BROADCAST ENGINEERING

AN INTERTEC PUBLICATION

January 1990/$4.50

Technology behind the news

When you need extra hands mixing audio, Shure's AMS can help.

Until recently, you needed outstanding hand-ear-eye coordination to mix audio in multiple-microphone broadcast situations.

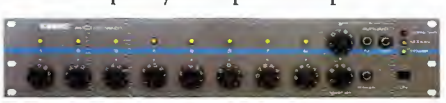
Now there's a system that gives you broadcast-quality audio when you can't cover all the faders at once. It's the Shure Automatic Microphone System (AMS), featuring patented direction-sensitive gating.

The Shure AMS continuously compares audio signal levels from two matched unidirectional condenser microphone cartridges located back-to-back in each AMS microphone. The rear-facing cartridge monitors ambient sound, while the front-facing cartridge handles sound from the desired source. When the front cartridge output exceeds the rear cartridge output by 9 dB, the AMS mic channel gates on automatically in .004 seconds.

Because of this unique gating concept, an AMS microphone channel will *only* gate on when addressed from within a 120-degree "window of acceptance" centered at the front of the microphone. AMS mics *not* addressed from within this angle remain off. So the number of open microphones is kept to a minimum automatically, with no need for manual control.

Since the Shure AMS automatically keeps track of the number of open microphones and adjusts the overall gain to compensate, your broadcast level stays constant as mics open and close, without troublesome gain-riding.

Direction-sensitive gating makes the Shure AMS the best system to use in multiple-mic situations, from panel talk shows to game shows to hearings on Capitol Hill. More and more broadcast engineers are discovering the advantages of having broadcast-quality multiple-microphone audio without the headaches of manual mixing or the time-consuming setup of so-called automatic mixers.



With AMS you not only get all the advantages of a truly automatic microphone system, you also get the broadcast-quality audio and reliability of Shure microphones.

For a comprehensive AMS literature packet, call us at 1-800-257-4873. For AMS technical support, call Michael Pettersen at 1-708-866-2512.

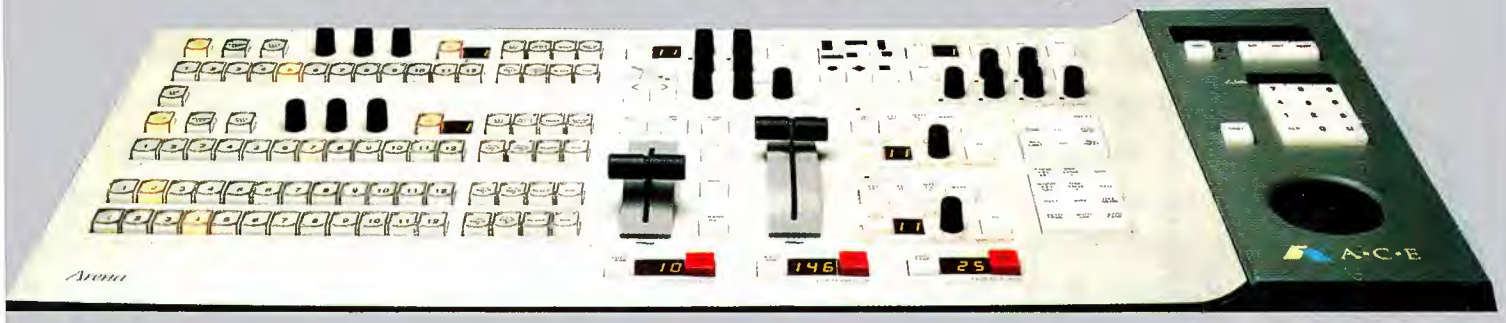
SHURE®

The Sound of the Professionals®...Worldwide.

Circle (1) on Reply Card

Maximum FX.

Minimum $.



A·C·E

Effects cost. And more effects cost more.

Those were the rules.

Until now.

Because the A.C.E. Arena changes all that. With an incredible array of powerful, creative keying facilities. For both live and post-production use.

At a price that's almost too good to be believed.

The Arena is as flexible and easy to use as it is affordable. With enhanced Memory Controlled Effects, ALPHA-TRACK to fly keys and 16 inputs with four linear key layers. As well as a separate serial interface to recall DVE events, dual pattern generators with 89 wipes, including rotary, 7 color matte generators and optional M.C.E. disk drive.

And so on.

All in a compact, attractive, ergonomic package.

And all this for a very affordable price.

Give your Midwest representative a call. For maximum information on the mini-priced wonder. The A.C.E. Arena Production Switcher.

the SOURCE

MIDWEST
Communications Corp.

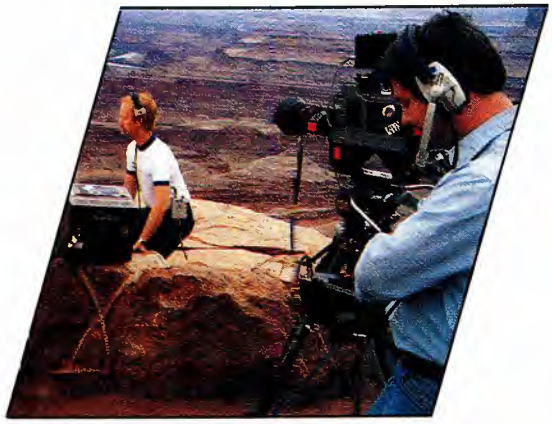
One Sperti Drive
Edgewood, KY 41017
606-331-8990

Circle (3) on Reply Card

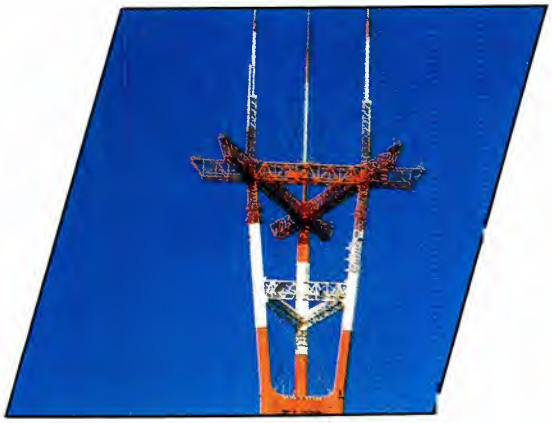
Contents

January 1990 • Volume 32 • Number 1

Page 26



Page 38



Page 50

BROADCAST ENGINEERING

WORLD-CLASS REMOTES:

Radio and TV stations are moving into the field in increasing numbers. Live remote broadcasting adds interest and immediacy to any program, and is invaluable in the coverage of news events. Field work also is proving to be an important marketing tool for local radio and TV stations. This month, we examine how stations can keep up with the pace of mobile technology.

OTHER FEATURE:

ON THE COVER

Technology has reshaped the news business for both radio and television. Broadcasting live from the scene of a major news story has become commonplace. Our cover this month illustrates the integration of news and technology. Illustration by Ned Steinberg, director of graphic arts for CBS News.

DEPARTMENTS

Hitachi makes it easy.

NOW, THE RIGHT CHOICE IN ADVANCED CCD CAMERAS IS CLEARER THAN EVER. THE NEW SK-F3 AND SK-F700.

Hitachi presents two new 3-chip CCD broadcast cameras that give you higher resolution and better image quality than you have ever seen before in a broadcast camera.

The SK-F3 dockable and the SK-F700 studio cameras include the newest Frame Interline Transfer (FIT) CCD technology. Smear is virtually eliminated. Sensitivity is dramatically improved.

A 6-speed electronic shutter and contrast function are both built-in. And as for high resolution, the SK-F3 and SK-F700 hit a crystal clear 700 lines.

Your choice for a high performance camera system has never been easier. Learn more about the new SK-F3 and SK-F700. In the studio or in the field, they are clearly superior.

Contact Hitachi, 175 Crossways Park West, Woodbury, NY 11797, (516) 921-7200.

Hitachi Denshi America, Ltd.

NEW YORK • LOS ANGELES • CHICAGO • DALLAS • ATLANTA

News

Chyron and Midwest reach agreement

Chyron, Melville, NY, and Midwest Communications, Edgewood, KY, have reached an agreement in principle to form a holding company that would operate as separate subsidiaries. Under the merger, each share of Chyron would be exchanged for one share of the holding company and each share of Midwest would be exchanged for 2.67 shares of the holding company.

Also, the parties have agreed in principle that the board of directors of the holding company would consist of 10 members, five designated by each of the parties. Alfred O.P. Leubert, chairman of the board and chief executive officer of Chyron, would be chairman of the holding company. David K. Barnes, president and chief executive officer of Midwest Communications, would be president and chief executive officer of the holding company.

The transaction is subject to approval by the boards of directors of each company, to the negotiation of a definitive merger agreement and to approval by the shareholders of both companies.

Ritchie assumes post as Ampex president

Ronald J. Ritchie has assumed the position of president of Ampex. He succeeds Max O. Mitchell, who retired at the end of December. Mitchell will remain on the board of directors and serve as chairman of its executive committee.

Ritchie joined Ampex as vice president and division manager of the recording systems division in August 1988. He was named executive vice president and chief operating officer in August 1989.

Ritchie's career includes senior management positions with Texas Instruments, Allied-Signal and Bunker Ramo Information Systems. He has experience in management, marketing, overseas operations and engineering for high technology, computer and consumer products.

McCurdy joins ATTC

John G. McCurdy Jr, has joined the Advanced Television Test Center (ATTC) as manager, equipment and facilities. He is responsible for the management of the test center's technical facilities, including the special-purpose equipment being assembled for the testing of several different systems for transmitting high-definition television.

The test center moves to new facilities this month, and will complete its testing laboratory in the spring.

McCurdy comes to ATTC from WJLA, channel 7, Washington, DC, where he was assistant director of engineering. He was responsible for the design and construction of technical and office space, RF system, studios, microwave, satellite, telecommunications and computer systems of WJLA's new station complex at the Intelsat Center.

McCurdy is a graduate of Ithaca College in New York. He is an active member of

Continued on page 96

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. RAPIDFAX: (913) 541-6697.

EDITORIAL
Jerry Whitaker, *Editorial Director*
Brad Dick, *Radio Technical Editor*
Carl Bentz, *Technical and Special Projects Editor*
Rick Lehtinen, *TV Technical Editor*
Tom Cook, *Senior Managing Editor*
Paula Janicke, *Staff Editor*
Dawn Hightower, *Associate Editor*
Suzanne Oliver, *Editorial Assistant*
Jennifer Hinkle, *Editorial Assistant*
Pat Blanton, *Directory Editor*

ART
Stephanie Swail, *Graphic Designer*

EDITORIAL CONSULTANTS
Fred Ampel, *Audio*
Nils Conrad Persson, *Electronics*
Ned Soseman, *Video*
Michael Heiss, *Consulting Editor*
Don McCroskey, *Consulting Editor*

BUSINESS
Cameron Bishop, *Group Vice President*
Duane Hefner, *Group Publisher*
Stephanie Hanaway, *Marketing Director*
Evelyn Hornaday, *Promotions Manager*
Darren Sextro, *Promotions Coordinator*
Dee Unger, *Advertising Business Manager*
Mary Birnbaum, *Advertising Production Supervisor*
Sally Nickoley, *Advertising Coordinator*

ADMINISTRATION
R.J. Hancock, *President*
Chuck Rash, *Corporate Circulation Director*
Sandra Stewart, *Circulation Director*
Doug Wilding, *Circulation Manager*
Customer Service: 913-541-6628
Kevin Callahan, *Creative Director*

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, *European Correspondent*
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
SUSTAINING MEMBERS OF:
- Acoustical Society of America
- Society of Broadcast Engineers
- Society of Motion Picture and TV Engineers

Member, Association of Business Publishers — ABP

Member, Business Publications Audit of Circulation — BPA

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.

BROADCAST ENGINEERING (ISSN 0007-1794) is published monthly (except in the fall, when two issues are published) and mailed free to qualified persons within the United States and Canada in occupations described here by Intertec Publishing Corporation, 9221 Quivira Road, Overland Park, KS 66215. Second-class postage paid at Shawnee Mission, KS, and additional mailing offices. POSTMASTER: Send address changes to **Broadcast Engineering**, P.O. Box 12960, Overland Park, KS 66212.

SUBSCRIPTIONS: Broadcast Engineering is mailed free to qualified persons in occupations described above. Others may subscribe at the following rates: United States, one year, $50; all other countries (surface mail), one year $60. Rates include postage. Foreign air mail and Canadian first class options are available at the annual subscription rate of $115. Single copy price $4.50, except for the annual Buyers' Guide/Spec Book, which is $20. Back issues, when available, $5; Buyers' Guide/Spec Book back issues $23. Adjustments necessitated by subscription termination at single copy rate. Allow six to eight weeks delivery for change of address or new subscription.

Advertising offices listed on page 127.

INTERTEC PUBLISHING CORPORATION

Selecting an ENG/EFP lens for your ⅔" CCD camera is a creative decision. It should be lightweight, responsive and zoom smooth as silk at any speed. Its design should utilize Extra-low Dispersion Glass to minimize chromatic aberration. It should include an anti-reflection coating for improved spectrum transmission ratio. And it should have an advanced design that improves corner resolution and produces a high, flat MTF curve. In short, it should be a Nikon.

But selecting an ENG/EFP lens is also a business decision. And on that score we provide something almost as compelling as Nikon quality – our unique Express Loaner Service. Simply register the Warranty, then in the unlikely event your lens needs service we'll get you a loaner lens overnight. All your investment in equipment and crews is more secure than ever before.

A service like this is remarkable in itself. But not quite as remarkable as our lenses.

As with all Nikon products, our new ENG/EFP lenses have all our renowned quality, tradition and technology built right in. Our growing line is also fully accessorized, including adapters that allow the use of your entire arsenal of Nikkor 35mm SLR camera lenses for special effects.

To find out more, call Nikon Electronic Imaging at (516) 222-0200 or write for our complete brochure: Nikon Electronic Imaging, Dept. D1 101 Cleveland Avenue, Bayshore, NY 11706.

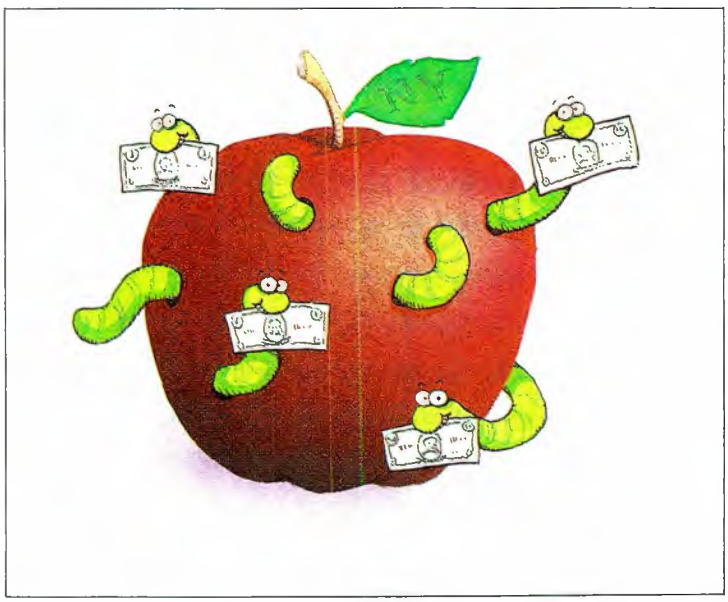
Nikon
ELECTRONIC IMAGING

Circle (4) on Reply Card

New York or bust

The 131st SMPTE show is now history. Overall, the gathering in Los Angeles (Oct. 21-25) was good, even though attendance on the show floor was light. The first day (Saturday) offered exhibitors their best opportunity to justify attending the convention. A variety of reasons was offered for the light turnout, including the Bay Area earthquake, which occurred four days before the convention opened, and the tight scheduling between SMPTE and AES.

In any event, the main gripe of exhibitors wasn't the '89 Los Angeles show, but centered instead on the 1990 SMPTE set for the Jacob Javits Convention Center in New York. A number of companies have threatened to pull out of SMPTE shows in New York unless changes are made in the attitudes of management and labor unions at Javits.



Exhibitors came away from the '88 show in New York with horror stories about shabby treatment by labor unions working the hall. The consensus was that the only way to get things done in Javits was to flash cash.

There is a general sense that the union situation in Javits is out of control. Exhibitors cite problems ranging from equipment damage to intimidation.

SMPTE officials promise that the problems experienced at Javits in '88 won't be repeated this fall. Many exhibitors, however, aren't convinced. Most are willing, therefore, to give SMPTE the benefit of the doubt and allow Javits one more try.

Concern about New York as a venue was not helped by reports from the AES convention, which concluded just one day before SMPTE opened. AES, held in the Hilton and Sheraton Center hotels in midtown Manhattan, experienced what may have been an all-time record for thefts — well into six figures. Numerous items were stolen from the floor of the Hilton exhibit areas, both during and after show hours when the halls were supposed to be secured. (The favorite items for theft were speakers and DAT players.)

A month before AES, exhibitors at Video Expo in New York, held at Javits, reported the theft of several cameras and monitors. As usual, no suspects were apprehended.

All in all, exhibitors don't like to go to New York. Nobody can blame them. The hotel rates are high, shipping expenses are outrageous and nothing happens without a pocket full of $50 and $100 bills. ($20s will only get you insults.) When you do a convention in the Big Apple, you check your pride and sense of fair play at La Guardia.

Nevertheless, SMPTE will venture back to Gotham City this fall, and we'll all be there. But the leadership of the society and other associations planning exhibitions in the city had better start listening to the manufacturers who pay the bills at conventions. If not, they may find that no exhibitors will show up to underwrite their shows.

Oh, yes, one other thing. SMPTE announced in Los Angeles that it has already signed up for the Javits Center in 1992. Good move, guys.

Jerry Whitaker,
editorial director

THE STANDARD IN LEVEL CONTROL

Orban's Industry standard automatic level control units excel for one simple reason: They offer extraordinarily transparent control action on a wide variety of program material. Whether being used for multi-track recording or on stereo mixes, Orban compressor/limiters can be counted on to maintain transparency and dynamic integrity while efficiently controlling levels and peaks, with few audible artifacts.

464A Co-Operator™ (Gated Leveler/Compressor/HF Limiter/Peak Clipper): A four-stage, system approach to level control. Features quick set-up with straightforward front panel controls. Two channels in one rack space. Your "assistant operator" for a wide range of production chores. Astonishingly transparent and easy-to-use.

422A/424A Gated Compressor/Limiter/De-Essers: A full featured, "hands-on" production tool. Designed to allow maximum control of individual parameters such as compression ratio, and attack and release times. Contains an effective de-esser. Ideal for voice processing. Widely recognized for its smoothness. 422A mono/424A dual-channel/stereo.

412A/414A Compressor/Limiters: Orban's inexpensive compressor/limiters. Utilize the same basic circuitry as the 424A, but do not include the de-esser, nor the gating. A THRESHOLD control makes them ideal for sound reinforcement. Very effective for basic, cost-effective level control. 412A mono/414A dual-channel/stereo.

787A Programmable Mic Processor: Combines a compressor having adjustable release time with 3-band parametric EQ, de-esser, and noise and compressor gates in a fully programmable package. Designed for voice talent processing, the unit can be used to store 99 commonly-used instrumental and vocal settings for instantaneous recall. MIDI, RS-232, and remote control interface options.

Optional Security Covers: Attractive, acrylic security covers are available to fit standard 19" rack-mount products—from one to four rack spaces, in opaque white, clear, and transparent blue.

orban

LISTEN TO THE DIFFERENCE.

Orban a division of AKG Acoustics, Inc.
645 Bryant St., San Francisco, CA 94107 (415) 957-1067 Telex: 17-1480 FAX: (415) 957-1070

Status of FCC station operation rules

By Harry C. Martin

The past few years have seen sweeping deregulation of the broadcast industry. As part of the FCC's new approach, the agency's oversight of station technical operation and logging has been drastically reduced. The regulations that remain are being enforced vigorously, however, and stations should not take the commission's rule relaxations as a signal that the chief operator's fundamental responsibility to maintain a technically sound operation has been diminished. With these considerations in mind, here is a summary of current FCC operational requirements as well as a list of typical problems found in FCC inspections:

Operators: All broadcast stations must have at least one person who holds a commercial radio operator license or permit (of any class, unless otherwise endorsed) in charge of the transmitter at all times during station operation. This operator may be stationed at the transmitter site, at an ATS monitor and alarm point or at another place where extension meters are installed. The operator must be trained in the operation and adjustment of the transmitter and must be able to observe and control the transmitter while on duty. The operator is permitted to do other work while on duty (disk jockeys or announcers), as long as that work does not interfere with the proper operation of the transmission system.

Chief operators: Each broadcast station must have a chief operator designated in writing with a copy of that designation posted with the station's license. If the chief operator is hired on a contract basis (as is allowed for AM stations under 10kW and all FM stations), the contract must be in writing and in the station's files. Chief operators need not be full-time but are required to work the number of hours necessary to fully perform their prescribed duties. The chief operator must hold a valid operator's license (of any class, unless endorsed). If the chief operator is not available for duty because of illness or a vacation, a substitute acting chief operator must be designated temporarily. Chief operators have the following responsibilities:

- Inspect and calibrate the station's transmission system, monitors, metering and control systems; and repair or adjust such equipment if it malfunctions.
- For AM stations that have specific measurement requirements imposed on them, the chief operator must make those measurements or tests periodically, as the rules or the station license requires.
- Once a week, the chief operator must review the station log and other records to ensure that entries are being properly recorded and that the station is being operated according to its license and the FCC's rules. The chief operator is responsible for signing off on the records after the review.
- These duties may be delegated by the chief operator, as long as he or she maintains supervisory control and responsibility for the proper execution of the tasks.

Station log: The commission officially eliminated most logging requirements in the early 1980s, but the rules still require that a station log be maintained at every AM, FM and TV station. Aside from the specific requirements listed below, the licensee is at liberty to record on its log those measurements and parameters that are of particular importance to the station. In a brief interview, an FCC field examiner told **BE** that a licensee should keep those records that are most likely to be helpful should a need arise, in order to document performance or answer other technical questions.

The station log must be kept and signed by competent station employees in a legible and easily understood format. Any changes made to log entries must be struck out and corrected, rather than erased, and all such corrections must be approved by the person who kept the log, the chief operator, the station manager or an officer of the licensee. The station log must contain the following:

- Tower lighting information: A description of any extinguished or malfunctioning light, the date and time a malfunction was noted and the date, time and nature of adjustment, repairs or replacements made.
- A record of all EBS tests sent and received. (This information can be kept on a separate log but is considered part of the station log.)
- Any other information required in the station's authorization or by the commission. For example, if an inspection of a facility shows a consistently high-power level problem, the commission may require the licensee to record transmitter power for a period of time to ensure that the problem has been remedied.
- Directional AM stations without an FCC-approved antenna sampling system have a number of additional, specific logging requirements. They are listed in section 73.1820(a)(2) of the commission's rules.

Typical problems

Here is a list of problems that frequently surface in FCC station inspections. Many of these items are easily remedied; and failure to do so could result in a substantial fine.

Safety related:

- Inadequate painting and lighting of towers.
- Inadequate locked fencing around AM towers.
- EBS operation, including missing or malfunctioning EBS monitors, failure to receive or transmit the weekly EBS test, failure to log those tests and lack of a current EBS checklist or authenticator word list.

Interference potential:

- AM directional antenna parameters and monitoring point levels outside of tolerance.
- Inadequate meters and transmitter control at the operator's position.
- Frequency and modulation outside of tolerance at TV stations.
- Overpower and other unauthorized operation of non-commercial educational FM stations.

Administrative:

- Failure to have, or items missing from, the station's public file.
- Lack of availability of the station's authorizations.

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

Editor's note: Portions of this column are reprinted from **BE**'s November 1988 edition.

It pays to be modular.

7510 Processing Amplifier
A new single-module amplifier, packed with features to clean up any off-air video signal.

Keeping your facility in step with the fast changing world of television is easy with modular products from GVG — products that pay off with the flexibility, economy and performance you need.

3240/41 Processing Amplifier
The industry workhorse, with quality features including toothed blanking and external frequency reference.

CV-20 Series Component Analog Video Equipment
Whatever your format, you can design practical systems with GVG's versatile family of CV signal generation and format conversion products.

9500 Series Sync Pulse Generators
The 9500 series sync pulse generators prove you can pay a low price without compromising on performance, reliability — or modular versatility.

8550 Series Audio Distribution Amplifiers
Make your next audio studio design simple and cost effective with an 8550 series high performance audio distribution system.

Digital Video Distribution Amplifiers
The DDA-101 and DDA-202 underscore the GVG commitment to the emerging D1 and D2 formats.

8500 Series Video and Pulse Distribution Amplifiers
State-of-the-art performance at the right price. That's what you'll find in every 8500 series video and pulse DA.

8560 Series Stereo Audio Distribution System
Custom-designing a stereo audio studio can be a problem. Here's the flexible solution you've been looking for.

Television is changing like never before. New formats are emerging. Powerful technologies are on the way. And product lifecycles seem shorter than ever.

Whatever challenges you face tomorrow, you can be ready to meet them with the full line of terminal equipment from GVG. When performance, design flexibility and competitive pricing really matter — it pays to be modular.

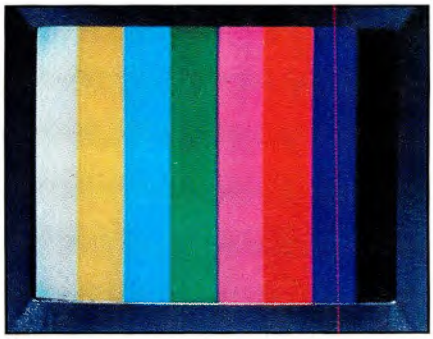
Grass Valley Group®

A TEKTRONIX COMPANY

THE GRASS VALLEY GROUP INC.
P.O. Box 1114, Grass Valley, CA 95945 USA
Telephone (916) 478-3000 TRT: 160432
FAX (916) 478-3187

OFFICES: New York (201) 845-7988; District of Columbia (301) 622-6313; Atlanta (404) 493-1255; Miami (305) 477-5583; Chicago (219) 264-0931; Minneapolis (612) 483-2594; Dallas/Fort Worth (817) 483-7447; Los Angeles (818) 999-2303; GVG International Ltd. (U.K.) + (256) 817817; Grass Valley Group Asia (HK) + 852-3-7874118; Grass Valley Group Sud America (USA) (305) 477-5488.

Circle (6) on Reply Card



Using wireless microphone systems

By Kenneth R. Fasen

Opportunities for using wireless microphones in newsgathering are increasing. Freedom of movement and elimination of microphone cable runs are two of many reasons why wireless equipment is desired. It has been possible to buy equipment bags with pouches that hold wireless microphone receivers near the decks, but soon you will be able to buy decks with microphone receivers built-in.

As the use of wireless microphones increases, many people will experience or hear of problems involving multiple wireless systems. However, these problems can be prevented. With some background information and familiarity with the equipment, you can be comfortable and effective in a multiple wireless microphone environment.

With a prudent choice of operating frequencies, you can comfortably use three systems simultaneously virtually anywhere. If you are free to use unused adjacent-channel TV frequencies, you can increase to six or eight systems. With planning and experience, 16 systems will perform well; but more than 16 is difficult, and dealer/manufacturer assistance is highly recommended.

Equipment selection

The first step is to identify the application and specify equipment accordingly. Many high-quality, reasonably priced wireless systems are on the market. Some are body-worn and some are hand-held microphones but not all of them perform well when many are used simultaneously. This is where the equipment designers' and manufacturers' attentiveness and experience come into play. Get information on the equipment with regard to multiple wireless system usage from the manufacturer. Specifications pertinent to multiple system usage are antenna-distribution output port isolation, transmitter spurious signal output, receiver local oscillator radiation, receiver front-end and IF bandwidth. Talk with the professionals who install or use multiple wireless systems to find out what has worked for them.

Coordinate with the manufacturer to specify operating frequencies or use frequencies that are known to work well for a specific model. Do not choose the frequencies yourself. Frequency selection is the single most critical and complex task in successful multiple wireless operation.

Many issues affect frequency selection, making it part art and part science. A computer program that will do the extensive arithmetic is mandatory, but intuitive interpretation of the computer output also is important. That interpretation requires some experience with the equipment make and model, some insight into RF equipment design and some firsthand application experience. Consult your equipment manufacturer or an experienced dealer.

Using the equipment

Good operating procedure also will have an effect on your wireless microphone success. Keep the equipment and cables away from sources of electrical interference (such as motors, generators and light dimmers). Keep receive antennas in line-of-sight to the transmitters. Place antennas at least three feet from metal objects. Place the two antennas from a diversity receiver/antenna distribution unit at least three feet from each other. The receive antennas should be as close as they can be to the transmitter, but no closer than 20 feet. Make the wireless transmitter/receiver coax paths as short as is practical. The installation should be neat and clean. It will look better, perform more reliably and be easier to diagnose problems, should they occur.

Leave the transmitters turned on while the receivers are on. The transmit signal will capture the receiver and minimize the effect of interference.

Also, perform an on-site system checkout at the time of day when the equipment is used. Occasionally, local interference may vary by day part. This isn't common, but it is a good insurance policy to perform this check.

Common problems

Multiple system interference can be non-existent, mild or severe. It is non-existent in only a few systems. As the number of systems grows, some compromises will invariably be made. A frequently forced compromise is frequency intermodulation.

Intermodulation symptoms include whistles and the ability to hear a transmitter's audio on a receiver other than its companion. Unfortunately, this interference may exist, but the effects can be so mild that it is never noticed. Your equipment manufacturer can tell you if your frequencies will result in any intermodulation interference.

Intermodulation interference can be made severe by bringing the offending transmitters within inches of one another or within several feet of the affected receiver's antenna. If you know that some transmitters will be used close to one another, advise the manufacturer. It can tell you which frequencies to use in close proximity to minimize the effects of signal intermodulation.

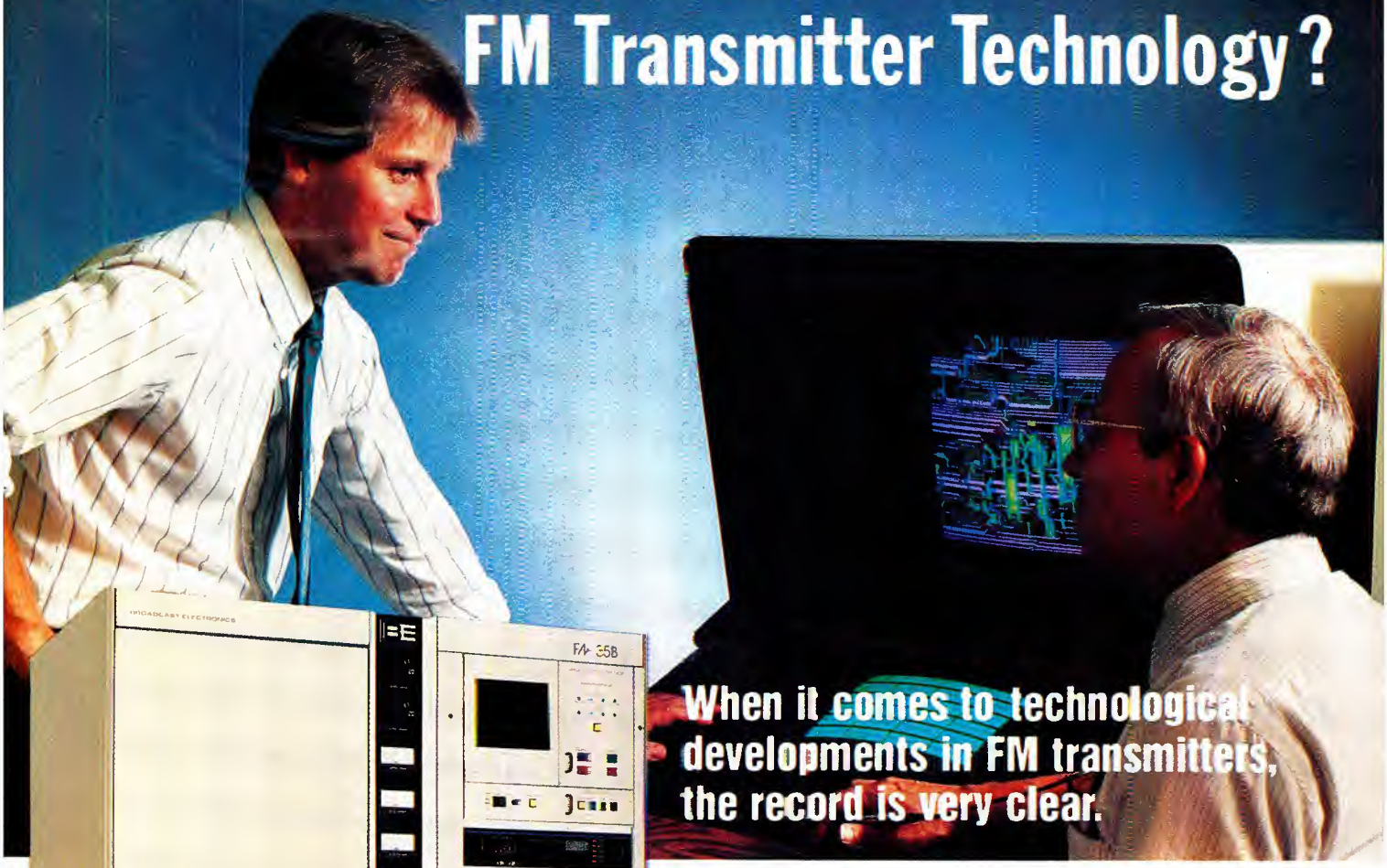
Of course, broadcasters must never forget the importance of frequency coordination. Prudent frequency selection, based on a thorough understanding of intermodulation and equipment design parameters, can make the difference between success and failure. Try to keep an updated list of wireless microphone users in your market, which includes make and model numbers. Let the manufacturer or dealer refer to this list when selecting frequencies for you.

Price is no object

Even modestly priced systems will perform well as long as the manufacturer is attentive to the necessary equipment design requirements. Your knowledge and some technical assistance will mean success in the ever-growing applications of multiple wireless systems.

Fasen is director of engineering with HM Electronics, San Diego.

Who's Setting The Pace For FM Transmitter Technology?



When it comes to technological developments in FM transmitters, the record is very clear.

Broadcast Electronics:

First to introduce a Proportional VSWR Foldback System.

First to introduce "PWM Automatic Power Control" with "Soft Start".

First to offer a built-in synchronous AM test port.

First to design a single tube high power 30kW FM Transmitter.

First to introduce a single tube 10kW FM Transmitter with a 4CX7500A tube.

First to introduce a single tube 3.5kW FM Transmitter with a 4CX3500A tube.

First to introduce a Microprocessor Video Diagnostic System.

First to offer built-in, PC based, transmitter remote control.

First to offer a standard synchronous FM booster option.

And, Broadcast Electronics again sets the world standard for FM Exciters with the new FX 50 which stands alone in audio performance with 93 dB S/N and .003% THD and IMD.

Patented Innovations

Broadcast Electronics has the largest and most skilled engineering staff dedicated to the radio broadcast equipment industry. Significant FM transmitter design patents awarded to B.E.:

- Folded Half-wave Output Cavity, patented 1982.
- Internal Second Harmonic Suppressor, patented 1982.
- Broadband Input Impedance Matching Circuit, patented 1985.

State of the Art Leadership

Stereo technology, only B.E. designs AM, FM and TV stereo generators.

Broadcast Electronics is the only major FM transmitter manufacturer who designs and builds its own solid state intermediate power amplifier (IPA).

All products are backed by B.E.'s 24 hour parts and service and a strict quality assurance program.

The result of this commitment to state-of-the-art innovation is a complete line of RF products, designed to provide you with years of reliable service. Certainly it's clear who **is** setting the standards for FM transmitter technology!

Circle (7) on Reply Card

BE® BROADCAST ELECTRONICS INC.

4100 N. 24th ST., P.O. BOX 3606, QUINCY, IL 62305, (217) 224-9600, TELEX: 250142, FAX: (217) 224-9607

re: Radio

Another trip to the lost and found

By John Battison, P.E.

Finding "lost antennas" was the subject of last month's column. Let's continue along those lines by discussing the radials that may exist on your station's maps.

After you've determined that your station is where it is supposed to be, your next job is to confirm that the radials and measuring points used are those shown on the map, or vice versa. It does no good to take a series of field-strength measurements on a radial only to find that the places where you measured are not the same ones used by the previous chief or contract engineer.

Follow the map

If you inherit a set of topographical maps that contain confusing or unclear markings, do one of two things: throw the maps away or carefully erase every mark. It's probably a better idea to just buy new maps. Before you discard the old maps, however, compare them with the new ones. There probably will be considerable differences between them. Changes usually are printed in purple. In any case, check the data section of the map. Notes about changes and dates will be listed there. It's important that the map you use is as current as possible. The newer the map, the easier it will be to locate landmarks.

Plot your transmitter site accurately. To do this, use the coordinates that the surveyor gave you (see the December 1989 "re: Radio" column). If you don't have new survey data, use the most accurate information available. It's important that the antenna site be plotted accurately on the maps.

Locate the MPs

For years, monitor-point measurements have been referenced to points such as "300 feet east of the bridge, 100 feet into the field." I worked with a station that used these types of references. I found that the array was within operating parameters, although the minor lobe for 355°T was actually at 359°T. Luckily, it measured only 13mV/m on the corrected radial and 15mV/m on the peak of the lobe, so the array was in. You may not be so lucky.

Once you've correctly identified the monitoring point, photograph it. Make the picture more descriptive than a pose of a grinning engineer holding a field-strength meter. Be sure there is a permanent and easily recognizable feature in the picture. Telephone poles often are used as references, but including only one pole in the picture, unless it is clearly identified, is of little use. Try to get a building, roadside telephone box or something else into the scene. The image must include visual references that will be there for years.

I always used to say that telephone poles should be identified by their numbers. This advice backfired on me recently. Last year, I made measurements along a quiet country lane in a rural part of Ohio, identifying my measuring point by pole number. A few weeks ago, I went back to make a partial proof and spent several minutes looking for my numbered pole. There was no sign of it. All the poles had bright new brass number plates. You guessed it: the power company had renumbered the poles.

Again, I was lucky. My point identification read "across from pole xxx across from xxx on country road xxx." With this description, I was able to identify the correct MP location. Although the pole number was new, I still was able to find my previous measuring point. I mention this to stress the importance of complete point identification. Don't shortchange yourself on information.

Example case

In the case just described, there were no measuring-point descriptions in the station records. The old partials and skeletons merely gave point number, time, distance and value in millivolts per meter. So on each radial, I had at least two numbers to choose from for each point, and sometimes three.

It is possible to use dividers and measure from some clearly definable landmarks, such as sharp turns in the road. However, remember that the real thing sometimes looks quite different from the map's symbols.

In this case, I was able to use this map by identifying points in my own way. Measurements were needed merely to determine radiation. Distance and millivolts per meter became the determining factors. I've since obtained new maps and marked the correct MPs referenced to identifiable points on the maps.

Extending radials across maps

At many stations I've found radials that pass over two or more maps. Too often, when these maps were made, the lines were continued merely by folding over the edges to get them out of the way. The maps then were laid edge to edge, and the radial was drawn. This is not a good way to extend radials over two or more maps.

Cutting off the margins and laying the maps together to draw the radials doesn't work well, either. Removing the margins often destroys valuable information and limits further use of the map.

Here's how I extend radials across more than one map. Measure the distance from where the radial cuts the edge of the printed portion of the map (not the paper edge) to some nearby easily identifiable point such as a longitude or latitude mark. Identify the same point on the next map, lay off the same measured distance along the edge and mark this point.

Using a protractor and the edge-referenced mark, draw the radial on the next map. When laying off radials from a transmitter site, be sure that the protractor is oriented properly so the north/south line is truly vertical and aligned with the north/south axis of the map. A parallel rule is a useful tool for this task.

Dividers also are useful for finding the distance to measuring points, but be careful when using these tools. It is easy to move a loose pair of dividers between the time you set them on the map and the time you transfer them to the scale. I prefer to make a copy of the scale, cut it out and lay it on the radial to make my measurements. In some cases, if there are plenty of maps, the actual scale can be cut out and used.

Remember that errors can be cumulative. Over a distance of 20 miles, an error of 0.1 miles becomes quite considerable. Such an error could affect the measured field. When it comes to mapwork, accuracy is the watchword. |:-)))|

Battison, **BE**'s consultant on antennas and radiation, owns John H. Battison and Associates, a consulting engineering company in Loudonville, near Columbus, OH.

Dolby SR improves the medium for your message.

TAPE RECORDERS

Dolby SR provides the performance attributed to digital systems while maintaining such analog virtues as economy, editing ease, and tape interchange.

CARTS

Along with their familiar ruggedness and all-around utility, carts with Dolby SR capture the full dynamics of all your source material, digital or analog.

1-INCH VTR'S

With Dolby SR, video can sound as good as it looks. Signal purity is maintained through the multiple tape generations necessary in today's post-production techniques.

DISCRETE STL'S AND RPU'S

Dolby SR improves headroom and lowers noise, while suppressing the effects of interference and fade.

TV STL AUDIO SUB-CARRIERS

With Dolby SR, there's no need to re-allocate subcarrier frequencies or replace existing equipment in order to deliver high quality audio to the transmitter.

SATELLITE AUDIO

Dolby SR improves analog channels without audible side effects yielding performance rivaling digital systems.

Listeners today expect better sound wherever they go — at home, at the movies, in the car. To keep up with their expectations, you need Dolby SR. Two channels, with the compact, easy-to-operate Dolby Model 363 (shown). Or up to 24 channels, with Dolby Laboratories' multitrack products.

Dolby SR dramatically reduces noise, increases headroom, and lowers distortion from initial production to final transmission. That means you can deliver your message today with the clarity you've been expecting from the technology of tomorrow.

Dolby Laboratories Inc • 100 Potrero Avenue • San Francisco, CA 94103-4813 • Telephone 415-558-0200 • Telex 34409 • Facsimile 415-863-1373
346 Clapham Road • London SW9 9AP • Telephone 01-720-1111 • Telex 919109 • Facsimile 01-720-4118

Dolby®

Circle (8) on Reply Card

Uncommon engineers

Hilmer Swanson

By Elmer Smalling III

Editor's note: With this issue we begin a new column in BE — *Uncommon Engineers*. Each month the column will feature an individual who has made significant contributions to the science of broadcasting. Comments and suggestions from readers are welcome.

You may not know Hilmer Swanson by name, but you know his work. Swanson's contributions to AM radio are legendary. He developed and holds patents on three key technologies that have helped move AM radio transmitters from low-efficiency tube designs to high-efficiency, solid-state technology. Swanson's work includes:

- pulse duration modulation (PDM).
- progressive amplitude modulation (PAM).
- digital amplitude modulation.

Swanson, a senior scientist at the Harris Broadcast Division, Quincy, IL, is a dyed-in-the-wool radio engineer. His first experience in broadcasting came when he began working for a 250W daytimer in LaPorte, IN, taking meter readings. It was a good job for doing homework. It also was a job that taught him the value of an education.

Swanson . . . is a dyed-in-the-wool radio engineer.

After a stint in the Signal Corps during the Korean War, Swanson returned to school. He graduated in 1961 with a master's in electrical engineering from the University of Iowa, Iowa City, IA.

He went to work for Collins Radio in Cedar Rapids, IA. He had worked with Collins gear in the Army and was impressed with it. He worked in the broadcast department at Collins designing FM transmitters and, later, 250kW shortwave transmitters. Soon, his whole department was moved to Dallas. After four years in the Southwest, Swanson and his family yearned to return to the Midwest.

At about that time, he heard of a job from an old friend at the Gates Radio Company in Quincy. Swanson joined Gates just as it was undertaking an order from the Voice of America for a 100kW shortwave transmitter. Gates engineers were trying to upgrade a 50kW unit by changing tube types and making other modifications. The project was behind schedule and results of the upgrade effort were not satisfactory.

Swanson came up with the idea of using a sawtooth waveform superimposed on the input audio to act as a switch, which would allow the generation of a waveform that conveyed audio through the width of individual pulses. The modulator was substantially more complicated than previously used. However, it allowed the modulator output tube to operate in a highly efficient Class D mode.

Swanson came up with the idea of . . . conveying audio through the width of individual pulses.

He tried the concept and it worked. Pulse duration modulation (PDM) was born. Nine months later, Gates delivered the 100kW transmitter using PDM, which offered greatly improved efficiency.

The customer was concerned about the new modulation system. Swanson recalls, "They were a bit nervous." But they eventually signed off on the project, and the first PDM transmitter was shipped to Asia. It is still operating today, more than 20 years later.

PDM started big and worked down to commercial broadcast powers.

The PDM project was unique in that most other new modulation technologies are designed for low-power applications and then built up to work at higher levels. PDM started big and worked down to commercial broadcast powers.

Swanson's latest credits include the digital modulation scheme implemented in the DX line of solid-state broadcast transmitters. Modulation is accomplished by digitizing the input audio and switching RF modules on and off as necessary to produce an AM waveform. The net effect is a digital-to-analog converter operating at the carrier frequency of the station. Swanson hopes to take the DX line up in power level to 100kW and above.

When Swanson is not on the job, he can be found on his farm outside Quincy. He once quipped that he gets his best ideas while astride his farm tractor. It must be working: Swanson holds 13 U.S. patents and has five more pending. Suffice it to say the top brass at Harris must consider Swanson's tractor one of the company's most valuable resources.

Swanson's talent of finding a *better way* has led to his many contributions to broadcast engineering, truly making him an uncommon engineer.

Next month: Blair Benson, author, consultant.

Profile

- *Senior scientist, Harris Corporation*
- *Holds 13 U.S. patents; five others pending*
- *Developed pulse duration modulation (1969)*
- *Developed progressive amplitude modulation (1975)*
- *Developed polyphase PDM (1979)*
- *Married with four children*
- *Hobbies: farming, horses*
- *Awards:*
  Harris Patent Hall of Fame (1969)
  Harris Outstanding Achievement Award for SX and DX AM transmitters (1981)
  Harris Outstanding Technical Achievement Award for PDM and PAM modulation systems (1979)

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

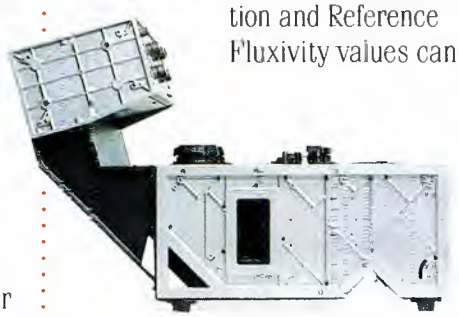
Fortunately for us, most radio engineers look before they leap.

Three cue locations and a zero memory can be accessed via the MX-55NM's built-in locator.

You've always been an analytical bunch, so we're sure you know that our MX-55NM 2-track not only gives you the features you need, but that it's also priced several thousand dollars below its nearest competitor.

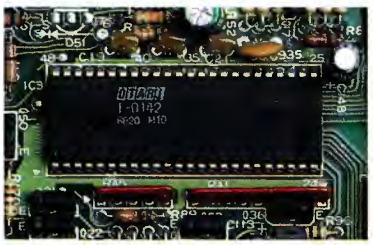
We know you're not about to overlook *major* features, like HX-Pro™ bias optimization, or gapless seamless punch-in punch-out, or that famous Otari sound. However, here's some fine points to examine as you do your "apples-to-apples" with our competitors.

For example, the MX-55NM incorporates a printed-circuit capstan motor (like that used on our MX-80 multitrack machine). This not only gives you low wow and flutter right out of the chute, but very fast start times. It's also worth noting that EQ selection and Reference Fluxivity values can be changed with a flip of a switch. And as you put the deck through its paces, notice that the varispeed control provides 0.01% step resolution. This means you can make precise changes, and perhaps more importantly, you can repeat a change *exactly* when necessary.



A 1.5" cast alloy deckplate, plus cast side frames give the MX-55NM the rigidity and ruggedness you've come to expect from Otari. (Let our competitors show you the inside of their machines?)

For your convenience, an optional voice editing module maintains normal pitch at twice normal speed. And the meterbridge keeps knobs and switches out of the way while you're editing.



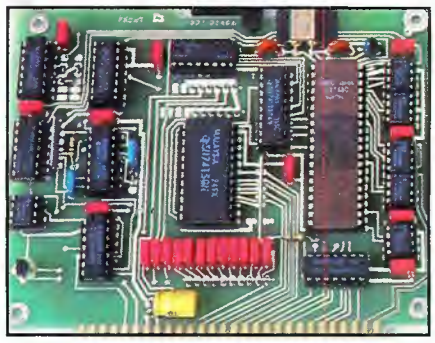
Because we know how hard you use our machines, we use a double-sided glass epoxy transport circuit board, and we silkscreen both sides of our PCBs so you can locate the components easily.

In the Otari tradition, we make the MX-55NM easy to service. Only four screws get you into the transport electronics. And when you get there, all servicing can take place with wiring intact. We also hinge all service panels, and use locking cable interconnects.

The specs? Why not call your nearest Otari dealer, or Otari at (415) 341-5900 and check them out. Like everything else, you'll find them "right on the money."

OTARI®

Circle (9) on Reply Card



How to construct a Smith chart

By Gerry Kaufhold II

The equations that describe the relationships between current and voltage in a transmission line can be quite cumbersome. A graphical tool to provide ready approximations to these relationships is the Smith chart.

About the chart

The Smith chart is built around two families of curves. The first of these families is the resistance circles. (See Figure 1.)

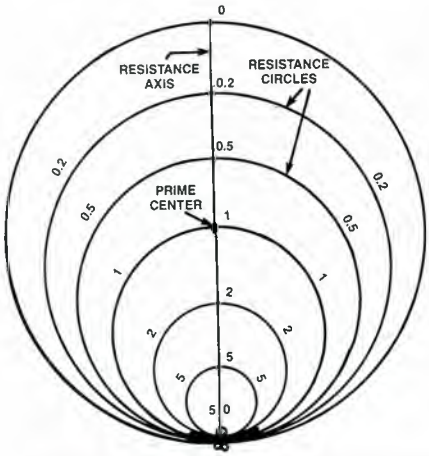


Figure 1. Resistance circles of the Smith chart coordinate system.

These are centered on the only straight line on the chart, the vertical line called the resistance axis. Notice that the concentric circles are given values starting with zero at the top and ending with infinity at the bottom. These are ratios of whatever value is assigned to the center point, called the prime center, which has a value of 1.0.

In operation, the prime center usually is set equal to the characteristic impedance of the transmission line, and the ratios of each circle are used as multipliers. This normalizes the chart for any value you care to assign the prime center. All points along a resistance circle have the same resistance.

The second family of curves is the reactance curves, shown in Figure 2. Only segments of these are plotted, and the resistance axis is one member of the family (with an infinite radius). As with the resistance family, these curves are labeled with normalizing multipliers, with respect to prime center. Also, all points along any one curve have the same reactance value.

Kaufhold is a market development engineer for SGS-Thomson Microelectronics, Phoenix.

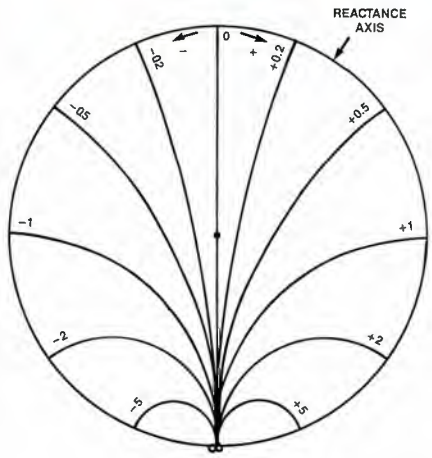


Figure 2. Reactance curves of the Smith chart coordinate system.

Plotting on the chart

Combining these curves yields a precursor to the Smith chart. Let's plot a couple of practice points. Recalling that a short circuit has zero resistance and zero reactance ($0 + 0j$), plot that at the top of the chart.

For some more useful numbers, assume a characteristic impedance of 100Ω. Let's say you wish to plot an impedance of 50Ω and an inductive reactance of 100Ω. Assign prime center a value of 100Ω, then divide each component of the impedance by 100. The normalized values then would be $50/100 + j(100/100)$, or $0.5 + j1.0$. This can be plotted on the chart, using the intersection of the 0.5 resistance circle and the +1.0 reactance curve.

Assume you are using 75Ω transmission line, as in a video cable. Setting prime center to 75, you have impedance that equals $50/75 + j(100/75) = 0.66 + j1.33$. This plots slightly below and to the left of the previous point, as shown in Figure 3. Therefore, it can be seen that the same impedance may occupy different positions on the chart, depending on the value chosen for prime center.

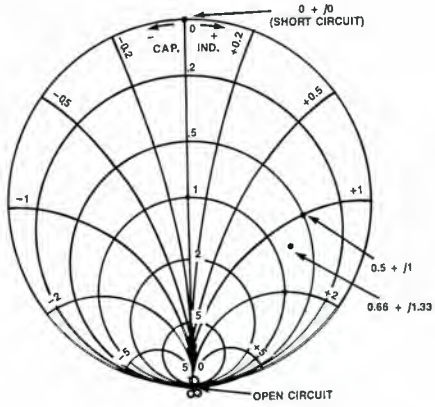


Figure 3. Complete Smith chart coordinate system, with sample values plotted.

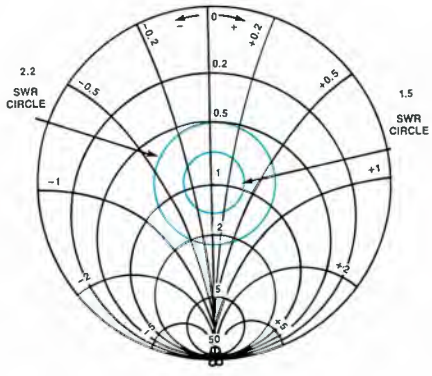


Figure 4. SWR circles drawn on a Smith chart.

SWR

One other family of useful circles, usually not printed on the chart, is plotted with a compass, as needed. These are the standing wave ratio (SWR) circles. They occur as concentric circles centered on prime center. With one compass leg on prime center, which has multiplier 1.0, move down the chart coordinate system marks until you come to one that corresponds to the SWR of interest. Draw the circle at that point. SWRs of approximately 1.5:1 and 2.2:1 are indicated, as shown in Figure 4.

Be prepared.

For the first real improvement in AM sound in more than a decade.

The future offers real promise for AM radio. NRSC AM radios are almost here, factory-installed in new cars. Soon, home stereos and portable sets will also be NRSC-equipped.

NRSC (National Radio Systems Committee) has created a voluntary national transmission standard that makes wideband high-fidelity AM radios practical. As broadcasters adopt the NRSC standard, receiver manufacturers can extend and flatten their frequency response without risk of increasing the audibility of interference.

Is your station prepared?

The 9100B NRSC-standard OPTIMOD-AM® is the first choice of AM stations concerned about improving their sound to compete with FM. OPTIMOD-AM sounds great on both the new NRSC receivers *and* on the millions of narrow-band receivers already in the field that will be in use for years to come.

When replacing older-style processors with OPTIMOD-AM, stations experience a significant increase in coverage area. And when replacing any processor, stations experience a dramatic improvement in sound quality, on both *voice* and *music*, with no sacrifice of loudness.

Superior sound is an important part of an overall strategy to increase ratings and profits. With OPTIMOD-AM, your announcers' voices will have presence and impact, while still sounding very clean. Music will have real bass, with punch and warmth, not boom. The highs will seem to open up. And loudness and tonal balance will be consistent from source to source.

OPTIMOD-AM can be configured to operate optimally in mono, C-QUAM® stereo, or Kahn stereo. Mono units can be field-upgraded later to stereo by simply plugging in additional cards.

Be prepared. Call your Orban Broadcast Products Dealer for more information on OPTIMOD-AM 9100B, or call us direct.

orban

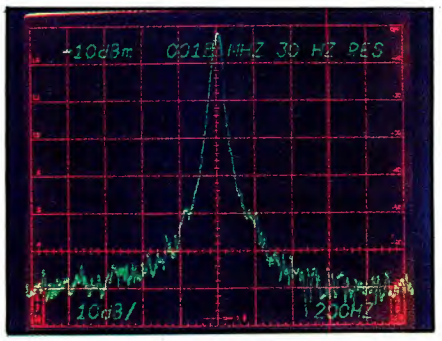
a division of AKG Acoustics, Inc.
645 Bryant St., San Francisco, California 94107 USA
Telex 17-1480 FAX (415) 957-1070
Telephone (415) 957-1067 or (800) 227-4498

Circle (10) on Reply Card

® OPTIMOD-AM is a registered trademark of Orban Associates Inc.
® C-QUAM is a registered trademark of Motorola, Inc.

Part 8

Troubleshooting



CD troubleshooting

By Brad Dick,
radio technical editor

By precisely arranging where data is stored along the tracks of a compact disc, it is possible to reduce the chance for a total loss of audio information. Compact disc players deal with missing data in three ways: error-correction, error concealment (interpolation) and muting. The sophisticated error correction used in CD recording is called the *cross-interleaved Reed-Solomon code* (CIRC).

With error correction, the player replaces the missing information. In the simplest of terms, the player uses redundant data stored along with the audio to correct for errors in data recovered from the disc. Error correction means that the player has determined exactly what the missing information was and has replaced it in the datastream. The resulting output is an exact replication of the originally encoded information.

Suppose not enough information is available for the player to correct or replace the missing data. In that case, the player shifts to the second stage of error correction, called error concealment. Unlike error correction, error concealment is a guess of what the missing data was. It is an interpolation based on the data surrounding the missing bits.

Some players may use an average of the preceding and following points. More sophisticated schemes involve complex calculations including a weighted average of several samples taken before and after the damage.

Error concealment sometimes can be heard. If it's audible, it means that the player is having to replace many pieces of data literally hundreds of times per second. In loud passages, you may hear a ripping sound or a series of clicks. Interpolation is usually inaudible during soft passages.

The third stage of error correction is really not correction at all. If the data is completely corrupted or missing, the player may simply mute the audio. If applied for short periods, especially during quiet passages, it may be undetectable. A large scratch may cause the player to mute for long periods, creating the impression that the player has skipped tracks.

Measuring the error

CD manufacturers can measure the amount of error on a disc. The term used is *block-error rate* (BLER). An accepted gauge of error frequency is how many 6-sample, $^1/_{7,350}$-second blocks containing one or more data errors occur in one second. The official Red Book specifies that this reading be made over a period of 10 seconds. The maximum BLER is 220 block errors per second. The average BLER throughout the disc must be less than 10.

Block-error rate is not the only measurement to be applied to CD quality. One test measurement on sample discs showed error rates ranging from a low of five to a high of 550. Even with the high error rate, the tester reported that it was impossible to hear any difference.

What this means is that a BLER of 220 is a conservative number. As long as no interpolation or muting occurs, the exact value is immaterial to the sonic quality of the disc.

Some disc manufacturers have tried to sell their products based on BLER alone, but it really has little bearing on the quality of the recovered audio. Also, BLER does not take into account several other important parameters. As long as the player does not have to guess about missing data (and the BLER is less than 220, the Red Book standard), the output will be identical to the recorded signal.

Test discs

With all the emphasis on the problems associated with recovering the CD signal, how can you evaluate players? There is no single standard by which players can be assessed. When it comes to player testing and maintenance, each manufacturer specifies a different test disk. Therefore, it's best to use the disc recommended by the manufacturer.

If you can afford only one, consider the Philips CC test set (17165500-40). Table 1 lists some players and the suggested test discs. For the sake of discussion, let's look at the Philips set of discs. One disc contains audio signals for CD audio alignment and performance measurements, and the other contains several types of simulated disc damage.

The first test simulated by the TS5A contains a wedge-shaped pattern of damaged inner surface. The damage existed on the mold, so each test disc is the same. The wedge has a minimum width of 400μm and widens in 100μm increments out to 900μm wide. It simulates pinholes of steadily increasing size. (Remember that the Red Book specifies that air bubbles be less than 100μm and black spots be less than 200μm in diameter.) Compact disc players should be able to play at least the 400μm section of the wedge without audible problems.

The disc also contains a series of black dots that are 300μm, 500μm, 600μm and 800μm in diameter. The dots are painted on the outer surface of the disc and simulate dust particles trapped in the polycarbonate. Philips recommends that all players be able to properly handle at least the 300μm dot.

Fingerprints are a common phenomenon with CDs. This is simulated on the Philips disc by a grid of dots, rectangular in shape. The grid is parallel to the track direction, making the test even more difficult.

PLAYER	RECOMMENDED TEST DISC
Denon	Denon
Studer/Revox	Philips TS5A
Sony	YEDS-7
	YEDS-18

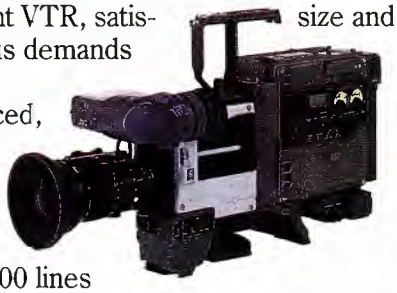
Table 1. Recommended test discs for some CD players.

Acknowledgment: Appreciation is expressed to Laura Tyson, sales engineer, Denon America; Martin Ledford, quality control manager, Denon Digital Industries; and Dave C. Bowman, director of professional products, Studer Revox for their help with this column.

"We've always known JVC makes great cameras...

...so we were especially interested to hear about their new KY-25U three chip camera. We've been looking for a camera that offers at least 700 lines of resolution, can dock with our component VTR's, and won't eat up our limited budget."

JVC's engineers specifically designed the KY-25U to be a versatile camera, with multiple signal outputs for docking to any component VTR, satisfying all the rigorous demands of field acquisition. Plus, it's well balanced, comfortable and feels great to use.



It's an outstanding camera that will give you over 700 lines of resolution to take advantage of today's superior recording formats like S-VHS, MII and Betacam. Three ⅔" high density CCDs, each with 360,000 effective pixels and a signal-to-noise ratio of 60dB, ensure exceptional picture quality.

Compare the KY-25U's compact size and advanced features including high speed shutter, stereo audio, advanced circuitry and much more. You'll agree...for price and performance there is just no better camera available today.

For further information call 1-800-JVC-5825 or write JVC PROFESSIONAL PRODUCTS COMPANY, 41 Slater Drive, Elmwood Park, NJ 07407.

JVC®
PROFESSIONAL

Circle (11) on Reply Card

World-class remotes

By Rick Lehtinen, issue editor

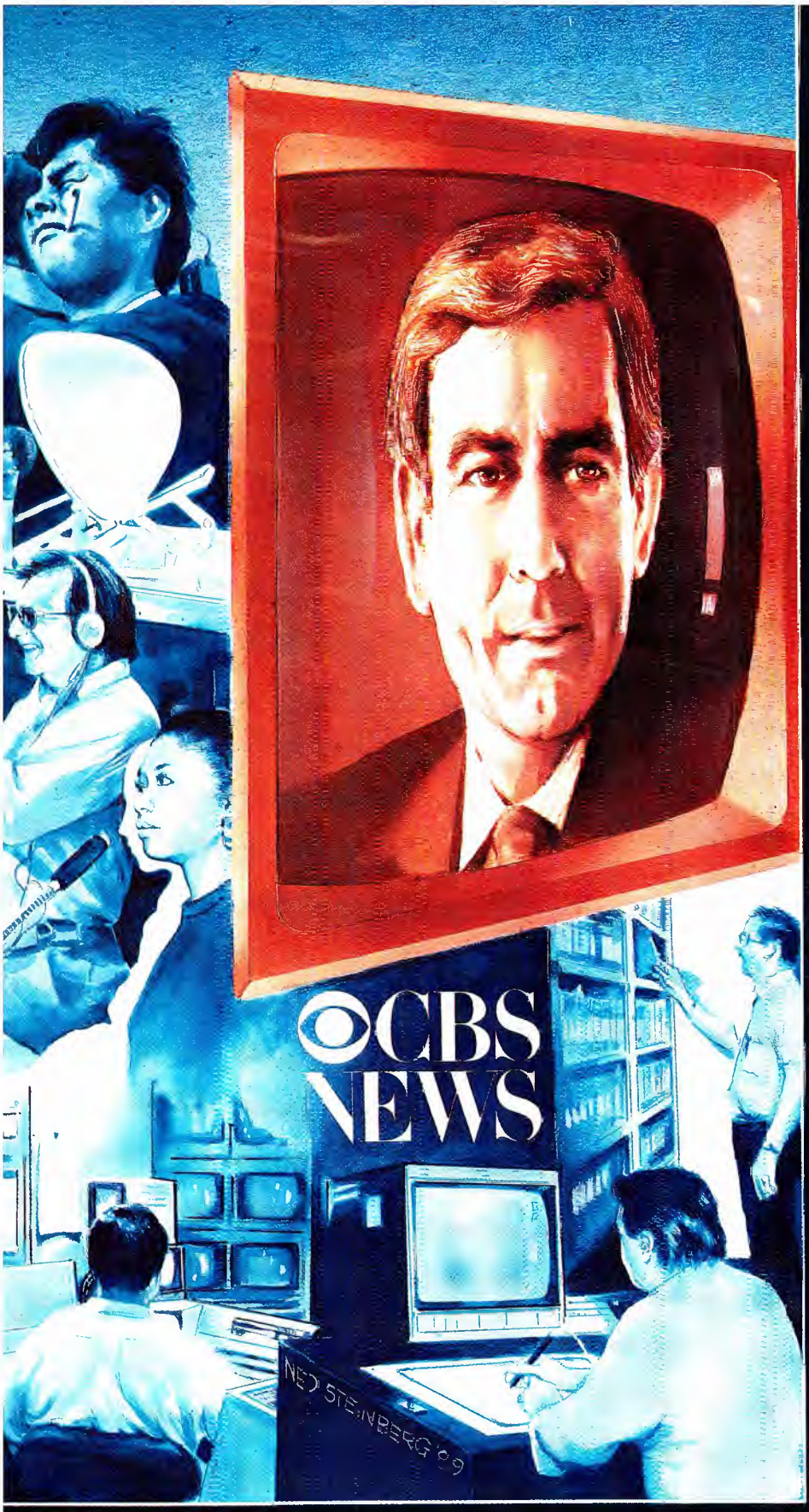
With care and dedication, any remote, whether local or national, can look like a world-class event.

There is an old saying that goes, "The shoemaker's kids run barefoot." If this generalization were true, there are likely two reasons for it. First, the shoemaker's resources must go into the production of shoes for sale to earn money. (No one said the shoemaker's kids should go hungry). Second, after a day spent filling orders for impatient customers, the shoemaker's own feet probably needed a rest. This made it easier to tell the kids to "get by without shoes a little longer."

Anyone who has done remote production knows it is the same with broadcasting. We're in the communications industry, but we often are not great communicators. Our efforts go toward keeping the public informed; but our associates often get left in the dark. We will spend hours creating graphics describing the technical ramifications of basketball's shot clock, but scrawl instructions for tuning a microwave receiver on a 3"x5" card.

We can't pull this off forever. If we want to consistently produce top-quality programming from the field we must eventually pay the price of solid planning, and do a good job of communicating plans to those concerned.

To gain the master's touch in any field, you must study the masters. This month, we will gain insights



from several of them. Additionally, we will take a peek at some emerging technologies for field communication, including some enhancements to cellular telephones.

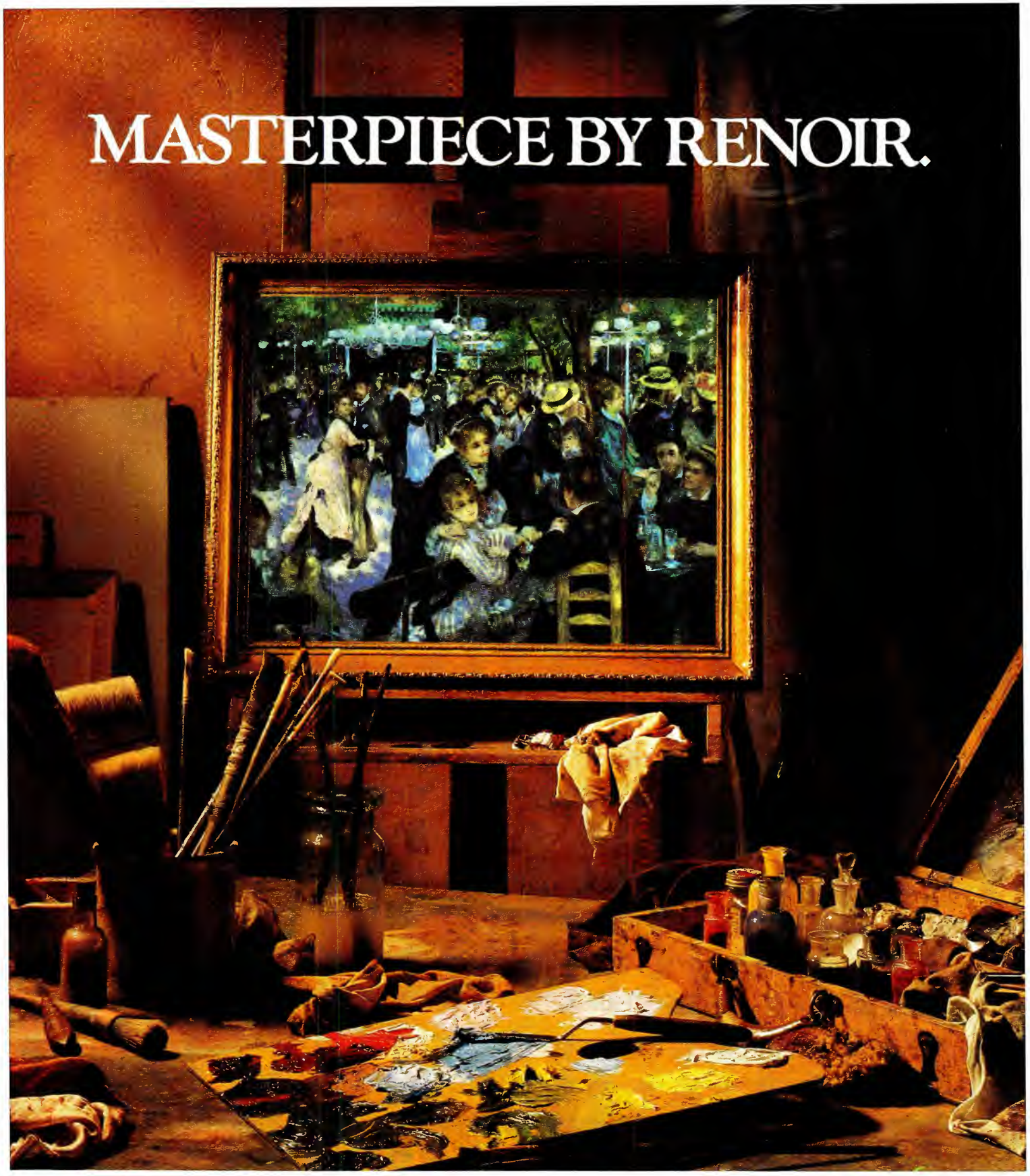
Articles in this month's coverage of remotes include:

Outside broadcasts, such as wars, funerals, barbecues or any other serious endeavor, are successful when well-planned and adequately advertised. As more stations do more live work from the field, the need to coordinate and communicate will increase.

Rick Lehtinen

Rick Lehtinen,
TV technical editor

MASTERPIECE BY RENOIR.



Genius is the secret of this great painting—and of the great images from two remarkable Sony CCD cameras. The BVP-7 and BVP-70.

The heart of both cameras is a CCD sensor that only Sony could design and make: the 768 HAD (Hole Accumulated Diode).

The 768 HAD is from the industry leader in CCD technology. So it produces an astonishing, true-to-life image that you won't believe until you see it.

The BVP-70 uses the FIT version of the 768 HAD sensor, making it the premier camera for critical EFP applications. With a full 700 lines of resolution and an extremely high

MASTERPIECE BY SONY.

signal-to-noise ratio. And almost no fixed-pattern noise.

Sony's workhorse camera is the BVP-7, which delivers masterpieces in an enormous range of EFP situations. It's virtually identical to the BVP-70, incorporating the IT version of the 768 HAD sensor.

To see these masterpieces, don't go to a museum. Just contact your Sony Broadcast Sales Engineer. Or call (800) 635-SONY.

SONY®

BROADCAST PRODUCTS

On the road with CBS News

By Bebe F. McClain

Getting a fast-breaking news story from a remote site to the viewer's living room is not a job for the faint of heart.

Success in the news business requires team effort by writers, producers, reporters, on-air talent, administrative personnel, engineers and technicians. Much has been written about the "front side" of TV production, but few kudos have gone to those technical titans on the "back side" of the camera.

This story is about people — the road warriors of CBS News, the non-prima donnas of broadcast. It is a rare glimpse into an organization that will hardly slow down long enough to have its own picture taken.

CBS News Division (CND) Operations Group, headed by Jim Paterson, is composed of people who supply, operate and maintain the coverage equipment, capture the event at some remote site and manage to send it, intact, to CBS News in New York, where it is integrated into the news broadcast before distribution to the viewers. When it comes to remote coverage, they work under these mandates: *Get the equipment there, get the story out, and be the first.* Whether the location is Broadway or Botswana, these people are not deterred by weather, political unrest, uncertain power supplies, danger or other impediments.

Planning for portability

Throughout 1982, a team at CBS News worked diligently to outline its requirements for modular remote broadcast systems. These were portable broadcast production centers that were built into cases. Once on site, the cases were stacked, the doors removed and the units wired together. Included in these modules were feed packs containing audio and video switchers, TBCs, test equipment, signal generators and monitors. CBS could be on the air with a remote broadcast within minutes.

It took time and research to decide on the equipment that would be applicable for a wide range of remote broadcasts. Many of the systems used were built at CBS. The hard part, as always, was finding the right people for the remote crew. Most were found within the company.

Billy Lee, maintenance supervisor, remembers the first time the new equipment was used. It almost turned out to be the last for him and the rest of the CBS News remote team.

Lee had finished work on the modules on Thanksgiving Day of 1982. He worked through the holiday in order to have everything shipped out to cover President Reagan's South American tour, where CBS had pool coverage plus its own extensive unilateral coverage.

All went well on that shakedown assignment. The new feed packs were put to a grueling test and performed well, as anticipated. But on the return flight, the chartered plane carrying the crew and equipment crashed. Luckily, no one was killed, but the belly of the plane was ripped open. The new portable feed packs survived intact, a tribute to their rugged design. The equipment had survived what was clearly a worst-case event.

In 1985, CBS News covered the World Economic Summit Meeting in Geneva, Switzerland. The remote broadcast was, at that time, considered a large production. A considerable number of equipment modules in the CBS News remote inventory were fitted together to make the remote broadcast center used in Geneva.

This particular complement of equipment has since been dubbed "a Geneva" by CBS News. A major remote now is described by the technical staff in terms such as a "Geneva minus (some equipment)," a "Geneva plus" or a "two times Geneva."

In the field

Before the coverage of President Reagan's South American tour, CBS News Operations completed a survey trip, but for many events, the team doesn't have the luxury of lead time. Fast-breaking stories, such as the TWA hijacking a few years ago,

McClain is president of B. F. McClain, Inc., Asheville, NC.

Harris Technology in Action

"The beacons were blown out of their sockets, but our transmitter barely blinked."

Robert LaFore knows all about lightning. As Chief Engineer for WQPW-FM "Power 96" in Valdosta, Georgia, he'd better: His 600 foot tower

Direct strike!

WQPW'S 600 FT. TOWER TAKES THEM WHENEVER THERE'S LIGHTNING.

is the tallest object for miles around. "We've been hit so hard the tower beacons were blown out of their sockets," he told us recently, "and so often that the lightning rod looks like someone's been beating chunks out of it with a sledgehammer. But so far our new Harris HT 20FM transmitter barely blinks at lightning. Occasionally we get a PA Plate Overload message, but that's it."

Robert also knows something about Harris reliability: Until they received a power increase to 50,000 Watts last year, WQPW had been on the air with a 3.5 kW Harris transmitter for thirteen years. "That transmitter was very good to us," Robert reports. "Still is, in fact—it's our backup now. Basically, we shopped around enough to be sure Harris could match or top the competition in both price and features: Things like Automatic Power Control for simple remote operation. Then we ordered a 20 kW HT 20FM transmitter."

About 45 days later WQPW's transmitter arrived (meanwhile. Robert supervised construction of a new transmitter building, tower and antenna). "We just took it out of the box and put it right on the air," he says. "Even the tuning movements were small. The installation went so smoothly, I told the factory 'You've got to do something—this transmitter's *boring*.' "

After a number of months of service, WQPW's HT 20FM remains just as "boring." Robert has only shut it down for routine monthly maintenance. "Even that is minimal," he told us. "I vacuum the cabinet out, check tube cooling, make sure nothing's overheating, and that's about it. Two or three times a week I do a meter check and log the readings. They hardly ever change. In fact, we're still using almost the same tuning numbers we got from the factory. And we're getting a very noticeable improvement in audio quality from our new Harris THE-1 exciter."

Chief Engineer Robert LaFore

WITH HIS NEW HARRIS HT 20FM 20 KW FM TRANSMITTER.

As you can tell, WQPW is very proud of their new transmitter. We're just as proud that

Look South...

FROM WQPW'S TOWER. AND YOU CAN SEE ALL THE WAY TO FLORIDA.

our HT 20FM is living up to their confidence in Harris engineering. But then, we expected it do exactly that from the moment it took shape on the drawing board.

For more information on HT family FM transmitters from 1 to 35 kW, call toll-free (800) 4-HARRIS, Ext. 3022. Outside the continental US, fax us at (217) 224-2764. And for the widest selection of studio products, call Allied Broadcast Equipment toll-free at (800) 622-0022.

HARRIS

HARRIS BROADCAST DIVISION
MARKETING DEPARTMENT
P.O. BOX 4290 • QUINCY, IL USA 62035-4290

Circle (12) on Reply Card

require the crew members to quickly make an equipment list, grab their passports and go.

The TWA plane was hijacked in the morning (Eastern Standard Time), and crew members left with equipment in the afternoon. They took cameras, field packs, three editing and four microwave systems. They leased an uplink unit and a trailer in London that was delivered by chartered plane and set up in one day.

In addition to equipment, there is a need for local "fixers" in countries such as Cyprus. These people do everything from arranging government permission for microwave use to securing hotels and ordering food on site.

For three weeks the story raged, during which time the hijacked plane was flown to Lebanon. Every day, tapes were shot in Lebanon and flown by private plane to CBS field headquarters in Cyprus for editing and transmission. The crew recalls mainly that it was "very hot."

Often it's very cold. At the Geneva summit meeting, the frigid wind blew so hard that when Lee put his cup of hot soup on a ledge for a few minutes, it froze. The knobs on the sound mixer froze so tight that they couldn't be moved. Weather can be a formidable enemy.

The time difference between these remote locations and New York often means that crew members work around the clock. By day they are taping the coverage of the events, and by night (which is daytime in New York) they are giving live reports interlaced with the prerecorded tapes.

"There is no such thing as relief people on a remote," Lee said. "The setup is not like on a mobile truck where everyone knows the layout. The man who knows is the man who set it up, so he better be there. Since you always run out of inputs, you're constantly swapping wires and only you know what's what. You get tired and hungry. If anything breaks you fix it 'cause you built it. Finally, the cardinal rule is: No matter how much cable you bring, it's never enough."

Much has been added to the CBS News field arsenal since 1982, but because of ENG field surgeons such as Lee, CBS News still has its original equipment in use. Those technicians built systems with foresight, and they made them tough knowing that their own success was riding on those systems.

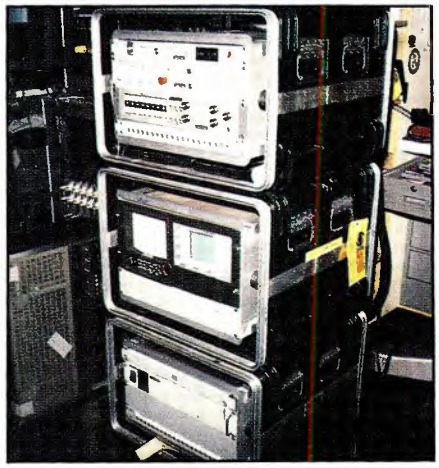
RF gear

Advances in microwave equipment have allowed CBS News to wander far from its remote broadcast centers for live reports. Wayne Wright, RF supervisor, probably has encountered every problem that could come up in the field, and he's lived to joke about it. Wright oversees all portable microwave equipment, including the hand-held 40GHz systems, satellite communications and the fly-a-ways (portable satellite uplinks).

When CBS News team members went to Cuba to cover Gorbachev's visit, they knew they wouldn't be able to rely on the Cuban telephone system. Instead, they wanted to take their DAMA (demand assignment multiple access) satellite communications system, complete with uplink, which is used in CBS Ku-band trucks.

Fast-breaking stories, such as the TWA hijacking a few years ago, require the crew members to quickly make an equipment list, grab their passports and go.

It took an incredible effort to get permission to do this. The U.S. State Department and the Federal Communications Commission had decreed that no domestic satellites could be used from abroad, and that no high-tech equipment could be taken to a communist country. Wright and Dan Klos, also of the CND RF department, flew down to Cuba in the back of a cargo plane with the DAMA unit, uplink and trailer. The last pieces of the needed equipment arrived from Miami at 3 a.m. All systems were set up by 4 a.m., with live pictures scheduled at 6 a.m. Then the announcement came: Because of the Armenian earthquake, Gorbachev was leaving Cuba. The highly touted Reagan-Gorbachev meeting never took place, but the show went on, and it was a remote to remember.



The portable feed pack, which houses audio and video switchers, TBCs, test equipment, signal generators and monitors, has been used since 1982 in the network's modular remote broadcast systems.

The network covered Gorbachev's visit to China last year and the student uprising that followed. According to Wright, "The hardest part of this job involves times like in Cuba and China when we were up about 40 hours, with jet lag, and had to perform 100%."

"Safety is a constant concern," he said. "In China, the ac plugs look just like U.S. ones, except they carry 220V. Our equipment plugs could fit the Chinese sockets perfectly — once. Power is our biggest problem on a remote. All power is temporary. Once we have the power sorted out, it's a matter of keeping it."

Road work

When asked about the challenges, problems and rewards of remote work, Wright launched into a running dialogue that is a most descriptive dissertation on road work.

"Whenever you're setting up, you keep in mind a quick tear down," he said. "Even at my home all the hookups are temporary, after 25 years! You buy things off the shelf, and you build black boxes, then you finish them on site. Everything is...modular. We are told the minimum operational requirements, and they leave it up to us about spares. We usually add 10% for failures, but any project will expand to use all the equipment available.

"It's like packing for a picnic. What do we take? Always too much. We take boards because there is no opportunity to repair on the component level. People coming in from New York carry in parts we need. Charles Kuralt is good with parts.

"Each job is different. It's technically very challenging and creative. It's never boring. I love the spontaneity of it.

"What are the enemies? Time. Never enough of it for perfect planning or surveying. Also, weather and jet lag. You do the evening news in the morning, and you end up having to call vendors at 2 a.m. your time. There's little time to sleep. And the script is always changing, and that means setup changes. Finally, you have problems striking the setup. Everyone is in a hurry to get out, and equipment can really get damaged when you're in a rush. You'll carry those problems to your next remote."

Sometimes the biggest problem encountered is simply getting the equipment to the next remote. "We've come a long way from the Vietnam days when we sent film cameras in and flew the film out," said George Kellock, CND traffic director. "For Emperor Hirohito's funeral and the 2-week coverage in Japan, we flew in thousands of pounds of gear. For the Iceland Reagan-Gorbachev summit meeting, there wasn't enough 'lift' (commercial cargo space) available, so we chartered our own planes.

Fortunately, there is one tape company that's as demanding as you are.

In this business, people are always striving for perfection. Always raising their standards and expectations. At 3M, we share that commitment. Because we realize that you can't afford a tape problem. And neither can we. So when it comes to products and service, we have one primary goal: **We won't be satisfied until you are.**

3M

Circle (14) on Reply Card

The control room for the first World Economic Summit Meeting in Geneva, Switzerland. This package of equipment has become the standard of reference among CBS remote team members.

Despite a tangle of red tape, the remote crew took this demand assignment multiple access (DAMA) satellite communications system to Cuba for coverage of the ill-fated Reagan-Gorbachev meeting.

We use planes, overland trucks, and once, in a Boston snowstorm, we hired a man with a snowmobile. We have to get the equipment in. You can't be a day late in the TV business."

Communications

Communication is the thread that holds any large remote together. This includes communications between subsites of the remotes and also back to New York. CBS solved its communications problems through the use of several devices, including specially built IFB systems, INMARSAT phones and a custom multiplexed digital RLX phone system.

Although CBS News had its own mix-minus matrix IFB systems built, the crew often has had to improvise on site. During the coverage of Japan following Emperor Hirohito's death, producers of "CBS This Morning" wanted to do a segment inside a Pachinko parlor, a Japanese gambling casino. IFB was needed to cue the talent, but there was no way to run cables in the crowded public casino. Microwave and walkie-talkies were impossible through the shiny metal building.

"We use planes, overland trucks, and once, in a Boston snowstorm, we hired a man with a snowmobile."

Frank Governale, CBS director of operations for special events, spotted a pay phone inside the parlor. An all-city cue system was brought into the side doorway next to the public phone, and the receiver side of the telephone was connected to the input of the cue system. A call was made to the phone on an IFB circuit from the CBS control room. The talent, outfitted with wireless receivers tuned to the frequency of the all-city cue, received audio that fed out of the phone into the transmitter and onto their wireless receivers. The segment, which was used to close the show, went live and turned out even better than expected.

In 1985, after ferreting out a small local vendor, CBS News pushed forward the development of INMARSAT phones for broadcast use. The phones arrived just before the coverage of the Mexican earthquake, giving CBS one of the only long-distance phones out of the entire area.

After enough bad experiences in foreign places with limited phone service, CBS News added a digital phone system to its host of modules. The system data compresses and multiplexes several telephones, 2-way data and 4-wire circuits into one T-1 slot of 56kb or 64kb.

This system was first used during the coverage in Japan of Emperor Hirohito's funeral, one of the largest CBS remotes to date. During its two weeks in Japan, CBS broadcast approximately 40 hours for "CBS This Morning," "CBS Evening News," "Sunday Morning," "Special Events" and weekend news. Paterson attributes much of the success to the support by TBS (Tokyo Broadcasting System), which is affiliated with CBS in Japan. TBS provided space, technical assistance and extra personnel.

"For the first time, we had plenty of room," Paterson said. This was seconded by Lee who explained, "Eighty percent of the remotes we do are out of hotel rooms. We take all the furniture out, hang things out the window, run cables down the hall-

It takes plenty of guts to back our products this solidly.

At QEI, we back our products — and our customers. Our power tubes, for example, carry the best warranty in the industry: 15,000 hours or 2 years. And only QEI includes a FREE comprehensive spare parts kit with every FMQ transmitter, exciter and remote control. Experience shows that you may never use more than 2 or 3 of these "guts". But since we can't be certain *which* 2 or 3, our kits include ICs, transistors, lamps, diodes, fuses — everything you're *un*likely to need.

24 HOUR SERVICE HOTLINE

Giving you the most complete spare parts kits in the industry is just the first step in a customer support program that lasts as long as your QEI transmitter. If you need expert advice on installing a spare whatever, call us any time at 609-728-2020, day or night. And if you ever need factory parts support, we can deliver — fast. We're just 1/2 hour from Philadelphia International Airport, not out in the middle of nowhere.

MAXIMUM EARNING POWER

You can count on it with every QEI transmitter, because we design them to stay on the air. And as a fully integrated company dedicated to RF and transmission products, we're able to build in quality and reliability — and still maintain our value advantage.

No wonder stations in both large and small markets have been using QEI products as long as we've been making them — since 1971. During that time we've put over 1300 exciters, more than 450 transmitters and over 1000 modulation monitors in service.

GET THE FACTS

When it comes to standing behind our products — and our stations — we're way ahead of the competition. That may make other manufacturers nervous, but it makes QEI customers very satisfied.

Call us at 800-334-9154, toll-free, for all the facts on the transmitters that deliver a solid return on your investment: the QEI "New Reliables."

QEI

Quality • Engineering • Innovation

QEI Corporation • One Airport Drive, P.O. Box D
Williamstown, New Jersey 08094
Toll-free 800-334-9154 • Fax 609-629-1751

Circle (15) on Reply Card

ways. The hotel manager has a heart attack."

Remote production, whether in the United States or abroad, presents problems, but Paterson explains the difference between the two. "You have to ship no matter where you go, but within the U.S., you can just get a plane, charter or commercial, for your people and equipment. No customs, no brokers. Securing hotels and work space is easier because, above all, you share a common language.

"Working with different cultures can be a logistics nightmare," he said. They have different methods of operation, different terminology, different formalities. You must be careful not to offend others, but you need to get on the air and that sense of urgency often is not shared by others."

Quick wits, a questioning mind and resourcefulness are key requirements for people working on remotes. For example, when Bob McKinley, director of operations for CBS Newsnet (the group that supplies technical services to CBS affiliates at large news remotes), went to Washington on a survey for the presidential inauguration coverage, his compass readings indicated direct access to the GStar2 satellite from Second Avenue. By checking a map, however, he discovered a 30° error. Investiga-

Continued on page 36

The CBS uplink in Cyprus during the remote team's 3-week coverage of the TWA hijack situation. Tapes were shot in Lebanon and flown to field headquarters in Cyprus for editing and transmission.

Wayne Wright, RF supervisor, oversees all portable microwave equipment. Here, he checks cable at the TWA hijack site in Cyprus.

The Aphex Audiophile Air Chain

"FM radio has become a ratings war in which we are the casualties by being subjected to a poor excuse for clean, accurate music."
Thomas J. Koch, *The Audiophile-File*

KTWV-FM The Wave. WHYI Miami-Ft. Lauderdale Top 40's. KKGO America's Jazz Station. WQXR New York's Premier Classical Station. All different, but all winners, because they have an overriding demand to deliver the best in audio quality. They know quality sound is essential to attract and keep loyal listeners.

That's why these premier stations rely on The Aphex Audiophile Air Chain, a combination of the Aphex Compellor®, Aural Exciter® and Dominator™ to achieve *consistent high quality sound*. Quick and easy to set up, this combination will achieve competitive loudness while maintaining the same high quality regardless of program or who is controlling the board. By comparison, other processors need to be tuned for almost every song, and achieve loudness by homogenizing or crunching to the point of pain.

AM, FM, TV or Cable ... rock to Bach or talk, if you want to be a winner in the "no win modulation wars", contact your Aphex dealer to arrange for a demo of the Aphex Audiophile Air Chain.

APHEX
SYSTEMS

11068 Randall St.
Sun Valley, CA 91352
(818) 767-2929

All Aphex products are designed and manufactured in the U.S.A.

Circle (17) on Reply Card

More and more people are lining up for the Panasonic SVHS Pro Series.

One look is all it takes. And you'll see why more and more people are lining up for the Panasonic® SVHS Pro Series. Because anyone in the market for a high-quality professional video production system, simply can't afford not to look at what the Pro Series can do for them.

Take Cost-Performance. The Panasonic SVHS Pro Series delivers both. By combining the efficiency and systems flexibility of half-inch technology with the exceptional performance of Y/C component signal processing.

The result. A comprehensive video production system that provides two hours of operation on a single cassette. With over 400 lines of horizontal resolution. And signal integrity through five generations.

By now it should be obvious. The closer you look and the more you compare the Pro Series to historical video formats, the sooner you'll line up for the Pro Series.

As a Panasonic SVHS Pro Series user, you'll have direct access to Panasonic's nationwide network of engineering, service and technical support specialists. And with over 300 professionally trained dealers, many of whom are self servicing, you'll always get the most out of your Pro Series equipment.

Finally, a professional video format more and more people are lining up for. The Panasonic SVHS Pro Series.

For more information and your local dealer,
call your nearest regional office.
Eastern Zone: (201) 348-7620 • Central Zone: (312) 981-4826
Southern Zone:
Dallas Region: (817) 685-1122 • Atlanta Region: (404) 925-6837
Western Zone:
Seattle Region: (206) 285-8883 • Los Angeles Region: (714) 373-7275

To assure excellent quality, support, service and professionalism, the Panasonic Pro Series is available through authorized dealers.

Panasonic
Professional/Industrial Video

Circle (18) on Reply Card

A hotel room in Cuba is transformed into a makeshift control room.

Continued from page 32

tion revealed his compass had been deflected by a lighting grid that was part of a street underneath Second Avenue that he didn't even know existed.

On-site planning

Each event is unique, and each has its particular problems. The more notice there is, the more planning the remote team can do, including making survey trips. But, sometimes the only notice the team gets is that it's going.

"I was at a funeral in Florida when I was told we were covering the impromptu Reagan-Gorbachev summit in Iceland," Paterson said. "The next day we put together the equipment and people we thought we'd need. That night we left, knowing we had unilateral and pool coverage. It was hectic, but it was the most interesting remote I've done."

The CBS News control center for the Reagan-Gorbachev summit meeting in Iceland. The crew set up in Iceland University's Student Union building.

"Eighty percent of the remotes we do are out of hotel rooms. We take all the furniture out, hang things out the window, run cables down the hallways."

The survey, which normally would be completed weeks ahead, was done upon arrival. An airport hangar was set up for pool. Inside, local builders quickly erected modular housing for each of the networks. CBS News, wanting separate facilities for its unilateral coverage, secured Iceland University's Student Union building after taking part in peace treaty-type negotiations with the students. The drawing card was that the building had five international direct phone lines, which were later multiplexed to 25 lines.

A local greenhouse was purchased and reassembled on the Student Union roof as an anchor booth. Its output fed down to the main production center containing six edit booths, a full control room and remote-control rooms. (The network later sold the greenhouse back to the vendor, recouping half the purchase price.) Two uplinks, repeaters (placed on the roof of a downtown hospital) and 11 portable microwave systems were used. A ferryboat was leased to house most of the crew.

Disappointingly few official statements

Jim Paterson (standing), general manager of the CBS News Division Operations Group, in the New York control room, where remote feeds are inserted into the network's news programs.

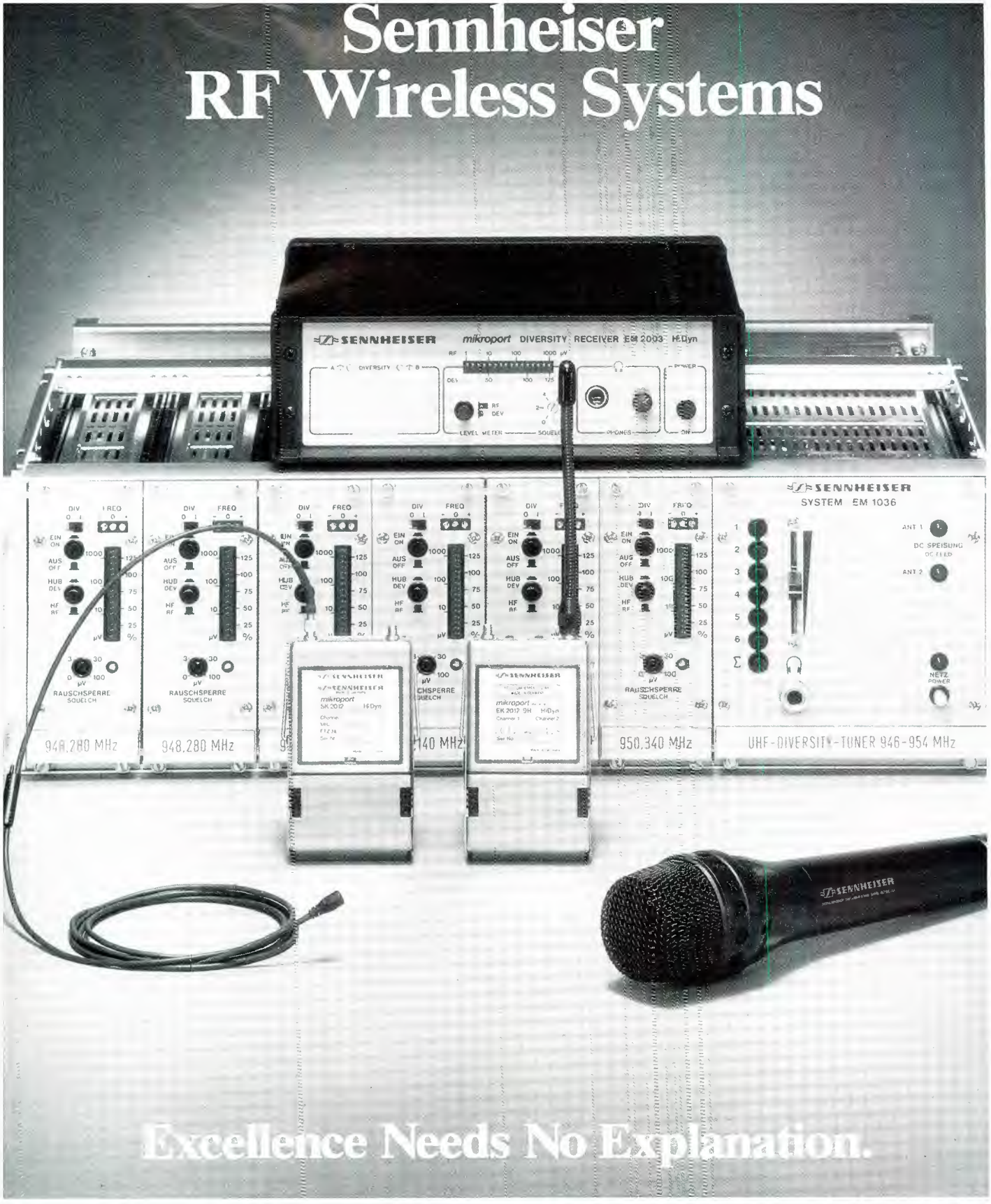
or interviews were given during the course of the summit. Then, the day it ended, Reagan announced that he would address the armed services personnel and their dependents in his airplane's hangar. Paterson recalls the scramble.

"We had no equipment at the hanger and very little equipment not in use," he said. "We managed to get an industrial-type 6×1 switcher, three cameras that we gen-locked together, plus some rooftop microwave equipment. The wind, gusting 50mph to 60mph, was overriding the clamps on the antenna we placed on the control tower. Wayne Wright had to climb halfway onto the roof and keep the antenna pointed toward the hospital repeater site. The viewers never knew the problems."

Even when a foreign remote is done under seemingly ideal conditions, such as in Japan — where there was a helpful host broadcaster, plenty of room, similar power and an abundance of it — the task is riddled with problems, apparent dead ends and fatigue. But imagine the overwhelming challenge of landing, dog tired, with a cargo plane full of equipment in a place you've never been, with a different power standard, a foreign language and no place to set up. Try to conceive of having to broadcast live from a site with only a few odd pieces of spare equipment available.

Don DeCesare, vice president of CBS News, summed up the special way the remote team approaches its work. "We are pushing the limits of what modern broadcast technology can do," he said. "And, as we push it, we redefine it, and then we push it again."

Sennheiser
RF Wireless Systems



Excellence Needs No Explanation.

To learn more about the Sennheiser excellence in design and engineering, please call or write.

SENNHEISER®

6 Vista Drive, P.O. Box 987
Old Lyme, CT 06371
Tel # 203-434-9190 FAX # 203-434-1759

Circle (85) on Reply Card

MICROPHONES • HEADPHONES • BOOM SETS • RF WIRELESS • INFRA-RED TECHNOLOGY

Manufacturing Plant: D-3002 Wedemark, Federal Republic of Germany

Making the most of remotes

By Rick Lehtinen, TV technical editor

With good planning and communications, any remote can be world-class.

Two keys to successful remote programming are planning, to eliminate the need for last-minute instructions, and good communications, to efficiently deliver last-minute instructions. In remotes, as in battle, planning is critical, but plans often fall apart. Things go wrong; opportunities arise. In any activity that concerns people, we must be prepared for the unexpected.

Before crews can deal with changes, they have to find out about them. We've all seen the classic blunders — talent "tossing" to the wrong personalities, announcing events that aren't going to happen, speaking when they shouldn't or being mum when they are needed. All of these can be avoided by good communications.

Cellular phones increase flexibility

Now that cellular phones are commonplace, broadcasters are finding ways to integrate them into their mix of production equipment. In most major markets, cellular phones might be used for transferring data and faxes from the control room to the field, or for just ordering lunch.

Where there are phones, there are antennas. After you consider how much equipment must be mounted in a vehicle to make it ready for newsgathering, where to mount a cellular antenna pales in comparison. Still, many stations probably would prefer a window- or glass-mounted antenna to one that mounts on a vehicle's exterior. With such antennas, it is not necessary to cut holes, which speeds up installation and possibly improves the vehicle's resale value.

Looking through the glass

Most glass-mount antennas are various forms of vertical elements, including 1/2-wave-over-1/2-wave and 1/4-wave-over-5/8-wave colinear arrays. They are shaped like a pigtail. The curl in the middle is a phasing coil (not a loading coil), which connects the two straight elements and keeps the radio energy in phase between them.

Although popular, glass-mount antennas have at least two disadvantages. First is the glass feedthrough. A coupler on the inside of the window excites current in the outside-mounted antenna. This may incur a 3dB penalty. Second, security, aesthetics or climate might make it undesirable to have the radiating part of the antenna located outside. In certain investigative journalism situations, communications are vital, but visible antennas are ill-advised.

No outsiders

Antennas disguised as standard whips for car radios have been available for some time. Now, there are two other types of antennas that work from inside the vehicle. They are the serpentine array and the directional discontinuity ring radiator (DDRR).

- *Serpentine array*

This antenna comes as a decal that adheres to the windshield. The serpentine array antenna, developed by Antennas America, Arvada, CO, is a 3″×3″ piece of polyester film. Inside the film, the manufacturer embeds 15 inches of 1.5mm by 50mm copper strip, which forms a series-fed, zig-zag pattern, log periodic antenna. The strip contains 12 1/2-wave elements that resonate at frequencies from 800MHz to 925MHz. The window-facing surface of the sticker bears a burglar alarm warning label.

The antenna connects with the cellular transmitter by a coax terminating in a special 3-pronged connector. The manufacturer claims the decal antenna has performance equivalent to or better than several current glass-mount antennas.

- *DDRR antenna*

Com-Rad Industries, Grand Island, NY, has brought its DDRR antenna to the 800MHz band for cellular telephone and

Continued on page 42

THE GRASS ISN'T ALWAYS GREENER.

DYNAIR introduces the DYNA MITE small routing switcher. And suddenly the competition's switchers are looking a little wilted.

Perhaps that's because DYNA MITE is available in 10 X 10. 20 X 10. And 30 X 10. In video or audio. As well as in a 10 X 10 single-unit A/V package. No doubt it has something to do with DYNA MITE's modular design, too. Which lets you expand all the way to 30 X 10 video or audio.

And as your needs grow, DYNA MITE continues to protect your routing switcher investment. By allowing you to stack units. And make the move to component video or stereo audio. You can even use DYNA MITE modules within our larger Dynasty frame for almost unlimited expansion. Even beyond 30 X 10. And with a full 40 MHz bandwidth, DYNA MITE delivers high-performance output now. While covering your future HDTV needs. Plus DYNA MITE's 2 RU frame gives you a full-function X-Y control. Standard. And it can also be controlled by any DYNAIR remote control panel. Or by computer.

	10, 20 or 30 Inputs	Fully Expandable	40 MHz HDTV Ready	Built-In Control Panel
Grass Valley	NO	NO	NO	NO
DYNAIR DYNA MITE	YES	YES	YES	YES

Graphic evidence that the DYNA MITE routing switcher outperforms the competition.

Our prices? Let's just say they're competitive. Very competitive. Even when compared to narrow-band switchers.

All of which no doubt has the competition's switchers feeling a little green. With envy.

For a more in-depth look, call 800-854-2831.

DYNAIR

Call today, 800-854-2831

Circle (20) on Reply Card

monitors, dial (800) 523-SONY.

SONY®

Sony Communications Products Company, 1600 Queen Anne Road, Teaneck, NJ 07666 ©1989 Sony Corporation of America Sony is a trademark of Sony

PROFESSIONAL VIDEO

Continued from page 38

2-way radio applications. Previously introduced models cover VHF and UHF bands. The DDRR looks like something that might be found in a washing machine. Mounting the antenna inside the rear window avoids the need to cut holes, but it can be exterior-mounted if desired. According to the manufacturer, the antenna may be mounted on upper vehicle body surfaces or concealed underneath the chassis.

The manufacturer claims that the high Q of the DDRR antenna improves receive audio performance by eliminating much interference from paging systems or trunked radio systems.

Live remote broadcasts can originate from almost anywhere. This program originated at Dead Horse Point, which overlooks the Grand Canyon. (Photo courtesy of KSL-TV)

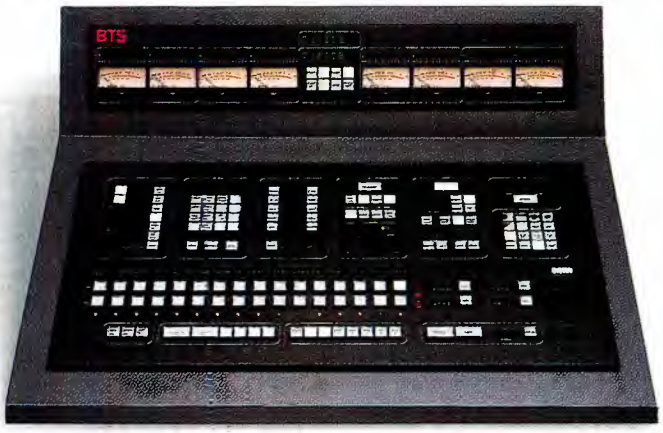
Do they work?

Some cellular antennas are thoroughly tested on calibrated antenna test ranges. The tests compare their emission patterns and gain figures, among other characteristics, to standard references. The use of standard references makes tests repeatable and reliable, and their results credible.

For example, original AT&T Bell Laboratories advanced mobile phone service (AMPS) specifications for cellular mobile antennas specify 3dB gain compared to a reference 1/2-wave dipole. Nevertheless, you will find some cellular mobile antenna gain figures are compared to 1/4-wave ground planes, isotropic sources or the competition. In most cases, you have to ask to learn what reference was used.

Many manufacturers, including those who make serpentine array and DDRR antennas, have not yet completed full-scale,

How to take control of a broadcast station.



MCS-2000 Master Control Switcher

Go ahead, be ambitious. Controlling a broadcast station is no small potatoes, but these advanced products from BTS make it easy by giving you total control of all on-air programming from two workstations.

The MCS-2000 Master Control Switcher together with the BTA-2300 Automation System automate many of the routine operations that are currently handled by staff, which makes both your people *and* your equipment more efficient and productive. Computerizing your station also drastically reduces programming errors. Since that prevents make-goods, the system quickly pays for itself.

You simply pre-program the BTA-2300 Automation System to air all programs, station and commercial breaks exactly as you want, in real time. The Master Control Switcher accesses material from whatever sources you select: Betacarts, character generators, live feeds or satellite systems, for instance.

BTA-2300 Automation System

The MCS-2000 is user configurable, so you can select (and change) which buttons access which sources. Since it uses the existing outputs from the routing switcher, you don't need a second router. And its on-air bypass feature lets it serve as a simple production switcher if necessary.

The computer system is not only powerful, it's extremely flexible, allowing you to revise the program on a moment's notice. And there's no more reliable automation system available. Both products go through 100% computerized factory testing and have a 5-year warranty.

So take a controlling interest in the station. Find out more about the MCS-2000 Master Control Switcher and the BTA-2300 Automation System. For complete information and technical specifications, call BTS at **1-800-562-1136, ext. 31.**

BTS
The name behind what's ahead.™

BTS is Broadcast Television Systems, a joint company of Bosch and Philips. P.O. Box 30816, Salt Lake City, UT 84130-0816.

Circle (22) on Reply Card

scientific tests with a standard reference antenna. Instead, they currently rely on informal measurements, casual observation, testimonials and comparisons with competitors' antennas. There is is nothing wrong with the "if it works, use it" approach to antenna selection, but broadcasters would do well to consider the nature of tests upon which performance claims are based.

Wider audio

Unfortunately, the cellular phone has been designed to be a wireless equivalent of the standard dial-up phone. As broadcasters know, bandwidth-limited telephone audio is not always a joy to behold. One solution to this is frequency extension. Successful in radio remotes, frequency extenders work by electronically shifting out-of-band frequencies into the telephone equipment's audio passband.

A frequency-extension system has been developed for use with cellular phones. This provides an easy way for broadcasters to get program-quality audio from wherever their phones roam. These units are available in configurations that provide either duplex operation for Q&A situations, or simplex, when extended frequency is required on a simple 1-way program feed.

Cellular frequency extenders are easiest installed on phones that have an external RJ11 modular jack. The same is used when connecting a cellular phone to a fax machine. Alternatively, the equipment can enter the circuit by connection to the 8-pin headset connector.

At the decoding end, cellular frequency extenders are available that provide auto-answer circuitry, auto-AGC and relay closures, which can remotely start cart machines to record incoming programming unattended.

Untie your talent

Even the best audio from the field is not

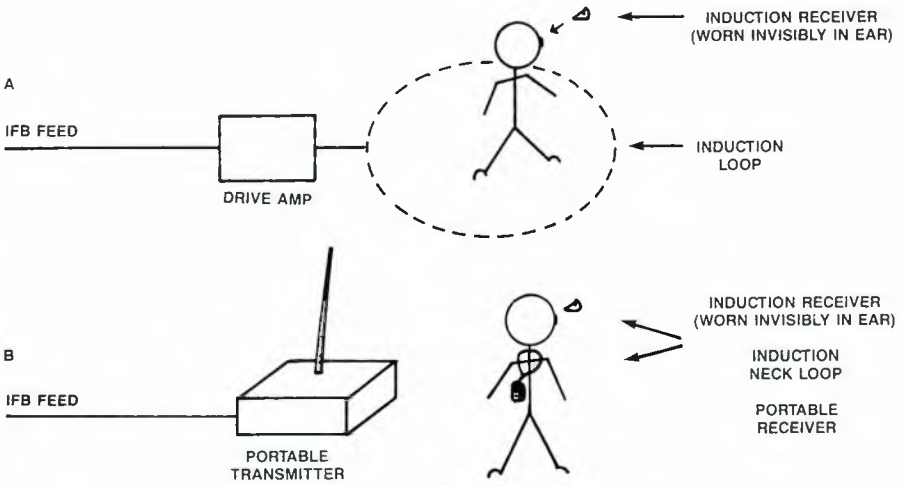
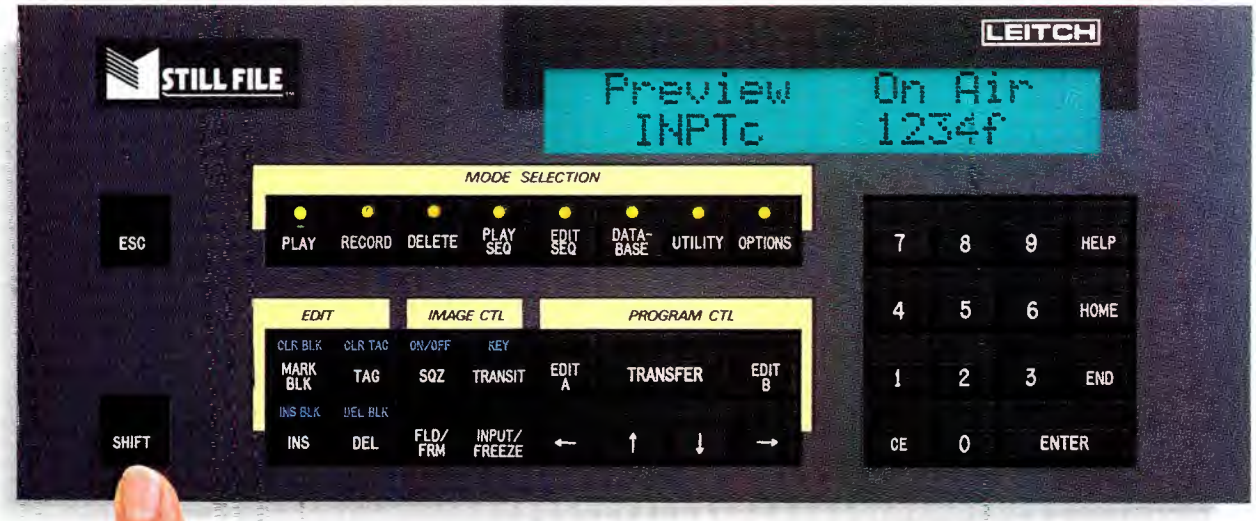


Figure 1. *Two IFB systems that use an induction earpiece. a) uses floor-mounted induction loop. b) uses personal radio transmitter and receiver.*

ONE TOUCH... AND YOU'LL SHIFT TO LEITCH



Once you get your hands on a STILL FILE by Leitch, you won't want to let go. The reason is simple ... the STILL FILE is the best designed still store on the market ... fully integrated and with a host of features that are as easy as the touch of a button.

Call Leitch today for a hands-on demonstration, and we'll even leave a STILL FILE at your studio for a while.

We're confident we won't have to pick it up again.

Don't just reach for the nearest brand name ... reach for the best. STILL FILE by Leitch.

LEITCH

D-2

Leitch Video of America, Inc., 825K Greenbrier Circle, Chesapeake, VA 23320 – Tel: (804) 424-7920 or (800) 231-9673 Fax: (804) 424-0639
Leitch Video International Inc., 10 Dyas Rd., Don Mills, Ont., Canada M3B 1V5 – Tel: (800) 387-0233 Fax: (416) 445-0595 Telex: 06-986241

Circle (31) on Reply Card

of much use if there is no way to cue the talent. Several recent advances in the field of interruptible foldback (IFB) promise to increase the efficiency of remote production. Among them are wireless IFB systems that use tiny, induction-type earpieces that require no external wires to the ear. (See Figure 1.)

In these systems, the minuscule earpiece, invisible to the camera, is inserted in the talent's ear. The induction earpiece is excited by an induction loop, usually worn about the talent's neck under the shirt or blouse, or on the back. Alternatively, an induction loop can be taped under the anchor desk or laid out on the ground in the area over which the talent will stand.

The IFB signal feeds the induction loop. In the case of body-worn induction loops, the IFB can come from a wireless source, such as a wireless microphone receiver. Combined with a wireless microphone, the system can have a comfortable, wire-free talent, with increased production flexibility, because changing a talent's position is reduced to moving the chair and adjusting the lighting. (Editor's note: Engineers concerned about having too many wireless microphones in the same area should read the "Strictly TV" column in this issue.)

Aural prompting

Where there is talent, there often is a need for cue cards and prompting devices. Even with these aids, it can require several takes to get material satisfactorily on tape. Aural prompting can sometimes be used to speed the production process.

Using a system called Ear-Talk, Bates City, MO, talent can dictate pre-scripted standups, introductions and voice-over commercials and then play them back to themselves as they repeat their words. (See Figure 2.) In addition to reducing the hardware and personnel requirements of a remote broadcast by reducing the need for cue cards and prompters, ear-prompting systems reduce retakes. Material can be consistent from take to take, both in quality and timing.

At first glance it may seem as if the talent will face similar problems to those experienced when they hear themselves with a satellite delay. The subtle distinction is that with an aural prompting system, the talent are following their voices, not leading them. What is heard thus becomes a pattern for what is spoken, not a distraction. Should they get too far behind the tape, talent can click the hidden pause switch and catch up.

World-class remotes

Good communication will do much to improve the quality of any remote situation. Talent can react better to sudden changes if they can clearly and comfortably be apprised of those changes. But what about world-class productions, in which there is plenty of time to check and double-check communications and productions systems? Is there any secret to pulling off a truly magnificent shoot?

One common thread running throughout many major remotes is careful, painstaking planning.

Plan and plan some more

Although the 1989 Wimbledon tennis tournament was played in late June, HBO planners had produced a detailed timetable of events, charting who and what were to be where, and distributed it on May 1. Production work and graphics began in May. Five days were allocated for the creation of new graphics, followed by initial editing work on teases and animations in early June. Just as the material was being converted from 525 to 625 lines for use in PAL, early crews arrived in England to receive incoming equipment shipments and to begin a 2-week period of set construction.

By mid-June, crews were in place shooting London feature shots. By June 20, the on-site graphics area at Wimbledon had been set up and the production staff and announcers were on their way. Two days later, production meetings were under way to finalize arrangements. During this time, and for several days thereafter, time was spent rehearsing, checking out equipment setups and programming character generators and still-stores.

Coverage began on Monday, June 26, and continued for nine days. During each production day, features were shot and edited, graphics were prepared, production meetings were held and teases were taped. At 2 p.m. full match taping began and continued until the match's conclusion. By 3:30, editing for the highlight packages was already under way.

Transmission of the day's matches began each evening at 7 p.m. During the feed, the crews taped teases and programmed the character generator for the following day's action. The highlight show and next day's teases were taped and fed at the conclusion of the match.

When it was time to go home, crews first began removing unobtrusive equipment. The internal strike began on Friday, July 7, with the full strike on July 10. During all construction and strike operations, club officials had strict rules concerning what hours noisy operations were allowed.

Master's touch

Whether it's a world-class tennis match, jazz event or a live report from the cow palace on the state fair grounds, planning and communicating what is planned are two keys toward improving the quality of productions. Good production teams can approach production in a world-class manner, whether the stage is around the world or right next door.

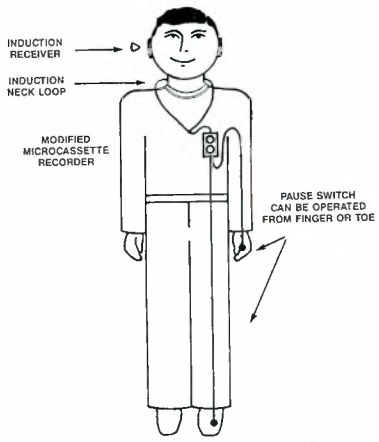


Figure 2. *Aural prompting system uses invisible induction receiver with neck loop and modified microcassette recorder.*

ABC goes golfing with NOMAD

By Kenneth J. Michel

The tournament's final round is drawing to a close. The leader approaches his ball on the 17th tee. He sets, swings and, with a resounding crack, launches the ball down the fairway. Four cameras are strategically positioned to cover this important hole. One of the high cameras follows the ball through the sky. As the ball descends, it heads out of bounds. It lands out of sight, among the crowd, under a group of trees.

A utility cart stops at the edge of the fairway. While the driver aims some antennas at a tethered balloon hovering over the course, the camera operator plays out the triax and gets in position for the next shot.

This scenario is not uncommon when covering a professional golf tournament. Sports producers often use RF cameras in situations where fixed cameras cannot cover all of the angles, especially in cases where the action of play is unpredictable or where roving cameras are required.

Michel is new technology development engineer for ABC, New York.

1953
1954
1955
1956
1957
1958
1959
1960
1961
1962
1963
1964
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989

35 YEARS AGO WE PIONEERED THE FIRST TRANSMISSION LINES...

FLEXWELL®

TODAY WE'RE STILL LEADING THE WAY!

Cablewave Systems 6-1/8″, 8″, 9″ and 12″ high power *Flexwell* coaxial cables represent the largest semi-flexible transmission lines of their kind in the world. Produced in continuous lengths, large capacity corrugated copper and aluminum *Flexwell* cables are designed to meet the high power requirements of medium wave and shortwave international broadcast installations.

The family of *Flexwell* transmission lines are produced and marketed worldwide by member companies of the Radio Frequency Systems Group. *Flexwell* corrugated transmission lines range in size from 1/4 inch jumper cable to 12 inch high power broadcast cable with up to 9 megawatt RF power handling and *Flexwell* elliptical waveguide from WR42 through WR430.....Cablewave Systems covers the whole spectrum.

For more information on the *Flexwell* family of RF transmission lines, contact Cablewave Systems division of Radio Frequency Systems Inc. North America. 60 Dodge Avenue, North Haven, CT 06473. (203) 239-3311.

RFS **Cablewave Systems**

Circle (25) on Reply Card

RF camera systems have evolved over the years from simply taking the video and audio output from a camera and feeding it into a portable microwave transmitter, to complex, remote-controlled, synchronized systems, which closely emulate hard-wired cameras. Complex RF camera systems can provide camera-control functions, gen-lock, tally and bidirectional communications, using radio signal paths in place of cables.

ABC Sports required such a system for golf. We wanted to have at least three cameras that could be efficiently set up, provide reliable coverage of the entire course, and maintain all of the features of the cabled cameras, including the ability to gen-lock the camera feeds without using frame synchronizers. ABC's RF operations and broadcast engineering departments set out to design a system that would meet Sport's requirements and would do so using a limited number of radio channels to conserve spectrum.

Once the requirements and operational system philosophy were identified, ABC's operations and engineering departments, with the aid of two outside companies, Telemetrics of New Jersey and MITEQ of New York, developed a unique camera command and multiplexing system that fulfilled all the operational requirements.

The major components of the system are as follows:

1. A 40-foot mobile unit to accommodate video and audio sub-control rooms, maintenance and utility areas.
2. Ikegami HL-95 cameras with custom Telemetrics triax adapters and base stations.
3. MACOM microwave transmitters and RF technology receivers.
4. Microwave transceiver and 950MHz transmitter. These components and additional electronics are housed in a weatherproof tube assembly, which, for lack of a better term, is called NOMAD. (Actually, it is named for its physical resemblance to a character in an old *Star Trek* episode).
5. Balloon, with a payload capacity of 150 pounds, or camera crane to suspend NOMAD over the golf course.
6. Telemetrics multi-triax ground station.
7. Utility golf cart.

How it all works

The system supports three fully commanded camera chains. The video and two audio channels, effects, mic and camera talk originate from the hand-held camera that is coupled to a custom-made triax adapter. The signals are multiplexed on triax and connected to the base station, which is housed in a protective rack on a utility golf cart.

The golf cart provides mobility and houses the microwave gear, power supplies, inverters and transmit and receive antennas. The video and audio are demodulated at the base station and fed to the microwave transmitter. Output power is kept to approximately 3W. The microwave transmit antenna and the 950MHz receive antenna are mounted on a pan-and-tilt head. This enables the driver to aim the antennas at a blimp-like balloon (or crane) positioned between 200 and 500 feet over the course. (FAA regulations limit the height above average terrain to 500 feet).

Once a good line-of-sight position is established, the antennas are aligned and a bidirectional radio path is established. Line of sight with the balloon is necessary because of the directional characteristics of the microwave signal. The 950MHz signal is less directional so that camera data and audio contacts are usually maintained even when the cart is moving.

Continued on page 94

The only way to squeeze more sound out of the telephone line is to squeeze more sound into it.

The telephone bandwidth, 300 to 3300 Hz, is its biggest limitation. Anything below 300 Hz is lost forever. The result: your remotes sound like they're broadcast from inside a 55 gallon drum. But now there is a solution.

THANKS TO GENTNER, I'M ON-AIR FAST AND SOUNDING GREAT!

How We Squeeze More Sound Into The Phone.

It's called Frequency Extension, though it would be more accurate to think of it as Frequency Recovery. Basically, before the signal goes down the phone line, we digitally up-shift the signal 250 Hz. This "squeezes" the low frequency information, normally lost, into the phone line. When the signal gets to the station, we digitally down-shift the signal 250 Hz to recover the low frequency information. What reaches your listener is a fuller, richer, more natural sound.

At Gentner, You Don't Just Get A Box, You Get A Choice.

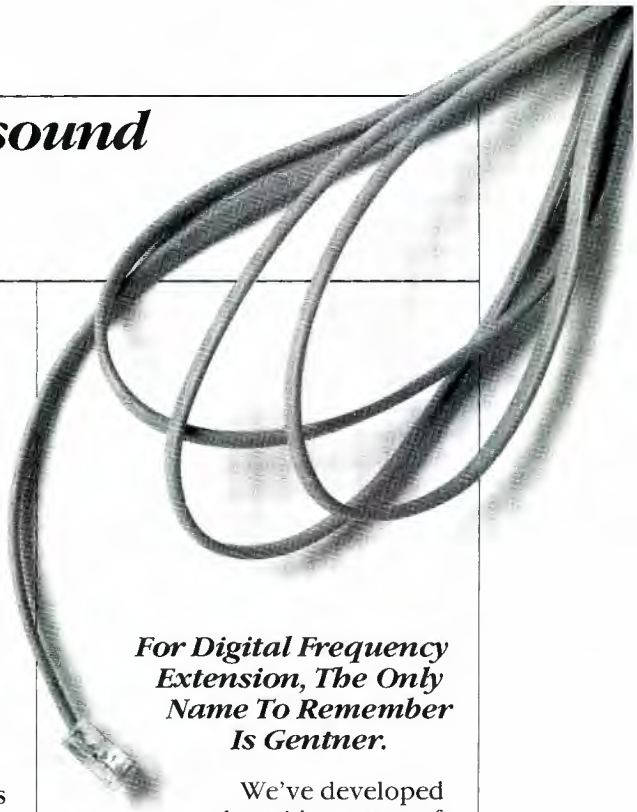
In the studio, you options start with the EFT-100, a low cost unit designed to be used with your existing hybrid and our new SPH-5E, a combination frequency extender and full-featured on-air telephone hybrid. The SPH-5E gives you the superior audio quality associated with frequency extension plus, at the touch of a button, the added benefits of a telephone hybrid.

For frequency extension from the field, the EFT-900 and EFT-1000 expand on the capabilities of the EFT-100. With internal mic and headset amplifiers and telephone couplers, you will haul less into the field and get on-air much faster. The EFT-1000 even includes auto-answer and auto-setup functions.

All Gentner extenders include filtering to reduce hum, built-in noise reduction and special processing of the high frequencies. Best yet, Gentner extenders are full duplex devices allowing true two-way communication. You get cues back to the broadcast site without compromising the effectiveness of your remote system or juggling unnecessary hardware.

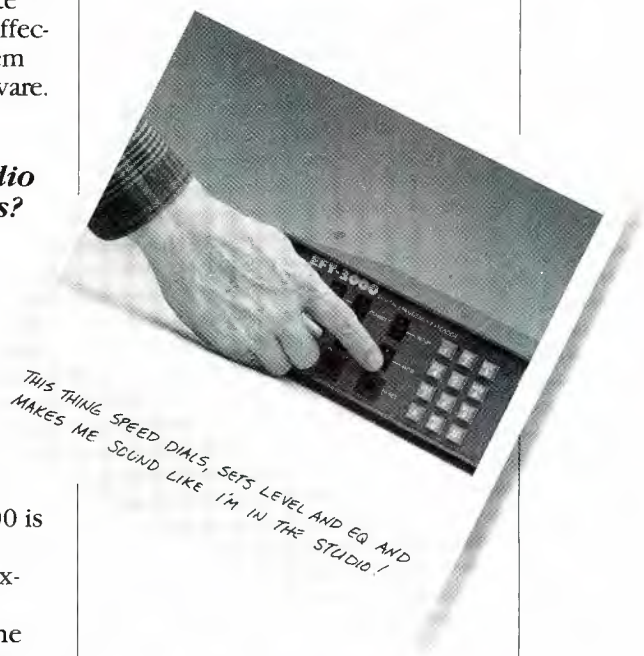
Would You Believe Broadcast Quality Audio From Telephone Lines?

That's right, we said broadcast quality. The newest addition to our growing line of frequency extenders, the EFT-3000, gives you enviable frequency response of 50 Hz to 7.5 kHz over three standard (dial up) telephone lines. The EFT-3000 is broadcasting's first and only three-line digital frequency extender. And, its a breeze to operate. Just plug in the phone lines and speed dial the station from the DTMF pad on the front panel. Then punch the Auto-Setup button. The EFT-3000 tweeks all three lines and you're on the air. You even get inputs for two mics and two headsets so you can do two person remotes without all the extra gear.



For Digital Frequency Extension, The Only Name To Remember Is Gentner.

We've developed the widest range of frequency extenders so you can easily squeeze just the right product into your system and your budget. For additional specs and the name of your Gentner dealer, squeeze a couple of minutes out of your busy schedule right now, and give us a call.



THIS THING SPEED DIALS, SETS LEVEL AND EQ AND MAKES ME SOUND LIKE I'M IN THE STUDIO!

GENTNER

Gentner Electronics Corporation
1825 Research Way
Salt Lake City, UT 84119
(801) 975-7200
Fax: (801) 977-0087

Call me, I'm interested. Circle (28) on Reply card.

Send literature. Circle (29) on Reply card.

Broadcasters respond to the quake

By Peter Hammar

As the world watched, broadcasters of the San Francisco Bay Area struggled to tell the unfolding story of the earthquake. Their experiences provide valuable lessons for all broadcasters.

When the earthquake struck the San Francisco Bay Area on Oct. 17, 1989, not a single broadcaster there was sufficiently prepared to cope with the emergency. Disasters, whether natural or man-made, hit radio and TV stations hard. Being able to keep damaged equipment running with little electric power and a staff under high stress means taking precautions and spending money now for the disaster that "probably won't happen."

Californians are not the only Americans threatened by earthquakes. Large temblors have been reported all over the continent in the past 200 years. Geologists estimate that the three great New Madrid, MO, quakes during the winter of 1811-12, the most violent in U.S. history, each measured from 8.4 to 8.7 on the Richter scale! All three quakes were many times greater than the 1989 San Francisco quake, devastating parts of Missouri, Illinois, Indiana, Arkansas, Tennessee, Kentucky and Mississippi, with minor damage as far away as Ohio and the Carolinas. The Mississippi River reportedly ran backward after each of the New Madrid earthquakes, with massive flooding around what is now St. Louis.

According to geologists, monster quakes occur in cycles of 100 to 500 years. The famous one that devastated San Francisco in 1906 measured 8.3 on the Richter scale. The 7.1 quake that hit the Bay Area in October was not "the big one." Geologists say that one is still to come, and it could hit at any time — in a few minutes or 100 years from now.

The lessons learned in the Bay Area apply not only to earthquakes, but to other situations as well. Any event can "take down" a station with equipment damage and loss of electric power, as we've seen from the recent hurricane and tornadoes in the southern United States. Industrial explosions and civil unrest also can threaten broadcast operations.

Hammar, chairman of the San Francisco section of the Society of Motion Picture and Television Engineers, is a broadcast consultant.

When the earthquake — the second largest temblor in California this century — struck the Bay Area at 5:04 p.m. that October day, most stations not physically damaged by the impact stayed on the air. However, at 5:05 p.m. the Pacific Gas & Electric (PG&E) grid went down. For a minute, the crowded Bay Area radio spectrum was completely dead. Circuit breakers on the grid had responded to overloading, with other shutdowns automatically triggered by earthquake sensors. PG&E then kept power off in most of San Francisco according to a pre-arranged earthquake plan, leaving a million customers in the dark. Most of those affected, including broadcasters, agreed that the lethal combination of broken gas mains and sparking power lines warranted the shutdown.

The physical damage and power outages tested the engineering skills and emergency preparedness of Bay Area broadcasters, as well as the Emergency Broadcast System, or EBS. Here are some basic measures you can take to prepare your station for any disaster.

1. Get your plant inspected now, not later.

Have independent consultants inspect towers, buildings and their foundations and deep-ground support for structural integrity. It's expensive, but this is a one-time cost that should be done now, not when you're staring at a mass of twisted steel, with your station's revenue losses piling up. Of course, some natural disasters will cause damage that no amount of inspec-

It takes teamwork to produce the industry's best-performing router. It takes confidence to guarantee it for ten years.

At Utah Scientific, people know how to work together to bring you the best in product design, product performance, and product support. Products like the AVS-2, the new generation of Utah Scientific routers.

With the best operating specs in the business, the AVS-2 offers these exclusive features:

☐ surface mount component technology—increased packaging density for maximum size reduction with no sacrifice in signal integrity

☐ up to 525 crosspoints per rack unit including power supplies

☐ 1280 x 1280 matrix sizes with 8 separately addressable levels

☐ HDTV compatible—video frequency response flat to 30 MHz

☐ matrix cards automatically assigned to location—change card positions without reprogramming

☐ full matrix salvo capability—reconfiguration in one vertical interval

☐ only multi-sourced components are used—no hybrid circuitry.

And even though the AVS-2 is a revolutionary new design, we have the confidence to guarantee it for ten full years—parts and labor.

That means you can have confidence every time you buy a Utah Scientific product. Confidence that you are buying the best. Confidence that our team of experts is available to help you whenever you need it. Confidence that your Utah Scientific switcher will keep working for you year-after-year with the best reliability record in the industry.

Call us today for more information about the AVS-2 or any other Utah Scientific product.

UTAH SCIENTIFIC

Confidence in Quality.

Utah Scientific, Inc.
4750 Wiley Post Way
Salt Lake City, Utah 84116-2878
(801) 575-8801 Toll Free: (800) 453-8782

Dynatech Broadcast Group

tion or planning can prevent.

The ABC-owned radio station, KGO-AM in San Francisco, and ABC affiliate KNTV-TV, channel 11 in San Jose, suffered major tower damage from the earthquake. Two of KGO's three 304-foot directional towers buckled over at mid-span. The third tower was left standing, but bent and out of plumb. According to chief engineer Bruce Schirmer, although KGO's AM transmitter sits on the muddy flats in the South Bay near the Dumbarton Bridge, the bases of the three towers are anchored in bedrock 60 feet below the bay mud. The quake's whipping action snapped the two non-directional towers in the middle like toothpicks. On the ground, everything moved in unison, so the transmitter building and its equipment came through undamaged.

Built in 1947, KGO's self-supporting towers are only 17 feet across at the base. The three replacement towers will have a wider, more solid design. Despite the damage, KGO radio was back on the air within an hour. When the towers fell, the 50kW transmitter could not handle the change in load and automatically shut down. No one was at the transmitter site at the time of the quake, but a KGO engineer who lives in the East Bay area quickly reached the site and patched everything over to the remaining directional tower. After just a few minutes, he had returned KGO to the air in a non-directional pattern at about 10kW effective radiated power, increased the next day to 22kW.

After a bigger transmission line to the tower was installed, power was later brought up to 50kW daytime, reduced to 10kW at night to protect WGY-AM in Schenectady, NY. The FCC has given KGO a waiver to continue operating with a 24-hour non-directional pattern until the three new towers are installed early this year.

KNTV also may have to replace its tower as a result of the quake. The 290-foot tower, on Loma Prieta Mountain west of San Jose, is located about five miles north of the quake's epicenter. Similar to what occurred at KGO, the north-south whipping action of the quake partially snapped the structure, but this time just below the top, in the middle of the 12-bay batwing array. The broken part of the guyed tower bent in the direction of San Jose, the biggest part of KNTV's South Bay market, actually strengthening the signal there slightly. The transmission line to the tower also cracked and was patched temporarily. The entire antenna and transmission lines may be replaced in the spring.

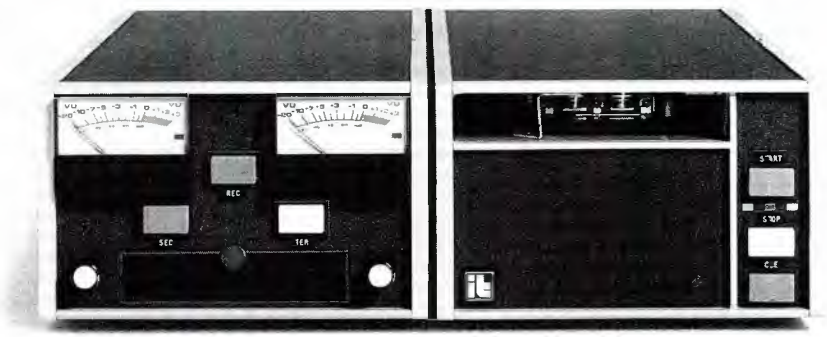
In contrast, the transmitter for NBC affiliate KSBW-TV, channel 8, is only six miles south of the quake's epicenter, about 10 miles from the wrecked KNTV tower. Chief engineer Willis Wells reported that the station's 1,500-foot tower was untouched. The NBC affiliate in Salinas was back on the air within 90 seconds of the quake. The Kline tower, built in 1984, was designed to withstand an 8.3 earthquake with a simultaneous 100mph wind blowing on it.

The studios of Oakland's independent KTVU-TV, channel 2, are located only a little more than a mile from the ill-fated Cypress I-880 structure, the collapse of which caused the greatest number of casualties. However, KTVU's bayside building, equipment and rooftop STLs came through untouched. The 1981 purpose-built structure sits on pilings anchored in bedrock and was unaffected by the violent shaking of the surrounding bay mud flats.

Don Lincoln, director of engineering for Sutro Tower, reported there was no damage to the 3-legged, self-supporting tower on Mount Sutro in central San Francisco, the transmitter site for 10 TV and four FM radio stations. The structure, rated to withstand a quake of at least 8.3 on the Richter scale, came through perfectly, as did all the arrays, transmission lines and the transmitter building. The site is located on stable bedrock, and the center of gravity of the 977-foot tower is actually 13 feet

The shared transmission facility on Mount Sutro in the middle of San Francisco came through the earthquake in perfect shape. Built on bedrock, the 977-foot tower and its arrays are designed to withstand a quake measuring at least 8.3 on the Richter scale. During the quake, the tower moved, but stayed well within its design parameters. (Photo by Don Lincoln, Sutro Tower.)

This is one reason we sell more cart machines than anyone else.



The 99B series Master Recorder features a patented erase, splice-locate and azimuth-adjust system (ELSA).

And here are three more.

Our Authorized 3M Dealers

Allied Broadcast Equipment	Broadcast Services Company	Broadcast Supply West
800/622-0022	800/525-1037	800/426-8434

3M International Tapetronics — The World Leader In Cart Machines.

3M

Circle (32) on Reply Card

below ground, adding to the stability of the design. During the quake, the tower moved noticeably, but well within its design parameters.

2. Check the ruggedness and reliability of your STLs.

In almost all cases, STL dishes stayed physically aligned on both ends. Loss of power to remote STLs was more of a problem. Susquehanna's KNBR-AM in San Francisco lost power to its STL on the roof of the Fox Plaza building two hours after the quake when the backup batteries ran out, reported KNBR/KFOG-FM engineering manager Bill Ruck. The station reverted to landlines for its transmitter link.

The studios of Capital Cities/ABC's KGO-AM and KGO-TV, channel 7, in San Francisco suffered no real damage. The station uses telco fiber-optic lines for its STLs, which, to the engineers' surprise, remained trouble-free throughout the disaster. The video fiber link from Candlestick Park used by ABC Sports immediately failed, however, and was abandoned when it became clear that coverage from the park would cease. KGO-TV has had problems in the past with its telco fiber STL and is considering replacing the underground link with its own microwave STL, perhaps with the fiber connection as a backup.

3. Secure those equipment racks.

Most stations in the quake area lost at least some equipment or air time when racks and cabinets fell over or even tore loose from the floor. At the KNTV transmitter building in the mountains above San Jose, almost every cabinet and rack was knocked over or tipped, according to chief engineer Dick Swank.

Prevented from falling over only by its RF, video and power cables, the microwave equipment continued to function. The quake ripped the heavy transmitter filterplexer loose, even though the unit was bolted to the floor. At this station, as at several others, lack of top-bracing caused the filterplexer and other cabinets bolted to the floor to whip back and forth, finally tearing loose from their bottom moorings and tipping over. Despite the problems with both tower and transmission equipment, the KNTV crew returned the station to the air less than two hours after the quake struck.

To hold your equipment steady in the worst quake, secure racks and cabinets by heavy angle iron across their tops, in addition to bolting equipment racks to the floor. The angle iron should be bolted to load-bearing members along the walls. Of course, racks that are unsecured in any way are especially vulnerable. Like seatbelts in your car, support bracing makes the equipment move with the building, not "oscillate" out of phase. Anchoring racks looks simpler than it is. Consider hiring a reputable structural engineer to do the job right.

4. Get a big generator.

No one wants to spend tens of thousands of dollars on a 150kW or 500kW generator that may never be used. According to KNBR's Bill Ruck, 90% of all PG&E power failures last less than 30 minutes. Approximately 99% last less than an hour. "It's that last 1% that will drive you nuts," Ruck said.

In big cities, generators and their fuel tanks create zoning problems. Yet, a big, automatic-start generator already wired into the system is like the parachute that the jet pilot probably will never open: It's nice to know it's there. Of course, there are practical limits to how much of your shop you can run on a generator. Assistant chief engineer Roy Trumbull of KRON-TV, channel 4, the NBC affiliate in

Continued on page 58

LEADER

THREE.

IN ONE.

And only in the 5870 Vector/Waveform Monitor.

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

No compromises.

This unsurpassed unit performs like three superb instruments in one.

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

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

Designed to go anywhere.

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

Call toll-free

1 800 645-5104

In NY State

516 231-6900

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

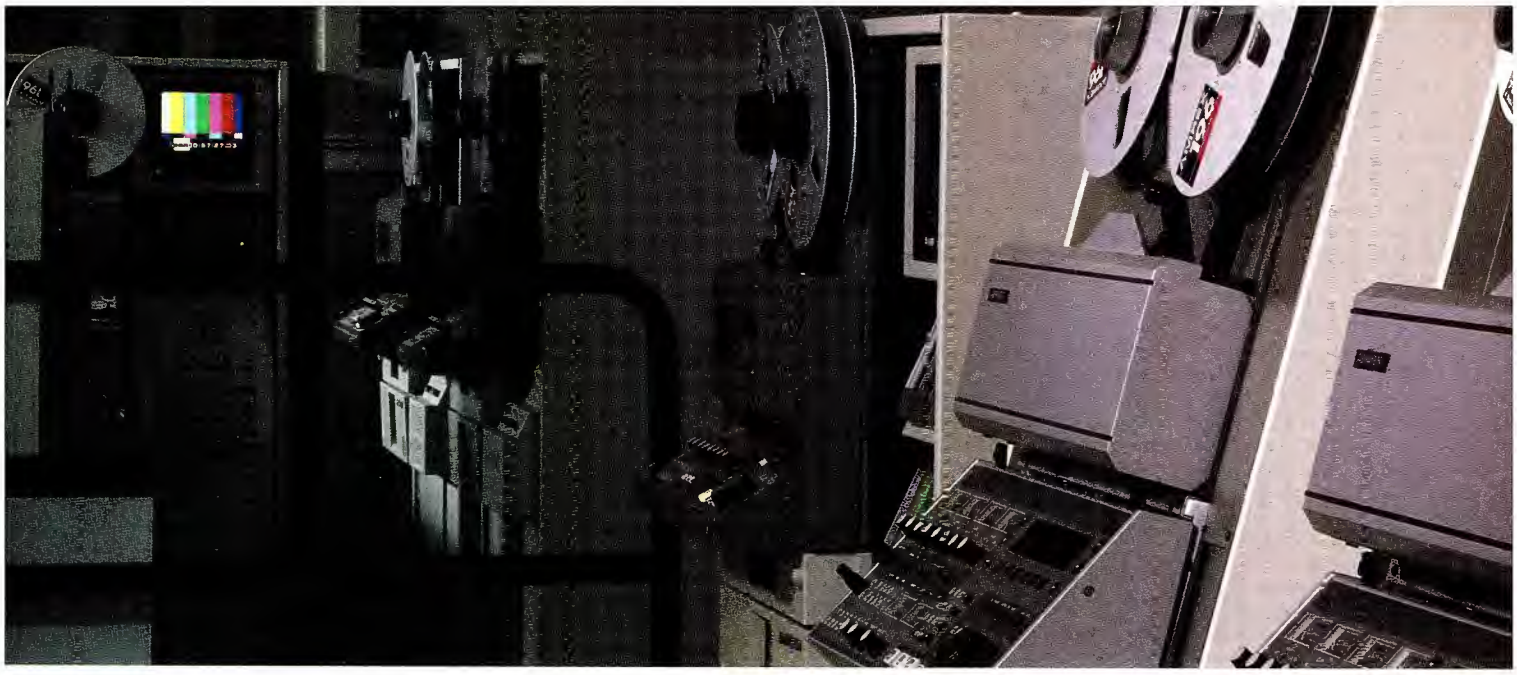
Leader Instruments Corporation
380 Oser Avenue, Hauppauge, New York 11788
Regional Offices:
Chicago, Dallas, Los Angeles, Boston, Atlanta
In Canada call Omnitronix Ltd. 416 828-6221

LEADER

FOR PROFESSIONALS WHO KNOW THE DIFFERENCE

Circle (63) on Reply Card for Product Demonstration

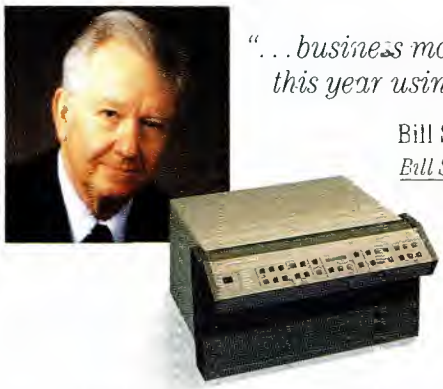
Circle (64) on Reply Card for Product Information



A convincing argument for Type C from a company that invented D2.

We didn't spend five years pioneering the world's first D2 composite digital recorder just to win technology awards—selling D2 machines is one of our top priorities.

But another and even more important priority for us is to make sure that the video professionals we serve have appropriate equipment for their jobs. And that they continue to look to Ampex



"...business more than tripled this year using Type C..."

Bill Stokes,
Bill Stokes Associates

Ampex Zeus Advanced Video Processor

for the straight story about that equipment and its applications.

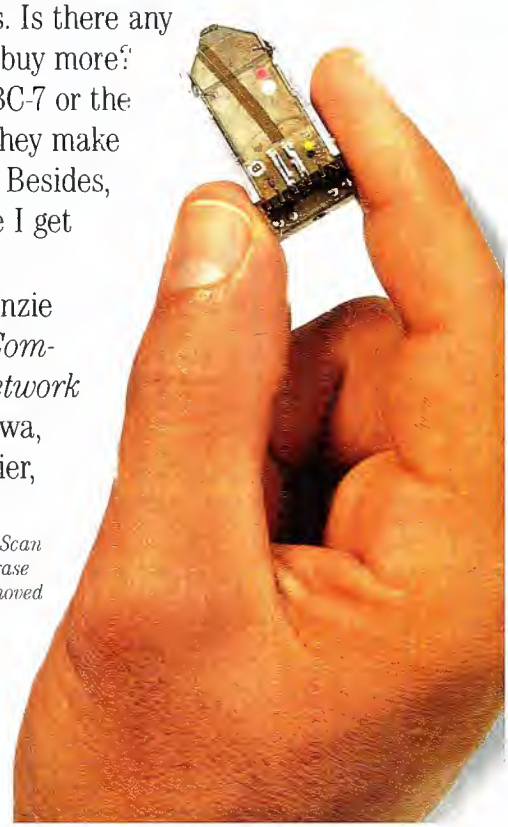
A case in point is the question we recently asked several of our customers who purchased Type C *after* we introduced D2.

"With the introduction of D2, why did you purchase Type C?"

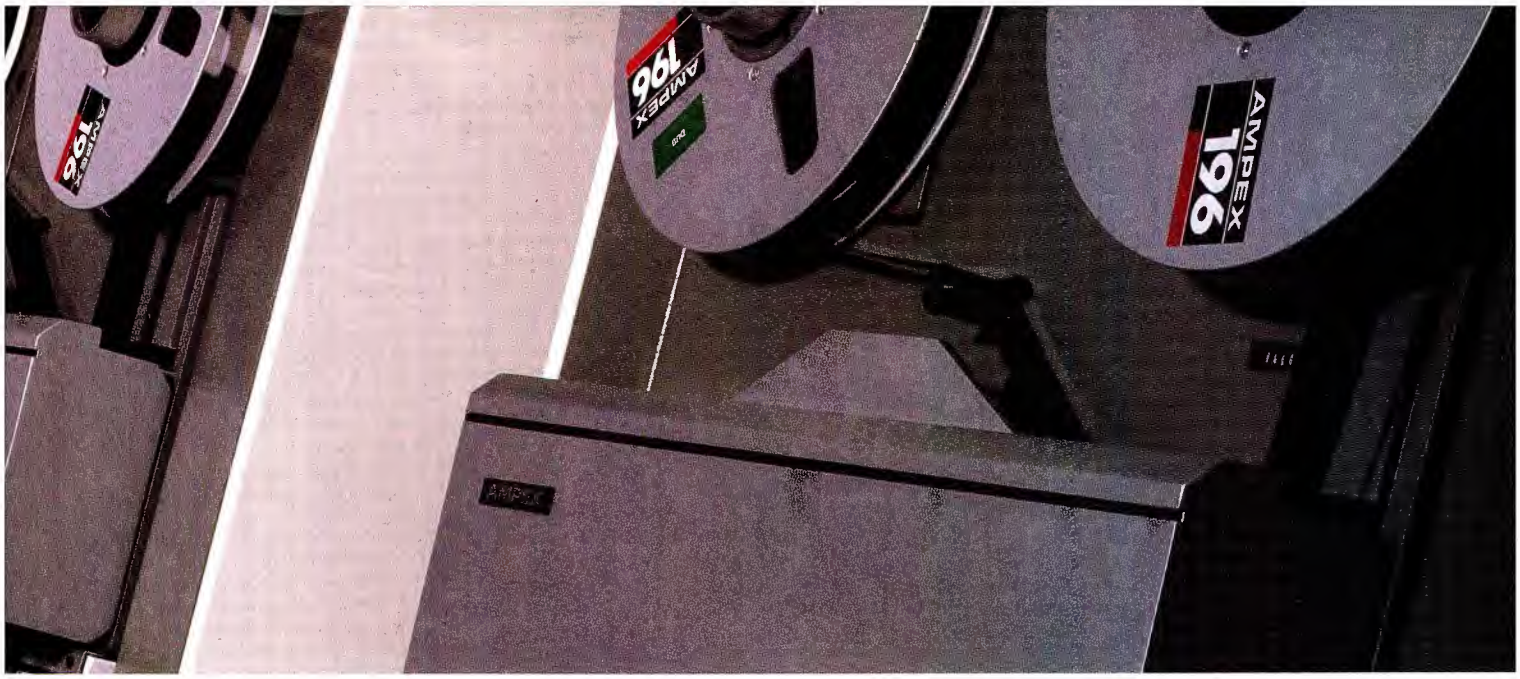
We think the answers we got may interest you if you're considering the purchase of *any* video machine.

Bill Stokes (*Bill Stokes Associates* in Dallas), came right to the point. "My business has more than tripled this year, and I'm using Ampex Type C machines. Is there any better reason to buy more? With the new TBC-7 or the Zeus processor they make perfect pictures. Besides, I like the service I get from Ampex."

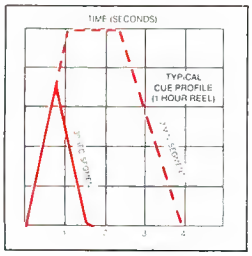
Jerry McKinzie with *Cycle-Sat Communications Network* in Forest City, Iowa, (a satellite courier,



The VPR-80's Automatic Scan Tracking head and its erase head are both easily removed and replaced with only a screwdriver.



production, and post-production business), thinks it's important to be able to update easily as his business changes. "The hardware and software upgrades Ampex makes in their equipment allow me to keep my facility current, and to always give my customers the newest look. I like that, and my customers demand it."



The VPR-3's incomparable acceleration allows a 30 second segment to be re-cued and synchronously played in 2 seconds, using one hour reels.

Darrell Anderson, whose company *Anderson Video* in Los Angeles, recently purchased several

"...Type C business is readily available..."

Darrell Anderson, *Anderson Video*

VPR-3s, pointed out that the Zeus port allows interface with D2. Darrell believes that, "Type C and D2 will co-exist successfully in a well-managed facility. Type C business is readily available." We were gratified to hear that he, "bought the best Type C machine he could find."

Consider your purchase decision carefully. When the excitement of a new equipment introduction passes, and you've put the pros and cons down on paper, Type C may be exactly the right machine for your application. After all, it's still the world's broadcast interchange and distribution standard.

"...hardware and software upgrades keep my facility current..."

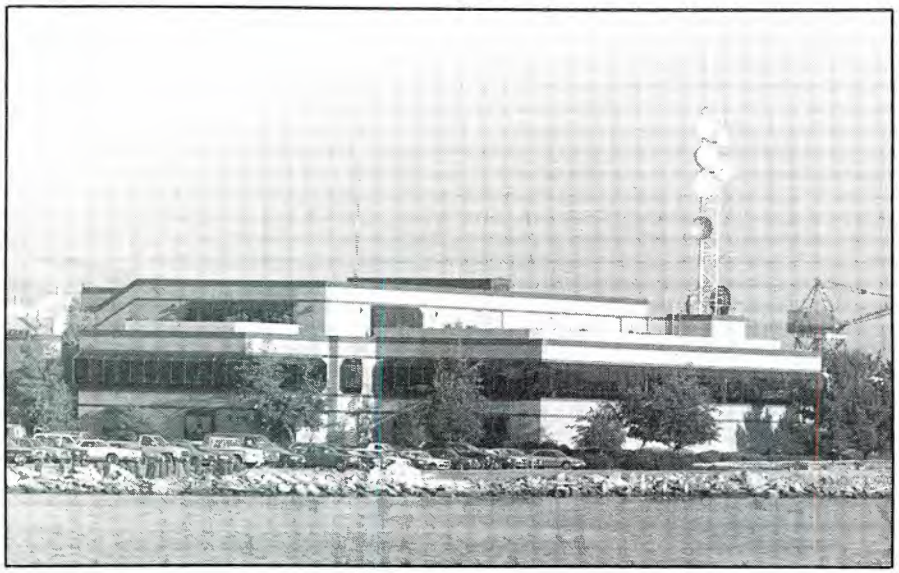
Jerry McKinzie,
Cycle-Sat Communications Network

And it is obviously the perfect choice for facilities that are moving up from ¾-inch.

We'd like to be involved in your decision-making process, and we're as close as your telephone. Call Ampex at 1-800-25AMPEX for some real help with a difficult decision.

AMPEX

BE-010-TYPC



KTVU-TV, Oakland, is located just a mile from the ill-fated Cypress I-880 structure, whose collapse claimed so many lives. Unlike the highway, the TV studios are built on pilings that go down to bedrock. During the quake, the building held perfectly, with the surrounding bay fill moving around the station like sea water around an oil rig in the ocean. (Photo by Sterling Davis, KTVU-TV.)

Continued from page 54

San Francisco, estimates that to simulate 3-phase, 4,000A, 208V PG&E power for his entire operation, he would need a 1.4MW generator, which is neither practical nor desirable. Between 150kW and 500kW with a carefully segregated load is enough to provide cost-effective emergency power.

Because KRON has lost power only once, for a short time, in the past 10 years and enjoys a good position at a major junction in the PG&E grid, station management did not see a need for a large backup generator for the facility. (Since the quake, management has hired a consultant to determine cost and zoning requirements for a full-sized emergency generator set and rewiring of house power.)

KRON's transmitter on Mount Sutro is already fully generator-supported and was off the air for only a few seconds. The station had power problems downtown, but only minor quake damage. When power in the studio went off, the staff used a small generator plus an ENG truck parked outside to power a couple of racks of equipment in the station, including the STL microwave and the remote control for the transmitter.

The shared transmitter site on Mount Sutro is fed by two PG&E feeds. Both feeds have been lost simultaneously only twice in the past 25 years, and then only briefly. The first real test of power backup systems at the site was on Oct. 17. In addition to each station's generator, the building and tower lights use a house generator. There has been talk at Sutro of installing a master generator and an identical backup to power all transmitters simultaneously instead of every station being on its own. Only a giant gas turbine — essentially a jet engine with a generator attached — could provide this much power. A turbine is more reliable than a diesel engine. Stations would keep their current generators as backup for the master power supply.

There were plenty of generator success stories during the crisis. Because KNBR-AM is the EBS Common Point Control Station-1 in the Bay Counties Operational Area, the station has always had generators at both the transmitter and the studio. Both came up immediately with no problems.

The generator at Sutro for KGO-TV got the station back up within a minute after the quake. Two of the three 300kW gas turbine generators at the studio downtown fired up and came on-line according to plan, also within one minute. The third generator is the backup for the other two. Engineers waited several minutes for equipment to stabilize before the entire plant was turned back on, powering the newsroom and the technical areas. The building air conditioning also was running normally.

Jim Kraenzel, chief engineer of independent KICU-TV, channel 36, San Jose, reported no damage to either studios or transmitter. Generators at the studio in San Jose and at the transmitter on Monument Peak near Milpitas in the East Bay hills came on automatically with no problem. The station was back on the air at 5:05 p.m., a minute after the quake, and aired the South Bay's first news about the disaster at 5:25 p.m. Kraenzel described the station's technical situation as "very uneventful," with the studio generator handling master control and a small jury-rigged news set and editing bay patched into master control.

By the time the earthquake had finished rattling and rolling, power had been restored to some parts of Group W's KPIX-TV studio building in downtown San Francisco, including most technical and some news areas. A pair of 150kW generators started automatically and kept the station on the air throughout the disaster. One generator supplies technical power, while the other provides certain lights and background power for the building.

What KPIX needed and did not have was lighting in areas such as the restrooms. In the generator startup interim, seven uninterruptible power supply (UPS) systems kept computer random-access memories alive in master control and in the newsroom, as well as in other gear scattered around the station. The generators lacked the capacity to run the air-conditioning chillers, although the blowers moved air around. A large, sealed window had to be broken to let cool evening air in, which was then circulated by portable fans.

The studio stayed on generator power for 14 hours. KPIX manager of operations and engineering Steve Moreen said the experience showed him the importance of having the entire plant powered, including all offices, equipment, studio lights and airconditioning. To that end, he probably will install a much larger generator set in the near future. He plans to keep the two 150kW units as backups.

Fortunately, the only problems for KSBW-TV in Salinas were a 2-way repeater and a few bookcases that fell over at the studio downtown and the loss of a surveillance camera at the transmitter site. The 450kW generator at the site turned on immediately, as well as the 500kW unit at the studio that runs everything from the STL to the air conditioning to the hall lights.

KSBW personnel were the first TV broadcasters to get to Santa Cruz, the seaside community devastated by the quake. The station has a small news bureau there, which it powered with a 2kW generator the engineering staff brought to the scene, one of several small gen-sets the station keeps in reserve for emergencies. The 2kW was enough to power the microwave and some ENG gear. With the telephones out between Santa Cruz and the rest of the world, the KSBW people relied on their 450MHz 2-way radio relayed by the repeater at the transmitter site in the Santa Cruz Mountains.

Most Bay Area cable users threw away their antennas long ago, depending totally on cable. Power outages took out some cable systems. According to Patrick O'Hare, chief engineer at Viacom Cable-

FOUR FIELD INTERPOLATION • MOTION ADAPTIVE • DSP

TETRA

THE NEW P165

The P165, code name TETRA, is a fully fledged bi-directional standards converter with four field motion adaptive temporal interpolation and a 4 line vertical spatial filter system using CCIR 4:2:2 8 bit digital processing.

- Fully bi-directional PAL-NTSC-SECAM etc.
- 4 field - 4 lines
- Movement interpolation
- Astonishingly low price
- 8 bit 4:2:2
- Low power
- Small size
- Light weight
- Very high performance

Exclusive Distributors:

JAMES GRUNDER & ASSOCIATES
5925 Beverly/Mission, Kansas 66202
(913) 831-0188
FAX (913) 831-3427

CEL

The Art of Image Control

Circle (35) on Reply Card

vision, a major cable operator in San Francisco, his system and others around the bay came through virtually unscathed. Viacom shares generator use at its cable head-end site with KGO-TV. A smaller 12kW propane generator powers its nearby satellite downlink site. Most of its "supertrunks" are standby-powered and were restored to operation immediately.

5. Build in fuel redundancy.

Several TV and radio stations went off the air because they lost the fuel supply for their generators. Either their tanks spilled or the fuel pumps feeding diesel from the main tanks to the day tanks failed. Preventing potential fuel-supply problems is tedious but not difficult. Backup electrical pumps powered by a UPS (hooked into main generator power once the gen-set is running) should be an essential part of your emergency setup. Split your fuel into separate tanks, if zoning permits. Anchor fuel tanks solidly in concrete, adding steel straps or guys under tension on all sides. Make sure you have simple tools handy at all times, such as pipe wrenches, hand pumps, 5-gallon cans and 55-gallon drums (along with plenty of cloth rags) so you can transport and receive emergency rations of fuel.

KNTV could not return to the air right away because it lost all 1,500 gallons of diesel fuel from its storage tank, which had toppled and ruptured. KBAY-FM, San Jose, which shares tower space with KNTV, also lost all of its diesel fuel for its generator. The station remained off the air until the following day, when KNTV was able to give it power.

Independent KLXV-TV, channel 65, also at the site, suffered severe transmission-line damage on its separate tower. Realizing it was off the air for the duration of the crisis, KLXV offered KNTV the use of its diesel fuel. However, no one there had any containers or other means of transporting the borrowed fuel the quarter-mile from one transmitter building to the other. Later, a nearby rancher, hearing of KNTV's fuel crisis, trucked over a 55-gallon drum of precious diesel, with an offer of more if needed. This kind of cooperation between broadcasters and citizens was typical throughout the emergency around the bay.

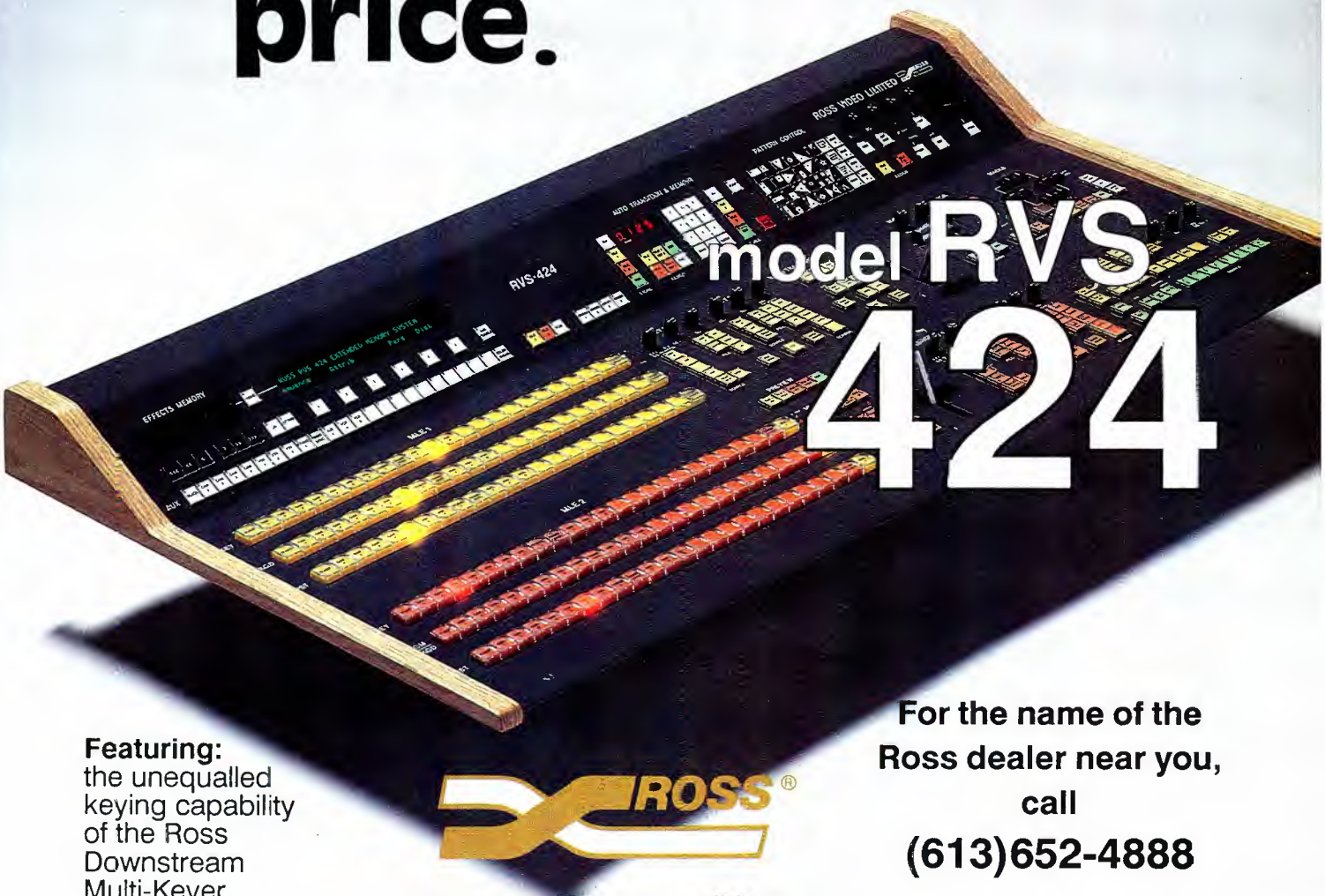
Meanwhile, the diesel fuel company that normally services KNTV managed to scramble a pickup truck to the site with several hundred gallons, adding to a fuel cache that lasted until regular power was restored to Loma Prieta two days after the quake.

KOFY-TV, channel 20, San Francisco, also had its share of Murphy's Law at work. With the power outages at Sutro and at the studio downtown, both generator sets came on normally, and the station began broadcasting special earth-

This 24 input switcher has all the features that people have come to expect ...

but it's the price that has them talking.

24 inputs at a remarkable price.



model RVS 424

Featuring:
the unequalled keying capability of the Ross Downstream Multi-Keyer

For the name of the Ross dealer near you, call

(613)652-4888

ROSS®

ROSS VIDEO LIMITED

"The Production Switcher People"

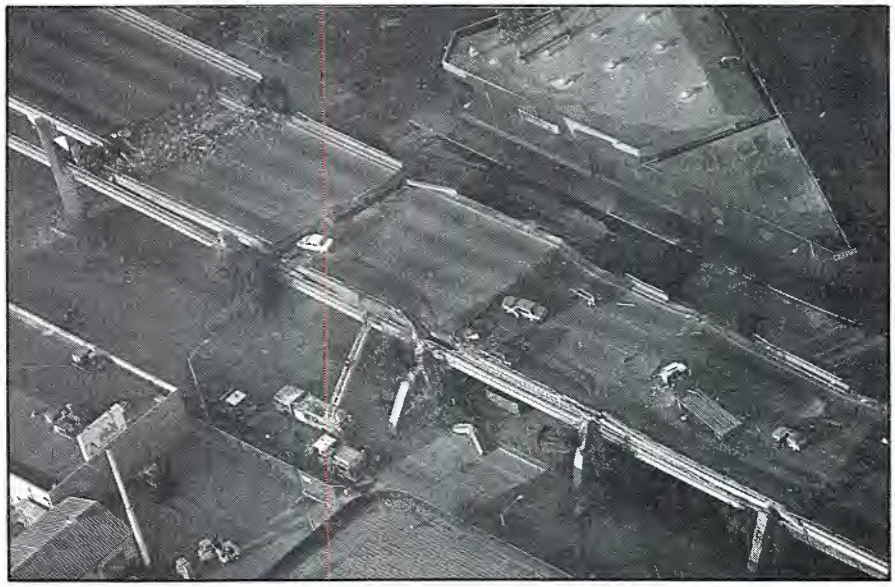
Ross Video Limited, PO Box 220, 500 John St., Iroquois, Ont. Canada K0E 1K0 Phone 613-652-4886, Fax 613-652-4425
Ross Video Inc., PO Box 880, Ogdensburg, New York, USA 13669-0880

Circle (37) on Reply Card

quake updates. But 40 minutes later, a 480V diesel fuel pump at Sutro burned out, and the fuel-starved 480V generator died. KOFY's Jim Gabbert and his engineer Doug Crall raced to the site. Assisted by Bill Ruck of KFOG/KNBR, they found a 55-gallon drum of diesel and hand-carried it to the day tank, filling the little reservoir with a hand pump. After the air was purged from the fuel injectors, the generator started easily and ran until PG&E restored power to the site at 10 p.m. Several FM stations on Mount Sutro use KOFY's generator.

Technical supervisor Shingo Kamada of KCBS-AM/KRQR-FM, San Francisco, said that just before the quake struck, they were preparing to switch over to Candlestick Park for the CBS Radio Network pregame show of the World Series. As soon as the quake struck, KCBS switched over to Candlestick for a report, because the stadium had not immediately lost power.

KCBS and sister station KRQR (which simulcasted KCBS throughout the emergency) are located on the 32nd floor of the 45-floor Embarcadero Center in the financial district of San Francisco. The stations and the building have auto-start diesel generators on the roof, and they share a main tank in the basement. A single pump forces diesel fuel up to both generator day tanks. The long fuel line was clogged, and building maintenance people hand-carried 5-gallon fuel cans to keep the 270kVA "house" unit running. With the fuel shortage, KCBS switched to house power, go-



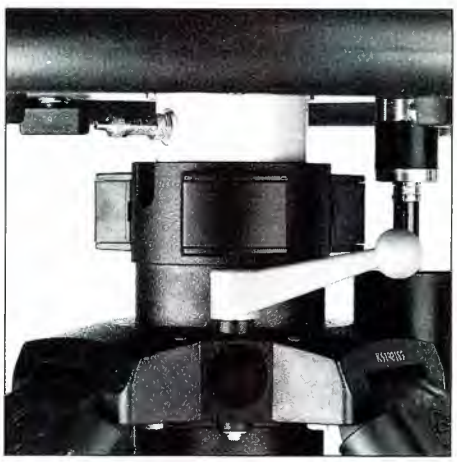
The collapse of the Cypress I-880 elevated freeway that ran through downtown Oakland toward the Bay Bridge took many lives, but more may have been lost if not for the World Series. Thousands had rushed home early to watch and listen to the third game of the World Series on ABC television, CBS radio and KNBR radio. (Photo by Deanne Fitzmaurice, San Francisco Chronicle.)

Hello world.
We can put you on a pedestal.

Sachtler has uniquely combined a pneumatic center column with a double-wheeled, steerable combi-dolly that utilizes modular construction and lightweight materials. The dial-in steps of drag and built-in counterbalancing let you pan and tilt smoothly and precisely, fast or slow, in any direction. It's as close as you can get to taking your studio with you on location. Anywhere. Anytime.

Sachtler is so confident of the performance of the Combi-Ped system that it has extended its normal usage warranty from **1** to **3** years and guarantees its leak-proof fluid modules for **5** years. It's the best warranty in the business and comes only with the best camera support systems in the world.

Call or write today for more information and the location of your nearest Sachtler dealer for a hands-on demonstration.



sachtler®
corporation of america

55 North Main Street
Freeport, NY 11520
Phone: (516) 867-4900

West coast:

3316 West Victory Blvd.
Burbank, CA 91595
Phone: (818) 845-4446

Circle (40) on Reply Card

ing off the air at 6 p.m. for about 10 minutes to make the transition. House generator operation lasted for two days.

6. Maintain and regularly check your generator and its fuel system.

A hundred little things can go wrong with a diesel, gasoline or propane generator to keep you off the air. In the quake, electric fuel pumps delivering diesel from main tanks to day tanks failed, transfer switches burned out and head gaskets blew. Although some of these problems never would have surfaced during routine maintenance, regular disaster simulation will help you discover many bugs.

Diesel generators are designed for constant operation, not intermittent duty. Diesels tend to foul when they are turned on and off and not allowed to run under load for long periods of time. For a 150kW generator that you can rely on, $3,000 or more in annual maintenance costs is not uncommon. Typical maintenance procedures include the use of a load bank to load the unit all the way down to test it, while not affecting station operations. Under a light load or no load, a gen-set will work perfectly, but a full-load test will force nascent weaknesses — a head gasket ready to blow or oil and fuel pump problems — to reveal themselves.

7. Arrange ahead of time with your local generator service and parts dealer for priority attention during a disaster.

Bay Area generator dealers provided broadcasters with excellent service during the crisis. However, had the disaster been any greater, these dealers could have been overwhelmed. Make sure you have a contractual arrangement, and a personalized "inside track," with a reputable generator service organization that will provide you with both instant response and a backup generator in case yours fails entirely. Insist on having the home phone numbers of key people in all your vendors' organizations. They'll cooperate if they really want your business. If they don't, then these are not the people you can rely on in an emergency.

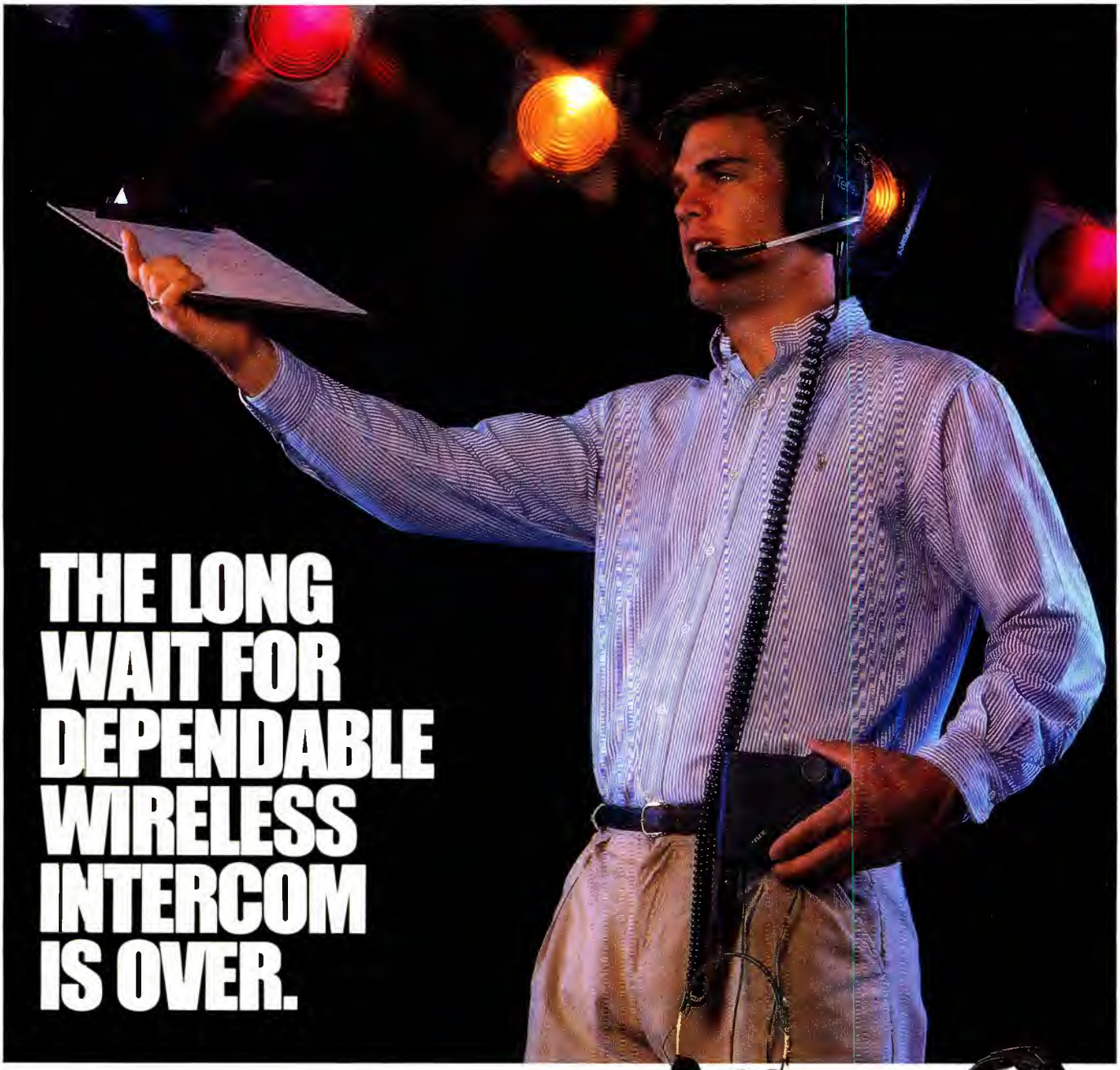
Sterling Davis, director of operations and engineering at KTVU, reports he was able to reach all needed vendors during the crisis. When his transmitter generator blew a head gasket, he immediately got through by phone to the generator company, whose people quickly got to the site with a standby unit of equal size.

8. Spend the money to rewire your equipment and house power circuits.

The wiring design of many stations prevents selective load management during generator use. Segregating loads does not mean you have to give up all your creature comforts to run equipment and lights. Air-conditioning chillers and lights in the restrooms are important to keep machines running and people happy. In the aftermath of a disaster, last-minute wiring and extension cords snaking all over the shop are clumsy and dangerous.

Make your equipment power as independent as possible from the house wiring. Be sure to include the elevators in your backup power plan. You don't want to leave someone trapped inside an elevator in the event of building evacuation forced by an earthquake, a fire or an approaching tornado.

Intelligent wiring design makes your all-important "backups within backups" most effective. If your built-in studio generator fails and you have to rely on a smaller backup unit brought in from a generator rental outfit, a simple flip of a few switches easily can route power to just those areas needed to keep a minimum operation going. Remember, for most stations, a disaster means your news department becomes king of the hill. You must not



Telex
RADIOCOM
is here and headset intercoms will never be the same.

Radiocom is new! It's a complete wireless intercommunication system from Telex, a company famous for its headsets, intercoms and wireless microphones. Even though it's a professional high band (150 to 216 MHz) system the cost is so low it will amaze you. Four beltpack transceivers can operate from the BTR-200 base station, and when two base stations are daisy-chained together, up to 8 headset stations can be tied into a full duplex communication network. Just think of the problem-solving possibilities.

The stylish new beltpack transceivers are compatible with Telex Audiocom headsets or other headsets with four pin XLR connectors. By using Telex Radiocom you can incorporate wireless headset stations into most existing wired intercom systems for exciting new mobility and freedom.

Yes the long wait for dependable wireless intercom is over but it was worth it. Each Telex system is completely tested as a system before it's shipped and carries the exclusive Telex THREE YEAR limited warranty. For complete details write to: Telex Communications, Inc., 9600 Aldrich Av. So., Minneapolis, MN 55420.

TELEX®

Circle (43) on Reply Card

The importance of building high-rise and high-weight structures on bedrock was emphasized by the failure of a portion of the Bay Bridge, which runs between San Francisco and Oakland. The concrete pier moved during the quake, pulling the bridge apart like a toy. (Photo by Deanne Fitzmaurice, San Francisco Chronicle.)

only keep it going under all circumstances (such as generator failure), but also be able to quickly make the needed power switchovers for lights and equipment if your main generator fails.

9. Don't forget the studio UPS.

With the exception of some aging batteries in a few uninterruptible power supplies failing sooner than expected, Bay Area broadcasters had no complaints about the way their units performed during the disaster. Besides helping with brief, "routine" power outages, a UPS in a major disaster will keep the studio on the air from a few minutes to several hours while you get your generator going. A UPS also will protect your gear from transients caused when the power company shuts down various grids to protect its own equipment. Of course, because most power outages in a big disaster also will affect your transmitter site, having your studio up and running could mean your STL is talking to a "black hole!"

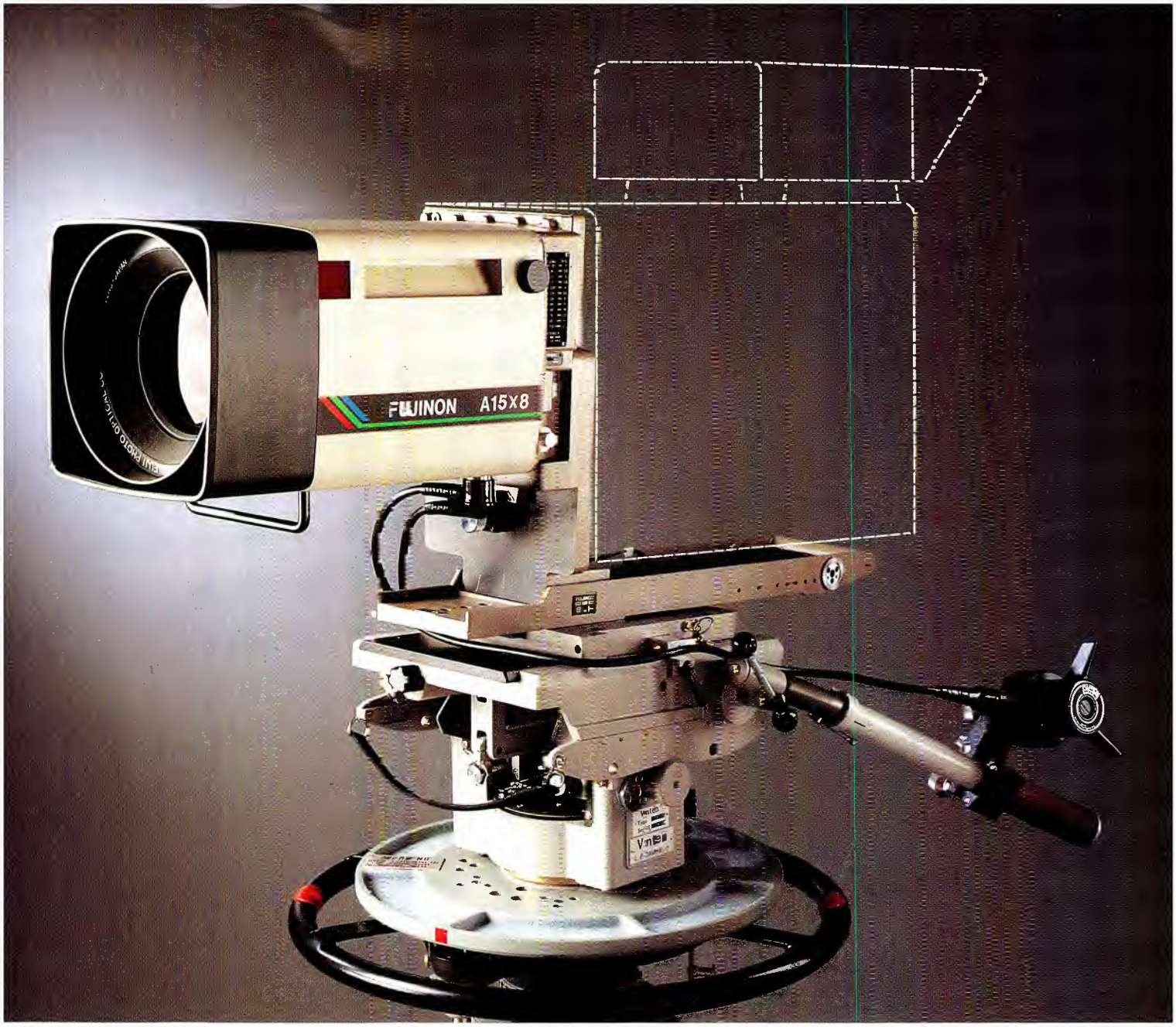
With the studio already operational, however, your listeners will get more than a carrier with dead air or black video when the generator at the transmitter site finally kicks on.

10. Make sure the design of your backup power system is as simple as possible.

Components in the generator and control systems should be the "off-the-shelf" variety. Parts not normally stocked locally should be replaced immediately, such as odd-voltage generator fuel pumps or unusual switches that have to be backordered from a warehouse somewhere across the country. Spend the time and money to simplify your system and to eliminate overly complicated parts and systems.

11. Keep battery-operated equipment handy.

Simple battery-powered, consumer radios and televisions should be available on site so staff members can check on themselves and the competition. Flashlights and electric lanterns, as well as the dry cell batteries to run them, are always at a premium in an emergency. Every staff member in the station, including secretaries and assistants, should have a flashlight of some kind. Some say rechargeable flashlights work best because their batteries don't go flat. Others maintain that rechargeables don't last as long when in use — many sites were without regular power for two days — and that a large sup-



READY NOW FOR THE NEXT GENERATION OF CCD CAMERAS.

FUJINON has created an entire line of studio and field lenses that meet the highest optical requirements for CCD cameras. Not only today's most advanced CCD cameras, but cameras still in development.

By working with camera manufacturers, establishing new standards for glass materials, building the prisms and creating systems to assure the critically precise placement of chips on the prisms, FUJINON has been able to achieve performance breakthroughs along the entire optical path.

The A15 × 8 ESM, shown here, has the lowest longitudinal chromatic aberration of any studio zoom. Results include the most accurate color and focus-tracking, higher MTF, and sharper corner resolution. Its F1.5 maximum aperture is absolutely flat from 8mm to 114mm (F1.7 at the full 120mm). But this is typical of all the FUJINON CCD studio and field lenses—A18 × 8, A20 × 7, A34 × 10, A34 × 20.5, A44 × 9.5 and the new A55 × 9.5.*

Regardless of camera generation, there's no gap. Conforming to the identical standards, these lenses are performance matched for total compatibility and interchangeability. For more information or a demonstration, call your nearest FUJINON location.

*Except for the A34 × 20.5 ESM, these 2/3" format lenses are also available in 1/2" format.

FUJINON INC. 10 High Point Drive, Wayne, New Jersey 07470 (201)633-5600
Southern 2101 Midway, Suite 350, Carrollton, Texas 75006 (214)385-8902
Midwestern 3 N. 125 Springvale, West Chicago, Ill. 60185 (312)231-7888
Western 129 E. Savarona Way, Carson, California 90746 (213)532-2861

FUJINON
A subsidiary of Fuji Photo Optical Co. Ltd.

Circle (49) on Reply Card

ply of dry cells provides better backup. Of course, over long periods, extra dry cells should be stored in a refrigerator or freezer that is easily accessible.

When KTVU lost power for its STL, telemetry and 2-way radio, it also lost the ability to check on its transmitter across the bay on Mount Sutro. Phones were out. There weren't any battery-powered handi-talkies to reach Sutro or even a simple, battery-operated television to use to check whether the carrier was still on. Thanks to the automatic generator, the transmitter was, in fact, on the air, broadcasting a black signal. The staff finally was able to determine that via phone calls to Sutro Tower.

12. Install surveillance cameras to help assess damage.

In this era of unattended transmitters, telemetry alone doesn't always tell the story. Even if the generator at the site has kicked on or you have a UPS to power your STL and other non-transmitter functions for a few minutes, surveillance cameras tied into the STL can help you visually assess damage quickly.

13. Plan for emergency 2-way communications.

Always have triple-redundant backup emergency communications with the transmitter site and with your vehicles going to and from the station, including ENG vans. In the aftermath of the quake, some engineers were forced to rely on irregular telephone service, including pay phones, to communicate with people at the transmitter and at the station. The quake knocked out many 2-way systems, although commercial cellular phones seemed to work well throughout the crisis.

Handi-talkies and mobile radios tuned to your 2-way frequency should be placed throughout the plant and distributed to station personnel to keep in their homes. The battery charge of the radios should be inspected regularly at all sites. With phone service out, you must be able to keep going by deploying your people efficiently. The listeners and viewers are depending on you to keep them informed.

When the violent shaking stopped, as well as their carrier signal, engineers at KNTV assumed the worst. Stuck in the middle of Silicon Valley, with the roads leading to the transmitter site in gridlock, the station's chief engineer, Dick Swank, and director of engineering, Lou Bell, located and rented a helicopter, normally reserved for news emergencies, to take them to the top of the mountain. The urgency of their mission was increased by the fact that 2-way communications with the site had been cut off, and they feared that their transmitter technician, Jim Farish, had been hurt and needed assistance.

The quake had physically knocked over and wrecked the 2-way 450MHz repeater on the mountain and severed telephone wiring inside the transmitter building, although Pacific Bell's transmission lines had not been damaged. The 2-way base station at the studio in San Jose had also tipped over and was out of commission.

Using malfunctioning handi-talkies, Farish managed to contact Swank down in San Jose, telling him the situation at the site was "real bad" and that he needed help. Because of problems with the handi-talkies, Farish could not hear Swank's reply. Farish did not respond to the base station's repeated questions about whether he needed medical attention. When Swank and Bell finally reached the transmitter by helicopter, they found Farish bruised and shaken, but otherwise fine. He was already at work repairing the damaged installation.

There's more than one way to get the word out in an emergency. When CBS News set up shop at KTVU in Oakland —

FULLY EXTENDS TO 58"

FULLY RETRACTS TO 26"

ADJUSTABLE BASE WIDTH FOR 27½" DOORWAYS

SEPARATES INTO 2 PARTS FOR EASY TRANSPORT

Classic™ Design Inside / Out.

CAPACITY: 120 lbs.

THE PORTABLE OSPREY

A TWO-STAGE, TWO-PART PNEUMATIC PEDESTAL

based on Vinten's timeless Classic™ design for easy set-up in the studio and out in the field. With features you've come to expect from VINTEN:

- Perfect balance and "on-shot" performance
- Self-pumping action or externally chargeable
- Positive locking wheel brakes
- 5" floating axle studio wheels
- Interchangeable 6" OB wheels (optional)
- Trim weights to maintain full, true counterbalance
- Crab/steer operation

Vinten

275-C Marcus Boulevard, Hauppauge, New York 11788-2001
Telephone: (516) 273-9750 Telex: 640470 Fax: (516) 273-9759

Branch Office:
8115-B Clybourn Avenue, Sun Valley, California 91352-4022
Telephone: (818) 767-0306 Telex: 182686 Fax: (818) 767-0772

Circle (50) on Reply Card

only later did the network news people move across the bay to CBS affiliate KPIX in San Francisco — telephone communications still were at a premium. The 14 limousines in the KTVU parking lot were not there for network bigshots or visiting dignitaries but because their cellular phones were needed by CBS news people.

14. Don't put all your backup studio "eggs" in one basket.

When preparing your facility for a disaster, you don't know what pieces you'll have to play with in the aftermath. Besides those measures taken for studio and transmitter power and equipment backups, have a contingency plan that allows you maximum independence from your traditional methods of operation.

As KPIX pulled itself together after the initial shock of the quake, master-control technicians put a slide up to let viewers know that emergency news coverage was about to begin. About eight minutes later, live earthquake coverage began from a small, on-air update desk in the newsroom not normally used for extended periods.

The news desk was designed for solo cut-ins, and was set up with only one microphone and one camera at the time. For the first 30 minutes, sitting before one camera, the two announcers passed a single lavalier microphone back and forth. Later, equipment was brought up from the newsroom, allowing KPIX engineers to build up more audio and video capability as they went along. The setup was so successful that KPIX news created a new 5 o'clock news program when normal broadcasting resumed. The new show is anchored from that technically improved desk, which will again become the broadcast center in the next emergency, able to be switched instantly to the STL or routed to other parts of the shop.

KGO-TV was in good shape to cope with a disaster. As soon as it regained power and reset the equipment, the station immediately switched "live" to the newsroom's update desk, to which on-air talent and news people already had scrambled. The update desk is used for the morning news and for news "teasers" and inserts during newscasts, but was not intended for long broadcasts. However, that area in the newsroom already was set up with two cameras, two microphones and simple lighting, with the output easily routed to master control and the STL.

The improvisational abilities of the engineering staff at KRON were put to the test in this crisis. For a variety of reasons, the station lacked a large standby generator, but had a smaller unit to power portions of master control and the STL. The staff patched a camera, a tape deck to roll footage and a microphone pre-amplifier directly into the STL rack. A small lighting kit illuminated the makeshift on-air news set placed in a corner of master control. KRON was back on the air with live news at 5:35 p.m., one-half hour after the outage. By the middle of the first evening, a large rental generator was tied into the main bus of the building, so the regular news set in the newsroom could be used again, along with background power for lighting and other functions.

Bay Area broadcasters were spared the kind of damage the quake inflicted on the Marina District near the Golden Gate Bridge. Unlike the bridge, the Marina is built entirely on bay fill, which went into liquefaction during the shaking, amplifying ground movement. Gas pipes ruptured and exploded as buildings crumbled. With pressure down to fight fires, only water pumped from the nearby San Francisco Bay prevented tragedy from becoming catastrophe. (Photo by Deanne Fitzmaurice, San Francisco Chronicle.)

Sometimes, the aftershocks of an earthquake are as intense as the initial jolt. No one in San Francisco knew whether big aftershocks would hit or whether widespread fires would break out, endangering the downtown KRON studios. Wanting backup for a possibly unstable studio situation, Trumbull, an ENG crew and two on-air news people left for the transmitter site at Mount Sutro. They commandeered the chief engineer's office and turned the room into an impromptu studio. Using house generator power, the KRON people set up two lights, a camera, microphones and a mic pre-amp. Trumbull ran video and line-level audio cables several hundred feet down to KRON's transmitter room one floor below.

They went on the air with this setup two hours after the quake, giving the people in the studio downtown a break and a chance to improve their makeshift newsroom in master control. Video switching was manual via a patch panel, causing some "glitches" over the air. By the time they went on the air from Sutro, the KRON engineers had set up a tape editor and two decks out in the parking lot next to the ENG truck, with a garbage dumpster making a convenient monitor stand.

At 9:30 p.m., the big rental generator had arrived downtown, so the little operation at Sutro took over for 30 minutes with tape playback and live reports to give studio engineers time to install the genset and switch over to its power. By that time, Trumbull had looped the video and audio from the Sutro office down to the ENG truck, which had a small switcher to go between the talent and the tape playback in the parking lot. The output of the truck went into the KRON transmitter room, where Trumbull stood by for his cue by telephone to switch manually from the downtown feed to Sutro. Luckily for the parking lot editors, it wasn't raining.

(NBC News was criticized for its late start in covering the disaster. The network, in turn, through widely publicized news reports, criticized KRON's delay in getting back on the air. In fact, KRON was off for only one-half hour during the entire crisis. By 5:45 p.m., NBC-TV affiliate KCRA-TV in Sacramento had picked up KRON's signal off the air and was uplinking the signal on NBC's K2 satellite.

CNN put up the KRON signal and rebroadcast the coverage around the world well before NBC News. KRON was available to NBC on two satellite frequencies, the KCRA feed and the CNN reuplink. KRON did not have enough generator power to run the NBC-owned uplink located at the studio downtown. NBC, which is responsible for the installation, maintenance and remote-control operation of the uplink at KRON, had no backup power for its unit.)

With power losses and bad luck, more studios than transmitters were knocked out in the earthquake. A solution to a dark or destroyed studio facility may be sitting in your news department parking lot. An ENG truck can be equipped to be your mobile studio if the transmitter is still going but everything else is down. The truck normally can function as an ENG unit, but in the event of a disaster that destroys or totally disables the studio, the unit's standing order is to "become" the station, transmitting directly to the transmitter with its own microwave.

For most stations, such a setup would require an additional ENG link at the transmitter, easily patched over by on-site personnel notified by 2-way radio. Besides cameras, hand-held and lavalier mics and related gear, the ENG/mobile mini-studio van should include basic tape-editing facilities, a rudimentary video-audio switcher, two 2-way radios on different frequencies, several handi-talkies on varying

Downlink Double Feature...

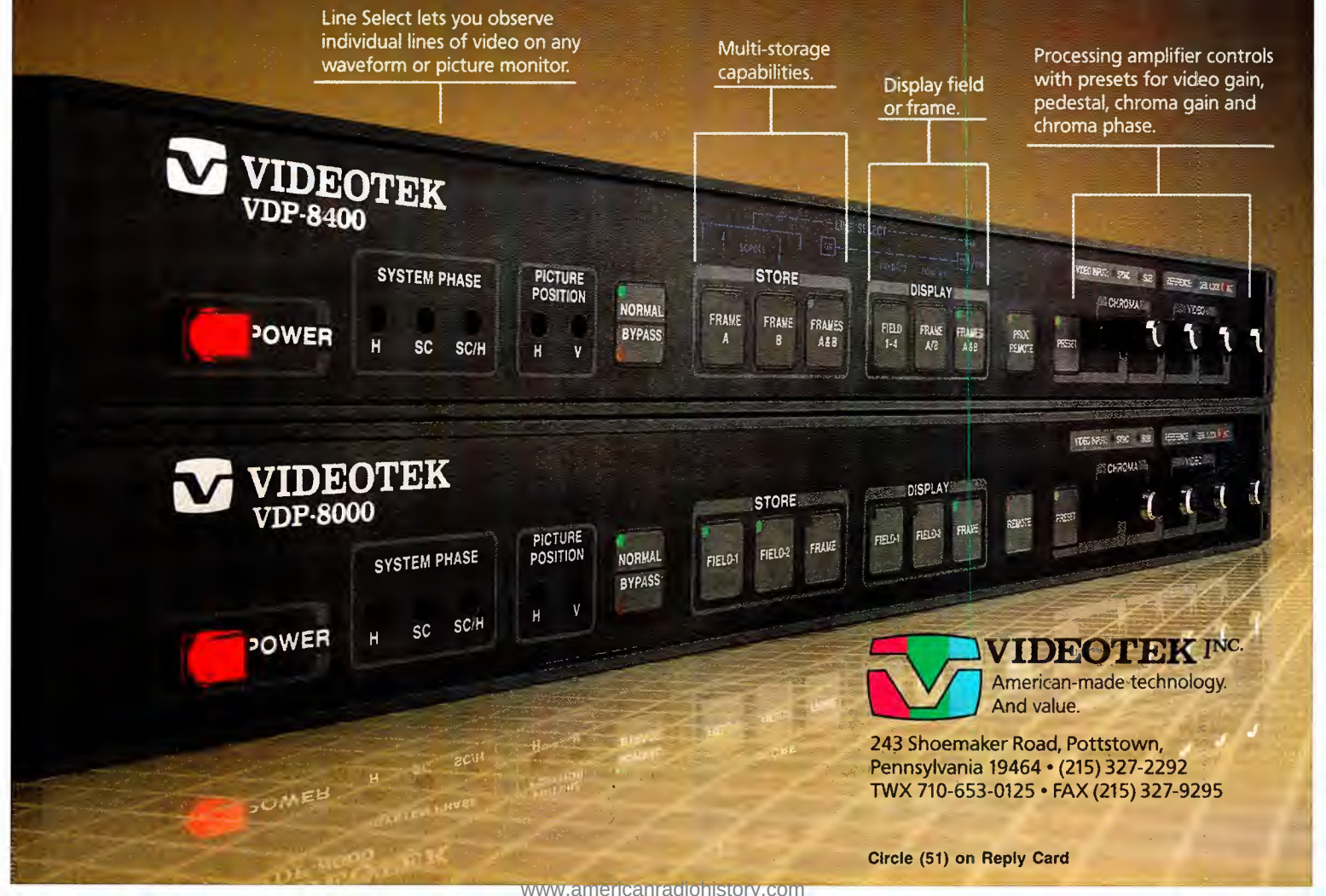
Upgrade with our new VDP-8400 frame store synchronizer or our field-proven VDP-8000.

Lock up and synchronize noisy satellite and microwave signals for uninterrupted operation with our two high-performance frame store synchronizers.

The new VDP-8400 has the same reliable front-end circuitry as the dependable VDP-8000. And both come with outstanding features to match. Like a processing amplifier to enhance picture quality even in the freeze mode. Clean "hot switching" of non-synchronous sources, and a line select that lets you observe individual lines of video on any waveform or picture monitor. What's more, a blackburst output allows you to use each of these units as a stand-alone sync generator. Want more? How about a price that's thousands less than the competition.

What's really uplifting about our down-link duo is their freeze-field/frame storage capabilities. The VDP-8000 lets you store two different fields or one field continuously, without interruption of live video. While the powerful VDP-8400 gives you enhanced storage capability of up to four fields.

So if you want to be in total sync, check out the VDP-8400 and VDP-8000 at your Videotek dealer today.



VIDEOTEK INC.
American-made technology.
And value.

243 Shoemaker Road, Pottstown,
Pennsylvania 19464 • (215) 327-2292
TWX 710-653-0125 • FAX (215) 327-9295

Circle (51) on Reply Card

frequencies, at least two cellular phones, lots of extension cords and adapters for all manner of video, audio and power hookups.

It also should include some basic office equipment and supplies, such as paper and a manual typewriter or battery-operated laptop computer and printer. The unit should be able to transmit directly to the STL at the transmitter and should be able to contact the nearest station engineer by 2-way to request that he or she join the mobile operation for the duration.

Out of necessity, KTVU created a similar ENG/mobile mini-studio in the middle of the crisis. The house emergency power switching system had malfunctioned, and the studio and STL were dark. While engineers worked to restore power to the studio, the news department got permission to try to transmit to the 2GHz STL on Mount Sutro using one of the ENG trucks. It was a stroke of good luck that the STL happened to be on the same frequency as the ENG transmitter. Some adaptations were made to the aural side of the link and, although the audio was distorted, the idea worked. KTVU news was on the air after 45 minutes, broadcasting from the parking lot directly to the transmitter. The makeshift situation lasted until about 7:30 p.m., when generator power to the studio and the STL was restored.

15. Make sure key equipment is safely located, but handy and well-marked.

Emergency equipment such as your EBS monitor, reset switches (with protective covers), alarms and 2-way communications should be installed where they will be protected from people wandering around in the dark or from being tossed around like tennis balls during an earthquake. The equipment must be handy for accessibility, however, and well-marked with clear lettering. Remember, in the first few seconds or minutes of an emergency, people may be groping around the studio and transmitter rooms using flashlights and cigarette lighters to locate and operate this gear.

16. Don't forget the creature comforts.

Broadcasters are an incredibly dedicated bunch of people. Most employees of Bay Area radio and TV stations, including members of the sales and secretarial staffs, who helped out in a hundred ways, stayed on the job until well into the following day. Be prepared for personnel to remain at the station for several days. A disaster could make movement in and out of the city impossible. Emergency supplies, such as drinking water and non-perishable food, are essential for your people both in the studio and out at the transmitter site. The deli around the corner that normally fuels your staff probably will not be in a position to serve you!

Along with first-aid kits, supplies should be well-stocked and checked once a year. Designate someone, perhaps an administrative assistant or a secretary, to handle this important task. Also, most generators cannot power the air-conditioning chillers, only the blowers. Keep a number of portable fans in reserve. They'll cool not only your equipment, but also your people.

17. Be sure at least two of your engineers can reach the transmitter and the studio at all times.

People in markets with natural obstacles such as the San Francisco Bay and the East Bay and Marin Hills depend on bridges and tunnels to allow them to get around. In the event of a disaster, engineering staff members who live on the same side of a body of water or a mountain where the transmitter and studios are located should automatically go there as soon as possible. They should assume they are needed,

GET IT RIGHT

GET IT FROM ALLIED

Why cart your CD's? Use the Denon CD Cart Player instead.

Nothing sounds better on the air than a CD. But ordinary CD players are hard to cue, interface and maintain. And no matter what you do, discs get dirty—that can cause skips and glitches. To avoid those problems, you spend hours dubbing to tape carts, losing the CD sonic advantage.

THE DENON DN-950FA CD CART PLAYER

Now Allied gives you the best of both worlds. With Denon's DN-950FA CD Cart Player, playing a CD is as easy—and reliable—as slapping in a cart. From its rugged computer-type disk drive to its XLR outputs, the DN-950FA is built for broadcast use. And it has broadcast-ready features like remote control, quick cue/review, end-of-message, index cue, selectable 2% speed increase and reliably accurate manual cueing. No wonder thousands of Denon CD Cart Players are at work in air and production studios worldwide.

Best of all, the DN-950FA uses Denon's specially developed CD Cart to keep costly CDs in mint condition. It eliminates the risk of greasy fingerprints, dust and smoke particles, food stains and scratches. And it plays as easily as any other cart.

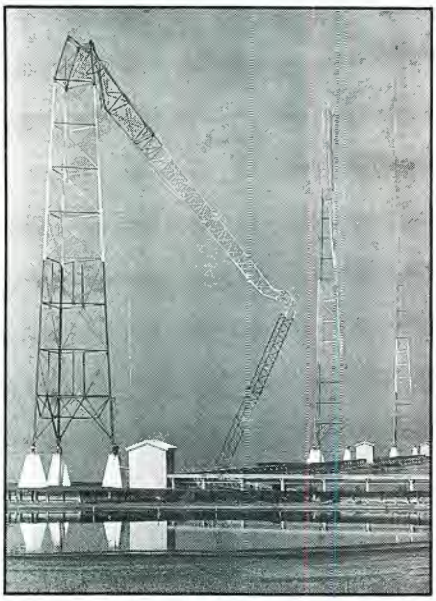
With the Denon DN-950FA CD Cart Player, you get the competitive edge of direct-to-air CD sound. Without giving up the convenience and reliability you're used to. So why put your CDs on tape carts? Put them in Denon CD Carts instead. Your Allied representative will show how easy it is—call today.

ALLIED BROADCAST EQUIPMENT
A HARRIS COMPANY

800-622-0022
CANADA 800-268-6817

STUDIO EQUIPMENT • HARRIS RF PRODUCTS • SATELLITE GEAR • TRADE-IN'S • TURNKEY SYSTEMS

Circle (54) on Reply Card



ABC-owned KGO-AM in San Francisco and ABC affiliate KNTV-TV, channel 11 in San Jose, both suffered major tower damage from the earthquake. Shown here are the two KGO 304-foot towers that buckled over at mid-span. The third tower was left standing, but was bent and out of plumb. The transmitter building and its equipment came through unscathed. (Photo by Ben Margot, Hayward Daily Review.)

because telephone and radio communications probably will be knocked out, as they were in most parts of the Bay Area just after the quake. Everyone should have pre-assigned tasks based on "if...then" scenarios worked out in advance.

When KTVU's transmitter generator stopped several hours into the crisis, transmitter telemetry indicating normal generator function confused the diagnosis of this new outage. With all bridges across the bay closed and traffic at a standstill in many places, no one could get from the studio in Oakland to Mount Sutro in San Francisco. Luckily, KPIX transmitter supervisor Steve Spies and KOFY-TV's Doug Crall were already at Sutro and jumped in to help, diagnosing the KTVU generator's problem as low water caused by a partially blown head gasket.

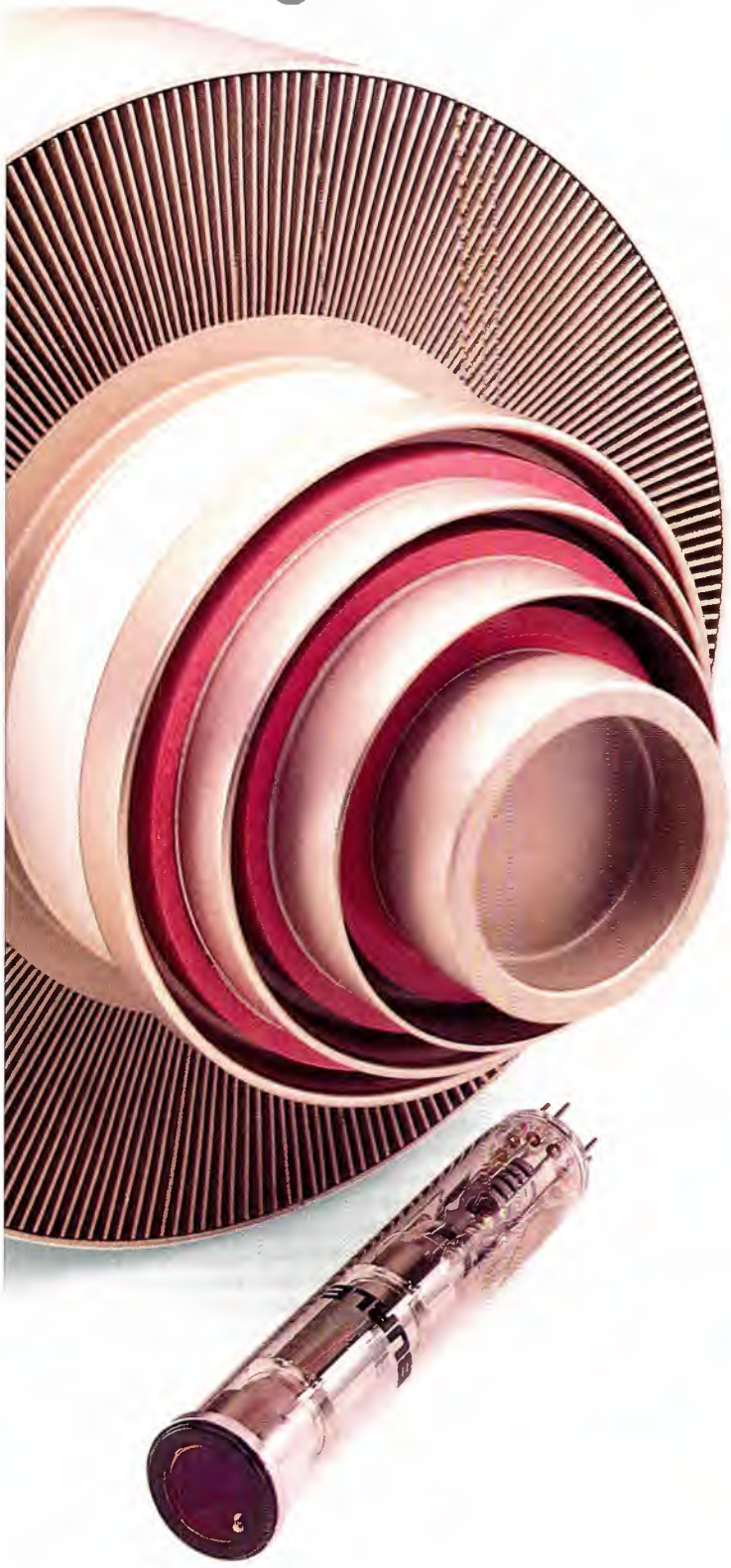
The Good Samaritan engineers refilled the radiator and restarted the KTVU generator. That episode kept the station off the air for only half an hour. Later that night, Sterling Davis of KTVU was able to get through by phone to one of his staff members, who lived on the San Francisco side of the bay, to ask him to go to Mount Sutro to nurse the ailing generator through the night until a replacement unit arrived.

The unattended KCBS/KRQR transmitters are located in Novato in Marin County north of San Francisco on the other side of the Golden Gate Bridge. After the stations lost power, a generator there kicked on automatically, and the transmitters reset and went back on the air. Still, the generator and transmitter needed tending. With the Golden Gate and other bridges closed just after the quake, KCBS was lucky that one of its maintenance engineers happened to live in Marin County and could reach the transmitter site easily within a few minutes.

18. Work out your emergency transportation arrangements now, not in the middle of a crisis.

Emergency transportation — 4-wheel-drive vehicles and helicopters not commandeered by your news department, the competition or the government — are essential to get your people to the transmitter site, to reach emergency parts and equipment sources and, if necessary, to transport injured staff members to a hospital. Naturally, the "911" emergency service during a quake or other major disaster is virtually useless. Four-wheel-drive vehicles were a necessity in getting equipment into and around the Santa Cruz area,

In broadcasting, Image and Power are everything.



BURLE is committed to providing a full range of camera and power broadcast tubes.

As television celebrates its Golden Anniversary, BURLE continues a 50 year tradition of broadcast technology leadership. We've supplied you with Vistacon, Saticon and Vidicon camera tubes since their introduction. And our power tubes are the industry standard for VHF TV.

BURLE supplies a wide variety of camera and power tubes for the broadcast industry.

It takes a domestic source like BURLE to maintain a half century commitment to producing and supplying a full line of broadcast electron tubes. From camera to transmitter, BURLE provides the tubes that keep the broadcasting industry on the air.

Count on us to keep you supplied with the full range of broadcast camera and power tubes you need. Today and tomorrow. Contact your local BURLE broadcast tube distributor, or call us at 1-800-827-TUBE.

Experience counts.

BURLE Electron Tubes

Circle (57) on Reply Card

both for news crews and for engineers maintaining equipment there. Damaged highways forced detours over rough roads. Things could have been worse; the rains that later turned the area into a quagmire held off for the days immediately following the quake.

You may think that, because your studios and transmitters are both located downtown, you won't need a 4-wheel-drive vehicle to get around in a disaster. But imagine what the condition of the streets of Chicago would be if a tornado ripped through the city. A Blazer or Bronco may be the only way to make your way over the rubble to get that vital transmitter part to the site. The main lesson of San Francisco is this: Except for the charity of your fellow broadcasters and a few citizens who may be hit as badly as you, you're on your own.

By the time KNTV engineers realized they had a generator fuel problem at the transmitter on Loma Prieta in the Santa Cruz mountains, flying fuel to the site was out of the question. The helicopter they had used to rush to the mountaintop had since been commandeered for emergency work by Santa Clara County public safety officials. An engineer at the studio in San Jose found some 5-gallon gas cans, filled them with diesel and drove to the transmitter site. The trip normally takes about an hour from the station. His journey through gridlocked traffic, complete with roads blocked by houses, rocks as big as cars and other debris, lasted five hours.

Sometimes you get lucky in an emergency. Working with ABC Sports, KGO-TV News had access to pictures from cameras on its helicopter already in the air for the World Series, as well as on the Goodyear blimp rented by ABC Sports, which first noticed the black smoke from the fires in the Marina District in the northern part of the city. These pictures were some of the first to show the extent of the quake damage.

Like other stations, when the quake struck, the KPIX traffic helicopter was already in the air. By 5:14 p.m., the station was airing live video of the collapsed Nimitz Freeway structure and relaying the pictures to its satellite uplink site in El Cerrito, east of Oakland.

19. Decide your station's EBS-use policy now.

Shortly after the quake, while KFOG/KNBR's Bill Ruck was driving to Mount Sutro to check on the transmitter, he heard San Francisco Fire Central Alarm and Alameda County Office of Emergency Services (OES) attempting to contact KNBR on 161.76MHz, the designated EBS channel. They were having problems getting through because of other radio traffic on the channel. San Francisco fire officials asked the other stations to leave the channel, but they apparently continued to use the frequency for a time. (See the related story, "EBS: Did the System Fail?")

The Emergency Broadcast System has its uses, but an earthquake may not be one of them. Some say the system should be revamped, that EBS is as outmoded as the Cold War. According to some, EBS in San Francisco didn't work very well and probably was not needed during the quake in the first place.

Engineering managers say this should have been decided months or years ago, not in the middle of the disaster. Station and engineering management should map out a dozen or so "typical" local disaster scenarios and decide when and how the station will participate in the system, if at all. Become active in your local and state EBS committees. You might call your colleagues in the San Francisco Bay Area for their ideas. Whatever your involvement in the system, make sure your EBS equipment is designed for real-life use, includ-

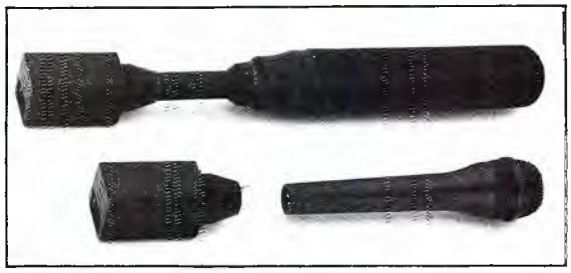
Who makes the best ENG wireless microphone system?

The best mini-receiver . . .

The CR185 offers a six-pole helical resonator front-end, followed by narrow-band crystal IF filtering at 21.4 MHz. This provides unmatched selectivity and sensitivity, and minimizes drop-outs and interference. A balanced, XLR output interfaces with any professional camcorder.

The best belt-pack transmitter . . .

The M185 is a highly refined belt-pack transmitter. It matches any input requirement and provides "phantom power" for almost any lavalier microphone via a standard 5 pin jack. The belt-clip is constructed of machined aluminum and steel parts, spring-tensioned for a secure fit on any belt or fabric. Audio level LEDs are provided on the control panel for accurate level adjustment.



The best "plug-on" transmitter . . .

The H185 introduces new flexibility to your ENG operations. It makes any hand-held or shotgun mic with an XLR connector wireless. The microphone body becomes part of the antenna circuit, forming a very efficient RF radiator. The audio input level is indicated by two LEDs next to the microphone coupler. These LEDs are clearly visible with the microphone attached for accurate level adjustment.

The best construction . . .

All external parts are constructed of machined aluminum for ruggedness and durability. Shock-mounted crystals are used in the IF filtering and oscillators for reliable operation. The transmitters and receiver are built for the real world of hard knocks.

The best factory support . . .

Whether it's frequency coordination or follow-up service, Lectrosonics will come through. Our commitment to the needs of broadcasters is second to none. Call us with questions, and you will get answers that make sense.

Call us toll-free to locate your nearest dealer:

1-800-821-1121

LECTROSONICS, INC.

P.O. Box 15900 ▪ Rio Rancho, NM ▪ 87174
581 Laser Rd. NE ▪ Rio Rancho, NM ▪ 87124
(505)892-4501 ▪ (800)821-1121

Circle (59) on Reply Card

ing accessibility in a poorly lit environment and easy cross-patching to other equipment such as recorders, boards and STLs.

20. Practice makes perfect.

Although KNBR-AM lost only about two minutes of on-air time, the problem may have been avoidable. On-air personnel in the studio did not understand the console reset procedure and had to be coached on the phone by chief engineer Ruck.

Drill not only your engineering and maintenance staff, but also on-air "combo" talent in technical procedures, including simple chores such as turning off sensitive studio and office equipment before power is restored. Guidelines should be written out, short and simple, and regularly distributed, updated and interpreted in staff meetings for all station personnel, no matter how low or high they are on the totem pole, and no matter what department they're in. Remember, during a disaster, your sales or traffic manager may end up running the board if your engineering staff members are away from the station or are injured.

Stress test your system. Engineers at KTVU had their share of tough luck staying on the air the first night of the emergency. Like most Bay Area broadcasters, they were having problems with electricity. When they lost power at 5:05 p.m. and the 450kW diesel generator in the studio's basement automatically turned on, one leg of the 3-phase, 600A transfer switch failed to connect, leaving much of the station dark. There's a chance that regular practice runs on the system might have uncovered this weak switch.

Besides regular generator maintenance, KPIX does a twice-yearly, full-building shutdown test by pulling the main breaker for the building, allowing the plant to go dark and letting the generators come up automatically. The staff sees what's working and what's not, what's blown and what needs resetting. When the station goes on emergency power, a handy check list shows what equipment needs to be reset. Usually, this drill results in the loss of one or more pieces of equipment — gear that would have failed in a real emergency. The KPIX staff says this "weeding out" of marginal equipment is the key to reliability both before and during a crisis.

Every six months, take your station "down" by killing the main breakers at both the studio and the transmitter. Watch what comes on and stays on and what doesn't, what handles fluctuating generator power and loads and what burns out. Is all the equipment being powered by that precious diesel fuel, such as that digital video effects box, really necessary to keep you on the air, your staff effective and your station looking and sounding acceptable in an emergency?

You can't predict every possible problem or plan every contingency for a future emergency that you can only imagine. However, the San Francisco earthquake of 1989 demonstrates the need to try. Common sense, and a clear sense of urgency, will pay you and your station big dividends when the next disaster strikes.

EBS: Did the system fail?

KNBR-AM is the Common Point Control Station-1 (CPCS-1) in the Bay Counties Operational Area for the Emergency Broadcast System. Within minutes of the October 1989 San Francisco earthquake, both the Alameda County Office of Emergency Services and the San Francisco Fire Department's Central Fire Alarm Station (CFAS) began transmitting on a designated remote pickup (RPU) VHF channel (161.76MHz) to KNBR requesting activation of EBS. The only message that Alameda County wanted to get out on the EBS system was, "All Oakland Fire Department personnel should return to duty," essentially a simple public service announcement. San Francisco city and county CFAS put city hall officials on the air several times, as well as San Francisco Mayor Art Agnos (with the same announcements in multiple languages) and California Lieutenant Governor Leo McCarthy, who was acting governor at the time.

According to broadcast engineers in charge of responding to EBS, the San Francisco Office of Emergency Services had no idea what the EBS was or how to implement it. No one at the San Francisco CFAS gave the EBS authorization code to activate the system. In the first minutes of the crisis, communications from government agencies to broadcasters were garbled or non-existent. KNBR's engineering manager, Bill Ruck, helped keep EBS going with much impromptu work, because City Hall was having trouble using the system.

Fortunately, an engineer friend of Ruck's, Mike Newman, who had been working on the fire department's communication system, arrived at San Francisco Fire Department headquarters and began transmitting fire department information to KNBR on the RPU. Ruck, who was on his way to the transmitter site, heard Newman's transmissions but realized the CFAS had not given the authorization code. He got on the 2-way radio to KNBR and told the staff to accept as valid any of Newman's information. The CFAS picked up the cue, and Newman and Ruck worked together through the night to make sure that Mayor Agnos and his staff could broadcast whatever they wanted on the EBS.

A serious engineering problem almost kept this disjointed EBS effort from succeeding. City Hall had an intermittent-duty, 2-way radio with a 90-second timeout timer to prevent burnout of the final stage. The unit is designed to transmit only 10% of the time and receive 90%.

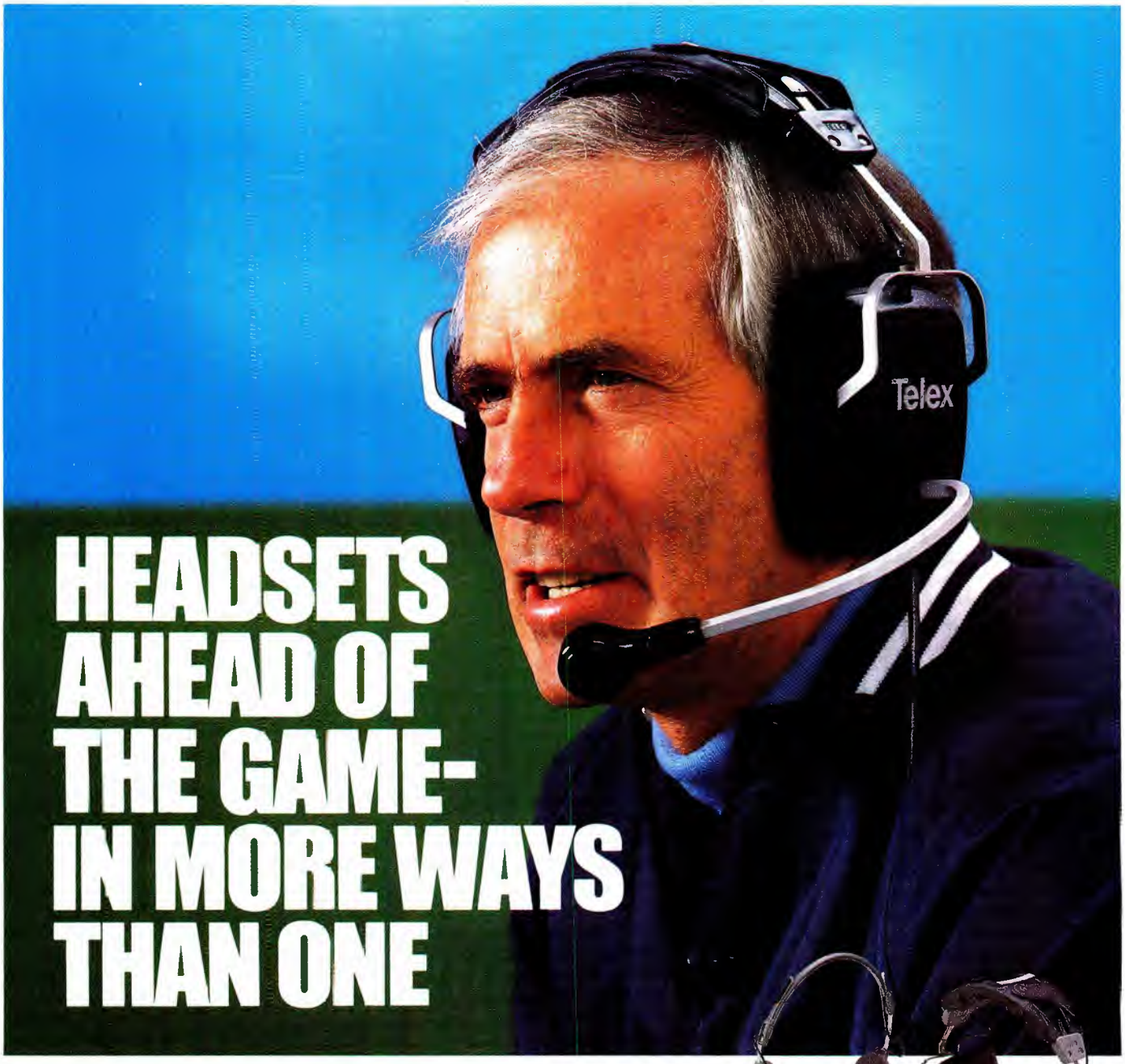
The disaster, however, required transmissions lasting several minutes at a time, including long statements from officials in several languages, including Spanish, Chinese and Tagalog. The little radio finally burned out. About 8 p.m., three hours into the disaster, Ruck took a heavier-duty Marti transmitter from KNBR, drove to the CFAS, climbed its tower in nearly total darkness, hung an antenna, ran coaxial cable into the building and set up the replacement rig for the city's use for the duration of the crisis.

How EBS is supposed to work

EBS is a chain. In an emergency, civil officials are supposed to activate the system by contacting the local CPCS-1 station — KNBR in San Francisco for the Bay Area — by 2-way radio on a reserved frequency. All other stations constantly monitor the CPCS-1 with special EBS receivers. When civil authorities or political entities activate the system to issue emergency orders for public safety, such as safety warnings, curfew or evacuation announcements, the CPCS-1 emits tones over its normal broadcast carrier. The tones trigger alarms in EBS receivers. The EBS receiver unmutes and begins providing CPCS-1 audio.

At this point, station managers open their Authenticator Envelopes containing the EBS validation code. There are "participating" and "non-participating" stations. The EBS directive in the envelope of a non-participating station during a Federal emergency states, "Leave the air now." The public then is compelled to retune to "official" stations receiving news from government officials.

During a state-level emergency, such as an earthquake, a non-participating station can either rebroadcast CPCS-1 audio or relay official instructions using its own station personnel. The participating radio and TV stations may be instructed to cease regular broadcasts and



HEADSETS AHEAD OF THE GAME- IN MORE WAYS THAN ONE

For coaches and broadcasters alike— the pros pick Telex.

On the football field and in the broadcast booth high atop the stadium you'll find Telex Headsets are the choice of the pros. National Football league stadiums and major television networks use a variety of Telex Professional Headset models day-in and day-out.

Furthermore, thousands of colleges, high schools and local radio/television stations who have recognized the value of clean, clear, dependable communications are also using Telex. If you're not already using a Telex, we urge you to take a closer look next time you have a requirement.

A model for every purpose. Whether your need is communication, camera, sportscaster, studio announcing or inconspicuous on-camera listening, Telex has a model that will fit your requirements perfectly. No other headset manufacturer has the tremendous model variation Telex offers.

Lightweight, full cushion, single sided or dual, boom mic or monitor headsets are all fully described in the latest Telex Headset Catalog. Full specifications are included and the catalog is free. Call or write today: Telex Communications, Inc., 9600 Aldrich Avenue South, Minneapolis, Minnesota 55420.

TELEX®

Circle (60) on Reply Card

to begin relaying CPCS-1 audio. TV stations put up a slide or crawl indicating the nature of the emergency.

Does this system serve the public, or are today's news organizations so effective that people are better served in an emergency with a wide choice of news and information sources? During the emergency in the Bay Area, not one broadcaster carried KNBR's signal or even aired taped excerpts of announcements that the station broadcast from City Hall. Radio and TV stations running news and continuous coverage got their information and sound bytes through their own sources and via wire service audio and satellite video. Also, in the first few hours of the crisis, all three EBS stations — the CPCS-1 (KNBR) and the two backup CPCS stations, KCBS-AM and KGO-AM — went off the air at one time or another.

Engineers comment on EBS

If you talk to Bay Area broadcast engineers about the Emergency Broadcast System and how it worked, or didn't, after the earthquake, some heated discussion ensues, much of it unprintable. Because of the controversial nature of this topic, most engineers asked not to be named, but did want to express some thoughts about the EBS system. Here are some sample comments:

"In San Francisco on Oct. 17, the EBS system failed."

"I thought it was good that they (EBS) were nice and quiet and stayed the hell out of the way."

"The news media scrambled and did a much better job than any official information system could ever do."

"EBS is a political problem, not an engineering problem."

"Since EBS was originally a national system, no one has decided who at the local level can activate it. Should it be the mayor of San Francisco? How about the mayor of Sausalito or the city manager of Huckleberry? Government officials who activate the EBS had better be sure that they're serving the public better than the stations with their own news and information they are taking off the air."

"EBS is an antiquated holdover from the old CONELRAD system, which EBS replaced in the 1960s. On any level — local, state or federal — it's a concept whose time has passed."

"EBS is totally outmoded. The local stations did a wonderful job of keeping everyone up-to-date. The state people admitted that they wouldn't have been able to tell us anything anyhow."

"The system is designed for early warning, not for emergency management. We need a whole new emergency system to meet our information needs today."

"The California state Office of Emergency Services administrates EBS. One of the most important decisions they make is where they're going for lunch."

"Most municipal officials in charge of emergency planning don't even know that KNBR exists. Many think that KCBS is the EBS Common Point Control Station-1."

"There is no video component for EBS. KNBR radio is supposed to feed both radio and television. Why is this? We certainly have affordable technology for video EBS."

It's 5:53! Where's Charlie, Jim and Jane?

There's nothing to worry about. AutoCam's™ ACP-8000 has control.

Repetitive and boring manual camera control is eliminated. AutoCam's ACP-8000 menu driven touch screen control easily learns and reproduces precisely and consistently all camera shots and floor positions. Now, experienced personnel can accept more challenging and rewarding assignments.

An example of AutoCam's power: After the opening Anchor stories on the 6 o'clock news, cameras 1 and 2 are easily relocated to the Weather desk during a 2 minute video. After Weather, cameras 1 and 2 are quickly repositioned to Sports during a 30 second break...then all 3 cameras return to the Anchor desk to close the show. Preset camera shots, floor positioning and cable management are performed easily and automatically with the HS-110P Pan/Tilt head and the SP-200 servo pedestal with X-Y base.

The proprietary X-Y base guidance system repositions the cameras within an 18 arc second rotational error. As the cameras are moved from position to position, there is zero cumulative error. Its sophisticated locating and collision avoidance system eliminate the need for rails or studio floor grids. If desired, AutoCam's manual control mode can be initiated at any time.

The AutoTrak™ talent tracking option maintains accurate framing of the Anchor even on tight head and shoulder shots. An essential operating requirement with key shots.

AutoCam's newsroom computer option gives the news director quick access to all camera resources. Scripted stories with all camera moves are automatically played via the ACP-8000 newsroom computer story list. Last minute changes are executed quickly and smoothly.

AutoCam can provide you with the most efficient communication link between your director and your on-air product. And, its reliability and sophisticated moves improve your on-air image. Call for a proposal and demonstration ...now.

TSM

TOTAL SPECTRUM MANUFACTURING INC.
709 Executive Blvd., Valley Cottage, NY 10989
914-268-0100 FAX: 914-268-0113

Circle (65) on Reply Card

The roots of the Ennes Foundation

By Bob Van Buhler

Some members may not understand fully how the Ennes Foundation relates to the Society of Broadcast Engineers. Simply put, it is the organization's educational arm, a separate incorporated entity, with officers and board members. Although the foundation functions with its own charter and purposes, its goals align closely with those of the SBE.

Ennes Foundation roots

The foundation was incorporated in 1986, during the presidency of Richard Rudman. The incorporators were past presidents Rudman, Roger Johnson and Jim Wulliman.

Today, the Ennes Foundation is administered by Wulliman, the executive director. It regularly awards scholarships with its own funds and also supports the Harold Ennes Scholarship, a long-standing project of the SBE.

The Ennes Foundation operates the society's certification program by carefully maintaining its credibility and relevance to the needs of the broadcast industry. Under the Ennes umbrella, technicians and engineers are certified from entry level through a full range of categories, indicating the degree to which they have mastered the art of broadcast engineering.

Broad goals that benefit the industry, such as the recruitment of women and minorities into broadcasting, are addressed in the Ennes Foundation's stated purposes. These goals are accomplished through arranging internships, accrediting college programs for certification and awarding scholarships.

Recently, the foundation conducted a study of the curriculum at the Armed Forces Radio and Television Service (AFRTS) program at Lowery Air Force Base, Colorado. As they increase their level of skill and progress in experience, AFRTS people will receive certification points. Other schools interested in beginning broadcast internship or certification programs should contact the Ennes Foundation.

The foundation also oversees and conducts technical workshops, such as those at the SBE National Convention and **Broadcast Engineering** Conference in October. The well-attended workshops were so successful that officials are planning another slate of sessions to be presented at this year's convention.

Important original resources for the study of radio and TV technology were the books authored by the late Harold E. Ennes. One of the goals of the foundation is to republish those textbooks.

Certification stats examined

The recent addition of the SBE professional broadcast engineer category has provided interesting information on the differing paths engineers have taken to attain this status. At the time of the national convention, 129 engineers had been upgraded to SBE-certified professional broadcast engineers.

Of these, 47 were upgraded from original grandfather status. Those engineers were certified in 1975-76, prior to examinations. A total of 39 broadcast technologists, broadcast engineers and tested senior broadcast engineers were upgraded to 20-year status. Another 43 engineers were inducted directly to the SBE professional broadcast engineer category of certification.

The requirements to obtain SBE professional broadcast engineer status are stringent. A candidate must have at least 20 years of professional broadcast or broadcast-related engineering experience in radio or television; demonstrate experience in maintenance, systems design, management or supervision; and show evidence of continuing education.

Candidates must be sponsored by a certified professional broadcast engineer or senior broadcast engineer and have a letter of reference from a certified professional or senior broadcast engineer. Also, each candidate must present a letter of reference from at least one person who has supervised his or her work.

The rules will change, effective Dec. 31, 1990. After this date, an applicant can be upgraded to an SBE-certified professional broadcast engineer only by advancement from senior broadcast engineer status. Applicants also must successfully complete an examination.

As of October 1989, a total of 4,402 engineers and technologists had been certified. This breaks down as follows:

- 1,500 grandfathered engineers.
- 1,232 tested broadcast and senior broadcast engineers.
- 1,541 broadcast technologists.
- 129 professional broadcast engineers.

New certification level

At the other end of the spectrum are the operators, a group that has not been addressed since the demise of the FCC third-class operator's license. The certification committee is developing a training guide and examination for these operators.

The committee is seeking help in developing questions for the examination. If you would like to suggest questions, remember that both radio and TV issues are important. Although there are common elements, such as transmitter operation, the job skills and demands on a TV master-control operator are much different from those of a radio operator. These differences must be reflected in the test questions.

If you're interested in helping, write to Jim Wulliman, Ennes Foundation executive director, at the national office, or call him at 602-648-1250.

Certification software

The computerized study guide demonstrated in the SBE booth at the national convention was popular with attendees. The software was modified later, based on convention survey results.

The interactive program tests and scores the results. It then provides answers to the types of questions typical of the certification tests. The first DOS version of the software will be ready for sale in time for the NAB convention in Atlanta this year.

Van Buhler is manager of engineering at KNIX-AM/FM, Phoenix.

Editor's note: For additional SBE information, !GO BPFORUM on CompuServe.

HDTV (round 8) the big news at SMPTE

By Jerry Whitaker, editorial director

As if the questions surrounding high-definition television weren't confusing enough, yet another system has been added to the long list of proposed technologies. At the 131st SMPTE technical conference and equipment exhibition, held Oct. 21-25 in Los Angeles, Eastman Kodak Company proposed the development of a high-resolution electronic intermediate system for motion-picture film.

In the keynote address, J. Phillip Samper, Kodak vice chairman and executive officer, urged SMPTE members not to limit filmmaking as an art form for the sake of implementing new technology. Samper lauded work done by the technical society in establishing standards and providing a forum for the exchange of ideas. However, he urged attendees to put the art of making movies for theaters and television ahead of the evolution of motion imaging. The message he delivered to attendees was clear: The film community, as seen by Kodak (the major film supplier), is not satisfied with the high- or advanced-definition video systems proposed to date.

"The 1,125/60 HDTV format introduced in 1981 is intriguing and laudable, but significant interaction with the creative community is necessary before any high-definition standard can become viable," Samper said.

Samper announced that Kodak is developing a high-resolution *electronic intermediate system* for motion-picture film. The system would be used to convert 35mm film to digital data for subsequent manipulation at an image-computing workstation.

"Initially, the electronic intermediate system would be used by visual effects specialists," Samper said. "It would allow them to take advantage of advances in digital imaging technology without compromising image quality or altering the *film look* that audiences prefer." The system also would allow for the conversion of digital images back to 35mm for theatrical release.

Samper painted a bright picture for a marriage of film and very-high-definition video. He forecast a vigorous theatrical film industry with the possible return of 70mm wide-screen movies and the rapid evolution of improved sound systems.

But here is the best part. Samper called on SMPTE to begin standardization work on the electronic intermediate system. This call comes less than a year after the American National Standards Institute (ANSI) rejected SMPTE's 1125/60 HDTV standard (240M). Whether the society wants to wade into the high-definition pool once again is the subject of some debate within the organization.

The Kodak plan

According to Joerg Agin, vice president and general manager of Kodak's motion picture and audio-visual products division, the electronic intermediate system would operate transparently between film input and film output without compromising image quality. The system consists of four basic hardware components: a high-resolution film scanner, image-computing

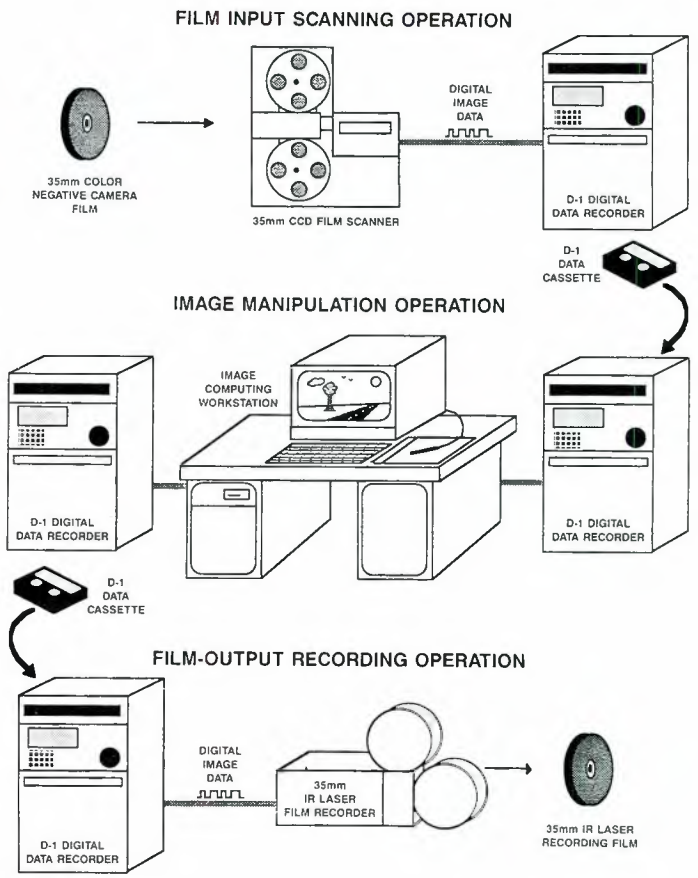


Figure 1. Three primary elements of the electronic intermediate system *proposed by Kodak at SMPTE.*

Everything you always wanted in a tube camera. Except tubes.

LDK 910 CCD Studio Camera

What you've always wanted in a tube camera is the best picture possible. But now you get the best picture in a CCD Camera — the new BTS LDK 910. And you'll never miss the tubes. Because the LDK 910 meets or beats the picture quality of tube cameras with a new CCD sensor that employs over 800 pixels per line, and over 406,000 total picture elements.

LDK 91 CCD Portable Camera

In addition to excellent resolution, the LDK 910 has a high signal-to-noise ratio, high sensitivity and accurate colorimetry. Along with a few other things you don't get with tubes. Such as BTS's frame-transfer technology, which eliminates smear. A high dynamic contrast range without blooming or burn-in. And excellent dynamic resolution enhanced by advanced electronic shutter control. It's also ready to shoot when you are — no waiting for warm up.

And here's another reason you won't miss the missing tubes. Not only is the LDK 910 priced competitively with tube cameras, but it costs less than you'd probably spend replacing worn out tubes over the life of a studio camera.

But of course, big ideas also come in small packages. The LDK 91, a lightweight, easy-to-handle ENG/EFP camera, is the LDK 910's portable companion. Singled out by *Broadcast Engineering* magazine as one of the ten "Pick Hits" of NAB '89, it has the same CCD sensor and the same top picture quality as the LDK 910.

Together, these fully compatible CCD cameras will make your old ideas about picture quality go right down the tubes. For complete information and technical specifications on the new LDK 910 and LDK 91, call BTS at **1 800-562-1136, ext. 11.**

BTS
The name behind what's ahead.

BTS is Broadcast Television Systems, a joint company of Bosch and Philips. P.O. Box 30816, Salt Lake City, UT 84130-0816.

Circle (67) on Reply Card

workstation, digital data recorder and high-resolution film recorder. (See Figure 1.)

The first application for the system would be the creation of visual effects, such as compositing image components, including live action, traveling mattes, miniatures, matte paintings, animation, text and computer-generated graphics. Also, the system could be used for color grading, altering contrast and brightness ratios, reducing or enhancing grain to achieve a particular look, removing scratches and dirt, and sharpness enhancement.

Kodak researchers say the electronic intermediate system must have between 2,000 and 3,000 scanning lines per picture height for an Academy aperture 35mm film frame to produce a duplicate negative that matches the original film. This exceeds the resolution characteristics of the 1125/60 HDTV system by a factor of at least two.

C. Bradley Hunt, director of advanced technologies planning for Kodak's motion picture and audio-visual products division, said, "In effect, when 35mm film is transferred to any of the proposed high-definition television systems, the image information is funneled through a low-pass filter, which reduces resolution, color and dynamic range to fit the constraints of the television recording and display devices."

Hunt also pointed out that conventional HDTV systems are required to operate in real time, but not the intermediate system proposed for film work.

"HDTV is a technological breakthrough, but the fact is that it is locked into operating in real time at 30 images per second. ... To construct a real-time video system with all of the image quality of film would require a quantum leap in high-speed image sensors, processing and storage technology."

The system proposed by Kodak is envisioned to process images to and from film at approximately one frame per second.

Film: still kicking

The future of HDTV in the film industry remains uncertain. Film is a superb medium. It is portable, requires very little power, can be strapped to the wing of an airplane, can be edited on a flatbed that you can rent on any street corner in Hollywood, and has a long, long life. Plus, film quality continues to improve. The newest generation of 35mm films are able to take maximum advantage of natural light, which has many practical and artistic benefits. Further improvements in sensitivity, image sharpness and grain are likely in the near future.

Along these lines, Kodak also announced the *Keykode* number system, a film that contains machine-readable edge numbers. The system is being tested on a variety of commercial projects. It is expected to be available to customers within a few months. Keykode data will make it possible to simplify many film-handling and editing operations during post-production.

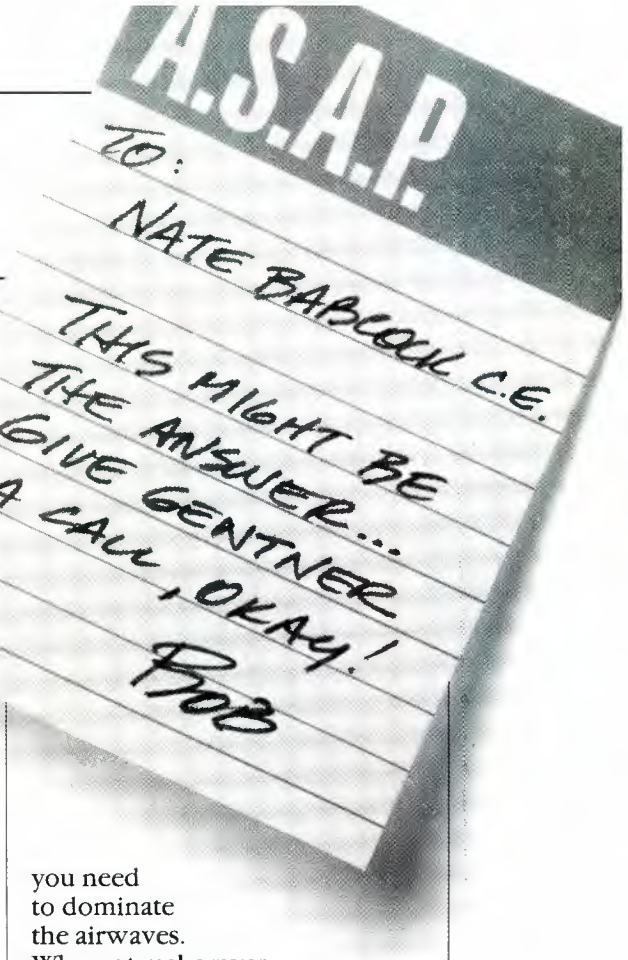
The system also offers new opportunities for the film industry. For example, programs shot on 35mm film today might be re-released in an HDTV format five or 10 years from now. With the Keykode system, the original video edit list could be used to assemble the program directly in the new video format.

In a related move, Kodak and Rank Cintel announced plans to commercialize an experimental CCD HDTV telecine developed by Kodak Research Laboratories, for transferring film to any of the proposed high-definition standards, including 1050/59.94, 1125/60 and 1250/50 HDTV.

Film will continue to be the dominant production medium for prime-time TV

Continued on page 95

What the Audio Prism is doing for ratings in FM, the Phoenix can do for your AM ratings.

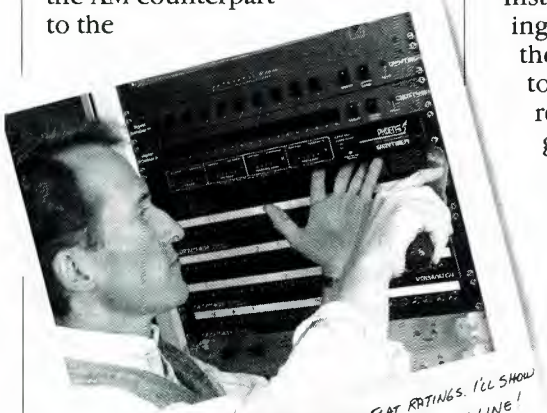


It's no secret. The Audio Prism has been giving FM stations the competitive edge for years. It's a proven commodity in the top 50 markets. And it's rapidly finding its way into middle and small market FM's, providing greater clarity and a stronger, more pleasing presence on the dial.

The Best Kept Secret In AM Broadcast.

With the Audio Prism setting records like it has, we're a bit surprised how little people really know about the Phoenix. It's the AM counterpart to the Audio Prism and does an equally credible job of getting your signal out there, loud and clear, right to the fringe.

The Phoenix delivers a smooth crisp sound that cuts through traffic noise, knocking engines and baby's screaming in the back seat. If listeners are what you're looking for, the ones that tune in and stay with you all day, you owe it to yourself to listen to the Phoenix.



RIGHT TALENT, TIGHT PROGRAMMING, FLAT RATINGS. I'LL SHOW 'EM WHAT ENGINEERING CAN DO FOR THE BOTTOM LINE!

It's Smooth It's Digitally Controlled. It's Easy To Operate.

Don't let the flashing array of LED's throw you. They're there to keep you posted on how the Phoenix is working. And, it does work well.

With the same digital control that has made the Audio Prism almost a household word, the Phoenix makes over-processing a thing of the past. Our motto: *If it ain't broke, don't fix it.*

Instead of constantly compressing and expanding your signal, the Phoenix is smart enough to leave well enough alone, relying on its digital intelligence to know when not to process. The result: your station will "hit the streets" with greater power and clarity than ever before.

An Added Benefit, Full NRSC-1 Compliance.

Maybe you can afford to wait until next June to meet NRSC-1 standards, maybe not. The Phoenix complies with the new standard today and gives you the punch you need to dominate the airwaves.

Why not make your move today, then sit back and celebrate the sweet sound of success. Tell your station manager it sounds a lot like a cash register, only louder.

Hearing Is Believing.

Give us a call, we'll put you in touch with your Gentner dealer. They'll give you complete product specs and arrange for you to put the Audio Prism, the Phoenix or both to the test. Hook 'em up, head for the country and listen to the difference.

HERE'S TO THE PHOENIX, NRSC-1 COMPLIANCE AND BETTER RATINGS!

GENTNER

Gentner Electronics Corporation
1825 Research Way
Salt Lake City, UT 84119
(801) 975-7200
Fax: (801) 977-0087

Call me, I'm interested. Circle 70 on reply card.
Send literature. Circle 71 on reply card.

SBE: Labcoats to laptops

By the *BE* staff

Outstanding might best describe the 1989 SBE convention. More than 3,000 attendees and exhibitors joined forces in Kansas City, MO, to create the most successful SBE show to date.

Many elements combined to make the show a winner. From the well-attended reception on Thursday night to the full-house banquet and entertainment on Saturday night, the convention planners showed that they knew how to make attendees and exhibitors happy.

The 25th anniversary logo and lighted arch signaled the entrance to the exhibit floor.

This year's scheduling was designed carefully to meet the needs of both attendee and exhibitor, allowing exclusive time for seminars and exclusive time for exhibits. The non-overlapping scheduling was greeted with enthusiasm by both factions.

The Thursday night reception combined refreshments, live entertainment and hardware in a casual setting. What more could an engineer want?

Labcoats, laptops and lapel pins

The white coats are coming, the white coats are coming! Friday's luncheon flaunted a new look: white labcoats sporting the special SBE 25th anniversary logo. The coats were provided to attendees complete with lunch, drink and dessert. One engineer remarked that it looked more like a hospital than an engineering exhibition.

It paid to stay until the show's end because prizes were awarded daily on the exhibit floor. The featured prize was a Zenith laptop computer, which was given away at the Saturday night banquet. Other prizes were awarded at the ham reception, which was sponsored by Fidelipac.

Special commemorative lapel pins were presented to those who attended the Saturday night banquet. The pin was designed by **Broadcast Engineering** graphic designer, Stephanie Swail. A unique pin design for each convention will become an SBE tradition. The original pin now promises to become a collector's item.

Ennes workshops

Convention activities actually began on Wednesday, the day before the official opening of the show. Special Wednesday workshops were conducted by the Ennes Foundation. A total of eight workshops were coordinated by Don Borchert, director of engineering at WHA-TV, Madison, WI.

Six of the workshops were presented by equipment manufacturers. The sessions provided hands-on, equipment-specific training. In these sessions, everything from transmitters to graphic systems to test equipment was on hand and operational for the training. The workshops allowed manufacturers to train potential and current owners on the maintenance and operation of their hardware.

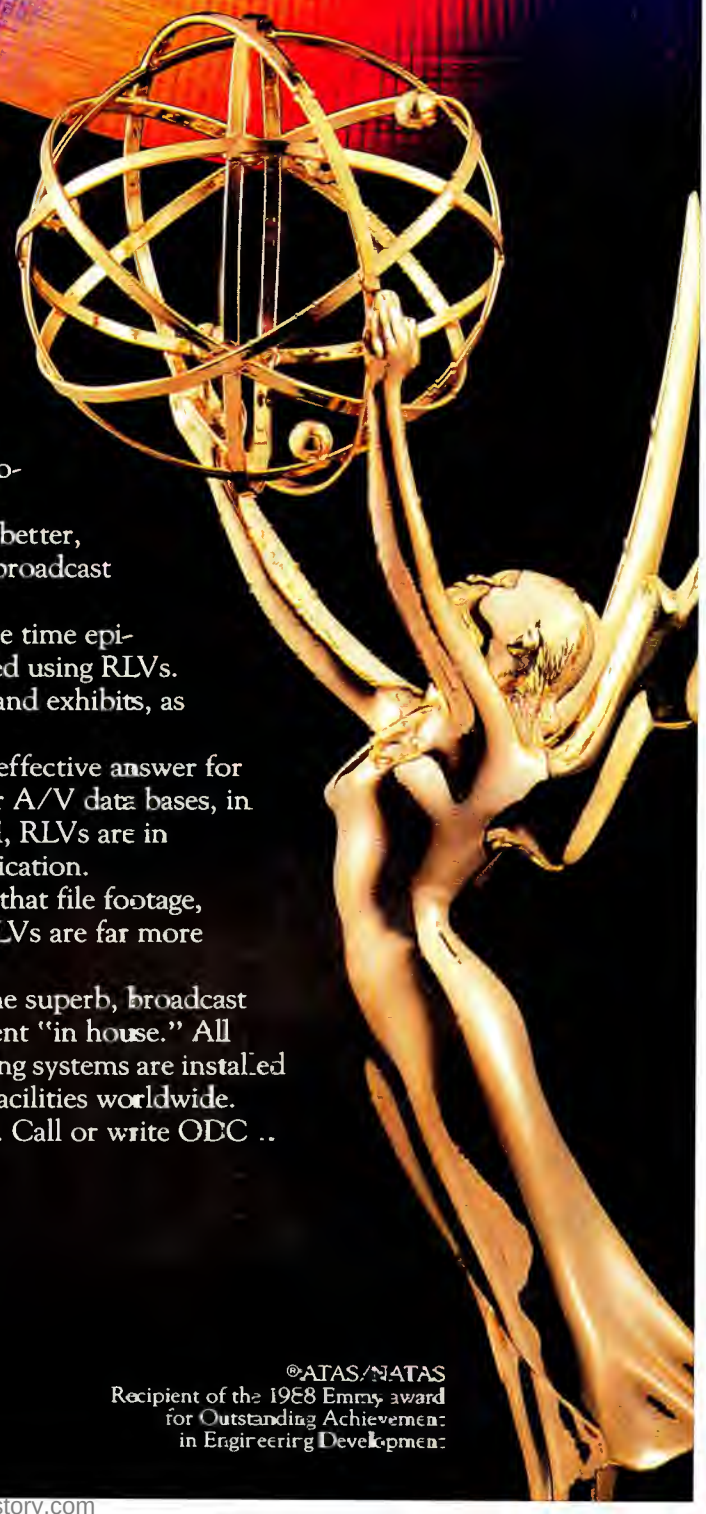
Having the working hardware in the sessions allowed the simulation of sample problems. The sessions were designed to condense into a single day, the same training an engineer might receive at a factory school.

The two other sessions, AM/FM antenna systems and management for engineers, rounded out the Ennes work-

New products kept attendee interest high and the exhibit floor traffic brisk throughout the convention.

FEATURED NOW AT A FACILITY NEAR YOU...

THE RLV.



The power, versatility and future of the laser videodisc has never been more evident.

The RLV Recordable Laser Videodisc from ODC is making the difference in an ever growing number of commercial, corporate and government video facilities.

It's because ODC's LaserVision industry standard RLV is a better, faster and more cost effective way to record, store and access broadcast quality video.

- **Prime Time Editing with RLVs**—Nearly half of all prime time episodic programs, plus many feature films and spots, are edited using RLVs.
- **Shows and Exhibits**—A/V presentations at trade shows and exhibits, as well as videowalls, are naturals for RLVs.
- **Corporate and Interactive Video**—The RLV is the cost effective answer for low volume use in business, government and education. For A/V data bases, in large random access libraries where confidentiality is critical, RLVs are in demand. RLVs can even act as a source for ½" and ¾" duplication.
- **The RLV in Broadcasting**—Broadcasters are discovering that file footage, station IDs, graphics libraries and commercials stored on RLVs are far more practical and easy to manage than expensive tape systems.

The RLV is both a technical and commercial success. Imagine superb, broadcast quality videodiscs recorded and available for you and your client "in house." All accomplished with surprisingly low media costs. ODC recording systems are installed at leading edge commercial, government and corporate video facilities worldwide.

The RLV is the technology of the future. But it's here today. Call or write ODC .. and let us prove it.

OPTICAL DISC CORPORATION

Optical Disc Corporation
17517-H Fabrica Way, Cerritos, Calif. 90701
(714) 522-2370 Fax (714) 670-9356

shops. The antenna session, coordinated by consulting engineer Don Markley, was filled to overflowing. The management session was presented by Brad Dick. Companies presenting workshops included: Ampex, Broadcast Electronics, Grass Valley/Dubner, Harris, Mitchell/Vo-Tech and Sony.

Outstanding seminars

Continuing his tradition of top-quality seminars, John Battison assembled four days of speakers and sessions. The sessions lasted all day Thursday, Friday and Saturday, concluding with a half-day session on Sunday.

Broadcast engineers need to be kept up-to-date on the industry, and Thursday's opening sessions did just that. Issues ranging from the entry of the telcos into signal transport to broadcasting's future were debated before a full house.

Tony Farry, Bell Atlantic, discussed ways broadcasters and telcos can cooperate. He noted that, instead of it being a win/lose situation, the broadcaster can benefit from the telephone companies' offer of a direct link into the homes of their audiences. In addition, because of the increased bandwidth, broadcasters can seek additional markets through new products.

Farry described his company's progress in replacing copper telephone cable with fiber. He noted that Bell Atlantic is upgrading 72,000 miles of copper with fiber every year. In Washington, DC, and Pittsburgh, 80% of all offices are connected with fiber.

The opportunities for broadcasters are tremendous, he said. An 8-city trial of a switched network distribution system organized by Bellcore was scheduled to begin in late 1989. He predicted that the test was just the first example of what could be done with fiber.

The engineering audience remained suspicious about the telcos' call to share opportunities. Some complained about already-high prices. Farry said that he had no immediate solutions to the prohibitive prices some broadcasters now find when seeking audio transport.

Wally Johnson, of Moffett, Larson & Johnson, reviewed an issue dear to the hearts of many broadcast engineers: regulation. He noted that deregulation has not stopped, although the pace of change seems to be lessening. Johnson cautioned engineers, however, that the quality of AM service has again begun to diminish. The

The SBE convention is unique in that the booths are staffed by engineers and technical representatives. Here, several attendees wait their turn to try a hands-on demonstration with working hardware.

Session rooms were packed to standing room only for the entire four days.

The Saturday night banquet was the highlight of the convention's celebration. The event was complete with awards, prizes and entertainment.

issue concerns more than just signal interference. Johnson noted that the land on which many AM transmitters are located is worth more than the stations themselves. Such situations make it difficult to justify continued operation.

Other Thursday sessions included discussions on automation, EBS and hardening broadcast facilities. Based on attendee response, the Thursday papers got the convention off to a fine start.

Sessions continued through Sunday morning. The Friday morning sessions, which began at 8 a.m., ended at 10 a.m. when the exhibit floor opened. The sessions resumed at 3 p.m. and continued until 6 p.m. Concurrent radio and TV sessions were held both Friday and Saturday. Night-owl sessions were held Thursday and Friday evenings.

Attendees, eager to witness the latest in broadcast equipment, strain for a better look at this booth's offerings.

SBE's first president, John Battison, and current president, Brad Dick, celebrated the society's 25th anniversary with a large birthday cake.

Saturday banquet

The Kansas City convention provided the attendees with several firsts. The Saturday night banquet, a first-class event, complete with entertainment, was perhaps the most talked-about. SBE Fellowships were presented to past president, Jack McKain and past vice-president, Bob Van Buhler. The featured speaker was Lex Felker, former chief, Mass Media Bureau, FCC. He addressed the audience on the importance of HDTV to broadcasters.

Another high point of the evening was the celebration of the society's 25th anniversary. A special anniversary cake was cut by the first SBE president, John Battison, and the current president, Brad Dick.

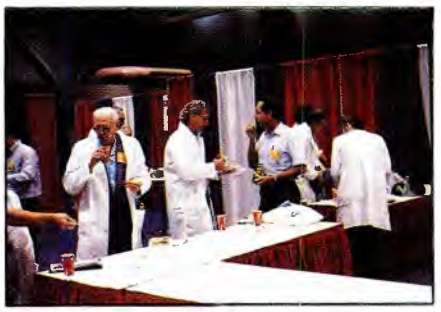
A laptop computer was given away to winner Dave Sawyer, C.E. at KIUL-AM, Garden City, KS. To be eligible to win, attendees were to visit exhibitors' booths and have their bingo cards stamped. Once the cards were filled, they were deposited in the entry box for the drawing. Sawyer

went home wiser from attending the sessions, but also richer with the Zenith laptop computer.

The banquet culminated with entertainment provided by comedian Calvin Coolidge, a fifth cousin to this nation's 30th president of the same name. He was well-received and completed his act to a standing ovation. Dick said Coolidge was chosen to entertain at the banquet because he "wanted to show everyone that engineers can have fun too."

Kudos all around

It was no secret that some stood on the sidelines waiting to see whether the 1989



The white labcoats proved to be a big hit among attendees. The coats went to those who attended the Friday exhibit floor luncheon.

SBE convention could rebound from last year. It did. The only ones unhappy after this convention were the exhibitors and attendees who stayed home.

Both exhibitors and attendees greeted the new exclusive scheduling of seminars and exhibit time with enthusiasm. The schedule allowed the attendee to devote attention to the technical sessions, knowing that plenty of time was reserved for the exhibit hall. Exhibitors knew that when the hall was open, there would be plenty of traffic. An additional plus was that the scheduling provided the opportunity for exhibitors to attend the seminars. The same formula is planned for next year in St. Louis.

The organization's first members were honored with a special "charter member" lapel pin. Here, Battison awards a charter member pin to consulting engineer, Vir James.

Planned success

The event was planned carefully to provide attendees with three important features. First, the convention provided topical and useful seminars — the kind of information not always available at other shows. Second, the convention provided a venue where exhibitors and attendees could assemble to discuss equipment and station needs. Also, the SBE convention combined everything into a first-class, cost-effective and fun package.

The formula worked. The show received a positive rating from more than 92% of the attendee survey respondents. According to the attendee survey, more than 83% of those who attended in 1989 plan to attend the St. Louis show next year.

SBE officials already are planning for a repeat of the 1989 success. This year's convention will be in St. Louis, Oct. 4-7. For more information on the SBE convention, call 317-842-0394.

The SBE booth usually was packed with members vying for information and a chance to try the new certification computer software.

Proceedings for sale

The *SBE Proceedings* was presented to each attendee as a part of the registration fee. This year's *Proceedings* contains most of the papers presented and runs about 300 pages. The book has become a must-have tool for many engineers throughout the country.

Limited editions of *Proceedings* from previous years (1986-1988) are available from the SBE national office. Contact the national office for more information.

Continued from page 48

Up in the sky

The 2GHz microwave signal is received by the hemispherical antenna attached to NOMAD, then block-converted to a VHF frequency in the 230MHz to 350MHz band. This signal is then passed through a line driver and coupled to an RG-59U coaxial downlead. The other end of the downlead is attached to the ground station, where the downconverted VHF channels are split off from the command signals and dc on the cable, and then upconverted to their respective 2GHz microwave frequencies. Each signal is then demodulated by a standard microwave receiver.

The baseband signals are then routed to one of three triax modulators at the ground station, from where they travel to the base station in the mobile support unit. From there, the signals are demodulated back to baseband video and audio.

In the opposite direction (production unit to camera), the director's audio, camera command and vertical-locking signals are combined, then multiplexed in the triax base station, and sent to the ground station, below the balloon. The ground station may be as far away as 5,000 feet from the golf support unit. This allows flexibility in choosing balloon launch sites.

At the ground station, the command data modulates a low-frequency subcarrier, combined with the director's audio and the dc power source, and sent up the coaxial cable to the NOMAD. The dc is split off and used to power the NOMAD. The audio and data signals are then transmitted over the 950MHz command frequency, to the receive antennas on the golf carts.

On the cart is a 950MHz receiver where the audio and data signal are demodulated and routed to the triax base station, and sent to the camera adapter. At the adapter, the data and director's audio are separated and sent to their respective circuits.

Gen-lock is achieved in two stages. A vertical lock signal is derived from the blackburst reference and is transmitted by embedding a frame rate pulse in the control data, which is sent to the camera on the 950MHz command link. Horizontal and subcarrier lock signals are derived in the triax base stations from the incoming reference.

Simple, really

Although this system seems technically complex, it has the advantage of requiring no special training on the part of the operators. The camera is a standard triax hand-held familiar to virtually every camera operator. No special peripheral equipment must be added to the camera operator's load, an important consideration during long, hot tournaments in August. The golf carts offer unlimited mobility, getting to difficult locations quickly, and transporting personnel to safety during sudden thunderstorms. The balloon package requires a single downlead, and can be simply raised or lowered by a power winch. If a crane is used, operation is simpler still. All system interconnects are made via commonly used triax cable, reducing setup time.

Effects audio, communications, tally and camera control are all maintained by wireless signal paths. Frequency conservation is achieved by using only one 950MHz channel for command of all three cameras.

Acknowledgments: The author would like to thank Don Brown of the ABC RF operations department, who led the design and development effort on this project, and who contributed his technical expertise to this article.

Continued from page 86

programming and commercials, and Rank Cintel and Kodak said the product will fill an evolving market need as HDTV finds its way into the homes of consumers.

Show stats

The theme of the conference was "Technology and Tradition — Partners in Progress." The technical program included 179 presentations in 23 sessions. All-day tutorial sessions on digital technology also were held. To complement the technical program, panel discussions were held on a variety of related subjects. Throughout the show, the SMPTE ad hoc group on high-definition production colorimetry demonstrated pictures produced using the colorimetry parameters specified in document SMPTE 240M.

The equipment exhibit was sold out — 259 companies from around the world displayed their latest equipment. The 85,000-square-feet exhibit was held in the Los Angeles Convention Center. Despite an attractive technical papers program and a floor full of equipment, attendance was light. Overall, most exhibitors were disappointed by the numbers of attendees. (See the *Editorial*, page 6.)

SMPTE opened the conference with a special presentation commemorating the centennial of the moving image. The presentation was hosted by the Hollywood section of SMPTE and the Academy of Motion Picture Arts and Sciences (AMPAS).

Kodak presented a screening of *Pieces of Silver*, a 7-minute theatrical short feature, which celebrates the 100th anniversary of film. The program is a collage culled from thousands of movies, TV programs and commercial images produced during the past 100 years.

The motion-picture industry can trace its roots back to 1889 when George Eastman provided Thomas Edison with the film he needed to complete development of an experimental motion-picture camera and projector.

Honors and awards

SMPTE recognized 22 people for outstanding service and technical achievements at the honors and awards luncheon. Honorary membership, the highest grade of membership and the greatest distinction the society can confer, was granted to Roger Ross and Walter Brunch, both industry consultants. Honorary membership is granted to pioneers whose contributions, when examined through the perspective of time, represent a substantial step forward in the recorded history of motion-picture and TV arts and sciences.

Actor Karl Malden, president of AMPAS, was the guest speaker at the luncheon. He thanked SMPTE for its continued work in improving the science of motion pictures. He challenged members to make technology a transparent window through which writers and actors can entertain their audiences.

Fourteen members of the society were elevated to the grade of Fellow during the convention. A Fellow of SMPTE is at least 30 years of age and has, by proficiency and contributions, attained an outstanding rank among engineers or executives in the motion-picture, TV or related industries.

Roger Ross, retired executive of the Canadian Broadcasting Corporation, was the guest speaker at the Fellows luncheon. Ross is the author of two books and many papers and articles on TV film.

All in all, film took front stage at the convention. Video, for a change, took a back seat insofar as the official functions of the society were concerned. It is humbling for video people to examine how the film community makes programming. We can learn a lot from them.

News

Continued from page 4

SMPTE and holds a lifetime general radiotelephone operator's license.

Nationwide fiber-optic TV trials commence

The first field trials of fiber-optic networks for broadcast television has already begun with ABC's transmission of live television from New York to seven cities across the United States at the beginning of December.

Coordinated by Bellcore, the five consecutive trials will use coast-to-coast fiber optic (and, perhaps in the future, microwave) links to test how efficiently network TV studios can broadcast programming to affiliate stations using a land-based alternative to satellite.

Each of the five major TV broadcasters (ABC, CBS, Fox, NBC and PBS) will have exclusive use of the trial networks established between Atlanta, Boston, Indianapolis, Los Angeles, Minneapolis, New York, St. Louis and Washington for up to three months. Approximately 50 TV stations, manufacturers, suppliers, interexchange carriers and exchange carriers are participating.

Conventional TV signals are being transmitted at 45Mb/second (DS3 rate) on these networks. The signals travel over a 2-way, tree branch-like network that permits broadcasters to distribute programming simultaneously to any number of affiliate stations and receive programming from those affiliates individually.

There are five forces that drive the DS3 video trials:

1. The cost of a DS3 channel on fiber is declining as new technology allows more programming and telecommunications traffic to be carried on a single fiber.
2. Fiber availability is increasing. Approximately 300 cities can be connected by fiber optics and are capable of transmitting video at the DS3 rate.
3. Several TV broadcasters are already using DS3 channels, although limited to collection of program footage between two dedicated locations.
4. Availability of space on satellites is limited. Satellites in orbit today are aging and few additional commercial ones are likely to be launched in the near future.
5. There are significant additional transmission advantages, which include near-instantenous customizing of a program's destinations, lack of signal interference, security from unauthorized receivers, multiple simultaneous audio channel capability and the flexibility to make every network affiliate a program source.

Nobody has seen Auditronics' new 900 TV audio console...

but stations are already ordering it.

And if you order now you can receive delivery as early as first quarter 1990.

What distinguishes the new 900 from every other TV audio console is Auditronics' exclusive computer preselect system. Connect the 900 to your house router and you've got instant board access to every audio source. Including 64-scene memory with preview and total recall of previous preselect setups at the push of a button. Neve doesn't have it. SSL doesn't have it. Only Auditronics has it. And our 900 costs considerably less than either of theirs.

Auditronics' new 900 also delivers these unique advantages to the television broadcaster:

- Small footprint of 36″ × 82″ conserves scarce control room space.
- Advanced ergonomics places all controls within easy reach from operator's chair.
- User-defined feature selection lets you order everything you need (and leave out what you don't need).
- Auditronics' legendary 24-year record for ruggedness and reliability stands alone.

Call your nearest factory direct engineering representative today for information on Auditronics' new 900 made-for-TV audio console.

West	Audio Images	415-957-9131
Central	Audio Broadcast Group	616-452-1596
South	GP Enterprises	817-572-0132
Mid-Atlantic	Broadcast Services	919-934-6869

auditronics inc.
3750 Old Getwell Rd., Memphis, TN 38118, USA
(901) 362-1350

Circle (100) on Reply Card

New products

Weather graphics

By Accu-Weather

• **Amiga Graphics software:** upgrade for fast-frame loops from satellite imagery, scripted graphic downloading, full-screen graphics displays; 9,600 baud and improved communications with Front Door unit; operates with The Director and The Director Toolkit software.

Circle (350) on Reply Card

Weather data service

By Accu-Weather

• **National Weather Summary:** service in National Weather Service (NWS) format; highlights major weather events in United States and extremes around the world during the preceding six to 12 hours; accessible at 9,600 baud and 19.2kbaud data rates; replaces part of service discontinued by NWS.

Circle (351) on Reply Card

Audio hard disk recorder

By Alpha Audio Automation

• **DR-2 disk recorder:** Winchester-based digital audio recorder; control system emulates typical 2-track analog recorder; 60-minute, 16-bit stereo capacity at 44.1kHz or 48kHz sampling; time-code capable; RS-422 serial ports connect to editing equipment; subframe job, shuttle and crossfade.

Circle (352) on Reply Card

Production switcher

By ALTA Group

• **Pegasus:** video switcher system in 3-bus architecture, keying with multilevel transitions to four video levels; 8-input with linear or hard key and optional RGB modes; wide Y/C, component capability; optional serial interface to editing controllers.

Circle (353) on Reply Card

Tape storage system

By Ampex Recording Media

• **Hanger caps:** enhancement for storage/rail system for Betacam/SP cassettes; snap-on device with retractable clip also adapts to non-Ampex storage systems; single storage rail holds 33 Betacam shippers or 28 U-matic cassettes; hanger caps increase Betacam storage to 38 units per rail.

Circle (354) on Reply Card

Lavalier microphones

From Audio Intervisual Design

• **COS-11, COS-12:** cylindrical and flat lavalier microphones; highly omnidirectional response in ultraminiature size; COS-11 offers dynamic range of 93dB from 40Hz-12kHz in 4mm×11.5mm package; COS-12 is 2.7mm×6.8mm×13.4mm, with 97dB range over 40Hz-20kHz; produced from joint venture between Sanken and NHK.

Circle (355) on Reply Card

Tape measurement

By Audio Services Corporation

• **Nagra tape timer:** clear, credit card-

PROVEN PROFESSIONALS

If you want to deliver the best, you have to start with the best. And for critical applications like original acquisition, editing, and mastering, you can't do better than Ampex 196 1" master broadcast videotape and Ampex 197 ¾" U-matic and 297 ¾" U-matic SP master broadcast videocassettes. They offer consistent low dropout performance with exceptional high RF output and superior signal-to-noise ratios. So you can depend on every reel, every cassette, every carton to deliver uniformly high performance every time, end to end. All backed by the industry's most acclaimed service and support organization. Surprising? No. It's Ampex.

AMPEX

THE PROFESSIONAL CHOICE

Ampex Recording Media Corporation
401 Broadway, Redwood City,
CA 94063, (415) 367-3809

Circle (86) on Reply Card

sized plastic device, slips over feed reel of audio recorder; allows a quick determination of the amount of time remaining on the reel; calibrated for 1/4-inch tape on 7 inch, 1,200-foot reel operating at 7 1/2-inch/second.

Circle (356) on Reply Card

Video inserters

By Audio-Visuel Systemes (AVS)

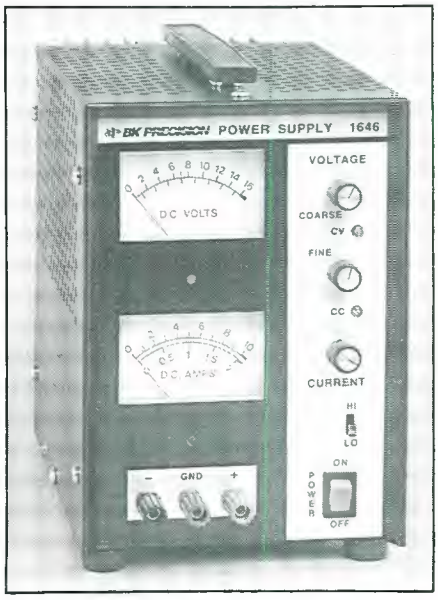
• **S161 series:** superimpose messages and graphics onto video images; meets NTSC, PAL and SECAM standards; several models display message from integral memory or from external data source, symbols or logos, time of day, LTC with user bits or audio VU meter.

Circle (357) on Reply Card

Bench power supply

By B&K Precision/Maxtec Int'l

• **Model 1646:** dc power supply for 10A current maximum overvoltage range of 0Vdc-16Vdc; coarse and fine voltage setting controls; closely regulated output current can be set to a current limit for constant voltage applications; overload/short-circuit, reverse polarity and overvoltage protected.



Circle (358) on Reply Card

Portable terminal

By BASYS

• **BASYS PET:** portable editing terminal compatible with BASYS newsroom computer systems; software for IBM PC or compatible laptop system; portable or remote computer becomes a field extension of the newsroom system.

Circle (359) on Reply Card

Fiber-optical planning

By Bellcore

• **Fiber options:** software for IBM PC; assists in designing cost-effective networks; calculate costs of varying architectures, maintenance; separate modules design network topology, DS3-level demands and network cost calculation.

Circle (360) on Reply Card

High-output microphones

By beyerdynamic

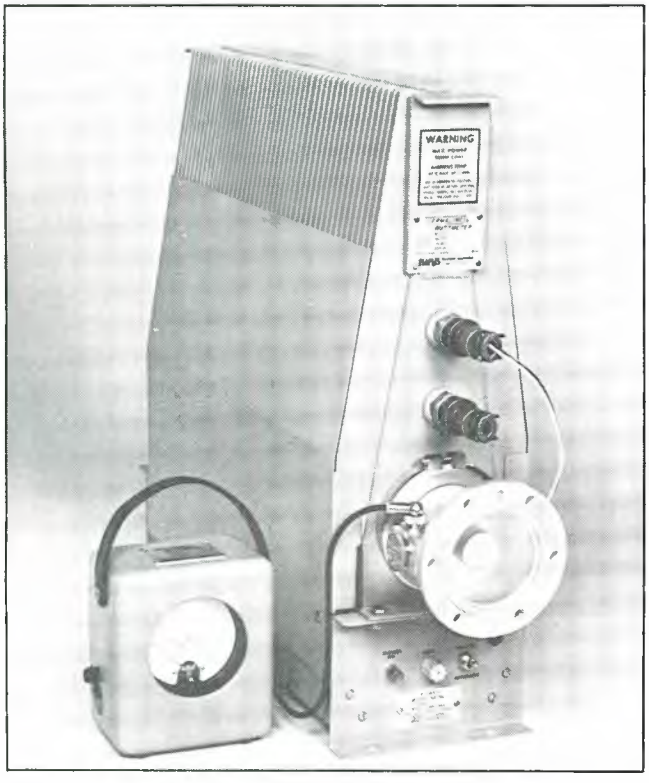
• **TG-X series:** high-decibel output microphones for live concert use; EM-field rare earth magnets (neodymium) achieve high output and transient response with ribbon mic, lighter diaphragm for minimal mass; four models to 140dB SPL levels.

Circle (361) on Reply Card

Absorption wattmeters

By Bird Electronic

• **TERMALINE wattmeters:** high-power ratings from 1.5kW to 10kW over the 54MHz-890MHz frequency range; combined measuring and terminating unit for 50 communications systems; 3 1/8" EIA flanged, unflanged connectors; convection and forced-air types.



Circle (362) on Reply Card

Talent prompting

By Blue Feather Company

• **Featherweight 14:** monochrome teleprompter display weighs 25 pounds with twice the viewing area of a typical 9-inch display; operation compatible with Blue Feather PC-based teleprompting software; package includes universal mounting bracket.

Circle (363) on Reply Card

Editor upgrade

By CMX

• **CMX 300 software:** package includes slo-mo control for dynamic tracking VTRs; fit/fill calculates speed to compress or expand material to fit time slot; auto-split edits; match-cut/match-frame search in EDL; channel assign swaps source, record VTRs; auto-clean removes duplicate edits.

Circle (364) on Reply Card

Safe area generators

By Broadcast Video Systems

• **SA-103:** four independent channels, each programmable for safe action, safe title, center cross, blanking markers, a character slate generator and 10s countdown clock; unit controlled from 16-button keypad.

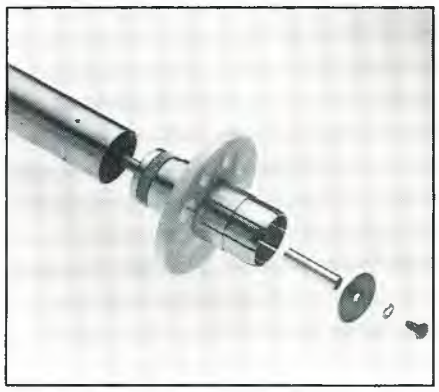
• **Model SA-102:** portable generator in 3×3×7/8-inch box; switch selects crosshatch pattern, safe action and title functions.

Circle (365) on Reply Card

Transmission line connector

By Cablewave Systems

• **Inner connector expansion:** replaces standard bullet anchor inner connector typically used with rigid line-section transmission line; reduces center conductor galling from thermal or other environmentally caused movement.



Circle (366) on Reply Card

VTR emulator

By Cipher Digital

• **Model 4815 Phantom II:** a VTR emulator with protocol conversion, synchronizer and time-code reader functions; editing systems using Ampex, Sony or CMX protocol interface to any parallel interfacing audio or video transport, including newer digital tape and DAT; communication to editing system through RS-422 port.

Circle (367) on Reply Card

Editing enhancement

By Editing Machines

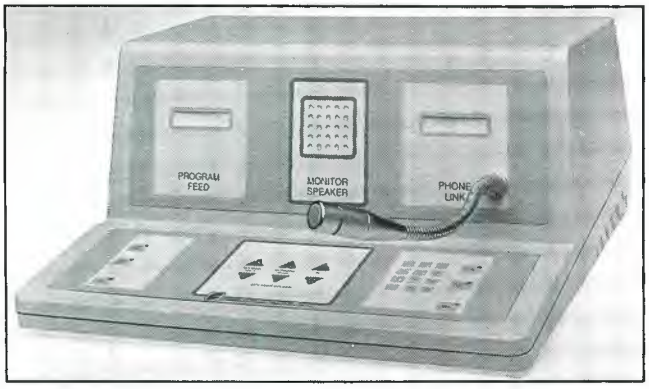
• **30-frame capability:** enhancement allowing editing operator to see every frame of recorded material in digital off-line editing system; upgrade includes a high-speed digital signal processor to enhance image compression and decompression; approximately 1-hour capacity of recorded material can be placed on each optical disk in medium-resolution mode; dedicated keyboard, RT-11 compatibility and expanded list management also available.

Circle (368) on Reply Card

Satellite audio terminal

By Corporate Computer Systems

• **VDAT audio terminal:** digital signal processor provides two full duplex audio paths, one duplex data path on 112Kb VSAT data channel; packaged in desktop console with XLR connectors; designed for radio operations.



Circle (369) on Reply Card

Digital encoder/decoder

By Dolby Laboratories

• **Model 500:** uses adaptive transform coding compression; unit codes two audio channels at 128kb/second per channel, one-sixth that of standard 16-bit linear PCM; dynamic range is not limited; allows two hours of music on 3-inch CD.

Circle (370) on Reply Card

Electronic art system

By Electronic Graphics

• **Pastiche:** electronic graphic art system; 2-D paint and animation, real-time cut-out manipulation; optional 3-D modeling, animation package; 4-D effects mapping, animation module.

Circle (371) on Reply Card

Electronic enclosures

By Equipto Electronics

• **Challenger enclosure series:** vertical rack systems available in two widths, four depths, 32 heights; console units with three slopes; low profiles; 132 standard and nine trim colors as well as custom-color schemes.

Circle (372) on Reply Card

Signal distribution and switching

By ETI

• **M/SAT system:** multiple switching for automated test; model 100 rack-mount controller with model 200 switch racks; 15 switch racks containing 195 modules, control 1,560 circuits; manual or remote-control capability; LCD display of status; model 300 combines control and switching, expanding from six modules to eight racks.

Circle (373) on Reply Card

Cleaning solvent

By Electro Insulation

• **Micro-Care Spec-Clean:** solvent dispenser for a variety of PC board cleaning uses; trigger-activated container supplies solvent through a brush on the trigger-grip activator; non-flammable anti-static solvent is applied directly to area needing cleaning with little waste.

Circle (374) on Reply Card

Voice network analyzer

From HUB Material Company

• **Metro Tel VNA70:** analyzer with multimeter, transmission test-set capabilities; LCD panel displays ac/dc volts, loop current, line polarity, dB level, signal frequency; autoranging with true rms accuracy, −44dBm to 125Vac.

Circle (375) on Reply Card

Video decoders and switchers

By INLINE

• **IN2095, IN2096:** interfaces for NTSC, S-VHS video to RGB+S monitor or video display systems; adjustable color, brightness, contrast levels, hue, peaking controls; can be used with digitizing boards.

• **IN3510, IN3520:** utility RGB+S switchers providing 4-in×1-out or 6-in×1-out; front-panel, hard-wire remote or RS-232 control; 200MHz video bandwidth; selects among various sources to a single projector or monitor.

Circle (376) on Reply Card

Wireless cable and ITFS

By ITS

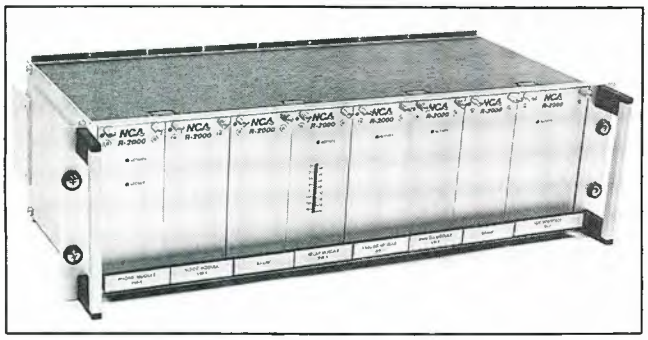
• **1510D, 1610D:** 20W transmitters for MDS and MMDS/ITFS/OFS services; integrated BTSC multichannel sound modulators; interfaces for remote control, telemetry; front-panel status, metering.

Circle (377) on Reply Card

Remote-control system

By NCA Microelectronics

• **R-2000:** transmitter monitor and remote controller; operates on standard dial-up telco line using DTMF touch-tone commands; synthesized voice responses; local LCD display, keypad; 32 inputs, either analog or digital; alarm reporting cycles through four phone numbers until the system receives acknowledgement.



Circle (378) on Reply Card

Audio noise control

By Furman Sound

• **QN-44 quad noise gate:** update of QN-4A unit adds attack control to each channel; low-noise, low-distortion, gain-control element gives simple, direct audio path; each channel discriminates and suppresses low-level noise in signals rising above a preset threshold level; available in balanced or unbalanced configurations.

Circle (379) on Reply Card

Modular utility products

By J.N.S. Electronics

• **The FRAME:** series of A/V DAs, audio monitor amps; 10 modules fit in one rack frame; functions include audio fail sense, stereo presence/validity, program changeover and RF demodulation.

Circle (380) on Reply Card

Speaker systems

By JBL Professional

• **4832A, 4835A:** concert series diffraction monitors; 2-way, high SPL stage monitors using 12-inch or 15-inch low-frequency vented-gap cooling and 2-inch neodymium compression driver with diffraction horn for 180° horizontal pattern; housings are birch ply with fiberglass coating.

• **4688 sub-bass system:** triple-chamber, tuned enclosure uses two 18-inch transducers mounted face-to-face and wired with opposing polarity for push-pull effect; operation down to 25Hz.

Circle (381) on Reply Card

D2 and 601 products

By Leitch Video International

• **DIG-220:** 4:2:2 digital component test generator with 10-bit resolution.

• **STG-2520:** D2 generator with 10-bit resolution in D2 and analog formats.

• **DFS-3020N:** D2 frame symchronizers with D2 input/output and analog outputs.

• **DSM-7150:** digital signal monitor for troubleshooting D2 or CCIR 601 digital signal paths.

Circle (382) on Reply Card

A/V carts

By Jensen Tools

• **Utility carts:** no-maintenance equipment carts, constructed of Duramold; load rating to 400 pounds; 24″W×36″L or 16″W×30″L, both stand 32.5″ high and have an optional middle shelf.

Circle (383) on Reply Card

S-VHS editing VCRs

By JVC Professional Products

• **BR-S811U:** S-VHS format editor; chroma enhancement, crosstalk canceling circuitry; tape-stabilizing head drum eliminates tape vibration, impedance roller controls jitter; rotary erase heads, blanking switcher, framing servo; composite, Y/C inputs/outputs with Y/C-358 and Y/C-629; balanced XLR audio connectors.

• **BR-S611U:** recorder, player without insert edit circuitry; source VCR for editing system; includes enhanced circuitry of BR-S811U for improved fidelity over several generations.

Circle (384) on Reply Card

Digital audio editor

By Lexicon

• **Lexicon Opus/e:** digital audio editing system; operates as stand-alone unit or with existing mixers; upgradable to full Opus production system or serves as satellite workstation; offers multitrack crossfading to eight tracks simultaneously; 30 editing operations with unrestricted number or placement of edits.

Circle (385) on Reply Card

Power conditioning

By Liebert

• **Datawave:** 50kVA, 75kVA rated systems, redesigned and down-sized to fit into computer rooms; 3-phase magnetic-synthesized, computer-grade power; accommodates 40% low-line condition, 200% overload, non-linear loads; compensates severe phase imbalances.

Circle (386) on Reply Card

Upgradable editing

By Quanta Editing Products & Calaway Engineering

• **CE-25:** 2-VTR, cuts-only edit controller; full expansion to CE-200 8-VTR system; disk-loadable system compatible to CMX and Grass Valley EDL; integral 3.5-inch disk, preview switcher, English display macros; A/V split editing, auto assembly; on-board help menus.

• **CE-75:** 3-VTR editor offers A/B roll with full expansion to CE-200 system; loadable system is CMX, Grass Valley compatible; includes all features of CE-25.

Circle (387) on Reply Card

Frame synchronizer/time base corrector

By I.DEN

• **IVT-7:** compatible with Y/C358 (Super VHS, Hi-8), composite video and Y688. Infinite window correction enables it to be used with domestic VCRs and cameras and permit frame and field freeze. A built-in DOC, ±20 times shuttle handling and 1H to +2H chroma line shift are standard. It has an ACC circuit, compensating for low chroma level inputs. It is one-rack-unit high and comes with rack ears.

Circle (388) on Reply Card

PC-based editing system

By M&R Data Services

• **Ensemble series:** A/B roll editing system with switcher interface, Macro capability, auto-assemble, match calculation and mixed format editing; PC-based system includes context sensitive help screens; SC-1 parallel interface allows operation with Panasonic AG-7500A, Sony VO-5800/5850 and JVC CR-850 VCRs.

Circle (389) on Reply Card

Synchronizer and automation interface

By Motionworks

• **Motionworker:** interface to integrate console automation, transport synchronizers and MIDI systems; enables engineering control of many functions from the console automation computer; can be controlled from external time code or MIDI code in tapeless studio; communicates with Audio Kinetics ES-bus, Lynx VSI, Adam Smith 2600/Zeta 3, SSL G/E series, AMEK Mozart/APC systems and GML 2000 automation.

Circle (390) on Reply Card

Precision cables

By Nemal Electronics International

• **No. 1570:** precision 75Ω video coax, similar to RG59/U in size; 0.7dB/100 foot loss at 10MHz.

• **No. 2201A audio cable:** single pair, 22-gauge cable, foil shielding, drain wire in 0.135-inch diameter; crush-resistant and allows removal of jacket and foil in one stripping operation; available in bulk or pull-out boxes; may be ordered pre-terminated; NEC CL2 compliant.

Circle (391) on Reply Card

Mics and mic stand

By Sennheiser Electronic

• **ME 80/K3U:** supercardioid/lobe, electret condenser unit with shotgun characteristics; K3U power module operates from an internal battery or external phantom power.

• **MKH 50-P48** transformerless, symmetrical transducer mic; supercardioid characteristics with ultralinear frequency response; operates from a phantom power setup.

• **SEMS mic stands:** withstands abuse of touring or studio; boom arm available; neutral gray color in reinforced ABS material and metal; friction washers hold height adjustment.

Circle (392) on Reply Card

SHOOT FROM THE HIP

STUDIO
NEWSROOM
LECTURE HALL
O.R.
CEILING
CONFERENCE
ROOM
STADIUM
COURTROOM

Only Vectorcam™ by Vicon offers all these pan/tilt possibilities and more.

Vicon Vectorcam™ camera positioning systems put professional-quality camera control at your fingertips—whether the camera is in your corporate conference room or positioned out of reach on the ceiling of a sports arena.

There's a Vectorcam™ system for your application from under $4,000 for a basic system to under $40,000 for a 4-camera programmable system with memory, 99 presets per camera station and RS232 compatibility.

And you can depend on the quality of Vectorcam™ systems because they're built to last—by Vicon, a company devoted to innovative accessories that enhance television camera operation. Vectorcam's rugged construction, close-tolerance gearing and high quality components ensure accurate positioning with precise stops, pans, tilts, zooms and focus.

The Vectorcam™ remote control unit is available in desktop or rack-mount configurations and can be tailored to your application. So, when it's time to shoot from the hip—or anywhere else—contact the professionals at Vicon or at your local Vicon dealer.

Professional Products Division

VICON

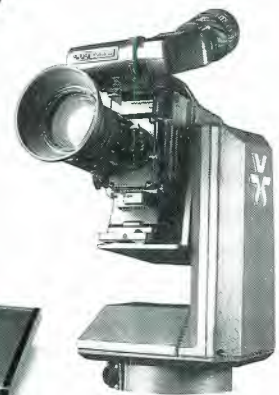
Vicon Industries Inc.
525 Broad Hollow Road
Melville, New York 11747-3703
516-293-2200
Fax: 516-293-2627

V6035PT

V6033PT

V7000C

V7100C



V6100PT/V6000PT

Circle (101) on Reply Card

Professional services

Classified

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.

BUSINESS OPPORTUNITIES

PRIME SCA SPACE AVAILABLE 900,000 + Population coverage over six counties. For information call Gary Minker (407) 965-9211 in southeast Florida Prime Metropolitan SCA Demographic Coverage. 1-90-2t

SITUATIONS WANTED

TECHNICIAL EIC/VIDEO ENGINEER SNV ENGINEER 16 years experience including major television network and nationwide mobile production facilities. FCC Licensed/SBE Senior Television Certified. For resume and information: (412) 264-4756. 1-90-1t

HELP WANTED

VIDEO

TV STATION ENGINEER

ILLINOIS INSTITUTE OF TECHNOLOGY'S instructional television fixed service has an outstanding opportunity available with an opportunity for advancement in the near future.

Work will involve a variety of technical tasks required to maintain operations at a highly professional level. Will perform necessary testing, installation, operation and maintenance of TV transmitter, studio, video recording equipment, satellite downlink and uplink equipment and other components in the IIT/V system.

Requirements include FCC license and 3-4 years experience as a Television Engineer. Bachelor degree preferred.

Attractive salary and benefits, including tuition in an outstanding research university. Apply to:

Manager Employment
ILLINOIS INSTITUTE
OF TECHNOLOGY
Chicago, Illinois 60616

Affirmative Action/Equal Opportunity Employer
M/F

MAINTENANCE ENGINEERS needed for Christian teleproduction facility. Experience in maintenance and component level repair required. Ampex AVC, ADO, VPR-3, Beta. Scientific Atlanta/MCL satellite. Resume to Chief Engineer, P.O. Box 819099-9099, Dallas, TX 75381. 8-89-6t

MAINTENANCE ENGINEER for UHF TV station. Need technician with experience repairing studio equipment. Send resume to: Gary King, WXON-TV, 27777 Franklin Rd., Suite 708, Southfield, Michigan 48034. Equal Opportunity Employer. 11-89-3t

MAINTENANCE ENGINEERS: Must have successful technical background with 3 to 5 years experience with betacam and 1 inch videotape. We're looking for winners! Major West Coast broadcasting group. Send resume and salary history to: R. Terneuzen, 663 Maulhardt Ave., Oxnard, CA 93030. EOE. 12-89-2t

CNN

TELEVISION ENGINEERS

Turner Broadcasting System, the leading News, Sports and Entertainment system in satellite communications, has career opportunities for engineers with **broadcast maintenance** experience. These positions demand an extensive background in television engineering and at least two years of training in electronics technology. Turner Broadcasting System offers an excellent benefit and compensation program. Send resume to:

Mr. Jim Brown, Engineering
Turner Broadcasting System, Inc.
One CNN Center
P.O. Box 105366
Atlanta, Georgia 30348-5366

404-827-1638

TBS is an equal opportunity employer.

MAINTENANCE TECHNICIAN SOUGHT FOR growing Los Angeles post-production facility. We are looking for qualified technicians for an anticipated expansion of the Engineering department. If you are a craftsman, not a repairman; if television maintenance is a career, not a job; if your hours are flexible, not restrained; then we want your resume! Experience with multiple formats of tape, production switchers, effects units, graphics units, editing systems, and/or digital processing desired. Send your resume and references to: Chief Engineer, Varitel Video, Suite 675, 3575 Cahuenga Boulevard West, Los Angeles,, CA 90068. Varitel is an Equal Opportunity Employer. 1-90-2t

TV MAINTENANCE ENGINEER. Bay Area Interconnect is looking for a super technician that is experienced in repair of Sony and JVC ¾" VCR's, Sony and Ampex 1" VTR's, cameras, switchers, etc. RF experience a plus. Four years broadcast experience required. Valid FCC General license or SBE certified. Send resume to: Chief Engineer, Bay Area Interconnect, 1310 North Fourth St. San Jose, CA. 95112. 1-90-1t

MAINTENANCE ENGINEER. State-of-the-art UHF independent TV station with active post-production business seeks person with 3 years minimum experience in video maintenance. Excellent work environment; Our recently constructed facility won 1988 BME Excellence In Engineering award. Applicant should be familiar with sophisticated post-production techniques and demands, and be capable of troubleshooting complex system-and component-level problems. Ampex ACE, ADO ESS and AVA maintenance experience desirable. Studio-production and audio background also helpful. Some nights and weekends. Send resume and salary history to Ms. Thornton, WATL, One Monroe Place, Atlanta, GA 30324. No phone calls please! EOE. 1-90-1t

MAINTENANCE ENGINEER with three to five years experience in repair of one inch tape, Betacam, Grass Valley and related studio equipment. RF experience a plus. Prefer Associated Degree. Send salary requirements and resume to Chief Engineer, WSPA-TV, P.O. Box 1717, Spartanburg, SC 29304. EOE. 1-90-1t

FOX TELEVISION, KRIV IN HOUSTON IS SEEKING A TV MAINTENANCE ENGINEER. Must have prior experience or training on Betacam equipment and at least three (3) years television broadcast maintenance experience. Primary area of responsibility will be for 1/2" Betacam eng. equipment. FCC license or SBE certification preferred. Please send resume to: KRIV-TV, P.O. Box 22810, Houston, TX 77227. Attn: Chief Engineer. No phone calls. EOE.12-89-2t

VIDEO MAINTENANCE ENGINEER. Detroit area post house seeks a person to maintain and modify postproduction equipment. Experience with Bosch FDL, Sunburst Color Corrector, Quantel Paint Box, Sony BVH/BVU, GVG 200/Kaleidoscope, or Abekas DDR an asset. Send resume to: Postique, 23475 Northwestern Highway, Southfield, MI 48075, Attn: Engineering Manager, or call (313) 352-2610. 12-89-2t

WANTED: FULL-TIME BROADCAST MAINTENANCE ENGINEER for VHF-TV station. RF experience required. Full benefits. Send resume to: Richard Hiett, WHSV, P.O. Box TV-3, Harrisonburg, VA 22801. Minority applicants encouraged. 12-89-3t

Advertising sales offices

NEW YORK, NEW YORK
Diane Gottlieb-Klusner
Telephone: (212) 702-3404
Telefax: (212) 702-7802
Mike Trerotoli
Telephone: (212) 702-3405
Telefax: (212) 702-7802
866 Third Ave.
New York, NY 10022

CHICAGO, ILLINOIS
Vytas Urbonas
Telephone: (312) 435-2361
Telefax: (312) 922-1408
55 East Jackson
Suite 1100
Chicago, IL 60604

SANTA MONICA, CALIFORNIA
Herbert A. Schiff
Telephone: (213) 393-9285
Telefax: (213) 393-2381
Jason Perlman
Telephone: (213) 458-9987
Telefax: (213) 393-2381
Schiff & Associates
501 Santa Monica Blvd. Ste. 504.
Santa Monica, CA 90401

OXFORD, ENGLAND
Nicholas McGeachin
Intertec Publishing Corp.
Roseleigh House
New Street
Deddington
Oxford OX5 4SP
England
Telephone: (0869) 38794
Telefax: (0869) 38040
Telex: 837469 BES G

TOKYO, JAPAN
Mashy Yoshikawa
Orient Echo, Inc.
1101 Grand Maison
Shimomiyabi-Cho 2-18
Shinjuku-ku, Tokyo 162, Japan
Telephone: (03) 235-5961
Telex: J-33376 MYORIENT

FREWVILLE, SOUTH AUSTRALIA
John Williamson
Hastwell, Williamson, Rep. Pty. Ltd.
109 Conyngham Street
Frewville 5063
South Australia
Phone: 799-522
FAX: 08 79 9522
Telex: AA87113 HANDM

CLASSIFIED ADVERTISING
OVERLAND PARK, KANSAS
Renee Hambleton
P.O. Box 12901
Overland Park, KS 66212
913-888-4664

Classified

SERVICES

TRANSMITTER TUBE REBUILDING SINCE 1941: 3CX2500, 4CX5000, 4CX15000 and many others. Write for details. FREELAND PRODUCTS INC., 75412 Hwy. 25, Covington, LA 70433. (504) 893-1243 or (800) 624-7626. 6-79-tfn

TAPE TRANSFER SERVICE We transfer all obsolete video tape formats, one inch AMPEX, IVC, TYPE B, and SONY EV series. Also, all half inch black and white open reel formats including PRE-EIAJ standard. No job too small. Call: TAPE TRANSFER SERVICE PHILA. PA 19116 (215) 464-3158. 1-90-1t

FOR SALE

FOR SALE
BOSCH FDL – 60 TELECINE
With Dubner Computer, Lipser-Smith CF-200 Film Cleaner, Magnatech Dubber, Cummings Air Knives, Dubner Grain Reducer and Air Compressor. *Best Offer.*
Contact Ted Dunn — (212) 944-9090

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 Thorncliffe Park Dr., Unit 28, Toronto, Canada M4H 1H2, 416-421-5631. 6-89-tfn

FOR SALE: Tubes 3CX1500A7, 4CX250B, 4CX5000A, 4CX3000A, and more. We carry lg. inventory, all major brands (EIMAC, AMPEREX, RCA) Call Stew 1-800-842-1489. 01-90-12t

PROF. VIDEO EDITING AND ENG EQUIPMENT: Sony 4-5800, 6-5850, 2—IVES II, 2—RM440 edit controllers, 2—Chyron VP2 CG. Tex Victor, wave form, sync color bar. 2—TBC's, Cross Point 5112.6109. Alta PYXIS switcher. Tascom M30 mixer, Sony 1220, 1271, 19100 monitors, Sony 2-M3K cameras 14X FUJ. lenses, Sony BVU 50, BVU110 recorders. JVC VHS editing 1-8600 & RM86 Editor. Many other pieces lights, battery belts, microphones, cases, etc. List available on request, 301-840-0296. 11-89-3t

ELECTRONIC TEST EQUIPMENT BOUGHT AND SOLD. Tektronix o'scopes, vectorscopes, NTSC generators, monitors, etc. Also HP, Fluke, Wavetek and other quality test equipment. Money back guarantee on all items. Special: Tektronix 335 portable 35 MHz dual trace o'scope $750. Fluke 8020A 31/2 digit handheld multimeter $75. Call now while supply lasts. Cal-Scope (408) 730-4573 or FAX want list to (408) 730-9537. 12-89-3t

1987 CUSTOM BUILT REMOTE STUDIO TRAILER 8×20, three rooms, generator, kitchen, dual a/c & heat, 2 PA systems, custom paint and detailing. Call for information: (619) 278-1130. 12-89-2t

DEMO & USED EQUIPMENT BROKER 45 ft. "B" Sports truck-$625,000. 45 ft "C" Production truck-OFFER. 22 ft U-Matic production truck-OFFER. 38 ft Chaparrel Production trailer & truck-$60,000. Two complete 1" A/B Roll edit suites. Complete SP U-Matic A/B roll edit suite. Chyron 4200 C.G. w/Motion, 2 channels-$38,000. Chyron RGU-2 C.G. 2 channels-$10,000. Grass Valley 1600-7H 24 in., 3ME switcher-$20,000. Ampex VPR-2B/TBC-2B 1" VTR. SLOMO-$16,000 Bosch 4000 Graphics system-$55,000. BETACAM & MII FOR SALE!! HUNDREDS OF ITEMS LISTED! LET US SHOP FOR YOU!! PROVID SUPPLY CORP.-Andy Turner-(708) 215-9010. 1-90-1t

Ad index

Advertiser	Page Number	Reader Service Number	Hotline
ADX Systems USA	62	39	800/444-4ADX
Allied Broadcast Equipment	73	54	800/622-0022
Alta Group, Inc.	94,95	78,79	408/297-2582
Ampex Corp. (AVSD)	56-57		415/367-2911
Ampex Recording Media	99	86	415/367-2911
Anvil Cases, Inc.	72	53	818/575-8614
Aphex Systems Ltd.	33	17	818/765-2212
Arrakis Systems, Inc.	21	13	303/224-2248
Audio-Video Engineering Co.	86	68	516/546-4239
Auditronics, Inc.	97	100	901/362-1350
Automation Associates, Inc.	101	88	215/489-1820
BCS Video	96	83	818/845-7000
Belar Electronics Laboratory, Inc	96	80	215/687-5550
Benchmark Media Systems	64	42	315/452-0400
Best Power Technology	62	38	800/356-5794
Bradbury Porta-Pattern	103	90	913/780-4844
Broadcast Electronics Inc.	11	7	217/224-9600
Broadcast Supply West	100	87	800/426-8434
Broadcast Video Systems, Ltd.	98	98	416/764-1584
Bryston Vermont	64	41	416/746-0300
BTS Broadcast Television Systems	43,85	22,67	800/562-1136
Burle Electron Tubes	75	57	800/827-TUBE
Cablewave Systems	47	25	203/239-3311
California Tube Laboratory, Inc.	93	76	800/824-3197
Canare Cable, Inc.	98	95	818/840-0993
Clear-Com Intercom Systems	106	93	415/527-6666
Conex Electro Systems	96	81	206/734-4323
Cortana Corporation	98	96	505/325-5336
Di-Tech, Inc.	IBC	2	516/667-6300
Dolby Labs, Inc.	13	8	415/558-0200
Dorrough Electronics	42	21	818/999-1132
Dynair Electronics Inc.	39	20	619/263-7711
Ergo 90	96	97	714/632-7045
ESE	93	77	914/592-6050
Fast Forward Video	80	62	714/852-8404
FGV Panther	102	89	818/761-5414
Fujinon Inc.	67	49	201/633-5600
Full Compass Systems	74	55	800/356-5844
Geleco Electronics Corp.	96	82	416/421-5631
Gentner Electronics Corp.	48	28,29	801/975-7200
Gentner Electronics Corp.	87	70,71	801/975-7200
Graham-Patten Systems, Inc.	76	58	800/547-2489
Grass Valley Group, Inc.	9	6	916/478-3000
James Grunder & Associates Inc.	59	35	913/831-0188
Harris Corp.	27	12	800/4HA-RRIS
Hitachi Denshi America Ltd.	3		800/645-7510
Hybrid Cases	96	84	800/343-1433
I-Den Videotronics Corp.	44	23	800/874-IDEN
Intraplex, Inc.	72	52	508/486-3722
Jampro Antennas Inc.	32	16	916/383-1177
JVC Professional Products Co.	19	11	800/582-5825
LDL Communications	83	66	301/498-2200
Leader Instruments Corp.	55	33	800/645-5104
Lectrosonics, Inc.	77	59	800/821-1121
Leitch Video of America, Inc.	45	31	804/424-7290
3M Broadcast & Related Products	53	32	800/328-1684
3M Magnetic Media Div.	29	14	800/328-1684
Mark Antennas, Div. of Radiation Systems	74	56	708/298-9420
Markertek Video Supply	66	46	800/522-2025
MCL, Inc.	92	75	708/759-9500
Midwest Communications Corp.	1	3	800/543-1584
NCA	104	91	716/852-4521
Nikon Corporation	5	4	516/222-0200
Opamp Labs Inc.	66	45	213/934-3566
Optical Disc Corp.	89	72	714/522-2370
Orban, Div. of AKG Acoustics, Inc.	7,17	5,10	800/227-4498
Otari Corp.	15	9	415/592-8311
Panasonic Pro Industrial Video	34-35	18	800/553-7222
Polyline Corp.	86	99	708/298-5300
QEI	31	15	800/334-9154
Queue Systems	66,96	48,69	213/656-0258
Roscor	48	34	708/539-7700
Ross Video, Ltd.	61	37	613/652-4888
RTS Systems, Inc.	90,91	73,74	818/843-7022
Sachtler Corp. of America	63	40	516/867-4900
Sennheiser Electronic Corp.	37	85	203/434-9190
Shure Brothers Inc.	IFC	1	708/866-2553
Sony Communications Prod./ Broadcast Div.	24-25		800/635-SONY
Sony Communications Prod./ Pro Audio Div.	68		800/635-SONY
Sony Communications Prod./ Pro Video	40-41		800/523-SONY
Standard Tape Laboratory, Inc.	66	47	415/786-3546
Tascam, Div. TEAC Corp. of America	105,107	92,94	213/726-0303
Telemetrics, Inc.	54	30	201/427-0347
Telex Communications, Inc.	60,65,79	36,43,60	612/887-5550
Telmak	66	44	800/637-4540
Total Spectrum Manufacturing, Inc.	81	65	914/268-0100
Utah Scientific Inc.	51	24	800/453-8782
Vicon Industries	108	101	516/293-2200
Videotek, Inc.	71	51	602/997-7523
Vinten Equipment Inc.	69	50	516/273-9750
Ward-Beck Systems, Ltd.	BC		416/438-6550
Winsted Corp.	80	61	800/447-2257

Audio / Video / Pulse / Sub-Carrier D.A. Requirements?

THE CORRECT CHOICE IS

di-tech

FOR RELIABILITY, SERVICE & COMPETITIVE PRICING

Introducing the NEW 200 SERIES

- 1 and 3 R.U. Mounting Assemblies
- VDA's to 70 MHz
- VDA's with Equalization to 50 MHz
- ADA's @ +18 or 24 DBU Mono
- ADA's @ +18 or 24 DBU Stereo
- PDA's with Variable Delay
- SDA's with 360° Phase Adjustment

di-tech inc.

48 Jefryn Boulevard, Deer Park, New York 11729 (516) 667-6300 • FAX (516) 595-1012

Circle (2) on Reply Card

More versatility!
More important functions!

The D8212 Distribution Amplifier System just keeps on growing!

All of Ward-Beck's substantial investment in R&D is directed towards one single objective ... to bring you the very best professional audio systems.

That's why other manufacturers, who try to satisfy a wider range of audio and video applications, simply cannot match the performance and quality of Ward-Beck audio products such as the proven D8212 DA System.

Now Ward-Beck is proud to announce the addition of new modules for the D8212 System. These include the M8200 transformerless, remote sensitivity microphone pre-amplifier, a stereo DA and a test oscillator.

We invite you to ask for details on these and other high-performance products in the expanding D8212 family.

WBS

WARD-BECK SYSTEMS

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