry. It is packaged in a 1¾-inch rack-mount with front-panel removable boards and self-test diagnostics.
• The Color Corrector in PAL permits independent adjustment of hue, saturation, and luminance of the six standard color-bar vectors.

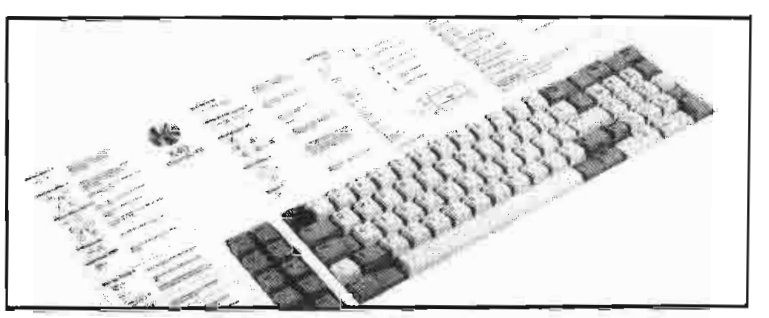


Fortel DHP 525 TBC

Circle (373) on Reply Card

Character generators

Knox Video has introduced the following products:
• The K200 Chromafont II is a high-resolution character generator that features eight fonts and uses the latest digital technology components in order to achieve a 40% reduction in power consumed; a noiseless cooling system also is included. The unit can be installed stand-alone, downstream of a video source, or as an input to a production switcher. It automatically gen-locks to any NTSC signal. The unit allows simultaneous display of 64 of the 512 colors available and complete intermixing of eight fonts in two sizes each. An execute mode allows automated timed sequences of rolls, crawls and full-page displays.
• The K40 Microfont is a full-function, high-resolution color character generator. This 58-key, two-and-a-half font machine comes packaged within its own keyboard, complete with an internal sync generator. It features automatic genlock and keying over any NTSC or PAL video. It has 16 pages of non-volatile memory, 32 intermixable colors, all around character edging, and 9-speed roll and crawl functions.



Knox Video K40 Microfont generator

Circle (374) on Reply Card

Automation software

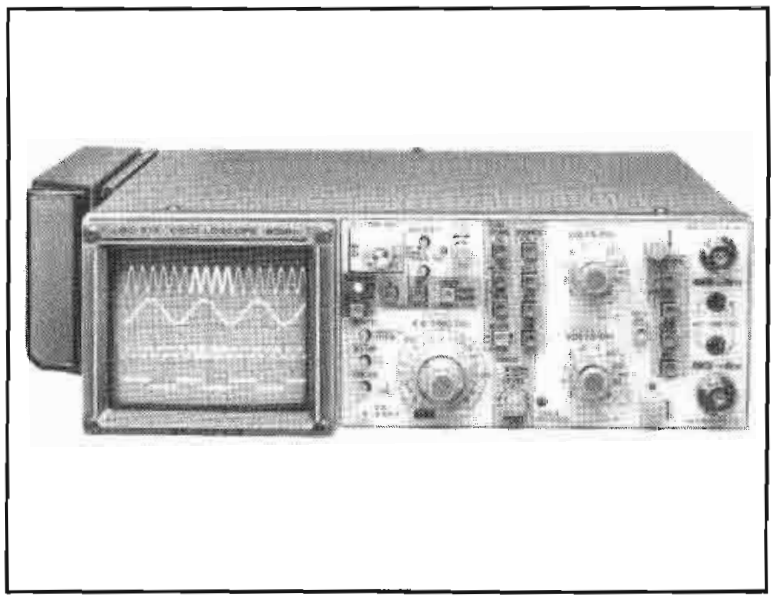
Lake Systems has introduced three software programs for the Automation 68000 microcomputer:

- BROADCASTOPS include interfaces and software to provide simultaneous 2-channel, on-line broadcast and off-line compiling operations. Spots and program segments can be stored singly or in time-code identified slots on cassettes, reels or disks. Up to 75 video and audio recorded and remote sources can be addressed.
- MULTIOPS retrieve and playback from multiple storage sources and can be configured with up to 10 independently scheduled but simultaneously operating channels. Operational options provide either real-time playback to air against the clock or network take cues, or compilation of each station break ahead of real time in its own dedicated VCR for 1-command playback.
- PRODUCTIONOPS automate dubbing, assembling and conforming activities. Interfaces are being developed to integrate Sony D-1 DTTRs and Panasonic and Sony small-format VTRs into systems that produce time-coded, air-ready cassettes and type C and quad spot reels.

Circle (375) on Reply Card

Oscilloscope

Leader Instruments has introduced the model LBO-315, a 60MHz, ac/dc, battery-powered oscilloscope. The scope fits into a 3-inch case and weighs 10 pounds. The unit operates from a supplied, self-contained 12V battery, an external 10V to 20V source, or from 85V to 264V ac without switching. A timing circuit prevents over-charging the battery. Other features are: 12kV accelerating potential, dual time base with calibrated delay, alternate sweep, and triggering facilities including alternate triggering for a stable display of asynchronous controls. The scope operates from 50Hz to 400Hz.



Circle (376) on Reply Card

HMI

Lee International has announced the 12kW HMI Luminaire. It has an electronic ballast that eliminates flicker and strobing regardless of film camera speed and shutter angle. The ballast is no larger than a portable television.

Circle (377) on Reply Card

VHF wireless microphone

Lectrosonics has begun shipments of the VHF Pro Series of wireless microphone systems. The series is available in both diversity and single antenna versions. Full-size receivers with

balanced outputs or pocket-sized receivers are available. The M185 is a machined aluminum transmitter offering either the mic cord or a ½-wave wire as the antenna. Accurate mod level adjustment is provided via a control and LEDs on the transmitter control panel. The full-size receiver uses a 6-pole helical resonator assembly in the front-end, a double-balanced diode mixer, and crystal filtering in the IF. Selectivity permits up to five channels within a 1MHz bandwidth.

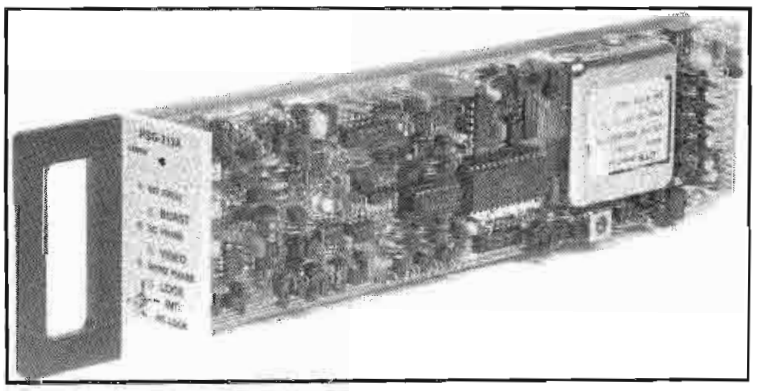
Circle (378) on Reply Card

Sync generator, encoder/decoders

Lenco has announced two products:

• The PSG-313A is a frame resident, RS-170A digital sync generator. Features are: multifunction gen-lock with PC lock, panel status lights, full ±5μs H phasing, a fail safe mode for loss of burst. Digital circuitry assures that proper 360° SCH phase relationship is attained in less than 3 seconds from system on, and is maintained in PC lock mode.

• The P.C. Resident series is a line of RGB encoders and decoders for the PC AT XT. The EN-10 and EN-15 encoders provide high resolution and recordable RGB to NTSC signals with chroma crawl eliminated. A wide spectrum of graphics boards from CGA to EGA in the CGA mode can be used. The EN-15 derives all drive signals directly from the P.C. without an external sync generator. The resident, dual 9-pin looping D connector eliminates the need for Y cables or adapters. The EN-10 derives its sync pulses from external sources. The DC-20 model is a high-resolution decoder that accepts any conventional NTSC signal via RCA type connectors on the back panel.



Lenco PSG-313A sync generator

Circle (379) on Reply Card

Digital effects system/audio time compressor

Lexicon has introduced the following products:

• The 480L digital effects system uses the alphanumeric remote console. The hardware and software contained in the 3-rack-space mainframe has seven banks of programs, each with a set of user-variable parameters. The system features a PCM 1610/1630-compatible interface that fully integrates the system into digital mastering and production systems. The mainframe is supplied with two independent digital signal processors, each with a mono input and stereo outputs.

• The model 2400 stereo audio time compressor uses digital signal processing algorithms to preserve true stereo imaging and mono compatibility in the pitch-corrected audio signal. Channel separation is greater than 80dBm, and phase coherence is within 15° at 15kHz. The compressor leaves sibilance and transients intact. Digital filters correct frequency response shifts caused by offspeed playback to NAB, CCIR or SMPTE standards. The unit uses SMPTE time code for closed-loop machine control. The compressor is controlled

from an ergonomic front panel through a 40-character alphanumeric display and a soft knob.

Lexicon 2400 time compressor/expander

Circle (380) on Reply Card

Automatic audio crossfader

Logitek has introduced the Crossfire, a stand-alone automatic audio crossfader to be controlled directly from contact closure outputs on A/B roll edit systems. The crossfader fades between two sets of dual-channel inputs, using any of three distinct fade styles. Audio can be faded to off, or can be faded down to background levels. A front-panel thumbwheel switch sets the fade duration anywhere from an instant cut to 9.9 seconds, in 1/10 second-increments.

Circle (381) on Reply Card

Ku-band TWTA system

MCL has developed a transportable Ku-band TWTA system consisting of two M/N 10975-111 200W TWT amplifiers along with associated control logic and RF circuitry that allows operation of separate amplifiers in phase-combined modes. The M/N 10847-TAB is a redundant integrated variable power combined, whose power output is 340W. This unit provides high maximum power that is consistent for use with 3.7 meter antennas. It is designed to uplink transmission to communication satellites. All components are top-mounted for easy removal and all high-voltage points are shielded from accidental contact.

Circle (382) on Reply Card

Pedestal dolly

Matthews Studio Equipment of America has introduced the Delta Dolly, a compact, all-terrain TV pedestal. It weighs 118 pounds and can support a camera complement of up to 220 pounds. It is equipped with telescoping rear axles for added stability. The TV-type pedestal permits 360° of continuous ring steering. Maximum typical lens height exceeds five feet with a low position of about 20 inches.

Circle (383) on Reply Card

Signal generators

Magni Systems has introduced two signal generators:

- The model 1515 component analog test signal generator, which also generates NTSC composite signals, is available in three different models supporting M-II, SMPTE and Betacam CAV formats. The generator also has an optional blackburst output.
- The model 2015 is the industry's first instrument to use an IBM compatible PC to generate signals for emerging as well as established formats. The generator has an option DV-422, which provides disk-based software to generate test signals in CCIR recommendation 601 4:2:2 component digital video.

Circle (384) on Reply Card

Editor's note

The term *Paintbox* is a registered trademark of Quantel. The term was inadvertently used in a new product description of another manufacturer's system in the **BE** November issue "New Products" department. We apologize for the error.

SBE Update continued from page 138

NE, Western	Chris Davies	(308) 532-2222
NJ, Southern	Larry Will	(609) 530-5069
NY, Central	George Braungard	(315) 425-5555
NY, New York City	Larry Solow	(212) 975-1776
NY, Northeast	Andy Yakovitch	(518) 436-4822
NY, Northwest	Paul Deeth	(716) 546-5670
OH, Central	Robert Dye	(614) 421-1714
OH, Eastern	Tom Hamilton	(614) 373-9390
OH, Lima	Tom Taylor	(419) 223-2060
OH, N. West/Central	Tom Taggert	(419) 244-8321
OH, N. West/Central	Bill Rossini	(419) 244-8321
OH, Northeastern	Ed Miller	(216) 431-5555
OH, Northeastern	Tom Miller	(216) 344-3358
OH, Southwest	Ron Lask	(513) 772-1919
OK, Central/West	Bob Ablah	(405) 478-1212
OK, Tulsa	Richard Hardy	(918) 627-2937
OR, Western/Central	Bob Moore	(503) 231-4222
PA, Central	Rick Markey	(717) 393-5851
PA, Northeastern	Charles Sakoski	(717) 823-3101
PA, Western	Jerry Kalke	(412) 244-4434
PR, (All)	E. Rodriguez-Velez	(809) 878-1275
RI, Providence	David Hutton	(401) 438-7200
SC, Greenville	Jerry Massey	(803) 271-9200
TN, Memphis (R)	Chris Karb	(901) 320-1356
TN, Memphis (TV)	Pat Lane	(901) 458-2521
TX, Corpus Christi	Marvin C. Born	(512) 883-6511
TX, Corpus Christi	Steve West	(512) 882-4394
TX, Dallas	Larry Kenward	(214) 620-2848
TX, Dallas Computer	Data 300/1200 BAUD	(214) 647-0670
TX, East	Butch Adair	(214) 592-3871
TX, El Paso	Carl Bahner	(915) 532-5421
TX, Houston	William Cordell	(713) 630-3631
TX, San Antonio (R)	Paul Reynolds	(512) 584-0068
TX, San Antonio (TV)	Jerry Norkseik	(512) 366-5000
UT, Salt Lake City	John Dehnel	(801) 575-5555
VA, Richmond	Allen Kass	(804) 780-3400
VA, Roanoke Area (TV)	Ronald B. Smith	(703) 344-0991
VA, Tidewater	Ted Hand	(804) 393-1010
WA, Eastern	Leon Skidmore	(509) 359-2228
WA, Seattle	Lee Pinski	(206) 582-8613
WA, Tri Cities	Jim Bradley	(503) 276-2281
WI, Eastern	Jirn Rammer	(414) 739-9311
WI, Milwaukee	David Janzer	(414) 425-6364
WI, S. Central/West	Ken Dixon	(608) 263-3970
WV, (State)	Tom Hamilton	(614) 373-9390
NFCC Committee	Vir N. James	(303) 755-7557
NFCC Committee	Robert Van Buhler	(301) 467-3000
NFCC Committee	Ben Wolfe	(301) 764-6188
NFCC Committee	Richard Rudman	(213) 462-5392
NFCC Committee	Larry Will	(609) 984-0304
NFCC Committee	Jerry Plemmons	(401) 276-6226
NFCC Committee (Chair)	Gerry Dalton	(214) 263-9911
NFCC Committee (Net) ABC	John Serafin	(212) 887-3484
NFCC Committee (Net) CBS	Robert O'Connor	(212) 975-3791
NFCC Committee (Net) NBC	Martin Meany	(212) 664-3354

News continued from page 4

Nov. 12-16. This technology allows use of any music signal to analyze frequency response. The company will incorporate the new technology in an instrumentation-quality 31-band (⅓-octave) professional real-time analysis system, which will be marketed within a year.

The dbx technology applied to the broadcast industry would allow analysis of transmitter frequency response using the music being broadcast, instead of test tones.

Ad index

Advertiser	Page Number	Reader Service Number	Hotline
Abekas Video Systems	31	18	415/571-1711
Acoustic Systems	46	28	512/444-1961
ADC Telecommunications, Inc.	84-85	53	612/893-3010
ADM Technology, Inc.	IFC	1	313/524-2100
Alden Electronics	65	42	617/366-8851
Alpha Audio	158	112	804/358-3852
Alpha Electronics	155	102	516/921-5335
Amber Electro Design Inc.	154	100	514/735-4105
Amperex Electronic Corp.	120-121	76	800/227-1613
Ampex Corp. (AVSD)	104-105	67	415/367-2911
Ampex Corp. (MTD)	50-51	32	415/367-2911
Andrew Corp.	141	87	312/349-3300
Arrakis Systems, Inc.	21	14	303/224-2248
Asaca/Shibasoku Corp. America	103	66	800/423-6347
Audio Technologies Inc.	54	34	215/443-0330
Audio-Video Engineering Co.	169	115	516/546-4239
Auditronics, Inc.	45	27	901/362-1350
Beyer Dynamic Inc.	92-93	59	516/935-8000
Broadcast Supply West	123	78	800/426-8434
Broadcast Video Systems Ltd.	158	113	416/697-1020
BSM Broadcast Systems Inc.	86	54	509/448-0697
C.O.A.R.C.	157	110	518/672-7202
Camera Mart, Inc.	71	45	212/757-6977
Capitol Magnetics, Inc.	78	49	213/461-2701
Cetec Vega	83	52	818/442-0782
Chyron Corp.	29	17	516/249-3018
Cipher Digital Corp.	110	120	301/695-0200
Circuit Research Labs, Inc.	13	10	800/535-7648
Clear-Com Intercom Systems	152	96	415/861-6666
Comark	37	22	215/822-0777
Comrex Corp.	100	63	617/443-8811
Conex Electro Systems	152	97	206/734-4323
Continential Electronics, Div. of Varian	157	111	214/381-7161
Crown International	124	79	219/294-8000
Data Check Corp.	122	77	619/578-0101
Datatek, Inc.	87	55	201/654-8100
Delta Electronics	126	81	703/354-3350
Dialight Corporation	145	89	201-223-9400
Digital Video Systems Div.	155	103	416/299-6888
Dubner Computer Systems	9	8	201/592-6500
Dyer Electronics, Inc.	156	104	313/349-7910
Eastman Kodak Co.	47	29	800/445-6325
ESE	161	116	213/322-2136
Fuji Pro Video Tape	40-41	25	
Fujinon Inc.	53	33	914/472-9800
Gentner Engineering Co., Inc.	144	65	801/268-1117
Grass Valley Group, Inc.	153	99	916/273-8421
Hitachi Denshi America Ltd.	3	4	800/645-7510
HM Electronics	95	60	619/578-8300
Hubbard Communications, Inc.	19	13	813/577-7759
IGM Communications	99	62	405/232-5808
Ikegami Electronics Inc.	34-35	21	201/368-9171
Intergroup Video Systems Inc.	135	83	800/874-7590
Intl. Tapetronics Corp./3M	43	26	800/447-0414
JamPro Antennas Inc.	32	19	916/383-1177
Jensen Transformers Inc.	156	105	213/987-6005
LJ Scully Manufacturing Corp.	127	82	203/368-2332
Landy Associates, Inc.	55	35	617/890-6325
Leader Instruments Corp.	5	5,6	800/645-5104
Leitch Video of America, Inc.	63	40	804/424-7290
Lenco Electronics	39	24	314/243-3147
3M	66-67	43	800/792-1072
Magna-Tech Electronics Co., Inc.	101	64	212/586-7240
Marconi Communication Systems Ltd.	149	93	
Matthews Studio Equipment	136	84	818/843-6715
MCL, Inc.	137	85	312/354-4350
Microdyne Corp.	49	31	904/687-4633
Microwave Radio Corp.	75	47	617/459-7655
Midwest Communications Corp.	1	3	800/543-1584
Moseley Associates Inc.	125	80	806/968-9621
NEC America Inc.	27	15	800/323-6656
NEC America Inc.	159	114	800/323-6566
Nurad	81	51	301/462-1700
Odetics, Inc.	97	61	800/243-2001
Opamp Labs Inc.	156	106	213/934-3566
Orban Associates Inc.	7	7	800/227-4498
Orban Associates Inc.	17	12	800/227-4498
Orban Associates Inc.	102	69	800/227-4498
Otari Corp.	15	11	415/592-8311
Paco Electronics	60	38	213/747-6540
Panasonic	142-143	88	201/348-7336
Philips Test and Measuring Instruments	108	30	201/529-3800
Polariod Corp.	56-57	36	800/225-1618
Polyline Corp.	148	91	312/297-0955
Potomac Instruments	64	41	301/589-2662
Quanta Corp.	111	71	801/974-0992
QEI	109	70	800/334-9154
RAKS	69	44	201/438-0119
Rank Cintel	79	50	
Rank Cintel	77	4 8	
Richardson Electronics Inc.	89	56	800/323-1770
Rupert Neve, Inc.	61	39	203/744-6230
Sachtler	91	58	516/867-4900
Scully Manufacturing Corp.	127	82	800/843-3338
Sencore	113	72	800/843-3338
Sescom, Inc.	157	107	800/634-3457
Sharp Electronics Corp.	114-115	73	201/265-5548
Shure Brothers Inc.	11	9	312/866-2553
Sitler's Inc.	156	109	800/426-3938
Solid State Logic	73	121	212/315-1111
Solutec Ltd.	154	101	514/521-5464
Sony Corp of America (Broadcast)	24-25		201/833-5231
Spectrum Communications	150	95	215/631-1710
Standard Tape Laboratory, Inc.	156	108	415/786-3546
Stanton Magnetics	151	46	212/445-0063
Studer Revox America Inc.	28	16	615/254-5651
Studer Revox America Inc.	139	86	615/254-5651
Surcom Associates Inc.	153	98	619/722-6162
TASCAM Div. Teac Corp. of America	59	37	213/726-0303
Telecom Research	90	57	416/681-2450
TFT, Inc.	106,107	68	408/727-7272
TMD,A Will-Burt Co.	119	75	216/682-7015
Transtector Systems	117	74	800/635-2537
Videotape Products Inc.	38	23	800/422-2444
Ward-Beck Systems Ltd.	BC		416/438-6550
Western Electronics Products Co.	148	92	714/492-4677
Wheatstone Broadcast Corp.	1BC	2	203/393-0887
Winsted Corp.	150	94	800/328-2962
Yamaha International Corp.	33	20	

Professional services

VIR JAMES P.C.
CONSULTING ENGINEERS
Applications and Field Engineering
Computerized Frequency Surveys
3137 W. Kentucky Ave.—80219
(303) 937-1900
DENVER, COLORADO
Member AFCCE & NAB

STEIGER, HURRAY & ASSOCIATES INC.
CONSULTING ENGINEER SERVICES
6816 Westview Drive
Cleveland, OH 44141
(216) 526-7187

EVANS ASSOCIATES
CONSULTING TELECOMMUNICATIONS ENGINEERS
AM-FM-TV-CATV-ITFS-LPTV SATELLITE
216 N. Green Bay Road
Thiensville, Wisconsin 53092
Phone: (414) 242-6000 Member AFCCE

FCC ON-LINE DATABASE
dataworld®
Allocation/Terrain Studies
AM • FM • TV • LPTV • ITFS
P.O. Box 30730
Bethesda, MD 20814
(301) 652-8822 1-800—368-5754

D. L. MARKLEY
& Associates, Inc.
CONSULTING ENGINEERS
206 North Bergan
Peoria, Illinois 61604
(309) 673-7511
Member AFCCE

CHIPS DAVIS
LEDE DESIGNS, INC.
Acoustics for Stereo Facility Design Consultation
(415) 459-2888

TEKNIMAX
TELECOMMUNICATIONS
DENNIS R. CIAPURA
PRESIDENT
11385 FORESTVIEW LN.
SAN DIEGO, CA 92131 (619) 695-2429

SMITH and POWSTENKO
Broadcasting and Telecommunications Consultants
2033 M Street N.W., Suite 600
Washington, D. C. 20036
(202) 293-7742

BLAIR BENSON
Engineering Consultant
TV Systems Design and Operation
23 Park Lane
Norwalk, CT 06854
203-838-9049

TELECOMMUNICATIONS ENGINEERS
LAWRENCE L. MORTON ASSOCIATES
21671 SUPERIOR LANE
LAKE FOREST, CALIFORNIA 92630
LAWRENCE L. MORTON, E.E.
AM • FM • TV
APPLICATIONS • FIELD ENGINEERING
ANTENNA BROADBANDING FOR AM STEREO
(714) 859-6015

JOHN H. BATTISON PE.
CONSULTING BROADCAST ENGINEER,
FCC APPLICATIONS AM, FM, TV, LPTV
Antenna Design, Proofs, Fieldwork
890 Clubview Blvd. North
Columbus, Ohio 43085
614/888-3364

Robert J. Nissen
THE NISSEN GROUP, INC.
Communications Technology Consultants
32 Ridge Drive • Port Washington, New York 11050
(516) 944-5477

BROADCASTING CONSULTANTS AND ENGINEERS
- FCC Applications and Field Engineering
- Frequency Searches and Coordination
- Tower Erection and Maintenance
- Facility Design and Construction

Contact:
KENNETH W. HOEHN
23400 Michigan Avenue
Dearborn, MI 48124
Teletech, Inc.
Communications Engineering Specialists
(313) 562-6873

SELLMEYER & KRAMER, INC.
CONSULTING ENGINEERS
J.S. Sellmeyer, P.E., S.M. Kramer, P.E.
AM FM TV MDS ITFS LPTV CATV
APPLICATIONS • FIELD ENGINEERING
P.O. Box 841 Mckinney, TX 75069
(214) 542-2056

ERIC NEIL ANGEVINE, P.E.
consultant in acoustics
specializing in broadcast studio acoustics
910 Lakeridge Drive Stillwater, OK 74075
405-624-6043 405-372-3949

ATT: CHIEF ENGINEERS
broadcast video maintenance
LUNAR VIDEO LTD.
FAST TURNAROUND ON ENG, EFP, EDIT SYSTEMS, MONITORS, TEST EQUIP. SONY, JVC, PANASONIC, TEKTRONIX—UPS & AIR FREIGHT. PU/DEL DAILY.
CALL COLLECT
138 E. 26th St, NYC (212) 686-4802

Consultation Services
Lightning · Power Conditioning · Grounding
Over 40 years experience, work guaranteed
Roy Carpenter
President
Lightning Eliminators and Consultants
13007 Lakeland Rd. Santa Fe Springs, CA 90670
(213) 946-6886 TWX 910-586-1381

PATCHPRINTS Video Tie Lines In 1 2 Aux 1 2 Mon A B
Custom Patch Bay Labeling for the Audio/Video Industries
By
PATCH BAY DESIGNATION COMPANY
Div. of Glendale Rubber Stamp & Printing Co., Inc.
CHARLIE SCHUFER
P.O. Box 6278, Glendale, CA 91205
4742 San Fernando Road Telephone
Glendale, CA 91204 (818) 241-5585

MAILING LABELS FROM YOUR COMPUTER!
We supply: AM/FM/TV broadcasters on computer diskettes.
Mailing labels.
Full direct-mail service.
STATIONBASE
Box 24092, Tempe, AZ 85282
(602) 437-3461

UNUSED
CALL LETTERS
CALL
dataworld®
1-800—368-5754

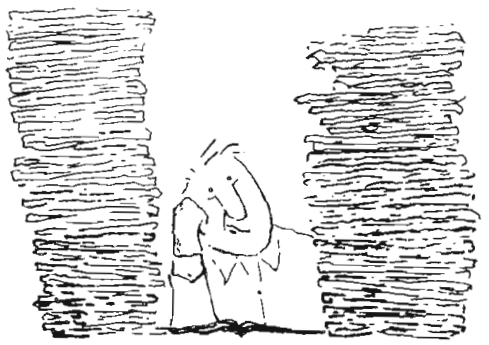
HOW SAFE IS YOUR TOWER?
Alpha Tower Design, Inc.
901 Waterfall Way, Richardson, Texas 75080
214-783-2578
STRUCTURAL ENGINEERS SPECIALIZING IN TOWER DESIGN REGISTERED TO PRACTICE IN 49 STATES...THREE DIMENSIONAL COMPUTER ANALYSIS WITH LATEST DESIGN TECHNOLOGY ...INSPECTION & REVIEW TOWER MODIFICATIONS

Why not run your business card here?
Only $65 per insertion.
Frequency discounts available.
Call 913/888-4664

Why not run your business card here?
Only $65 per insertion.
Frequency discounts available.
Call 913/888-4664

ENG SERVICE Bill Nelson
Chief Engineer
V T R Associates, Inc.
Prompt TURNAROUND on ¾" editors, color ENG cameras.
3023 Holiday Drive, S.W. Phone
Huntsville, AL 35805 (205) 533-0571

Classified



Don't wade through 1000 different product brochures

Use BE's Buyers' Guide/ Spec Book Instead!

Advertising rates in Classified Section are $1.50 per word, each insertion, and must be accompanied by payment to insure publication.

Each initial or abbreviation counts a full word. Minimum classified charge, $35.00.

For ads on which replies are sent to us for forwarding (blind ads), there is an additional charge of $40.00 per insertion, to cover department number, processing of replies, and mailing costs.

Classified columns are not open to advertising of any products regularly produced by manufacturers unless used and no longer owned by the manufacturer or distributor.

TRAINING

ELECTRONICS DEGREE by correspondence. Earn Associate, then Bachelor's. NHSC accredited. Free catalog. Write Grantham College of Engineering, Dept. EE-5, 10570 Humbolt St., Los Alamitos, CA 90720. 8-82-tfn

FCC GENERAL RADIOTELEPHONE operators license through cassette recorded lessons at home plus one week seminar in Boston, Washington, Detroit or Philadelphia. Our twentieth year teaching FCC license courses. Bob Johnson Radio License Preparation, 1201 Ninth, Manhattan Beach, Calif. 90266, Telephone (213) 379-4461. 8-81-tfn

SERVICES

ONE STOP FOR ALL YOUR PROFESSIONAL AUDIO REQUIREMENTS. Bottom line oriented. F.T.C. Brewer Company, P.O. Box 8057, Pensacola, Florida 32506. 7-71-tf

VACUUM TUBE REMANUFACTURING—Save 60%. Longer life. Better performance. We specialize in Transmitting Tubes, Vacuum Capacitors, Power Tubes. All major types. Write or call: FARADEX ELECTRONICS COMPANY, 150 Main Street, Port Washington, New York 11050, (516) 775-7838. 8-86-6t

3-D TELEVISION,—true stereographic NEW! LeaVision tm over/under (not red/blue). Viewers, consulting. lens rental. Info-SASE. DEMO (VHS/BETA)®photo® viewers-$29.95 * $2 S&H. TVLI-BE, CS3030 Lindenhurst, NY 11757 (516) 957-4393 (212) 245-6119. 9-86-tfn

TRANSMITTER TUBE REBUILDING SINCE 1941: 3CX2500, 4CX5000, 4CX15000 and many others. Write for details. FREELAND PRODUCTS CO., Rt. 7, Box 628, Covington, LA 70433. (504) 893-1243 or (800) 624-7626. 6-79-tfn

FOR SALE

RCA COLOR TELECINE SYSTEM, New/unused. To include: TK-66, color camera, TP-66, 16mm telecine projector, TP-7, 35mm slide projector, TP-55B, camera multiplexer. Write to: P.O. Box 23555-273, San Diego, CA 92123. 1-86-tfn

FOR SALE: R.C.A., BRAND NEW from factory. 16mm Telecine Projectors, TP-66 with R/C and lens. Call Mr. Frank N. Bovino, S.B. Video, 201-489-6358. 10-86-tfn

CONSOLE. MCI 528B with all options; 28 inputs, 32 busses, plasma display, automation, 8 returns, send meters, phase meter. Large producers desk. Asking price $30,000. Call 305-940-7971. 10-86-tfn

EQUIPMENT FOR SALE—Television, good condition. Quanta Q-7B character generator, JVC CR4700U ¾" portable video recorder. Call (404) 458-1168. 12-86-2t

DEMO EQUIPMENT. BRAND NEW CONDITION. Lang Two Shot. Ikegami cameras, monitors. Videotek routing switchers. ADC audio/video patch panels. Vectorscopes, waveform monitors. Save up to half. DYMA Engineering (800) 222-3962. 1-87-3t

FOR SALE: TLR-100A SN5002 and SPU 100-109 with carts. Three (3) TK-45 cameras with cable and lens. Call Mr. Lynn Kurth, KGW-TV 503-226-5004. 1-87-1t

(2) AMPEX VPR 2B RECORDERS w/TBC 2B. New AST head, tape path, tracking and interchange set-up at Ampex. Insert and assemble editor built in. Shipping cases, manuals, Ext. cards. Inquire: Kirk (818) 841-5051. 1-87-1t

YOUR AUDIO QUALITY won't reach your listeners without quality STL's and EXCITERS. All new, guaranteed, reliable, absolutely best quality available for the price. Call BEXT, INC. (619) 239-8462. 1-87-1t

COMPUTER PROGRAMS, to inventory cable runs. IBM, TRS-80, and Apple. Cables $45.00, Tubes $25.00. Dbase III + version of cables $65.00. TETRONICS CO., 3864E Town & Country Blvd., Ellicott City, Maryland 21043. 1-301-465-7352. PO's accepted. 1-87-2t

TEKTRONIX TV TEST EQUIPMENT, 1450 demodulator, 147A NTSC generator, 148 PAL generator, 1440 color corrector, 60% off cost. 818-352-6619. 1-82-1t

FOR SALE; Harris FM Antenna, FMC4-A, four bay with radome, gain 2, 13, tuned 93,3 MHz. Price: $6,000.00 can. Contact CJRG-FM, P.O. Box 380, Gaspé, Québec, G0C 1R0, 418-368-3511. 1--87-1t

CRYSTALS: Save a bundle on guaranteed T12A or BH8 types in stock, tradeins taken. Also new crystals for oven holders for AM, FM and TV transmitters. 51 years in business! Eidson Electronic Co. (817) 773-3901. 1-87-1t

FOR SALE—EQUIPMENT. RCA TCR-100 with TR-60 master machine. Recently refurbished with spare heads, parts and cartridges. Call KRIV-TV, (713) 626-2610, Wendell Wyborny, VP/CE. 1-87-1t

FOR SALE—EQUIPMENT. AFC/Microdyne 14 ft. conical horn satellite antenna with motor drives and MAP controller. Call KRIV-TV, (713) 626-2610, Wendell Wyborny, VP/CE. 1-87-1t

FOR SALE—EQUIPMENT. Five RCA TK44A studio cameras with lenses and pedestals. System includes camera control unit and cable. Call KRIV-TV, (713) 626-2610. Wendell Wyborny, VP/CE. 1-87-1t

WANTED TO BUY

HIGHEST PRICES for 112 Phase Monitors, vacuum capacitors and clean, one kw or greater powered AM and FM Transmitters. All duty and transportation paid. Surplus Equipment Sales, 2 Throncliffe Park Dr., Unit 28, Toronto, Canada M4H 1H2, 416-421-5631. 3-86-tfn

WANTED: WW-II German and Japanese radio equipment. Unused US Navy and Signal Corps radio equipment before 1943. Pre-1923 radio equipment and tubes. August J. Link, Surcom Associates Inc., 305 Wisconsin Ave., Oceanside, CA 92054, (619) 722-6162. 7-86-tf

EMPLOYMENT OPPORTUNITIES

WE PLACE ENGINEERS

ALL CATEGORIES FOR TV & VIDEO
(EXCLUDING OPERATORS)

America's Leading Source for a Decade

(TV STATIONS, PRODUCTION FACILITIES, CORP. TV, MFG., CATV)

For information phone or write Alan Kornish

key SYSTEMS

479 Northampton Street
Kingston, PA 18704

Employer Paid Fees

(717) 283-1041

Reconfirm your involvement in the broadcast industry! Renew your subscription today.

HELP WANTED

RF FIELD ENGINEER – Manufacturer of broadcast RF system components and antennas has attractive opening for an experienced field service engineer with extensive RF background. Send resumes to: Micro Communications, Inc., P.O. Box 4365, Manchester, N.H. 03108. 1-87-1t

CHIEF ENGINEER – Requires maintenance of AM directional, FM, automation, RPU, satellite, along with orderly record keeping and ability to instruct personnel in proper use of equipment. Experience is not a factor if applicant has basic technical background and is eager to learn. Two openings. Resumé to: Director of Engineering, Jim Gibbons Radio, Inc., P.O. Box 151, Frederick, MD 21701, (301) 663-4181. EOE. 1-87-1t

MAINTENANCE ENGINEER. Experience: 3 years broadcast, 1 year maintenance. Associate Degree and/or General Class FCC desirable. And, **VIDEOTAPE EDITOR.** Experience: 2 years minimum Ampex VTRs; familiarity with Ampex ACE, A.D.O., A.V.C., VPR-3 systems a must; Dubner CBG highly desirable. Word Of Faith Church, Box 819099, Dallas, TX 75381 or 214-620-1586 (Joe). 1-87-2t

SALES ENGINEER – INTERNATIONAL: Broadcast and communications equipment sales company. Experience in preparing systems quotations. FM/AM stations and HF/VHF/UHF communications. Miami location. Send resume and salary requirements to: SINGER PRODUCTS CO., 1840 West 49 Street, Suite 402, Hialeah, Florida 33012, ATTN: Mr. John E. Hillman. 1-87-1t

MAINTENANCE TECHNICIAN – KRIV-TV, Fox Television, Houston, is seeking a qualified studio Maintenance Technician. Must have minimum of three years experience and an FCC license, SBE certified, Betacam and VPR formats a plus. Send resume to: KRIV-TV, P.O. Box 22810, Houston, Tx. 77227. Attn: Wendell Wyborny, VP/CE E.O.E. 12-86-2t

ASSISTANT CHIEF ENGINEER. Immediate opening at Chicago UHF TV station. Familiarity with studio equipment and UHF transmitter necessary. Excellent salary and benefits. Send resume to: Bernie Hoelting, WCIU-TV Channel 26, 141 W. Jackson - Suite 3200, Chicago, Illinois 60604. EOE. 12-86-2t

Reconfirm your involvement in the broadcast industry! Renew your subscription today.

TV/FM ENGINEER/TRANSMITTER: Immediate full-time position available in Pittsburgh area for a TV/FM Stereo Transmitter Engineer to operate and maintain our facility consisting of FM, VHF and UHF Transmitters. Formal electronics training and RCA TTG-50H 'G-line' experience preferred; 5 years RF experience required. Excellent salary and benefit package. Submit resume and salary requirements in confidence to Broadcast Engineering, P.O. Box 12901, Dept 674, Overland Park, KS 66212. EOE. 1-87-1t

CHIEF ENGINEER: VHF network affiliate. Applicant must have electronics degree or equivalent, 5 years experience in television operations, maintenance, supervision and be people oriented. Position reports to General Manager. Send resume and salary requirements to Personnel, WDTN TV2, Box 741, Dayton, Ohio 45401. AN EQUAL OPPORTUNITY EMPLOYER. 1-87-1t

TV MAINTENANCE ENGINEER: Applicant should have a minimum three years maintenance experience. SBE Certification and/or FCC General Class and/or College degree. Must be familiar with state of the art analog, digital and RF components and circuits. Also must be capable of troubleshooting to the component level. Reply: D. Winters, WBFF-TV, 3500 Parkdale, Ave., Balto., MD 21211. 1-87-1t

VIDEO ENGINEER: Chicago area Video Post facility. Requires minimum 3 yrs. experience in repair and maintenance of 1" VTRs, switchers, editing systems, and related support equipment. Rank experience a plus. Excellent career opportunity with nationwide company. Comprehensive benefits package, salary commensurate with experience. Allied Film & Video, 1322 W. Belmont Ave., Chicago, Ill. 60657, Attn: Jim Wheeler. 1-87-1t

WHYI-FM – Assistant Engineer, good wiring & electronic troubleshooting skills, (Analog, digital & RF), set up & assist remote broadcasts, maintain & install operating equipment. Valid driver's license & required on call duty. Send cover letter/resume to H. Quinton, c/o Y-100, 2741 N. 29th Ave., #300, Hollywood, FL 33020. EOE. 1-87-1t

IMMEDIATE OPENING for Product Specialist with growing computer graphics, character generator company in Salt Lake City. Must have four years broadcast/post production experience, two years Engineering degree, and character generator knowledge. Product definition requires creativity and excellent written/verbal communication skills. Marketing/Engineering liaison. Good benefits. Send resume with salary history to Quanta Corporation, Personnel, 2440 South Progress Drive, Salt Lake City, Utah, 84119. 1-87-1t

POSITION WANTED

NEW OPPORTUNITY WANTED: Experienced Broadcast Engineer looking for permanent employment in Western U.S. Experienced in AM/FM transmitter/studio installation and maintenance. Excellent communication and administrative abilities. Design and managerial experience. Reply to P.O. Box 432, Sweet Home, OR 97386. 12-86-2t

Want more information on advertised products? Use the Reader Service Card.

Advertising sales offices

CHICAGO, ILLINOIS
Tom Nilsen
Phone: (312) 887-0677
(312) 887-0684
15 Spinning Wheel Rd.
Ste. 430
Hinsdale, IL 60521

NEW YORK, NEW YORK
Diane Gottlieb-Klusner
Phone: (212) 682-6630
(212) 682-6631
Josh Gordon
Phone: (212) 687-5076
(212) 687-5077
630 Third Ave., Eighth Floor
New York, NY 10017

SANTA MONICA, CALIFORNIA
Herbert A. Schiff
Phone (213) 393-9285
Jason Perlman
Phone (213) 458-9987
Chris Woodbury
Phone (213) 451-8695
Schiff & Associates
501 Santa Monica Blvd., Ste. 504
Santa Monica, CA 90401

NORWOOD, AUSTRALIA
Hastwell, Williamson, Rouse Pty. Ltd.
P.O. Box 419
Norwood 5067, Australia
Phone: 332-3322
Telex: AA87113

LONDON, ENGLAND
Nicholas McGeachin
Suite 460, Southbank House
Black Prince Rd.
London SE1 7SJ
Telex: 295555LSPG
Telephones: 01-582-7522
01-587-1578

TOKYO, JAPAN
Haruki Hirayama
EMS, Inc.
Sagami Bldg., 4-2-21, Shinjuku
Shinjuku-ku, Tokyo 160, Japan
(03) 350-5666
Cable: EMSINCPERIOD
Telex: 2322520 EMSINCJ

INTERTEC PUBLISHING CORPORATION

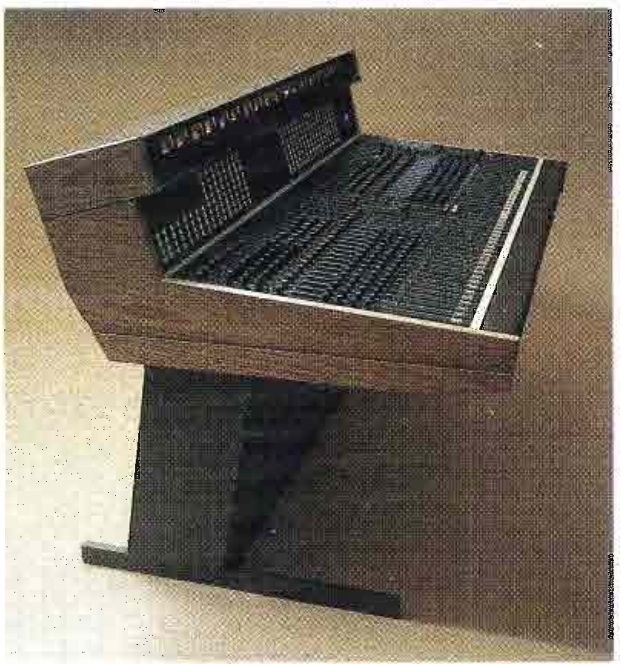
SAVE TIME

For fast, accurate service, please remove the peel off label used to address your magazine, and attach it to the Reader Service Card, the Address Change Card or to any correspondence you send us regarding your subscription.

Multiple Choice:

What do you need in an audio console?
Every application is different; what are *your* requirements? Should the input section be stereo or mono, mic or line? What kind of outputs and subgrouping do you need? Is a matrix mix important? Do you require mix-minus capabilities? What about metering, timers, tape remotes, mainframes, future expansion?

A-500 Radio On-Air



TV-80 Television Master

WHEATSTONE consoles give you all the choices. Our sales engineers listen to your requirements, then work with you and plan your console from the first module to the last VU meter. The result is custom-configured equipment built specifically to your needs.

The truth is, there's only one choice when specifying broadcast equipment: QUALITY. There's simply no room in broadcast for cutting corners; when you're on-the-air the phrase "Time is Money" takes on real meaning.

SP-5 Stereo Production

So whatever your application, stereo or multitrack production, television master control, on-air, video edit, or mobile installation, consult WHEATSTONE.

3224 Multi-Track

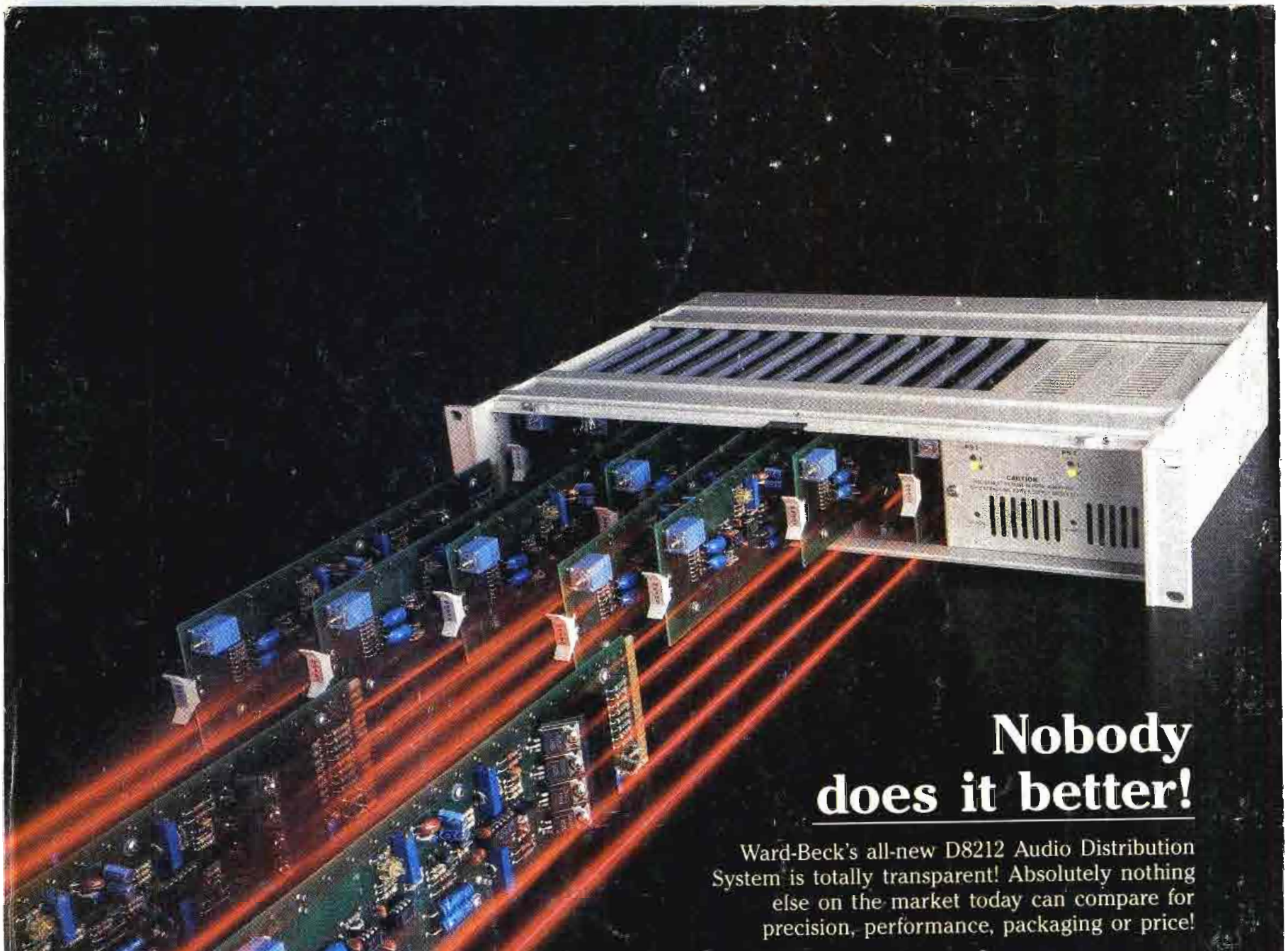
QUALITY

There's No Better Choice.

Wheatstone Corporation

6720 VIP Parkway, Syracuse, NY 13211 (315-455-7740)

Circle (2) on Reply Card



Nobody does it better!

Ward-Beck's all-new D8212 Audio Distribution System is totally transparent! Absolutely nothing else on the market today can compare for precision, performance, packaging or price!

Check these features:

- Twelve high-performance modular DAs each with 8 outputs.
- Dual switch-mode power supplies.
- 3½" rack mounting frame.
- Unique hinged/quick-release front panel.
- Gold-plated terminals throughout.
- Integral typewriter designation strip.
- Unmatched overall performance specifications.
- Renowned Ward-Beck Reliability and Quality.
- Priced right.

WBS

First by Design.

The Ward-Beck D8212 System – An Investment in Quality!

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