BME

FOR TECHNICAL AND ENGINEERING MANAGEMENT

AN ACT III PUBLICATION

MAY 1989
$3.00

INSIDE: TEST AND MEASUREMENT

What HAPPENS when the FCC INVESTIGATES your STATION?

WHY DIDN'T SOMEONE THINK OF THIS BEFORE?

A FAST-PACED PRODUCTION CONSOLE

THE WHEATSTONE SP-6 AUDIO CONSOLE lets production people quickly accomplish 8 and 16-track work, yet easily handle routine transfers and dubbing operations. With its unique track monitor section it can facilitate simultaneous stereo mixdown during the multitrack bed session – almost halving typical production time cycles. Input channels are laid out just like an air console, with machine starts below the channel fader, so staff familiar with on-air consoles can quickly become comfortable in the production environment.

For those interested in more advanced techniques, the SP-6 employs a powerful talent monitor section designed to rapidly call up live mic and track combinations, making difficult punch-ins a breeze. Standard SP-6 input channel equalizers are more comprehensive than those supplied as optional items on competing products, allowing much greater creative freedom. Input channel auxiliary send sections are designed to be the most versatile in the industry, providing 4 different auxiliary buses to allow digital delay, reverb, talent foldback, and mix-minus feeds. Stereo input channels can provide either mono or stereo effects sends. Even more, the SP-6 has 4 auxiliary effects return inputs that allow effects to be recorded onto the multitrack or sent to the monitor buses.

The SP-6 provides independent headphone control room and studio monitor feeds, as well as stereo cue/solo. Control room and studio mute and tally functions are independently dipswitch selectable on individual input channels. Additional studio modules may be ordered to accommodate larger, multi-studio installations. The SP-6 may be configured with any combination of mono and stereo input modules, in mainframe sizes ranging from 16 to 32 or more inputs. The console is available in either an 8-track production format or a 4 stereo subgroup TV master control configuration. So why not profit from Wheatstone's experience and reputation? Call us today and learn more.

Wheatstone® Corporation

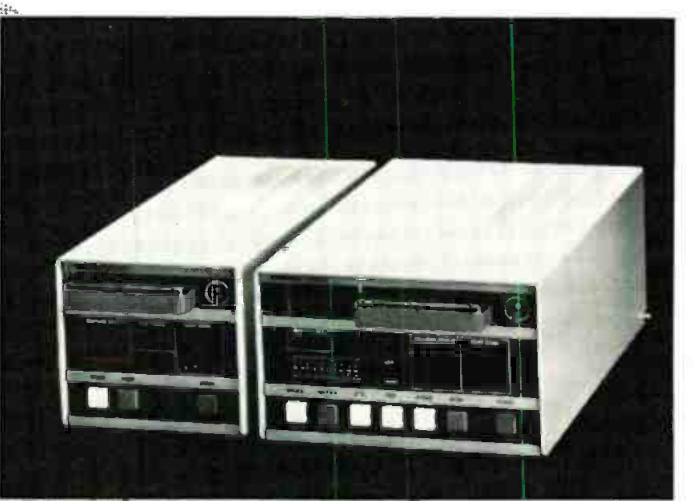
6720 V.I.P. Parkway, Syracuse, NY 13211
TEL 315-455-7740 FAX 315-454-8104

Circle 100 on Reader Service Card Page 51

GO WITH THE WINNERS. DYNAMAX CTR100 SERIES

"The VOA equipped 28 of its Washington, D.C. studios with over 200 DYNAMAX cartridge machines. The staff is very pleased with the installation, minimal maintenance requirements, and problem-free operation of the equipment."

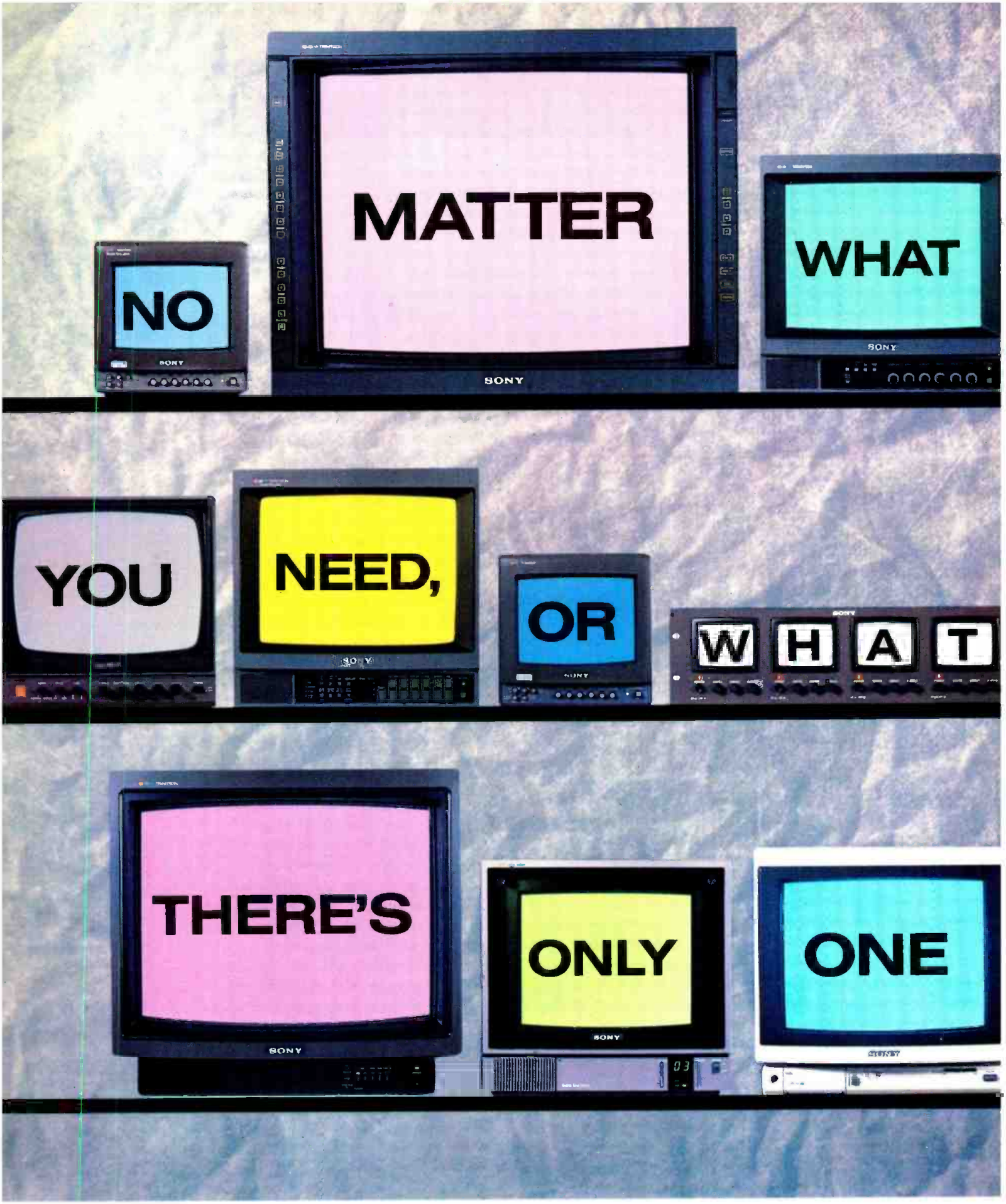
Leo L. Darrigo
Technical Program Manager, Ret.
Voice of America
U.S. Information Agency



DYNAMAX™
PRODUCTS BY FIDELIPAC®

Fidelipac Corporation
P.O. Box 808
Moorestown, NJ 08057
U.S.A.
609-235-3900
TLX 710-897-0254
TAX 609-235-7779

Circle 101 on Reader Service Card



And only one number to call. For more information on Sony's latest innovations in its line of quality

nonitors, dial (800) 523-SONY.

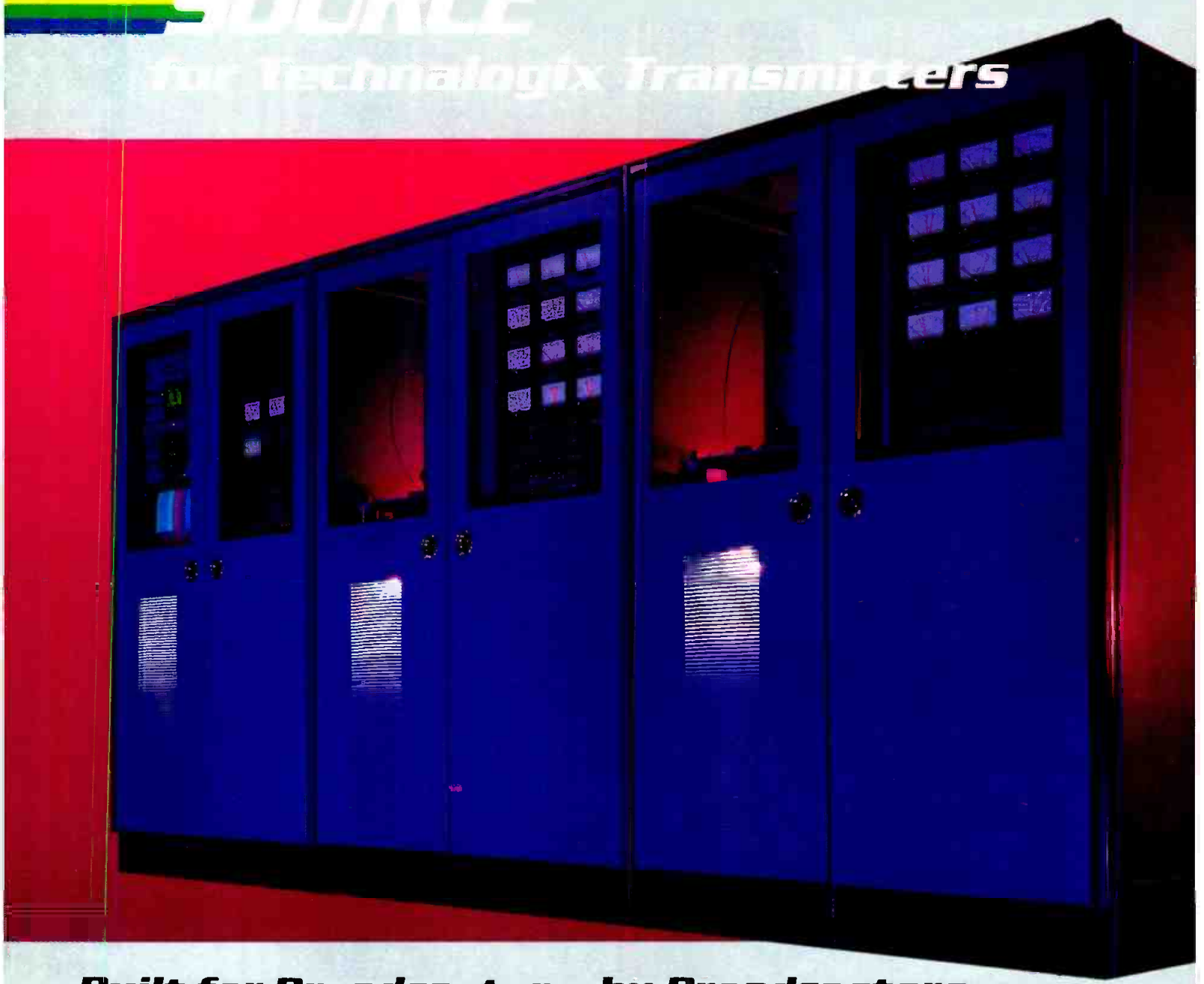
SONY®

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

PROFESSIONAL VIDEO

Circle 102 on Reader Service Card Page 51

the SOURCE for Technalogix Transmitters



Built for Broadcasters, by Broadcasters

The strength of Technalogix Transmitters owes as much to the people behind them as to the technology within them. LeRoy Wallace, Sr., LeRoy Wallace, Jr., and Don Adams, a design team that possesses over 60 years in the broadcast industry, have created the line of high power UHF transmitters they've always dreamed of building.

Performance, Reliability and Serviceability.
Technalogix and Midwest have teamed up to create a complete line of UHF television transmitters ranging from 30KW to 280KW. Each transmitter is meticulously designed to deliver high performance, reliable operation, ease of service and trouble-free maintenance.

Technical Service and Support.
Midwest has over 50 sales and service centers throughout the country. Plus, the Technalogix Response Team is on-call 24 hours a day to respond quickly to solve your problems.

Replacement Parts Availability.
Technalogix transmitters have been designed using readily accessible "off the shelf" parts, so they can be quickly obtained from numerous third-party sources. By utilizing these parts, your replacement costs are also kept at a minimum.

When it's time to purchase a new transmitter, go with a Technalogix from Midwest. Because your transmitter is the last thing you need to worry about.

MIDWEST
Communications Corp.

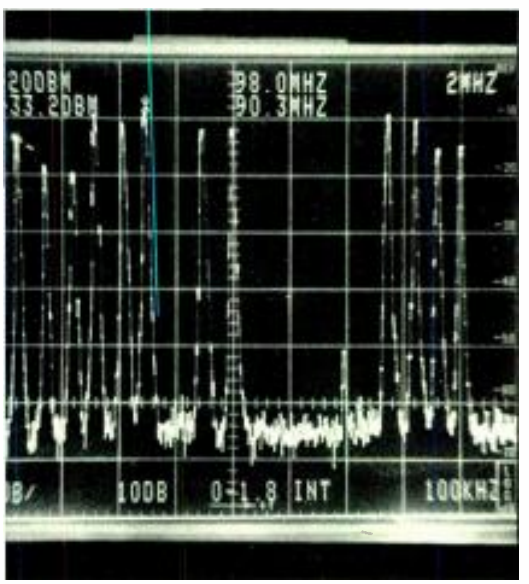
One Sperti Drive
Edgewood, KY 41017
606-331-8990

Circle 103 on Reader Service Card Page 51

BME
FOR TECHNICAL AND ENGINEERING MANAGEMENT
MAY 1989
VOL. 25, NO. 5

On the cover:
The cover illustration is by the husband-and-wife team of Arlen Schumer and Sherri Wolfgang (Arlen is the designer and Sherri is the color artist): The Dynamic Duo Studio, Inc.

30 *Gauging T&M Needs*

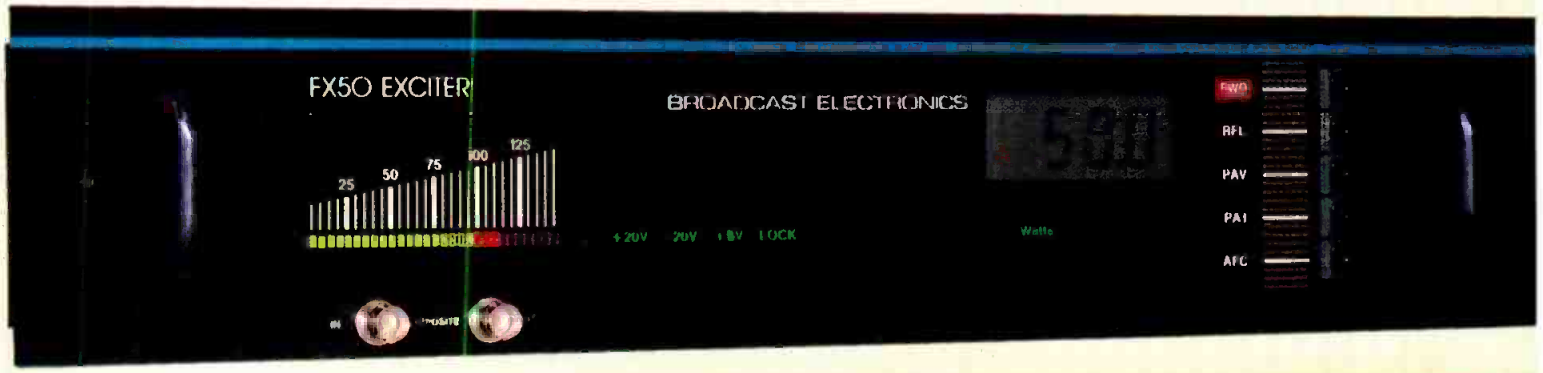


46 *FCC Finds Boise*

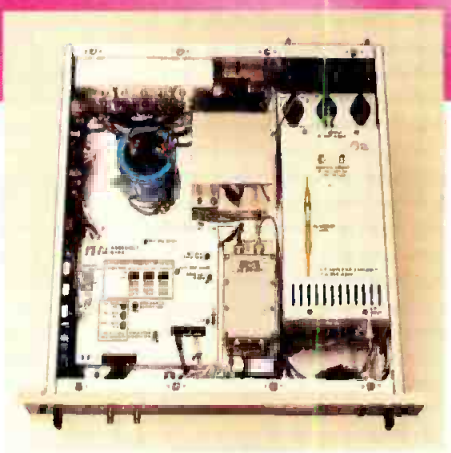
Features

New FX 50 Exciter

Audio Performance That Rivals CD's



THD and IMD 0.003%, 93 dB S/N, 50 Watts



Broadcast Electronics introduces the ultimate FM Exciter - the new FX 50 - with performance even superior to the world standard FX 30.

CD Sound

The new FX 50 Exciter has the lowest distortion of any exciter available with THD and IMD of 0.003%.*

CD Dynamic Range

With a signal to noise ratio (S/N) of 93 dB* the FX 50 can handle all of the nuances and power of compact discs.

Move Up To CD Standards

Every new "B" Series FM Transmitter incorporates the FX 50 for true CD transparency. And, the FX 50 is the ideal retrofit for your present exciter.

Set It And Forget It — 50 Watts

Sophisticated automatic control systems assure stable reliable 50 watt MOSFET power output even under mismatch conditions.

*Typical

For information on the FX 50 Exciter and on Broadcast Electronics' new "B" Series FM Transmitters which incorporate the new FX 50 Exciter, call Bill Harland or Russ Erickson at 217-224-9600.

BE® BROADCAST ELECTRONICS INC.

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

Circle 104 on Reader Service Card Page 51

BME
BROADCAST TECHNOLOGY AND ENGINEERING MANAGEMENT

Publisher
MICHAEL D. BAILENSON

Editor
EVA J. BLINDER
Senior Editor
BETH JACQUES
Technical Editor
JAMES A. ACKERLEY
Managing Editor
T. GWEN GRIFFITH
Copy Editor
PATRICK D. O'NEILL
Contributing Editor
SKIP PIZZI

Art Director
DON KROGMAN

Production Director
NICK TARTAGLIA
Assistant Production Manager
MARGOT SUYDAM

Northern District Sales Manager
WILLIAM P. DEY
Advertising Sales Representative
PAMELA S. VAHTER
Western District Sales Manager
DENICE NICHOLS
Advertising Manager for Europe
JIM PARKINSON
Newick East Sussex, England
Promotion Manager
STACY AARON
Circulation Manager
JOSEPH SCHILLMOELLER

Act III Publishing
President
PAUL DAVID SCHAEFFER
Chief Operating Officer
ROBERT C. GARDNER
Senior Vice President,
Technical Division
KEVIN J. CONDON
Senior Vice President,
Corporate Development & Planning
MARTHA LORINI
Senior Vice President,
Corporate Planning &
International Development
GERARD A. BYRNE
Vice President,
Finance & Administration
SAM SCHECTER
Director of Marketing
& Communications
JENNIFER WARE

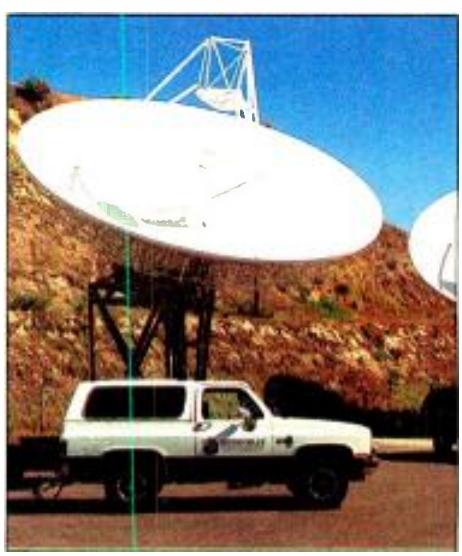
Act III Publishing, Technical Division
401 Park Ave. So., New York, NY 10016
(212) 685-5320 Telex: 64-4001
Fax: (212) 679-0919
Also publishers of:
World Broadcast News
Corporate Video Decisions

ABP VBPA

BME (ISSN 0005-3201) is published monthly by NBB Acquisitions, Inc. BME is circulated without charge to those responsible for station operation and for specifying and authorizing the purchase of equipment used in broadcast facilities in the U.S. and Canada. These facilities include AM, FM and TV broadcast stations, CATV systems, ETV stations, networks and studios, audio and video recording studios, teleproduction facilities, consultants, etc. Subscription prices to others: $36.00 one year, $50.00 two years. Foreign: $50.00 one year, $75.00 two years. Air Mail rates on request. New York City. Second class postage paid New York, NY, and additional mailing offices.

POSTMASTER: send address changes to BME, P.O. Box 6056, Duluth, MN 55806.

Columns & Departments



16 *Wold Merges with Bonneville*

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 105 on Reader Service Card Page 51

VIEWPOINT

The telcos are in a unique position to change the face of broadcasting forever.

What's likely to happen if Congress authorizes the regional Bell operating companies to become information providers? Broadcasters fear the death of free TV; cable companies fear the advent of fiberoptic distribution by the telcos; even the American Newspaper Publishers Association is concerned about the RBOCs entering electronic publishing.

The RBOCs are classic common carriers, providing information-carrying services to all comers, more or less, but barred from originating any of that information themselves under the terms of the 1982 consent decree that carved them out of the old AT&T monopoly. Massive amounts of information pass along their wires daily into the offices and homes of customers. Fiberoptic technology could allow the telcos to provide video and audio services with the same ease as data, if they chose to do so. With the telephone an established institution in virtually every U.S. home and business, such services could blow traditional broadcasters out of the water.

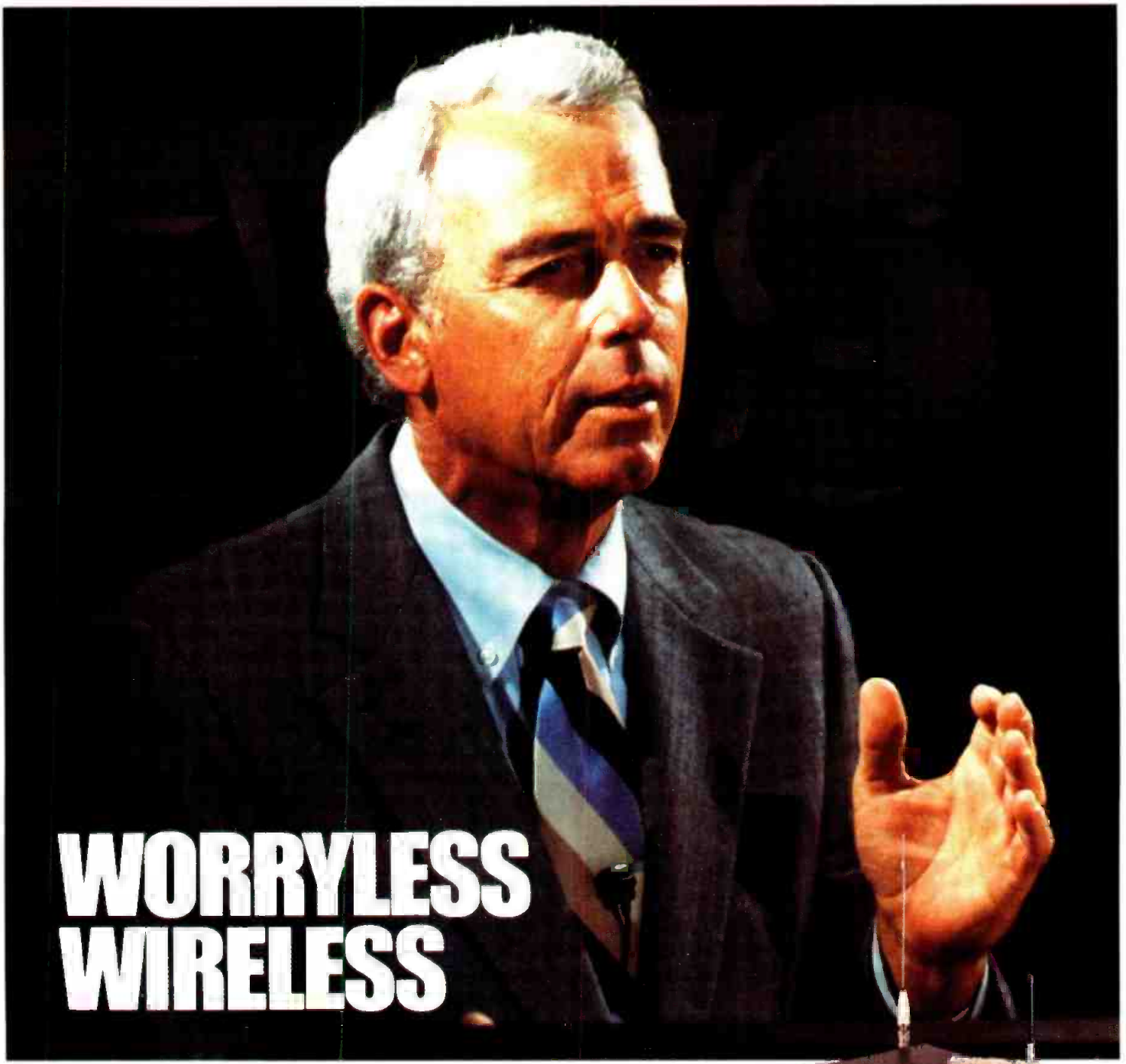
All signs indicate that the RBOCs, along with post-1982 AT&T, are feeling the seven-year itch. In mid-April, AT&T asked the U.S. District Court in Washington to let the rules that prohibit it from originating information expire in August, as the original decree indicated they might. Even if the court responds favorably to AT&T's petition, however, the RBOCs' situation will remain unchanged: the 1982 decree permanently barred them from becoming information providers.

That too could change if legislation recently proposed by Representatives Thomas J. Tauke (R-IA) and Al Swift (D-WA) is enacted. Tauke and Swift's proposed legislation would lift most of the 1982 restrictions on the RBOCs. On the cable front, the RBOCs themselves are challenging the 1982 decree. Pacific Telesis Group recently agreed to acquire majority ownership of the Chicago cable franchise owned by Group W Cable Associates. The action pits PacTel not only against the courts, but against the cable television industry.

The telcos are in a unique position to change the face of broadcasting forever. If the telcos, relieved of their present constraints, could offer services that were truly better than those available now—say, interactive services or pay-per-view movies on demand or wideband, fiber-delivered HDTV—doesn't the public deserve those options? Or would the potential for unfair advantage outweigh the benefits? The broadcast industry will not be protected against possible telco encroachment simply by lobbying in Congress; laws and regulations change with the political and economic climate. Our focus should rather be on a strong and aggressively competitive broadcast industry that can meet the challenges tomorrow's technology will throw our way. ■

Eva J. Blinder

Eva J. Blinder
Editor



Your mic is the last thing you should have to worry about when you are on the air.

Telex understands the broadcast and video production industry. After all we've been a leading manufacturer of broadcast quality microphones, intercoms and headsets for over fifty years. And, recently our wireless systems have become first choice among those who can't afford to have their mics fail. When you clip on a Telex—don't worry.

We know that, in the serious business of television news, when the story is unfolding you've only got one shot at it. And, in production, when you make expensive talent wait for a new mic—you've just lost money.

Telex wireless microphone systems have been designed to stand up to the rigors of difficult remote ENG assignments as well as the daily abuse of studio and location work.

Shown above is our frequency selectable series featuring the FMR-4 rack mount receiver, ENG-4 portable receiver, HT-400 hand-held transmitter/mic and WT-400 beltpack transmitter with lapel mic. For more information call or write to: Telex Communications, Inc., 9600 Aldrich Av. So., Minneapolis, MN 55420.

TELEX®

FEEDBACK

Credit Where Credit is Due

In the January issue's "Excellence in Engineering" section, there is a salute to WATL-TV, Atlanta. The article gives the impression that the complete design of the building, technical layout, and choice of equipment was the sole work of Jerry Plemmons, Outlet's corporate VP for engineering. There is a note at the end of the article indicating that "WATL's chief engineer during the rebuild was David Jones."

As that station's operations manager, who joined WATL in the spring of 1985, along with Mr. Jones and all the other department heads, I had a front-row seat to that complete rebuild. (I left last October.) Mr. Plemmons did select the architect and contractor.

However, the technical layout, including the floorplan and interior design of all the technical rooms (master control, production control, studio, edit rooms, graphics room, etc.—virtually the entire first floor) and the actual choice of specific equipment for each area (including those two famous satellite dishes on the roof) were the *sole* decision of David Jones.

I was intimately familiar with the entire process as Mr. Jones and I had offices only a few feet apart, and we were in constant contact. As operations manager, I handled the production, master control, and film departments.

The article indicates Mr. Jones "has since left the station." Well, he certainly isn't working the fry machine at McDonald's! During the design and construction of the technical facilities, Mr. Jones hired Midwest Communications in Atlanta to execute the technical drawings (as Mr. Jones did not have a draftsman on staff). Midwest was later hired by the Walt Disney Co. to design and build control rooms for the new Disney-MGM Studios at Walt Disney World in Orlando.

Because Midwest incorporated many of Mr. Jones' ideas in their control room layout, Disney decided to go to the source, and hired Mr. Jones last summer. He is the manager of studio & broadcast engineering at Disney-MGM, responsible for three huge sound stages and associated control rooms and equipment. One of his first tasks was modifying the Midwest design to bring it into line with changing Disney requirements. And he will personally supervise the continued technical expansion of those studios.

Jim Schoonmaker
former Operations Manager
WATL-TV, Atlanta

Keep in Touch

I found the article on the use of "touchscreen" control at KSLU (December 1988) interesting. I thought you might be interested in the use of touchscreen control at another station.

KHCC/KHCD in Hutchinson, KS, is using a Fluke touchscreen terminal for the operator interface to their transmitter control system. The system consists of a Hallikainen & Friends DRC190 remote control driving the touchscreen terminal and a printer at the studio. Additional DRC190 units are located at the KHCC transmitter site (Hutchinson), the STL relay site (Roxbury) and the KHCD transmitter site (Vine Creek). All units communicate over a single "outbound" subcarrier on the STL system and an "inbound" 450 MHz telemetry return link system. Should any link in the transmitter control system fail, backup communications are automatically established over dial-up lines.

The touchscreen interface presents several screens of information. The main screen appears to be backlit push buttons for transmitter controls at each transmitter site (filaments off/on, plates off/on, auto power control off/on, power raise/lower for KHCC and KHCD transmitters). The current state of a control brightly lights the touch target area. For example, if the filaments are on, the off target is dim and the on target is bright.

The main screen also displays the output power for each transmitter and any alarm messages. Additional touch targets allow for alarm confirmation (stopping the terminal beep) and selecting other screens.

Additional screens show detailed metering (30 channels at KHCC, 10 at the relay site and 20 at KHCD), detailed status (32 channels at each site), a block diagram showing the status of the STL system (power output of each transmitter and fade margin on each receiver), and dial-up modem status/control.

Harold Hallikainen
Hallikainen & Friends
San Luis Obispo, CA

Do you have any questions, comments, or criticisms concerning what you read in BME*? Any bulletins or issues you want to open up to other engineering management readers? Our letter column, Feedback, is your forum. Write to: Feedback—BME Magazine, 401 Park Avenue, South, New York, NY 10016.*

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 107 on Reader Service Card Page 51

UPDATE

FCC Plagued By Budget Cuts ... Patrick Leaves As FCC Chairman ... TCI Backs Processed Digital for HDTV Transmission ... Wold Merges With Bonneville

FCC Plagued By Budget Cuts

An eleventh-hour reprieve in the form of a $500,000 slice of a House budget supplemental has saved the FCC the ignominy of having to furlough its entire work force for a two-day period next September. Responding to a $5 million start-of-the-fiscal-year shortfall, the FCC instituted a hiring freeze, promoted an "early-out" retirement program, and cut spending to the bone.

By March 7, these measures had reduced the projected shortfall to $890,000—which would have meant a three-and-a-half-day furlough—and by April 6, continuing economies had further reduced the shortfall to $500,000. This amount was covered by the budget supplemental.

In spite of the narrow escape from the threat of having to furlough employees, it has been, according to FCC associate managing director for operations Marilyn McDermett, "a very tough year."

Measures taken so far have resulted in severe personnel cutbacks and loss of services. According to McDermett, the fiscal year began with 1800 full-time equivalent (FTE) employees, but attrition is expected to reduce that number to 1620 by fiscal year's end. Even with approval of the requested appropriation, McDermett expects the staff to recover only up to 1783 FTEs.

On March 7, FCC Chairman Dennis Patrick told the House Commerce Appropriations Subcommittee, "We simply have not had the funds necessary to maintain our speed of service in processing applications. . . . Delays in licensing caused by staff shortages . . . affect not only applicants, but . . . reduce tax revenues."

Patrick proposed a FY 1990 budget of $109,831,000, a rise of $10,218,000 over the present appropriation.

Approximately $4.1 million would go to increased personnel costs and another $2.6 million for additional data processing equipment, software, production support and maintenance services to continue the commission's productivity improvement. ■

Wold Merges With Bonneville

In what may be a growing trend in the satellite television transmission industry, Wold Communications has merged with Bonneville Satellite Communications to form a new entity yet to be named. In a straight stock transaction, the owners of Bonneville were given 60 percent of the new company and the remaining 40 percent was divided between the owners of Wold and the new company's management.

David E. Simmons was named chief executive officer of the newly formed company. He is also president of Simmons Satellite, Inc., one of the Bonneville owners. Both Simmons and

Bonneville: merging with Wold.

David M. Connell, Wold's president and chief executive officer, declared themselves very pleased with the new arrangement.

According to Connell, "Services will be maintained and expanded in all cities previously served except Los Angeles, where two TOCs will be replaced by a new facility and some jobs may be lost." ■

Wold/Bonneville merger: services maintained and expanded.

How Good is Our 3rd Generation? Take a Look at Our 5th!

PERFORMANCE DATA (AG-7500A)

	1st Generation	3rd Generation w/o TBC	3rd Generation w/TBC-200	5th Generation w/TBC-200
Horizontal Resolution (Color Mode)	400	370	360	350
S/N Ratio (dB)				
Luminance (Color Mode)	57.2	51.7	52.0	49.0
Chrominance (AM)	51.8	47.5	51.4	44.5
Chrominance (PM)	44.3	40.1	43.8	35.2

Data represents measurements by independent engineering evaluation. VCRs taken at random from inventory.

- Signal Source: Shibasoku TG-7 1
  - Luminance: 50 IRE flat field w/burst
  - Chroma: 50 IRE w 100 IRE p-p
  - Resolution: Monoscope Shibasoku 58A/1
- Noise Meter:
  - Y-S N: Rohde & Schwarz UPSF2 UPSF2E2 200 kHz HPF subcarrier trap on 4.2 MHz, LPF weighted
  - C-S N: 100 Hz HPF 500 kHz LPF unweighted

From the first to the third, even to the 5th generation Panasonic® SVHS Pro Series specifications speak for themselves. And they say "outstanding." Here are some of the reasons:

The AG-7500A editing VCR with its new laminated amorphous heads produces superb quality generation after generation.

The AG-A750 editing controller has everything you need for highly accurate single event editing.

And the AG-7400 portable 2-hour VCR is a natural performer in the field.

Our TBC-200 time base corrector has a 16-line correction window, chroma plus/ enhancement, chroma noise reduction and no-roll circuitry. To make multi-generation recordings even better.

The UTP-1 signal transcoder is more than ready to transcode virtually any component signal into any other component signal. Saving you an extra generation.

The IFP-44 editing interface controls Pro Series decks on both the source and edit side. To easily integrate into selected 3/4" systems.

Our CCD Cameras are equally spectacular. And with the Panasonic SVHS Pro Series you not only get outstanding performance, you also get the added economy of 2-hour operation in the field and in the studio.

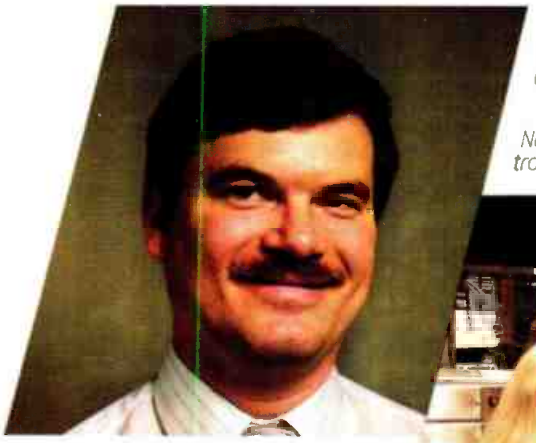
The Panasonic SVHS Pro Series. In a word it's outstanding.

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

SVHS

Panasonic
Professional/Industrial Video

Circle 108 on Reader Service Card Page 51



Ron Gaier. Chief Engineer. WHIO-AM-FM-Dayton. Ohio. Cox Broadcasting.

Newscaster Dawn Matthews on the Auditronics 212 in WHIO-AM news studio.

"Reliability makes Auditronics boards winners with us",

Jim Jones on the Auditronics 224 in WHIO production.

says WHIO AM-FM chief engineer Ron Gaier. "Our job in engineering is to keep the station on the air, so our three Auditronics consoles' record of zero failures makes me very happy."

"When we renovated three years ago, I insisted on enough input capacity so every signal source could have its own channel with no switching or patching. So we bought the 224 for production and on-air, and the 212 for news. This also gives us the flexibility to easily reconfigure the boards as our needs change."

"We got everything we wanted from Auditronics through our dealer Allied, including timely delivery which was critical to us then."

"Based on our trouble-free experience with the Auditronics 200 series thus far, I'd buy them again tomorrow."

If you'd like to know more about why Ron Gaier specifies Auditronics consoles, call toll-free 800-638-0977 or circle reader service number.

auditronics inc.
3750 Old Getwell Road, Memphis, TN 38118
901-362-1350

Circle 109 on Reader Service Card Page 51

UPDATE

TCI Backs Processed Digital for HDTV Transmission

Sie promotes digital HDTV.

Processed digital, an emerging technology as yet untested for video applications, has been proposed by John Sie, senior vice president of Tele-Communications, Inc., as potentially the best way to transmit HDTV.

"Processed digital" is a generic term for a variety of technologies designed to reduce a digital signal to transmittable size. Simply converting an analog NTSC transmission signal into its digital equivalent creates a signal requiring the equivalent of 145 MHz of spectrum to transmit. Obviously this "brute force" digital is not suitable for either broadcast or cable transmission.

Several processed digital proposals are now under investigation. One version, for example, would save spectrum by transmitting only those segments of a frame that have changed since the last frame was transmitted. Another scheme would encode the signal into a much more compact form using fractal geometry or some other compression algorithm. All such schemes are computation-intensive and require the equivalent of a computer at both the transmitter and the receiver ends to encode and decode the signal and to remove and reconstruct the portions of each frame not transmitted.

Present technology does not permit transmission of a video signal using processed digital. Sie believes that with a national commitment and the combined efforts of many disciplines, it should be possible in 10 years time to transmit HDTV on only one 6 MHz channel using processed digital.

William F. Schreiber, director of the Advanced Television Research Program at M.I.T.'s Media Lab, says, "The future of processed digital for HDTV transmission is uncertain and it will take some years of work to determine what is possible." The Media Lab is currently researching processed digital transmission at the behest of Home Box Office.

As Schreiber points out, the other major problem, in addition to compressing and decompressing the signal, is knowing the rate of data transmission that can be reliably achieved. The nature of a broadcast digital signal is such that one signal strength gives a perfect picture, but a slightly weaker signal strength gives no picture at all. In trying to determine, for instance, whether a 6 MHz channel can support, at adequate strength, a data rate of 20 megabits per second, the effect of the signal-to-noise ratio can be closely calculated, but the effect of multiple transmission paths is still uncharted.

Another digital advocate, Capital Cities/ABC senior VP, technology and strategic planning, Julius Barnathan, says, "With regard to the transmission problems that might develop, we simply don't have the answers at this point." ■

Patrick Leaves As FCC Chairman

Citing personal reasons, Dennis R. Patrick has announced his resignation as chairman of the Federal Communications Commission to take effect as soon as a successor can be confirmed. The announcement was not unexpected and brings to a close two years of effort in the cause of deregulation.

NAB president Edward O. Fritts commented, "Dennis Patrick is a man of principle and dedication who has made his mark on communication policy. He has championed the fight for First Amendment rights for broadcasters. His leadership on the critical issues of syndicated exclusivity and comparative license renewal reform also are to be congratulated."

Patrick's advocacy of free enterprise brought him into sharp conflict with the Congress. His most notable accomplishment, the repeal of the Fairness Doctrine, is expected to be overturned by Congress later this year.

There are already two vacancies on the FCC. If President Bush does not reappoint Patricia Dennis, whose term expires in June, the FCC will consist entirely of new commissioners except for James H. Quello. Most often mentioned successors to Patrick are Sherrie Marshall, a partner in the law firm of Wiley, Rein and Fielding, and Alfred C. Sikes, head of the Commerce Department's National Telecommunications and Information Administration. Also under consideration are Susan Wing, a partner in the law firm of Hogan and Hartson, and James Smith, an attorney in the firm of Reed, Smith, Shaw and McClay. ■

Our Network Ratings Are In.

Our clients have certainly appreciated the cost savings, and everyone has enjoyed the extra time satellite has provided us. Cycle-Sat has proven that satellite is a very viable method to distribute commercials.

—Dana Geiken, DMB & B

In association with [illegible] has been an exciting time for us. Cycle-Sat has made it easier for us to execute spot TV buys in multiple markets.

—Merle Welch, Foote, Cone and Belding

We have become accustomed to the ease and reliability of receiving commercial spots via satellite. We are also impressed with the flexibility of the system in regard to getting refeeds and special feeds. We look forward to a long working relationship.

—Karl Hagnauer, KPLR

Our experience at WGN-TV with Cycle-Sat has been quite positive. The system has been very reliable and the convenience of receiving the commercials in non-primetime has been helpful in scheduling our tape machines. Our equipment has been freed for production use during the prime hours.

—Robert Strutzel, WGN-TV

The quality and reliability of the hardware and software is outstanding. It's error free in its operation, and the speed with which we receive commercial feeds saves us make-goods and lost time.

—Jim Martin, WOAY-TV

If you haven't already joined the Cycle Sat spot delivery network, check out the reception we're getting from those who have. We guarantee network quality transmission of your spots, along with standardized traffic instructions. For service that's out of this world...Call 1-800-274-2728. ©Cycle Sat, 1989

CYCLE▲SAT, INC.
A COMMUNICATIONS NETWORK
A SUBSIDIARY OF WINNEBAGO INDUSTRIES, INC.

CROSSTALK
AN ENGINEERING MANAGEMENT JOURNAL

Top of the Hour ... HDTV Follies ... HDTV Follies Too

Top of the Hour

All-news radio dates back almost 25 years, but a news-intensive format on local television is definitely something new. With the concept, KMOV-TV, St. Louis, found a creative technical approach to its competitive pressures.

On February 26, right after *60 Minutes*, the CBS affiliate (formerly an O&O) premiered "The 24 Hour News Source," an innovative format that preempts commercial time at the top and bottom of each hour to bring viewers up-to-the-minute, locally produced news briefs. KMOV's executive news producer, Larry Shenosky, stressed, "It's important to note that the updates are news, not promotion. This was central to our goal of providing a 24-hour news presence."

KMOV's 24 Hour News updates originate from the station's central control facility. An ALTA Pictoris video effects system is seen to the left of operator Ray Vadjia.

"The NBC station here is hyper-agressive," Shenosky remarked. "We launched what amounted to a pre-emptive nuclear strike against them." Because of stiff local competition, the project was conducted in utter secrecy. The nature of the "Black Box" project, as it was dubbed, was known only to half a dozen KMOV executives.

The classified project faced an additional restraint—budget restrictions. Even so, the station manages to make creative use out of inexpensive equipment. The 35-second news updates that run at the top of each hour are switched through computer-controlled production equipment located in the station's central control room. Each incorporates a "signature" animation with theme music, a live camera source for the talent and a digital time clock that ticks off the time.

The updates are switched by KMOV's automated master control equipment. The system first triggers playback of the animation and music carts. Then, a trigger pulse is sent to the Alta Pictoris digital effects system, which slides a compressed camera source onto the screen (typically a news anchor or a live ENG shot from a breaking story).

Talent writes their own scripts, which are prompted on a Computer Prompting Corp. teleprompter.

Weather reports, which run on the half-hour, are accomplished in much the same way. The video entered into the Pictoris is either local color weather radar or a live picture of downtown St. Louis from KMOV's "Skywatch" camera, located atop a downtown high-rise.

The KMOV 24 Hour News graphic image was developed by Digital Images of Boston.

As part of the increased news commitment, the station added news bureaus in two nearby bedroom communities, St. Charles, MO and Fairview Heights, IL. Offices were rented and clear microwave signal paths established without security leaks.

HDTV Follies

Just when you thought it was safe to go back to the production studio, two major U.S. organizations have reversed their previous stands on HDTV.

In a major action under their new chairman, former FCC Mass Media

BETTER BY HITACHI

VL-S100

Hitachi Has Made Life a Little Easier for the Video Professional with the VL-S100.

S-VHS

AND FIVE REASONS WHY:

BUILT-IN DIGITAL TBC — makes this recorder the most versatile, with pristine playback in the field or in the studio. So picture composition and editing are easier.

SIMULTANEOUS PLAYBACK — a special video head enables the playback picture to be viewed on a monitor during recording. Which means error-free recording is now a reality.

SERIAL REMOTE CONTROL — the RS-422 serial protocol enables convenient connection to the Hitachi VL-EC10 editing controller.

FRONT LOADING — easy, jam-free operation and you can stack them or rack them.

FLYING ERASE HEAD — ensures clean and transparent insert and assemble edits.

And there's a lot more to appreciate in the VL-S100. Like a chroma noise reducer that produces dazzling colors and greatly reduces noise. A rotating preamplifier mounted inside the drum that eliminates transmission loss and ensures high S/N ratio. A new amorphous video head that cuts deterioration during dubbing. And of course, the S-VHS recording system for exceptional horizontal resolution.

So, better buy Hitachi, a recorder that will make life easier at last.

HITACHI

Hitachi Denshi America, Ltd. 175 Crossways Park West, Woodbury, New York 11797 Tel: (516) 921-7200

Circle 111 on Reader Service Card Page 51

James C. McKinney now heads the ATSC, which has changed its stance on 1125/60, calling for a delay on final decisions.

Bureau chief James C. McKinney, the Executive Committee of the ATSC has unanimously approved a series of recommendations concerning the May 1989 International Radio Consultative Committee (CCIR) meeting in Geneva. In a letter to Secretary of State James Baker, the committee suggested that the State Department move to delay final decisions on a single world production standard for HDTV to the next study period of the CCIR which will run from 1990 to 1994. This reverses the ATSC's prior position in support of 1125/60.

One reason the ATSC cited for the change is Europe's rejection of any 60 Hz HDTV standard.

One reason the ATSC cited for the change is Europe's rejection of any 60 Hz HDTV standard, while the U.S. seems strongly committed to 59.94 Hertz. Also cited was the belief of some in the U.S. private sector that attention should be focused first in the area of transmission standards and that a direct linkage exists between production and transmission standards.

At the same time, the ATSC expressed support for exploration of a common image format.

McKinney stated, "Clearly this is a shift in the ATSC position but one which the Executive Committee thought was appropriate given the current state of HDTV development throughout the world. But I do want to make it clear that in taking this action, the ATSC continues to believe that a world standard—acceptable to the U.S.—remains a very important goal to achieve."

HDTV Follies Too

To standardize or not to standardize? Just before press time, the American National Standards Institute capitulated to an appeal by Capital Cities/ABC and rescinded its former approval of ANSI 240M, the 1125-line, 60 Hz HDTV standard proposed by SMPTE.

Early in February, ANSI rejected a bid by Cap Cities/ABC to strike down 240M. Apparently, the network's appeal did the trick. In its decision, the ANSI Appeals Board said that SMPTE 240M "lacked current consensus based on the latest information presented to the ANSI Appeals Board at its April 18, 1989 meeting.

Despite the pressure, development of 1125/60 continues.

As a result we find that standardization of SMPTE 240M will not serve the objectives of ANSI standardization at this time. ANSI-approved standards are intended to represent national practice as defined by national consensus of U.S. opinion, for use in the U.S. industrial system."

The rejection is another blow for 1125/60, which remains the only HDTV production standard in active use in the world. Early support for the standard, backed by Sony and a number of other manufacturers, has softened in the face of several factors. Among them are the FCC's mandate that U.S. HDTV be NTSC-compatible, political pressure to have a U.S.-developed standard, and a pulling back of the motion picture industry's early support. Both ABC and NBC have opposed 1125/60, preferring other systems that would operate at the NTSC field rate of 59.94 Hz.

Despite the pressure, however, development of the standard continues. The 1125/60 Group, a consortium of manufacturers dedicated to the standard, fielded a large HDTV Pavilion at the NAB Convention earlier this month. ■

For more information contact SMPTE (914) 761-1100 or Capital Cities/ABC (212) 887-7777.

In this business, you can't afford to be satisfied with less.

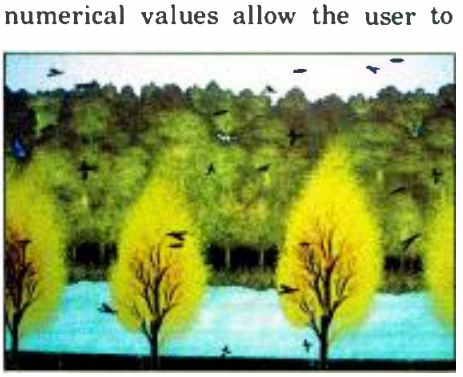
The people who use our tape are not easily satisfied. In fact, our best customers are never satisfied. They constantly demand more from themselves. And more from their tape. That's why they demand 3M tape. And why you should try it. Because, in our products and service, 3M is committed to one goal: We won't be satisfied until you are.

3M

decompression. The transformations that compose the IFS codes are operated on, in turn, by a random iteration algorithm. Rather than moving from the next point on a figure, the algorithm operates on the transformation to move from its present location to a new location where it plots a point. The first movements are random, but they quickly settle into a predictable pattern and the moving point generates the desired image segment. Each of the IFS codes reproduces a segment of the image. The sum, when all codes have been decoded, is a complete image.

Currently, the most exciting potential application of image compression using fractals is the creation of HDTV at the receiver end without changing the signal. This could be done by compressing and immediately decompressing the incoming image at a much higher resolution. Unfortunately, with existing hardware, the best experimental rate for decompressing images is four frames per second, not nearly fast enough to produce a moving picture.

Other important potential applications for fractals include image analysis, measurement, and comparison. The descriptions of graphic images as numerical values allow the user to



VRIFS screen showing the original digitized image and fractal synthesized version.

study these images in a quantitative way. Similar images will have similar numerical values. Possible applications include the screening of medical images and the automatic analysis of weather images.

Iterated Systems offers a number of software packages including VRIFS (Vector Recurrent Iterated Function System). VRIFS is supported on a Sun workstation and allows the user to create a graphic image from scratch or to synthesize digitized bit-mapped images. Using the system is like assembling a crossword puzzle. The system provides the "pieces" and aids the user in assembling the picture. A forest can be made of one tree "piece," bent, rotated, sized, and shaded hundreds of ways. Pieces may be decoded at any resolution enabling the user to place trees in his forest at the proper scale and resolution.

Real estate agents can show homes to clients without leaving the office.

Intel has a rival system called Digital Video Interactive (DVI) technology. DVI is able—as a one-time operation and not in real time—to compress 30 frames of video into 150 kbytes of data. Then, in real time, DVI can recreate the original video at the normal viewing rate of 30 frames per second. The first DVI application is a simulator for training truck drivers available from Applied Optical Media Corp. A more recent product development is an agreement, announced on March 28 of this year, whereby Intel will develop hardware to bring DVI technology to IBM's Personal System/2 computer family.

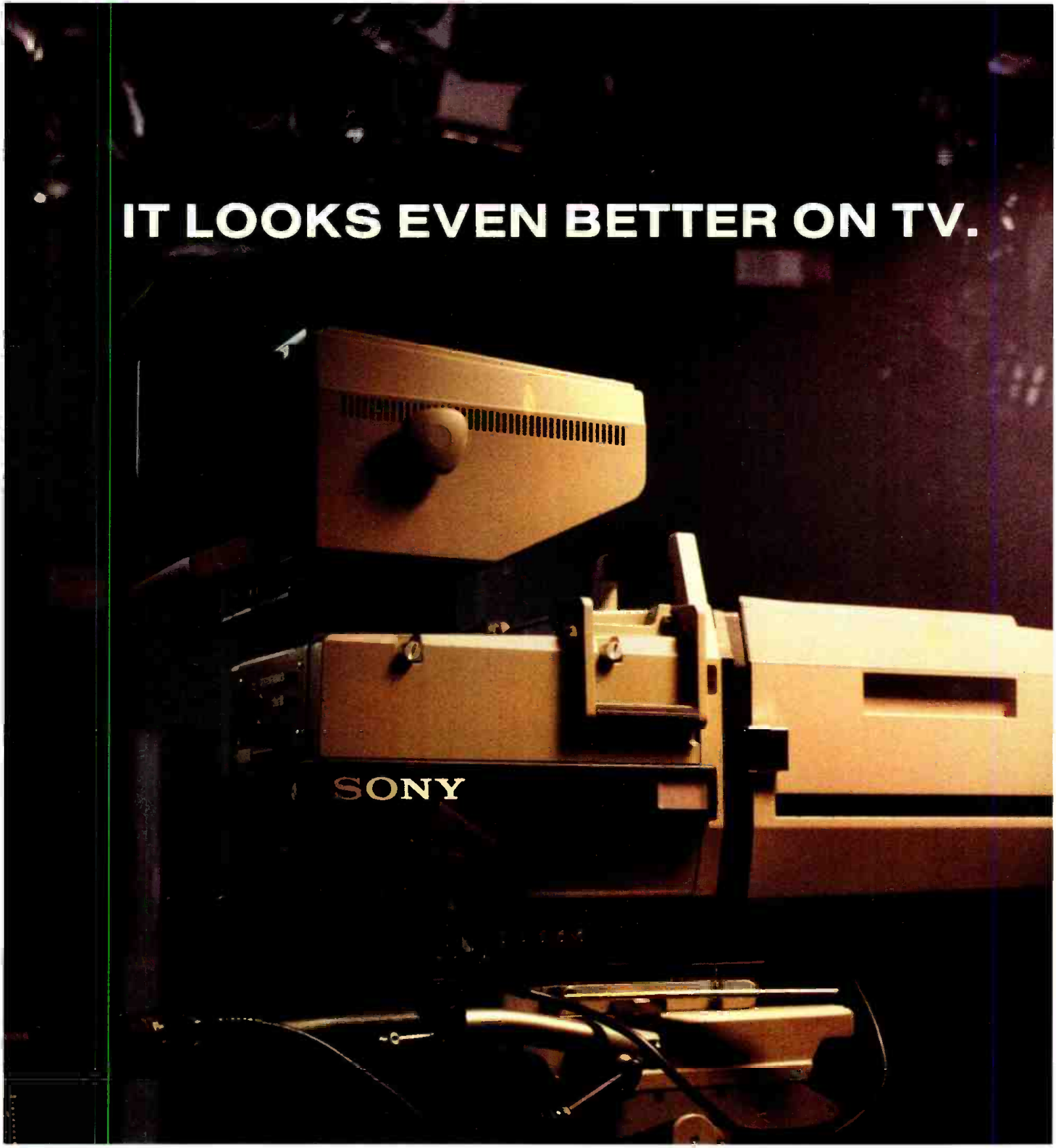
Intel market development engineer Kevin Gazzara notes that Intel uses a hybrid technology that can't be divulged for proprietary reasons. Iterated Systems expects to have a prototype of its own DVI system ready in September.

Another system finding important market applications is CSX digital signal processing from CompuSonics Video. This system is the basis of Digilist, a software package designed to improve the productivity of real estate salesmen. Digilist stores and makes immediately available 20 views of any of 10,000 homes. Homes may be selected for viewing on the basis of price, style and many other criteria. Split-screen comparison viewing is possible.

Both on the job and at home, there are fractals in our futures. As Barnsley recently predicted, "Image synthesis techniques based on fractal geometry are the future of computer graphics because of their ability to cope with vast file sizes efficiently." To which he added, "Fractal DVI techniques will be the basis of future home entertainment systems." ■

Ackerley is technical editor of BME.

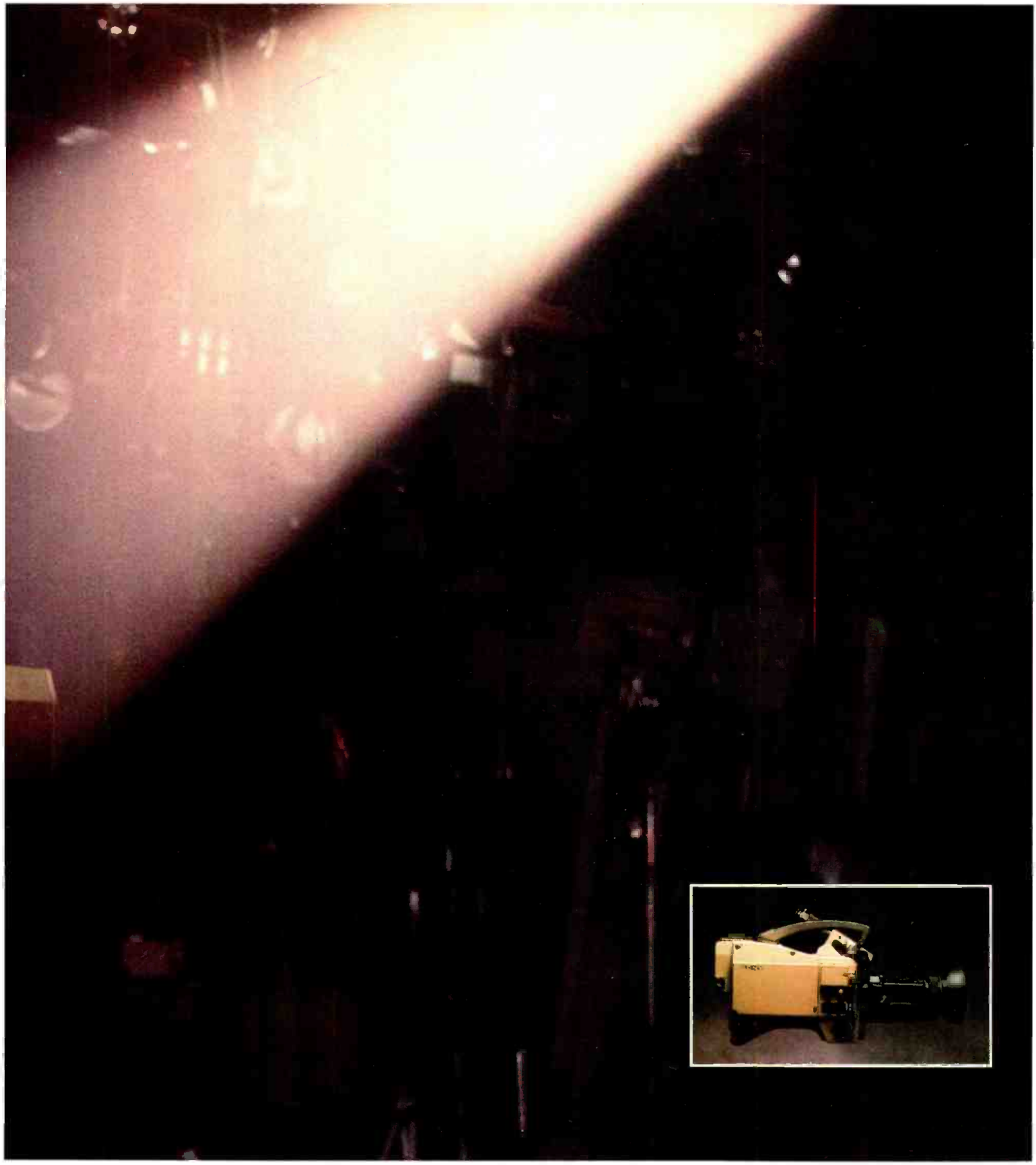
IT LOOKS EVEN BETTER ON TV.



And no wonder—it's the Sony BVP-360. The best-looking studio camera on TV. And the one with the best-looking picture.

The BVP-360 offers state-of-the-art mixed-field technology in 2/3" Plumbicon™ tubes—precise and ultra-stable geometry and registration, and more than 700 lines of resolution. The best signal-to-noise ratio. And the most accurate color reproduction. To the darkest shadows and highest-level whites. And the widest range of light levels in between.

By design, the BVP-360 is ideally suited for studio and outdoor production. And, since the portable companion



BVP-350 uses the same circuit boards and optics, its picture is exactly the same.

But most of all, the BVP-360 looks good because it's from Sony—the leader in broadcast camera sales. And it's backed by Sony service. Our national service organization is on call 24 hours.

Any day. Anywhere.

But see the BVP-360 for yourself. Contact your Sony Broadcast Sales Engineer. Or call Sony at (800) 635-SONY.

SONY®

BROADCAST PRODUCTS

GAUGING YOUR T&M NEEDS

The careful choice of testing and measuring equipment can maximize your plant's efficiency.

BY PAUL McGOLDRICK

At a time when it is becoming increasingly difficult to recruit good broadcast engineers, the need to test and verify any additional or replacement equipment purchased is probably the last thing your budget-conscious station and facility managers want to think about. Why invest in more equipment, they say, when you haven't the staff to maintain what you do have? But the mutually interactive relationship between equipment purchase choices and successful facility planning isn't really that cut and dried. Considerations of equipment acceptance, maintenance and future expansion and change affect the choices you make from the start, and if not taken into account, they can have serious consequences across the board for your operation.

It is not unusual these days to go to a major TV station and find that the maintenance day shift has shrunk to two or three people who have literally no time to cover anything close to the work that really needs doing. If you were to ask about their new installations, you would probably find that they never get completed, but only just "made to work." This situation is a bomb waiting for only a small trigger to set it off.

The broadcast engineer who has been well trained and who keeps on top of his or her professional practice is a valuable commodity and will always be in demand, but even the broadcast engineer cannot do it all. If station or facility management expect, as they should, the highest possible level of efficiency in engineering, that really means keeping equipment not just "working" but up to the best standards it is possible to set. Bare-bones, front-line, emergency maintenance can all too easily lead to the worst-case situation—the total crash—and if it happens on-air it certainly cannot be ignored.

How does test equipment enter into this scenario? One of the best ways to prevent downtime on equipment is undoubtedly to keep it very close to the peak of its performance; while equipment that is kept up to specifications does sometimes fail, of course, those failures are invariably more noticeable and easier to service than the gradual deterioration in performance of a non-maintained box.

But test equipment probably ranks among the general manager's least-loved items. It doesn't make pictures, it doesn't record them, it doesn't transmit them, and it sure doesn't

Basic test equipment—a Magni WFM560 waveform monitor and Tektronix 1420 NTSC vectorscope—is integrated into Edit Room 1 at Frame Runner in New York City.

matter to the advertisers or producers. Someone renting production time in a facility will be concerned with the computer graphics system used or the character generators available, and will pay for them but probably couldn't care less whether the VTRs were aligned using a generator and waveform monitor/vectorscope from company X, Y or Z.

For many years it has been accepted that about 10 percent of a facility's budget was spent on test and measurement equipment. Interestingly, that percentage has gone down in years when budgets were really loose and up when they were tight. When budgets are tight, the existing major capital equipment has to be kept in service that much longer, and part of the TLC procedure has to be the ability to diagnose where it is sick.

When T&M is among the first items to be cut from a budget, it is often because the facility and capital equipment are new, and it is assumed test equipment will make no real difference to the first-time operation of the equipment. In most cases this is at best a short-term gain. In the long term, test equipment should be considered an integral part of the system, and the whole operation trained around the ability to monitor and test a new area or facility.

One of the very first distinctions to be made by the person specifying new test equipment is to ask whether the equipment being considered is to be used both for *monitoring* and *measuring*. This is an important distinction to make. Pure monitoring facilities can be provided with very low-cost boxes, but measurements using those same boxes may be questionable. At the other extreme are products for very high-quality measurements—in some cases to what can only be called laboratory standards. Using those for monitoring would be very wasteful. Some other products follow a middle ground. They are easy to operate or can be controlled from memories by

When test equipment is brought in at the start of a new installation, the system can be accepted on specifications, as a benchmark for future comparison.

operators, but if taken out-of-service to a maintenance area they can perform high-grade measurements with features that the average operator literally never sees or uses.

Let's take some typical operating conditions and look at the sort of test and monitoring equipment you would want to think about investigating and budgeting for:

Studios. Test signal generator with at least 15 test signals and genlock capability; measurement-quality waveform monitor with at least three composite inputs and switchable/parade/alternate filters; measurement-quality vectorscope with at least three composite inputs and SC/H measurement capabilities.

Control areas. Test signal generator with at least 15 test signals and genlock capability; measurement-quality waveform monitor with at least three composite inputs, operator memory recalls, and full line select (check CRT intensity); measurement-quality vectorscope with at least three composite inputs, operator memory recalls, full line select and SC/H measurement.

Transmitter sites/transmission control. Test signal generator with up to 40 test signals, genlock capability and black burst output; measurement-quality waveform monitor with operator memory recalls, switchable/parade/alternate filters and full line select; measurement-quality vectorscope with operator memory recalls and full line select.

Remote, satellite and uplink vehicles. Test signal generator with up to 40 test signals, programmable identification label and black burst output; waveform monitor with at least three composite inputs, switchable/parade/alternate filters and full line select; vectorscope with at least three composite inputs, full line select, SC/H measurement and color framing detection.

Videotape areas. Test signal generator with up to 40 test signals, programmable ID label and black burst output; waveform monitor with at least three composite inputs, operator memory recalls, switchable/parade/alternate filters and full line select; vectorscope with at least three composite inputs, operator memory recalls, full line select, SC/H measurement and color framing detection.

Film/telecine areas. Test signal generator with more than 15 test signals and programmable ID label; waveform monitor with operator memory recalls and switchable/parade/alternate filters; vectorscope with memory recalls and SC/H measurement.

Maintenance. Test signal generator with up to 40 test signals and black burst output; waveform monitor with at least three composite inputs, switchable/parade/alternate filters and full line select; vectorscope with at least three composite inputs, full line select, SC/H measurement and color framing detection.

All areas require waveform monitors and vectorscopes with measurement as well as monitoring capabilities. A combined waveform monitor/vectorscope that meets necessary standards should be considered where space is an issue.

Different tape formats also have special T&M requirements. For use in D-2 installations, a test signal generator should have D-2 output capability simultaneously with NTSC signals. Some D-2 machines require waveform monitors with 90 Hz remote capability. All test equipment should include a transcoder to change D-2 signals to NTSC for monitoring.

For installations that combine NTSC with component analog video (Betacam and M-II), a test signal generator should produce NTSC sig-

Closeup of Frame Runner's ER1. ER2 is similarly equipped, but uses a Magni WFM560 waveform monitor and VS560 vectorscope.

The Faroudja LINE DOUBLER

Ahead of its time

The LD-1 Line Doubler accepts 525 line, 2:1 interlaced, 59.94 Hz video signals and converts them to 525 line progressive scan or 1050 line interlaced signals.

The motion detection techniques used in the LD-1 are considered by experts in the field as being the most advanced. Along with proprietary bandwidth expansion techniques* and patented detail processing, Faroudja Laboratories LD-1 delivers images that rival HDTV.**

35 mm Film Quality

The absence of visible scanning line structure, edge blurring or motion artifacts at the LD-1 outputs makes it an ideal companion for large screen TV displays. Its crystal clear, artifact free image delivers a "cinema-like" feeling from standard 525 line video sources.

SuperNTSC™

The Faroudja LD-1 Line Doubler, CTE-2 Encoder and CFD-N Decoder comprise the basic building blocks of the fully compatible SuperNTSC™ ATV system.

* Patent Pending
** Patent Numbers 4,030,121 and 4,262,304

FAROUDJA LABORATORIES

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

Circle 114 on Reader Service Card Page 51

nals and three-wire CAV signals in the desired standards, with added RGB capability. The waveform monitor inputs should be configurable for the CAV standard in use, or RGB with scaling transcoder built in. Three inputs are adequate for studio and film/telecine areas; for other areas, six inputs are needed to time sets of component signals. Built-in component vectorscope is very useful.

The original NTSC vectorscope is fine for most CAV use when the waveform monitor has component vector capability. For full timing capability in control, remote and maintenance, use a six-input vectorscope.

Test equipment probably ranks among the general manager's least loved items.

When NTSC is combined with D-1 component digital video, simultaneous D-1 and NTSC outputs are necessary on the test signal generator. Eight-bit generation is sufficient for most recording/editing only situations; 10-bit generation capability should be added for studio, control and maintenance. The generator must be capable of the same component signal generations.

Waveform monitors and vectorscopes with six inputs each and quality measurement capabilities will serve in D-1 installations, with the addition of a high-performance 4:2:2 D-1-to-analog transcoder. They should be capable of operation in eight- and 10-bit modes and future conversion to 4:4:4 operation.

In general terms, if you are operating with more than two formats you should have a programmable generator available—in your maintenance area, at the very least. Stick with instrument "families" wherever possible; it makes your engineering and operating crews more comfortable.

Think ahead and allow that 10 percent test and maintenance budget in advance instead of having to scramble for it later; this will allow you to buy smarter than the "this will do for now" attitude permits. It should be possible, for example, for the generator you purchase today to still be used tomorrow in slightly different circumstances—composite NTSC now, add D-2 later. Or Betacam today, with NTSC signals and D-2 or D-1 (or both) tomorrow. And even when a facility says, "No, we're not going to invest in Betacam or D-2 for the foreseeable future," it is surprising how quickly that scenario can change when the market price of a new format changes, or peer pressure from a sister station becomes intolerable, or the demand arises for interchange of program material.

It is also very true (although it sometimes takes a while for the user to prove it) that you can't "cheat" across format lines in testing. You may be going in and out of Betacam in NTSC, but if you are not checking the VTR internally, in its own component format, you are fooling yourself. If you do not verify the performance of your D-2 machines *in D-2* —not just from the NTSC ports—how are you going to use your D-2 machines to edit in D-2 with any confidence?

The same is true of display devices. They should be capable of monitoring and measuring, in NTSC *and* component; they should have enough inputs that component channels can be compared to one another; they should have the capability of measuring day-to-day editing functions such as SC/H phase; and they should be able to identify correct color framing. If the equipment being specified lacks the flexibility to work across different technology environments, then today's marginal savings are more likely to turn into a need for complete replacement tomorrow.

Everyone hopes that equipment will last forever and that the manufacturer will be kind enough to honor the warranty rather loosely in terms of time; in our business, in fact, manufacturers are truly concerned about the quality of their products, and it is unlikely that any of the major players would take issue with whether the warranty strictly expired today or last month. If there is a quality or workmanship problem, we want to know about it, and generally customers are quite vocal in telling us.

But if you *really* want to keep your facility running at exactly 140 IRE units, then keep a fairly reasonable calibration program going in the facility. A measuring waveform monitor is not significantly different from a high-quality modern oscilloscope—there are cursors for voltage measurements, cursors for time measurements, calibrated SC/H, differential phase and gain on some. Send at least one master unit back to the manufacturer once every six or nine months for recalibration. The few hundred dollars involved will bring great peace of mind when you know that the equipment is being calibrated against known national standards. Many manufacturers will also take the opportunity of updating the product as well at the same time.

Also, never be afraid to ask a manufacturer about training—operations and/or maintenance—in the field and at their factory. Your local sales engineer is probably also a font of information about video test and measurement; he or she will always be very happy to train your operators or offer advice on applications.

There are some exciting challenges around the corner for test equipment manufacturers. Equipment must be designed to be even more multifunctional while retaining user-friendliness, and the next four or five years are going to result in some clever uses of new technologies to achieve that. Further developments in advanced television standards, which are going to continue relentlessly, will result in new amalgams of technologies, particularly involving computers. If you want to see variety and change, you are around at a good time in television; if you wanted only the quiet, steady life it is probably time to go fishing and hope everything is still working when you get back. ■

McGoldrick is vice president, sales and marketing, for Magni Systems, Beaverton, OR. He holds BSEE and MSEE degrees from Plymouth (UK) Polytechnic and is the author of numerous engineering articles and books.

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 132 on Reader Service Card Page 51

Directing Traffic In The Heart Of NYC.

Directing Traffic In The Heart Of NBC.

NBC/New York needed a routing switcher for the 1988 Summer Olympics that offered 9 levels of switching and 182,464 crosspoints. They chose 3M. Later, they needed a routing switcher for their Visa Graphics facility in New York. Once again, they chose 3M.

For over 25 years, we've been surpassing the standard in the broadcast equipment business. Before you commit to any routing system, large or small, call us at 1-800-328-1008.

We'll help you get where you're going.

Broadcast and Related Products Division

3M

LEAN, MEAN AND BUILT FOR SPEED

Inside the innovative DME-450, Sony's entry into the production switcher market.

BY STEVAN VIGNEAUX

There is no doubt that the heart of any television production system is the video switcher. The advent of modern technologies such as integrated circuits and microprocessors has effected radical change in the inside of switchers by enhancing their complement of features, greatly extending reliability and virtually eliminating drift. However, these internal changes have had little impact on the outside of switchers.

Operating traditional switchers has always been a fairly difficult task reserved for specialists. Each television facility has a small number of engineers who have developed the necessary skills. Even with skilled staff, however, the complexity of operation slows down many speed-sensitive production efforts such as news editing. As a result, "cuts-only" editing has been the norm in many working environs because the alternative requires too much time or effort.

As part of a continuing program of product development, Sony's product planning staff concluded that if the technological barrier of switcher operation could be broken, then a much wider range of video professionals would find switchers a practical tool for their work.

Design goal one was simplicity of operation. Historically, switchers have presented an intimidating face to new users. The decision was made to eliminate every possible operational adjustment in pursuit of operational simplicity.

A second goal was speed. The editor preparing a news story which must go to air within the next 20 minutes does not have time to spare. Nothing can be allowed to interfere with the end

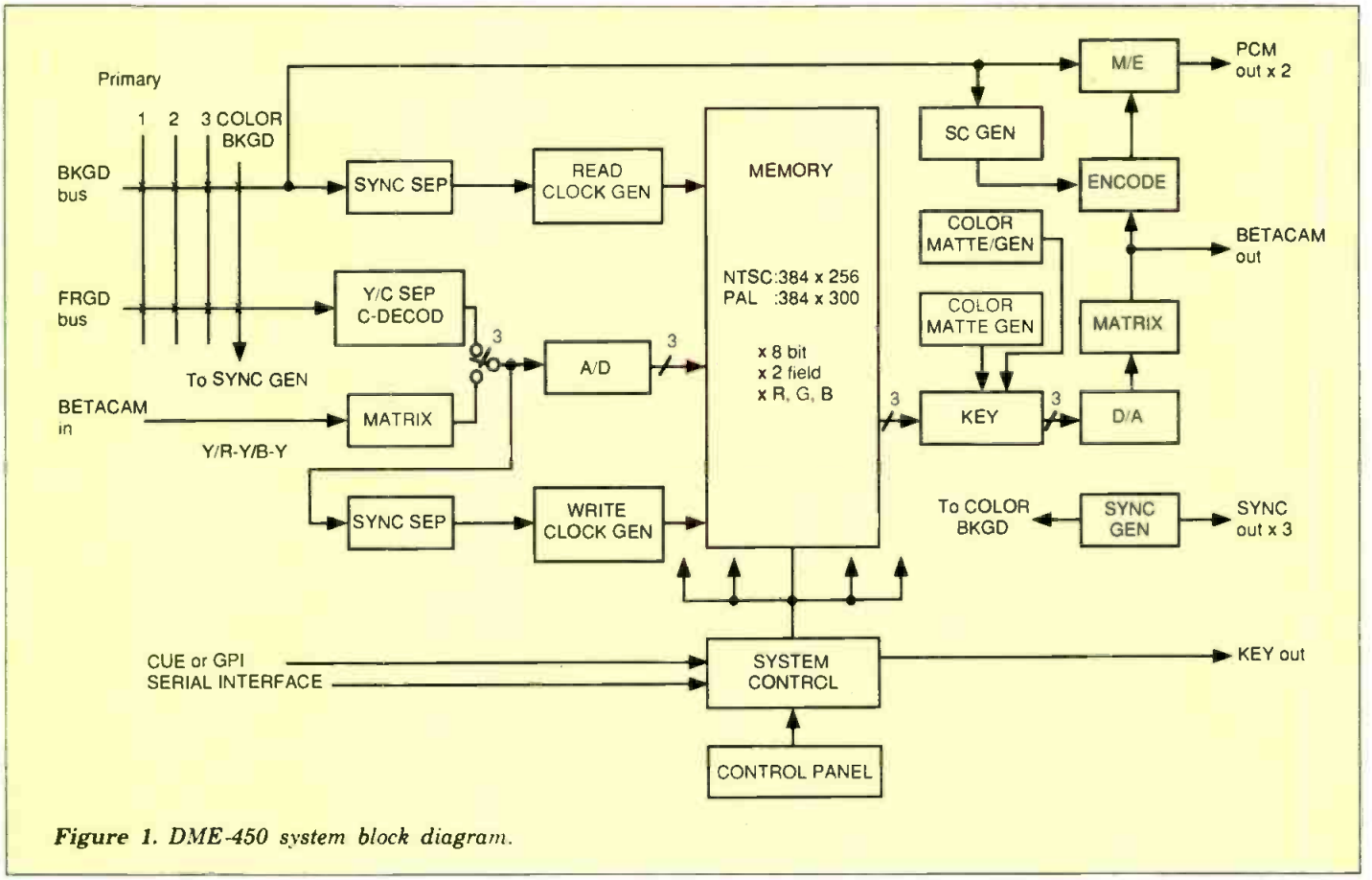


Figure 1. DME-450 system block diagram.

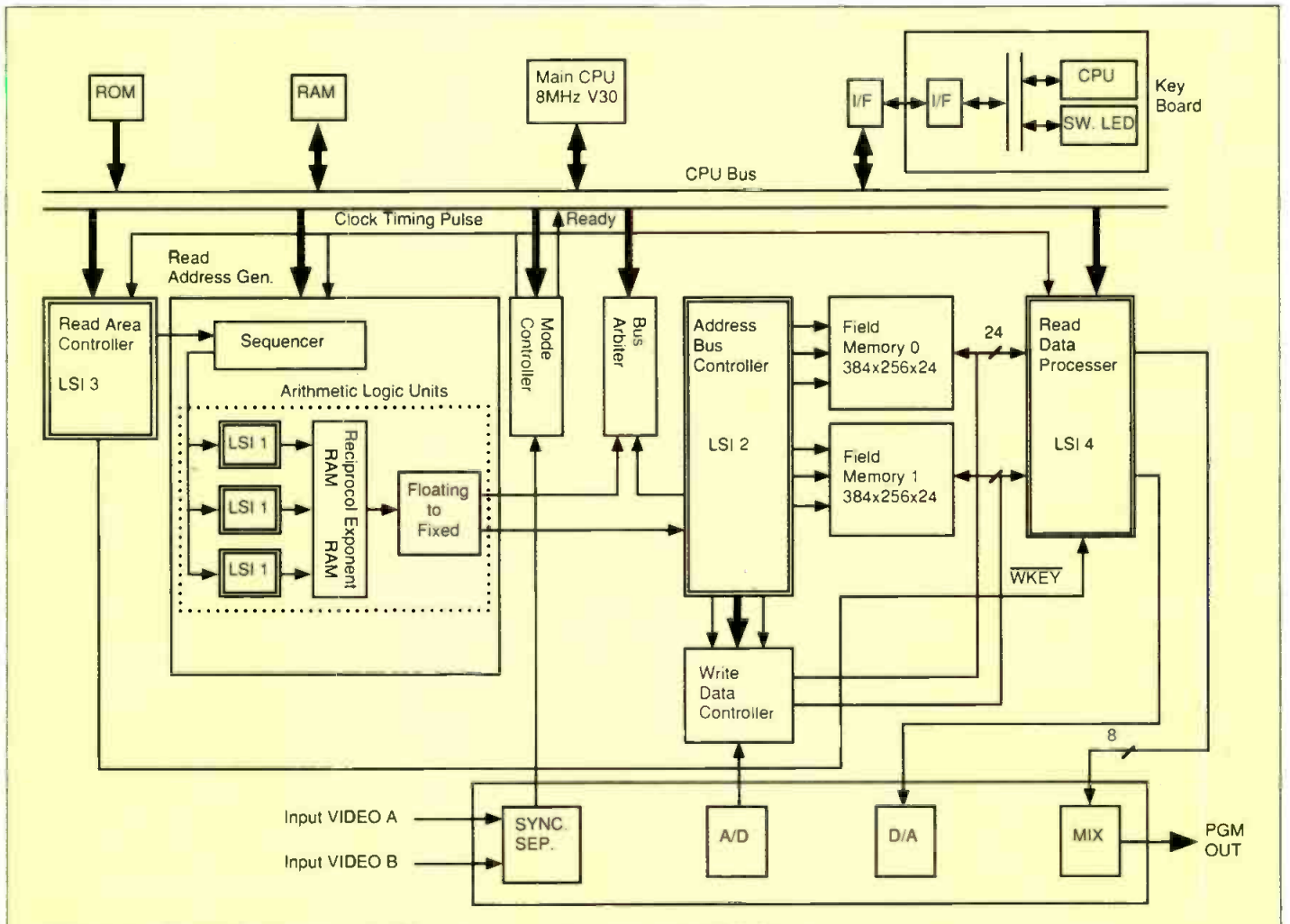


Figure 2. The DME-450 uses a ROM-based approach to generate video effects.

goal of getting the edited story in on time. If each operation requires many different adjustments, each of which uses controls whose adjustment is neither precise nor easily repeatable, then the entire process will generally slow to a crawl. Interestingly, speed can be achieved by the exact same process as simplicity—eliminate as many controls as possible and make those that remain unambiguous.

Affordability was another goal. Even the simplest, fastest, most technologically magnificent switcher is a failure unless it is actually used. A survey of typical editing applications quickly showed that many make use of two playback VCRs and one recorder, and sometimes include a character generator. Specific customer research confirmed this finding; therefore, a three-input design was adapted.

Early in the design process, a firm decision was made that the end product would utilize custom integrated circuits as necessary in order to minimize both the parts count and physical size. Further, it was decided to reexamine the fundamentals of switcher implementation technology to find entirely new approaches which would provide the desired combination of features and cost.

In yet another stride toward maximum affordability, a goal was established to eliminate TBCs in the playback VCRs. The planning and design teams agreed that adequate development would lead to a suitable, reliable technique to meet this end.

Finally, the planning team determined that the switcher must set new standards for power and function. Again, this was to be accomplished by applying innovative technology and operating interface concepts to the product implementation. Therefore, the end product was required to have full 3D digital video effects as a standard function integrated into the operation and electronics.

Given the above parameters, it was clear that the control panel would have to be incredibly simple without sacrificing necessary functions.

The lower left corner contains the input selectors for the two buses, while the lower right corner is the transition select area. The user can select any of the three inputs plus the output of a background generator. The transition select mechanism achieves the design goal of simplicity by replacing the fader bar with five preset speeds selected by pushbuttons. The operation of the switcher is extremely fast due to its simplicity, just as the design team required.

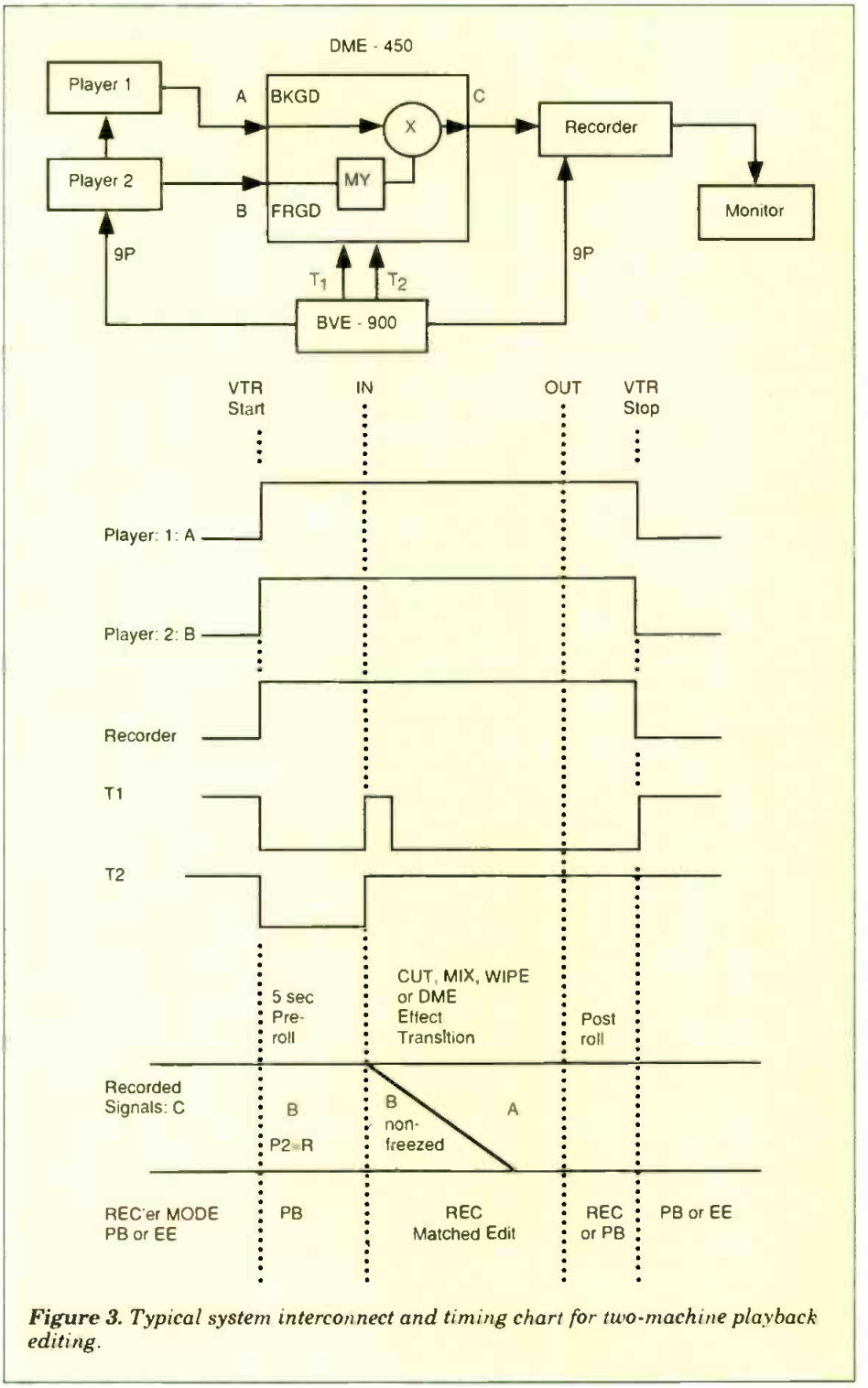


***Figure 3.** Typical system interconnect and timing chart for two-machine playback editing.*

Background and border controls, located in the upper left, provide flexibility with a minimum of operator action. The two color generators can produce any one of 72 different hue/saturation/luminance combinations by using the preselectors.

Effect selection, in the top right-hand section, provides over 100 special effects under very simple operator control. Five of these buttons have been assigned common wipe patterns, one a mix and one a standard cut. Four other buttons are available for the user to assign to selected choices from the 100-plus additional effects stored in ROM. The operator may use the up/down controls immediately below the digital readout to select any ROM effect or the numeric keypad integrated into the pattern selector buttons to command a selection.

Several key design elements of the switcher are visible by examining the system block diagram (Figure 1). The composite foreground video is passed through a Y/C (luminance/chrominance) separator to decode it into analog RGB components. If the com-

ponent analog input is used, this Y, R-Y, B-Y signal is transcoded to RGB by the input matrix. These three RGB components are then digitized by the A/D converter and stored in the video RAM memory at a rate controlled by the write clock generator, whose control signal is twice the color subcarrier frequency as derived from the video's sync. Specifically, the sampling frequency is 455.0 x horizontal frequency. The video memory consists of two fields of component digital memory. The specific capacity is eight bits per sample, with 98,304 samples per component per field, which works out to 98,304 samples/field x 8 bits/sample x 2 fields x 3 components = 4.72 Mbits of video memory. The above figures are for NTSC. In PAL, the total memory is approximately 5.6 Mbits.

In order to eliminate the need for TBCs in the playback VCRs, it was essential to find a technique to synchronize the foreground and background videos. Standard practice in editing systems has usually been to use separate time base correctors to synchronize the two VCR outputs to a master reference which was also used to lock the switcher. However, all this was only done in order to assure that the two videos would be at the same state when a transition occurred. The solution of providing built-in TBCs was rejected as overly expensive. The path of matching the two videos and slaving the switcher was selected.

In the DME-450, the background bus is used as the reference for the digital memory readout during effects transitions. The signal selected on the background bus enters a sync separator whose output is used to drive the read clock generator which, in turn, is used to clock the output from the video memory. The output digital video signal from this memory will obviously be in sync with the background video because the background video is used to drive the memory read clock. Having two full fields of memory provides for essentially infinite window error correction.

The digital video output of the memory is then passed to the D/A converter, which returns it to analog RGB. This RGB is then matrixed to Y, R-Y, B-Y for the Betacam component output, followed by encoding to composite analog for final processing.

The composite analog video enters the mix/effects amplifier for combination with the composite analog background video. As mentioned before, this is possible without using TBCs because the videos have been synchronized as a result of the digital write and read process.

The two full fields of memory also provide the ability to freeze a frame of incoming signal. As a result it becomes possible to simulate A/B roll editing while using only one player.

First, the last frame of video from the A take is frozen in the switcher. Once this has been accomplished, the B take is played and a transition commanded between the frozen final frame of the A take and the real-time video of the B take now running. The end result is a transition between two separate video elements, an effect not

achievable in traditional switchers.

The two color generators shown provide another example of the techniques used to accomplish the design goals stated previously. Instead of providing complex analog color generators, the DME-450 generates and inserts its color background and border in the digital domain.

Rather than directly adjusting analog gain settings, the front-panel controls actually select specific addresses in ROMs which then produce specific prestored outputs which, when returned to analog, represent specific chroma, hue and luminance values. The output of the ROMs is keyed digitally into the digital output of the video memory and is changed to analog along with the foreground video when it passes through the D/A converter. This approach completely eliminates the need for an actual color generator by adding digital color values to the video data stream.

A similar ROM-based approach is used to generate the video effects and is illustrated in Figure 2. Digital video effects systems generally require extremely high calculating power because of the intense demands of video processing, parameter derivation and address calculation. The design for the DME-450 was specifically chosen to offer a specific preprogrammed series of effects whose fundamental parameters are stored in ROM. These parameters replace values which would normally be determined in real time by additional calculating hardware every time an effect was initiated. They were calculated off-line and programmed into the ROM at the factory. Each effect is capable of running at any one of the five preprogrammed speeds selected via the front panel.

The parameters from the ROMs are processed by an address calculator consisting of a read area controller, a sequencer, and an arithmetic logic unit composed of three 24-bit accumulator/normalizers and one 15-bit shifter/16-bit adder/comparator. The address calculator utilizes the parameters stored in ROM to map each video memory element onto the screen. The parameters for a specific effect are clocked out of the ROM and factored into a linear equation for ray tracing, which is processed with relative ease to yield output screen addresses. The input video which was already clocked into the video RAM is then mapped to these output locations, which produced the special effects. The read area controller is a 64-pin package containing 3000 gates. The 324-bit accumulator/normalizer is an 80-pin package incorporating 6000 gates, while the 15-bit shifter/16-bit adder uses 2200 gates in another 80-pin package.

By applying this technology, the DME-450 has been able to include sophisticated effects generally available only on significantly more complex systems. These effects include: compression, expansion, push on/off, aspect ratio change, perspective, true 3D rotation, mirror, scroll.

A read data processor is used to generate the video effects which do not require address calculation such

as mosaic, false color, posterization, reversed video, wipes, cut and mix. This is another LSI developed by Sony for the DME-450. The read data processor is a combination of register, selector, key controller and mix selector in a 120-pin package with 2200 gates on board.

For ease of system interconnection, the DME-450 offers three sync outputs for feeding sync back to the VCRs in order to achieve H-lock (horizontal lock). This eliminates the need for an external distribution amplifier, which again reduces the system complexity.

The DME-450 has two major operating modes. The first and most obvious is standard two-machine playback editing. Figure 3 shows a typical system interconnect and a timing chart to illustrate editing flow. The effect is executed at the in point and completed at the out point.

The second mode of operation is for single-player editing. Figure 4 shows a typical system hookup and the associated edit timing diagram. The effect begins and ends at the in and out points as above. Note here that the user is able to simulate A/B roll editing by using a freeze of the final frame from the player and using an effect to transition from this video to the next segment.

Any switcher/digital effects device designed to work with a variety of editors must offer flexible control. The switcher's 8 MHz V-30 CPU accommodates control from a cue signal, 25-pin parallel control or RS-422.

The control panel to mainframe controls signals are conveyed over a 25-pin parallel cable. An additional capability offered by this flexible control arrangement is the ability to interface the DME-450 to a larger switcher in order to use the DME-450 as an outboard digital effects device.

The Sony planning and engineering design teams saw a need and developed a plan to meet it which required the development of several specific LSI chips, innovative technology to eliminate the need for TBCs in the players and a control interface which will make switchers both unintimidating and truly useful to every video operator. ■

Before joining Sony Corp. last year as manager of new product development, Vigneaux was chief engineer of WFSB-TV, Hartford, CT.

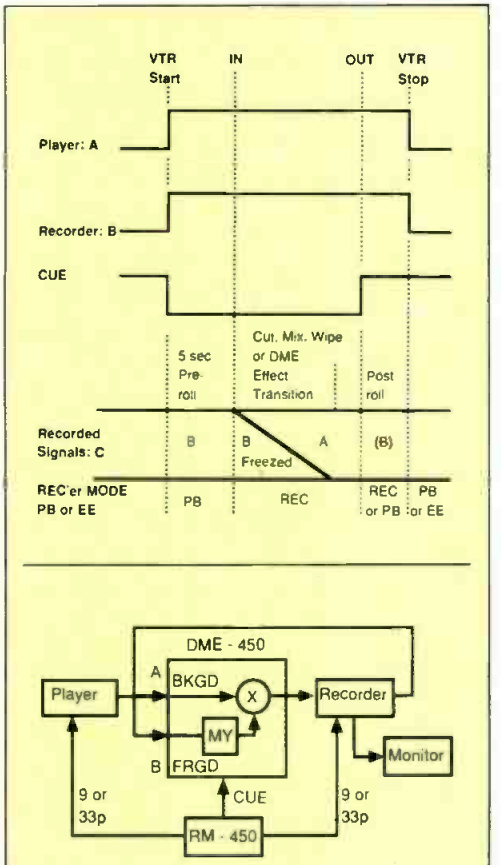


***Figure 4.** Typical system hookup and the associated edit timing diagram for single-player editing.*

Triple Play

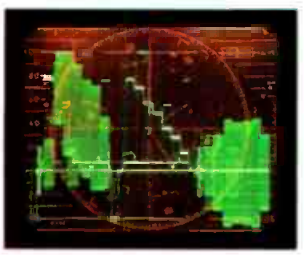
Videotek's new combo monitor gives you more inputs, more output and more memory for less money.

Only Videotek's TVM-620 waveform monitor/vectorscope gives you three selectable inputs for multiple viewing combinations, a roster of other winning features *and* the economy of a two-in-one unit.

Parade or overlay modes let you view any combination of up to three inputs simultaneously with one touch of our new membrane control panel. And ours is the only combo monitor that currently offers user-defined, one-button memory recall.

For portable monitoring of video signals during remote shoots, the TVM-620 is available with an optional internal AC/DC power supply (ADC-1). A four-pin XLR connector provides an easy interface with a variety of DC power supplies.

Engineers look to Videotek for thoughtfully-designed equipment that's built to be reliable and priced to be in your ballpark. See your Videotek dealer today about the TVM-620 plus our full line-up of test equipment.



Triple Filter Parade— 1 H each of Flat, Low Pass and Chroma Filters

Triple Vector Overlay— SMPTE Bars on A, B and C inputs delayed by 6° and 12° to demonstrate phase error

Combination Display— Simultaneous waveform and vector displays of a single input

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

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

Circle 119 on Reader Service Card Page 51

WE'VE SEEN THE FUTURE AND IT FITS.

Just when broadcasters and professional users are shifting from one-inch and 3/4-inch video tape systems to 1/2-inch analog component video, along comes the specter of 19mm D2. First they made it smaller; now they want to make it bigger again.

When Panasonic set out to design Composite Digital recording systems, we had a big responsibility —to keep it small. Our customers have a right to expect their investment in 1/2-inch to be preserved. We know that a change in technology means more than a change in equipment; walls, racks, layouts, suites, vans and tape storage are all long-term investments that shouldn't have to be re-done every time there's a new chip on the block.

Panasonic's new Composite Digital system not only delivers superior multi-generation capability, long-term signal stability and unprecedented operating ease. It is designed to fit right where it should—into your existing facilities.

Panasonic's design philosophy is always to create products for the future with today clearly in mind. Our editing recorders and systems work with all of today's existing standards for video, audio and control. When you're ready to convert your editing suite to Composite Digital video, Panasonic will fit in.

Panasonic cameras, from our new, all solid-state AK-450 to the new all-digital DPC-1, are designed to slip transparently into the operators' experienced hands.

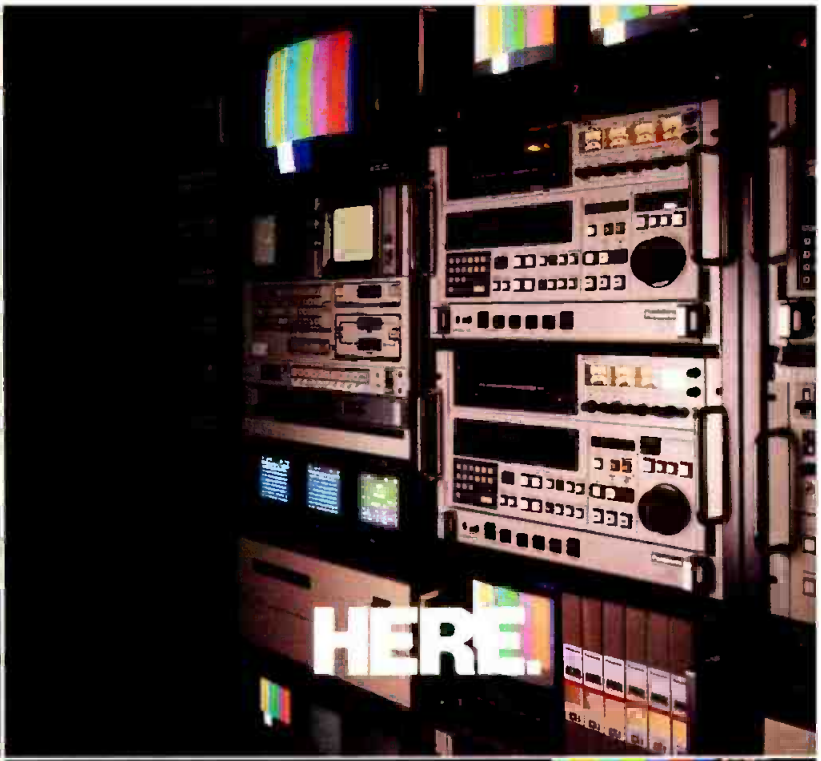
Today's mobile teleproduction requirements include everything from commercial production to fast-breaking news. That's why our system design is built around interchangeable components and true portability—and will remain so from today to digital to HDTV.

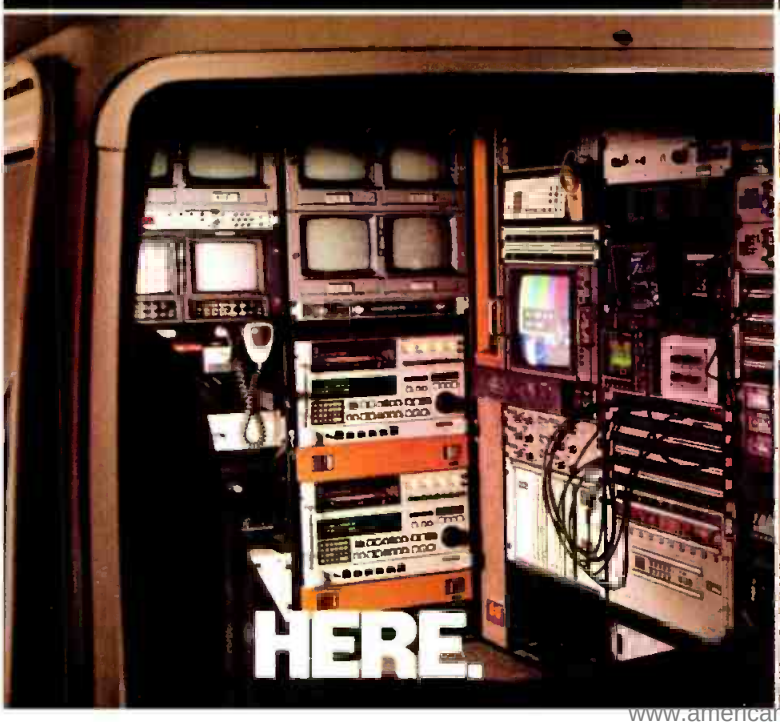
Here's the bottom line. Television in the 1990's demands technical advances and innovations—digital video and HDTV. But *your* demands are for systems that permit smarter, leaner operations. And that is why Panasonic's broadcast equipment, both for today and tomorrow, is designed to fit into your plant, your vision and your budget.

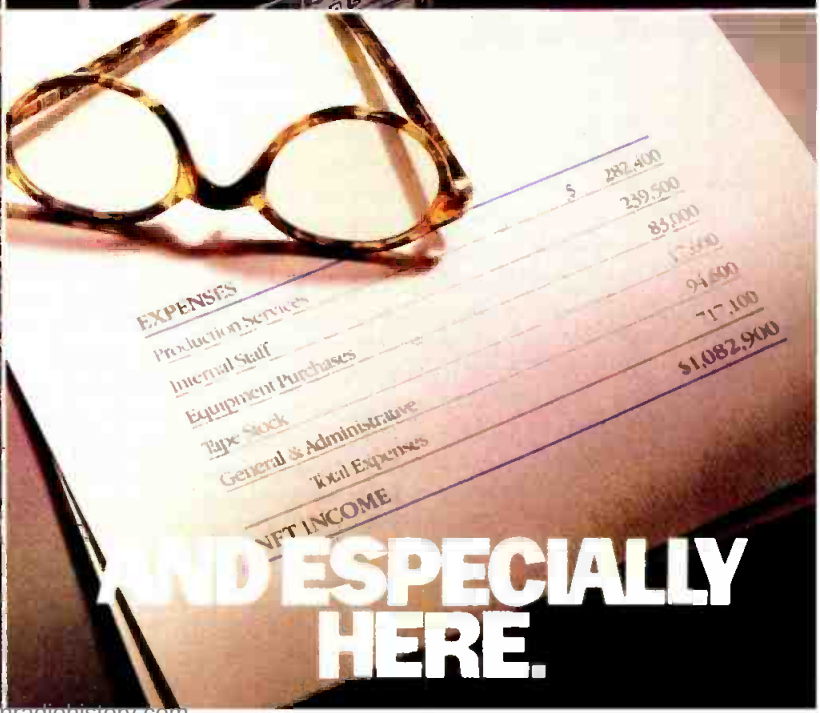
Panasonic
Broadcast Systems

Panasonic Broadcast Systems Company, One Panasonic Way, Secaucus, NJ 07094 (201) 348-7671

Circle 120 on Reader Service Card Page 51







FCC FINDS BOISE, INSPECTS STATIONS

What happens when the FCC makes a surprise visit to an FM station in the out-of-the-way precincts of Boise, ID?

BY TIM McCARTNEY

Geographically isolated from nearby cities, Boise is frequently chosen to test a variety of consumer products. The closest large market, Salt Lake City, provides 335 miles over which to minimize "advertising interference" from radio and TV stations.

So, when the FCC visits town, it's an event of sorts, since such inspections do not occur all that often. Our day arrived last July when the Field Operations Bureau from Seattle (over 500 miles away) sent in Laurence S. Jones, electronics engineer and FCC inspector. The last such FM and TV inspections in Boise had been four years earlier, although CATV and AM inspections had occurred in the interim.

Before visiting any station, Jones had already studied all of the local TV and FM stations, noting who was in compliance, etc. He had also photographed, literally, the FM and TV signals at two isolated locations in the area. I saw two "maps" of all the area FMs, which were photographs of the spectrum analyzer dialed up to examine the entire FM band. The photos were taken at two separate locations—one about 30 miles outside of Boise and the other inside the city limits.

This monitoring meant that Jones knew a lot about KBSU before knocking on our door. As we soon found out, however, he did not know *everything* about KBSU.

When an FCC inspector is in town, word travels very quickly. But, in our case, it was truly a surprise since KBSU was the first station to be visited. His 10:30 a.m. arrival at the studios opened with an introduction and identification which included a badge, clearly setting the tone for an official visit.

For KBSU, this was an important time. The station was about to complete equipment tests on its greatly upgraded signal. Why, we thought the whole world knew all about it! Imagine our surprise to learn that the FCC inspector who handed us "first visit" honors was not totally versed on this modern-day phenomenon. He was not aware of the construction permit allowing KBSU to change frequencies. Word had not reached him of the increase in power, and the 3500-foot increase in elevation was not a topic of everyday discussion in the Seattle area.

This experience demonstrated that the regional FCC inspector does not always have current information from the Washington, DC offices. While the information is available via computer from DC, it is usually easier to review station documents during inspections and discuss them with station officials.

Nevertheless, we were pleased to have the opportunity to demonstrate our hard work in complying with FCC requirements. The new management team had inherited a station in which it was policy to scoff routinely at all government regulations. The group of rebels behind this policy had proudly collected a file of FCC citations to document their anarchy. We felt certain this inspection would go very well and we hoped the results would serve to validate our efforts in the eyes of the university administration, KBSU staff, members and listeners.

So, here are summaries of our inspections—studio and transmitter. We were asked to produce two weeks of logs showing the sending and receiving of EBS tests. Jones later indicated that he usually asks for the last month's logs. If the recent logs appear in compliance, he asks for no more. However, if problems surface, the last three to six months of logs may be sought.

He noted the receive times so as to compare them with logs from other stations in the market, since we all monitor the same AM radio station. Then, he asked our on-air operator to conduct an EBS test, observing how he handled it, so that he could determine if the licensee had properly trained the operator (73.1860(C)). Also, he was then able to determine that the equipment was functional and modulation of the two tones was sufficient on the studio monitor.

He asked to see our red authenticator envelope. Weren't they pink before? For the first time, these envelopes now cover a full year instead of six months. Jones later explained that since deregulation, many stations assume EBS requirements have somehow decreased. Not so! He also pointed out that the licensee (presumably represented by the designated chief operator) must conduct an investigation should a week go by in which an EBS test is not logged as received.

We were asked to show that the logs with EBS entries were being checked each week by the chief operator. The mechanism by which stations should log their investigations into EBS problems consists of answering the questions: Is the equipment malfunctioning? Are the tests being done but not logged? Are the tests not being sent by the primary station?

At least one station in Boise was cited for a six-month failure to maintain a functional EBS receiver. In such cases, FCC Field Operations Bureaus are *required* to issue a fine. Jones indicated he would not issue such a mandatory fine for an occasional logging slip-up, however. Specifically, if a station misses one week's logging, there will be no fine. Those stations receiving forfeitures (fines), he noted, were missing many weeks. If a station's EBS apparatus is not operational at the time of the inspection and its nonfunctional status is not so logged, Jones indicated, a fine is certain.

KBSU was asked to produce the following documents from the public file: the "Public and Broadcasting" manual, the most recent station license renewal, and the last two "Issues/Programs" summarizations. The FCC requires that the April-May-June "Issues/Programs" reports be filed by July 10. Since his visit was just four days after this deadline, it was a joyful moment to find the report in the file as required. We know his visit to Boise was not planned with this deadline in mind. But surprise inspections always pose situations of this type.

Jones suggested that broadcasters designate a file as the "public file" and label file folders in accordance with each of the paragraphs in 73.3526/2T. Thus, file folders would read "Issues/Programs Reports," "Public and Broadcasting," "Applications," "Ownership Reports," "Employment Reports," etc.

He asked to see the station license (in our case, license and construction permit) and operator licenses. He asked the on-air operator to point out his restricted operator permit.

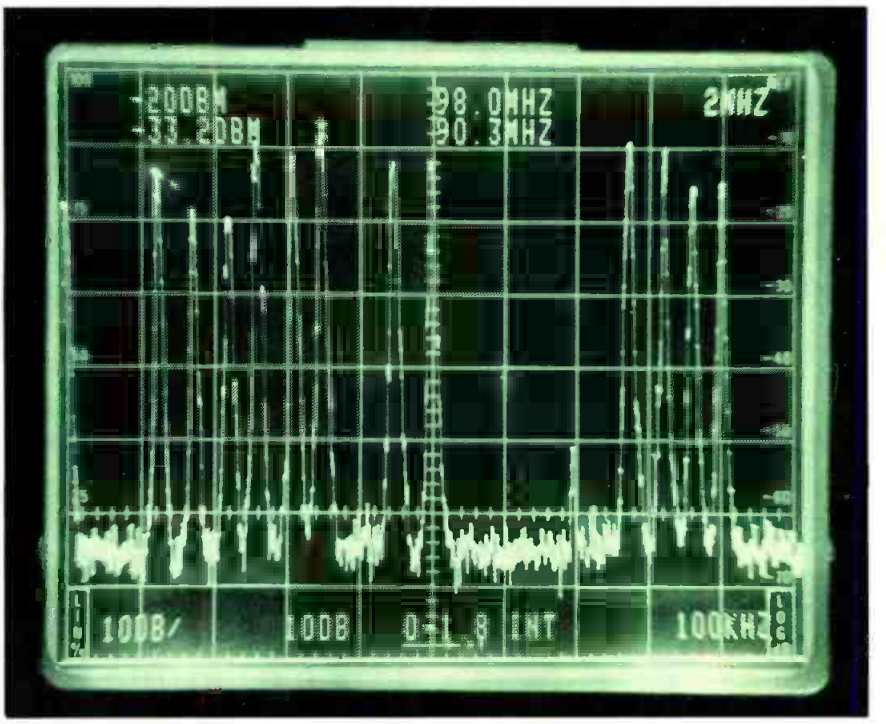
We explained how our dial-up access remote control was being used. Jones observed while the on-air operator called the transmitter and took readings. He studied the instructions posted next to the remote controls, with headings like Sign-On, Sign-Off, Fail-Safe, How to Put the Transmitter Back on the Air, etc. At this stage, he asked how 100 percent power was established at the transmitter. We explained that our transmitter power output was set up and calibrated to the authorized TPO, which equals 100 percent as demonstrated on the transmitter reflectometer and on the remote control meter reading.

Jones observed the levels on our new frequency-agile studio monitor. Then, he asked to see two FM stations which he had already noted were hitting 125 percent modulation and, indeed, our monitor agreed with the results from the equipment in the FCC truck. Since each of these two stations had two subcarriers, he said they should reach only 110 percent modulation. Jones indicated that modulation levels are commonly misunderstood. Just how much modulation is allowed with a given number of subcarriers confuses many broadcasters.

A typical, proper level would be a stereo FM station using subcarriers at 67 kHz and 92 kHz, each SCA with 10 percent injection, for a total modulation of 110 percent. Two rules on SCA injection levels are checked. The first rule is that the total of all SCA injections must be 20 percent or less. The second rule is that those SCAs greater than 75 KHz cannot exceed 10 percent injection. Figure 1 highlights two examples of typical SCA injection level violations while Figure 2 shows three acceptable combinations.

Jones indicated that many stations are unclear about how to measure their SCA injection levels under SCA modulation conditions. He, too, has this difficulty in his remote monitoring vehicle. So, he first checks to see that the total modulation limit is not exceeded. If the limit is exceeded, he looks in the baseband for a reason.

Frequently, Jones finds that stations have designated a chief operator who cannot address the issues raised during inspections. Clearly, the chief



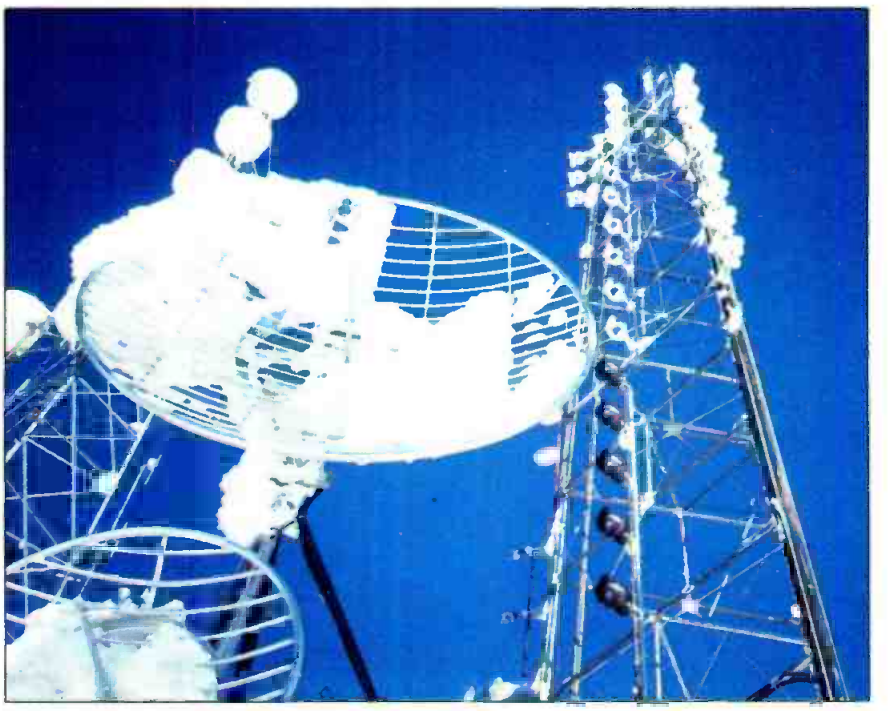
FCC-eye view of Boise's FMs, photographed in Laurence Jones's monitoring truck. Left to right: KBSU, 90.3 and 91.3; KIYS, 92.3; KIZN, 93.1; KBXL, 94.1; KFXD, 94.9; KLCI, 96.9; KQFC, 97.9; KJHY, 101.7; KHEZ, 103.3; KLTB, 104.2; KJOT, 105.1; KCIX, 105.9.

67 kHz SCA	92 kHz SCA
8%	12%
25%	0%

Figure 1.
SCA injection levels in violation.

67 kHz SCA	92 kHz SCA
10%	10%
15%	5%
20%	0%

Figure 2.
SCA injection levels in compliance.



KBSU's 240-foot tower on Deer Point Mountain.

operator must understand all of the above areas; otherwise, his ignorance places the station at considerable risk. In KBSU's case, we would have also been embarrassed by ignorance of the basics. At this point, the studio inspection was complete for KBSU. Jones summarized his findings as "very impressive, no problems."

Next, Jones arranged for a visit to the transmitter site at Deer Point Mountain the following week. (Usually in an inspection, the transmitter site would be visited immediately after the studio.) Soon thereafter, I decided to be certain everything on the mountain was perfect. I saw a number of other engineers showing up in the next few days doing likewise. After all, we had taken the surprise studio inspection, but we had some time to think about any potential problems at the transmitter site.

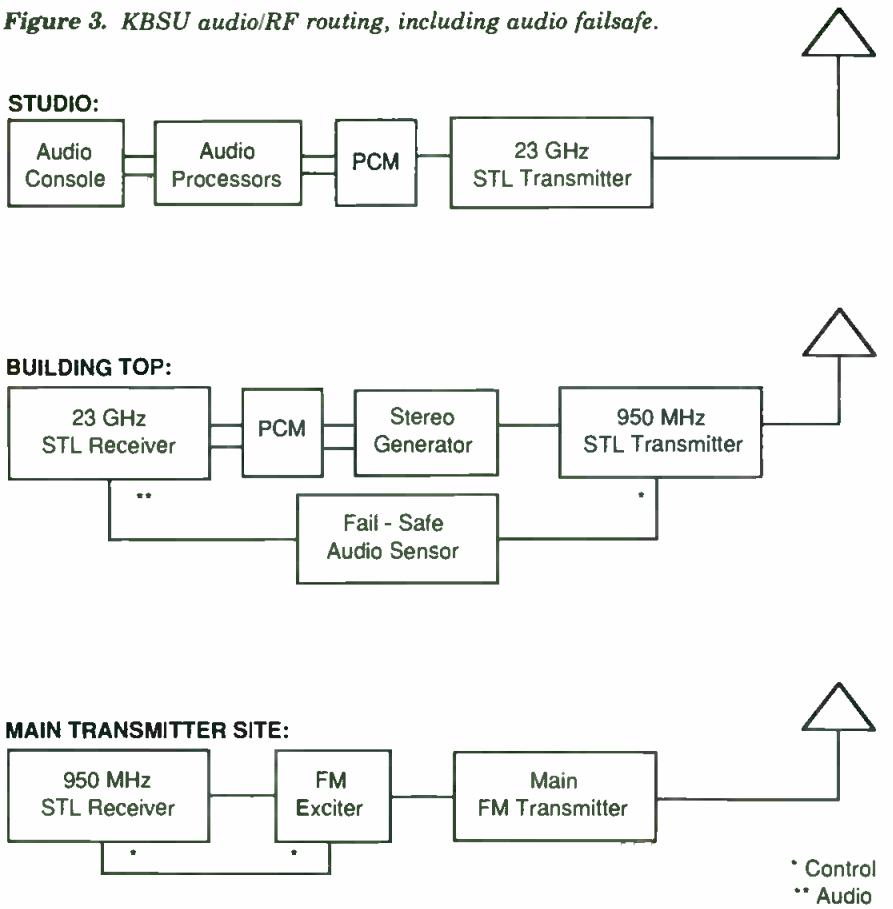
All stations on the mountain were to be represented: FMs in the morning, TVs in the afternoon. The first issue requiring resolution was the matter of lighting and painting the tower. Most of the 13 users on our tower learned that their licenses require that the tower be painted the usual orange and white. But, alas, Jones pointed out that the tower was not painted at all! Subsequent discussions turned up the possibility that the Federal Aviation Administration might exempt licensees on the tower from the painting requirement.

Since four painted towers closely located on the mountain top surround the unpainted tower, the FAA may deem it to be an acceptable situation. If the FAA so recommends to the FCC, we would then seek to modify our licenses and construction permits. Also, the question of responsibility for the daily tower light checks surfaced. One user on the tower assumes the responsibility, but the agreement is informal and the required written agreement of same with the others did not exist.

These tower lighting and painting requirements actually reach beyond the FCC and FAA, to the U.S. Forest Service, which is charged with managing the mountain site. So a can of worms was opened which must be closed, and will be now that the FCC has noted some discrepancies.

Jones compared our antenna to the

Figure 3. KBSU audio/RF routing, including audio failsafe.



KBSU assistant GM Michael Exinger recording meter readings from dial-up transmitter remote control.

one authorized on the KBSU construction permit. Since there are so many FM antennas on our tower, he asked that ours be pointed out. He wrote down the three primary transmitter readings: plate volts, current, and power forward. He then asked for verification of the remote control readings of these parameters.

I called our on-air operator at the studio and asked him to take readings and call back to speak directly with Jones. The plate voltage reading was a little off, but well within the FCC ±2 percent tolerance. The other two were right on target.

An explanation and demonstration of the wiring were sought in relation to KBSU's fail-safe operation. Since we use dial-up remote control, this is a matter of considerable recent interest. Our fail-safe system is based on program audio. An audio sensing unit detects loss of audio at the hand-off point between the STL hop receiver 1 and the STL hop transmitter 2. After a preset period of time, which we selected as 10 minutes, a set of contacts opens which mutes the RF output of the STL hop transmitter 2. The STL hop receiver 2 then squelches at the main transmitter site, muting the FM exciter RF output. (See Figure 3.)

Word had not reached the inspector of the increase in power, and the 3500-foot increase in elevation was not a topic of everyday discussion in the Seattle area.

This provides the capability to turn the transmitter off in the event the remote control dial-up telephone connection is inaccessible. Some broadcasters call this the "Mother's Day Syndrome"—when all of the available telephone lines are busy. KBSU has its own dial-up phone line for remote control, but some stations share such connections; this sharing factor amplifies the need for a fail-safe if the phone line is tied up.

Jones asked how TPO was determined on the basis of the construction permit authorization, which is noted only in ERP. I showed him a copy of the RF Specialties computer program I had run, which started with ERP and calculated backwards using antenna power gain and line loss to arrive at TPO. And I demonstrated how the in-line wattmeter and dummy load mounted above the transmitter are used for power level calibrations, since we use the direct method.

While on the topic, I asked if a six-month recalibration is required when using the direct method of power calibration. Jones said it is not routinely required, and that either indirect or direct are acceptable methods. However, he advised from the FCC rules that calibration is required "whenever there is any indication that the calibration is inaccurate or any component of the metering circuit is replaced."

As it turns out, the RFR standards are not being enforced by the FCC. Rather, such responsibility falls under the Environmental Protection Agency's domain. This is confusing, since the FCC certainly addresses the ground radiation standards in its licensing and renewal processes. But these standards are not enforced by FCC regional field offices.

After enough discussion with Jones, it became clear that the terms of an FCC authorization are not in the hands of the field offices. So when I asked about the proposed unattended operation of our station overnight, Jones explained that such authorizations come from the policy-making branch of the Commission. His role is to ensure that stations comply with the terms of their FCC license and not to evaluate the quality of those terms.

In other words, the field offices get involved in interpretation and enforcement, but not policy-making. The lesson, then, is that the station authorization (license) is to spell out critical information as much as possible. If in doubt, approval should be sought from the policy makers so that the FCC inspection can examine current, accurate authorizations.

"I'm from the government and I'm here to help you." True or false? Well,

Reject load above KBSU's Broadcast Electronics FM-10A transmitter.

this visit was certainly one for which most Boise broadcasters answered "true." The visit fixed the attention of station management on areas of concern to their own engineering departments. It cleaned up modulation levels. It began discussions on tower lighting and painting. And it served to remind everyone of easily overlooked FCC regulations.

Then there's the matter of attitude. Does the FCC inspector relish his power and wave it around? Or does the inspector treat broadcasters as colleagues? We certainly enjoyed the way in which we were treated by Laurence Jones. Previously, I went through similar inspections in other parts of the country and did not find this impressive caliber of treatment. In Boise, even those cited for violations felt they were treated fairly.

In these days of deregulation and government cutbacks, it's easy to assume that remotely located Boise will be forgotten by the FCC Field Operations Bureau. Now with their interest established, and the considerable consumer test marketing underway in the "City of Trees," one question remains. Will I still have to spell Boise for everyone east of the Hudson? ■

Tim McCartney is director of engineering at KBSU-FM in Boise, ID.

RADIO ENGINEERING

NUMBER EIGHT SPECIAL SECTION MAY 1989

GLW Acquires Harrison Assets

GLW Enterprises, Inc. has acquired the assets of Harrison Systems, Inc. Completed in early April, the transaction enables GLW to manufacture the Harrison line of consoles at its facility in Nashville, TN.

The acquisition includes the Harrison trade name along with other assets including design, inventory and manufacturing capability, GLW president William B. (Bill) Owen told *BME*. "GLW is extremely well capitalized, and our ability to function far exceeds the former capacity of Harrison Systems," Owen said. "We are in the market for the long term."

The former Harrison Systems, Inc. and GLW Enterprises, Inc. are privately held companies. GLW will be "more aggressive" in its marketing and will continue to support current owners of Harrison consoles.

Many GLW officers and employees were formerly employed by Harrison Systems, Inc. Former Harrison management members included Owen, who was president, David Harrison and Claude Hill. GLW said David Harrison has been retained to provide engineering and technical services but will not take a financial or management role in the new company.

"GLW has retained all the members of the former Harrison Systems engineering, administration and sales departments with one exception," Owen said.

GLW has no plans to phase out the Harrison name. "We're happy with it," Owen said, adding that future versions could include "Harrison by GLW". Discussions about the incorporation of George Massenburg Labs (GML) fader technology underway at the time of the acquisition will continue, he said. ■

New Recording Instruction Videotapes

First Light Video Publishing of Los Angeles, CA, has launched a series of professional learning videotapes which aid users of personal multitrack studios.

First seen at the AES last fall, the series—called "Shaping Your Sound"—is a guide to the equipment and techniques of modern recording.

The tapes are designed so users can hear a sound change while they study the exact procedures which affected it. Topics covered include microphone theory, selection and placement; equalizers, compressors and gates; and reverb and delay. The tapes are priced for non-profit group education or for individual study. Workbooks or manuals are included. For more information, contact First Light at (213) 467-1700. ■

Recording expert Tom Lubin demos theory and practice on First Light tapes.

Digital Audio: The Song Remains the Same

Quick—you've created a quantization error spectrum around a low-level square wave at 15.333 kHz in a 44 kHz sampling system. What to do? Don't worry, be happy, the second edition of *Principles of Digital Audio* (Howard W. Sams & Co., no. 22634) is now available. Authored and updated by Ken Pohlmann, a University of Miami professor of music engineering and an editor for Act III sister publication *Mix*, this technical reference work also serves as an easy-to-understand user's handbook. Suggested list price is $29.95. It's available at bookstores, computer stores and from the publisher: (800) 428-7267. ■

CONTENTS

ANALOG DISTRIBUTION: STILL CRAZY AFTER ALL THESE YEARS?

As satellite distributors weigh the merits of a full digital pipeline, NPR's 10-year-old analog system keeps the customer satisfied.

Is analog audio distribution still a viable delivery method in these days of high-gloss PR for "digital sound"? It never went away, and it shows no signs of leaving any time soon. Today, two important satellite distribution formats are analog, and a third, digital multiplexing, provides network-specific user benefits such as central control with no appreciable improvement in audio quality. All three systems offer cost/benefit tradeoffs which are contingent on priorities established by the users. Perhaps surprisingly to the bit/byte set, subjective listening tests, measurement and bottom-line performance show the 10-year-old analog system designed by National Public Radio still defines the state of the audio quality art.

The NPR system depends heavily on a unique and flexible design called "Single Channel Per Carrier" (SCPC). Capable of accommodating up to 59 channels of mix-and-match program audio, voice-grade audio and data, the system can be independently accessed and controlled from any uplink that has sight of NPR's satellite. Accessing WESTAR 4 via 20 uplinks, some 330 stations are current members of the public radio satellite system; NPR also makes the system available to outside users on a commercial basis. Now accepted as a standard method of distribution, a small manufacturing industry has grown up to supply SCPC equipment.

Industry sources say analog SCPC can provide better high-quality audio capability than the current competitive analog system FM^2 (also known as "Satellite Communication System" [SCS], a proprietary version of the format developed by United Video). Analog SCPC also provides more channels per transponder and better spectrum efficiency by a margin of nearly three to one than Digital Audio Transmission System (DATS) digital multiplexing, the system commonly used by commercial networks.

Current digital multiplex systems use a single uplink and all audio sources must be backhauled to a central point. This makes the system expensive (because separate satellite transponders are required) and complicated to coordinate. On the plus side, digitization reduces the signal degradation that can be introduced by multiple uplinking. While various forms of digital SCPC are currently bright ideas in development, NPR questions whether digital's potential ergonomic convenience or degree of audio improvement would justify committing to a still-expensive and less spectrum-efficient system any time soon.

Furthermore, NPR tests show that digital systems, which are generally perceived as offering high audio quality across the board, do not in fact noticeably outperform a carefully managed analog SCPC system.

"There are various ways to skin a cat," says Peter Loewenstein, NPR's vice president for distribution, explaining that analog-versus-digital comparisons are meaningful only in terms of what overall goal the end user is trying to accomplish.

"If you put 200 people in a room and ask them whether it's better to be analog or digital, you'll get a different answer from each of them," he notes. Historically, people tend to associate digital equipment with high audio quality and cost or performance benefits, but the advantages or disadvantages are contingent on the situation, Loewenstein explains. "The engineering data is there to make comparisons between analog and digital systems, but you have to decide what data is meaningful in the comparisons you are trying to do," he adds.

Comparisons in quality between analog and digital systems performing at optimum audio capability are moot in any case because broadcast FM stations are legally limited in the amount of audio spectrum they can deliver to the home listener. Satellite distribution in the current analog SCPC system already exceeds broadcast delivery specifications. It's also important to remember that satellite distribution is just one link in a three-part chain (*i.e.*, source, distribution,

BY BETH JACQUES

receive), any and all of which can affect audio quality. NPR's goal for the satellite component is to create a "transparent" pipe: "We want to make exactly what you put in get from one place to another," says Jim McEachern, director of operations and engineering for NPR's distribution division. "If you put kerosene in, you should get kerosene out."

"What's important to NPR is investment in a good system that operates for at least 10 years. If we were starting over from scratch and we could get, say, a 3 dB improvement from a digital system, we'd look at it," says Loewenstein, pointing out that the NPR system has an occasional requirement for occasional "audiophile" quality that many commercial systems don't. The factors that make the current system attractive would still be strong contenders even if the net were starting over, he adds.

Listener expectations for NPR program audio can be high and the net's philosophy is that it must give "demonstrably better" quality performance. "We beat the old FCC performance specs for FM by a long way," McEachern says. (See table on page 59.) FCC transmission requirements prior to deregulation called for 60 dB S/N and a frequency response of ±2 dB from 50 to 15 kHz. NPR delivers an S/N ratio of 70 dB. (The satellite distribution segment of the transmission chain is companded to accommodate the use of smaller antennas; an uncompanded satellite transmission would provide a low S/N ratio around 35 dB due to signal loss in the space path.)

"We're of the 'if it ain't broke don't fix it' school," McEachern says, adding that the point at which analog SCPC "breaks" is when the current demodulators out in the system are obsolete beyond repair. One reason for this timeframe is that NPR does not want to impose expensive equipment purchase requirements on stations which have recently joined the service.

Another is that the net remains unconvinced that the economic and logistic trade-offs necessary to reproduce digital audio's 96 dB dynamic range across a transmission chain are more than an expensive luxury. "Most drivetime listeners are in cars and you have to compress the audio heavily just so they can hear it over the traffic," McEachern says. "It would be great in terms of high-quality music, but achieving it for its own sake just isn't worth it. Digital does make the pipeline more transparent and it's a goal we should probably shoot for, but from a practical radio program standpoint, it's probably overkill."

A number of problems affecting audio quality are inherent in any satellite distribution system and currently limit the reproduction of full digital audio quality. Both FCC-mandated audio filters and RF intermodulation distortion (IM) can cause audible problems in satellite distribution. FM transmission requires filters at 19 kHz to prevent audio mixing with the stereo pilot and affecting stereo decoders; the pilot is at 19 kHz to avoid a "brick wall" at 15 kHz. The effects, which are particularly noticeable with low-quality, voice-grade audio, according to McEachern, can be dealt with by careful companding. RF IM distortion, which develops from the nonlinearity of the travelling wave tubes, is common to all analog satellite systems. Consequently, one of NPR's system design goals was to

Format Comparison Chart

Analog SCPC
Maximum number of channels: 59 (15 kHz)
Mode: Analog
Delivery Method: Single channel per carrier
Advantage: Multiple independent access; Full mix and match
Economics: Low space cost

FM² (SCS: United Video)
Maximum number of channels: 27 (15 kHz)
Mode: Analog
Delivery Method: Single saturated FM video signal
Advantage: Mix and match; Accommodates small antenna
Economics: Low-cost downlink site for subscribers; Requires single central uplink.

Time Division Digital Multiplex (DATS)
Maximum number of channels: 20 (15 kHz)
Mode: Digital
Delivery Method: Time division multiplex (8.78 Mbps; 7/8 Error correcting; sample frequency (15 kHz): 32 kHz; compression ratio: 15:11)
Advantage: Central control; Full digital domain; Low signal degradation
Economics: Low ground costs to subscribers; Requires single central uplink.

T-1 Carrier (AT&T)
(Used for terrestrial distribution to uplink and two-way audio communication)
Maximum number of channels: 24 each way: 24 (2.5 kHz); 4 (15 kHz)
Mode: Digital
Delivery Method: Time division multiplex (1.544 Mbps; compression ratio: 14:11)
Advantage: Flexible voice grade; mix and match; International two-way capability (NB: audio programming subject to aliasing)
Economics: Voice grade space costs; Best for two-way point-to-point uses.

minimize distortion in other parts of the system to compensate for the distortion inherent in satellite transmission.

RF intermodulation distortion can also develop on the satellite itself when there is more than one carrier present, McEachern says. NPR can "shoehorn" up to 60 carriers on a single transponder but must work to make sure they fall where there isn't a desired signal. "We have to make sure we aren't harming our own carriers or blowing anyone else on the satellite away," he says. The SCPC system's unique ability to mix powers and bandwidths requires careful management and spacing of a high-power carrier (16 dBW). Western Union, in contrast, used to shoehorn up to 120 low-power signals with 10 dBW carriers. NPR also recommends FCC frequency clearance procedure at each receive site to prevent interference from terrestrial microwave operations.

"A lot of people will wing it, but we suggest you should check up front and license the site to prevent future interference," he says.

Other factors limiting audio quality in a satellite distribution system occur as a function of interconnection and of conversion between various audio formats, Loewenstein points out. "The satellite is just one link in a series of links," he explains. "You may make every effort to make your satellite perfect in all its measurements, and it may test as superior, but in the end it's the conversions that may have a deleterious effect." Those effects may negate any measured specification difference between analog and digital systems, he adds. Engineers scrutinizing satellites tend to focus narrowly on making a satellite transparent to the exclusion of other considerations, but Loewenstein says broadcasters must also scrutinize the mix-and-match factors and especially conversions between digital formats.

"We can't look at the satellite monolithically as the be-all and end-all," he says, pointing out that the whole transmission chain from the nature of the program through reception by the home user must be examined when specing a system or planning transmission. "You have to be aware of the whole chain so you don't chase a factor which makes sense if you're just looking at a satellite, but doesn't necessarily make a meaningful contribution if you're looking at the service from end to end," he says.

Interformat conversion and its attendant potential for signal degradation will become increasingly more important if and when the industry develops a totally digital satellite delivery system, Loewenstein adds. "Assuming it's possible, designing such a 'golden ear' all-digital service is only one piece of the equation," he says. "When you take it out, what are you putting it on?" Broadcasters will have to consider what digital format they'll source from, what satellite they must use, and whether they will download to an audio console, a tape machine or a digital audio storage device at the station receive end. "Any interformatting will require conversion, and you can safely say that there will never be one digital format applied to digital audio," Loewenstein says.

"Engineers scrutinizing satellites tend to focus narrowly on making it transparent, to the exclusion of all other considerations."

Although all the current systems can deliver roughly equivalent audio quality, the economics and the control aspects of analog SCPC and FM^2 differ significantly from the digital DATS system. "All the current systems have different applications for users with different needs," Loewenstein says. "It's not so much an issue of how much the uplinks or the space segments cost *per se* as how one gets the best quality and best dollar over the longest period of time."

The economics of a satellite system often depend on how the investment in that system is structured. The success of a commercial service is based primarily on the number of subscribers equipped to receive its service. If the service provider pays for the space segment (transponder time and attendant costs) and the receiver pays for the downlink, a commercial service may weigh the tradeoffs in putting more of its money in an expensive space segment or in ground connections. This ratio is ususally determined by which market the service wants to reach and the size of the potential subscriber base. In general, Loewenstein says, over time a digital multiplex system, which offers lower ground segment costs, will work to the advantage of services with a large number of terminals where the subscriber base buys its own hardware. The penalty with a DATS system is the cost of the space segment, but the upside is that the service can more easily attract a large subscriber base due to less-expensive ground purchase costs. The reverse is true for analog SCPC, where the cost of the space segment is less than digital multiplex but the ground costs are higher.

"Assuming there's an equal tradeoff on performance between the systems, the economics involved are really a maze, especially for a small network," Loewenstein says. "To really plan what's best, you have to think long and hard about all these factors rather than just thinking, 'Oh digital, it's obviously better than analog.' "

The control issue is basically flexibility versus single, centralized control. The SCPC system enables real-time independent access and control from each originating station. Each channel is treated separately, although NPR works to ensure each channel is as identical as possible. "Then it's 'garbage in, garbage out,' " McEachern quips. In contrast, digital multiplexing provides centralized control as program and other material is backhauled to a single uplink. In the U.S., commercial radio networks, which prefer central control for legal

reasons, at least, work from three DATS transponders on SATCOM F1R. Two uplinks are in Vernon Valley, NJ and a third is located at IDB Communications' headquarters in Culver City, CA.

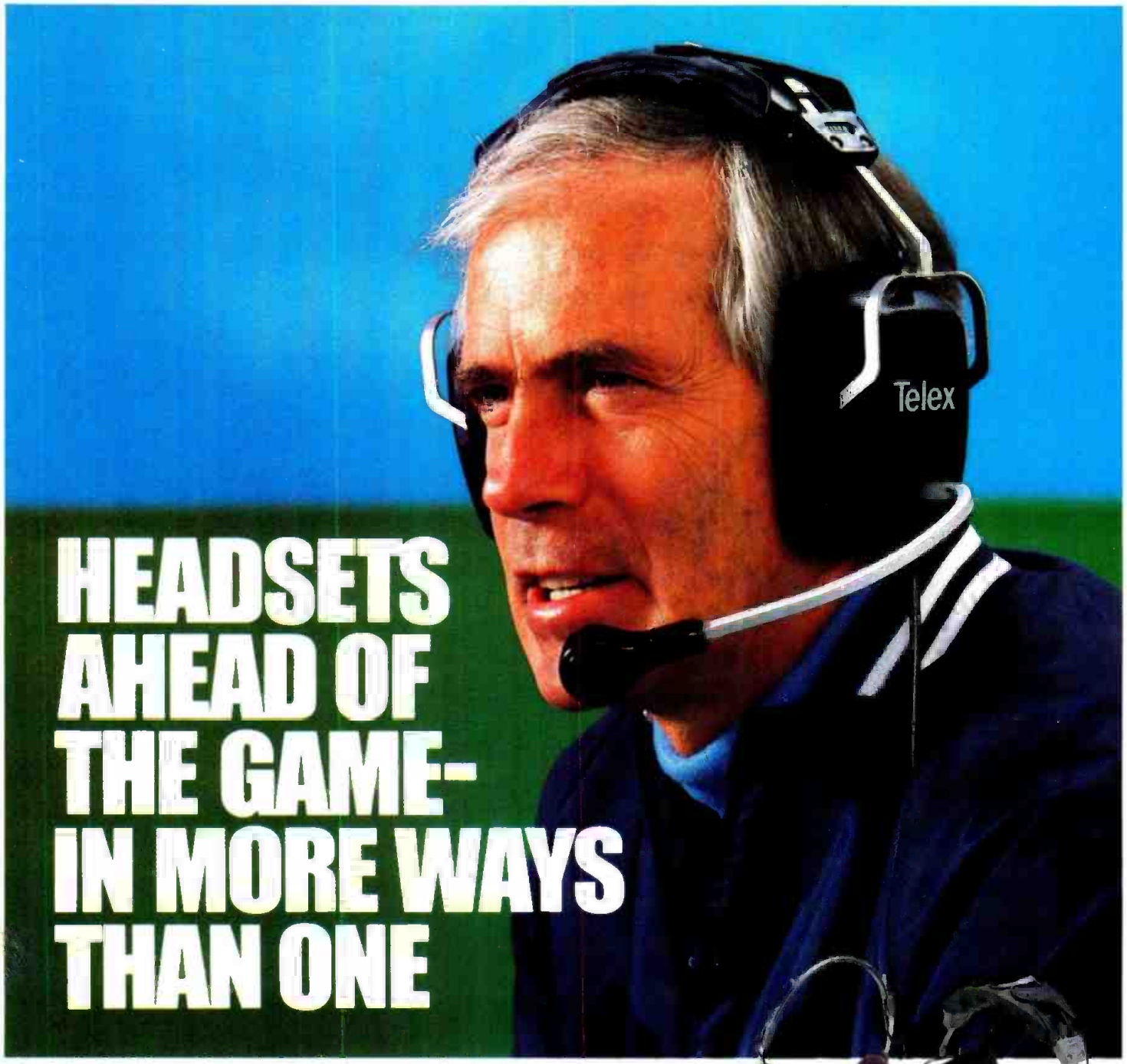
FM², the other current analog distribution system, combines central control with low ground costs to its subscriber base. The system is designed as a video signal that combines many FM subcarriers. It uses one carrier on a transponder to accommodate up to 27 15 kHz channels, which can then be mixed and matched in a ratio of two 7.5 kHz channels to each 15 kHz channel. FM² works by using a single carrier to saturate a transponder; each receiver site uses a video receiver to pick up the entire transponder and a demodulator to select specific carriers. A compact one-piece package, the system uses Wegener Communications' Panda 1 and Panda 2 processing and works with small, and therefore less expensive, antennas because the saturated transponder delivers high power down to earth. The cost of the space segment, however, is proportionately greater due to increased monthly costs for space capacity and power up to the satellite. While audio quality is good, sources say the format sometimes sustains some problems in quality control. The primary advantage to FM² is a low-cost downlink, an attractive factor for services trying to attract a subscriber base quickly. The downside is increased costs—usually to the service—for space uplink and channel charges.

Looking into NPR's crystal ball, both Loewenstein and McEachern see hybrid systems. "We're constantly looking at new things like digital SCPC," says Loewenstein, adding that his particular hobbyhorse was more spectrum to develop a higher-quality broadcast audio chain he terms "High Definition Radio."

"We're not just looking for the sake of science, but to develop interconnections through a variety of technologies," he says. "In the future we're probably going to see a mixture of things rather than a reliance on one type of format versus another." NPR's sophisticated listening base also demands that the net deliver state-of-the-art quality audio. "We have our own requirements for digital audio but that doesn't mean our whole system must accommodate it," Loewenstein explains, pointing out that voice grade might not warrant the cost of the space segment and equipment to deliver the highest-quality audio. "The day is coming, but not everything warrants that magic digital solution. What we are examining is how to accomplish both types of service on the same service, how to accommodate both types of audio on the same transponder. We're looking, and some things appear feasible." ■

Jacques is BME's *senior editor.*

SPECIFICATION	PARAMETERS
Input/Output Impedance	**600 ohms**
Pgm Operating Level (Avg. Program Level)	**+4 dBm**
Peak Program Level	**+18 dBm**
S/N Ratio (ref. to Program Operating Level/Unweighted/Minimum)	**61 dB**
S/N Ratio (ref. to Peak Program Level/Unweighted/Minimum)	**75 dB**
Interchannel Crosstalk	> **75 dB**
Frequency Response 50-15,000 Hz (1 kHz POL)	**+.5 to -1 dB**
THD (At Peak Program Level/Not counting noise components at any in-band frequency)	< **1.0%**
IM Distortion (At Peak Program Level/Not counting noise components; SMPTE method, 60 Hz and 4 kHz combined 4:1)	< **1.0%**
Stereo Audio Interchannel Phase Difference at any frequency 50 Hz-15 kHz	< **13 degrees**
Companding Ratio	**3:1, linear**
Pre/De-emphasis Used	**None**
Occupied RF Bandwidth per carrier	**200 kHz**
Minimum Received Carrier-to-Noise Ratio in 200 kHz	**14 dB**
Nominal Downlink Power per carrier	**16.5 dBW**
Carrier Deviation at POL	**43.7 kHz**
Carrier Deviation at Peak Program Level	**75.0 kHz**



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 121 on Reader Service Card Page 51

FMX—DO WE HAVE THE WHOLE STORY?

The gloves come off as Bose Corp. takes on Broadcast Technology Partners over the FMX format's performance.

By now you've no doubt heard something about the battles over FMX, the proposed FM noise reduction format. Unveiled in the early 1980s by the now-defunct CBS Labs, FMX claimed to reduce the noise penalty on FM stereo broadcasts to practically that of FM mono, while maintaining compatibility with standard FM stereo receivers.

Since then, FMX's road has been rockier than expected. Although successes were registered, poor results in a few earlier tests in 1986 required some redesign of the format and the prototype encoding hardware. The system also survived the dissolution of its parent CBS Labs, ending up at a new home, Broadcast Technology Partners, created by its co-inventors, Emil Torick and Tom Keller; the NAB also owns a stake in this company. Things were looking up, though, as subsequent tests of FMX proved more favorable, and the path toward general acceptance seemed assured with more than 50 stations broadcasting in the format, decoder chips becoming available, and receiver manufacturers announcing upcoming FMX-equipped products.

That's how things stood until January 25 of this year. It was then that Drs. Amar Bose and William Short of the Bose Corp. presented their scathing report on the format at no less prestigious a location than the halls of the Massachusetts Institute of Technology, where Dr. Bose is a professor.

Their report faulted FMX for not solving its intended noise problem and for causing others, namely increased multipath distortion. In its 50-plus pages, the study claimed that FMX would worsen multipath problems because it adds more high-frequency energy to the FM baseband (as any subcarrier does). The study emphasized that this increased distortion would be audible to *all* listeners, stereo and mono.

Moreover, Bose and Short described how FMX might degrade normal stereo reception under multipath conditions due to receivers' difficulty in distinguishing between the normal subcarrier and the compressed one. Such confusion would be caused by the 38 kHz subcarriers' phase shift relative to the 19 kHz pilot, and the quadrature distortion products that multipath reception produces. With standard FM stereo, these problems result in noise bursts and stereo image changes, but with the FMX subcarrier modulated in quadrature, these conditions could cause its unexpanded, unde-emphasized L-R audio to be intermittently demodulated in error by FMX and non-FMX receivers, thus causing tonal and level shifts, according to the report.

The fur has flown freely ever since the report's release, with discussion focusing primarily on the following areas of contention:

1) Only one FM station was used for the Bose/Short on-air experiments, a 200 W college station. Was it of sufficient quality to permit valid test results? BTP claims that it was not, but cites the solving of similar problems at other stations by adjusting their transmitters and FMX encoders, which they were not permitted to do for these tests. Bose claims, without getting too specific, that tests were performed on the station before the experiment began, and that results were satisfactory.

2) Was receiver hardware properly implemented? Bose says absolutely yes. BTP argues that the Sanyo chip used was an outdated prototype and unsuited for mobile use, and that Bose knew it when they performed their tests. They also question the validity of Bose's disabling of blend and HF rolloff circuits on the mobile receiver used. Bose counters that the chip was the most up-to-date at the time of the tests (Fall 1988) and that the next revision didn't arrive until a few weeks before their results were released. They admit awareness of the chip's defects, but claim they were either remedied or had no impact on the tests. Bose adds that they found a few more problems with the chip on their own. Moreover, they claim,

BY SKIP PIZZI

their test was *not* a mobile reception study, but only used a car receiver parked at multiple locations for convenience in gathering samples. BTP remains especially skeptical about this point.

3) How valid are the statistical conclusions the Bose study draws? BTP claims that this is the study's area of greatest skew toward a predetermined finding. BTP quotes a probability of encountering the deleterious audio effects noted in the Bose report as 0.000015 percent (6.7 million to 1). Bose stands by its data.

4) Are the mathematics in the study a true representation of real-world conditions? BTP says that the math is overly simplistic and generalizing, and flawed in that it "freezes" certain values that are in reality continuously variable elements of modulation. Bose asserts that upon more detailed subsequent recalculations, their results varied by no more than one percent from those published, and that BTP's argument over the static values assigned to a parameter of modulation is a cavil. Both sides strongly contest each other's understanding of the mathematics employed.

5) If the report is accurate, why has no one else complained or noted similar problems? BTP points to the over 50 stations using FMX and the manufacturers building products for use with the format. Shooting from the hip, report author William Short speculates that just as BTP threatened the Bose Corp. with legal action over the release of this study, perhaps this same tactic has chilled others' reporting of negative data to the public. More realistically, many of the stations successfully using FMX employ formats with little dynamic range; according to the report, the problems associated with FMX under multipath are most evident when the S′ modulation is relatively high, a condition that occurs more frequently in wider-dynamic-range applications. But BTP claims that classical stations have also implemented FMX with good results, although several chief engineers involved acknowledge that AM synchronous noise must be closely monitored.

6) Perhaps most widely discussed is the issue of motivation. What led the Bose Corp. and MIT to become involved in this study? Bose and Short claim they performed the study simply because of their interest in the format and its possible implementation in their domestic hi-fi equipment offerings. BTP and others see more nefarious purposes, chiefly due to Bose's alignment with Delco Electronics. During the Q&A following the report's original presentation, Bose referred to an unnamed but well-known car radio manufacturer who "wanted this information"; this fueled speculation that Delco might have a competing system in the works, or a product already in their three-year pipeline that was belatedly found to have difficulty handling FMX broadcasts.

The report's findings have resonated strongly among still-tentative U.S. broadcasters, slowing FMX's momentum toward acceptance, at least temporarily.

We are all left to draw our own conclusions, but a few thoughts emerge as the smoke clears. Theoretically, at least, FMX seems vulnerable under multipath conditions to both improper decoding and incompatibility problems with normal FM stereo due to the quadrature distortion products generated by multipath reception. (The report also lends further support to the value of turning off all subcarriers when not in use.) On the other hand, the Bose report seems subject to valid question in some of its statistical conclusions and extrapolations.

And to be fair, the authors cannot be considered totally unbiased, the MIT imprimatur notwithstanding. Perhaps some of the poor experimental results were due to excessively high AM synchronous noise in the WMBR transmitter, for which no documented prior testing has been produced, and this whole episode will come to be looked upon a tempest in a teapot, as BTP claims the Japanese manufacturers are considering it.

But the report's findings have resonated strongly among the still-tentative U.S. broadcasters, slowing FMX's momentum toward acceptance, at least temporarily. As in its last skirmish in '86, it seems unlikely that FMX will escape completely unscathed from this, and at the very least will have a steeper, slower road to climb.

It seems the only course to steer clear of this rocky archipelago will be charted by further proper, sophisticated and *independent* study, perhaps by the likes of the NRSC (in its upcoming FM multipath testing) or the National Bureau of Standards. (The NAB is not an option here because of its financial stake in FMX, a situation that has raised some additional concern within the industry.) But such testing is expensive and time-consuming.

Meanwhile, what becomes of well-intentioned attempts to improve systems and introduce new formats in a competitive and deregulated environment where broadcasters must act as their own research entities, and use their own air as a proving ground?

There are probably a few more good chapters left to this story before it's over. Fasten your seat belts, and stay tuned. ■

Pizzi is a contributing editor to BME.

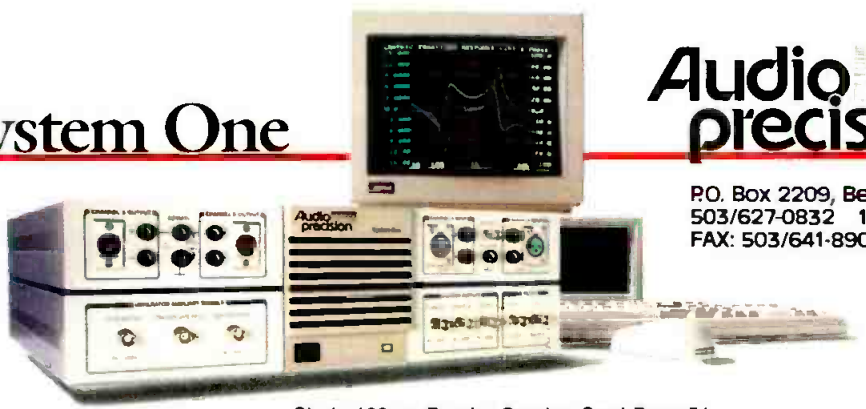
Let's compare automated audio test equipment capabilities:

FUNCTIONS/ MODES AVAILABLE	AUDIO PRECISION SYSTEM ONE	H-P 8903B	S-T 3100/3200	TEK AA5001/SG5010
Wideband amplitude	YES	YES	YES	YES
Selective amplitude	YES	NO	NO	NO
Dual input/output	YES	NO	YES	NO
Simultaneous 2-channel ampl. meas.	YES	NO	NO	NO
Real time ratio/crosstalk meas.	YES	NO	NO	NO
THD + N	YES	YES	YES	YES
SMPTE IMD	YES	NO	YES	YES
CCIF IMD	YES	NO	NO	YES
Transient IMD	YES	NO	NO	NO
Wow & flutter	YES	NO	YES[1]	NO
Phase measurement	YES	NO	YES	NO
Frequency measurement	YES	YES	YES	NO
Squarewave	YES	NO	YES	YES
Sine burst	YES	YES	YES	YES
Pink/white/USASI noise	YES	NO	NO	NO
COMPUTER & SOFTWARE				
Available computer interfaces	IBM-PC, IEEE-488, RS-232	IEEE-488	IEEE-488, RS-232	IEEE-488
Software package	included	none available	$575-$1220	$300
Typical controller price	$600-$3000[2]	$5750[3]	$1000-$3400[4]	$8440-$12435

[1]Announced, no specifications available.
[2]Personal computer. Interface card included in instrument price.
[3]H-P Model 310M IEEE-488 compatible.
[4]Personal computer plus IEEE-488 interface card.
Competitive data compiled from H-P 1988 catalog, S-T data sheet 3000A 1987, Tektronix 1988 catalog.

For a much more complete comparison of these and other audio test sytems, call or write Audio Precision.

System One



Audio precision

P.O. Box 2209, Beaverton, OR 97075
503/627-0832 1-800/231-7350
FAX: 503/641-8906, TELEX: 283957 AUDIO UR

Debug Studio Sound: Calculate Its Resonant Modes

By Ronald F. Balonis

Like people, every studio is different. Each has its own unique personality—that certain sound, a certain ambiance. Sometimes it's smooth and mellow and liked by all, sometimes it's sort of rough and a little harsh and disliked by all who use the studio.

Like people, studios have different sound personalities because of their size, shape, and surfaces. While diversity of personality adds to the richness of a culture, society, or day-to-day relationships, a studio with a sound that doesn't sound right or mix well detracts and distracts from the studio's sound product. And, like it or not, it is a technical problem.

Debugging a studio "sound" problem can be a very perplexing task—mostly because its the domain of another kind of engineering. So, there's no obvious, rational way to measure what it is that they or you hear. And from an engineering standpoint, it may not be considered that important. However, the studio is part of the overall system and all sound problems are important.

This kind of problem calls for the services of an expert in acoustical engineering. But you don't have to be one to use their theory and practice to help you identify, if not solve, the problem of a studio that just doesn't sound right.

This month's Compute program is the first of two that are useful for "Debugging Studio Sound." This month's program, ROOMODE.BAS, makes a tabular analysis of the resonant modes of a studio, given its dimensions, and next month's, ACOUSTIC.BAS, calculates the studio's reverberation times for six octave bands, given its dimensions and the kinds of surfaces it has.

According to the wave theory of room acoustics, sound waves behave like radio waves—each in their respective transmission medium: sound waves in air in a closed environment and electromagnetic (radio) waves in space or in a transmission line. Their behavior is alike in that, in their respective transmission mediums, both waves bounce, reflect, and form standing waves. And sound standing waves have the similar detrimental characteristic of frequency discrimination.

The result, and oftentimes the sound problem, is that all studios have resonant modes that are determined by the shape and the size of the room: height, width, and length. For each dimension there are resonant modes, frequencies and multiples of them, at which a standing wave will occur in the studio, the overall effect of which depends on the studio's basic dimensions. It can be one of diffusion with a good sound; combfilter-like frequency discrimination with a sound that doesn't sound right; or somewhere in between.

The theory further says that to minimize the fre-

```
ROOMODE.BAS          +++++ Resonant Modes of a Studio +++++

Dimensions of the Studio:  HEIGHT <##.# FEET>:? 11
                           WIDTH  <##.# FEET>:? 13
                           LENGTH <##.# FEET>:? 16.5
Volume = 2359.5   <H:W:L> = < 1 : 1.18 : 1.5 >   <A>xial <T>angential <O>blique

  Freq   H,W,L Type    Freq   H,W,L Type    Freq   H,W,L Type    Freq   H,W,L Type
  34.24  0 0 1  A    106.61  1 2 1  O    138.86  2 2 1  O    163.72  3 1 1  O
  43.46  0 1 0  A    108.28  2 0 1  T    140.14  1 3 0  T    165.99  0 3 3  T
  51.36  1 0 0  A    110.66  0 2 2  T    143.70  0 1 4  T    165.99  2 3 0  T
  55.33  0 1 1  T    111.54  2 1 0  T    144.04  1 2 3  O    168.62  3 0 2  T
  61.73  1 0 1  T    111.54  0 1 3  T    144.26  1 3 1  O    169.30  2 2 3  O
  67.28  1 1 0  T    114.85  1 0 3  T    145.28  2 0 3  T    169.49  2 3 1  O
  68.48  0 0 2  A    116.68  2 1 1  O    146.28  1 0 4  T    170.16  1 2 4  O
  75.50  1 1 1  O    122.00  1 2 2  O    147.28  0 3 2  T    171.21  2 0 4  T
  81.11  0 1 2  T    122.80  1 1 3  O    150.99  2 2 2  O    173.76  1 3 3  O
  85.61  1 0 2  T    123.46  2 0 2  T    151.64  2 1 3  O    173.85  0 4 0  A
  86.92  0 2 0  A    130.38  0 3 0  A    152.60  1 1 4  O    174.14  3 1 2  O
  93.42  0 2 1  T    130.89  2 1 2  O    154.09  3 0 0  A    176.64  2 1 4  O
  96.01  1 1 2  O    134.57  2 2 0  T    155.98  1 3 2  O    176.92  3 2 0  T
 100.96  1 2 0  T    134.57  0 2 3  T    157.85  3 0 1  T    177.19  0 4 1  T
 102.73  0 0 3  A    134.81  0 3 1  T    160.10  3 1 0  T    179.56  2 3 2  O
 102.73  2 0 0  A    136.97  0 0 4  A    162.22  0 2 4  T    180.20  3 2 1  O
```

Demo screen for ROOMODE.BAS.

```
0  'ROOMODE.BA ++ Resonant MODES of a Studio ++
5 'By Ronald F. BALONIS  10/79 & 9/21/86 & 1/31/89
10 '
30 CLEAR 200:DEFINT I,J,K,M,N:MD=4:'----- MD=No. OF MODES
40 N=MD^MD/2:DIM F(N),NL(N),NW(N),NH(N):C=1130/2
50 TLE$="          +++++ Resonant Modes of a Studio +++++"
100 CLS:PRINT "ROOMODE.BAS";TLE$:PRINT:H$="":W$="":L$=""
105     PRINT "Dimensions of the Studio:  ";
110     PRINT "HEIGHT <##.# FEET>:";:        INPUT H$
115      IF H$="" THEN STOP ELSE H=VAL(H$)
120     PRINT TAB(28);"WIDTH  <##.# FEET>:";:INPUT W$
125      IF W$="" THEN RUN 0 ELSE W=VAL(W$)
130     PRINT TAB(28);"LENGTH <##.# FEET>:";:INPUT L$
135      IF L$="" THEN RUN 0 ELSE L=VAL(L$)
140       IF H<=0 OR W<=0 OR L>100 THEN RUN 0:'-Too small
145        K=100:IH=K*H/H:IW=K*W/H:IL=K*L/H
150        PRINT "Volume =";(K*H*W*L)/K;"  ";
155        PRINT "<H:W:L> = <";IH/K;":";IW/K;":";IL/K;">";
160        PRINT "   <A>xial <T>angential <O>blique":PRINT
200 PRINT "++++ CALCULATING RESONANT MODES ++++":N=0
205 FOR NH=0 TO MD
210  FOR NW=0 TO MD
215   FOR NL=0 TO MD
220    F(N)=C*SQR(NH/H*NH/H+NW/W*NW/W+NL/L*NL/L)
225    NH(N)=NH:NW(N)=NW:NL(N)=NL:N=N+1
230   NEXT NL
235  NEXT NW
240 NEXT NH:N=N-1:LOCATE CSRLIN-1,1
250 '
300 PRINT "++++ SORTING MODES BY FREQUENCY ++++"
305 M=N:'------------Do it with a Shell-Metzner sort
310 M=INT(M/2)
315 IF M=0 THEN 500 ELSE I=1:LL=N-M
320  J=I
325  K=J+M
330  IF F(J)<F(K) THEN 365
340   F=F(J):F(J)=F(K):F(K)=F
345   NH=NH(J):NH(J)=NH(K):NH(K)=NH
350   NW=NW(J):NW(J)=NW(K):NW(K)=NW
355   NL=NL(J):NL(J)=NL(K):NL(K)=NL
360   J=J-M:IF J<1 THEN 365 ELSE 325
365  I=I+1:IF I>LL THEN 310 ELSE 320
400 '
500 KR=CSRLIN-1:'-------------And Then Display All of Them
505 FOR PAGE=0 TO 1
510  FOR COL=0 TO 3
515   LOCATE KR,20*COL+1:PRINT "  Freq   H,W,L Type ";
520   FOR J=1 TO 16
525    LOCATE KR+J,20*COL+1:I=PAGE*64+COL*16+J
530    IF I>N THEN PRINT SPACE$(18);:GOTO 555
535     NH=NH(I):NW=NW(I):NL=NL(I):F=F(I)
540     IF NH*NW*NL<>0 THEN TYPE$="O" ELSE TYPE$="T"
545     IF (NH+NW=0)OR(NH+NL=0)OR(NL+NW=0) THEN TYPE$="A"
550      PRINT USING"####.##  # # #  \\";F;NH;NW;NL;TYPE$;
555   NEXT J
560  NEXT COL:LOCATE KR+16,79:A$=""
565  A$=INKEY$:IF A$="" THEN 565
570 NEXT PAGE:IF A$="A" OR A$="a" THEN 505 ELSE RUN 0:'END.
```

Basic code for ROMMODE.BAS, a program for determining the resonant modes of a studio.

quency discrimination effects of standing waves in a room, the room's dimensions should be chosen so that they are not integral multiples of each other. And, it suggests that the room dimensions be in the ratio of, or multiples of, the cube root of 2. Some experts prefer dimension (height:width:length) ratios of 1:1.25:1.6 for small rooms; 1:1.6:2.5 for average rooms; and 1:1.25:3.2 for long or low ceiling rooms. Others prefer to calculate room modes on a computer to determine the best shape for a given space.

Any way it's done, the idea is to obtain a diffuse and even distribution of the natural room resonances in the studio. An optimum shape helps. An odd shape, such as nonparallel walls, helps too. But the realistic solution lies in the application of acoustic surface treatments such as rugs, acoustic tile, drapes, or acoustic resonators. Acoustical treatment, however, must be applied carefully; too much will kill a good or a bad room. A resonant mode tabulation provides a good starting point for identifying the troublesome dimensions and surfaces.

ROOMODE.BAS computes the "theoretical" room resonance frequencies for four multiples of the axial (between two surfaces), tangential (between two pairs of surfaces), and oblique (between all the surfaces) modes. The goal for an excellent sounding studio is a diffuse pattern of many close (less than 20 Hz apart) and evenly dispersed resonant frequencies. They all matter, but lower frequencies beginning with the fundamental axial, tangential, and oblique resonant modes have the greatest ability to be problems.

The program consists of four program modules: data input in lines 100 to 160; resonant mode calculation in lines 200 to 240 uses an nested loop iterative algorithm; mode frequency sort in lines 300 to 365 uses a sort algorithm called Shell-Metzner; and the two-page tabular analysis display in lines 500 to 570. At page 1, a null enter displays page 2, and at page 1 pressing A displays page 1 again. As always, entry errors cause the program to restart and you use the screen print key to make a copy of the analysis.

The studio for this example is a relatively good one with a shape close to the preferred one for a small room. And, as expected, page 1 of its resonant mode tabulation shows only some minor resonant mode problems at the low end frequencies. This studio is also the example for next month's program, ACOUSTIC.BAS, for calculating a studio's reverberation times, and the acoustic surface treatments coincided with an improved reverberation characteristic. For this studio, the treatment to minimize the critical room mode resonances was to put acoustic tile on one wall for the length-related modes and a drop ceiling and rug for the height-related modes.

Much more information on room mode resonance can be found in most every book with the topic of acoustics or audio. Chapter 3, "Acoustics of Small Rooms" in the *Handbook for Sound Engineers: The New Audio Cyclopedia*, 1987 edition by Howard W. Sams & Co., is a particularly good source. Finally, never forget that computers perform numerical calculations with deterministic precision and that all formulas represent theoretical and/or approximate models of reality, as we know it. ■

Balonis is chief engineer of WILK-AM, Wilkes-Barre, PA.

FCC Proposal: Goodbye to Regulation?

By Harry Cole

In a curious proposal that may reflect more desperation than hope for the future of AM radio, the Commission announced in February that it was considering changes in its technical rules governing the AM service. Viewed from a slightly different angle, the proposed changes could be read more broadly as a tacit admission that the FCC's ideal of an unregulated, maximally competitive broadcast industry may not now be considered the best approach after all.

On the surface, the changes themselves don't appear particularly overwhelming. If adopted, they would simply permit an AM licensee to reduce the area encompassed by the protected contour. The idea is that such reduction would in turn reduce interference to one or more stations. This could be accomplished by reduction in power, change in transmitter site, directionalization—or, and this is the surprising alternative—by having a station "relinquish all of its service areas." In other words, the Commission is talking about reducing interference by having stations voluntarily take themselves off the air!

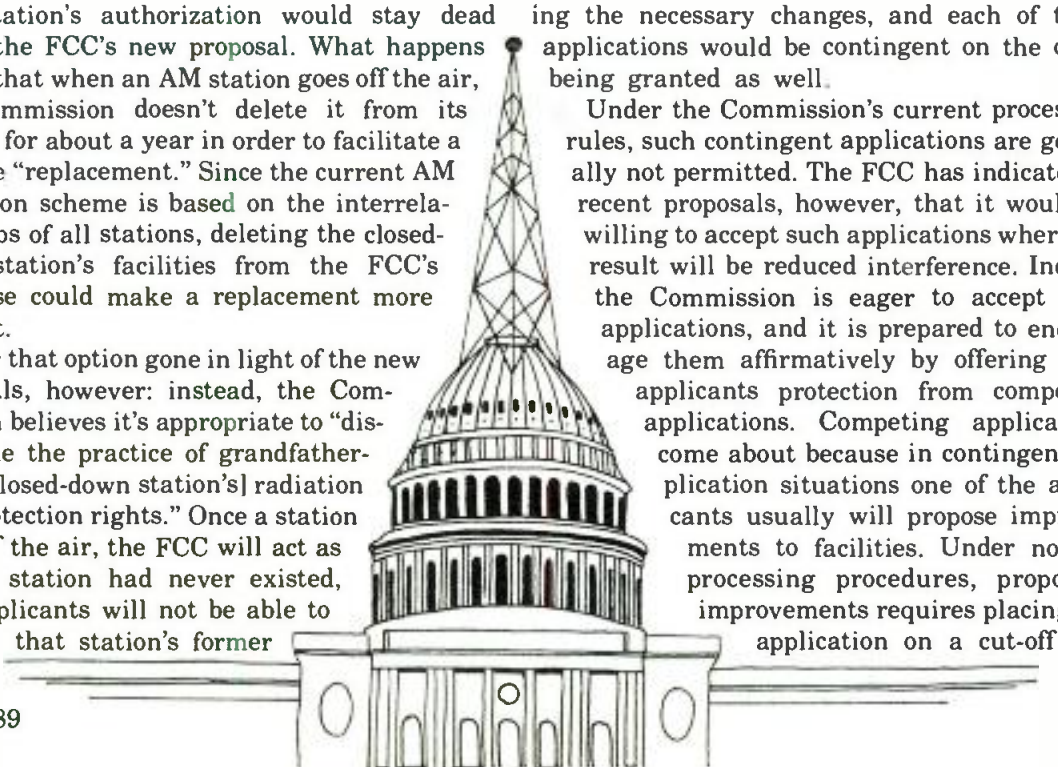
If a station were to take this suicide option, that station's authorization would stay dead under the FCC's new proposal. What happens now is that when an AM station goes off the air, the Commission doesn't delete it from its records for about a year in order to facilitate a possible "replacement." Since the current AM allocation scheme is based on the interrelationships of all stations, deleting the closed-down station's facilities from the FCC's database could make a replacement more difficult.

Color that option gone in light of the new proposals, however: instead, the Commission believes it's appropriate to "discontinue the practice of grandfathering [a closed-down station's] radiation and protection rights." Once a station goes off the air, the FCC will act as if that station had never existed, and applicants will not be able to rely on that station's former facilities. New applicants will instead have to demonstrate that their proposed facilities comply with all overlap and interference criteria. As a result, if a station does choose to "relinquish all its service area," there will be virtually no likelihood that the station's facilities might be revivified: the burial will be effective instantaneously.

A second and related proposal permits two or more AM licensees to enter into an "interference reduction arrangement" pursuant to which an AM licensee can presumably bargain away some or all of its service area in a private transaction. Such changes would require changes in facilities of both affected stations, which in turn would require prior FCC approval. Since the changes would be contingent—*i.e.*, both sets of changes would have to occur in order to implement the agreement—each of the affected licensees would have to file an application proposing the necessary changes, and each of those applications would be contingent on the other being granted as well.

Cole is a partner in Bechtel, Borsari, Cole & Paxson, a Washington, DC-based law firm.

Under the Commission's current processing rules, such contingent applications are generally not permitted. The FCC has indicated in recent proposals, however, that it would be willing to accept such applications where the result will be reduced interference. Indeed, the Commission is eager to accept such applications, and it is prepared to encourage them affirmatively by offering such applicants protection from competing applications. Competing applications come about because in contingent application situations one of the applicants usually will propose improvements to facilities. Under normal processing procedures, proposing improvements requires placing the application on a cut-off list,



which in turn creates the potential for mutually exclusive applications.

It's not entirely clear how the Commission might offer blanket protection against the filing of mutually exclusive applications. Suppose two separate sets of interference-reduction applications were filed at the same time, for example, with the upgrading application in one set mutually exclusive with the upgrading application in the other set. In such a case the Commission would appear hard-pressed to favor one set of applications over the other. The FCC nevertheless seems prepared to try to offer this kind of encouragement.

The Commission is talking about reducing interference by having stations voluntarily take themselves off the air!

The final element in these proposals involves the concept of a "service floor" to be used in the evaluation of AM modification applications. The "service floor" would be the "level of service that must be maintained subsequent to any changes in facilities." While the precise parameters of such a "floor" haven't been delineated yet, the Commission has suggested that such applications be prohibited from creating new "white" (*i.e.*, unserved) or "gray" (*i.e.*, underserved) areas. In theory, this principle ensures that any gains arising from a negotiated interference deal would not lead to significant losses in service to the public.

These proposals are troubling on three levels. First, it appears the FCC is encouraging AM licensees to consider bargaining away some of their authorization to operate. This stance does not inspire confidence in the Commission's willingness to address and correct the serious problems in the AM service. It suggests instead that the FCC has despaired of an easy or convenient solution and has decided that AM licensees should be permitted to bargain among themselves to decide who will stay and who will go.

Second, by encouraging private parties (*i.e.*, licensees) to establish interference levels by negotiating among themselves, the Commission appears to be stepping aside from its role of "traffic cop" of the radio-frequency spectrum. It has always been the Commission and not private parties that determined acceptable levels of interference and necessary levels of noninterference service.

The thrust of the FCC's current proposals seems at odds with that traditional approach. Commissioner Patricia Dennis stated in her separate statement that the proposal "does not contemplate 'negotiated interference.'" In contrast, Commissioner James Quello said in *his* separate statement that "the procedural mechanisms contained in the proposal could lay the foundation for a system of negotiated interference rights." If the Commissioners themselves can't agree, we are hard-pressed to provide a conclusive opinion about what this proposal may portend for the Commission's role.

Third, and perhaps more basic, the FCC's proposed approach may be inconsistent with at least some of the principles of its overall program of deregulation. That program has long been touted as based on the "miracle of the marketplace," which in turn is based on that notion that where market forces are permitted to take their course in a freely competitive environment, the market will afford the best form of industry regulation.

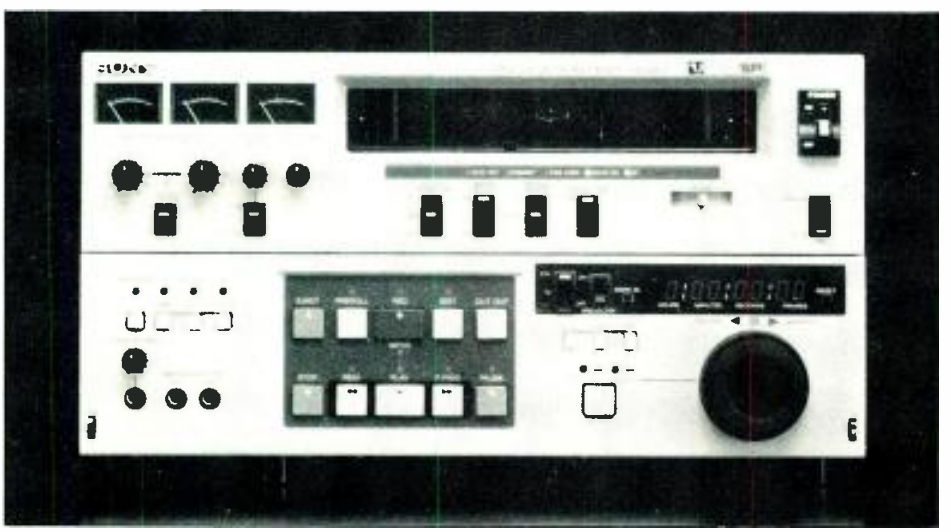
In an effort to create a freely competitive environment, the Commission generally chooses *not* to consider the effects of competition in its allocation decisions. For example, consider Docket No. 80-90, where the Commission created approximately 700 new FM channel allotments despite concern by existing broadcasters that this could lead to ruinous competition by fractionalizing the existing revenue base too much. The FCC has taken the position that competition itself is inherently good.

But the Commission's recent AM proposals contradict this point of view. In a separate statement, Commissioner Dennis noted with apparent approval that the proposals could result in a "less cluttered AM dial" and "the emergence of more high-power AM stations that have the facilities to cover an entire market and the resources to compete effectively." This comment indicates that Commissioner Dennis is prepared to recognize that some limits may exist to the concept of freewheeling competition.

That observation is particularly important because in a different proceeding Commissioner Quello explicitly disagreed with the Commission's claim that there is no such thing as "ruinous competition" in the broadcast industry. Commissioner Quello has maintained consistently that while the marketplace may provide an efficient and reliable form of regulation, the Commission is obligated to continue to define and advance public interest objectives encompassing more than just market efficiencies. ■

EQUIPMENT

Sony U-matic SP Adds Time Code...
Ortel Introduces Laser Modules...Harrison Upgrades Series Ten...Accu-Weather Amiga System Features Paint



Sony Extends U-matic SP Product Line

Sony has extended the capabilities of its U-matic SP product line with the introduction of the VO-9850 Type IX editor/recorder and the VO-9800 Type IX feeder/recorder. For customers using CTL-based editing in a configuration that includes a 2-VTR-cuts-only edit system, the Type IX editor/feeder package offers the addition of time code capability together with superior video/audio quality. SP technology delivers higher horizontal resolution of 330 lines and distinct improvements of luminance and chrominance ringing effects, both contributing to improved overall multigeneration recording quality. U-matic SP is compatible with conventional U-matic machines. These units can record and playback in both SP and conventional modes. Also, jog operation has been added and helps to easily and accurately locate edit points.
Reader Service #201

Fidelipac Introduces Three-Deck Cartridge Machine

Featuring a more efficient power supply and better signal-to-noise ratio, an enhanced CTR30R series three-deck cartridge recorder/reproducer from Fidelipac was introduced at the AES Convention in Hamburg. The unit is equipped with a dc servo motor and will operate on either 50 Hz or 60 Hz.
Reader Service #202

Nalpak Has New Tripod Case

Nalpak introduces a new, smaller line of 7.5-inch Tuffpak tripod cases. This new smaller and lighter case is especially designed for the new lightweight tripods and camera support systems of Miller, Sachtler, ITE, O'Connor, Bogen and Quickset. Like all Tuffpak cases, it features the unique octagon shape, twin molded handles, and quick-release buckle for easy opening.
Reader Service #203

Nady Offers Portable VHF Wireless System

In situations that call for indirect camera input sound recording without a soundcart, the 501 VR from Nady provides a professional quality alternative. The unit operates on five VHF channels between 170 and 216 MHz and provides a dynamic range of 120 dB with a full frequency response of 25-20,000 Hz. Housed in a steel case only 6 by 2.85 by .9 inches, the receiver's double-heterodyne de-

One class beyond. More and even tungsten light. Sachtler Reporter 650H.

The new dimension in lighting.
Reporter 125D, 270D, 100H, 250H, 300H, 650H; Production 575D, 1200D.

Sachtler's new product line brings innovation in lighting. Built with worldwide known Sachtler quality.

The Sachtler Reporter 650H is setting new standards for 600–1000 watt tungsten lights. It achieves 3200 lux in spot setting (at a distance of 16.4 feet/5 m) and distribution remains extraordinarily even for the whole focusing range (1:6).

The lightweight, compact housing holds a 4-inch reflector with an integrated filter slot and barn doors.

The Reporter 650H set comes complete with three lamps; bulbs for 650 W, 500 W, and 300 W for the utmost creative flexibility in illumination; all in one case, including accessories.

The Reporter 650H set as if you had 3 kW.

sachtler®
corporation of america

55, North Main Street
Freeport, N.Y. 11520
Phone (516) 867-4900
Telex 140107 sac frpt
Fax (516) 623-6844

California office:
3316 West Victory Blvd.
Burbank, CA 91505
Phone (818) 845-4446

Circle 123 on Reader Service Card Page 51

sign and 16 poles of RF filtering give it exceptional selectivity. The receiver is powered by a 9 V battery and comes with a convenient headset and "rubber duck" antenna.
Reader Service #204

Ortel Debuts Laser Modules

Superior microwave performance for such applications as antenna remoting, wideband analog data links, microwave delay lines and high-speed data buses are provided by Ortel's model 1515A and 1515B 10 and 12 GHz laser modules. These units modulate microwave signals onto a 1300 nm laser coupled to a single-mode optical fiber and transmit them for distances of 20 km and more. The units have superior linearity and noise properties with typical RIN values below -150 dB/Hz at 2 GHz. Designed for analog transmission, the modules feature flat response, 50 ohm coaxial SMA input, single-mode 1300 nm optical fiber pigtail and -40 degree to 70 degree Centigrade operation.
Reader Service #206

ESE Announces Color/Digital Effects Character Generator

A new color/digital effects character generator, the ES-CG, from ESE features a 16-color palette, four upper- and four lower-case fonts, 10 display styles and 30 pages of memory. A standalone unit, it has internal or external genlock capability. List price is $1395.
Reader Service #205

Accu-Weather Presents Enhanced Weather Graphics System

An enhanced Amiga weather graphics system from Accu-Weather now offers paint capability, easy operation, NTSC output, automatic log-in, color table movies and looping, over 40 wipe styles, and total weather segment production. Color graphics available from Accu-Weather on the Amiga system include national and regional satellite images, national and regional radar and precipitation displays, current and forecast temperature and weather maps, jetstream patterns, long-range outlooks, major events in weather history, major weather concepts and color graphics.
Reader Service #207

Loma Introduces New Transmitter

Model LS125ST from Loma Scientific is type accepted under FCC rules, parts 21, 74 and 94, at any output peak visual power

range of 10 through 20 W. This top-of-the-line unit features full front panel diagnostics, separate aural and visual amplifier chains, a built-in microwave diplexer and performance specifications that reportedly surpass all FCC part 73 rules for full broadcast television. According to the manufacturer, performance and reliability are superior to equipment considered state of the art until now and the price is below typical industry cost.
Reader Service #208

New Automation System for Harrison Series Ten

Harrison Systems demonstrated their Macintosh II-based automation system for their totally automated Series Ten console at the March AES in Hamburg. The new automation system greatly increases the operational speed and productivity of Series Ten's total dynamic automation. Using the Macintosh II system assures reliability and widely available field service support, says the manufacturer. In addition, its power allows the addition of many features to the automation system that have been long in coming. The upgrade is being made available to present Series Ten owners.
Reader Service #209

Fluke Offers New Bench Multimeter

Model 45, a multifunction dual display multimeter is said to be an industry first from Fluke. Many measurement combinations including two different measurements of the same signal are possible. For example, in measuring the frequency response of an amplifier, voltage can be viewed on the primary display while frequency appears on the secondary screen. Among the many features are a compare function for in-tolerance testing, a frequency counter function to 1 MHz, a dB function with 21 reference impedances, diode testing, audio power testing, continuity testing, and a built-in RS-232 interface for PC instrument applications. Basic one-year accuracy specifications are: .025 percent V dc, .2 percent V ac, .05 percent dc A, .5 percent ac A, .05 percent Ohms and .05 percent Hz. List price is $595.
Reader Service #210

New Tek Debuts New Video Digitizer

Digi-View Gold is New Tek's latest version of the Digi-View video digitizer designed specifically for the Amiga 500/2000 line computer. The new hardware design offers better image quality by operating directly on the computer with no gender changer required. The filter wheel has also been redesigned to use professional photographic gels. The new digitizer captures images in 2.1 million colors, the highest resolution of any Amiga digitizer, and includes the ability to remap pictures between all Amiga resolution modes. List price is $199.95.
Reader Service #211

Symetrix Offers Digital Processing Recorder

Intended for the film and video post production, recording, and broadcast production markets, the DPR-100 digital processing recorder from Symetrix is a digital audio worksta-

3-Way Lounger

One of these revolutio the world looks at TV w

BTS did not invent the three-way lounge chair. Barcalounger® did.

But you'd be surprised at how many of the most revolutionary ideas in the history of video did come from BTS. In fact, because we look at things differently, the whole world looks at things differently.

We introduced the first CCD film scanner, for instance. The first Plumbicon camera tube. The first software-based character generator. The B format for videotape recording. The modular routing switcher. And of course, the first 3-D computer animation system, for which we won one of our three Emmies.

BTS has been a technological innovator in the video industry for six decades. Our cameras,

3-D Computer Animation

ıary changes in the way
ıs not invented by BTS.

switchers, videotape recorders and graphics equipment are among the best-engineered, highest quality and most reliable in the world. Our work in High Definition and CCD products is pacing an industry which faces the most sweeping technological advances since its beginning.

And we're as dedicated to better product service and support as we are to better products.

So although BTS may not yet be a household word, here's a word to the wise. In the years ahead, BTS will continue to be more forward thinking, more responsive and more innovative in our approach to video technology than anyone else.

Including Barcalounger.

BTS
The name behind what's ahead.

BTS is Broadcast Television Systems, a joint company of Bosch and Philips. For more information, please call 1-800-562-1136 or write BTS, P.O. Box 30816, Salt Lake City, UT 84130-0816

Circle 126 on Reader Service Card Page 51

tion that blurs the distinction between signal processing and audio information storage. Model DPR-100 provides digital domain recording, mixing, and signal processing in a compact, modular system with a throughput of over 50 million instructions per second. The system utilizes multiple 24-bit digital signal processor ICs. With this much DSP power on line, simultaneous real time effects for all tracks include level, pan, and 3-band parametric EQ, all of which can be automated. User interface is via an Apple Macintosh.
Reader Service #212

Microwave Radio Introduces Short Haul Microwave System

Microwave Radio has a new series of 18 and 23 GHz short haul microwave links for broadcast ENG back hauls, video teleconferencing, surveillance, cable TV, and remote monitoring and control uses. MicroLink II is an RF frequency synthesized system offered with .003 percent frequency stability and UHF intermediate frequency to minimize interference. Audio and video are applied directly to the RF head which eliminates the need for a controller, and the systems are available in simplex, duplex, and multiplex configurations with system gain from 167 dB. Priced from $7500 to $20,000 depending on configuration.
Reader Service #213

Data Translation Introduces ColorKit And QuickCapture

ColorKit is a software product from Data Translation which lets QuickCapture, Data Translation's 256-gray level frame grabber board for the Macintosh II, capture, display, and store images with full 24-bit color. ColorKit works with QuickCapture to capture 24-bit color images from RGB video cameras and

still-video devices for use in color electronic publishing, color compositions, computer art, and slidemaking applications. ColorKit follows the standard Macintosh interface of pull-down menus and icons for ease of use. Although the Macintosh II can display images with only 8 bits of color, ColorKit's advanced color mapping system optimizes the Macintosh II display and manipulates and stores images with 24 bits of color.
Reader Service #214

Toa Electronics Debuts Wireless Amplifier

Model WA-640 from Toa Electronics is a VHF high-band portable wireless amplifier designed to provide sound reinforcement for meetings and public gatherings. Three microphones, two wireless and one standard mic with cable, may be used at one time. An optional receiver module is required for each wireless microphone. Unique tone-key circuit design ensures virtually interference-free transmission. A new compander circuit provides extended dynamic range and an exceptional signal-to-noise ratio.
Reader Service #215

Ross Video Premiers Downstream Multi-Keyer

Ross Video's Downstream Multi-Keyer is an option for its Model RVS416 production switcher. The multi-keyer brings the number of key levels on the 416 to 12. Each of the unit's eight keys has its own controls for key level, softness, mask size and position, invert, non-add key, matte color, bordering and border edge intensity. Each key can be bordered independently with an all-around border, drop shadow or outline in color.
Reader Service #216

Alan Gordon Picks Up Audio-Technica

Alan Gordon Enterprises has added the Audio-Technica line of products to its sales division. Among the products is the AT4462 stereo field mixer, featuring two automated circuits and a stereo limiter; the 40 and 800 series of shotgun microphones; and the ultra-miniature lavalier series featuring 1.5 V battery or 9-48 V phantom power operation.
Reader Service #217

BUSINESS BRIEFS

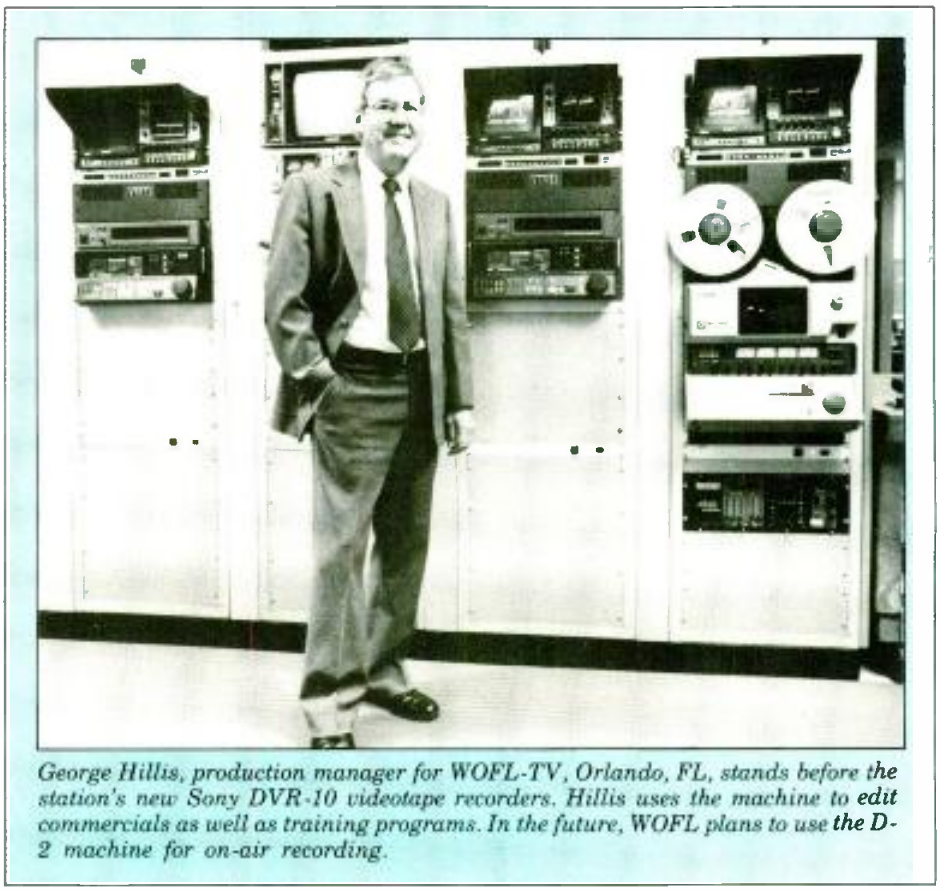
Communications Engineering, Inc. has been retained by **NBC** to study and evaluate the existing core communications systems serving both the network and its New York City O&O, WNBC-TV, at 30 Rockefeller Plaza. The existing technical communications system has evolved over many years, and is to be replaced by an integrated system using the McCurdy equipment purchased for use at the 1988 Summer Olympics in Seoul...**WHTJ-TV**, Charlottesville, VA, has installed what is reportedly the world's first air-cooled 10 kW common amplification UHF transmitter. The transmitter, a product of **Comark Communications, Inc.**, Colmar, PA, meets or exceeds all broadcast specifications and does it without a diplexer...Video facilities continue to spend more per site than any other segment of the broadcast and professional video industry, according to *1989 U.S. Video Facility Marketplace*, published by **Market Tech Associates**, New York. Video facilities plan to invest nearly $400,000 per operation on new equipment in 1989. The Market Tech study is available for $17,000.

Radio Systems, Inc. has begun operations at its new 33,000-square-foot headquarters in Bridgeport, NJ. The address is 110 High Hill Rd., P.O. Box 458, Bridgeport, NJ 08014-0458; telephone 800-523-2133 or 609-467-8000.

Dave Collie has been named product development manager at **Solid State Logic**, based at SSL's Oxford headquarters...**IDB Communications Group, Inc.**, Culver City, CA, has promoted Miles Thomas to manager of the audio control center. He was previously audio control center technician. He will oversee center operations and will report to Linda Murray, director of operations. Gus Skinas has been promoted to senior product manager, professional audio with **WaveFrame Corp.**, Boulder, CO. Dave Frederick has been named product manager, music applications.

C-SPAN is replacing its U-matic ¾-inch equipment with half-inch MII format equipment from **Panasonic Broadcast Systems Co.** "We are converting completely to MII," said Brian Lockman, C-SPAN's vice president of network operations. "We will be using it to provide live and taped coverage of the House of Representatives and the Senate"...**The Glendale Studios**, Glendale, CA, has purchased new ¾-inch and half-inch Betacam equipment. Vice president and general manager Chris Cates says the complex has made its editing bay available to outside producers, as well as those production companies currently taping there.

Sony Corp. reported net sales of $4,871,579,000 for the third quarter of fiscal 1988 with net income of $229,381,000 (or $.74 per share). The company also reported net sales of $12,746,659,000 for the nine-month period ending December 31, 1988, with net income of $460,992,000 ($1.53 per share)...**Ampex Corp.** posted sales of $702 million in 1988, an increase of 13 percent over sales of $619 million in 1987. The company says revenues grew in all of its major businesses of professional TV recording and video systems, magnetic tape and data storage products. ■



George Hillis, production manager for WOFL-TV, Orlando, FL, stands before the station's new Sony DVR-10 videotape recorders. Hillis uses the machine to edit commercials as well as training programs. In the future, WOFL plans to use the D-2 machine for on-air recording.

ADVERTISERS INDEX

SALES OFFICES

MICHAEL D. BAILENSON, Publisher
295 Madison Avenue, New York, NY 10017 212-685-5320 Fax-212-679-0919

Eastern States
295 Madison Avenue
New York, New York 10017
212-685-5320
Fax: 212-679-0919
Telex: 64-4001
William P. Dey
Pamela Vahter

Western States
21757 Devonshire Street
Suite 3
Chatsworth, CA 91311
818-998-5154
Denice Nichols

Europe/United Kingdom
(082) 572-4144
Fax: (082) 572-4155
Jim Parkinson

Japan/Far East
5-24 Sanbancho
Chiyoda-ku, Tokyo, 102 Japan
(81-3) 234-2161 Telex: J28208
Fax: (81-3) 234-1143
Takashi Kasai
Shoichi Maruyama

CLASSIFIED

Can't Beat 'Em? Why Not Join 'Em?

By Richard R. Arsenault

AM broadcast stations are now facing ever-increasing competitive difficulties in a world of new technologies. For the majority of AM broadcast stations without a co-located sister FM station, there's an almost immediate need to find problem-resolving solutions. The fact is, about 80 percent of all radio listeners are on the FM band, making it increasingly arduous for the AM-only station to survive in the highly competitive radio marketplace. This dilemma is magnified when one realizes that the majority of commercial radio broadcast stations authorized to operate in the United States are located on the AM band!

The Federal Communications Commission is increasingly aware of this predicament, and is attempting to procure answers to aid the very stations that have served the public effectively for 30, 40, 50 and even 60 or more years, well before the heyday of FM.

The AM transformations that resulted from FCC rule changes in this decade have provided insignificant or sometimes partial solutions to the problems of the AM broadcaster, and in some cases have actually done a disservice to AM radio. What is required are real answers that address the substantive problem, not repeated patchwork.

If listeners cannot be persuaded to tune in to the aged technology of AM, the sole conceivable remaining choice is for AM-only stations to find a way somehow to join the listeners on FM. AM broadcasters must uncover a way to simulcast their AM programs on the FM band or accept the uncomfortable certainty that many AM-only stations will cease operation over the next decade due to serious financial difficulties. Numerous communities will stand to lose the only local radio service they now have, contrary to the public interest.

I believe it is possible to develop a method for the majority of AM-only operations to simulcast on the FM band with reduced power and without interference to existing FM stations. To this end, I submitted a Petition for Rulemaking to the Federal Communications Commission in March, requesting rule changes that would establish a new class of commercial FM facility. This proposed facility assignment would be made available only to standalone AM stations without amendment to the FM Table of Allocations as currently required for all commercial FMs, and only on a secondary noninterfering basis to the primary coverage areas of existing FM authorizations.

This assignment method has been used now for almost a decade by secondary Class D Educational FMs, which also operate on the commercial band.

With an effective radiated power of up to 1000 W, FM coverage in excess of 10 miles from the transmitter site could be obtained for a relatively small investment by the AM station. Many AM daytime and full-time stations, particularly outside of FM radio-congested larger urban cities, could take advantage of such an opportunity and provide clear FM coverage on a full-time basis to their local communities. What do you think? ■

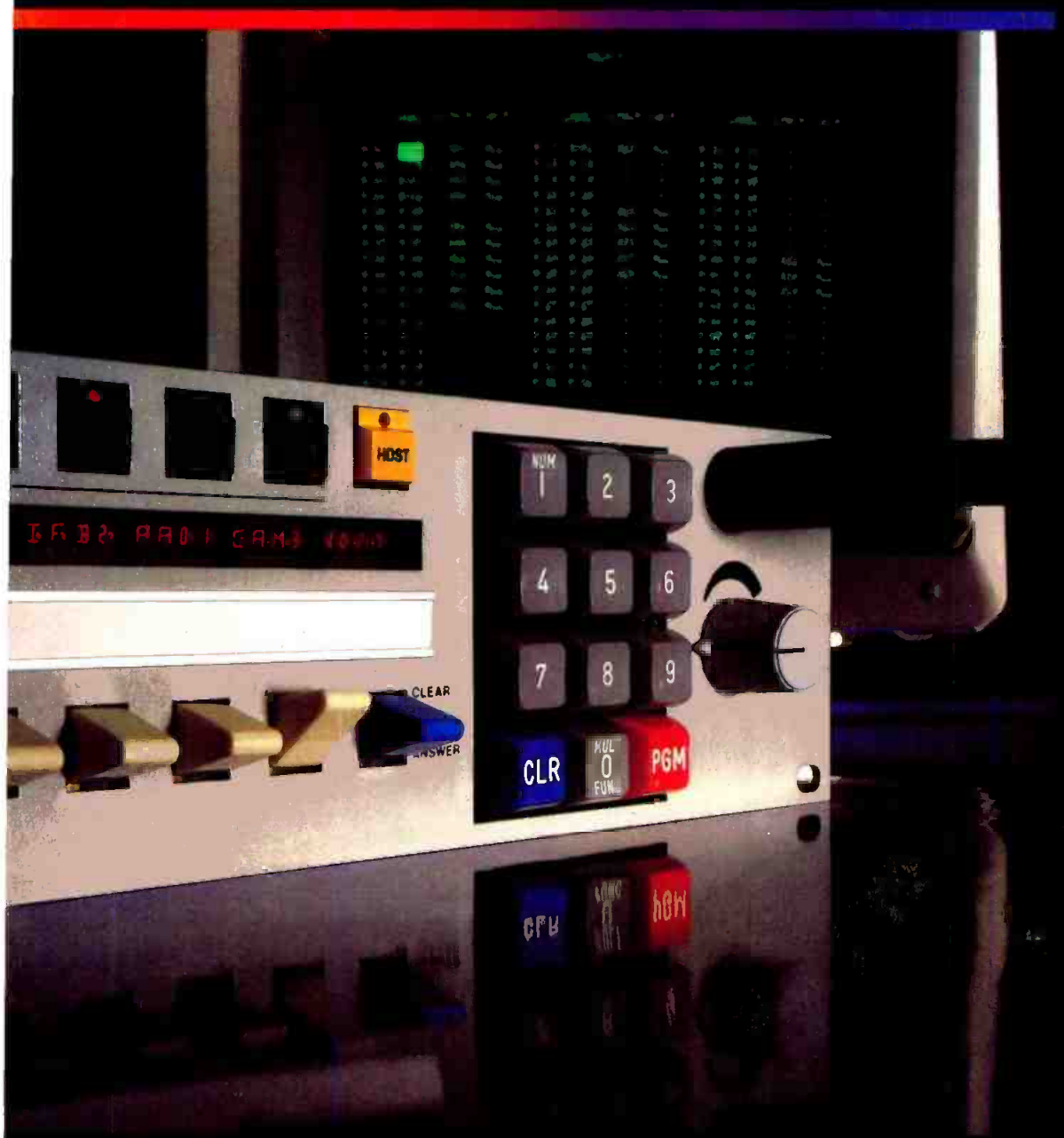
Richard R. Arsenault, B.Sc., operates a broadcast consulting firm and is a member of IEEE. He is also an SBE-certified Senior Broadcast Engineer.

THE INTERCOM SOLUTION FROM McCurdy

Looking for an integrated communications system? Look to McCurdy for the affordable solution. McCurdy's advanced Digital Intercom Systems have set a new standard for programmability, flexibility, expandability and reliability. We offer you cost-effective solutions to your intercom needs, large or small.

Our affordable, high performance intercoms are integrated communication systems with the following superior capabilities:

- Point-to-Point communications
- Programmable Party Lines
- Programmable IFB's (Program Interrupt)
- Programmable selective Group Calls
- 2-wire beltpack interface
- 2-way radio interface
- Telephone interface with auto answer
- Camera interface
- Camera ISO capability
- Relays for auxiliary equipment control.



Other features include:

- Ultra-reliable
- Instantaneous Cross-point Access Time
- Fastest system reconfiguration time
- Disk based storage system or EEPROM
- Completely modular and field expandable
- 3-pair telco wire between matrix and control panels
- Wide choice of control panels
- Bright, easy to read 4 character alpha-numeric displays
- Easy to program
- All keys universally programmable locally or at central terminal
- System configuration can be changed by user at any time
- Very compact: CS9500 50×50 matrix is only 3 RU (5¼") high

40 YEARS OF EXCELLENCE

McCurdy's intercom systems are in use around the world; they range in size from 10×10 to 400×400 systems.

As the premier intercom supplier for the 1988 Calgary and Seoul Olympic Games, McCurdy intercoms succeeded with flying colors!

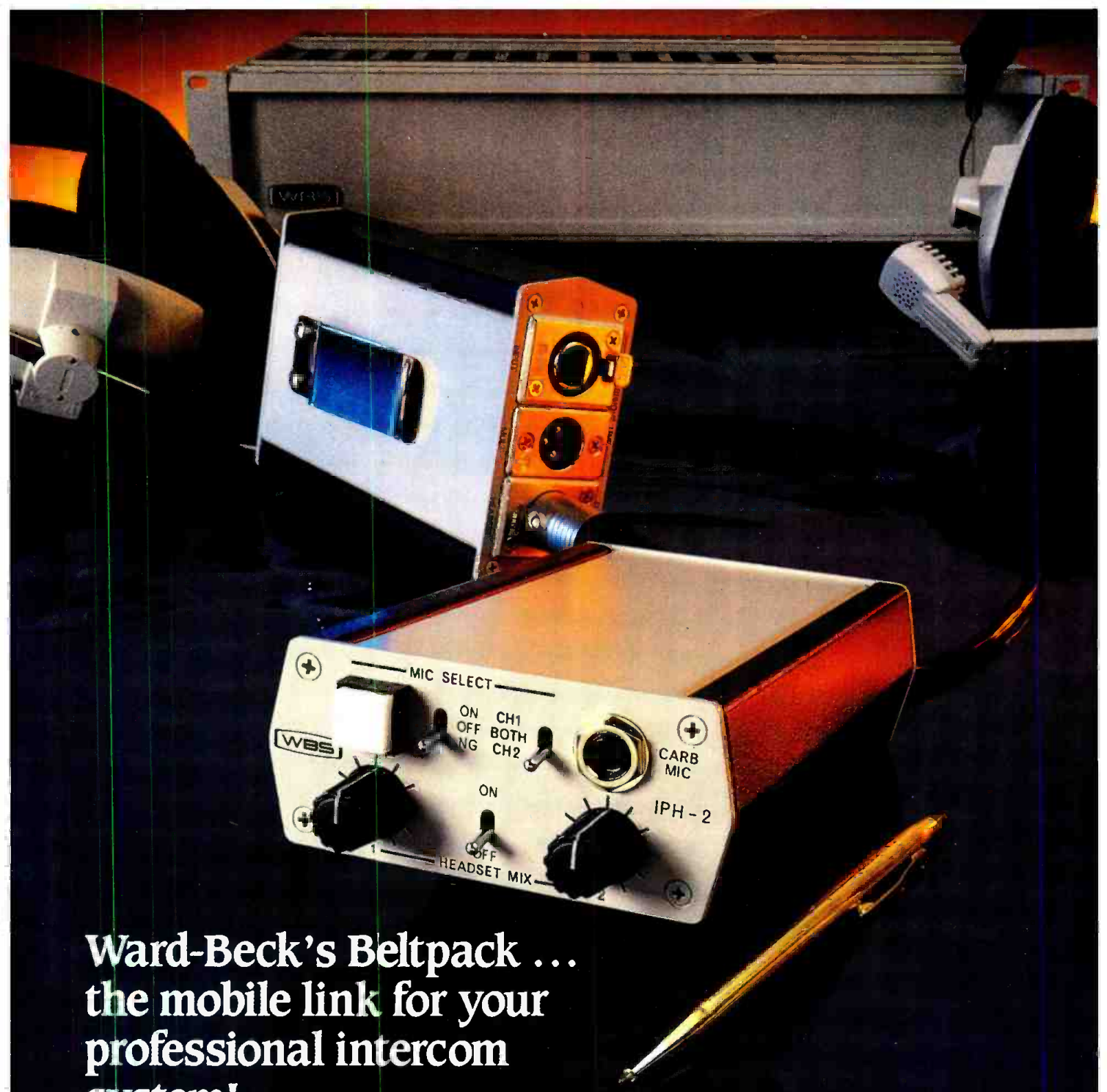
Make it an easy choice. Select McCurdy's Digital Intercom System ... the Integrated Intercom Solution.

Circle 131 on Reader Service Card Page 51

McCurdy

McCurdy Radio Industries
108 Carnforth Road, Toronto, Ontario
Canada M4A 2L4 Tel: (416) 751-6262
Telex: 06-963533 Telefax: (416) 751-6455

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



Ward-Beck's Beltpack ... the mobile link for your professional intercom system!

Now total communications has become a reality with the new high-performance WBS Interphone Beltpack.

This superbly designed two-channel, single pair wired, compact unit interfaces with Ward-Beck's advanced four-wire, programmable MicroCOM system. It assures studio quality voice communications to your outermost mobile location.

Beltpack moves quality communications yet another step ahead of the rest of the pack ... and at a very attractive price!

WBS

WARD-BECK SYSTEMS

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