OCTOBER 1979 $3.00

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SMPTE PREVIEW

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Although it's a desk-top model, our 1600 Series audio console offers a brilliant array of features and capabilities for handling the most demanding program material.

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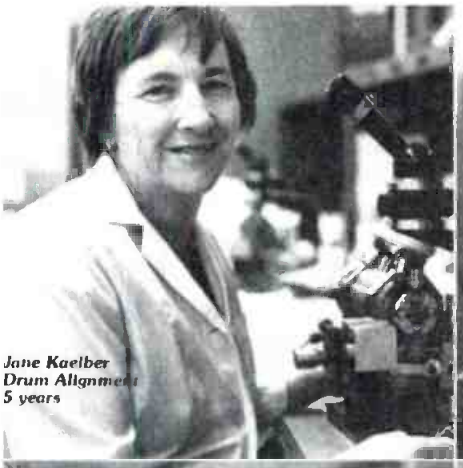
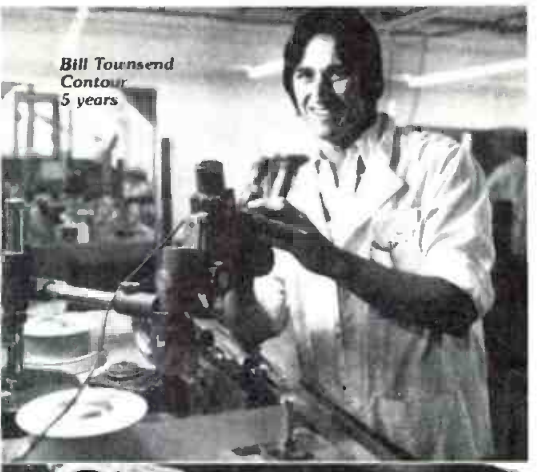
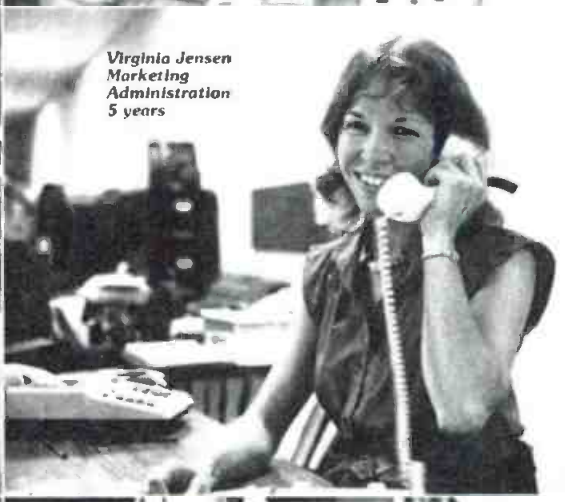
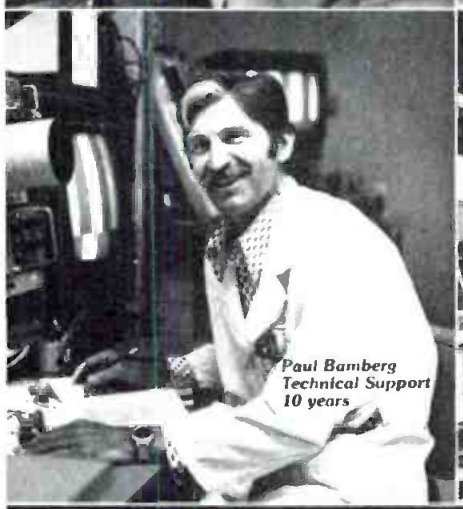
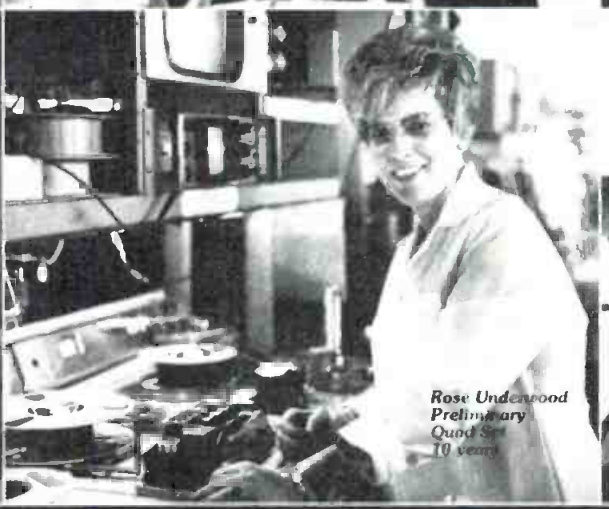
Make sure you control the entire audio spectrum. Contact Audio Designs and Manufacturing, Inc., 16005 Sturgeon, Roseville, MI 48066. Phone (313) 778-8400. TLX-23-1114. *The Audio Company.*

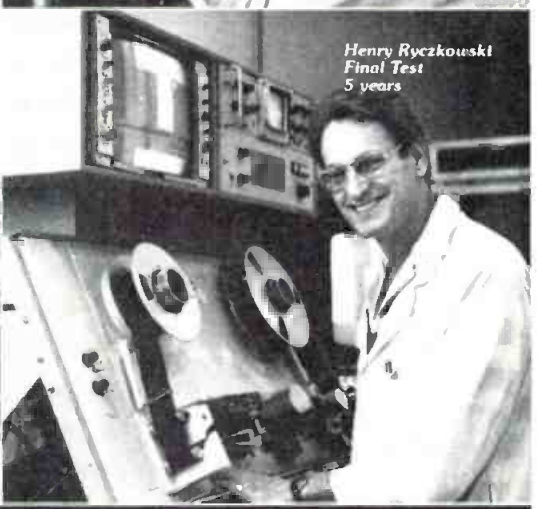












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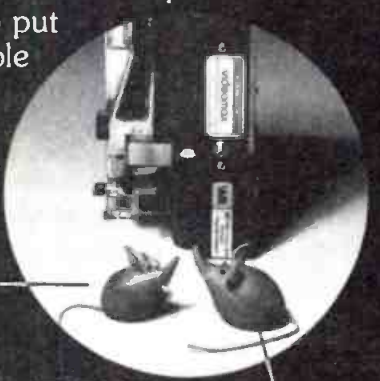

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Microcam, developed by Thomson-CSF Laboratories. The first shoulder-mount color TV camera to offer the combined benefits of studio-quality broadcasting with lightweight portability. In fact, Microcam weighs just 12.4 pounds for a total of 22 pounds, complete with motorized lens and a 5 pound silver cell battery which operates the camera for 6 hours on a single charge. Microcam provides all the essential features for superior pictures from the field or in the studio.

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Plus complete VTR Control, including start-stop, VTR stand-by and return video. And a complete set of operating indicators, including VTR status, located in the viewfinder.

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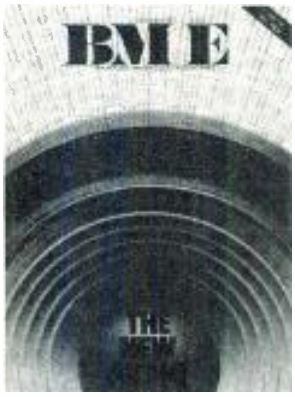
BM/E
BROADCAST MANAGEMENT/ENGINEERING

OCTOBER 1979 / VOLUME 15 / NUMBER 10



Digital technology and the spread of stereo to AM and eventually television constitute the dawning of a new era for viewers and listeners.

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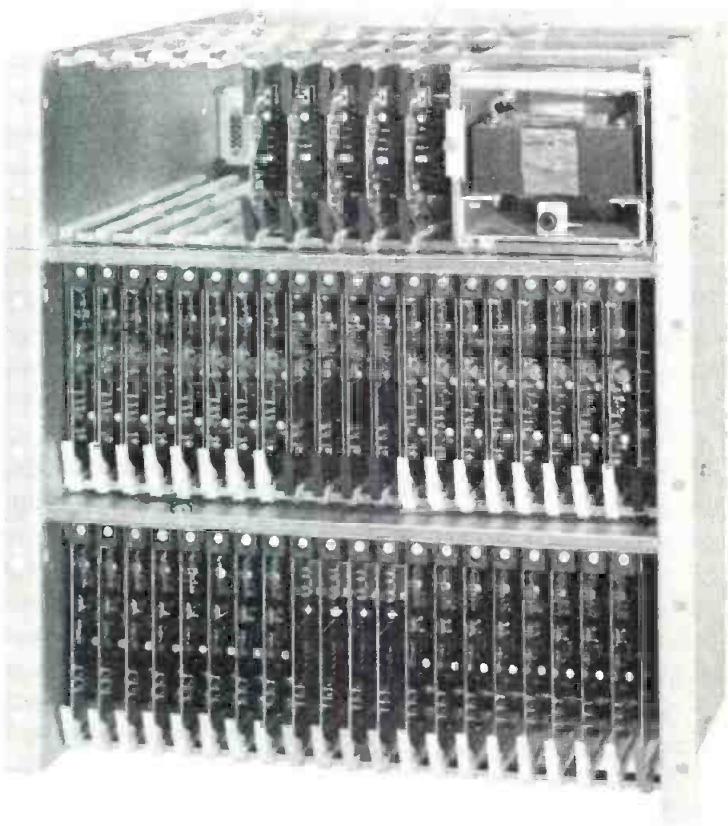

Grass Valley Group's range of television terminal equipment is the broadest in the industry, from distribution amplifiers, sync generators and video processors to large production switchers and audio/video assignment matrices.

Since Grass Valley Group manufactures a *complete* range of products, customers can be confident that equipment will perform in a system as well as on an individual basis.

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BROADCAST INDUSTRY NEWS

NAB Urges FCC To Reconsider AM Broadcasting Conference

Devote time to planning rather than decisionmaking at the upcoming Region II (western hemisphere) Administrative Radio Conference on AM Broadcasting. That is the suggestion of the National Association of Broadcasters to the Federal Communications Commission.

NAB has asked the Commission to work up a "master plan" for AM broadcasting that would clearly chart the course for AM radio at the regional meeting to be held next March.

The reason for NAB's request is that actions taken at the 10-week-long World Administrative Radio Conference (WARC), which got underway last month in Geneva, could have a profound effect on the meeting and could negate many preliminary steps.

While the U.S. hopes to expand the AM band from 1605 to 1860 kHz during WARC, technical information requested for the Region II meeting is based on the current allocation structure of 535 to 1605 kHz. Citing "serious reservations regarding the propriety of commencing the present inquiry and holding a Region II meeting before all the facts have been developed and all countries have agreed as to the proper and rightful allocation of the AM broadcasting band," NAB is calling for a joint government-industry study that would focus on efficient spectrum use.

Westar III Launched, Joins Sister Satellites

Artist's depiction of Westar III, launched August 9 at Kennedy Space Center in Florida

Westar III, Western Union's third domestic communications satellite, was launched successfully this summer and jockeyed into its final geostationary orbit over the equator, where it will provide capacity for broadcasters and other communications services.

The satellite's assigned position is 91 degrees west longitude, almost directly above the Galapagos Islands. Westar I is located at 99 degrees west longitude, 420 nautical miles west of the Galapagos, while Westar II is positioned at 123.5 west longitude, nearly 1900 nautical miles west of the islands.

The Public Broadcasting Service broadcasts to 279 public television stations via Westar, and later this year Mutual Broadcasting System — the nation's largest radio network — will provide radio transmission with the Westar system. National Public Radio, with nearly 200 member stations, will be interconnected via Westar next year.

Other broadcasting industry customers include Robert Wold Co., Hughes Television, ABC, CBS, the Spanish International Network, the Physicians Radio Network, and the AP Radio Network.

Each of the three Westar satellites carries 12 transponders. Each transponder can relay one color television signal with accompanying audio, or 1500 one-way voice channels or about 60 million bits of data per second.

First Major Meet Of Satellite Broadcasters: "Revealing"

"Network affiliates will increasingly switch from their full-time network feed to a part-time programming source," according to W. L. Johnson, AT&T's product manager-television. Johnson made his prediction at the first major seminar sponsored by the Satellite Broadcasters Association, formed two years ago to keep broadcasters abreast of satellite technology developments and legislative problems. The seminar, held in New York City, assessed the carrier's role in future satellite transmission.

Johnson added that overall satellite design must include the capability to occasionally divide networks into regional feeds that would meet advertisers' demographic requirements. Such regionalization, Johnson noted, will become more intense as competition for audience share increases. "Thus, only one uplink and one transponder to feed all stations on a particular network, full-time or part-time, will prove inadequate," he concluded.

RCA-Americom's Larry Driscoll revealed that nearly 200 stations around the country have indicated firm interest in the company's SMARTS program, introduced at the NATPE convention earlier this year. SMARTS is expected to be operational next January. Nevertheless, Americom has not firmed up plans beyond the initial experiment with Post-Newsweek stations.

Experimental satellite transmission of commercials direct to TV stations, initiated by Blair Television, has been successful, according to Blair's Jack Bray. But Bray added that the company has yet to decide whether or not to go ahead with satellite transmission of commericals on a regular basis.

Minority Groups Ask For AM/FM Combo Divestiture

The National Association for the Advancement of Colored People (NAACP), the Minneapolis chapter of the Committee for Open Media, and the National Latino Media Coalition have

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Control the complete audio spectrum. At the controls of the new ADM® broadcast consoles you command every aspect of audio broadcast production. At your fingertips is a unit far beyond the scope of ordinary expectation. It's designed to the most exacting standards; manufactured to the most rigid tolerances. Its functions appear limitless; its quality obvious. So confident is ADM of their consoles, that they're backed with an exclusive five year warranty. For a complete catalog and list of users contact Audio Designs and Manufacturing, Inc., 16005 Sturgeon, Roseville, MI 48066. Phone: (313) 778-8400. TLX-23-1114.
The Audio Company.

jointly filed a petition with the FCC asking for divestiture of existing AM/FM combinations. According to the petitioners, breakup of the combos would "foster diversity of ownership, enhance minority ownership opportunities, and promote the development of FM broadcasting." The petition for rulemaking also asked for prohibition of future cross-ownership of AM and FM stations in the same market.

In an answering statement to the Commission, the NAB claimed a new rulemaking procedure was not justified because the issues raised in the NAACP petition had been previously considered by the FCC. A new proceeding, said NAB, "would invite the wasteful expenditure of time and resources to resurrect tired questions of public policy." The association also said that while radio is prospering financially, this does not mean that divestiture is economically feasible for most stations, as the petitioners contended. Nearly one-half of independent FM stations continue to operate at a loss, NAB noted, and divestiture might weaken them seriously.

The NRBA also filed comments on the NAACP petition with the FCC, noting concern about the various proposals it contained. The radio group indicated that it would wait for a formal proposal from the Commission before participating more fully, but stated that its decision to wait did "not arise either from a lack of concern . . . or from any basic agreement with the [NAACP] positions."

Three Issues Cited For Further Study In FTC Ad Ban Case

The controversial inquiry into television advertising aimed at children could flare up again, following a recommendation to the Federal Trade Commission by Administrative Law Judge Morton Needelman.

Needelman has asked the FTC, which has been conducting the inquiry, to further investigate three issues at a hearing where concerned parties could cross-examine FTC staff.

Issues that Needelman wants aired include: the extent to which children between the ages of two and 11 can distinguish between commericals and programs, particularly to the point that they can comprehend the sales motive behind advertising; the extent to which children can defend themselves against techniques in advertising such as cartoons, premiums, limited information and appeals; and whether or not children viewing commercials are subject to real or potential health effects because they do not understand the full extent of the selling message.

In addition, Needelman suggests that further written submissions be made concerning four other areas: whether independent broadcasters and UHF stations would be hard hit by an advertising ban; the effect a ban might have on programming decisions; the impact of a ban on prices of products advertised to children; and whether additional product information or stronger distinctions between commercials and programming would remove any deception that might exist in children's television advertising.

Southern Sports Viewers Appeal Discrimination Petition

Viewers of the South, a group of seven Mississippi and Louisiana television viewers, has asked a Federal appellate court to review an FCC denial of a petition the group filed against the NBC network, 13 NBC affiliates, and the National Collegiate Athletic Association on the grounds of discrimination.

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- Seattle (206) 575-1680

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Woodbury, New York 11797

Hitachi SK-90: portable ENG mode

Digital Command Unit (with coax/triax option)

Remote Operating Unit (features RGB out)

The group contended that NBC, the affiliates, and the NCAA displayed racial discrimination in their programming by failing to telecast basketball games played by black colleges and universities.

Earlier this year, the FCC denied the original petition on the grounds that Viewers had not shown relief was necessary. The Commission added at that time that it had no jurisdiction over the NCAA and that Viewers had not demonstrated specifically that any of its allegations warranted further action.

FCC Switches Stand Over Private Terminals

The FCC has cut away some of the legislative brambles that have ensnarled direct-to-home broadcasting in this country.

The Commission has authorized private ownership of receive-only satellite earth stations, and by doing so has abruptly reversed its long-standing policy regarding private terminal ownership. It is now giving a routine green light to applicants who want to start construction on private terminals. Although there are only four private applications before the FCC — three of which are from Scientific-Atlanta — the decision to grant approval routinely will cut paperwork and ease frequency coordination requirements.

Nevertheless, the Commission has made it clear that technical standards will have to be met. Those standards will be contained in the results of its earth station rulemaking, slated to appear on the agenda September 20.

The private terminal policy shift, a mid-August decision made without official fanfare, was endorsed by FCC Common Carrier Bureau chief Philip Verveer. Reactions to the deregulatory move were touched off almost immediately. Edward Taylor, president of Souther Satellite Systems, predicted that the decision could trigger a wave of terminals in hotels and apartment buildings. "Fifty thousand units with 100 customers each is five million people," Taylor calculated. "That's when we get excited."

Radio Revenues Sparkled In 1978

Radio hit a financial high-water mark last year, according to a recently issued report from the NAB.

Based on financial returns from more than 1700 AM and FM radio stations, typical time sales were up 19.9 percent and net revenues grew 19.4 percent over the previous year. Results bettered 1976, which until last year had marked all-time record highs. For the third year in a row, radio's growth in national-regional sales exceeded substantial gains in local advertising.

Although operating expenses gained on 1977, the 17.8 percent increase lagged behind revenues, giving the typical radio station its highest pretax profit, $26,400, a 40.4 percent jump over 1977.

But not all stations turned in glowing balance sheets. Of the responding stations, 28 percent reported losses last year.

News Briefs

Burke Marketing has dropped out of the radio ratings game, but is reportedly considering a comeback attempt. A deficit of over $1 million was cited as the reason for the action, which leaves Arbitron virtually unchallenged in the field. Metromedia, however, committed its 13 stations to using Burke services if they resume; Burke's decision was due in mid-September . . . . The

For KVII-TV in Amarillo and KVIA-TV in El Paso ... the ideal choice was MNC-71CP!

Marsh Media Ltd. looked long and hard when they set out to outfit their local ABC-TV affiliates in Texas with lightweight, portable ENG/EFP cameras. No simple task, considering the many video cameras currently on the market and the numerous claims made on their behalf.

In the final analysis — as Marsh Media Ltd. management well knew — dependable dealer service and full manufacturer/distributor support, with readily available parts and liberal warranty terms, were just as important as the particular features of the camera.

Marsh Media chose to go with Victor Duncan, Inc., the regional dealer for Cinema Products' line of *NEC* portable ENG/EFP video cameras.

"From an engineering standpoint, Cinema Products' backup program and Victor Duncan's dependable service completely free our hands from what has previously been a problem area," says Bill Canady, Marsh Media's Director of Engineering.

KVII-TV and KVIA-TV got MNC-71CP reliable, broadcast-quality performance at a reasonable price, backed by an unprecedented one-year warranty and round-the-clock service.

Can you afford less?

"Our MNC-71CP cameras have seen considerable action since we've taken delivery of the three cameras initially ordered by Marsh Media," says Dan Garcia, Assistant News Director, KVII-TV. "The problems have been virtually nil, and with a little proper training, adjustments can be made in the field with the greatest of ease."

Alan Sheffield (right), Victor Duncan's Director of Video Sales and Rental, seen with Dan Garcia of KVII-TV during a recent video equipment seminar held at Duncan's Dallas headquarters.

"User training and preventive maintenance programs are the backbone of Victor Duncan's total commitment to the video industry," says Sheffield.

For further information, call toll-free: 800-421-7486.

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News Briefs

FCC is **petitioning the Supreme Court for review** of the court's decision that the Commission must hold hearings on proposed station sales that may involve changes in unique formats (see *BM/E*, August, 1979, p. 10).

Recent Federal Election Commission regulations governing the funding and conduct of debates between candidates for federal office **could bar commercial radio and TV stations from airing such debates**, according to a petition filed with the FEC by CBS, Inc. The NAB has declared its support of the CBS position, calling the regulations "unconstitutional, contrary to the mandates of both the Federal Election Campaign and Communications Act and violative of the national goal of an informed electorate" . . . . **Broadcast claims for cable copy right royalties are justified**, said the NAB in a filing with the Copyright Royalty Tribunal. The association said that royalty distribution should be governed by the criteria of copyright ownership and time, and also devised a sample claim form . . . . **Dwight M. Ellis** has been named director of the NAB's Department of Minority and Special Services. Ellis was formerly coordinator of the association's Employment Clearinghouse.

Kathryn Hilton and **Robert Ross** have been appointed senior vice presidents of the **NCTA**. Hilton will oversee industry affairs while Ross will be in charge of government affairs . . . . The following broadcasters have been elected NRBA regional directors: Bob Herpe, WPLR/WOMN, New Haven, Conn. (Region 1); Bernie Mann, WGLD/WOKX, High Point, N.C. and WKIX/WYYD, Raleigh, N.C. (Region 3); Ron Kempff, WHIO-AM/FM, Dayton, Ohio (Region 5); Paul Lange, KDLR, Devils Lake, N.D., (Region 7); and Eric Hauenstein, KDKB-AM/FM, Phoenix, Ariz. (Region 9). Their two-year terms commence October 7 .

RTNDA has announced the winners in its annual International Awards competition. KSFO, San Francisco, and WISC-TV, Madison, Wisc., took the spot-news category; WBBM, Chicago, and KYW-TV, Philadelphia, won in investigative reporting; KCBS, San Francisco, and KSL-TV, Salt Lake City, rated high in editorials, and CFAX, Victoria, British Columbia, and WCCO-TV, Minneapolis, received the Edward R. Murrow award for documentary.

An NAB-sponsored **Broadcast Leadership Conference** will take place October 25 and 26 at Washington, D.C.'s Embassy Row Hotel. The agenda will include briefings, speakers from Capitol Hill and federal agencies, and meetings with White House staff and legislators — all designed to find out "how broadcasters can be better motivated to become a really effective political force in Washington" . . . . **RCA Americom has filed to launch Satcom IV** in June of 1981. The communications satellite, which was originally to be constructed as a ground spare, would be positioned at 83 degrees west longitude if the FCC approves the application . . . . **COMSAT will construct a $7.7 million earth station** in Cayey, P.R., to operate with the INTELSAT system, pending FCC approval. The proposed site is about 35 miles south of San Juan.

Black Entertainment Television (BET), called the **nation's first black television network**, has been formed to distribute programming to cable systems throughout the U.S. via satellite. The company will be headed by Robert L. Johnson, soon to resign as vice president for government relations of the NCTA . . . . Wometco Home Theater has announced plans to **bring blacked-out sports events to cable subscribers** in the New York/New Jersey area. WHT service is also being

MAKE THE MOST OF MOTION

With DSA NEC's Digital Strobe Action lets you generate, in real time, multiple images of a subject in motion. But it doesn't stop there. You can also vary the frequency of display, colorize individual images, painting them a variety of vivid hues, and control the rate of decay of previous images.

The DSA Light Pen also allows you . . . to specifically control the area in which strobing is desired. Spectacular results are achieved where fluid, dance-like movements are involved such as gymnastics, figure-skating, diving and ballet. DSA applications also include strobing and sharply defining the path of objects such as a football, basketball, soccer ball, or tennis ball, while the rest of the action is carried live. Character generators take on computer graphics dimensions when processed by DSA.

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Another option for NEC's FS-15 frame synchronizer.

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News Briefs

expanded to Philadelphia and southern New Jersey, according to Wometco senior VP Louis Wolfson.

WNJU-TV, serving the New York metro area, has become the **first Spanish-language station to join Arbitron**. The healthy UHFer will be rated in the October book . . . . A **Spanish-language pay TV system** will begin service October 26 on RCA's Satcom I. Dubbed Gala Vision, the service will be headquartered in New York.

Video Expo New York '79, happening October 16 to 18 at the New York Statler, will include six basic production-oriented seminars for participants. Eighteen advanced seminars are also scheduled . . . . Fiber optics will be the focus of the **SCTE's Fall Engineering Conference on Emerging Technologies** this November 7 and 8 at the Doubletree Inn in Monterey, Calif. For info contact SCTE, 1100 17 Street NW, Washington, D.C. 20036, (202) 659-2131 . . . . Imero Fiorentino Associates will hold a three-day **seminar on Television Lighting and Staging Techniques** November 14 to 16 in New York City. Contact the firm's Education Division at 10 West 66 St., New York, N.Y. 10023, (212) 787-3050.

An industry advisory panel is working on the program for *Billboard's* first **International Video Music Conference**, to be held November 15 to 18 at the Sheraton-Universal in Los Angeles. Full information is available from the Billboard International Video Music Conference, 9000 Sunset Blvd., Los Angeles, Calif. 90069, (213) 273-7040.

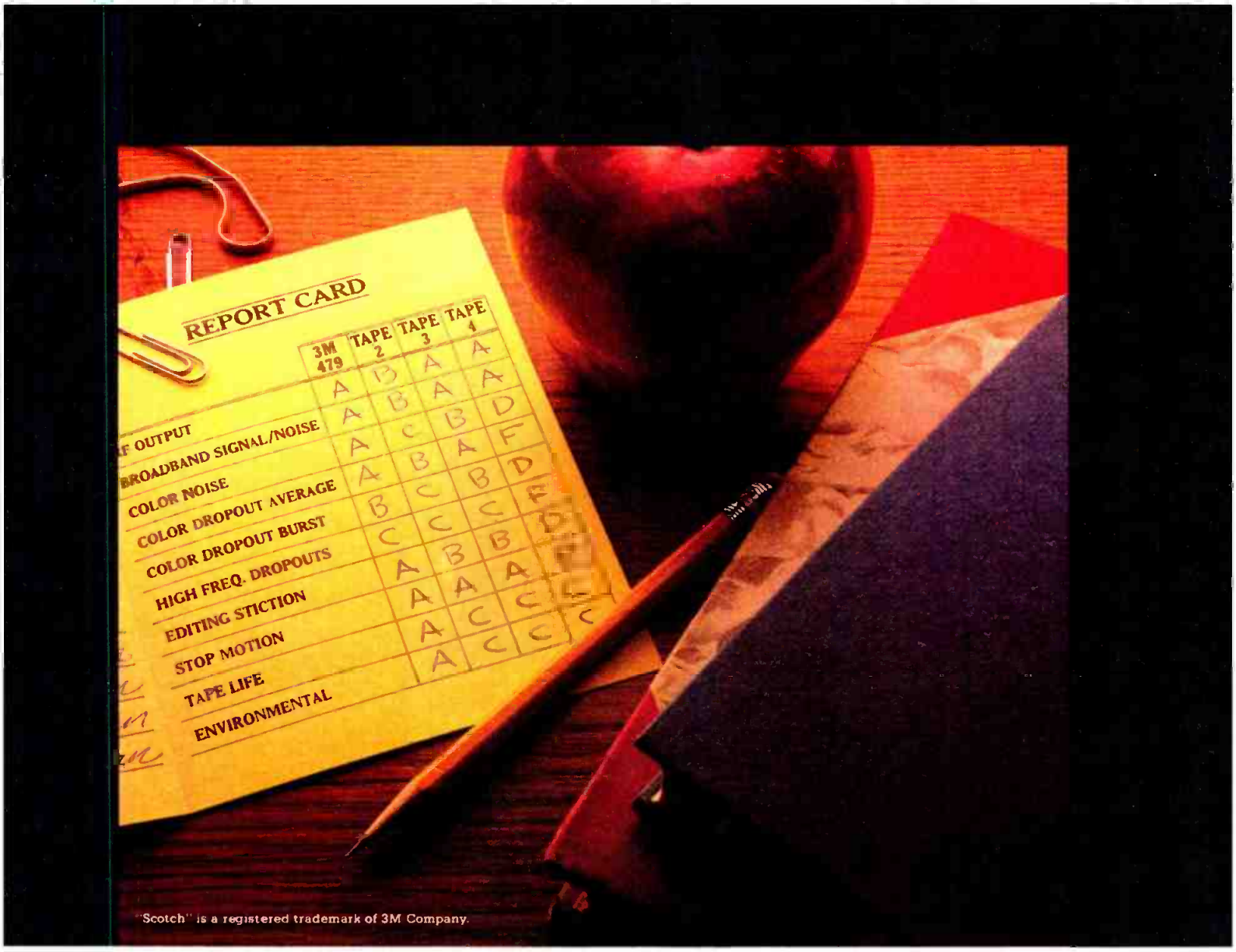
In August we reported that two parties are seeking to operate long-vacant Channel 43 in Bridgeport, Conn. We erred, however, in stating that the city presently has no TV station; **WEDW, Ch. 49**, has been in continuous operation in Bridgeport since December, 1967.

Business Briefs

3M Company will have exclusive marketing rights in the U.S. and Canada for the recently announced **NEC** Type C helical-scan VTR, under a multi-million dollar contract with Nippon Electric Co. and NEC America, Inc. The agreement, for five years with options to renew, includes equipment, parts, and warranty backup . . . . **Telex Communications, Inc.,** has acquired **Conrac Corp.'s** Turner division for cash. Sale price for the microphone manufacturing business was not disclosed . . . . **Scientific-Atlanta** has completed its acquisition of **Adar Associates, Inc.,** following approval by Adar's shareholders. The Massachussetts-based test equipment maker is now part of S-A's instrumentation group.

Ampex Corp. has announced its intention to produce VPR-2 VTRs and TBC-2 time base correctors at its Nivelles, Belgium manufacturing facility. Recent orders for the VPR-2 included **NBC's** purchase of four of the units and **WBTV-TV's** (Charlotte, N.C.) receipt of two machines . . . . **Ampex Canada, Inc.,** has signed a lease agreement to supply CTV with a variety of broadcast video equipment for its coverage of the 1980 Winter Olympics at Lake Placid. The contract includes nine VPR-2s, six BCC-10 broadcast color cameras, and two DRC series video production switchers, plus ENG units consisting of three VPR-20 VTRs and three BCC-14 cameras.

NASA's largest-ever wideband data communications service will be supplied by **RCA Americom** under the terms of a $130,000-per-month contract. The Satcom II satellite will transmit data in support of the Space



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Business Briefs

Shuttle, Spacelab, and Landsat D programs . . . . **WBTW**, Florence, S.C., will move to circular polarization in mid-1980 with a new RCA transmitter and antenna valued at more than $1 million . . . . Another million-dollar contract reported by RCA will supply **KGMC-TV** with broadcasting equipment. The new independent commercial station is located in Oklahoma City . . . . **Scientific-Atlanta** has received an order from Storer Broadcasting Co. of Miami for seven receive-only earth stations, to be installed at Storer stations throughout the country.

Western Union has filed with the FCC for permission to increase rates for voice-grade and wideband channel services on its Westar satellites . . . . Citing a 25 percent increase in demand for its services during 1978, **INTELSAT** is lowering its rates by 15 percent — the ninth annual rate reduction in a row . . . . **Parasound, Inc.**, of San Francisco has been named exclusive worldwide distributor (except Europe) for **Synton Electronics** of Holland, marking the introduction of the Synton line to U.S. users . . . . **Audio & Design Recording, Inc.**, is moving its U.S. headquarters to the Seattle area in preparation for setting up a manufacturing base there. Mailing address is P.O. Box 786, Bremerton, Wash. 98310; telephone is (206) 275-5009 . . . . **JVC** has appointed **Grandy, Inc.**, of Fairfield, N.J., its U.S. distributor.

Listec Television Equipment Corp. has opened a West Coast office at 4527 San Fernando Rd., Glendale, Calif. 91204, (213) 244-0838 . . . . Antenna manufacturer **Anixter-Mark** has moved its entire operation to a new and expanded facility in Des Plaines, Ill. New address is 2180 S. Wolf Rd., P.O. Box 1540, Des Plaines, Ill. 60018, (312) 298-9420.

Adda Corp. has opened a Pacific district sales office at 10100 Santa Monica Blvd., Suite 2500, Century City, Calif., (213) 557-2550 . . . . **Toshiba Broadcast** has appointed the following distributors for its line of cameras: Video Systems Network, Los Angeles; Lake Systems Corp., Newton, Mass.; Video Equipment Corp. of America, San Diego; and Klopf Audio/Video Co., Dayton, Ohio.

New VHS VCRs from JVC, Akai, Hitachi, Matsushita, Mistsubishi, and Sharp will incorporate the **Dolby** B-type system for noise reduction.

Jennifer Squire Ries, vice president of marketing of **Telecommunications Industries, Ltd. (Porta-Pattern)**, died July 18 in Los Angeles after recurrence of an old illness. She is survived by her husband Ed, president of the company.

Hiroyasu Sugimoto has been named executive vice president of **NEC America, Inc** . . . . Homer Hull is new director of marketing at **CEI** (Commercial Electronics, Inc.) of Mountain View, Calif . . . . C. Ridley Rhind has been elected VP of marketing for **Ampex Corp** . . . . James Keane now fills the newly established post of director of international marketing for **Chyron Corp** . . . . James Leu is new president and Philip Lohman is vice president of marketing at **UMC Electronics.**

International Video Corp. (IVC) has named Robert H. Goldmann president and CEO . . . . **McMartin Industries** announces the appointments of Robert Switzer as director of domestic sales and Thomas S. Butler as director of international sales . . . . **Jerrold Electronics**, subsidiary of General Instrument Corp., has appointed John P. Forde vice president sales and Kenneth L. Coleman vice president marketing . . . . Richard G. Rakovan takes over as senior vice president of **Outlet Co.'s** Radio Station Group (Broadcasting Division).

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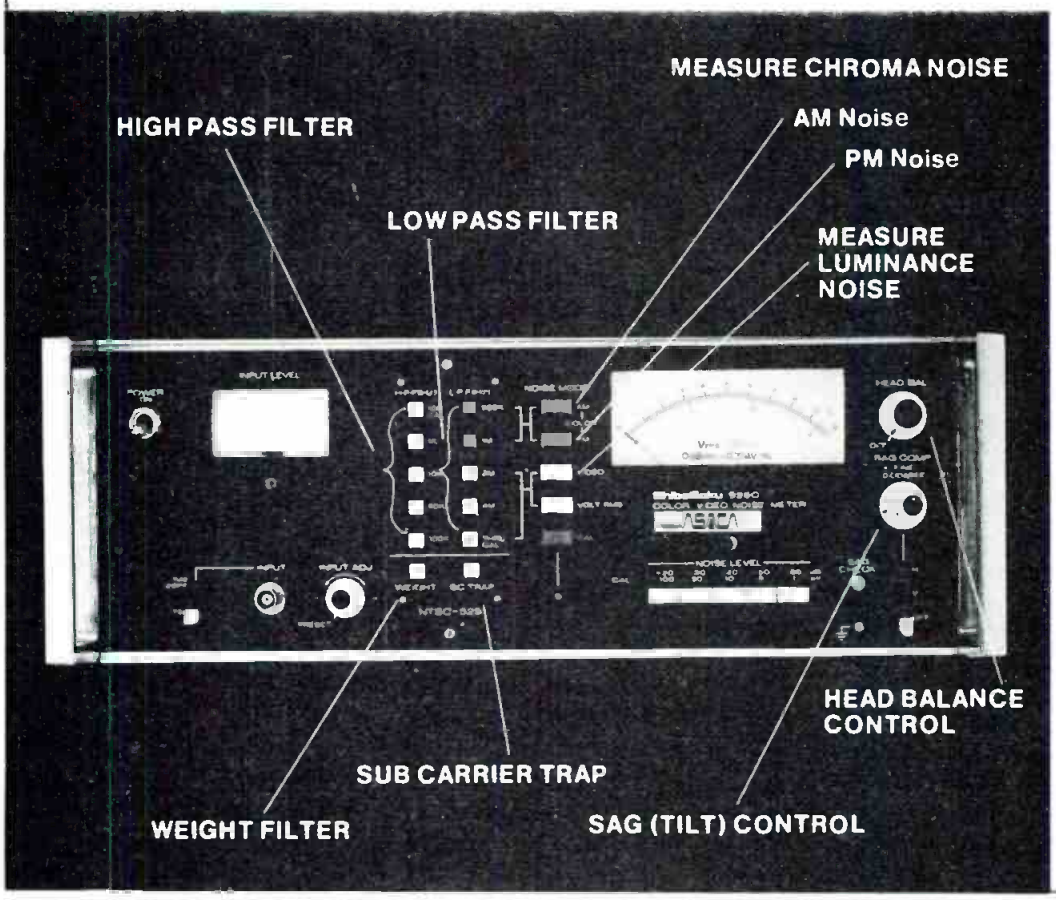

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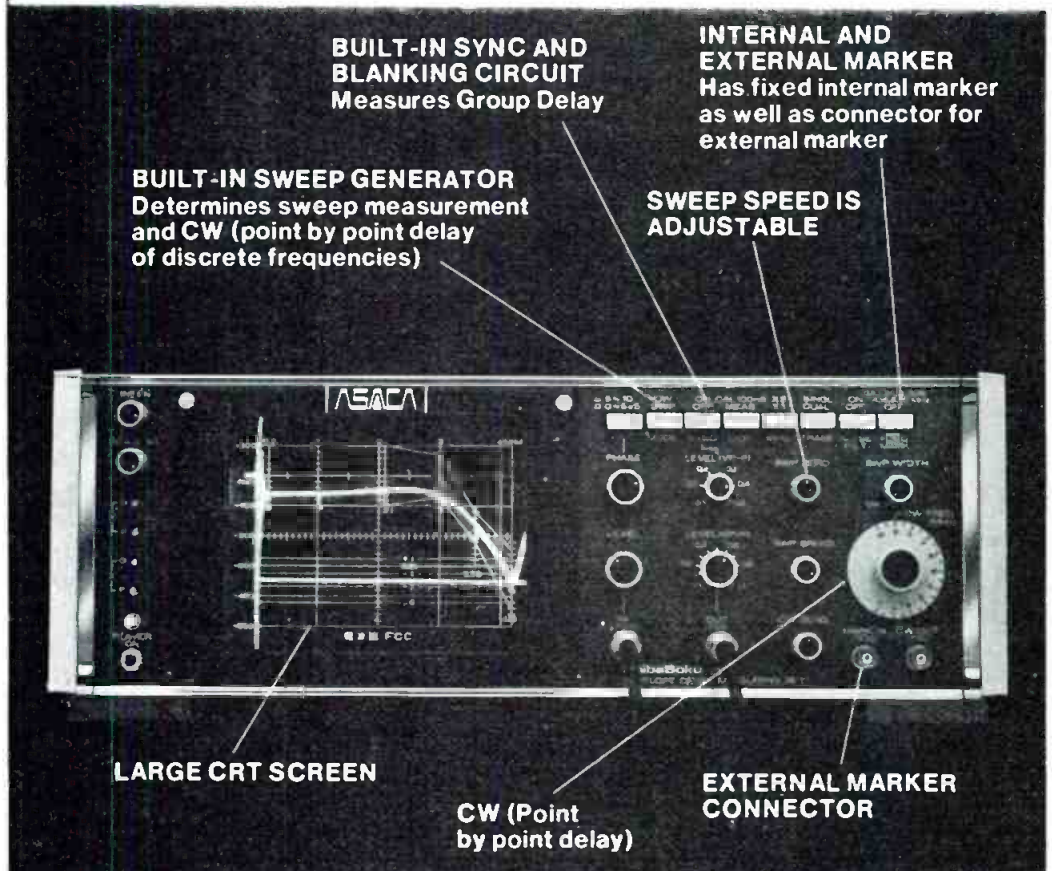

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When it comes to brains beat brawn

Rumor has it that a new cart system "solves" the stereo phase shift problem by relocating the heads. (Ready to retape your *entire* library?)

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But it strikes us that these "solutions" are going to cause more problems than they cure.

And that a better approach is to use your head, rather than just moving it around.

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cart phase shift, every time.

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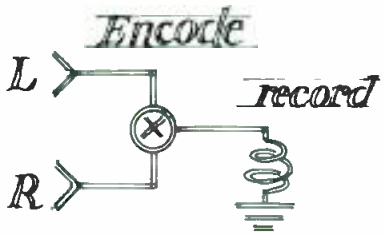

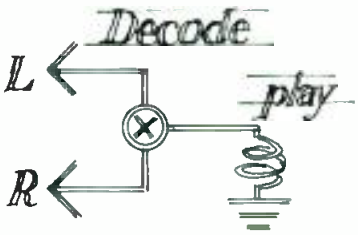

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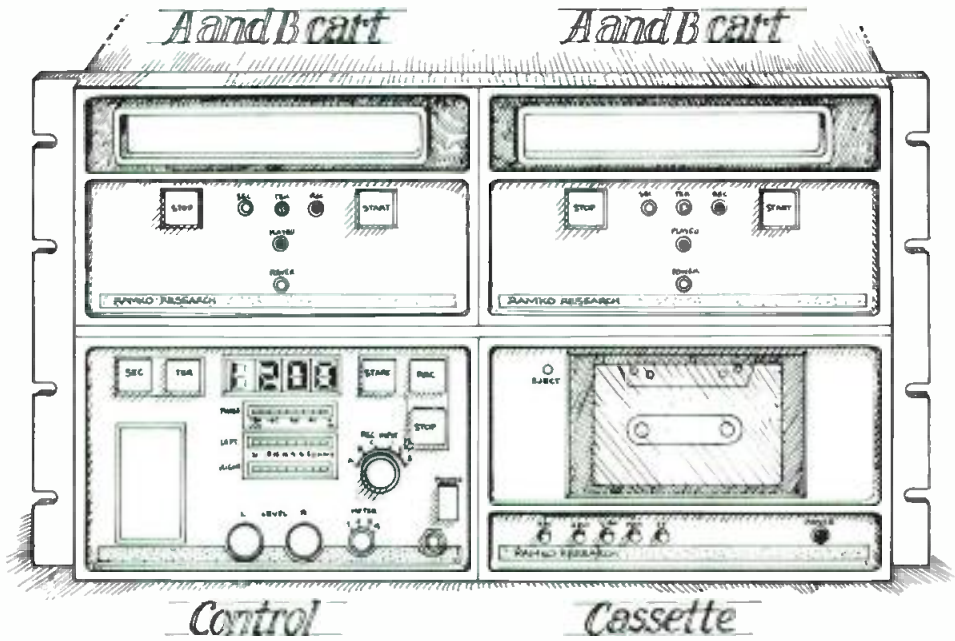
Meets broadcast standards and needs.

The Ramko PhaseMaster includes all three cue tones, with digital sensing for sharp, error-free detection. Has left, right and phase analysis meters monitoring both Record and Play. Provides pushbutton-controlled diagnostics. Has a built-in automatic digital timer. Includes a crystal-controlled brushless dc motor for higher speed accuracy and lower heat generation (speeds field-adjustable to 3¾, 7½ and 15 ips).



And there's more, because we've built in everything you've ever wanted to give you cleaner sound and easier operation with today's carts.

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Weather (continued): The Private Forecasters

LAST MONTH THIS SPACE was devoted to the sources of "straightforward" weather reporting, mainly the government (the NOAA is the basic source of weather information in this country, and radio stations have a number of ways to plug in on the NOAA forecasts). But a radio management may want a more elaborate or "personalized" kind of weather report, one that requires both professional skill in producing weather forecasts and a sense of on-the-air style. Few radio managements can afford to hire a person with these skills for permanent staff duty (for one station that has, see below).

To get more stylish weather forecasts, many radio stations, now go to private forecasters, who form a large and flourishing service industry. Some kinds of businesses have used private forecasters for many years. Radio has in the last couple of years increased its use of private forecasters strongly.

Another thing the private forecaster can do is pinpoint forecasts to a particular small area; this has obvious value for a station emphasizing information in its programming (see notes on WHO, below). For example Accu Weather of State College, Penn. has a staff of 35 meteorologists. Elliot Abrams, manager, told *BM/E* that 12 of the professional staff are in every morning at 3:00 a.m. to work out forecasts for many small areas covered by radio subscribers. He reports that about 40 stations are using Accu Weather. The advisories to radio stations are often written in a more vivid style than NOAA allows itself. Before giving the figures for the day's weather, the report might say it was going to be "sapphire and breezy" or "golden."

Weather Forecasting, Inc., of Cleveland, also emphasizes forecasts tailored exactly to the client's city, whether large or small. Gilbert Gomez, president, told *BM/E* that the staff forecaster can go on the client station live, being introduced by the DJ there just as though he were on the station staff.

Another firm, Compu Weather of Flushing, N.Y., has two kinds of service: a hard-copy script to be read by a radio staff person, and a live forecast sent in by telephone for airing. Like the others described, Compu Weather has a staff of professional meteorologists, with 10 to 12 on tap at the present time.

Metro Weather of Rosedale, N.J., is another weather firm that can provide live reports or scripts for use by station personnel, whichever is wanted. Metro is another company that localizes forecasts to the station's own vicinity. This allows a highly personalized style, too, popular with the firm's clients.

An unusual arrangement is that of the Mt. Washington Observatory, Inc., at the top of Mt. Washington in New Hampshire. This private forecaster, with a special position for making observations, supplies the National Weather Service with information. In addition, certain radio stations in the area get morning forecasts direct from Mt. Washington.

That is a very small fraction of the private weather firms at work in this country. But the pattern of operation is much the same with the majority of the firms.

In the rest of this report we describe how news is handled at several different kinds of radio stations. Robert Richer, manager of WNCN, classical outlet in New York City, told *BM/E* that the AP wire brings in all the weather the station needs. KHIT in Walla Walla, Wash., has a direct telco line to NOAA, and supplements this with the AP weather wire.

Two stations with more elaborate weather coverage are WHO in Des Moines and WOR in New York. Both put most of their program time into information.

WHO, as described in the December, 1978 issue, is a 50 kW clear covering a large section of the midwest with a variety of information programs: agricultural, financial, personal care, and others. Listener call-in shows are important parts of the bill of fare.

Robert Engelhardt, chief engineer, told *BM/E* about the weather programs. Most come from Accu Weather with a trained meteorologist going on the air directly by telco line. Engelhardt says this gives the weather report an authority and credibility that WHO likes.

The station also gets weather charts directly from the weather satellite through an Alden receiver. And all this is supplemented by both the NOAA teletype and the radio service, covered in last month's report.

Yet another source of weather infor-

mation for WHO is the pilot in the helicopter sent up each morning for traffic reports. He can give an eyeball report if he sees, for example, a thunderstorm in the area.

All this reflects WHO's finding that their audience wants hard, accurate, full weather reporting. The large area served by the station and the variety of its listeners make it necessary to air a variety of weather reports, adapted to each area and audience.

WOR, in New York, covered in the June, 1979 issue, is a nearly all-talk operation, with a large following in the city that has made it a success for many years. The management has solved its problem of needing both authority and a certain style in weather reports by hiring its own meteorologist, Paul Corbel. His reports have become important to the station's image and on-air character. He fashions data from NOAA and other sources into broadcasts that are convincing, entertaining, and informative. **BM/E.**

BM/E's Program Marketplace

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RADIO PROGRAMS with religious content have become a solid and sizeable minority operation in many American cities. Something between 400 and 500 stations describe themselves as predominantly religious or sacred in program emphasis. There are at least a half-dozen chains, and some of them are supplying religiously oriented stations with syndicated programs.

One of them is the Bible Broadcasting Network, with headquarters in Norfolk, Va. BBN has owned for some time three stations, WYFI-FM in Norfolk, WHPE-FM in High Point, N.C., and WAVO-AM in Decatur, Ga. When this was written the chain had just bought WIVE-FM in Richmond, Va. The high density of Christian-slanted stations and nets in the Southeast would seem to have close connection with the special strength of that religion in the area, a fact that even a casual visitor soon notices.

BBN not only programs the four stations but also sends roughly half of the programs out on tape to other religious stations that may want any of them. Recording is at 3¾ ips on 10-inch reels, for three hours on one reel, duplicated on Revox machines. The programs can be used by either commercial or noncommercial stations.

In the case of many noncommercial, especially religious-slanted, stations, BBN often joins in to help with the station's fund-raising campaign, with some agreed division of the money based on the programming and campaign aid supplied by BBN. This has turned out to be an excellent approach both for the station and for BBN.

Those programs include several worship services during the day; Bible readings and lessons; regular news and weather programs; and inspirational material, emphasizing the family, Americanism, and other social bulwarks.

Music of a straight Christian nature is very important in the programming. Dr. Harold Richards, network production director, explained to *BM/E* that the chain has collected a large number of recordings of religious music going back to the 1920s and 1930s and coming on down to the present. This is *not* the religious-slanted rock and pop music which some religious stations use, at least in moderate amounts. It is basically hymnology and closely related popular material, recorded in large quantity over the past 40 years.

BBN has built its own collection and buys or borrows recordings from listeners and from other religious stations. The music has an intensely devoted audience.

BBN also naturally has its on-air "stars" with large personal followings. Most of them are inspirational speakers and Bible expositors. An interesting variation is Bill Pearce, a musician (trombonist) with a late-night program called "Nightsounds." Pearce is the religious-oriented parallel to the DJ who has worked out an intimate relation with late-night workers, truck drivers, and others who welcome a friendly voice to get them through the solitary hours. Pearce not only plays the uplifting kind of music his listeners like, but also talks with his audience "one on one" to provide some comfort for those particularly downcast for one reason or another. He does the whole job combo, working the controls himself and giving the program whatever shape the responses of his audience suggest.

Any commercial or noncommercial station that would like a single religious program or a lot of them should get in touch with Dr. Richards at the address above. He has told *BM/E* that samples of the recorded programs can be had for the asking. **BM/E**

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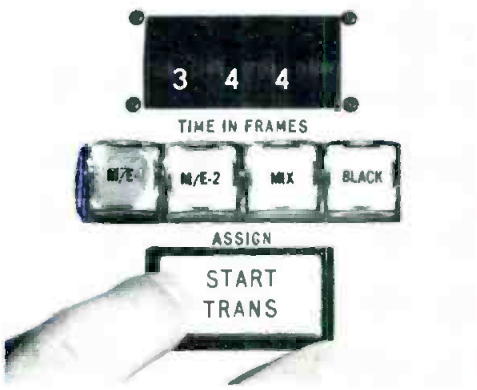

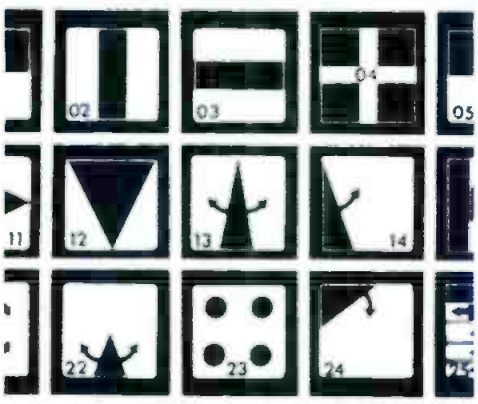

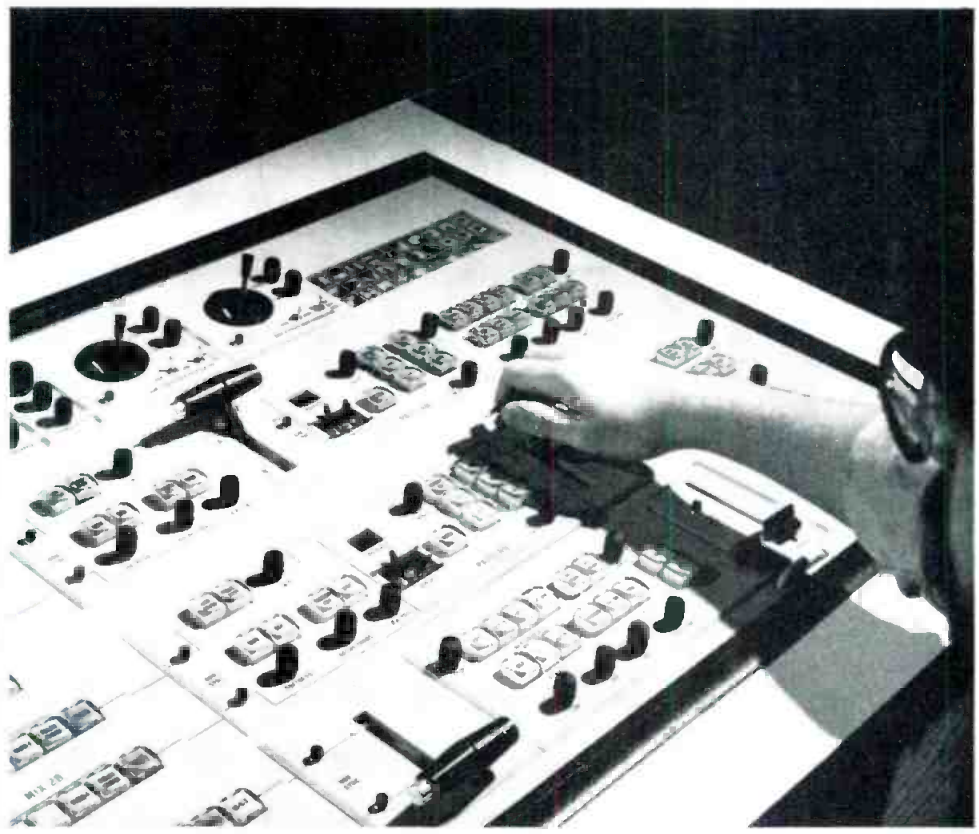

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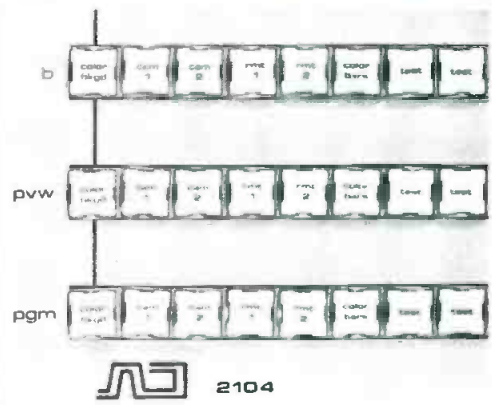

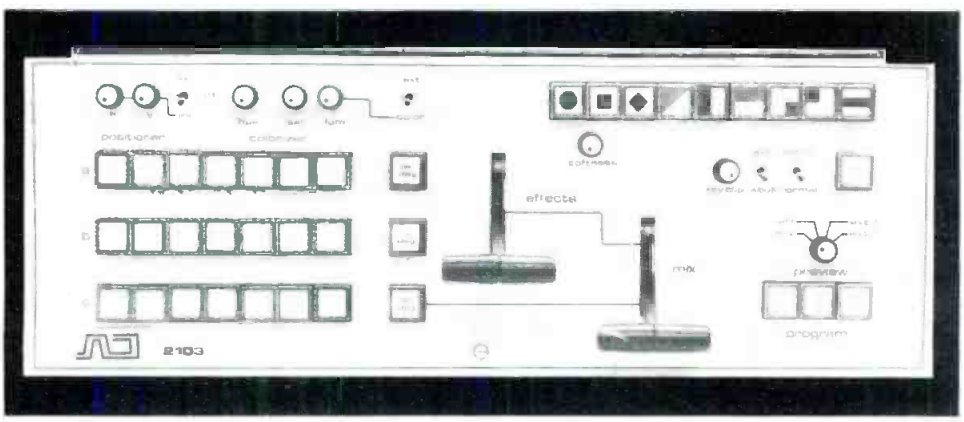

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News At Field: Short And Fleet

WHILE NEWS and the technology of news has spawned great growth at many stations, some, mostly UHF independents, have either offered no news or simple sign-on and sign-off voice over headlines. The reason for the absence of news on these stations is simple: the absence of money. But now, Field Communications, with its five UHF independent stations, has begun a rapprochement in the news area and developed a format and news style that may offer other UHF independents a profitable and responsible way of getting into the news game.

It wasn't all that long ago that the news departments of many stations were viewed as necessary expenditures in the interest of public service and responsible broadcasting. But in the 1960s, the news department became more important. New technology and a new consciousness on the parts of advertisers and audience began to push news programs to the fore.

The introduction of electronic news gathering equipment quickly brought a new excitement to the newsroom and an enhanced image of television news to the viewer. But during this heyday of news, some organizations were taking it on the chin. Kaiser Broadcasting, which was to become the nucleus of Field Communications' broacasting enterprise, fit the formula for a flop in the newsroom.

The Kaiser stations were UHF independents in major markets, which

Byron MacGregor (right) anchors the WKBD, TV-50 Newscene, first of the Field Communications news programs to air

Anchor for Chicago's WFLD-TV Newscene is Kathy McFarland (left), who also works as morning drive-time anchor reporter for WLS-AM

Edwina Moore is the anchor for KBHK's Channel 44 News-Update. Each of the three programs shares the same basic visual format

meant that they were shut out from national news programs while competing on the local level with strong network affiliates. According to Herb Victor, executive vice president of Field, the Kaiser stations, which had embarked on an ambitious news program in their local markets despite the odds, were losing nearly $2 million annually on this operation. When Field took over the Kaiser stations, they abandoned news temporarily as part of their long-term strategy to turn the ledgers from red to black.

Weather reports and financial news are handled with character generators over slides

How news fits the "total" strategy

It was never the intention of the Field organization to do away with news entirely. Instead, it was their intention to reorganize each station on the basis of a broad counter-programming philosophy and eventually use news as part of this strategy. The result of this planning is now evident at Fields' Detroit, Chicago, and San Francisco stations.

Known as *Channel 50 Newscene* in Detroit, *Channel 32 Newscene* in Chicago, and *Channel 44 News-Update* in San Francisco, the formula is essentially the same: a five-minute newscast anchored by an established news personality and aired just prior to the major evening news programs of competing stations. The programs air in Detroit and Chicago at 9:55 p.m. and in San Francisco at 10:55 p.m. The timing is essentially defensive in that viewers from the lead-in program will receive a dose of news sufficient to dissuade them from tuning in competing news and tuning out Field's late-night programming.

In addition to the five-miute newscasts, there are also one or two one-minute news updates broadcast during prime time as a means of keeping viewers informed and assured that the world outside has not changed radically during the *Mev Griffin Show*.

According to Victor, there is no contention on the part of the Field organization that these brief news programs are equal in depth or detail to the full-fledged newscasts offered by competing network affiliates. "If a DC-10 goes down in Chicago," said Victor, "we'd expect the viewer to turn to one of the affiliates for the full story." On the other hand, Victor contends that there are many so-called "slow news days" when nothing happens of such magnitude that a five-minute newscast is unable to satisfy most viewers' needs.

In addition to answering the needs of the audience for news, the Field newscasts also answer the needs of certain clients. There is one one-minute commercial availability in the five-minute newscast and a 10-second availability in the one-minute version. These news availabilities have attracted such upscale clients as American Express, Ford Motor, Wells Fargo, Mazda Motors, the Michigan National Bank, and others.

Anatomy of a newscast

At each of the three Field stations currently offering the news program there are several common threads. Each of the shows is produced by the local

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station's own news director and news anchor. Much of the news is derived from wire service material, telephone contacts, and other sources. There are no news writers *per se*, nor are there reporters going out to gather the news first-hand. There are no news teams, mobile units, microwave links or any of the other paraphernalia associated with the modern news program.

Nevertheless, there is a distinct look and style to the newscast. The look is of the network-type news updates: an anchor supported by chroma-keyed slide graphics. The style of the news is largely derived from the individual anchors, though there are common elements. There is national and local news (more local than national), sports, weather, and a technique that Victor calls "franchise."

According to Victor, the idea of the local franchise is to develop a local angle on stories that relate specifically to the character of the community served. For example, in Detroit, home of the "Big Three" auto manufacturers, automotive industry news gets consistent attention and the impact of other developments on the automotive industry is explained.

Occasional elements in these news programs include videotaped reports from Washington, D.C., produced by the Potomac News Service, which contracts with the Field stations to develop stories on federal activities with local impact. Such stories include interviews with elected officials from the regions served by Field stations and stories about other government officials and agencies. The local news director is in contact with Potomac consistently to suggest stories. Occasionally, Potomac develops stories on its own and then offers them to the local station. When such stories extend beyond the limited time available on the individual newscasts, they are often included in one of the numerous public affairs programs that are produced by Field stations.

Another element in the Field news and public affairs program is the "salute." Local personages from either public or private life are selected by each station for special recognition. Persons selected may be a city mayor who successfully brought a convention to town or a school crossing guard who has served with distinction. Throughout all of the elements in these newscasts, the idea of *local* news is continually reinforced.

Perhaps the most important aspect of each of the shows has been the selection of the news anchor. In each case, the stations have sought out newscasters with impeccable credentials, on-air experience, and established reputations.

At WKBD in Detroit, the news anchor is Byron MacGregor, who in addition to his duties at WKBD-TV continues to be the morning/afternoon news anchorman for Detroit's all-news radio station, WWJ. At WFLD-TV in Chicago, the anchor is Kathy McFarland, who is also the morning-drive anchor and reporter for ABC-owned WLS-AM. In San Francisco at KBHK-TV, the anchor is Edwina Moore, who served for four years as a reporter and co-anchor of the 5:00 p.m. news at WBBM-TV, Chicago.

In addition to the news anchors, the news directors are Frank Philpot at KBHK, Amyre Makupson at WKBD, and Naurice Roberts at WFLD. Further support is provided to the newscasts by a graphics art department at each of the stations which makes up the chroma-key slides. The technical staffs are supplied by the stations' engineering departments and are not assigned exclusively to news.

The style of the news is more radio than television, but with brevity and the graphics the aura of television comes through. In the representative programs viewed by *BM/E* it was clear that the news anchors are given quite a bit of latitude in developing their own approach. For instance, in the Detroit newscast viewed, Byron MacGregor managed to deliver two national news stories (one of them including a General Motors angle plus sidebar), nine local stories, an announcement of the winning lottery number, two sports stories, and a weather report. In San Francisco, Edwina Moore provided somewhat more detail in her reports but still managed to deliver 12 stories, including the Dow Jones report and weather.

While these newscasts deliver little more than a headline service to the viewer, Victor contends that for many viewers they satisfy the appetite and all viewers are kept informed of important news. If they desire details, they can turn to another station which offers a full-fledged report.

The *Newscene/News-Update* approach is practiced successfully at each of the three stations and will soon be introduced at the Field stations in Philadelphia and Boston. Victor does not rule out the expansion of the news operation. He points out that these short news programs are just the beginning and have already been expanded in some ways. Field will, however, proceed cautiously. While the company can envision, pehaps, a 10-minute *Newscene* at this time, there are no plans to undertake a complete news operation for some time to come. Nevertheless, Victor feels that the addition of *Newscene* and *News-Update* have gone a long way toward getting out the complete package of entertainment, news, and information that Field has set its sights on. **BM/E**

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For tomorrow's Telecommunications Technology

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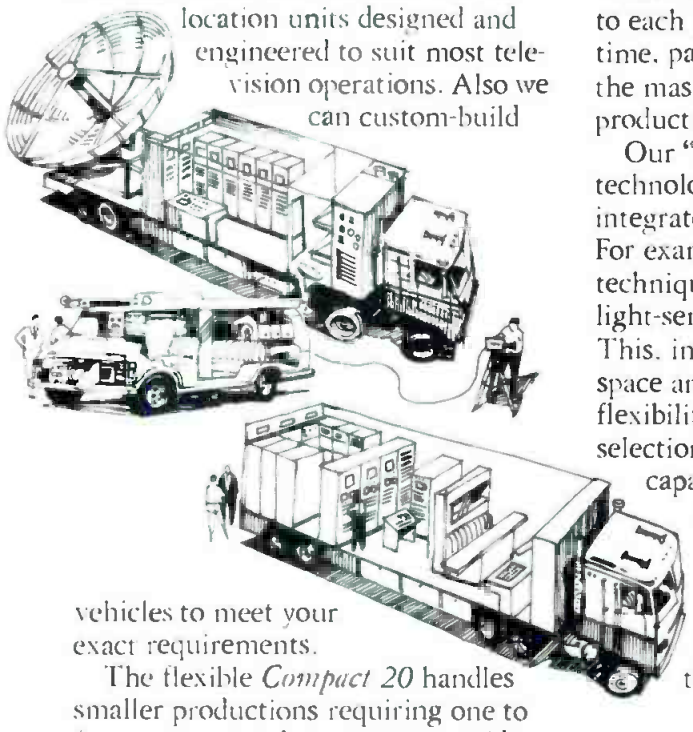

The flexible *Compact 20* handles smaller productions requiring one to four cameras and can answer a wide range of production needs. For entertainment specials, or sports events, there's the *Compact 27* offering up to six-camera capability. Our 40-foot unit, comes as an eight-camera remote system. And, all our mobile units feature one-inch C format videotape machines.

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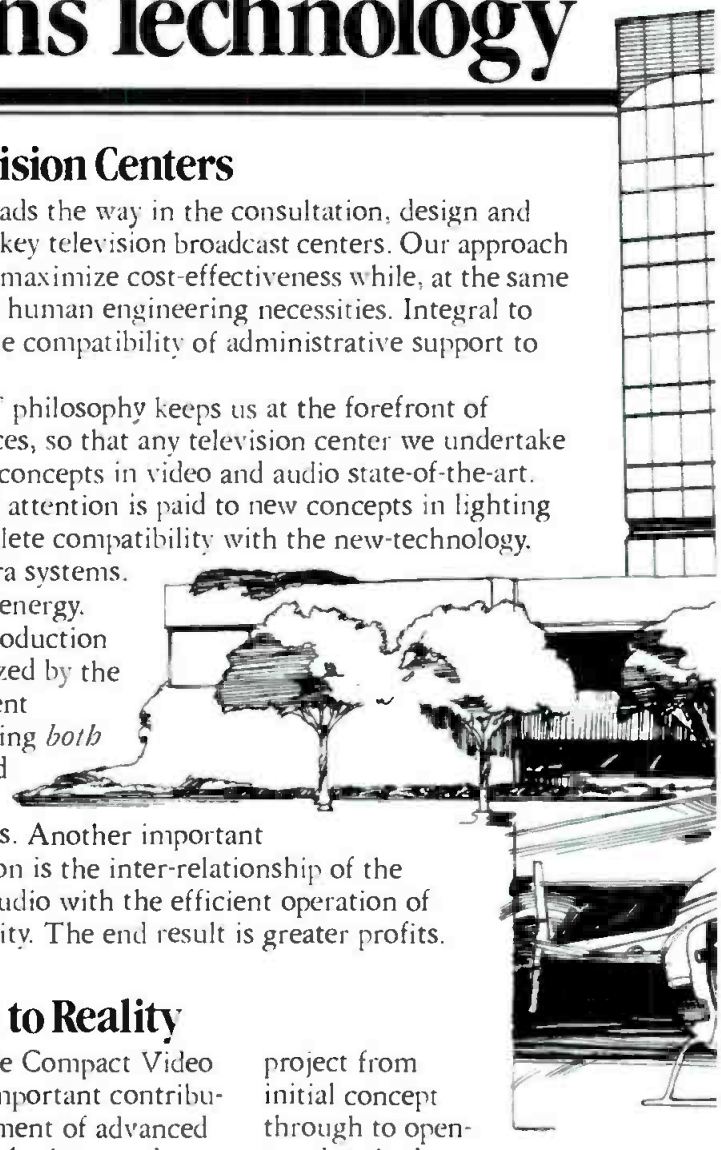

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For nearly a decade Compact Video Systems has made important contributions to the development of advanced telecommunications facilities and services.

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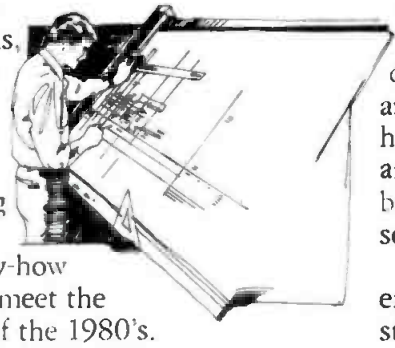

Working closely with your company's president, financial officer, chief engineer and production head, Compact gets involved in your facilities project from initial concept through to opening day. And more than expert engineering goes into it. Working from your business plan, we develop a comprehensive blueprint that incorporates all details to insure optimum electronic and human performance. We believe human considerations, so vital to any creative enterprise, must not be subordinated to engineering solutions.

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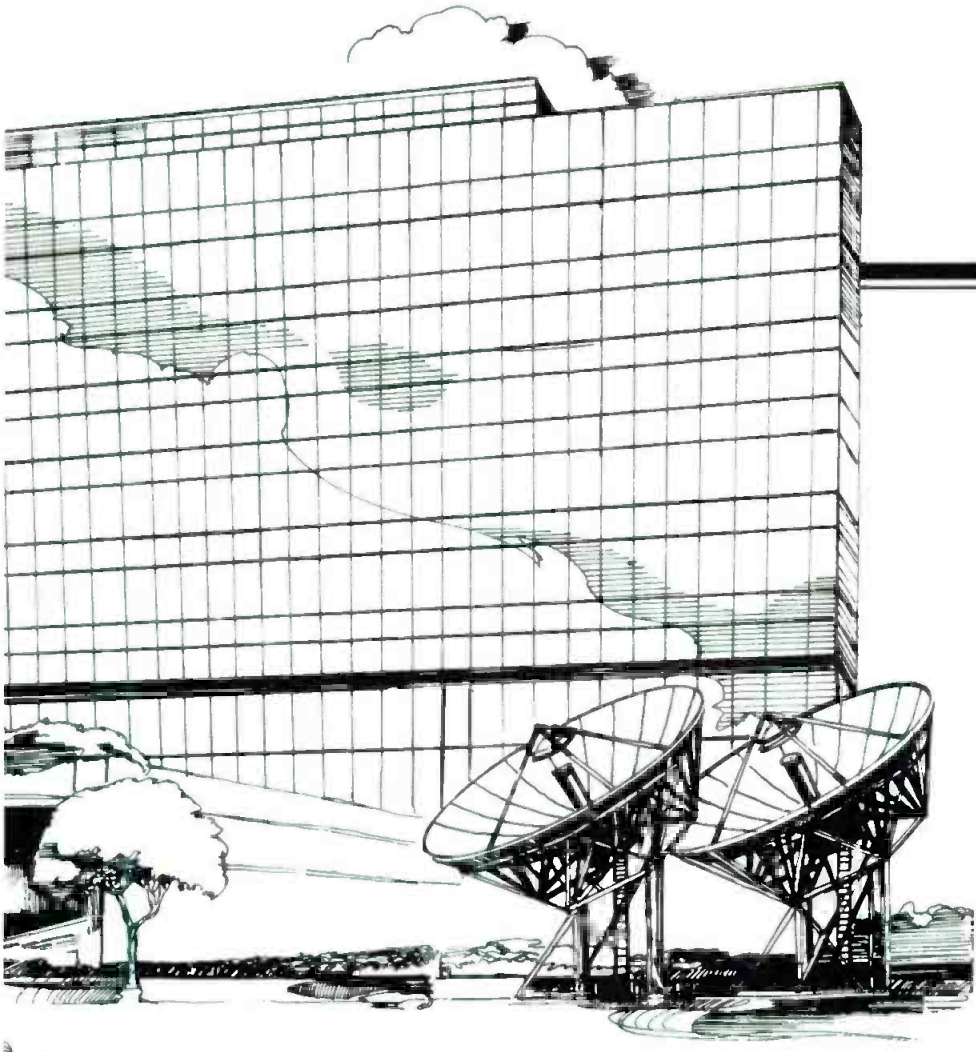
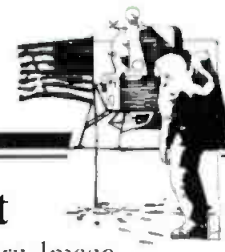
Circle 121 on Reader Service Card





State of the Art

Compact's subsidiary, Image Transform, pioneered state-of-the-art noise reduction and image enhancement and received round-the-world plaudits when it "cleaned up" television pictures from the moon for NASA. And, Image Transform will be playing an ever-increasing role in "cleaning up" satellite transmissions from here on earth and above.

State-of-the-art is built into every Compact facility. From the latest in high-efficiency highly flexible mobile location systems to custom-built production studios and post-production systems.

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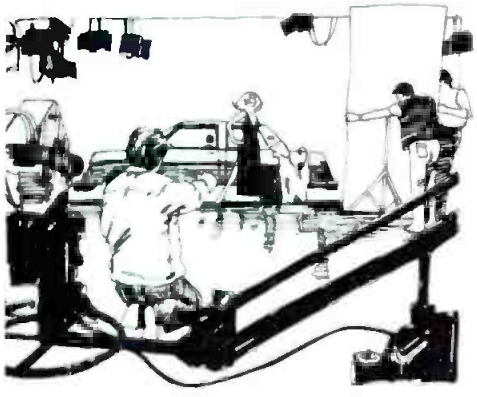
To find out how Compact quality, reliability and comprehensive planning can help your television operation get the most out of tomorrow, contact us today.

We build Intercommunications Systems



We're a telecommunications company that's heavily into intercommunications, too. Our subsidiary, RTS, Systems Inc., builds high performance intercommunications systems that are literally the talk of the industry. RTS systems are widely used in television studios and on location, while industrial users include security and operation personnel, construction crews, large scale research teams and manufacturing teams.

Compact Video Systems INC

Sales Division

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Chicago (312) 337-5333
625 No. Michigan Avenue, Suite 500
Chicago, IL 60611

New York (212) 986-2430
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Circle 122 on Reader Service Card

AT LONG LAST, GOOD SOUND IS NEARLY HERE FOR TELEVISION

Pushed along by the new network audio systems, by digital audio, by sharply rising listener standards, and by the receiver industry's search for new market impetus, an excellent grade of sound, including full stereo, could start to reach TV viewers in the next two to three years.

TV WATCHERS HAVE BEEN IN A PRISON of thin, measly sound throughout television's thirty-odd years. For a long time the viewer, spellbound by the picture and with no experience of sound freedom, accepted imprisonment as the natural order of things.

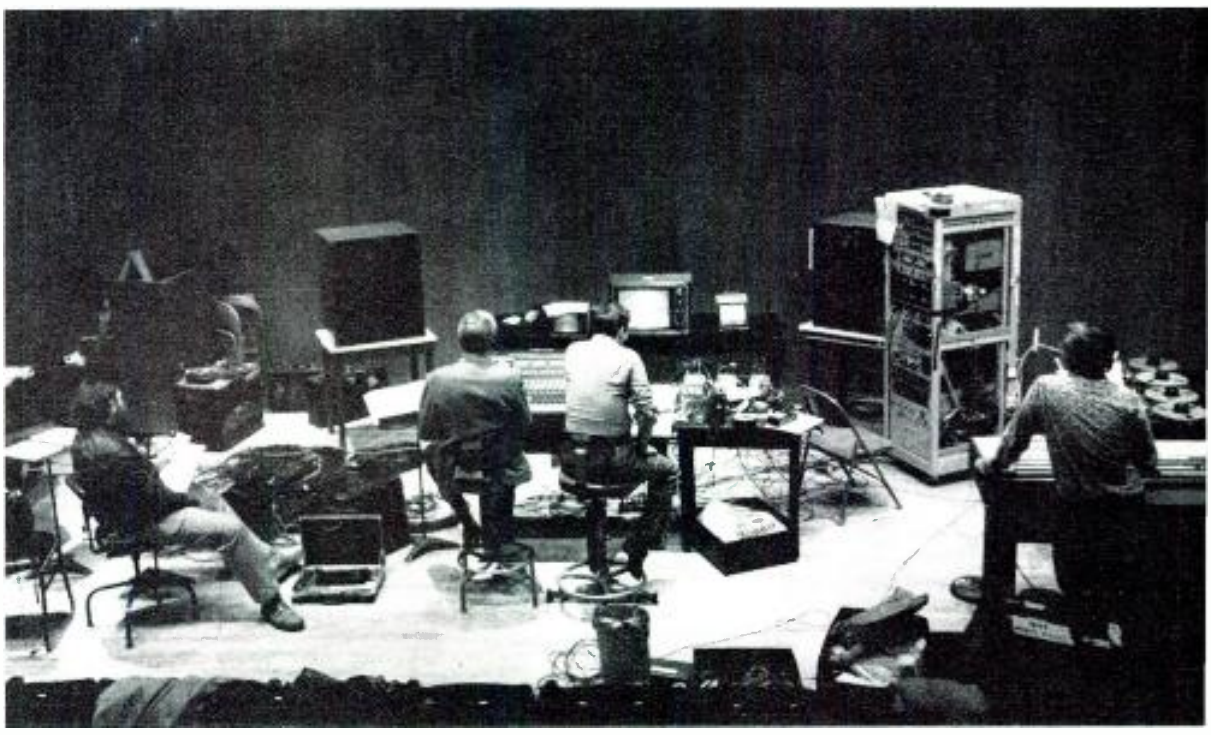
But in the last few years the prison walls have begun to shake and the prisoners to stir. Two years ago, in "Broadcasting's Audio for the 80s" (October, 1977), *BM/E* identified the forces that were building up to lift the quality of television sound. In the two years since then, those forces have carried the TV sound liberation movement ahead to the verge of victory. We are sure now of the grand finale: television sound will be on the same high level of realism and excitement as the picture, a quality that buyers of television receivers deserve and increasingly expect. The sound will have the guts and power of real bass, the sharpness of highs open all the way to the top, the clarity of minimum distortion. This will make television far more satisfying than it is now, with effectiveness that TV watchers have never known.

Many TV managements will want to start thinking about the effects of the new sound on their own operations. In this review of today's TV sound situation, *BM/E* will first give a quick summary of the main forces now at work, followed by detailed consideration of each of those forces and their import for the operation of television stations.

First: The new sound is already getting to many local TV stations country-wide via the DATE digital audio system used by PBS in its satellite net and via the AT&T diplex system used by the commercial television nets.

Second: With snatches and samples of sound freedom coming through to the viewer via the new network systems, viewer expectations are on the rise — the old passivity is fading away. The high fidelity experience, about to gain tremendous force with digital audio, is also helping to banish TV sound passivity.

Third: The TV receiver industry's need for fresh mar-



TV's new attention to sound reaches a kind of summit in audio control room during a Live From Lincoln Center *telecast. Setup is in a nearby small auditorium for monitoring in live acoustics. All mics feed for mixing to console in center, where John Pfeifer, left, follows score and Gino Lombardo, right, has program cues. Ray Matthews, far right, records pix and sound on U-Matics and sound on Ampex 440Gs. Picture is also recorded on two-inch videotape in truck outside. Tech consultant Mark Schubin follows at extreme left. (Credit: Susanne Falkner Stevens/Lincoln Center)*

ket force is turning industry attention to improved sound, and several of the largest manufacturers have this summer brought out what are the first mass-markedted "hi-fi" TV receivers.

Fourth: The final blockage keeping TV's own stereo sound (not a loan from FM simulcasting) out of the home is the local transmitter-receiver combination. This is at last under intensive study looking toward the best method to clear the way through.

Fifth: The technical and audience success of stereo sound in Japanese television, with its enhancement of many kinds of programs, is a strong stimulus for American industry and audience.

Half-way to freedom, via the new nets

Getting good sound from program originators to the local TV station was for a long time harder than putting a man on the moon, basically because many in the industry thought it wasn't necessary. But a number of people thought otherwise, and advancing technology finally gave them the ready means to start the first big campaign of the sound liberation movement. The Public Broadcasting System and the headquarters of the three major TV nets were the movers and shakers.

A decade or so ago, PBS started planning its satellite net for public television stations, and early opted for a top-grade, four-channel digital audio system called DATE, described in earlier issues of this magazine and throughout the trade press. A summary of the technical characteristics of DATE accompanies this article.

The PBS satellite net got underway early this year, with about 165 public TV stations hooked on, each by its own earth terminal. When this article was written, about 70 of those stations had the decoders needed to turn the DATE digital audio signals back to analog form. But even those PBS stations not yet using DATE were getting the new-minted, top-grade mono audio signal described in the box, thanks to the wide-band, low-distortion capabilities of satellite transmittal.

The good sound coming from the PBS satellites to the local stations is reaching many viewers in mint condition via the simulcasts put on by PBS stations from time to time. For example, John Rolle, chief engineer of WUSF in Tampa, Fla., told *BM/E* the signal he is getting is "fantastically improved" over the old network signal. He produces simulcasts when stereo programs come from PBS by recording the sound on a high-grade audio machine (Ampex ATR-100) and going on the air with VTR and audio machine synced together, the audio going out over the associated stereo FM station. Ernestine Miller, program director, said that the response from viewers has been strongly enthusiastic. "Many are retired musicians and they know what stereo is all about; they love it," she told *BM/E*.

In Chicago, WTTW's chief engineer Larry Ocker also calls the audio from the satellite "fantastic," both in mono and stereo. He has been simulcasting with the help of Chicago FM stations WXRT and WFMT. Again, audience reaction is extremely positive.

Chief engineer Ruggiero of WETA in Washington adds his great praise for the DATE sound quality. The station has been one of the first originators of PBS stereo programs sent out by satellite and DATE. WETA's affiliated FM station is used in the simulcasting. Ruggiero, too, says that the audience knows the "plus" with stereo and recognizes it quickly. Clyde Miller, chief engineer of KERA, Dallas, is another who says his simulcasts have been highly successful. The KERA audience includes many electronics professionals, and they too know stereo instantly and love it.

BM/E talked with others tuned in on DATE. Nearly all reported sizable audience recognition of an improvement in sound quality, with special response to stereo.

Ma Bell's assist

The AT&T diplex system (also described technically in the box) came into the campaign largely because of the unhappiness at network headquarters with what happened to TV sound on the way to local transmitters. AT&T had been experimenting with the technology for several years. Prodded by the networks, it put the system into use early this year. By spring all three networks were using it for most of their transmissions to O&Os and affiliates.

The changeover was rapid. Ron Gnidziejko, transmission chief at NBC, pointed out that all the O&Os and more than a hundred of the affiliates cut over to the diplex system on the same day. And there was a distinct reaction of approval from the audience — not a flood of audience communications, but enough did call or write with praise to make it clear that even on standard TV receivers, with their audio inadequacies, a better audio signal on the air means better sound in the living room.

The diplex system has full stereo capability, not being used by the commercial nets at this time. There have been a number of stereo simulcast programs from network headquarters in recent years. However, general use of stereo by the TV nets will wait for the clearing of a path for stereo through the local TV transmitter and the receiver in the living room. The diplex stereo capability does add its pressure to the push for stereo in TV, however.

First bits of freedom, then the uprising

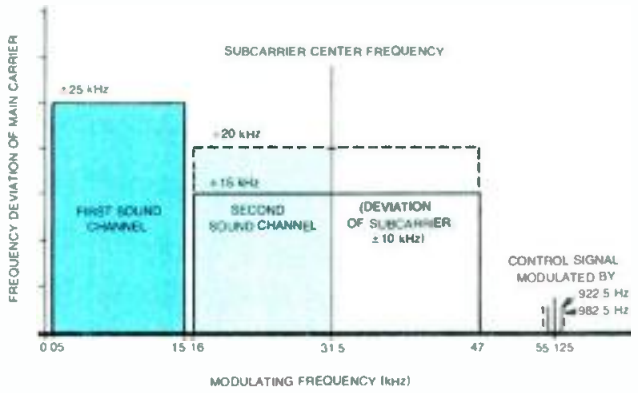
Impossible to quantify but undeniably powerful is the pressure from the good-sound experience now reaching more and more TV watchers. Hearing much better reproduction of sound than the kind one is used to has proven over and over to have a radical effect on a person's rating of sound quality. The amazing spread of the hi-fi addiction is based on this. A fever for hi-fi takes hold when the victim is exposed to sharply better reproduction and realizes that what he or she heard before is faulty.

Even though hi-fi devotees are a minority among TV watchers, they make up a sizeable and growing minority, a strong "liberty brigade" pushing the liberation movement along from the inside. And they are being joined as well by TV watchers with no special indoctrination in hi-fi.

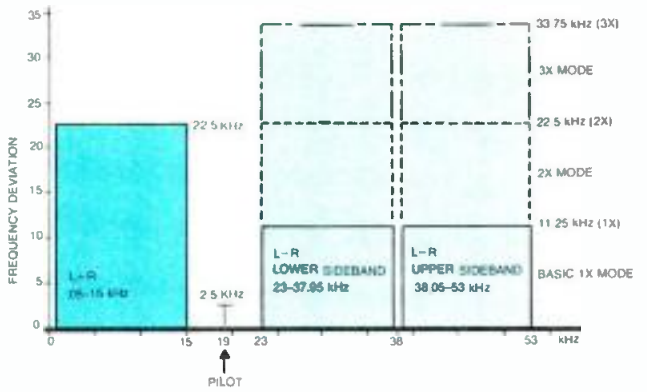
To shift the metaphor, we can think of average TV viewers as somewhat like a subjugated people who are passive and hopeless until they get some scraps of freedom. Then comes the revolt. In the TV case, though, freedom is coming from both inside and outside — major elements of the industry are also pushing toward better sound. The industry's attack will be strengthened and expedited by clear signs of uprising on the inside.

Digital audio, bomb in the loudspeaker

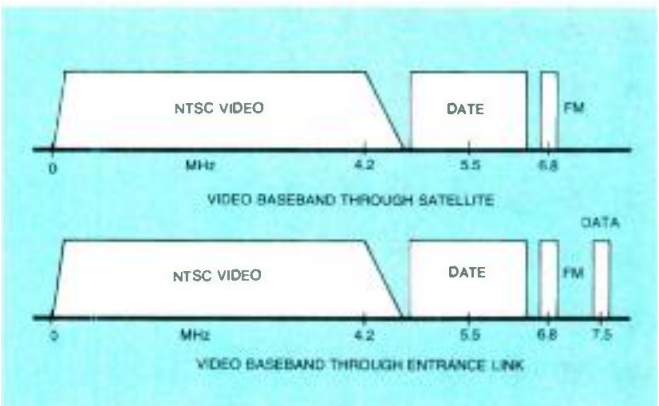
This standards-raising process will get large force from digital audio as that spreads to the public. Another piece in this issue brings the digital audio story up to date, and an exciting story it is. We know already that a good digitally



Spectrum of system used for stereo sound in Japanese television has a second sound channel on subcarrier centered at 31.5 MHz; lower sideband carries one signal, upper sideband a second. Control signals set receiver for stereo



Experimental TV stereo sound system of Telesonics, Inc., used for year at WTTW in Chicago, has L+R from 0 to 15 kHz, L−R to improve signal-to-noise ratio



Baseband spectrum of signal transmitted in the PBS satellite net shows the DATE digital audio system on subcarrier at 5.5 MHz and high-quality analog mono audio at 6.8 MHz. Data channel at 7.3 MHz is for communication to PBS members

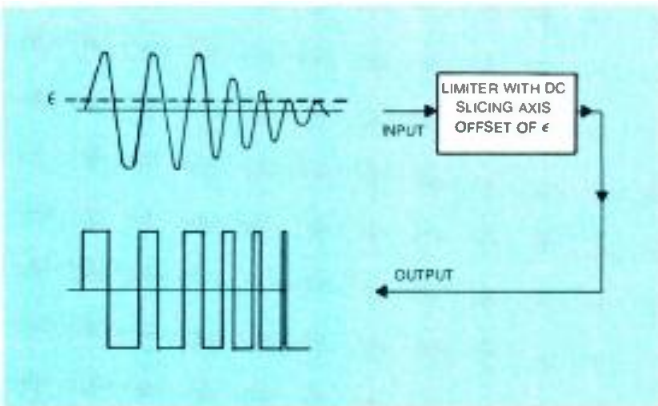


Diagram illustrates AM-to-PM conversion which reduces audio quality in television signal when receiver limiter has asymmetric slicing. Phase problems in transmitter can also degrade noise margin, are one of many aspects needing control

mastered recording, even though the sound is about half analog when it comes out of the home machine, is an extremely powerful sound-quality educator. People hear only one such record and know that what we have now is inferior. Poor TV sound will certainly not escape the damaging comparison as digital audio reaches the public widely.

The people say yes to stereo

Many of the PBS stations now simulcasting from time to time have found a positive response from viewers to TV stereo. The first systematic study of attitudes on the subject confirms this finding. General Telephone and Electronics, parent of Sylvania, hired Gene Reilly, Inc., an opinion research firm, to find out how the average TV viewer reacts to stereo.

About 650 people in three cities made up a sample population that cut across age and economic groups. The demographics of the group were carefully recorded for matching against their responses.

Before hearing the test programs prepared by Sylvania, seven out of 10 of the subjects gave the *idea* of stereo sound in television a very high rating. The influence of the hi-fi "liberty brigade" may be even stronger than we thought; in any case we can say that the American TV watcher is heavily presold on stereo.

After hearing the experimental stereo programs, 85 percent of the subjects gave stereo sound strong approval as compared with a mono hi-fi sound and a regular TV sound. They liked the stereo for "truer and more lifelike sound," for greater "clarity," for its enhancement of the enjoyment of music. A majority said they would pay a reasonable bonus to get a receiver with regular stereo sound.

GT&E summarized the results of the very detailed study, only a small fraction of which are noted here, as follows: "Although there is no reference point with which to compare the high ratings accorded stereo sound for television, by any standard it is substantial. In our experience few new product ideas, especially of this magnitude, are so well received." A Sylvania spokesman told *BM/E* his firm looks on stereo sound in the early 80s as potentially comparable to color in the 60s in its power to lift the receiver market.

Through the last barrier with hi-fi mono

Getting regular stereo to the TV watcher, though, won't be possible until the industry and the FCC agree on a method of getting two sound channels through the local TV transmitter and the home receiver. We describe in the next section the moves now underway toward such an agreement; getting there will take a little while.

Meanwhile, the TV receiver industry is not waiting for stereo in its effort to build fresh market force with im-

proved sound. In August several of the large set makers brought out "hi-fi" television receivers. Sylvania called it "Supersound"; Magnavox named it "Super Sound"; RCA said "Dual Dimension Sound." In each case the new receivers have higher-powered, low-distortion amplifiers and speakers far larger than the classic TV three-incher. The speakers are in sizeable boxes or compartments for vastly stronger bass than TV has ever had. The good-sound models have sold well, at prices a little above those of standard receivers. Sylvania told *BM/E* its limited production run has already nearly sold out.

There are also some sound-only tuners and receivers that take the TV sound carrier right off the air and turn out a hi-fi mono sound signal. Pioneer has a tuner, Model TVX-9500, with specifications in the top hi-fi range. It is intended to feed a mono signal to a hi-fi system. Ron Petty, marketing director for Pioneer, told *BM/E* the tuner is selling in numbers comparable to the sales of other hi-fi specialty units.

Evidently none of the big manufacturers expects a wildfire response to good sound right now. As reported in *Television Digest*, a Sylvania spokesman said that "sound is not a consumer hot button" at this time. The industry is moving in a little bit to try the waters and educate the TV watcher to good sound. The education will be two-way, with the viewer learning the pleasures of good sound and the industry learning how that pleasure is likely to affect the market for television receivers.

Working at the last barrier to stereo

As already noted, stereo television sound is reaching about 70 PBS stations via the DATE system, and the AT&T diplex system is set to carry stereo to commercial stations. So stereo is up against the last barrier between the program originators and the living room. Removing that barrier entails a new technology in TV transmission and reception, one that includes multichannel sound as part of the regular signal composition.

Getting a change of this kind through the industry and the FCC has in the past been a slow process indeed, but the pressures for stereo sound in television are now so high that many in the industry think action will come very soon, perhaps in a year or less. For example, James Gabbert, who had some claim to the title of "Mr. Radio" as a founder and long-time president of the National Radio Broadcasters Association, recently sold his radio stations and bought a television station. "Stereo in TV is just around the corner and there is going to be a TV revolution and I want to be in on the ground floor," was his public explanation.

Active industry discussion of the question is now underway through the Subcommittee on Multichannel Sound of the Broadcast Television Systems Committee of the Electronic Industries Association. Tom Keller of WGBH in Boston, subcommittee chairman, explained to *BM/E* that they will examine proposals for multichannel sound in television starting in mid-September. Later there will be tests of likely systems, followed by a complete engineering analysis and report to the EIA and the FCC. They hope to complete the whole process before the end of 1980. A report has already been filed on a system developed by Telesonics of Glen Ellyn, Ill. Company head James Simonton told *BM/E* that the system has been in experimental use at WTTW in Chicago for more than a year. The station found the results satisfactory, as detailed in its report to the FCC. A brief technical account of the system appears in a box accompanying this article; the system will be considered by the BTS Subcommittee.

Simonton made the interesting observation that in his opinion, if television did not adopt stereo, cable television certainly would. His contacts with cable managements have convinced him that the cable industry will move ahead on stereo rapidly as soon as the technology has been approved.

Industry sources say that Zenith Radio Corp. will file a proposal, and several others are tentative. Also before the committee will be the system now in use in Japan.

Stereo betters sports, drama, music in Japan

The Japanese television industry, under the leadership of NHK, the public system, has experimented with various methods of putting stereo into TV for over 15 years. The system chosen went into regular use last year. It is FM/FM multiplexing, with a subcarrier in the TV audio baseband centered at 31.5 kHz and extending from 16 kHz to 47 kHz. That gives room for a frequency range of 50 to 14,000 Hz, with a maximum signal deviation of ±20 kHz.

Harmonic distortion is rated at less than one percent at 1 kHz; S/N is 51 dB. Standard mono receivers can be brought into the system with adapters that cost from $10 to $30; receivers with the adapters built in are available on the Japanese market.

These Network Systems Are Getting Super-Audio To Local TV Stations Everywhere

The PBS DATE System. DATE was developed by PBS in co-operation with Digital Communications Corp. of Gaithersberg, Md., for use in the PBS satellite distribution net. It has a subcarrier in the TV aural baseband centered at 5.5 MHz, high enough above the video baseband at 4.2 MHz to allow room for four channels of digital audio, all combined into one bit stream. The sampling rate for each audio signal is 34.43 kHz (high enough at twice the 15 kHz bandwidth, plus the extra needed to make the low-pass filters practical). The coding is 14-bit. After processing for transmission, the coding is 13-bit, and the resulting combined bit stream carries 1.79 megabits/sec.

Signal characteristics, as delivered to the receiving TV station after decoding, are 50 Hz to 15 kHz ±0.25 dB; noise referenced to +18 dBm, unweighted, −70 dB; distortion at any frequency at +18 dBm, less than one per cent.

In addition to the four-channel digital signal, the system carries a 15 kHz low noise FM-modulated audio signal on a subcarrier at 6.8 MHz; this high-grade mono signal is available to any PBS local station not equipped with the DATE decoder or not wanting a stereo signal. As noted in the accompanying story, the mono signal is getting rave notices from PBS local stations, as is the multichannel system.

The AT&T Diplex System. The commercial TV nets all use the AT&T diplex system to take TV audio to O&Os and most affiliates. The system uses a subcarrier in the audio baseband at 5.8 MHz, FM-modulated, analog, for a 15 Hz bandwidth at about 65 dB of signal-to-noise ratio. The system is designed to put another subcarrier at 6.4 MHz for stereo or multilingual audio when desired.

The audio signal is diplexed onto the video transmission channel and the composite can be carried by regular coaxial cable, by microwave, or eventually by satellite.

THE VERSATILE TK-760. IT'S REALLY THREE CAMERAS FOR ONE COST-EFFECTIVE PRICE.

With its 38-pound (17 kg) camera head, the TK-760 has the heft you need for smooth studio work, and the lightness for easy transport to the field either as an ENG or EFP camera.

You get big-camera performance plus the capability to convert it in minutes to the lightweight champ, TK-76.

It's a camera that delivers outstanding picture quality in the studio, on-location, or in portable operation. That's cost effectiveness!

New features make TK-760 a smarter buy than ever.

The TK-760 starts with the great camera design and performance features that have been proved in more than 1500 TK-76's in worldwide use. Add to that a full complement of operational conveniences for efficient studio and field production. And now, more improvements to further expand the camera's capability:

Electronic comet tail suppression (CTS) for enhanced performance, improved picture quality. Multi-core cable extends remote control of the camera to 3,000 feet; Triax operation to 5,000 feet. And the system adapts to wireless operation with full EFP remote control capability. Plus reduced-width horizontal and vertical blanking to help you meet the most rigid picture specifications.

RCA offers more cameras, and more than cameras.

The full range of RCA cameras is built on quality performance and unique capabilities. Start with the TK-47, the world's first fully automatic studio camera. Next, the studio standard, the popular TK-46. The TKP-46 is the production portable that provides studio quality pictures. For ENG, the TK-76C, a lighter-weight version of the preferred portable, with new features added. And, of course, the improved TK-760, the versatile one—three cameras for one cost-effective price.

RCA offers a wide scope of TV broadcast equipment: cameras, VTRs, projectors, film chains, antennas, transmitters, and much more.

Quality is the key to true cost-effectiveness.

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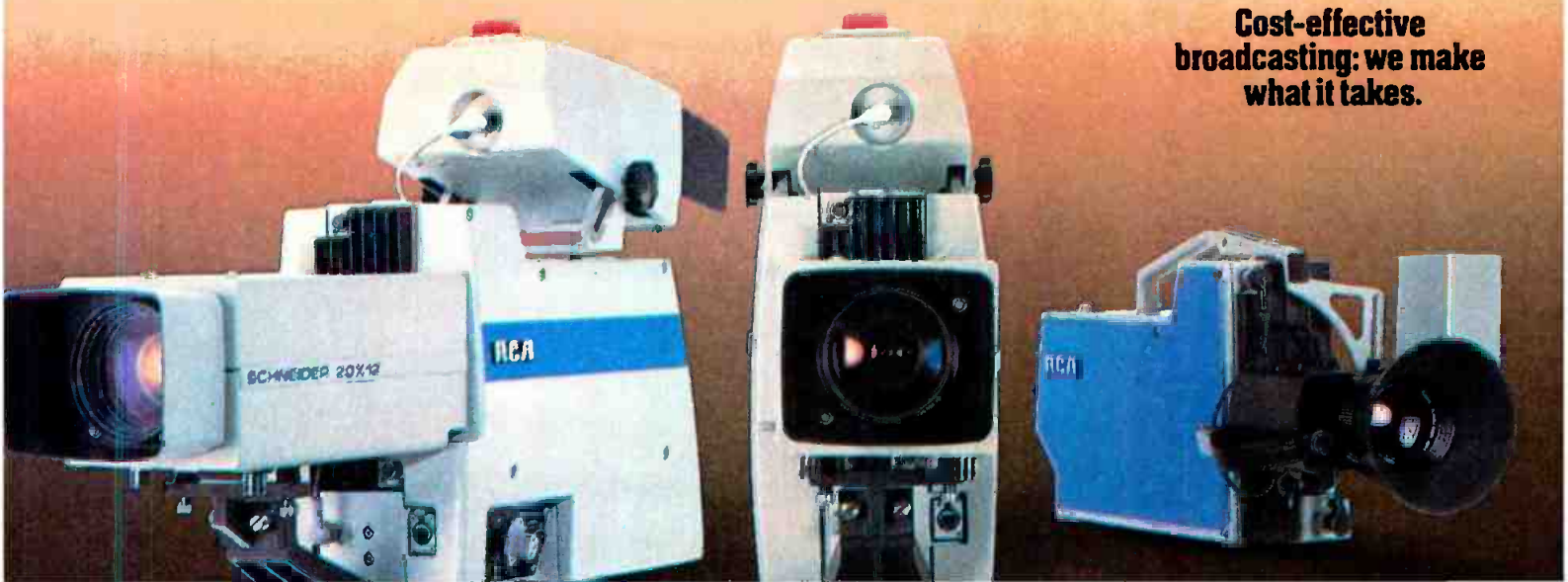
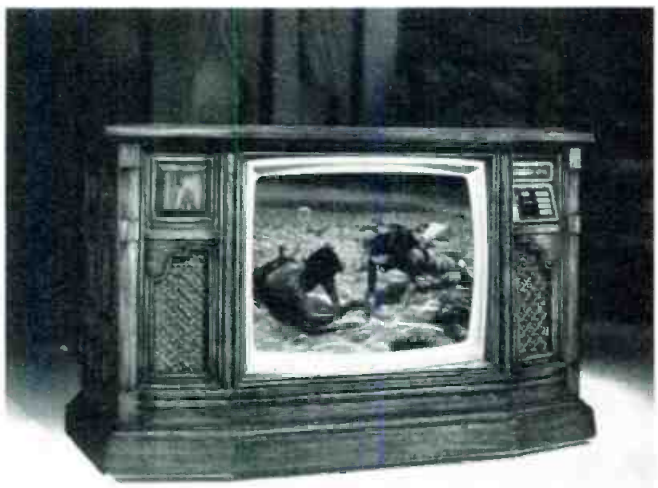


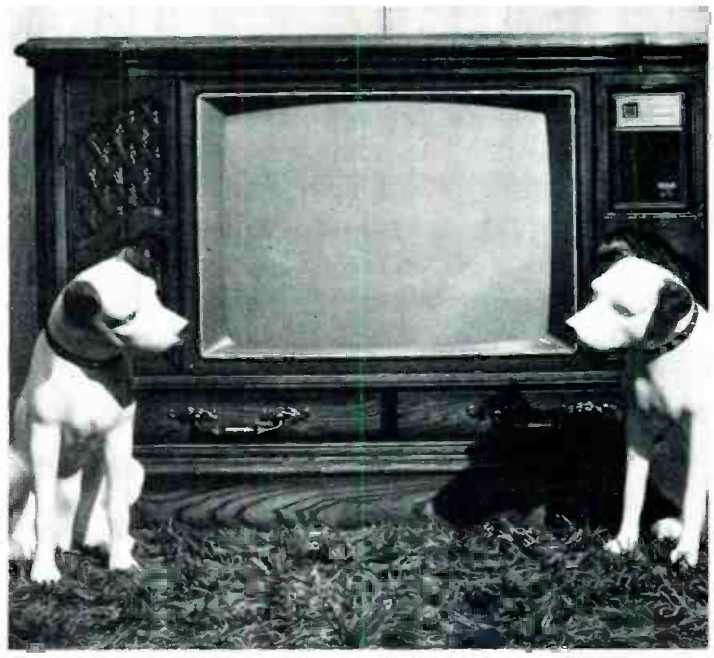
Good Sound For Television

About 500,000 Japanese had stereo reception when this article was written, and the number is expanding steadily. Both NHK and practically all the commercial stations were putting on stereo programs from time to time throughout the day; the viewer can get five to 10 hours of stereo on most days, with all channels added in. A recent program listing shows stereo used for a symphony concert, the All Japan High School Baseball Championship, pop music, *TV Jockey*, the "Pink Lady" special, a pro baseball game, *Sound Inn S*, a variety show, the *Stereo Music Hall*, and *Sound Break* — on just the first two days of the week.

An American observer recently in Japan, Bayly Neal of Sylvania, told *BM/E* that he watched a baseball game on Japanese television and had a strong feeling of being "right there" with the crowd noises all around him and the player noises out in front. Television drama, very popular in Japan, gains from having the dialog separated in space and has added clarity and force. Even quiz shows get an extra push, as do all the varieties of cops-and-robbers shows, with the chase cars screaming across the scene. The result has been that the Japanese TV watcher now regards stereo as added excitement for many kinds of program, whether he himself has stereo or not.



Magnavox "Super Sound" has amplifier rated 12 watts at low distortion, three-way speaker system. It is one of several "hi-fi" TV receivers successfully marketed this fall by American manufacturers



New "hi-fi" TV receiver from RCA has "Dual Dimension Sound," which puts low frequencies in one speaker, highs in another for simulated stereo

Sylvania's TV receiver with "Supersound" has 8 watt audio amp rated with less than 0.5 percent distortion, plus separate tweeter and large woofer with high compliance mounted in tuned-port enclosure

Cleaning house for the new sound

Reported from both public and commercial television stations getting the new sound is another kind of education now underway — the education of engineering staffs in the proper care of audio within the station. Priorities of the past 30 years have put audio very low on the engineering attention scale in most television stations. Now the noise and distortion that the engineer for years didn't know existed have become obtrusive and offensive. They are no longer masked by the faults of the signal coming in over the wire, and will be reproduced clearly on receivers with better audio.

Luckily this education will not be too difficult. The techniques for preserving the quality of the audio signal as it travels through a broadcast station have been highly developed, especially by the "good music" FM stations, and are widely available to professionals (see many recent articles in *BM/E*, including the series just completed by Mark Durenberger). Moreover, the best audio equipment now available for broadcast stations, radio or television, has reached an extraordinary level of refinement. There is no longer any reason why the consoles, distribution amplifiers, and other gear in the station should add more than the most minute amount of distortion and noise to the super-signal coming in by satellite or wire.

Satellite transmission is injecting another engineering group into the audio chain which may need some education. The chief engineer of an FM station doing many fine-music broadcasts told *BM/E* a story that illustrates this point. In the middle of a program reaching the station via satellite, an operator at the uplink transmitter (a commercial installation) suddenly decided that the signal level was too low and cranked up the gain a good handful of decibels. This threw an emergency to the staff of the station, who had to do some very fast resetting of controls to keep the signal in decent shape as it passed through the station.

The local transmitter: good enough?

The local television transmitter is, of course, a prime link in the audio quality chain. The quick answer to the question above has been, yes, the TV transmitter has FM sound and can broadcast a high grade of audio whenever called on to do so.

But any broadcast engineer will sense (if he doesn't already know) that the old answer is entirely too quick. We know that the process of putting a color video signal and an audio signal on a television carrier is highly complex, and we may guess that many factors must be controlled carefully if the audio is to come through pure.

This insight is confirmed with comprehensive technical detail in a paper given by Daniel Talbot of dbx at the Audio Engineering Society meeting in Los Angeles last May. (The paper is available from the AES, 60 East 42 Street, New York, N.Y., 10017, as their preprint no. 1482, and is strongly recommended to any television engineer interested in the subject.)

Talbot says that the following changes should be made in average television operating practice to maintain high audio quality (he gives a very thorough technical rationale for each):

- A minimum of compression of the audio baseband signal;
- Better trapping of visual frequencies in the vicinity of the aural carrier;
- Separate handling of the audio signal in the receiver (although the intercarrier system is better than a fixed-reference discriminator);
- Higher aural carrier levels, possibly going back to old FCC standards for higher aural output power;
- Synchronous detection;
- Lower AM-to-PM conversion in the receiver, accomplished by reducing amplitude or slew-rate assymetery or both;
- Better fidelity in the receiver audio chain.

The last three, of course, have to do with the receiver rather than the transmitter; they are included here to give the full sweep of Talbot's recommendations.

Hard work, but much more fun for the viewer

The foregoing is just a sampling of the stricter audio regimen that the new sound will impose on TV engineering staffs. It is going to be harder work than it used to be, but the result will be hugely rewarding for the viewer. With cable, the video disc, and the videocassette recorder all invading the living room in the coming years, television is going to need all the appeal for the viewer it can muster. This may well be the final and most important of the forces that are to revolutionize television sound. **BM/E**

Stereo TV Gets One-Year Test In Chicago

Chicago public TV station WTTW recently sent the FCC a comprehensive report on a system for stereo sound in television. The system, developed by Telesonics, Inc., of Glen Ellyn, Ill., was used at WTTW after regular hours for about a year under FCC temporary authority.

The report, which was received by *BM/E*, is *prima facie* very convincing as to the feasibility and aural benefits of stereo sound in American television. WTTW's extensive and detailed tests led the station to the overall conclusion that the system produces excellent stereo sound with no effect on the picture, and is moreover extremely simple to set up and get on the air.

In contrast with the Japanese system described in the accompanying article, the Telesonics system puts the left and right audio signals into a matrix for the familiar L+R and L−R components used in FM stereo. The two signals are applied to a standard FM stereo generator, with the L+R coming out to occupy .05 to 15 kHz of the aural baseband and the L−R carried by a suppressed subcarrier at 38 kHz. The lower L−R sideband extends from 23 to 37.95 kHz; the upper L−R sideband extends from 38.05 to 53 kHz.

An important feature of the system is the enhancement of the L−R signal to improve the signal to noise ratio. The system can be used in three modes. In the first the L−R gets no special boost, so that it suffers from the well-known division of energy into the two sidebands, reducing the noise margin. In the 2X mode the L−R is 6 dB up; in the 3X mode it is 9.5 dB up. Increasing the L−R level was very effective in the tests in keeping the noise at a low level. With the on-air signal at the lowest level giving acceptable picture quality, the stereo sound had an S/N of 54.5 dB. Dolby B was tried in some experiments, raising the S/N to 59.5 dB. Frequency response is 14 Hz to 14.5 kHz at 3 dB points.

The accompanying chart shows the spectrum of the aural baseband with the stereo system active. One change from standard FM stereo is the use of a 25 microsecond preemphais. Another is the setting of levels for maximum deviations as shown on the chart (33.75 kHz in the 3X mode).

The Telesonics system will be among those considered by the Subcommittee on Multichannel Sound of the Broadcast Television Systems Committee.

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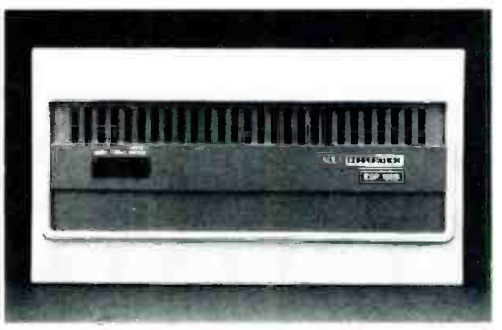

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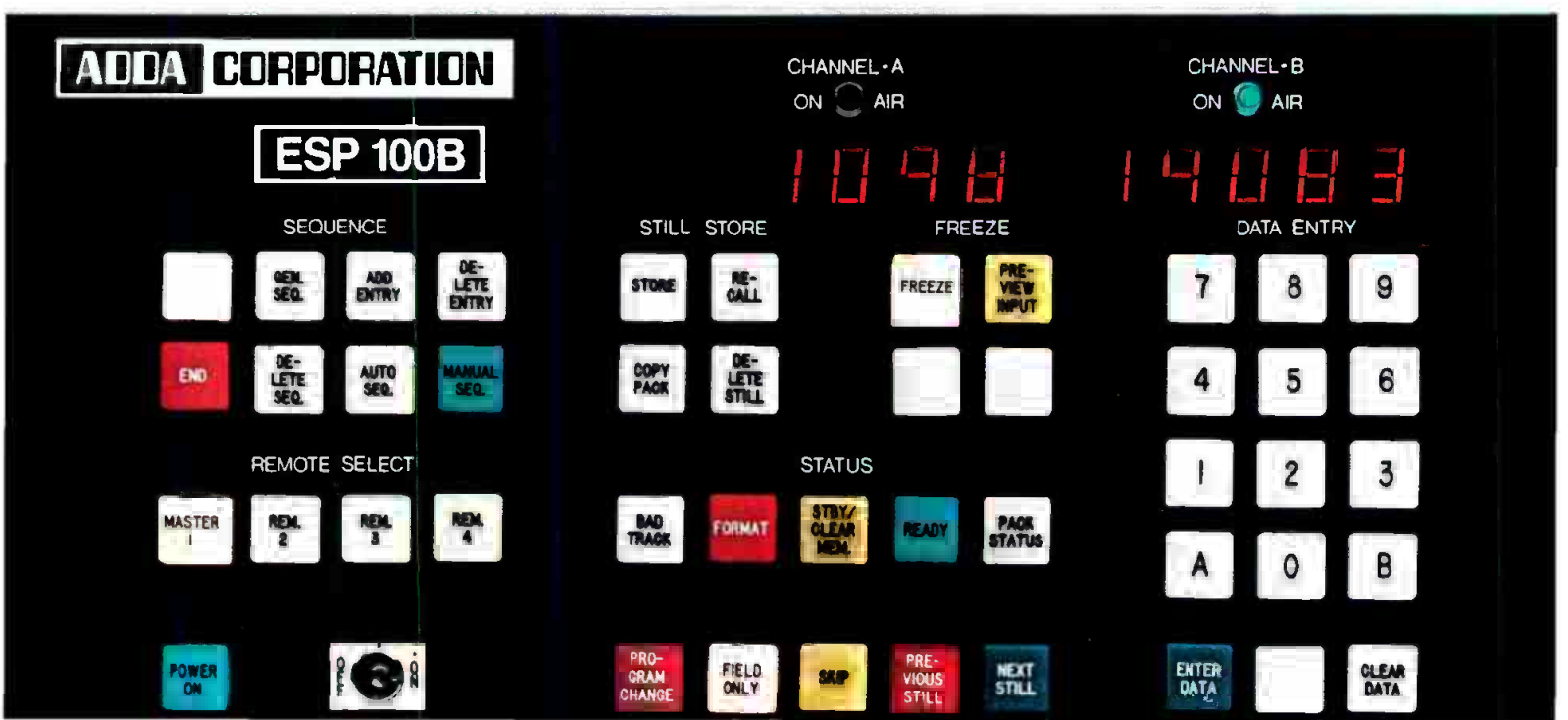

AM STEREO: READY, SET; WAITING ON THE "GO"

There are as many ways to get prepared for AM stereo as there are AM stations. Nevertheless, some experts and some of the broadcasters that have been down the AM stereo road have solid ideas for the coming crucial months.

"IT IS ALMOST LIKE the Oklahoma Land Rush," said Jack Williams of Pacific Recorders and Engineering. We've got a few 'sooners' who are jumping across the line just because they don't want to get trampled when the gun goes off. When the gun finally sounds, you're going to find the more powerful stations pulling away from the smaller guys and the smaller guys are going to be mopping up."

Even though a final decision on AM stereo is not likely until as late as the end of 1979, and even though no clear indication has come from the FCC on which of the five proposed AM stereo systems it will select, some broadcasters have been preparing for the switch for nearly five years. Moreover, almost all manufacturers of audio consoles report that they haven't seen an order for a mono console in two years or more. What Williams meant was that AM broadcasters have been lining up for some time in anticipation of AM stereo and that the latecomers may very well find long and costly delays when ordering the equipment required to go stereo.

According to Williams, Pacific Recorders and Engineering, as well as most other manufacturers of the most essential radio gear, have anticipated a surge in demand for things stereo during the coming months. Most have already developed plans for expanding production when the demand materializes and broadcasters should be able to find high-quality equipment in good supply. Delivery times on most equipment should stay within four to eight weeks, with more difficult to obtain items taking as long as 12 weeks to deliver.

The FCC is unlikely to make its AM decision public until the end of 1979, and will probably adopt the proposed nine-month moratorium on permission to implement AM stereo. With these factors considered, most broadcasters will probably have the better part of a year to prepare.

A year may not seem like a lot of time when one considers all that has to be done. Most AM-only stations were designed without stereo in mind, and nearly all of the experts we spoke with agree that the AM-only, especially those that are highly directional, have their work cut out for them. George Capalbo, vice president of RKO Radio, reports that his group has been in the process of broadbanding and improving the antenna systems of the RKO stations for more than three years and still has work left to be done. Jack Williams of Pacific Recorders suggests that AM-only stations will be best off by starting all over again in a new plant or, barring that, converting a studio at a time to stereo and removing all existing wiring rather than trying to have the old and new live side by side.

Aside from the technical retooling that broadcasters need to concern themselves with is the equally time-consuming and important job of rerecording libraries so that when the starting shot is fired stations do not find themselves standing silently at the line.

When the above is completed, broadcasters will also have to reconsider their existing formats and give serious thought to whether or not their current format will work in a stereo environment; if not, an even more time-consuming search will have to begin to locate a format that will be successful. Even further along on the conceptual tangent will be perplexing questions about whether stereo AM stations should program more like successful FM stations or develop some heretofore undiscovered style of radio programming.

These are but a few of the questions that broadcasters making the switch to AM stereo will face in the coming months. To many of these questions, especially the programming ones, there are likely to be no answers until the affected stations have been on the air for some time. Even some technical questions will probably have to wait for a period of experience, particularly those relating to audio processing and loudness.

Tale of two conversions

At RKO, with AM radio stations in Los Angeles, San Francisco, Memphis, Boston, Washington, and New York, AM stereo has been a part of the technological development plan for several years. According to George Capalbo, "We started with the antenna and worked backwards, which may seem odd, but we knew the antennas would take a lot of time and money." Nevertheless, RKO found the antennas would be a good place to start since (a) they started early, (b) they could amortize the cost over a longer period of time, (c) well-tuned, broadbanded antennas would improve the signal of each station now, and (d) "You have to realize that consultants have more than just you for a client."

Richard Mertz, chief engineer of WBT, Charlotte, N.C., where the NAMSRC conducted its stereo AM tests, felt that his antenna system was already in good shape, so he started off by converting his studios.

Both Mertz, at WBT, and Capalbo, at RKO, faced the classic AM situation. Like a lot of AM operations, the facilities to be converted were in need of modernizing anyway. As Mertz explained, "I've been working for the past year and a half changing our on-air studio . . . Then of course, we had a lot of equipment here that has been in our operation since we moved into the building in 1955; so with the upgrade we just killed two birds with one stone."

From these two cases and from the advice of others involved in AM stereo conversions, it is possible to conclude that the one approach that won't work is the "band-aid" approach. It was typcial of some AM stations that Jack Williams worked on to open up the cable trays and

find layer after layer of undocumented wiring lying on top of documented wiring that dated back to the station's original construction. As Williams pointed out, "A lot has changed over the years — theories on grounding, methods of documentation, and so on. It's best to rip all that out and start over."

For the most part, broadcasters will not be surprised by any of the things required to convert to stereo. Those with AM-FM combo operations will already be familiar with the requirements of stereo. In fact, according to Mertz, they are likely to find certain economies through conversion. The stocking of spare parts should become simpler, only stereo carts need be used, and the expansion of the facility to nearly complete redundancy will be an operational improvement.

If there are problems in conversion, they will probably crop up between the studio and the transmitter. There is a problem in some cities getting the telephone company to cooperate in providing phased stereo pairs. In the WBT case, Mertz knows that he will have to go with a microwave STL and he is currently working with Moseley PCL 505s tuned center channel. When he goes stereo, the STLs will be modified for split channel. "A lot of stations," said Mertz, "need to get with their phone companies or consider alternatives. Here in Charlotte they just don't have the wire facilities." According to Capalbo, ". . . ultimately the best way to go is a microwave STL; I think everybody in the industry knows that."

Transmitters do not appear to be a major concern. At WBT, which broadcasts with a Harris MW-50, Harris has already modified the transmitter. At the various RKO stations, new or upgraded transmitters have been put into service. In these cases RKO is using Harris, Collins, RCA, and Continental transmitters. In all cases the hope is that simple adjustment and the addition of a stereo exciter will be all that is required. Capalbo, however, does feel that AM stereo will eventually lead to the introduction of a new generation of AM transmitters, but he believes that this introduction will wait on the FCC's selection and a period of on-air experience.

Converting studios is really a very subjective process, and the individual style of the station is as much a factor as meeting absolute stereo requirements. Though costly, especially where cart machines are concerned, the conversion of studios can take place rather quickly. Nevertheless, converting studios now is important since one of the fundamental tasks will be rerecording the station's library. This can be a very lengthy job. At KHJ, RKO's Los Angeles station, the rerecording is nearly complete on the station's nearly 3700-cart library. Furthermore, there is no real need to wait since material recorded in stereo can simply be jumpered for mono until the time comes for stereo broadcasting.

The costs involved in conversion will be considerable. According to Capalbo, "You can look at what it cost to do an FM station and figure on about the same thing for your AM. As a rule of thumb, stereo will prove to be about 15 percent more expensive for equipment, though the figure is kept fairly low because manufacturers are tooled for stereo whereas manufacturing mono at this time is more the exception than the rule. Modifying the transmitter will probably cost somewhere between $3500 and $10,000, with the average modification coming in at around $5000. The cost of broadbanding the antenna system will vary widely depending on whether the station is directional or not. The multi-tower directional broadcasters are in for a very expensive and time-consuming renovation.

A look at what you may have to do

Many AM stations have been engaged in the conversion process for several years now. Those with FM stereo stations probably already have the skilled personnel and the experience to do the job.

According to Mark Durenberger, a frequent contributor to this magazine, "There are two things that every AM broadcaster ought to be doing right now: learning about stereo and insuring that his engineering staff is experienced or is afforded the chance to learn about new language and requirements." The process begins, said Durenberger, with an overall look at the physical plant with the aim of bringing its performance up to the state of the art. "Whether the broadcaster is planning to go to AM stereo or not," Durenberger explained, "better receivers are likely to enter the market and he's going to have to deliver better sound."

Durenberger believes that at the very least, the broadcaster should be looking at new consoles, source equipment, monitoring equipment, and test gear. The timetable for the purchase of this equipment will depend on the individual broadcaster's own sense of costs, waiting time for construction, ordering, and the ability of the engineering staff to deal with stereo.

Consoles have been vastly improved over the past five years, so whether an existing console is stereo or not, if it is more than five years old it is a candidate for replacement. Durenberger points out that distortion in consoles has plummeted from a typical 0.5 percent THD to 0.005

Programming And AM Stereo

Over the past decade, AM broadcasters have watched their audiences slowly defect to the sound of FM. Loring Fisher, executive vice president of Bonneville Broadcast Consultants, believes that this erosion is not necessarily technologically based. Instead, said Fisher, it has more to do with the amounts and kinds of music available on FM and the fact that the clustering of commercials and the lighter commercial loads still give FM listeners the sense that "they are getting free music."

AM radio has remained quite healthy by and large and should not be construed as waning — but in some markets, it has had its troubles. The statistics clearly show that while AM has grown slowly, FM has grown quickly, so that it can be presumed that FM is doing something right. The difference between the two media is most apparent in the number of commercials and location of these commercials, though there are style differences as well. Often, the most successful AM stations have relied heavily on a mix of talk, information, personality, and — to a lesser extent than FM — music.

The problem for AM programming when stereo is initiated will be one of positioning itself in the market. Fisher believes that some stations will do well to adopt some of the programming strategies common in FM, especially those strategies related to the number and placement of commercials. "A well-engineered AM stereo station will sound every bit as good as a moderately well-engineered FM station," says Fisher. The real technical difficulty will be ridding itself of restrictive regulations regarding hours of broadcast, power, and coverage. But for programming, AM stereo stations might be well advised to consider the FM formats they are competing against as well as the AM formats in their markets.

Listeners, according to Fisher, won't be all that conscious of whether the station that plays what they want to hear is AM or FM.

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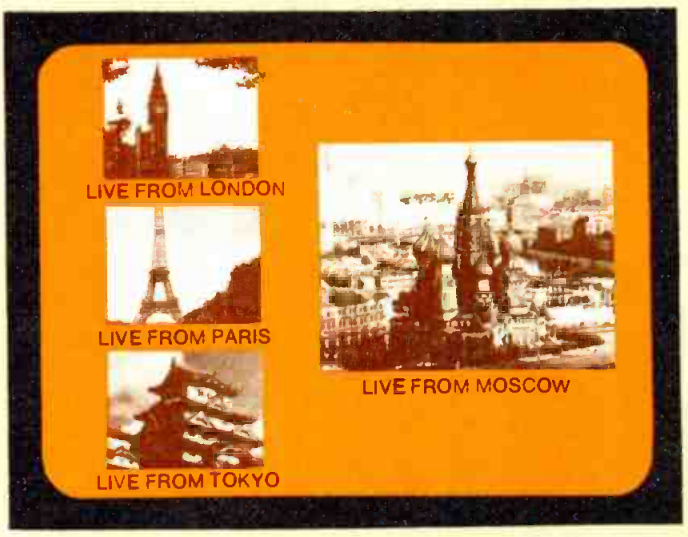

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percent THD and IM over the recent past. Particular attention should be paid to the console's phase response characteristics, "because this parameter and the associated differential frequency response will probably be the most critical for early AM stereo." Noise figures and distortion, asserts Durenberger, will become increasingly important when, and if, high-quality AM stereo receivers penetrate the market.

Though most AM operators have probably installed, or at least ordered, stereo consoles by this late date, the broadcaster with a recent-vintage AM plant may want to check into converting the existing console to stereo. Durenberger believes that it may make sense to simply convert the needed input channels to stereo by installing good stereo faders and a pair of stereo program amplifiers using the active combining network (ACN) approach. The savings can then be used to purchase source gear, with a total console replacement scheduled for sometime later. If the new or rebuilt console is prewired to the 66-type connecting blocks, the down time for console replacement can be kept to a single night's shift, according to Durenberger.

Stereo source machines will also be a high priority, and there are now on the market several reasonably priced direct-drive turntables. Stereo cartridges for these machines must be carefully considered since there are significant differences between those "designed for broadcast" and those that are not. Sensitivity of such cartridges to vertical rumble is critical. A good stereo preamp is also a must.

A good "dub chain" is essential, says Durenberger, and this should include an excellent stereo turntable and a direct connection of the turntable preamp to the cart machine. The console at this point in time might be a mono console used for monitoring the cart playback so that the broadcaster can approximate what the mono listener will hear. Phase response will be the most critical performance characteristic since even though the AM receiver will mask high-end phase shift, poor phase response will degrade stereo separation. A mono sum switch which allows the L+R signal to be heard is a must somewhere in the system.

The greatest difficulty will be encountered in the cart machine area. The brand of cart used may have to be reevaluated; some cart manufacturers, such as Capitol Magnetics, are known to have worked closely with manufacturers developing the new generation of stereo cart machines. The new generation of cart machines has come a long way, but according to Jack Williams there are still vast differences in the quality of machines not only between manufacturers but also between different models from the same manufacturer. New stereo cart machines are still arriving on the market, and you can look to better performance as manufacturers come to grips with sticky design problems. Since the purchase of stereo cart machines is expensive and since the conversion of mono cart machines is ill-advised, Durenberger suggests that existing mono cart machines be phased out and gradually shifted into commercial service. Eventually, if commercials finally go stereo, they too can be replaced. Because of the smaller track width and other factors, be prepared to find stereo carts noisier than mono machines.

Nearly all commercials are produced in full-track mono as they come from the agencies and will have to be dubbed to cart from a reel-to-reel machine. A two-track stereo tape recorder, however, should be a fairly high-priority item since it not only can be used for stereo work but can function in the mono production environment as an A/B roll deck for three-machine mixes when only two machines are available.

Another area likely to remain mono for the forseeable future is news. Since most radio news gathering today is done by telephone, stereo news seems a questionable practice. Talk, however, is something else. RKO did equip its talk radio station, WOR, New York, for stereo (see *BM/E*, June, 1979), and some experiments by the Public Broadcasting FM stations showed that stereo talk gives the listener a highly satisfying psychoacoustic perspective.

Test and monitoring equipment is another area that should rank high on the priority list, noted Durenberger. A dual-trace scope is important, as are the "right" modulation monitors. New alignment tapes (MRL) and test equipment capable of measuring phase response and differential frequency response should be granted some importance. Since the modulation monitor will deliver an unnatural sound to the speakers, Durenberger recommends that a matched set of roll-off filters be installed, approximating the sound of a typical AM receiver. This will be a must if processing is used.

Processing is, as George Capalbo put it, "a whole new can of worms." RKO is currently developing its own processing for the coming of AM stereo. The problem is that no one quite knows how processing will be employed. The clipping and limiting done now is likely to cause severe distortion in stereo environment and, as Jack Williams said, "There is no reason to think that listeners will prefer two channels of noise to one." For the immediate future, the cautious route seems to be to go with FM-type processing and then wait to see how the AM receivers perform.

As mentioned before, one very sticky area for AM stereo is going to be the STL. The telephone company is going to be difficult to deal with when trying to get proper phasing, and its typical 15 kHz line offers a noise figure of -57 dBm. A microwave STL is highly recommended but there are problems here too, especially in larger markets where, according to Durenberger, there is already at least one STL on each available frequency. Cross-polarization will help as will high-gain antennas, and second paths on the same frequency at right angles to the original signals are planned. Many STL manufacturers will provide loaners and several crystals to enable the broadcaster to find his niche. Durenberger recommends that you "do this *now*."

Nearly all the work and all the expenditures that are effected over the coming months will benefit the AM broadcaster whether he goes stereo or not. Each of the experts we spoke with also pointed out that the final selection of one of the AM stereo systems from among the five proposed is not liable to cause you to redo any of the important preparations you undertake now.

The most serious concern expressed by all of the people who spoke to *BM/E* was the eventual quality of the AM stereo receiver. Said George Capalbo, "It is up to the receiver manufacturers to make a decent receiver or we are going to be in trouble with AM stereo." There is a legitimate desire on the part of the broadcasting industry to somehow, perhaps through the FCC, force AM stereo receiver manufacturers to come through with high-quality equipment. **BM/E**

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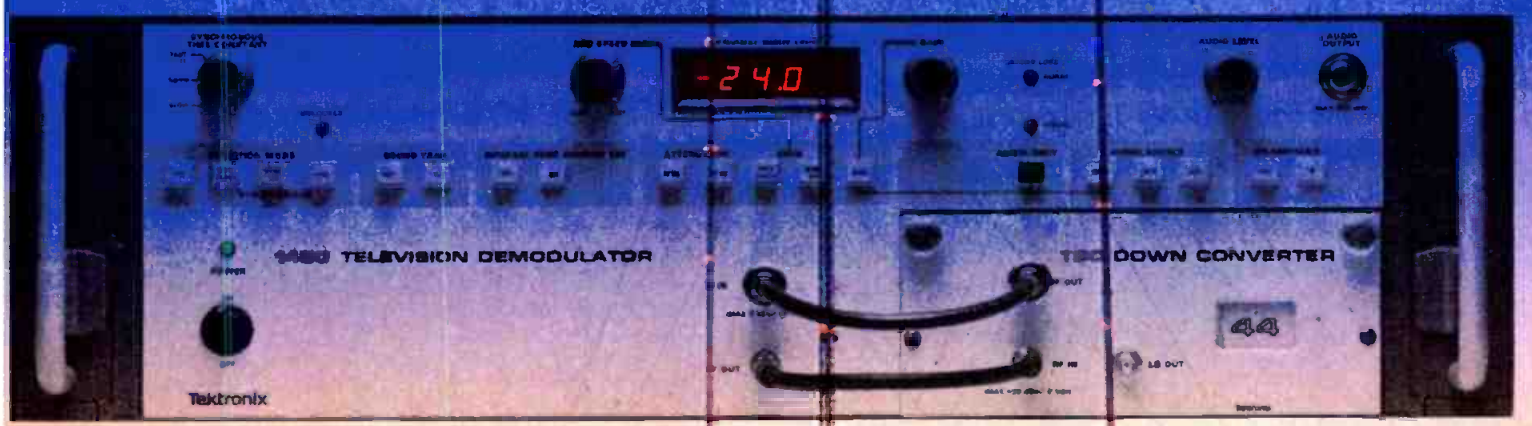

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- Split carrier sound detection speeds troubleshooting and alignment of the aural transmitter because no vision carrier is required.

Reduce equipment maintenance costs

- SAW filter IF strip requires no adjustment; extends time between normal periodic recalibrations.

Improve your program sound

- Synchronous detection and dual video detectors operating in phase quadrature facilitate measurement of the incidental phase modulation of the vision carrier that appears as noise in the received sound.

You can use the 1450-1 anywhere — at the transmitter or off-air at a remote site — without attenuators or external amplifiers.

If you think there's a problem with the performance of your transmitter or antenna system but you're not sure, choose our UL listed 1450-1. The Transparent Demod will clear the air for accurate, reliable television transmission.

Call your nearest Tektronix Field Office and ask for a demonstration of our 1450-1 Television Demodulator, fixed channel or tunable VHF or UHF. For additional specifications, write Tektronix, Inc., P.O. Box 500, Beaverton, OR 97077

Tektronix

WGBH engineers talk about the Ikegami HK-312

WGBH covers Boston Pops Orchestra concerts with Ikegami HK-312 cameras from Symphony Hall, Boston.

Eight Ikegami HK-312 studio color cameras are in service at WGBH, Boston, some dating back to October 1977 – long enough for intelligence on their performance. From recent interviews with key WGBH people, read these excerpts.

Pops without noise
Tom Keller, Director of Engineering:

"The HK-312s have such high sensitivity that we were able to reduce significantly our light levels at the Boston Pops and Symphony telecasts. Yet, despite the major light reduction, we experienced no visible noise with the HK-312s . . . With their remarkable reliability record, we can depend on 6 cameras for 6-camera coverage, and not 7 for 6 as in the past. After all, you can't stop a live orchestra performance for a retake if you've lost a camera."

2 IRE, but a complaint
Ken Hori, Senior Engineer for Advanced Development:

"We tested several camera makes for RFI within a quarter-mile of a 50 KW radio transmitter. The HK-312 measured 2 IRE, whereas most others were in the 5 to 7 IRE area, and some as high as 20 IRE . . . For symphony remotes we'd need 2 to 5 hours for warm-up, but nowadays we're set up in less than an hour . . . We like its straightforward design – example, its truly high signal-to-noise ratio as compared to other cameras that resort to reduced bandwidth to attain a comparable ratio but wind up delivering noise too . . ."

We did get one complaint from the maintenance crew. They said that because they rarely found the problem of a down HK-312, they would never get to know the HK-312 well enough to fix it.

Washouts and dropouts
Bill Fairweather,
Video Control Engineer:

"During a lighting seminar staged here by Imero Fiorentino Associates, an actor in a normally lighted scene held up a sheet of white paper with printing on it to show loss of detail in the case of more than 60 percent tv white reflectance. The HK-312, however, was able to retain enough detail for the printing to be readable on the monitor.

Next came a demonstration of the dangers of too much or too little light on a chroma-key background. The HK-312 held the key to such a low light level on the blank background that the lecturer grinned and said, "I guess WGBH has pretty good cameras!" and went on to the next subject."

The HK-312 is the camera that met WGBH criteria for performance, stability, and reliability. They also have HL-53s, high-performance portable cameras that interface with HK-312 CCUs and can operate portably with their own CCUs.

Adapters for triax cable, using digital techniques, make their cameras remote-usable at nearly a mile from base stations, yet easily revertible to multicore cable whenever needed.

In daily use, their HK-312s and HL-53s are interfaced with microprocessor-computer control units that automatically cycle them through all set-up adjustments, including black-and-white balance, flare and gamma correction, video gain, and eight registration functions, then recheck all those adjustments – all within 45 seconds. The cameras can also operate independently of the set-up computers, a feature that is an Ikegami exclusive.

If all of this suggests that the HK-312 is probably the best studio/field color camera in the industry, consider this: camera, set-up computer, and triax adaptor are not only operational, they are deliverable. For details or a demonstration, contact **Ikegami Electronics (USA) Inc.**, 37 Brook Ave., Maywood, NJ 07607, (201) 368-9171 / West Coast: 19164 Van Ness Ave., Torrance, CA 90501, (213) 328-2814 / Southwest: 330 North Belt East, Houston TX 77060, (713) 445-0100.

Ikegami HK-312

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WITH THE DIGITAL PHONO IN THE LIVING ROOM, CAN RADIO STAY STRONG?

What digital audio is doing in and for radio right now, and what it seems likely to do in the near future, are more than incidental questions. A strong implication is that radio must sharply raise the technical quality of its signal over the coming years.

ONE MESSAGE WE ARE GETTING from the rapid advance of digital audio is this: before too long radio will be competing in the living room with a radically improved phonograph, a digital machine that produces sound of a quality well above anything we knew before. Will radio be able to hang on to something like its present share of the consumer's attention? Or will the phonograph finally get its revenge for the drubbing radio gave it in the '30s?

Radio and phono in the most recent decades have had a carefully balanced symbiotic relationship that has been fruitful for both. But a sharp advantage in sound quality for the phono might upset the balance and send radio to a lower level where it would be confined to news, weather information, and similar material. Predictions of the future in the volatile arena of home entertainment devices are notoriously hazardous, but we can guess that radio, to avoid any such downgrading, must raise the technical quality of its sound considerably over the next three to five years.

One essential for that is the adoption by radio of digital technology as soon as equipment production and prices will allow. *BM/E* suggests here several parts of radio operation which might use digital techniques fairly soon. Radio will also get a large quality boost on network programs from satellite distribution, as noted often in this magazine and elsewhere in recent years. This article is a look at the probable early future of digital techniques in radio. The story is not only about greatly improved sound quality because digital techniques will aid the operation of radio stations in several other ways, too.

Close at hand: universal digital mastering

The "right now" of digital audio is in the recording studios where commercial recordings are originated. Digitally mastered recordings are beginning to pile up. Three systems, those of Soundstream and 3M (multitrack fixed-head machines) and Sony (PCM-1600 converter plus a videocassette recorder) are in active use by producers of commercial recordings. A partial list of digitally mastered recordings now on the market is given with this article; the list will be incomplete by the time this sees print.

Digitally mastered records are also coming from Japan and England, and chances are good that other countries will soon join in. *BM/E* recommends strongly that any radio chief engineer or music director interested in the future of sound quality get a couple of the digitally mastered records and listen to them on high-grade playback equipment. The listener should remember that these are still analog recordings in the form reaching the user. The digital technique is used to produce the master tape only. The definite advance in sound quality makes us aware of the loss we have been experiencing with even the best analog tape recording.

Good starters are the Stravinsky *Firebird* and Borodin *Prince Igor* selections on Telarc or the Copeland *Appalachian Spring* on Sound 80. Almost any of the pop music recordings will do the job if that is more to the listener's taste. By late fall there will be a number of digitally mastered recordings from leading orchestras here and abroad to demonstrate the power of the technique, some from the leading record companies.

Radio programmers can begin to ride the digital revolution by using digitally mastered recordings on the air. Every large and many small record producers are experimenting with the technique. The executive of a large record company told Roger Pryor, manager of Sony's digital audio division (who told *BM/E*): "It's no longer a question of whether we go digital or not. It's *whose* digital, and at what price."

A push for digital from the performer

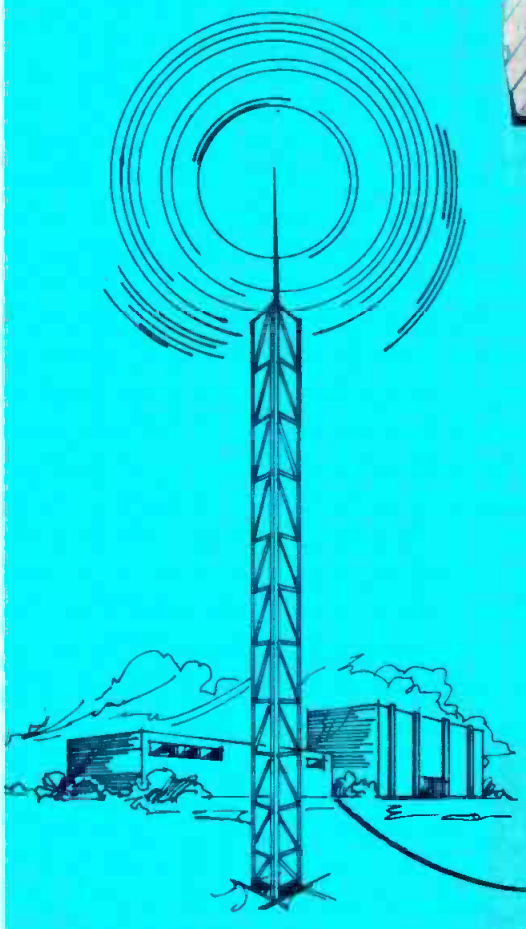
It is not just recording industry personnel who get the digital gospel. Professionals in music who have a thorough exposure are immediate converts. For example, Stevie Wonder, the greatly talented and successful singer, has bought the Sony PCM-1600 along with the accessory videocassette recorder and editing equipment and will do all his original recording with this equipment from now on, according to an announcement from Sony. He will also transfer all his old tapes to digital form to eliminate degradation through time. A digital tape keeps its quality practically forever, and the program can be dubbed to another digital tape at any time with no loss of quality.

How fast will the recording industry move?

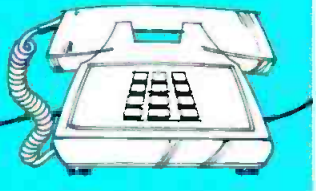
Furthermore, *BM/E* has learned that a successful music performer has bought a radio station and will rapidly convert it to 100 percent digital operation. This is likely to be highly influential among radio managements, who often move to match opponents' new technology.

The speed of the recording industry's acceptance of the digital revolution now depends primarily on the availability and prices of the digital machines. 3M has announced that its system, available on lease only until recently, will now be sold; deliveries started in September. The price for the two-unit system is $150,000, including $115,000 for the 32-track machine and $35,000

ST1910/1911 Spectrum Translator



- Extends the low frequency spectrum of standard, voice-grade telephone facilities by 240Hz, delivering the added punch needed by the broadcaster at minimum cost.
- Provides a gain of over two octaves in frequency response normally lost due to the bandwidth-limiting of telephone facilities.
- Easily connected to existing circuits.
- Simple, easy to operate, two-unit system consisting of a transmitter, which translates the spectrum of 60-2760 Hz up to 300-3000 Hz for transmission and a receiver which recovers the original signal after reception.
- Lightweight, portable transmitter and receiver are housed in rugged, molded ABS plastic cases equipped with a convenient handle/stand.
- Low distortion, low noise, fully protected input and output circuits.
- Capable of providing bandwidth up to 5kHz where permitted by transmission facilities.



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for the four-track machine: either can be bought separately. Sony's PCM-1600 is on the market at about $40,000 and must have a videocassette partner to do the actual recording of the "pseudo-video" signal. These are the two systems that can be bought at this moment. Soundstream is using its pioneer machine only for leased recording services so far, although president Tom Stockham told *BM/E* two years ago that they would eventually put it on the market.

There may be another two-track machine on the market from a new source when this magazine comes out, or shortly thereafter. Florida tape machine maker MCI and English electronics and music giant EMI have announced a joint effort which envisions a number of digital machines. The first is a two-track recorder, promised for this fall at a price around $20,000. Lutz Meyer, vice president of MCI, said that the firm could make up to 600 of the machines in 1980 if the demand develops. MCI and EMI have also promised a prototype of a multitrack machine this fall, with marketing in 1980.

As noted in *BM/E's* roundup of the digital scene in the February issue, both Mitsubishi and Matsushita have shown prototypes of multi-track fixed-head machines, which they will presumably bring to the market when they judge the time is ripe. And Ampex in this country is known to have a full-scale development program on a digital recorder underway; it could be announced at any moment.

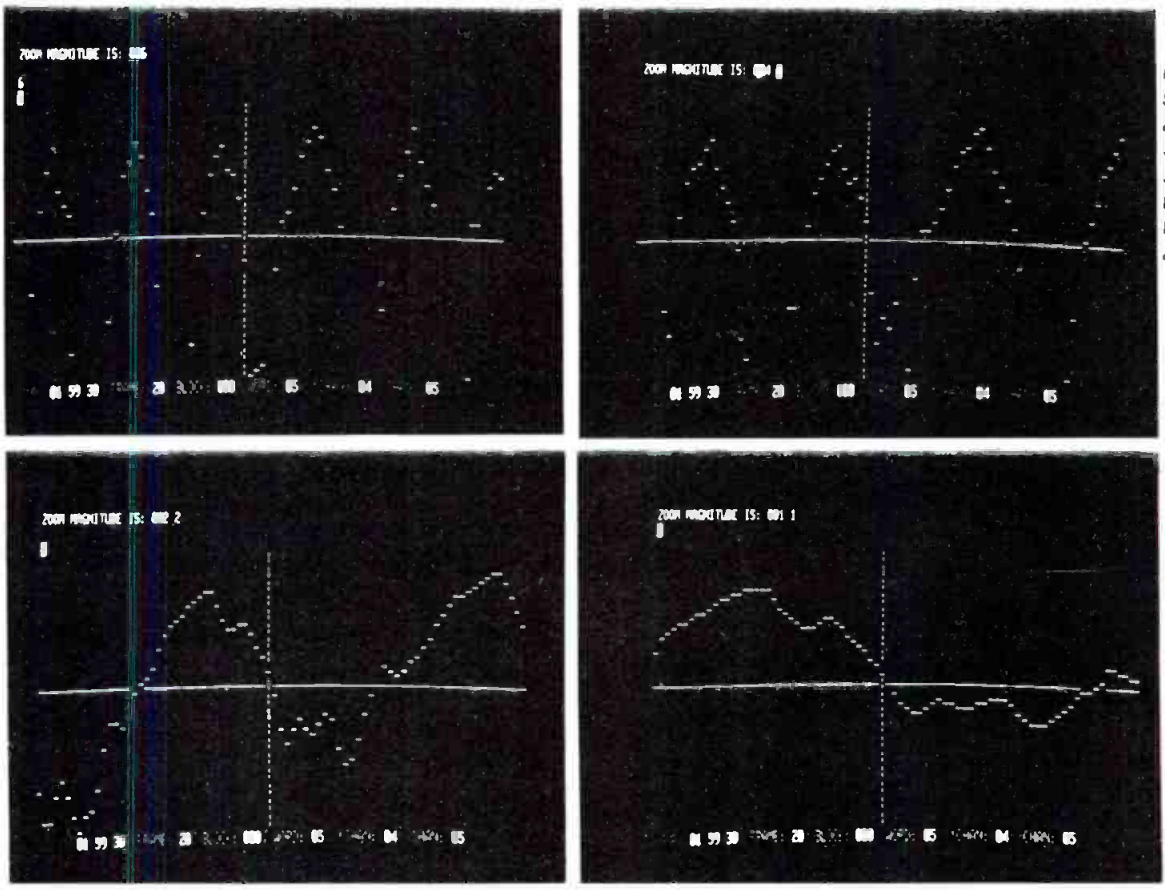
Super-editing is nearly here

So plenty of digital machines will be offered for sale before 1980 is over. One hindrance to rapid assimilation of digital technology into the recording industry has been the difficulty of editing tapes made on the multitrack machines. The classic razor-blade and reel-rocking methods are hard to use. Sony has an editor, the DEC-1000, for the pseudo-video PCM signal on videocassettes, but the multitrack machine makers admittedly need an electronic editing system.

The new precise electronic editing on the way for digital recordings is exemplified by this prototype system shown by 3M at a recent audio symposium

And all have promised such systems. 3M showed its in prototype last spring and says it will have it ready this fall. Sony says it will have one too for its multitrack machine; MCI-EMI have also promised one for their upcoming multitrack machine. The editing problem looks on the way to solution.

But what about the non-compatibility among the various machines? No two have the same coding, sampling, or error correction methods, which puts obvious stumbling blocks in the path of digital advance. These difficul-



The 3M editing system uses a video screen to show signal amplitudes around the editing point. System can "zoom" as shown here from six cycles to one cycle (bottom right) for precise matching of amplitudes

ties won't exist for a radio station that buys a digital recorder and concentrates on the use of that recorder for its own purposes. But eventually full exploitation of digital techniques will require that tapes made on one system can be used on others.

On the horizon is a fix for the standards problem that was not in sight a few years ago. A number of workers in the field have recently proposed several kinds of systems that would allow one variety of digital machine to "talk" with others. A Sony spokesman, for example, told *BM/E* that the program in "pseudo-video" form produced by the PCM-1600 could be fed into the PBS DATE system without leaving digital form—Sony knows a way of doing this. Another particularly interesting proposal came from Bjorn Bluthgen of Polygram Records of Hanover, West Germany, in a paper given at the Audio Engineering Society meeting last May. It was one of several papers on the topic at that meeting. A summary of the main technical features of Bluthgen's proposal appears in an accompanying box. This system, or something like it, could expedite the use of digital techniques tremendously.

Meanwhile, leaders in the field like Tom Stockham make the point that one overall standard would be much too confining at this time for a technique so complex and in such a state of rapid development.

Should radio get in now?

Digital recording machines undoubtedly look very expensive to most radio managements used to paying a tenth as much for tape recording. But at $20,000 to $40,000 for a two-track digital machine, some radio managements may want to get started on what will certainly be one of the main digital operations in radio: the recording of live music which can be broadcast directly from the digital machine at an unsurpassed quality level. Good music stations that do such broadcasts, or that originate such programs for the new networks, will certainly do it this way when the price is considered right: the quality advantages are simply too great to forego.

In June, Sony demonstrated exactly this process with the help of WQXR, veteran classical outlet in New York City. A number of concert pieces were recorded with the PCM-1600 in Japan. The videocassettes were played back through the PCM-1600 in the WQXR studios and put directly on the air. Chief engineer Zaven Massoomian told *BM/E* he found the quality "truly extraordinary"; a dozen or so listeners wrote in to the same effect. Massoomian agreed with *BM/E* that digital recording will be used this way by more and more good music stations in the future as prices for the machines stabilize.

Editing unit developed by Sony for "pseudo-video" recordings of PCM digital audio on video cassettes. Unit allows precise punch-ins, assembly edits, etc., with matched signal amplitudes

Looking a little ahead

Somewhat in the future are some other possible functions for digital technology in radio stations. One startling idea—it is only an idea so far—centers on the use of the videocassette with PCM audio in automation systems. With two hours or more of music on one cassette, the system would have great density of music storage at the new super-high quality level. Each tune on the tape could be given an address so it could be found in a few seconds by the automation computer: the system would have rapid random access. With two or more playback units, a slack machine could be cued up while an active one was on the air for back-to-back programming. Putting the tunes on the tape, or changing them one at a time or in groups, would be an easy recording process.

A couple of other functions in which the high quality and high storage density of the videocassette PCM audio recording would be attractive are in the distribution of program material by radio syndicators and of promo recordings by the record industry. Digital techniques will aid the syndication industry in several ways when prices get to a level attractive in that industry. Some of the leading syndicators are known to be discussing possibilities with the makers of digital machines.

All-digital signal handling: blue sky still

Further in the future, and dimmed at present by the cost of computer memories, is a potential development noted in *BM/E's* February, 1979 roundup—the complete digitization of all signal handling, with the programs stored in computer-type memories and all signal processing and control using digital techniques. The extreme flexibility and precision of signal processing and control in digital

The Philips "Compact Disc," which uses a four-inch disc recorded and played back by a laser beam, is one of several digital phono systems which are ready to bring the digital revolution to the home-only lack of standardization holds them back

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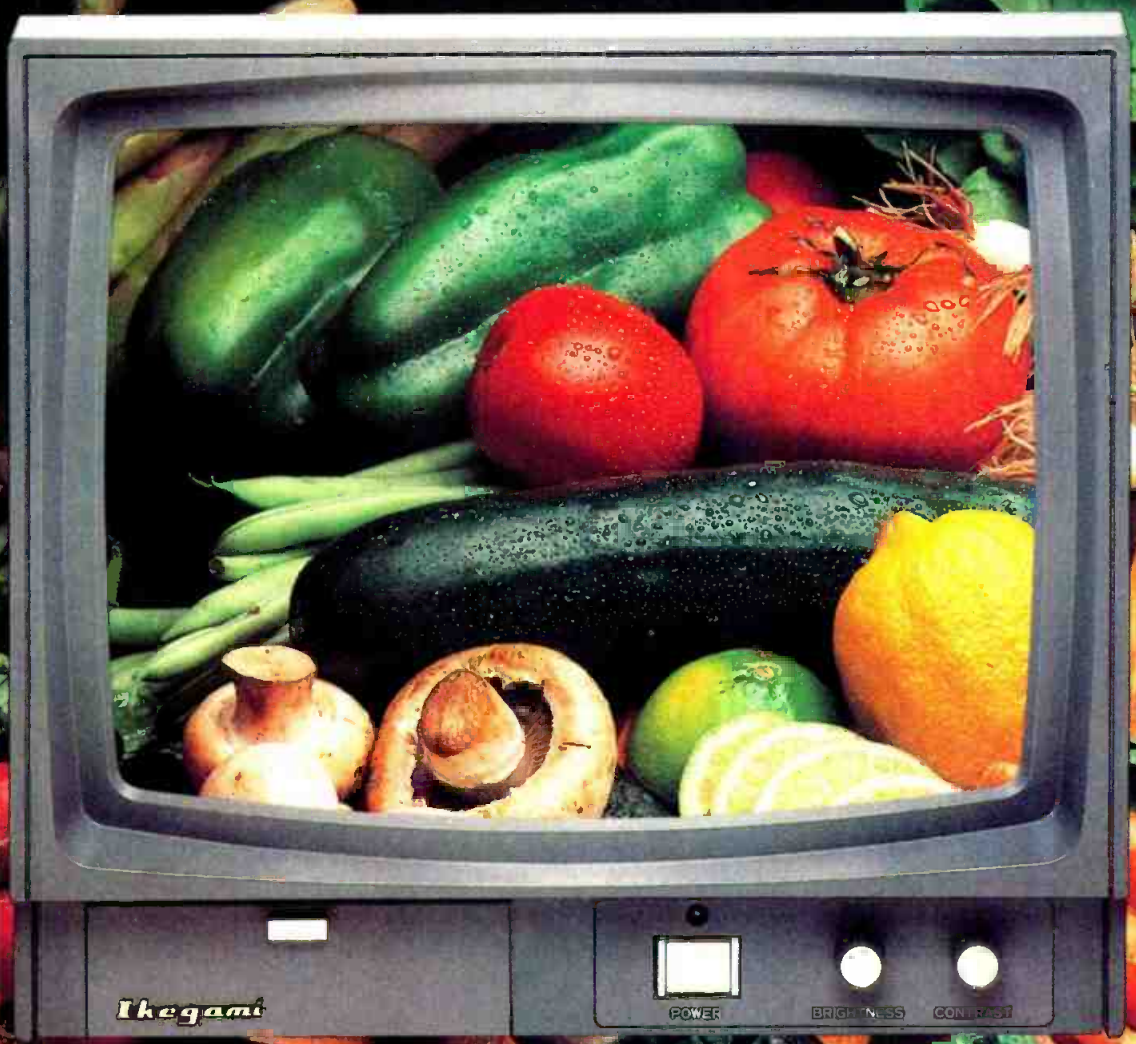

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form will surely bring this to pass. The cost of memories must fall very substantially to make it feasible for radio. The history of memory costs gives us hope that it won't be too long.

The great digital pressure-point is the living room

Finally most pressing for radio, perhaps two to four

To Hear Digital Audio In Its First Stage, Listen To These Records

Digital mastering applies the new technique only to the original tape on which the recording is made and to copies of that tape used in record production process. The striking advance in sound quality of many of the digitally mastered recordings is thus a very convincing confirmation of the value of digital audio. The following is a partial list of digitally mastered records on the market at the time this article was written; many more will reach the market in late 1979 and early 1980 from all digital systems in use.

Label	Music	System Used
Orinda Recording Corporation	Diahann Carroll with the Duke Ellington Orchestra "A Tribute to Ethel Waters"	Soundstream
Telarc Records	Frederick Fennell The Cleveland Symphonic Winds Holst: Suite #1 in E flat Suite #2 in F Handel: Music for the Royal Fireworks Bach: Fantasia in G	Soundstream
Telarc	Robert Shaw The Atlanta Symphony Orchestra and Chorus Stravinsky: The Firebird (Suite, 1919 Version) Borodin: Overture and Polovetsian Dances from Prince Igor	Soundstream
2000 B.C.	"California Smoker" Pop Instrumental	Soundstream
Telarc Records	"Malcolm Frager Plays Chopin"	Soundstream
Telarc Records	Frederick Fennell The Cleveland Symphonic Winds Vol. II "Macho Marches"	Soundstream
Telarc Records	Erich Kunzel the Cincinnati Symphony Orchestra Tchiakovsky: 1812 Overture Capriccio Italien "Cossack Dance" from Mazeppa	Soundstream
Chalfont Records	Morton Gould the London Symphony Orchestra "Shostakovitch, Ravel, Ginastra, Wenberger"	Soundstream
Chalfont Records	Morton Gould the London Symphony Orchestra "Danzas Fantasticas"	Soundstream
Chalfont Records	Morton Gould the London Symphony Orchestra "Carlo Curley Goes Digital"	Soundstream
Nautilus Records NR2	The Kingston Trio "Aspen Gold"	Soundstream
Orinda Recording Corporation	Carmen Dragon Conducting the Glendale Symphony Orchestra with Sabu "The Bee Gees Music"	Soundstream
Telarc Records	Lorin Maazel the Cleveland Symphony Orchestra Mussorgsky: Night on Bald Mountain Mussorgsky-Ravel: Pictures at an Exhibition	Soundstream
Telarc Records	"Mel Lewis Jazz"	Soundstream
WEA Music of Canada, LTD.	"True Myth"	Soundstream

More than 20 other recordings mastered on the Soundstream digital machine were in preparation at the time of writing.

Motown	Bonnie Pointer "Heaven Must Have Sent You"	3M
A & M	Herb Alpert "Rise"	3M
Warner	Ry Cooder "Bop Till You Drop"	3M
Warner	Randy Newman	3M
Sound 80	Flim and the BB's	3M
Sound 80	Copeland "Appalachian Spring" and Ives, "Three Places In New England," St. Paul Chamber Orchestra	3M

In preparation using the 3M system: a Stephen Stills album (CBS Record Plant); Herb Alpert (A&M); Heeb Pilhofer (Sound 80); and the New York Philharmonic (CBS/Columbia Masterworks).

Century	Anita Kerr "Anita Performs Wonders"	Sony
Audio Directions	"Bits of Percussion and Jazz" Farrel Morris, Ron Carter, and Stan Getz	Sony

Many others are in preparation using the Sony PCM-1600.

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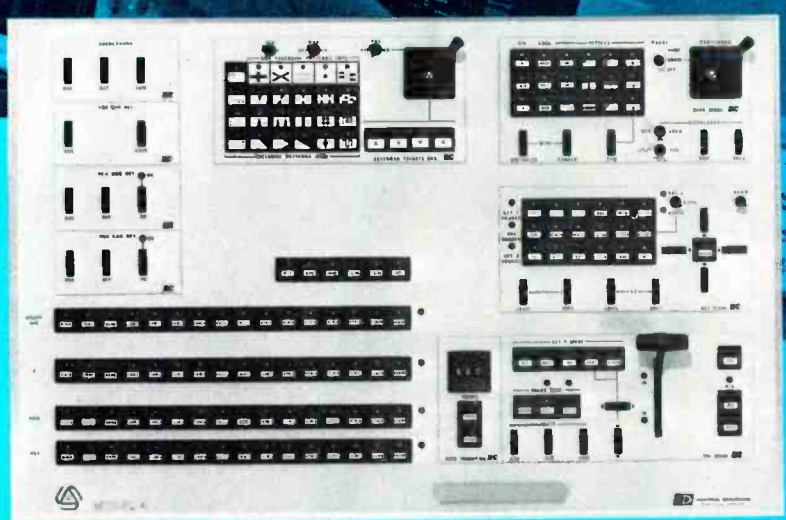

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CENTRAL DYNAMICS

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years away, is the entry of digital reproduction fully into the living room, the radical event signalled at the beginning of this article. Instead of the half-analog process of digitally-mastered recordings, we will have a complete digital chain from program origination to and through the disc bought by the home user. The PCM home disc player is a fact right now, a fully developed technology demonstrated by several firms during the last three years. One of the earliest was the Teac-Mitsubishi-Denka laser disc machine that astounded listeners at the Audio Engineering Society, as reported in *BM/E*, February, 1978. The most recent is the Phillips "Compact Disc," demonstrated in New York in June (see *BM/E*, August, 1979).

The PCM disc will bring the real digital revolution, and the industry is looking toward it in those terms. Roger Pryor of Sony says that his firm has been aiming from the beginning at the consumer market in its large-scale five-year development of digital audio. The professional systems that Sony is marketing and will soon market are intended to help the industry get onto the technique and to give Sony an intimate grasp of the technology for expert use in consumer devices.

The hold-up on the home PCM phonograph, as everybody knows, is the lack of standardization. Firms with prototype PCM phonos at recent meetings have told *BM/E* that they are putting final development on the back burner until the industry agrees on one system.

There is strong agitation among Japanese industry leaders and government officials for an agreement. Representatives of about 35 firms met in Japan in the spring for discussion, but no consensus emerged. Spokespersons of the various firms are now wary of predictions about the timing or nature of possible standardization. But the economic and political pressures for an agreement are tremendous, and it is hard to believe that the industry will delay it for too long. Gregory Bogantz, executive at RCA's Indianapolis plant, said of the digital phono at a recent technical meeting, "It can't be stopped."

The decision could, of course, be thrown to the consumer, but that would be extremely costly for everybody and might kill the whole development, as it did four-channel sound: the consumer wants and deserves access to all the software when buying a machine.

When we get the discs, they will supply radio with program material of super-technical grade. If the form finally chosen has random access s capability—the laser system has this—the discs could be part of a radio automation system. As compared with the videocassette PCM systems, the discs would not supply capability for recording and re-recording by the user. Perhaps both kinds of digital audio would be in the automation setup, the discs to bring program material into the station for dubbing onto the videocassettes, the whole process maintaining super-grade quality all the way though.

The transmitter and receiver will be standing between that quality and the home radio listener, who by then will have a personal PCM disc machine to supply the new super sound. Transmitter quality is a large topic in itself and *BM/E* wants to explore it in some detail soon. Here we can say that there is no reason for permanently accepting the transmitter as a choke point in the quality chain: recent trends are toward sharpening transmitter performance, and those trends will be accelerated.

Many in the industry have in the past been skeptical about any quality advances in the broadcast chain because of the very low quality of so many of the radio receivers now in use. But there is now quite a bit of evidence that substantial upgrading of the signal on the air comes through at least to some extent on low-grade receivers.

However, the standard kitchen-table $9.95 special will obviously always sound like garbage compared with a laser-disc home phono. If the user is disturbed by this discrepancy, he might cut down heavily on radio listening. Or he might buy a good receiver, if he knows that the radio station is actually putting an excellent signal on the air.

That suggests a two-part response by the radio industry to the coming of the digital phonograph. First, radio broadcasters must, in fact, get the new sound quality on the air. Then the industry must educate the public on a grand scale to the fact that the good sound is there, with suggestions as to how to bring it in. Such an educational campaign could bring huge rewards to radio broadcasters, to receiver manufacturers, and to the consumer. **BM/E**

Teaching Digital Recorders To Speak Each Others' Languages

The drag on the advance of multitrack recorders, imposed by the proliferation of standards, might be removed if a proposal made by Bjorn Bluthgen of Polygram Records in Germany were adopted by the industry. Actually, Bluthgen's idea was one of several that came up in recent meetings, all looking toward one kind or another of "multi-standard" operation that would allow digital tape systems with different standards to interchange tapes without difficulty.

Bluthgen's projected system seems on the surface to have a great deal of logic. The main idea is that each of the operating standards of a digital system be called up by a code word or words which could be recorded along with the program at the beginning or in the "interblock" areas, which correspond roughly to the frame and line intervals on videotape. The standards that would have to be specified cover a very long list, reflecting the high complexity of digital recording as compared with analog techniques. Among the many variables controlled by the codewords would be: number of bits/sample; length of sample A-B checkword (or other error correction coding method); cyclic redundancy checkword; sync word; number of interblock area bits; block format with the data sequence program; data-block format with its sample word interval program; number and allocation of data tracks per audio channel; clock rate; sampling rate; tape speed; and data modulation code.

With the codewords on the tape, the machine receiving the tape for playback would be "instructed" what variety of digital machine it must be to play the tape properly.

There would be enough memory in the system to make available any normal standard for each of the system characteristics. Bluthgen admits that the cost of memory is a present disadvantage of his proposal. He hopes the down trend of memory costs will remove this before too long.

In the same paper, Bluthgen discusses methods for preserving razor-blade editing with digital recording. His solutions to this problem are also very ingenious. The electronic editing systems now on the way, however, promise to bring precision and versatility far beyond anything attainable with a "hand" editing method.

Among the several other interesting papers addressed recently to the digital standards problem was one by Martin Willcocks of Advent Corp., given at the Midwest Acoustics Conference in Chicago in May. Willcocks discussed the basic mathematics of converting from one sampling standard to another and showed that the operation could readily be implemented.

OLBY FM: QUALITY CALL LETTERS

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not everyone has heard the difference Dolby FM can . That's why at the NRBA convention Dolby Laboratories will be conducting brief demonstrations of the Dolby FM system.

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STAGE CENTER, THE MICROPHONE!

The new sound in radio and television, among its many other results, is bringing back central attention to microphone technique among broadcast engineers who put any live material on the air. Here some live-pickup experts in radio, television, and recording tell how they get a good sound right at the start, in the outputs of their microphones.

"THERE IS NO HIDING PLACE out there!" might be the cry of microphones users in radio and television today (assuming the staffers were inclined to such self-expression). As radical improvements in signal handling are made along the chain of transmission, the listener will hear more and more clearly any blemishes in the signal produced by the microphones. Those blemishes will no longer be masked by the noise and distortion that used to be added all along the line.

At stake are the traditional (and widespread) faults of poor microphone technique: distortion and limited frequency response from use of inferior microphones; severe unbalance among the different instruments in musical groups; poor acoustics (too dry or too reverberant); bumps and flutter from echo effects, to name a few. Although the acoustic and balance faults may be subtle in some cases, they can nonetheless become crucial when they stand distinct and unobscured. They may determine whether the sound is pleasing or unpleasing, whether or not it grips the listener. And microphone technique, as pointed out below, can make a sharp difference in attractiveness not only for music programs but for some others as well.

Since the fundamental broadcast sound of the future will be stereo in both radio and television, the general story is about stereo mic technique. Many radio and TV listeners for years will still be using mono receivers. But if the sound is well-produced for the stereo listeners (who will be an army in any case), a good mono follows easily. There are several different ways to do this: by matrixing, as in FM stereo, to provide an L+ R signal that the mono listener gets; by transmitting (in TV) both a mono and a stereo signal; and in several other ways.

Three ways to pick up stereo

Some readers may welcome a very brief review of stereo mic basics; those who want to can skip over to the specific recommendations from practicing engineers. There are three distinct approaches to stereo pickup. One uses two coincident mics, one above the other in the same spot in the horizontal plane: this technique is very popular in England and in Europe. The mics are directional, with one oriented toward the left sector of the musical group and the other toward the right sector. There are variations on this, a main one being the orientation of one mic straight ahead, the other at right angles; this requires matrixing.

The main reason for the coincident mic technique is that it avoids phase differences that may punch "holes" in a sound that travels different distances to the two mics. Most American recording engineers, however, prefer the second system, with two mics some distance apart across the front of the musical group. This can produce much more "spread" and depth in the stereo image. Phase cancellations are controlled in various ways, as noted in some of the following reports from engineers.

For example, Jack Renner, who has worked with Soundstream on may of the digitally mastered recordings produced by that firm (see article in this issue on digital audio), told *BM/E* he uses two omnidirectional microphones separated in front of the musicians, plus a third mic somewhere in the middle to produce a "center mono" that reduces phase cancellations.

This is ultra-simple in basics but is likely to be complex in practice because the balance among the instruments, and the balance of acoustical quality between the dry and the reverberant, depend on the exact placement of those two mics. Recording companies often use the third method, many mics with multi-channel recording, and get their balances in the mixdown. But there is a growing two-mic group composed of people who think the musical results they get are often superior that way.

The difficulty with the two-mic technique, of course, is the very high skill needed; but this is a fact of life in greater or lesser degree with all mic techniques. The mic user needs experience, skill, and some degree of personal artistry. These qualities come with practice. The engineer learns how to move his mics if the sound is too dry, or too mushy, or too anything; or if the trombones are too loud or the cellos too soft. In a strange hall, this may take considerable trial and error, but the engineer's experience will guide him to likely solutions.

The general rule guiding trials of this kind is known to everybody: mics close up for a sharper, drier sound,

farther back in the hall for more reverb.

As already noted, if the engineer can use a number of mics and multi-channel recording, his balance problems are easier to solve. However, if the sound is going out on the air, balancing becomes a skilled operation.

Scott Schacter of NBC television puts on a spectacular demonstration of this kind of skill each week as the noted audio man of *Saturday Night Live!* Schacter is often faced with a famous rock group in the studio, and has a number of microphones in place to pick them up. He has a very elaborate multi-channel console under his hands, with equalization on each channel and other features.

Schacter told *BM/E* that he often listens to the recordings of a rock group before the program goes on and tries to duplicate the sound in his own mix. "With good modern equalization you can do almost anything," he noted. So far, the sound on this show is mono, but the operation involved will be much the same in stereo.

One of the most highly experienced professionals in the United States, when it comes to pickup of large musical groups for broadcast in stereo, is Richard Kaye of WCRB Productions in Boston (see profile of WCRB in *BM/E*, September, 1979). For years WCRB has recorded the Boston Symphony, the Boston Pops, and the New York Philharmonic for syndication to radio stations around the country.

Kaye gave *BM/E* a brief summary of his mic technique. In Boston Symphony Hall, one of the premier halls of the world in acoustic character, Kaye uses two widely separated mics, one for each channel, at points fairly near the orchestra determined by careful trial and error. These are for the major part of the sound energy. Each channel has a secondary mic well back in the hall which can be mixed in to add any selected degree of reverb if the sound is too dry for the music.

The phase cancellation problem is taken care of basically by the hall itself, which notoriously produces a blend of the instruments, with enough of each instrument on both sides to eliminate serious holes in the sound. Kay sometimes uses additional close-up mics to improve the clarity of soloists or choruses when words must be clearly enunciated in the recording. The same sometimes applies to violin soloists, to make the performer's skill and musical artistry clearly apparent. These close-in solo mics are not for level, and are carefully adjusted simply to improve clarity, not to change the balance of sound.

In New York's Avery Fisher Hall, the situation is somewhat different. The hall produces less blending of the instruments than the Boston hall does. Moreover, the management of the New York Philharmonic has a somewhat different philosophy of recording than the Boston management (executive preferences can be an influence on mic techniques in radio stations, too).

The result is that in New York, Kaye uses his two main microphones for basic stereo separation, but not for nearly all the sound level as in Boston. In New York there are additional microphones to pick up each section of the orchestra separately. These mics are permanently in place and are practically always used.

Each recording, therefore, requires a prerecording rundown to get the balances right for the music to be played. In addition to the "section" mics, solo mics are also used when needed. The whole pickup system feeds a large, modern console at which the mixing can be done with precision.

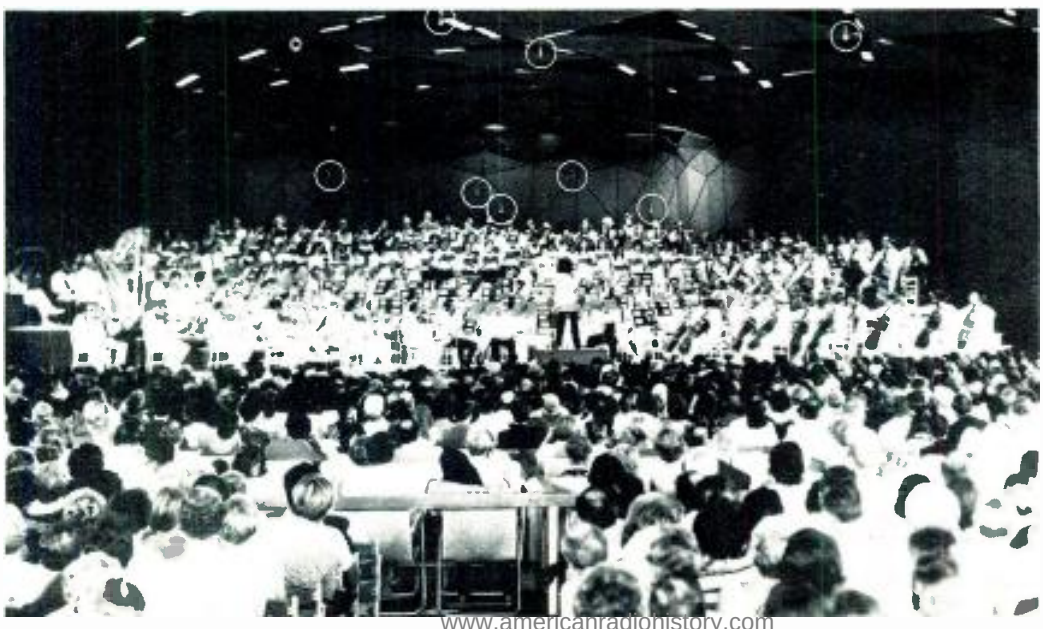
Kaye noted that before the most recent rebuilding of Avery Fisher Hall, WCRB used artificial reverb in all recordings made there. That is no longer necessary; the hall now supplies adequate reverb.

Commenting further on the phase cancellation problem, Kaye said that in a strange hall where he and his team did not have experience leading to placement for a good blend of sound, he might use a center (mono) mic to reduce phase problems. And praising the blending power of the Boston Hall, he pointed out that recording companies who come in to make commercial recordings there have to spread the various groups in the orchestra far from each other to make the multi-mic technique, now nearly universal in large record companies, work reasonably well.

As a final note on the phase cancellation problem, Kaye said that he often finds coincident mics giving excellent results with chamber music or any small group.

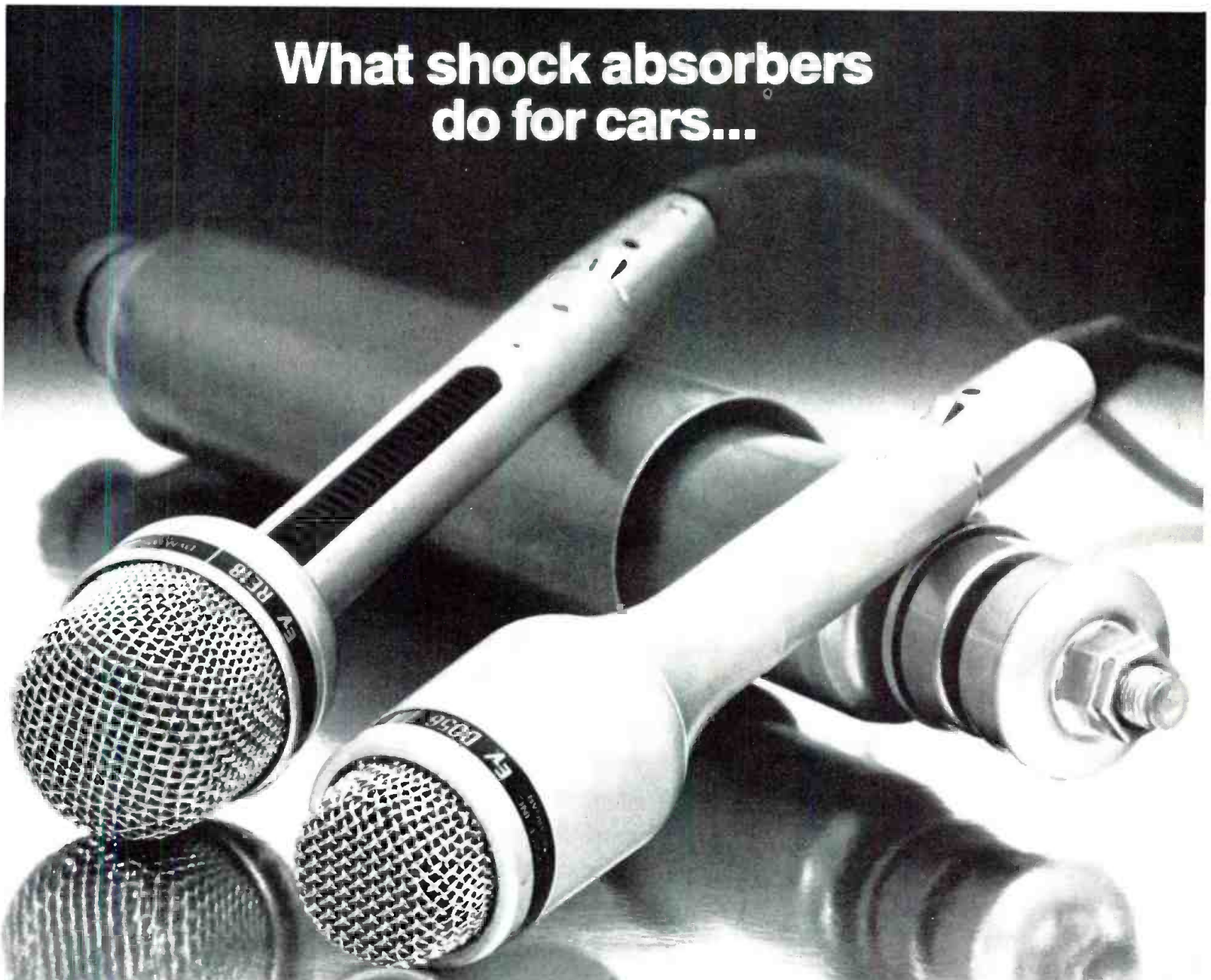
Edward Williams, associate director of transmission engineering at PBS in Washington, agreed with *BM/E* that the high audio quality on the networks (particularly on the PBS DATE system, described in another article here) is putting pressure on local stations to upgrade their audio. He said that network shows now often sound sharper and clearer than local ones; the local staff must look to improve its own performance. This is going on in may PBS-affiliated stations with new consoles and other equipment.

Essential to this upgrading are better microphones, he noted; and this puts needed attention on the choice of



Some of microphones used in recording Boston Symphony and chorus by WCRB for radio syndication are circled in photo, taken in Tanglewood music shed. In foreground, center and right, are "reverb" mics (see story): over orchestra are main left-right mics; near chorus are some "clarity" mics

What shock absorbers do for cars...



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Stage Center, The Microphone

microphones for a really good sound. A good microphone costs a lot more than a poor one, generally speaking. Without a wide-range, low distortion mic, however, even the best technique can't produce a really top-grade result.

Williams reported an exciting encounter with Japanese TV stereo in sports programs (as did some others interviewed by *BM/E*; see the story here on TV sound). He liked the sense of the crowd noise around him, the play action sound moving across the scene. Williams strongly recommends that American television staffs consider originating sports in stereo even now, when it can be available to the viewer only through occasional simulcasting. And why not stereo in ENG in general for a sharper, more exciting sound, with ambient noise aiding rather than obscuring the main effect?

He remarked on the problem of sound perspective when the TV cameras focus on one or a small group of performers in a large music group. Should the sound be focused directly, too? His conclusion is that the sound perspective should not change in such cases; eye focusing is enough to give a psychological emphasis to the sound from the selected soloist.

Mark Schubin of Lincoln Center, involved for several years in the refinement of the *Live From Lincoln Center* simulcasts, also believes that the sound perspective should not change in a large-group pickup when the cameras focus on certain performers. He said they have found at Lincoln Center that the overall sound pickup must have something of a "close-up" quality so that the viewer doesn't get a shock when the camera shifts to a soloist. Constantly changing the sound perspective would upset the viewer drastically.

He said that a major part of the problem television engineers face in deploying microphones in many kinds of large-scale music broadcasts — symphony, opera — is how to get a good acoustic balance and a low-noise pickup with microphones that must be out of camera view. Highly directional mics are an obvious approach — Lincoln Center finds it necessary to use shotgun mics in opera pickups, for example — but Schubin noted there are still problems in the use of such mics. He thought the new, high-quality wireless mics might be good for many kinds of television shows, including drama, comedies, and police shows. The mic or mics could be out of sight behind some object in the scene, or even in view if somewhat disguised, and no cables would signal their presence.

Jim Mancini of WTTW in Chicago points out, however, that there are many telecasts in which on-camera mics will be unobtrusive or naturally present. An example is a rock concert like *Sound Stage*, originated at WTTW: audiences expect mics as part of the stage paraphernalia in rock music. In talk shows, though, WTTW does use hidden or very unobtrusive mics.

Will Morton of WGBH in Boston, where telecasts with special attention to sound have been originated for a long time, also notes that large-orchestra pickups with many mics can sometimes have the mics in sight if they are carefully placed. When that doesn't work, shotgun mics on booms may be useful; double-booming may be necessary. For talk shows, lavalier mics are one solution, as they are for WTTW (and probably most other television operations). **BM/E**

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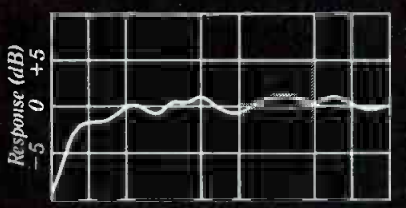

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HOW TO MAKE RECORDINGS THAT SOUND GOOD ON THE AIR

By Vladimir Nikanorov and Loring S. Fisher

A recording for radio broadcast has to be different from one designed to be played on a home phonograph. Here are the reasons for that, and the methods used by a syndicator of radio programs to put recorded material in proper shape for broadcasting.

IMAGINE A MUSICAL program director of a radio station wearing a hearing aid; such a program director would select music regardless of the way it sounds. Then the station's chief engineer, who was told to come up with a "quality" sound, would build a mass of audio processing equipment, one device on top of another, to compensate for the difference in sound of the selections. Add a frustrated listener to the two and a picture of a typical radio station is ready.

Even though the musical programmer is not deaf, the situation for an independent radio station is not much better because nearly all of what is available for musical broadcasting is phonograph records recorded for home entertainment.

There are about 560 registered recording companies in the U.S. with an estimated 2500 recording studios. Some 360 of the professional recording studio equipment manufacturers supply the studios with their devices. An army of more than 10,000 recording engineers is involved in recording, mixing and cutting discs; this does not include movie and television soundtrack recordings, which are often used to produce records. The differences between musical selections represent different equipment and acoustics of recording studios, different sound perceptions and styles of engineering.

The processing equipment that is expected to produce a miracle in sound quality has its own limitations and tends to display results directly proportional to the amount of money paid and inversely proportional to the level of expectations. So the final results are always less than they could be if the station were to originate uniform musical programs right at its studios and get rid of all the heavy processing. Such an "incredible" idea is not something new or unknown. American radio stations used to produce and transmit live performances from their studios when it was profitable. In Europe, this is still the case.

The element of program origination, or program source, is recognized as the most important factor in determining broadcast quality. European radio stations are designed in such a way that they transmit uniform material originated on the spot. In the United Kingdom, for instance, most broadcast musical programs are originated by BBC. They are either performances transmitted by BBC live or material recorded by BBC, often in the same studio.

BBC is a good example; its equipment and working requirements are standardized in the broad sense of the word by the European Broadcasting Union. BBC has a few dozen recording studios in London and its suburbs, several of them located in Broadcasting House. Among them are the BBC Concert Hall, designed for chamber and instrumental music and small orchestras; a complex of three music studios at Maida Vale in northwest London, one of which accommodates a full size symphony with chorus; Golders Green Hippodrome for the BBC orchestra; and so on. Various concert halls have permanent BBC installations and are connected directly to Broadcasting House. The result of this approach is uniform and high-quality program material *designed for broadcasting*. In the U.S., however, the principal program source is the phonograph record — engineered for the home stereo audience and not for the broadcast process.

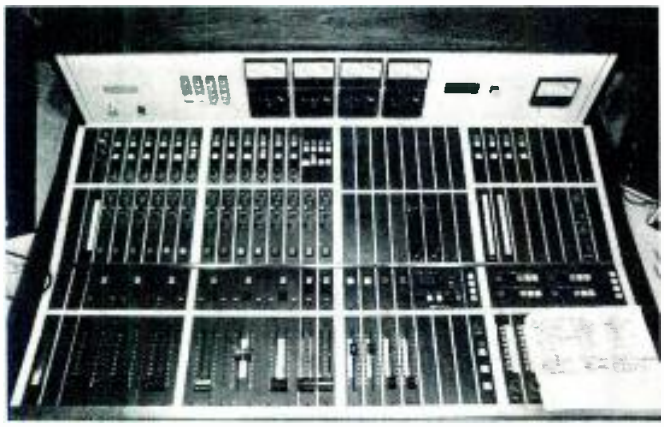
Nevertheless, technical advances such as direct-to-disc recording and the growing popularity of digital recording suggest that the general quality of recording will be greatly enhanced. Though the U.S. does not have the superior live broadcasting facilities and practices of the BBC's "live" operation, our adoption of the new recording technologies is likely to bring our quality abreast of the British, at least, and perhaps surpassing them. While the technology will be available to the BBC, the strength of their unions and their heavy investment in current systems is likely to retard their advance relative to our own. Already, the best musicians worldwide are defecting to U.S. recording studios where this technology is available.

The theory at Bonneville is: As most recorded program material is not designed specifically for broadcast, available material must be carefully processed in order to undo what has been done in the production of the original recording that is anathema to broadcasting, and to redo what needs to be done in order to provide program material truly compatible with the broadcast process.

It is also part of the theory at Bonneville that if we can provide uniformly high-quality recordings to stations, the cost of this programming will be at least partially offset by subsequent savings on their technical operations. That is, with programming designed for broadcast, the expensive (and rarely effective) processing equipment buildup at stations is rendered unnecessary.

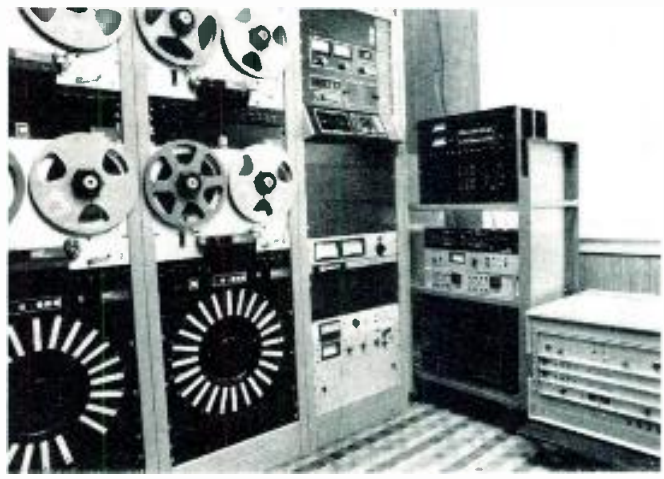
To achieve a high-quality sound from recording for use in broadcast, a specially designed facility with customized equipment and a series of specialized practices have been established at Bonneville's Tenafly, N.J. location. The production studios are designed for transcription of prerecorded material from conventional sources: records or tapes. Studio number one (Figure 1) is equipped with a

Vladimir Nikanorov is technical director and **Loring S. Fisher** is executive vice president of Bonneville Broadcast Consultants of Tenafly, N.J.



The custom-built McCurdy console provides −80 dB S/N and +40 dB headroom for a dynamic range of 120 dB

Studio control room B. The stereo phase meter (center) helps the operator keep phasing within one degree



The final Bonneville product is played through their own automation system in conjunction with various broadcast chains similar to the ones used at the client station

custom-made mixing desk with 16 inputs and four outputs and Studer A80 tape recorders. The room is acoustically tuned in a way that the mixing engineer receives virtually flat sound. The console was made by McCurdy in accordance with Bonneville's requirements and specifications.

Studio number two (Figure 2) is also acoustically tuned. It too has a McCurdy console with 16 inputs and four outputs; it is equipped with Studer A80 machines and Ampex ATR100 recorders. In addition to its transcription abilities, this studio is also used for voice recordings. The main product of both studios is master tapes for high speed duplication.

Duplication is accomplished by Bonneville Productions, located in Salt Lake City. Bonneville Productions consists basically of four recording studios. First is a Westlake-type design studio that accommodates a 50-piece orchestra. Another is primarily for instrumental music, vocal overdubbing, and rock groups (accommodates 25). The third is used for animations. There is also an installation in the Mormon Tabernacle in Salt Lake City, Utah. The auditorium, which accomodates a big symphony plus chorus, is known around the world for its excellent acoustical qualities.

To assure the quality of the product that comes from these facilities, a laboratory has also been established. The laboratory consists of basically three parts: the test equipment, the facilities of Bonneville Broadcast Center, and Quality Control facilities (see Figure 3.)

The broadcast center is a Control Design automation system, the output of which is routed through a switch into the QC room to select various processing equipment. The processors chosen by the switch feed several exiters that can be switched to one or another chosen processor and are terminated by dummy loads. Figure 4 is a block diagram of the broadcast center. Stray RF, dissipated by the dummy load, is enough to drive a tuner in the QC room and receivers at Bonneville offices.

Production techniques

Without exception, all broadcasting syndicators claim that their tapes are of highest quality possible, but so far nobody ever made an attempt to describe how the quality is actually achieved. One of the keys to quality product is good specifications of the recording equipment, and this means understanding which specifications are most critical.

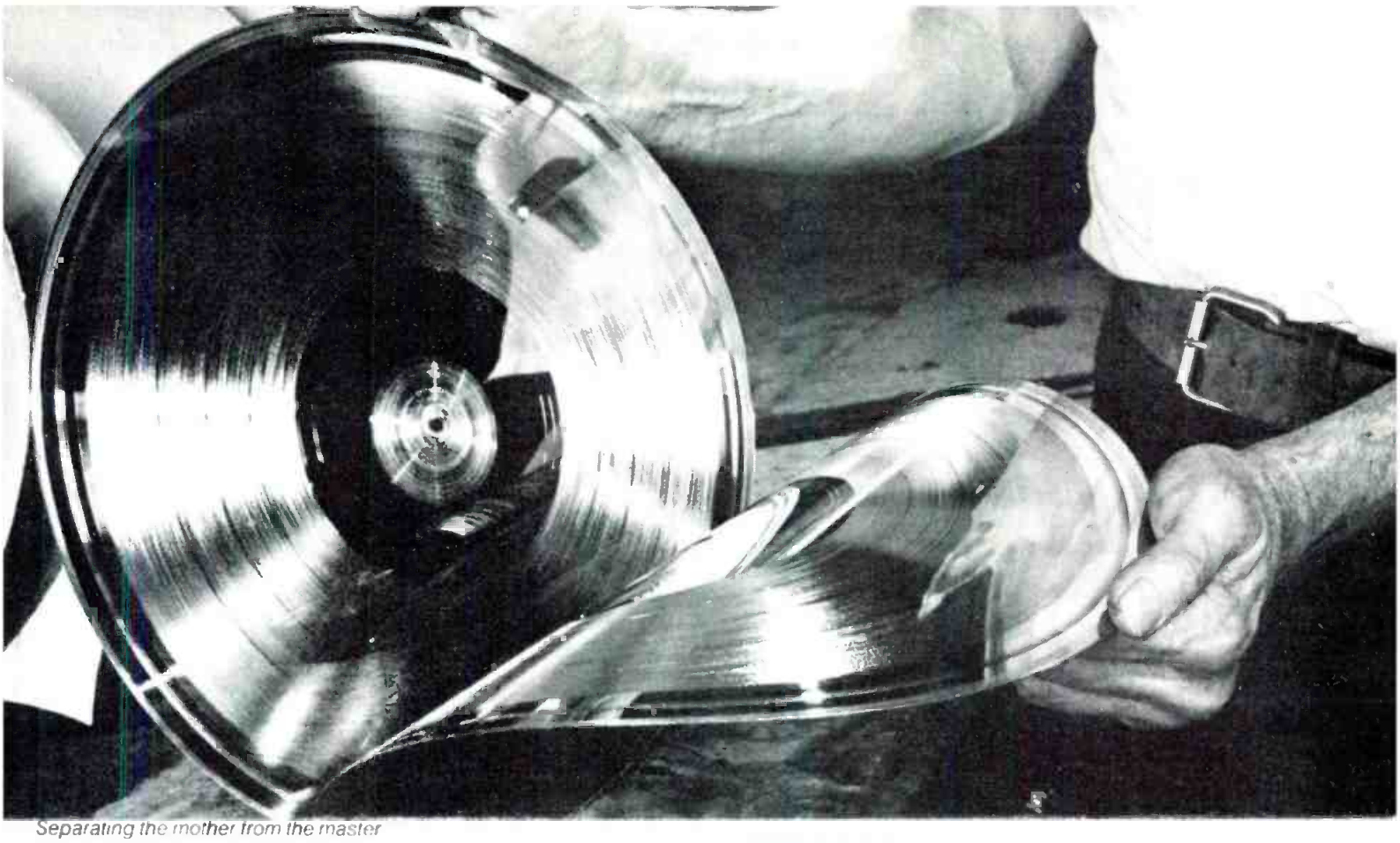
The most important parameters are signal-to-noise ratio, distortion, and frequency response. Equally important parameters which sometimes escape specifications are headroom, IM distortion, the ability of equipment to pass transients without altering the wave form characteristics, and phase response.

To give an example, Bonneville's number one mixing board signal-to-noise ratio is better than -80 dB and headroom is+40 dB, so that the desk is capable of passing 120 dB dynamic range. This is achieved by using low-noise electronic components and a studio configuration which does not require 600 ohm conventional terminations. This, perhaps, would not present advantages to a radio station; on the contrary, elimination of 600 ohm terminations could result in greatly reduced flexibility and redundancy.

Dynamic levels and balances

When Bach and Mozart composed their music they did not anticipate the frustration and intervention of a future recording engineer and broadcaster. Original scores were oriented to a performance limited by the acoustical balance of instruments in an orchestra. Although Bach himself frequently expressed dissatisfaction with the situation, it has actually never improved since his time.

The problems that Bonneville faces are similar to the ones that caused frustrations to the great composer. Prerecorded material used is a finished product in the form of disc or tape. Acoustical and electrical balances, timbres of instruments, echo, and noises are all encoded in the tape or a record. If this record is played at home in the form of an album, a listener most likely would adapt to the sound over the course of play and might not even realize how good or bad the sound is. But imagine that an individual likes to spin records in a manner similiar to the way a radio disc jockey does. The differences of character of selections played one against another can be noticed immediately.



Separating the mother from the master

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Once the recording studio has delivered the lacquer disc to the plating plant it is sprayed with liquid silver making it electroconductive, and then electroplated with nickel, which is separated from the lacquer. The nickel is now a negative image called a master, and has, instead of a groove, a ridge that comes to a point. The master is treated and nickel plated again and upon separation forms a mother, a positive metal record. Engineers rely on the Stanton 881S cartridge in playback evaluation of the mother.

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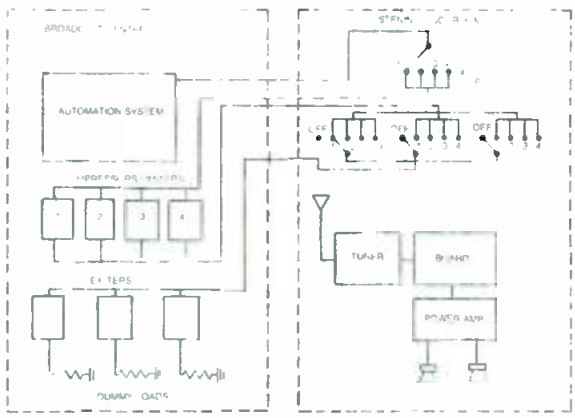
Recordings For Radio



Block diagram shows quality control system used to assess performance level before music is shipped to client station

These differences and the techniques for their identification are actually subjects for a separate and quite sizable article. A few major ones, however, could be mentioned here. One of the major differences in recordings is levels. Human hearing reacts mostly to RMS levels which give us a sense of overall loudness, but we also sense peaks which go above RMS levels. Those peaks produce additional distinct differences in perception of sound because they shift our sensitivity to high frequencies and low frequencies in accordance with Fletcher Munson curves.

Conventionally used VU meters were designed more or less to follow RMS levels. The meter integration time is 300 milliseconds, so only peaks longer or equal to 300 milliseconds are shown accurately. Shorter peaks will show less level.

If two identical program materials look the same on the VU meters but sound somehow different, there is a good chance that the peak levels of the two are different. Such peaks can go up to+30 dB or more above the average levels and overload devices through which they are passed. The peaks are therefore monitored by peak meters. Peak meters, in conjunction with VU meters, help to establish the peak-to-average level ratio, one of the most important factors in terms of uniformity of sound signal for broadcasting. They also help to prevent high level peaks from overloading audio chains and oversaturating magnetic tape.

Problems of equalization

Another major problem is frequency distribution. Everyone's experience based on use of hi-fi equipment indicates that if sound is muddy, treble must be turned up, or if it lacks bass, then the bass has to be turned up. Theory based on spectrum analysis indicates, however, that brilliance of sound does not depend only on the level of high frequencies and prevalance of bass does not always mean a high level of low frequencies. Sound character depends on the balance between frequency bands.

Of course, different equipment, acoustics, and recording techniques always produce different sound character. But it is possible sometimes to figure out what was initially done based on studio common practice. For instance, it is possible to trace down the original frequency distribution of a recording based on typical EQs which are routinely used in cutting laboratories. If the desire is to produce the real sound of the program a mixing engineer can then do the opposite of what was done originally.

There is a story which is told among broadcasters about a well known "audio guru" who used to come to radio stations with a "black box." The box properties were such that if it were connected in place of any given audio processor in a broadcast chain -- an AGC, a compressor, an equalizer or so on -- quality of the sound would be instantly improved. The rumor said that inside the box were two straight wires.

The story might have more truth in it than the humor suggests, but what is generally overlooked by proponents of "flat" reproduction is that literally all prerecorded material is processed. It is equalized and compressed at least twice: once during the recording mixdown session and once again during disc cutting.

Broadcasters, whether they like it or not, are involved in equalization. From the moment the phonograph needle touches the groove, the signal begins a journey that passes through an RIAA equalization network built into the phono preamp, probable FM preemphasis and deemphasis (each 45 microsecond equalization curves), and equalization associated with most STLs. EQ is just as much a part of tape recorder systems, which typically employ NAB or other built-in equalization.

Therefore, the straight-wire concept does not seem to have much place in the real broadcasting world. However, the jock's suggestion is valid: audio processing at a radio station is always a tool to achieve loudness at the expense of quality.

Pressures coming from increased competition and the tremendous number of stations and diversity of programming to be found on any dial virtually force radio stations to seek ways to make their signals stand out by being louder, or certainly as loud as, the competition. Loudness is a controversial benefit of attempts to homogenize and smooth out the disparities and differences of prerecorded material assembled for airplay. A factor which also contributes to the problem and has to be recognized is inadequately trained personnel. How many times have program directors exclaimed that it's impossible to train people to pay attention to meters? Sometimes an operator will have a meter barely moving or showing mid-scale indication while at other times it is pinning. With this kind of variation the end result perceived by the station manager driving along the road in an automobile, comparing his station's performance to another, is likely to result in exclamation of, "You've got to make our station louder than WXYZ."

The very range and disparity of operation technique and operating level compounds the problem. Even if operators were to observe meters assiduously, one could go off on a tangent to describe the anomalies of different AGCs, compressors, limiters and meter characteristics.

The problems outlined above cannot be cured just by playing Bonneville tapes on the air. There are no tapes that encode compensations for all possible variations of a radio station's performance. But the tapes *are* prepared to be aired and attention is given to broadcasting requirements. The specifics for Bonneville productions are provided by the laboratory and broadcast center.

The broadcasting center serves the following basic purposes: it helps the creative music programmers to evaluate a flow of music by imitating real broadcast situations, it allows a determination of how a particular recording approach affects quality and uniformity of sound on-the-air, and it helps to choose equipment for the best performance on-the-air.

Phase response

Another Pandora's box in the description of production

for broadcasting purposes is the phase relationship between stereo channels. Phase conformity is absolutely vital for fidelity reproduction of the sound signal. If the phase shift between channels is more than 25 milliseconds, the original stereo image is distorted. With increasing phase shift, stereo becomes fuzzy. Loss of high frequency content within a channel is audible if phase shift measured at 8 kHz is more than eight milliseconds. Audible cancellation occurs if phase shift of signals electrically combined to mono is more than .025 milliseconds (3600 seconds equals one degree).

The most complicated parts of the audio chain in terms of phase response are turntables and tape recorders. Turntables, for instance, require audiophile-type arms which are not only precisely adjusted for trackability but also can be adjusted for a perspective cutting angle just as heads of a tape recorder have adjustments for azimuth and zenith.

Literally every stage of production can change the phase and has to be adjusted for optimum phase performance. Level adjustments, frequency response, bias and so on are done by VU using sine waves. However, phase shift in prerecorded material is not always related to the transcription equipment adjustment. It could be encoded in tape or record during recording, mixdown, disc cutting, or copying sessions. Therefore, the phase requires continuous observation, which is done routinely during recording by scope and "mono" level indicators mounted on the mixing desk. It is also measured during adjustments by a laboratory-type phase meter, Wavetek model 740.

The production process

The first step is the recording of the master tape. The tapes are recorded at 320 nwB/m, which improves S/N on a master tape substantially by comparison to standard levels. NAB standard recording level is 185 nwB/m. Each tape is provided with level set tone and high frequency tone for phase and high frequency level adjustment.

The second step is editing. The editor's job is to eliminate all transient noises that don't belong to musical content and place the musical selections in order, adequately spaced.

The third phase is quality control. All selections are listened to in terms of overall quality and uniformity of sound; phase and frequency response is measured. If any errors in mastering are detected then the selection is sent back for remastering. The quality control room is shown in Figure 5.

The last step is high speed duplication and QC of the final product. The high speed duplication system is a customized Gauss 1200 series. One of the features of this duplication is "focused gap" heads that provide better frequency response and S/N.

The operations are straightforward. Master tapes are duplicated and then played real time at 7 ½ ips. The tones must be within+1 dB with respect to the master. Phase is measured by a Wavetek F40 phase meter, used on all the stages of production, which must show no more than ±15 degrees. If the measurements and sound are satisfactory then the tape is shipped to a radio station.

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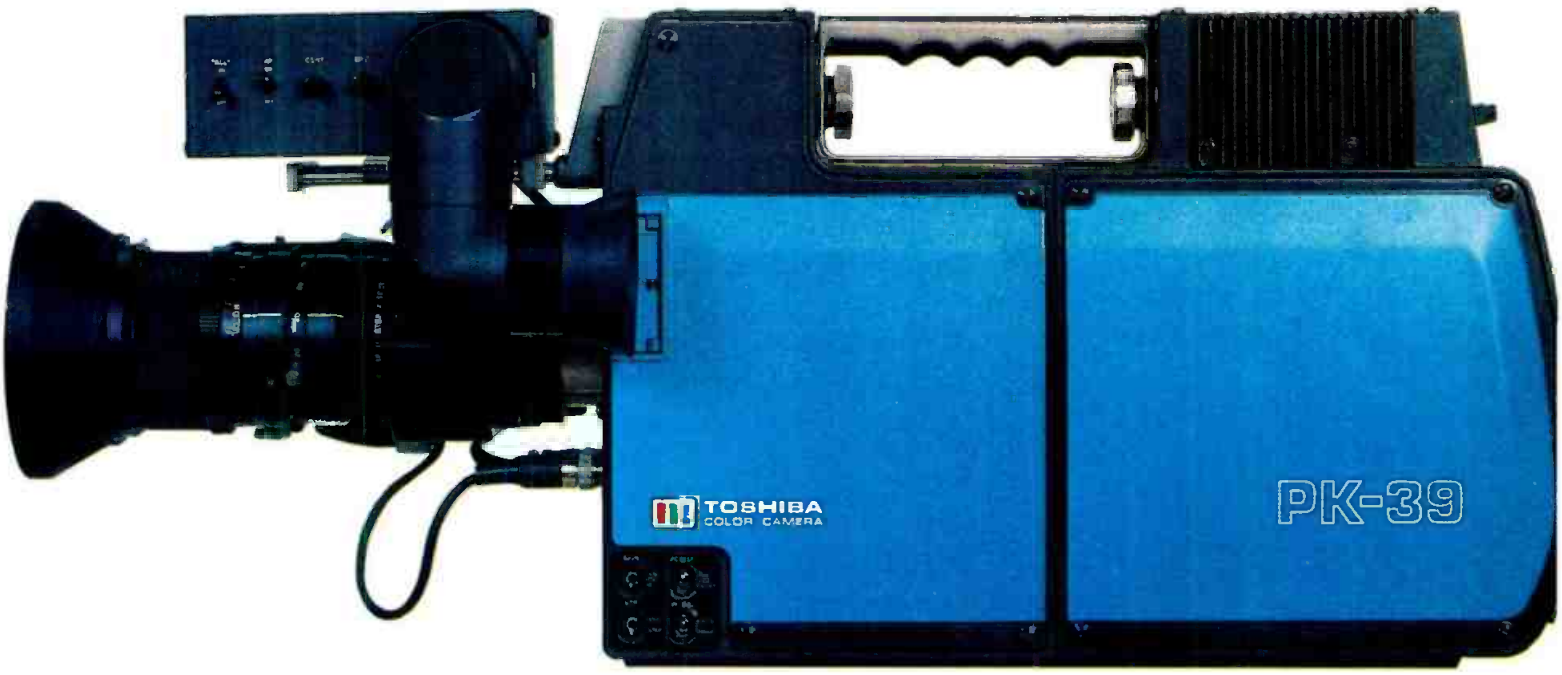

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FOR GOOD AUDIO QUALITY, CONTROL THESE PARTS OF YOUR TECHNICAL OPERATION - PART 3

By G. Mark Durenberger

Turntables, consoles, remote pickups, telco connections, system design, and grounding are the main topics of this third installment of Durenberger's advice on how to get and keep the best audio performance.

THE EQUIPMENT AND TURNTABLES are available today to get topmost quality in a turntable line, and any station using discs must start there. A number of manufacturers now make turntable preamps with state-of-the-art performance.

Verify that your cartridge is looking at the proper load. Capacity of the pickup arm cable should not exceed that specified by the cartridge manufacturer. If it does, shorten the cable. If it's substantially lower, add a capacitor at the preamplifier input. Insure that the load resistor at the preamp is correct for your cartridge. Unless you're using the old passive equalizer with a flat preamp (ugh), you'll find typical cartridge loads around 47 K ohms.

When you measure response, don't worry too much about the extremes. It's more important that response be smooth through the major part of the audio spectrum.

As with the tape cartridge, low-frequency garbage can cause problems. Put the needle on an LP with the motor stopped, and open the fader. Pound on surfaces adjacent to the turntable or drop a dictionary on the floor. Does the console VU tell you you've got a problem? Maybe the turntable isn't isolated in its own base or cabinet. Or perhaps you need a sandwich-type base for the cabinet, functioning as a mechanical filter. Mounting the turntable on a sand-filled pedestal is the solution of some engineers.

Crank the fader and the master wide open and move the arm around. Does the cartridge pick up hum from the turntable motor or an adjacent transformer? Perhaps the preamp power and output transformers need to be removed from each other to get the noise down below turntable rumble.

Expect to pay in the thousands of dollars for a truly state-of-the-art turntable system. But it's one area in which you can beat the home system, so don't skimp!

Don't let down standards in a production studio!

The production studio must certainly be considered a major source of broadcast material and operating specs should meet or exceed those of the main console. Needless to say, both the record units in production and the playback machines in the control room are part of the same system, but when was the last time you did a quick check of response and noise starting in production and ending in the control room?

Here again, pink noise and an audio spectrum analyzer allow the job to be done daily. An invaluable tool in the production studio is the calibrated monitoring system. At the very least, it should consist of a pair of professional bookshelf monitor speakers (JBL 4301 or better), a professional power amplifier such as the BGW 100B or the Crown D75, and a third-octave equalizer.

If you consistently monitor at high levels, much more power and bigger speakers will be needed. Don't make the mistake of underpowering your speakers. Clipping products resulting from a solid-state amplifier being overdriven will destroy a high-frequency driver a lot faster than will pure raw power from a bigger amplifier.

Equalization is accomplished either with pink noise and an audio spectrum analyzer with calibrated microphone or a pulsed measuring device such as the UREI Sonipulse. Energy is measured at different points in the room to spot any standing wave problems. The equalization is adjusted for a "house monitor" curve. This monitor system becomes the frame of reference for your entire station sound. In the monitor circuit is a selector switch which allows you to monitor any point in the operation, including all of the audio processing, allows you to perform A/B comparisons, and has a mono-sum switch to see how your stereo sounds to the mono listener.

Two-channel versus stereo consoles

The production console itself should be at least two-channel, although stereo is an acceptable compromise. If this sounds a bit strange, remember there *is* a difference. A two-channel board is usually more flexible. All faders are mono and can be assigned to one or both channels or through a pan (balance) pot to both. It's necessary to move two faders at the same time for stereo work and this is one reason the slide-fader consoles are so popular.

The stereo board has a stereo fader in each position, but it's not quite as flexible. The two-channel board also lends itself nicely to mono production work in conjunction with a multi-track tape recorder. A professional two-track with silent punch-in is more flexible and useful than two separate mono machines; a two-track and a mono are all you need to do three-machine work since the two-track has both A and B rolls side-by-side and in sync.

Except for some gentle compression in front of a cart recorder, the only other place compression could be needed in the production room is in the mic channel. Use the same rules as with the control room console. Remember that any circuit's noise performance will be degraded by the amount of compression employed.

Keeping automation equipment top-grade

Check the rated output of the playback machines. Some less expensive automation systems do not employ line

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amplifiers but simply run the machines wide open, using swamping pads to reduce switching transients. It is not uncommon for an automation system to deliver "0" dBm output with the machines running out of headroom up around +12 dBm or so. Unless you know your taped programs are peak-limited, allow the usual 15 dB or so of headroom.

As with other amplifiers, determine the optimum operating load. You might find the line termination switch on and the machine forced to look at a second load in the automation! If you're super-tweaking, investigate the idea of using an active combining network (ACN). Most automation systems are designed to run unbalanced. You might be able to remove output transformers in the machines, using the ACN and a line amplifier. While you're at it, why not remove the high-pass 25 Hz filters (there should be one in *each* channel) and substitute a new super opamp as an active notch filter?

If you do a lot of remotes, one of the best investments you can make is an equalizer, wired after the board remote input selector. Auditioning facilities are a must to preset the equalization. One of the small octave-band graphic equalizers will do a nice job, but again, pay particular attention to the headroom, remembering headroom is diminished by the amount of boost. This usually isn't a problem as all you're trying to recover is a relatively flat response.

Making telco pickups sound good

Telephone systems can be the topic of an entire article. Three generally accepted means of putting the telephone on the air are: (1) through an interface such as a recorder-connector (beeper), (2) the balanced-level mixing method (best fidelity), and (3) the speaker-phone system.

The speaker-phone method allows for easy connection of an equalizer in the speaker output circuit, but care must be taken with operating levels since the speaker-phone amplifier overloads easily.

The telephone can be made to sound great on the air. For the newsroom, a device such as Ma Bell's KS 19645-L2 provides excellent response, longitudinal and metallic noise rejection, adjustable automatic gain control, and easy interfacing with broadcast equipment. The beep can be shortened or removed.

If you do a lot of pickups with the voice coupler (the QKT arrangement), you may have already discovered there are diodes across the device to limit the amount of level you can feed into the telephone network. These usually start conducting at about zero dBm. Since many remote broadcast mixers deliver+8 dBm at zero VU, you can get in real trouble with a needle-bender announcer. It's best to pad the output to approximately - 10 dBm . . . being aware that noise will increase on the dial-up circuit. The biggest drawback to broadcasting through the Bell System is the frequency response, and devices are commercially available to extend response and lower the noise.

Pushing down noise in remote pickup equipment

The remote pickup unit should be mentioned as a source. The equalizer you're considering at the console remote input selector is a good tool to improve sound quality. But the biggest problem we encounter with the RPU is noise, and it's usually a signal problem.

You may not have a calibrated signal generator as called for in the alignment procedures on the receiver, but you can use one of your transmitters at a distance — you've checked the transmitter frequency and power as part of the annual FCC requirement anyway. Assuming the transmitter is far enough removed so no overload takes place, you'll be surprised what you can do to the receiver with the instruction manual and an insulated tuning wand. It's not at all uncommon to improve S/N by 6 dB or more by careful tuning and retuning.

Console installation for top quality

Now that we've poked around at source equipment, let's attack the console itself. These comments apply to the production and news consoles as well. Often the reason a console performs poorly is that it's not installed properly. Most consoles use an unbalanced mixing system. The less expensive consoles do not provide transformer isolation on all inputs and outputs and as a consequence the console common, as well as the low side of the mixer bus, is brought out to the external equipment and often grounded several times.

A single-point ground system must be used with all equipment common to a studio or installation. That point is usually at the console itself. All cahles in and out have shields tied to this point and floating at the other end. All inputs and outputs are either transformer-isolated or made active. Each piece of peripheral equipment is grounded through its own wiring, usually the three-wire ground plug into the rack outlet. (In high RF fields it may be necessary to use a piece of copper strap along the inside rack wall, insulating it at one end and bonding it to the rack as it leaves.) If the third-wire ac ground is used, a separate third wire must be run from *each* group of outlets back to the power company common (preferably near the station ground point). Don't rely on the usual method used by electricans, connecting the outlet to the conduit, because without that separate third wire, your equipment might be tied to ground through a series of thinwall conduit pipes, splices, and pull-boxes as it wanders from room to room!

Where did *that* noise come from?

Let's assume your console is properly grounded and is meeting or exceeding its noise specs as long as nothing but the analyzer is connected. The minute you start tying cables to the board, the noise starts to rise! You may be facing a board that's RFI-proof by itself but can't handle RF coming in through the leads. In the worst case, you may need low-pass filters . . . 2 to 10 mH chokes with RF bypass capacitors from each lead to ground will work.

Be aware that lead lengths in quarter-wave multiples of your FM transmitter wavelength can make dandy pickup antennas. RF may also be arriving via power supply or control leads. These must be bypassed, not only at hum and ripple frequencies, using electrolytics, but also at RF, with the use of mylar or disc capacitors.

In a console, ac is a no-no

This shouldn't need saying, but there should be absolutely no ac in a console if you're trying to establish superior noise performance. Better boards have an external power supply, properly decoupled at the console, but it's not unusual (though a bit scary) to find turntable 110 V ac start circuits brought up into the console through a fader assign key! For a few bucks you can purchase TTL or CMOS chips, a small 5-volt supply, and a relay. Pass just

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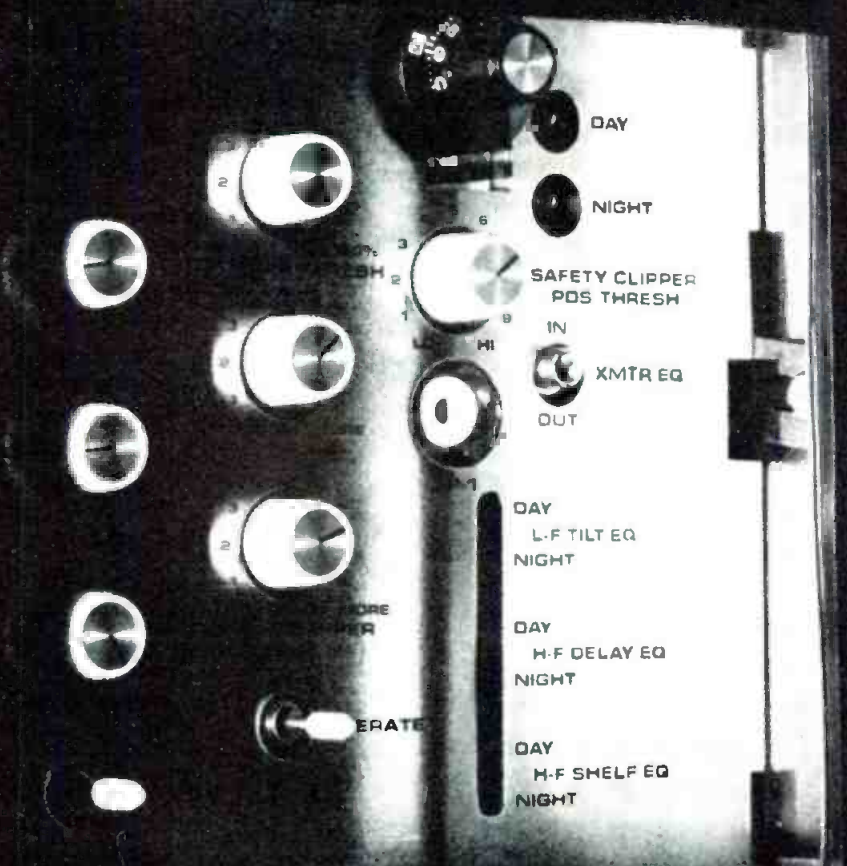

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a few mils of low voltage dc through your control switches, and watch the hum disappear while you multiply the life expectancy of the switches.

In addition to decoupling, bypassing, RF suppression, and a properly installed ground system, you may be able to further reduce noise in a console by rethinking operating levels. As a general rule, the higher the level you can obtain from your source equipment, the better you can make your console perform. Standardize on +4 dBm throughout the station, using boosters where necessary. Run faders as wide open as possible.

Unless you've got a real noise problem in a tube-type console, remove the output pads and redo the meter pad so the board delivers+4 into 600 ohms at zero VU. This will get you in line with the recording industry. If the board now delivers+20 dBm, you've got the needed headroom. If not, go after the modular opamp cards or roll your own again.

If this is your decision, scrap the conventional ladder-fader system with its build-out resistors in favor of the ACN approach. The ladders can still be used, providing they still see the proper input and output resistances. But once terminated, these ladders can look at a 10 K combining resistor at the input to the ACN amplifier. Adding faders is a breeze, and worn-out ladders can be replaced by high-quality potentiometers such as the A-B Mod Pots.

If you're not crazy about using input transformers, look to the active input as a state-of-the-art approach to a balanced input channel. Its common-mode rejection is excellent over a limited range. So is frequency response, lack of phase shift, and electromagnetic immunity. But care must be taken to employ a good high speed opamp, and the circuit must be designed to protect the opamp against differential-input breakdown and RFI. If you wish to use the opamp in its best operating range, a limited dynamic range is available. But a good active input is far cheaper and outperforms a high-grade transformer. Differential output circuits are becoming popular in limiters to eliminate transformer ring and consequent overmodulation.

Board specs: what they must be

Now that you've rebuilt your board, expect worst-case performance of less than 0.1 percent distortion, frequency response within 0.1 dB from 20 to 20 kHz, noise at least 75 dB, a minimum of 16 dB headroom, and greatly improved transient response!

By the way, stereo console measurements should also include phase response and simultaneous frequency response. An oscillator fed to both channels is swept up and down and the results observed on a dual-channel scope connected to the left and right console outputs

By the time we reach the console output in our systems approach, audio must be as near to perfect as we can make it in the real world. We're going to screw it up enough with processing as it is!

Now let's consider how the console fits into the overall station layout. It's extremely important that your station layout be accomplished with regard to every piece of equipment in every room. For many years brute force grounding was the rule. Exposed cable shields were all bundled together and bonded to racks wherever possible. There were obvious problems with this approach, but its proponents rallied around the argument that there were enough low-resistance paths to ground to make it work effectively. While some consoles still around employ this as a simpler approach, brute-force grounding has been abandoned in favor of the single-point ground.

The reason it's so important to consider your station a *system* is that to make the single-point ground work, there can be *no exceptions*. The rack, the console, the power supplies, and each group of equipment should have its common brought back separately to station ground. Shields on cable runs between rooms will usually be grounded at the console taking feed.

All unbalanced inputs and outputs, and this includes monitor amplifiers and cassette machines, are either transformer-isolated or active. If you're dealing with an older installation and cannot determine whether a cable is grounded or not, you can use disc capacitors on the order of 0.1 μF or so, connected between the shield and the ground point, as a path to ground for RF without creating ground loops. But this approach should be used only when all else fails, and is no substitute for careful system planning.

Get rid of shared commons!

Then there's the shared-common problem. I've seen installations where a 110-volt signal lamp is operated with a single wire, and the lamp current is forced to bull its way through the station ground! Exacting console designers even separate the audio power supply common from the common for relays, lamps, and control circuits. It's the only way to get down to doday's best possible noise performance.

A few words about distribution before we close out this section. A lot of circuits — network, air monitor, etc. — run throughout the station and sometimes matching becomes a problem. The classic approach to distribution — combining pads, then amplifiers to make up the loss — was great for equipment manufacturers. They sold a lot of coils, pads and amplifiers. But a complete system approach, rethinking the entire circuit, establishing one termination at the far end of the circuit, and using balanced bridging inputs for all consoles, recorders, monitors, and the use of a standard level (+4 dBm), will provide superior distribution, better reliability, a less complex installation, and more flexibility.

Distribution nets are fine when you're tying just a couple of pieces of gear together, or when you need a loss. Otherwise they should end up in the same file as the three-winding hybrid, sometimes used for combining two channels to make a third without interaction between channels. For a simpler, less expensive circuit, see the combiner in Part 1 (*BM/E*, March, 1979). Instead of $90, it'll cost you 35 cents, and it'll work better! But watch your commons.

And goodby to patch bays

Speaking of commons, I haven't said anything about patch bays — perhaps in the hope they'll go away forever. About the only place the patch bay has in the air studio is as a test point, although I realize the production room is a different matter. Rotary or pushbutton input selectors should be used for all inputs. Even your slick new output switcher can be bridging if the first amplifier in the processing chain has enough gain. Patch bays can be a source of intermittents, noise, and ground loops. Think about removing them and see if you can't work around them quite nicely in most cases. As in the combining net, it's another example of "less is more"! **BM/E**

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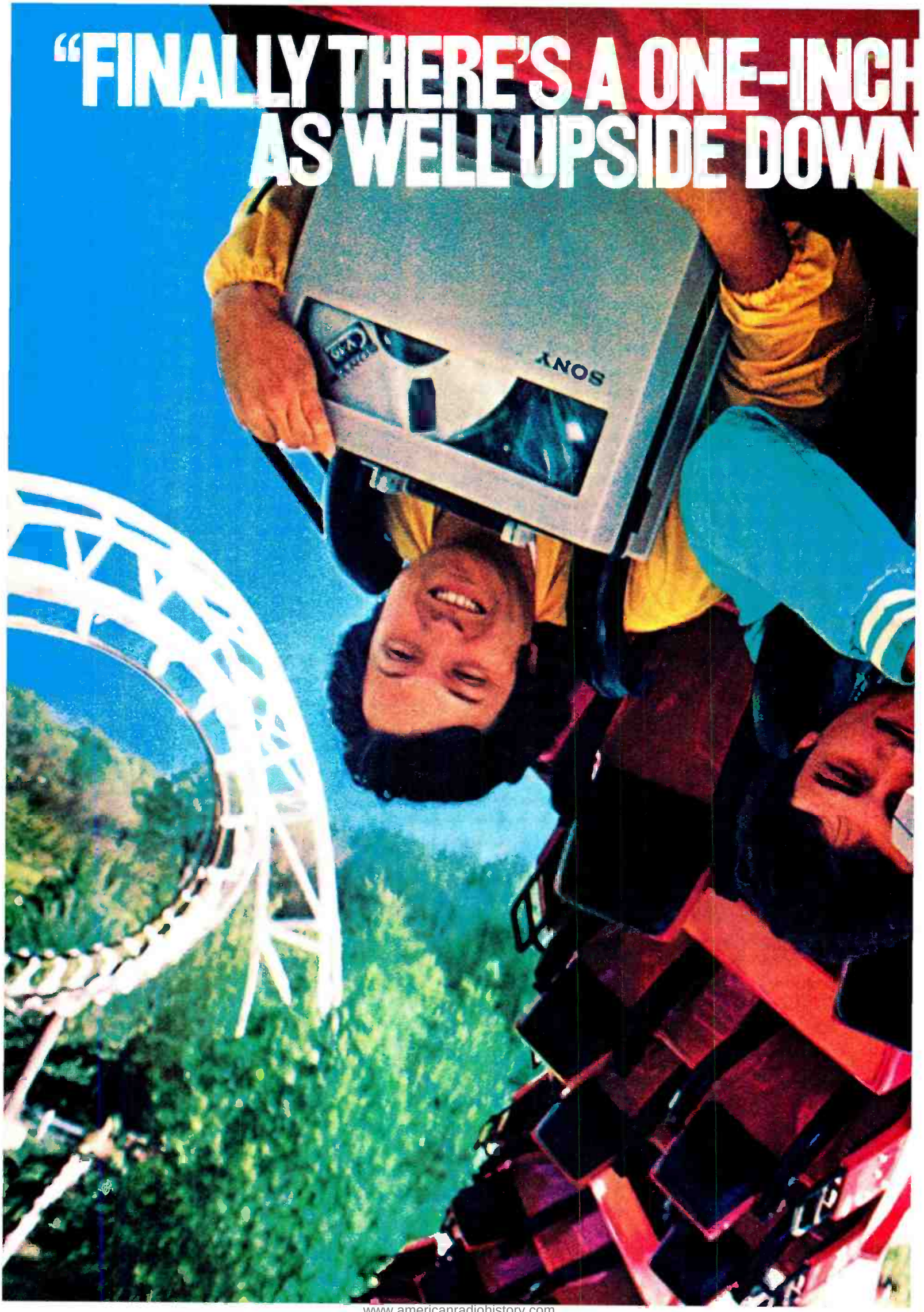

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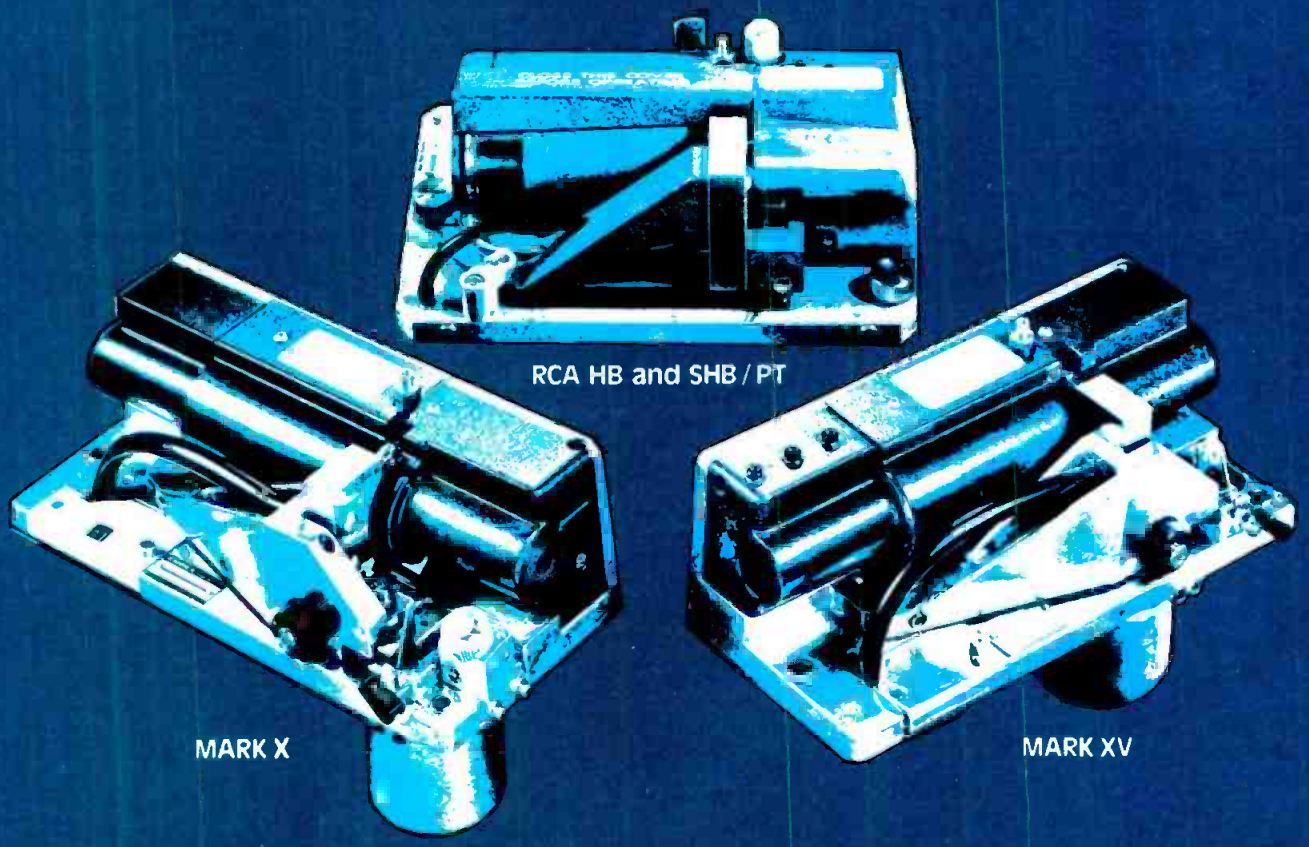

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INFORMATION MANAGEMENT FOR YOUR PLANT OPERATION

By Paul D. Breneman

The increased reliability and stability of today's equipment makes the information about this equipment and its care more important than ever. Several practices can be instituted to insure that complete and accurate information will be available to your technical staff whenever and wherever they need it.

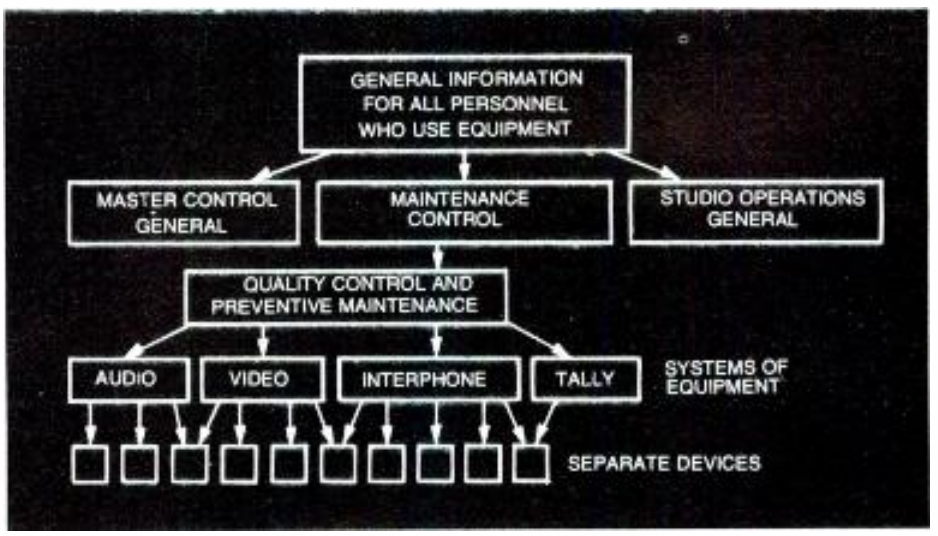
WHEN EQUIPMENT WAS less reliable and less automatic than it is today, maintenance crews were kept busy repairing equipment that had gone bad — obviously bad. As a result, maintenance personnel often knew certain pieces of equipment by heart. Now, however, the equipment in the production or broadcast chain that is the source of today's problem may not have been worked on in weeks, or it may be so complex that the average technician cannot grasp its true function and the role it plays in the whole system. In fact, the third-generation commercial that the viewer sees on the screen may have gone through more than a score of devices, any one or combination of which contributed to the manifest deficiency.

This state of affairs demands a redefinition of the role of your maintenance personnel and a new approach to handling the information they will need to complete this new mission. Much more attention will now have to be given to quality control and preventive maintainance so that problems can be solved before they become critical. Procedures will have to be developed to permit personnel to monitor equipment performance on an ongoing basis. This means that information regarding the performance standards of individual devices must be logically arranged and easily accessible. The first step is the development of an efficient library system for your personnel and the second is a tenacious effort to keep equipment calibrated properly so that drifts in performance can be quickly identified.

Any maintenance department uses a lot of data to keep all its equipment repaired and properly aligned. Appro-

Paul D. Breneman is a maintenance engineer at Warner QUBE, Columbus, Ohio. He has been active in broadcasting for the past 10 years and has specialized in video systems design for the past five. Also, he is currently studying electronics at Ohio State University.

Fig. 1. Library organization, general to specific



priate documentation and organization of this information can help the department maintain picture quality and function efficiently. The library and its data can be indexed and explained so different information is easily located. As shown in Figure 1, the maintenance department information can be organized as part of a library for all of the personnel that use or maintain the equipment. In some facilities personnel groups might include master control operations and studio operations as well as maintenance. General information for all personnel who use the equipment appears at the top of the diagram; more specific data is included at the bottom. It should be noted that there are many different ways to organize such material. The examples presented here may not be the most ideal for all situations. That organization is achieved is more important than how it is achieved.

Organize general information

The general information for all personnel who use the equipment should be arranged so that new employees can quickly grasp a general knowledge of the plant operation. Anyone who has ever begun work at a plant without signal flow diagrams knows how difficult it can be to learn the basic system. Reference materials should include all signal flow diagrams and commonly available reference books that explain how the basic equipment works and how the television system functions as a complete unit. General department procedures, notes and memos could also be kept as part of the library reference material. Some information, such as equipment operating procedures, can be divided between different areas such as studio and

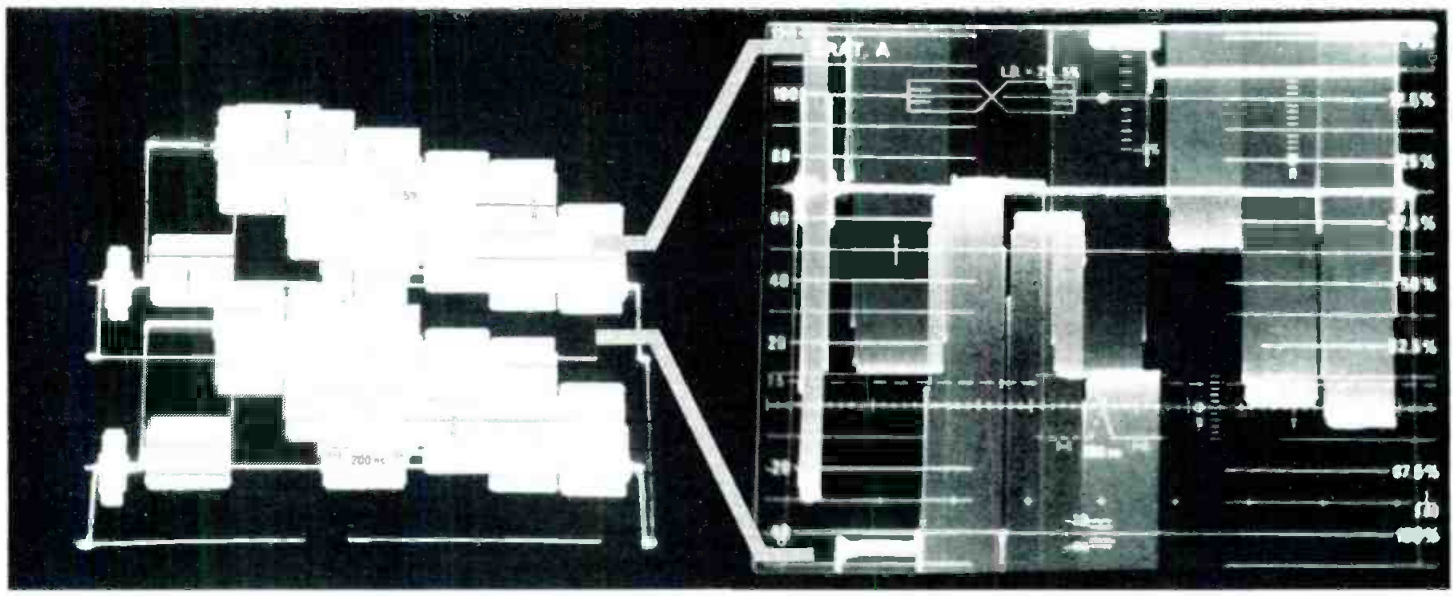


Fig. 2. The .714 offset can be used to check the 100 percent, 77 percent, and 7½ percent levels at five times normal gain. The 100 percent level is adjusted to overlay the blanking level, the 77 percent level 115 units below it, and the 7½ level 37½ units above it

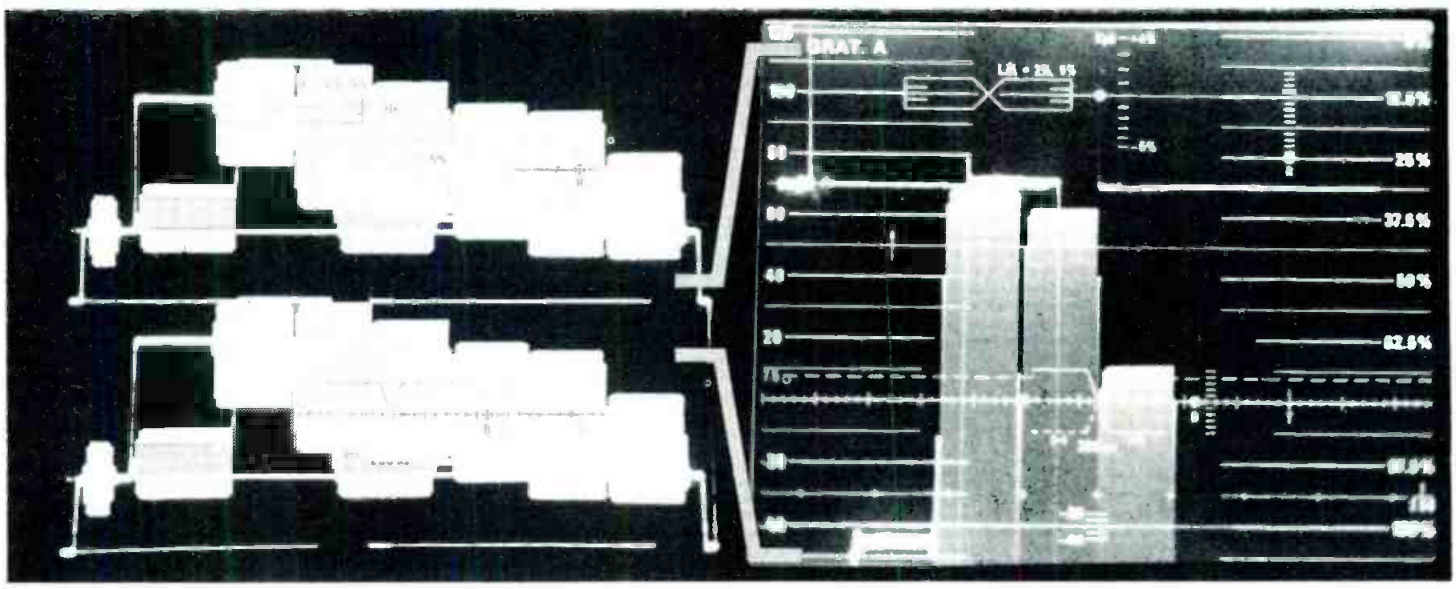


Fig. 3. The 40 percent sync level can be checked at five times normal gain using the 1 V offset and a calibrated 100 percent or 77 percent level. The sync is adjusted to overlay the 100 percent level or 115 units above the 77 percent level

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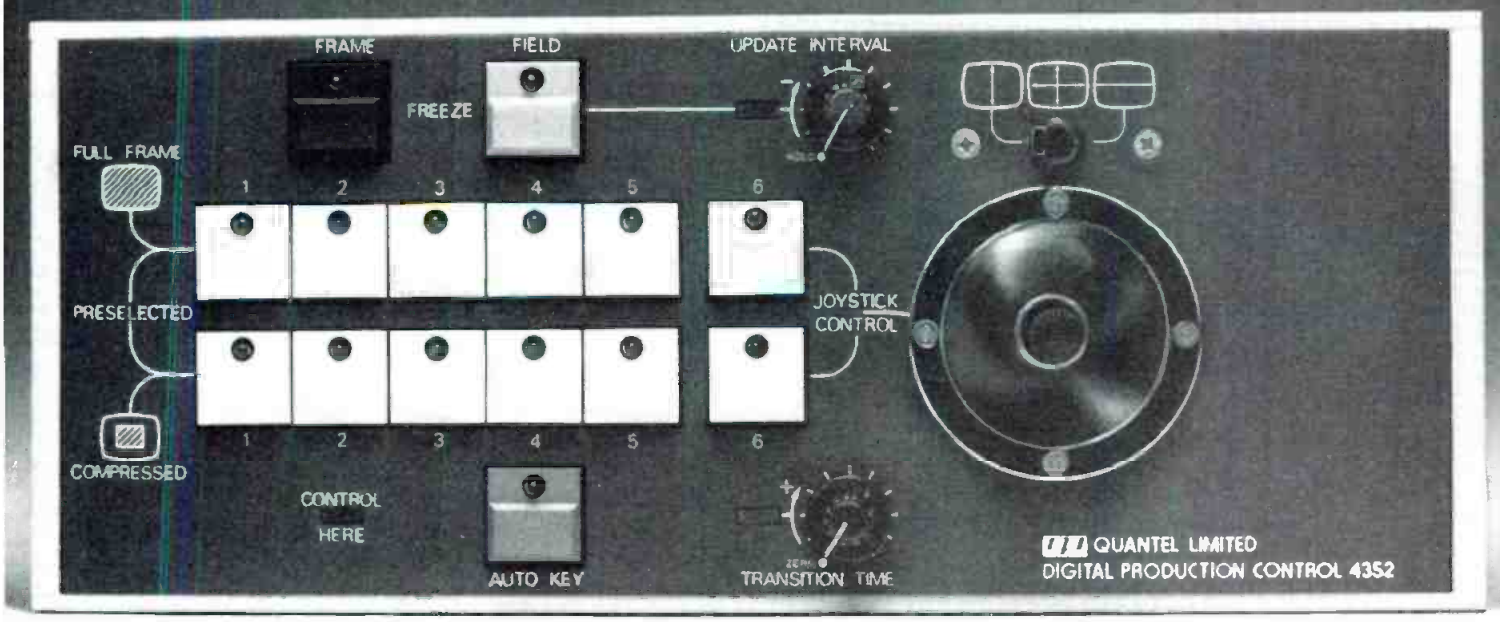

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master control operations, as shown in Figure 1.

Quality control and preventive maintenance

Just as many people now appreciate high-fidelity sound in their stereo systems, television viewers may appreciate quality pictures more as television receivers become more accurate and stable. Since the television system is so large and complex, quality control procedures, similar to "proofs" done at radio and television stations, should be used to regularly verify the quality of all the equipment so that multiple device paths do not seriously degrade the signal.

All of the department's regular functions, such as preventive maintenance and quality control procedures, can be organized in one master checklist. Instructions for the more common procedures could be kept with the checklist for quick reference. Each description should include all relevant information, such as test points and adjustment location. Procedures written up in this manner can be performed more efficiently because needed information does not have to be located in separate equipment manuals. Explanations of less regular, more complex procedures could be stored with more specific information. An explanation of the whole checklist and how it is designed to serve its purpose is also useful in clarifying how the department performs its regular functions.

Just as the quality of broadcast equipment has improved, test equipment has also improved so that adjustments are more accurate and easier to make. These improvements have affected the whole spectrum of equipment available, although only a portion of the video system will be discussed here. Most present-generation waveform monitors contain a switchable calibration pulse (.714 V or 1.0 V) which can be used to offset the signal so that encoders and plant levels can be set at five times normal gain as shown in Figures 2 and 3. Measurements made this way are more obvious and less tedious, and accuracy is also improved. As shown in Figure 2, the 77 IEEE unit gray-bar can also be checked in this mode. Its accuracy is especially important in insuring that the chrominance/luminance ratio is the same between a number of camera endcoders.

Many measurements are now easier to make because of improvements such as the insertion of VIT signals, which allow in-service measurement through the video system. Automatic VITS analyzers now available make many accurate measurements and save time. The use of these devices for studio facility measurements is just becoming more common. These signal analyzers could be easier to install, and efficient utilization of their capabilities may begin sooner, if quality control procedures using older test equipment already exist.

Quality control procedures vary tremendously from one device to the next. Cameras and other signal sources have their own requirements, as do transmission and storage devices that only pass along the original camera signal. Signal sources must be accurately set up because many distortions are not easily corrected later in the television system. Transmission and storage devices should be adjusted to be at unity and as transparent to the signal as possible. A lot of time can often be saved by seeing that all devices in a plant are at unity and then making a measurement of a multiple device path. The multiple device measurement can then be made regularly. When an out-of-

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tolerance condition occurs, devices may be monitored individually to locate its source.

The use of preamp patch cords and special charts can help to simplify the unnerving and difficult task of setting focus in cameras. If the contours are turned up in a camera that derives contours from one channel, the other tube preamps can be patched into the one channel and accurate electrical focus adjustments can be made using the

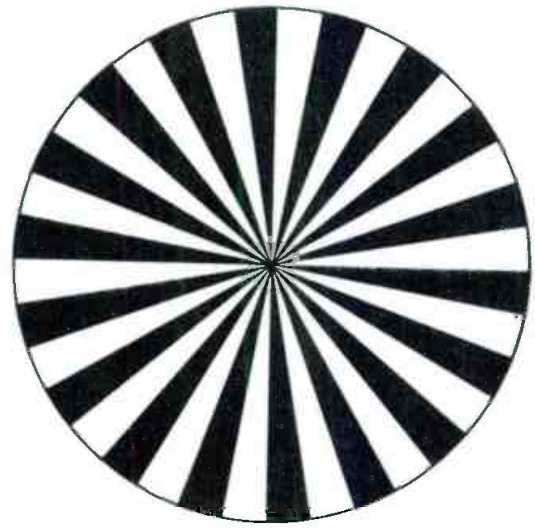

Fig. 4. Optical focus star chart

standard resolution chart (Figure 4) with the camera lens iris at maximum aperture. The adjustment may be easily visualized by misadjusting the monitor brightness down and the contrast up until a black dot appears in the center of the chart. Adjustment is made to minimize the size of the dot. In this way accuracy does not depend as much on the monitor resolution.

With storage devices such as VTRs, all record parameters should be standardized so that in-house tapes can be interchanged with little or no adjustment. A basic method of standardizing VTRs is to play an alignment tape (even one made for daily use, as long as it matches the main reference tape on every parameter) and use it to accurately set up all playback functions. Record parameters can be matched to the aligment tape by recording a reference source and changing the record settings (sometimes by trial and error) until the playback of the recording matches the alignment tape in every parameter. This standardization is necessary with automated videocassette machines where individual tape setup is not possible. In other VTR situations where individual tape setup is possible, this standardization could increase efficiency and accuracy.

Information on equipment systems

The maintenance library should contain information on each group of equipment such as audio, video, interphone, and tally. By grouping material on equipment systems in this manner, the importance of data that applies to each can be understood more clearly. Information on equipment and rack layout, wiring diagrams and cable lists, and signal phasing could be organized for these systems of equipment.

Equipment installation entails many considerations of

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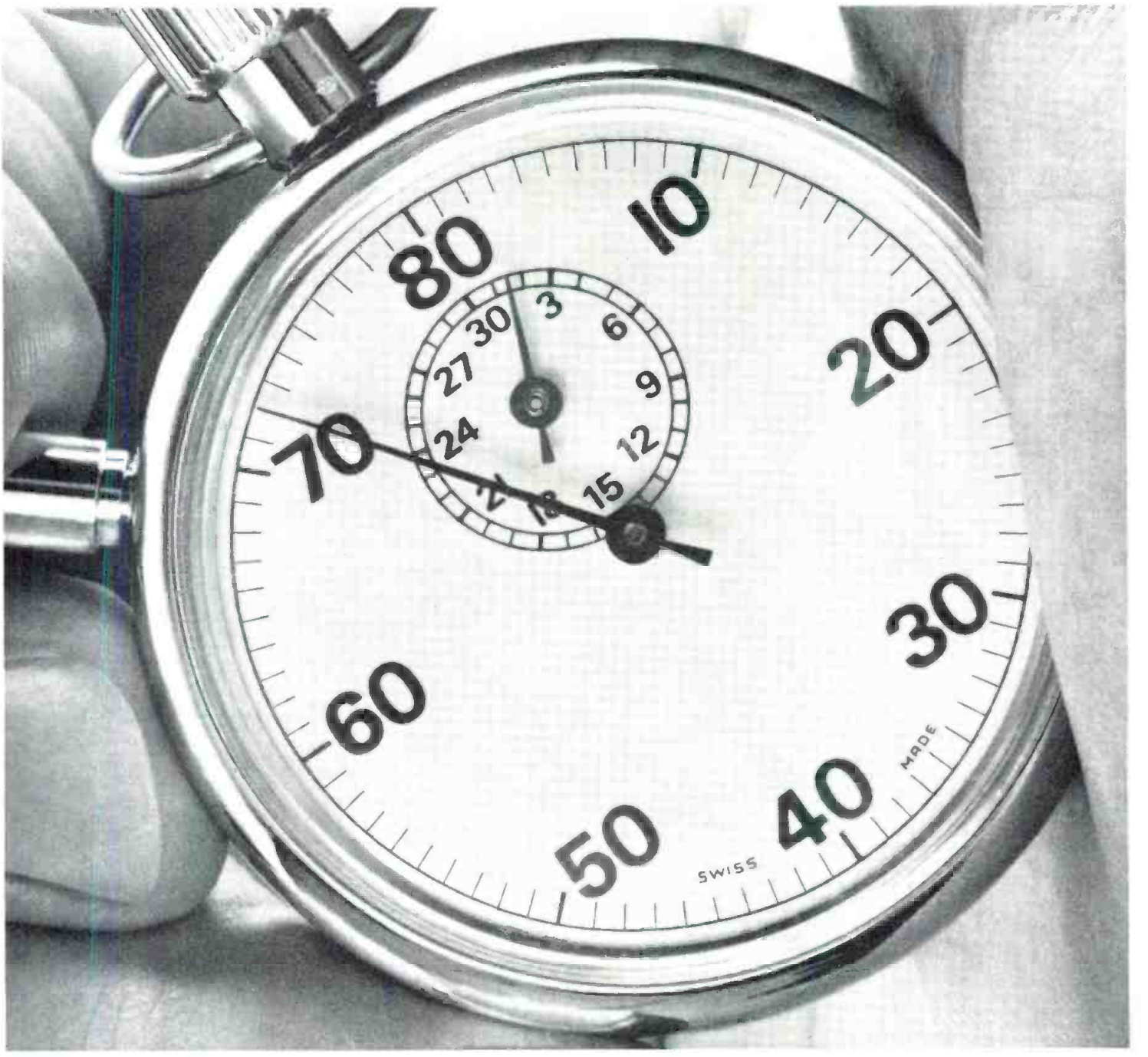

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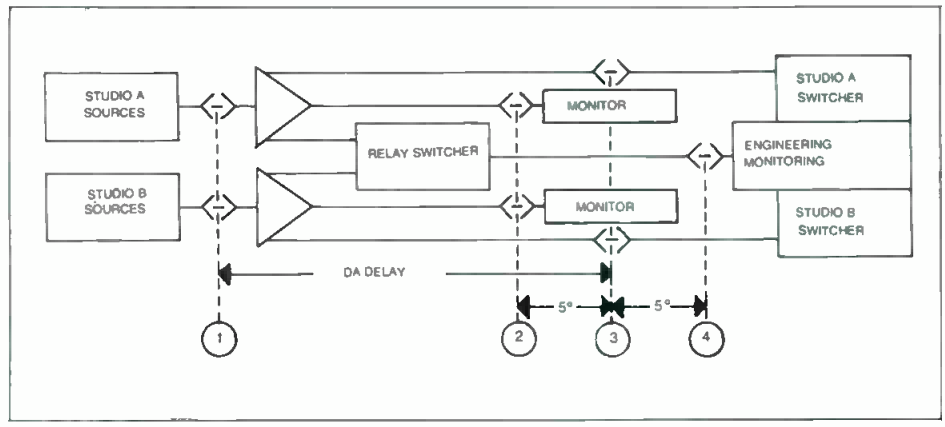

Fig. 5. Example of patch panel time levels

cabling, operation, and ease of performing maintenance and quality control. Recording information of this type could display design criteria and how they were met, as in the case of equipment and rack layout. The plant cabling could be shown on master diagrams and cable lists. The master diagrams could be divided into several smaller sections so they can be carried around easily by maintenance personnel. The use of lists to record the numbers, lengths, and cable and connector types as well as location on the master diagram permits labeling cables by number only. The cabling to pieces of equipment which are regularly disconnected can be tagged with the function as well as the cable number. Information such as cable length and connector type can be useful when making equipment or timing changes.

Signal phasing information can be written to display design criteria and to explain how the signal phasing is accomplished. In many video systems, patch panels can provide valuable flexibility and can also be used as test points to set each device at unit. If equal length cables are used where necessary, the plant timing could be matched for each section of patch panel time levels, as shown in Figure 5, by using device delay adjustments or cable. Unless two or more switchers are downstreamed from each other, as is commonly done in a multiple studio facility, all timing of sources is accomplished in the actual device or in the pulse system feeding it. This arrangement of matching the time levels of patches can have several desirable features. An enginering switcher could be used to set up and phase the sources without using a switcher program or preview bank. If the delay between time levels 2 and 3 in Figure 5 is made to match the delay a patch cord presents, sources in a multiple studio plant can be cross-coupled into other studios and system timing will be maintained.

A processing amplifier that regenerates sync and burst can be used on the switcher program banks to reduce the amount of critical adjustment necessary to maintain signal levels and phasing. Different devices, such as time base correctors and monitors, can reference to different edges of the horizontal sync. Therefore, unless a proc amp is used, the system horizontal timing cannot be matched any closer than the sync widths can be matched. The problem is compounded because some pieces of equipment may not have a sync width adjustment or may have one with only coarse steps. When a proc amp is used, only one edge of sync needs to be critically phased up (the proc amp reference edge). The other edge will line up since the proc amp should always put out sync of the same width. These proc amps also provide a valuable service in the regeneration of sync and burst because many videotape recorders and monitors use the sync and burst levels in an AGC mode to control the overall amplitude of the video and chroma signals. If a proc amp is not used, shifts in video level and chroma saturation may occur at the same point horizontal sync shifts would occur in switchers that switch the blanking region (including sync and burst) during effects. Use of a proc amp in this manner can minimize many on-air disturbances.

Specific information on separate sources

The most specific information in the library may be kept with the normal manuals and schematics supplied with each piece of equipment. A lot of material on peculiarities, common problems, and solutions can be documented for each piece of equipment. Keeping this type of data can save time because personnel can learn from each other and not have to make all discoveries on their own. Information can be kept on all equipment modifications to show how the changes were made and to explain why. Anyone who has ever used a schematic that doesn't match the equipment knows how frustrating maintenance can be if the books are not corrected as changes are made to the equipment.

Various logs can be kept for each piece of equipment as necessary. Corrective maintanance logs can be used to describe problems as they are found and corrected. These records can be used to find common equipment problems, trace intermittents, and pinpoint problems early for easier maintenance. Much time can be saved fixing repetitive problems if a similar problem was logged earlier along with its solution. Records can also be devised to check equipment drift. They can then be used to determine how often a certain quality control pocedure should be done. In this way different setup procedures can be written determined by the stability of the equipment and how often the particular adjustments are necessary.

As the equipment used by broadcasters continues to improve, more accurate methods of adjustment will be necessary to utilize it at its full potential. Information used by the maintenance department can be organized and documented in many different ways to achieve many different results. A library of such material is often hard to begin because of the extra time and effort required. However, these will pay off by increasing the department's efficiency in maintaining signal quality and keeping the equipment repaired. Your station will certainly find establishing such a library worth the trouble. **BM/E**

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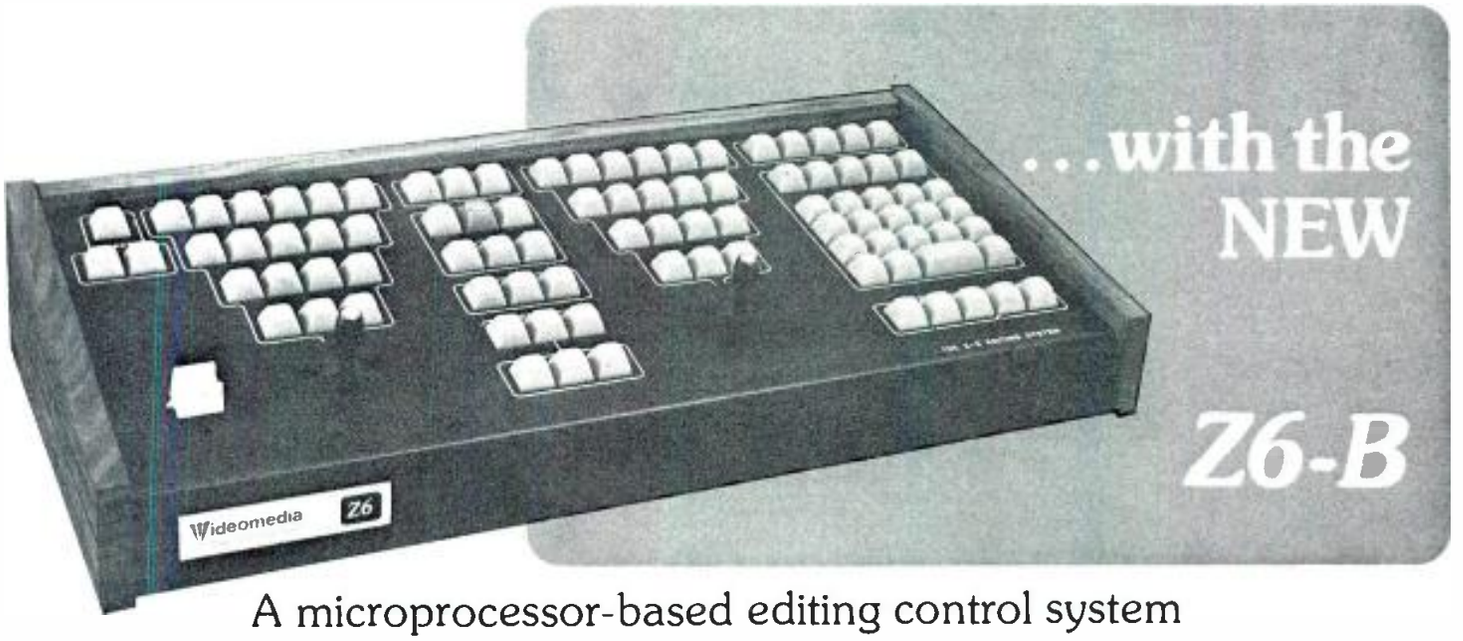

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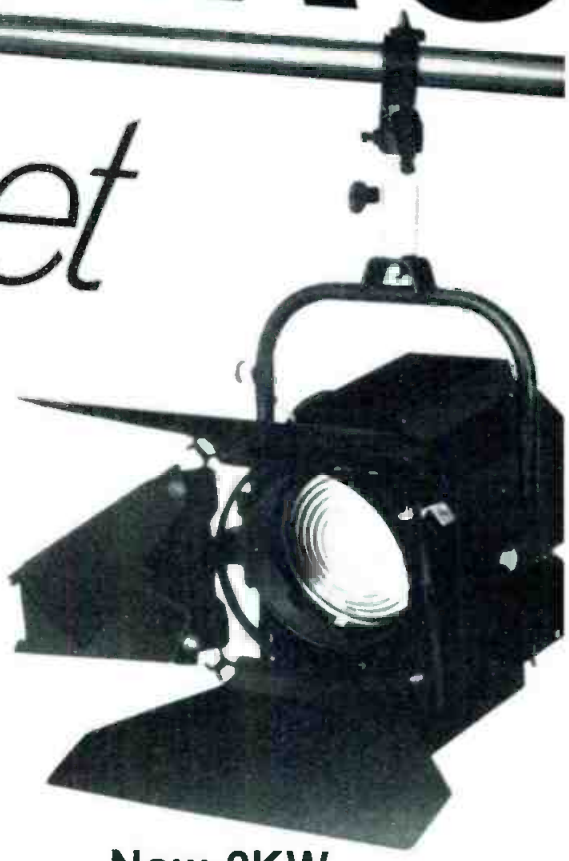

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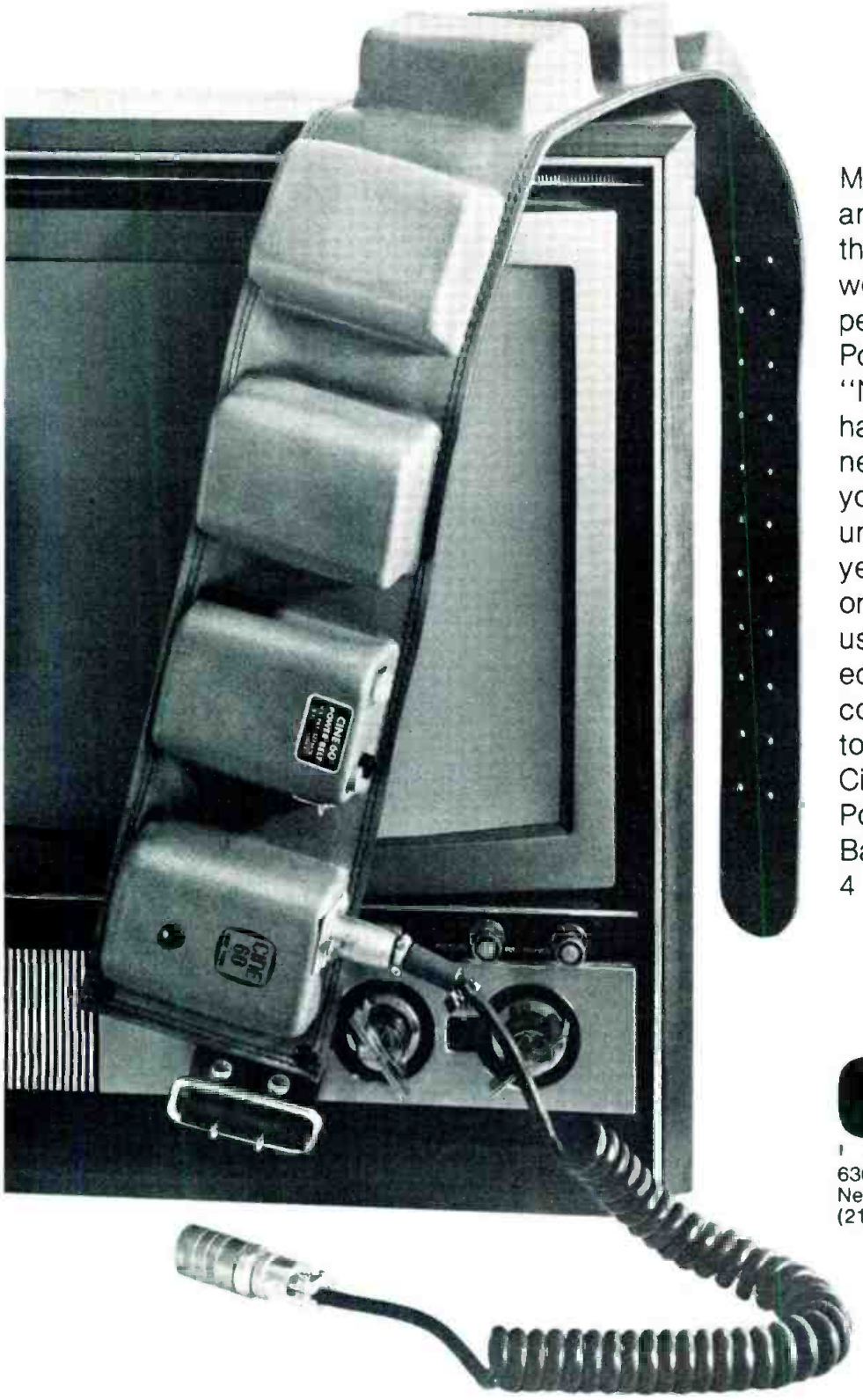

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CIRCULARLY POLARIZED TRANSMISSION FOR TV UNDER FIRE

A CBS study concludes that CP could lead to increased co-channel interference, while a Bonneville report concludes that traditional HP is superior to CP. CP proponents and users remain unconvinced.

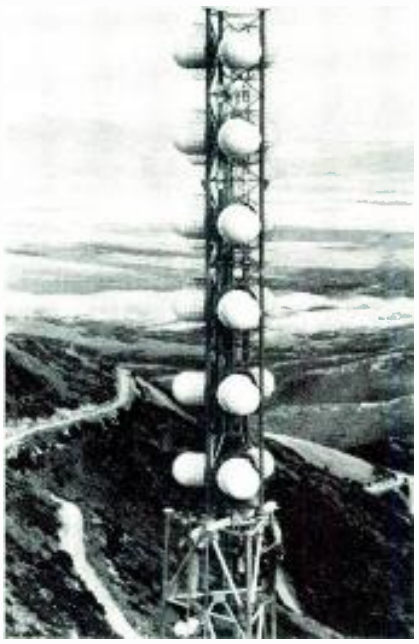
ACCORDING TO A CBS Technology Center report submitted to the FCC, "Electromagnetic wave propagation theory and the available experimental data show that the level of co-channel television interference will increase when broadcasting stations convert to circularly polarized transmissions." Another report, prepared by Bill Loveless, chief engineer for Bonneville International Corporation, concludes on the basis of tests he conducted in Salt Lake City, "Both CP field tests and electromagnetic theory demonstrate that horizontal signal polarization is generally superior to CP in the poor reception areas on all types of antenna. Standard HP is therefore recommended over CP as the preferred mode of TV transmission."

Considering that more than a dozen stations are already transmitting CP and that many more have ordered CP transmitting gear for future installation, these two negative reports are bound to cause alarm among those broadcasters who have already gone to, or are contemplating going to, the expense of making the switch to CP.

While the CBS report does not condemn CP out of hand, it does raise questions about the possible increase of co-channel interference under certain ionospheric and tropospheric conditions, taking care to point out that these interference problems are likely to be most troublesome to low-band VHF stations. On the basis of this report CBS has stated that it believes ". . . a test program to determine the magnitude of the increase in co-channel interference that will be caused by circular polarization should be initiated immediately. . ."

Reaction from the proponents of CP was predictable. ABC filed a comment on the CBS report with the FCC stating that the CBS report shows only a minor increase in co-channel interference (about 3 dB, three percent of the time) and under such limited conditions that the phenomenon would be negligible. Neil Smith of Smith and Powstenko, the consultants who did much of the work on the Chicago WLS-TV CP tests that formed a large part of the basis upon which the FCC issued its permissive ruling on CP, claims, "Tropospheric interference decreases as you go up in frequency such that it is a minor problem on Channel 13 and a major problem on Channel 2, with gradations in between."

As for ionospheric interference, Smith points out that it is "accepted that ionospheric interference problems, which can actually produce greater interference levels, cut off at about 55 MHz, which is just at the top of channel 2." Smith, though he admits CBS has properly stated the theories, feels that the problem is so infrequent, of such a low level, and limited mostly to so few stations (channel 2 is most subject to these types of interference, while each higher channel is less sensitive) that the conclusions of the report hardly justify the action suggested. CBS, on the other hand, contends that " . . .the introduction of circular polarization for television broadcasting would significantly increase the levels of both tropospheric and ionospheric co-channel interference throughout the country," and suggests that more experimental data is needed to determine the magnitude of this increased interference. Further, CBS states that tropospheric and ionospheric interference "can only be measured over an extensive period of time — certainly at least the six months encompassing the period from May through September, but preferably at least one year."



The KBYU CP antenna that figured in the Bonneville tests

The CBS report is the result of a year-long theoretical study on circular polarization prepared by the CBS Technology Center (CTC), Stamford, Conn. The theoretical model chosen for the tropospheric portion of the study is that of a television reception point located 126 miles from the undesired station and 44 miles from the desired station. The receiving antenna is described as HP and the desired signal is described as transmitted with HP with the interfering (undesired) signal being transmitted in CP. The stations meet the minimum FCC separation standards.

CP For TV Under Fire

The study then evaluates the quality of the picture reception at the established reception point under five different tropospheric ducting conditions. The results of the CBS calculations indicate that there will be about 3.3 dB greater co-channel interference under four of the five tropospheric ducting conditions when the interfering signal is CP than when the interfering signal is HP.

This higher level of interference, according to the CBS study, can be attributed in part to a tendency of the vertically polarized signal to cross-polarize under some of these tropospheric conditions. If the vertically polarized component remains in a 90 degree phase relationship to the horizontally polarized component, as it should, than CP should cause no greater interference than HP. But, according to the report, the VP component can be shunted out of phase and generate additional HP wave whenever the troposphere is in other than standard propagation mode.

The ducting conditions occur mainly from August to September during any hour of the day and are caused by various weather conditions. Generally, tropospheric conditions cause interference at distances of less than 800 km. Interference at distances greater than 800 km are generally associated with ionospheric conditions; specifically, sporadic E-layer (Es) propagation. According to the report, "Es interference will often occur on the low-band VHF channels, but rarely on the high-band VHF channels." The probability of Es interference at 100 MHz is about 10 percent of the occurrence at 50 MHz. According to an EBU study, cited in the CBS report, "E-layer propagation can be neglected at frequencies above 60 MHz." Nevertheless, the CBS study concludes that ". . . the level of ionospheric co-channel interference will be approximately 6 dB higher with CPT than with HPT."

The Loveless report

Though the conclusions of the CBS report should be of concern to many broadcasters, the circumstances are of a basically limited scope. Obviously, low-band VHF broadcasters will be most alarmed by the study, with higher frequency broadcasters decreasingly concerned. The Bonneville study, however, raises a far more frightening spectre — namely, "horizontal signal polarization is generally superior to CP in the poor reception areas on all types of antennas. Standard HP is therefore recommended over CP as the preferred mode of TV transmission."

This startling conclusion was contained in a report released by Bonneville International Corporation to a handful of publications that cover the broadcasting industry. According to the letter that accompanied the report, "At this moment TV station managers and engineers are wrestling with the decision about whether or not to invest in CP. The report provides a factual basis for making the CP decision and may be published, edited or quoted as necessary."

The report, *Circular Polarization (CP) Field Tests*, by Bill Loveless, chief engineer, Bonneville International Corporation, was undertaken in order to determine if a planned CP installation at Bonneville's KIRO in Seattle, Washington would yield the hoped-for benefits of CP. Based on the results of Loveless's report, KIRO has since decided to relocate its existing transmitter into its planned new building rather than installing two new transmitters for CP.

At New York City's World Trade Center, ABC goes full speed ahead with its CP installation, remaining convinced of CP's benefits

The tests were conducted in Salt Lake City where Bonneville has another station, KSL. Salt Lake also is the home of KBYU, channel 11, which transmits CP, and KUED, channel 7, which transmits HP. Since KBYU and KUED share a common transmitter location, it was thought that a comparison of the two stations' signals could provide significant insight to the value of CP.

The field tests were designed, according to the report, to answer three questions: "(1) Does CP cancel multipath ghosts and reflections in the TV picture? If so, under what conditions and how much? (2) Does CP provide a stronger, more snow-free TV picture than HP? If so, under what conditions? (3) How much does CP cause multipath ghosts and reflections that degrade rather than improve TV reception? Under what conditions?"

The report examined these questions in the light of three ghosting conditions: (1) ghosts that are produced by a signal reflecting from a highly conductive flat surface; (2) free-space conditions without ground reflections; and (3) ghosts produced by a CP signal reflecting from a poor conducting dielectric surface.

Loveless conducted his tests using a specially built CP receiving antenna cut to channel 11. The antenna consists of a five-element horizontal yagi mechanically phased 90 degrees in front of a five-element vertical yagi on the same boom. The boom is end-mounted to the mast behind the vertical reflector for minimum mast interaction. A remotely switchable phasing system was used to switch the CP antenna feeds among vertical, horizontal, right-hand circular, left-hand circular, and a separate rabbit-ear antenna mounted atop the vertical mast. The rabbit-ear antenna length was adjusted half-way between maximum channels 7 and 11 video carriers signal strength on the field meter with elements set 45 degrees from vertical. Two separate horizontal yagis for channels 7 and 11 were also used to compare the HP component of the channels.

After obtaining predictable free space results at a control site chosen for its near-perfect reception conditions (line of sight), 11 other sites, each with various reception conditions, were selected and visited. At each site, the same set of tests and measurements were made using a Rohde & Schwarz field meter, a 17-inch Sony color TV set, and a 35 mm SLR color film camera for taking pictures of the transmissions. At each of the sites the

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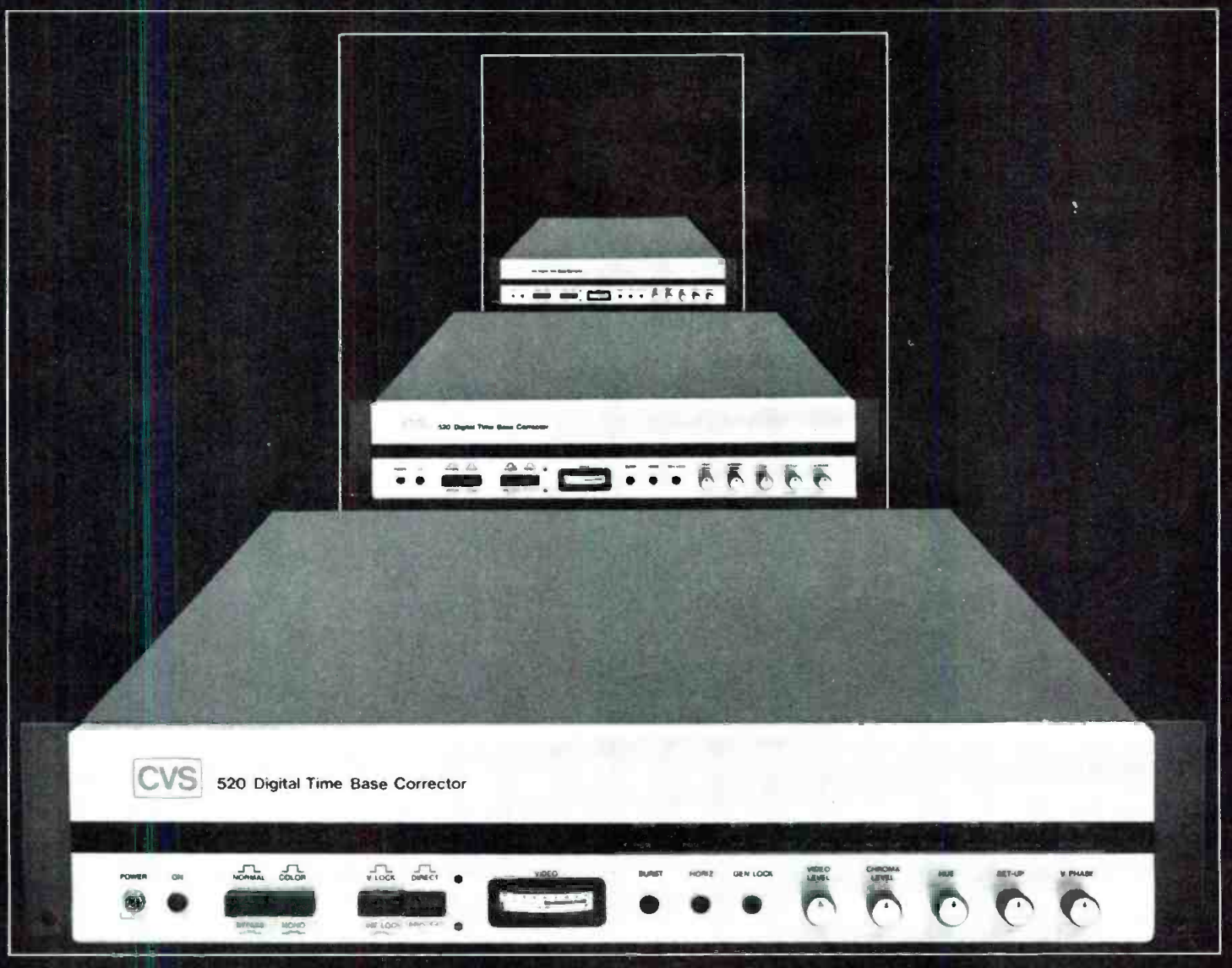

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antennas were positioned for a uniform signal field at a fixed height of 15 feet and oriented for maximum signal.

At those sites where condition two prevailed, the Loveless report confirmed that CP did deliver the expected "double power" signal. At sites where condition one prevailed (a perfect 180-degree phase reflection), ghosts can be reduced with a proper CP receiving antenna.

The results at condition three sites, however, led Loveless to his highly critical conclusions. At these sites the reflected signals were off irregularly shaped objects such as power lines, apartments or office buildings with outcroppings such as terraces, or off naturally irregular shapes such as trees, mountains, or water. Here, concludes Loveless, the irregular reflections cause the vertical component of the CP signal to lose its 90-degree phase relationship to the horizontal component and the result is additional ghosting on HP receiving antennas and failure of the CP receiving antenna to cancel such ghosts. "The defective vertical component of the CP signal is usually low in amplitude and has multipath ghosts," says the report, and "this non-correctable condition causes condition three ghosts and reduces the signal strength on all antennas, including CP and rabbit ears."

What do CP proponents say about these reports?

As might be expected, the proponents of CP do not give either the CBS report or the Loveless report much credence. The CBS report, which was submitted to the FCC, has been answered formally by a number of CP proponents, primarily from the ranks of manufacturers, and ABC, which has been the main supporter of CP among broadcasters. Their responses challenge the CBS report on essentially two counts. First, ABC contends that the conditions which produce increased co-channel interference occur so infrequently as to render the increase statistically unimportant. Secondly, they claim that these aberrations affect only a few broadcasters and that the broadcasters who stand to benefit from CP should not be denied such benefits in the interest of minor annoyances to some other broadcasters. The third point is that the FCC has already approved CP on a permissive basis and that the proposed test period would work an unfair hardship on those broadcasters who have made the decision to go to CP in good faith based upon the FCC ruling.

Another objection is that the cost of the type of tests recommended by CBS cannot be justified by the likely results of such tests. RCA's resident authority on circularly polarized transmission, Dr. Siukola, said of the request for a period of study, "It would be nice, but extremely expensive. They are very difficult tests — they are statistical tests that you would have to perform at various times and at various locations and on various channels. You have to ask, 'Do you get your money's worth out of it?' " Said Siukola, "Their (CBS's) point is well taken, but is only one small part of the overall picture. In fact, what is to be gained (from CP) outweighs what is to be lost."

Siukola did, however, agree that in theory, CBS was right and that if the FCC determined that tests would be required, RCA would certainly want to consider participating.

Neil Smith, the broadcasting consultant responsible for

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the CP tests conducted at WLS in Chicago that formed the basis of ABC's backing for CP, contends that the CBS report doesn't provide evidence of a problem of significant magnitude to change his conviction that CP has definite advantages for many broadcasters. "They," said Smith, "don't plug in the benefits of CP, so they assume there are not benefits — only degradation. I think that's a bit unfair."

The major objections raised to the Loveless report stem primarily from objections to the testing methods used and the contradictory experiences of broadcasters who have gone CP. The methodology established for the TASO picture quality system stipulates that the antennas should be mounted on a 30-foot mast, not the 15-foot mast used by Loveless in the Bonneville study. Loveless, said, however, "The 30-foot mast is the way the TASO report says you should do it. However, you should also realize that the average home viewer does not have a 30-foot mast on his home. It is more likely to average out at about 15 feet. Moreover, the TASO report says that you should take about 30 readings in a circle of about 30 feet in diameter at each testing location and then average all those readings and come up with a reading for that location. I agree that is the way that TASO says you should do it, but it is rather impractical in this sort of situation where you are taking a lot of readings and a lot of pictures."

Critics of the Bonneville report, however, contend that by the time you consider a roof-top antenna or rabbit ears in a second floor or higher apartment, the average viewer's antenna is a lot closer to 30 feet than 15.

Nevertheless, Loveless expressed confidence in the methodology he used. He explained, "On our methodology we talked to A.D. Ring Associates, one of the top-flight people and Howard Head, a former FCC chief engineer, and they said, 'Yes, that is exactly the way it should be done.' "

Ralph Silver, chief engineer of KBYU, whose CP signal it was that Loveless compared to HP, maintains that his own "admittedly subjective tests" confirm his belief that CP has given him considerable benefits. "All I can tell you," said Silver, "is that since we've gone CP we are really filling in those nulls and getting into areas that before CP we couldn't penetrate."

At WRAL, Raleigh, N.C. (See "Progress Report: Circularly Polarized Antennas for TV," *BM/E*, October, 1978), chief engineer Lee Poole has done a series of carefully constructed tests and measurements both before and after his station's conversion to CP. Though Poole's procedures did not conform to the letter of the so-called TASO methodology, they were substantially similar.

CP installations continue around the country as broadcasters try to determine if their stations will benefit

Prior to switching to CP, Poole set out to document his predicted Grade A contour using a custom-designed CP receiving antenna, dipole antenna, and calibrated field strength meter. The antennas were mounted on a 30-foot pressure-operated mast.

A number of locations were chosen at the perimeters of the contour. Several measurements were made at each location and an averaging technique used to profile the location. After the conversion to CP, Poole returned to the documented locations and made the same measurements.

Said Poole, "We have carefully taken into account increased tower height so that we could track what was attributed to circular and what was attributed to increased height. Taking all that into account, the improvement exceeded all of our expectations." According to Poole, the greatest improvement seems to be achieved on rabbit ears and monopole antennas. "I went into areas and locations 60 miles out and," said Poole, "where previously there wasn't even the faintest trace of a signal on a set with rabbit ears . . . they can now watch the station snow-free."

On the other hand, Poole's tests also confirm some of what the Loveless report states, though the interpretations differ. Namely, Poole found that where ghosts were present on a standard HP receiving antenna, the use of a CP receiving antenna "cancelled 90 percent of the reflection." However, said Poole, when both odd and even order reflections were present causing multiple ghosts, "the even reflections do come through."

Based on his own tests, Poole maintains, "We are very sold on it [CP] and apparently so are a lot of other people here in the Raleigh-Durham market." Poole pointed out that since WRAL has gone CP, a number of other stations in or near his market have also decided to convert.

Both opponents and proponents of CP hold each other's motivations suspect. Some opponents are accused of "sour grapes," while some proponents are similarly accused of "needing to justify a costly decision." Whatever the case, it seems clear that CP is what it has always claimed to be — not a cure-all for every station, but a benefit to some stations faced with a particular set of problems. Broadcasters will have to proceed cautiously on CP, carefully analyzing their own particular set of circumstances in order to determine whether or not CP is right for them. Danny Hampton, a communications engineer with WRAL, pointed out that they have received a handful of complaints about increased ghosting in areas where they formerly did not have ghosting problems but, said Hampton, "How much of this is due to CP or just to the fact that we are pouring in a lot more RF, I don't know." It seems clear that, even as the earliest reports on CP indicated, some viewers will get an impaired picture, and some will experience no perceptible change. The question for broadcasters to ask themselves is, "How many of each?" A very difficult question indeed.

Whatever the answer to this most important question, the discovery of it will prove interesting. ABC, for example, will convert its flagship station in New York, WABC, to CP when its transmission site is moved to the new World Trade Center location. To make such a move in the nation's number one television market with millions of viewers at stake is a decision not lightly taken. But ABC's vice president, broadcast engineering, Verne Pointer, is confident. Based on the experience gained at ABC's O&O WLS in Chicago, Pointer intends to go full speed ahead with CP in New York. **BM/E**

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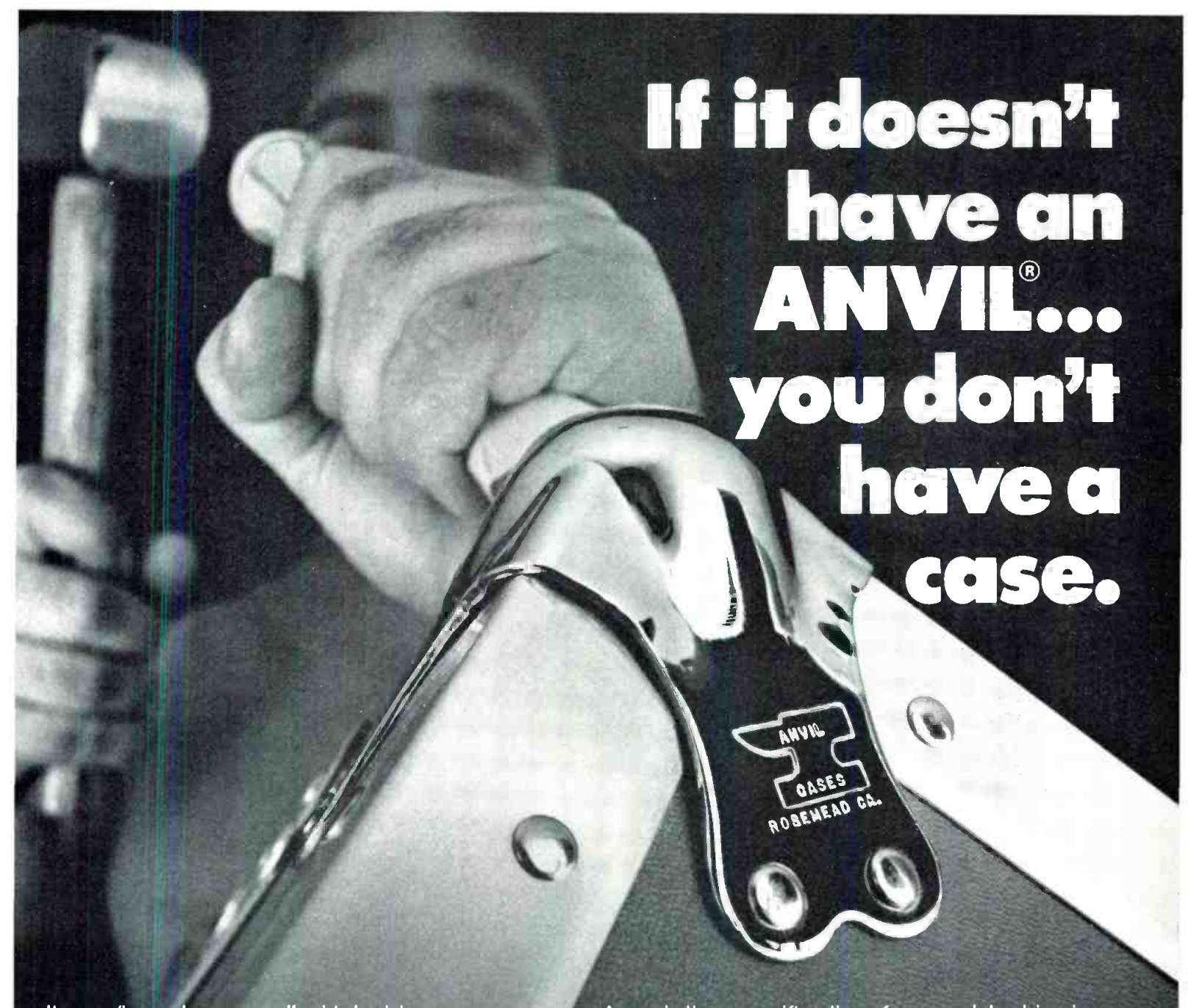

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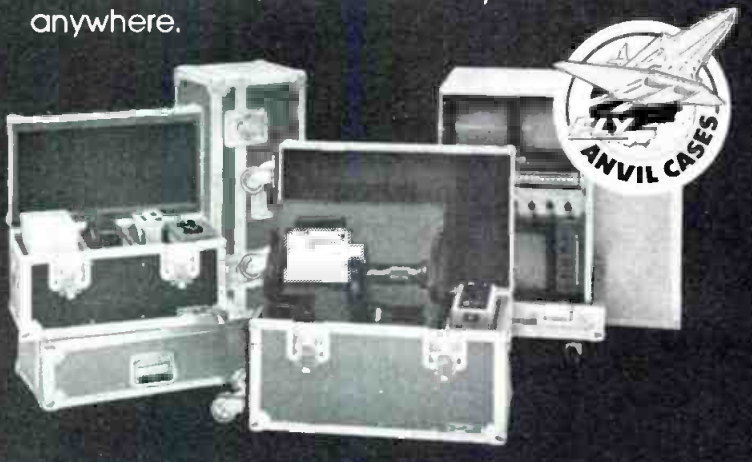

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ENG EDITORS: LIVING UP TO EXPECTATIONS

By Bob Mastrangelo and Maury Weingart

In Part 1 of this article (*BM/E*, March, 1979), the authors discussed the "care and feeding" of VCR-type editors. In this final segment, engineers will get some answers to how these systems can live up to the demands of television news gathering.

OUR INITIAL ARTICLE IN THE MARCH ISSUE dealt with problems encountered by interfacing Sony ¾-inch VTRs to after-market editing systems. We made some suggestions on updating or modifying the transport to more readily accept bidirectional tape movement and lessen the chance of tape damage. This month, we will review areas of the VTR that require no editing modifications, yet are subject to high failure from continuous usage.

System control: solenoids

The system control section of the VTR comprises two separate areas: control electronics and mechanical implementation via solenoids. System control electronics are usually reliable in U-type VTRs and many problems that appear to be electronic in nature are actually related to mechanical solenoid failures.

The major failures in solenoids are the magnetizing of the solenoid plunger, scoring of the plunger and barrel, and plunger sluggishness or binding because of dirt accumulation. Solenoids will rarely fail from coil opening.

When performing a general overhaul of any 2000 series transport, it is important to remove and clean the plunger from each of the following solenoids: pinch, function, forward, stop, and all three keyboards. When the plungers are removed, clean the cylinder with a cotton swab saturated with alcohol to remove any accumulated dirt.

The most common problems which plague solenoids are as follows

- *Pinch Solenoid*. Accumulation of dirt and grit from transport cause sluggish operation. Further, there is a tendency for the new type of black plunger to become magnetized.
- *Function Solenoid*. This is the same part number as the pinch solenoid and is subject to the same problems. In addition, you must check for the correct amount of plunger travel. If the amount of plunger travel is incorrect, it will not allow the machine to latch in any mode, i.e., fast forward, rewind, or play.
- *Forward Idler Solenoid*. This solenoid is highly subject to scoring of its plunger, which is caused by the excessive outward travel of the plunger in its barrel when de-energized. Check for a broken stop tab, as described in Part 1.
- *Stop Solenoid*. This part rarely has any problems. Occasional cleaning may be necessary, however.
- *Keyboard Solenoids (fast forward, rewind, forward)*. The most common failure related to keyboard solenoids is the magnetizing of their plungers. When magnetized, the keyboard assembly will not latch when the machine is remotely controlled.

System control: mechanics

In 2000 series transports, the fast forward and rewind modes are engaged by moving the rubber idler wheel against the appropriate reel table. The mechanical action depends upon two nylon rollers that cam the rubber wheel left or right as required. These cams are located below the fast forward/rewind idler wheel and tend to become grooved from repeated contact with the fast forward or rewind keyboard lever actuator. If one of the nylon rollers is worn, the fast forward or rewind tension will be low or erratic, causing poor tape packing and run speed. Further, when reading time code in shuttle modes, the tape will oscillate past the time code read head, causing erratic time code reading.

System control: electronics

System control circuits are quite stable electronically, and require almost no maintenance. From past experience, we have found repeated failure only in the following areas.

- The dual J-K flipflop which controls pause mode and slow memory, located on the ED-1 board, may fail to change state when properly pulsed.
- The CX-130 chips, located on various boards and used in place of relays, sometimes fail in normally closed position or refuse to operate.

Tape path and tape interchange

Throughout this article we have discussed several important areas of machine operation. Tape path and tape interchangeability are the most important considerations when proper record and playback are to be achieved.

Before we explore the subject further, we must discuss some basic procedures for adjusting tape path for correct interchange.

Over the past few years we have used many Sony alignment tapes in the installation of new heads and adjustment of tracking. We have *rarely* found two tapes that would track at the exact same point on the tracking meter. We recommend, therefore, that you utilize only one alignment tape at your facility to adjust the tracking of all decks. In this way, any machine used for record or playback will have the same tracking interchange.

Adjusting tape path to correct an interchange problem should be avoided until diagnosis confirms that absolutely nothing else in the transport is causing the interchange

Bob Mastrangelo and **Maury Weingart** are engineers at two Los Angeles stations. They have formed Hollywood-based V.T.R. Service and Sales, a company specializing in on-site service to West Coast teleproduction companies.

problem. Once the tape guides are factory set and sealed they normally require no readjustment unless some part affecting tape height or tension has been replaced but not properly adjusted or positioned. We recommend that you leave all guides alone and look to the transport for more obvious problems affecting the tape path.

If it is necessary to alter the tape path, we use the monoscope segment of the standard Sony alignment tape. Monoscope contains no burst or chroma information which may present a false indication during your tape path setup.

Sony's alignment tape label advises against the use of the tape for the path adjustment. We have no knowledge of any better guide for these adjustments. We have used this tape repeatedly for path adjustment and find it very satisfactory.

Tape guides and interchange

Problems we have found with defective guides and how they affect the playback RF envelope are as follows:

• *Breathing or Flutter*. The RF envelope varies in amplitude as the tape moves through the tape path. The upper and lower tape guide flanges may become grooved or cut by the tape's edge when the machine is continually used over a long period of time. To cure this problem, rotate the existing guides to a previously unused area. Adhesive or oxide may accumulate on guide surfaces and should be removed since it can cause tape to move erratically and squeal.

• *Loose Guides*. The entire guide post assembly may become loose at the point where it attaches to the chassis. This allows the guide sufficient side movement to cause fluctuation in the RF envelope during playback.

• *Non-Linearity of RF Envelope*. In addition to guide wear problems, other assemblies common to the tape path can cause the RF envelope to become distorted and non-linear in its overall appearance. The tension regulator arm which affects skew or back tension is subject to bearing failure and can cause the tension regulator arm to move to a position not parallel to the head drum. This causes the tape to ride up or down, depending on which bearing has failed. The tape then enters the head drum assembly at an improper angle, causing the RF envelope to appear distorted as though a guide were improperly adjusted.

Interchange: skew

Thus far we have only discussed interchange problems affecting tracking. Mechanical interchange, as it relates to tape tension, is almost as important.

The proper back tension on the tape and its standardization from machine to machine will affect the playback. If back tension is not the same on all record or playback decks, the tape may be stretched while recording due to unusually high skew tension. If this same tape is played back on a normally adjusted machine, it can cause insert editing problems. Tape tension should always be uniform.

The manufacturer's procedures should be followed to set proper skew tension. A calibration instrument such as the Tentelometer can also be used.

Since it is impossible to cover every adjustment that needs to be performed to optimize your machine's performance, we have attempted to bring to your attention some of the major problem areas in helical editing equipment. We hope you find our suggestions a helpful guideline when troubleshooting your equipment to localize machine failures. **BM/E**

COVERAGE PREDICTIONS USING PROGRAMMABLE CALCULATORS

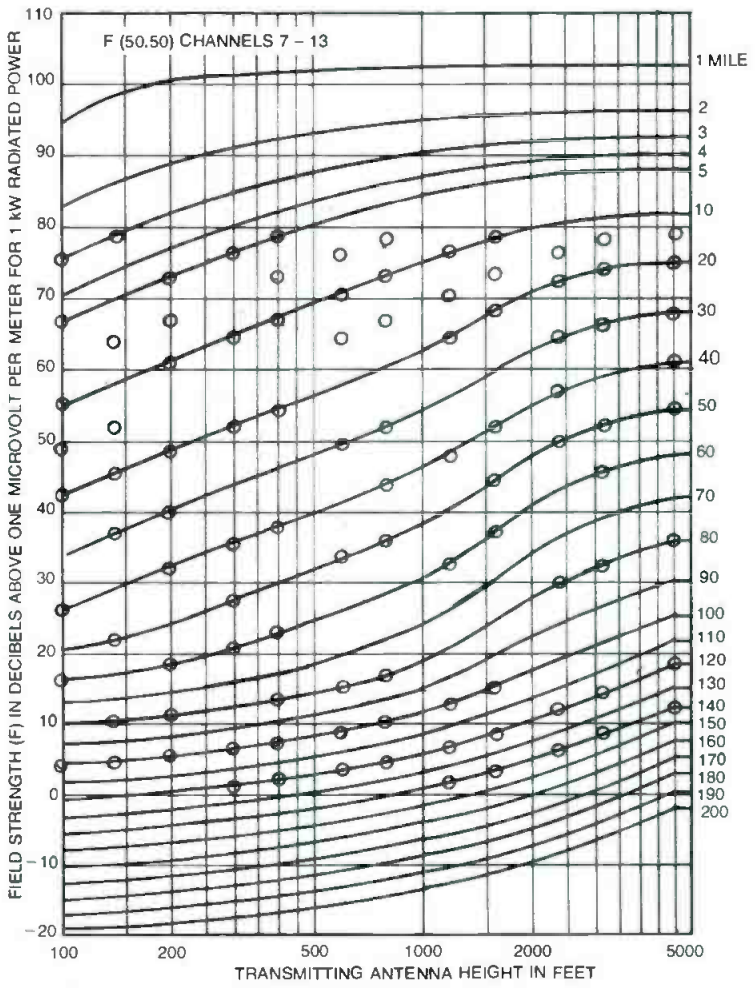
FM and TV broadcast coverage can now be accurately estimated using a new equation that approximates the FCC 50,50 curves.

By E.C. Westenhaver

Editor's note: The program listings referred to in this article are far too lengthy to be published here. Harris Corp. assures us, however, that the complete listings for any of the calculators mentioned or BASIC language listings for readers using personal computers can be obtained free of charge by writing to Harris Corp., Transmitter Product Development, P.O. Box 4290, Quincy, Ill. 62301.

E.C. Westenhaver is employed by the Harris Corporation in its transmitter product development section.

POWERFUL HAND-HELD programmable calculators such as the TI-59 and HP-67/97 and a new equation which curve fits the FCC field strength charts now allow for accurate estimation of FM and TV coverage with a few simple keystrokes. Consider, for instance, an FM station with an antenna height of 640 feet and 27.5 kW ERP. The following sequence will give the distance to the 1mV/m contour. Enter 640, press key A, press key B, enter 27.5, press key C, enter 1, and press key D. Seventeen seconds later the calculator will indicate 31.5 miles. Compare this to the traditional methods using sliding scales and interpolation on the field strength charts.



Location of 100 test points, FM and TV Ch. 2 – 6

the terrain roughness factor exceeds 50 meters the predicted coverage will be reduced.

The effective radiated power in kilowatts is entered, followed by pressing key C. The ERP is the power delivered to the antenna multiplied by the antenna gain relative to a half-wave dipole. Section 73.684 (c) specifies details including consideration of depression angles.

Next the field strength is specified and the calculator determines the distance. Enter dBu/m and press key E or enter mV/m and press key D. The mV/m value will be converted to dBu/m followed by the calculation of the distance in miles. The field strengths designated for various grades of service are shown in Figure 2. These field strengths are the value occuring at a receiving antenna height of 30 feet. The field strength should be exceeded at 50 per cent of the locations, 50 per cent of the time at the distance calculated.

The curve-fit equation was developed for the area of the field strength charts between 0 and 80 dBu/m/kW on the left hand vertical axis. Therefore, following key D or E the calculator will stop and indicate an error display condition if the dBu/m/kW value is outside this region. Calculations may be resumed by pressing R/S (TI-59) or pressing E twice (HP-67/97) and a distance answer will be obtained. In this case the answer should be checked against the field intensity chart to insure accuracy. Most predictions of a practical nature will fall in the 0 and 80 dBu/m/kW region and the error warning will not occur.

A discussion of the accuracy of the calculator results must cover several aspects. Since the basic intent is to duplicate the FCC field intensity charts, the coverage predictions will be no more accurate than the FCC techniques. The basic concern here is not the accuracy of the FCC techniques, but how accurately the calculator programs duplicate the FCC result.

To analyze the accuracy, 100 test points were selected to evenly cover the most used area of the field strength charts. These points are at intersections of specific mileage curves so that interpolation is not required. See Figure 3 for typical test point locations. When one kilowatt ERP is used, the dBu/m values of each test point should yield the corresponding mileage. The percent error of computed distance for each point was used to construct the histograms of Figure 4. These histograms allow an estimate of the probability of achieving a specified accuracy. For instance, for Chs. 7–13, 97 per cent of the points have less than 3.5 per cent error.

The 100 test points also allow identification of the areas of the chart where the curve-fit equation has greatest error. For instance, the FM and TV Ch. 2–6 error distribution shows four points grouped around five percent error. Three of these are at 5000 feet antenna height and 10, 30, and 40 miles distance, which is a little-used area. The fourth point is 4.6 percent error at 1600 feet antenna height and 10 miles. The TV Ch. 7–13 error distribution shows three points with greater than 3.5 percent error. The largest error of 5.6 percent occurs at 2400 feet and 20 miles. At 140 feet and 50 miles the error is 4.5 percent and at 1200 feet and 14 miles the error is 4 percent. The technique of least squares curve fit reduces slightly the curvature and smoothes out the 20-mile line on the Ch. 7–13 chart.

These approximations of the FCC coverage prediction techniques may not have suitable accuracy for formal submission to the Commission, but their ease and speed are very useful. Tradeoff studies of changes in power of antenna height are now much quicker and the difficulties of interpolation between mileage curves are eliminated. The convenience of performing predictions with only a calculator and magnetic cards is refreshing. **BM/E**

SMPTE, LOS ANGELES TO FOCUS ON PRODUCTION AND POST PRODUCTION

This month's 121st Conference of the SMPTE will take on a decidedly international flavor and reflect the growing importance of television and electronics.

WHEN THOUSANDS OF Society engineers gather at the Century Plaza in Los Angeles later this month for the 121st Conference of the SMPTE, they will indulge in one of the largest and most comprehensive programs ever put together by this organization. Those members who have attended these conferences regularly will find some significant changes that reflect the way the motion picture and television industries themselves are changing.

Of the 91 papers scheduled for presentation, more than half will relate directly to television and electronics, reflecting the growing role that these technologies are playing in Hollywood as well as the rest of the country. Moreover, the growing importance of the international television and film industries is reflected by the great number of papers authored by representatives from Japan, Germany, England, Belgium, France, and other countries. A panel discussion scheduled for Wednesday morning (October 24) will feature a report on the state of the television and film industries in the People's Republic of China.

The broadening of the industry into consumer and industrial markets will also be reflected in sessions devoted to these two growing areas.

With more than 150 exhibitors scheduled to appear in Los Angeles, the increased importance of the Society's membership to manufacturers is reflected. The exhibits will add an important dimension to papers presented as delegates will be able to adjourn from the papers to the exhibit floors and find practical representations of the latest

With nearly two years of one-inch videotape technology under its belt, the SMPTE will cover advances in on-line and off-line editing approaches

List Of SMPTE Exhibitors

Booth#	Exhibitor
Santa Monica Room (section A)	
101–103	Convergence
104,105	Canon
106,107	NEC
108	Rank Cintel
109	Rank Precision
110	Chrosziel/Film-Technic
111–113	Matthews
114	Strand Century
116	Cinema Products
124–126	Oxberry
127	Listec
128,129	Multi-Track
130,131	General Electric
Los Angeles Room (Section B)	
201–204	3M Co.
205,206	Bosch Fernseh
207,208	Lenco
209–211	Fujinon
212,213	Ampex
214,215	Vital
216	Agfa-Gevaert
217	JVC
219	Ampex
225–227	TeleMation
230–237	Philips
238,239	Tektronix
240,241	Grass Valley
242,243	Datatron
244	Fuji

continued on page 108

SONY INTRODUCES WIRELESS MICROPHONE SYSTEMS WITH AN INNOVATION NOBODY ELSE HAS: SIGNIFICANTLY BETTER SOUND.

Until now, using a wireless microphone system meant sacrificing the quality of the sound in a trade-off for portability.

No more.

Sony has engineered wireless microphone systems as portable and versatile as any on the market.

But with a very big difference. Excellent sound.

To begin with, Sony offers a wider dynamic range than any other wireless system, a range of 96 dB. This accommodates sound pressure levels up to 130 dB. (While most other wireless systems have limiters which hold their dynamic range to, at most, 75 dB, Sony engineering has produced a system that requires no limiters.)

So what goes into the microphone comes out again at the same sound level. And nothing takes away from the thrill of performance.

What's more, audio distortion is less than 0.1% and signal-to-noise ratio is better than 57 dB (both ± 2.4 kHz deviation, at 1 kHz).

And the new Sony systems are virtually drift-free. Frequency stability is an amazing ± 0.005%.

Furthermore, Sony wireless systems are available with up to 14 channels in UHF, which means that interference from other sound sources is much less likely than at lower frequencies.

And while many wireless systems are put together with a mixture of components from several manufacturers, Sony uses only one: Sony.

So we've been able to create fully integrated systems that offer you a wide variety of options.

For EFP and ENG, Sony's system includes a tiny lavaliere mike, a transmitter about the size of a cigarette pack and a tuner smaller than a paperback book.

The system also comes with a shoulder-strap antenna and a leather carrying case. Altogether, it's compact and efficient and offers outstanding sound.

For studio and stage use, Sony has a modular rack-mounted system that can be engineered in any combination you want, from single-channel to multi-channel diversity reception.

It can be portable or fixed, and runs from 110 volts AC or 24 volts DC.

For more information, call Sony Professional Audio Products at (212) 371-5800, extension 143 or 145.

You'll find out that no other wireless systems sound as good as Sony's.

SONY

We've never put our name on anything that wasn't the best.

technology discussed in the sessions.

For those delegates from the broadcast and teleproduction sides of the industry, the major emphasis will be on the continuing effort to improve television production techniques in the electronic era and on the latest technology for television post-production. There are also a number of papers on the enhanced telecine technology that is opening the way to a more effective blending of film and television and improving the efficiency of film-to-tape transfer.

Reports are scheduled on applications of television technology in Olympic coverage and the development of post-production techniques at Televisa Mexico. Other subjects to be discussed in papers range from a progress report on SMARTS (RCA Americom's satellite distribution scheme for radio and television) to the latest experiments with digital transmission of television and audio signals.

Though only one paper ("Advances in ENG/EJ Systems Concepts," E.J.

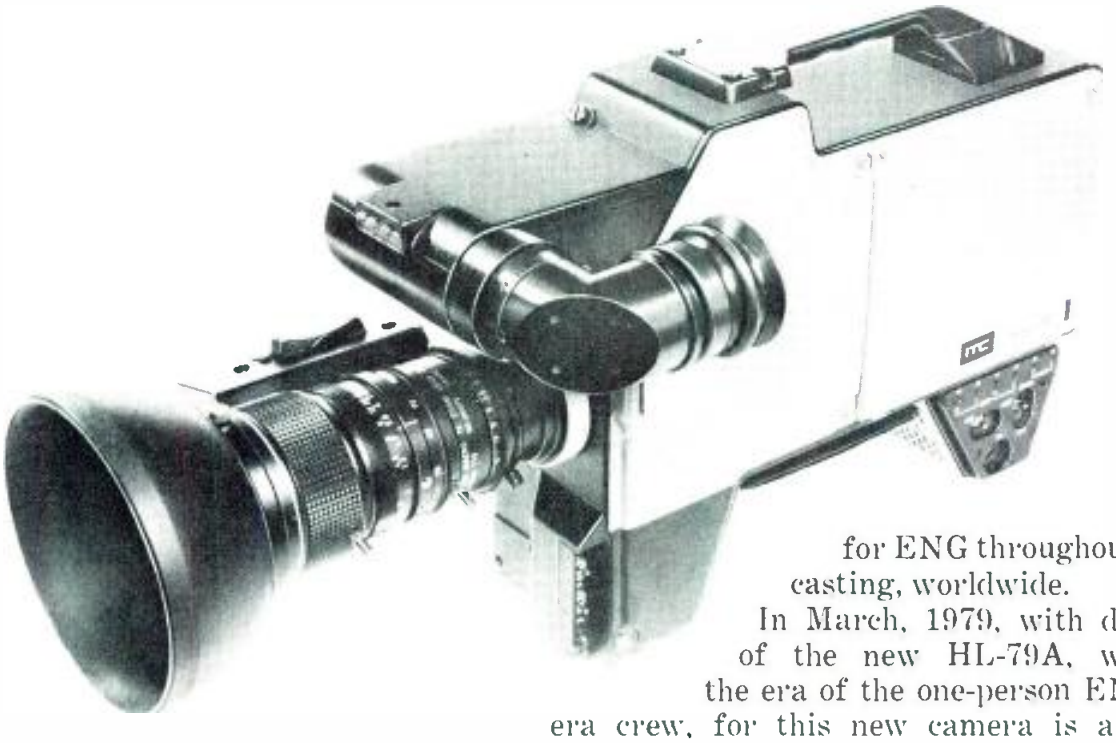
continued on page 110

SMPTE Exhibitors

Booth#	Exhibitor
Beverly Hills Room (Section C)	
301,302	Ikegami
303	Marconi
304,305	Dolby
306,307	O'Connor
308,309	Recortec
310,311	Asaca
312–314	Hitachi Denshi
316	Sony
324,325	Nurad
326,327	Eigen
328,329	Consolidated Video Systems
330,331	Berkey Colortran
California Drive (Section D)	
401–405	Magnasync/Moviola
406–408	Goldberg Brothers
409,410	Peterson
411–413	F&B/Ceco
414	Mitchell Camera
415–418	Oldelft/KLM
419–422	RCA
423,424	Allen Products
425–427	Eastman Kodak
428,429	Frezzolini
430,431	Bell & Howell
432–434	Arriflex
435	Image Devices
436	Norton Associates
437	Carter Equipment
438	Motion Picture Enterprises
439	Wide Range Electronics
440,441	Hazeltine
442–444	KEM
445,446	Westrex
447	Rosco
448	Vega
449	Macbeth
450	Century Precision
451	Bolex
452	Perf-Fix
453–456	Ferco
457	Carter Equipment
458,459	Houston Fearless
460–462	Arriflex
463–465	Magna-Tech
466	LaVezzi
467–469	Plastic Reel
470–474	Alan Gordon
475	Sylvania
476,477	Audio Services
478,479	Birns & Sawyer
480	Super 8 Sound
481,482	Belden Communications
483	Nagra
484–487	Mole Richardson
488,489	Hollywood Film Co.
490–493	LTM
494,495	Lowel Light
496–498	Lipsner-Smith
California Showroom (Section D)	
501,502	Electronic Applications
503–505	Toshiba
506	Millimeter
507	Arvin/Echo Science
508–510	Micro Consultants
511,512	CMX
513–516	Panasonic
517	Digital Video Systems
518,519	Commercial Electronics
520,521	Tele-Cine

continued on page 110

Ikegami inaugurates the era of one-person ENG camera crews.

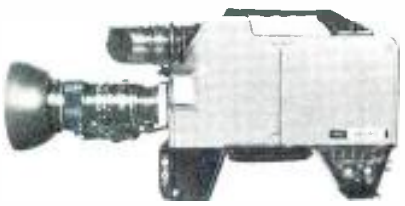


A remarkable new television camera is ready for ENG broadcasters, a new-generation camera significantly more compact, yet higher in performance than any prism-optic ENG camera now offered.

The new HL-79A is like other Ikegami cameras in its performance and reliability. This tradition is well-known in the industry. It dates back some six years to the pioneering HL-33 head-plus-backpack camera that first made broadcast-quality ENG truly feasible. The HL-33 and its successor, the HL-35, carried on this tradition of reliability. And the current HL-77A head-plus-battery camera is today's standard for ENG throughout broadcasting, worldwide.

In March, 1979, with deliveries of the new HL-79A, we enter the era of the one-person ENG camera crew, for this new camera is an all-in-the-head design – fully integral, with no power cord to a separate battery. Its reduced weight and size enable the camera-person to slip solo in or out of vehicles or through crowds, unhampered as never before. In performance and reliability it is the ENG camera of tomorrow in the authentic lineage of Ikegami cameras of yesterday and today.

Ikegami Electronics (USA) Inc., 37 Brook Ave., Maywood, N.J. 07607, (201) 368-9171; West Coast: 19164 Van Ness Ave., Torrance, Calif. 90501, (213) 328-2814; Southwest: 330 North Belt East, Suite 228, Houston, Texas, 77060, (713) 445-0100.



Ikegami HL-79A

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SMPTE

Forbes, Microwave Associates, Friday morning) will deal directly with ENG topics, electronic field production will get thorough treatment from a number of papers covering applications in production and post-production.

Partial list of manufacturers exhibiting **Transmitting, Microwave, & Testing Equipment** at SMPTE:
Di-Tech booth # 574; Hitachi 312 – 314; Lenco 207, 208; Marconi 303; NEC 106, 107; Nurad 324, 325; Philips 230 – 237; RCA 419 – 422; Tektronix 238, 239; Utah Scientific 640

Cameras and camera technology

Monday, October 22, will be the big day for papers on camera advances. Several papers will be delivered on the subject of microprocessor-controlled cameras, including a paper by Steve deSatnick of KCET, Channel 28, Los Angeles, who will discuss his practical experience with such systems.

continued on page 112

SMPTE Exhibitors

Booth #	Exhibitor
522	Chyron
523–531	Compact Video
532	Amperex
533,534	ADDA
535,536	TV Equip. Associates
537	Digital Video Systems
538,539	Videomedia
540,541	Merlin Engineering
542	Central Dynamics
543	Microtime
544,545	Cine 60
546	Christy's
547–550	Steenbeck
551	AATON
552	Hudson Photographic
553	EPRAD
554	Industrial Silver
555	Lighting Dimensions
556	Smith Victor
557	Miller
558	Pace International
559	L–W International
560	Twenty-Fourth Frame
561	Photo Research
562,563	Coherent Communications
564	Cine Precision
565	Gray Engineering
566	Hollywood Assoc.
567	Pioneer Marketing
568	Sennheiser
569	Telescript
570	Memorex
571	Thermodyne
572	Tentel
573	Winsted
574	Di-Tech
575	NL Film Products
576	Swintek
577,578	Bogen

Malibu Room (Section E)

601	J.M. Cumming Co.
602	Corp. Comm. Consultants
604	G&M Corp.

Sherman Oaks Room

605	KB Systems
606,607	Kliegl Brothers
608,609	Movie Cam

Westwood Room

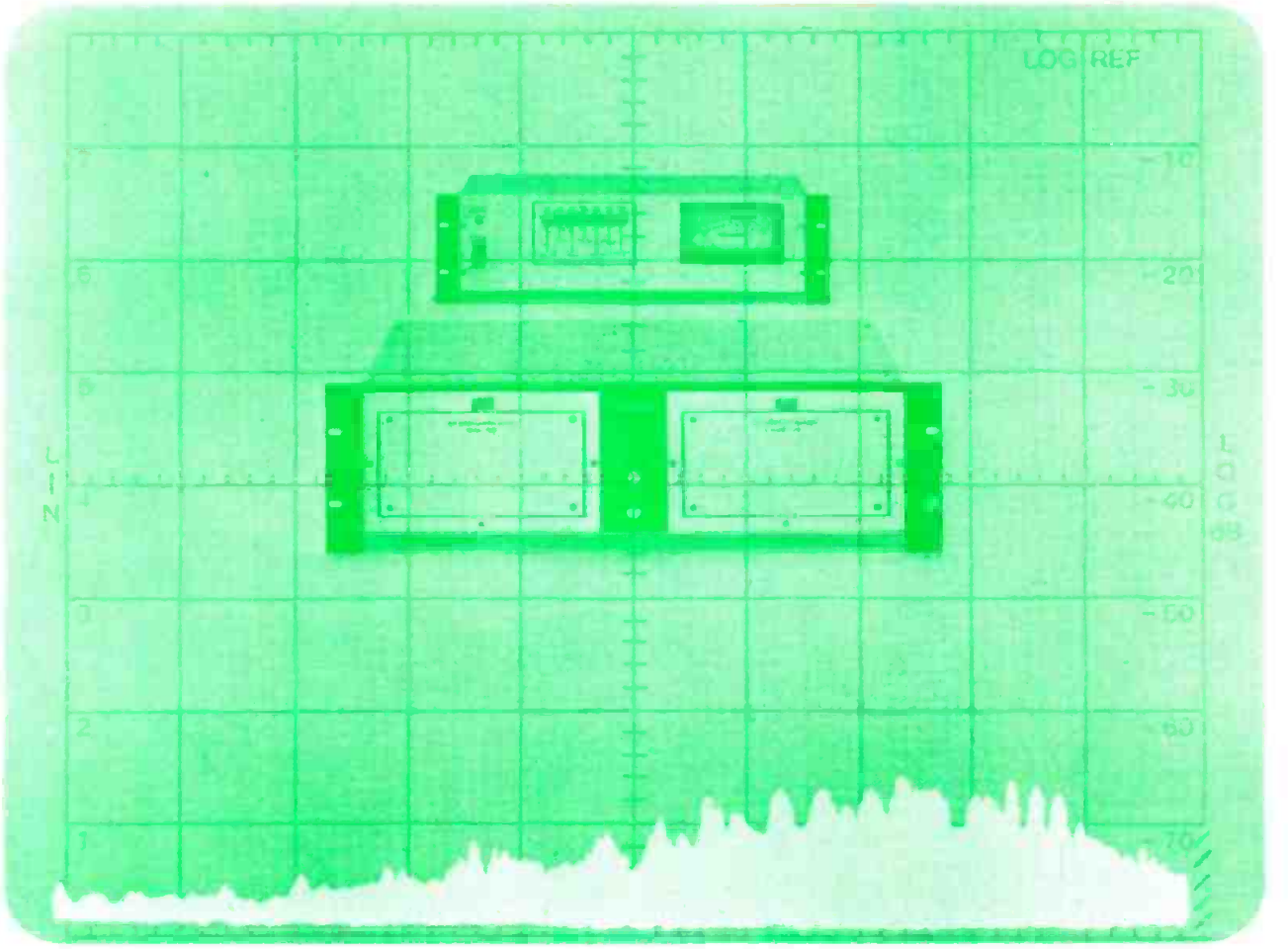
610,611	Lab Methods
612	SERA
613	Harrison & Harrison
614	Jamieson
615	Network
616	Pringle
617	Marco Scientific
618	Durafilm

Encino Room

619,620	Soremec Eclair
621	Film Equipment Service
622,623	Thorn Lighting

Pacific Palisades Room

637	Systems Concepts
638	Brumac Industries
639	Coolight
640	Utah Scientific



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SECURITY: Fully redundant receiver and transmitter, both with automatic transfer and alarm.

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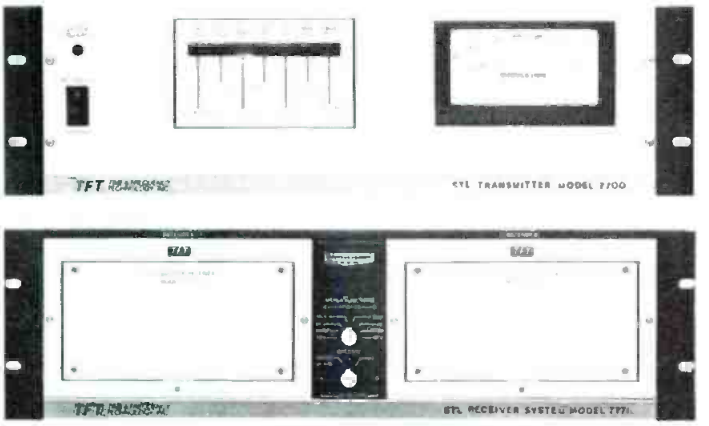
TEST RESULT BASIS: Vertical = 10 dB Div.; Horizontal = 10 kHz/Div.; 10 dB ref. = 100% modulation. 0 to 100 kHz.



TFT TIME AND FREQUENCY TECHNOLOGY, INC.

3090 OAKMEAD VILLAGE DR., SANTA CLARA, CA. 95051 (408)246-6365 TWX 910-338-0584

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SMPTE

New advances in tube technology will also be discussed in several papers and a new approach to specifying the resolving power of camera pickup tubes will be advanced by L.D. Miller of RCA.

On Thursday, under the heading of Advanced Transmission Techniques, the use of fiber optics connections with minicams will be discussed by Gary Miller of Fiber Optics Co., Wallingford, Conn.

Partial list of manufacturers exhibiting **TV Cameras, Camera Technology & Lenses** at SMPTE:
Amperex booth#532; Ampex 212, 213, 219, 228, 229; Asaca 310, 311; Bosch Fernseh 205, 206; Canon 104, 105; Cinema Products 116; Commercial Electronics (CEI) 518, 519; Century Precision 450; Fujinon 209 – 211; Hitachi 312 – 314; Ikegami 301, 302; JVC 217; Marconi 303; NEC 106, 107; Panasonic 513 – 516; Philips 230 – 237; Rank Precision 108, 109; RCA 419 – 422; Sony 316; Tele-Cine 520, 521; Toshiba 503 – 505

Production applications

The use of one-inch videotape recorders and other field production grade equipment will get a going over from a number of vantage points. Such technology is likely to be a primary focus of the international reports from England, Japan, and France scheduled to be presented on Wednesday morning. On Monday morning, Norbert Wassiezek of the Austrian Broadcasting Company will discuss the uses of the one-inch videotape format in his country. Bill Hogan of Ruxton, Burbank, Calif., will deliver a paper covering the uses of the "B" format one-inch system. His company has used these machines under the most severe environmental conditions and his paper will report on the performance of the machines under stress.

Partial list of manufacturers exhibiting **Production Equipment** (VTRs, switchers, SEGs, character generators, etc.) at SMPTE:
ADDA booth#533, 534; Ampex 212, 213, 219, 228, 229; Arvin/Echo Science 507; Asaca 310, 311; Bosch Fernseh 205, 206; Central Dynamics 542; Chyron 522; Cinema Products 116; Digital Video Systems 517, 537; Eigen 326, 327; Grass Valley 240, 241; JVC 217; 3M 201 – 204; Marconi 303; Merlin 540, 541; Micro Consultants (MCI) 508 – 510; Microtime 543; NEC 106, 107; Philips 230 – 237; RCA 419 – 422; Recortec 308 – 309; Sony 316; System Concepts 637; TeleMation 225 – 227; Toshiba 503 – 505; Vital 214, 215

Post-production and the digital era

The sessions concerned with post-production of video will clearly show the impact of digital equipment for effects and control. C. Liu, of Datatron, will discuss a wide variety of ways that producers can get maximum flexibility from a post-production system through the imaginitive use of time codes. His paper will be presented on Tuesday morning. Also that morning, Bruce Raynor of Grass Valley Group will present some thoughts on the use of a digitally controlled post-production switcher.

This time out, audio in the video post-production process will also be considered, in a paper by Steven Chan of Adams/Smith. This paper will take a good look at the use of a synchronizing system for audio/video. Richard Ellis, a representative of Pye TV Ltd., will describe the role that digital noise reduction can play during the critical post-production phase.

The place of the computer in post-production will get a fresh treatment from Gene Simon of CMX, who will

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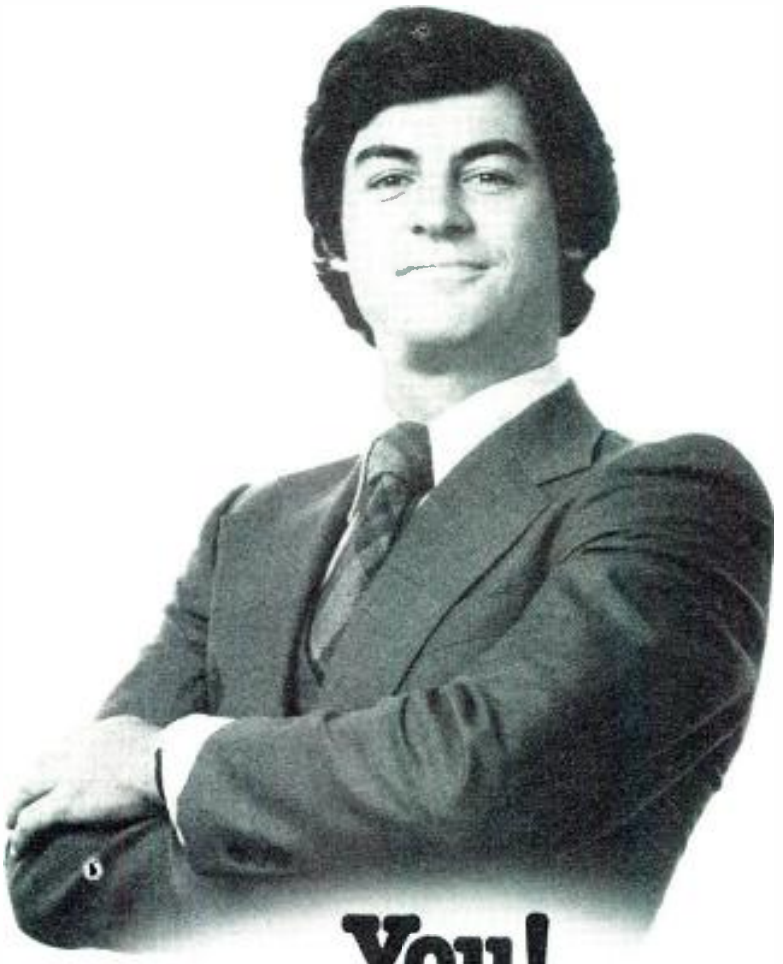

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Partial list of manufacturers exhibiting **TV Post-Production Equipment** at SMPTE:
Ampex booth #212, 213, 219, 228, 229; Bosch Fernseh 205, 206; CMX 511, 512; Compact Video 523–531; Consolidated Video Systems 328, 329; Convergence 101–103; Datatron 242, 243; JVC 217; Panasonic 513–516; Philips 230–237; RCA 419–422; Sony 316; TeleMation 225–227; Videomedia 538, 539

describe a "self-tailoring" technique through the use of microprocessor controlled-editing systems.

A cost/benefit breakthrough in the area of off-line editing of video will be described by Joseph Flaherty of CBS. This paper will concern itself with the Betamax-based off-line editing developed by CBS for use at its Hollywood studios.

The promise of stereo TV audio

As the industry wakes up to the possibility of stereo audio in television programming, any number of techniques for transmitting and producing stereo audio have been uncovered. This entire subject, covering areas as diverse as multilingual programming through multiplexed audio to a progress report on stereo from the responsible SMPTE committee, will be covered in papers on Wednesday afternoon.

But broadcasters appear just as concerned with mono audio quality and papers generally concerned with quality control will be presented on Wednesday as well. New technology for working with audio will also be discussed in papers presented on the new Vidi-Mag™ from Magna-Tech and in a paper on automated mixdowns.

Thursday afternoon the papers and discussions will focus on the role played by microprocessor equipment. The possibilities and limitations of microprocessor technology will be explored by several presenters.

Partial list of manufacturers exhibiting **Audio Equipment** at SMPTE:
Bogen booth #577, 578; Coherent Communications 562, 563; Compact Video 523–531; Dolby 304, 305; Image Devices 435; Magnasync/Moviola 401–405; Magna-Tech 463–465; Multi-Track 128, 129; Nagra 483; RCA 419–422; Recortec 308, 309; Sennheiser 568; Sony 316; Swintek 576; Vega 448; Wide Range Electronics 439

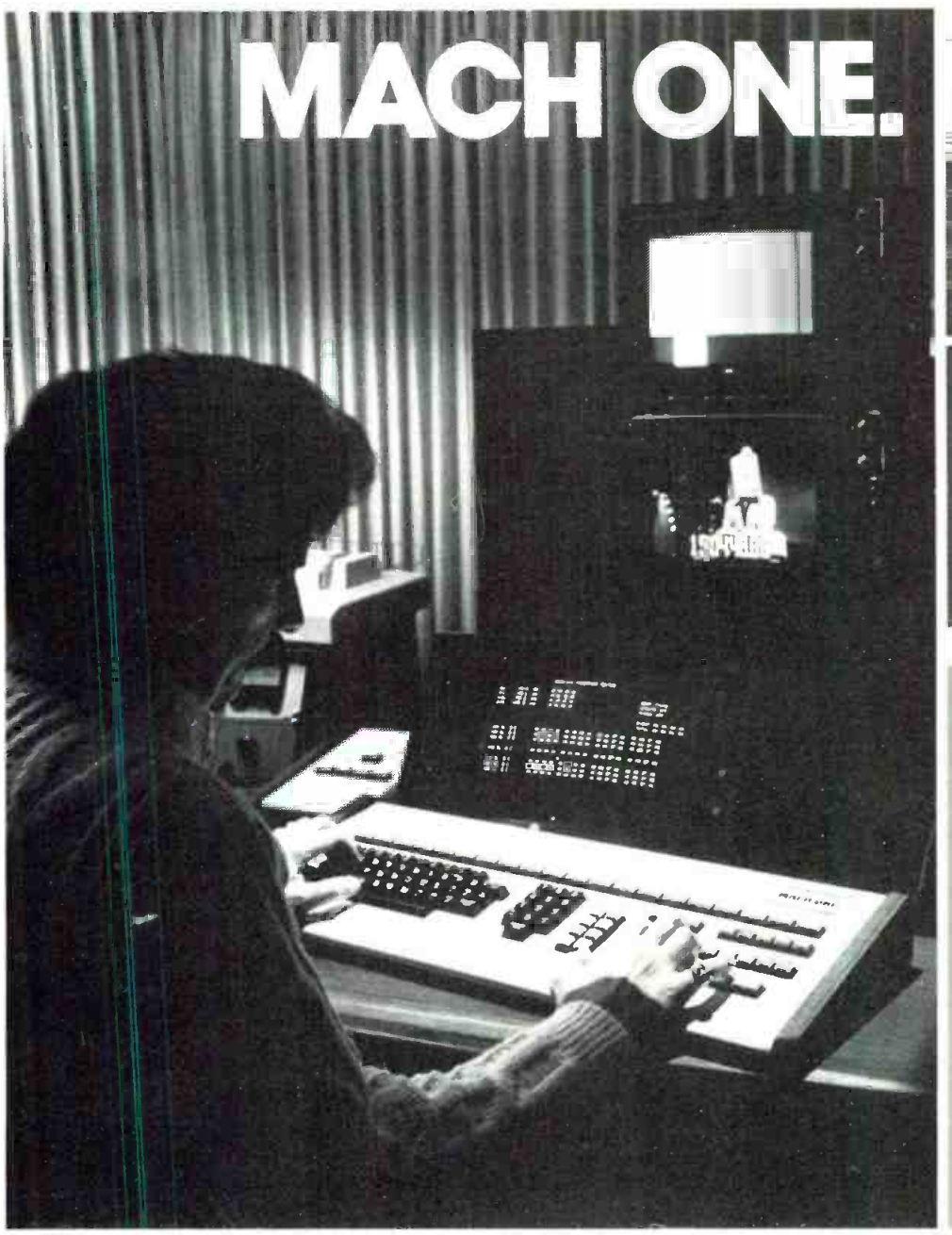
Telecines and film-to-tape transfers

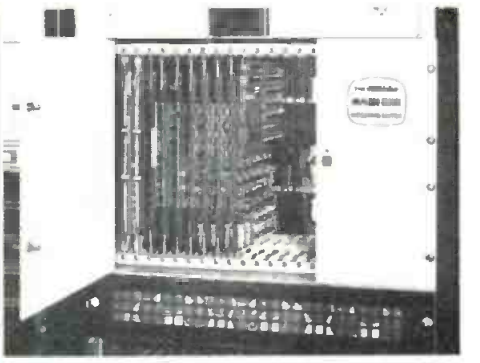
Despite the hasty conclusions drawn by some pundits concerning the future of film, technological advances in film technology, its high quality, and its fitness for solving important problems has kept it center stage. The latest advances in telecine technology will be reported in several papers, including one by Henry Zahn of Bosch-Fernseh (Monday a.m.), who will describe the CCD-based telecine recently introduced at Montreux.

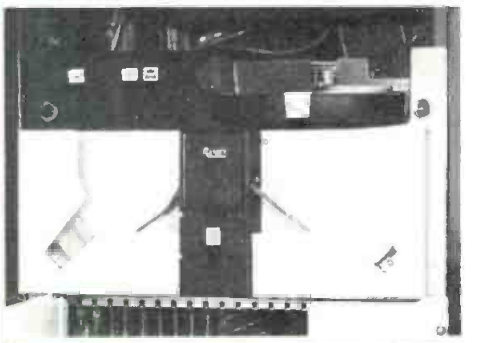
One area where film will continue to play an important role is in the international field where differing electronic color recording standards impede the advance of video. This subject will be covered on Monday by Andrew Armstrong and others from Transcan Video of London, England.

Partial list of manufacturers exhibiting **Telecine Systems** at SMPTE:
Bosch Fernseh booth #205, 206; Cinema Products 116; Ikegami 301, 302; L-W International 559; Philips 230–237; Rank Cintel 108, 109; RCA 419–422

A full report on the details of these papers and on the reactions of broadcasters to the exhibits will be featured in the November issue of *BM/E*. **BM/E**







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Selected Papers of Special Interest to Television Broadcasters

MONDAY MORNING, 22 OCTOBER

Television Production

Microprocessor Controlled Cameras and Their Operation
-Steve deSatnick, KCET-LA

Continuously Variable Speed Forward Reverse 16mm/Super 8 Flying Spot Scanner Operational PAL, NTSC, SECAM, 50-60 Cycle
-Andrew Armstrong, Alan Groves, and Richard Whittington, Transcan Video Ltd., London

A Newly Developed 30 Millimeter Pickup Tube for Cameras in Teleproduction and Other Demanding Non-Broadcast Uses
-Al Month, RCA Corp., Lancaster, Penn.

High Quality Montage Picture by Soft Chroma Key
-Jun Ichiro Nakamura, Japan Broadcasting Corp., Tokyo

Matching of the TK-47 (A High Performance Color TV Camera) to a Unique Pickup Tube Design
-S.L. Bendell and C.A. Johnson, RCA Corp., Camden, N.J.

A New Method of Specifying the Resolving Power of Television Camera Tubes
-L.D. Miller, RCA Corp., Lancaster, Penn.

The Usage of One-Inch Video Tape Format in TV Production in Austria
-Norbert Wassiezek, Austrian Broadcasting Corp., Vienna, Austria

SMARTS System Progress Report
-Lawrence T. Driscoll, RCA Americom, Piscataway, N.J.

Automatic Set Up System for a Broadcast Color Camera
-Brian Astle, Robert A. Disehert, Robert E. Flory, and Michael Lurie, RCA Laboratories, Princeton, N.J.

Layout and Performance of a Modern CCD-Telecine
-Henry Zahn and D. Poetsch, Robert Bosch GmbH, Fernseh Group, W. Germany

TUESDAY MORNING, 23 OCTOBER

Television Post Production

Post Production in Televisa Mexico
-Eugenio Ruesga and Cenobia Moriel, Televisa Mexico

Post Production Switching with a Digitally Controlled Switcher
-Bruce Rayner, Grass Valley Group, Grass Valley, Calif.

A Flexible Audio/Video Tape Synchronizing System for Television Production Applications
-Steven Chan, Adams/Smith Corp., Boxboro, Mass.

An Adaptive Digital Noise Reducer for Professional Television Applications
-Richard Ellis, Pye TVT, Ltd., Cambridge, England

Advanced Computer Editing Techniques
-C. Liu, Datatron, Inc. Irvine, Calif.

Single Camera Editing Systems
-J.A. Flaherty, CBS Television Network, New York, N.Y.

Operating Experience with the "B" Format for Electronic Field Production and Post Production
-Bill Hogan, Ruxton, Burbank, Calif.

Film-to-Tape Transfer: Thoughts of the Solution of the Problems by Modern Means
-D. Geise, Robert Bosch GmbH, Fernseh Group, W. Germany

Image Quality Transfer Through Film and Television
-Karel Staes and Lucien Hayen, Agfa-Gevaert, Montsle, Belgium

WEDNESDAY MORNING, 24 OCTOBER

International Progress Reports from England, Germany, Japan, France, and the People's Republic of China as well as the U.S.

THE REST OF THE MORNING WILL BE DEVOTED TO A PANEL DISCUSSION BY OFFICERS AND MEMBERS OF SMPTE WHO HAVE RECENTLY VISITED THE PEOPLE'S REPUBLIC OF CHINA.

WEDNESDAY AFTERNOON, 24 OCTOBER

Television Sound Technology

Stereophonic Sound and Multilingual Television Broadcast Services by Multiplex Method
-William S., Halstead, Consultant, Woodland Hills, Calif. and Richard W. Burden, Richard W. Burden Assoc., Canoga Park, Calif.

Vidi-Mag™: A New System for Television Audio Post Production
-C. Robert Fine, Magna-Tech Electronic Co. Inc., New York, N.Y.

The Peak Program Meter and the VU Meter in Broadcasting
-Hans Schmid, ABC, New York, N.Y.

Progress Report of the Multi-Channel Sound Sub-Committee of the Broadcast Television System Committee
-Thomas Keller, Jr., WGBH-TV, Educational Foundation, Boston, Mass.

A Report on the Effects and Measurements of Videotape Mechanical Modulation of the Audio Signal
-Koichiro Hori, WGBH Educational Foundation, Boston, Mass.

Automated Mixing
To be announced

Audio is becoming a major factor, at last, in television production and both papers and exhibits will reflect this

THURSDAY MORNING, 25 OCTOBER

Consumer Video Technology

A Survey of Stereophonic Home Television Systems
-James F. Butterfield, Stereo-Video Laboratories, No. Hollywood, Calif.

Teletext and Viewdata
-Joseph Roizen, Telegen, Palo Alto, Calif.

Technology and Copyright Protection
-S. Mittleman, MCA, Hollywood, Calif.

QUBE Television
-To be announced

The Future of High Definition Television (Report of the SMPTE Study Group on High Definition Television)
-Donald G. Fink, chairman of the Study Group

Panel Discussion: Technical Aspects of Consumer Television

continued on page 118

SMPTE Papers

THURSDAY AFTERNOON, 25 OCTOBER (CONCURRENT SESSIONS)

Scientific/Industrial Film and Video Systems

The Technology Present and Applications Future of the Video Disc
-C. Robert Paulson, AVP Communications, Westborough, Mass.

Dynamic Application of Unique Camera Systems
-Hallock F. Swift. International Applied Physics, Inc., Sunnyvale, Calif.

And others

Microprocessor Systems Control

Getting Aboard the Microprocessor Bandwagon
-Fred J. Hodge, William N. Speck, Charles Germon, and Stephen Kent, 3M Co. Mincom Div., Camarillo, Calif.

The Promise and Reality of the Microcomputer
-Carl A. Lindke, The Grass Valley Group, Grass Valley, Calif.

Maximized Microcomputer for Television
-Ray Unrath, System Concepts, Inc., Salt Lake City, Utah

Innovative Self-Tailoring Techniques with Microprocessor Controlled Editing Systems
-Gene Simon, CMX, Santa Clara, Calif.

FRIDAY MORNING, 26 OCTOBER (CONCURRENT SESSIONS)

International Image Distribution

Reaching the Global Village
-Thomas W. Hope, Hope Reports, Inc., Rochester, N.Y.

Olympics in Moscow, Distribution in SECAM
-Craig Curtis, NBC-TV, New York, N.Y.

Tutorial on the NTSC-SECAM and PAL Systems
-Arch Luther, RCA, Camden, N.J.

Advanced Transmission Techniques

Advances in ENG/EJ Systems Concepts
-E.J. Forbes, Microwave Associates, Burlington, Mass.

DATE: System for Audio Transmission
-Digital Communications Corp., Gaithersburg, Md.

Digital Television Terminal for Multiplex Television Signals
-H. Shigehara, NEC, Tokyo, Japan

Fiber Optics Interconnection for a Minicam
-Gary Miller, Fiber Optics Co., Wallingford, Conn.

PBS Captioning for the Deaf
-John Bell, PBS, Washington, D.C.

Friday morning's sessions will deal with a broad range of subjects focusing on advanced transmission techniques and the advance of transmission systems using satellites

ADR at NRBA Booth #605

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INTERPRETING THE

FCC RULES & REGULATIONS

Sponsorship Identification Rules

By Frederick W. Ford and Lee G. Lovett; Lovett Ford and Hennessey, P.C., Washington, D.C.

A LITTLE MORE THAN A DECADE AGO, a prominent politician decided to run for governor of a southern state. A local television station soon thereafter carried a program critical of this gubernatorial hopeful's past record. The program was sponsored by the "Capital TV Committee for Good Government." The television station announced that the program was sponsored by this committee, although it knew that the committee was actually a front for the opposition candidate's campaign organization.

As sometimes happens, the true story came to the public notice. Eventually, the FCC found the television station liable for forfeiture for violating its rules requiring sponsorship identification of the person "in whose behalf such agent (here meaning the committee) is acting." Although the Commission was effectively overruled by the Federal Courts (due primarily, to imprecise wording of the Commission's rules), this case is significant since it prompted the Commission to institute proceedings to define its sponsorship identification rules.

In general, Section 73.1212 of the Commission's rules requires that all broadcasts for which a station charges for time must contain an announcement identifying the sponsor or the person on whose behalf the broadcast in reality is being aired. Such an announcement need not be made if the station airs the program for free as long as the sponsor is not providing use of the film or tape to "secure free advertising" for itself or someone else.

The broadcast station has the duty to use "reasonable diligence" in obtaining the program sponsor's name (or the name of the person on whose behalf the program is being aired) to make the required identification announcement. The Commission specifically recognized problems inherent in determining the straw organization's true source of funds. Did the funds emanate from the opposing candidate's campaign organization or from one of his/her supporters? The Commission answered this question by saying, "In those instances, the licensee must exercise reasonable diligence to ascertain facts. We do not require more of him. But we do not condone less."

A program of five minutes or more that addresses a political matter or controversial issue of political importance must be preceded and followed by a sponsorship identification announcement.[1] A program of less than five minutes' duration need make only one such announcement at the program's beginning or conclusion. A commercial product advertisement that at least once clearly states the product's name, the sponsor's trade name, or the sponsor's corporate name is deemed to have complied

[1]In Sponsorship Identification and Candidate Authorization Notices, 43 RR 2d 275, 19 (1978), the FCC and the FEC issued a joint Public Notice. The notice stated as follows:

4. The following authorization notices and sponsorship identification announcements, in the situations described, comply with both the FCC and FEC equlations:

I. Broadcast communication which is authorized by and financed (or furnished) by the candidate or the candidate's authorized committee:

(1) 'Paid for by [Name of candidate or committee].'

(2) 'Paid for and authorized by [Name of candidate of committee]' or

(3) 'Sponsored by [Name of candidate or committee]' or

(4) 'Furnished by [Name of candidate or committee].'

NOTE: Where a candidate or his committee is paying for or furnishing a broadcast matter, authorization by the candidate is assumed and need not be specifically stated.

II. Broadcast communication which is authorized by the candidate or the candidate's authorized committee, but financed (or furnished) by a third party:

(1) 'Paid for by [Name of third party] and authorized by [Name of candidate or committee]' or

(2) 'Sponsored by [Name of third party] and authorized by [Name of candidate or committee]' or (where appropriate)

(3) 'Furnished by [Name of third party] and authorized by [Name of candidate or committee].'

III Broadcast communication which is financed by a third party and not authorized by any candidate or any candidate's authorized committee:

(1) 'Paid for by [Name of sponsor/payor] and not authorized by any candidate' or

(2) 'Sponsored by [Name of sponsor/payor] and not authorized by any candidate' or (where appropriate)

(3) 'Furnished by [Name of person or group furnishing broadcast] and not authorized by any candidate.'

5. The following additional announcement is required by FECA in any of the above situations if the communication (1) is financed by a political committee and (2) solicits political contributions:

"A copy of our report is filed with the Federal Election Commission and is available for purchase from the Federal Election Commission, Washington, D.C."

The logic behind the Revox B77.

The logic is the logic which is built-in.

It's an ingenious and highly sophisticated system—much like the human nervous system—which controls the deck's functions.

You can push any button in any order with no chance of damaging your tapes. Our motion sensing system constantly feeds status reports to the logic circuitry which activates your commands in proper sequence.

The logic also permits full-function remote control, and an editing mode that keeps the playback circuitry live, even when the motors are stopped. You can make your splices right on-the-beat, and our built-in splicing block makes it easy.

The design and construction of the Revox B77 further guarantee smooth and accurate operation. To get the long-life advantage of ferrite without static build-up or heat degradation, we use Revox's exclusive Revodur heads, made of metal to dispel heat and static, and vacuum-coated with permalloy for durability.

The B77 has a unique capstan motor that's monitored by a tacho head to precisely control speed and limit wow and flutter to professional studio standards.

Revox offers many options with the B77 including a full range of speed configurations from 15/16 IPS to 15 IPS, variable speed control, ¼ track record/playback and more.

All this professional quality is neatly engineered to fit in a deck you can carry. After all, if you own a machine this good, it's logical to take it with you.

Experience the B77 and the full line of Revox and Studer professional products at your franchised dealer today.

STUDER REVOX America, Inc.
1819 Broadway, Nashville, TN 37203 615 329-9576/ In Canada: Studer Revox Canada, Ltd.

Circle 173 on Reader Service Card

with the identification rule. Even if the advertisement exceeds five minutes in length, it is still deemed in compliance and two identification announcements are not required.

Licensees broadcasting political material or matter dealing with a controversial issue of public importance that was paid for or furnished by a "corporation, committee, association or other unincorporated group or other entity must compile a list of the 'chief executive officers or members of the executive committee or the board of directors of such organization.'" The list must be placed in the licensee's public inspection file for two years. While organizations such as the Red Cross or United Fund are exempted from this "listing of officials" requirement, they are still subject to the sponsorship identification announcement requirement.

Exemptions to the rule

The identification announcement rules do not apply in three situations.

First, "want ads" or classified ads sponsored by an individual are exempted. Businesses, be they individual proprietorships, partnerships, or corporations, are not deemed to be within this exemption. However, when the exemption does apply, the station must do the following:

- List the name, address and phone number of the individual advertiser;
- Attach a list to the station's program log for the day the advertisement was aired; and
- Permit access to the list to any person having a "legitimate interest" in the materials contained therein.

Second, the sponsor identification announcement need not be given regarding any "feature motion picture film produced initially and primarily for theater exposition."

Third, any program filmed or recorded on or before June 20, 1963 is exempted from the identification requirement rules.

Conclusion

The Commission sponsorship identification rule and the numerous interpretative rulings are very complicated. Therefore, licensees are advised to carefully study the rules and their attendant examples. Failure to identify fully a sponsor who has furnished valuable consideration may be considered the taking of "payola" and can result in a fine or even imprisonment.

Perhaps the single most important point to be gleaned from the amended sponsorship identification rule is that the licensee must exercise "reasonable diligence" to discover on whose behalf the campaign candidate or controversial issue material is being raised. "Reasonable diligence" means making a *bona fide* effort to discover "straw" organizations. Licensees should always keep in mind the principle underlying the sponsorship identification rules:

> ". . . the public has a basic right to know by whom it is being informed, particularly as to the political matter or controversial public issue."

Further, any decisions made by licensees in this area should be done in consultation with their communications counsel. In this manner, licensees may avoid the many pitfalls inherent in these rules. **BM/E**

Here are some facts you should consider about a broadcast recorder. Our competitors wish they had.

PERFORMANCE:
Overall Signal-to-Noise: 66 dB unweighted at 520 nWb/m (30 Hz to 18 kHz audio filter).

Playback Signal-to-Noise (electronics): 72 dB unweighted (with audio filter).

Headroom: +24 dB. Maximum Output: +28 dBm.

Overall Frequency Response (15 ips): 30 Hz to 22 kHz ±2 dB.

Playback Frequency Response (MRL test tape): 31.5 Hz to 20 kHz ±2 dB.

RELIABILITY: An unmatched four-year track record of on the job performance for the original compact professional recorder. Day in, night out. Just ask someone you trust.

ALIGNABILITY: Any tape recorder must be aligned to achieve maximum performance. With the MX-5050-B, all primary alignments are on the front panel. So is a 1-kHz test oscillator. Secondary alignments are inside the bottom panel. You or your maintenance people can align it fast and easy. This saves you time, money, and enhances your reputation.

INTERFACEABILITY: With a flick of the output switch you can plug-in to any system: +4 dBm 600 ohm or −10 dB high impedance. No line amps or pads to mess with. A perfect match everytime.

ADDITIONAL BENEFITS: Three speeds, dc servo ±7%, ¼ track reproduce, full edit capability, over-dubbing, noise free inserts, XLR connectors, NAB/CCIR switching, unique three-position alignment level switch.

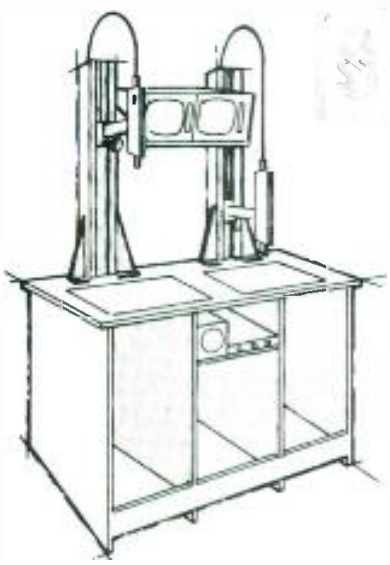
PRICE: Suggested retail price $1,945 (USA).

MX-5050-B: The best value in a professional tape recorder.

OTARI®

Call Ruth Pruett Ables on 415/592-8311 for the name of your nearest Otari professional dealer.
Otari Corporation, 1559 Industrial Road,
San Carlos, CA 94070 TWX 910-376-4890
In Canada: BSR (Canada, Ltd.),
P.O. Box 7003 Station B, Rexdale, Ontario M9V 4B3
416/675-2425

Circle 175 on Reader Service Card



SPEAK OUT

"Leasing Equipment Is A Good-Sense Alternative," Says William E. Reilly

William E. Reilly is manager, eastern region, Banker's Leasing Corp. of San Mateo, Calif., a wholly-owned subsidiary of the Southern Pacific Co. In this month's Speak Out column he sets out his reasons why broadcast station managements should consider leasing, rather than purchasing, the equipment they need to produce top grade programming.

NEXT TO THE QUALITY of the programming itself, the key to a successful station is the ability of the station to bring programming to its audience in the most technically efficient way possible. This means using the best equipment available and keeping current with significant changes in broadcast technology. Often, station managers would elect to upgrade their equipment if the funds were available to do so. But management may want to conserve its funds for more pressing financial needs, or for one reason or another funds may just be unavailable.

The traditional source of funds for the broadcasting industry is bank debt. Typically, major equipment is purchased with a secured loan from a bank over three to five years at floating interest rates, i.e., rates which are adjusted on a periodic basis (usually quarterly) to reflect any change in the bank's prime lending rate. However, a number of capital-intensive industries have discovered that leasing is a viable alternative to bank financing. Hence leasing is a financing approach which may be worth exploring for the broadcasting industry.

In 1975, 15 percent of all capital equipment was acquired on a lease basis, and it is estimated that leasing will account for 20 percent of all equipment expenditures in 1980. Leasing lends itself nicely to the acquisition of equipment which will show a direct contribution to revenues or result in immediate and continuing cost savings. Such equipment effectively pays for itself. Also, because a lease is structured for fixed payments throughout its term, additional earnings which result from employing revenue-producing equipment can be measured.

Since leasing offers funds for the immediate acquisition of equipment, companies that lease extensively find it convenient to establish a line-of-credit with one or more leasing companies. For this arrangement, a "master lease" contract is written. This document establishes the terms of the agreement between the user and the leasing company. The master lease facilitates the placement of a prearranged dollar value of equipment on lease over a prearranged take-down period of time (six to 12 months). Since the lease rate is usually fixed over the take-down period, this approach is particularly attractive when interest rates are rising. Thus, if a radio station wants to acquire new, state-of-the-art equipment, such as that required for the proposed switch to AM stereo, it may be useful to develop a master lease. Once AM broadcasters are allowed to proceed with AM stereo, the first entries into the marketplace will capture the largest share of the listeners. This is a situation where management should line up financing commitments in order to insure an immediate and successful response to changes in the broadcast environment.

Leasing is based on the principle that benefits are derived from the use of the equipment rather than from its ownership. A lease is a long-term contract, which generally is non-cancellable, between the leasing company (lessor) and the company using the equipment (lessee). This is a very different concept from the dated notion that leasing is only for a short-term basis, as an automobile rental. Most equipment leases are for a period of five years or more; they may cover such diverse equipment as oil drilling rigs, computers, and even highly sophisticated medical equipment. Any equipment that can be purchased can also be leased.

Perhaps the single most important reason that companies have turned to leasing is the tax advantages that result from a lease arrangement. Under a true lease, whereby there is no stated provision for the lessee to purchase the equipment at the end of the lease, the leasing company receives the investment tax credit (ITC) and other benefits as owner of the equipment. These benefits may be passed along to the customer or they may be retained, in which

case the lessee benefits from lower lease rates. This flexibility may have particular merit for the microwave distribution system (MDS) and CATV operation segments of the broadcasting industry. In early years of operation when no taxable income is generated, the substantial tax benefits which result from acquiring new equipment essential to the start-up operation need not be lost. Through the lease approach, these benefits can be traded for low-cost financing. Therefore, assuming the enterprise is basically sound, an MDS operation could acquire 100 percent of its equipment under a true lease for a five to seven year term, at a rate well below the prime lending rate.

For the station that is highly profitable there may be other incentives to lease. A station which is buying a broadcast camera may expect to use it for only a few years because of an expected change in technology. While the camera may have a useful life of eight years, from past experience the station knows that the equipment will be kept for only four or five years. It is entirely possible that standard practice has been that the camera is not resold but placed in the storeroom as soon as another new camera arrives a few years later. Here is a case where the equipment was paid for in full, yet was used for only a part of its useful life.

Leasing provides an opportunity to dramatically reduce this hidden cost. A lease would be written for a five-year period whereby less than the full cost of the equipment would be paid out by the station. At the end of the lease the station could buy the equipment from the leasing company for an agreed-upon price if it wished to continue to use it, or the station could order a new camera and begin a new lease. The result is that the lease payments are based on payment of about 80 percent of the original equipment cost. Of course, interest payments are added to the overall cost. This type of lease arrangement makes sense and saves money, especially when the equipment will be used for only 80 percent of its useful life.

Considerable flexibility may also be exercised in the matter of the lease term. For the AM station that acquires new equipment for AM stereo conversion, the first six to 12 months after installation are sure to be a time of heavy promotional expense and uneven revenues. Therefore, the station may elect to write a lease with a payment stream where payments are nominal amounts during the first year of the lease. Any desired payment schedule that is agreed upon can be incorporated directly into the lease.

Leasing is an idea whose time may have come for broadcasting. In this capital-intensive growth industry, lease financing can make a good deal of sense. **BM/E**

GREAT IDEA CONTEST

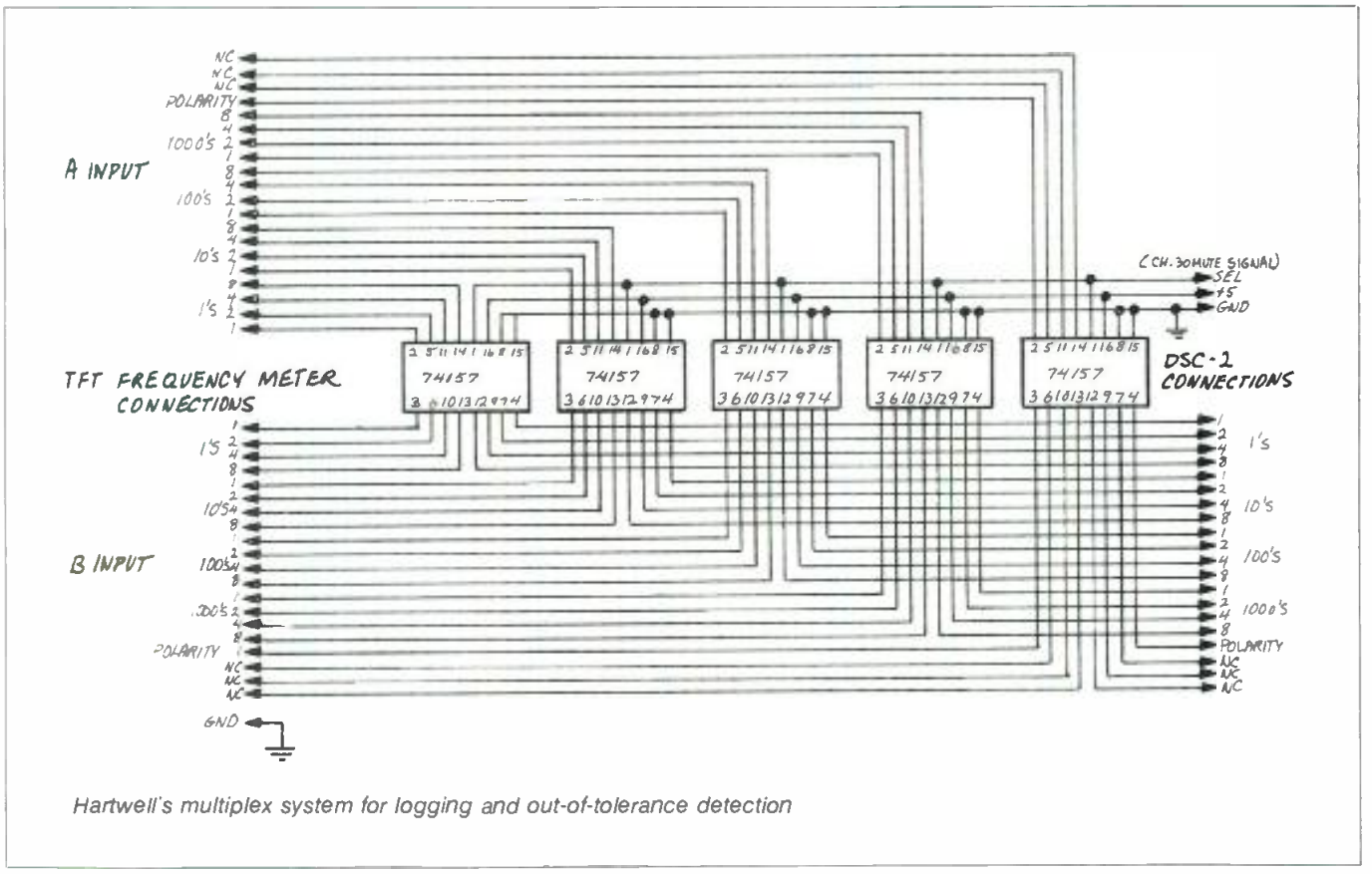
24. Automatic Logging and Out-Of-Tolerance Detection

John Hartwell, Studio Engineer, KQED-TV, San Francisco, Calif.

Problem: To expand a Moseley DCS-2 transmitter remote control to accept two external BCD coded words, allowing the interface of a TFT 701 modulation and frequency deviation monitor to the remote control system for automatic logging and out of tolerance detection.

Solution: We built this simple multiplex system using 74157 chips. The circuit is common and self-explanatory. Connections were made in the normal manner for the 1's, 10's, and 100's BCD inputs to the multiplexer from the TFT monitor. Data representing the 1000's place from the monitor is not normally available, so the over range flash enable signal was added to the TFT BCD output. This added signal was connected to the 1's bit for the 1000's BCD word. The 2, 4, and 8 bits were grounded.

In an unmodified DCS-2 system only data channel 31 will accept an external word into the system. To get around this we lifted pin 4 of IC-9J (Moseley drawing 9106617, transmitter unit) from making in its socket. This allows both channels 30 and 31 to accept the external data words from the multiplexer. To switch the multiplex unit from one input to the other, the channel 30 mute signal, available on the back of the DCS-2, was used. When this signal (low) is connected to the "SEL" control of the multiplexer, the "A" input is fed to the DCS-2 system.



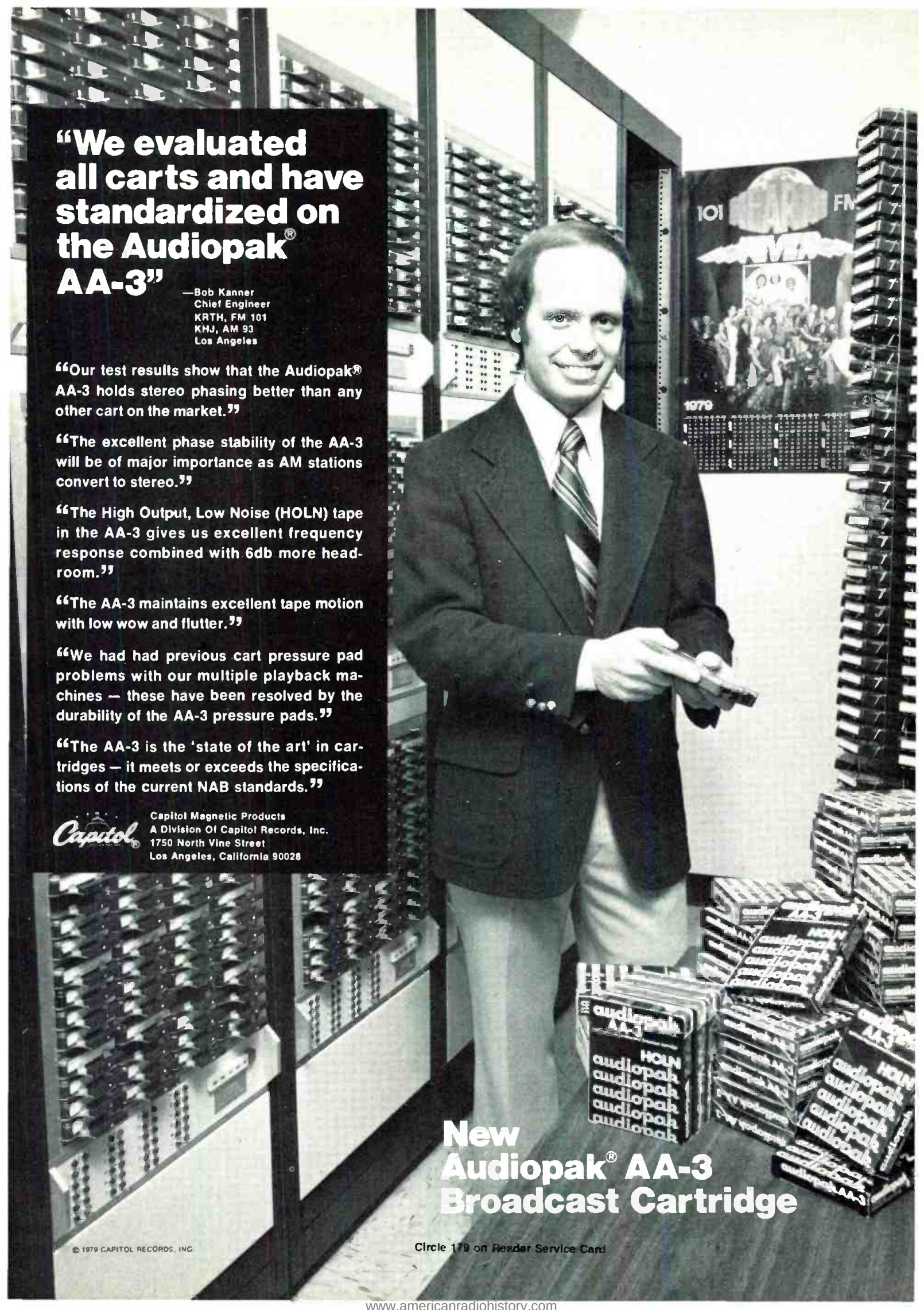
Hartwell's multiplex system for logging and out-of-tolerance detection

25. Off The Air Alarm

Paul F. Moraghan, Chief Engineer, WILI-AM, Willimantic, Conn.

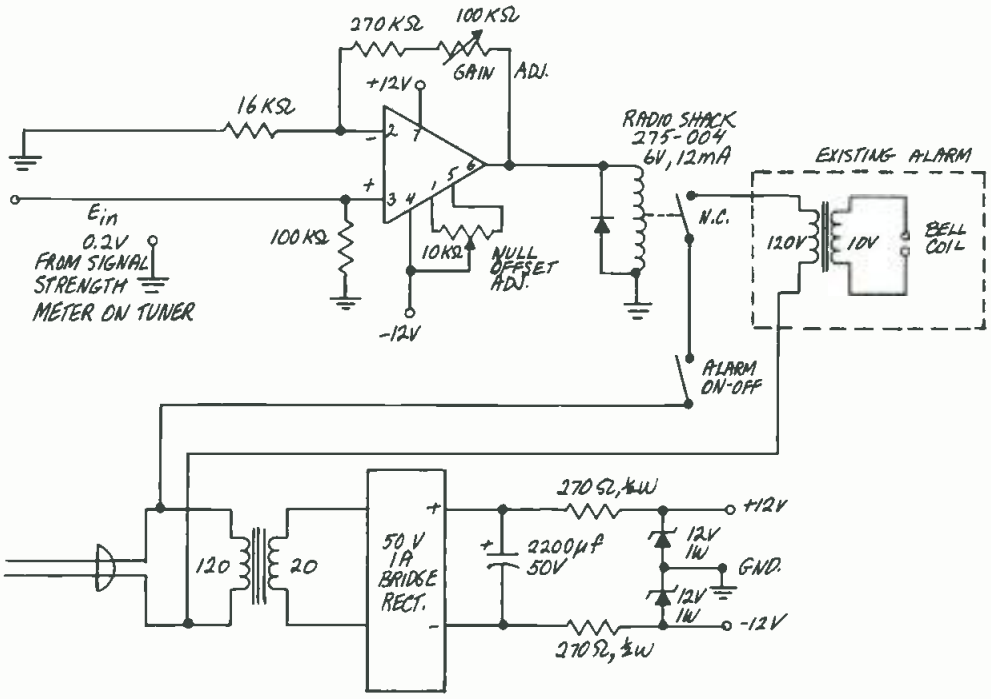
Problem: To build a reliable off-the-air alarm to warn of carrier failure.

Solution: WILI had been using a Gates Radio Model M5144A RF amplifier which provided a contact closure to operate an alarm to warn of carrier failure. Within the last year, it had begun to eat tubes and the sensitivity had to be adjusted daily for the alarm to operate properly. Since our modulation monitor is at the transmitter, it was impossible to use it for an alarm with our remote control. The solution was to build a carrier failure alarm with an op-amp employed as a dc amp to operate a miniature relay. The input voltage was obtained from the signal strength meter of our tuner and the 100K pot was adjusted until the relay was activated. The 10K pot is used to null the output when



there is no input voltage present. Our tuner (Pioneer TX-7500) signal strength meter reads 5 on a 0–5 scale when the carrier is present, which corresponds to 0.2 V at the meter terminals; this is amplified to approximately 4.5 V to operate the relay. When the reading on the S-meter falls below 1.5, the relay releases and bells sound continuously. This circuit has been in service for since last July without any problems, and I'm sure it could be used with most other tuners.

Moraghan's carrier failure off-the-air alarm

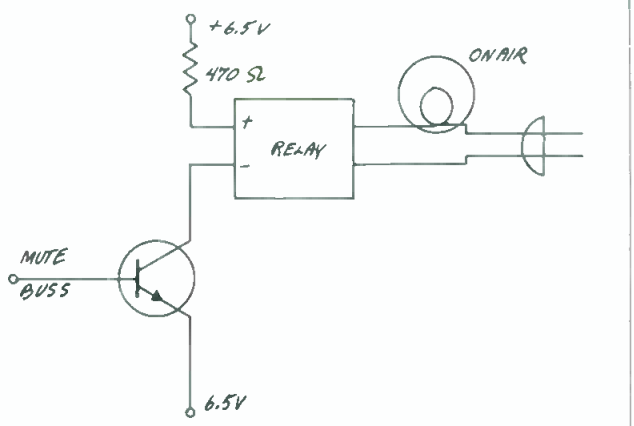


26. "On-Air" Light Relay

Richard Sweetland, Technical Director, KCEY/KMIX, Modesto, Calif.

Problem: To add an "on-air" light relay to our Ramko SC-5MR audio control console.

Solution: Although the Ramko SC-5MR console is an extremely versatile unit for its size and price, it does not have an "on-air" light relay. To correct this deficiency, I designed the circuit shown here. The external relay unit uses the power supply in the control console. The only



Sweetland's on-air light relay

parts that I had to buy were the switching transistor (Radio Shack 276-2030) and the solid state relay (Radio Shack 276-236). The total cost of this project was under $5.00, and it took less than one hour to build. The unit is completely silent and in no way interferes with the normal operation of the console.

27. Coincidence Detector For Vital Switchers

A. A. Kelley, Maintenance Supervisor, WFLA-TV, Tampa, Fla.

Problem: Horizontal picture shift when dissolving between cameras and VTRs.

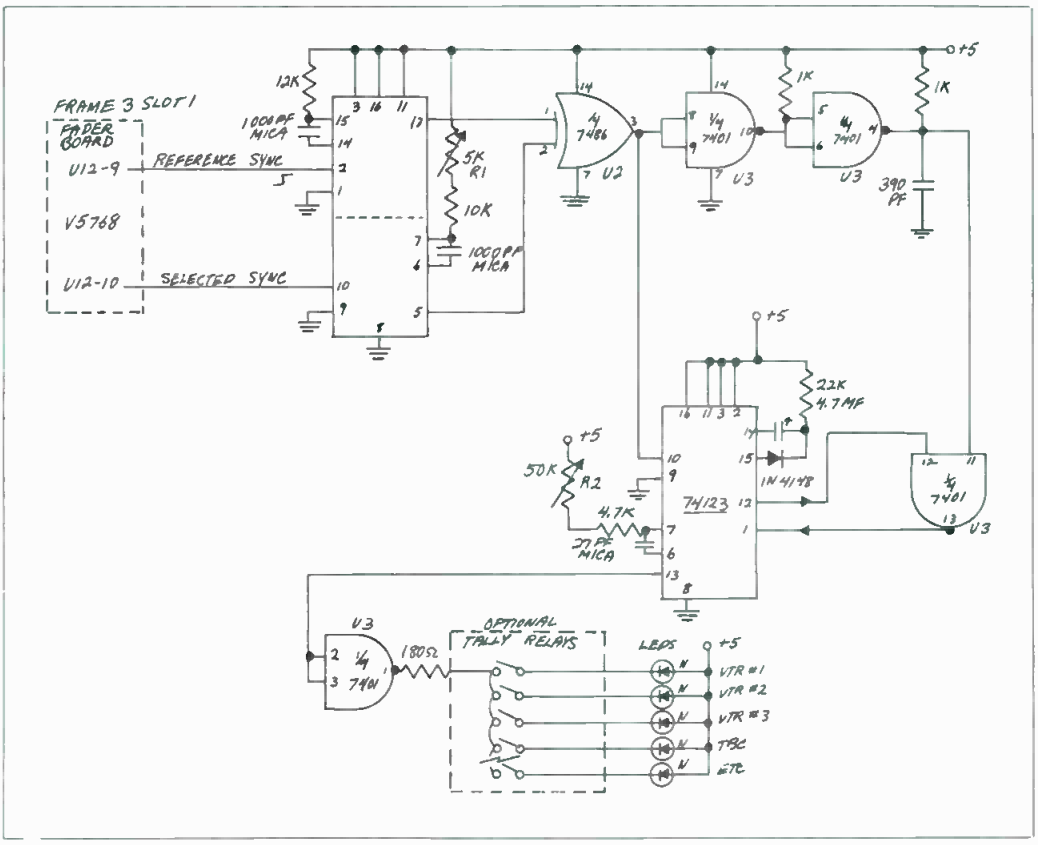
Solution: Maintain close tolerance in system timing by adding an indicator to the Vital VIX-114 switcher that can be used to detect small errors before they become a problem and serve as a means to immediately correct them. The circuit is similar to one used in the Vital for mix inhibit, except a circuit has been added to make it respond to leading edge timing only and the resolution is greater.

Four TTL integrated circuits are wired as shown on a small circuit board or wirewrap board and attached to the fader board in frame 3, slot 1. Power and signal pulses are derived from the fader board. To align, temporarily tie U1 inputs to the same trigger signal at U12-9, which is station reference sync. Adjust R1 for identical pulse widths at the two outputs of U1 and connect a scope to U2-3 to fine-tune R1 for no pulses present. Reconnect U1-10 to U12-10 and, with a tape machine adjusted so it is about 200 nanoseconds out of horizontal sync timing, adjust R2 so the LED just comes on. It will then be possible to set the tape machine very close to reference sync by observing the light only.

Great Ideas

The tape room is a good location for this LED, as the signal sources that tend to get out of adjustment are servo-controlled. A refinement of the basic idea is to wire the indicator circuit to the spare section of the tally system with several LEDs corresponding to inputs you wish to monitor. We have done this. It enables us to immediately identify which machine is out of adjustment and correct it.

Schematic for Kelley's coincidence detector for Vital switchers



Rules for BM/E's Great Idea Contest

1. Eligibility: All station personnel are eligible. Consultants to the industry may enter if the entry indicates the specific station or stations using the idea or concept. Manufacturers of equipment or their representatives are not eligible.

2. How to Enter: Use the Official Entry Form on this page or simply send *BM/E* a description of your work. State the objective or problem and your solution. Include diagrams, drawings, or glossy photos, as appropriate. Artwork must be legible but need not be directly reproducible and not exceeding three in number. Camera reproducible material is preferred. Length can vary, but should not exceed 500 words. *BM/E* reserves the right to edit material. Entry should include: Name, title, station affiliation, and the class of station — TV, FM, AM. Indicate if idea is completely original with you.

3. Material Accepted for Publication: *BM/E* editors will make all decisions regarding acceptability for publication. If duplicative or similar ideas are received, *BM/E* editors will judge which entry or entries to accept. A $10 honorarium will be paid for each item published.

4. Voting: Every reader of *BM/E* is entitled to rank the ideas published. This can be done on the Reader Service Card in the magazine or by letters or cards sent to the *BM/E* office. To vote, readers should select the three ideas they like best and rank them 1, 2, or 3.

5. Winners: Top rated entries in the year-long tally will become winners in each of the three major categories (AM, FM, TV). Final winners will be picked in February 1980 and announced in the March 1980 issue of *BM/E*.

6. Prizes and Awards: Three top prizes will be awarded: a programmable electronic calculator will be awarded for the highest rated entry in the respective categories of AM, FM, and TV. Ten engineering slide rule calculators will be awarded as secondary prizes for the highest rated entries in the following additional categories (top three winners are not eligible for these prizes): audio (three prizes, one each in the AM, FM and TV categories); RF (three prizes, one each in the categories of AM, FM, TV); Control (three prizes, one each in the AM, FM and TV categories); Video (one prize in TV).

Mail to:
Editors, BM/E
295 Madison Avenue
New York, New York 10017

1979 Entry Form

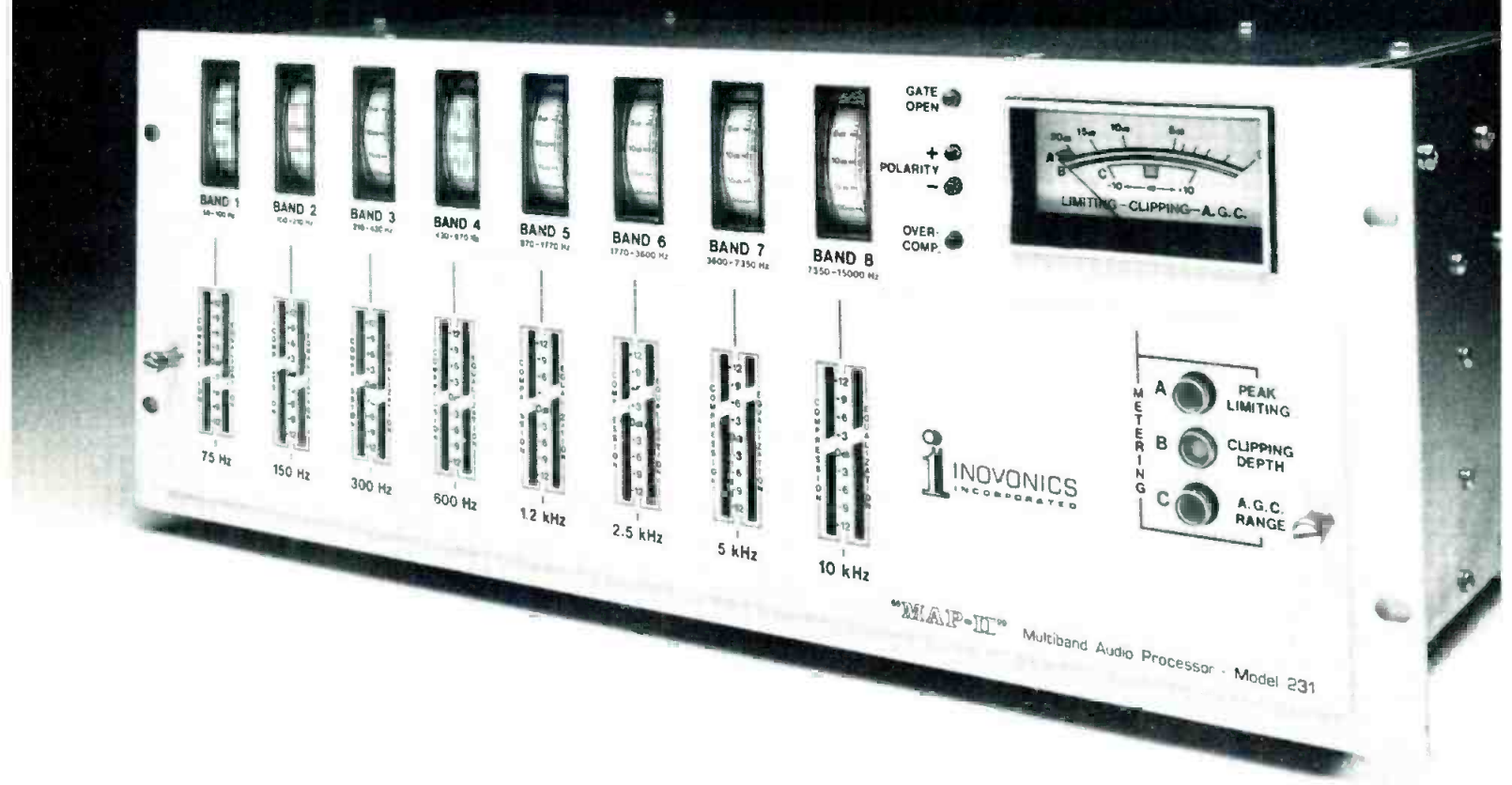
Name _____ Title _____
Station Call Letters _____ City _____
State _____ Zip _____
Telephone No. _____
Licensee _____
Class of Station at which idea is used (check one)
TV _____ FM _____ AM _____
Category: Audio ___ RF ___ Video ___ Control ___
Objective or Problem: *(In few words; use separate sheet for details)*

Solution: *(Use separate sheet—500 words max)*

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

Signed _____ *Date* _____

Get the most from your AM signal...



for less.

The new MAP II Multiband Audio Processor combines the latest advances in audio technology for optimum modulation of your AM/AM-Stereo program. Yet it costs much less than similar systems.

Discriminate Compression and Equalization
Only MAP II offers you 8-band compression. Input level is held constant by a slow, gain-riding A.G.C. Each band has its own compression and equalization controls, so you can tailor your sound while maintaining a high program density. Sound remains smooth, even with considerable compression, because each compressor changes gain in response to inputs to both its own and adjacent bands.

Inaudible Phase Optimization
Program phase is silently "rotated"—rather than instantaneously switched—to maintain maximum positive modulation.

Absolute Peak Control
MAP II's unique integrated peak controller combines a hard clipper with a low-distortion peak limiter. An adjustable control loop gives you control over clipping depth which then remains constant regardless of program content. For stations with remote transmitters, the integrated peak controller can be unplugged and installed at the transmitter site.

Convenient Operation & Maintenance
MAP II has several features to make your audio processing convenient and precise. For precise control over frequency range, selectable low- and high-pass filters let you choose between three cut-off frequencies at each end. Front-panel meters monitor compression, A.G.C. gain, clipping depth and peak limiting. A "proof" mode defeats all processing at the touch of a button, leaving the signal path intact. There's even a built-in pink noise source for convenient system set-up and maintenance. Circuit boards unplug from the front and contain no "black boxes" or selected components.

Write or call today for technical and cost information on the MAP II. Your program—and your budget—will thank you. MAP II—$1670.

Inovonics Inc.

503-B Vandell Way
Campbell, CA 95008

Telephone
(408) 374-8300

Circle 183 on Reader Service Card

BROADCAST EQUIPMENT

Videotape Editing System 250

The ECS-103 is a videotape editing system which offers the availability to mix ¾-inch VCR and one-inch VTR formats. The system can handle special effects switching and A/B rolls with store, recall, and status display. Tape search and split audio-video edits are possible based on the SMPTE system. Options include Liplock® audio pitch control, edit decision listing, automatic dialogue replacement and animate remote control. CONVERGENCE CORPORATION.

Portable ENG Receiver 251

The MA-2P ENG receiver may be used in conjunction with a transmitter as a portable repeater system for special events coverage. The unit can also be used in a field recording station or an

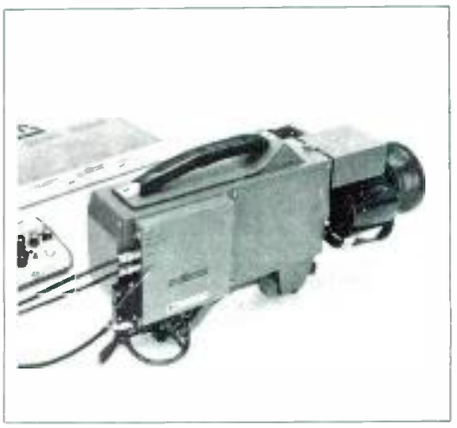
aircraft repeater system. The MA-2P runs on either 12 V dc or 115/230 V ac, covers the 1990 to 2110 MHz band, has a receiver noise figure of 3.5 dB, and employs modular construction throughout. The user may select either one or two audio subcarrier demodulators as well as either a 20 MHz or 12 MHz IF bandwidth for desired selectivity. Audio output is switchable to 0, +9, or +18 dBm at 600 ohms balanced. MICROWAVE ASSOCIATES.

All Solid-State Audio Console 252

The Series 2000 audio consoles are all solid-state, and available in five-mixer (14 inputs) and eight-mixer (20 inputs) models. Mixers are of printed-circuit board modular construction with dual audio buses. The series is designed for reliability and economy, according to the manufacturer. CETEC BROADCAST GROUP.

Mini-CCU 253

The CP Co-ax Control remote control unit for ENG/EFP mini-cameras uses a single coaxial cable to the camera. The system allows studio-like remote control in the field through its rack-



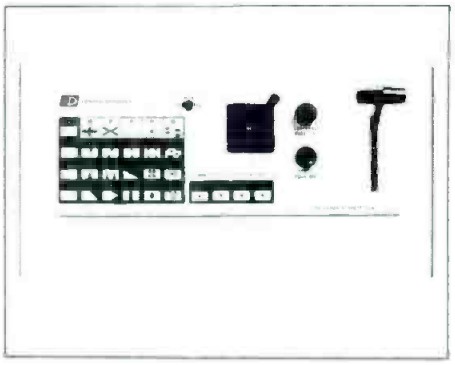
mounted digital encoder and camera-mounted decoder. The encoder and decoder permit the use of coaxial cable to the camera, reducing weight, cost, and bulkiness on long runs. Each digital encoder unit will accommodate two CCUs and two camera decoders. Available for Ikegami HL-77 series and HL-79A cameras and RCA TK-76B cameras; similar systems for other cameras are expected soon. $7500. CINEMA PRODUCTS CORP., 2037 Granville Ave., Los Angeles, Calif. 90025.

Extended Effects Generator 254

The EEG-1980 may be connected to any size video switcher to combine the effects available on both units for simultaneous use. An example would be a clock wipe from the EEG-1980

For more information circle bold face numbers on reader service card.

Broadcast Equipment



within the switcher's circle pattern. The effects generator is interfaced by simply connecting it to an external key input on the switcher. The center point of any of the wipes can be positioned anywhere on the screen and soft edge wipes are possible. The system has 24 wipes, including star and matrix patterns, and consists of a control head with rack-mountable electronics. CENTRAL DYNAMICS LTD.

Broadcast Phono Cartridge 255

The SC39 line of phono cartridges is designed to meet professional requirements for durability and provide high quality sound reproduction. The SC39ED offers essentially flat response while the SC39EJ and SC39B are flat up to 15 kHz with a smooth rolloff to 20

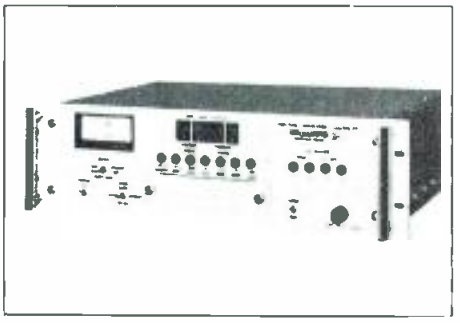
kHz to minimize high frequency splatter in high frequency preemphasis FM broadcasts. All three cartridges have protection against damage from both backcuing and side impacts. An internal wire support and elastomer bearing insure stable and accurate backcuing. Side-Guard feature retracts the stylus into the housing before it bends when pressure is applied from the side. There is also a lever-operated locking stylus guard. The SC39ED has an elliptical stylus and tracks from .75 to 1.5 grams. The SC39EJ has an elliptical stylus and the SC39B a spherical one. Both track from 1.5 to 3 grams. SHURE BROTHERS, INC.

Dual Spring Reverb 256

The Orban 111B Dual Spring Reverb has been modified to include six springs per channel instead of four. This change is said to provide lower flutter, higher echo density, and smoother, more natural sound. The 111B processing includes a "floating threshold" limiter to minimize "spring twang" and an equalizer with quasi-parametric midrange and shelving bass section for sound enhancement. ORBAN ASSOCIATES, INC.

Amplitiude Modulation Controller 257

Model AMC-1 automatically controls the modulation levels of an AM transmitter despite audio level variations among different program sources. It continuously samples modulation levels at the transmitter and compares them with internal preset minimum and maximum thresholds; digital logic then adjusts audio level. Features include up to ±8 dB adjustment of audio level;



front panel meter indication of audio operating gain, RF carrier level, and test modulation percentage; and front panel adjustment of seven modulation control levels and audio level adjustment rates. Audio input/output is rated at 600 ohms balanced, +10 dBm nominal, +20 dBm maximum output. Frequency response is ± 0.50 dB (typically ± 0.10 dB), 20 Hz to 30 kHz; harmonic distortion is one percent maximum at +20 dBm output, typically less than 0.4 percent. Requires 115/230 V ac, 50/60 Hz, approximately 35 watts, and takes up 5¼ inches of 19-inch rack space. DELTA ELECTRONICS.

High-Efficiency TWTAs 258

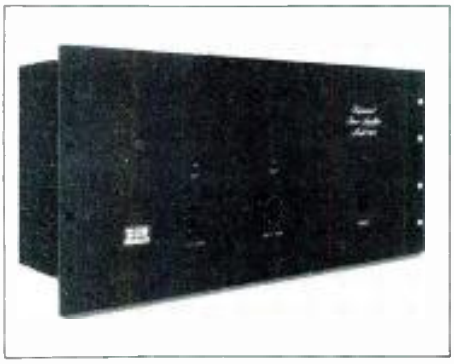
This series of microwave-link traveling wave tube amplifiers has overall electrical efficiency rated at approximately 30 percent (about 40 percent better than previous models). They incorporate high-efficiency TWTs and have two depressed collector stages and only one high-voltage adjustment. Models cover the 6, 7, 8 and 11 GHz frequency ranges, with output powers of 10 to 15

Broadcast Equipment

W. Available as 19-inch rackmounted or separately mountable power supply and tube versions. THOMSON-CSF.

Audio Power Amplifier 259

The BGW 600 power amplifier, intended for professional use, incorporates a high-speed 15 MHz op-amp front end, redundant output stages employing ten 150 watt complementary transistors, and loss-of-feedback clipping indicators. The amplifier has 175 watts of continuous power per channel at no more than .1 percent THD with hum and noise 106 dB below rated output into an 8 ohm load with a frequency response of +0, −.25 dB, 20 Hz to 20 kHz. $849.00 BGW SYSTEMS.



Dual Low-Pass Filter 260

The 752A-02 Dual Low-Pass Filter is designed to prevent aliasing of out-of-band components in such applications as spectral analysis, digital communications and waveform analysis. Each independent channel provides a rolloff

rate of 115 dB/octave and cascaded, the two channels offer 230 dB/octave rolloff. The cutoff frequency range is from 1 Hz to 110kHz. ROCKLAND SYSTEMS CORP.

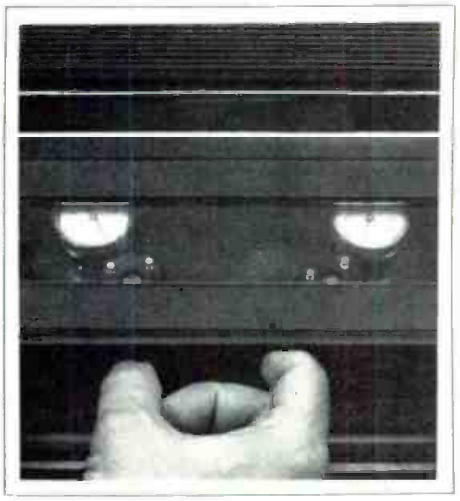
FM Exciter 261

The Model 690PLL is frequency-synthesized phase locked-loop exciter with output power from 3 to 15 watts. Stability is rated at ±300 Hz (with ± 100 Hz typical). Frequency range is programmable in 100 kHz steps. Automatic frequency control has a 100 KC channel spacing, with a frequency range of from 88 MHz to 108 MHz. Compatible with all FM transmitters and with all available audio processing systems. CETEC BROADCAST GROUP.

U-Matic Spindle Height Gage 262

The U-Matic Spindle Height Gauge is designed to help eliminate tape edge damage and tape binding within the cassette, as well as control and audio track misalignment. The meters, which read in thousandths of an inch, are mounted on a ½-inch aluminum die plate. They measure both height of the spindle and the out of flatness of the four cassette locating pins. The gauge

For more information circle bold face numbers on reader service card.



includes a master checking block and case. $495. TENTEL.

Dual Trace Triggered Scope 263

The 1479 dual-trace, delay-line scope is designed for accurately viewing high-speed waveforms. Rise time is 11.7 ns or less and visible delay is 12 to 160 ns, making the scope suited to microprocessor system development and maintenance as well as other digital ap-

plications. The screen is 8x10 using P31 blue phosphor with a slotted bezel to accept a standard scope camera mounting. The 1479 has a claimed smooth response to well beyond 30 MHz and can trigger on signals up to 50 MHz. Modulation patterns of RF signals can be displayed by selecting the built-in AM detector. Signals can also be viewed at TV IF frequencies without a demodulator probe. The unit has automatic selection of chopped or alternate mode of display, automatic triggering, and vertical attenuator from 5 mV to 5 V per cm at an accuracy of ± 3 percent. Internal high and low-pass filters and 20 calibrated sweep positions from .2 μsec/cm to .5 sec/cm with 5x magnification to increase maximum sweep speed to 40 ns/cm are also featured. $1,099. B&K-PRECISION/DYNASCAN CORPORATION.

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A new standard modular audio console offering full facilities, quality circuitry of proven reliability, comprehensive features and a range of standard, pre-wired options. A maximum of fourteen channels are available along with a convenient centrally-located script board and input and accessory modules to satisfy any requirement. Standardization allows these features to be incorporated into a well engineered, compact, functionally styled package at an unusually economical price.

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Ward-Beck brings you unexcelled quality in the versatile R1200 and R2000 Series radio consoles.

Designed for AM and FM, Mono or Stereo applications, engineered AM Stereo ready, this is truly contemporary radio.

WBS

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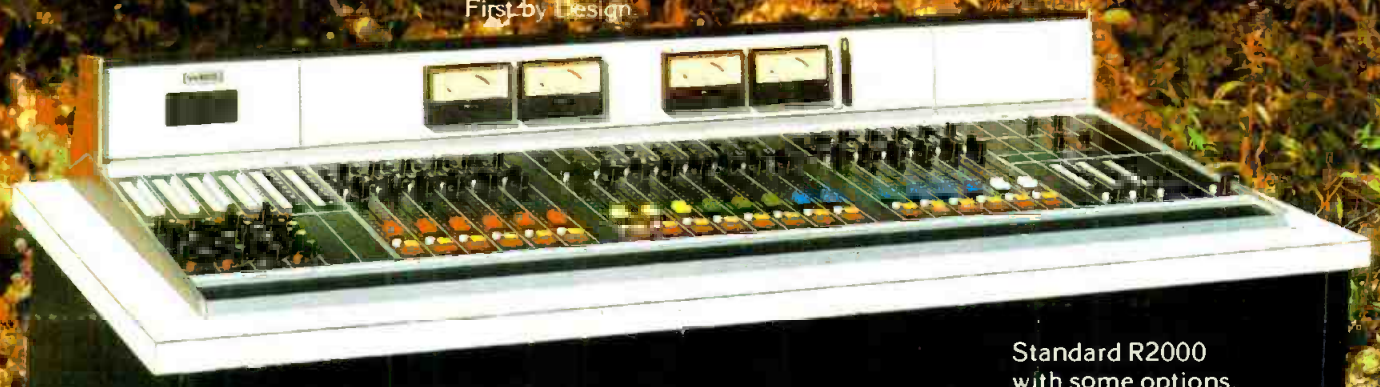

Standard R2000 with some options.

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