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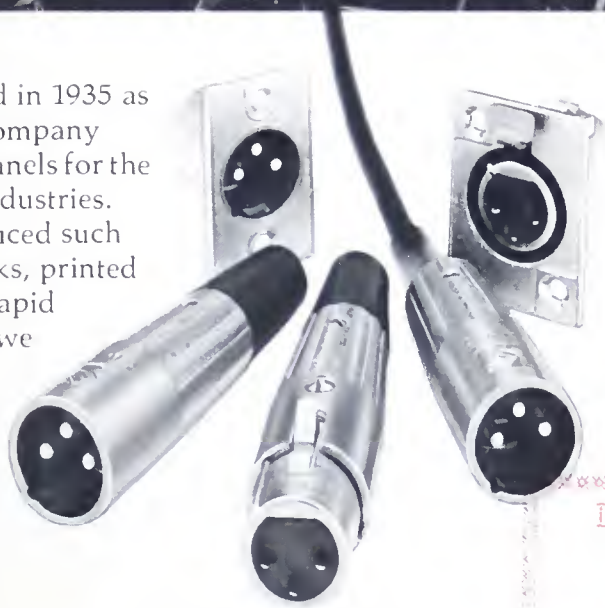
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BROADCAST[®] engineering

The journal of the broadcast-communications industry

February, 1979 □ Volume 21 □ No. 2

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THE COVER

An artist's concept of the 3-color additive mixing process used to create electronic color in video is shown on this month's cover. A review of the basics of color video begins on page 44 and will continue in the March issue of **Broadcast Engineering**.

NAB PRE-CONVENTION GUIDE

See page 38 for a schedule of the upcoming NAB Convention exhibits and engineering programs.

READER SURVEY

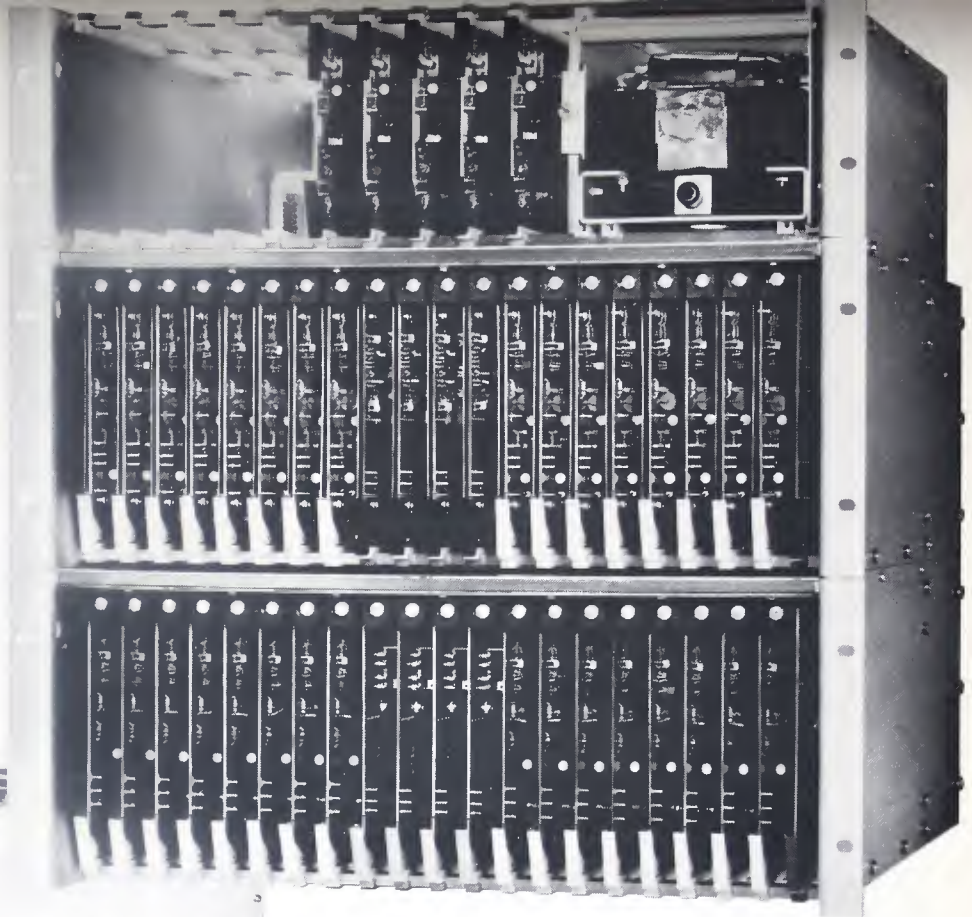
See page 81 for a special survey of problem areas in broadcasting and broadcast engineering which, in your opinion, need special attention and solutions.

MARCH ISSUE

- The NAB/Dallas Convention Special with guidelines to products, exhibits and technical sessions.
- Automatic Transmitter Systems Update.
- Continuation of *Basics of Color Video*.
- Design and performance of Saticon pickup tubes for TV cameras.

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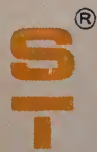
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FCC update



February, 1979/By Howard T. Head and Harold L. Kassens

FCC again visits VHF drop-ins

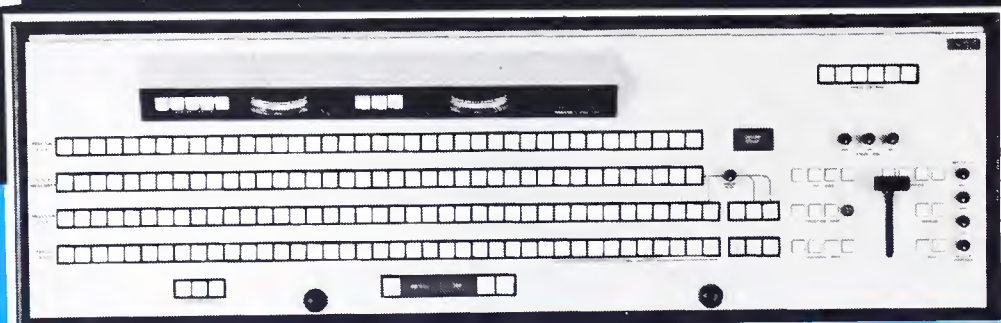
In a flurry of year-end Hanukkah activity, the FCC marched up the hill on VHF-TV drop-ins, turned around and marched back down again. In early 1977, they proposed to drop VHF channels into Charleston, West Virginia, Salt Lake City, Knoxville and Johnstown-Altoona, Pennsylvania. As a result of rule-making comments, the broadcast bureau proposed that the commission forget VHF drop-ins. The commissioners disagreed and have instructed the staff to examine terrain shielding and terrain roughness as a way to support additional drop-ins.

Clear-channel proceedings revisited

The commission in December, 1978, once again examined its clear channel allocation policies and decided to duplicate the twelve remaining unduplicated clear channels, as well as to further duplicate the 13 on which it provided for Class II-A stations back in 1961. The staff has advised the commission that by this means probably 150 new unlimited-time assignments can be found. The staff predicts receiving a minimum of 600 applications for these facilities. The commission has indicated that stations in filing applications would be expected to comply with all other allocation rules, including service to white areas, but has clearly indicated it would seriously consider waivers of most allocation rules to minimize applicants.

It will be some time before the commission will be in a position to consider any applications because it is presently in the process of issuing a Notice of Proposed Rule Making to determine whether all Class I stations (including Class I-Bs) should be protected to their 0.5 mV/M 50% skywave contour or the 0.5 mV/M groundwave contour. The decision on this matter will determine the type of facilities (power and location) which might be applied for.

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Proposal for reduced AM channel spacing

Hot off the presses, the National Telecommunications and Information Administration of the Department of Commerce has filed with the commission a Petition for Rule Making asking that AM channel spacings be reduced from 10 kHz to 9 kHz. NTIA indicates that 12 to 14 more AM channels would become available providing for 700 additional new AM stations. The NTIA recognizes that the United States cannot change to a 9 kHz spacing without considering the other countries in Region II which includes North, Central and South America, but feels that commission action would encourage the institution of regional conferences to consider the subject.

Third class broadcast operator rules changed

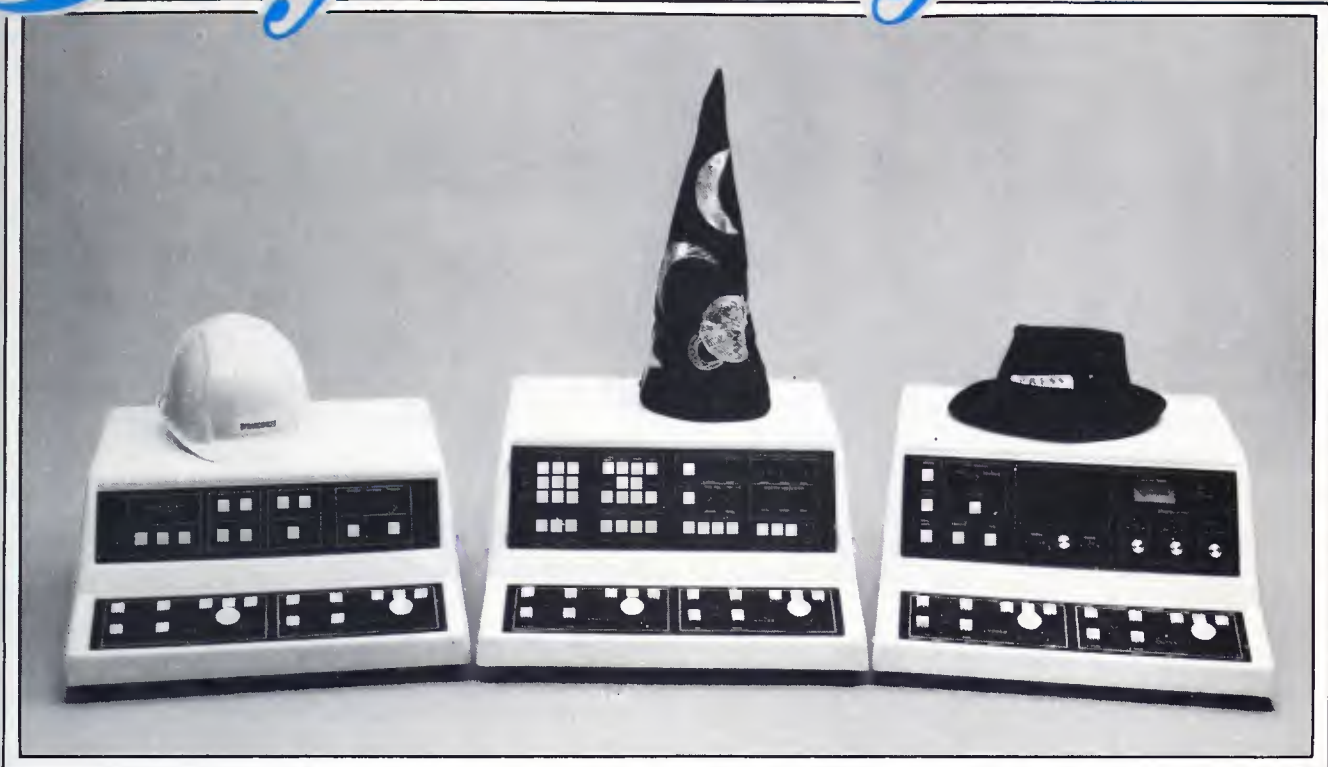
As a result of a rule-making proceeding, the FCC has issued a Report and Order modifying its operator rules to eliminate the requirement for a third class operation with broadcast endorsement at broadcast stations. Commencing in February, 1979 stations will be permitted to use anyone holding any class of commercial radio operator license, including the restricted radiotelephone operator permit, to perform routine technical operations at all FM and virtually all AM stations where formerly a third class permit with broadcast endorsement was required. Since the restricted radiotelephone operator permit can be obtained by mailing FCC Form 753 to any FCC field office, or to Washington, DC, operator examinations for these operators would no longer be required.

TV scanning problems

In the November issue, we reported on the examination of TV scanning problems, and the commission's temporary policy issued in June, 1978 that it would issue violation notices if the horizontal blanking interval exceeded 12 μ s and vertical blanking exceeded 23 lines. Subsequently, it was learned that the commission was granting informal waivers upon individual request. The policy has been under examination since its inception, and in January, 1979, a new policy was released for the period until July 1, 1979. The FCC will not now issue advisory notices, or notices of violation for vertical or horizontal blanking in excess of 21 lines and 11.44 μ s, respectively. However, the commission warns that "under this policy licensees must, in the exercise of their responsibility to broadcast in the public interest, take such measures as are necessary to ensure that the technical quality of program material used comports with this responsibility."

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Model 104-BA
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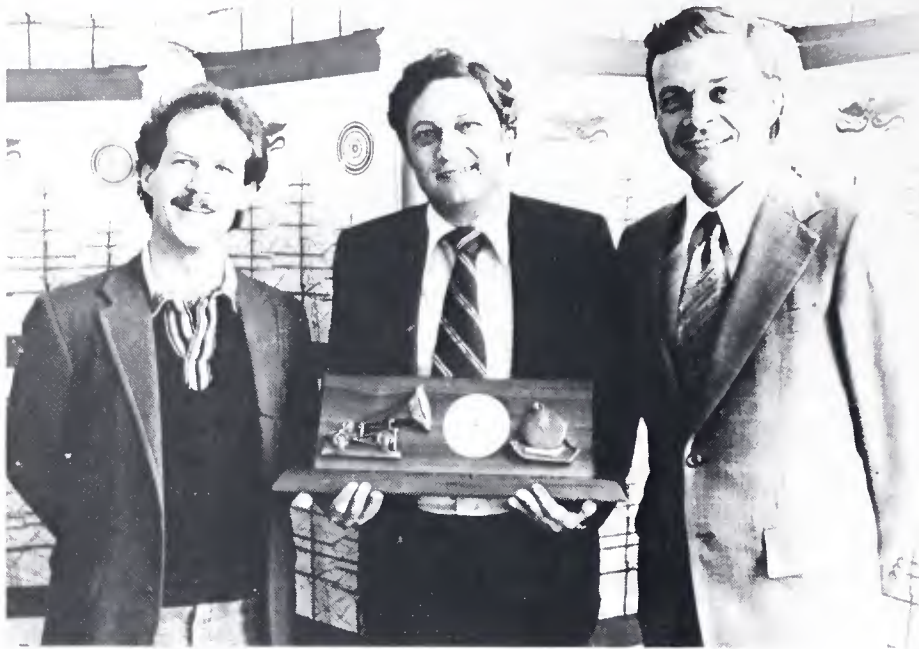
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Grandson of inventor presents award for achievements in microphone business



Oliver Berliner (center) holds the Maker of the Microphone award presented annually in New York. This year's recipient, Dr. Peter C. Goldmark, developed the fine groove long playing disc record and was a host of other audio and video innovations. Peter Goldmark, Jr. (right) accepted the award on behalf of his late father. Goldmark's other son was also present.

Berliner is the grandson of Emile Berliner, inventor of the microphone and the disc record, in whose name the trophy is awarded. Goldmark was the 15th to receive the award, which will be presented 25 times to commemorate the fact that Berliner was 25 years old when he invented the microphone.

FCC grants authorization for AM stereophonic testing to two radio stations

The FCC is issuing AM stereophonic test authorizations, but the NAB says the tests aren't necessary. Two stations, WSM in Nashville, TN, and WGAR in Cleveland, OH, were authorized for over-the-air testing of Magnavox's AM stereophonic system for December 1978.

According to NAB, the FCC has sufficient information to establish AM stereophonic broadcasting standards without supplementing or

amending its Notice of Proposed Rulemaking as requested by Belar Electronic Laboratory.

NAB also stated that Belar's suggestion that the FCC laboratory should conduct the whole testing program "is not an effective solution." The association noted that each station has experience and knowledge of its system and should perform additional experiments.

It agreed that the FCC's Field Operations Bureau should observe

testing of the systems during normal operating hours under normal program conditions. (Under terms of the authorization, WSM and WGAR may not use the test authority for promotional purposes, though the tests may be announced.)

After completion, the two stations are to submit test results to the FCC for inclusion in Docket 21313. More test authorizations are expected to be granted to other AM stereophonic proponents.

Radio deregulation: How far will the FCC go? vs. How far should they go?

Although the NRBA, the NAB and the FCC agree that radio should be deregulated, they disagree on the degree of deregulation.

Vincent T. Wasilewski, NAB president, challenged the FCC to deregulate radio November 9 at the NAB Fall Conference in New Orleans. Since then, the NAB has filed a general petition for rulemaking, requesting deregulation in several areas of radio regulation. The NAB also asked the FCC to stop setting

commercial time standards for radio stations.

FCC Commissioner Tyrone Brown addressed Wasilewski's proposal in a speech to the 17th Annual Southern California Broadcasters Public Service Workshop. He said he agrees with Wasilewski that FCC-imposed limits on commercial time and FCC ascertainment requirements should be eliminated. He also agreed that existing FCC programming guidelines for radio

should be eliminated, but he insisted that "radio stations continue to have a public service obligation to their local communities" which should be met by a "minimum fixed percentage of public service programming."

According to NRBA's December Washington Memo, the radio association is gratified that its position regarding the separateness of radio and television is becoming accepted but is upset that some of the

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proposals which are being advanced fall short of the full deregulation of radio which NRBA advocates. So, the association is organizing a mass Broadcasters' Rally Against Over-Regulation to take place in Washington during the first week of March. They have invited all broadcasters and industry associations to join them, including radio and television, commercial and non-commercial broadcasters. For more information, contact the NRBA, Dept. BE, Suite 500, 1705 De Sales St., NW, Washington, DC 20036, (202) 466-2030.

Engineer receives award

The NAB will present its 1979 Engineering Achievement Award to Robert W. Flanders during the NAB Engineering Conference luncheon March 27 at the Dallas Convention Center. Flanders is vice president and director of engineering, McGraw-Hill Broadcasting, and di-

rector of engineering at WRTV in Indianapolis.

He designed and built the first cameras and related equipment for WFBM, WRTV's predecessor. Under his supervision a small assembly line was set up to manufacture cameras for several early TV stations. And in 1950, he designed and built one of the first programmable automated switchers.

Technical report prepared

A 600-page report has been prepared in a special preparatory meeting organized by the ITU's International Radio Consultative Committee. Scientists and engineers from 87 countries met in Geneva from October 23 to November 17 and studied over 400 documents for the report.

Needed by the World Administrative Radio Conference (WARC) when it revises the radio regulations next year, the report is concerned with the specification of technical cri-

teria which would enable a reallocation of frequencies for existing services to be made and indicate frequencies most suitable for possible new services.

The report defines the status of CCIR studies in relation to recommendations and resolutions of administrative radio conferences held since 1959.

The report is being distributed as a document for the 1979 WARC. It cannot be purchased and is not available to the public.

Videotape format works

After analysis of results obtained from a test of the 1-inch Type C helical-scan videotape format, SMPTE is convinced that equipment manufactured within the specifications of the Type C documents provide acceptable interchange.

In December 1977, the standard committee of SMPTE approved five documents which define the 1-inch Type C helical-scan videotape

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Throughout 1978, three experimental Type C format interchange tapes were exchanged between interested manufacturers and users under the supervision of the SMPTE helical recording subcommittee. The consensus view is that the exchange was a success.

The SMPTE working group on 1-inch videotape test materials is now drafting a set of documents that will define reference tapes for the Type C format.

Broadcast transmitter and antenna licensing: procedures misinterpreted, says broadcast bureau

The FCC Broadcast Bureau announced that some stations have misinterpreted the amended rules to modify the broadcast transmitter and antenna licensing procedures.

One of the procedure changes was to discontinue the separate licensing of a station's auxiliary transmitters used with the main

antenna system. Some station licenses have assumed the rule changes also apply to transmitters in the broadcast auxiliary services.

This is not so according to the FCC. The revisions are applicable only to AM, FM and TV broadcast stations licensed under part 73 of the rules.

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THE PD II RECORDER plays mono tapes in "A" size cartridges. Stops automatically on 1kHz cue. Big and small buy it for the same reason: nothing else does this task so well, so long, so reliably, with so little maintenance. Also available in Reproducer Only for \$650.

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Workshop highlights EMI

The National Bureau of Standards' second annual Workshop on Electromagnetic Interference (EMI) was held November 2 and 3 at NBS headquarters, Gaithersburg, MD. Two hundred participants from government agencies and private industry were present.

Chris M. Kendall, a private EMI consultant from Running Springs, CA, was the principal speaker at the workshop. He spoke on microprocessor technology becoming status symbol.

Don R. Justesen of Veteran Administration Hospital, Kansas City, MO, discussed the biological effects of electromagnetic radiation. He called for further study in the area.

After these sessions, the participants broke into five separate groups for discussions of EMI problems in the areas of communication, transportation, consumer products, industry and medicine.

A limited number of papers presented at the workshop are available by contacting Frederick J. McGehan at the Program Information Office, National Bureau of Standards, Boulder, CO 80303.

NAB cites refund unfair

NAB's Medium Market Radio Committee commended the NAB demand to the FCC that it refund fees paid to them in order to compensate licensees for inflation and lost interest during the time which the FCC held the funds.

The committee, at its December meeting, cited the FCC's proposal for returning fees as unfair to small and medium radio stations.

If the FCC refused to fully refund broadcasters, then, according to the Association, it should refund broad-

Look to Cetec Broadcast Group for first-quality radio systems

Cetec System 7000:

The exceptional microprocessor-based program automation system speaks broadcast English. Up to seven days' programming; up to 10,000-event memory. Backed by 26 years of radio automation leadership and more than 1000 systems in the field!

Cetec FM Antennas:

Great JSCP circularly polarized antennas, proved in more than 1600 installations. One bay to twelve bays. Precision tuned and tested to your specifications.

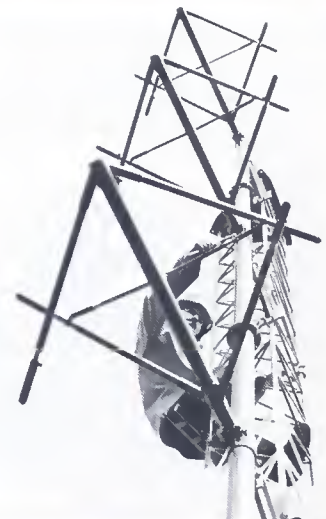
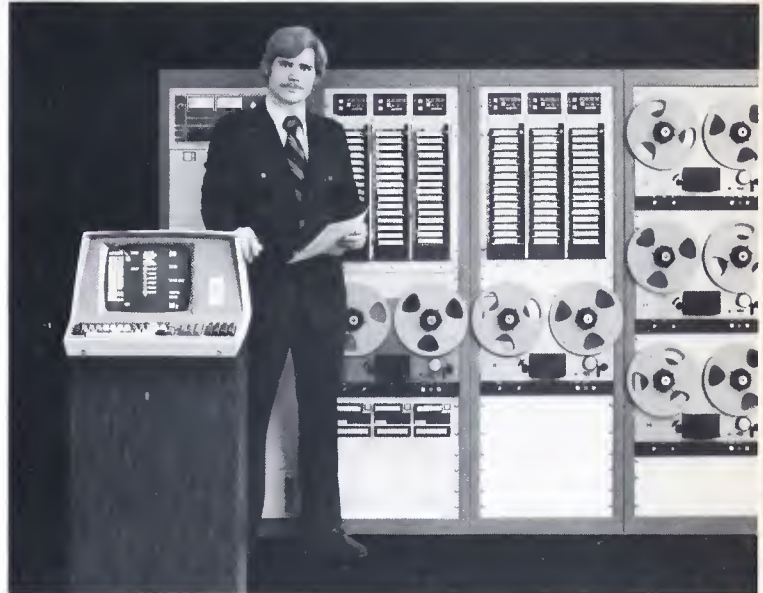
Cetec AM and FM Transmitters:

From 10 watts to 50,000 watts. Both solid-state and tube-type models. Strong, simple, rugged, dependable.

Cetec Studio Equipment:

Centurion II mono and stereo consoles, tape cartridge machines, professional turntables, complete studio systems, designer series studio furniture.

See Cetec quality in action at the NAB Show in Dallas!



Cetec Broadcast Group

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casters who are not now scheduled to receive anything 60% of the amount paid under the 1970 and 1975 annual license fee schedules.

Court affirms orders

Three sets of FCC orders were affirmed by the US Court of Appeals on November 13. The orders authorized American Satellite Corporation, Western Union International and RCA American Communications to construct and operate satellite earth stations to transmit private line communications between the US mainland and Hawaii. Each company requested the service in order to comply with contracts awarded by government agencies.

Hawaiian Telephone Company and GTE Satellite Corporation sought review of the commission's orders. They argued that in authorizing construction and operation of the earth stations the FCC relied excessively on the awarding of contracts by the government agen-

cies, thus abdicating to those agencies its role in determining "public convenience and necessity."

Reusable launch vehicles

Intelsat will use both the US space shuttle and the European Ariane launch vehicle to place its Intelsat V series satellites in orbit.

The board of governors decided to order from NASA two shuttle launches and from the European Space Agency one Ariane launch. The orders, worth about \$82 million, will cover the orbiting of the fifth, sixth and seventh satellites in the series, during 1981-1982. The shuttle will provide Intelsat with its first experience with reusable launch vehicles; the Ariane will also be the agency's first non-US launch vehicle.

Agencies use frequency

The US Office of Education, Department of Health, Education

and Welfare has authorized a grant to KWIT, Sioux City, IA, to acquire special receivers so that area non-profit agencies can receive programs via a special sub-channel frequency not available on commercial sets. The grant provides 80% of the funds for the radios; the remaining 20% will be paid through long term rental by various Iowa agencies. These agencies will have access to the sub-channel at the same times that KWIT's main frequency is in use.

FCC combines applications

FCC forms 701, Application for Additional Time to Construct Radio Station, and 321, Application for Construction Permit to Replace Expired Permit, have been combined into a single form, 701. The rule amendment and new form becomes effective March 23, subject to clearance by the General Accounting Office. □



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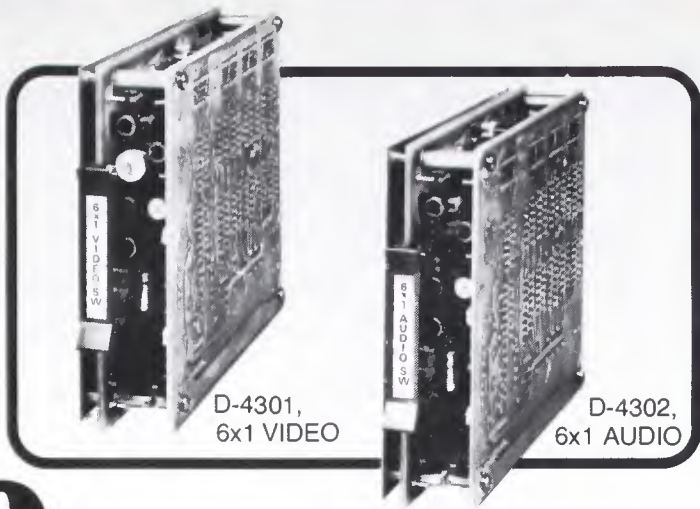
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D-4302,
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Datatek has now added the D-4300 series video and audio switching units to its line of routing switchers. With building blocks of 6x1, 16x1 and 20x1, these switching units may be used for:

- Input preselects to production switchers to expand their capacities
- Switching inputs to vectorscopes and monitors
- Adding preview busses to existing switchers
- VTR Input selection
- These units may also be stacked to make up small routing switchers at an economic price.



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D-4304,
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February 1979 *Broadcast Engineering* 17

New Standard for Portables...

LDK-14



In the great tradition of Philips portables:

1968...PCP-70 The industry's first portable. The one that started it all.

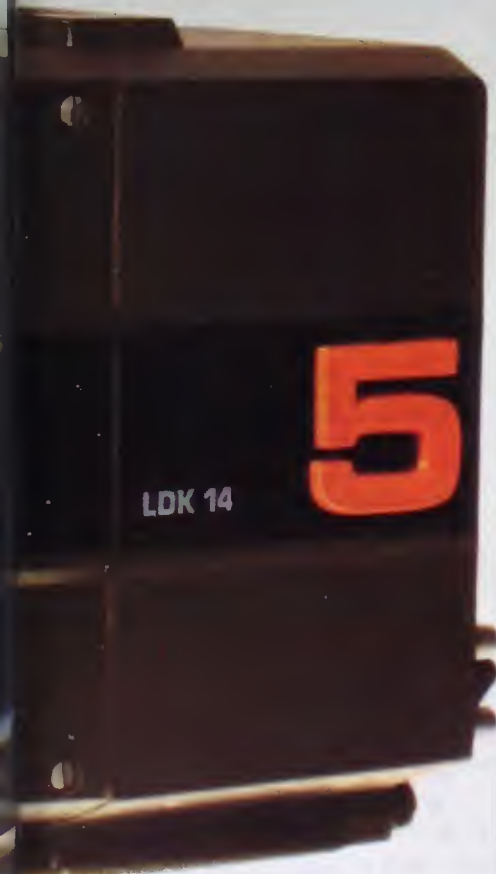
1969...PCP-90 Step two. World famous Minicam.

1975...LDK-15 First generation of triax field production cameras.

1976...LDK-11 A smaller, lighter, lower cost field and studio camera.

1977...Video 80 An innovation in lightweight camera and production system...LDK-15L Latest version of the LDK-15.

Evolving from this long history of portable equipment leadership, Philips' engineers have created a new concept in portable and field equipment. *The LDK-14 broadcast systems camera.*



A futurized camera offering three advanced configurations for field and studio use...all achieved without equipment repackaging:

1. **ENG**—studio quality portable; self-contained, one piece; film camera handling; weighing less than 15.5 lbs. (7 Kg) lens included; less than 12 lbs. (5.5 Kg) without lens.

2. **EFP**—studio quality portable, with remote control; timing and phase adjustable gen lock; instant convertibility to studio camera use by simple change of viewfinders.

3. **Studio**—compact, maneuverable; full broadcast quality; 5" viewfinder.



The LDK-14 combines innovative design and unique capabilities in a state-of-the-art 2/3 inch camera that is *much lighter* and *uses significantly less power* than the competitive ENG-only camera. Plus the LDK-14 gives you additional advantages in size, picture quality, stability, maintainability and cost.

Among its many other unique features for portable and studio use are:

- Only 27 watts power consumption (almost 1/3 less than the ENG-only competitive portable) gives longer continuous operation with choice of battery belt or small battery pack affixed to camera. A standby switch further conserves battery power between takes.



- Viewfinder displays include: contour enhanced camera picture or external video signal; status monitors for video level, color balance, bars on, battery discharge, VTR functioning, intercom call and camera tally.
- Automatics include: color balance; white and black level; centering; noise reduction when operating with extra gain; auto iris with set and hold facility.
- Externally switchable black stretch and contrast expansion.
- Dynamic Beam Control (DBC), regulates beam current to suppress comet tailing and blooming.
- Circuitry designed to maximize advanced capabilities of the latest rear-loading Plumbicons.

- Optional remote control facilities.
- Easy access for set-up and maintenance. Rear casing flips up for access to five main plug-in circuit boards.
- The rugged magnesium housing and titanium quick-release lens mounting holds all optical and electrical components in absolute registration. (Lens mount is strong enough for the heaviest extended range zoom lenses.)
- Rain, splash and RFI proofed.
- Other features include electronic raster rotation for better registration; linear matrix for optimal and Philips compatible colorimetry; and 360-degree hue-selectable chroma key.
- Other competitive cameras may have some of these LDK-14 features—no one has them all.

Camera-Recorder Systems

With this unmatched combination of performance and portability, the LDK-14 is *also the ideal camera for field recording of ENG and EFP.*



And just as Philips has always offered the widest selection of portable and studio cameras to meet your specific needs, the same policy now applies to your choice of 1" VTR's and TBC's. Offering 'C' format and 'B' format VTR's in both portable and studio configuration, Philips can provide the greatest objectivity and cost-effectiveness in packaging systems to match your requirements.

Philips, the company that started it all, now introduces the latest portable breakthrough, the LDK-14 broadcast systems camera. It will be the industry standard for years to come. And for a camera-recorder package to match your requirements, your choice of 1" VTR formats. Only from Philips.

For all the facts on this innovative new camera or camera-recorder system (please specify) write: Philips Broadcast Equipment Corp., 91 McKee Drive, Mahwah, N.J. 07430 (Canada: Philips Broadcast Equipment, 601 Milner Ave., Scarborough, Ontario M1B 1M5)

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PHILIPS

TM/NV Philips



Editors study economy

According to a study of 110 editors, representing 34 states and the District of Columbia, an economic slowdown is in store for 1979. The study, conducted by Hill and Knowlton, cited high interest rates and taxes as well as rising inflation as major causes.

Major outcomes of the survey revealed the following:

- Editors view inflation as the most important problem business will face in 1979.
- Energy is a long-range, although secondary, problem compared to inflation for 1979.
- Foreign investment in American companies is considered inevitable and generally beneficial by many editors.
- Editors think the tax revolt is increasing, although they question whether it will produce tangible results.

"Uncertainty" and "lack of confidence" were the two pivotal ideas in editors' comments again this year. For more information, contact Hill and Knowlton, Dept. BE, 633 Third Ave., New York, NY 10017, (212) 697-5600.

Intelsat reduces charges

Satellite communication charges of Intelsat, international telecommunications satellite network, have been reduced again this year.

The monthly charge for a full-time two-way telephone circuit via an Intelsat satellite has been reduced from \$1,140 to \$960 and became effective January 1. On-demand telephone circuits have been reduced from 16 cents to 14 cents per minute.

Electronics plant planned

Sharp Electronics plans to build a manufacturing plant in the Memphis, TN area. It will be their first US manufacturing facility.

A. Saeki, president of Sharp and chairman of Sharp Electronics, announced that the initial facilities will be completed this fall and will begin manufacturing microwave ovens and color television sets. Saeki said, "This will be a multi-product manufacturing facility, and

we will eventually expand production capabilities and manufacture audio and business equipment products. During the first year, we plan to produce 30,000 microwave ovens and 10,000 color television sets per month, and employ over 700 people."

Public securities sold

In the first public securities offering of Compact Video Systems made December 5, investors purchased all of the 600,000 units at \$7.50 a unit.

The units consisted of one share of common stock and a warrant to purchase an additional share within three years.

The company, located in Burbank, CA, provides mobile videotape systems and computerized post-production systems for electronic editing.

Consultants form company

The Redwood City, CA, based technical consultants, Candex Pacific, recently incorporated. The company offers such services as product planning, design engineering, prototype hardware development and software design.

Projects include commercial video equipment and military instrumentation as well as consumer electronics. A light electronic assembly and quality-assurance facility are also maintained.

TV station acquired

WILX-TV, the NBC affiliate serving the Lansing-Jackson, MI, market, has been acquired by A-T-O Communications of Willoughby, OH. The cash purchase from Television Corporation of Michigan is A-T-O's first broadcast property.

New fiberoptic company

Fibronics International, a joint venture affiliate of Valtec Corporation and Elron Electronics Industries, has been formed and will produce and market fiberoptic systems and components.

Fibronics' facility at the Science-

Based Industries Center, Technion City, Haifa, presently is designing and manufacturing fiberoptic data links.

According to James A. Godbey, Valtec president, most of Fibronics' marketing will be directed toward the European and Middle East economic communities.

Sony center opens

A magnetic videotape instead of the traditional ribbon was used when Sony Corporation of America recently opened its national parts center at the Air World Center in Kansas City, MO.

Kazuo Iwama, president of Sony Corporation, Tokyo, and Mayor Charles B. Wheeler, Jr., as well as several Kansas City dignitaries and Sony America officials participated in the ceremony.

The center adjoins the distribution and testing facility comprising over 300,000 square feet of space. The facilities employ over 200 people.

SALES/CONTRACTS

Harris

Brunei, a sultanate on the north coast of Borneo, will be the site of the installation of a \$4½ million Harris Corporation satellite communications earth station with a 42-foot diameter antenna.

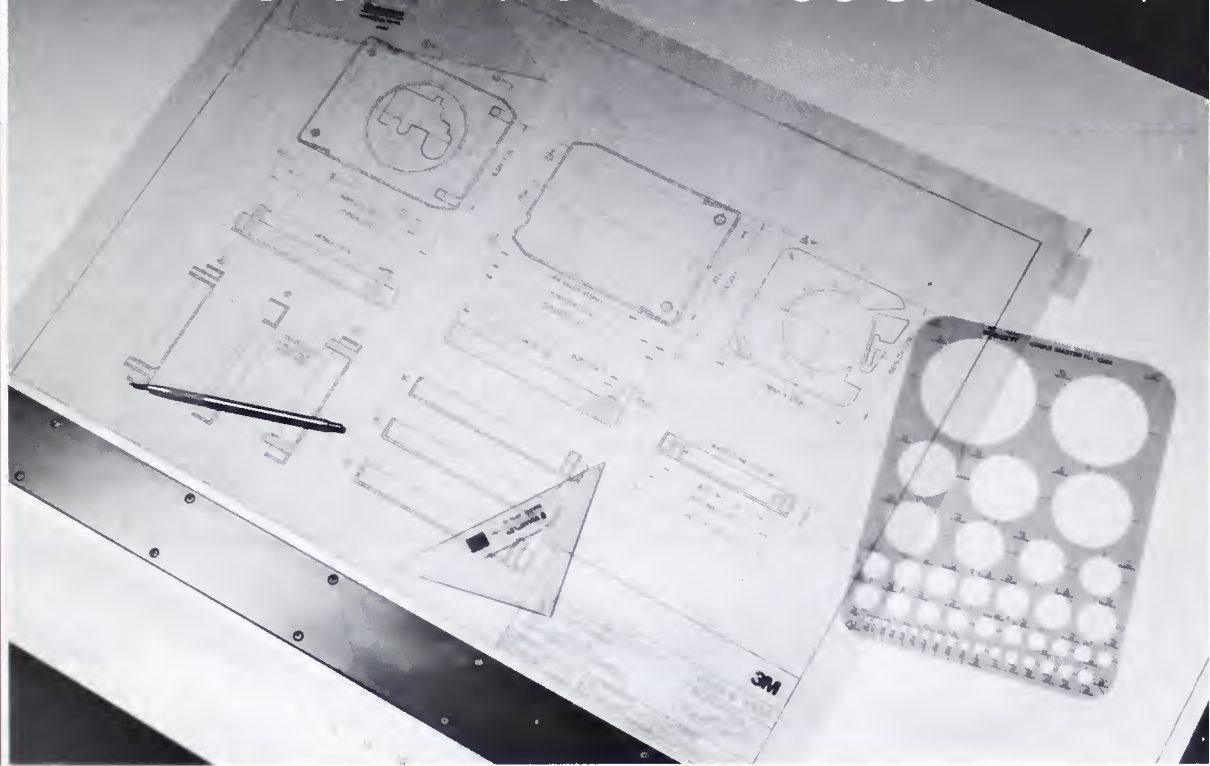
The company's satellite communications division will produce and install the Intelsat Standard B unit and construct permanent buildings for offices and equipment.

CBS network

An affiliation agreement became effective January 1 between WTOP AM, Washington DC's only all-news radio station, and CBS. It enables the station to air CBS network broadcasts on the hour, as well as selected CBS news/information features at other times.

"This mix will offer our listeners outstanding world and national news coverage," said Orrin H. McDaniels, station general manager. McDaniels added, "It also

IT'S ABOUT TIME SOMEONE REINVENTED THE RADIO CARTRIDGE SYSTEMS OF THE '60'S.



AND WE'RE ABOUT TO BE THAT SOMEONE.

While broadcasting technology leapfrogged through the '70's, one system in your station remained unchanged. Your tape cartridge system. It's almost identical to the one that hit the market in the early '60's. And that's not much help when you're programming for the '80's.

Right now, 3M's working on a completely new tape cartridge system called CentraCart™ that's designed to give you the equivalent audio quality of reel-to-reel. It's an inte-

grated system of recorders, players, magnetic tape and a very unique cartridge. And it'll offer better phase stability, better signal-to-noise ratios and longer tape life.

You can't run out and buy one just yet. But you can see and hear one at Booth 439 of the NAB Show or in our demonstration room at The Fairmont Hotel. Come visit us. We'll show you what's in store for the '80's.

CENTRACART™

3M

Business news

frees our entire local staff to concentrate entirely on wide-ranging and in-depth coverage of Washington-area news."

WTOP-AM is one of five radio and four television stations owned by the Outlet Company of Providence, RI.

RCA

Recent sales agreements made by RCA Broadcast Systems include domestic as well as foreign contracts.

WKRG-TV in Mobile, AL, purchased television studio and transmitting equipment which included a 50-kW transmitter, two color TV studio cameras, three TK-76 portable cameras and a 1-inch videotape recorder.

The Israel Broadcasting Authority, Jerusalem, acquired four TK-76 ENG color TV cameras. Two cameras are being used in a mini-mobile unit and two as stand-alone units.

The operator of the two government-sponsored television broadcast networks in Venezuela, Venezolana de TV, Caracas, expanded its film

origination systems and live color TV camera capabilities with the purchase of two TK-28B telecine systems and two TK-760 studio/field or production cameras.

The studio, field production and ENG capabilities of the five group stations of Post in Appleton, WI was expanded with the purchase of 10 color television broadcast cameras. Station locations include: WEAU-TV, Eau Claire, WI; WLUC-TV, Marquette, MI; WLUK-TV, Green Bay, WI; WOKR, Rochester, NY; and KTVO, Ottumwa, IA/Kirksville, MO.

Three TK-760 studio/field production cameras, a TH-100 1-inch helical scan videotape recorder and a TH-50 portable 1-inch recorder have been added to the facilities of Palette Productions, a television program and commercial production facility in Toronto, Canada.

Two Westinghouse Broadcasting Company (Group W) stations benefited from a purchase which included two TT-50FL, 50-kW low-band transmitters, transmission lines and associated equipment. The stations are WBZ-TV, Boston, and KDKA-TV, Pittsburgh.

In addition to the sales, RCA American Communications, announced plans to launch a third 24-transponder satellite in early December. The two 24-transponder spacecraft in orbit are nearing capacity and Satcom III will ensure RCA Americom's ability to serve the needs of the business, government and electronic media markets into the early 1980s.

Ampex

Ampex Corporation recently announced an order from the Christian Broadcasting Network for 22 VPR-2 1-inch helical-scan videotape recorders and associated systems. According to Donald V. Kleffman, vice president/general manager of Ampex's audio-video systems division, the systems will be used in the broadcast school and four teleproduction studios at CBN's international headquarters in Virginia Beach, VA.

In another transaction, WAGA-TV, Atlanta, and KOCO-TV, Oklahoma City, each ordered three BCC-10 broadcast color cameras.

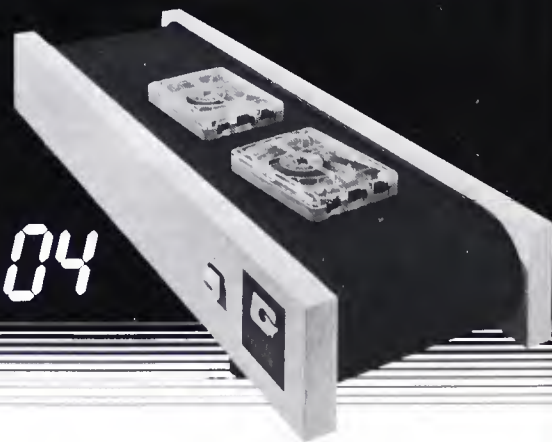
Two BCC-10 cameras were also

Erase tapes in seconds...clean!



GARNER'S NEW VIDEO'RASER

In less than five seconds, get video tape erasure depth that exceeds professional standards. Garner's compact Video'Raser Unit completely automates your video cassette erasing in a simple one-step, in-and-out operation...perfect tape erasure in one pass.



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In four seconds, our audio erasing units deliver a clean, "no-whump" erasure that meets the most stringent recording standards. Just hit the power button and drop any reel or cassette up to 16" on endless belt. You'll save valuable man-hours and do a better job.



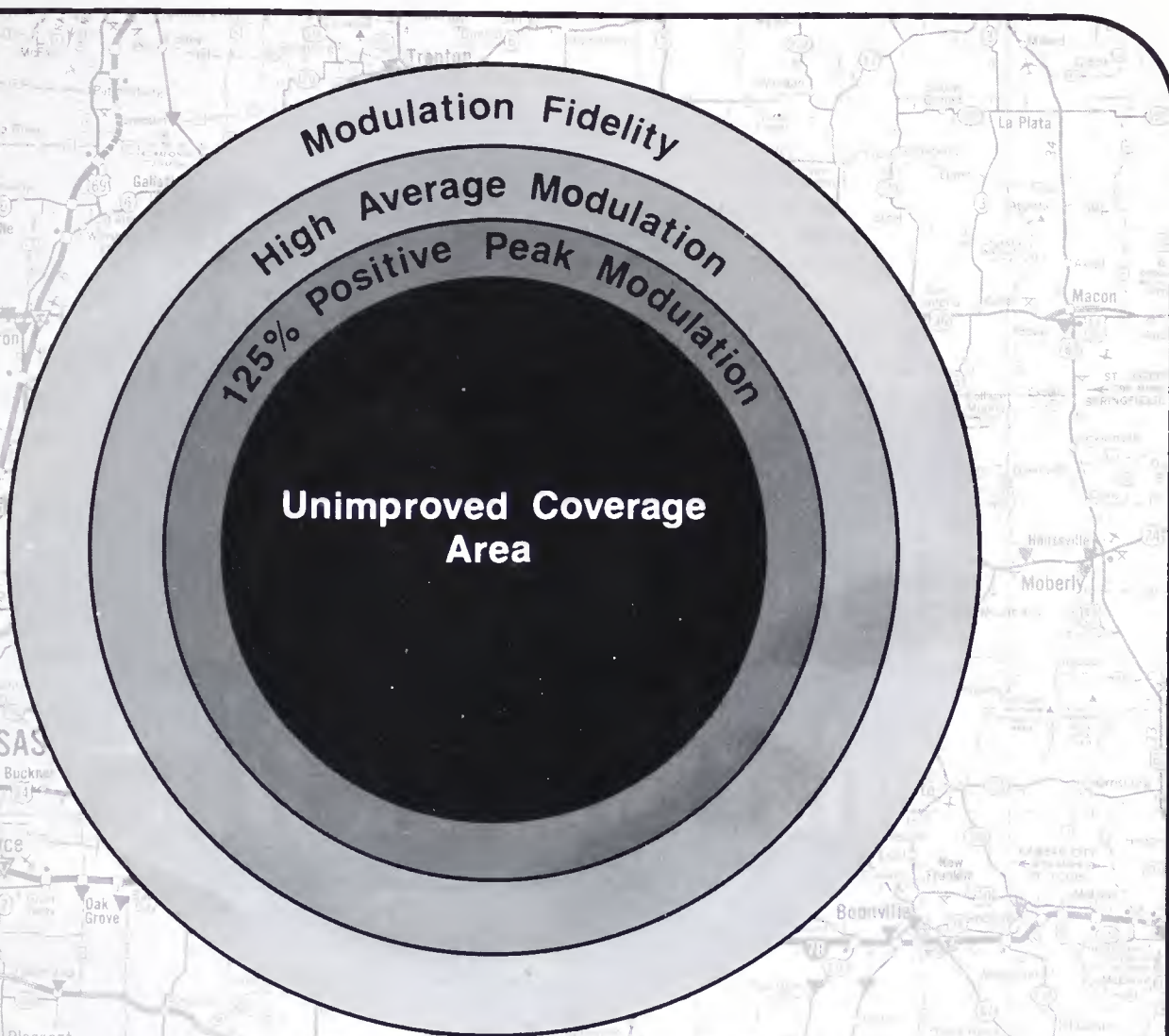
Look to Garner for quality electronic audio and video products, including the Garner high speed tape duplicator. For more information, write or call:

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Harris AM transmitter features that deliver a significant increase in both loudness and listener coverage are:

- Positive peak modulation capability to 130%, PDM or PSM*.
- Continuous high average modulation capability.
- Modulation fidelity which reproduces highly processed audio without distortion or over-modulation problems.

Gain fringe benefits through increased loudness in your present coverage area and larger expansion of your listener area with a Harris AM transmitter.

Write or call Harris Corporation, Broadcast Products Division, Quincy, Illinois 62301.



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COMMUNICATIONS AND
INFORMATION HANDLING

*Harris developed and patented modulation techniques

Circle (17) on Reply Card

Business news

purchased by Creative Image Productions of Anaheim, CA, which produces, duplicates and distributes videocassettes to the home video market. The firm's first products were marketed for Christmas under the Visual Records label.

TeleMation

Television station KTLA in Los Angeles has purchased a dual Compositor I Graphics Generator from TeleMation, a division of Bell & Howell.

The Compositor I consists of two independent character generators operating with one computer.

RCA Alascom

An agreement in principle has been made between Alaska and RCA Alascom to continue existing levels of live television.

Governor Jay Hammond said, "Under the terms of the agreement those areas of Alaska already receiving live TV will continue to receive it at the same level of service. In addition, 27 rural communities which presently do not

receive live TV will begin receiving it for the first time."

Because of the agreement, more than 90% of Alaskans will receive live television including news, sports, entertainment and educational programs.

Philips

The Radio and Television Commission of the Southern Baptist Convention has purchased three Philips LDK-25 studio color television cameras, according to a recent announcement by William E. Amos, vice president/marketing, Philips Broadcast Equipment.

The cameras will enable the commission to increase programming nearly 100% as part of a new production facility in Fort Worth, TX.

NEC

WNNE-TV in Hanover, NH, recently installed a NEC 30 KW transmitter atop the 21,070 foot summit of Mt. Ascutney.

The assembly of the transmitter, which uses high-efficiency Klystrons

to reduce power consumption, was supervised by a NEC representative.



The transmitter features solid-state exciter/drivers for high reliability and easy-to-service plug-in modules.

Utah Scientific

Utah Scientific, a manufacturer of audio and video routing switchers,

Superior SMPTE from BTX

4300 Reader and Video Display

4200 Reader and Digital Display

4100 Edit Code Generator

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BTX guarantees superior performance from 1.5 to 1200 IPS even at -18dBm or with any degree of time jitter.

BTX guarantees superior reliability and assures it with a 100-hour operational burn-in prior to shipment.

BTX guarantees time-code system compatibility with its complete line of cost-effective modular building blocks. For complete information, call:

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The portable **HITACHI SK-80**

The remarkable new SK-80 has three superior 2 1/3" icons at its heart, for unexcelled image and color fidelity. Hitachi's sophisticated electronics coupled with the high resolution capability of the Saticon set a new level of performance for a portable EFP camera under the most demanding conditions. Moreover, the SK-80 feels and handles like a true portable should. And its 2-hour battery belt with 1-hour charge time assures you of adequate power for continuous long-term shooting when you're on location. The standard C-mount and optional Arri adapters give you added versatility of selecting the exact lens that fits your shooting requirements.

But performance is only half the SK-80 story. A special training tape on videocassette is available with complete camera set-up and maintenance instructions, to help you keep your SK-80 making its excellent pictures. Beyond this, our six Hitachi regional offices are all staffed with qualified engineers and fully stocked with parts. They stand ready to back up our vast national network of servicing dealers.

We urge you to check out the performance features of the SK-80, as well as its low price, before specifying any other camera. Arrange a demonstration with your local Hitachi dealer or call the Hitachi regional office nearest you.



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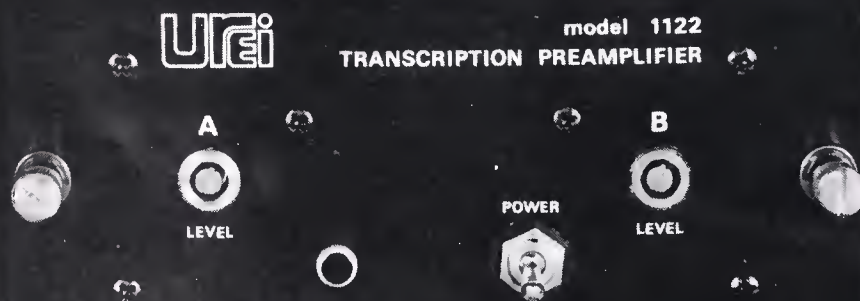
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February 1979 *Broadcast Engineering* 25

Our Phono Preamplifier is a familiar face with a new low price!

Now the proven performance of our professional phono preamp formerly sold under another name is available as a UREI product and at a new low price. The 1122 is a two channel, solid-state preamplifier offering precise RIAA/NAB equalization for either stereo or two channel mono disc reproduction for both broadcast and recording studio applications. High-impedance inputs match most all magnetic disc reproducers. Individual high and low frequency equalization trimmers are on each channel as are individual channel level controls. The 1122's performance proves that it is not just another pretty face. Pick one up from your UREI dealer.

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Circle (20) on Reply Card

Business news

recently received orders for \$330,000 worth of equipment.

The J. Walter Thompson Company, New York City, will use the system for program distribution at their headquarters and in their TV studios. WBAL-TV, Baltimore, will replace an old unit. Opryland Productions located in the Opryland Theme Park outside Nashville is expanding to keep up with demands for network presentations. And finally, Taft Broadcasting will use the system in a new space shuttle program at the Lyndon B. Johnson Space Center outside Houston.

FINANCIAL

Ampex

Ampex's second quarter 1979 interim report ended October 28, 1978, reported earnings of \$4.4 million, or 38 cents per share, up from the \$3.1 million, or 29 cents per share earned in the second quarter of 1977. Sales and other revenues were \$92.6 million.

Net earnings were \$6.9 million, or 61 cents per share, compared to net earnings of \$5.1 million, or 47 cents per share the year before.

Outlet Company

Outlet Company, a group broadcaster and retailer, recently announced third quarter net earnings of \$2,320,000 or 83 cents per share. Revenues of \$70,038,000 also were reported for the period ended October 31, 1978. The earnings figure is an 18.7% increase over last year's \$1,955,000.

Scientific-Atlanta

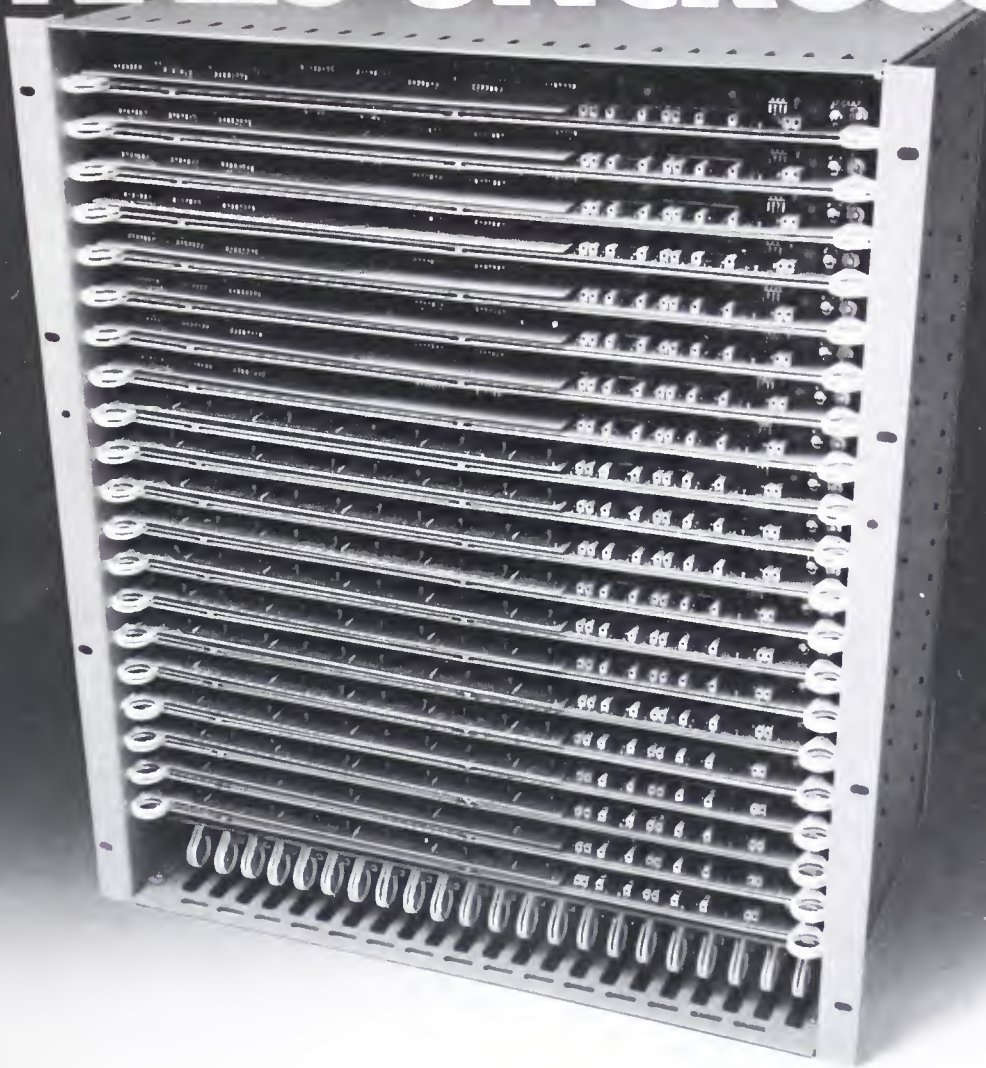
Sales for the first quarter ended September 30, 1978 for Scientific Atlanta were \$25.3 million, a 26% increase over last year. Net earnings were \$1.4 million, or 58 cents per share, a 21% increase.

General Instrument

General Instrument reported third quarter revenues for the period ended November 26, 1978, increased from \$130,946,572 last year to \$140,416,501. Earnings on common stock increased 31% to \$9,143,134 or \$1.18 a share.

Nine-month revenue increased from \$378,190,392 to \$397,182,100 while earnings on common stock rose from \$2.36 a share to \$3.11, a 32% increase.

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No matter how complicated your studio operation is, we can unscramble your signals and send them on their way, with one of our nine off-the-shelf Switcher series.

For example, many broadcasters use our lower cost 15X or RX Series Switchers to switch input signals to their VTR machines. By providing instant access to signals at the touch of a button, difficult editing jobs are accomplished on the spot and, during the Vertical Interval.

And to minimize system downtime we've designed our Series 20X and 40X Switchers for optimum reliability and capability. Most units have a microprocessor in every channel to eliminate total system failure if the logic system malfunctions. And you can replace a channel

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For audio use, our solid-state Series AX Switchers make the old fashioned patch panel a thing of the past.

All 3M Routing Switchers can be built to nearly any input/output capability, with vertical interval switching and can be operated by many types of controls.

Studio operation is getting more complex every day. You can't fight it, so why not switch? Switch to 3M Routing Systems.

Circle the reader service card number at the back of the book for more information or call 205-883-7370 for system design assistance. 3M Video Systems. Watch us in action.

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3M

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**meetings,
events & seminars**

February 24—Engineering Index will hold a training seminar on the Compendex database at Rensselaer Polytechnic Institute in Troy, NY.

For more information, contact: Nancy F. Hardy, communications coordinator, Engineering Index, Dept. BE, 345 East 47th Street, New York, NY 10017.

February 28—A rally for the deregulation of radio will be held in Washington, DC. The rally is sponsored by NAB, NRBA, NRB and Daytime Broadcasters Association.

For more information, contact: NRBA, Dept. BE, 1705 De Sales Street, NW, Suite 500, Washington, DC 20036.

March 6—The Hollywood Radio and Television Society will hold its International Broadcasting Awards Presentation Dinner at the Century Plaza Hotel in Los Angeles. Awards will be given for radio and television commercials.

For more information, contact: Oliver H. Crawford, Hollywood Radio and Television Society, Dept. BE, 1717 N. Highland Ave., Hollywood, CA 90028.

March 13-16—The Audio Engineering Society 62nd convention will be held at the new 30-floor Brussels Sheraton Hotel. A travel package has been planned by AES to assist US members in attending. Several workshops are planned for March 14.

For more information, contact: C. Silich, AES, Dept. BE, 60 East 42nd Street, New York, NY 10017.

March 16-18—The 40th annual Intercollegiate Broadcasting System convention will be held at the Shoreham Americana Hotel in Washington, DC.

For more information, contact: Don Grant, Intercollegiate Broadcasting System, Dept. BE, Box 592, Vail Gate, NY 12584.

March 25-28—The 1979 NAB Annual Convention will be held in Dallas at the Dallas Convention Center. More than two dozen workshops will cover various subjects such as programming, sales, production ratings, promotion, cable TV, AM stereo, TV blanking and UHF. Top panelists will discuss the fundamentals of station operations.

More than 200 exhibitors will show transmitters, video and audio recording equipment, stereo and studio equipment, mics and cameras, satellite gear plus radio and TV syndicated shows. Exhibits will be open from 10 am to 6 pm Sunday through Tuesday and 10 am to 5 pm Wednesday.

For more information, contact: Yvette Colbert, National Association of Broadcasters, Dept. BE, 1775 N Street NW, Washington, DC 20036.

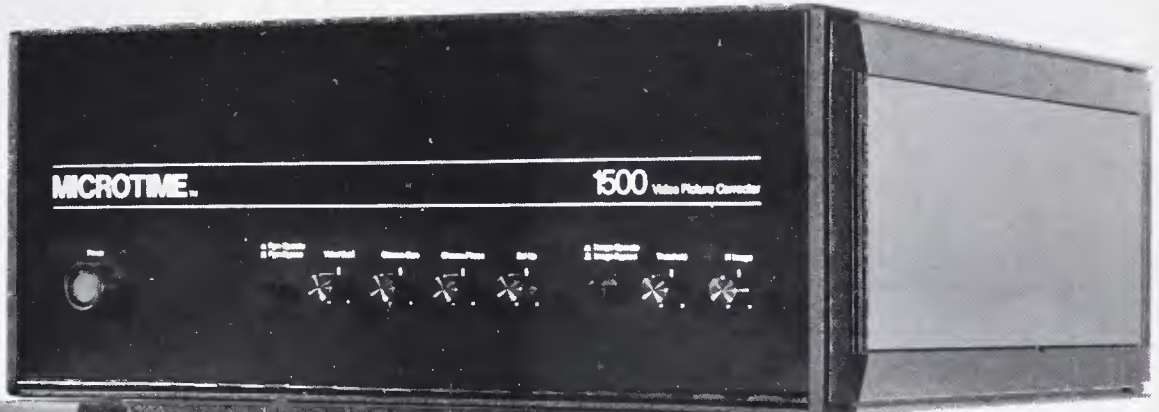
April 1-4—The 1979 IEEE Region 3 Conference and Exhibit will be at the Hotel Roanoke in Roanoke, VA. Activities include technical and student paper sessions, exhibits, tours, professional activities committee meetings and region 3 committee meetings. For more information, contact: K. Reed Thompson, Dept. BE, Southeastcon 79, General Electric Company, 150 Roanoke Boulevard, Room 244, Salem, VA 24153, (703) 387-7370.

May 11-13—A weekend conference to be held at the

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The 1500 CCD Video Picture Corrector is one of two MICROTIME time base correctors utilizing an advanced charge coupled device design to provide an outstanding low cost/high performance package for video signal processing.

The 1500 provides simplicity, reliability, and economy for CATV, Pay TV, and Industrial applications. The 1500 corrects skew errors, tearing, and horizontal jitter in unprocessed video from any non-segmented source . . . all at the lowest price available.



The 1600 CCD Time Base Corrector is primarily designed to provide broadcast quality electronic field production where lightweight and durability, along with high performance specifications are essential. The 1600 provides features that optimize the playback of

$\frac{3}{4}$ " V-Lock VTRs in either the standalone heterodyne or VTR 3.58 MHz subcarrier feedback modes of operation. The 1600 features also provide outstanding performance in studio applications for post production or broadcast purposes.

MICROTIME's CCD Video Signal Processing equipment offer the lowest priced/high performance signal correction system available today. Both units provide optional Image-Ex™ Image Processing for chroma/luminance delay correction, 3 dB signal-to-noise improvement, and picture detail crispening.

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Meetings, events & seminars

Golden State Room, Los Angeles Hilton Hotel, will be presented by the department of the arts, UCLA Extension, with national leaders in technology and programming being present.

The symposium, in cooperation with the Audio Engineering Society and Audio magazine will lead into the 1979 Los Angeles Convention of the AES.

For more information, contact: Martin Polon, director, audio visual services, University of California, Dept. BE, P.O. Box 24902, Los Angeles, CA 90024.

May 12—The 1979 Midwest Acoustics Conference will take place at Norris Center, Northwestern University, Chicago.

The conference will explore changes which are taking place in the recording industry through the increased use of digital technology. Speakers will include researchers and manufacturers of digital recording and sound synthesis equipment as well as people from the recording industry.

For more information, contact: William R. Bevan, Shure Brothers, Dept. BE, 222 Hartrey Ave., Evanston, IL 60204.

May 15-18—The Audio Engineering Society's 63rd Convention will be held at the Los Angeles Hilton.

Sessions will include Measurement and Instrumentation, Signal Processing, Sound Reinforcement/Audio in the Theater, Transducers, Broadcast Audio, Consumer Audio, Digital Techniques, and Magnetic Disc Recording.

For more information, contact: Martin Polon, director, audio visual services, UCLA, CASO, Dept. BE, Royce Hall 130, 405 Hilgard, Los Angeles, CA 90024.

May 27-June 1—The 1979 Montreux International Television Symposium and Technical Exhibition will be held at Montreux, Switzerland.

Two sessions will be held throughout the symposium. The A Session will be devoted to progress in systems design or technology featuring three or four invited survey papers on key developments. The B Session will be devoted to equipment innovations and consist of selected papers on the subject theme of the associated A Session.

For more information, contact: International Television Symposium and Technical Exhibition, Dept. BE, P.O. Box 97, CH-1820, Montreux, Switzerland.

Various dates—Integrated Computer Systems is offering special on-site training courses held throughout the US. A 5-day course, Microprocessors and Microcomputers will be held February 26-March 2 in Washington, DC; March 12-26 in New York; and April 2-6 in Philadelphia.

Computer Graphics, a 4-day series, will be in Los Angeles February 27-March 2; Dallas, March 20-23; Washington, DC, March 27-30; Detroit, April 17-20; Boston, April 24-27; and San Francisco, May 8-11.

The training course, Fiber Optic Communication Systems, will be held February 27-March 2 in Washington, DC; March 13-16 in Dallas; April 3-6 in Los Angeles; and May 1-4 in New York.

For more information on these and other courses offered, contact: Integrated Computer Systems, Dept. BE, 300 N. Washington St., Suite 103, Alexandria, VA 22314. □

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Lenco's new line of PMM-900 Series professional monochrome monitors is not only the finest available, but it's available *now*. Unlike other monitor manufacturers, we don't make promises . . . we deliver.

Our special warm, white phosphors produce an exceptionally sharp, bright picture with *900 lines of resolution*. And the foot-candle output is twice that of other monitors on the market.

And only Lenco gives you the unique, plug-in modular chassis that allows you to interchange the five individually shielded circuit

modules with any of the 900 Series monitors regardless of CRT size.

Couple that with our *two-year warranty*, underscan and pulse-cross options, a range of cabinet monitors from a 9" through a 23", dual 9" and 12", 15" and 19" rack-mounted models. That's a combination that can't be beat.

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Radio/Television

Tommy Walker has been promoted to general manager of WKIX-AM and WYYD-FM in Raleigh, NC. For the past year and a half, Walker has served as general manager of WGLD-FM, Greensboro, Winston-Salem and High Point, NC. He assumed his new position January 15.

The new director of TV operations and engineering at the Robert Wold Company is **Richard N. Marsh**. Marsh has been with the company since 1977 as TV traffic account manager.

Donrey Media Group's broadcast division has appointed **Eugene Doren** to director of broadcast engineering. He will assist all Donrey broadcast companies in Nevada, Arkansas and California.

Wilbur Brann has been promoted from studio-supervisor at WPTF-TV, Durham, NC, to chief engineer. Brann has been with the station since December of 1977.

Two air personalities have been added to the staff of KMBR-FM, Kansas City, MO. **Ron Moore** will host the 7 pm to midnight slot and comes to the station from

KLIN, Lincoln, NB. **Larry Ross** will cover the afternoon slot and comes to the station from KARD, Wichita, KS.

Thomas H. Sittner has been appointed chief engineer of EZ Communications' WEZR-FM in Fairfax, VA.

Joe Reighley has been appointed chief engineer at KORK-AM/FM, Las Vegas. Reighley was most recently transmitter supervisor at KSHO-TV, Las Vegas.

Government/Associations

Three senior staff appointments were recently announced by the Canadian Radio-television and Telecommunications Commission. **Kenneth L. Wyman** has been appointed director general of telecommunications and will be responsible for developing procedures for public hearings, coordinating the development of information and advice for the members of the commission and assisting commissioners in the drafting of telecommunications decisions. **Michel Arpin**, as director general of broadcast programs, will be responsible for developing information and advice for the commission with regard to

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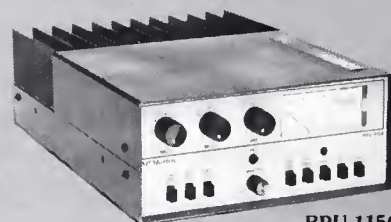
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McMartin RPU-1103/1403, three-watt transmitters — Hand carried portables for radio on the go. Lightweight. Line/Cassette/Mic inputs. Built-in compressor-limiter. Rechargeable battery. AC and mobile options.

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McMartin RPU-1150R/1450R, RPU receivers — Feature the exclusive McMartin Precise Tracking Decoder for dramatically reduced distortion and noise. Effectively extends useful reception range. Remoteable dual channel capability.



RPU-1150



RPU-1103

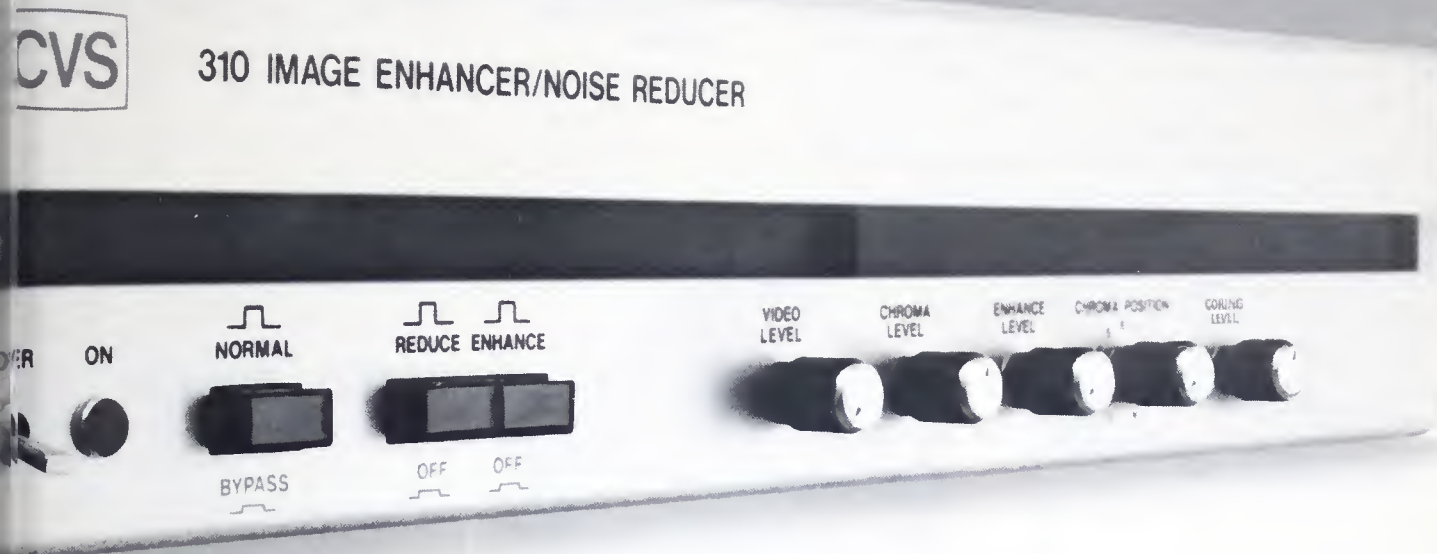


RPU-1150R

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Now! A noise reducer that enhances intelligently.



The CVS 310 gives you outstanding noise reduction and broadcast quality image enhancement—for use separately or together—in a single, compact instrument.

In addition, its intelligent circuitry automatically delivers only the amount of detail you preselect on the front panel. As long as the desired level doesn't exceed that amount, you don't have to adjust for each new source.

The CVS 310 works with any analog or digital TBC, or other video source, and is ideal for any application—broadcast, CATV or CCTV.

For a sharper picture, the CVS 310

- enhances vertically or horizontally
- uses a combed detail signal to eliminate hue shifts
- enhances horizontally with 3 dB less noise than other methods
- allows adjustment of vertical detail from 0 to 100%
- allows adjustment of horizontal detail from 0 to 50%

For a quieter picture, the CVS 310

- reduces luma and chroma noise by 6 dB
- reduces chroma-to-luma crosstalk by 20 dB
- corrects chroma/luma delay errors up to ± 350 ns
- minimizes fine grain noise, moiré and streaking

Along with all of this, reliability is ensured because of the signal processing experience gained from the more than 3500 CVS digital TBCs now in use worldwide—more than any other manufacturer.

So, if you want sharper, quieter pictures, see the CVS 310. It's the intelligent way to get them. For details and a demonstration, call, write or contact your local authorized CVS distributor.



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Telex: 268316

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"This struck BM/E as one of the most useful audio handling units introduced at the show."

The editors of November 78's issue of BM/E* were talking about our new ARA-1612 Audio Router/Amplifier introduced at the 1978 NRBA convention. What they saw may be destined to become the universal replacement for today's patch-bays and all their attendant drawbacks.

Whether you are preparing for AM Stereo or just revamping your present mono or stereo operations, the ARA ushers in a new era of convenience and flexibility. Local and remote routing of all your audio sources; balanced bridging inputs for zero loading effects on sources; individual input gain adjusts for consistent level distribution; remote and local LED source status displays; expandable inputs and outputs capability; mix and match mono/stereo capability; and fully protected, instantaneous switchover, dual power supplies.

Stop by NAB booth #409 for your personal demonstration of this and our other great new audio tools. From the new ESP-38 turntable preamp to the incomparable P5M remote console.

If you won't be coming to NAB be sure to circle the bingo card, call collect or contact one of your nearest reps for further information. You will be money and performance ahead.

See us at N.A.B. Booth #409

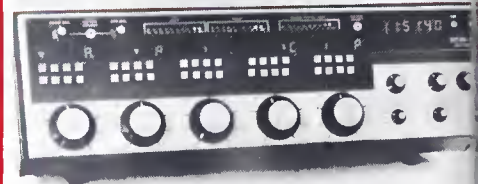
NEW



TURNTABLE PREAMPS. Leaders in their field. MP-8 & SP-8 — Bal. out; 0.05% dist.; 68dB gain; +8dBm out (+21dBm max.); S/N —77dB down rel. to 12mv in @ 1kHz & +8dBm out. ±1dB RIAA, remote scratch & brilliance activation. Mono, stereo, table top, and rack mount versions. \$98 to \$162. ESP-38 — Bal. out; 0.03% distortion; S/N, —85dB down referred to 12mv in @ 1kHz and +8dBm out; ±0.5dB RIAA; remote & local scratch, brilliance, rumble filter and mono activation; +8dBm out (+21dBm max.), +60dB gain. Left & right Hi/Lo equalization trimmers and recessed level controls. Built-in turntable remote start/stop relay. Stereo only. Price — \$325.



AUDIO DISTRIBUTION AMPLIFIERS. Available in 12 different rack and table top versions. All inputs and outputs may be used balanced or unbalanced and in any combination on the same amplifier. All outputs are individually amplifier isolated and will work into any load over 125 ohms without change in distortion or response. Response 10Hz to 30kHz, ±0.5 dB. Distortion 0.1% or less. Hum and Noise 98dB down referenced to +20dBm out. Channel separation —75dB. DA's start as low as \$145 for our 1x30 mass feed model, thru our 1x6 line and mic level units, to our modular 20x80 rack mount design. No need to pay more or settle for less. Price — \$145 to \$2,276.



DC38 SERIES AUDIO CONSOLES. Outstanding versatility and advanced technology. Unparalleled features such as 4 inputs per mixer, high Z balanced bridging inputs accept mic level thru high level, patch-panel input gain select, DC control of all audio, back lit alpha numeric readouts above each mixer, solid state LED VU meters dual channel (plus mono mixdown channel on stereo), solid state switching and muting for noiseless operation, selectable muting, plug-in electronics, and optional built-in Clock/Time. Available mono or stereo and 5, 8, or 10 mix versions. 4 year warranty with 2 week trial period. Price — \$2,447 to \$4,980.



DC-12 SERIES AUDIO CONSOLES. A remote control console with low profile control head and rack mount electronics that may be located up to 90 feet away. Features 2 inputs per mixer, silent illuminated touch switches, dual channel (plus mono mix down channel on stereo), solid state LED VU meters, DC control of all audio, patch panel input gain select, selectable solid state muting and switching, slide ladders with dual cue entry and plug-in electronics. Since the DC-12's are totally modular you may order any number of mixers and add on later. Twelve channels may be accommodated and an additional 8 may be added via the DC-12 extender. 4 year warranty. Price — \$4,200 to \$5,200.

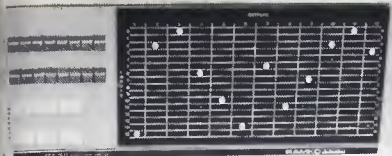


SC-5, DC-5, & DC-8 SERIES AUDIO CONSOLES. This series of consoles, whether single or dual channel; table models or rack mount; 5 or 8 mixers, mono or stereo, feature illuminated touch-pad audio select switching, solid state LED VU meters, Simul-Q monitoring capability, full-range gain selects on each input, selectable solid state cue and monitor muting on all channels, and plug-in electronics. DC control of all audio with built-in relays for on-air lights and aux. muting. Options include 4 and 8 channel extenders, Simul-Q latching and remote control of AC equipment. These popular consoles have recently been up-dated to incorporate many new features. Price — \$995 to \$2,375.

NEW



PORTABLE CONSOLE. P5M — A full 5 mix audio console in miniature. Bal. in & out, 8 inputs, 3 of which are mic/line selectable & individual compressors on mic channels #1 & #2. Tone gen., cue and monitor feed with gain controls & phones select with gain control. Last 2 channels equipped with Q switch & the first 3 channels provide muting. A folding stand is part of the unit and may be removed for rack mounting. +8dBm out nominally (+18dBm max.), ±2dB, 20Hz to 20kHz; S/N —75dB high level and —62dB mic level. Max gain of 90dB and a distortion of 0.3%. Compression/limiting range of 35dB and a slope of 50:1. 9 3/4" W x 9 1/2" x 3 1/2" H. Price — \$545.



ROUTER/AMPLIFIER ARA-1612. The versatile switcher on the market. Plug in for up to 16 inputs & 12 outputs. Each input as an amplifier and level adjust for attenuation and up to 17dB of gain. Output cards are dual bal. 600 Ohm outputs, momentary gated controls (may be slaved from other outputs), LED output status lights show thru front panel, and on-board mono/stereo selector. A smoked plexiglass front panel allows operator to tell the status of any output. Also on front panel are 2 rows of silent momentary selector switches. One row for output selection & one row for input select. Contact RAMKO for further info. and specs. Price — \$1,099 to \$2,296.



LINE AMPLIFIERS. The ideal solution for your line level problems can be found in one of the 4 different models offered. LA-2 (table top or rack) and LA-5S/10M: mono or stereo, balanced or unbalanced high impedance inputs, +21dBm maximum input level, +21dBm maximum output into 600 ohm balanced line, frequency response +0 —1dB 10 Hz to 50kHz, distortion 0.008% at +8dBm out. The LA-2 is a 2 channel amplifier. The LA-5S/10M is a modular rack mount unit with up to 5 stereo or 10 mono channels. The LE-3 is a 3 channel mono line amplifier with equalization for high and low frequencies and is also modular. Gain of all units, variable to +20dB. Price — \$135 to \$453.



DUAL MIC COMPRESSOR/AMPLIFIERS. Portable dual mono & stereo mic limiters that amplify, mix, limit and control gain. The DML-dual mono is used where 2 separate mics must be independently amplified and compressed and mixed into a common 600 ohm output. Primary and backup batteries (or an optional AC supply). Includes tone generator & talkback ability. The DML-1S is an AC powered, stereo version. Input: —60dB nominal, —18dB max. Gain: 90dB max. Limiting Output Level: DML-2M, +10dBm. DML-1S, +18dBm or +8dBm. Balanced Inputs and Outputs. Dist.: 0.3%. Attack Time: 2 microseconds. Noise: 60dB below limiting output. Size 2 1/2" H x 5 1/4" W x 8 1/2" D. Price — \$239 to \$281.

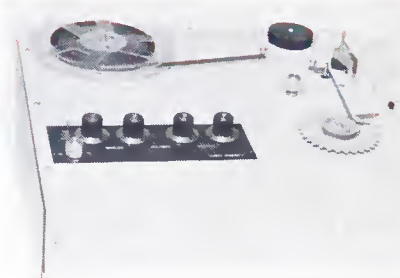


LINE AMPLIFIERS. Dual function for microphone or line. The MLA series are ideal for radio broadcasts, churches, mixer expansion, and emergency situations. Front panel controls for line selection and level. Mic input —60dB +4dBm out. Line input balanced bridging gain variable +26dB. —18dBm in provides 13dBm out with an additional 13dBm of headroom. Distortion is 0.1% or less. Response: Mic channel ±2dB 20Hz to 20kHz. High level channel ±1dB 5Hz to 30kHz. Inputs may be used for unbal. XLR Mic connectors. Single or dual channel, table top or rack mount. Price — \$185.

NEW



STUDIO MONITOR AMPLIFIERS. Exceptional reproduction with high performance and versatility. 7 different models to choose from. MA-12 (mono) MA-20 (stereo): 12 watts mono/20 watts stereo. Response: ±1dB, 10Hz to 50kHz. Distortion 0.05% max. @ 1kHz and rated output. Input: 5k unbalanced. Table top or rack mount. SMA series: mono or stereo, table top or rack mount. 25W RMS per channel into 8 ohms. Inputs: high Z balanced bridging. Response: ±1dB 15Hz to 90kHz at rated output. Distortion: 0.6% at rated output. Built in muting circuit with input and output level controls and bass contour adjust. Price — \$121 to \$325.



AUTOMATIC CARTRIDGE & CASSETTE LOADER. Precision wind your own carts and cassettes and save up to 40% on reloading costs. The ACL-25/E is simple to use, just dial in the time desired and push the run switch. The ACL stops automatically, precisely to —O, +1 second of playback time. The exclusive playback speed selector ends mental gymnastics figuring tape length versus playback speed. Simply set the selector to 1/8, 3/4, or 7 1/2 i.p.s. and the ACL does the rest. An optional cassette adaptor enables you to wind both carts and cassettes on the same machine. An optional pancake adaptor is also available. The ACL-25/E has a nominal winding speed of 30 i.p.s. Price \$375.



PHONICS PROFESSIONAL SERIES BY PANASONIC. Ramko Research is proud to be one of the largest distributors of this extraordinary moment. The SP-10MKII and the SL-1500-Turntables have set new standards by their turntables will be judged for many years. The direct drive units with Quartz-phase speed control maintain speed within 0.2%. Wow and flutter is 0.025% WRMS. Rumble —73dB. Also available are reel to tape recorders, portable and fixed cassette units, power amps, parametric equalizers, speakers, and a series of studio monitor speakers will astound you with their phase-linear reconstruction.

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"YOUR KEY TO QUALITY"

People in the news

broadcast program activities, trends and problems concerning commercial and political matters as well as program production and program services. **Jean-Pierre Fournier** is now director of public relations in charge of developing responses to media and industry information requirements regarding public hearings and the work of members of the commission.

Manufacturers/Distributors

Clark Daugherty has been elected chairman and chief executive officer of P. R. Mallory & Company succeeding **Charles A. Barnes**, who was named chairman of the executive committee. In other appointments, **William L. Conlin** was named president of the Mallory Capacitor Company and **Donald R. Chapman** as vice president and controller. **Robert A. Patrick** has been promoted to director of marketing of the division.

Dr. Geoffrey Bate has been appointed vice president of advanced development for Verbatim Corporation with responsibility for maintaining the firm's position in the digital recording market and developing new products in computer media. Bates comes to Verbatim from IBM where he was for 19 years, most recently as manager of recording physics.

The newly created position of marketing services manager at Telex Communications has been filled by **Ronald Taylor**. Before joining the firm, Taylor was

director of marketing services at Turner Division of Conrac for seven years.

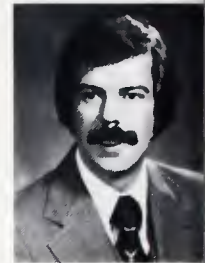
Scully Recording Instruments recently announced the appointment of **Frank Santucci** as international sales manager. Santucci will be responsible for sales of Scully professional audio recorders and dictaphone voice communications recording systems.



Taylor



Santucci

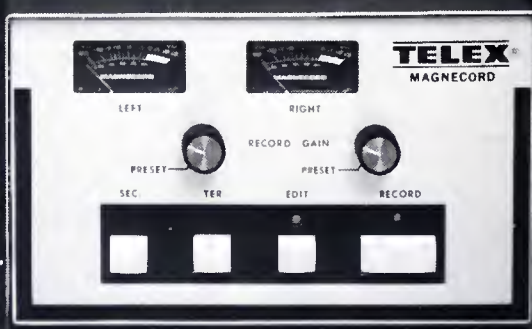


Gaffney

Bernard J. Gaffney has been appointed national sales representative for Telex Communications audio visual products group. Gaffney most recently served as sales manager of the micrographic division of Canon/OPS.

Rosemarie Monaco has been appointed director of advertising and sales promotion for Sony Video Products. Monaco was formerly advertising manager for Sony's business products division, a unit of Sony Industries.

At Last, a Cart Machine that Keeps its Cool



Telex/Magnecord broadcast cart machines run cool and steady. So cool no ventilation is required, so steady not even voltage or frequency fluctuations will alter their speed. Thanks to our dc servo flutter-filter drive.

The MC series offers broadcasters a host of options, including field convertability from mono to stereo or play to record and, of course, end of message, secondary/tertiary cue tones.

Designed for type A or B carts, the MC series meets all NAB specifications, offers full immunity to EMI and RFI, is remote controllable and automation compatible with CMOS digital logic. Audio muting, air damped low voltage

dc solenoid and fast forward are standard features on every MC unit.

Four broadcast cart machines to choose from in the Telex/Magnecord MC series. Running cool and steady. With a pleasant surprise—they're affordable.

For detailed information please write:

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HI-BAND U-format VTR



“Quad” Quality in a $\frac{3}{4}$ ” Format

The model HBU-2860 (Hi-Band U-format video cassette recorder) is a modified SONY VO-2860 with Recortec electronics mounted on top of the unit. The modification provides direct hi-band video recording made possible by tripling the scanner speed and the linear tape speed.

Quality—At the 1200 ips head-to-tape speed the HBU video quality is as good as the “quad” or the new one-inch format. Professional audio quality is also obtained with this modification.

Convenience—Standard and widely available 3/4-inch video cassettes for the HBU allow for simple loading, handling and storage.

Dependability—The HBU does not alter the U-type recording format and thus takes advantage of the proven interchangeability of the U-type recorders.

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NAB/Dallas: The industry's really big, big show March 25-28 at the Dallas Convention Center

With more exhibitors and an increased emphasis on workshops, NAB/Dallas promises to be an exciting convention this year!

As **BE** goes to press, the NAB's 57th Annual Convention on March 25-28 at Dallas's spectacular Convention Center rockets ahead in growth and planning. The number of booth exhibitors now approaches 300 and is mounting daily.

For registration information, contact the NAB at 1771 N. Street N.W., Washington, DC 20036, or call (202) 293-3570. For exhibit details, contact the NAB St. Louis office: Ed Gayon, (314) 721-7717.

The technical sessions of the convention begin at 2:30 PM on Sunday, March 25, and close with the luncheon on Wednesday, March 28, featuring top entertainment at 2:00 PM. Exhibits close at 5:00 PM on the 28th. With an excellent list of exhibitors serving all facets of the broadcast industry, and with the increased emphasis on technical workshops, this year's NAB Convention promises to be an exciting event.

NAB

Broadcast Engineering Conference Committee

Representatives from many sectors of the industry make up the NAB Engineering Conference Committee to help make this year's program an outstanding technical success. The committee is chaired by Gerald Vander Sloot, radio station WOOD, Grand Rapids, MI and consists of the following members (listed alphabetically): Robert Butler, NBC, New York; Edward Herlihy, Golden Gate Broadcasters, Los Angeles; Eldon Kanago, radio station KICD, Spencer,

IA; Robert Niles, Capital Cities Communication, Philadelphia; James Parker, CBS Television Network, New York; R. LaVerne Pointer, ABC, New York; Mike Shapiro, television station WFAA, Dallas; Leonard Spragg, Storer Broadcasting, Miami Beach; Robert Wehrman, Cox Broadcasting, Atlanta; William Wisniewski, Mutual Broadcasting System, Arlington VA; and Charles Wright, station WBYS AM/FM Canton, IL. George W. Bartlett, NAB vice president for engineering coordinates the engineering activities for the upcoming convention.

The technical program and exhibit schedule follows along with a map locating the Dallas Convention Center and nearby motels/hotels.

Exhibits: 10:00 AM-6:00 PM, Sunday, Monday, Tuesday
10:00 AM-5:00 PM, Wednesday

1979 Broadcast Engineering Conference

SUNDAY, MARCH 25

3:00-5:00 PM Opening General Assembly

MONDAY, MARCH 26: RADIO ENGINEERING SESSIONS

9:00-10:30 AM WORKSHOP: Audio Processing, Measurement Test, and Monitoring.
10:30-12:00 AM WORKSHOP: Engineering Principles of Communications Satellite Systems.
12:30-2:30 PM Engineering Luncheon
2:30-3:00 PM PAPER: Adapting AM Transmitters for Stereo Transmission.
3:00-4:00 PM WORKSHOP: AM-FM Receivers, The Manufacturer's Viewpoint.
4:00-5:00 PM WORKSHOP: AM Stereo Broadcasting.
5:00-6:00 PM Amateur Radio Operators Reception.

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Circle (31) on Reply Card

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.”

RFI, but a complaint

Zen 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 6 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 multi-core 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

Circle (32) on Reply Card



MONDAY, MARCH 26: TELEVISION ENGINEERING SESSIONS

- 8:30-10:30 AM WORKSHOP: 1-inch Videotape.
- 10:30-12:00 AM WORKSHOP: Teletext, Closed Captioning and Other Television Ancillary Signals.
- 12:30-2:30 PM Engineering Luncheon
- 2:30-4:00 PM WORKSHOP: TV Blanking Progress Report.
- 4:00-4:30 PM PAPER: The CBS Blanking Width Corrector.
- 4:30-5:00 PM PAPER: The TK-47 Auto-Cam Camera.
- 5:00-6:00 PM Amateur Radio Operators Reception (See Radio Engineering Sessions)

TUESDAY, MARCH 27: RADIO ENGINEERING SESSIONS

- 9:00-10:30 AM WORKSHOP: Audiocassette, Cartridge and Reel-to-Reel Tape: Performance, Measurement and Standards.
- 10:30-11:00 AM PAPER: Microprocessor Based Cartridge with Open Reel Quality.
- 11:00-12:00 AM WORKSHOP: The Absence of Radiation Hazards in Broadcasting.
- 12:00-2:30 PM Engineering Luncheon/Achievement Award.
- 2:30-6:00 PM Afternoon free to visit exhibits.

TUESDAY, MARCH 27: TELEVISION ENGINEERING SESSIONS

- 9:00-10:30 AM WORKSHOP: Digital Editing and Special Effects for Television, 1979 Update.
- 10:30-11:00 AM PAPER: Roplacoment of Slow Motion with 1-inch Tapo.

- 11:00-12:00 AM WORKSHOP: The Absence of Radiation Hazards in Broadcasting (See Radio Sessions).

2:30-6:00 PM Afternoon free to visit exhibits.

WEDNESDAY, MARCH 28: RADIO ENGINEERING SESSIONS

- 9:00-10:30 AM WORKSHOP: Building New Radio Studio Facilities: Planning through Purchasing.
- 10:30-11:00 AM PAPER: A Fresh Look at Directional Antenna Phasors.
- 11:00-12:00 AM Joint Meetings with Radio and Television.
- 12:00-2:00 PM Closing Joint Engineering/Management Luncheon (with entertainment).
- 2:00-5:00 PM Afternoon free to visit exhibits.

WEDNESDAY, MARCH 28: TELEVISION ENGINEERING SESSIONS

- 9:00-10:30 AM WORKSHOP: Broadcast Tall Towers, Aeronautical Hazard?
- 10:30-11:00 AM PAPER: Engineering Preparations for the 1980 Olympics.
- 11:00-12:00 AM Joint Meetings with Radio and Television.
- 12:00-2:00 PM Closing Joint Engineering/Management Luncheon (with entertainment).
- 2:00-5:00 PM Afternoon free to visit exhibits.

Happy Planning. See you in Dallas.
The BE Editorial staff.

What makes these new Sintronic FM transmitters so exciting?



SI-10-T (10 Watt)

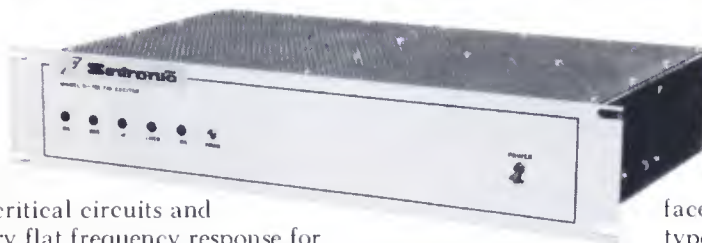
SI-F-25 (27.5 kW)

SI-F-5 (5 kW)

Well for one thing...

The new Sintronic SI-10-E solid-state, direct-carrier FM Exciter! Why? Because it does not have crystal ovens, or thermostats to burn out. It provides continuous LED monitoring of critical circuits and has low distortion and a very flat frequency response for excellent stereo and SCA operation. It utilizes a protected, regulated power supply and has a truly conservative specification throughout. . . We find this exciting. . . and the SI-10E "excites" all of our new FM transmitters too.

Our new transmitters' conservative design can also be exciting! They use stable zero-bias, grounded-grid power amplifiers, eliminating neutralization and the screen and bias power supplies. Their tuning and loading lines are really heavy duty, made for long-term reliable service. The entire transmitter's design is clean, straightforward and mechanically conservative. Standard features on all our FM transmitters include automatic step/start switching, full protection



against overload, recycling with a memory-type visual indicator that tells you the status of all critical circuits. Further, they will interface with any standard STL or wire-type remote control and have a built-in, automatic power output control.

The 1.5, 3.5, and 5 kW models each occupy a single modern style cabinet. The 15 and 27.5 kW models are housed in a single dual-section cabinet. All models are self-contained other than the RF harmonic filter and use our new "12 pulse" power supply. We find this pretty exciting stuff. If you ask us about price we think you will find our transmitters pretty exciting too!

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Sintronic CORPORATION
Sintronic is a subsidiary of Singer Products Co., Inc.

Circle (77) on Reply Card

Basics of color video

Basics of color video Part 1

By John W. Wentworth, manager of broadcast technical training at RCA Broadcast Systems

The technical standards for color TV broadcasting in the US were formally approved by the FCC in December, 1953, and became effective in January, 1954. Engineers and technicians active in the broadcast industry at that time had numerous opportunities to learn the fundamental principles incorporated in these standards through training seminars conducted by RCA and other major manufacturers, or by studying technical papers.

But 25 years have elapsed since the beginning of color broadcasting and many of the pioneers deeply involved in its development are entering their retirement years; their children now entering the broadcast industry may not have been born when the standards were adopted.

Many tutorial works used by the pioneers are no longer readily available, and it appears timely to prepare a fresh review of color TV fundamentals for those now entering the industry. The author, as one of the younger people actively involved in the development of color TV in the early 1950s and currently involved in the technical aspects of broadcasting, is in a favorable position to bridge the "generation gap."

Color vision and primary colors

This paper will assume that the reader is familiar with the basic principles of monochrome TV: the scanning process, the role of synchronizing and blanking pulses, and the basic modulation and demodulation processes involved in transmitting and receiving broadcast signals. Attention primarily will be given to the special problems involved in the broadcast transmissions of color images.

In scientific work, color is recognized as a property of light, not of physical objects, and the investigation of color properly belongs in the realm of psychophysics. That is, color can be understood only by considering the physics involved in the radiation and reflection of light energy in association with the physiological and psychological factors involved in the interpretation of this energy by the human eye and nervous system.

It is helpful at the outset to remember that the overall objective of TV technology is the creation of illusions. TV systems actually create on the kinescope in a televiewer's home a constantly changing pattern of light generated by a tiny flying spot, but this pattern of light stimulates the viewer's optical and nervous system so that he gets the illusion of actually witnessing a scene taking place before the TV camera. Color TV is more appealing and more effective than monochrome television because it is capable of producing more convincing illusions. Normal vision for most humans is color vision, so any picture-producing process not including color relies more on the observer's imagination than does one that includes color.

Color perception results from the combination of three psychological sensations, each of which is a nonlinear and wave-length-dependent function of the light energy falling on the retina. These sensations are commonly known as brightness, hue and saturation.

• Brightness is that characteristic in which colors may be located in a scale ranging from black (darkness) to maximum white. (Brightness is the only attribute of a color which can be transmitted via monochrome television.)

• Hue is that characteristic in which colors may be categorized as red, green, yellow, blue, etc.

• Saturation refers to the degree by which a color departs from a gray or neutral of the same brightness; pale or pastel colors are much less saturated than those that are deep or vivid.

Brightness

Consider briefly the relationships between color sensations and the light energy that constitutes the physical stimulus. The human eye is sensitive to electromagnetic energy extending over a wavelength range of roughly 400 to 700 millimicrons. (A millimicron is equal to one nanometer.) The response of the eye is not uniform over this region, but follows a response curve shaped much like a probability function peaked at 555 millimicrons (Figure 1). This curve describes the spectral characteristics of the brightness sensation only, and indicates that a given amount of energy may appear much brighter at some wavelengths than at others. Response curves vary somewhat from person to person, but Figure 1, represents the average response of many observers, was adopted by the International Commission on Illumination in 1931 as the standard **luminosity function** or **visibility curve**.

Hue and Saturation

The other two variables of color—hue and saturation—are controlled by the relative spectral distribution of light energy. As an approximation, hue is determined by dominant wavelength. In fact, the various wavelength regions of the visible spectrum are commonly designated by specific hue names ranging from violet for the shortest

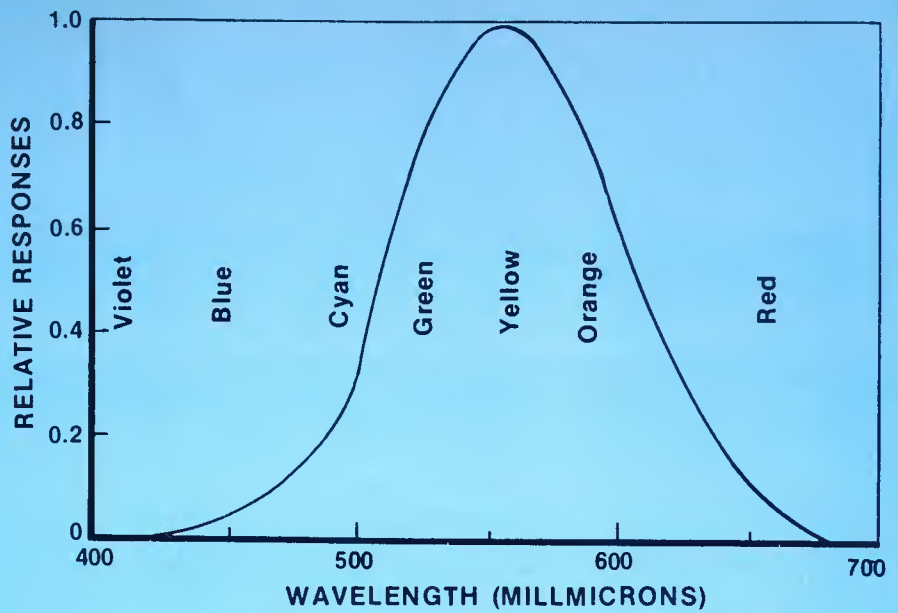


Figure 1. The luminosity function, an averaged curve over many observers, shows a peak sensitivity of human vision in the yellow region of the visible spectrum at 555 μm .

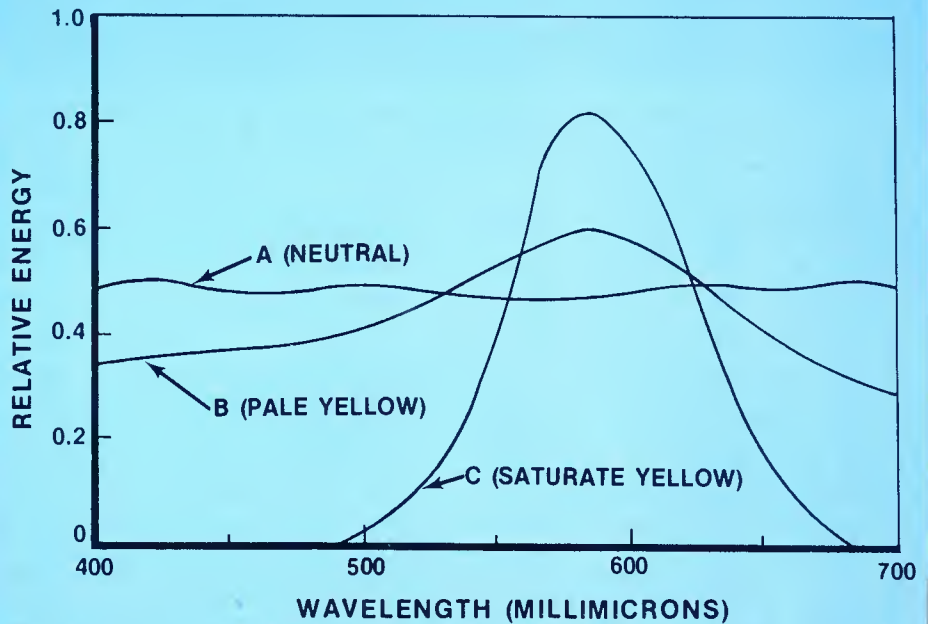


Figure 2. In the visible spectrum, hue and saturation are controlled by the spectral distribution of light energy.

Figure 3. For color TV the primary colors are red, green and blue. A wide range of colors are possible by mixing of the primaries, with white being an equal mixture of all three.



Red + Green = Yellow
 Red + Blue = Magenta
 Blue + Green = Cyan
 Yellow + Blue = White
 Cyan + Red = White
 Magenta + Green = White

wavelengths to red for the longest. These major hue regions are designated roughly on Figure 1.

Saturation is determined by radiant purity, or the extent to which the light energy is confined to a single wavelength, or to a very narrow band.

Figure 2 illustrates how hue and saturation are controlled by the spectral distribution of light energy. If the radiant energy from a color is spread out uniformly over the visible spectrum, as shown at A, it is generally perceived as white (or gray, depending upon the relative brightness). If the distribution curve has a slight hump or peak, the color is perceived as a pale or pastel shade of the hue corresponding approximately to the dominant wavelength. For example, a color with a distribution curve corresponding to curve B would be perceived as a pale yellow. If the distribution curve consists of a fairly sharp peak around the same dominant wavelength, as shown in curve C, the color generally has the same hue but is more highly saturated. Maximum saturation occurs when the spectral distribution curve is a single line, corresponding to single-wavelength radiation (as in the output of a laser).

Perceiving color

Psychologists and physiologists are still searching for a completely satisfactory explanation as to how humans perceive colors. The most promising theory of color vision is based on the assumption that there must be three kinds of cone cells in the human retina with overlapping spectral sensitivity curves but with peaks occurring in roughly the red, green and blue portions of the spectrum. According to this theory, the brightness sensation is

Color television

controlled by the sum of the responses of the three types of cells, while hue and saturation are determined by the ratios of stimulation. If each of the receptor systems is assumed to have an independent and nonlinear automatic-gain-control system, this 3-receptor model can account for most of the known phenomena of color vision.

Fortunately, we do not need a complete understanding of all the intricate processes involved in human vision in order to develop a color-reproducing process. Instead, we may employ the primary color concept which has been verified by experimental data: characteristic of human vision, nearly all colors encountered can be matched by mixtures of three primary colors.

Primary color concept

Consequently, it is possible to produce

full-color images of complete scenes by superimposing three primary color images; this basic process is used by nearly all modern color-reproducing systems, including color photography and color TV. The practical success of 3-color reproduction processes is convincing evidence supporting the tri-stimulus theory of color vision.

Contrary to popular belief, there is no one set of colors with unique properties that make them the primary colors—any set of three will do, provided only that no combination of any two is capable of matching the third. The most useful set for color TV purposes consists of highly saturated red, green and blue. The FCC signal specifications use standard colorimetric designations to describe a specific set of red, green and blue primaries recommended for color television.

A few of the many colors that can be

made by mixing red, green and blue light are illustrated in Figure 3. Red plus green gives yellow; red plus blue gives purple or magenta; and green plus blue gives cyan or blue-green. A combination of all three primary colors produces white or neutral.

Colorimetry and color TV

In a color TV system, a full-color image is produced by adding the light output of three registered images in red, green and blue. These images usually are produced by a tri-color kinescope (Figure 4). Three electron guns produce three beams which are independently controlled by red, green and blue video signals. These three beams are all made to scan in unison by deflection coils around the neck of the tube. A special convergence yoke just beyond the gun structures produces dynamic magnetic

Signal processing in a modern color camera

The accompanying article contains a brief explanation that the function of the RGB section of a color TV camera is simply to generate video signals corresponding to the red, green and blue components of the full-color image; mention also was made of the fundamentally-important gamma correction process. Actually, a great deal of complex signal processing takes place in a modern camera, over and above the important adjustments for pickup tube control and registration. Highlights of typical signal-processing functions are summarized below.

- **Wide-band amplification:** Overall, each of the three channels must raise a video-bandwidth signal from a few hundred nanoamperes (or less) at the target electrode to a standard 1 V level.

- **Cable compensation:** Both level and frequency response must be adjusted either manually or automatically as the length of camera cable is increased, and timing pulses supplied to the camera head must be advanced in proportion to the length of the cable to provide a standard timing relationship at the camera's output terminals.

- **Gain shading:** Very few pickup tubes are absolutely uniform in sensitivity across the image surface, so each of the primary signals must be multiplied by a custom-adjusted correction signal synthesized from sawtooth and parabolic waveforms at horizontal and vertical frequencies.

- **Black Level Control:** Accurate control of the black levels in the three primary channels is a complex process that only begins with a feedback-stabilized clamp operated during the retrace or target-blanking periods. Spec-

ial circuit arrangements are also needed for (a) dark current cancellation, (b) bias light cancellation, (c) additive shading to correct for any nonuniformity in the bias light, and (d) flare compensation (which involves the development of a dynamic correction signal proportional to the average picture level to compensate for light that spills over from bright areas into picture blacks because of spurious reflections in the optical system).

- **Color balance:** As noted in the article, color balance is achieved by careful gain matching of the red, green and blue channels, but this operation must be performed whenever the quality (spectral distribution) of the scene illumination is changed. Many recent RCA cameras have automatic circuits which make the required adjustments at the push of a button while the camera is pointed toward a white card at the center of its field of view.

- **Gray scale matching:** The basic gamma correction process is discussed in the article, but it should be emphasized that practical cameras need arrangements to assure that identical grey-scale performance is achieved in all three channels.

- **Aperture compensation:** The finite size of the scanning spot in a pickup tube results in reduced picture sharpness in both the horizontal and vertical directions. Modern broadcast cameras provide compensation for this effect by so-called contour enhancement circuits which usually generate an additive signal to restore the attenuated frequency components. Proper compensation in the vertical direction requires the use of two ultrasonic delay lines,

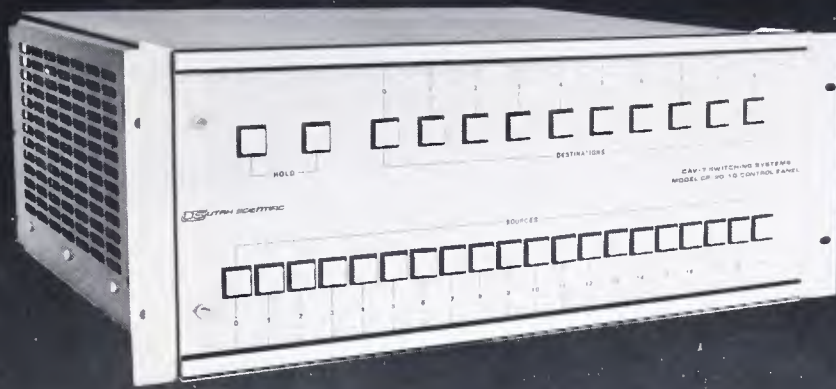
each providing a delay of one horizontal period. Because of the cost and complexity of these delay lines, the contour enhancement signal is usually generated from the green channel only, but then inserted into the luminance (M) channel where it provides appropriate compensation for all three colors. In RCA cameras, processes known as coring and combing are utilized to improve the S/N ratio of the final pictures.

- **Color correction:** Some broadcast color cameras provide nonlinear cross-mixing circuits which permit operational adjustment of color fidelity. In the case of live cameras, these controls are used to achieve precision in matching multiple cameras or making minor compensations for lighting or pigment-color problems in the scene itself. In telecine cameras, color correction circuits are useful in compensating for "off color" conditions in photographic materials.

- **Signal encoding:** The processes of matrixing, bandshaping, two-phase modulation and frequency interlace are fully explained in the paper.

- **Scene contrast compression:** Some deluxe broadcast cameras provide a feature that enables an abnormally wide contrast range (such as that encountered in a sports stadium in the late afternoon when half of a playing field is in bright sunlight and the other half is in shadow) to be compressed for appropriate reproduction through the limited range of a television system. This process requires an elaborate circuit (typically involving at least four analog signal multipliers) to permit alteration of gray-scale values without affecting color rendition. □

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CV-20/20 and CA-20/20	10 x 10 20 x 10 10 x 20 20 x 20	3,350 4,450 5,250 7,450	3,050 3,950 4,650 6,450	6,100 7,900 9,300 12,900	6,400 8,400 9,900 13,900
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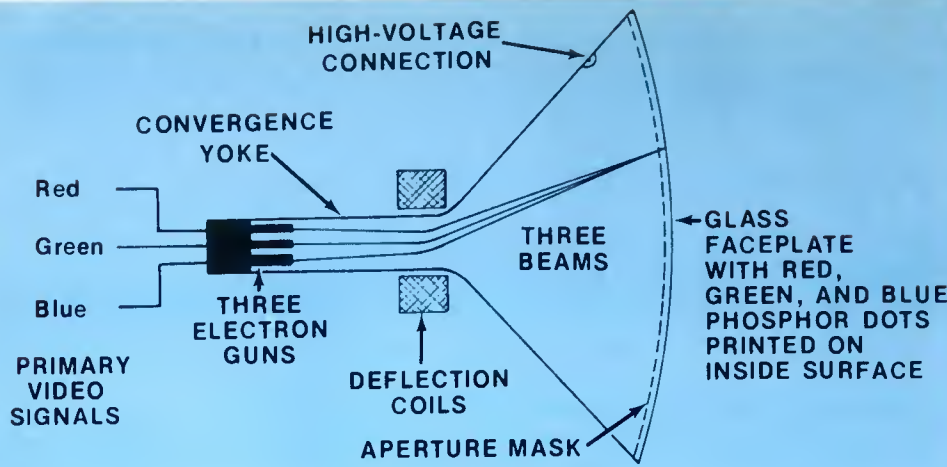


Figure 4. This schematic view shows the working elements of a three-gun color kinescope picture tube for color video.

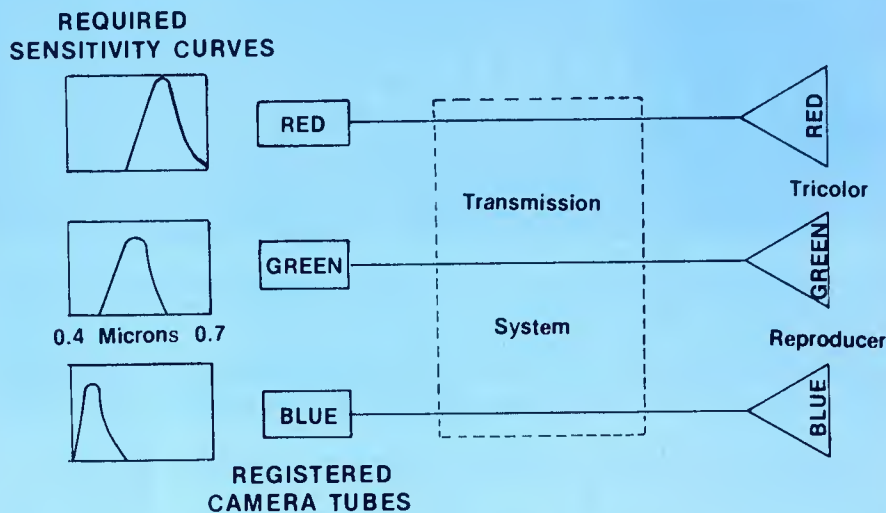


Figure 5. This block diagram shows how video signals for three color images are derived using three registered pickup tubes.

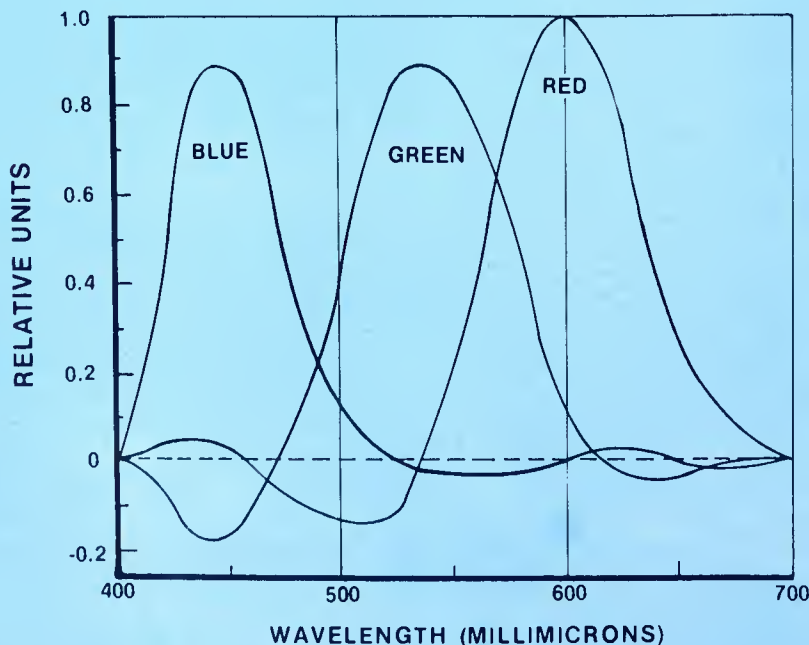


Figure 6. The 'ideal' color camera would require positive and negative sensitivity (output) curves to produce correct kinescope colors. In practice, cameras are designed with spectral sensitivity curves conforming to the positive lobes only.

fields which cause the three beams to converge at the screen, producing registered images.

The phosphor screen of the color kinescope consists of an array of very small primary color dots. Approximately one centimeter behind the phosphor screen is an aperture mask, which has one very small opening for each group of red, green and blue phosphor dots. Alignment of this aperture mask and screen is such that each beam is permitted to strike phosphor dots of only one color. For example, all the electrons emitted by the red gun must strike either red phosphor dots or the aperture mask—they cannot strike the green or blue dots because of the "shadow" effect of the mask. Likewise, the beams emanating from the other two guns strike only green or blue dots. In this way, three separate primary color images are produced on the screen of the tri-color tube. But, since these images are formed by closely intermingled dots too small to be resolved at the normal viewing distance, the observer sees a full color image of the scene being televised.

Video signals for control of the red, green and blue images may be derived from a color TV camera using three registered pickup tubes (or equivalent solid-state image sensors) (Figure 5). Registration usually is accomplished by passing the light from a single zoom lens through a special multiple-element prism to form three images identical in geometry but different in the spectral distribution of light energy. The required differences in spectral sensitivity are accomplished by dichroic surfaces within the prism—such surfaces use carefully-controlled layers of materials with different indices of refraction to cause reflected light waves to be reinforced in certain wavelength regions and canceled (through interference effects) at others.

Because dichroic surfaces rely on interference effects rather than absorption effects, a well-designed optical prism for a color television camera can be quite efficient, directing most of the red, green and blue portions of the total light energy to the appropriate images. (Most of the light that is not reflected from a given dichroic surface is transmitted through the surface, and can be used in a different image channel.) The scanning signals in deflection coils surrounding the three pickup tubes are all derived from common sources, and trim signals are supplied through registration controls to assure that the three images are scanned in precise synchronism.

Ideal sensitivity

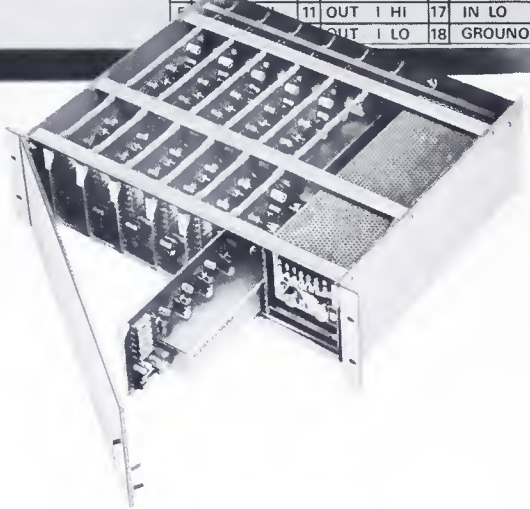
A specific set of red, green and blue primaries is identified in the FCC color television standards by means of chromaticity coordinates based on a former system of color specifications standardized by the International Commission of Illumination (known as the CIE, fo



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Commission Internationale d'Eclairage). By manipulation of a large body of CIE-standardized statistical data representing the average response characteristics of a large number of observers, it is possible to determine with considerable precision the optimum spectral sensitivity curves to be used in a camera to control any given set of primaries. Such curves for the FCC primaries are shown in Figure 6.

Note that the peaks of these ideal camera sensitivity curves occur in roughly the red, green and blue portions of the spectrum, but that they overlap appreciably. Note also that lobes of negative response are theoretically required in certain spectral regions. Although colorimetric techniques are available for achieving the effects of these negative lobes (through controlled cross-mixing of the red, green and blue signals), most practical cameras are designed with spectral sensitivity curves

that conform to the major positive response lobes only. The colorimetric errors resulting from failure to achieve the negative lobes are of little practical importance; colorimetry is a statistical rather than an exact science.

Developing RGB signals

The basic process of developing red, green and blue (RGB) signals in a color TV camera is illustrated by Figures 7 and 8. The optical system within the camera first separates the full-color image into red, green and blue components, as illustrated by Figure 7; these primary-color images are formed on the sensitive surfaces of three pickup tubes. The three images are then scanned in synchronism in the conventional manner.

A single scanning line through the typical color image at the point shown in Figure 8 produces three separate waveforms. (For simplicity, assume the use of

an image in which the colors consist of either pure primaries or equal-part mixtures of primaries.) Note the correlation between the waveforms in Figure 8 and the image at the top. The yellow shutters, for example, must be produced by a mixture of red and green; the blue signal is not required. At this interval in the scanning, the red and green signals are both at full value and the blue signal is at zero. The white door utilizes all three signal components. Similar correlations can be seen for other parts of the image along the designated scanning line.

Brightness and color adaptation effects

The psychological sensations of brightness, hue and saturation cannot be measured or expressed in absolute quantities, even though they are strongly correlated with psycho-physical characteristics (luminance, dominant wavelength and spectral purity) that can be precisely measured. The reason for the vagueness of the psychological sensations associated with color is that the human visual system has a remarkable ability to adapt itself to wide variations in the overall illumination conditions. A surface at some specific luminance value can appear very bright under some viewing conditions but may become psychologically equivalent to dark gray (or black) under other viewing conditions. Likewise, a surface that appears distinctly yellowish under certain conditions can appear distinctly bluish under other conditions, even though colorimetric measurements might show that the spectral distribution of light energy has not changed. Anyone concerned with the practical operation of a color TV system should be generally familiar with both brightness and color adaptation.

Brightness adaption

Thanks to brightness adaptation, familiar faces and objects look nearly the same whether viewed in bright outdoor settings or in subdued interior lighting. The highest-luminance object in one's field of vision (not counting light sources causing glare) tends to become the psychological point of reference (that is, it becomes bright), and the gray-scale value of everything else in the visual field is interpreted with respect to this temporary brightness standard.

There is a common misconception that this brightness adaptation effect is controlled by the size of the pupil in the eye since nearly everyone has observed that the pupil widens in dim light and becomes quite small in bright light. Actually, the optical speed of the eye system in the typical human eye can change from about $f/2.3$ to $f/10.4$, a range of only about 20 to 1, so the major part of the effect is better explained as an electro-chemical automatic gain control.

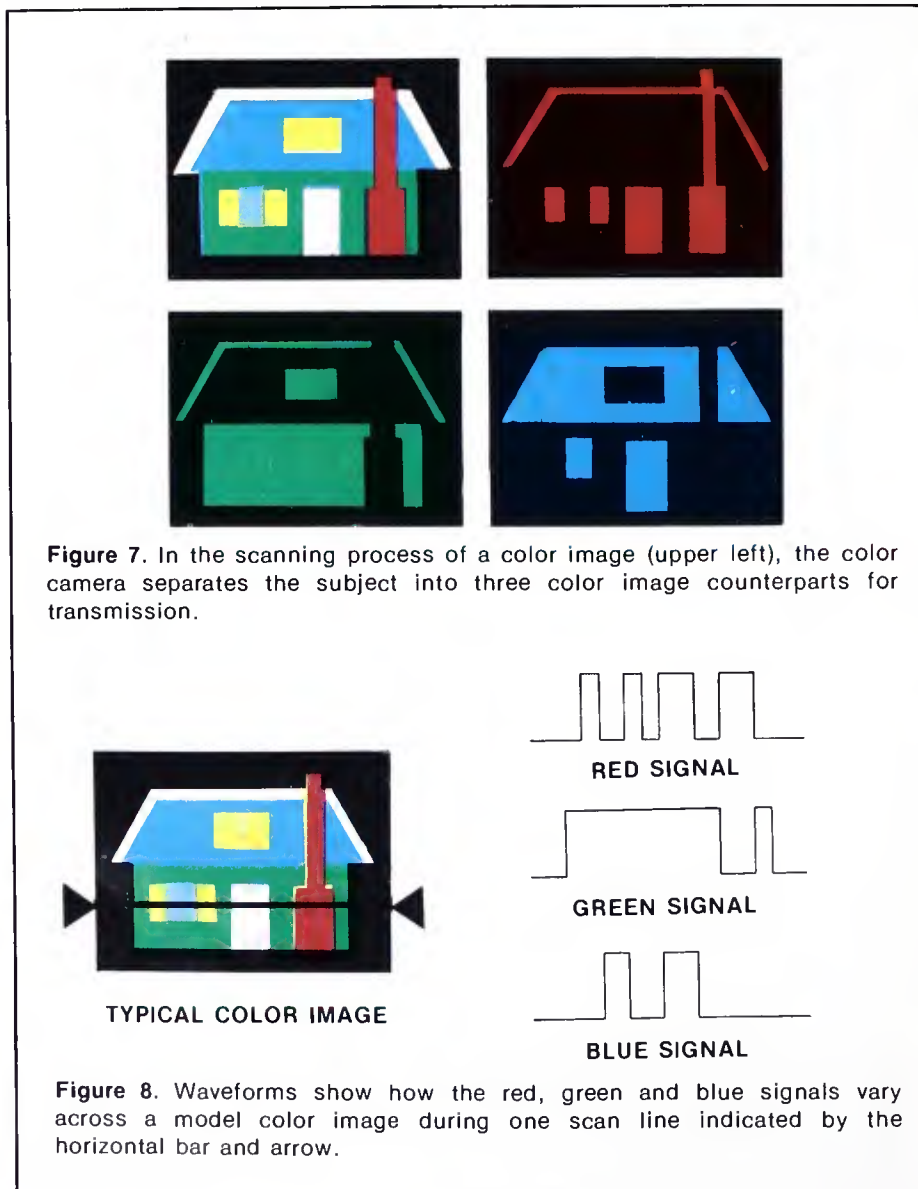


Figure 7. In the scanning process of a color image (upper left), the color camera separates the subject into three color image counterparts for transmission.

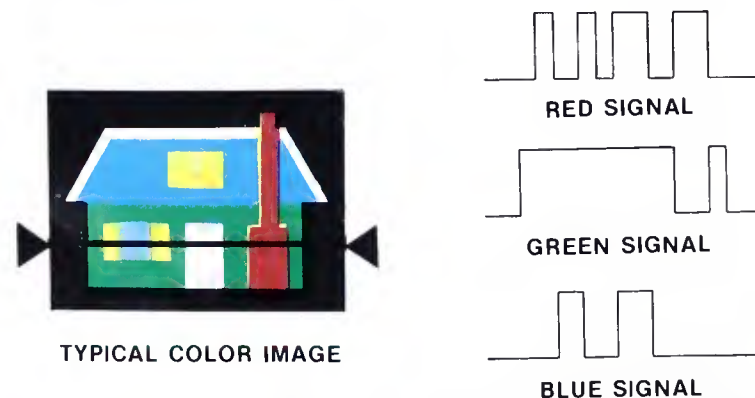


Figure 8. Waveforms show how the red, green and blue signals vary across a model color image during one scan line indicated by the horizontal bar and arrow.

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trol system within the retina and nervous system. (There is much experimental evidence, for example, that the "visual purple" substance in the cone cells which actually captures incoming photons to trigger the electrical firing of nerve cells becomes reversibly bleached upon exposure to bright light.)

Brightness adaptation has long been exploited in both motion pictures and television. One cannot hope to duplicate the absolute range of luminance values encountered by a TV or film camera,

but perfectly satisfactory images can be produced by accepting the brightest portion of a scene as a temporary 100% luminance standard and faithfully presenting the relative luminance values of other image areas over a practical range of typically 50 to 1.

Color adaptation

Of particular significance to the color TV specialist is the phenomenon of color adaptation, which enables the human

Variations in internal color transmission

The color TV system described in the accompanying article is commonly known as the NTSC system, named for the National Television Systems Committee which formulated the detailed signal specifications. Many of the principles originally developed for the NTSC system also are utilized in other world standards. The majority of countries throughout the world which have 50 Hz ac power sources (instead of the 60 Hz power prevalent in North America and Japan) employ an alternative scanning pattern based on 625 lines per frame and 25 frames per second for both monochrome and color broadcasting. The video bandwidth in most such countries is 5.5 MHz (although there are some variations from country to country). With the exception of France and the Soviet Union, most countries with 625-line standards use a minor variation of the NTSC system known as PAL for encoding compatible color signals.

The most distinctive characteristic of the PAL (Phase Alteration Line rate) system is a reversal of the phase sequence of a 2-phase modulated subcarrier signal after every line. At the transmitting end of the system, the alternation is accomplished by periodically reversing the phase of the subcarrier fed to one of the two modulators. At the receiving end of the system, the two quadrature vectors (which PAL proponents designate U and V instead of I and Q) are separated by means of a special circuit involving a 1H (ultrasonic) delay line. When the subcarrier signals from two successive lines are added, the +V vector transmitted during one line cancels the -V vector transmitted during the preceding line, leaving only the sum of two nominally-identical U vectors (which are in phase for all lines).

When the subcarrier signals from two successive lines are subtracted, the U vectors from the two lines will tend to cancel each other, but the V vectors will reinforce each other because the subtraction process cancels the effect of the phase alternation. It is still necessary, however, to periodically reverse the phase of the carrier fed to the synchronous demodulator used to recover the V signal in synchronism with the alternation at the transmitter.

This basic PAL technique reduces the vertical resolution for chrominance information by 50%, but this is justifiable because the human visual system cannot resolve this chrominance information anyway. The benefit derived from the PAL technique is relative immunity to differential phase errors (slight errors which might be introduced during any one line period are effectively canceled by the opposite phase errors which occur during the following line). The technique is not perfect. Serious differential phase errors are translated into differential gain errors, and the picture content of successive lines is seldom truly identical, but the tolerance limits on signal-handling equipment can be loosened somewhat.

Under the PAL standards, the bandwidth is the same for both chrominance signals (nominally 1.0 MHz). The matrix equations used for PAL yield a color-bar signal whose amplitudes (including subcarrier envelope amplitudes) are the same as for the NTSC signal. The U signal is 0.493 (B' -M), and the V signal is 0.877 (R' -M). The subcarrier frequency used in most PAL countries is 4.43361875 MHz. The burst waveform is similar to that of the NTSC system, but the nominal burst duration is 10 cycles and the phase of the burst is alternated plus and minus 45° relative to the equivalent NTSC burst phase position to enable receiver circuits to detect the proper phase alternation sequence.

Because there is an odd number of lines in every TV frame, it takes two frames (or four fields) before a given phase sequence is repeated on any one line in the picture. To identify this 4-field sequence, the PAL system utilizes a so-called meandering burst. Although the equalizing pulses and vertical sync pulses in a 625-line system occupy only a 7.5 H period, bursts are omitted for a 9 H period that meanders in a characteristic way with respect to any given reference in the vertical sync period. (The special gating waveform used to modify the burst flag signal is called "Bruch blanking" in honor of the developer of the PAL technique.) Because the phase alternation technique inhibits normal operation of the frequency interlace principle (as in the NTSC system), the

PAL subcarrier frequency is offset with respect to the scanning frequencies in such a way that successive color frames (four fields) will have out-of-phase subcarrier signals. The net result is that the PAL signal from a stationary image truly repeats itself only at a 6.25 Hz rate.

Another alternative approach to color encoding is the SECAM system used primarily in France and the Soviet Union. The term SECAM is derived from the French phrase meaning Sequential Color with Memory. Instead of using two-phase modulation to permit simultaneous transmission of two chrominance signals, the SECAM system uses a single frequency-modulated subcarrier to transmit two chrominance signals (R' -M and B' -M) in time sequence at a line rate. Simultaneous signals are restored at the receiving end of the system with the help of a 1H delay line. The delay line provides a stored signal for each of the two chrominance channels during the period when the real time transmission channel is occupied by the opposite type of signal. (As in the case of the PAL system, SECAM reduces vertical resolution for chrominance information by 50% relative to the NTSC approach.)

The chief advantage of the SECAM technique is almost total immunity from differential gain and phase effects. The frequency-modulated subcarrier can be passed through limiters prior to demodulation to remove unwanted incidental modulation. There are several significant disadvantages in the SECAM system, however, including the impossibility of passing encoded SECAM signals through a lap-dissolve amplifier (which can be done routinely with either NTSC or PAL signals). Another disadvantage is that the frequency interlace principle does not work for a frequency-modulated subcarrier, so the SECAM subcarrier signal must be transmitted at a rather low level to minimize degradation of monochrome pictures by the superimposition of the constant-amplitude subcarrier. This in turn leads to marginal S/N performance for the chrominance channels. The SECAM standards include some fairly complex pre-emphasis/de-emphasis techniques to minimize some of those problems. □

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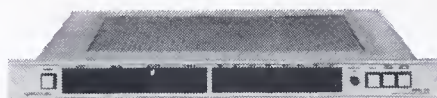
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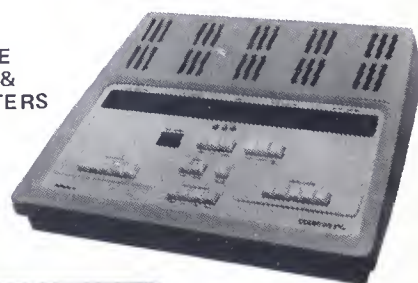


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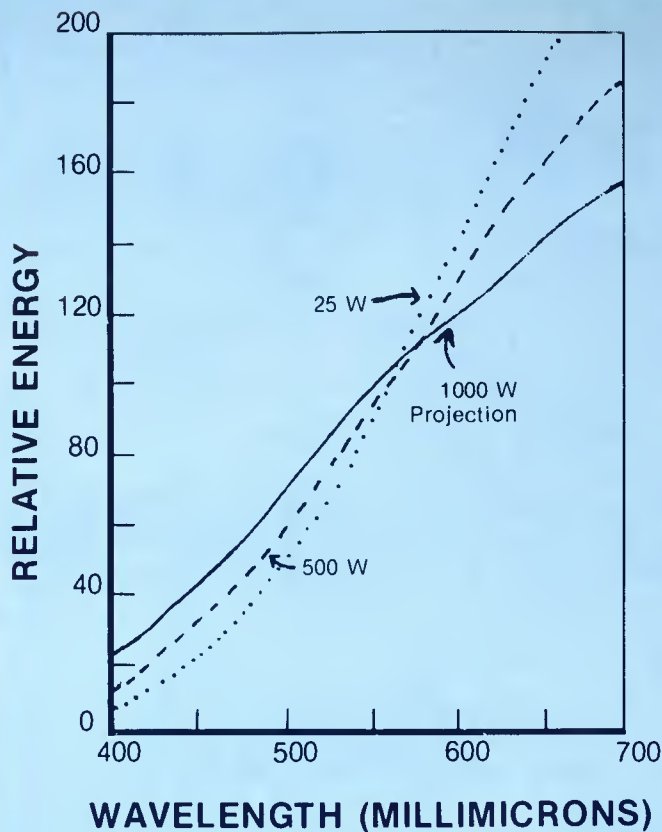


Figure 9. The spectral energy distribution for tungsten filaments varies with the lamp wattage.

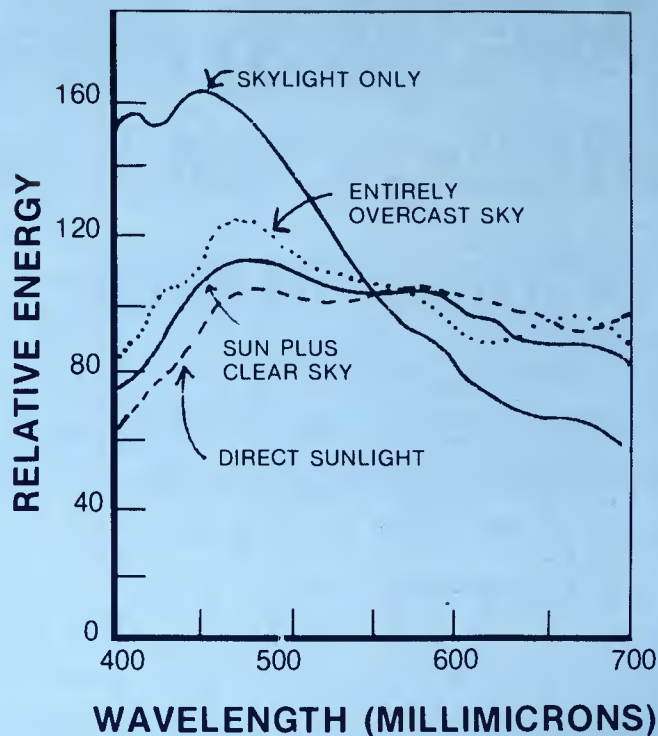


Figure 10. The solar spectral energy distribution in daylight varies with sky conditions.

Color television

visual system to interpret a non-selective reflecting surface as white even though the illumination falling on this surface varies widely in spectral distribution. Some of the commonly encountered variations in illumination quality are shown in Figures 9 and 10. Note that light from incandescent lamps is high in yellow and red energy, but quite deficient in blue. Daylight, on the other hand, tends to have strong blue light because the dome of the sky functions as a large-area source of bluish light. In spite of these wide variations in spectral distribution, a white card or white shirt tends to appear white whether seen under indoor or outdoor conditions, and all other colors (such as skin tones) are interpreted by the visual system on a relative, rather than an absolute basis.

Because of the color adaptation phenomenon, strict colorimetric fidelity is neither a practical nor an appropriate goal for a color TV system. The television screen typically occupies only a small fraction of the total visual field of a viewer, so his color adaptation is controlled primarily by factors external to the image. As a practical matter, the broadcaster is expected to adjust the color balance of each image in such a

way that the reproduction of a neutral reflecting surface has a consistent reproduction on the screen regardless of the spectral quality of the light illuminating the card. This adjustment usually is accomplished by setting the relative gains of the red, green and blue channels in the color camera in such a way that the signals are of equal amplitude when scanning the white surface within the scene to be televised.

As guidance for the broadcaster in evaluating the subjective aspects of color pictures, FCC standards indicate that the quality of white light intended to be reproduced at the receiver has the same colorimetric coordinates as CIE illuminant C (a standardized illuminant intended to be representative of typical daylight). In practice, there are wide variations in the actual quality of reference white at color receivers, but all other colors are displayed with reference to the selected white value. Since TV studios typically are illuminated by tungsten lamps (with color temperatures somewhere in the 3200 K range), the colorimetric coordinates of all reproduced colors are definitely altered between the lens of the camera and the final reproduced values. □

Editor's Note:

This lengthy article by Wentworth on the basics of color video will be continued in the March issue of **Broadcast Engineering**.

Because this article is devoted to basic technology, it is not keyed to any particular camera or system. However, RCA presented an in-depth technical article at the SMPTE meeting in New York on its new TK-47 fully automatic color TV camera which uses complex micro-processor circuits. This camera will be covered again at the NAB/Dallas Convention in a technical paper scheduled for Monday, March 26, at 4:30 PM.

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RENG: A view from K-101

By James Gabbert, president of K-101 and the NRBA

All-music stations don't have comprehensive news because the prevailing attitude by radio programmers in most instances seems to be pro-music and anti-news. Since programmers don't want to increase the amount of news, radio's task is to improve the quality of news to keep the listener up to date on whatever is happening that affects him.

Television news networks employ hordes of people and have millions of dollars worth of equipment to

perform this function. Obviously, since radio is primarily a music medium it isn't practical to compete with anyone who sells news for a living, but with the advent of ENG equipment in radio, we audiences can be provided with immediate news coverage.

Unlike television which did not use ENG until the Patty Hearst/SLA shootout in Los Angeles, radio has had ENG equipment since the 1920s. It was crude and very cumbersome then, requiring large batteries and

generators. Now, of course, with the use of repeaters, hand-held walkie-talkies are common.

Misused and abused

The live coverage of the Patty Hearst affair established television as a mobile electronic news medium, and the relative newness of this instant availability lends itself to a great deal of misuse. It is used many times without rhyme or reason just to remind viewers they have live facilities. If someone wins a

The K-101 access van with the aid of the two station wagons equipped with 2-way radios transport the newsteam to the scene of the news event so they can inform the public as quickly as possible.





The news department at K-101 prepare the news for broadcasting in the news preparation studio. From left to right are: Pat Palmer, news director; and Chuck Rubin and Jerry Bell, newsmen.



Pat Palmer, K-101 news director, is shown broadcasting from the K-101 studios.

RENG

ribbon in a cow contest at the fair, it is likely to be televised live; or a weather forecast is given from atop the Golden Gate Bridge.

Generally, when a radio station first gets its RENG equipment, the same thing happens. It is a new toy which has to be used frequently. Once it reaches maturity, it is used for what it was originally designed—electronic news gathering.

For instance, in San Francisco when Mayor George Moscone was shot, most of the reporters at City Hall were unable to obtain telephone lines, but the radio stations with RENG equipment were first with the story.

A lot of the use of these facilities depends on the market and the times. For example, during the 1960s when there were many college riots on the various San Francisco Bay Area university and college campuses (peace rallies and anti-Vietnam demonstrations and draft card burnings), the RENG facilities of all Bay Area radio stations were used extensively. Currently, however, the use varies according to demand. The one thing that wears thin with the listener is when it is used unnecessarily just because it is there.

Obtaining equipment

K-101 is a typical RENG installation. There are various ways that a system can be set up. One is to buy all new equipment from the various manufacturers supplying RENG gear. This can get to be quite expensive and depends, of course, on the budget of the station. Other options are to shop the used mobile equipment market and buy equipment that meets the FCC Type Acceptance requirements. Generally, this equipment can be found quite inexpensively. For instance, K-101 purchased a large quantity of KAAR Engineering mobile units which were new, but were designed for mobile telephone units. Apparently, the FCC had changed the mobile frequencies and these units were no longer of any value to the manufacturer.

So, with two station vehicles equipped with 2-way radios and the addition of the K-101 access van, K-101 can send field reporters out with confidence that they will have immediate access to the station, and therefore the audience. The van is a fairly sophisticated mobile recording and broadcast studio, complete with a mixing board with eight stereo inputs which can be used as an anchor station for extensive electronic remotes. Not a lot of equipment, but what a monumental task it performs!

Multiple uses

Once the appropriate equipment is acquired, don't be afraid to put it to use in other capacities which would justify any expenses incurred



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establishing a RENG system. K-101, Honolulu, will be using the unit more for parade broadcasts and live remotes from discos. Therefore, units with 15 kHz bandwidth capabilities have been selected. The unit also will double for news gathering and news stories.

Another use of remote pick-up facilities is for actual live broadcasts, as the FCC has allocated some 15 kHz channels. Good FM quality broadcasting can be done using the station's remote pick-up units, which is a rather tricky business since San Francisco's topography, with its rugged, hilly terrain precludes line of sight transmission. K-101, uses a repeater at the FM transmitter site. This repeater uses selected tone encoding to insure that only authorized transmissions are rebroadcast.

The van is also used as a free speech studio. K-101, as part of its public affairs programming, makes one-minute free speech messages available to anyone who wants to speak out on any issue that is of importance to the community. Listeners call the radio station and say they are upset because of and would like to record a free speech message.

The van is then dispatched to their home and the listener's free speech message is recorded. It can be either taped or transmitted back to the studio. This enhances the station's image by showing the community that the station is concerned about local affairs; the listener who voices the message tells his friends that they are going to be on radio, so the friends tune to the station to hear it; and all of the other people who hear the message feel as if they, too, can have access just as easily to that radio station.

With the basic equipment described here, the K-101 newsteam maintains a high level of visibility within the market while providing listeners with the same sense of "being there," as television's eye-witness news. Led by Pat Palmer, news director, the six-person crew (three fulltime and three parttime) can be found at virtually every news story of interest to the stations' listeners.

Future alerting system

With an eye on what to expect in the near future, California is establishing a system that will use one of the RPU 450 MHz channels as a

statewide alerting system, patterned after the Los Angeles Sigalert system. Statewide facilities are being set up which will link all broadcast facilities. Each radio station will have a receiver with an amber, green and red light alerting system. The red light will be used for a natural disaster or war, and require activation of the EBS system; the amber and green lights will be used

for bulletins, major traffic tie-ups and accidents, large fires, etc. For amber and green light alerts, a tone system will be encoded at the start of the transmission which will activate tape recorders at the broadcast facility. This system will be a major aid to K-101's commitment to getting the news quickly and accurately to its listeners through RENG. □

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SMPTE'S digital TV session drew excellent attendance at the New York Americana Hotel. Shown here (from left) are Merle Thomas, PBS; Frederick Remley, Jr., University of Michigan and session chairman; Charles Ginsberg, Ampex; Robert Hopkins, RCA; Al Goldberg, CBS Technology Center; Willard Bucklen, TRW; John Lowry, Digital Video Systems; and Yves Guinet, CCETT (TV & Telecommunications Research Center, Rennes, France).

Digital Impact at SMPTE and AES

By Bill Rhodes, editorial director

The back-to-back Society of Motion Picture and Television Engineers and Audio Engineering Society meetings in New York last October and November gave heavy emphasis to advances in digital TV and audio technologies. But that's just the beginning. The SMPTE's meeting in San Francisco on February 2-3 will be devoted extensively to several aspects of digital video recording, and AES's West Coast meeting in mid-May will continue movements began in New York last October-November on digital audio and digital standardization.

Attendance at both the fall SMPTE and AES meetings was excellent. At SMPTE, there were 211 booths covering all aspects of the TV and motion picture industries. There were more than 1600 paid attendees to the technical sessions and more than 72,000 non-paid in attendance at the exhibits. Attendance at the AES was less (some 7000), but the Waldorf-Astoria was packed with exhibit booths and buzzed with attendees gathering the latest technical data on audio advances.

Loud audio demonstrations at AES were confined to the 53 demo rooms

reserved on the 12th floor. This was an astute limitation on exhibitors by AES because it left the main floors acceptable for communications while audiophiles upstairs enjoyed demos at high audio levels.

Digital technology for TV at SMPTE was, in the main, confined to a closed session of the standards committee for TV video technology and to an open session of papers and panel discussion which ran over three hours. The accompanying photo shows the dais for this well-attended session.

The members of the digital standardization committee of the SMPTE discussed the status of their efforts in standardization for the industry at one meeting. During the hush that followed the round of member introductions, the press was advised by the committee chairman that nothing about the meeting could be published until reports or notices were issued by the SMPTE. Though this restriction effectively bound lips and typewriters, attendees were privileged to a dynamic phase of the industry not normally seen.

The first release from the SMPTE to come from this standards group accompanies this article. As can be seen, this release says very little about what's going on at the SMPTE in terms of standardizing digital. Moreover, it does not release the press from its promise to publish nothing on the standards committee's work.

However, a few words must be written in fairness to the industry, and in defense of the SMPTE effort.

- First, the limitation on the press at the SMPTE standardization committee meetings appears to be justified. As a result, the committee members are free to discuss all aspects of their works and thoughts without concern of being misquoted, or in being quoted at all on subjects

where they want their views confined to the committee rooms.

- Second, while the inertia behind committee work is traditionally sluggish, SMPTE appears to be making some progress in standardization of digital interfaces. After witnessing part of this struggle first hand those behind the scenes should be commended for their dedicated work.

- Third, the separation of the standards effort from the technical sessions allows the standardization effort to proceed at its relatively slow pace while firms discuss their technical advances independently.

Thus, while the technical content of the standards committee's work on digital technology cannot be reported, the dynamic quality of these efforts which significantly affect the industry can be related

Bilingual TV

A demonstration occurred during the standards committee meeting which can be reported because it was independently discussed at the technical session on digital TV. This demo involved a short videocassette program on bilingual stereo TV transmission in Japan. A stereo transmission of a concert in one portion of this tape included some of the most beautiful TV audio quality I have ever heard. While the bilingual possibilities of this innovation certainly is to be commended, the stereo possibilities of this system should have extensive consumer appeal.

Digital TV at SMPTE

The technical session on digital TV at SMPTE involved four papers plus a lengthy panel discussion on its near-term future by the paper authors, members of the SMPTE Study Group on Digital TV and members of the Working Group on

SMPTE working group prepares for initial field tests of digital interface hardware

The SMPTE Working Group for Standardization of Digital Control of Television Equipment has held several meetings, with good progress towards development of digital interface standards for television broadcast equipment.

Industry-wide participation in the initial field testing of manufacturers' hardware is planned for the summer of 1979.

Anyone interested in participating in this program may contact the working group chairman: Robert W. McAll, Vital Industries, 34 Autumn Lane, Hicksville, N.Y. 11808, 516/735-0055.



PCM-3200



DRX-1000



Sony's digital equipment: (clockwise from top left) the PCM-3200, the DRX-1000, the DAD-1X, and the DMX-800.

Digital Video. The papers included: The Antiope Broadcast Teletext System by Yves Guinet of CCETT (France); Optical TV Link Employing a Digitally Modulated Laser by A. A. Goldberg, S. Juchnowycz and J. Rossi of CBS Technology Center; A Monolithic Video A/D Converter by Willard Bucklen of TRW; and Digital Processing in the DPS-1 by John Lowry of Digital Video Systems.

Additionally, in the Canadian Embassy offices a few blocks away, Digital Video Systems ran full demo sessions on their DPS-1 system about which John Lowry gave his paper. Although separated from the main convention activities, this demonstration was well attended.

Digital at AES

The AES meetings and exhibits followed SMPTE and fairly hopped with digital—especially at the Sony and 3M hospitality suites. In the technical sessions, there were 14 papers on digital in audio plus a tutorial session devoted to the applications of digital technology to audio recording. In addition, the AES celebrated this session by devoting the October, 1978, issue of the *Journal of the Audio Engineering Society* to the digitization of audio. Reprints of the AES meeting papers and copies of the digital issue are available through the AES Headquarters, Dept. BE, 60 E. 42nd Street, New York, NY 10017.

Sony digital

Digital audio made a big splash at the Sony hospitality suite with a digital recording of the Cleveland Orchestra played back in near-

perfect reproduction (-90 db S/N) at a volume level high enough to approach pain.

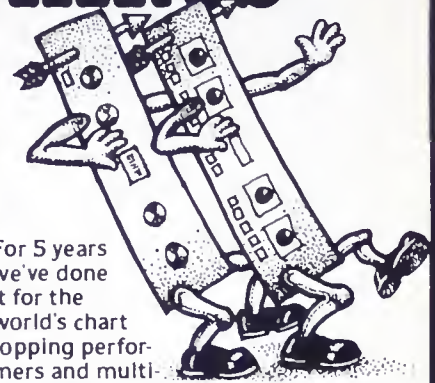
Roger Pryor, general manager of the newly formed Sony Digital Audio Products Division, demonstrated the Sony digital systems and discussed the bright future for digital audio techniques. His views are repeated in an article beginning on page 76 of this issue of **Broadcast Engineering**.

Sony went all out for this AES show, as they did for SMPTE. For the third straight year they demonstrated a new digital audiodisc, this time their DAD-1X which boasts the world's longest playing time—2½ hours, all on one side. In view of the disc's unprecedented playing length, the system also provides for a reference signal to be recorded between programs on the disc for automatic location of each program's beginning. Discs for the system are cut by a laser beam, coated with a reflective material, and reproduced by the scan of a low-power, He-Ne laser which makes no contact with the disc surface.

Long playing time has not been achieved at the sacrifice of signal quality. The 16-bit linear encoded PCM recording and playback system used allows 95 dB dynamic range, less than 0.03% distortion and undetectable wow and flutter. Drop-outs and other errors are corrected automatically or compensated for using a new, highly-efficient error correcting code.

While the Sony digital audiodisc was exciting, it was the PCM-1600 that rocked the building. This is a 16-bit, 2-channel PCM processor

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WILD IDEAS THAT WORK

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Digital

used with Sony's broadcast model 3/4-inch videocassette recorders and editing equipment. This system is reported to be "affordable and available," and now in production for professional studio use.



3M digital mastering system



3M digital editing system

Sound 80, a Minneapolis recording firm, released two albums in December, 1978, recorded on 3M's new digital mastering system. Tom Jung, Sound 80's chief engineer, is shown working with the system.



With the PCM-1600, Sony claims that a studio can record a stereo master or submaster with better than 90 dB dynamic range, and distortion less than 0.05% over the entire audio spectrum at all levels up to the system's wide dynamic range. Wow and flutter are immeasurable, being functions not of the mechanics of the tape transport but controlled by the precision of a quartz sampling-rate clock. And, there's also absolutely no hint of type hiss or print-through.

In addition, Sony unveiled four prototypes of 16-bit digital studio equipment: the DMX-800 all-digital mixer, the DRX-1000 digital reverb-eration unit, the PCM-3200 multi-channel recorder, and the ADA-1600 two channel, A-D/D-A converter. These were shown to elicit comments from potential professional users for features and specs required in the final production models.

As **BE** goes to press, Sony reports the first sale of the PCM-1600 digital audio processor to a recording company. According to Pryor, the staff of Polygram Records saw the Sony system demonstrated at the AES and decided to acquire it. Polygram is using the system to record the Los Angeles Philharmonic Orchestra in concert at the Music Center in L.A. but will take the system back to Germany when their project is completed.

3M strong at AES

Meanwhile, just down the hall, 3M was in the process of strengthening its own position in the professional digital audio field. Ful-

filling its announcements at the previous AES meeting, 3M unveiled an electronic digital editing system and disc lathe preview equipment for its digital mastering system and disclosed that it had begun preliminary work on a studio console.

The new digital equipment developments and the announcement of imminent deliveries of the first 32-channel, 2-unit mastering systems were verification of 3M's total commitment to the goal of making the superior quality of digital sound ultimately extend from microphone to speaker, according to Dr. Marshall Hatfield, vice president of 3M's Mincom division.

Bob Brown, marketing manager for the 3M equipment division acknowledges there is still industry discussion on standardization. "However," he said, "3M feels it must proceed into the market in behalf of the studios and technology. In all probability, it will be the day-to-day successful use of system that will determine what standard studios will accept, rather than an arbitrary decision at this point. 3M in working up its system's parameters with additional expertise from BBC, feels it has a strong leadership position in entering the market with digital equipment."

Regarding 3M's mastering system, small changes have been made in the data and parity deployment of signals on tape to improve "punch in" and editing capabilities. Beginning in mid-1979, the system also will incorporate a new styling.

The disc lathe preview unit, to be available as mastering systems are installed, is an accessory that delays a set of digital signals from the master recorder while analog signals proceed to a conventional lathe controller that optimizes the spacing between disc grooves.

The most significant announcement by 3M at AES was of a programmable electronic digital editing system for use with the multi-channel digital mastering system. This latest development was engineered jointly with Inter-technology Exchange (ITX), Ltd., of Hollywood, a research and manufacturing firm with expertise in studio design. The programmable digital editing system is expected to be available in late 1979.

According to Bob Youngquist, research manager for Mincom, and Don Davis, ITX manager of digital systems development, the new system offers major improvements over conventional editing comparable to the improvements which digital recording has exhibited over analog recording.

Field strength measurements: The microprocessor approach

By Serge Bergen, consulting engineer, Fairfax, VA

Around 1948 the transistor was invented and gradually became the broadcaster's best friend. A few years ago the microprocessor, containing thousands of transistors on a chip no larger than a chewing gum pack, arrived on the scene promising to make life easier by providing capabilities heretofore considered impossible.

The microprocessor possesses several virtues: it can make logical decisions, it can count, it can respond to input and modify it, it can control output, and it can perform many other processes at high speed and with unsurpassed reliability.

It was then natural to consider harnessing its capabilities for a fast analysis of measured data, to provide a printed output and display the results on an oscilloscope for an immediate visual assessment.

Measured fields in the broadcast bands are seldom steady. While in AM, a strong signal may be steady in time, it can still show location variability. When it becomes necessary to measure a low level interfering contour, time and terrain variations are quite pronounced, the former due to the presence of one or more co-channel beats and scatter components. The correct result is derived by determining the median value—visually a difficult task due to the rapidly pulsating instrument needle.

In FM and TV, the signal varies even more and its median value has to be determined in accordance with FCC rules.

The component aggregate used to achieve the desired purpose is shown in Figure 1. It was used (without the oscilloscope option) in June, 1977, near Galion, OH, to establish the values of an AM interfering contour, with mobile runs over a distance of about 200 feet.

After approximately 200 data points were acquired, they were immediately statistically processed,

and the results printed. Figure 2 shows the tabulation of the analyzed decile values and the median value along with other collateral information.

Statistical distribution

Once a set of data is acquired, it is frozen in time and can be stored, transmitted, analyzed and displayed, immediately or in the future. With a

subsequent inclusion of an oscilloscope facility, we are now able, in addition to the printed analysis, to observe the ensuing statistical distribution of the measured data within seconds after acquisition.

Of major interest are these distributions: sinusoidal, normal (or log-normal), and Rayleigh.

A sinusoidal distribution is the result of a beat between the

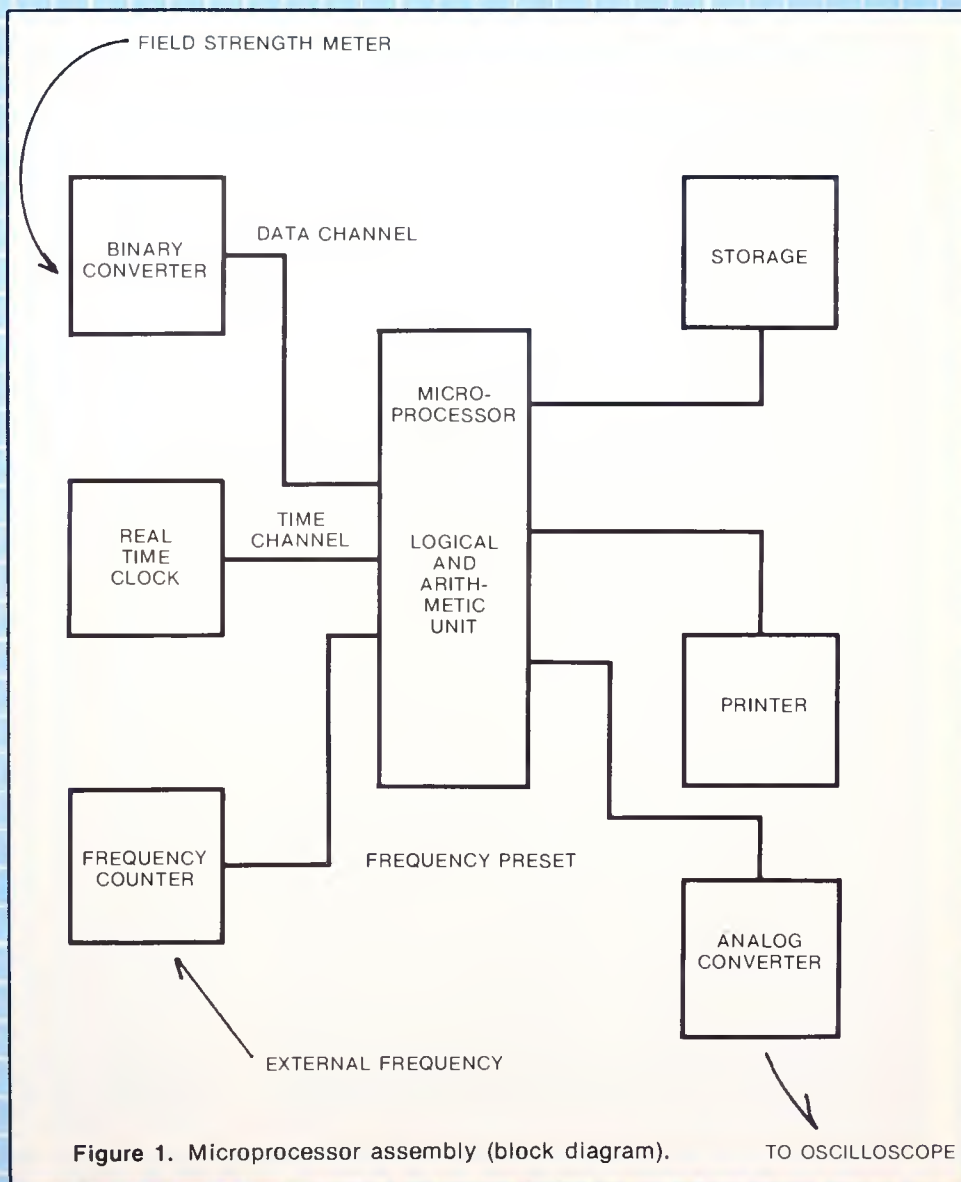


Figure 1. Microprocessor assembly (block diagram).

TO OSCILLOSCOPE

Microprocessor

JUNE 18, 1977	
POINT NO. 37	
DATA START	13 : 36 : 58
DATA STOP	13 : 37 : 34
x	=OR>
90	7 UV/M
80	8 UV/M
70	10 UV/M
60	12 UV/M
50	13 UV/M
40	13 UV/M
30	15 UV/M
20	17 UV/M
10	19 UV/M
LOWEST	4
HIGHEST	25
MEDIAN VALUE= 13	
TIME OUT: 13 : 39 : 5	

Figure 2. Microprocessor analysis of mobile run. Decile printout indicates time and location variations.

measured station and another co-channel station.

A normal distribution becomes log-normal when the signal is measured in the log or dBu mode, and is the most widely applicable.

A Rayleigh distribution results from the superposition of numerous co-channel fields of arbitrary phase.

These distributions are calculated in advance and stored. Their oscilloscope displays are shown in pairs, for easier comparison, as figures 3 and 4. Figure 3 shows the sinusoidal and the normal distribution (cumulative). The normal distribution is more S-shaped. In each case, the percentage axis is horizontal, the magnitude is vertical. The upper

right corner is the maximum for both.

Assessing data

Figure 4 shows, superimposed, the S-shaped normal distribution and the asymmetrical Rayleigh distribution (cumulative); on the left side it is below the normal curve. The serrations result from the digital nature of the output. These three stored distributions can now be cyclically invoked and act as stencils against which the measured distribution, appearing on the second oscilloscope channel, is matched for best fit.

Figure 5 shows the result of a daytime co-channel beat and very

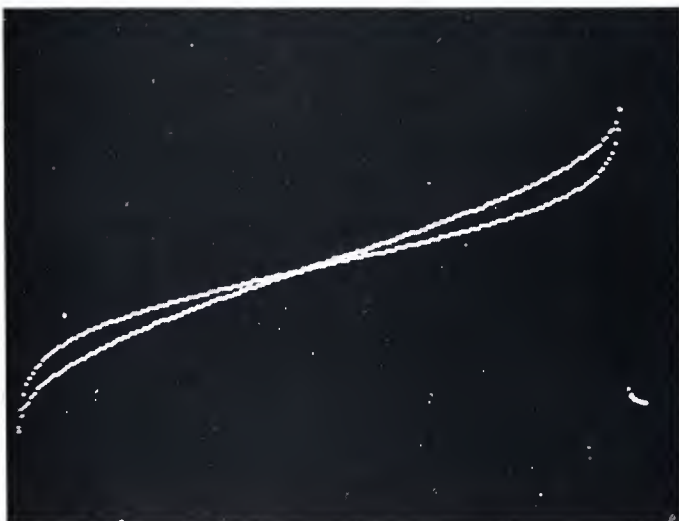


Figure 3. Sinusoidal and normal cumulative distribution superimposed.

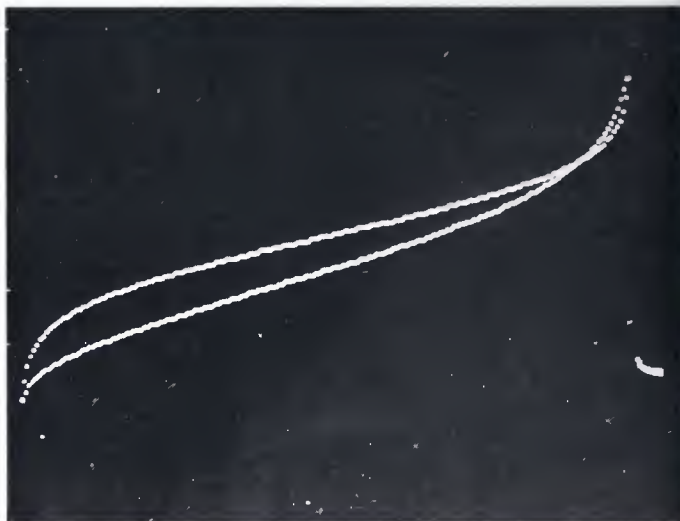


Figure 4. Normal cumulative and Rayleigh cumulative superimposed.



Figure 5. Co-channel beat daytime, sinusoidal distribution.



Figure 6. Co-channel beat with noise component (note noise bubble on left).



Figure 7. Co-channel beat with skywave setting in (note rag on left).

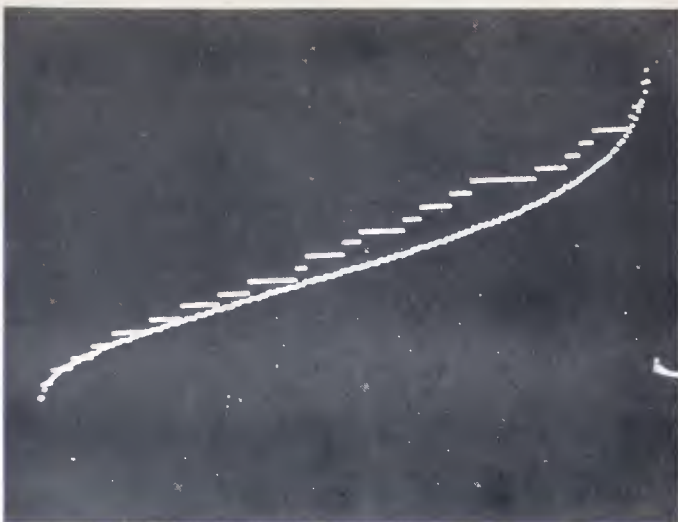


Figure 8. Co-channel beat with skywave setting in, compared to Rayleigh (note left portion).

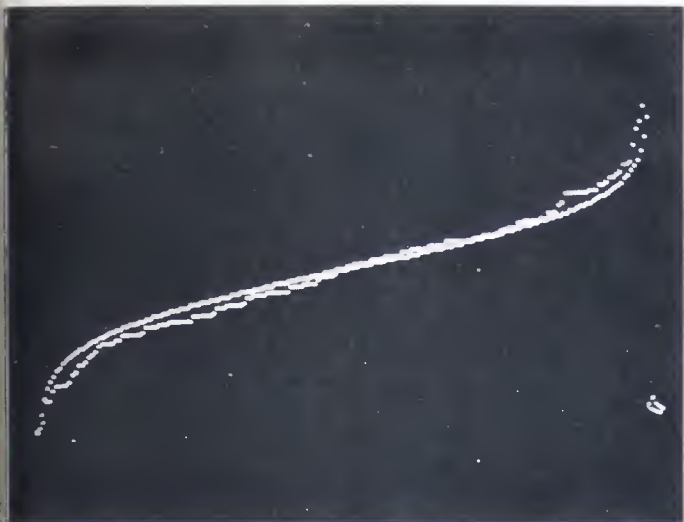


Figure 9. WRVA nighttime skywave, log-normal, 1140 kHz clear.

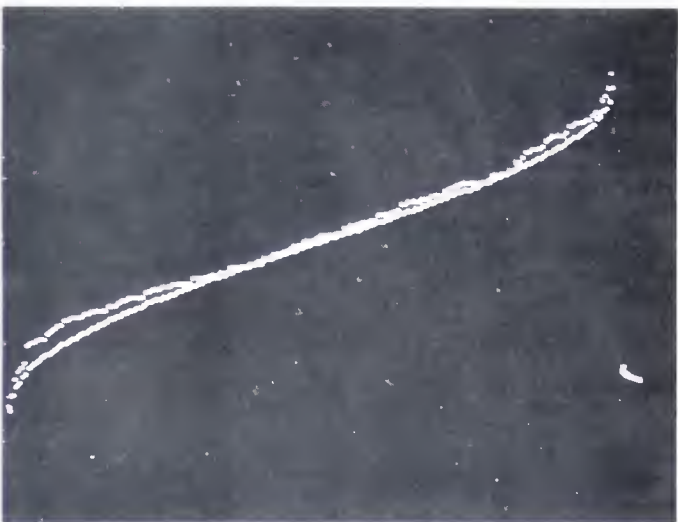


Figure 10. WRVA nighttime skywave, log-sinusoidal, 1140 kHz clear.

good match with the sinusoidal distribution. This display (as well as subsequent displays) is sensitive to the presence of electrical noise. The ambient noise is manifested by a bubble on the left which distends the curve upwards and moves to the right with increasing intensity (Figure 6). The left tail of the curve shows a steep fall-off of a normal curve, consistent with the Gaussian noise distribution. A hidden noise component can thus be discovered even when masked by a strong signal.

When the left flank of the curve rags as in Figure 7, it is an indication of the onset of a daytime skywave and the presence of scatter fields. Weaker than the two

dominant heterodyning ground-waves, they are confined to the left portion of the display where they exhibit a Rayleigh distribution. This is confirmed by superimposing the Rayleigh stencil with the same measured curve (Figure 8).

If you are measuring, the message is clear: Stop! Your values will be higher than normal and your conclusions erroneous.

The displayed data thus creates its own signature which after a modicum of practice becomes increasingly legible.

Nighttime skywave recordings of clear channels show occasional log-normal distribution (Figure 9); more frequently the signal was log-sinusoidal (Figure 10). Therefore, the

reason and the consequences are not immediately assessable.

On regional channels, due to multiple signals, the nighttime skywave agrees with the Rayleigh type (Figure 11). On local channels, because of the greater number of signals, the faithful compliance with the Rayleigh distribution is truly impressive (Figure 12). Thus, from the realm of wildly dancing vectors bordering on pandemonium, there emerges an orderly and consistently predictable distribution of the resulting field, in accord with theory.

It is now a simple matter to predict the service area of a proposed or contemplated nighttime station for the applicant's benefit. The above methods yield the actual

Microprocessor

value of the 10% interfering field, from which the service area can be readily determined. Preliminary measurements indicate lower interfering fields than those determined using methods contained in the FCC rules.

The distant daytime groundwave signal of a clear channel station shows fluctuations due to added scatter components. While these are Rayleigh distributed, superimposition on the much larger groundwave vector would cause the same to undergo normal deviations. This was confirmed by the distribution of the measured signal from station WOR, New York, in the Washington, DC area (Figure 13). The signal was measured with a linear setting.

Immediate results

The described method is ideally suited for making mobile measurements in FM and television. The measured field can still be recorded on paper tape as a permanent visual record. Unlike the old method of analyzing tapes upon return (slowly and laboriously) the microprocessor, using the same method as described, yields immediate results with the same printout as in Figure 2, using either uV/m or dBu units.

The terrain is an important factor in influencing propagation in the VHF and UHF bands. We can store the terrain profile data and display these on the oscilloscope during the course of measurements to indicate line-of-sight conditions and follow the progress (Figure 14).

Since the data are already pro-

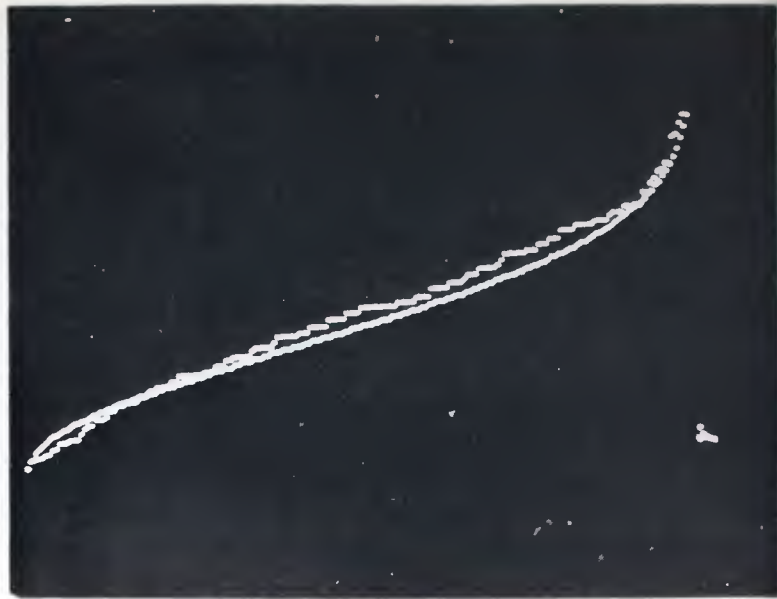


Figure 11. Regional channel night Rayleigh distribution.

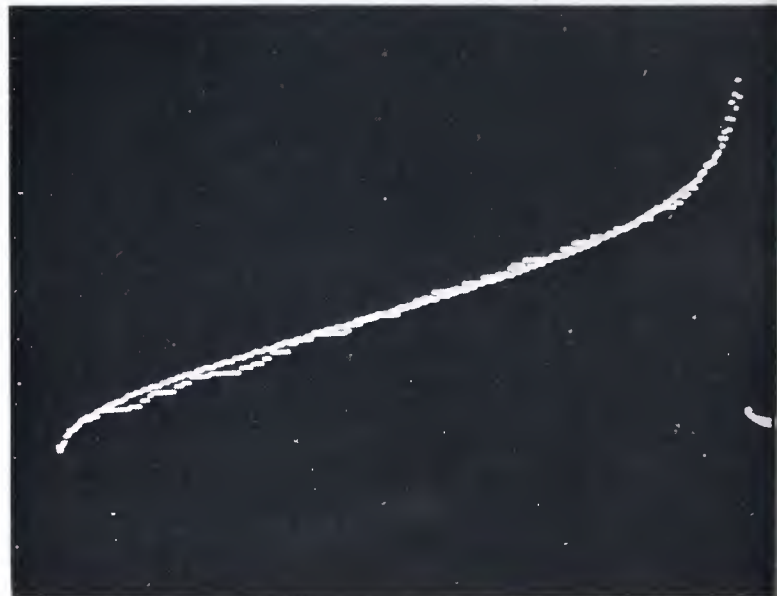


Figure 12. Local channel 1230 kHz night, Rayleigh distribution.

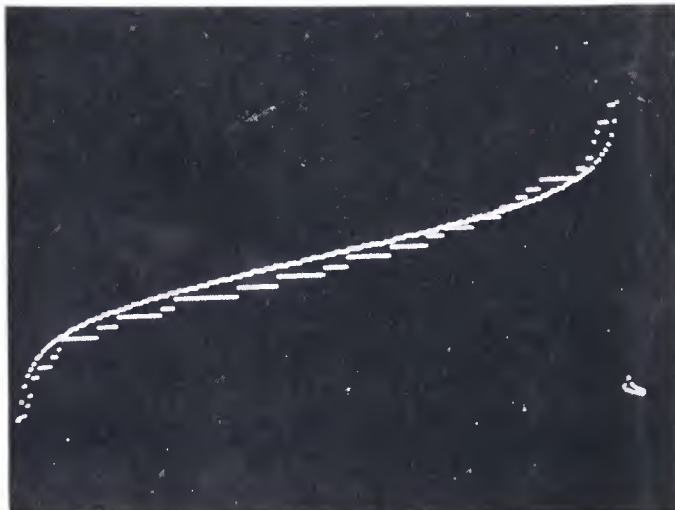


Figure 13. WOR 710 kHz NY, clear daytime groundwave at 220 miles.

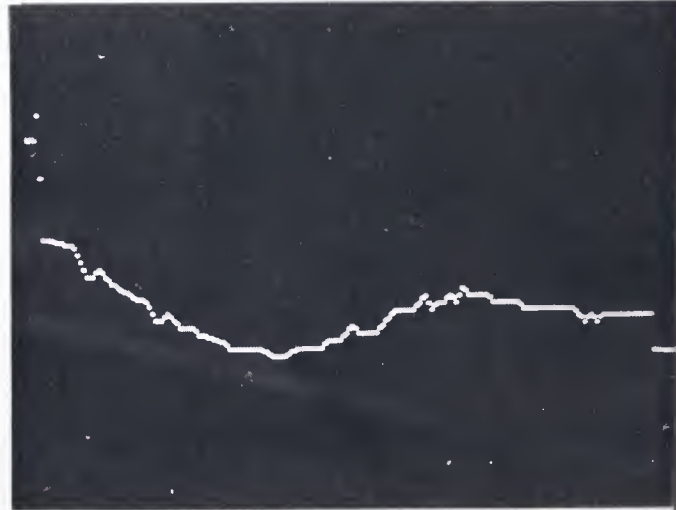


Figure 14. Terrain profile antenna center, bar upper left.

cessed, it becomes an easy matter to feed the information to a plotter for a graphic record of the mobile run with a best-fit line, indicating ideal log-normal distribution (Figure 15).

The method used can be applied to any variable measurements: correlation between horizontal and vertical fields of an FM station, loudness of program material, or on a much slower scale, parameter variations of a directional system with the possibility of ferreting out any functional and causal relations. The list goes on.

In these procedures an INTEL type 8080 microprocessor was used, but a comparable type would perform equally well. Proper coding is of paramount importance. It is a harsh and unforgiving activity: one wrong entry usually sends the process into a tailspin without recovery. When everything is cleared up, however, things move quickly.

While today's interesting discoveries become tomorrow's standard operating procedures, there are still many uses of the microprocessor to be discovered and implemented in the broadcast field. □

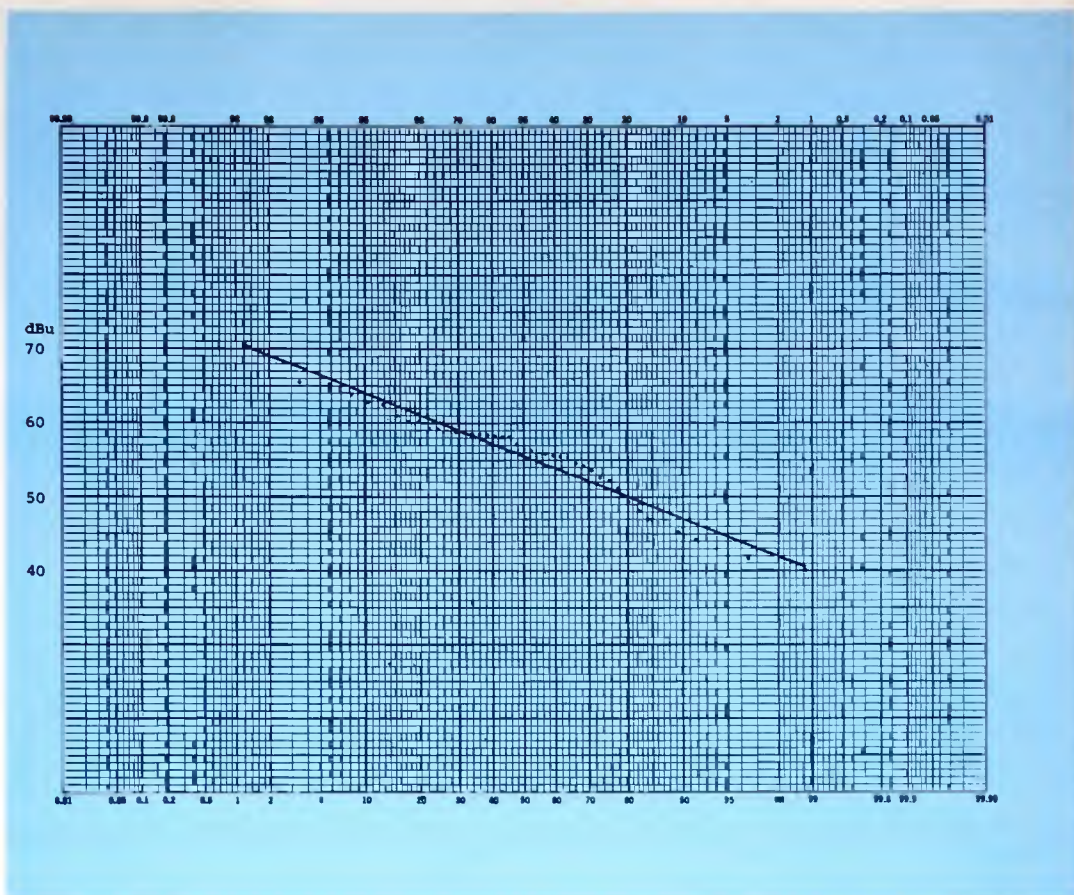


Figure 15. Graphic record of mobile run indicating ideal log-normal distribution.

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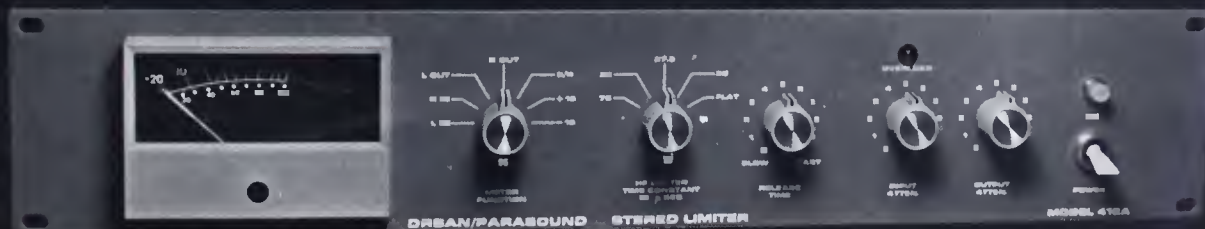
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FM antenna and line measurements

By Donald L. Markley, facilities editor and consulting engineer

When most television stations install a new antenna or transmission line system, great care is taken to check both the antenna and line after installation. The antenna is usually completely assembled on the ground at the site and measured by several methods to check for proper impedance match and bandwidth. In some cases, the transmission line is tested and match-marked at the factory for optimum performance. Once the system is all in place, a whole series of exotic tests may be performed, including introducing small irregularities into the line to optimize the load seen by the transmitter.

On the other hand, when the antenna and line for most FM stations arrives at the site, the chief engineer or manager usually will apply strict QC (in this case meaning Quantity Control) while checking for obvious forklift damage. If the system passes these rigorous tests, a further test may be applied in which the line is checked to see if it still has pressure. If so, everyone assumes that it will fully meet the factory specifications. If not, a little worry strikes all involved (usually dispelled by some unknowledgeable bystander who states that the factory probably forgot this time).

The system is then installed and the line attached to the transmitter. By this time, the manager probably

wants to be on the air immediately and this desire is accompanied by a rush to the cars to see "how the signal sounds in X-ville." Next the chief engineer usually will run a quick check on the voltage standing wave ratio (VSWR) as indicated on the meter built into the system. If this indication is within reason (interpreted to mean something below 1.5:1 to 2.0:1) the system is declared to be operating properly and removed from consideration when attempting to determine the cause for any further problem.

Good, but not good enough

In the simplest of terms, that isn't enough. The FM antenna itself can be compared to the AM directional array configuration which the reader may find to be more familiar. The antenna system consists of the actual radiating elements, antenna tuning units, transmission lines, power dividing and phasing circuitry and an input impedance matching network. This differs from the AM array primarily by the size of the components due to the frequency involved and because most of those networks are composed of transmission line sections which have been carefully modified rather than the familiar big box full of capacitors and inductors. This antenna system is tuned to cause it

to be directional in the vertical plane (sometimes the horizontal plane too) while maintaining good bandwidth.

By proper adjustment of all of the above components, it is possible to achieve such esoteric parameters as beam tilt and null fill. Again, all of this needs to be done while maintaining a bandwidth capable of permitting the transmitter to operate over the entire channel width. The sidebands which will occupy the distant edges of the channel will provide the signal necessary for stereo and SCA.

The transmission line itself need only to be essentially flat over the channel, not have large impedance discontinuities, and be capable of handling the transmitter power output with a reasonable safety margin. In some cases, the line will handle far more than the planned power; a larger line may be selected primarily to reduce the total line losses rather than for a higher power rating.

Measuring attenuation

The first and simplest of the measurements to be performed is the transmission line attenuation at the frequency of the station. To accomplish this, it is highly desirable that the coaxial cable be shipped so that both ends are

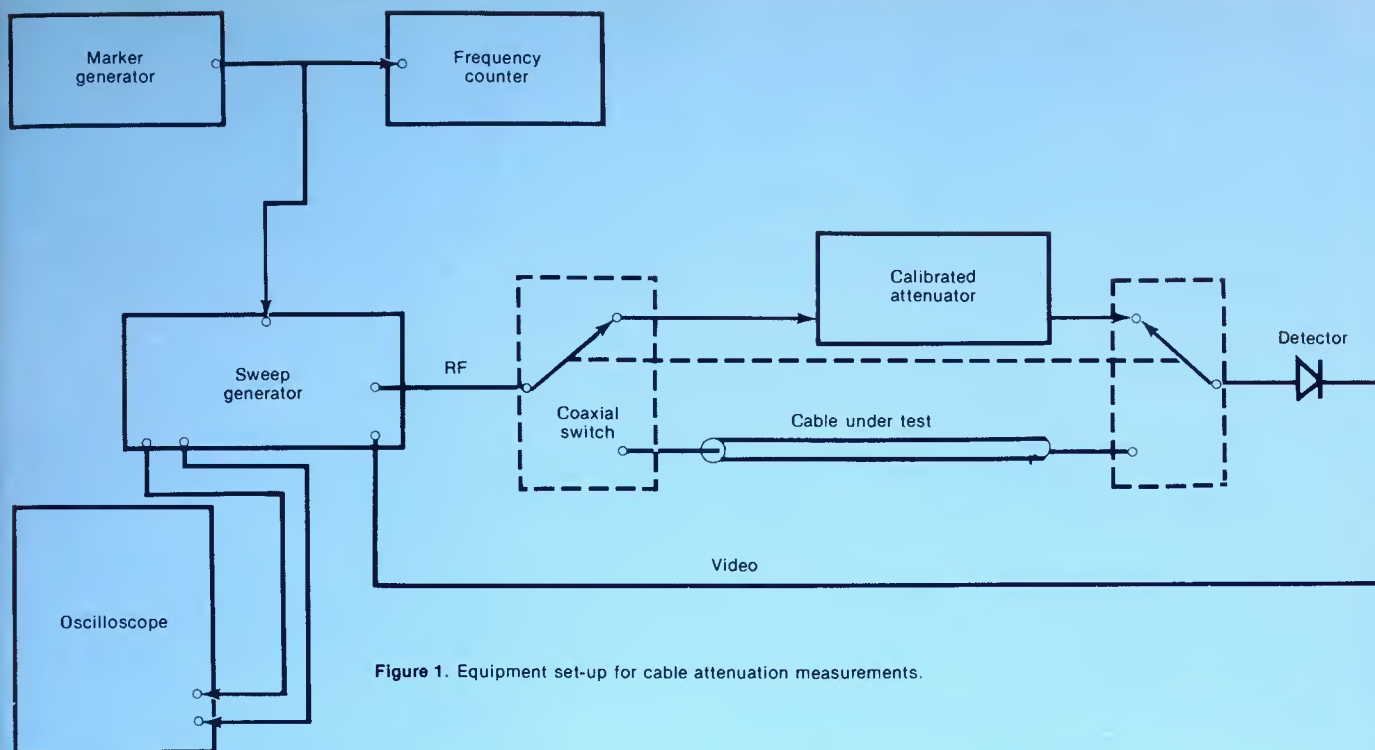


Figure 1. Equipment set-up for cable attenuation measurements.

accessible. The line then can be checked on the reel to determine if any shipping damage has occurred. The attenuation can be measured by use of an equipment configuration such as that shown in Figure 1. The system is adjusted to display the channel in use with a reasonable margin above and below that frequency.

The signal level at the far end of the cable then is compared on a direct basis to the signal passing through the calibrated attenuator, and the attenuator is adjusted so that the losses are equal. The amount of attenuation shown on the attenuator then equals the cable attenuation at that frequency.

It is advisable to look at the cable over all frequencies available on the sweep generator to avoid any possible unpleasant surprises caused by a periodic fault in the cable. Such faults can cause the cable to be extremely frequency sensitive regarding attenuation. This attenuation also can be measured using a stable frequency generator and a field strength meter. When performing this measurement, it is imperative that the proper impedance matching be performed throughout. The generator and cable must be terminated properly at all times or the test results are meaningless.

An additional test which might be performed at this time would be to

terminate the line in a short and feed the line with a time domain reflectometer (TDR). The TDR simply feeds either a step or a pulse into the line and watches for any reflections of that step or pulse. These reflections are displayed on an oscilloscope as vertical deflection versus time. By use of a calibrated control on the TDR it is possible to determine the distance down the line to the discontinuity.

To understand better what is happening with this measurement, a review of basic transmission line theory is helpful. The characteristic impedance of coaxial cable is given by:

$$Z_0 = (138/K) \log (b/a),$$

where K is the dielectric constant of the interconductor material (air = 1); b is the inner diameter of the outer conductor; and a is the outer diameter of the inner conductor.

Any discontinuity in the cable will cause an impedance at that point in the cable which would not be equal to Z_0 . For example, a dent would cause an apparent decrease in the diameter b. This would cause an apparent impedance to be placed across the conductor which could be calculated if one knew the exact dimensions and shape of the dent.

In any case, a signal traveling down the cable would see such a discontinuity as an improper impedance match and some of the signal would be reflected. The amount to be reflected would be determined by the magnitude and type of the mismatch. This is usually described by the reflection coefficient Γ where:

$$\Gamma = (Z_L - Z_0)/(Z_L + Z_0).$$

Note that if $Z_L = Z_0$, then $\Gamma = 0$ and the reflected signal will be zero as

$$V_{\text{ref}} = V_{\text{forward}} \times \Gamma$$

By applying a step or pulse of known value to the line and measuring the magnitude of the reflected signal, the TDR can indicate the magnitude (if not the exact value) of the reflection coefficient. If the attenuation of the line is known, it is possible to calculate accurately the magnitude of the discontinuity. However, usually it is sufficient to know simply that the problem exists and where its location might be in the cable. This permits the necessary repairs to be made if the problem is significant.

After installation

The next measure is to look into

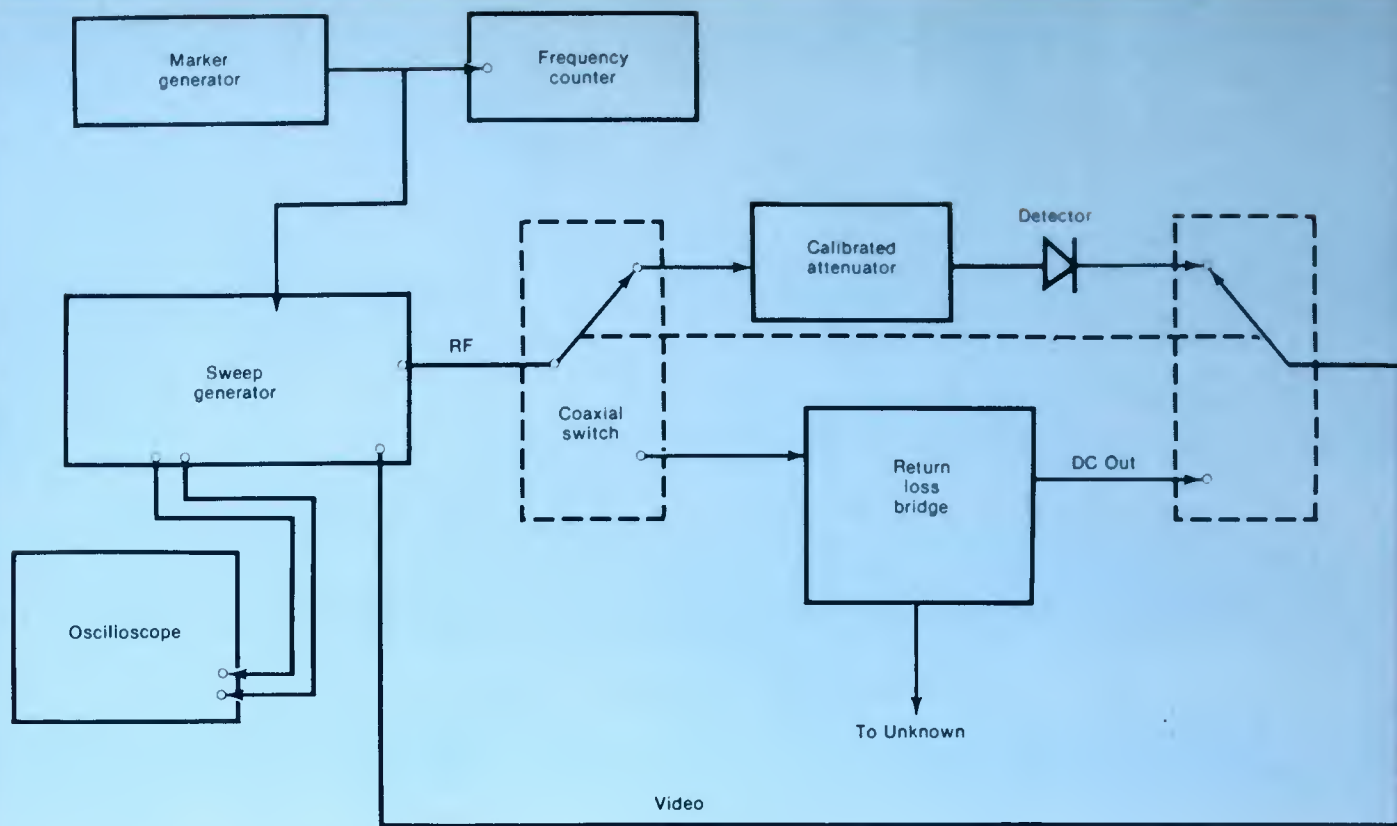


Figure 2. Equipment set-up for measurement of return loss / VSWR.

Measurements

the line and antenna after installation with a return loss bridge, slotted line or other device of this type. These devices are common in that they all look at the returned signal for a reference input to the system. The method of display may be quite different, but basically the same information can be obtained: the VSWR or impedance of the system as a function of frequency.

With sweep type instruments, such as the return loss bridge or Smith Chart plotter, the VSWR is plotted on the oscilloscope versus frequency. With a marker generator and frequency counter, it is possible to determine exactly what the response of the antenna and line might be with a very informative display of the system bandwidth. If necessary, the antenna can be tuned while observing the response in this fashion to optimize the impedance match over the desired band. Due primarily to the high quality of the FM antennas available in the US, this tuning is usually not necessary. This system type is shown in Figure 2.

It is not sufficient to observe this on the transmitter VSWR meter. For one thing, that meter is not designed to provide the degree of accuracy of a complete test set up. In addition,

without knowledge of the line attenuation, the interpretation of the meter indication becomes difficult.

As a first example, assume that 500 feet of 1-5/8 inch coaxial cable is being used to feed an antenna with a VSWR of 1.5:1. It can be shown that the VSWR at the input of the cable is

$$\text{VSWR} = \frac{1 + \Gamma_L [\log^{-1}(A/10)]^2}{1 - \Gamma_L [\log^{-1}(A/10)]^2}$$

where Γ_L is the reflection coefficient at the load, and A is the attenuation of the cable in dB. This would result in a VSWR indication at the transmitter of 1.28:1. That wouldn't usually be considered to be too bad.

For a second example, assume a load VSWR of 2.0:1 with 500 feet of 7/8-inch foam-filled coaxial cable. (There are still quite a few stations out there with that type of line.) This would result in a VSWR at the transmitter of 1.15:1. Everyone would feel great about this system based on that reading. Yet the transmitter would tune "funny" (obviously inferior equipment), the stereo would not sound right and the SCA cross-talk into the studio

lights would be a problem.

In summary, when a new transmission line arrives at the site it should be checked for attenuation and discontinuities. This should be done to check for shipping damage as well as for flaws in manufacture. When the system is in place, it should be pulsed and checked with VSWR measurement type devices of one of the types described earlier. This data should be fully recorded and filed with the permanent station records. If a fault should occur or be suspected at a later time comparison with these initial measurements can be extremely valuable. Only through the performance of a careful analysis of the antenna and transmission line as installed can a station be sure that they are receiving the performance intended by the equipment manufacturers.

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1978 Editorial Index

The following index references subjects covered in most of the articles and departments contained in **Broadcast Engineering** in 1978. Regular articles are represented, as well as Industry News, Business News, FCC Update (Direct Current from D.C.), Station-to-Station, News Features and Radio Workshop. There also are

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Microprocessors: Impact on broadcast instrumentation

By Bill Rhodes, editorial director

At the NAB convention in Dallas in March there will be a lot of new instrumentation that has been made possible because of the microprocessor. Exhibitors at NRBA, SMPTE and AES displayed such models in all areas of audio and video and the trend will continue at NAB as new features and flexibility are made possible with powerful microprocessors.

Exactly how much the new equipment at NAB will feel the impact of this new technology is not known at this time. However, the June issue will be a Post-NAB replay, and it will review the effect of microprocessors on new developments. For openers, look for the equipment to be there that was recently covered

in articles in **BE**: October 1978, pages 48-54; November 1978, pages 40-56; December 1978, pages 62-65; and January 1979, page 67. This last article covers the Zilog Z80 microprocessor and its usage in the Cetec System 7000 automation system.

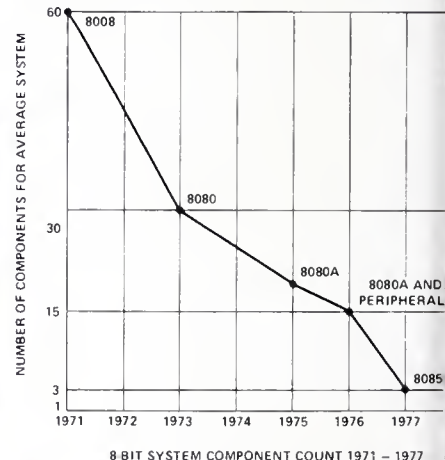
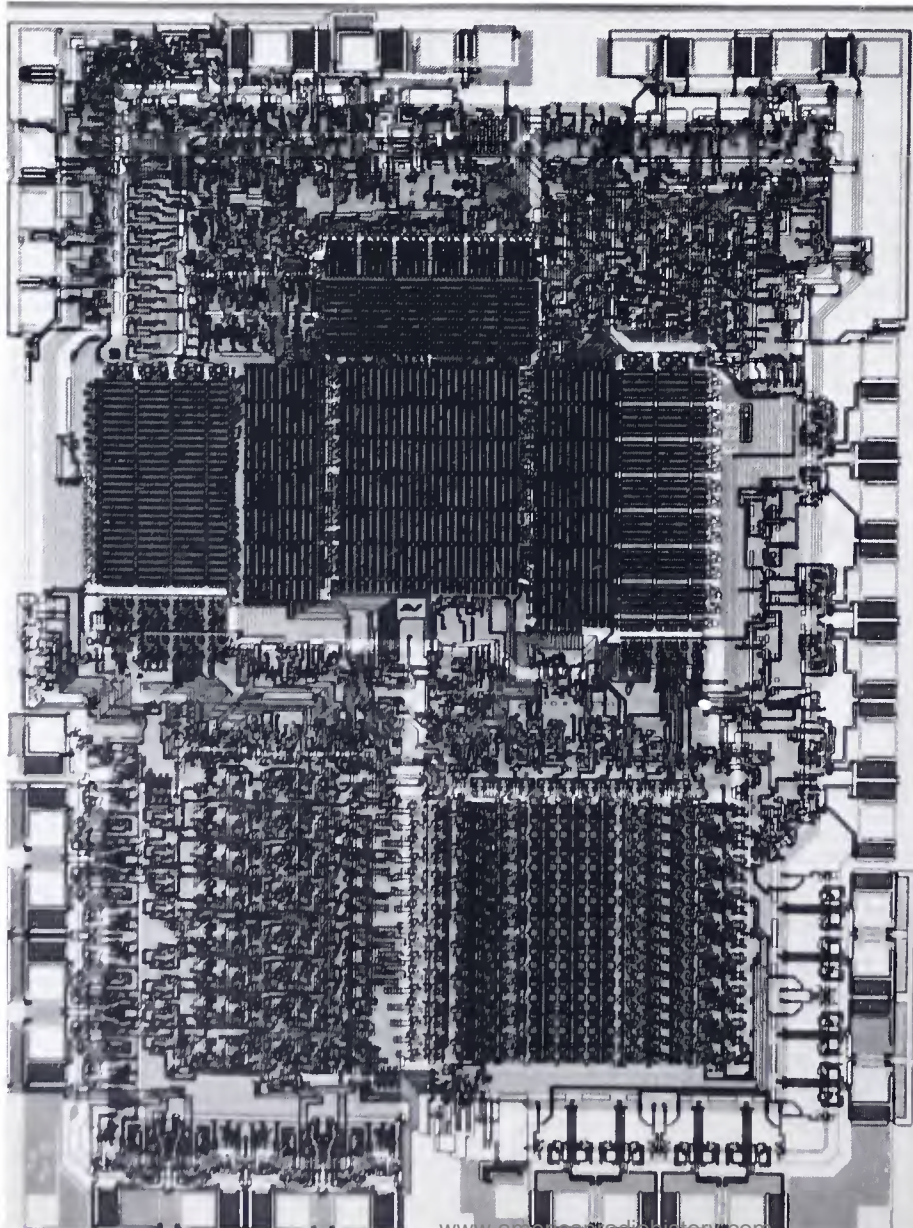
The utilization of the Intel microprocessors in the Harris broadcast system will be covered in this issue, but note that the Intel 8085 microprocessor (see photograph) also was reported in the December article already referred to.

The 8080/8085

The historical development of the powerful Intel 8080/8085 microprocessors (CPUs) begins in December, 1971. Intel then introduced the

forerunner of this family, the 8008. It was the first general purpose 8-bit microprocessor, and it was implemented in P-channel MOS technology and packaged in a single 18-pin Dual In-line Package (DIP). It used standard semiconductor ROM and RAM and, for the most part TTL components for I/O and general interface. Recognizing that software was equally as important as hardware, Intel also developed the software tools needed by engineers to make the transition from prototype to production simple and fast. With both hardware and software available, and a 20 μ s instruction execution, the 8008 found ready applications in terminals and computer peripherals.

The Intel 8080/8085 microprocessor family is being used in complex systems for broadcasters. Both are used by Harris in systems to be at NAB/Dallas.

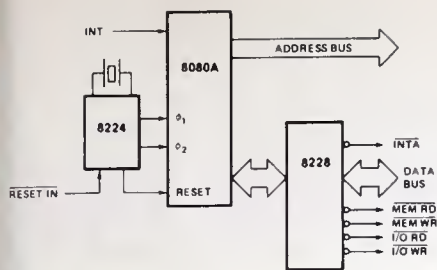


8 BIT SYSTEM COMPONENT COUNT 1971 - 1977
Component count has shrunk markedly with advanced microprocessor design.

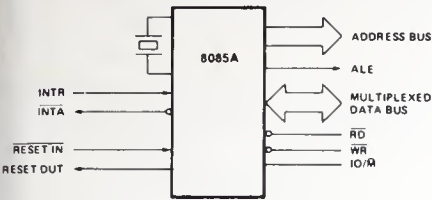
In 1973, Intel introduced the 8080A CPU using high-production N-channel RAM memories and 40 pin DIP packaging. While compatible with the 8008 CPU software, the 8080 provided a 2 μ s instruction execution and dramatically reduced the number of components required to implement a system. Large system features (such as DMA, 16-bit addressing and external stack memory) were included on the chip to increase its spectrum of applications. Since its introduction in December, 1973, the 8080 has served as a primary building block for microprocessor-based applications and the benchmark by which other CPUs were developed.

Further advances led to the introduction of the 8085 microprocessor.

Editor's note: Graphics and product descriptions are courtesy of Intel and Harris and are used with permission.



MCS-80™ CPU GROUP (BASIC FUNCTIONS)



MCS-85™ CPU/8085A (BASIC FUNCTIONS)

Left: Continued advances in CPU fabrication put more functions into the new CPUs.



Right: The Harris System 9000 uses the 8080 CPU, computer-type keyboard, and CRT display. Significant display lines can be brightened for ease in editing.

cessor in 1977, the Intel MCS-85 microcomputer system. The basic philosophy behind its development is one of a logical, evolutionary advance in technology while preserving investments in software. Thus, the MCS-85 provides an increase in performance; a decrease in component count; a single 5 V operation; add-on features to optimize a systems development; and 100% compatibility with software developed for the 8080. This final factor may well be one of the strongest points for the Intel line because an abundance of software for it is available from the industry.

The MCS-85 integrates many of the functions which are auxiliary to the 8080A system: clock generation, system control and interrupt prioritization. However, the 8085A, as the central element of the MCS-85 family, is designed to be the controlling of a unique, multiplexed bus system.

CPUs at Harris'

Harris will exhibit at NAB at least two systems using Intel microprocessors: the System 9000 Program Control, with its special broadcast-oriented keyboard, and the TEC-70 CRT display as shown here and their new 9100 Facilities Control which will be featured next month in an Automatic Transmitter System update article. The 9000 Program Control uses the 8080 CPU while the 9100 Facilities Control uses the 8085—and behind the selection of CPU and equipment development lies an intriguing story of trade-offs in technology, hardware, software, costs, marketing and product acceptance in the marketplace.

The development of the 9000 System was discussed in detail with Mark Hutchins, product marketing supervision, control systems, and David Grimes, automation product specialist, both of the Harris Broadcast Equipment Division. The System 9000, introduced for the first time at NRBA last September in San Francisco, represents several advances over its system SC-90 predecessor introduced in 1975.

"The most significant advances," noted Hutchins, "are the full computer-type keyboard with alphanumeric and broadcast-function keys and the CRT display. Internally, the CPUs have let us shrink the boards and add multi-language capabilities to the system. We now have English and Spanish versions and see no reason why virtually any major modern language can't be done if the customer wants it."

Every manufacturer using CPUs has major design decisions and compromises to make in developing a turn-key system. "At Harris," said Grimes, "we faced these same circumstances and we're pleased with the results. Maybe we were

lucky, but I think its a combination of in-depth knowledge of what microprocessors are capable of doing and how to use them, a careful selection of peripheral and of program development, plus an exceptional rapport with the broadcast industry in developing exactly the tools it needs for business."

Harris selected the 8080 CPU for many reasons, but chief among these was the quality of the product and the available software. "It just happens that our single-CPU approach offers us several advantages over other systems," continued Grimes. "We have the full speed capabilities of the 8080 and we've avoided the interacting problems possible when coupling CPUs into a system. Plus, we have plenty of memory, not only to handle the system functions as envisioned now but to expand as the industry may demand. Also, the 9000 is compatible with the SC-90 so that users can readily be updated if they so wish."

The Harris system currently uses the TEC-70 terminal and the TI or Extel RO-CH printers, but Harris has the capability of changing these to fit broadcaster's needs. □

The Harris 9000 Program Control provides multi-lingual printouts and terminal display by change of a single PC board. The first few minutes of the Events from memory are shown here in English and Spanish as typical languages.

2000	PLAY 07-01	2000	TOCA 07-01
2001	TIMER 00:31	2001	RELDJ 00:31
2002	PLAY 06-04	2002	TOCA 06-04
2003	TIMER 00:29	2003	RELDJ 00:29
2004	PLAY 07-04	2004	TOCA 07-04
2005	TIMER 00:59	2005	RELDJ 00:59
2006	PLAY 33	2006	TOCA 33
2007	RETURN	2007	REGRESA

What's ahead: The all-digital studio is on the way

By Roger Pryor, Sony Digital Audio Division general manager

Editor's Note: The December issue featured a look at the future of broadcast technology in a number of subject areas. One of the topics we wanted to cover was digital, but we were unable to find anyone with the courage to attack the subject in print. We had lengthy discussions on the future of digital with Roger Pryor and the Sony staff at the AES in New York. Since then, Roger has consented to cover this topic for us, at least from his viewpoint and from Sony's dedication to the field. This article is the result of his efforts to look at the future of digital in broadcasting.

Undoubtedly, the first law of broadcasting is that signals deteriorate. What the camera records in the studio is never quite the same as the signal that is picked up from a cable, relay or a transmitter 16 states distant. That law, at least so far as signals still under the broadcaster's control go, is about to be repealed.

The secret of perfect message transmission and recording is, as you may know, digital encoding. While digital recording and transmission requires a great deal of bandwidth, it also permits the exact reproduction at any stage in the transmission chain of the signal that

first entered the chain. The difference is like that between sketching something from memory and re-creating it by following a highly detailed follow-the-dots diagram. Errors recorded during the drawing from memory process become part of future generations of the image. Numbers, on the other hand, can be checked very easily for accuracy and can be corrected easily when found to have gone astray.

Digital encoding also allows broadcasters to correct for virtually any kind of error, including noise, distortion, print-through and all but the grossest dropouts. And because digital signals are under quartz-

crystal clock control, there's no wow and flutter to worry about.

The effect of digital

This oversimplified explanation of digital encoding is the basis of the digital revolution which is now looming on the horizon of both the audio and video industries. But beyond the fantastic promises of improved recording and recovery of signals, how will the digital revolution affect you and your broadcast operation? And, what hardware requirements will it impose on the whole broadcast chain, from program origination to the viewer at home?

First of all, forget your fear that entire broadcast facilities will become obsolete overnight. That's not very likely. Instead, one can expect that video, audio and relay systems gradually will be replaced by digital equivalents. For a few years, as the revolution gains momentum, the most important digital device in the studio will be the analog-to-digital/digital-to-analog converter, or A/D/D/A for short. This device will allow you to interface existing equipment with new digital gear.

Up until the last AES convention the only digital equipment you would have to interface would be digital relay transmission systems. But at the 61st AES convention last November, Sony showed the nucleus of the digital studio of the future including a digital mixer, digital reverberation unit, a multi-channel (up to 48) digital mastering recorder, an A/D-D/A adaptor unit, and a PCM processor that can record two channels of sound digitally with 90 dB+ S/N, on any video recorder, from a 3/4-inch on up.

Stereo television

The PCM processor, Sony's PCM 1600, is now in production and is already in use by NHK in regular commercial broadcast work. As you're undoubtedly aware, in Japan stereo television broadcasts are already a reality. There, engineers designed the Japanese TV system



Michael Schulhof, president of Sony Industries, listens to the PCM-1600 digital audio processor, plus a 3/4-inch recorder (left).

with stereo in mind, allowing them to convert to stereo soundtracks with little difficulty. Tuners and receivers with TV-band reception are available in Japan so users can hear top quality TV sound through their stereo systems. And because the Japanese broadcast hundreds of hours of musical presentations, the need for premium sound reproduction was always felt. All this points to the need for broadcast stations here to transmit first-rate sound, and in stereo.

Sony's PCM-1600 can record audio better than any existing analog recorder, but it does so on a video recorder. The sampling rates necessary to accurately encode digital signals uses up the entire videotape bandwidth, necessitating the addition of a second video recorder for the video portion of the program. While this might appear to be an inconvenience, in-studio syncing of two VTRs solves this problem handily. In this manner, whatever sound is recorded by the mics goes out faithfully to the listener.

However, especially in television production, one generally doesn't want to send out just what the mics pick up. Studios designed for television use (or, as often is the case, adapted to TV use) don't necessarily make the best possible sound studios. Broadcasters try to get around these problems by mixing as dry as they can and then sweetening the sound with a touch of reverberation, which causes its own problems. Delay systems have their own built-in twangs and rings and these tend to color the signal, too. And because reverberation units are expensive to construct, eat up valuable studio space, and add coloration, they are not the perfect solution to the problem either.

Digital delay units

Sony expects to introduce digital delay units within a year. They will be much smaller than current delay equipment and (as is typical of digital equipment) will cause no coloration of the original sounds. Engineers will simply set it to add in the initial delay (which produces the illusion of various size rooms) and decay time (which stimulates hard or soft room acoustics) and out comes the desired sound.

This may appear to many to be visionary thinking, especially in light of what little attention has been paid to the audio portion of video broadcasts to date. But better quality sound is becoming attainable and more important to broadcasters and consumers alike. The telephone company already has 15 kHz land

lines in place, and satellite relays provide better sound transmission than previously possible. Stereo broadcasting in Japan has been readily accepted and is quickly winning converts here. Add to that the talk of AM stereo broadcasts and the last remaining bastion of monophonic sound may very well be television.

With the home market for video recordings expanding at a rapid clip, the demand for better sound reproduction cannot be far behind. Better video-linked home sound systems and tomorrow's stereo, or stereo adapted TVs, will play stereo off the air as well as from pre-recorded software. Television had better be ready for stereo.

Networks first

The television networks will be the first to switch to stereo and digital encoding as the obvious choice for accurate audio reproduction and transmission. They have the money to make the initial investment in digital technology and they produce and broadcast the lavish musical extravaganzas that demand superior sound quality. As digital studio equipment such as the Sony PCM-3200 multi-track recorder and the digital mixing console become available, one can expect the networks to adopt them as solutions to the audio problem and to allow them to produce soundtrack recordings of superior quality quickly and easily for sale and promotional applications.

In the long run, I envision studios converting to digital right after the microphone, and maintaining the digital mode through transmission. Mixing, reverb and even the link to the transmitter will be handled digitally to provide the cleanest possible sound.

In the home, I see television as the first digital component of future home entertainment centers. The first breakthrough obviously will be stereophonic sound. Second, as the cost of A/D-D/A converters comes down to the point where they can be incorporated into TV and FM receivers, true digital broadcasts will begin. We may have to await the opening of a new band so that current equipment will not become totally obsolete. But when the digital era in home TV begins, home reception will be a faithful reproduction of the master tape from which the broadcast emanates. Admittedly, that's quite a dream, and its realization is far off. But in the studio, as demonstrated by the PCM-1600, digital sound is already a reality. □



Sony's prototype 32-track digital audio mastering tape recorder was shown at the AES show.



Michael Schulhof (right) checks the mic in front of the PCM-1600 processor as Roger Pryor looks on.

Sony's nucleus of the digital studio of the future (from left): the 3/4-inch recorder, the PCM-1600 audio processor, the DRX-1000 reverberation unit, and the DMX-800 prototype digital audio mixer.



Microphones: What's the difference?

By Don Gayle, Shure Brothers

Most microphones are designed to do one job well. But a reasonable knowledge of microphone principles and operation leads to the observation that many microphones can have multiple uses. Since few stations have unlimited budgets, it stands to reason that maximum equipment utility and versatility are best obtained when the user knows something about the equipment.

Operation

The primary function of any micro-

phone is the detection and conversion of sound waves into corresponding electrical signals. Sound waves consist of alternating high- and low-pressure pulses that act on a vibrating membrane called a diaphragm. The diaphragm in turn affects the transducer element, which generates tiny electrical pulses that may then be amplified through mixers and/or amplifiers, and recorded or broadcast.

One of the most common transducer types is found in the dynamic, or

moving-coil microphone. Here, a tiny lightweight coil of wire is attached to the diaphragm and suspended in a magnetic field. Sound pressure pulses move the diaphragm, causing a minute voltage to be induced in the coil as it moves through the magnetic field. This voltage is then amplified through the sound system. Dynamic microphones, generally rugged and reliable, are capable of responding to a wide range of audio frequencies and are usable under severe temperature and humidity conditions.

The ribbon or velocity microphone is a special case of the dynamic microphone. The diaphragm is a thin, metal foil ribbon suspended in the field of a permanent magnet. The ribbon functions as a "one-turn coil," responding to the pressure pulses from sound waves, and inducing an electrical signal through its motion in the magnetic field. Ribbon microphones are excellent in both voice and music applications. They are quite rugged except for their susceptibility to ribbon damage from fast-moving air currents.

In the condenser microphone, the diaphragm is one plate of a variable capacitor. The diaphragm motion resulting from sound waves varies the distance between capacitor plates, changes the capacitance and modulates a supplied voltage. This voltage is made available through either a permanent electrostatic charge on the diaphragm, an internal replaceable battery, an external power supply, or external powering from the associated mixer or broadcast console.

High-quality condenser microphones respond with equal output (flat response) to a wide range of audio frequencies and are excellent for voice or music. They are suitable for indoor or outdoor use, although extremes in temperature or humidity may cause some condenser microphones to fail.

Crystal and ceramic microphones make use of the piezoelectric principle where a voltage is generated as a result of mechanical stress on a piezoelectric element. The element is attached to the diaphragm and supported at one end. Sound waves acting on the diaphragm bend or twist the piezoelectric element generating an output voltage. Crystal and ceramic microphones are considered good general-purpose types, with a limited high-frequency response. They often are used in sound level meters.

The forerunner of all microphones, the carbon microphone, uses a cylindrical button containing tiny carbon granules suspended between a conductive diaphragm and a conductive backplate



Figure 1 Omnidirectional dynamic hand-held vocal microphone.

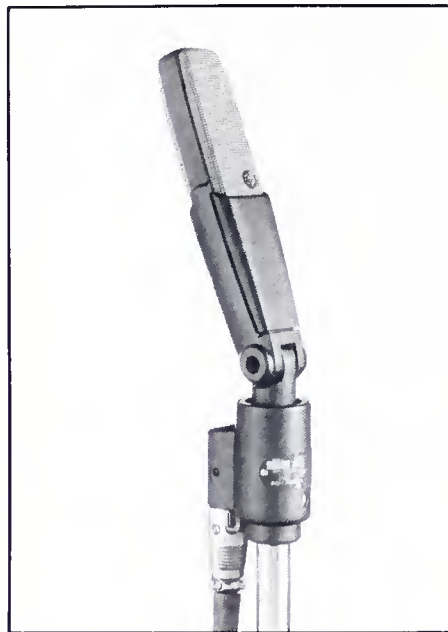
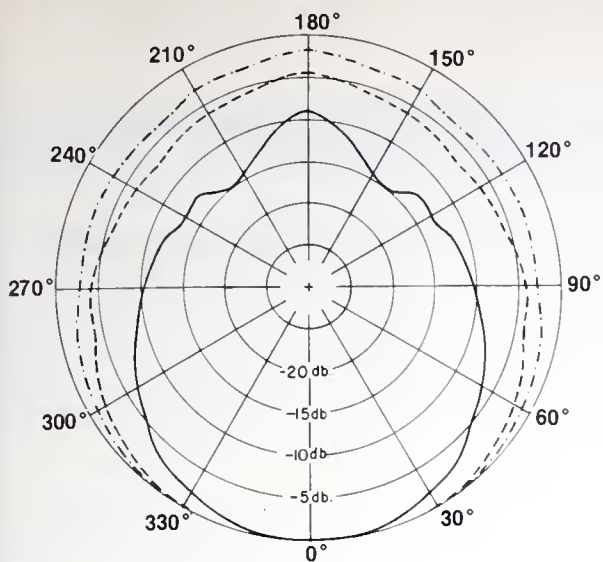


Figure 2 Bidirectional ribbon microphone with built-in shock mount.

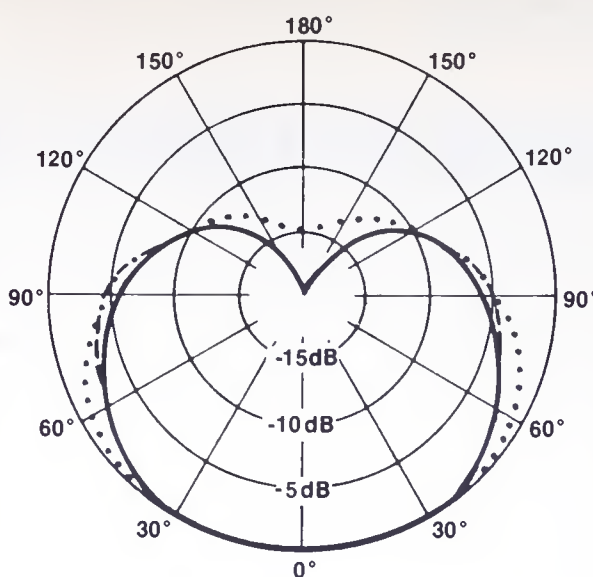


Figure 3 Unidirectional condenser microphone with low-frequency response switch and built-in attenuator switch.



LEGEND

---	2.5 kHz
- · - · -	4.0 kHz
—	10 kHz



LEGEND

—	2 kHz
---	500 Hz
.....	100 Hz

Figure 4 Typical omnidirectional microphone pickup pattern (note high-frequency directional tendency).

Figure 5 Typical unidirectional (cardioid) microphone pickup pattern at several frequencies.

ound waves striking the diaphragm compress the carbon granules, varying their resistance to a current from a battery or external power source. The changing resistance modulates the current, resulting in an audio output voltage. Carbon microphones have a limited frequency response and are fairly noisy, but they are quite rugged, have a very high output, and can be used under virtually any environmental conditions.

Pickup patterns

The directional aspects of a microphone (its relative sensitivity to sounds arriving from different directions) is collectively referred to as its pickup or polar pattern. A microphone displaying little variation in output voltage as the sound source moves around the microphone is considered *nondirectional*, or *omnidirectional*. This microphone responds to pressure, and achieves equal directional sensitivity to all sound waves by the use of a sealed rear cavity behind the diaphragm. In this manner, only the front of the diaphragm responds to sound, and in effect, the microphone picks up sound equally well from all directions. (Most omnidirectional microphones have a tendency toward directionality—greater sensitivity to sounds arriving at the front of the microphone—at higher frequencies.)

For many applications, a directional microphone is desirable. In disc-type diaphragm microphones, a specially designed rear sound entry system makes the microphone least sensitive to sounds originating at its rear and only partially sensitive to sounds from the sides. The

result is the unidirectional microphone, of which the cardioid (“heart-shaped”) pattern is the most common. Two special cases of unidirectionality are the super- and hyper-cardioid patterns in which the rear entry is designed to further minimize sensitivity to pickup from the sides (although these designs allow some rear pickup).

Bidirectional microphones are usually ribbon types. Because the front and rear of the metal foil ribbon are exposed to sound waves, the microphone is insensitive to sounds from the sides and fully sensitive to sounds from the front and rear. The “figure 8” polar pattern that results is often employed where performers must be on both sides of the microphone, where difficult feedback problems exist.

Two other special cases of directional microphones should be mentioned. The noise-canceling microphone, used in applications where high acoustic noise levels are present, is a classic example. Because of its bidirectional polar characteristics and high proximity effect, this microphone discriminates against sounds from distant sources in favor of near sources. Another type of directional microphone is one that has been optimized for close-talking applications. This unidirectional type makes use of a super-cardioid pickup pattern and extreme proximity effect to minimize sounds from distant sources while retaining a strong, natural voice-frequency response.

Frequency response

The most used specification associated with microphones is that of

frequency response, the relative sensitivity of the microphone to all frequencies in the audio spectrum. It is often given as a range (50 to 15,000 Hz), or as a plot of output voltage in dB versus frequency in Hz. In practice, the range numbers may be misleading, and the output-versus-frequency plot must be examined carefully to extract meaningful information.

For example, the ideal response for musical instrument pickup should be flat, that is, the voltage output should be

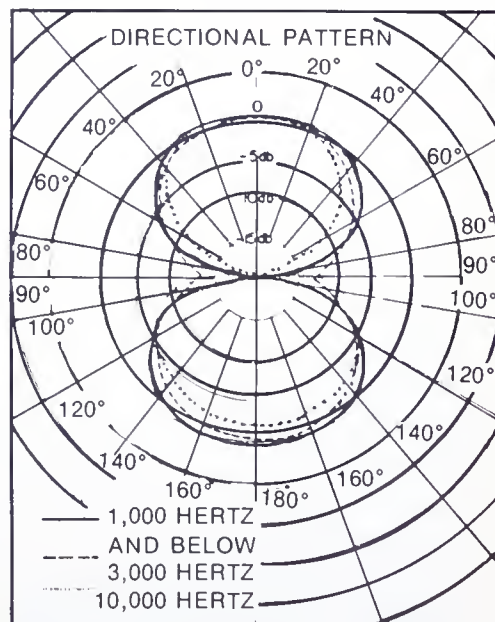


Figure 6 Typical bidirectional microphone pickup pattern (note figure eight side nulls).

Microphones

approximately the same at all frequencies. However, a neck-worn lavalier microphone should have a noticeable rise in the upper voice-frequency area and a low-frequency rolloff in order to eliminate both unwanted noise and the barrel effect of being located close to the chest cavity. Also, many general-purpose microphones exhibit a presence peak (3 to 5 dB) in the voice-frequency region; this serves to emphasize the performer's voice against a musical instrument background.

A low-end rolloff, a reduction in the bass response, is often designed into microphones. It helps eliminate wind noise, a major problem outdoors and sometimes indoors with low-frequency musical instrument pickup and overactive air conditioners. Then, too, when the microphone is used close, it provides a flat response due to proximity effect, the increase in bass response that occurs in directional microphones as the distance between the sound source and the microphone is decreased.

The output-frequency curve also may indicate how the microphone was measured. Measurements, however, are usually made in an anechoic (echo-free) chamber with the microphone at least two feet away and pointed directly at the sound source. Real use of the microphone at closer distances may incur the proximity effect. Also, moving the sound source as little as 45° off-axis may result in high-frequency losses that are unacceptable for the user's application. A good microphone should maintain its front response when working off-axis to avoid sound coloration as the performer moves about.

Microphone output

The output level (sensitivity) of a microphone is specified as a voltage or power output for a given sound pressure. Three factors are considered in deriving the specifications: sound pressure (expressed in microbars; 1 microbar equals 74 dB sound pressure level), output voltage and output impedance. These factors can be used to obtain both the open-circuit voltage and maximum power specifications.

A hypothetical open-circuit voltage would read: -80 dB re 1 V/1 microbar; output impedance 200 Ω resistive. This means that for a resistive output impedance of 200 Ω and a sound pressure of 1 microbar (1 millionth of atmospheric pressure of 14.7 lb/in²), the unloaded output voltage of the microphone, expressed in dB, is -80 dB with respect to 1 V. This figure corresponds to .1 mV/1 microbar, which would be a typical output for conversational speech at one foot. Note that a less sensitive microphone would be indicated by a larger negative dB number.

A maximum power specification might be: -60 dB re 1 mW/10 microbars. This means that the microphone's power output, expressed in dB, is -60 dB with respect to 1 mW for a 10-microbar sound pressure (94 dB SPL).

Of the two specifications, the open-circuit voltage is the easiest to understand and apply to amplifier or recorder matching requirements. In general, the open-circuit voltage of high-impedance microphones is about 10 times (20 dB) greater (more sensitive) than that of low-impedance microphones.

Microphone matching

Matching the microphone to a mixer, amplifier or recorder input is done for three reasons: to minimize microphone output signal loss, to minimize degradation of frequency response, and to minimize pickup of unwanted signals. When a microphone is connected to the sound system, a small portion of the microphone's output signal is lost to the sound system because the microphone's output is divided across the microphone's internal impedance and the sound system input impedance. To minimize this loss, the input impedance should be about 10 times the microphone's impedance.

When using ceramic or crystal microphones, matching is a different situation. The capacitive nature of these microphone's output impedance means that resistive loads tend to roll off the low-frequency response rather than attenuate the overall level. Therefore, an input impedance of 1 Ω or more is generally needed for a good low-frequency response.

Microphone impedance is generally specified as a rated or rating number (although the actual impedance may also be given). Rating classifications often used are: 150 Ω (low impedance)—actual impedance from 19 to 300 Ω ; 600 Ω —actual impedance from 300 to 1200 Ω ; 2400 (medium impedance)—actual impedance from 1200 to 4800 Ω ; and high impedance—actual impedance greater than 10,000 Ω . Some microphones are dual or multiple impedance: a switch or internal connector permits selecting the required impedance for the equipment input.

High-frequency response loss in dynamic, condenser and ribbon microphones can be minimized through careful attention to cable length. Because the microphone cable acts as a shunt capacitor to the microphone, certain combinations of cable length and microphone output impedance may incur noticeable high-frequency loss. If the microphone output impedance is 600 Ω or less, several hundred feet of cable can be used with minimal loss. However, for microphones with high output impedance (20 k Ω or more), cables should be limited to 15 or 20 ft.

Unwanted noise, generally in the form of hum and buzzes, also can be avoided by proper attention to the cable (although some microphones have shielding and other built-in hum rejection systems). A high-quality cable with a braided mesh or foil shield should effectively eliminate electrostatic signal pickup. Hum pickup can be minimized by routing microphone cables away from

power lines or other hum sources, and by using balanced microphone inputs.

High-impedance microphones are generally free from electromagnetic signal pickup because of their higher signal voltages and short cable lengths. For long cable runs (over 20 ft), the use of low-impedance microphones will avoid high-frequency loss. However, the hum pickup may increase due to the lower signal level. To solve the problem, a balanced microphone line (a shielded cable with two shielded conductors) plus an additional transformer at the equipment end of the cable are used.

Special-purpose microphones

Most microphones can be made to perform tasks beyond their usual application. But some microphones are purposely designed for only one type of use. A prime example is a line-level condenser microphone designed specifically for live remotes. It has a built-in peak limiter to prevent overloading of microphone line amplifiers or remote broadcast amplifiers, and its balanced line level amplifier can directly drive telephone lines or other line-level inputs. Its high output means that a mile of unshielded cable can be used between the microphone and the line input.

The boom microphone is another special-purpose microphone whose function (overhead miking) limits it to non-visible applications. Since it's out of the picture, it can be as large as necessary, often incorporating elaborate elastic shock mount suspension systems. These suspension systems reduce mechanical noise pickup to the negligible levels required for studio work. The boom microphone often incorporates a heavy-duty windscreen to prevent wind noise generated by the suspension assembly and from fast boom swings. It should also contain a hum-bucking coil for reducing electromagnetic hum to insignificant levels.

The head-worn microphone is designed primarily for remote broadcasting. Its close-talking, unidirectional microphone provides strong, natural voice frequency response while reducing annoying background sounds. The physical design minimizes visual interference for on-camera use. The headband and microphone boom adjust to fit various head sizes, and cabling is generally designed to be inconspicuous.

Accessories

Microphone manufacturers realize that there is no one microphone for all applications. The object, therefore, is to make the microphone as versatile as possible without raising its cost much.

Foremost among microphone problems solvers is the add-on windscreen. These acoustic foam devices minimize wind noise and pop (explosive breath sounds). Other useful accessories include isolation microphone stands and isolation stand adapters, low-frequency rolloff filters, cough buttons, low-profile microphone stands, and many devices for modifying impedances and signals.

Microphone roundup

As discussed in the preceding article (Microphones: What's the difference?), microphones come in many different sizes, shapes, materials and pickup patterns. Since mic manufacturers have developed almost every combination of the above, it is nearly impossible to present a meaningful *comparison*-type roundup.

Instead, a few representative microphones have been chosen from each manufacturer to indicate the range of choices available. These include lavalier, hand-held, wireless and many more. Detailed manufacturers' data may be obtained by using the reader service card or by contacting the manufacturers at the addresses listed. Most of the manufacturers can provide literature on several more mics which are not listed here.

AKG Acoustics

Philips Audio Video Systems,
1 McKee Drive, Mahwah, NJ 17430



D2000E

D-2000E—Adjustable response dynamic microphone features a super-cardioid pattern which reduces feedback more than standard cardioids. A B-M switch (Bass-Med) allows sound control, reduced proximity effect, reduced feedback and increased intelligibility in over-reverberant locations. Presence and clarity are produced by a slight and gradual mid-frequency rise. Sensitivity is -52 dBm; sound-pressure levels greater than 128 dB can be produced without any audible distortion.

D-224E—Two-way cardioid dynamic microphone features response flat to 20 kHz. The cardioid polar pattern is constant and symmetrical at virtually all frequencies. The unit includes a 3-position bass-rolloff switch (0.7 dB or 12 dB attenuation at 50 Hz); sensitivity is -56.5 dBm. The model is said to exhibit virtually no proximity effect.

C-424—Quadraphonic condenser microphone provides four outputs grouped in two pairs: one dual-diaphragm CK-12 is fixed to the main housing, while the other CK-12 swivels through an angle of 0-180°. Frequency range is 20-20,000 Hz; sensitivity at 1 kHz is -64.4 dBV.

Itec-Lansing

15 S. Manchester Avenue,
Anaheim, CA 92803



C70C

C70C—Cardioid condenser microphone is designed for stage and concert halls, studio recording and high quality commercial sound installations. Frequency response is uniform from 20 Hz to 15 kHz; sensitivity is -70 dBm; and average front-to-back discrimination is 20 dB.

C71—Condenser microphone features an omnidirectional pickup pattern. Frequency response is uniform from 20 Hz to 15 kHz; sensitivity is -40 dB adjustable four 10 dB steps to -70 dB.

D81—Omnidirectional dynamic microphone maintains its response characteristics uniformly over the entire polar range at 360°. Frequency response is 50 Hz to 15 kHz; sensitivity is -55.5 dBm.

Audio-Technica

3 Shiawassee Avenue,
Fairlawn, OH 44313



AT801

AT801—Omnidirectional electret condenser microphone requires only a common AA battery to power the FET impedance-matching network. Battery life exceeds 3500 hours in normal use. Frequency response is 40-18,000 Hz; sensitivity is -48 dB; max input sound level is 125 dB; and S/N is greater than 50 dB at 1 kHz, 1 μ b.

Circle (180) on Reply Card

AT811—Cardioid unidirectional electret condenser microphone also requires only a common AA battery. Battery life exceeds 3500 hours in normal use. Frequency response is 50-20,000 Hz; sensitivity is -56 dB; max input sound level is 130 dB; S/N is greater than 50 dB at 1 kHz, 1 μ b.

Circle (181) on Reply Card

AT803S—Sub-miniature omnidirectional electret condenser microphone features low current demands; an AA penlite cell should provide about 2000 hours of intermittent use. Frequency response is 50-15,000 Hz; sensitivity is -57 dB; max input sound level is 130 dB; and S/N is greater than 40 dB at 1 kHz, 1 μ b.

Circle (182) on Reply Card

Mic roundup

Beyer Dynamic

Hammond Industries,
155 Michael Drive, Syosset, NY 11791



M69N(C)

M69N(C)—Dynamic moving coil microphone features a hypercardioid pickup pattern. The SM version has a built-in Voice-Music switch. Frequency response is 50-16,000 Hz; sensitivity is -144 dBm.

Circle (183) on Reply Card

M160N(C)—Non-linear distortions are imperceptible with this dynamic unidirectional ribbon microphone. Frequency response is 40-18,000 Hz; sensitivity is -152 dBm.

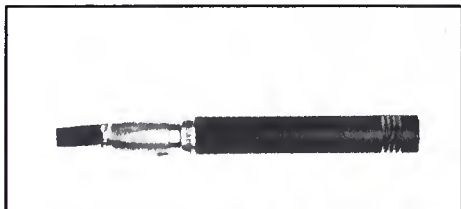
Circle (184) on Reply Card

M111N—Dynamic moving coil lavalier microphone features omnidirectional pickup pattern. Frequency response is 60-15,000 Hz; sensitivity is -155 dBm.

Circle (185) on Reply Card

Calrec

Eddor, 16782 Hale Ave., Irvine, CA 92714



CM1050C

CM1050—Condenser microphone features cardioid pickup pattern. Frequency response is 30-20,000 Hz; front to back response differential is about 20 dB; sensitivity at 1 kHz is 1000 Ω is 0.8 mV/ μ b; approximate max level is 134 dB.

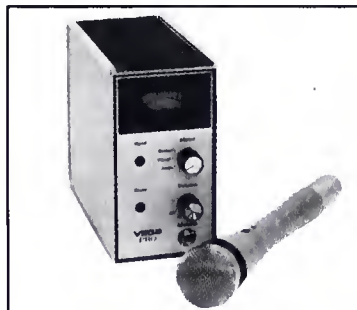
Circle (186) on Reply Card

CM2001C—Handheld condenser microphone features omnidirectional pickup pattern. Frequency response is 20-20,000 Hz; sensitivity at 1 kHz is 1000 Ω is 0.8 mV/ μ b; approximate max level is 134 dB.

Circle (187) on Reply Card

Cetec Vega

P.O. Box 5348, El Monte, CA 91731



54

54—Microphone-transmitter contains a Shure SM-58 dynamic cardioid microphone element in an 11-inch case that is well balanced and comfortable to hold. A miniaturized transmitter, replaceable battery and integral antenna are part of the case which weighs 19 oz.

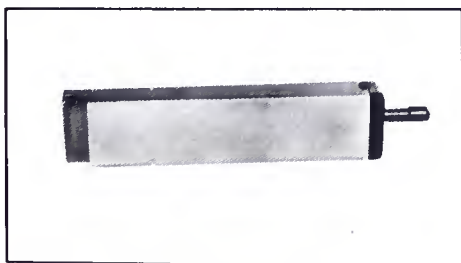
Circle (188) on Reply Card

77B/58—Compact, crystal controlled, battery-powered 77B transmitter can be interfaced with almost any professional microphone. The ultra-sensitive 58 receiver features complete monitoring via headphones, VU meter and LEDs. When used with a suitable antenna, these components assure reception over a 50-ft range under any conditions and over a 1000-ft range with favorable conditions. Drift is non-existent. The Professional I has a S/N of 70 dB or better.

Circle (189) on Reply Card

Comrex Corporation

56 Union Avenue, P.O. Box 269,
Sudbury, MA 01776



HHT-1KA

HHT-1KA—The ENG-MIC features 1 W output; crystal controlled; replaceable penlite batteries; automatic modulation control; built-in electret microphone; and frequency range of 450-451 MHz, 455-456 MHz.

Circle (190) on Reply Card

450TA—Wireless microphone transmitter frequency range is 450-451 MHz; power output is 100 mW; microphone is any low impedance dynamic or electret.

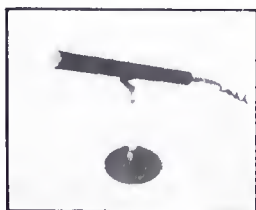
Circle (191) on Reply Card

450RA—Wireless microphone receiver is meant to be coupled with the 450TA transmitter. Sensitivity is 1 μ V; output is -50 dBm at 150 Ω ; antenna is a flexible rod.

Circle (192) on Reply Card

Dyma Engineering

Route 1, Box 51, Taos, NM 87571



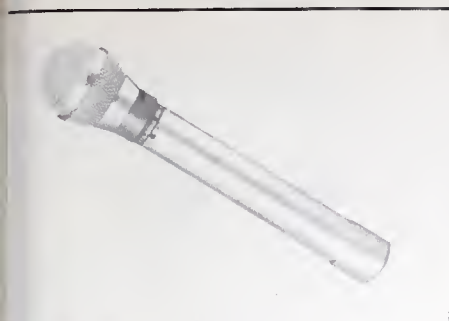
The Traveler

The Traveler—Self-contained remote dynamic microphone features omnidirectional pickup pattern. It uses three 9 V batteries with battery life more than 100 hours in normal use. Frequency response is uniform 200-10,000 Hz; attenuated 20 dB at 59 Hz for freedom from wind effects.

Circle (193) on Reply Card

dcor

5782 Hale Ave., Irvine, CA 92714



PM-5

PM-5—Wireless dynamic microphone features cardioid pickup pattern. Operates on 30-50 MHz (business band); frequency response is 40-15,000 Hz; and gives optimum performance to 200 ft.

Circle (194) on Reply Card

PM-1—Wireless transmitter with built-in electret condenser microphone also features cardioid pickup pattern. Operates on 30-50 MHz (business band); frequency response is 50-14,000 Hz; and gives optimum performance to 200 ft.

Circle (195) on Reply Card

PM-4—Wireless lavalier transmitter with dynamic microphone features omnidirectional pickup pattern. Operates on 30-50 MHz (business band); frequency response is 50-12,000 Hz; and gives optimum performance to 200 ft.

Circle (196) on Reply Card

Electro-Voice

100 Cecil St., Buchanan, MI 49107



RE20

RE20—Dynamic cardioid microphone design is free of any bass-boosting proximity effect. It features an integral blast filter; a bass tilt-down switch; frequency response of 45-18,000 Hz; and output of -57 dB.

Circle (197) on Reply Card

RE16—Dynamic super-cardioid microphone can be hand-held very close without "p-pops" because of its blast filter. It features rejection of unwanted sounds at 150° off axis; a hum-buck coil reduces hum an extra 25 dB; a bass roll-off switch; frequency response from 80-15,000 Hz; output of -56 dB; and -125 dBm hum pickup level.

Circle (198) on Reply Card

CO85—The electronics of this button-size condenser omnidirectional microphone hold it in place and are concealed. Though used normally with battery power, the unit also may be powered by wireless transmitters and recorders without using the battery/transformer housing. Frequency response is 70-16,000 Hz; output is -56 dB; and battery life exceeds 1000 hours.

Circle (199) on Reply Card

The Ken Schaffer Group

100 East 49th St., New York, NY 10017



Schaffer-Vega Diversity System

Schaffer-Vega Diversity System—Dual-diversity VHF wireless system is available in both hand-held and lavalier packages. It offers protection against dropouts and interference in a minimum operating range of 500 ft. The S/N is 85 dB.

Circle (200) on Reply Card

Howles Electronics

100 N. Mannheim Road,
Franklin Park, IL 60131



CA

CA—Condenser electret microphone has an integral FET pre-amplifier reducing the output impedance at 1000 Hz to 1700Ω. It has flat response and is available in narrow and broad band versions. The vibration sensitivity and stability make it suitable for a wide range of audio and acoustic devices.

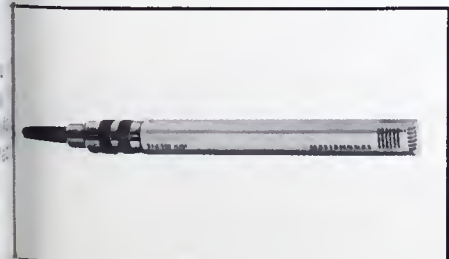
Circle (201) on Reply Card

CB—Subminiature high efficiency balanced armature speakers can be used in portable dictating machines and recorders, pocket pagers and small transceivers. It is designed for high speech intelligibility at low power consumption. The nominal impedance at 500 Hz is 12Ω, center tapped.

Circle (202) on Reply Card

Sennheiser Electronic

100 West 37th Street, New York, NY 10018



MKH 406-P48

MKH-406-P48—Cardioid microphone with an almost frequency independent directional pattern records with sound pressure levels of up to 130 dB SPL and has a dynamic of 110 dB. It features low self-generated noise, frequency response of 40-20,000 Hz, a cardioid characteristic, a minimal load impedance of -34 dB. The S/N is 73 dB and the volume handling capability is 131 dB SPL.

Circle (203) on Reply Card

MKH-816T—Special condenser microphone combines a pressure gradient transducer with a long interference line resulting in a basically club-shaped pickup pattern. It features a frequency response of 40-20,000 Hz, an output level re. 1 mV/10 dynes/cm² of -30 dB and a minimal

Mic roundup

sound pressure of 118 dB SPL. The S/N is 73 dB and it has a cardioid directional characteristic.

Circle (204) on Reply Card

MD-441—Design of the microphone includes a switchable equalization network. A presence switch enhances the region above 5 kHz without affecting the general output level. The second and independent equalizer switch makes a 5-step adjustment of the bass possible. The frequency response of this super-cardioid directional characteristic mic is 30-20,000 Hz. The rejection at 130° and 1000 Hz is 20 dB to 3 dB.

Circle (205) on Reply Card

Shure Brothers

Professional Products, 222 Hartrey Ave.,
Evanston, IL 60204



SM81

SM81—Unidirectional condenser microphone features a selectable 10 dB attenuator and a 3-position low-frequency response switch. The polar pattern is uniform with frequency symmetrical about axis. The maximum sound pressure level at 1000 Hz is 135 dB (attenuator at 0) with 800-ohm load. The S/N ratio is 76 dB. A 10 dB attenuator is accessible without disassembly.

Circle (206) on Reply Card

SM7—Unidirectional dynamic recording microphone features flat, wide-range frequency response of 40-16,000 Hz, a cardioid polar pattern uniform with frequency and symmetrical about the axis, internal suspension shock isolation, highly effective pop filter and a built-in hum rejection system. Slotted response selector switches emphasize bass roll-off and mid-range. The power level is -57 dB.

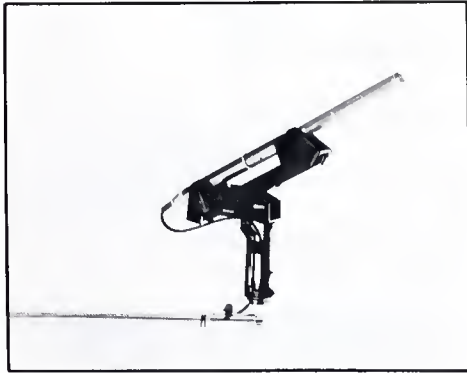
Circle (207) on Reply Card

SM61—Omnidirectional dynamic microphone can be used for anything from remote broadcast interviews or sports coverage to onstage and television hand-held use. The mic is virtually insensitive to wind, pop and handling noises. The Veraflex grill protects the microphone against damage from a drop of up to 6 ft, resists dents and is impervious to rust, corrosion and moisture. The frequency response is 50-14,000 Hz with power level of -60.5 dB.

Circle (208) on Reply Card

Sony Industries

Audio Division, 9 West 57th Street,
New York, NY 10019



C-74

C74—Shotgun type microphone with super-unidirectional pickup is suited for ENG work. The mic offers 30° coverage; 60 dB S/N; sensitivity of -40 dB; and it can be phantom powered. Self-contained batteries provide 10 hours of continuous operation.

Circle (209) on Reply Card

ECM-50PS—Omnidirectional electret condenser microphone with miniature design is the most commonly seen tie-tack mic on TV. It features a frequency range of 40-14,000 Hz, 66 dB S/N and sensitivity of -56 dB. The microphone may be powered from an external phantom power supply or operate for more than 3000 hours with an internal power mode with self-contained battery.

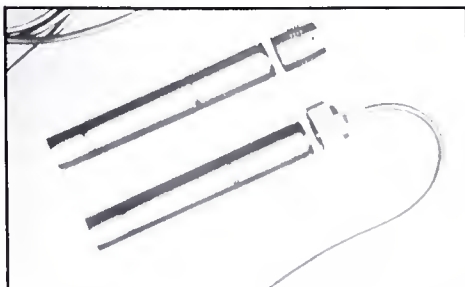
Circle (210) on Reply Card

C-37P—Microphone is a FET version of the Sony C-37A. Its directivity enables the mic to function in both omnidirectional and unidirectional modes at a turn of the selector switch. The advanced FET circuitry allows a pickup of up to 154 dB.

Circle (211) on Reply Card

Studer ReVox

1819 Broadway, Nashville, TN 37203



SKM5

SKM 52 UG—Microphone system employs the SKM 5 amplifier which features a small mechanical size. Only one diaphragm is used in the multi-pattern capsules. Directional characteristics are varied by changing the acoustic-mechanical elements of the capsules (capsules may be removed and extended 15 ft without quality loss). The mic features a frequency range of 20-20,000 Hz; S/N is 77 dB; and maximum sound pressure level for .5% total distortion is 130 dB SPL.

SKM 541 UG—Hypercardioid, flat response mic features 77 dB S/N; frequency range of 40-20,000 Hz and maximum sound pressure level for .5% total distortion of 130 dB SPL. The system uses the SKM 5 amplifier.

SKM 56 UG—Three pattern, flat response microphone has a frequency range of 40-16,000 Hz. The maximum sound pressure level for .5% total distortion is 134 dB SPL. The S/N for this mic which uses the SKM 5 amplifier is 73 dB.

Television Equipment

Box 260, South Salem, NY 10590



436B

436B—Sportcaster headset with close-talking dynamic microphone features frequency range of 50-15,000 Hz. The microphone impedance is 400 Ω and the sensitivity is 2 mV for close speech.

Circle (212) on Reply Card

136B—Single-phone sportcaster headset has a frequency range of 50-15,000 Hz. The close-talking dynamic microphone has a sensitivity of 2 mV; the impedance is 400 Ω .

Circle (213) on Reply Card

433B—Features of the sportcaster headset with noise-cancelling dynamic mic include a frequency range of 50-15,000 Hz (headset). The impedance of the microphone is 300 Ω ; the frequency range is 100-8000 Hz (mic). The microphone sensitivity is approximately 1.5 mV for close speech.

Circle (214) on Reply Card

Telex Communications

Professional Audio Products,
1600 Aldrich Ave., S., Minneapolis, MN 55420



CS-91

CS-91—Boom microphone of the sports announcer's headset features a frequency response of 150-12,000 Hz and a power level at -63 dB. The mic matches all low impedances from 50-250 Ω with an omnidirectional polar pattern.

Circle (215) on Reply Card

CS-81, 83, 85 and 87—Carbon boom microphone of these cameraman's headsets features a frequency response of 300-4500 Hz, a sensitivity of -52 dB and impedance of 20 Ω . The headphone has a sensitivity of 113 dB with a frequency response of 200-4000 Hz. The impedance of the left earphone is 275 Ω and the right (when used) is 625 Ω .

Circle (216) on Reply Card

Turner Microphone

109 17th Street NE, Cedar Rapids, IA 52402



35A

35A—Lightweight lavalier microphone is ideal for television, video recording and other professional applications. It features a Turner Dynaflex non-metallic diaphragm which gives smooth response over a wide frequency range and withstands extreme temperatures. The polar pattern is omnidirectional. Other features include a power level at -60 dB; EIA sensitivity of -154 dB; and a frequency response of 50-12,000 Hz.

Circle (217) on Reply Card

SE11—Dynamic cardioid cartridge offers maximum rejection 180° off axis. The polyflex diaphragm gives optimum frequency response in both highs and lows. The controlled low frequency response of 50-15,000 Hz minimizes bass proximity effect. A controlled cavity with double shock mounts isolate against handling and mechanical noises. The discrimination is 20-25 dB over frequency range.

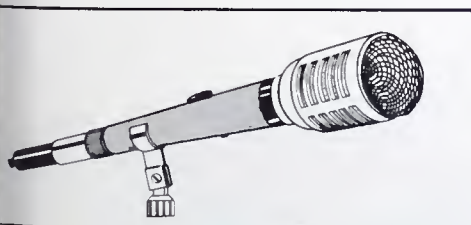
Circle (218) on Reply Card

TC11—Dual rear entry ports of this dynamic cardioid microphone achieve closely controlled cardioid characteristics. It features a Lexan diaphragm for desirable response across complete frequency range of 50-15,000, a double wall cartridge and a series of silicone shock mounts, a power level at -55 dB and a discrimination at 22 dB over frequency range. Natural sounds are maintained with response below 100 Hz attenuated a maximum of -10 dB.

Circle (219) on Reply Card

Vidair Electronics Manufacturing

50 Buffalo Ave., Freeport, NY 11520



855

855—Dual impedance dynamic cardioid microphone features a brown flock finish with matching 20-ft shielded mic cable, plug and holder. A flip of the speech/music selector switch produces the tonal quality necessary for performing or taping. The frequency response is 50-15,000 Hz with a sensitivity of -52 dB at 50 K Ω and -70 dB at 600 Ω .

Circle (220) on Reply Card

730—Omnidirectional electret condenser microphone features a frequency response of 30-18,000 Hz. The sensitivity is -65 dB at 1000 Hz.

Circle (221) on Reply Card

729—Sensitive omnidirectional walk-around type miniature microphone clips on the tie or lapel of the user. Thirteen feet of flexible cable is included. The frequency response of the tie-tac electret condenser mic is 50-16,000 Hz with a sensitivity of -65 dB at 1000 Hz.

Circle (222) on Reply Card

Station-to-station

Subaudible noise—do you have it? How do you know?

by James A. Newbanks, director of engineering, WSSR, Springfield, IL

The broadcast engineer of today faces new problems almost everyday. One of my most interesting problems surfaced shortly after our current facility went operational. The problem was related to our new technology and was generated from a single source but caused problems in three primary areas.

To put the situation into perspective, allow me to ask a few questions. Have you experienced problems with tape dropout? Of course you have. It was probably an intermittently occurring problem, wasn't it? You probably discarded the tape and went on about the other problems facing your opera-

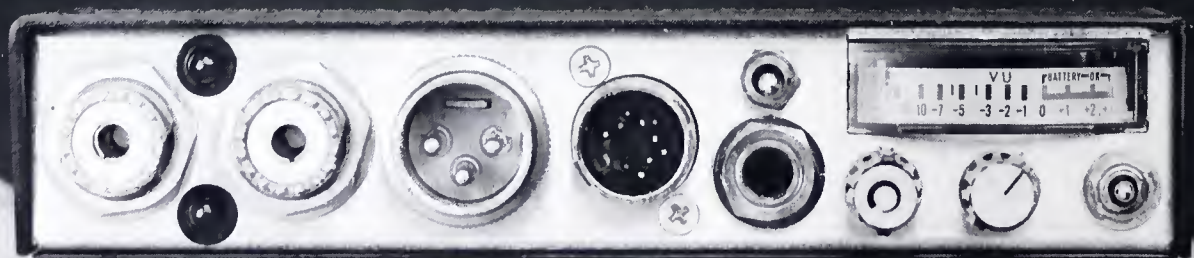
tions; that may have been a mistake. Does your transmitter frequency monitor fluctuate abnormally once in a while? If so, you may have reset the AFC on the transmitter and/or the STL and went on with other business; that may have also been a mistake. If you are having any of these problems, hang in there; I'll get to the problem and the explicit cures shortly.

In the past, technology and equipment design would have masked the problem I experienced. Today, the design engineer working with new components can virtually design his equipment to the broadest of specifications to satisfy his purist custo-

mers. He has no problem ranging from almost dc to 20 kHz: an admirable design situation. The environmentalist speaks strongly of conserving our natural resources. Recycled aluminum, paper, vinyl and other wastes to preserve the world's resources: an admirable program for conservation.

These two areas combined can bring about the problem I'm addressing here. Record manufacturers are using, and will continue to use, recycled vinyl. However, some companies lapse into quality control problems with this vinyl and produce records with impurities in the grooves. The most minor of grooves

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Circle (41) on Reply Card

regularities can cause a frequency of approximately 2 Hz to appear. As regularities worsen, the frequency range broadens by virtue of the fact that low frequency square waves are produced more often than sine waves. So, let's assume we may have 2 Hz and all the other multiples present with a single hit in a groove in one revolution of a 33 rpm record. Our thinking should be broadened to consider the possibility of several hits in one revolution.

Most of WSSR's equipment was manufactured by Harris and Scully. The subaudible frequencies generated by the records were passed by the turntable preamps, consoles, tape recorders, STL and the FM transmitter. I decided to make changes primarily in the turntable preamps but also somewhat to the tape recorders and the receiver. The changes in the preamps virtually eliminated the problem in the entire system, but I changed an input capacitor in the recorder and an output capacitor in the STL as added assurance. One must be careful not to go too far with these changes because too much change could alter impedances. Also, because capacitor tolerances are normally large, I recommend high-

grade tantalum capacitors for these changes. In stereo operation this could be critical for maintaining phase relationship between the left and right channels throughout the audio range.

In the Harris IC stereo turntable preamps C11, both 50 MFD, were changed. C11 is now 2.2 MFD and C12 is 1.0 MFD. Since the preamps characteristics are not flat, I carefully plotted the response of one preamp before I changed values and then plotted again after each change to check the net effect of each. Most, if not all, the response change was effected by changes in C11. A final check on the preamp changes was made by checking the frequency response while playing the NAB test record. The results were very good. Previously, when playing a defective record, the lead grooves before cut number 1 started the console VU meters fluctuating wildly due to the sub-audible noise. After the changes were made, none of the aforementioned problems existed. Since I have made the changes to the turntable preamps and recorders, I am not sure that the STL receiver charge was needed.

I hope my experiences will be of

help to other station engineers and manufacturing design engineers. If I can be of any help to anyone who has similar problems you may contact me at WSSR, Sangamon State University, Springfield, IL 62708, or I might suggest you contact the manufacturer of your equipment and consult with them. My experiences have been that most manufacturers service departments are very willing to give a helping hand.

WGGG's cheap count-up clock

By Craig S. Butler, chief engineer,
WGGG, Gainesville, FL

Last fall, WGGG's programming department decided to go to carted music for on-air programming. It was determined that announcers would need some sort of timing device in order to judge the intro and outro of songs. At the same time, the device would have to be inexpensive and able to connect to the starting operation of several different makes of machines. The

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Circle (42) on Reply Card

Station-to-Station

situation was hampered by the fact that most clocks and clock kits used in broadcasting were either expensive (in excess of \$75), required a great deal of construction time or would need a complex interface with our equipment.

While buying parts at a local Radio Shack, I found the Realistic MA 1010-L clock module. After examining its specifications, it appeared that it could be made into what we needed. The unit itself was a complete 12-hour digital clock and had a LED display already mounted and installed on the top of the circuit card. The clock had a row of 24 pins which controlled its various functions. These included snooze, alarm and seconds. The only external requirements needed were a power supply, jumpers and switches.

Construction was simple. A jumper from pin 7 to pins 14 and 24 locked the clock in seconds mode. Power was supplied from a special clock transformer and connected to pins 1, 2, 13 and 15. That transformer was a Radio Shack 273-1520

and is depicted with its wiring color code in the schematic. Reset to zero was accomplished by momentarily supplying source supply voltage (V_{SS}) at pin 23 to pins 19 and 20. For counter stop/hold function, V_{SS} at pin 23 was supplied to pin 19 only.

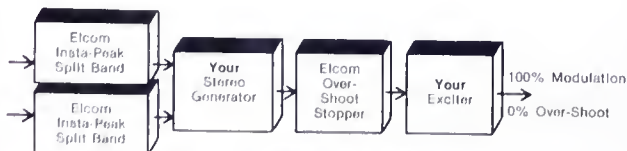
For control and interface with our machines, we decided on another simple, inexpensive method. Stop/hold was controlled by a SPST switch on the front panel of the chassis. Reset to zero operated in conjunction with double-pole momentary switches used for our remote machine starts. A cart can be started on the air by the remote switches which activate the machine and reset the clock; however the announcer can listen to another cart by starting the other machine manually and not disturb the count on the clock. The V_{SS} at pin 23 was supplied to pins 19 and 20 through a 12 V, double pole relay, controlled by the remote start switches for the machines. Power for the relay comes from a second, 12 V trans

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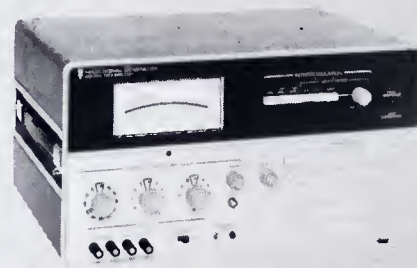
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AT NAB



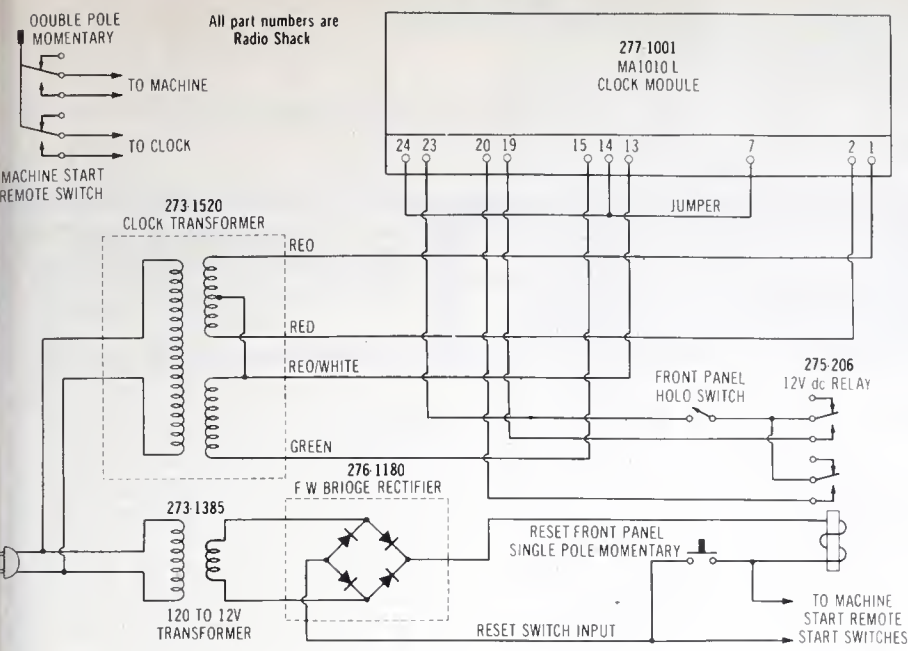
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former and a bridge rectifier. The reset switch input comes in series with the coil circuit to the relay. On our model, we added a front panel reset switch so that an announcer could operate the clock without affecting a machine. This clock module can probably

be modified and used in many other ways. However, be very careful in wiring and soldering on the module. The pin holes are small and very close together. Large wire will not fit at all. Use small size wire. Also be careful in soldering. A huge joint can short pins together. □

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PROFESSIONAL WUHY-FM, Philadelphia, rates Stanton's 881S superior in every aspect!



Disc Jockey, Stephen Brooks at the mike

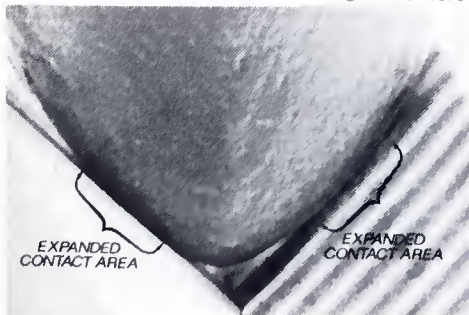
The Stanton 881S cartridge, with its Stereohedron stylus, has been rated, worldwide, as the outstanding stereo cartridge of its time. So, it ought to be a rather delicate pick-up. Not so, says WUHY...outstanding National Public Radio FM Station in Philadelphia. Mr. Ajit George, Director of Development and Awareness, quotes his Engineering Staff in this way:

- 1) "We back cue the 881S with no damage to the stylus.
- 2) It has excellent flat frequency response.
- 3) It handles high level complex music passages with complete freedom from mis-tracking.
- 4) The 881S has the highest output compared to average high quality magnetic cartridges, plus the fact that it gives superior signal-to-noise ratio from the phono pre-amp."

We are in total agreement with all of the above except, honestly, the 881S was not designed for back cueing.

Stanton guarantees each 881S to meet the specifications within exacting limits. The most meaningful warranty possible, individual calibration test results, come packed with each unit. Whether your usage involves recording, broadcasting or home entertainment, your choice should be the choice of the professionals...the Stanton 881S.

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Scanning Electron Beam Microscope photo of Stereohedron® stylus, 2000 times magnification; brackets point out wider contact area

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association news



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SBE welcomes four new chapters

The society is extremely happy this month to announce the addition of four new SBE chapters, including Chapter 56, Tulsa, OK; Chapter 57, Rochester, NY; Chapter 58, Northeast New York and Chapter 59, Kansas City. Chapter 56 was organized under the direction of Leonard Ballard, director of engineering for Swanson Broadcasting. Chapter 57 was organized through the efforts of Frank Romeo, chief engineer, Rochester Institute of Technology.

Chapter 58 was organized under the direction of William Humphrey, supervisor of engineering services, New York state education department, and Chapter 59 was organized through the efforts of Emerson Ray, RCA broadcast division, and Jack McKain, assistant director of engineering, KCMO-TV. The society is very proud of these gentlemen and especially for their time and interest in recruiting new members to help start their chapters.

CHAPTER REPORTS

Chapter 1—Binghamton, NY

The January 9 meeting in the Owego Treadway included a program on the influence of broadcast practices as related to design of high fidelity AM and FM tuners and receivers.

Chapter 2—Northeastern Pennsylvania

The studios of WVIA TV-FM was the location of the January 8 meeting. The program, Wireless Microphones, was presented by Ted Bennett, president of Sphere Associates, and William Sien, vice president of Systems Wireless, Limited.

Chapter 3—Kansas

The December 11 meeting at Forren's Restaurant in Emporia included a presentation on competing AM stereo systems by Harris Broadcast.

Chapter 11—Boston, MA

Dr. John Opsepchuck, consulting scientist, research division of Raytheon was the speaker December 19 at WGBH in Allston. He discussed microwave radiation and how this new topic of concern for environmentalists affects broadcasters.

Chapter 16—Seattle, WA

The December 13 meeting held at Ivar's Captain's Table featured Don Moyer, KOMO transmitter engineer who presented and discussed his

computer hardware. Walt Jamison, KOMO assistant chief engineer also demonstrated the computer's software versatility.

Chapter 22—Central New York

The Northway Inn in Syracuse was the site of the December 14 meeting. Barry Enders from Tektronix discussed and demonstrated a TV demodulator with synchronous demodulation and SAW filter technology.

Chapter 25—Indianapolis, IN

The December 12 meeting was a social occasion with spouses and guests at Beef'n'Boards Dinner Theatre.

Chapter 28—Milwaukee, WI

The December 19 meeting at the TV studios of Video Images included a program presented by Barry Hettinger, district sales manager for Panasonic Video Systems Division. He demonstrated four of Panasonic's color cameras, a videocassette editing system and the new VHS home recorder.

Chapter 34—Albuquerque, NM

The Royal Fork's Restaurant was the site of the December 13 luncheon and business meeting. It was decided that meeting times will be alternated with one month a night meeting and the next month a noon luncheon meeting.

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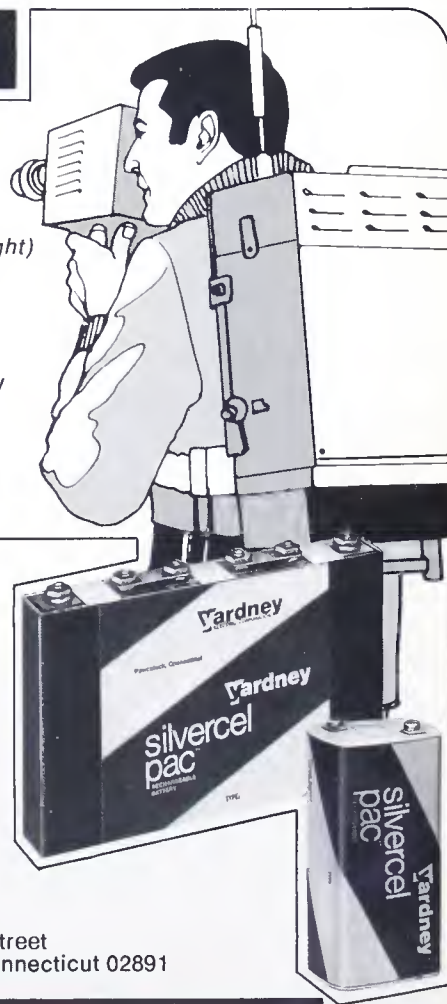
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By Yardney

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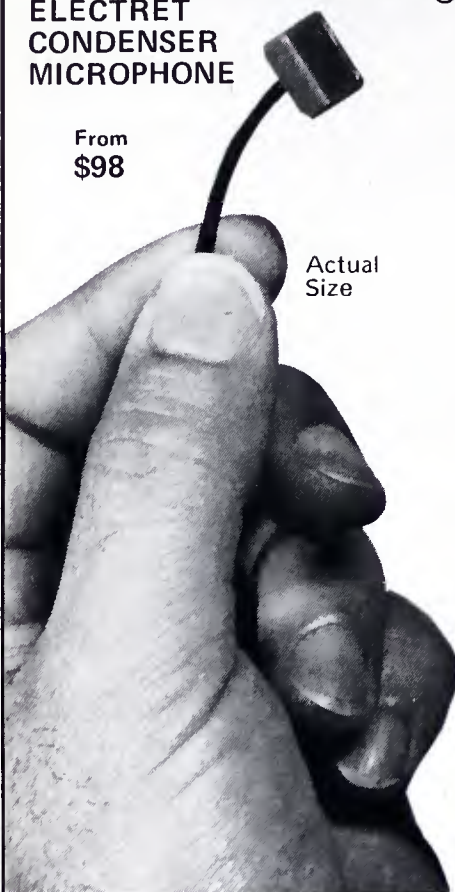
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association news

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Take 1

(ASTVC Editor's note: True to his work, and also his word, Tony St. John, ASTVC's San Francisco regional rep, has sent in the following description of the State of the Art Seminar held at KRON's studio B.)

By presenting this hands-on equipment seminar, featuring some of the newest VTRs and cameras, my intention was to bring examples of state-of-the-art television technology to those people who are never able to go to the NAB or SMPTE conferences (the guys on the street lugging TK-76s and BVU 100s and the guys back in the tape room who shuttle quads all day) to show them what's coming before they are asked to use it on the job.

Sony was just as eager to meet with these people for feed-back from those who are after all, the ultimate end-users of their product. Additionally, it was felt that these very people, attracted by the chance to learn what was new on the market, might also be attracted to the ASTVC for its dedication to the concepts of on-going member education and establishment of lines of communication between user and manufacturer. Bringing fellow professionals together on occasions like this is also a stimulant for that fraternal esprit de corps.

A sampling of the newest in ENG and EFP gear was chosen for hands on use. Bob Daines, from the new Sony Broadcast facility in Palo Alto, was most helpful in making all the arrangements. Everything came together smoothly on the day of the



Bob Daines, Sony, demonstrates the BVU 50.

seminar with equipment arriving from all over the country. I can't praise his efforts enough. And Bob who was pleased with the success of the seminar, noted, "Interest was very high among those attending.. each person had a specific piece of



equipment he was keen on trying out. And this always makes for a good show."

Of the 110 invitations sent to San Francisco Bay Area broadcasters, over 80% attended.)

Take 2

ASTVC Editor's note: Because of its general interest to all TV personnel, we are printing extracts from this year-end message from the British Guild of Television Cameramen.)

...News from the Guild is that we had a very successful Annual General Meeting in the famous city of Plymouth last month. We were joined by three French cameramen and their ladies...they cover the Tour de France and other cycle races, sitting backwards on motorcycles with lightweight cameras, making the pictures back live via a helicopter in which there's another camera...it's all fantastic stuff...and we awarded them our Television Cameramen's Award for this year. There was some frantic detective work behind the scenes to (locate the cameramen concerned)...and we finally got through with the help of the French Embassy in London and the French TV networks...There you are...International cooperation again! We had a great time at the meetings with the French people, thanks to volunteer interpreters, a great deal of arm waving, and a certain amount of alcohol! Perhaps I should explain that as well as the GM itself, the weekend included lunch provided by Westward Television for the members and guests...a party with disco...a coach trip for families...while the cameramen were at the meeting, and all in all a most friendly atmosphere and good will. We haven't heard from Canada recently, but we are getting some news from (of all places) the Arabian Gulf States, where some of our members have been working on contract.

Don't forget to let us know your news, it's always fascinating to see how alike and yet different we are in the way we work. It's good to keep in touch with our friends around the world. All our good wishes to all ASTVC members and their families, and may I wish you a peaceful and prosperous New Year. Sincerely, /s/ Vern Dyer." □

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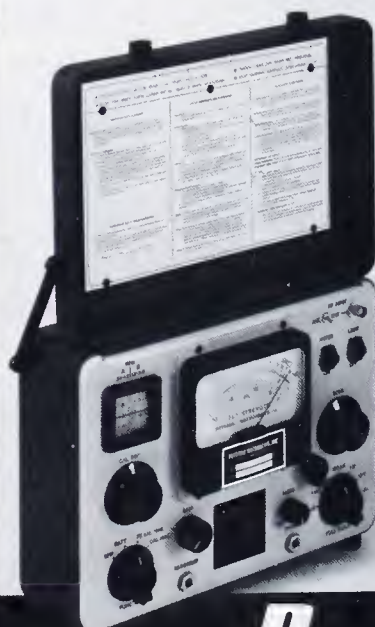
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Crane arm bulletin

Listec Television Equipment Corporation—A descriptive bulletin on the Vinten Dolphin crane arm offers specifications and photographs. Vinten is an equipment manufacturer located in Suffolk, England for which Listec is the US agent.

Circle (87) on Reply Card

Oscilloscope packet

Tektronix—A literature package contains 34 pages of data sheets for portable oscilloscopes. Photographs, selection criteria and specifications for all 200-, 300-, 400-, and T900-series scopes are included as well as price and ordering information.

Circle (88) on Reply Card

Recording supplies catalog

Recording Supply Company—The Professional Recording Supplies catalog contains 23 pages of both audio-tapes and videotapes and accessories. Product specifications and prices are included on such things as ¾-inch videocassettes, ½-inch reel-to-reel tapes, empty reels and boxes.

Circle (89) on Reply Card

Product bulletin

MCI—A 2-page product release contains specifications on the JH-32 multitrack recorder and JH-600 console. Standard features and available options are outlined.

Circle (90) on Reply Card

Broadcast towers

Aluma Tower Company—Brochure AT-15 contains eight pages of descriptions, specifications and drawings of all types of broadcast towers including telescoping (crank up), wall mounted (Fascia), guyed and fixed.

Circle (91) on Reply Card

Political guide

National Association of Broadcasters—The NAB has published a booklet to familiarize political candidates with federal regulations governing political broadcast advertising. *A Candidate's Guide to the Law of Political Broadcasting*, by Erwin Krasnow and John Quale, summarizes the laws and regulations concerning equal opportunities, reasonable access, rates that may be charged to candidates for broadcast time, the Fairness Doctrine as it applies to political campaigns, the personal attack and political editorializing rules and the rules on sponsorship identification, logging of broadcasts and records which stations must maintain.

Circle (92) on Reply Card

Choke release

Cambridge Thermionic Corporation—A 1-page product bulletin contains descriptions and specifications of two series of low inductance, fixed RF chokes for higher frequency circuits.

Circle (93) on Reply Card

Canadian handbook

Canadian Radio-television and Telecommunication Commission—A broadcast advertising handbook divided into five sections contains acts, regulations and guidelines regulating the broadcast advertiser.

Circle (94) on Reply Card

Equipment sales catalog

Leasametric—A 13-page catalog describes product characteristics, specifications and options of electronics equipment offered by Leasametric. Photographs are included of such devices as amplifiers, counters, generators, meters and oscilloscopes.

Circle (95) on Reply Card

Video supplies

WIDL Video—A full line of video supplies and accessories is featured in the 1978 catalog from WIDL. Photographs, descriptions, prices and ordering information is included of printed products, video audio and studio supplies.

Circle (96) on Reply Card

Multimeters

Soar—A 4-page brochure features full specification for a line of portable digital and analog multimeters. Photographs of the 3½-digit models also are included.

Circle (97) on Reply Card

Broadcasting guide

European Broadcasting Union—Document SPB 62 *Guiding Principles for the World Administrative Radio Conference, 1979*, is a study of technical questions of interest and a synthesis of EBU members' requirements for future developments in broadcasting.

Circle (98) on Reply Card

Antenna information

Phelps Dodge Communications Company—A catalog sheet contains information on a series of circularly polarized FM broadcast antennas. A typical antenna is illustrated with descriptions of three models which comprise the series.

Circle (99) on Reply Card

Alpha-numeric printers

Syntest—A 4-page brochure covers the full line of alpha-numeric printers including impact journal printers as well as ticket and sprocket drive units.

Circle (100) on Reply Card

Display/interface ICs

Sprague—A short-form guide, WR-161B, offers information on display/interface ICs and transistor arrays including LED, incandescent and electromagnetic display integrated circuits.

Circle (101) on Reply Card

Oscilloscope instruction

Hewlett Packard—A descriptive brochure features

.....
Information on *How to Use an Oscilloscope*, a color videotape program designed to provide a basic education in the theory and operation of waveform measurement with oscilloscopes.

Circle (102) on Reply Card

Distribution amplifier

TeleMation—Literature describing the 6-output TVA-128 Precision video distribution amplifier which utilizes ac or dc coupled operation, accepts delay and equalizer plug-in boards is offered by TeleMation.

Circle (103) on Reply Card

Cross-reference directories

PCA—Cross-reference directories cover some 145 new MK types that replace more than 13,000 industry solid state devices including rectifier/damper tube replacements, NPN transistors and PNP transistors.

Circle (104) on Reply Card

SCR data book

Westinghouse—The 128-page Westinghouse Fast Switching SCR Data Book describes the full line of fast switching thyristors and includes frequency ratings and parametric characteristics.

Circle (105) on Reply Card

Potentiometers

Genitech Corporation—The *Infinite Resolution Film Potentiometer Handbook/Catalog* is a 48-page book containing information on linear, rotary and multi-turn potentiometers.

Circle (106) on Reply Card

Application note

TRW Power Semiconductors—A 16-page application note features design information on switching power supplies for 5-V systems. Three proven designs as well as a parts list are included.

Circle (107) on Reply Card

Semiconductors

Cherry Semiconductor Corporation—A 35-page product catalog features specifications and diagrams of the firm's full line of semiconductors.

Circle (108) on Reply Card

Tape recorder

Audioder ReVox—Technical information on the A800 professional multichannel tape recorder is featured in a 16-page brochure. Photographs and diagrams also are included.

Circle (109) on Reply Card

Technical data

Shintron—Several technical data sheets are available on various Shintron products including chroma keys, credit code generators, chromatic production switchers, video typewriters and integrated production units.

Circle (110) on Reply Card

Get Aligned Stay Aligned with STL precision magnetic test tapes

These dependable tapes are used by broadcasters, recording studios, equipment manufacturers, governments and educators throughout the world. Offered in alignment, Sweep, Pink Noise, Level Set, Azimuth and Flutter and Speed. Available in reel to reel, cartridges and cassettes.

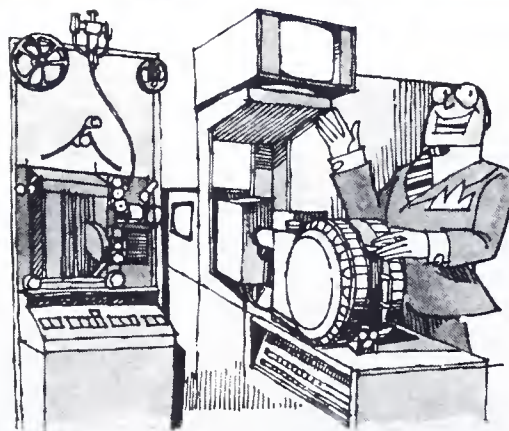
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Every innovative feature found in today's K128 can easily be added to our very first K128 — and to every unit we've built since.

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Circle (53) on Reply Card

Editor's erratum:

The elusive typographical error has been the pitfall of printing since the industry began. We diligently try to avoid such errors, but they do raise their ugly heads at times and we must make amends. Such has been the case with the December issue of BE. The following notes are intended to correct errors of commission and omission in this issue.

PBS legislation and its implications, page 42, by President Jimmy Carter.

Two errors were made in translating the President's message to our forecast issue format. First, the title should have read "Public broadcasting legislation..." rather than PBS. Second, in the third column, paragraph 2, lines 12 and 13 should have read "and help ensure that these funds are never used for improper political control of program content." The omission of the word "never" has totally altered the meaning and intent of the President's message.

In a separate letter we have apologized directly to the president for any embarrassment this error may have caused him. This note, hopefully, will help correct erroneous impressions gathered by readers.

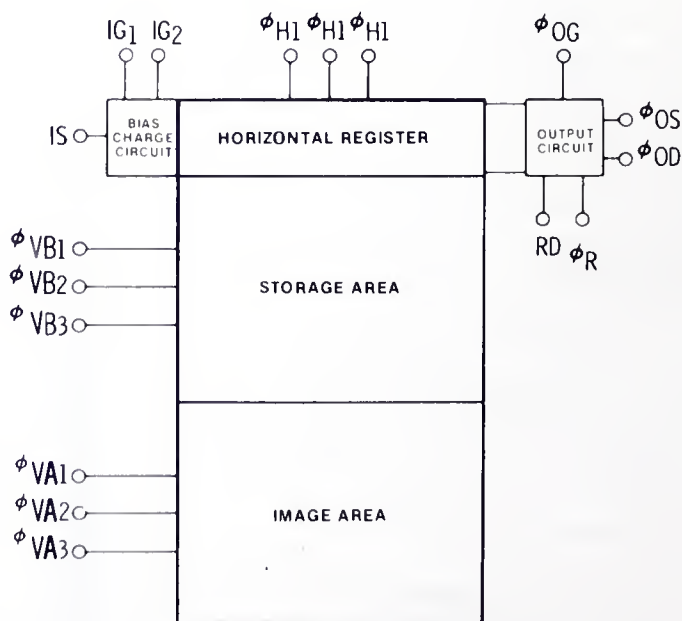
CCDs in broadcast color TV cameras, page 47, by Hopkins, Lind and Sidney of RCA.

We had intended to include a diagram of the CCD being discussed and a chart comparing different pick-up tubes. In production, the art and text got separated and the graphics omitted. They appear here as a late addition to the RCA look at the future of CCDs in broadcasting.

KEY CHARACTERISTICS FOR COLOR CAMERA SENSORS

	CCD	1/2" TUBE
1. RESOLUTION	-	+
2. SENSITIVITY	-	+
3. SPECTRAL RESPONSE	0	+
4. GEOMETRY	+	+
5. REGISTRATION	+	+
6. LAG	+	0
7. TRANSFER FUNCTION:		
a. HIGHLIGHT OVERLOAD	0	0
b. COLOR TRACKING	+	+
8. SIGNAL-TO-NOISE:		
a. DARK CURRENT	0	+
b. SPURIOUS SYNCHRONOUS	0	+

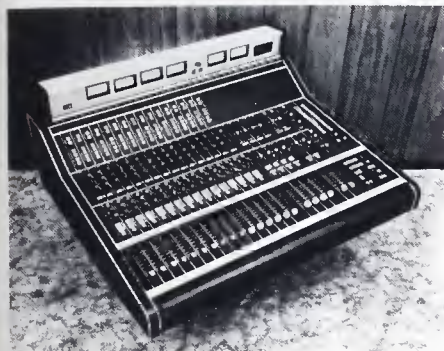
CODE: + GOOD; 0 ACCEPTABLE; - LIMITATION



new products

Console

ADM has announced the 1600 Series broadcast production console. The 1600 Series console is a 16-input, 4-submaster, 2-output console which utilizes standard ADM 780 input, 880 submaster and 980 master output modules.

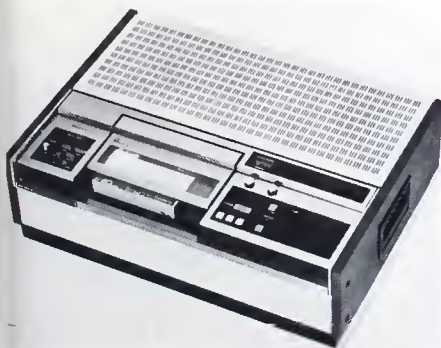


The 1600 is capable of up to 22 microphone and 26 line level sources of which any combination, up to 16, may be used simultaneously. The console utilizes the ADM Slidex for noise-free attenuation throughout.

Circle (111) on Reply Card

Playback feeder

Sony Video Products has introduced VP-2260, a capstan servo 3/4-inch playback unit. The system can be used as the player side of the Sony VO-2860/RM-430 editing system.



The VP-2260 has pause operation for still frame viewing, a program operation selector permitting automatic rewind and repeat operation and internal dropout compensator.

Circle (112) on Reply Card

Television Camera

The CEI-310 color television cam-

era system from Commercial Electronics Corporation transfers much of the electronics from the camera head to the Electronics Unit. The EU control includes two-line vertical



and horizontal enhancer, color bar generator, color sync generator with external gen lock and automatic timing.

The CEI-310 camera with optional time code generator supplies time of day, frame count and other user-specified digital information for recording on videotape.

Circle (113) on Reply Card

Film processor

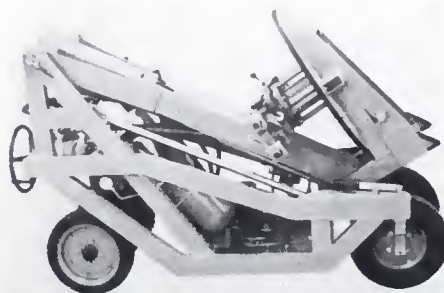
The Allen Products' RVNP-82 film processor is constructed of stainless steel with non-corrosive, self-cleaning plumbing. Some of the features include a 2000-foot film magazine, magnetic coupling pumps and digital feet-per-minute readouts.

Also standard on the processor are accurate temperature control, uniform solution agitation, Allen's ATA (Automatic Tension Adjusting) film transport system throughout the variable speed control 0-200 fpm and soft touch tires all solution rollers.

Circle (114) on Reply Card

Camera crane

The Vinten Kestrel OB camera crane offered by Listec Television



OTARI BROADCAST RECORDERS



MX-5050-B

A complete line of professional tape machines (from one to eight tracks) built to meet the current and future needs of the broadcaster (including AM stereo) for long term reliability, high performance, full production capability, and backed by a new expanded program of parts and technical support.

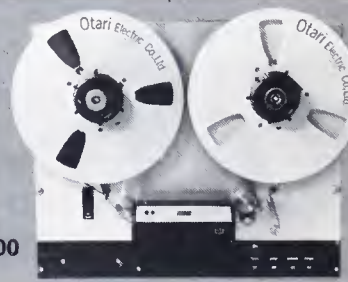
MX-5050-B Compact Broadcast Recorder.

Newest version of this field-proven two-channel machine, widely used in broadcasting worldwide. Three speeds, 24 dBm headroom, dc capstan servo, and modular construction.



Mark II

Mark II Broadcast Recorder. Separate transport and electronics for mounting convenience, plug-in card electronics, complete alignment accessibility. Two-channel 3/4-inch or four-channel 1/2-inch models.



ARS-1000

ARS-1000 Automated Radio Station Reproducer. Two-speed two-channel stereo reproducer specifically for automation systems. Ruggedly constructed for long term reliability and continuous operation.

Call Ruth Pruett at 415/593-1648 for your nearest Otari broadcast dealer.

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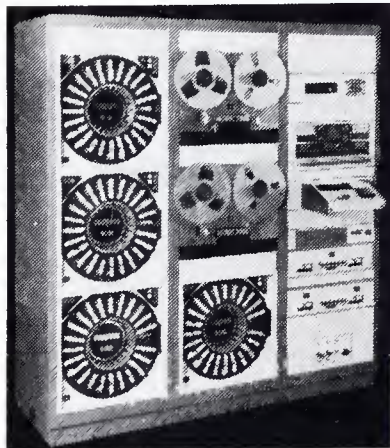
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**IF YOUR OPERATION
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WITH ABILITY
THEN WE'VE GOT
ESP FOR YOU.**



Introducing the new ESP-1 programmer system from SMC, the innovators in broadcast audio control.

The ESP offers a modern microprocessor controller with a deep 4,000 event memory, including sub-routines and fully programmable clock. The only simple thing about ESP is the ease of service and the lack of knobs, buttons and complex video terminals.

And what's even better, the ESP just happens to be the lowest priced programmer of its ability on the market.

Investigate before you buy. Call or write SMC for complete information and a proposal on how ESP can work for you and your station.



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309-829-6373

Circle (55) on Reply Card

New products

Equipment can be folded for portability. The rotating camera and cameraman seat platform assembly has a 500-lb. capacity. The type 743 crane with silent operation has manual or powered jib elevation.

Circle (115) on Reply Card

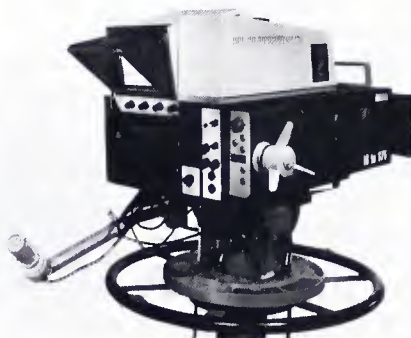
Alignment gauges

The Memorex spindle height alignment gauge (SHAG) detects improper spindle height alignment in 3/4-inch videocassette tapes. The gauge consists of a steel base for the gauge assembly, which is the size of a mini 3/4-inch cassette.

Circle (116) on Reply Card

Studio color camera

Marconi Electronics has introduced the Mark IX studio/remote color camera for operation with triax cable. Triax modules are included within the camera head and the unit can work with up to 5000 feet of 13mm triax cable.



The camera accepts a wide range of lenses designed for the 30mm pick-up tube ranging from 10:1 to 42:1. Manual or servo zooms can be provided.

Circle (117) on Reply Card

Sync generator

Consolidated Video Systems has introduced an automatic VTR advance sync generator. AVA (Automatic Vertical Advance) reduces the possibility of excess vertical blanking with broadcast-type time base correctors.

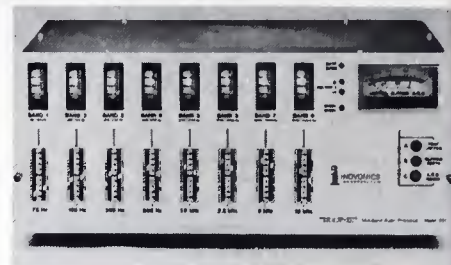
The AVA is 1 3/4 inches high and fits in a standard 19-inch rack.

Circle (118) on Reply Card

Multiband processor

Inovonics has introduced MAP-II, a second-generation multiband audio processor.

The MAP-II features a gated, gain-riding AGC amplifier to erase long term program level variations and to provide subsequent process-



ing stages with a constant program level. The selectable high- and low-pass filters allow user control over bandwidth restriction.

Circle (119) on Reply Card

FM amplifier

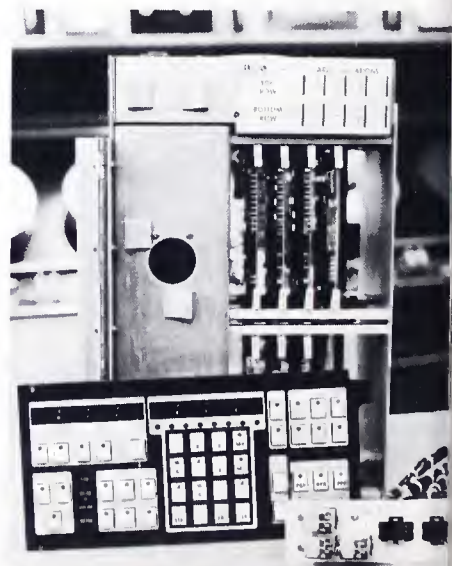
A 100 W FM power amplifier (B-9100) from McMartin Industries is designed to be coupled with a 10 W exciter to make a 100 W FM transmitter.

The B-9100 consists of a 100 W FM power amplifier and internal harmonic filter but is also available as a complete 100 W transmitter consisting of a B-910 exciter and the B-9100 amplifier. This package is designated B-9100T.

Circle (120) on Reply Card

Editing system

The AE-600 electronic system for automatic videotape editing by EECO can perform audio-only, video-only and split audio/video edits.



The system consists of a module nest containing a dc power supply,

seven or eight circuit boards and local edit control panel.

Circle (121) on Reply Card

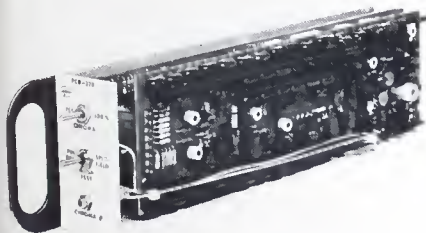
Time and date generator

The TD-414 video time and date generator from *Thalner Electronic Laboratories* superimposes 12 digits of time and date on any monochrome or color video picture. The display includes hours, minutes, seconds, month, day and year. A source identification option is available which displays two digits of field programmable information on the screen.

Circle (122) on Reply Card

Color bar generator

A precision color bar generator which includes the SMPTE alignment color bar test signal with chroma and black set signals is available from *Lenco*.



A full field bar signal which includes a white and black bar also is provided along with the split-field signal. Model PCB-320 encoded color bar generator also offers composite video delay circuit which allows system timing of test signals up to 1.5 s.

Circle (123) on Reply Card

Weather radio receiver

Gormon-Redlich Manufacturing has introduced a receiver for National Weather Service (NWS) transmissions on 162.40, 162.475 and 162.55 mHz.

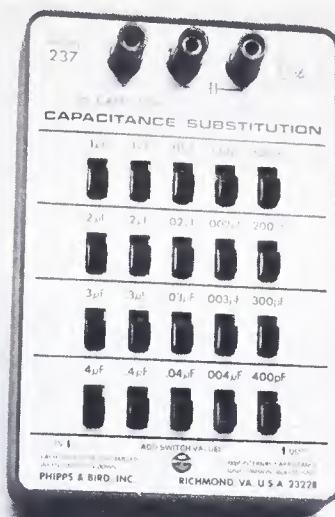
Model CRW is equipped with tone decoders that process 1050 and 1650 Hz signalling tones transmitted by NWS for automatic audible and visual alarm. The receiver is rack mountable, has rear terminals for remoting and terminals for an external antenna.

Circle (124) on Reply Card

Capacitance substitution unit

Phipps & Bird has introduced a slide-switch capacitance substitution

unit. Model 237 offers a 5-decade range of capacitance, and a discharge feature which provides safe substitution in sensitive circuits.

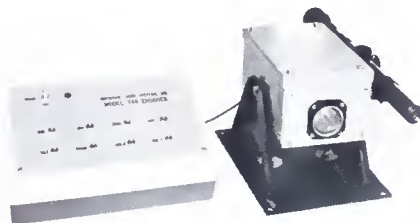


The unit weighs one pound and is housed in a metal case.

Circle (125) on Reply Card

Transmission system

American Loser Systems has developed a license-free optical transmission system capable of remotely controlling TV camera-pan, tilt and zoom, gate interlocks or industrial processors.



Model 748 has a transmission range of approximately 1/2 mile. The control panel consists of eight double throw, center-off switches labeled with the appropriate control function.

Circle (126) on Reply Card

Camera system

Cinemo Products has introduced the GSMO, a 16mm reflex camera system. The sync-sound quiet camera features cassette-type coaxial magazines in three sizes: 30m, 60m and 120m.

The optical system features a single-blade, full-speed rotating mirror shutter set at a 45° angle, providing a 180° shutter opening.

OTARI MARK II BROADCAST RECORDER



A second generation recorder incorporating all the field-proven Otari features plus several new items of special interest to broadcasters. These include: modular transport and electronics for convenient console, rack or portable mounting, plug-in cards for ease of maintenance, splicing block, complete accessibility to all electronics adjustments for fast bias and record/reproduce alignment, variable speed ($\pm 7\%$) dc capstan servo to precisely match program length to a specific time slot, and interface jack for dbx or Dolby noise reduction switching. Standard Otari features include true professional quality and reliability, motion sensing, selective reproduce on all channels, 19 dBm headroom, XLR connectors, edit and cue, and built-in test oscillator. Available in two-channel 1/4-inch or four-channel 1/2-inch models.

Compare features and benefits, compare performance, compare our track record for reliability. Call Ruth Pruett at 415/593-1648.

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Circle (58) on Reply Card

102 *Broadcast Engineering* February 1979

New products

For more information, contact:
Cinema Products, 2037 Granville
Ave., Los Angeles, CA 90025.

Sync generator

Echolab has announced a genlocking sync generator, model SG/4, which can be plugged into their SE/2 switcher/special effects generator.

The SG/4 features bidirectional vertical ratelock, automatic color and sync switching with sync presence and burst presence circuitry, separate phase-locked loops for subcarrier and sync and RS-170 specifications.

Circle (127) on Reply Card

Repair equipment

Autotronic Products has announced the development of a product line of micro-electronic repair equipment built around the Solder Mate 5000, a self-contained, high flow power soldering/desoldering system.



The unit is designed to remove components from any electronic assembly, allowing the undamaged removal of components for testing and/or replacement.

Circle (128) on Reply Card

Mounting assembly

Grandy recently introduced a multitrack head mounting assembly. Promix 1 is designed to reduce alignment time as well as simplify magnetic head maintenance.

A built-in head subplate enables a technician to remove an individual head to change its configuration, relap it or replace it.

Circle (129) on Reply Card

Electronic cabinetry

The Ruslang Corporation has a full line of broadcast studio furniture available for radio stations. Included are electronic racks, three different models of tape transport consoles, and turntable and mixer bases.

Racks are delivered fully assembled and mounted on optional casters.

Ruslang Tape transport consoles are available in three models: the RL 500, the RL 600 and the RL 700. Each includes front panel access in both horizontal and vertical positions plus a rear shelf.

Circle (130) on Reply Card

Capacitors

Sprague Electric has introduced Type 226M Fabmika high-voltage film-wrapped reconstituted-mica capacitors. The new units are intended for high-stress, light-duty discharge applications in RF equipment, induction heating, precipitators, missiles and aircraft.

Circle (131) on Reply Card

Comparator

Coastcom has developed a voice frequency comparator to expand channel capacity of high density terrestrial and satellite microwave communications networks. The model 935 VF Comparator is CCITT compatible. Both compressor and expander are on the same PC board.

The model 935 offers manual or automatic disabling circuitry to permit unaffected data transmission.

Circle (132) on Reply Card

Pulse/function generator

Model 734, 30 MHz pulse/function generator from Exact Electronics combines a true pulse generator with single pulse, double pulse, pulse delay, ECL, $\overline{\text{ECL}}$, TTL and $\overline{\text{TTL}}$ outputs available simultaneously along with the main output.



Pulse delay is controlled with a seven position rotary switch while pulse width is controlled by an eight position rotary switch.

The unit offers sync, square and triangle waveforms over a frequency range of 0.0001 Hz to 33 MHz.

Circle (133) on Reply Card

Metric connector

A 1-piece connector from AMP features self-locking panel latches for snap-in installation or snap-out removal from either side of panels 0,8 mm to 2,3 mm thick without auxiliary hardware.

Metrimate connectors are available in free-hanging, panel mount and printed circuit board configurations.

Circle (134) on Reply Card

Frequency counter

Leader Instruments has introduced a 250 MHz general purpose frequency counter featuring an 8-digit fluorescent display.



The model LDC-823 offers 20 mV sensitivity, pushbutton attenuation control and selectable 50 Ω or 1 m Ω input impedance for triggering over a broad signal range.

Circle (135) on Reply Card

Voltage standard

The Data Precision model 8100 dc voltage standard is a portable, line powered, dual output, EMF reference source. Dual simultaneous outputs are provided on the model 8100.

Each instrument is packaged in a lightweight metal case for bench top usage. It can also be ordered with provision for rack mounting.

Circle (136) on Reply Card

Multimeter

A 3½-digit pocket-sized digital multimeter has been introduced by Hickok Electrical Instrument for electrical/electronic test, maintenance, field service and other test and measurement applications.

The LX 303 features auto-polarity, auto-zero and automatic overrange indication.

Circle (137) on Reply Card

Audio connector receptacles

A series of audio connector receptacles equipped with printed circuit board terminals has been introduced by Switchcraft. The receptacles are designed to connect with the Switchcraft Q-G audio connectors and are intended for use in audio mixers, consoles, public address systems and other audio connecting applications.



A detented latch on Y(*)FD and Y(*)FDPC series receptacles allows immediate disconnect by pulling the connector straight out with a 4 lb force.

Circle (138) on Reply Card

ZIF connector

The sequential ZIF (zero insertion force) connector from AMP includes a contact timing mechanism to ensure that signal, power and ground circuits make and break in the proper sequence during pc board mating and unmating. A safety lock prevents the contacts from closing unless the board is properly positioned and helps hold the board in place.



Circle (139) on Reply Card

OTARI MX-5050-B BROADCAST RECORDER



Otari's new MX-5050-B continues the proud heritage of the MX-5050 Series, a recorder now extensively used by television and radio broadcasters worldwide. The new version has all the proven features of the earlier pace setter, including front adjustable bias and record EQ, built-in test oscillator, edit and cue, splicing block, motion sensing, selective reproduce, and adds many new features all its own: ultra reliable TTL switching, noise free inserts, three speeds in field-selectable pairs of 15/7½ or 7½/3¾ ips, 24 dBm headroom with 28 dBm output into 600 ohms, dc capstan servo with $\pm 7\%$ speed control (to match program length to a time slot), peak reading LED plus standard full sized VU meters, return to zero memory, and LED function indicators, among others.

Add these features to a 66 dB S/N ratio and a frequency response from 30 to 22,000 Hz ± 2 dB at 15 ips and you have a machine that competes with those costing thousands of dollars more.

Compare features and benefits, compare performance, compare our track record for reliability. Call Ruth Pruett at 415/593-1648.

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Circle (59) on Reply Card

QUALITY TALKS FOR WTSO

Madison, Wisconsin



Continental's new 5/10 kW AM transmitter is setting records for acceptance. It has performance and efficiency, with the cleanest sound around. Listen to Continental: quality talks.

Write for brochure: Continental Electronics
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(214) 381-7161

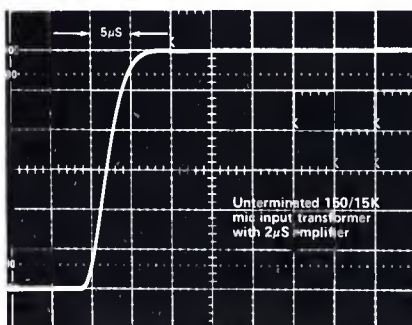
Continental
Electronics

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jensen transformers

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Minimum Transient Distortion
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(Visitors by appointment only.)

Circle (61) on Reply Card

New products

Line transient suppressors

The ND 220 Series of line transient suppressors developed by Novadyne combines a line filter and a transient clipper to supply 2-way protection of equipment from line surges and transients.



The unit is readily adaptable to new equipment design or to retrofit of equipment in the field.

Circle (140) on Reply Card

Portable color camera

Marconi Electronics' Mark IX portable color camera is designed to be a companion unit to the Mark IX studio camera and EFP camera. It can be either hand held or tripod mounted.



The portable version can be connected to the Mark IX studio camera control unit via standard camera cable and may be either ac or battery powered.

Circle (141) on Reply Card

Test signal generator

A device for television studios and mobile units that originates identified signals to prevent cross-feeds has been introduced by QSI Systems.

The QSI CB 8000 color bar identifier is a color bar and character generator combined with an audio signal source to originate an

identified television source from any location.



For microwave transmission, the unit provides a final system check and identifies microwave links in compliance with FCC regulations.

Circle (142) on Reply Card

In-cassette duplicator

Otari has announced a second version of its DP-4050 in-cassette duplicator. The DP-4050-CCF features a cassette master and five slaves with ferrite heads.



All tracks are copied simultaneously with a duplicating speed ratio of 8:1. Photocell sensing provides automatic rewind of master cassettes.

Circle (143) on Reply Card

Multimeters

Two multimeters with 4-digit readouts and 0.01% resolution have been introduced by Philips Test & Measuring Instruments.

Model PM2517 is available with a choice of LED or LCD readouts and offer autoranging as a standard feature in addition to manual ranging.

The units provide true RMS measurements for AC signals and are protected against overloading.

Circle (144) on Reply Card

Tube test channel

The Link Electronics tube test channel model 107 grades camera tube performance insuring optimum color camera balance, quality control and objectivity.

The self-contained unit includes a camera channel, measuring oscilloscope, a picture monitor, automatic test slide changer, an optical bench assembly with lens and yoke, a standardized light source and filters.

Circle (145) on Reply Card

Cart monitor

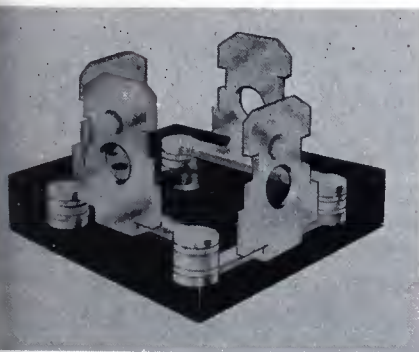
Studio Film & Tape has released a tool to assure that video CART machines correctly air commercials and spot announcements.

The DOM VA (for Ampex ACR 25 units) and the DOM 5R (for RCA TCR100 units) not only monitor every key cycle in the automatic selection and airing of tapes by those units, but the timing and sequence of the loading, threading, unloading and unthreading are checked by a built-in microprocessor.

Circle (146) on Reply Card

Rectifier bridges

Electronic Devices has added a new line of silicon rectifier bridges. Features of the PTF bridge include the miniature size, quick-connect terminals and an epoxy filled, plastic case.



The PTF bridge is available in ratings of 8 A from 50 to 1000 V. The surge is 150 A as a result of large size junctions.

Circle (147) on Reply Card

ENG/EFP camera

Panasonic VSD has introduced a three Plumbicon tube, self-contained portable color camera for ENG/EFP. Model AK-750 features operating

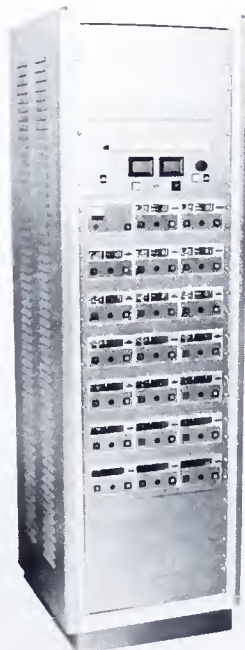
controls on the front of the camera, weighs less than 16 lbs and can be adapted for studio use with an optional studio viewfinder and remote control unit. The unit can be used with any other VTR.



Circle (148) on Reply Card

News recording system

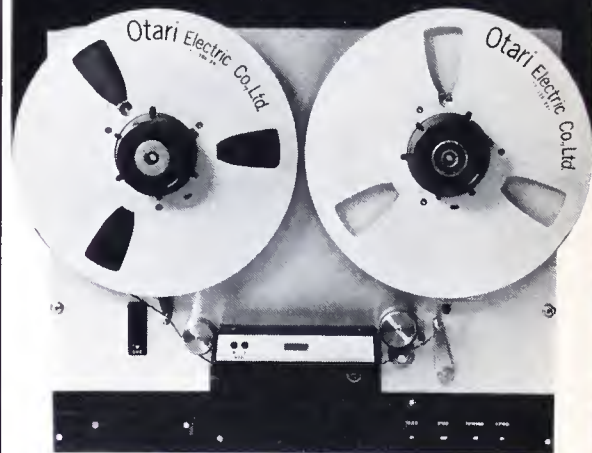
UMC Electronics Broadcast Products Division has announced a news recording system for major radio stations and networks.



The ART system consists of 20 Beucart Type 10 cartridge machines, a common record amplifier, an equalizer for input of the telephone line, four silence sensors, a 16-tone touchtone decoder circuit and a computer logic control sequencer.

Circle (149) on Reply Card

ARS-1000 AUTOMATED RADIO STATION REPRODUCER



Widely used in leading automation systems. Specifically designed to meet their stringent requirements for highest audio performance, long term reliability and around-the-clock operation. Basically, the ARS-1000 is a work horse two-channel stereo reproducer with two tape speeds (7½ and 3¾ ips) and the following features: heavy duty 19-inch top plate, head mounted pre-amp to minimize hum, RFI and yield superior S/N, special long-life polyurethane pinch roller tire, friction reducing ball bearings, heavy duty motor and brake assemblies, and gold plated PCB connectors. It's easy to maintain with its plug-in PCB's and mother board configuration, easy-access flip-up head cover, and front adjustable output level and head azimuth (to minimize stereo phasing errors). Its operating features include removable Play and Stop, a ready light to indicate proper tape threading, head lifters for fast modes, a cue control for audible monitoring, and optional 25 Hz cue tone sensor. All connections are brought out to a single 25 pin Cinch connector.

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Circle (65) on Reply Card

New products

Cables

Marshall Electronics has announced the marketing of a series of speaker and audio cables called Neglex.

The cable has solid copper conductors and has been made stiffer to keep the electrical conductors in a specific pattern. A black-jacketed cable is also available for less critical use.

Circle (150) on Reply Card

Tape controller

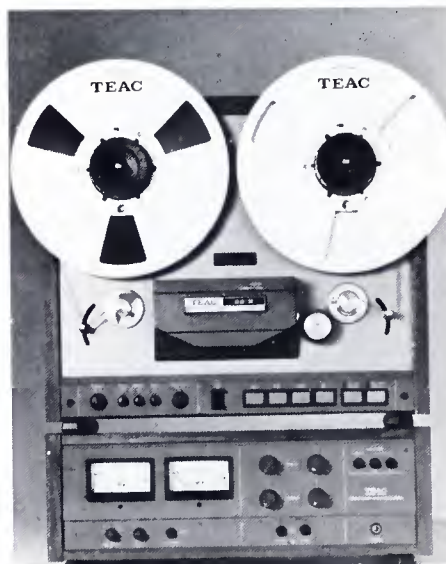
The BTX 4600 SMPTE tape controller allows pre-program production sequences by developing as many as 30 consecutive instructions using either keyboard entry or automatic capture of time code locations.

Each 4600 receives a 100-hour operational burn-in prior to shipment, may be used to control any make of recorder, with or without synchronization and is compatible with all SMPTE-based systems.

Circle (151) on Reply Card

Mastering deck

A 35-2 mastering deck with optional dbx has been introduced by TEAC. The unit features an electronics package which includes full logic with motion sensing, up-front bias and EQ controls and a separate 1/4-track playback head.



Circle (152) on Reply Card

Noise filter

TeleMation, a division of Bell & Howell, has introduced the TDF-1 digital noise filter that improves the signal-to-noise ratio of television

signals by as much as 18 dB.

Included with the TDF-1 are a RS-170A processing amplifier that regenerates incoming sync, burst and blanking; a self-test system; internal genlock; and bypass circuits.

Circle (153) on Reply Card

Audio analyzer

The model 910 audio analyzer from American Scientific can be used in four modes: analyzer, scope, FM multipath and audio, enabling room equalization, component diagnosis and adjustment.



Built-in pink noise generator has flat octave noise power spectrum in the audio range. The CRT display is calibrated in dB for SPL acoustic or electronic response measurement.

Circle (154) on Reply Card

Monolithic converters

A series of monolithic CMOS A/D converters have been introduced by Datal Systems and feature a linearity of 1/4 LSB for 8, 10 and 12 bit resolution models.

The ADC-ET converters employ the quantized feedback integration technique which achieves accurate conversions with noise immunity.

The power requirement is ± 5 VDC with 5 mA maximum current drain and conversion times are 1.8, 6 and 24 ms maximum for the 8, 10 and 12 bit models respectively.

Circle (155) on Reply Card

Desoldering iron

Air-Vac Engineering Company introduced model HVSG70Z, a hatchet type desoldering iron.

An air-operated vacuum transducer pump mounts directly on the handle.

The vacuum is activated by a finger-controlled valve, and the tool is held in the same manner as a hatchet type soldering iron.

Circle (156) on Reply Card

Signal generator

The R-1201A series signal generator from Motorola provides continuous frequency coverage between 100 Hz and 1000 MHz at increments of 100 Hz, in CW, FM or AM generation.



Spurious signals are at least 40 dB below the desired output at all amplitudes below 110 MHz. Purity is not degraded when reducing the amplitude of the desired signal.

Circle (157) on Reply Card

Logic fault indicators

Opcoa offers red T 1-3/4 LED lamps designed to operate at low current as logic fault indicators.

Designated LST-4053F the devices are packaged in a low profile high contrast T 1-3/4 epoxy lense that is 0.250-inches high.

Applications include computer fault indications, portable radio stereo indicators, scanner channel indicators, logic troubleshooting probes, power on indicators, scanner channel indicators or any application requiring LED to operate from current levels of 5mA or less.

Circle (158) on Reply Card

Demodulator

The DM-4R professional demodulator from Videotek is designed for broadcast, CATV, microwave modulation and CCTV application.



The unit requires 3 1/2-inches of vertical rack space and includes channel demodulation with dual

video and outputs as well as dual 4.5 MHz outputs.

Circle (159) on Reply Card

Multimeter

The Calcumeter 4100 offered by Electro Scientific Industries combines a handheld autoranging DMM and a microcomputer calculator.

Standard features include: test leads with fingerguard probes and recessed connectors, direct prod for probing with instrument in hand, two alligator clips that screw on to end of probes, storage case and benchtop cradle.

Circle (160) on Reply Card

Multipliers

TRW LSI products division has introduced a line of monolithic multipliers which provide n-by-n bit multiplication of 24-, 16-, 12- and 8-bit numbers.

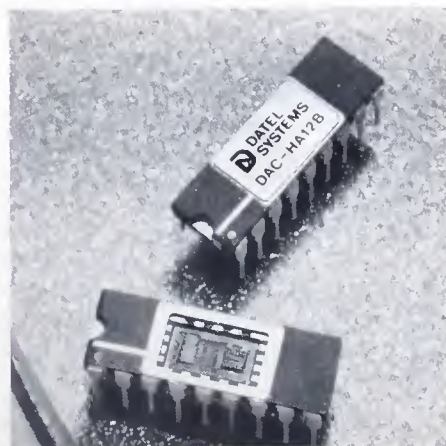


All units include input registers that feature simplified clocking—no data-hold time; and, output registers that can be made transparent for asynchronous output.

Circle (161) on Reply Card

D/A converters

Two multiplying 12 bit digital to analog converters from Datel Systems, DAC-HA12B and DAC-HA12D, have 12 bit binary coding and 3 digit BCD coding respectively.



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Circle (68) on Reply Card

New products

The low capacitance ladder network results in a 20 MHz reference bandwidth; input resistance to the network is 10K ohms $\pm 30\%$. A feedback resistor for an external amplifier is included in the resistor network.

Circle (162) on Reply Card

Radome

Phelps Dodge Communications offers a heavy duty radome for use with the company's ECFM series of education antennas and CP1000 series of circularly polarized broadcast antennas.



The radome is 28-inches in diameter with a two part sphere which isolates antenna elements from the external environment.

Circle (163) on Reply Card

Frequency counter

A high-stability time base is available for B&K-Precision's model 1820 frequency counter. Model TCX-20 is said to increase the accuracy of the frequency counter 10 times.

The unit is a temperature compensated crystal oscillator (TCXO) time base and features temperature stability of better than ± 1 PPM from 0 to 50 C.

Circle (164) on Reply Card

TV pattern generator

More than 20 diagnostic test pattern combinations are provided by a color TV pattern generator introduced by Philips Test and Measuring Instruments.

The PM 5519 produces professional level signals for testing color and monochrome TVs, videocassette players and videodisc systems to CCIR or RTMA standards.

Patterns are modulated on an RF carrier which can be tuned electronically to the IF and almost any

VHF or UHF channel. Up to six frequencies can be preset separately for touch button selection.

Circle (165) on Reply Card

FM broadcast amplifier

The EDU-100 FM broadcast amplifier from Radio Manufacturing Company is specifically designed for meeting the FCC's requirement that 10 watt FM radio stations increase their transmitter power to 100 watts.

The system uses the stations' existing 10-watt unit as a driver thus reducing the transition costs. It features full remote control, and is protected against technical faults.

Circle (166) on Reply Card

Resistors

RWR Resistors at "S" level approved failure rate, have been announced by RCL Electronics Division, AMF Incorporated.



The wire wound power resistors have a silicone coating and are rated from 1 watt to 10 watts. Resistance tolerance of $\pm 1\%$ is standard.

Circle (167) on Reply Card

Aural exciter

The Aphex aural exciter has been improved due to new electronics which increase even-order harmonics and eliminate odd-order harmonics.

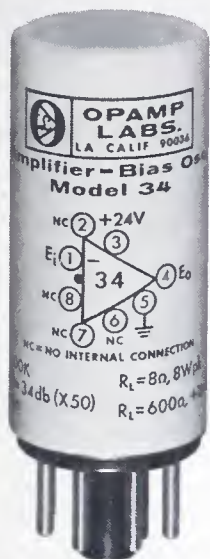
The device has greater head room and offers greater dynamic range in terms of amplitude. In terms of subjective listening, the harmonic generated now bear a closer relationship to the instruments which produce them as well as a close relationship to the harmonics the brain generates without the benefit of Aphex processing.

Circle (168) on Reply Card

Amp/bias oscillator

The model 34 audio amplifier-10 kHz magnetic tape bias oscillator

buffer from Opamp Labs is used for general purpose signal processing, earphone-speaker power amplification, distribution amplification, combine amplification, microphone amplification and magnetic tape erase-record service.



The output is short-circuit proof with up to 1 μ fd output capacitive loading.

Circle (169) on Reply Card

Bi-color LED

Opcoa has introduced a two leaded green/red, bi-color, LED lamp in a T-1 $\frac{3}{4}$ package. The lens is manufactured with a rugged uncolored diffused epoxy encapsulant which results in a lens that is fully flooded with light.



Typical luminous intensities are 2 mcd for red and 4 mcd for green at

a forward current (I_f) of 25mA. The red to green light ratio has been optimized for best visibility in ambient lighting.

Circle (170) on Reply Card

DC/DC converter

Wide input range high-performance dc-to-dc power converters by Intronics are designed to power +5 or -5, +12 or -12 and +15 or -15 analog circuits from 12, 24 or 48 VDC buses or batteries. Complete separation of output circuits from dc bus is possible because of high input/output isolation.

All nine models employ high-frequency inverters and high-performance regulators for high efficiency, close regulation and close response.

Circle (171) on Reply Card

Cable tie tool

Panduit has introduced a semi-automatic cable tie installation tool which is pneumatically operated for high-volume production harnessing.



The PSA1.5M can be used on wire bundles of up to 1.30-inch diameters. The tool operates on 85 psi, non-lubricated air and automatically wraps hand-fed miniature cross-section cable ties around the bundle.

Circle (172) on Reply Card

Playback feeder

A capstan servo $\frac{3}{4}$ -inch playback unit, the VP-2260, has been introduced by Sony. The system can be used for broadcast transmission and cable TV systems and operates on ac current at 120 V 60 Hz. Power consumption is 130 W.

Standard features include BNC in and out connectors, internal drop-out compensator, external sync and SC connector for operation with the Sony time base corrector.

Circle (173) on Reply Card

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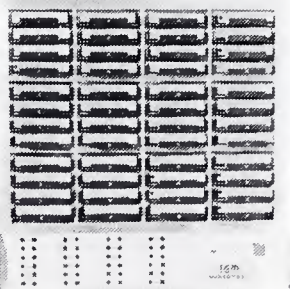
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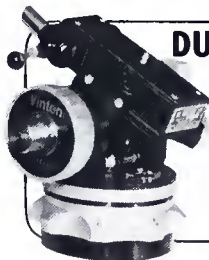
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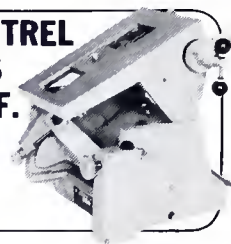
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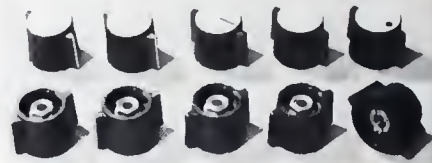
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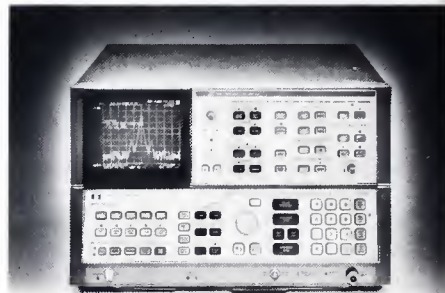
gray or red with eight optional cap colors available. The style is available in 15mm and 21mm diameters of short knob (13.5mm high).

Circle (174) on Reply Card

Spectrum analyzer

Model 8566A spectrum analyzer from Hewlett-Packard uses micro-processor controls and 100 Hz to 22 GHz resolution bandwidths.

Sensitivity is -137 dBm to 1 GHz, -134 dBm to 5.8 GHz, -115 dBm at 22 GHz. High sensitivity includes the presence of built-in pre-selection from 2 to 22 GHz.



The CRT display features an electronically-generated graticule and character generation for digital display of control settings and measurement data.

Circle (175) on Reply Card

Oscilloscope

Goold Instruments model OS253 12 MHz oscilloscope features dual trace and X-Y display capability and dc coupled Z-modulation input.

Other features include brightline operation, calibrator output and a front-panel trace-rotate control. Horizontal sweep rates are variable over 18 ranges from 500 ns/cm to 0.2 s/cm. The maximum effective sweep rate is 100 ns/cm at X1 Expand.

Circle (176) on Reply Card

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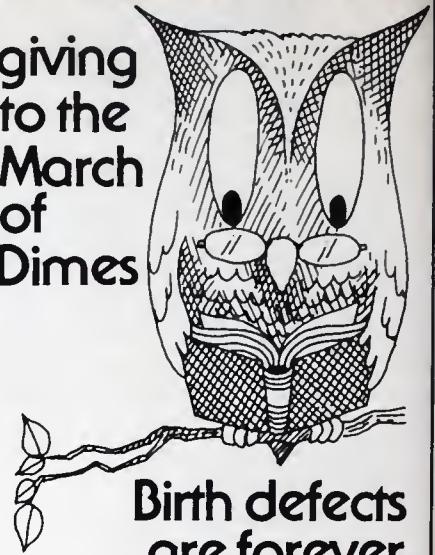
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