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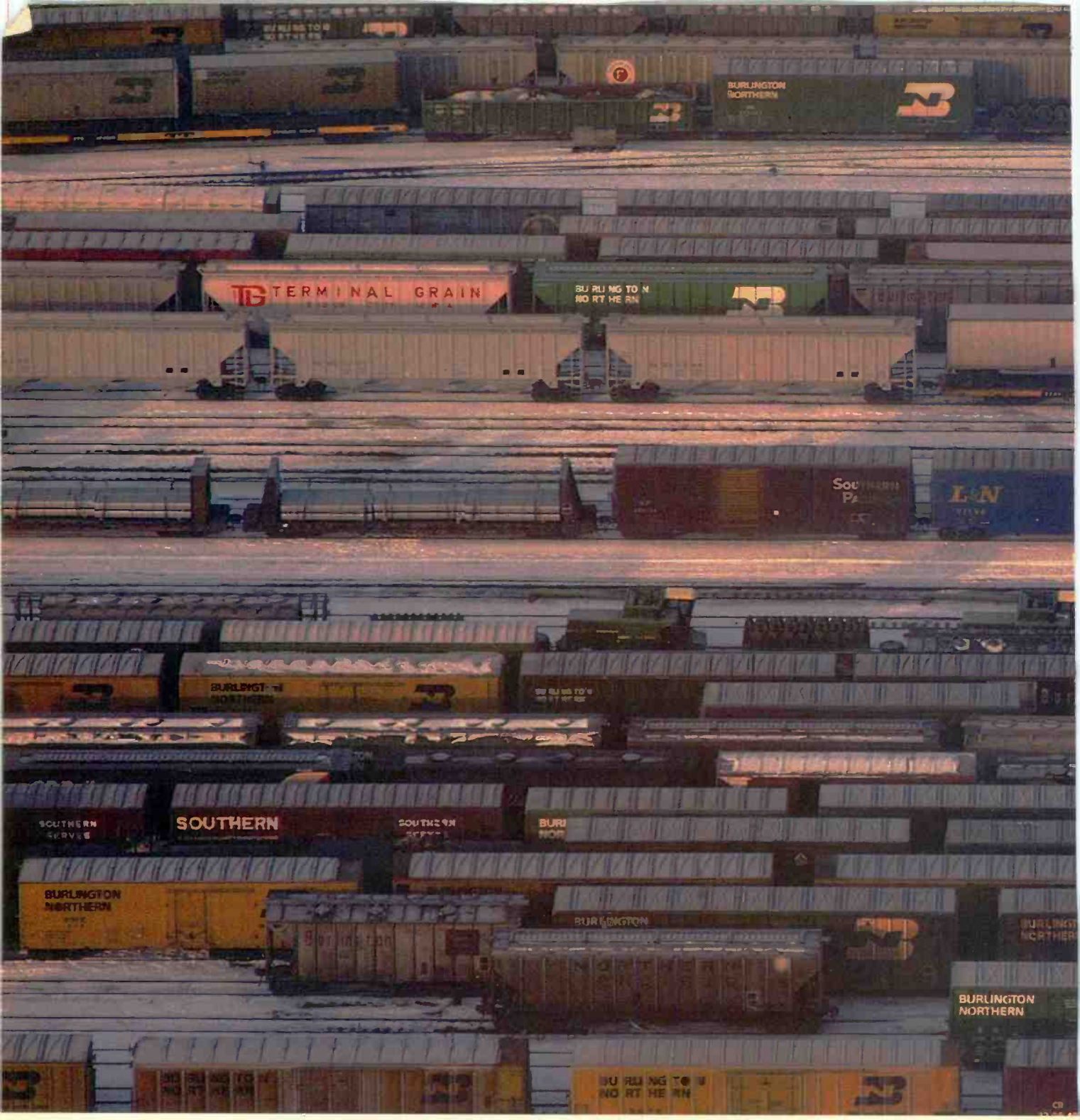

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The ever-increasing diversity of radio and television field production technology is the theme of this month's Special Report: EFP.

Art direction for the April issue by Saija Osis.

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APRIL 1982/VOLUME 18/NUMBER 4

Special Report: EFP

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Satellites in Radio and TV is the theme of a Special Report, with exclusive early-line coverage of new offerings at the NAB plus reports on TV DBS advances and new Radio nets.

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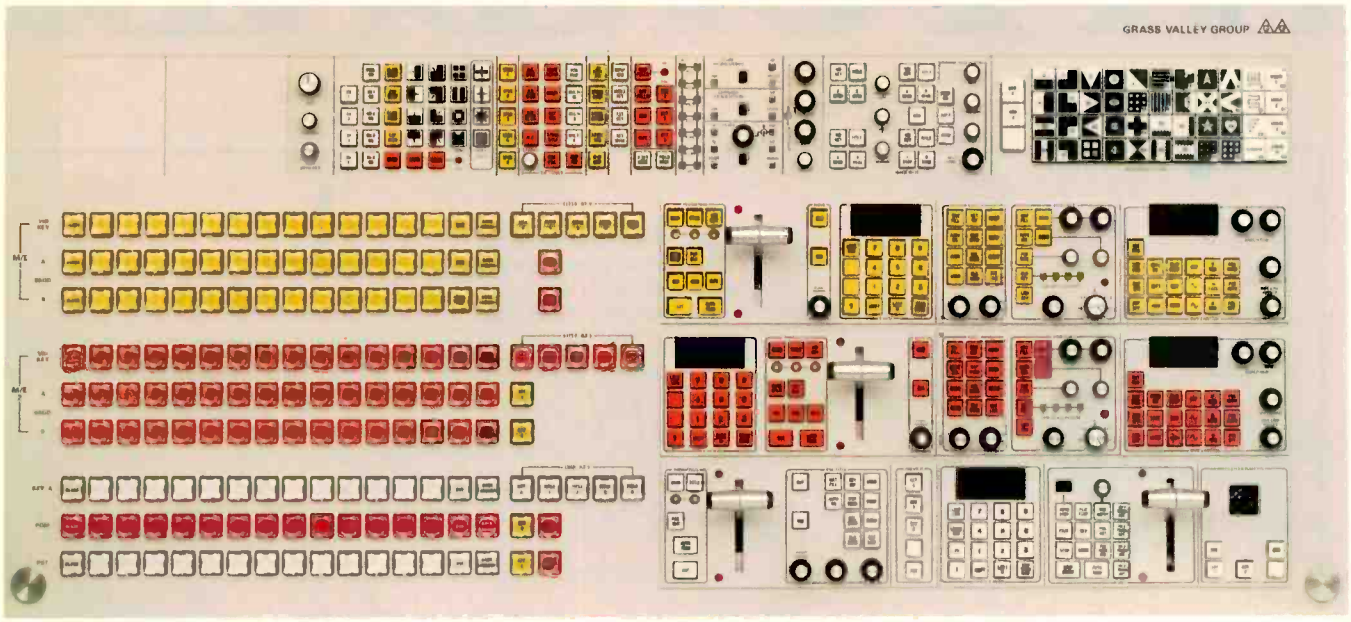

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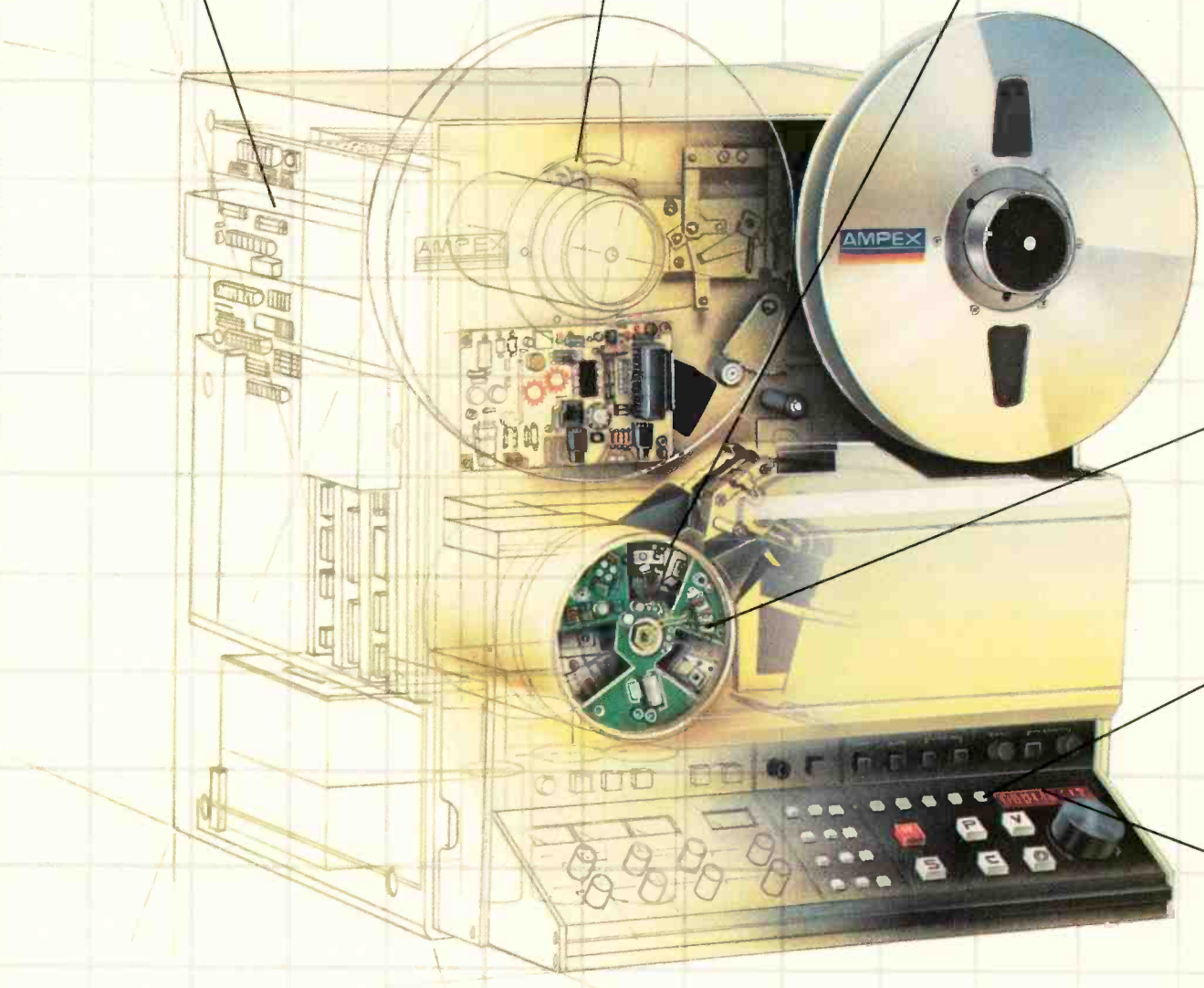

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EDITORIAL

The Future of HDTV is Now

AT THIS STAGE IN ITS DEVELOPMENT, high definition television—whether the 1125-line NHK system recently demonstrated around the country by CBS or a still undetermined standard—is blue sky for most broadcasters. But virtually everyone who has seen the astonishing demonstrations agrees that HDTV represents the future of the medium.

The hardware for producing HDTV signals is already evolving. But high definition faces an urgent, pressing threat: unless frequency allocations are made now, it may never become a broadcast service—whether through DBS satellites or directly through transmitters. There is today no single spectrum allocation assigned to broadcasting which can handle the 20 to 30 MHz bandwidth necessary for the 1125-line signal or its equivalent.

At the 1983 meeting of the U.S. region of WARC, a major decision will be reached concerning the allocation of the 12 GHz frequency. There are many contenders for the frequency, including those who urge that it be assigned for immediate exploitation by NTSC-standard DBS service. Others point out, however, that 12 GHz is the last spectrum allocation left in this part of the world that is capable of handling HDTV's signal bandwidth. Denying its use for HDTV broadcasting now would crush the hopes of being able to broadcast HDTV signals—except by inefficient co-opting of currently available adjacent channels.

Once surrendered it will be virtually impossible to retrieve. The FCC and other government agencies should target the 12 GHz band for broadcast high definition applications lest the future of HDTV be lost.

Whither the U.S. manufacturer?

While on the subject of the future of HDTV, we cannot help but wonder where the Americans have been during the research and development of this technology. Why is Japan's NHK the driving force?

At a time when high technology is one of America's strongest suits in international competition, where are the U.S. manufacturers of HDTV equipment? Where is the innovative thrust that has made this country the broadcast leader of the world?

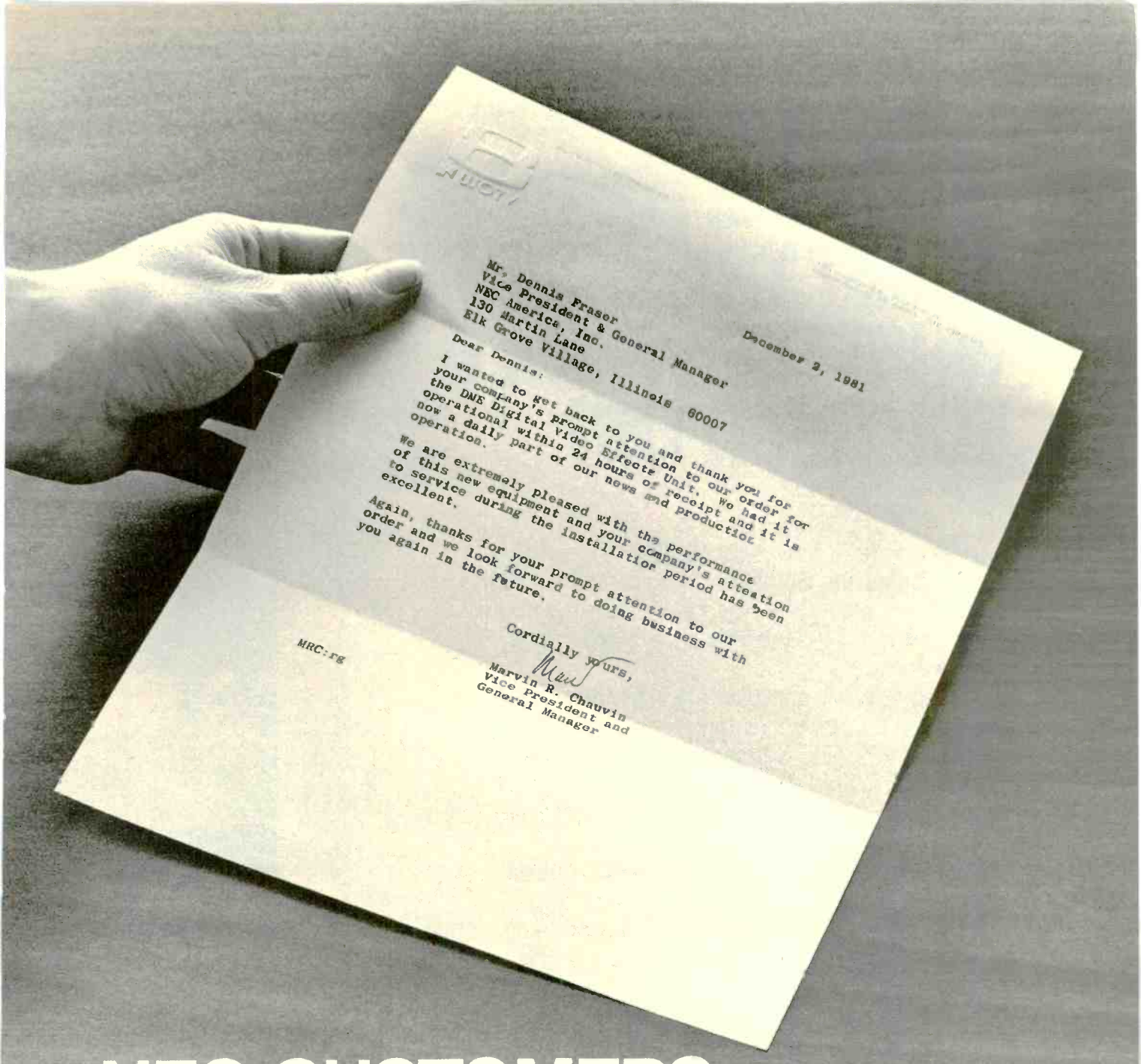
The answers to these painful questions are not simple. They involve the vast differences between government-industry relations in Japan and government-industry relations in the U.S.

There is no research facility in the United States comparable to the government-supported NHK laboratory. Having worked on HDTV for over a decade, it's clear that the NHK lab can afford to operate with a long term view. By contrast, company-funded R&D efforts in this country have tended to aim for short term, fast turnaround results. R&D is more and more expensive and the bottom line is a top priority, forcing American managers to strive for quick return on investment.

Finally, the reason the Japanese companies have the jump on developing the equipment is obvious. Would NHK invite RCA, Ampex, and Harris to help it develop HDTV equipment? Of course not. Japanese companies—Ikegami, Sony, Matsushita, Fujinon, and Hitachi—got the nod.

All of this is not to imply that the U.S. lacks the capability, the know-how. Far from it. What seems to be missing is the financial impetus. We are seeing another result of a government that has for too long neglected high technology except for projects championed by the Defense Department.

There is no source for the all-important seed money that mobilizes U.S. invention for a long-term effort. True, we did not need this kind of commitment when television was born. But times, quite clearly, have changed.



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BROADCAST INDUSTRY NEWS

FCC's AM Stereo Stance: Marketplace Must Decide

Despite strong pressure from broadcasters to select a single system for AM stereo, the FCC opted in early March to let the marketplace decide which of the competing systems will prevail.

The decision, hardly surprising in the face of the current administration's strong pro-market position, was opposed by only one commissioner. Abbott Washburn voted against the proposal, arguing that incompatibility of the competing systems could lead to higher costs for consumers, who might be forced to buy sets capable of receiving more than one system.

NAB president Vincent Wasilewski responded immediately to the Commission's move, saying that NAB "will concentrate every effort to equip broadcasters with the technical and marketing information necessary to aid them in converting to stereo transmission if they so desire . . . Our efforts will now shift toward insuring that AM stereo becomes a marketplace reality."

Both NAB and NRBA had previously gone on record as favoring a single-system approach to AM stereo. In addition, a survey conducted by Harris Corp. earlier this year showed strong support among broadcasters for selection of a single system. Of the stations stating a preference, 74.6 percent said they would like the FCC to name a system.

In deciding for the marketplace approach, FCC chairman Mark Fowler noted the lengthy delays that could be caused by litigation if a single system were selected. He also said that all the designs met FCC specifications and none seemed to be superior to the others; therefore, selection of one would be arbitrary.

One sign of the times for AM was the recent switch of WABC-AM, New York, to talk from its long-time Top 40 format. The station held the number one position in New York City for many years until it was bumped by disco FMer WKTU about four years ago. Commented one ABC official, "AM is finished for music."

RCA Sets $13 Million Fee For Satcom 4 Transponders

RCA Americom will lease transponders on its Satcom 4 satellite for a fixed rate of $13 million each under the terms of a new tariff submitted for FCC approval late in February.

Potential customers for the service were instructed to submit their orders—accompanied by the fee—to RCA on March 29. If more applications were received than the number of available transponders, RCA said, it would hold a lottery to determine the recipients. The tariff was scheduled to take effect March 26.

The $13 million charge, which gives the lessee use of the transponder from the day the satellite goes into service until December 31, 1989, is based on two factors, RCA said: the average price bid at the company's ill-fated auction (see *BM/E*, March, 1982, p. 12 and the cost to RCA of providing service. Satcom 4 was scheduled to become operational April 1. Under the proposed tariff, RCA waives the right to increase rates during the term of service in almost all cases. Users will at first lease their transponders on a preemptible basis; they will be upgraded to unprotected status around January, 1983, and to protected status by about the following June.

Clear-Channel, Program Acquisition Rules Upheld

Two FCC decisions that had been appealed have been upheld by courts in Washington and New York.

The U.S. Court of Appeals for the District of Columbia Circuit has affirmed the Commission's 1980 clear-channel ruling, which opened up the clear-channel frequencies to additional full-time stations by limiting nighttime coverage for existing stations to approximately 1500 miles in diameter. Two clear-channel licensees, Capital Cities Communications, Inc., and Loyola University, had appealed the ruling. Capital Cities is licensee of WJR, Detroit, and WBAP, Ft. Worth; Loyola holds the license for WWL, New Orleans.

While noting that it could not "pass on the wisdom of the scheme adopted by the Commission," the court said,

NASA Klystron Modification Could Halve TV Power Bills

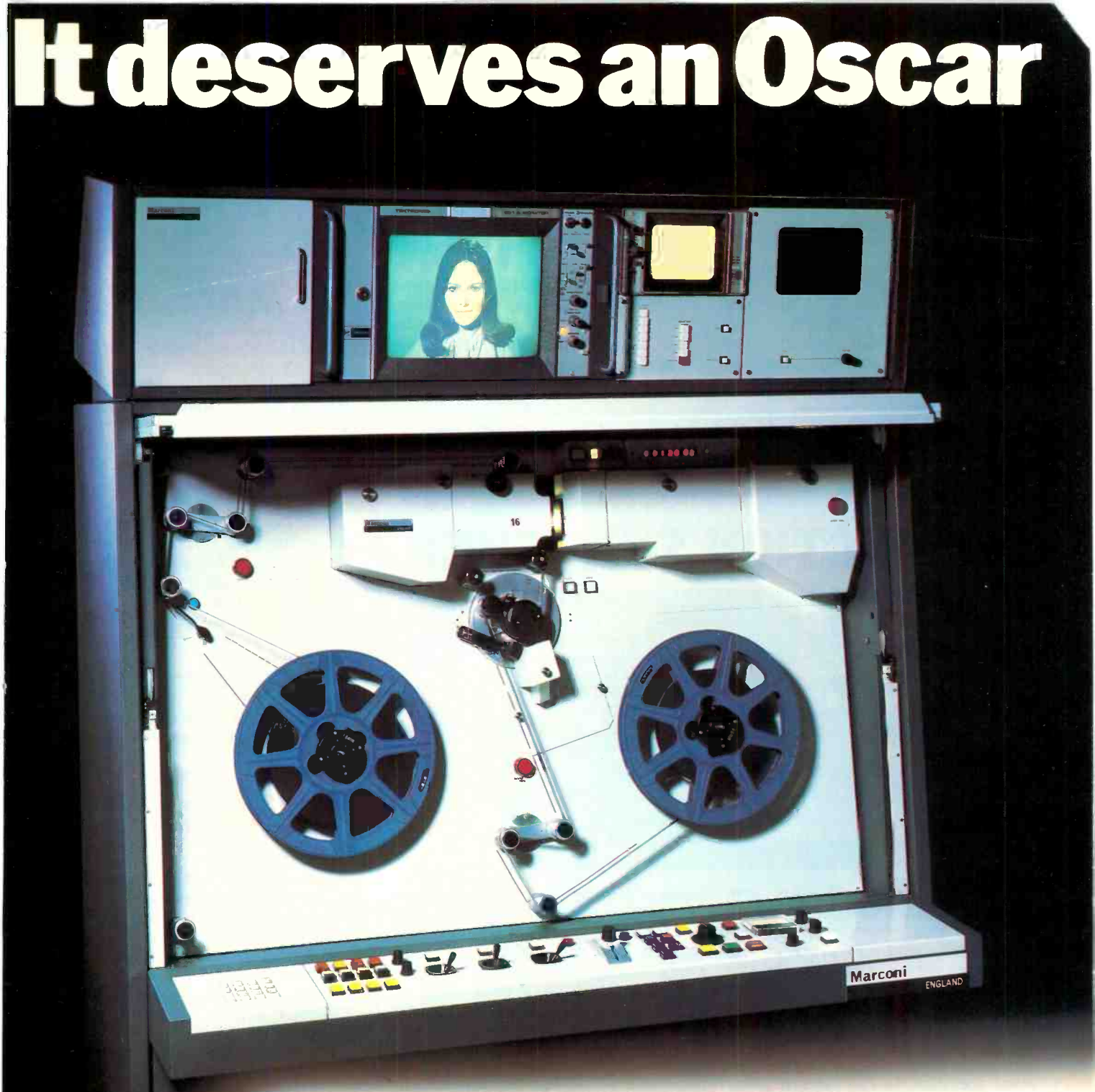
A scientist at NASA has invented a device that, when incorporated into a klystron, could cut the power requirements of UHF TV stations by as much as one-half.

The device, called a multi-stage depressed collector, increases klystron efficiency to as much as 30 percent—far higher than the 10 to 15 percent efficiencies now common in klystrons in UHF transmitters. Its inventor is Dr. Henry G. Kosmahl of the Lewis Research Center in Cleveland, OH, and its original purpose was to increase the signal intensity of communications satellites without increasing power consumption. Kosmahl pointed out that the price of electricity is rising by 20 percent a year; he suggested that such savings could make it attractive for stations to share the development costs of the new tubes.

With such obvious benefits to broadcasters, won't the device be on the market soon? It's not so simple, according to Robert Symons, program manager for UHF-TV products at Varian's Palo Alto Microwave Tube Division. Symons told *BM/E* that manufacturers may shy away from committing the large sums required for R&D on the device. Because depressed-collector tubes have already been built on a small scale, it might be difficult to patent the device. The tubes "offer extremely attractive advantages for power saving," Symons explained, "but it is not at all clear how a manufacturer will recover the development cost."

NASA's Dr. Henry G. Kosmahl with his invention, the multi-stage depressed collector.

It deserves an Oscar



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"We cannot conclude that the Commission abused its discretion . . . nor . . . that the Commission acted in an arbitrary or capricious manner."

In the other case, the U.S. Court of Appeals for the Second Circuit (New York) upheld an FCC ruling that the Commission's financial interest rule did not prohibit the three major television networks from acquiring nonbroadcast rights to TV programs. Viacom International had sought review of the ruling, which was in response to a request from CBS, Inc. At the time, CBS had argued that the original rule had not foreseen new home video technologies, such as videodiscs and cable.

Viacom countered that the rule prohibited nets from acquiring rights to independently produced programs other than license for network airing, and said that the FCC's interpretation constituted a de facto rulemaking and should be voided. The court sided with the FCC, however, saying that the action was in fact a reasonable interpretation of an existing rule and not a rulemaking.

RKO Loses WNAC at FCC; Next Stop, Supreme Court

Barring further appeals from RKO General, Inc., the FCC has given its preliminary approval for the New England Television Corp. to take over RKO's WNAC-TV, Boston. The fate of the station has been hotly contested since January 1980, when the Commission found RKO unfit to be WNAC's licensee because of the business practices of its parent company, General Tire and Rubber Co.

RKO has already filed an appeal with the U.S. Supreme Court—its last chance to keep WNAC. Until the court reviews the case, RKO must keep profits from the station in an escrow account, the FCC ruled. The money will go to public broadcasting or another nonprofit cause if RKO loses the case, the FCC said.

Last December, RKO lost an appeal before the U.S. Court of Appeals for the District of Columbia Circuit court, although the court ordered the FCC to reconsider its plan to revoke two other RKO television licenses, those of WOR, New York, and KHJ, Los Angeles.

If RKO fails in its final bid before the Supreme Court, the Commission plans to approve NETV, Inc., a subsidiary of the New England Television Corp., the WNAC license.

Mutual Sues Western Union, Alleging Breach of Contract

Claiming that Western Union has refused to deliver additional satellite channels that were specified in the contract between the two companies, the Mutual Broadcasting System has filed a suit against Western for performance of the contract and for $200 million in damages. The suit was filed in the U.S. District Court for the District of Columbia.

Mutual is presently using three single-channel-per-carrier audio circuits on Westar 1 for its networking operation. However, according to the Mutual complaint the contract with WU, dating to February, 1977, specified that WU would deliver up to five additional SCPC channels on Mutual's demand, and also make available a backup transponder on the same satellite to assure service if the first one failed.

Mutual says that WU has claimed that additional channels are not available, but has apparently sold some to other users whose contracts postdate that with Mutual. Mutual notes that long-based plans to serve its affiliates, now numbering about 1000, will be impossible to carry out without the additional channels. The damages claimed, according to Mutual, repre-

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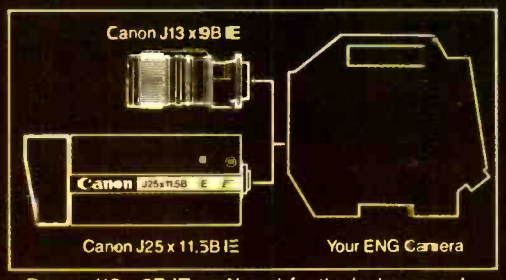

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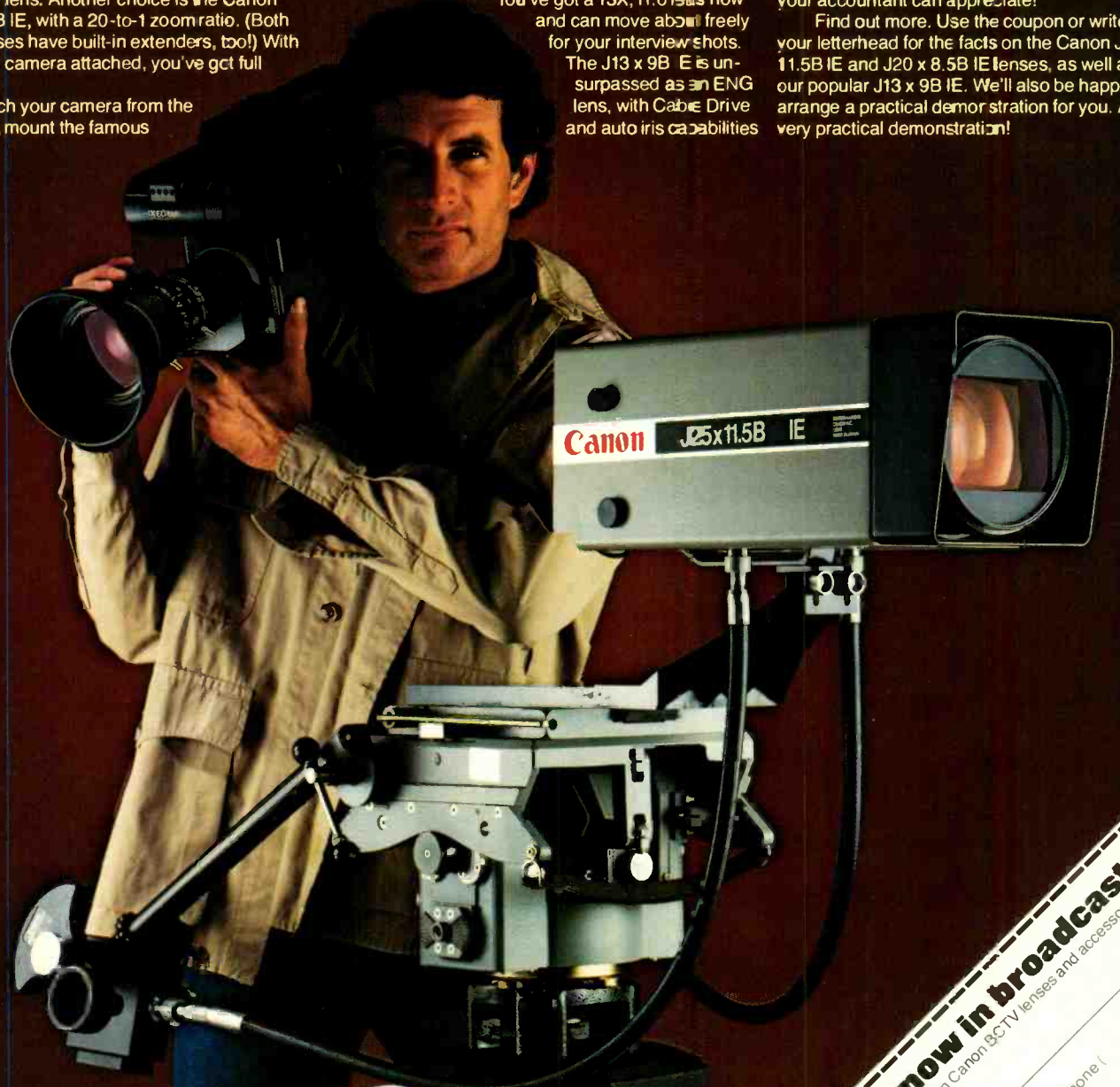

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sent a conservative estimate of the resulting loss of business. Western has refused to comment on the suit at press time.

No Industry Consensus on Teletext Standards Issue

With the comments in on the FCC's notice of proposed rulemaking on teletext (see *BM/E*, December, 1981, p. 12), the broadcast industry appears far from a consensus on whether the FCC should pick a standard or let the marketplace decide.

Lining up on the single-system side were NAB, CBS, ABC, NBC, and RCA. CBS, NBC, RCA and Telidon Videotext Systems, Inc., which markets the Canadian Telidon system here, all spoke up in favor of adoption of the North American Broadcast Teletext Specification (NABTS), worked out a year ago by CBS, AT&T, and proponents of Antiope and Telidon.

Taking the opposite stance were several broadcasters, including Field Communications, Taft Broadcasting, and Koplar Communications. Zenith Radio Corp., the UK Teletext Industry Group, and Satellite Television Corp. also voiced their opposition to a single standard.

In a related development, WGBH-TV, the Boston PBS outlet, has announced a teletext test with the Antiope system. The year-long test initially will involve 10 permanent and 10 rotating Antiope-supplied receivers, to be placed in public areas such as libraries, schools, transportation terminals, and shopping centers. David O. Ives, president of WGBH, cited the success of the current Los Angeles experiment involving public KCET-TV, CBS-owned KNXT-TV, and KNBC-TV, as "an important factor in our choice" of Antiope technology.

NAB Study Warns AM of Cuban Interference Threat

New high-power AM stations proposed by Cuba at the last Region 2 radio conference could have disastrous effects on AM stations in the United States, cautions a study just released by the NAB. According to the NAB's Michael Rau, who conducted the exhaustive survey, stations in 32 states and the District of Columbia would suffer interference if the proposed stations were built.

Hit hardest would be the AM clear-channel stations, some of which would lose their entire secondary service areas, Rau told *BM/E*. As an example, he cited WMAQ, Chicago: a proposed 50 kW station on WMAQ's frequency, Rau stated, would wipe out 98.3 percent of the station's coverage area.

Information from the station inventory submitted by Cuba at the regional conference was entered into the FCC's computer, using the FCC's AM model. The computer then determined which stations would be affected by each of the proposed Cuban stations, and what percentage of service area would be lost for each affected station. NAB plans to use the information to inform Congress that Cuban interference poses a serious threat to U.S. broadcasters.

In a related development, RTNDA reports that Radio Havana, broadcasting on 1160 kHz with 150 kW power, has been picked up as far away as Salt Lake City, UT. The "illegal transmitter" broadcasts English-language material from Radio Havana, plus programs from Radio Moscow.

Minority, Group Ownership Up, NAB Surveys Indicate

According to figures compiled by the NAB, minority ownership of commercial radio and television broadcast stations rose 21.5 percent last year. The association said that as of early February 164 commercial stations were owned by minority-group members—

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Vital Industries has instituted a cost-saving manufacturer-financing program - applicable to any Vital equipment purchase.

In accordance with our longterm commitment to more responsive television industry service, equipment purchases are being directly financed by Vital Industries itself **at 10% interest.**

Recognizing the barriers raised by prohibitively high interest rates, this financing program is offered well below prime — to permit prompt acquisition, without delay, of the advanced programming and operational systems so essential to productivity and profitability.

This bottom-line economy adds to the special advantage Vital offers TV management: **a complete line of switching, video effects and station automation equipment, available from one single source** — 25 sophisticated system options, totally line compatible. Including production and post-production mixers and switchers, plus our exclusive digital video manipulation system, the versatile Squeezoom®. All are state-of-the-art products of Vital's innovative technology; and all are now available with Vital 10% financing.

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News

compared to 135 a year earlier.

The majority of those stations—128—were owned by blacks, including 11 commercial television stations, seven of them VHF network affiliates. Hispanics own 28 radio stations and three TVs; three stations are owned by Native Americans and two by Asian-Americans. In addition, 32 of the almost 1400 noncommercial broadcast stations are licensed to minorities.

Dwight Ellis, NAB VP for minority and special services, cited the FCC's tax certificate and distress sale policies as instrumental in the growth of minority broadcast ownership. The rules, adopted in 1978, account for all the Native American and Asian-American-owned stations, NAB said.

Also up is group ownership of television stations, especially UHFers, according to a report prepared for NAB by Dr. Herbert H. Howard of the University of Tennessee's College of Communications. Broadcast groups now own 85.9 percent of VHF stations in the top 100 markets, up from 76 percent in 1975; multiple ownership of UHFs in the same markets has risen to 67.5 percent from 57.4 percent in the same period. The report notes that the number of UHF stations jumped from 106 to 157 in those seven years while the number of VHFs remained almost constant.

The number of stations affiliated with local newspapers has dropped significantly, the report claims, while overall affiliations with newspapers have climbed steadily.

Back to Leave NATPE

George Back, executive director of NATPE International since February, 1980, will step down from his post when his contract expires on May 31. Back cited increasing outside demands in program development and distribution, saying that the dual role had become too demanding.

NATPE's Executive Committee and Board of Directors, which met during last month's NATPE Conference, named Steve Currie as Back's successor. Currie, of KOIN-TV, Portland, previously served as president of the Executive Committee. Charles W. Larsen, NATPE first vice president and program director at WABC-TV, New York, headed a search team to screen applicants.

Currie said of Back, "He has been deeply involved with NATPE during several major and successful organizational changes and the introduction of new and improved membership services." He said he hoped to persuade Back to continue with NATPE as a consultant.

CBS's Bill Leonard Retires

Television news veteran William A. Leonard has retired after many years with CBS and CBS News. Replacing him as president of CBS News is Van Gordon Sauter, who had been deputy president since last fall.

Leonard's first job for CBS was a news reporter's spot for WCBS-TV in 1945. He had been with CBS News since 1959, except for a stint as CBS Washington VP in the mid-1970s. He reached the company's mandatory retirement age a year ago.

Among Leonard's credits are the naming of Dan Rather as Walter Cronkite's successor, the two-hour *CBS Morning News*, *60 Minutes*, and *Sunday Morning*.

Also experiencing a change of guard is NBC News, where Reuven Frank has taken over as president after the resignation of William J. Small.

New Radio Consulting Firm to Stress News, Information

A newly formed New York City-based radio consulting company, Cameron Communications, will assist clients in the development of news and information programming. Its founder, Jim Cameron, is a veteran in the field, with three Major Armstrong Awards and one Peabody Award among his credits. He is former news/public affairs director at WCOZ, Boston, and WHCN, Hartford. Most recently, he was instrumental in the creation of NBC's "The Source" radio network, and served as its news director since its inception in May, 1979.

"A modest-sized, properly directed, credible news operation can bring huge ratings to an AOR or AC station," Cameron insists. He says that deregulation frees news directors to "concentrate staff energy on quality news rather than its quantity."

New Company to Distribute Synchronizers in U.S., S.A.

A newly formed company will import and distribute the Audio Kinetics "Q-Lock" synchronizer in the United States and Central and South America. The company, Audio Kinetics, Inc., is the result of a merger between Quintek, the former importer and distributor, and Screen Sound, which held a software license to write specialized operating software for the film and video business. Audio Kinetics will continue to provide these programs, along with other new developments.

Audio Kinetics, Inc., is located at 4721 Laurel Canyon Blvd., North Hollywood, CA 91607, (213) 980-5717. Outside California, the toll-free number is (800) 423-3666.

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*U.S. Patent 4,225,751. Other U.S. and foreign patents pending.

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News Briefs

Almost **300 LPTV applications** were accepted for filing with a cutoff date of March 19, 1982, as the FCC moves ahead on its backlog of 6000 LPTV applications . . . . Satellite Television Corp., the Comsat subsidiary that has applied for a DBS commercial license, has urged the FCC to act quickly to **process the DBS applications** it has received . . . . The FCC, declining to create a new auxiliary broadcast license class for nonbroadcast station licensees, has **authorized broadcasters to use auxiliary frequencies** on a short-term, secondary basis without prior approval . . . . The Broadcast Bureau has **disbanded its Reregulation Task Force** and has named James (Steve) Crane as liaison to the Regulatory Review Working Group.

AT&T has filed a proposal with the FCC to offer **nationwide distribution of radio programs** over its Comstar satellite system. The high-quality, multichannel transmission and distribution system is planned to start up later this year with syndicator DIR Broadcasting as the first customer . . . . **Radio ENG is the key** to the viability of the medium, UPI Audio Network's general manager David R. Donovan told delegates at the recent Colorado Broadcasters Assn. annual meeting . . . . **Over 40 stations have signed** to carry RadioRadio, CBS's new young adult radio service, scheduled to premiere April 26.

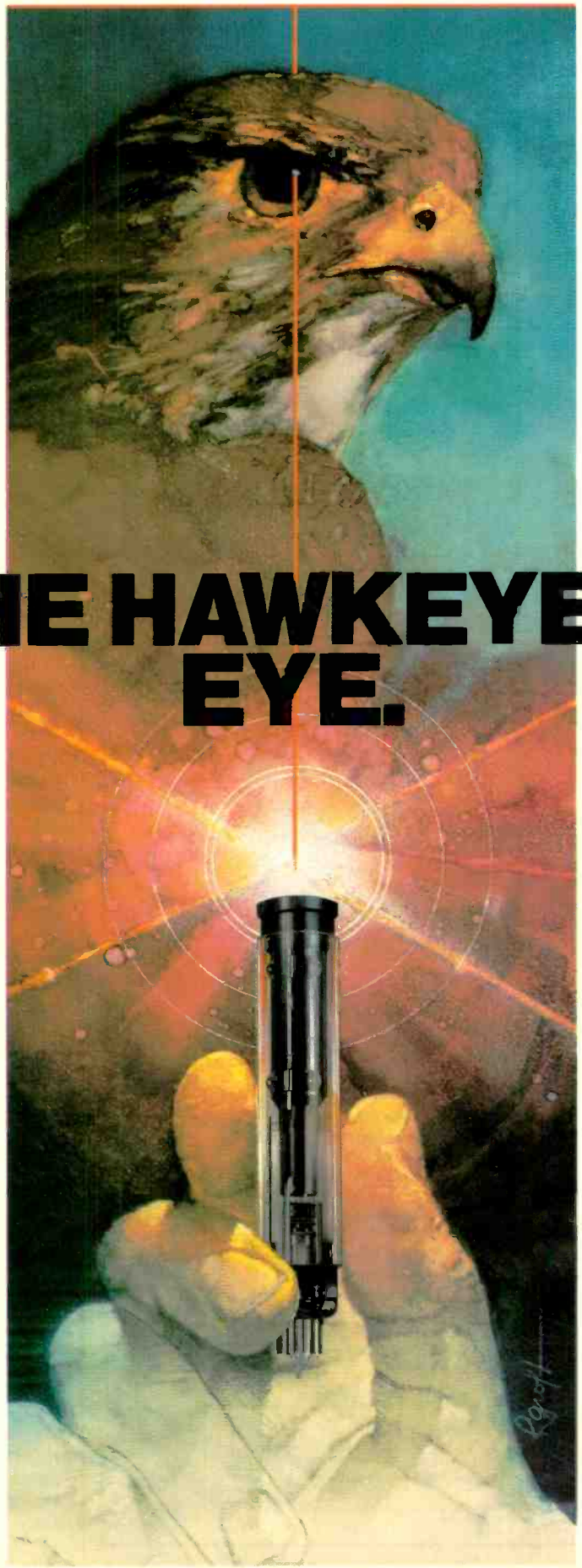
RTNDA president Wayne Godsey has called upon the Senate to **pass S. 20,** the bill that would allow radio and television coverage of Senate floor proceedings . . . . SMPTE's working group on **standards for the half-inch cassette video recorder** for broadcast applications is continuing to meet regularly, but may face difficulty reconciling the different systems . . . . Applications are due April 26 for the next **SBE certification exams,** to be held June 18 to 26. For an application, write to the Certification Secretary, SBE, P.O. Box 50844, Indianapolis, IN 46250.

The NAB has told the FCC it supports the Motion Picture Assn. of America's **copyright proposal for CATV systems,** which calls for "all evidence that is relevant and material to establishing the full value" of distant signals and syndicated programs to be considered in setting copyright royalties . . . . The association also told the CRT that **broadcasters deserve a share of the royalties** awarded for syndicated programs, many of which they produce.

Radio's **pretax profits for 1980 dropped** 33.6 percent from the 1979 levels, according to the FCC's annual financial figures for commercial radio. Total revenues rose 10.4 percent, but increased expenses accounted for the loss in net . . . . Entries for the **1981 Major Armstrong Awards,** sponsored in part by NRBA, are due June 1 . . . . RKO says that its **RKO One radio net ranked number one** among all 10 nets in its target demographics according to the spring 1981 Arbitron . . . . The RKO Radio Networks have become charter members of the new **Radio Network Association,** formed February in New York City. RKO president Thomas F. Burchill is vice chairman of the group, which is chaired by Edward F. McLaughlin, president of the ABC Radio Networks . . . . WNGE-TV, Nashville, TN, received a **first place award** in the U.S. Television Commercials Festival for a station promo written and produced in-house.

The Audio Engineering Society will hold a conference on **"The New World of Digital Audio"** at the Rye Town Hilton, Rye, NY, June 4, 5, and 6 . . . . **Test & Measurement World Expo** will take place April 19 to 22 at the San Jose Convention Center. More information is available from conference director Meg Bowen at (617) 254-1445.

INTRODUCING



THE HAWKEYE'S EYE.

RCA's revolutionary new handheld HAWKEYE ENG camera was built around a revolutionary new RCA tube — the ½ inch SATICON*. Its superior performance is the direct result of enlightened design techniques and the inherent characteristics of the Selenium-Arsenic-Tellurium photoconductor.

The SATICON tube offers outstanding resolution, and handles high-contrast scenes without unpleasant distortion or discoloration. Color pictures come through spot-free, without flare. For these and many other reasons, SATICON tubes are now used in over 50% of the new color cameras sold in North America and Japan.

On the basis of performance, reliability and general user acceptance, they will soon predominate in color television cameras worldwide.

SATICON tubes are now available as new or replacement equipment for most ENG, studio and remote cameras. For more information, please write RCA Camera Tube Marketing, New Holland Avenue, Lancaster, PA 17604. Telephone: (717) 397-7661. Or RCA Brussels, Belgium. Sao Paulo, Brazil. Sunbury - on - Thames, Middlesex, England. Paris, France. Munich, W. Germany. Hong Kong. Mexico 16 D.F., Mexico.

RCA

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Business Briefs

Ramko Research, Inc., with the backing of one of the world's largest banks, now has a low 10 percent per year financing plan for up to two years .

Midwest Corporation has announced an agreement with the National Republican Congressional Committee to install a one-inch video editing system in the group's studio facility . . . . **Ampex Corp.** has signed a contract with **Metromedia Television** to deliver 10 VPR-2B VTRs, a VPR-20 portable one-inch VTR, and related video equipment valued at over $1 million . . . . A white paper on "One-Inch Videotape and the VTR" has been released by **3M** and will be available to members of the industry who send their requests on a company letterhead to 3M in St. Paul, MN 55101.

Sony has announced that **The Vidtronics Company, Inc.,** has purchased five BVH-1180 VTRs for its videocassette duplication and post-production divisions . . . . **Video Transitions** has added Sony BVU-800s to its ¾-inch, one-inch Edit Bay II . . . . **Western Videotape Productions, Inc.,** has purchased two Sony BVU-800 VCRs for its post-production department.

Satellite Communications Network, Inc., has announced the leasing availability of occasional transponder time on two satellites: Westar I-transponder 3 and Comstar D2-transponder 10V . . . . **Satcom Technologies, Inc.,** has received orders totaling more than $600,000 for earth station antennas to be used at TV broadcast stations . . . . **The Graphics Express Corp.** has recently designed sets for five of the six Times-Mirror television stations . . . . **RCA Astro-Electronics** will build four advanced Satcom satellites, the first of which will be launched in October 1982 and dedicated to Alaskan service. The company's Commercial Communications Systems Division has begun regular deliveries from production of its TR-800 one-inch VTRs . . . . Radio station KYXY, San Diego, CA, recently installed a new **Harris** FM-25K FM transmitter. Harris Farinon Video has changed its name to **Harris Broadcast Microwave** to appropriately designate that division's marketing format.

Oak Industries, Inc., expects to file with the SEC a registration statement covering a $100 million convertible subordinated debenture offering . . . . In its second year as a fully operating company, **Logica, Inc.** more than doubled both its revenues and profits, according to Dr. M. C. Faulkes, president.

Radio Arts has concluded its best year ever with strong sales at the end of 1981 . . . . **ADDA Corp.** announced record earnings for the first quarter of 1982, surpassing those of any full year in the company's history. Walter Byers and Thomas Pashos have been named to the Board of Directors at the company's annual meeting in January . . . . ADDA has also announced delivery of ESP-150C still store systems to **Warner-Amex,** New York, and to **Paramount Studios,** Los Angeles.

Alcon Productions, Inc., recently completed videotaping (for the three major network affiliates in New Orleans and for ABC in San Francisco) the launching of the largest container ship ever built in the U.S.

With its increase in size and production method, **Wolf Coach** has moved to a larger facility at 7 "B" Street, Auburn Industrial Park, Auburn, MA 01501 . . . . **Independent Television Sales** has moved to 444 N. Michigan Ave., Suite 1770, Chicago, IL 60611 . . . . 7201 Lee Highway, Falls Church, VA 22046 is the new address for **Perrott Engineering Labs,** supplying the firm with larger quarters and superior facilities . . . . **Gateway Productions,** an independent commercial and pay television production company, is now headquartered at 304 East 45 St., NY, NY 10017.

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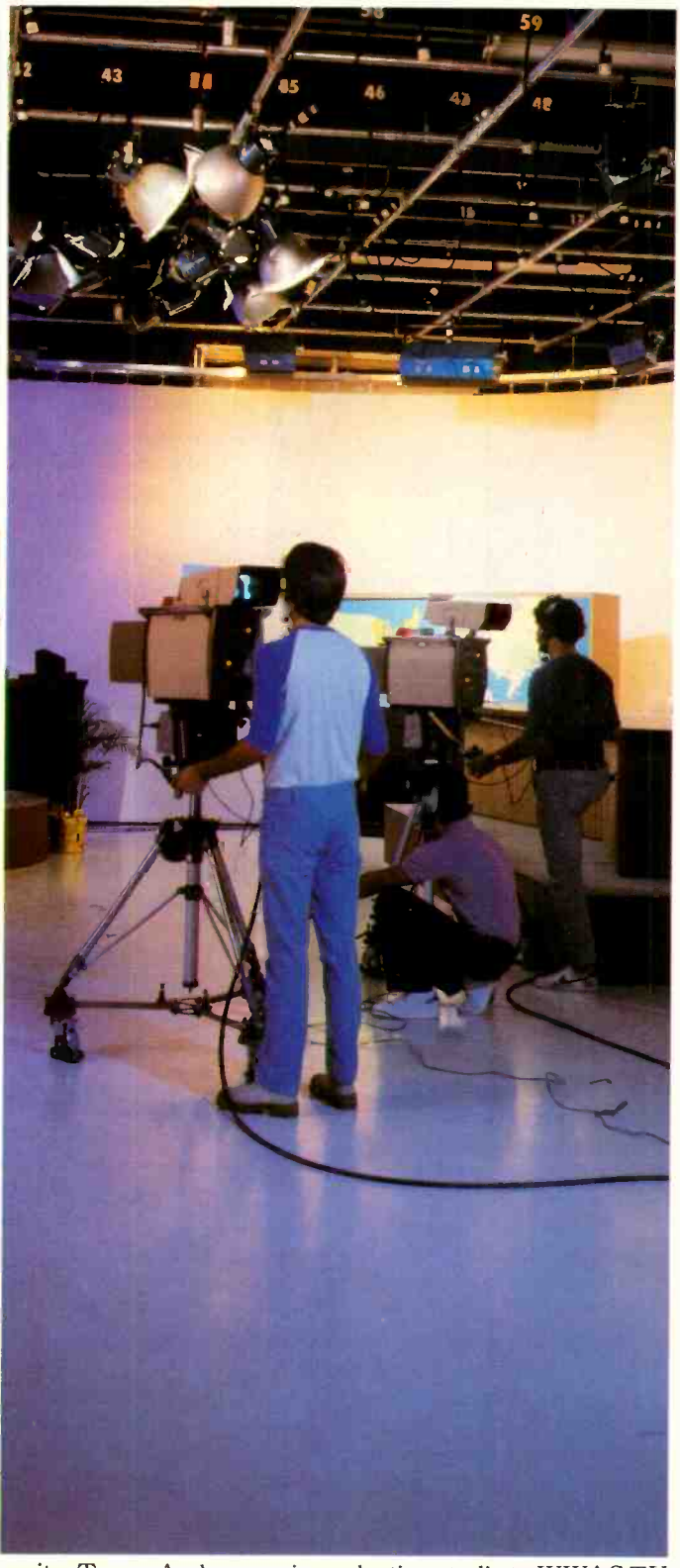

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Prime Time

For information on the products or services mentioned here, contact your RCA Representative. Or write RCA, Prime Time, Bldg. 2-2A, Camden, NJ 08102.

TR-800 Field Reports A-OK

Final testing is completed on the latest shipment of customer-bound RCA TR-800 VTRs.

Successful integration reports of the TR-800 one-inch helical scan video tape recorder are arriving daily at the RCA Camden assembly facility. The announcements have come from around the world as the TR-800 proves itself in both the International and United States video production markets.

Multi-Feature Deliveries

Various configurations of the versatile TR-800, from the compact transportable to the multi-feature studio console with monitor bridge, have been accepted at customer locations. To meet specific broadcast and production requirements, many of the TR-800s have been equipped with AE-800 time code editing systems, TBC-8000 time base correctors and Multi Rate Video Controllers. The micro-computer controlled TR-800 will interface with existing RCA Quad and One-Inch recorders providing operations with versatile and cost-effective installations.

HAWKEYE Now Even More Versatile, More Compact

Applications versatility was a major design objective of the HAWKEYE system. Modular system design the inevitable result. Now the system is even more flexible to meet more of your field and studio operations needs. HAWKEYE *is* the most complete, and adaptable recording camera system available today.

Compact Recording Camera With Field Playback

The HCR-1 one-person field production system is more versatile than ever. A built-in time code generator, new as a standard, saves your crew valuable post-production time. A new playback option allows your operator to play back recorded material thru the viewfinder for in-the-field confirmation of picture results.

New Remote Control Option

For electronic field production flexibility, HAWKEYE offers triax remote control for the HC-1 camera. There's no beltpack, simply a triax adaptor that links to the HC-1 camera back. The system, with complete video, control, and audio functions, provides power for the camera over cable lengths up to 5,000 feet. NTSC or PAL composite, Y-I-Q baseband or R-Y, B-Y signals may be transmitted between camera and base station. Compact, the base station mounts in a half-rack space, allowing more convenient monitoring and scope arrangements. The compact operator's panel reduces console space requirements.

New VTR Configurations

Engineered VTR improvements include new configurations. Field recorders are more compact. A four-channel microphone mixer built into the baseband adaptor offers added audio capability without bulk. The HR-2 studio VTR now provides a search and jog function to allow quick location of recorded material. Accessibility is facilitated with a front panel that swings up to reveal all circuitry, even while the HR-2 is in operation. That's convenience, that's flexibility.

HAWKEYE. The best performing, most versatile recording camera you can consider. Our new brochure Form #9298B will reveal all the HAWKEYE system advantages. Write for your copy.

TR-800 World-Wide Performer

Starting in late 1981, deliveries of RCA's TR-800 video tape recorder have been made internationally to many customers. These include:

The Arab Republic of Egypt
P. T. Taju Puspa Ltd.—Indonesia
Venevision—Venezuela
HSV-7—Australia
WOR—New York, NY
WRGB—Schenectady, NY
WREX—Rockford, IL.
WEHT—Henderson, KY
Ft. Bliss-El Paso, TX
KVUE—Austin, TX
WTRF—Wheeling, WV

TR-800 deliveries continue, and RCA has announced that new orders are now being accepted for Spring delivery.

TTG-Series TV Transmitters: 10 kW to 100 kW

With the addition of the new TTG-35H, highband 35 kW model, RCA's G-Line series of VHF Transmitters now includes 27 models, covering highband, lowband, single-end and parallel systems—in a range of power outputs from 10 kW to 100 kW. Models are available for all video color standards—NTSC, PAL and SECAM.

TTG-Series transmitters are designed for superior picture and sound quality; high reliability and operating economy. Solid state up to 1600 watts in high power versions, the transmitters employ only two tubes—an aural and a visual. There are a minimum of tuning controls, and the broadband driver has no tuning controls. Precision sideband shaping is accomplished with a high precision surface acoustic wave (SAW) filter.

Catalog TT.1000B provides descriptive data on TTG-Series transmitters, and a listing of available models. Write for your copy.

More than 100 of these new generation transmitters have been sold in a combination of single ended and parallel operation, and field performance results have been excellent.

New Generation Camera, TK-47B

RCA introduces the TK-47B, a new generation camera that refines the finest picture quality available today and cuts production time even further.

TK-47B's "Smart" remote control unit doubles the number of video controls. With its memory base, operators can file video decisions for up to 32 scenes and recall any scene at any time and in any order.

Registration is radically improved due to an asymmetrical correction scheme that reduces error throughout the entire raster. And a new preamplifier design virtually eliminates video noise for picture perfect results.

Other new features include selective auto set-up, an external chart checkout capability, and lens files that correct for lens optical path differences during auto set-up.

All American TV25 Airs Daily Show on Satellite with Three RCA TK-47 Automatic Cameras

RCA TK-47 cameras get daily workout on "Richard Hogue Show". Program is beamed via satellite to audience of over seven million.

"We put our TK-47 cameras to the test every day." Those are the words of D. K. "Spec" Hart, Chief Engineer for All American TV25, KOKH-TV, the three year old John Blair Company station in Oklahoma City. "The TK-47s have come through with flying colors . . . are doing an outstanding job, day in and day out," is how he sums up the performance of the cameras.

In addition to a heavy commercial production schedule, the cameras are used for the satellite airing of the hour-long Richard Hogue Show produced by the station's production arm, Studio 25.

Mr. Hart, a veteran of 28 years in the business, first saw TK-47s in action at KDFW, Dallas, at the time of the 1979 NAB. He said the newsroom shots were the quietest he had ever seen. Turned out, they were the first TK-47s shipped (Serial No's. 1 thru 4).

Shortly after joining KOKH-TV later in 1979, Mr. Hart made a return visit to Dallas to talk to KDFW personnel to get first hand information on the 47s. He also did comprehensive performance comparisons with four other cameras. Results of all that groundwork ended up with the selection of three 47s for All American TV25 and Studio 25.

"We run the cameras through a daily check—it takes only a few seconds—every day before the live show and we know we're ready to go. The 47s have helped us grab an ever increasing share of production business, too. For a new station in the market, that's a real bonus."

D. K. "Spec" Hart, Chief Engineer at All American TV 25 and Studio 25, KOKH-TV, Oklahoma City.

RCA

Special microphones for special sound requirements

As an audio specialist, you know making do with "utility" microphones isn't good enough. You need a complete assortment of microphones, each suited for specific applications. Microphones that not only sound superb but are built to withstand the abuse of session to session punishment.

Shure SM line professional microphones offer built-in ruggedness and reliability and are designed to give you the optimum performance you need in every circumstance, whether it be for • a bass drum (SM7); • an acoustic stringed instrument (SM17); • percussion instruments (SM56 and SM57); • snare drum or acoustic guitar (SM81); • amplified instruments (SM53 and SM54); • studio quality vocals inside the studio (SM59); • studio quality vocals outside the studio (SM85); • stand-up interviews (SM61 and SM63); • desk-top applications (SM33)... or *whatever* your needs.

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RADIO
PROGRAMMING & PRODUCTION FOR PROFIT

Mutual Tees Up For Golf Course EFP

Larry Michaels, Mutual sports producer, tries out new backpack radio remote.

HOW DO YOU keep a sports reporter on the air via a national network as he or she follows a golf tournament from green to green, sometimes crouching in front of the crowd to give a whispered account of the action? Mutual, in the business of reporting the major golf tournaments for many years, has in the last year built a multi-element remote pickup and production system that brings technical quality and flexibility to the reporting job.

The mobile parts of the system are all carried in a backpack by the reporter. Those units connect the reporter with a command post set up in the press pavilion located at most large golf tournaments, or in any other spot that has access to telephone lines. The system is used not only for golf but also for other sports when a completely mobile reporter is essential.

Bill Wisniewski, Mutual's chief engineer and the principal designer of the new remote system, says the backpack, built by the Mutual engineering department, was configured for long-term comfort. It has a hinge near the middle so that when the reporter crouches at the edge of the green, the bottom of the backpack won't stick out horizontally.

The main program transmission is with a Comrex wireless microphone on 445 MHz. A nine-inch transmitting antenna is fastened to the top of the backpack frame, which also serves as a ground plane. A 5 A battery in the frame gives up to five hours of continuous service.

The Comrex system easily covers more than a mile, which is good enough for most any golf pickup. The receiving equipment for the wireless microphone, set up in the command post, has two antennas for diversity reception; the antennas can be placed for best coverage, taking into account the terrain and any interfering structures.

At the present time the program is sent to Mutual's Washington studio via two conjoined telco lines, using the Kahn band-expander system, which shifts frequencies to get a full 50 to 5000 Hz bandwidth on standard telco lines. This requires, of course, encoding at the transmitting end (the field command post) and decoding at the Washington studio. From the Washington studio the program goes to Mutual's own uplink in Bren Mar, VA, for na-

Radio Programming

tional distribution by the Mutual satellite net (See *BM/E*, November 1981, p. 71).

However, Wisniewski reports that Mutual is actively exploring the possibility of using a mobile uplink at sports sites to get the signal to Washington via satellite. This plan will undoubtedly be implemented at some future date when suitable uplink units are available at reasonable cost. Most mobile uplinks in use now were designed for television and are very wasteful of bandwidth — and thus of cost — for radio.

A second system incorporated in the backpack and in the command post is the Comrex 26.37 MHz IFB (interrupted feedback radio link). This allows a producer at the command post to break into the monitored program audio, which the reporter is following with a standard broadcast receiver, to give instructions, ask questions (answered over the same system), and direct the operation as a whole. This becomes essential when there are two or more reporters on the course, as there must be in the early stages of a golf tournament. The producer must be able to direct the reporters for efficient coverage.

Mutual claims the IFB radio has supplied the "missing link" in wireless network coverage of sports. The IFB is backed up with a Motorola 5 W VHF high-band walkie-talkie system, also in the backpack, which can be used in an emergency.

Another improved operation in the system is supplied by a new cassette recorder, the Sony TCM-5000, which Wisniewski says has eliminated the susceptibility to RF interference that plagued earlier cassette machines. At any major sports event, with both radio and television remote operations crowded close by, the RF field is likely to be intense and varied. The new Sony machine is unperturbed by straying and powerful RF energy.

Before the development of the mobile system, covering a golf tournament required the preliminary laying down of telephone lines over the course, with outlet boxes at points judged likely to be centers of interest during the play. Mutual's vice president for sports, Jack Clements, points out that these spots often turned out to be wrong guesses, and the crew had to move the telephone lines and boxes in a hurry, with the risk of missing important action.

With the mobile system, Mutual's golf reporters can go where the play is, while the listener gets precise play-by-play descriptions and the kind of "you are there" feeling that makes Mutual's coverage effective. **BM/E**

IF THE FCC ISN'T GOING TO SET A STANDARD FOR AM STEREO, WE WILL.

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Real People Proves U-Matic a Real EFP Alternative

THE POPULAR TELEVISION series *Real People*, known for its many "television firsts," is now one of the first prime time network programs to be produced almost entirely on ¾-inch videotape. The less expensive, more portable U-Matic equipment allows *Real People* production crews to capture a candid side of life that would have been missed just a few years ago.

Real People was one of the first to take television out of the studio and into the field, popularizing the current trend in reality programming. The program's use of U-Matic video recording gear has resulted in more individual assignments being accomplished by smaller crews. According to George Schlatter, producer of *Real People*, "When you can put the tools into the hands of people—when you can provide inexpensive, quality equipment to creative people so that they become viable contributors—you'll find that adventure returns to television."

Portable U-Matic equipment permits Real People *production crews to capture a candid side of life.*

Adventure is the key ingredient of *Real People*'s success. During the show's three-year history, over 3000 on-location stories have been shot. In many respects, the evolution of the program parallels the increased reliance on ¾-inch gear for reshaping traditional television production methods. Most recently, Schlatter has added Sony's new BVU-800 U-Matic VTRs to his production scheme.

Real People crews shoot 90 percent of their material on ¾-inch tape using Sony BVU-50s. They also carry a Sony BVU-110 that has playback capacity for reviewing material in the field. Each crew consists of five people, and according to Hank Barr, location manager, "They carry about half as much equipment as they did when we first started shooting the show." At that time, almost 80 percent of the stories were shot on film.

The *Real People* BVU-50s and BVU-110s have been put through more extreme conditions than any testing laboratory could have devised. According to Barr, segments have been shot in mud, rain, and snow; in the freezing Texas winter for the annual "Pig Day"; in the intense heat of the Arizona desert; and in both indoor and outdoor locations with dramatically fluctuating temperatures and humidity.

At less than 13 pounds, the light weight of the BVU-50 has made life easier for Stuart Fox, tape operator and sound recordist for *Real People*. Much of the program is literally shot on the

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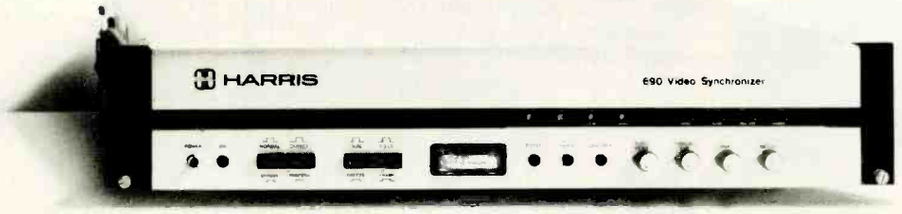

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run, as in following sporting events or chasing down stories in progress. Fox explains, "The BVU-50 is a machine I can carry on my shoulder with additional equipment—a mixer, wireless receivers, fishpole mic—and still have something left in me at the end of the day."

The most dramatic incident in the show's history took place during the taping of a rodeo when a raging Brahma bull charged the *Real People* crew, leaving its hoofprint on Fox's BVU-50. Although the VTR suffered a few bent brackets, the tape was recovered and aired. The VTR was back in service within a week and has been functioning reliably ever since. This equipment dependability has allowed for the extremely tight scheduling necessary for the show's breakneck pace and multiple crew logistics.

The U-Matic cassettes shot in the field are brought back to headquarters and simultaneously transferred to cassette work prints and bumped up to the one-inch working masters. Time code is burnt into the work prints coinciding with the one-inch masters, and the average two hours of tape for each five-minute segment are edited off-line.

Following several stages of editorial decisions, the one-inch masters are edited, assembled, and then broadcast during the presentation of the show with live audiences at NBC in Burbank. Since the BVU-800 has just recently been introduced, there are currently various uses of the machine still being planned.

According to Schlatter, "The significant differences now with the new BVU-800 are its tape transport system, controls, and picture quality."

"We are going to do a sitcom that will be shot on location," reports Barr. "We will be using the BVU-800s rack-mounted in a van and then editing those tapes utilizing the other BVU-800s we have. Frankly, I think ¾-inch is more reliable in the field than portable one-inch. As far as producing a complete prime time television program on ¾-inch tape, I have no reservations at all."

The cost of a BVU-800 is a fraction of the cost of a comparable one-inch machine, but the real broadcasting advance comes in the reduction of critical generation losses. Schlatter explains, "We can go from five BVU-800s feeding a one-inch machine and do all the opticals, going from the original onto the one-inch tape. This is put on a composite reel, and by the time we get to our air copy, we are no more than three generations down."

Because of the improved picture quality it offers, the BVU-800 is immediately used in the current production setup for the transfer to one-inch. The new machines have also been incorporated into the new on-line editing suite, where both format machines work in equal combination.

Designed for broadcast applications, the BVU-800 is capable of capstan controlled search and jog modes with fixed speeds of 1/30 to 10 times normal speed in either direction. Editing functions include ASSEMBLE, INSERT, PREVIEW, AUTO EDIT, REVIEW, ENTRY IN/OUT, and TRIM. With the new microprocessor-based control system built into the BVU-800, the unit interfaces in a variety of fixed and compact mobile applications. "It's an absolute natural to have a couple of BVU-800s in a news truck, because you can seriously begin packaging the stories in the field," points out Vince Humphrey, engineering manager.

To utilize the full capabilities of the BVU-800, a new editing suite has been designed at Schlatter's Hollywood studios. Here, the machines are combined with Sony BVT-2000 time base correctors and high-quality video and audio distribution amplifiers. "It's strictly an on-line room with top-of-the-line quality in all signal handling equipment," Humphrey states. **BM/E**

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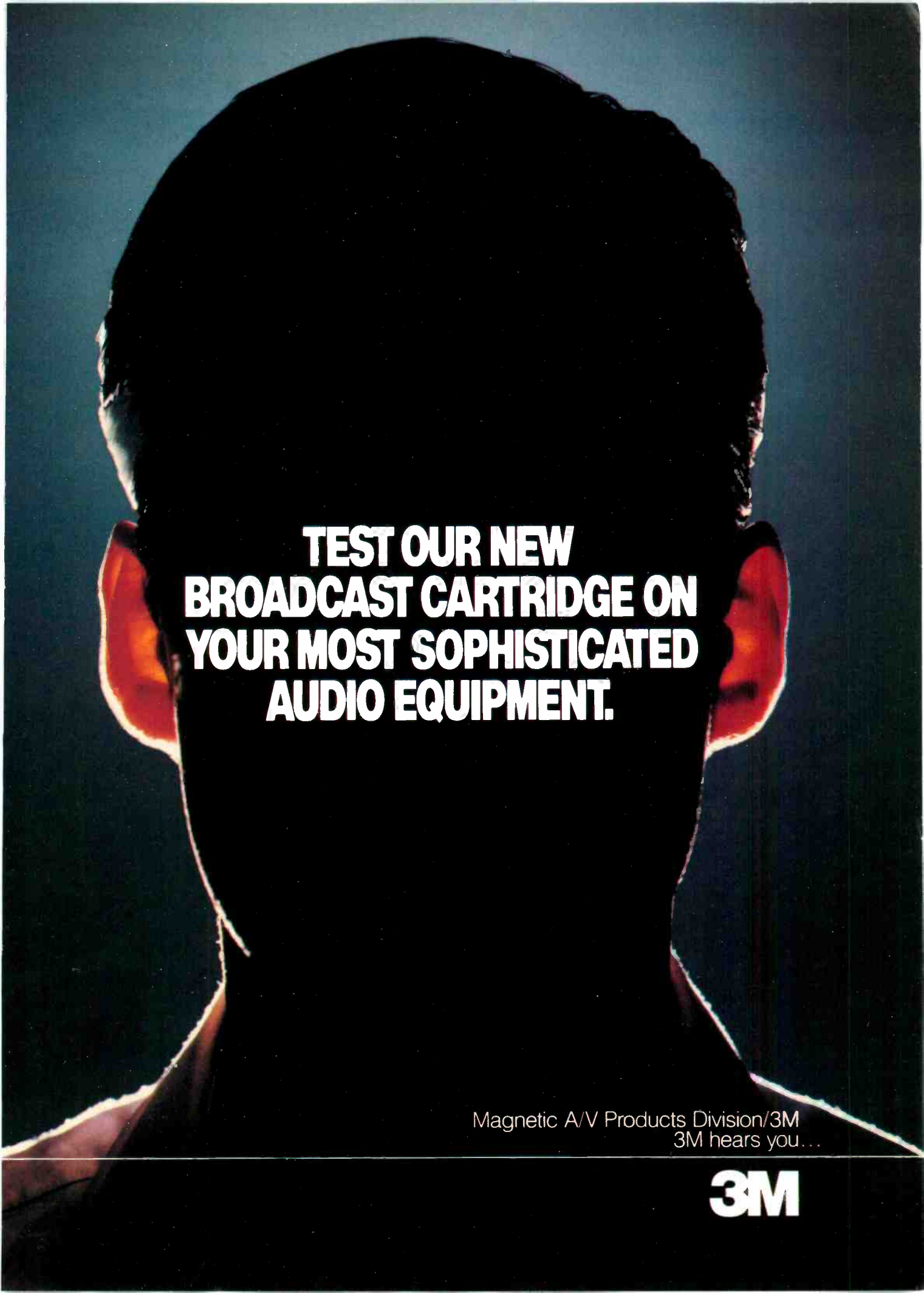
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EFP

CONVOY!

When television production goes on the road, it moves in everything from giant tractor-trailers to panel trucks.

FIELD PRODUCTION is a cornerstone of today's television programming — and the cornerstone of field production is the mobile production vehicle. Broadcasters and program producers have a broad range of options in choosing a vehicle, from the impressive studio-on-wheels packed with the most sophisticated production equipment to the modest, do-it-yourself van designed for simple but high-quality work. From one end of the continuum to the other, however, the goal remains the same: getting the best possible picture on tape.

NBC: an all-out truck for all-out sports

Network sports coverage is big business, and when NBC Sports decided to replace one of its older mobile trucks, it knew better than to pull any punches. The net's latest truck, now being built by A.F. Associates in Northvale, NJ, on a Gerstenslager box, promises to be one of the largest production vehicles on the road. The 45-foot truck has an expandable design that allows one side to pull out to a width of 24 feet, greatly increasing workspace in the videotape and switching areas.

"It's a super configuration," says Don Baer, vice president of sports operations for NBC-TV. "It's much more like you might find in your studio within a building." Baer told *BM/E* that the layout of the production area is opposite that usual in a truck of this kind, giving the producer, director, and TD additional workspace. Baer had seen a couple of trucks laid out this way — one at the Canadian Broadcasting Corp. in Vancouver — and was impressed with the comfort and efficiency of the design.

Perhaps the most innovative aspect of the new truck, however, is that it is designed for independent operation. According to Baer, NBC Sports has traditionally travelled to major sporting events with three 40-foot trucks: a control truck, a video truck, and a utility truck. The 45-foot trailer, on the other hand, will be able to handle all but the very largest event with no auxiliary vehicles.

"It's going to save us money in the long run," Baer explains, "because all the interconnecting that's involved in the initial setup among the trucks is eliminated. And it will be far more efficient."

Much of the equipment for the new truck will be taken from a 23-year-old 40-footer now based in Burbank, CA that NBC is taking out of service. The gear is hardly of the same vintage as the old truck, however, and includes recent RCA cameras and one-inch RCA tape machines with slow mo. The truck will handle up to 12 cameras, Baer says, but normally will be outfitted with seven tripod-mounted cameras and one hand-held — all from RCA. The switcher is a 28-input Grass Valley Series 300 with digital video effects and E-MEM.

Other production equipment will include a Quantel framestore and a two-channel Chyron IV for graphics. For audio, the truck will carry a 60-input console.

"The reason we're going that large," explains Baer, "is that we envision this truck eventually being able to handle every major golf tour — we won't have to supplement."

Baer is looking forward to taking delivery on the truck September 1 — "and this will not be the only one," he insists, just the first. Plans call for this, and all other NBC mobile units, to be based in the New York area, although it will travel across the entire country.

Production houses look to big trucks

AVT Television Productions of Knoxville, TN, started out thinking small, but ended up with a 45-foot state-of-the-art mobile production facility. Company president William H. (Bill) Tapp explains what happened:

"The World's Fair will be in Knoxville beginning in May. We went to the director of entertainment at the World's Fair and said that we'd like to build a small production truck — three cameras and a small switcher — to use on the site for whomever might need it." The World's Fair folks were amenable to the idea, Tapp says, but the discussions and research failed to turn up any way to do it "in a positive financial way." Tapp and his

associates couldn't let the idea go to waste, however, so last May they went to New York City, where they spent a hectic two days talking to major users of large mobile facilities to find out exactly what their needs were.

The final result was the Performer, a 45-foot truck that went on the road last November and has already racked up several major sports and entertainment specials. The truck was built by Lerro Electrical Corp. of Philadelphia, with fabrication and decoration supervised by Spinlab. "Lerro provided a great deal of support as far as their staff of engineers and their close working relationship with Hitachi," Tapp says, "and they've been invaluable."

The Performer carries production facilities that would impress all but the most jaded: a 24-input Grass Valley 1600-7K switcher with three M/Es, an MCI/Quantel DPE-5000 digital production system, and a two-channel Chyron IV graphics system with remote keyboard capability. All seven cameras are triax-equipped Hitachi SK-96s, five in studio configuration and two hand held. Tape machines are also from Hitachi — three HR-200 one-inch decks with waveform, vectorscope, SMPTE time code, and slow-mo controllers, plus an HR-100 portable one-inch VTR. In addition, there is a JVC-CR8200U ¾-inch machine. Total cost for the system was $2.5 million.

The truck also used to house a Convergence ECS-104 editor. "Our thought in this was that it would be nice to be able to do something and post-produce it and send it straight back in tight, tight situations," Tapp explains. Using the editing system, however, became too complex, and customers responded less enthusiastically than AVT had hoped. The system is therefore being removed.

Audio equipment includes a Yamaha PM2000 32-input stereo board and three Broadcast Electronics stereo cart machines. Video monitors are by Conrac, Videotek, Hitachi, and Sony; signal monitoring is by Tektronix.

Somewhat similar in approach is Trans-American Video's new truck, the 740, which TAV designed and built itself. Ross Eassty, executive vice president of the Hollywood-based production company, told *BM/E* that the truck is equipped with a complete telephone system with a hookup for 52 phones on the outside, a boon for network users who use many phone lines.

"We did a lot of research in designing the truck," Eassty says, "and of course we did a lot of investigation and talking at the NAB convention with all of the manufacturers. We decided to go with the RCA TK-47 computer-controlled triax camera, and that was the biggest decision. There are four TK-47s and two Ikegami HL-79A hand helds. For tape machines we have Ampex VPR-2Bs with slow mo." Other equipment includes a Quantel DPE, Chyron 4B graphics system, and RTS Systems IFB.

The 740 is built in four separate compartments: video, production, audio, and videotape. Eassty notes, "We saved a lot of room by having four doors in our truck. That way, you don't have to lose space to corridors from one compartment into the other. Most people who have used the truck think that's a lot better." A big — and successful — investment, the truck cost TAV some $2.25 million.

Video West goes two routes

With a host of major network and cable clients, Video West of Salt Lake City (a division of Bonneville Productions and associated with station KSL-TV) decided to diversify its mobile holdings with two trucks. The larger, a 35-foot Kenworth diesel with a 27-foot box, carries up to six triax-equipped HL-79 cameras with a full assortment of lenses and two Ampex VPR-2Bs with slow mo. When *BM/E* talked to Video West's Al Henderson, he said the company was just in the process of replacing the truck's 12-input audio board with a 24-channel unit.

"We found that for sports, even if it's a simple sports setup,

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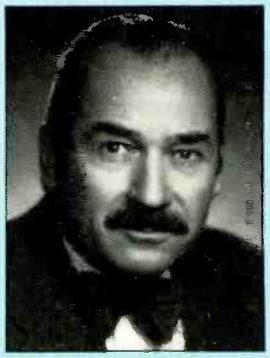

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Video area and monitor wall of AVT's big truck.

needed. Jon Munderloh, Centro's president, says that the truck's switcher is a Grass Valley 1600-7K with 24 inputs, many optional keyers, and a single-channel Quantel DVE. Because it is designed to work in conjunction with the tape truck, the production truck normally carries no VTRs; however, space is provided for up to two VPR-2s or a variety of other recorders.

In addition, the truck has control positions for two Arvin still stores, plus a full complement of Conrac color and mono preview monitors. Plenty of attention was given to communications, with an RTS intercom and IFB system and an internal telephone system. Audio is in a separate area, built around a Ward-Beck console, with cart recorders and processing equipment. According to Powers, ABC plans to use the truck for its *Good Morning, America* program and for west coast news events.

An ambitious project now underway at Centro, Munderloh says, is the building of three 44-foot trailers for Nigeria, which is establishing television broadcasting in its regional states. "What's unique about the Nigerian trucks," Munderloh asserts, "is that they're designed to be both production and on-air facilities, with separate areas for production and origination." The state broadcasting services will operate out of the trucks until permanent facilities are constructed, Munderloh says. The equipment list includes Ampex and RCA cameras, GVG switching equipment, Conrac and Tektronix monitoring and test & measuring gear, and Neve audio.

According to Munderloh, Centro — which until now has concentrated exclusively on custom work — will introduce a line of standard EFP vehicles this year, aimed primarily at cable.

Centro's award-winning videotape truck, delivered last year to ABC Hollywood. View shows the preliminary editing/machine control area, looking aft into the tape area with its five VPR-2s.

TV trucks off-the-rack

In a field where "custom-built" seems to be everything, the standard-model television production truck seems like an unusual concept. That hasn't fazed Midwest Corp. of Cincinnati, which offers two mobile vans in standard configurations: the smaller M-1 and the larger, more production-oriented M-20.

According to Midwest's Chris Summey, a standard three-camera M-20 comes to $171,000. The unit is built on a dual-wheel Cutaway van chassis with a 138-inch wheelbase, outfitted with a Stahl utility body with weatherproof outside storage compartments on both sides. Cameras are Hitachi FP-21 three-tube prism optics units in a studio configuration, with Fujinon 14:1 lenses, heads, tripods, and dollies. Customers can choose two Hitachi HR-200 one-inch VTRs or Sony BVU-800 or VO-5850 ¾-inch machines, all with associated editing equipment.

The production switcher is either a Crosspoint Latch 6112 or 6124 (both have eight inputs, double reentry with chromakey, and full wipe and key effects). The character generator is a System Concepts (now Quanta Corp.) Q-7A with dual disk memory. Sync and distribution equipment is all by Lenco.

The audio equipment is based around a Yamaha board with eight, 12, or 16 inputs, as the customer chooses, plus an Ampro audio cartridge recorder, Electro-Voice handheld and lavaliere mics, a JBL monitor speaker, a Crown power amp, and six Telex intercom headsets. The whole package is a turnkey job, complete with all wiring, cables, and associated equipment.

Also supplying a full line of standard production vans is Central Dynamics Corp. of Mahwah, NJ. The vans come in four standard models, ranging from a one- or two-camera van with an 11-foot production area to a large truck carrying up to six cameras and having an 18- to 24-foot production area. The second smallest, a 22-foot van with 14 feet of production space, is built by Shook Electronics; the others are built by Wolf Coach of Auburn, MA.

A company spokesperson said that a wide range of equipment is available for any of the vans, depending on the customer's requirements. Encompassing Central Dynamics Ltd., Philips, and American Data Corp., CDC has plenty of gear available from its own product lines, but customers can choose equipment from any manufacturer. CDC, of course, recommends its own cameras in the standard package — such as the Philips LDK14S ENG/EFP model, the LDK5B triax or LDK25B multicore remote/studio cameras, or the new LDK44 ENG/EFP camera. Philip's latest camera, the automatic LDK6

studio/field model, might also be appropriate for the larger vans.

The largest of the trucks, Model D-22, has three to six cameras, one to three studio VTRs, an A/V routing switcher, two audio cart recorders, and a telephone system. Although the trucks themselves are standard models, prices vary widely with the equipment chosen. Customizing is also possible, if the customer so desires; the designs allow enough flexibility to meet individual needs.

At press time, CDC was feverishly at work on an even larger truck destined for the World's Fair in Knoxville and built on a Wolf body. The company was planning to bring the truck to the NAB show and was keeping its fingers crossed that all the equipment would arrive in time for the trip to Dallas.

Video control room of TAV's 740 truck contains computer controls for the unit's six triax color cameras and a full complement of video monitors.

Tele-Measurements, Inc., of Clifton, NJ, also has a standard small production van, the CAV-1. This Econoline-type vehicle is targeted at cable operators for their remote pickup needs. The company recently built a field

KGO Gets its Feet Wet in Underwater Remote

By Allen W.L. Topping

When San Francisco's famous Steinhart Aquarium announced plans to travel to the Sea of Cortez off Baja California on an exotic fish-gathering expedition, two of KGO-TV's news staff, both avid scuba divers, were quick to take note. The "Baja Project," hatched with the approval of aquarium director Dr. John McKosker, resulted in a live underwater news insert, complete with studio anchor and field communications.

KGO considered the possibility of a live underwater remote from the onset of the project. Helle Engineering in San Diego, CA, recommended the Helle model 10830 full-face diving mask, which comes equipped with a microphone port. Helle also supplied a waterproof microphone (mic level) to fit the port. A common tie-wrap compressed the port against the mic body for a watertight fit. For return audio, Helle supplied its Model 10771 earphone — essentially a waterproof vibrator (10–12 ohms) that is slipped under the diver's wetsuit hood. The vibration is sufficient to be conducted through the skull and "heard" as in the consumer's so-called "Bone Fone." The audio layout designed by our technician, Stan Wong, required three audio mixers and a telephone circuit for IFB. The network resulted in diver-to-diver communication, diver to studio and return, with the underwater cameraman, George Lang, monitoring.

Farallon-Oceanic of San Leandro, CA, built the housing for our Ikegami HL-79 camera. Designed by Wes Williams, the housing was constructed of nominally half-inch aluminum plate. All joints were milled flat with a laser cutting tool, then welded to survive a test depth of 500 feet. (Normal operating pressures would not exceed 200 feet).

Finished, the housing is 30 x 15 x 14 inches and weighs 96 pounds including the camera — slightly "negative" when underwater for ease of control. The lens viewport is constructed of ⅜-inch Plexiglass, six inches in diameter, and threaded into the housing with a rubber "O" ring for a watertight fit.

In operation, the camera, with an on-board battery, is turned on before the endplate is secured. The lens remains in the wide-angle position (10 mm) and is in auto-iris. Video is taken from the camera using an electro-connector on the exterior of the camera housing. The connector, originally designed for underwater flashguns, provides a video line and shield to the light-weight, low-cost Belden "Siamese" cable we used in Baja and the underwater live shot. During the fish-gathering expedition, the camera was tied to 500 or 1000 feet of cable that terminated aboard the expedition ship and at the VCR.

KGO's George Lang (in wetsuit) and Dwain Peirano putting the Ikegami HL-79 into the camera housing.

The live underwater insert was set up to introduce the first segment of the miniseries on the evening news program. The location, the porpoise tank at the Steinhart Aquarium, has a large glass observation window that allowed a second ENG camera to cut away to and show the reporter, interviewee, and cameraman underwater. Owing to darkness, a second technician was in the tank with lights. Videowise, the system worked as planned. Audio was fine, somewhat muffled, but leaving no doubt that the voice was underwater.

Upon opening the interviewee's mic we discovered a curious problem: scuba divers don't breathe in unison. While one was speaking, the other, naturally, took the opportunity to breathe, pumping "bubble sounds" into the system. When the studio anchor asked a question, each diver was listening to the other's bubbles. Communications rapidly deteriorated and our director gave us a quick wrap. Later, we easily eliminated the problem by installing push-to-talk switches on each of the diver's mics.

Allen W.L. Topping is technical operations manager of KGO-TV's electronic journalism unit.

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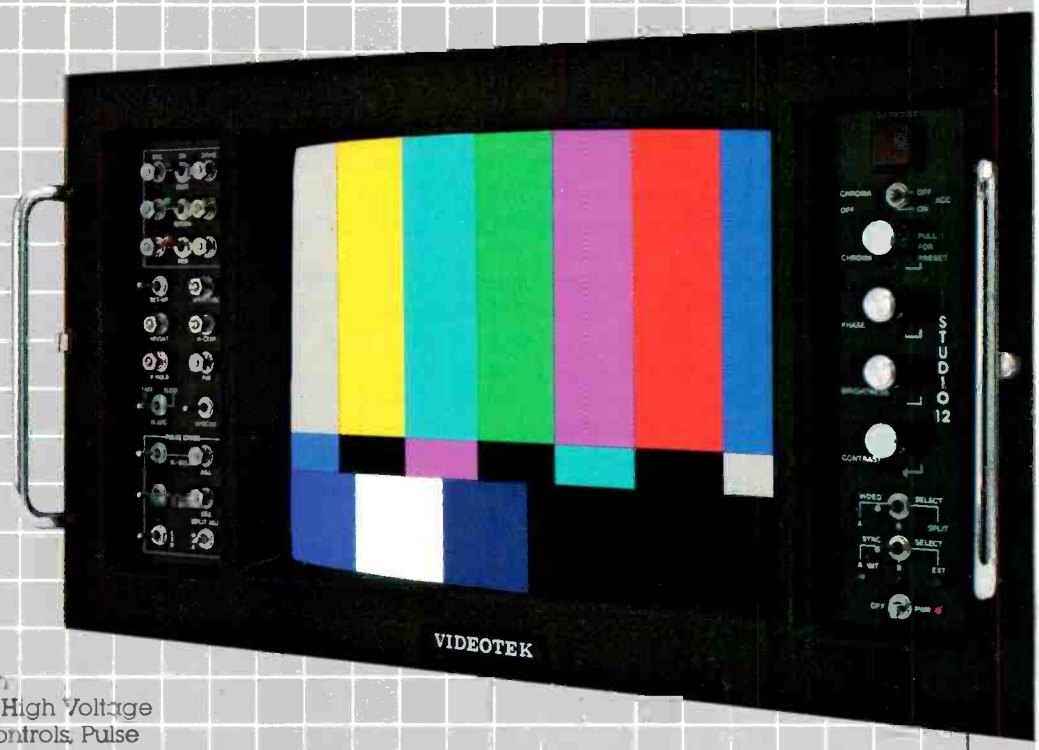

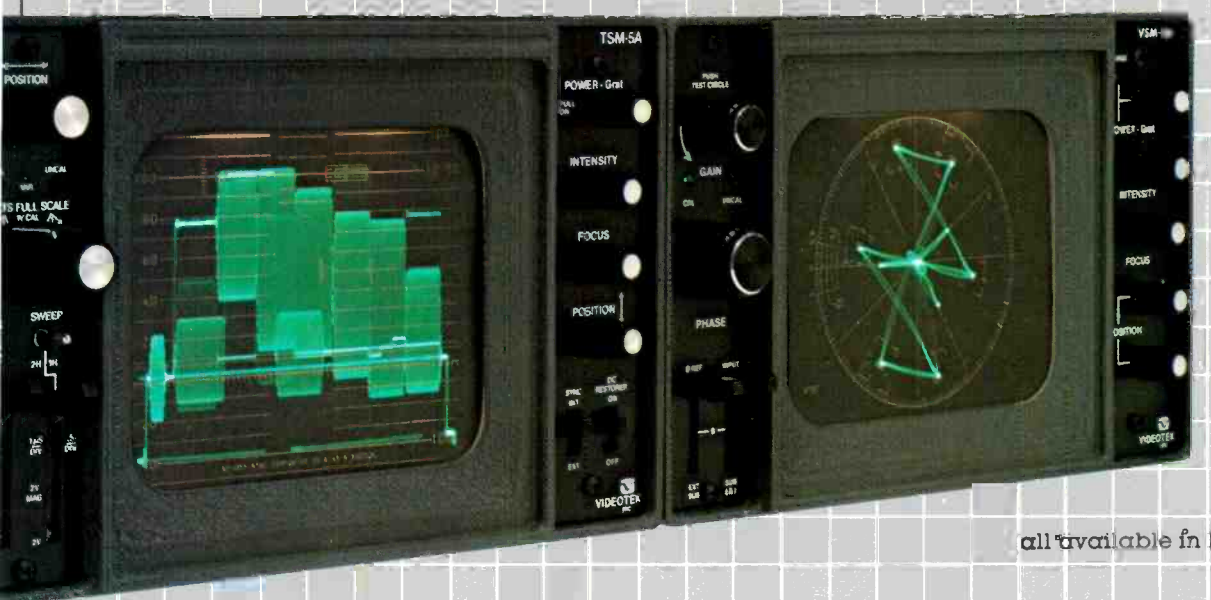

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production van for a cable company in New Jersey. Powered with two 6.5 kW generators, the van carries four Hitachi FP-40SS color cameras, a JVC ¾-inch editing system, and a System Concepts character generator. All coach work is by Wolf Coach.

A more traditional customized approach is provided by Shook Electronics of San Antonio, TX. Ed Shook says the company has built many trucks of different sizes for broadcast manufacturers and equipment companies, but that it also builds directly for the end user. He emphasizes the need for quality in an economical package:

"We have to consider the user's needs when putting equipment in a unit," Shook explains. "That's what we really want to do, because mainly our clients ask for cost-effective units, and I think that's what's important in the industry right now. Mobiles are no longer a luxury item; they're a necessity, and people have to be able to afford them."

One of Shook's most popular designs is a 22-foot unit with a 14-foot production area, capable of carrying three cameras, that goes for $52,000 (plus equipment). In fact, the last two NAB shows have featured this van, fully equipped by Philips — and Philips uses it as one of its standard models, described above. The self-contained, self-powered vehicle (built on a Chevrolet chassis) is divided into the production area and an equipment storage area. It has a 6.5 kW air-cooled gasoline generator, installed in a soundproof compartment, and a roof-mounted 13,700 BTU air conditioner/heat pump. Although Shook does not sell equipment, it will help arrange to purchase equipment and will install it.

This compact mobile unit was completed last fall by Peirce-Phelps, Inc., Video Systems Division of Philadelphia, for Warner Amex Cable Communications of Mesquite, TX (part of the Dallas market). It is outfitted with Sharp XC-700 cameras, a Microtime TBC, plus character generator, ¾-inch VCRs, and various audio and intercom components, and has a built-in 43-foot hydraulic mast.

Last year the company also built a mobile production unit for Warner Amex operations in Columbus, Cincinnati, and Pittsburgh. The 25-foot truck, based on a Gerstenslager vehicle, is equipped with Ikegami HL-790DA and HL-79DA cameras fitted with Schneider 15:1 lenses.

Local stations think small

Active field production is one of the most effective ways a local station can make itself vital to its audience. Fisher Broadcasting's two outlets in the Pacific Northwest — KOMO-TV, Seattle, WA, and KATU-TV, Portland, OR — are excellent examples of stations with active commitments to field production. Although KOMO and KATU have mobile units much smaller than most of those we have discussed, they utilize their resources to the fullest.

KATU's Don Wilkinson, chief engineer, and Lee Petrik, production manager, explain that the largest vehicle is a high cube van, slightly bigger than an average panel truck, with a homemade portable switcher unit that handles up to five cameras.

Wilkinson notes, "It's a departure from the traditional remote truck in that it's small, compact, and not what you would usually expect when you think about a television remote truck. Our goal was to build something that was light and quick enough to let us get a remote on in a hurry and still use the same cameras we use for normal field production and ENG work." The cameras are Ikegami HL-79s or 77s, complete with remote paint pots. Petrik adds that setup can be accomplished in an hour, "if we're really pushed."

The station equipped the van itself out of "good quality professional equipment," Wilkinson says. The pull-out module, for example, includes a Tektronix sync generator, Grass Valley distribution amplifier, a small American Data switcher, and an eight-input Yamaha audio board. It even has basic special effects, such as wipes and supers. In addition, the van carries BVH-500 portable one-inch VTRs, typically with a BVU-200 as a backup.

The van also has its own 6.5 kW generator, so that KATU can send it almost anywhere without worrying about power. Much of the production for KATU's *Town Hall* and *AM Northwest* programs is done from the van.

In addition to the van, the station has four small panel trucks — one for each camera crew. The station remodeled Chevy vans so that cameras, connectors, and tape machines are accessible through the back door, and added an extra passenger seat. The vans usually go out with a single camera and three-person crew (reporter, camera operator, and grip).

KOMO's approach is even simpler. Says production manager Kurt Horn, "If you went to a car rental and rented a Ford Econoline, you would have our van." The van goes mostly on one- and two-camera shoots — about half commercial production and half in-house programming, such as the station's *Up Front* and *Town Meeting* public affairs shows. Post-production, of course, takes place back at the station. The van has no generator, but packs batteries for situations where power is unavailable.

"It's pretty small and pretty simple," Horn explains. "You can go anywhere you want with it." And go the station does. The little van is kept on the run five long days a week. **BM/E**

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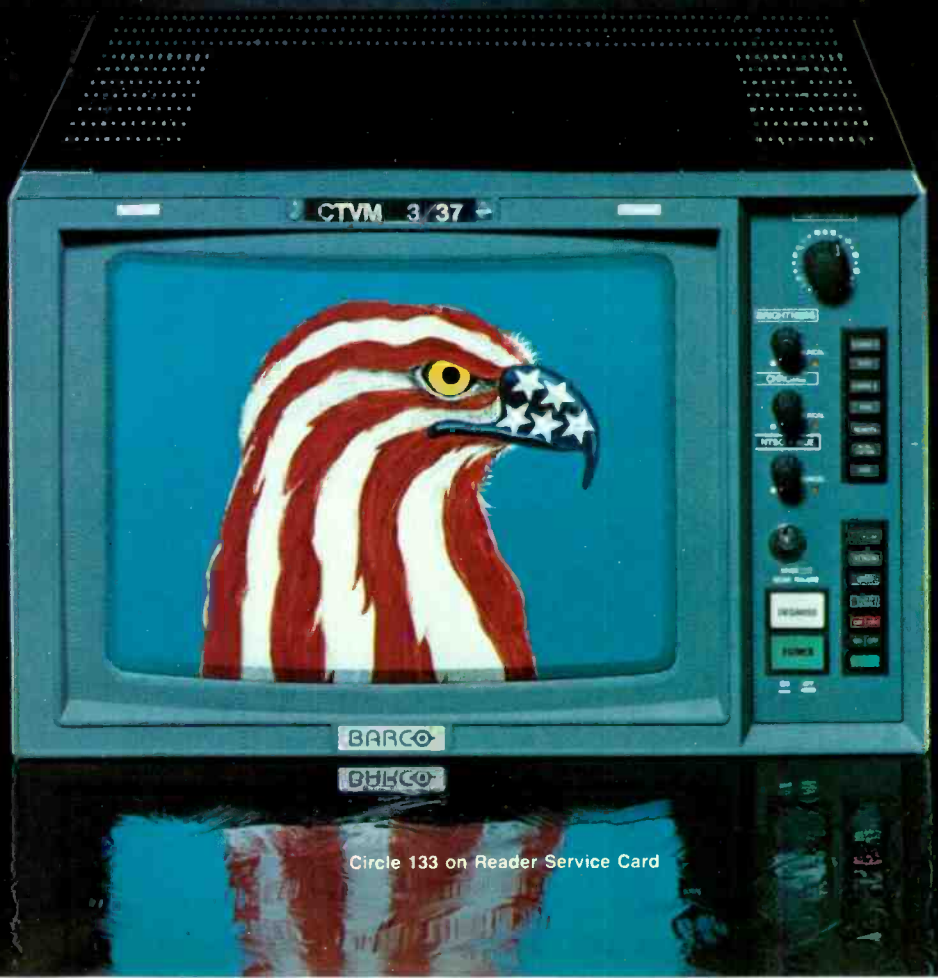

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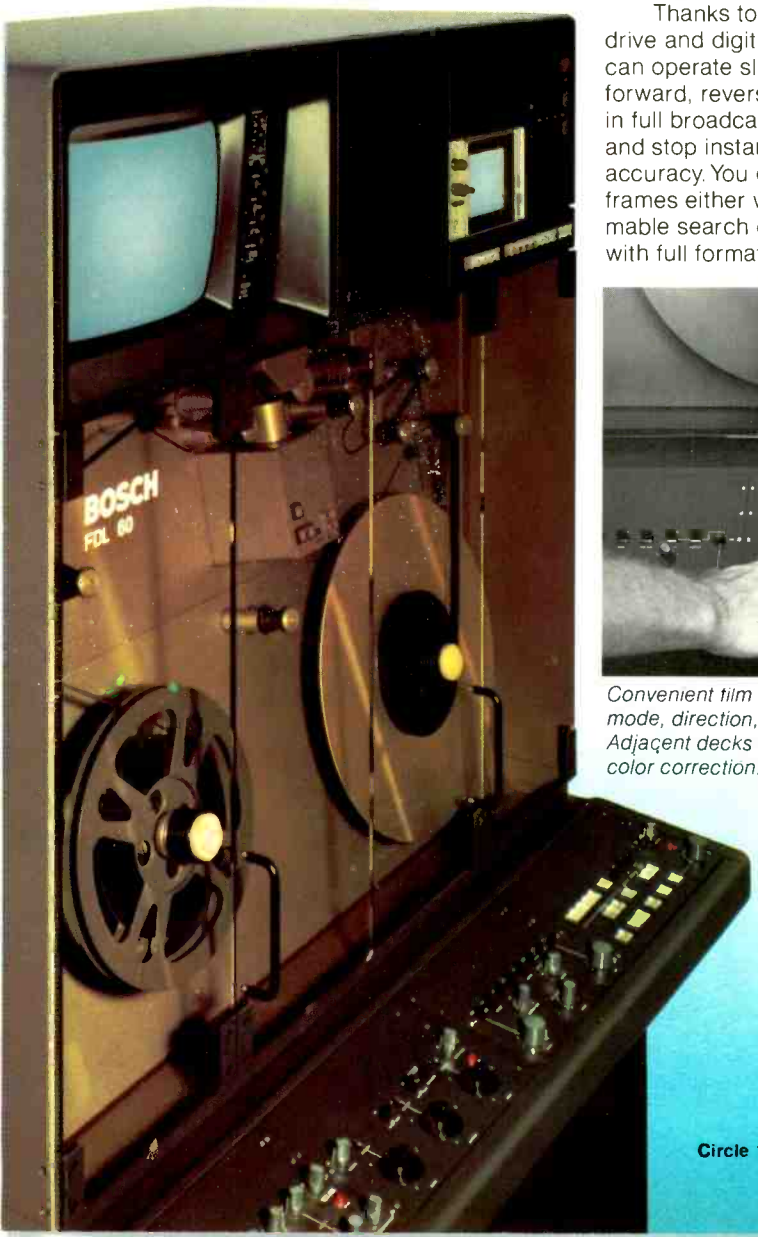

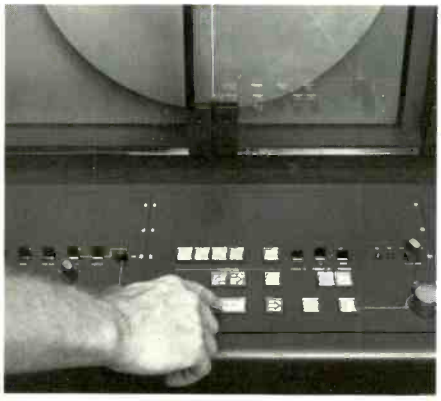

Convenient film deck controls include speed, mode, direction, format, framing, and focus. Adjacent decks control audio, video, and color correction.

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SPECIAL REPORT

FULL STUDIO QUALITY ON WHEELS: A HIGHLY SUCCESSFUL RADIO MOBILE

By Philip J. Lerza

At KFRC in San Francisco, a mobile studio that completely duplicated the quality and operation of the main studio has been a boon to the station's operation.

WHEN WE DECIDED to design and build a mobile studio, we visualized a rig that would be used for a few weekend remotes, maybe a parade or two, and some annual KFRC promotional events. But in a few months of highly successful operation, the mobile studio has turned out to be far more valuable than we had expected.

All music for KFRC's Rock format is put onto carts for broadcast. Our plan for the mobile was to have the operator do the complete job there, with all the material, music, commercials, etc. on hand on the carts, which would be handled in exactly the same way as the operator would do it in our main studio. Most of our operation is done combo, with a few split broadcasts, such as the morning drive, when one of our most popular air personalities uses an announce position with an engineer at the main board.

To carry out our operation objectives, we incorporated into the mobile studio an operating console, with all auxiliary controls and cart storage within reach for combo operation, as well as an announce position for the split broadcasts, as shown on the accompanying floor plan.

Our very first mobile studio broadcast, done from the front of the station, set the pattern. It was immediately

At main console, operator looks forward from rear of vehicle. Announce position can be seen on right side near front. Cart players are to right of console.

Philip J. Lerza is chief engineer of KFRC Radio, San Francisco, CA.

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apparent that we were gaining a great deal of exposure. Passers-by were stopping to look in and ask questions, bumper stickers and autographed jock pictures were being handed out, toes were tapping to the music, and we hadn't even left the main studio.

From that point on we have been to dozens of public spots — ball game parking lots, county fairs, shopping centers. We've spent weeks at the toll plazas of Bay Area bridges waving at commuters on their way to work.

The DJ goes to sea

We devoted a full day to the return of the aircraft carrier USS *Coral Sea* from its tour of duty. In order to be literally "on deck" in a specially planned dependent day cruise, we hoisted our 5½-ton mobile studio up to the flight deck with a huge crane. We were then able to broadcast our full-quality regular programming live for a whole day, 6:00 a.m. to 7:00 p.m., while under way 35 miles out to sea. From time to time, planes took off or landed on the flight deck. The on-air man would simply interject a word or two — "plane landing" — and go on with his planned talk. The signal reached the main studio (via UHF radio), using repeaters near the shore.

Building the mobile

One factor in the quality of our mobile studio was the conversion process. We started from scratch with our own design rather than working around an existing scheme based on the requirements of a motor home.

We chose a 1975 26-foot GMC motor coach in immaculate condition, not only mechanically but asthetically. The GMC was selected because of its low profile and large windows on the sides. We added additional windows at the rear side areas to increase the overall visibility.

The coach is equipped with a pneumatic system to raise and lower each side of the vehicle for leveling. This is helpful, as most roadways are sloped toward the curb for drainage. The location selected for broadcast is rarely totally level and, although the equipment will operate satisfactorily at an angle, there are obvious inconveniences. The adjustment of two controls eliminates the problem by automatically leveling the coach.

The overall equipment design for the mobile studio was rather straightforward. Our goal was to have exactly the same convenience and technical quality that we have in our main studio. We based the list of studio equipment on those standards and came up with a facility that requires very little compromise on the part of our on-air talent.

The first step was to strip the coach completely of all interior furnishings. This was done by an individual who was willing to trade his labor for the items removed. We were fortunate that he had done this type of work before and didn't destroy any of the existing equipment or wiring designated to remain.

Next, we took our plans detailing the major construction portion of the project to E-N-G Corp., a local company whose primary business is building vans for television remote pickup work. E-N-G came highly recommended through a number of sources, mainly chief engineers from TV stations using their vehicles. A tour of the plant was the clincher, as we were impressed with not only the facilities and quality of workmanship, but also the staff's creativity and willingness to engineer around mechanical problems that come up when working with any piece of existing equipment especially one this large.

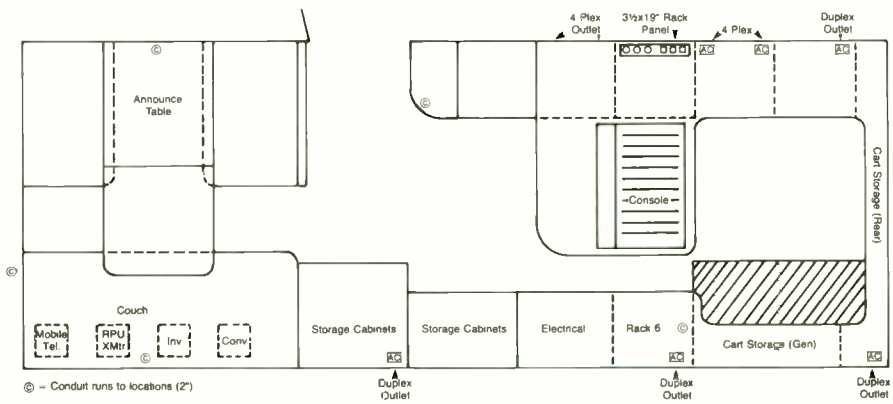
E-N-G installed all cabinetry, carpeting and ac and dc electrical power. They manufactured the equipment racks to our needs, and did most of the other mechanical fabrication, which our limited station facilities could not carry out.

While the heavy reconstruction work was taking place, our engineering department was busy back in the shop prewiring panels, cables, connectors, and equipment slated to be installed in the coach. This advance work was the key to a smooth installation of the equipment.

The equipment choices

The operation centers around a Pacific Recorders BMX-14 stereo mixing console, fully loaded with all optional monitor and remote line selector modules. Additional panel space was obtained by use of an overbridge assembly holding a number of modular panels for our remote UHF transmitter control, tape control functions, digital timers and clocks, and other gear. We use this system in our main studios to keep "bud boxes" out of the control rooms when additional switches and lights are required.

Tape cartridges are played back through eight slots: two ITC triple-deck mono machines for spots and jingles and



Floor plan of mobile studio shows main console at right (rear of vehicle), announce position near front. Cart storage goes around rear, equipment racks on both sides.

two ITC single-play stereo machines for music. KFRC has been reproducing its music in stereo ever since our participation in AM stereo testing beginning in April 1979. This serves the dual purpose of being compatible with our tape format at the main studio as well as preparing us for the hoped-for advent of AM stereo.

Additional tape equipment includes a rack-mounted Otari 5050B recorder/reproducer for tape recording and playback of special program material and a rack-mounted Tascam 122 cassette machine for air checking. As in our main studio, we control the air check machine through the microphone circuit to permit telescoped air checks in the field.

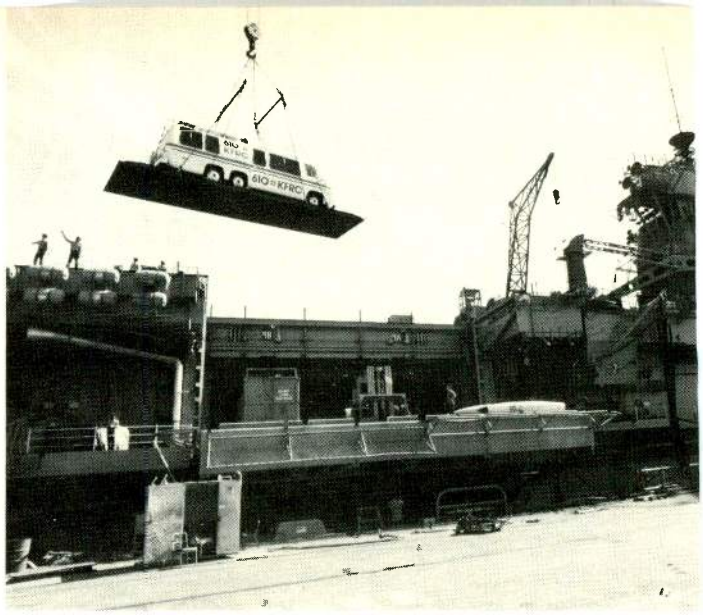
Other units in our mobile studio are various rack-mounted equalizers and limiters for microphone processing both direct and wireless; audio oscillator for making studio equipment and telco line measurements; headphone and loudspeaker monitor amplifiers; AM monitor receivers; and jack strips for most signal routing.

Loudspeakers, inside and out

The loudspeaker complement includes two interior monitor speakers for the operator in the vehicle, plus a set of permanently mounted weatherproof horn speakers on the roof. The quality of these horn speakers is not quite up to that of the interior monitors, but they allow us to distribute the program live to the crowd outside the vehicle immediately on our arrival at a remote. Whenever the weather allows, we later stand four high-quality monitor speakers on top of the coach and switch them in to feed the on-air program to the people outside.

Also incorporated are two Swintek wireless microphone systems, one hand-held type used for studio quality voice transmissions from the field and the other with a dual purpose: it can be used as a second on-air mic or, in a reverse configuration with the wireless transmitter in the coach, to send an air monitor feed and cues back to the announcer. This transmitter audio input is normally fed by the studio monitor selector in the console, interrupted by a talkback microphone by means of a switch to permit rapid voice cues to the announcer in the field. Both wireless microphone receivers use external quarter-wave antennas mounted on top of the vehicle for better signal performance.

In addition to output feed points to ship audio back to the studio via equalized telco loops, eight normal microphone input circuits are brought up on two access panels located in the rear and roof areas of the coach. These access panels also provide convenient termination points for utility line level monitor feeds to existing public address systems, where available, and speaker level feeds for local PA monitoring when needed. Since all eight microphone inputs are accessible at locations inside and outside the coach, individual monitor mute switching has been employed to control monitor muting separately, depending upon whether the microphone is to be used in or outside the mobile studio.



Crane lifts mobile studio to deck of USS Coral Sea for remote broadcast on trip 35 miles at sea. UHF radio in vehicle took program to repeater on shore.

Three Crown D-75 amplifiers provide the local monitor feeds around the coach and are found to have more than adequate power. Outside monitors have to be run conservatively to avoid resonant acoustic feedback when operated in close proximity to live microphones. However, observers do need an air monitor outside as a reference to assure them you are actually broadcasting live from the coach.

Three sources of power

AC supply power comes from three selectable sources: commercial, which we call "shore power"; a 6 kW Onan motor generator; and, as a backup, a 1000 W ac sine-wave inverter capable of running enough broadcast equipment to keep us on the air, and driven by a "house battery." The outputs of these three feeds are distributed down through two circuits that are termed "essential" and "nonessential."

The essential power line runs to plug strips for the console, cart machines, microphone processing, and line amplifiers. It is normally either generator or shore power, which is routed down this line through a transfer relay. If this power is interrupted or lost, the system automatically switches over all of the essential outlets to the ac inverter, keeping us on the air without interruption.

An override switch provides the option of staying on the inverter until the cause of the power failure has been determined. When doing remote broadcasts, shore power often comes over long heavy-duty extension cords from fairly precarious sources.

One problem we ran into when operating on the motor generator was the unstable frequency of the ac line, which caused unstable operation of cart machines. We remedied this by operating the cart machines off the ac inverter, which puts out a stable 60 Hz.

The house battery that runs the inverter is charged automatically by the built-in alternator in the motor generator and by a separate 25 A battery charger fed from 117 V ac. The charger was selected because of its automatic charging rate, which operates at the proper level, up to 25 A, necessary to maintain battery voltage. It also has the capability of reducing down to zero when the battery has

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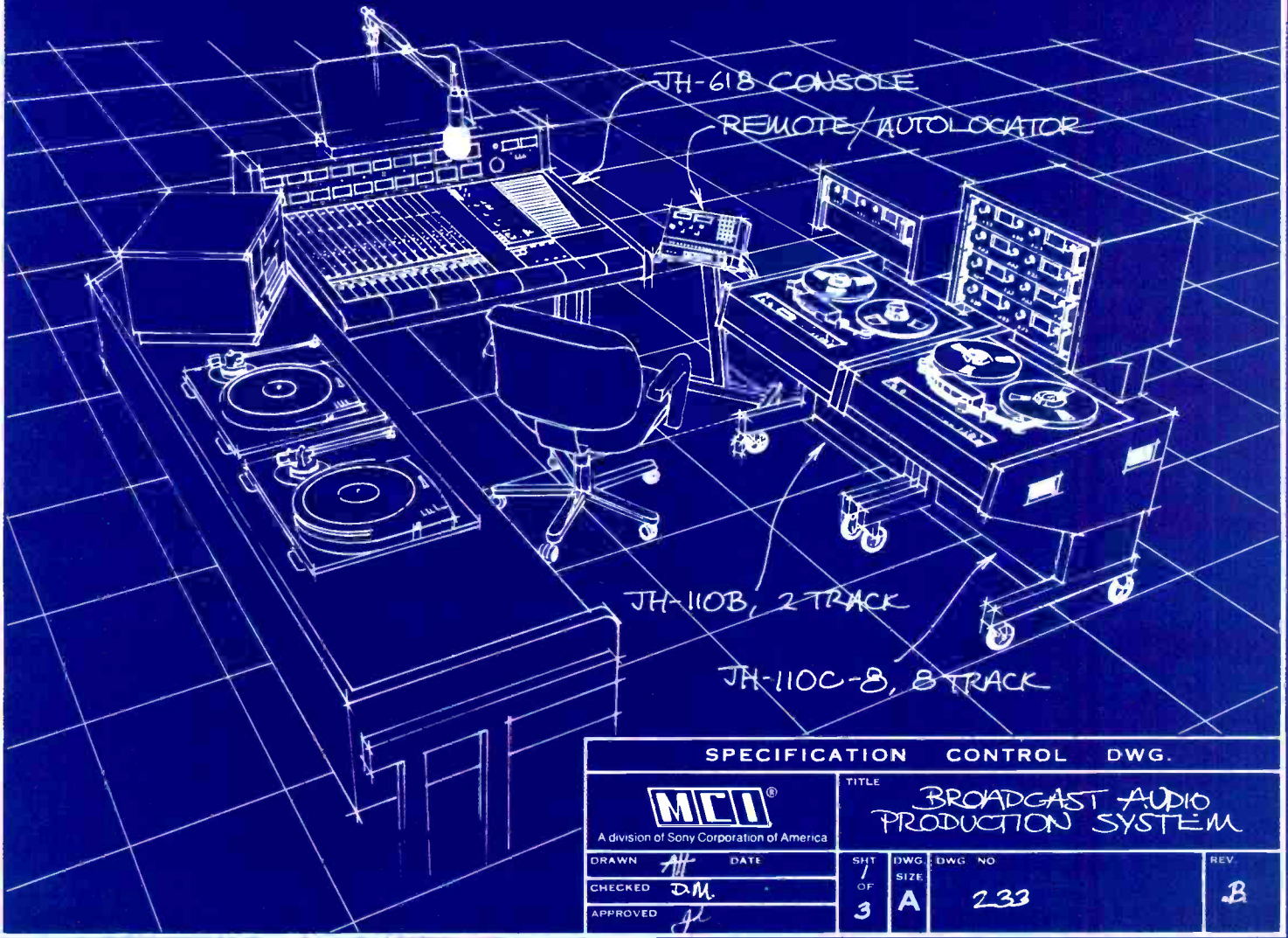

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been fully charged. This enables us to leave the unit on line at all times without having to worry about the possibility of overcharging the battery. There are two separate outputs: one feeds the house battery, the other the vehicle or engine battery. In addition, there's a switch to put the 200 A batteries in parallel.

A special four-circuit lighting track is mounted on the ceiling for overhead lights. One circuit powers the lights. The three remaining circuits are utilized for microphone warning, end-of-cartridge warning, and telephone signaling when microphones are turned on and ringers muted.

A switch panel located by the doorway controls the overhead lights, as well as the 12 V dc lights used when the mobile studio is not being fed with ac power. The porch light just outside the doorway, also controlled with the switch panel, is connected to the microphone and end-of-cartridge warning circuits to inform station personnel that a mic set is in progress so they will wait until we get back into music before entering. Outside lighting is controlled by additional panel switches that activate four exterior 12 V quartz lights mounted on the roof-rack grid to provide utility lighting when setting up or striking down after dark.

Telephone and communications

We installed a complete telephone key system with the capability of handling up to four incoming lines. Multiline telephones are located at the console, announce desk, and doorway area. Additionally, we provided for plug-in phones at two outside access panels. Speaker phones are included at the two main operating areas for hands-free listening. The telephone audio is routed through a line amplifier and available on remote inputs for airing. All ringers are, of course, muted when microphones within the coach are operational.

A 100 W Mitrek two-way radio is used to communicate with the main studio for setup and necessary cues when telephone service is not available. Control units for the two-way system are located under the dash, by the announce table used for split operation, and at the console area for combo work.

The two-way is also used for contests in conjunction with the KFRC promotional van, which, in addition to our news cars, is equipped with a similar two-way radio unit. This allows our air personalities to be roaming around in the promotion van with giveaways during a mobile studio broadcast, reporting back from time to time with winner on-air response, either live or recorded.

A mobile telephone has been installed in the front of the coach next to the driver so that last-minute communications can be established while en route to a remote site. The mobile phone also serves as a backup means of communication to the main studio in the event of a total loss of communications with our normal systems.

Links to the main studio

The mobile studio can use three different methods for relaying the program signal back to the main studio. One is a temporary equalized phone line leased from the telephone company. This is not only expensive, but also often unreliable. As the name "temporary" implies, these circuits are usually patched in at telco toll offices and do not offer the security typical of permanent circuits.

For this reason, we also have our own remote pickup link, a UHF radio system. The system begins with a 10 W Moseley 455 MHz transmitter, fed into a 100 W linear amplifier that in turn feeds a Scala 10 dB gain Yagi directional antenna, for a total ERP of 1000 W. The air system that operates the vehicle leveling device, described earlier, also drives a pneumatic telescopic tower. The Yagi is mounted on top and can be raised approximately 40 feet above ground level by a control handle inside the coach.

Additionally, the antenna can be spun 360 degrees for perfect alignment toward our pickup points. A sensor switch monitors air pressure in the tower cylinder and flashes two large warning lights located on the dash to prevent accidental movement of the vehicle while the tower is in the raised position. An additional nondirectional antenna mounted on the roof can be switched in from the console overbridge and used as a backup.

Morning-drive on-air man, Dr. Don Rose, talks with listeners by phone from announce position in mobile studio, while watching commuters pass at Golden Gate Bridge toll plaza.

Cart storage under rear window of coach makes combo operation compact and easy. Telephone, two-way radio are also close at hand. Other units are in side racks.

The maximum for the minimum

In designing the HK-302, Ikegami kept the frills —and the price—to a minimum while maximizing the performance. And that helps keep a moderate equipment budget from interfering with first-quality program origination.

However, staying with the basics doesn't mean sacrificing advanced technology. The HK-302's highly efficient optical system coupled to ⅔" low capacitance diode-gun Plumbicon* tubes and high transconductance FET pre-amps deliver sharp, low noise pictures (S/N 57 dB) with excellent colorimetry. And the compact camera head includes a full range of operational automatics to ensure consistent signal quality.

Built-in test, maintenance and operational features are integral parts of this camera's "basics" as well. A comprehensive test pulse system lets you adjust the video with the pick-up tubes off or removed.

Complete monitoring circuitry and a broadcast quality sync generator with genlock are also standard features.

To add to the versatility of the HK-302, use the Ikegami automatic highlight compression option. It ensures highly detailed pictures even in high contrast scenes.

With the HK-302 you don't have to mortgage your station to afford prime time performance. So if you're looking for the maximum in studio production capability with a minimum of cost and maintenance, look over the Ikegami HK-302. For complete information and a demonstration, contact Ikegami.

Ikegami HK-302

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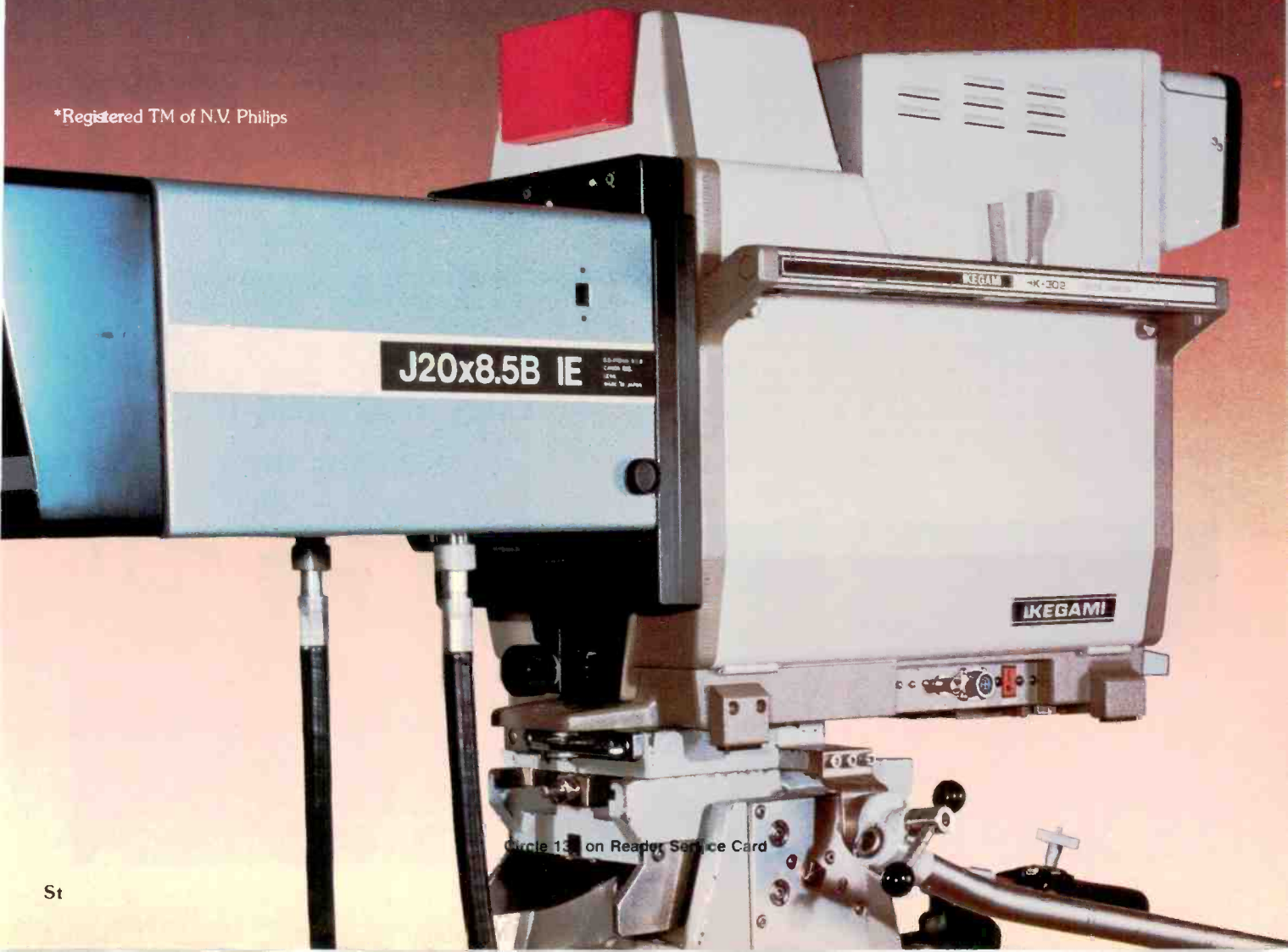

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St

Repeaters for the studio link

One of our receiver sites is located approximately 1200 feet above ground level at a fellow ham radio operator's home. A Bay Area amateur repeater is in operation at the site and is virtually the only transmitted RF energy in close proximity to our equipment, yielding fairly interference-free operation.

The signal is received via two stacked Yagi antennas feeding two companion Moseley receivers through a co-axial switch. One receiver operates at 455 MHz for direct transmissions from the mobile studio. The second 450 MHz receiver is used in conjunction with our portable repeater unit, described later. The audio output from the receivers is switched with the coaxial relay to feed the appropriate signal to the main studio via a permanent 15 kHz equalized program line.

A portable repeater, an additional 450 MHz transmitter, and a 455 MHz receiver are housed in a custom-built Anvil carrying case. The repeater will operate on either 177 V ac or 12 V dc, allowing it to be used virtually anywhere. With a 24 V to 12 V converter, we have been operating the portable repeater in some airborne tests to look into the possibility of originating from the mobile studio while in motion, sharing the morning and afternoon drive with fellow listener-commuters while underway.

The portable repeater, as I noted at the beginning, was used to relay the signal from the deck of the USS *Coral Sea* on our flight-deck remote. The repeater was taken to a high point overlooking the ocean and the antenna on the mobile studio aligned for adequate S/N performance that got our program to the main studio in fine condition.

Two additional repeater points are planned for the near future, one atop a 44-story building in downtown San Francisco to offer better coverage when operating among high buildings. The other will be at our remote transmitter site, allowing us to utilize the coach for an emergency studio in the event of a disaster that might disable our main studio complex. This seems to be an excellent way to protect us from main-studio breakdown.

Our third mobile-to-main studio link is an extended-bandwidth system that delivers 5 kHz program audio over two standard dial-up telephone lines. The system we are using is manufactured by C.N. Rood Co. and sold in the U.S. by Marcom in Scotts Valley, CA, and has worked well. It is extremely easy to set up on both ends. No matter what telephone circuit we get, bandpass is virtually flat from 50 Hz to 5kHz, with S/N figures around 60 dB. The device uses audio frequency splitters and shifters to move the program signals into the bandpass of a standard dial-up telephone line (400-2800 Hz), with the addition of companding to yield acceptable noise figures.

Although the bandwidth extender opens the telco band

to only 5 kHz, it has enabled us to use the mobile studio in locations where our microwave system is inadequate because of rough or mountainous terrain, or where the telephone company cannot provide equalized service.

Mobile studios need full station support

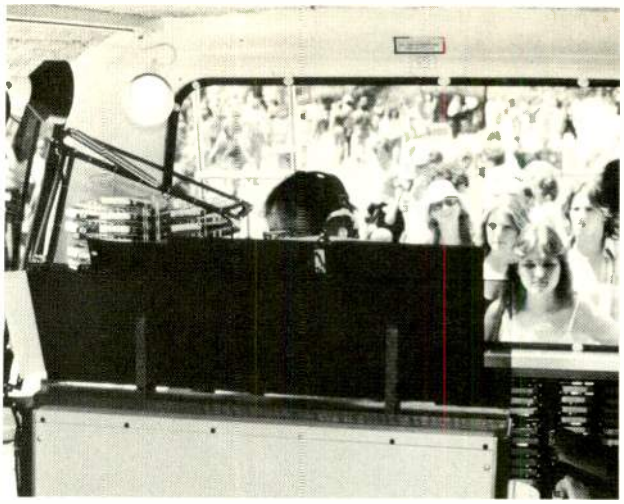
There are many indirect support requirements for a mobile studio broadcast. Each station department needs to contribute toward the success of a remote.

Because of the large number of remote broadcasts (approximately five to six per week), we have found it necessary to duplicate all our carted spots, promos, and music. Two identical cartridge recorders are used in production to speed up the redundant carting process. For guaranteed reliability, every prospective remote broadcast must be prefielded to make sure adequate power is available and signal transmission acceptable.

The traffic department must see to it that the appropriate commercial logs are ready in time, and programming is responsible for such things as getting necessary live copy and music lists to the remote site.

It's a winner if you do it right

The benefits derived from being out in the public eye add up to a very big plus. But doing remote broadcasts is somewhat risky, as you are increasing the danger of technical failures, of lowered broadcast quality, and of overall programming deviation. Remember that the listener to be most concerned with is the one who doesn't care where your broadcast originates. He just punched up your station to hear his favorite music or personality and shouldn't be tampered with. On the other hand, the dedicated listener will most likely accept virtually anything you do and probably won't desert.



People gather at local amusement park to watch operator through rear of vehicle and listen to program over roof-top speakers

The net of all this is that remote broadcasts, with the most careful concern for existing and potential listeners through top technical quality and total planning, can be a very rewarding venture for a radio station.

Since the beginning of this year, when the coach was put into operation, KFRC has gone from an average quarter hour figure of 4.2 to 5.4 in the ratings, with a cumulative increase from 700,000 to over 1,000,000 listeners. We're convinced that the mobile studio contributed to this increase. **BM/E**

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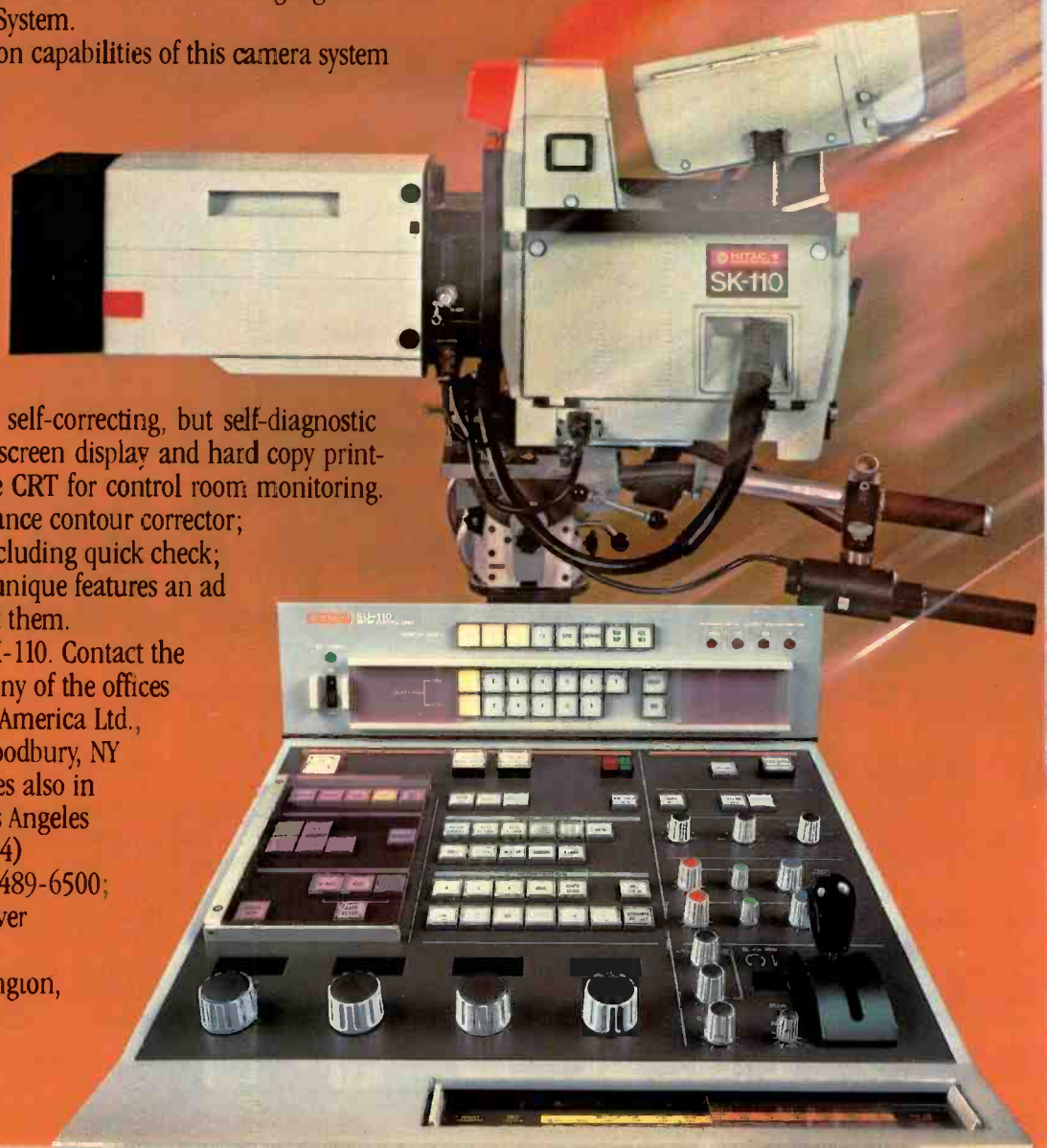

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EFP CAMERA TECHNOLOGY:

SPECIAL REPORT

A MICROPROCESSOR'S WORK IS NEVER DONE

Diascope image used for auto setup of Ampex Digicams.

With field cameras being pressed into constantly expanding applications, microprocessor-based remote control systems for setup and matching are keeping pace with latest developments.

IT SEEMS THERE are as many definitions for the term "field camera" as there are applications for EFP. These cameras arose originally from the desire to have "something more" when shooting a documentary-style production than could be found in simple ENG cameras—more features, better signal quality because of the production on one-inch rather than ¾-inch recorders, automatics for functions such as white and black balancing, finer control capabilities for more precise registration, and so forth. Enter cameras such as the Ikegami HL-77 and subsequently the 79, the CEI 310 and 330, the MNC 81CP, Sony BVP series, Thomson-CSF 700 series, and so forth. Manufacturers of ENG cameras such as the RCA TK-76 also realized the potential for EFP, and "souped up" the ENG cameras for better field performance—into the TK-760, for instance.

On the other hand, in applications where field production meant large-scale, multi-camera setups for sports events, parade coverage, political conventions, and the like, an entirely different camera was required—one that had the ability to be interconnected with other cameras and matched, that offered superior signal quality for applications such as live network feeds, that could be operated by camera technicians used to working in a studio environment. The 2/3-inch tube cameras of the ENG/EFP variety were not adequate, and engineers began looking to bring studio cameras into the field, basing them inside large mobile trucks. Some of the most sophisticated vans even came to rely on 30mm tube studio cameras.

To cloud the matter still further, a new generation of cameras yielded field/studio convertible configurations. Several cameras came onto the market that could be used hand-held, mounted on a tripod with a triax or multicore adapter and five-inch viewfinder for the field, or mounted on a pedestal with a seven-inch viewfinder and studio-type lenses, all using precisely the same electronics and basic camera body.

The concept of convertability, of course, primarily arose from marketing strategies rather than from the technology itself. In the broadcast and production environments, a studio camera is dedicated to studio use. Rarely is the news department's ENG camera pressed into service in a multi-camera system. And lens configurations used in the field can almost always be adapted if the camera is brought inside and used in the studio.

Remote control strategies

When it comes to remote control of EFP cameras, however, the confusion is quickly eliminated. Except on those occasions when a single camera and single VTR are being used to shoot documentary-style, EFP cameras are almost always used in multi-camera configurations and require remote control capabilities for both synchronization and color control.

It is here that field camera technology is making its most rapid progress. Microprocessors, installed in either the camera head or in the remote control panel or in both, are making production in the field comparable with studio shoots. The microprocessors are making it possible to both set up and align a multi-camera shoot within minutes,

eliminating costly ESU time. They also enable far more precise alignment than video operators could ever hope to achieve through observation of sometimes misaligned monitors and manual control with analog signals.

The technology is pervasive, with digital control systems available from the simplest 2/3-inch ENG/EFP camera to the largest 30 mm triax-controlled system. Automatic setup and digital control are becoming as important to field production as the latest generation of high-quality cameras themselves.

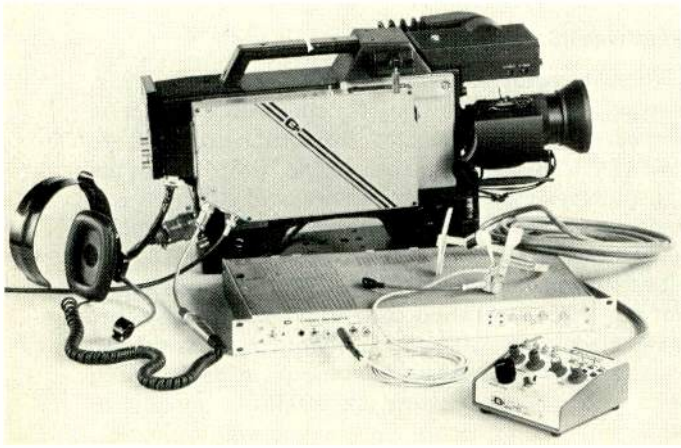
Toshiba digital memory

Certainly one of the most innovative approaches to digital remote control is the Toshiba system offered with its PK-60 ENG/EFP camera, supplementing a completely analog remote control system that uses either triax or multicore. The camera incorporates a nonvolatile memory for white balance, black balance, and centering that function even when the camera is powered down. Through a connector built into the back of the camera, a small box containing an eight-bit microprocessor is connected with the camera; in this way, setup data that has been programmed into the digital memory pack can be transferred from one camera to another, and the box removed once the data has been transferred.

An important part of the Toshiba system is the digital auto setup box, which senses RGB signals coming back from the camera and provides appropriate digitally encoded correction signals. This information is used to program the memory unit, which can then operate independently of the setup system.

Another configuration for the PK-60 is with a digital base station that controls as many as 10 cameras using coax connections up to 1,000 feet. The base station interfaces through the memory adaptor, with one required for each camera. The base station can be used for manual control of RGB levels and centering, or the automatic setup unit can be connected to the base station, enabling up to 10 cameras to be set up sequentially.

Cinema Products Digital Co-Ax control offers command of one or two cameras and incorporates an intercom in the single coax-transmitted signal.



Cinema Products coax remote control

A somewhat similar, low-cost system for digital remote control is marketed by Cinema Products, designed for cameras such as the NEC MNC-81, RCA TK-76 and 86, Sharp XC-7000 and 800, Sony BVP-300 and 330, and several other cameras. The system works with a D/A decoder installed inside the camera body that connects with the A/D encoder over coax cable to 5,000 feet.

The cable carries 21 control channels, in addition to return video and a PL intercom system, for either one or two cameras. Control functions, through the mini-CCU supplied with the system, are quite extensive and include genlock, auto white and black balance, iris control, tally, RGB centering, pedestal, and gain.

Ampex Digicam approach

Digital remote control is becoming so commonplace that it has virtually eliminated the need for multicore analog systems. Were it not for the power distribution capabilities of triax, large cables would be on their way to becoming virtually extinct in field production.

This is true not only for the smaller ENG/EFP camera systems but also for larger systems such as the Ampex BCC-20 and BCC-21 Digicams. Both the 20 and the 21 (the latter is a studio version of the camera with seven-inch viewfinder, studio lenses, tally, and teleprompter capabilities) incorporate a microprocessor within the camera head. The on-board microprocessor is used in the SPEC spacial error correction system, in which the memory in the head stores correction coefficients for vertical and horizontal registration, and also shading values for each of the 192 rectangles into which the screen is divided. The registration system, which provides 0.05 percent registration accuracy in all three zones, works by comparing the preprogrammed microprocessor memory with a diascope image projected from the lens. The shading values are programmed by moving a cursor either manually or automatically to the various rectangles in the grid.

The on-board microprocessor is also used in conjunction with a master setup panel for setup and registration, interconnected either directly through a junction box on the camera or through a base station. Up to eight cameras can be controlled through the setup unit. In the manual mode, the operator uses function buttons to address the parameter to be aligned, then uses the dials to send control pulses to the camera head microprocessor to make the actual adjustments for tube alignment, black and white shading, registration, tracking, black and white balance, and enhancement. The panel is prompted even in the manual mode, so that the panel suggests the next, most logical step in the alignment procedure (though it can be easily overridden).

Automatic setup of up to eight cameras is also controlled through a separate module of the master setup panel. The auto setup unit directly addresses the Z-80 microprocessor in the camera and performs all the spacial error correction adjustments automatically, comparing each zone in each camera separately. The ASU also performs the registration procedure automatically, analyzing the diascope pattern with digital comparators. Other steps in the auto setup sequence include, in order: master black,

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CEI microprocessor control

Completely automatic setup, including registration, can also be achieved with the CEI 340 camera with a newly introduced microprocessor remote control panel; a circuit card is also required in the camera head, which has slots for functions such as time code generation.

White balance and black balance are achieved automatically once the cursor is aligned over a suitable area; the iris is capped automatically during black balancing. If the image being scanned by the cursor falls outside the parameters normally expected for white balancing—a colored area, for instance—the microprocessor will not perform the balancing and will tell the operator, via a message on the monitor, that something is wrong. The cursor can also be used as a spot meter to align all the values in a scene to a particular area of the image. The same can be done with gray scale tones so that the microprocessor is programmed through the cursor to always represent a particular color in the scene with a particular gray-scale shade. During all of the above operations, the microprocessor will also provide a message if there is not enough light.

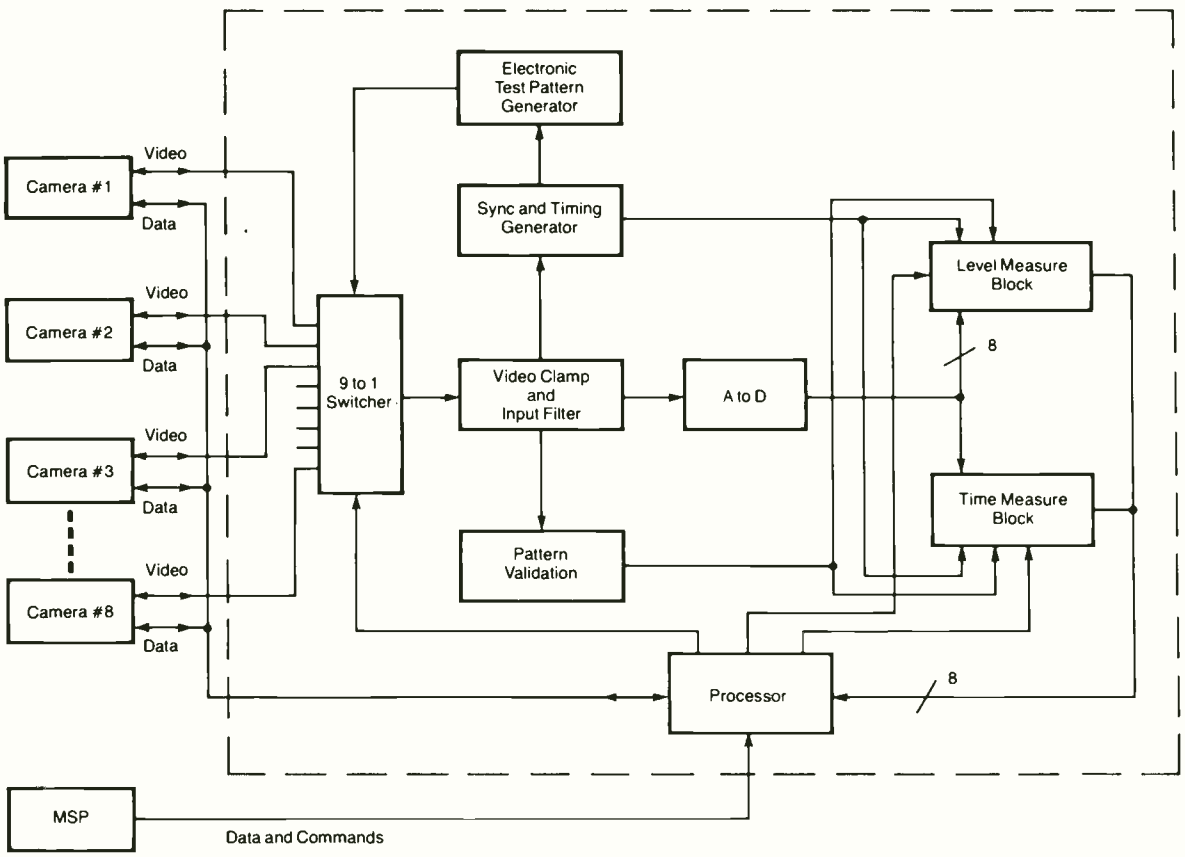
Registration and centering are performed automatically and continuously while the microprocessor is on (when the unit is disconnected, the camera automatically holds its last setting). Rather than using a diascope for registration, the system relies on sharpness of detail in the image itself. Using samples taken from a matrix of cursors every 16 frames so as to avoid setting the camera to random errors, the alignment system automatically registers the three guns. Again, messages appear if the alignment required is beyond the capability of the microprocessor; a message might read "turn red gain down." After the operator has made the adjustment and the red gun is within tolerable deviation, the computer takes over again.

Ikegami in the field

Ikegami is among the small number of companies that are promoting microprocessor setup and control of one-inch tube cameras specifically designed for field production. Its HK-357A, billed as the company's third microprocessor-controlled camera, uses much the same approach as the HK-312 and 322 studio cameras.

In the case of the Ikegami system, the microprocessor is located in the automatic setup unit, which interfaces with the base station together with a remote control panel or remote control box. Actual base station connection with up to six cameras is by standard multicore or triax cable.

Block diagram of Ampex Automatic Setup Unit control shows typical features of digital control system.



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BME

The automatic setup relies on a diascope in the lens to perform complete registration and balancing of each camera within 60 seconds. The following is the automatic sequence: iris, G pedestal, RB pedestal, RB gain, RGB gamma, RGB flare, RBH centering, RBV centering, RB width, RB height, RBH linearity, RBV linearity, RB skew, and RB rotation for focus.

The setup unit is organized into six sections, one for each camera, permitting the storage of operating details about the different cameras in the system. The data register can thus be programmed with information about whether the camera is on triax (up to a mile away) or multicore (up to 2000 feet), and the specific cable length. It is also possible to store the values of lens chromatic aberrations for each camera used, allowing the microprocessor to compensate automatically for the difference between the diascope image and an actual through-the-lens scene. Another feature is the ability to register the camera manually first, then store the information in the microprocessor, which can subsequently duplicate the manual settings.

A brand-new approach from Philips

Being shown at the 1982 NAB for the first time, the brand-new Philips LDK-6 incorporates some of the very latest in microprocessor control of field cameras—in this case, user-specifiable for either 25 or 30 mm tubes in an all-triax configuration.

The camera head itself incorporates four microprocessors that provide, within 60 seconds of powering up, completely automatic registration, resolution, shading, and focus. The parameters for all specifications are as good in zones two and three as they are at the center, since the raster is divided into 49 rectangular zones that are individually set up by one of the camera's microprocessors to a precision several times better than that achievable on a conventional camera. The diascope is housed within the camera itself rather than the lens.

The brand-new Philips LDK-6 is the latest microprocessor setup field camera.

In addition to the four microprocessors, each camera contains six randomly accessible operational memories and four lens parameter memories for preprogramming various aberrations. The microprocessors within the camera communicate with those in the master control panel, common control panel, and camera processing unit via two-way data links carried within the triax cable, up to 2000 meters with the standard system and up to 5000 meters with the Philips/ABC triax repeater. Control signals are transmitted to the camera via digital pulses from the control panel and translated by a D/A converter in the camera head. All automatic functions for camera setup and registration can also be accessed manually through the panels.

The CPU itself contains no operating controls and requires connection with a master common control panel. Through an optional control assignment panel, each master control panel can service any number of individual camera channels. Once connected to a selected channel, it automatically displays a status report of all current settings of hundreds of parameters. Single pushbuttons initiate full, partial, or individual automatic adjustments. The same component provides displays and controls for automatic trouble diagnosis and correction.

Common and remote control panels provide adjustments of operating parameters normally available in a manual camera CCU. These include contour amplitudes, auto iris peak/average, and common adjustment of R and V gains of multiple cameras simultaneously.

Up to six individual camera setups can be stored by one CCP in each of up to six camera channels. Because of the distributed intelligence system, all components in a multi-camera system are truly and randomly interchangeable during system operation.

A single CPU/MCP/ASP combination could be located at the terminus of a permanently laid triax star network. A pair of camera heads could then be hopscotched among the shooting locations, each ready for immediate use with lenses and operational setup matched to the scene being shot. For heavy production schedules, LDK-6 heads, each with six operation setups preprogrammed, could be installed at each shooting location.

RCA studio camera in the field

Some would consider a camera such as the RCA TK-47, with its 30 mm tubes, too large to be considered a field camera. But as companies such as TPC with its Startruck are proving, the TK-47 is ideal for coverage of network-quality sports events, especially because of its microprocessor-based automatic setup and control.

In the RCA approach, the microprocessors are located in the camera processing unit, which communicates with the camera head using conventional triax systems; neither the head nor the CPU contain any analog potentiometers at all, and instead are programmed by a remote control unit or automatic setup unit, both of which connect with the CPU via dual twisted pairs.

The remote control unit provides full operational control of the camera, including a joystick for iris and black level and a "paint enable" button to allow white and black balance controls to be switched in or out. Other pushbuttons control automatic features such as auto iris, auto white balance, and auto black balance. Other controls are

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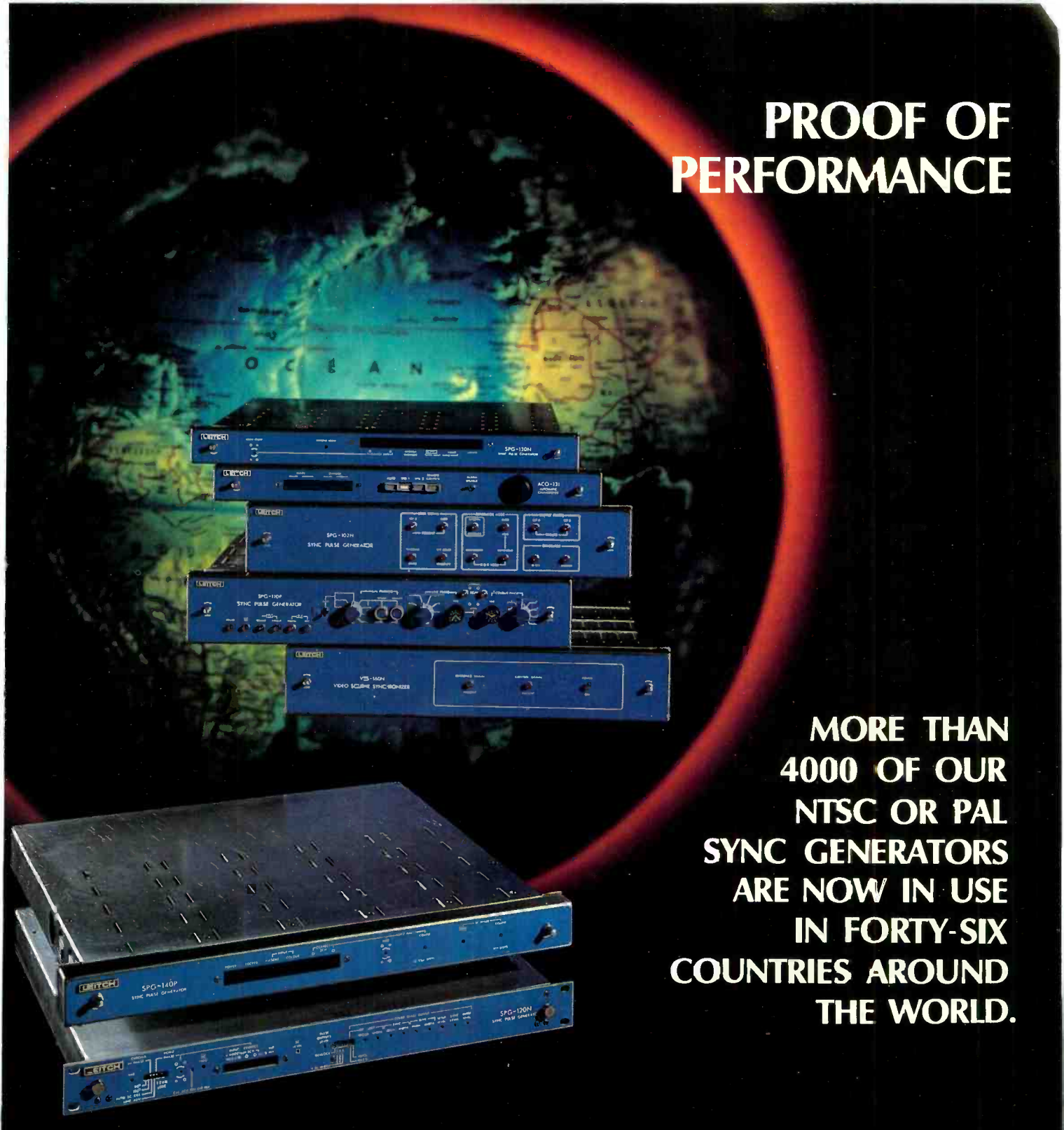

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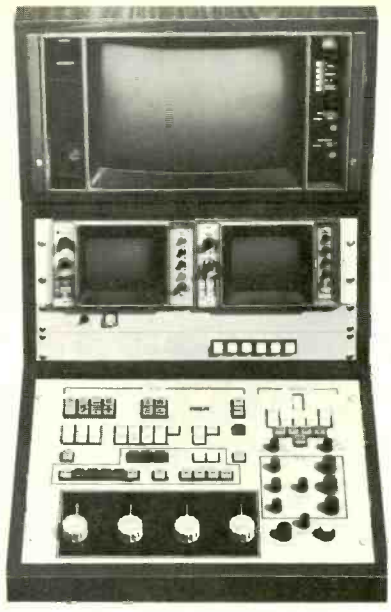
Circle 144 on Reader Service Card

SPECIAL REPORT

provided for painting, master gain, color temperature selection, and so forth.

The setup terminal is a completely digital system that can be disconnected from the CPU's nonvolatile memories once it has programmed them with setup data. A single setup terminal can control up to 12 cameras. All of the line-up control functions for the cameras are delegated to four knobs at the bottom of the panel, with an alphanumeric LED display above the knob showing to which function it has been assigned. Each knob operates a digital signal generator, transmitting digital pulses to the CPU; over 100 different setup functions are controlled. Three different modes of operation are available through the setup unit, starting with a completely manual mode in which the function to be controlled is called up and manipulated. In the semi-automatic mode, the unit automatically goes to the next most logical step in the setup procedure, waiting for the operator to make the adjustment and move on to the next step. In the optional completely automatic mode, a single pushbutton activates the automatic setup of 94 camera parameters to preprogrammed levels. In the auto mode, all three color channels, including green, are adjusted in minutes for registration, shading, level set, gamma tracking, electronic focus, and beam alignment.



Setup panel for the RCA TK-47. Setup is either completely automatic or manually sequenced.

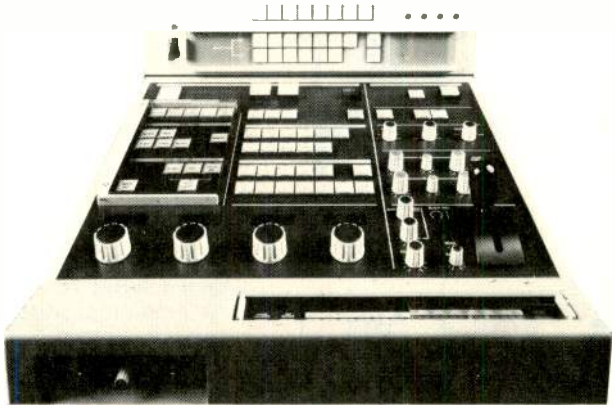
New digital control from Hitachi

Another large, 30 mm tube camera primarily designed for studio applications but also with remote broadcasting possibilities is Hitachi's new SK-110. Again, extensive microprocessor-based control has been designed into the system to provide extremely simple setup procedures.

Hitachi's approach has been to incorporate its microprocessors and memories in the setup control unit rather than the head. The SCU sets up 34 camera parameters of up to six cameras simultaneously in less than two minutes. The setup unit connects each camera's CCU, which also incorporates extensive microprocessor memory. This includes preprogramable data storage of parameters for normal setup, special painting setups, H reverse, V reverse, and H/V reverse. In addition, random access memory is provided for storing information on lens aberrations when auto registration is performed with the diascope.

Hitachi's automatic setup method employs "zero control," in which the R, G, and B channels are controlled, eliminating the need to manually adjust the G channel.

Automatic setup unit for Hitachi SK-110. Four digital control knobs are assignable to different functions.



With a digital setup unit for every group of six cameras, up to 24 cameras can be controlled with a single setup control unit. By adding a transfer switch unit, control capabilities can be expanded to up to 42 cameras using two SCUs. Five auto setup modes are provided: full, registration, color balance, G reference, and white balance.

Other developments

The above account of recent developments in the use of microprocessors for controlling field cameras focuses on the most complex systems for multi-camera setups. But there are other processor-based cameras. Hitachi's FP-22, for example, features a low-cost automatic setup system for registration, white balance, and black balance that automatically remembers and recreates the previous setup values even when the power is turned off. Ikegami's EC-35 electronic cinematography camera also has extensive microprocessor-based automatic setup, as does the HK-312 camera, which Ikegami markets almost exclusively for studio applications. Marconi's Mark IX, which can be either hand held or tripod-mounted for studio operation, has an automatic setup module for its CCU to provide automatic centering, iris, registration, black level, color balance, and dynamic gain functions.

Many field production cameras incorporate microprocessors used in self-contained functions such as auto white and black balancing, centering, and registration. Thus, in field camera technology, microprocessors are coming to be almost as important as the camera imaging systems themselves, and camera designs, based on increasing use of microprocessors, are reflecting the growing needs of EFP. **BM/E**

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CHYRON IV's digitizing tablet provides full flexibility for the artist to draw, change select colors and fill. He has, in effect, a true electronic paint system. *Background graphics* can be created and displayed or stored for later use. In addition to the digitizing tablet, graphic information can be entered with a black and white camera in the font compose mode.

This new background graphics capability gets the artist away from plain text into the generation of "pictures": graphic images, representations, vignettes with as many as 16 colors or gray scale values, etc.

Multicolor characters are available, too. Full color or halftone artwork is digitized and displayed with up to seven different color values per character. The display can be changed from *gray scale values* to psuedo-color for ease of trim and area identification. This means that multicolor logos or other artwork can be displayed and treated as a single character to take advantage of all the CHYRON IV animation and character manipulation features.

New Board is the Key

A state-of-the-art multimode graphics module is the heart of the new capabilities. It replaces the existing font compose module and operates in several differing modes.

In its basic operation, the new module provides an advanced means of camera font compose. A built in A/D convertor samples incoming camera video at 10 times subcarrier and digitizes each sample with four-bit accuracy (thus, the 16-level gray scale). Software then analyzes the data to produce extremely smooth curves and slopes for virtually perfect capture and the elimination of trimming in most cases.

Many Other Features

Other CHYRON IV features provide even more flexibility. Up to four "vignettes" may be created and independently positioned or animated. Text can be moved out of the safe title area, the color palette has been expanded to 512 choices, character edging can be any color and diagonal typing has been provided. The roll and crawl modes have been improved to allow smooth motion through horizontal and vertical blanking. And there's more. Call or write for all the details.

The CHYRON® COURIER

An Occasional Newsletter Dedicated to the Latest Chyron Developments.

Vol. I, No. 1

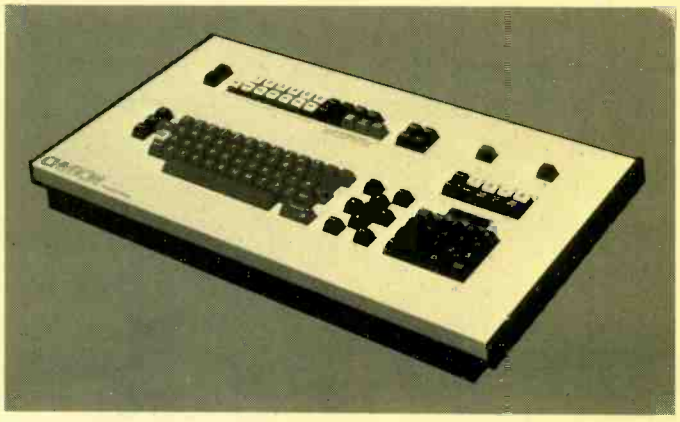
Earlier CHYRON IV's Can Be Retrofitted for New Features

The new CHYRON still carries the model number IV. It will not obsolete the many earlier CHYRON IV's still serving nobly out in the field.

Your current CHYRON IV can be retrofitted to provide all of the newly-developed features. Return your IV to the factory, *and we will replace the unit's present font compose module with the new multimode graphics module* and add the necessary systems modifications to accept the new features. It will convert your old CHYRON IV into a true graphics generator, with all of the many advantages of the new model.

Updated training sessions will be available, too. Classes for operators may be scheduled at Chyron headquarters in Melville, N.Y. or at your place of business.

For details on the retrofitting of your earlier CHYRON IV and on the latest operator training, call or write today.



Highlights of the New System

In brief review, these are the main features of the new CHYRON IV.

- Background graphics plane
- Advanced font compose with 16 levels of gray scale
- Multicolor characters (7 colors each)
- Digitizing Tablet
- Winchester disc
- 512 color choices
- Four-level animation plane
- Blanking-to-blanking display capability
- Colored edge
- Fader provides 256 levels, with gamma correction (pre-programmable)
- Diagonal typing
- Software-based for future enhancements.

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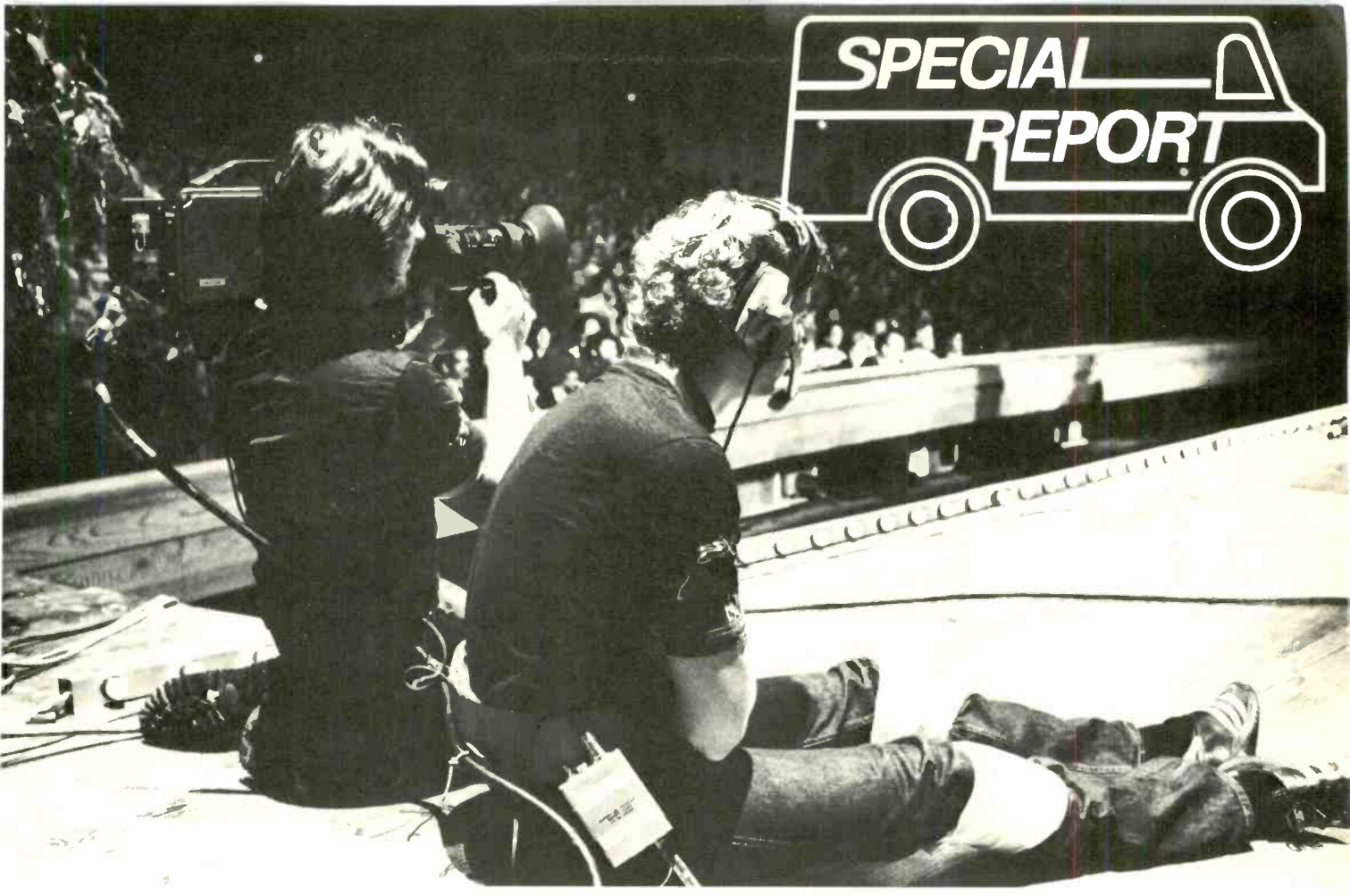


Hardwired intercom helps coordinate stage production for One Pass Video.

INTERCOMS IN EFP: VERSATILITY IS THE KEY

Handling the various challenges of field production can be easier if your internal communications system fits your needs. The proficiency of a system may depend on its ability to change with the territory.

MOBILITY AND FLEXIBILITY. These two words encompass virtually every requirement placed on intercommunications systems that are used in field production. Mobility is essential if the system is being used with hand-held equipment, obvious to the operator who must concentrate on more important matters such as staying in focus. Flexibility, on the other hand, is vital if the intercom system is to be able to handle the enormous variety of productions — everything from local basketball games to rock concerts — demanded of EFP.

Sometimes, there must be a trade-off — having a totally flexible system in which mobility takes second place to the need for elaborate, multi-channel setups, for instance. In other cases, mobility wins out — as with the new RF intercom systems coming onto the market. But increasingly, systems offering both features are proving to be the key to users' requirements.

Hardwired system to parallel video cables

"We use the Bang-Campbell (BCA) system [distributed by Television Equipment Associates] because of its easy adaptability at minimal cost," says Don Landis, engineer at television station WHTM in Harrisburg, PA. The station's remote productions typically involve sporting and community events, as well as local commercials. Usually two RCA TK-76 cameras are connected by a hardwired intercom to the director's panel in the truck in a party line system. Each camera operator uses a belt pack with a receive volume control.

In this type of setup, camera cables must be run, so it is

no extra effort to lay the intercom lines right along with them, enabling the director to use a reliable hardwired system in the difficult RF environment of Harrisburg.

To cover a Christmas Eve service at a local church, the station added a third camera as well as an audio console. The BCA Interphone permitted all four user stations to be combined through a single master box, so that only a single cable was required for each station — reducing the possibility of potential problems. A modular system with plug-in building blocks, the BCA offered the simplicity of being able to change with the type of production.

RF systems provide freedom

For less confined productions, the mobility of the intercom becomes extremely important. For example, the wireless system designed by R-Columbia provides Prime Time Design, a production facility in Oklahoma City, with the freedom necessary in remote productions.

"The wireless systems give us the freedom we need because of the different kinds of productions we do, which is everything from commercials to rodeos," claims Jay Kruger, part owner of Prime Time. A one-camera operation, Prime Time was the first production company in the southwest to use the R-Columbia wireless system. "We chose it because of its ability to meet the demands of shoots in any location," says Kruger. Another reason for supplying wireless headsets is that as the need for more cameras arises, Prime Time often hires freelance camera operators whose equipment often does not interface with a standard hardwired intercom. On other occasions, clients will specify exactly what kind of cameras they want used — again necessitating an easily adaptible system.

In addition, Prime Time went wireless because it often runs a straight coax video cable to the switcher, eliminating the possibility of using standard hardwired intercom cable. Still another reason, according to Kruger, is that "We often shoot in other countries, or in places like rodeos, where the location is so remote there is no available source of power. All our equipment must be battery-powered."

At a recent production for the rodeo, four send-and-receive headsets operated in conjunction with one receive-only unit. The director and the three camera operators used the send-and-receive units, while a production assistant wore the receive-only unit. In this way, the director could communicate back and forth with the camera people and dispatch the assistant to any location to rectify problems as they arose.

RF at the Met

Wireless intercom systems are not restricted to the outdoors. Ken Schaeffer of Schaeffer Audio has used Swintek's Mark 200 wireless headset for indoor applications with great success. "The Mark 200 is a very hi-fi system that can do a great deal and has almost any kind of interface you would want, including crystal mic level, low level, line level, and more," he observes.

Schaeffer recently designed the New York Metropolitan Opera's intercom system around the Mark 200 because of the system's hands-free capability and because the units adapted easily to the rigors backstage. "At the

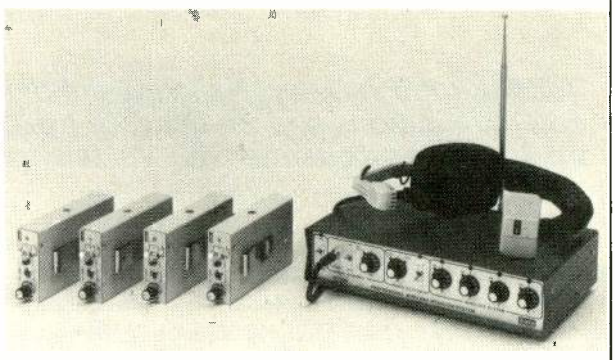
Trend in Intercoms is Toward Wired/Wireless Combinations

Cetec Vega's extended efforts in the use of wireless and hardwired intercoms has resulted in the QX-1 and QX-2 systems. With the QX-1, the addition of a QT-1/QR-1 unit allows a walkaround, full-duplex wireless station within an otherwise wired system. The QX-2 permits from two to six wireless stations in a party line configuration with optional interface to a wired system.

Among the other leaders in the trend toward wired/wireless systems is HM Electronics. Its 150E system contains two main elements. First, the IC-150 Base Station combines the functions of base transmitter and receiver, wired systems interface, and control center. The base station transmits on a single VHF high-band frequency and receives the VHF mid-band frequency from the remote units. The received signal is simultaneously fed to the base operator's headset, to the wired system interface, and to the transmitter section for rebroadcast to each remote unit.

The second part of the system is the MT-1000 remote transceiver. In full duplex operation, each remote unit uses its own transmit frequency, with the base station able to receive up to four different frequencies (from four different units). In push-to-talk operation, all MT-1000s can use the same transmit frequency with operator sidetone provided through rebroadcast of the receive signal by the IC-150, automatically confirming receipt of communication.

The IC-150 base station permits the expansion of a hardwired intercom to include the freedom of wireless stations. Combinations of full or half-duplex are possible. The HME system makes the wired intercom a part of the wireless communications loop and feeds the wireless signal to the wired system. All parties remain in the communication link. Accommodating many different wired intercoms, the system also allows the base station operator to switch between two separate party lines, as in most hardwired systems.



HME's base station and remote units.

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The digital video people.

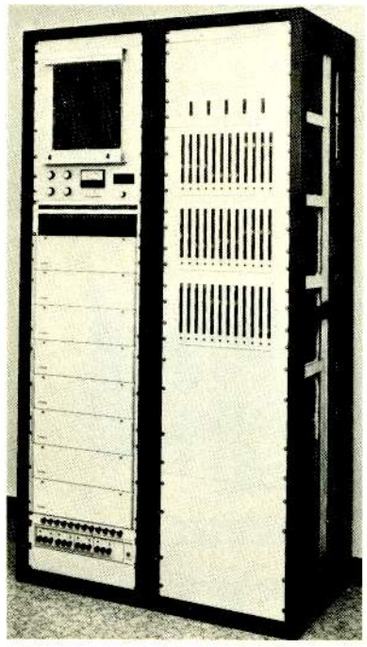
opera you often have stage workers using both hands to hold up props and maneuver scenery, so you need the hands-free capability of RF," explains Schaeffer. At the Met he assigned six Mark 200s for the backstage people to communicate with the director.

The Swintek system has full duplex capability when only a single pair of headsets is used; when more than two people are on line, it becomes a simple push-to-talk unit. Schaeffer overcame this problem with a repeater. Each person's belt pack/headset transmits on a different frequency. The repeater, equipped with six different receivers, sums all the signals and retransmits the signal on a frequency to which all headsets are tuned. In this way, with no extra buttons or unwieldly panels, the director is able to make an all-call so that each crew member knows what everyone else is doing.

Selective monitoring through central control

When the complexity of a production prohibits the use of wireless, or when the intercom system must go through a main switchboard or control panel, it is necessary to go with the hardwired systems. Clear-Com's System II is a complete intercom package that has multi-channel capability through different types of main switchboards. One Pass Video in San Francisco chose the Clear-Com system because such features provide the ready flexibility needed in adapting to various types of productions without having to design extra equipment that may never again be used.

For example, One Pass recently used System II compo-



Ward-Beck rack units with pin board and push-button matrix facilitate channel assignment.

Solid state circuitry makes Swintek's Mark 200 a hi-fi system.

nents on a large and complex operation at the International Jazz Festival in San Francisco — a multi-camera production that was simultaneously recorded and sent live via satellite to Japan. The production involved a large staff, three vans, and audio equipment for both the recorded and live sources. There were also two directors, one in the production van at the intercom main station and the other in the transmitting van. The intercom consisted of interconnects between the two directors and from the production van to the different personnel in the stage area.

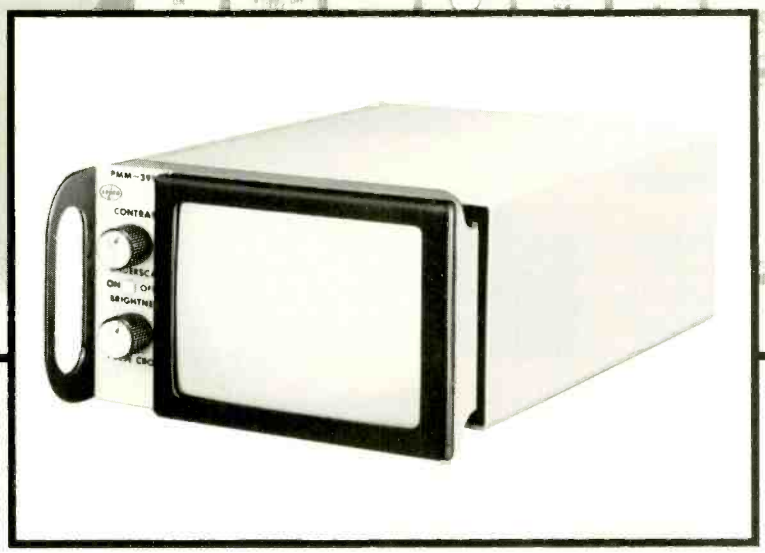
The Clear-Com modular units were used to combine through the communications system the people who were working on separate parts of the show, enabling them to coordinate communications successfully within a complete party line system. The director in the production truck used two channels to the field, one for lighting and crew and one for all cameras, VTRs, and audio. For the second truck and the other director, a party line communicated with the main production van and also the personnel involved with transmission and live roll-in responsibilities. Together, the recording unit and the live satellite transmission team required 20 stations — six cameras, plus the lighting, audio, and stage crew. In such a complex and highly charged sound environment, a low-power wireless system would have been overwhelmed and could not have provided the multi-channel main switchboard made possible with the hardwired system.

ABC turns to a matrix

As the location for various productions changes, so do the logistics of setting up the intercom systems. ABC-TV decided on the Ward-Beck 7000 Series because it provided a complex network of communications for the many different types of productions ABC must deal with in its worldwide coverage. Six of ABC's production trucks carry the WBS systems. The entire system was designed to conform precisely to the needs of ABC's operations as specified to WBS by ABC design engineers.

A particularly attractive feature of this matrix system is the wide variety of crosspoint types it offers, permitting selective priority of one channel over another. The connections from each panel to the corresponding crosspoints in the matrix are made prior to each production. Stations can be checked through channels on a separate pin board.

IT'S IN THE 300 SYSTEM!



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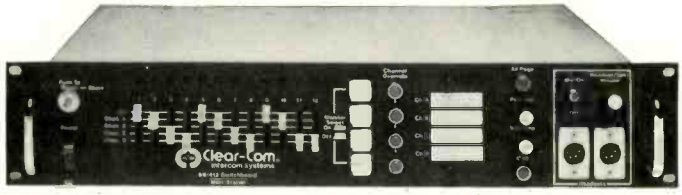
When a pin is inserted at a point representing an intersection of the communication matrix, the connection tests the reliability of that particular channel crosspoint before the channel is used during the show. In addition, 12 selectable IFB channels are available in the central matrix.

"The hands-on portion of the system places a control panel in front of every major user involved in the production," says Geoffrey Felger, manager of field operations for ABC. Thus, the keys on the director's panel activate the crosspoints that put him in touch with the people appropriate to his job (i.e., cameras, VTRs, audio, associate director located in the tape truck, etc.). On the other hand, the panel in front of the audio engineer communicates with the stations relating to his job, in this case all but camera operators.

A rack-mounted, vertically aligned pushbutton panel can direct the signal from 12 intercom stations to a different receive point. The system has 12 camera circuits, 12 circuits for the separate tape truck to handle different stations, and five additional station circuits in the production truck. Every user station passes through the central matrix and is directed by predetermined hookup to the appropriate location. If, once at the shooting site, the audio operator (who sets up the intercom) decides to assign cameras one through six to the production truck and cameras seven through 12 to the tape truck, then he need only push the corresponding row of buttons to properly reassign the cameras.

The systems in all the trucks are matched and designed to work together, even with such a broad range of applications possible. Each truck has matching external ports for cable hookup so that any truck in the ABC fleet assigned to cover an event will be sure to fit into the system. Of course, the system costs considerably more than a simple party line setup, but affords the options necessary to such large and complex remote productions as those at ABC. According to Felger, ABC has used wireless units in conjunction with the main system, but too often the coverage (such as *Monday Night Football)* takes place in crowded urban industrial areas where RF interference is severe. Also, because of the extensive planning and experience in this type of coverage, the cameras and field crew

Clear-Com mainstation provides monitoring through central control.



Superior video results. Automatically. Or not.

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The FP-22 and the FP-21 both feature Hitachi's Automatic Beam Optimizer circuit. Both are built to take a beating, with rugged construction that withstands rough handling and environmental extremes.

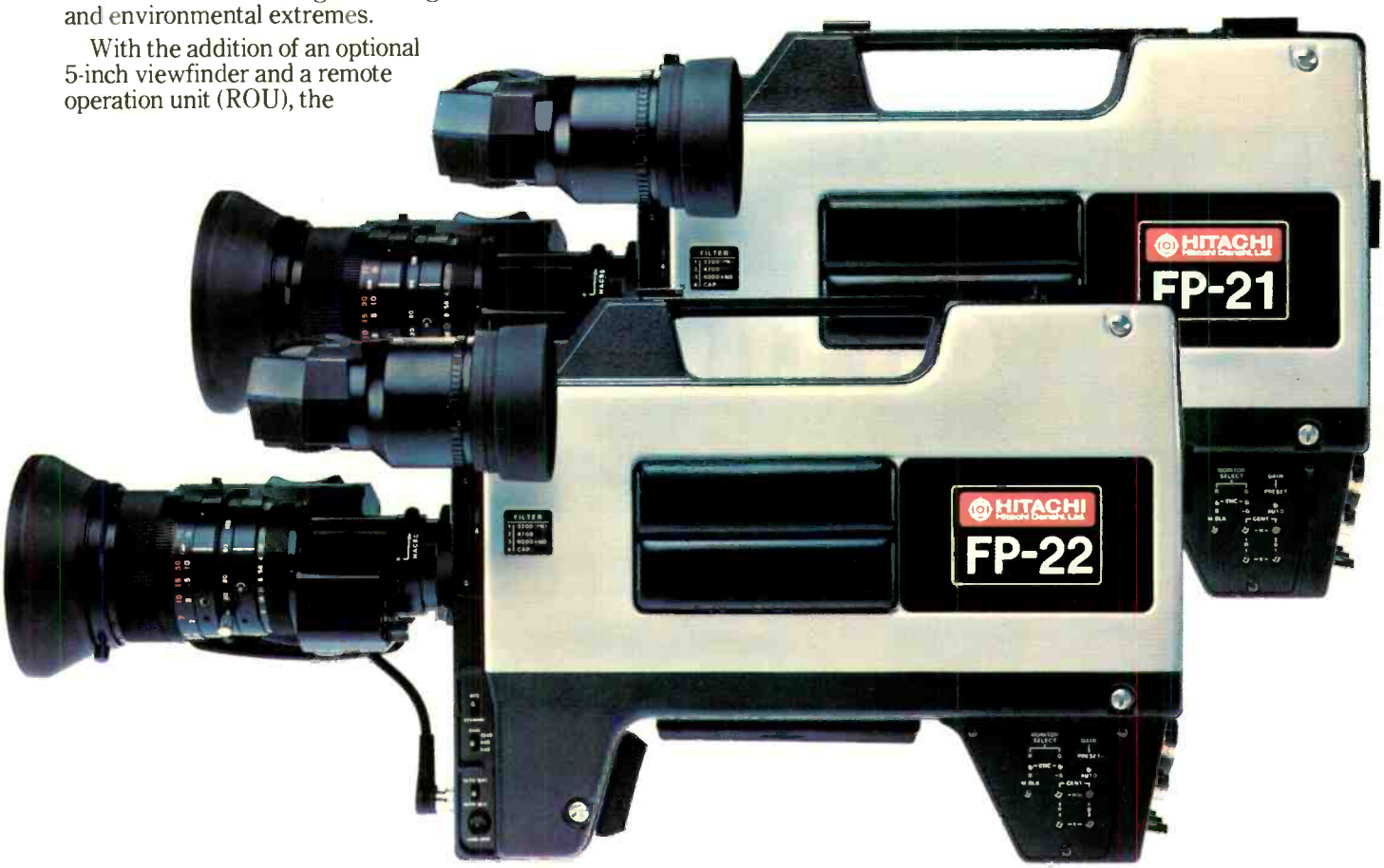
With the addition of an optional 5-inch viewfinder and a remote operation unit (ROU), the FP-22 and the FP-21 become high-quality studio cameras. Each has low-power consumption and RGB outputs for chroma key. Additionally, a two-line image enhancer is included.

Auto set-up makes it simple.

The big difference between the two is the 'Auto Set-Up' function found only in the FP-22. This computerized capability makes registration set-up simple and convenient, by eliminating troublesome centering adjustments, white balance and black balance. The previous set-up information is digitally processed and held in memory—even when the power is turned off—an unheard-of feature for this comparatively low-priced camera.

If you desire the ultimate in automatic registration control, the FP-22 is the only camera you should consider. For those who presently need only the capabilities of the FP-21, the unit can be upgraded to FP-22 standards later.

Whichever way you go, you can be assured that the high standards of quality and uncompromising performance for which Hitachi has become famous, will deliver superior color video results. Automatically. Or not.



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are strategically placed and don't require the freedom of movement provided by the wireless intercom systems.

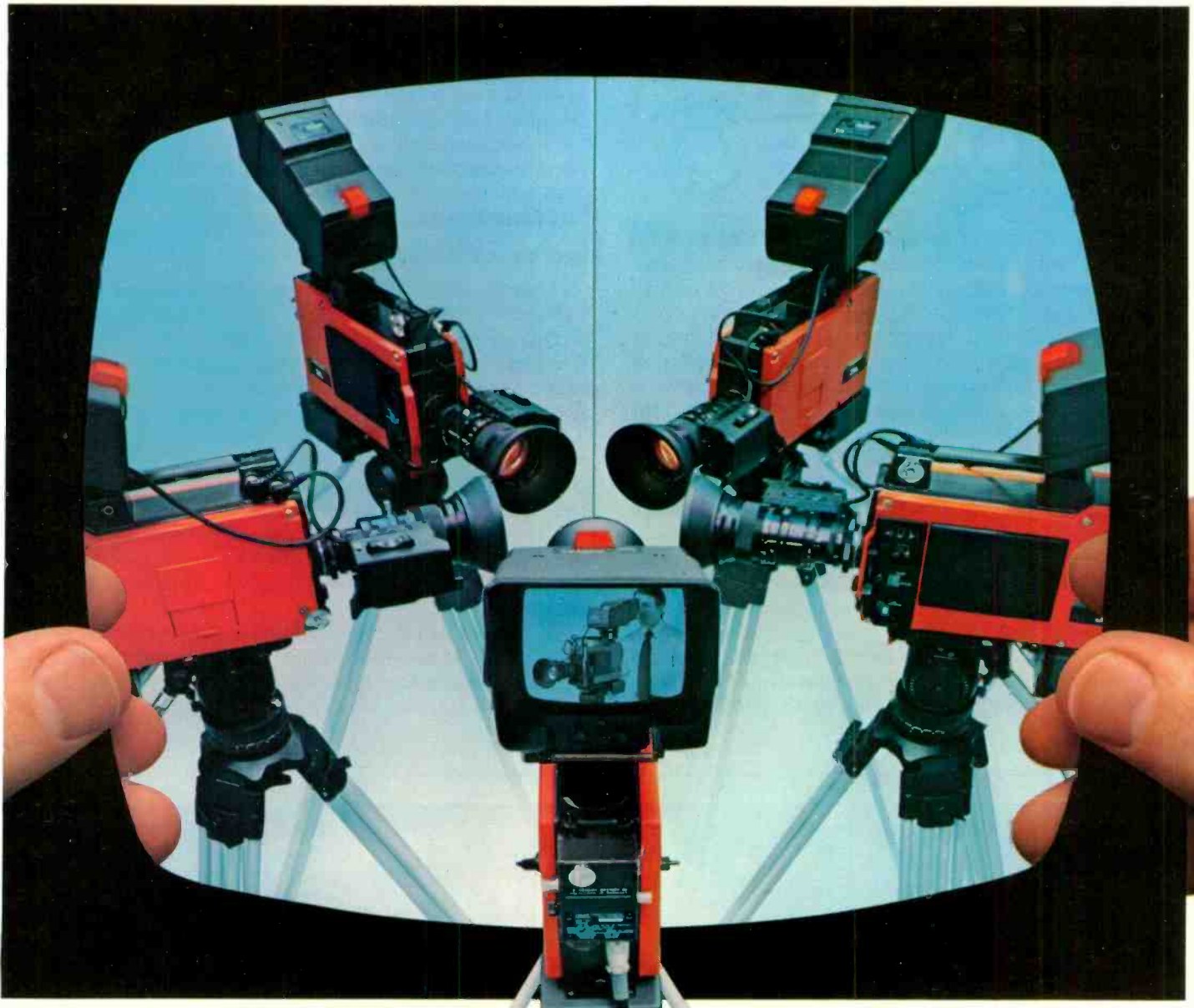
Multi-station compatability

A system's ability to conform to the rigors of any given situation is what makes it attractive to those involved in EFP. An integral feature of the RTS intercom system is its capability of powering 50 user stations by one central supply, while the same pair of conductors is used for the power and for the conversations and call signals.

Television station WTVJ, Miami, uses the modular RTS "TW" system for a wide range of field applications from football and boxing to parades, configured with three channels in the field and two in the studio. This was

Cetec Vega's master station allows full-duplex, wired/wireless interface.

Compare



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the way it was set up to cover the last Orange Bowl Parade, with a universal interface to telco lines so that the director in the field could communicate with the director in the studio, who was adding Chyron information.

At the parade, a two-channel setup gave the director complete communications with the field unit as well as easy access to the people in the studio. One channel was hooked up as a party line to the camera operators, the spotter, and other crew members, the other was employed as a communications link between the assistant director and the people in the studio. According to George Butch, engineer at WTVJ, "The RTS interfaced with our Philips LDK-5s with no problem. We had to change the jacks on the camera because we used the dynamic microphones available with the headsets. But otherwise, the internal electronics of the cameras were perfectly compatible with the RTS."

For feedback to the on-air talent, the station used a system made by Farrtronics, a firm based in Toronto. This system gave the director access to six different talent positions from his IFB panel, located next to the intercom unit in the truck. The producer was on the party line communications circuit, but had IFB available on a separate headset.

Typical of its field operations, the station used a spotter located at street level who was patched into the director-to-camera party line, allowing the spotter to update the director on upcoming floats. This type of system configuration produced on demand the communications necessary for the situation, and is just as easily applied in other field operations such as boxing and football.

Goal is greater flexibility

Presently, the intercom market offers a number of high-quality systems with useful features affording production units a high degree of applications flexibility. With these products, the engineering department usually manages to come up with the solutions to the demands made by producers and the problems of hostile locations.

An example is Cetec Vega's new QX-2 RF system, which can interface with wired intercoms to allow up to seven parties in a full duplex communications system. R-Columbia now offers a line of base stations to interface wireless units with the hardwired intercoms. Other manufacturers are seeking ways to interface wireless intercoms more efficiently with the microprocessor-controlled matrix units.

As the systems move toward greater flexibility and a higher degree of versatility, remote production units will find new vistas before them and old problems behind them. **BM/E**

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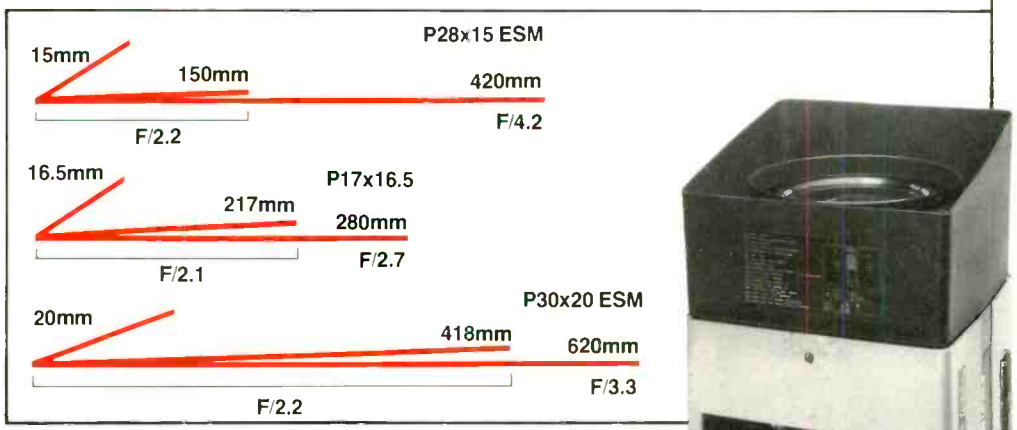
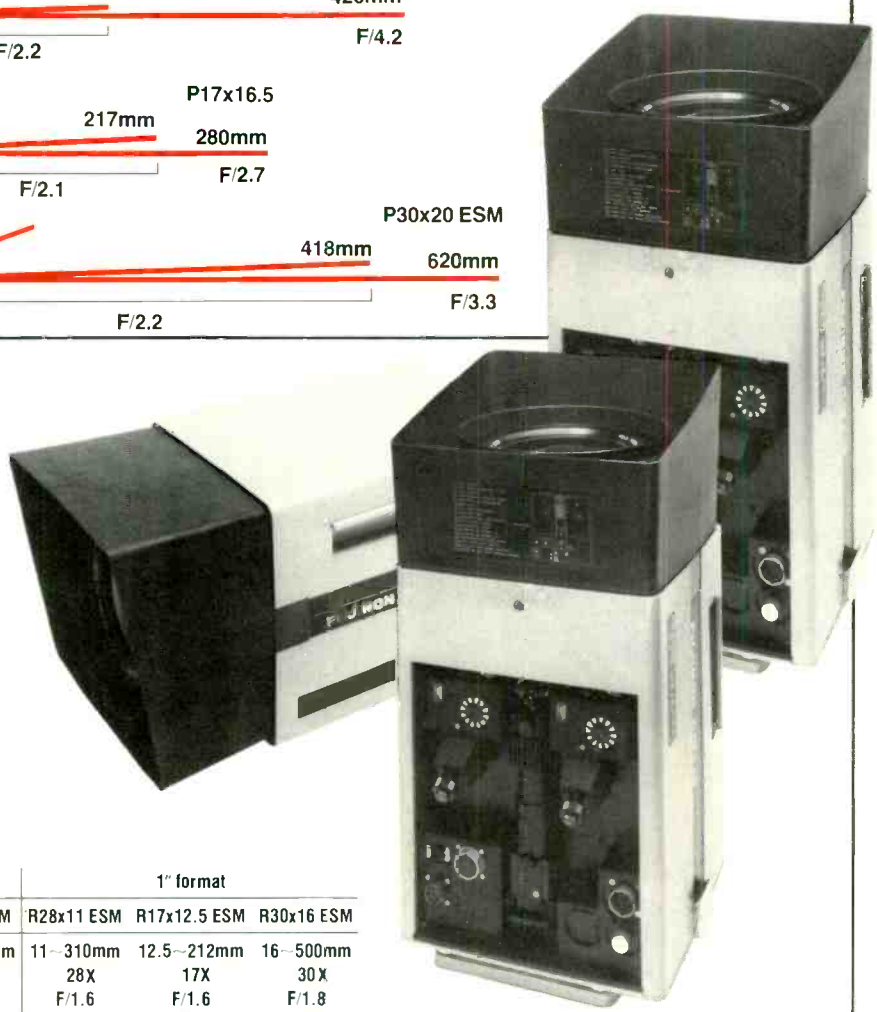
For more information on the newest and finest BCTV lenses, and why they are the best performance investment for your new or existing cameras, contact Fujinon. Large format zoom lenses are another reason why the world sees itself more clearly through the eyes of Fujinon.





Specifications:	1¼" format			1" format		
	P28x15 ESM	17x16.5 ESM	30x20 ESM	R28x11 ESM	R17x12.5 ESM	R30x16 ESM
Focal Length	15–420mm	16.5–280mm	20–620mm	11–310mm	12.5–212mm	16–500mm
Zoom Ratio	28X	17X	30X	28X	17X	30X
Max. Aperture	F/2.2	F/2.1	F/2.2	F/1.6	F/1.6	F/1.8
M.O.D.	.95m	.75m	2.5m	.95m	.75m	2.5m
Range Extender	1.7X	1.5X, 2X	2X	1.7X	1.5X, 2X	2X

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ZOOM LENS PRIMER

By Bebe F. McClain

No images would be possible without lenses. And engineers who have no basic knowledge of lenses–that is, understand their architecture, as well as related optics terminology–can be in the dark about how to evaluate these expensive "hunks of glass."

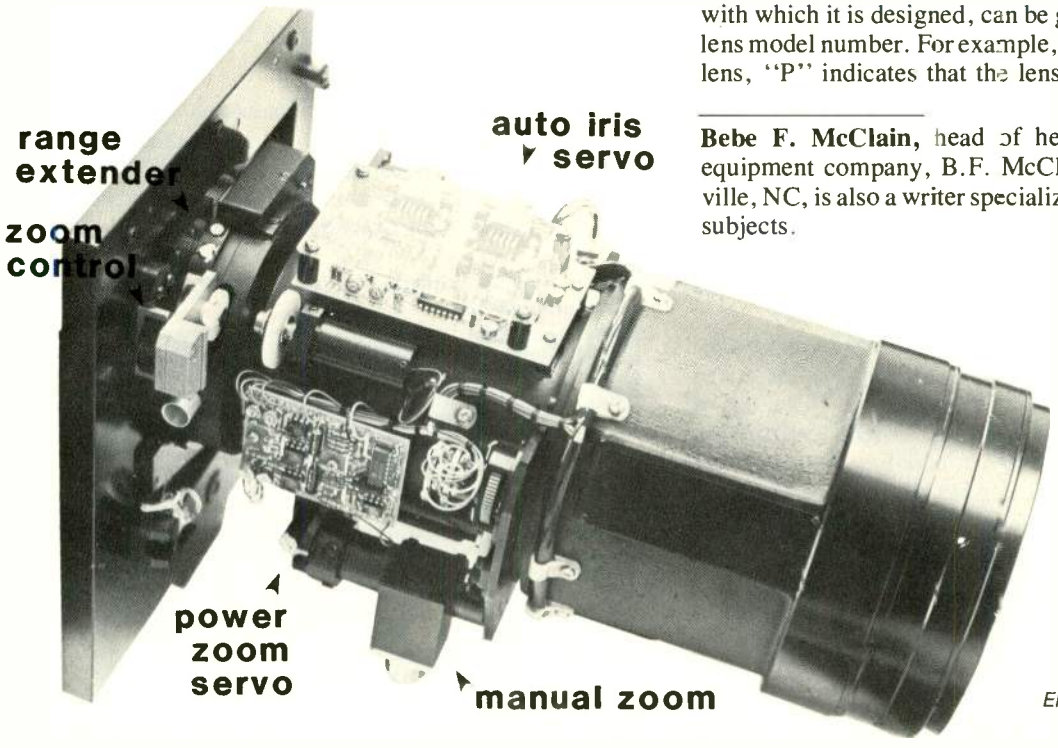
QUICK. WHAT'S THE MOST IMPORTANT part of a camera? The pickup tubes? Gain boost? Enhancement? Remote control configurations?

If you are like most TV engineers, you probably did not immediately think of lenses. Most people view lenses as merely the "large hunks of glass" that are attached to the front of the camera through some mechanical mount and require a cable or two for iris and zoom control and should be capped when not used. TV engineers see their place as literally behind the lens working with the camera body electronics.

But the relationship between cameras and lenses is this: no images would be possible without lenses. And understanding lenses better should benefit any engineer who works around cameras. For a lens is much more than a hunk of glass attached to the front of a camera.

Some idea of a lens' complexity, and the intricate care with which it is designed, can be gained from looking at a lens model number. For example, on Canon's P12x18BIE lens, "P" indicates that the lens fits a camera with 1¼

Bebe F. McClain, head of her own production and equipment company, B.F. McClain Productions, Asheville, NC, is also a writer specializing in television-related subjects.



Elements of the J20x8.5BIE Canon lens.

inch Plumbicon tubes. "B" means that there is a compensation for prism optics. "IE" indicates that there is an internal focal length extender. In the number sequence shown 12 stands for the zoom ratio, in this case, 12:1; and 18 represents the widest focal length, 18 mm. The narrowest focal length (the most telephoto setting) can be determined by multiplying the two numbers: 12 x18 mm = 216 mm.

Elsewhere on the lens are a set of numbers (but not shown in this example) such as 1:2.1, indicating the widest aperture setting of the lens, in this case, f/2.1.

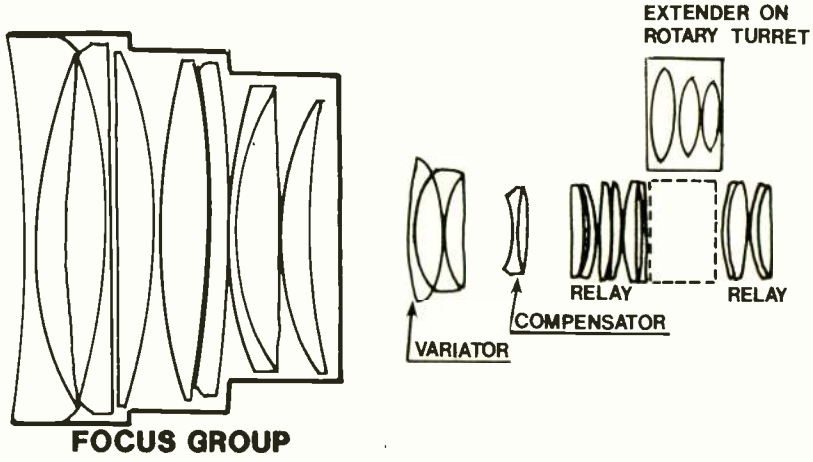


Figure 1. Optical layout of lens.

Basic zoom lens architecture

The letters and numbers indicate only some of a 300 mm lens complexity. All lenses have four basic sets of optics. Starting at the front is the "focus group," the most critical optics, since the image is gathered here, but also the most vulnerable since it receives the most abuse during camera handling.

Next is the "variator" that can move backward or forward to change the focal length of the lens (the "zoom" elements). Behind them is the variator "compensator" that corrects the focus for errors caused by moving the zoom elements. And there are two sets of relay optics, the final stop before the light enters the camera. Between the relays is the "range extender" or multiple extenders on a rotating turret.

Angenieux's all-weather zoom lens for EFP/ENG cameras is resistant to rain, snow, and high humidity.

Several operational criteria are essential for lenses designed for broadcast applications. For instance, the image size and focus must be the same for all three colors throughout the entire zoom range. Light transmission should also remain constant. In addition, lenses should operate as quietly as possible, since noise can be picked up by adjacent microphones. And, if there is an electronic iris or servo, it should have low power consumption and operate over a wide range of temperature.

Lens specifications

One of the most important considerations when selecting a lens is its magnification power, usually described in terms of focal length. But because video cameras have different-sized tubes, lenses with the same focal length yield completely different scene widths. This happens because the lens is filling different imaging areas. For example, two lenses, both with focal lengths of 20 mm, placed the same distance from the subject, yield different area coverage because they have different camera tubes:

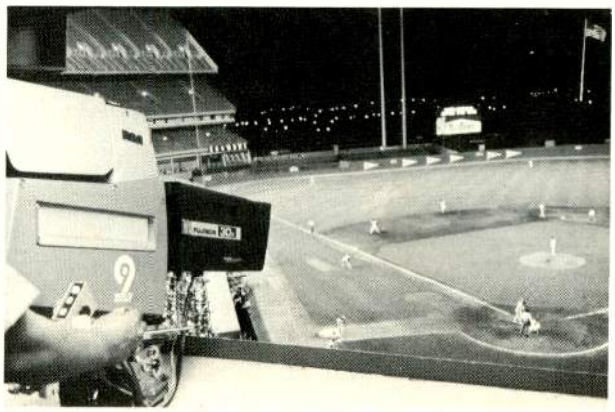
Focal Length	Distance to Subject	Tube Size	H Area Covered
20 mm	40 ft.	1¼ in.	34.23 ft.
20 mm	40 ft.	1 in.	25.61 ft.

A much more useful specification than focal length is therefore horizontal viewing angle (HVA). HVA yields a truer basis of comparison:

HVA	Tube	Distance	Scene Width	Focal Length
30°	1¼ in.	40 ft.	21.44 ft.	31.91 mm
30°	1 in.	40 ft.	21.44 ft.	23.89 mm

Another confusing lens designation is "f/stop" that represents only the amount of light entering the lens and not what is being transmitted to the tube (light is lost because of both absorption and reflection within the glass elements in the lens). A better way to rate lenses is to

Long focal length zooms such as this Fujinon model are typical in sports productions.



Yankee Stadium (photo above) as seen through the lens of Canon's P18x16BIE at a wide angle setting (56°). Runner approaching first base is recorded through a Canon P18x18BIE lens at the telephoto setting.

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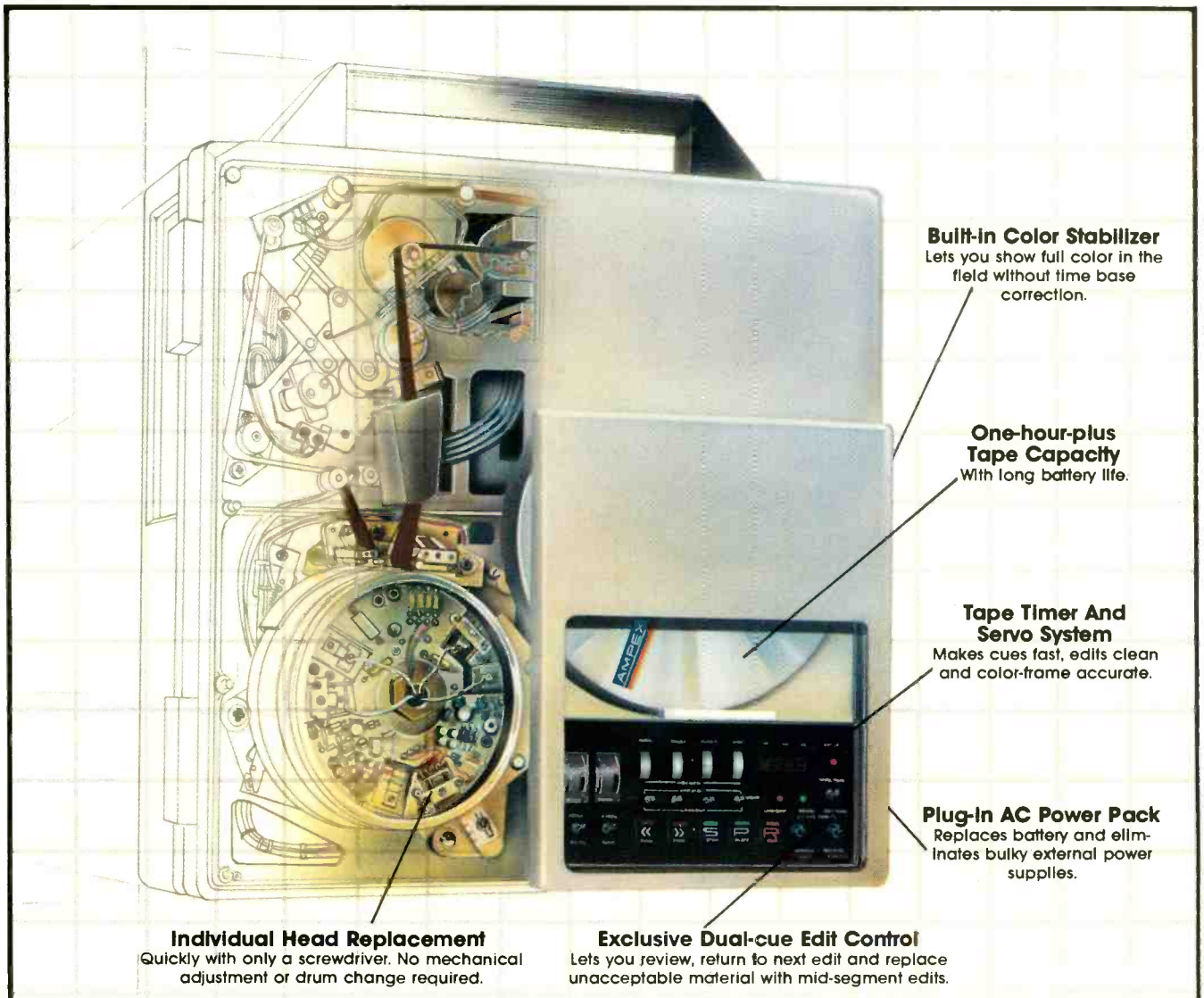

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Aperture	F/2.1			F/5.6		
Focal length (mm)	Center	Middle	Corner	Center	Middle	Corner
18	88	82	77	93	94	91
70	83	77	48	91	94	89
216	56	63	62	92	85	59

represent the transmittance of the lens as a ratio of the light that enters to the amount that emerges:

$$\text{Transmittance} = \frac{\text{emerging light}}{\text{entering light}}$$

This basic formula yields the "T stop", a reciprocal factor of the amount of transmittance based on the f/stop:

$$\text{T stop} = \frac{\text{f/stop}}{\text{transmittance}}$$

It is also useful to know how the transmittance changes with the focal length—the less, the better. In a typical 288mm lens, for instance, the maximum aperture of f/2.1 might be maintained over 80 percent of the zoom range (from 16 to 230 mm) decreasing linearly to f/2.7 at its maximum zoom setting of 288 mm. By operating at apertures larger than f/2.7, the variation in transmission will not change during a zoom.

Another important lens characteristic is its sharpness, referred to as modulated transfer function (MTF). This performance specification is given as a percentage, where 100 percent would indicate a perfect lens with perfect sharpness.

Since specifications can vary throughout the zoom range and according to the amount of light entering the lens, MTF measurements are taken at different focal lengths, different f/stops, and on-axis or off-axis. A good lens will be as uniform as possible across these ranges and should have similar sharpness in the center and in the corners. Also, sharpness should not significantly decrease when a range extender is put into place.

A typical set of specifications for the MTF is shown in the table above. These measurements were taken at two different f/stops and three different focal lengths.

A second measure of optical performance is the distribution of the light or "vignetting" as the lens moves through the zoom range. This value, usually plotted on a graph, shows how evenly the lens illuminates the field. When the lens is wide open, some fall-off is to be expected at the edges of the field.

Close-up capability

The close-up capability is a lens specification of great importance. This can vary greatly from lens to lens and could severely limit the use of the camera. Close-up capability can be defined in one of two ways. One is the minimum object distance (MOD) that refers to how close the lens can come to an object and still focus and maintain its full zoom range; a short MOD can considerably increase a camera's flexibility. The other close-up measurement is the object dimension at MOD. This indicates the field of view covered when the lens is focused as close as possible.

Distortion is almost impossible to eliminate totally from a zoom lens; the measure of the amount of distortion as the lens moves through the zoom range is another reflection of the optical performance. Looking at Figure 3 we see how the distortion changes.

At the extreme wide angle setting all TV lenses tend to exhibit barrel distortion, when the image bows out on the sides, at the top and at the bottom. Any vertical lens on the left or right sides of the scene being shot cause the barrel distortion to become quite obvious. As any zoom lens moves through the focal lengths there is one setting at which there is absolutely no distortion.

After that point, as the focal length moves from the wide angle range, the type of distortion changes to pin-

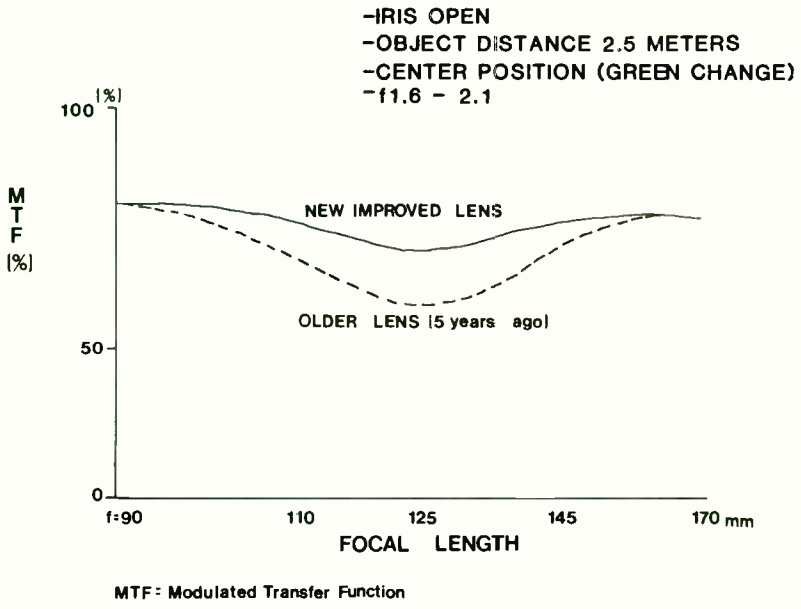


Figure 2. Comparison of modulated transfer function by zooming (lens model: Canon J20x8.5BIE).

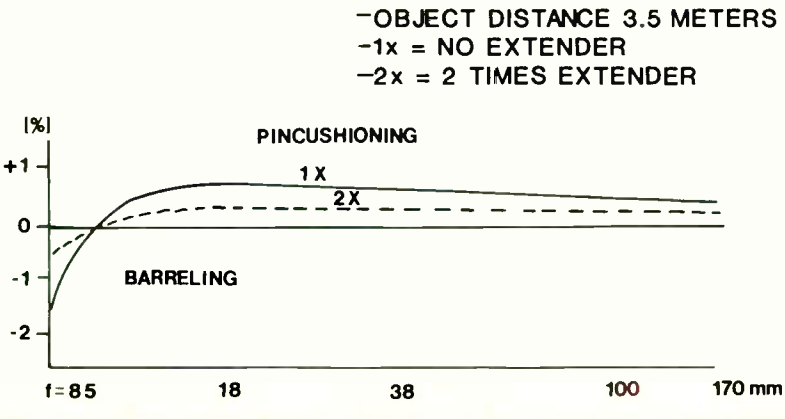


Figure 3. Diagram shows distortion through zoom (lens model: Canon J20x8.5BIE).

cushioning, when the sides seem to be pulled into the scene.

A well-designed lens will exhibit below 2 percent TV distortion as it is tracked through the zoom range. The figure shows that the distortion decreases as the focal length increases; therefore an extender will actually lessen distortion, since it increases the focal length.

Other lens measurements can be used as a basis for comparison—such as spectral transmittance. This information will tell at what wavelengths the transmission through the lens is best. Typically the green is best, then red, then blue. Similarly the variation of how the lens changes the colors, called the "chromatic aberration," can be determined.

Zoom lens options

Certain options are available when one is purchasing a lens that can increase or decrease the performance of the camera. Obviously there are advantages to adding some options, but what, if anything, is sacrificed?

The most commonly requested option is the addition of one or more range extenders. Distortion, for instance, lessens because the range extender narrows the portion of the lens field used, reducing the amount of distortion projected on the image plane. For this same reason, vignetting is improved. But there are sacrifices, too. Using a 2X range extender, the amount of light transmitted will be decreased by the same factor—in this case, twice. Optical aberrations are increased, and the sharpness is decreased. But most of these impairments are minor compared to the versatility of being able to take close-ups.

Another increasingly popular option is power zooming, with 60 to 70 percent of the lenses sold for studio use having power zooms. Close to 100 percent of broadcast ENG cameras have power lenses. Under 10 percent of the cameras used for outdoor broadcast (OB) are outfitted in this manner.

Built-in pattern projectors (better known as "diascopes") used to assist automatic setup of certain broadcast cameras, are being offered on an increasing number of lenses. They replace an extender element in the rotary turret and can be easily placed into use.

Recent improvements

Lens technology has been improving constantly since the time of Galileo, but it was the advent of computers that provided the quantum leap forward. A Canon representative estimates that 25 years ago it took an engineer and 30 assistants almost a year to design a new lens. The assistants would work in teams of two, checking each other's calculations, and if both did not arrive at the same answer, the computation had to be recalculated. Thousands of computations involved light transmission, curvature of the glass, distances, diameters, thickness, and so on carried out only a few decimal places. Computers have dramatically changed the process. Now one engineer can design a new lens in weeks and to more exacting specifications.

With the aid of computers, minute calculations can be made to improve the MTF so that it does not vary too much as the focal length increases. The light distortion is now improved, thus enabling the field to be evenly illuminated—a function of the curvature of the lens that thanks to computers, can be made more uniform, particularly for large lens elements.

Another recent improvement is the development of new coatings that affect the transmission of light. Five years ago lenses such as the P18x16BIE had a transmission of 56 percent at 450 mm, but today the transmission is closer to 70 percent because of the advanced technology of coatings.

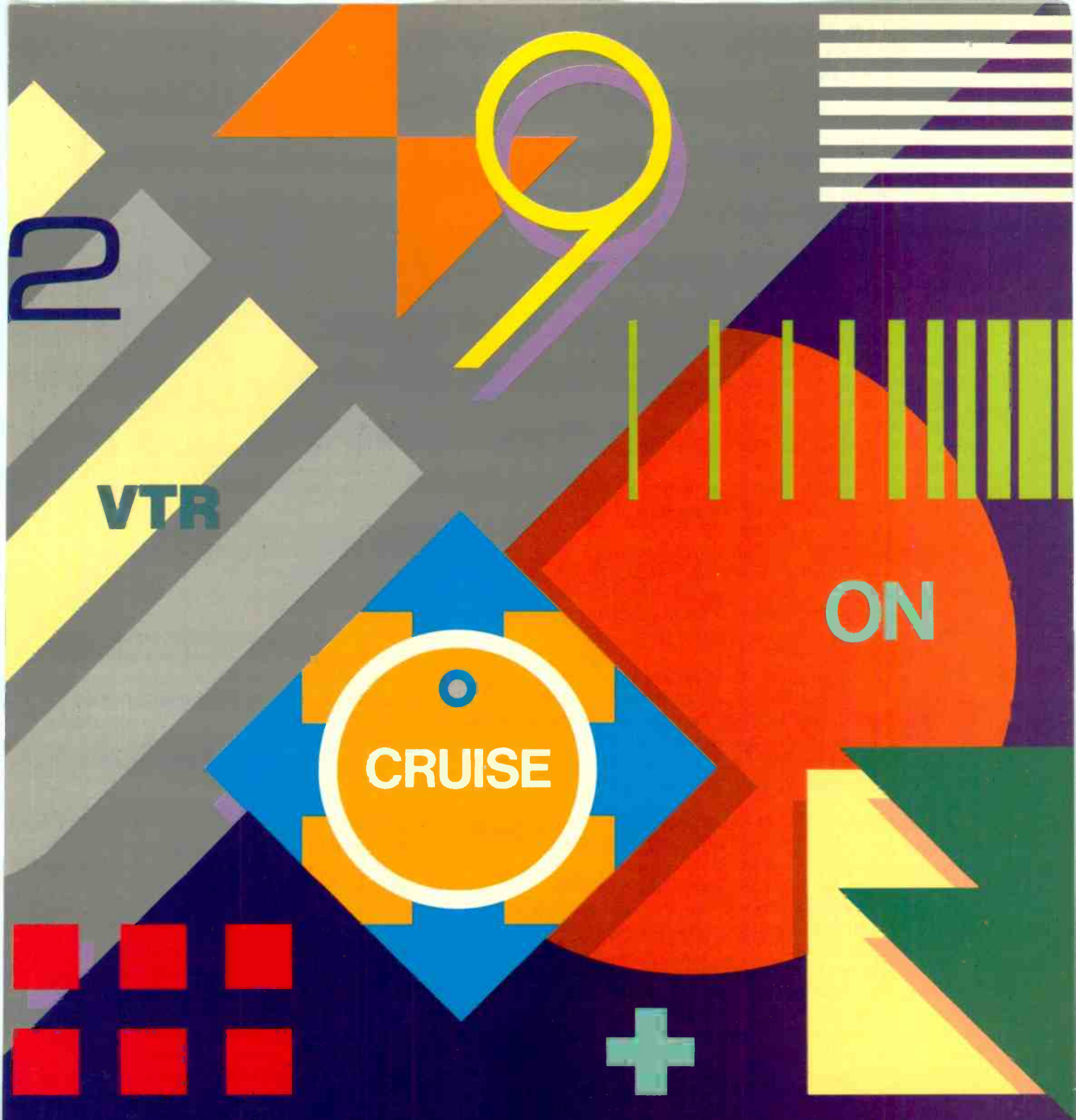
One of the most significant improvements, good performance at lower apertures, not only makes many lenses more versatile but also affects the overall economics of TV production. By lowering the f/stop, cameras are able to be used in lower lighting situations. Studios used to be lit to shoot in the f/5.6 to f/8 range. But today's technology produces lens designs that give maximum performance at the lower aperture settings such as f/2.8 to f/4.

Cameraman Richard Kerr shooting a scene from Ryan's Hope *with a Canon P12x18BIE lens.*

Different applications

Determining how a lens is to be used should be the very first selection evaluation. Lenses beneficial to ENG production may have no bearing in studio situations.

For example, what are the lens requirements of a soap opera production such as ABC's *Ryan's Hope?* Richard Kerr, cameraman, operates one of the four Ikegami studio cameras used to tape the daily program, each outfitted with a 12:1 Canon 300 mm. He explains that although small size is not as critical here as it is for an ENG situation it is still a factor. When four cameras are crowded into the set of a small studio, a short lens has far less chance of being picked up in another camera's shot.



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Zoom Lens Primer

The lenses, used on *Ryan's Hope* will focus up to three feet although they are seldom called on to go in that close; instead 2X extenders are inserted for the frequent close-ups. The low aperture settings are also rarely used, since the low key mood of this show calls for lighting in the f/5.6 range.

KHOU-TV in Houston, which uses the P18x16BIE that can focus closer than two feet (0.6 m), finds application for this capability daily to shoot special news graphics and weather maps. The range extenders are necessary for close-up work, and the large viewing angle on the 18:1—56° as opposed to the 12:1—50°—helps when the cameraman wants to cover the entire news set.

The considerations for ENG zoom lenses are entirely different from those for the studio. Weight and balance, prime ENG factors, are hardly considerations in the studio, since tripods are used.

Zoom ratio is usually kept between the 10:1 and 15:1 range, because long telephone settings are impossible to sustain with hand-held cameras.

Bob Freeman, an ABC news cameraman who has covered assignments in hostile areas such as Iran, Nigeria, and El Salvador, says that a range extender is of great importance on an ENG camera. The range extender is particularly important in a war zone (to get the shot without getting shot).

In many ENG situations, the f/number is a critical factor because news people are usually required to shoot in existing light. Indoor locations and night assignments demand that the lenses have aperture settings well below f/1. Fast lenses are required for ENG type work so that picture quality can remain relatively acceptable at all light levels.

A power zoom is also a key ingredient, allowing the hand that holds the camera to also operate the zoom, keeping the other hand free to focus.

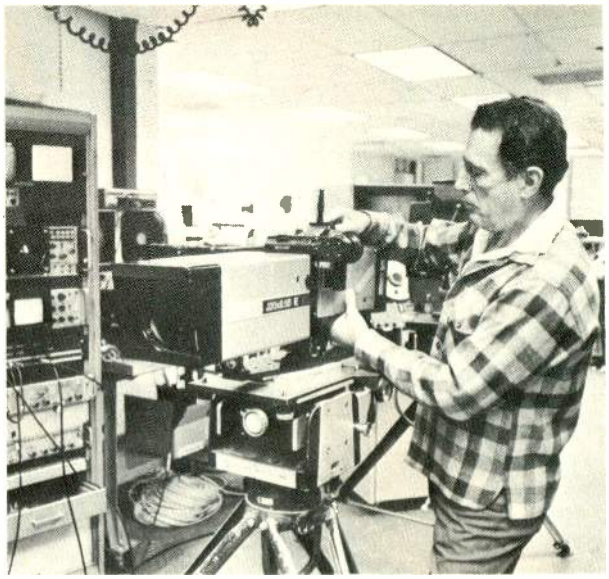
EFP situations are often less demanding than ENG, since the action is usually staged with tripods and lighting. Even so, the equipment used in the field must be portable, rugged, and not too bulky.

But OB is different. Considerations such as minimum focus are of lesser concern on sports remotes, where nine feet is more than acceptable as the MOD. Over the years there have been increasing demands on the lenses used in OB such as wider angles than those used in the past. The audience is no longer satisfied to merely see the main part of the action. They want to view the entire field of action and also see the participants close-up.

Locations such as Yankee Stadium in New York can present problems because the diamond looms so wide from where the camera must be placed that it is difficult to include all of the area covered and still be able to zoom in tight enough to capture the close-up action of the players.

Evaluating lenses

If you're like Phil Godfrey, manager of the ABC Engineering Lab in New York, you will want to set up your own lens comparison tests, using test equipment such as a waveform monitor, rather than accepting manufacturers supplied specifications. Godfrey's main conclusion is that "the lens is usually limited by the camera behind it," since most lenses are able to deliver more than the cameras can accept.



Cameraman at ABC Engineering Lab attaches a Canon J20x8.5BIE lens to camera for EFP use to undergo lens tests.

Some lens tests are performed by ABC at the Lab; but for involved optical testing, say determining MTF and chromatic aberration, an outside testing lab such as Perkin-Elmer is used.

Godfrey explains that the Lab's testing procedure is to compare a lens to a standard. First, a test lens is mounted with a fixed focal length onto a camera; the parameters of this lens have already been documented from an optical testing lab. The ABC test engineers then observe and measure shading, light transmission, distribution, flare, vignetting, and so on. After making a videotape recording they would replace the test lens with the lens to be evaluated, using the same video camera and the same flat illumination and perform the same tests, including recording a tape. Later, using a video switcher they can observe and test the recordings made of the two lenses side by side. When comparing in this manner, barrel or pincushion distortion and relative illumination become more evident.

An important test performed is the check of the transmission at various f/stops. With the test lens and later with the new lens, several f/stops are selected, and using the same light level, the video level is monitored.

One of the toughest tests a lens must undergo at ABC is the evaluation of its human engineering aspects. The lens is completely inspected for quality and ruggedness or parts and placement of function switches. Godfrey gives this advice if you do not have test equipment and must make a judgement between lenses: observe how the lens performs as you slowly take the camera through its zoom range. Pay particular attention to the extreme ends checking for mechanical problems, focus, distortion, and so forth. Determine if the lens has good focus tracking that holds through the entire zoom.

Lenses remain, in general, the least understood component of a camera. Many broadcasters spend months evaluating similar cameras, yet devote almost no time to selecting the lens. In many cases, specifications such as low f/stop and zoom range are greatly overrated and are often the main reasons for selection when there might be no need for them. Understanding the nature of the specifications, determining the applications, and knowing how to compare lenses are the primary steps in making a wise lens selection. **BM/E**

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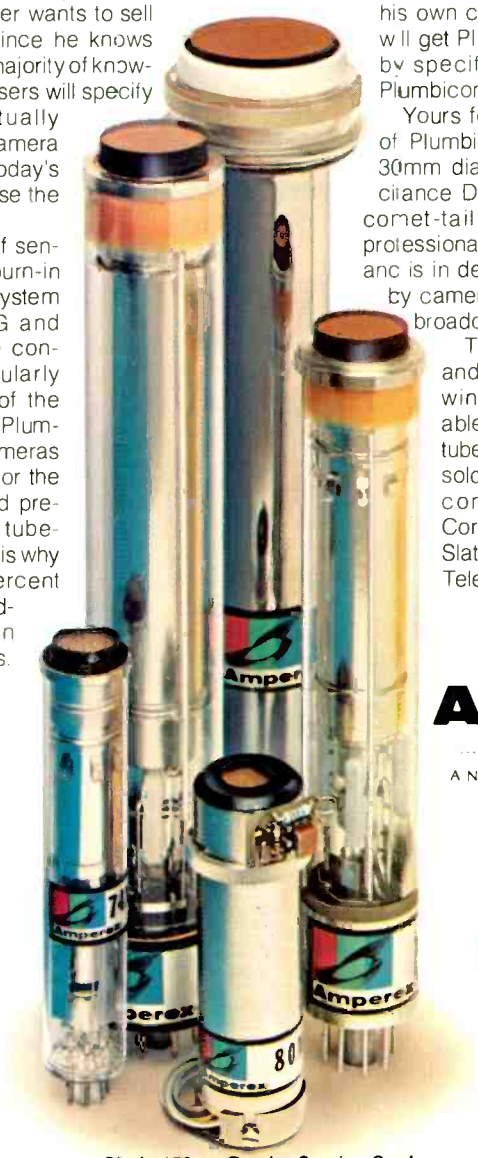

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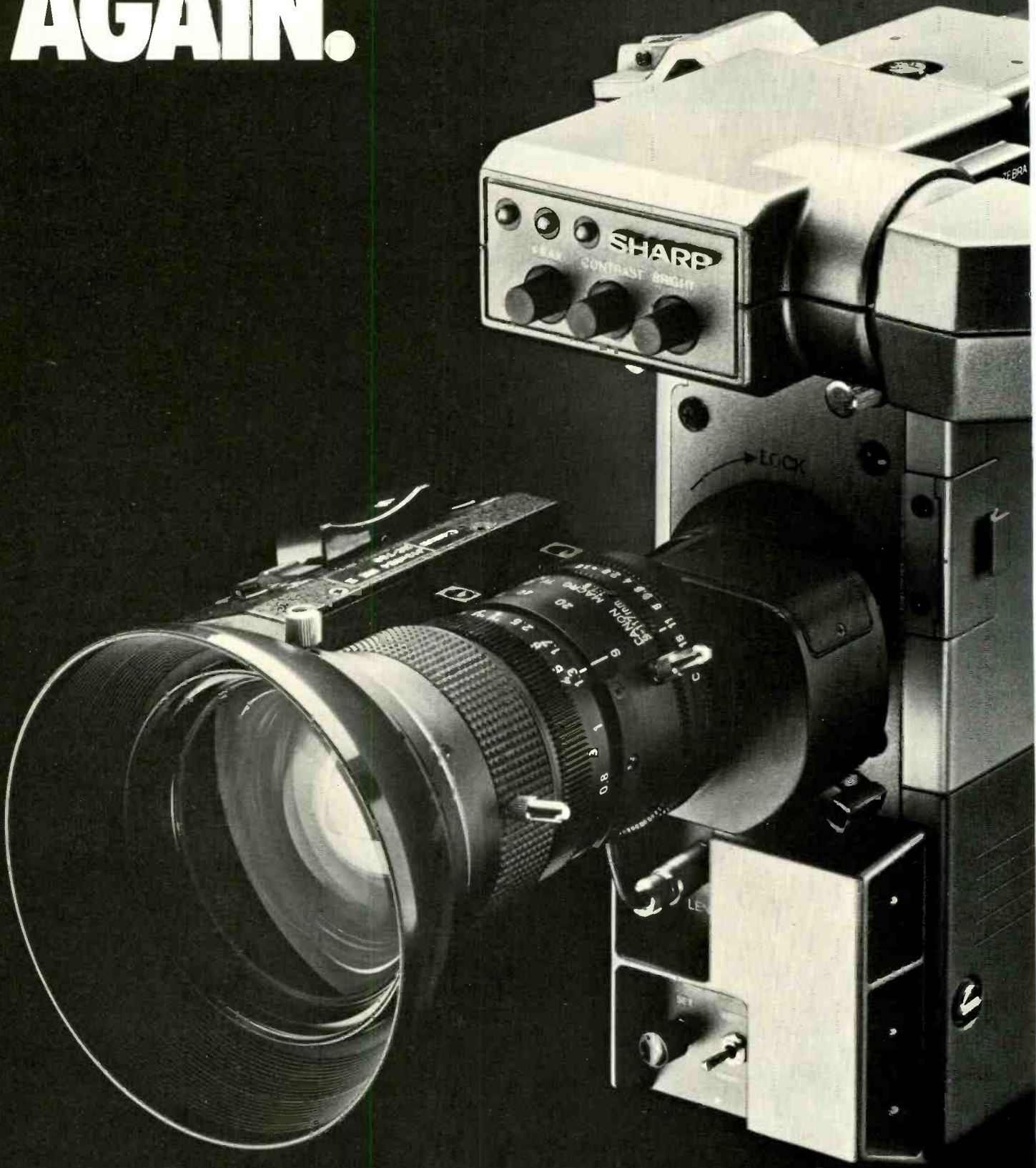

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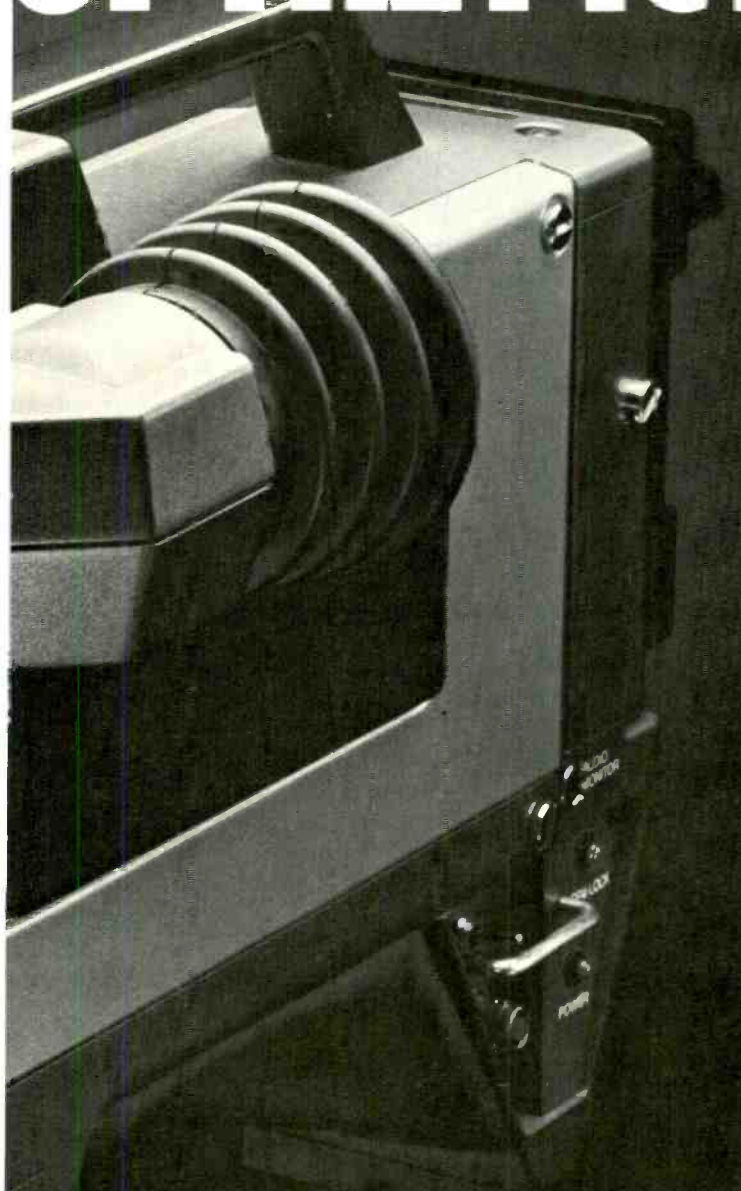

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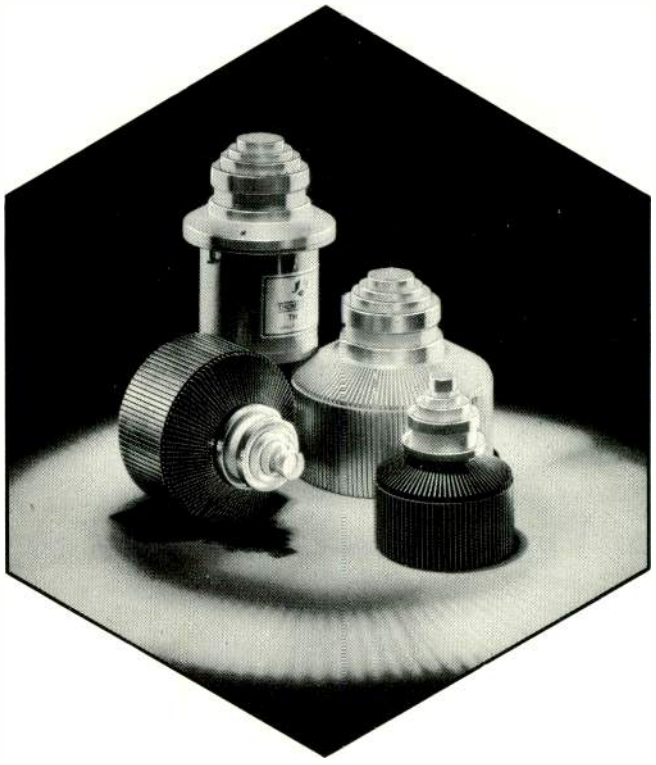

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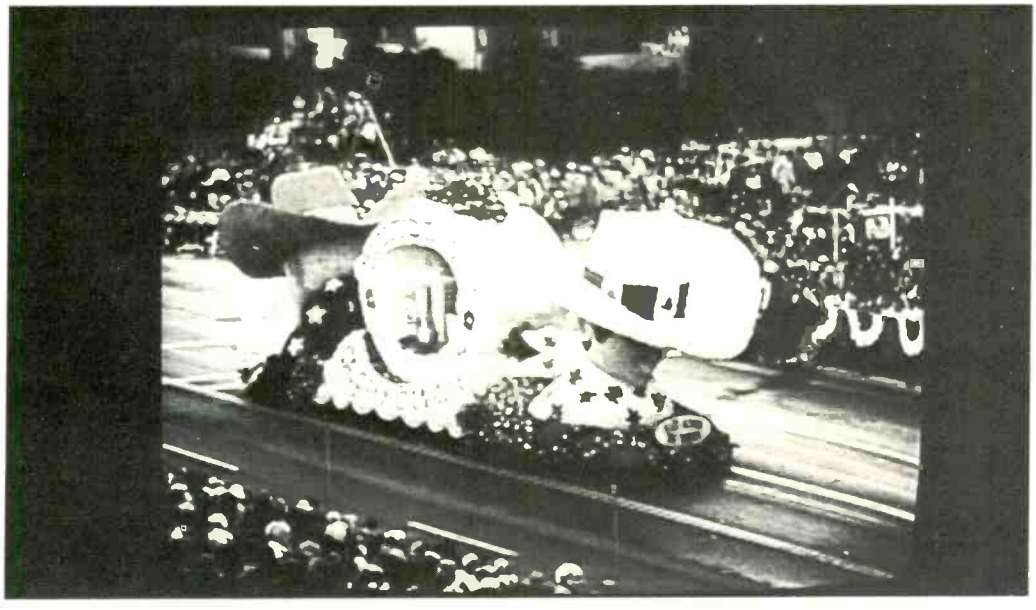
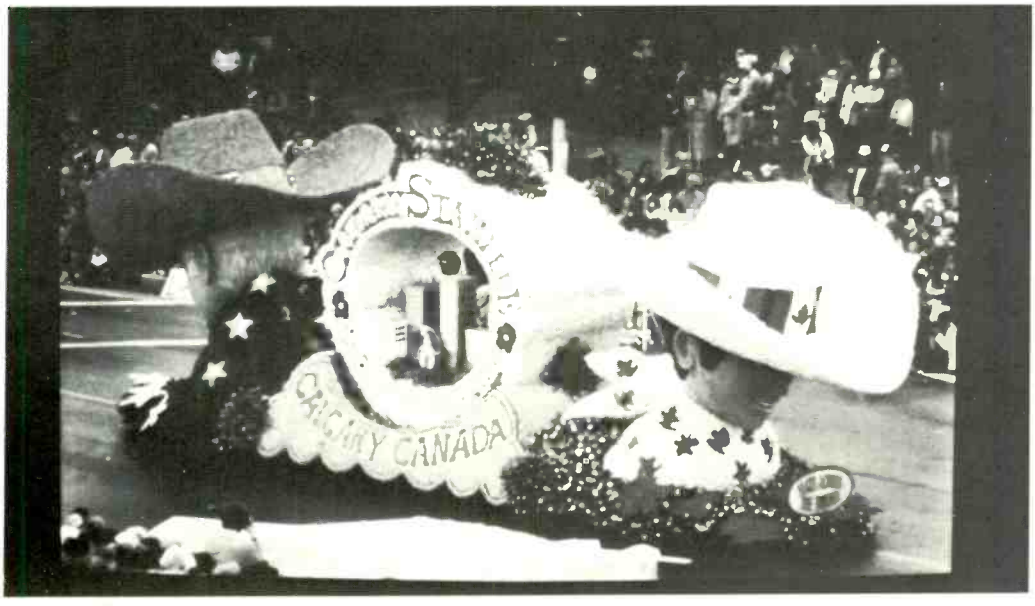
Illusions and Realities of HDTV

THE MOST STRIKING impression of high definition television is its absolutely clear reality. Looking at side-by-side monitors, one a high-resolution NTSC model and the other one of the new Panasonic HDTV units, displaying the same image, one's first thought is that the NTSC monitor is misaligned; the picture is fuzzy, the colors smeared, the vibrancy of color pale in comparison with the HDTV image. Then the mind awakens with the realizations that the NTSC monitor *is* perfectly aligned and adjusted, that it represents the best of television as we know it today (and as it has been since the 1950s), that the HDTV display is infinitely superior.

Not only is the image far sharper — 1125 scanning lines and 30 MHz bandwidth yielding five times the resolution of the NTSC system — but it is also wide screen, a 5 x 3 aspect ratio as compared with the 4 x 3 NTSC format (a 2 x 1 format has also been proposed). A close-up of a newspaper page is easy to read.

The other side to the wonders of the HDTV picture are equally real, however. HDTV will not appear fully developed overnight. It will not radically replace the current structure of the broadcast industry (nor, for that matter, the motion picture industry). And it is likely to be an expensive system, too — both for broadcasters and home viewers. The question that must be asked, and apparently answered quickly, is whether there is a future for HDTV in the broadcast service. Details of the decision probably will not be ironed out for years. It is even possible that HDTV may not be a broadcast service at all; adjacent cable channels could be operated together to provide HDTV service immediately if VCR manufacturers





Off-screen photograph (top) of the 525-line NTSC coverage of the Rose Bowl Parade reveals discernible scanning lines. A high definition picture of the same event – with 1125 scanning lines – shows high resolution. New technology also yields sharper colors.

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could modify head and transport speeds to perhaps distribute HDTV cassettes.

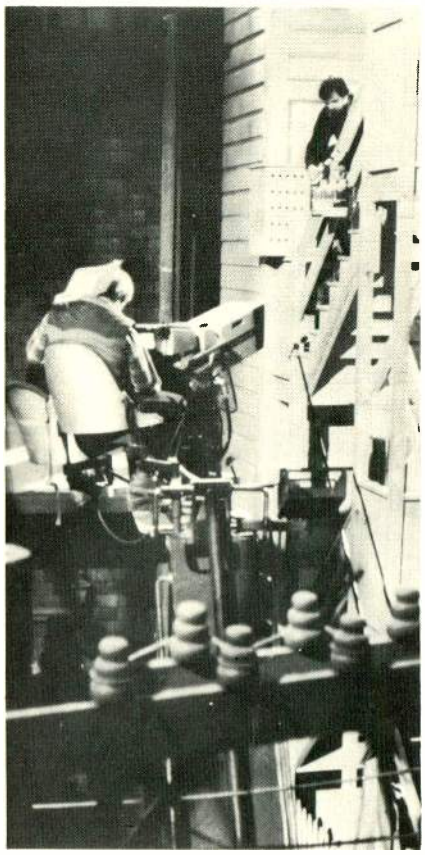
One of the first illusions about HDTV is that it all lies somewhere in the distant future. This is partially true, for there are many, many problems to be solved. At the recent SMPTE winter conference in Nashville, some 82 people — a record number — attended the HDTV study group session, many representing diverging viewpoints. The study group, now divided into four subparts, has yet to transform itself in the working group structure that could even begin standards-setting procedures. Unfortunatly, according to Joe Flaherty, CBS's VP of engineering and development and an active proponent of HDTV, there is a little over a year to come to some decision about an HDTV system for the U.S. The 1983 WARC conference for Region 2, the part of the world that includes the U.S., will decide what to do with the 12 GHz frequency. This hotly contested spectrum allocation has brought broadcasters head-to-head, with some seeking to have 12 GHz set aside for use by an HDTV service once high definition is perfected and others wanting to go ahead with NTSC-based DBS service.

"What's decided about 12 GHz at WARC will affect the shape of television for generations," claims Flaherty, who sees it as the only frequency still available that could handle the 30 MHz bandwidth necessary to transmit an 1125-line HDTV signal. Likening the conflict to the early days of radio, when Major Armstrong fought so valiantly for frequency allocations for the then-experimental FM radio service, Flaherty feels 12 GHz is our last chance to secure a future place for HDTV as a broadcast service, and notes that Japanese broadcasters, who several years ago gave up the 12 GHz frequency for other industrial uses, are now trying to win it back for use in HDTV broadcasting.

HDTV here and now

Another illusion about HDTV is that it is still five to 10 years away from becoming even a possible reality. This is simply not true.

The CBS/NHK HDTV demonstrations held recently in Hollywood, New York, and Washington, DC, featured equipment "just a step away from being capable of factory production," according to Flaherty. NHK, which has been developing the system in its laboratory for over 10 years, and which also showed the system a year ago at the SMPTE winter conference in San Francisco, has been coordinating a massive R&D program involving several major



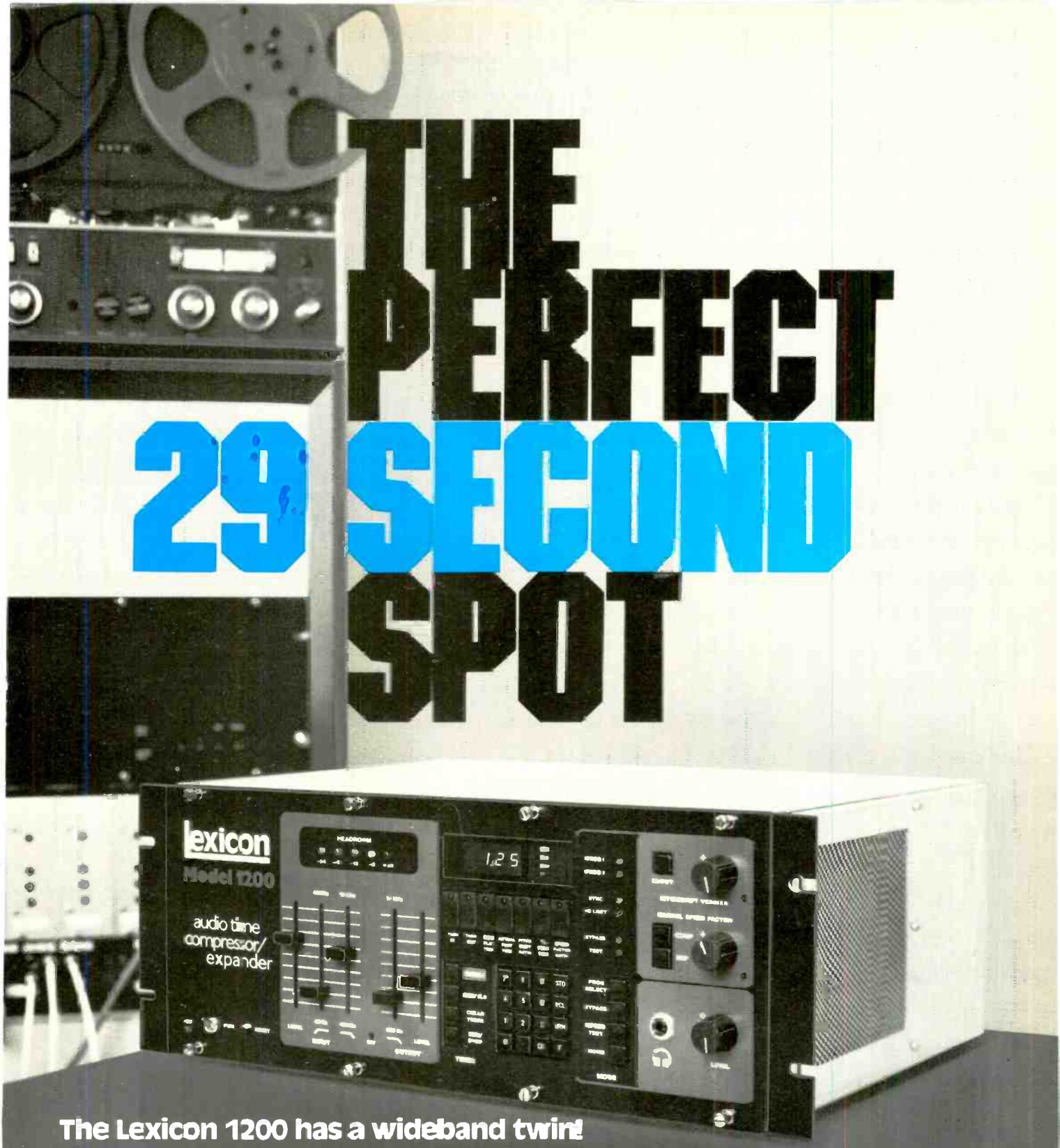
Zoetrope uses high definition camera, this time on a crane, for filming Double Suicide.

Japanese manufacturers.

The camera system was co-developed byIkegami and Sony, which modified existing cameras to accept the demands for far greater resolution with less noise. The modified Ikegami HK-357A camera used in the demonstration incorporates three brand-new one-inch tubes developed by NHK — a DIS design (diode gun, impregnated cathode Saticon) that touts 50 percent higher resolution than normal tubes at 800 TV lines, low lag with less than 1 percent after three fields, and uniformity of resolution over the entire image area.

Overall performance specifications for the camera are currently 44 dB S/N for the Y channel, more than 1,600 lines center resolution and more than 1,200 at the edges, and a sensitivity of 2,000 lux. An Ikegami spokesman says the company is now working to apply some of the digital processing techniques developed for the EC-35 electronic cinematography camera to the HDTV system to give it an even more "high-quality, motion picture look." Approximately one f-stop is lost due to HDTV capacity, but the camera is designed for resolution rather than sensitivity, and performs quite well in even 50 fc illumination.

Another major feature of the camera is its precision registration system. The



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registration circuit uses 570 sampling points (30 H x 19 V) distributed uniformly throughout the raster. The deflection distortion at each point is stored in memory and is read out again during scanning, with individual corrections in the deflection current made at each point.

Complementing the camera developments, Fujinon created a special HDTV lens. The P14X16.5 has a maximum focal length of 230 mm with an aperture of f/2.1.

Another major HDTV hardware development has been the three-channel VTR developed by Sony, which has abandoned as impractical its original scheme to record the R, G, and B signals separately on three synchronous decks. The new recorder format is based on the Sony BVH one-inch VTR, and lays down parallel R, G, and B tracks, each with its own composite sync signal; "more than three recording heads are used," a Sony spokesman said, but declined to elaborate further on the recording format. Specifications of the VTR include luminance bandwidth of 22 MHz, chrominance bandwidth of 19 MHz, and tape speed of 48 cm/s, providing a maximum recording time of 48 minutes on a standard tape.

Sony has also been experimenting with an HDTV camera, also using Saticon tubes and boasting 2200 lux sensitivity (at f/4, 89.9% reflectance), with Zone 1 registration 0.025%, Zone 2 0.05%, and Zone 3 0.1%. The camera uses a 12.5–175 mm lens. This camera was used extensively by CBS for production of HDTV material for the demonstration.

Monitors for displaying the new HDTV signals have also been under development for some time, particularly by Matsushita/Panasonic. At the CBS/NHK demonstrations, the most spectacular monitor was an eight-foot diagonal projector, though, as with all current projection TV systems, the image is the same as would be present on a standard monitor but spread out over a larger area and therefore more diffuse.

The 28-inch diagonal HDTV monitor, with is 5 x 3 aspect ratio, was nonetheless little less than spectacular. Part of the more brilliant picture is the inclusion of twice as many phosphor dots as in conventional receiver/monitors, along with a newly developed high resolution deflection yoke and dynamic focus and corner registration circuits. No longer the weak link in the TV chain, the receiver has a 1000 line H resolution and 750 line V resolution.

However, as Renny McMann of Thomson-CSF noted in his overview of developments in HDTV at the SMPTE winter conference, display systems for HDTV are still the weakest link in the HDTV process. Like many, he offered the hope that there might one day be a wall-sized CRT capable of displaying the full resolution of HDTV, for to experience it properly it must be seen almost as large as a motion picture. But like most, McMann fears these developments will not take place in the immediate future.

HDTV alternatives

There is not, at the present time, an HDTV standard, despite the years of development that have gone into the NHK project. And no standard may be forthcoming, despite the cautions about the need for making an immediate decision on 12 GHz. As mentioned, the debate is hot and furious at the SMPTE study group on HDTV headed by Donald Fink, and many standards have been proposed. There is the concern that a worldwide standard for HDTV be

CBS employed a high definition video system when taping an NFL game.

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established in the same way that SMPTE and EBU were able to arrive at the universal digital sampling standard. Flaherty, however, concedes that the worldwide standard might be simply impossible; his proposal is for a dual production/transmission standard in which programs would be produced throughout the world in a single HDTV format, but then broadcast or distributed in standards corresponding to each country's particular needs. This way tapes could be shipped around the world, but transmitted locally. Flaherty rules out international HDTV satellite hops as requiring far too much power and solar panels that would have to be acres wide.

Much of the debate over HDTV alternatives centers around the use of satellites, for this will almost surely be the way much television is distributed in the future, and the wise are planning for the future now. This is even more significant since, with the advent of DBS, it may be that the satellite, rather than the broadcast transmitter or even cable system, becomes the primary means for distributing an HDTV signal.

NHK has been experimenting in Japan with satellite distribution of its 1,125-line signal with stereo audio for some time. Flaherty and CBS have proposed a somewhat similar system for the U.S., distributing three simultaneous signals over the DBS system. One would be beamed directly to local CBS affiliates, the program consisting of standard TV fare, movies, and news produced in an HDTV format and then retransmitted by the local stations together with commercial insertions. The second two channels would be used for educational and industrial applications, with direct satellite transmissions to receivers.

The problem with the proposed system, of course, is that it requires 20–30 MHz bandwidth for transmission over either the satellite or standard transmitter; with compression this could probably be reduced to 20 MHz. But that is still twice the bandwidth and requires twice the power of today's transponders. Opponents of the DBS/HDTV hookup, such as Stanley Hubbard of Hubbard Broadcasting, point out that the delay that would be caused if the FCC and others were to wait for an HDTV standard might permanently cripple the U.S.'s chances of providing world leadership in the DBS area. Another problem with the CBS HDTV/DBS proposal, say Hubbard and others, is that it would be too limiting for the future of DBS to link it permanently to an HDTV signal.

What, then, are the alternatives? One of the most convincing thus far was the demonstration at last fall's SMPTE Conference in Los Angeles when Compact Video proved it could record, transmit, receive, and display an HDTV signal through currently available equipment. By using a "double PAL" standard of phase alternating lines/alternating fields, a full 655 lines of resolution can be attained within the existing 10 MHz bandwidth of satellite transponders. For a recorder, the Imagevision system uses a Merlin-ized Fernseh BCN VTR with expanded 10 MHz bandwidth.

Other alternatives are directed toward reducing the bandwidth requirements of the 1125-line system, for example, by bandwidth reduction techniques. the SMPTE winter conference also saw considerable discussion of a proposal by the EBU's HDTV study group. That system transmits standard chrominance and luminance signals of the PAL format through conventional signal pathways. The "excess" luminance required by the HDTV signal, however, would be split off and transmitted separately, together with digital audio channels. In this way, conventional home receivers would continue to get signals little different from ordi-

nary PAL, but those who wanted to invest in special decoders would be able to receive the stereo sound and the wide bandwidth luminance signal.

As for alternatives in HDTV production gear, the NHK system is by no means the final U.S. standard. As Charlie Rhodes of Tektronix pointed out in a paper at the conference, HDTV may finally give us the ability to break free of the NTSC two-field interlace standard. Incorporating an inexpensive framestore, he suggested, might permit the same 60 Hz standard to be achieved with single-frame high-speed scanning.

HDTV applications

"HDTV is to color television what color was to black and white," observed Flaherty at the CBS/NHK demonstration. Indeed, the impact of HDTV on all who have seen it has been profound, reflecting the feeling that "this is what television ought to be." NHK claims for it a resolution equivalent to that of a 35 mm slide and better than that of 35 mm motion picture film. For this reason, it has also developed a brand-new laser printer system to kinescope HDTV images onto 70 mm film.

But will HDTV ever really replace motion picture film in the entertainment industry? Francis Ford Coppola certainly thinks so, and part of the CBS/NHK demonstration was a "mini-movie" Coppola produced for the demonstration in HDTV. Coppola and others have proposed that the movie theater of the future will be a large-screen video projection system showing HDTV images, perhaps received directly through a direct broadcast satellite.

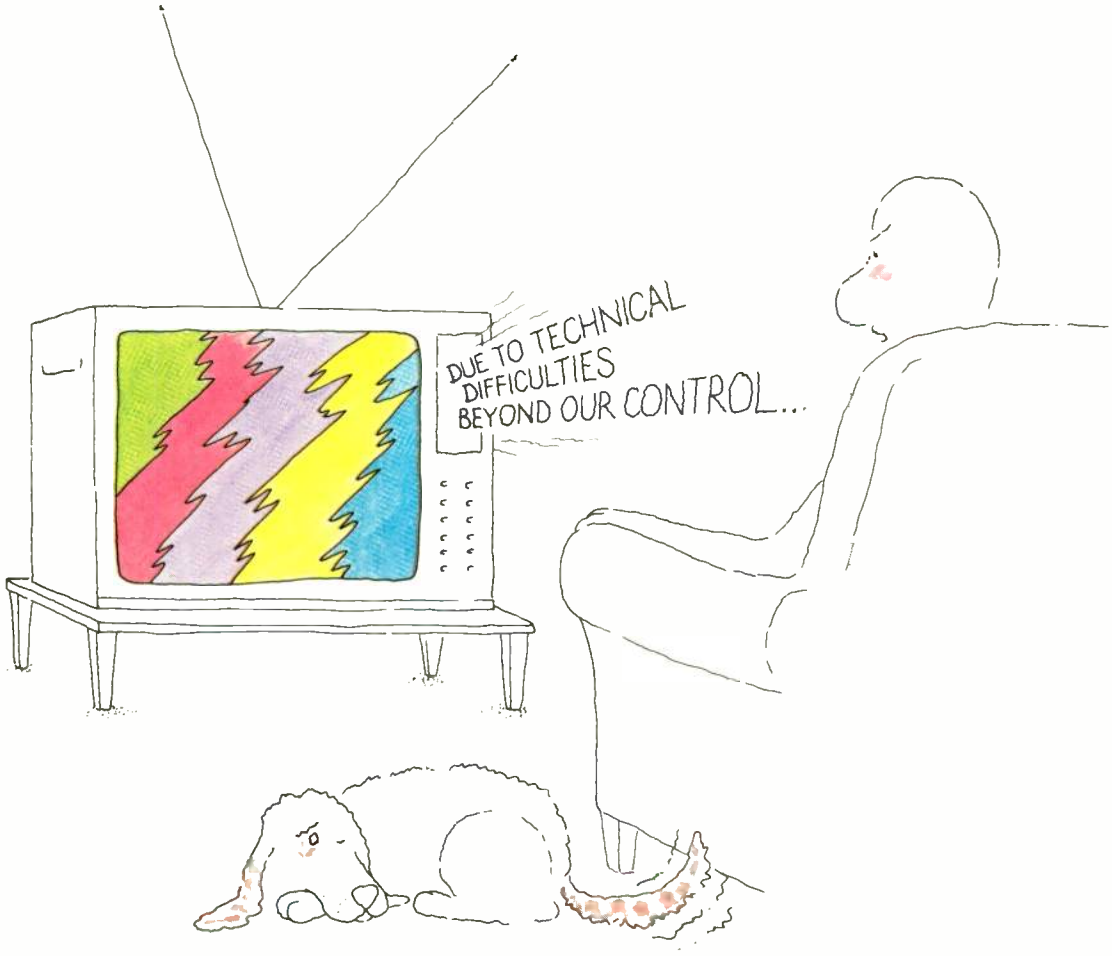
Glen Larson, producer of such popular TV series as *Magnum, PI* and *Fall Guy*, a more recent convert, also thinks HDTV will succeed film. Seeking a more flexible, cost-effective production tool, Larson invited a team from CBS, which was producing material for the demonstration, to work alongside his 35 mm film cameras to shoot selected scenes from an episode of *Fall Guy*. No special concessions were made for the video cameras at all, including preserving existing light levels. The result was an image virtually indistinguishable from the film product.

And Flaherty and CBS certainly think so. A current CBS proposal to the city of Alameda, CA, would franchise CBS to open an HDTV cable operation that would use perhaps five adjacent cable channels to carry wide-screen images with stereo sound. Viewers would be treated to movies preserving the wide-screen, full tonality of the original, plus sports coverage such as CBS produced for the demonstration. Imagine in a football telecast being able to see clear details in both offensive and defensive lines at the same time in the same wide-angle shot, then being able to watch the passer *and* the receiver run their play, also at the same time.

Confronted with this much enthusiasm, the broadcaster who is a little skeptical may feel like a lone voice in a vast wilderness. But the broadcaster is certainly not alone. The motion picture industry has been creating movies for almost a century using the same equipment, with the addition, comparatively recently, of sound. It is unlikely, despite the prophetic voice of Coppola, not always well regarded in Hollywood, that moviemakers are suddenly about to discard their film cameras and replace them with HDTV. Skeptics in the film industry point out that film stock is hardly a major cost factor in film production anymore, especially since it can be transferred to videotape for post-production, then cut and released as a film product; HDTV therefore offers little cost savings. Film cameras have always been lighter and more maneuverable than their video counterparts, and require no separate power supply or recorder; there is therefore little advantage in HDTV's flexibility, especially since a video pickup can always be attached to the film camera, allowing the director to view the action through the lens. And HDTV simply approximates the image quality of 35 mm film, which is itself constantly improving.

As far as the production of made-for-TV movies and TV series is concerned, HDTV is again confronting a well-established, decades-old production industry, geared up for 35 mm film production and hardly likely to welcome the huge capital investment necessary to convert to HDTV. Further, though HDTV signals can be transferred to film, what is the advantage of producing in HDTV to the producer who must release his product in motion picture film format to foreign countries?

It is perhaps in television itself that HDTV stands its greatest chance for near-term, widespread acceptance. Quite simply, the economics of taking an HDTV-equipped production van to a sports event are virtually the same as with a conventional system. Production requirements are virtually identical. The industry is already geared up to the video medium, and used to its electronic eccentricities. And, finally, HDTV offers television viewers not "something as good as the movies," but something they have never had before — television the way it ought to be. **BM/E**



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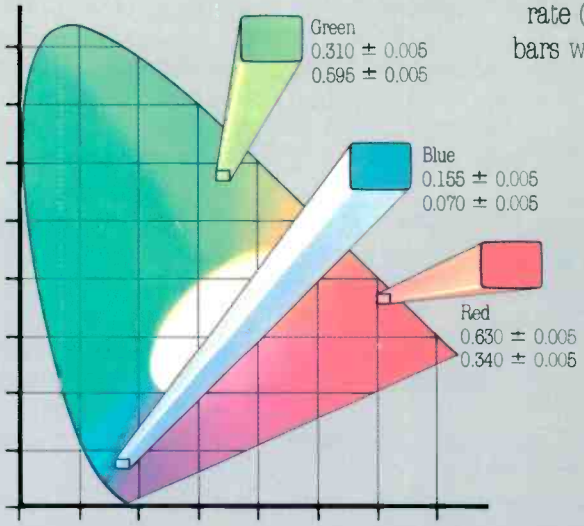

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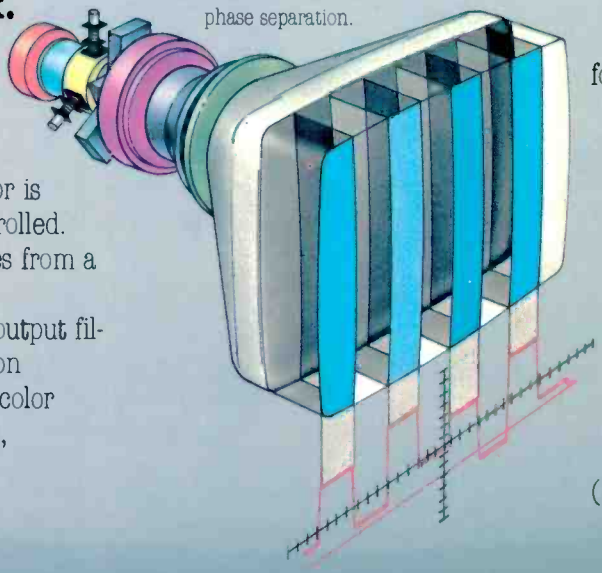

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BM/E NEWS FEATURE

SMPTE Winter Conference Explores Tomorrow's Technology

HELD IN NASHVILLE February 5–6, SMPTE's sixteenth annual winter conference was an occasion for TV broadcasters to take careful stock of current technological trends and look toward the not-too-distant future when some of the developments may come to bear fruit in daily operations. With no major demonstrations—such as last year's component coding extravaganza—and an extremely intimate equipment exhibit, attendees were able to focus on the material presented in the papers—sessions that were unusually well attended.

As predicted, the report of the SMPTE working group on digital videotape recording standards proved one of the highlights, especially with the revelation that the group is within 18 to 24 months of providing the documentation that commences the formal standards-setting procedures. One of the group's main concerns is to come up with the digital equivalent of coax cable. Another is defining how "packets" of digital information will be organized to handle various signal parameters. Current thinking is to leave at least 70 percent unassigned and therefore available for user specification.

Another major paper was a report from the working group on digital control of TV equipment, which now has the first of its standards-setting documents in to SMPTE for balloting. Basic to the proposed standard is a 38.4 kbits/second serial data connection using a nine-pin "D" plug; all pins and conductors in the cables are preassigned. In its machine control setup, the proposed standard first transmits 17

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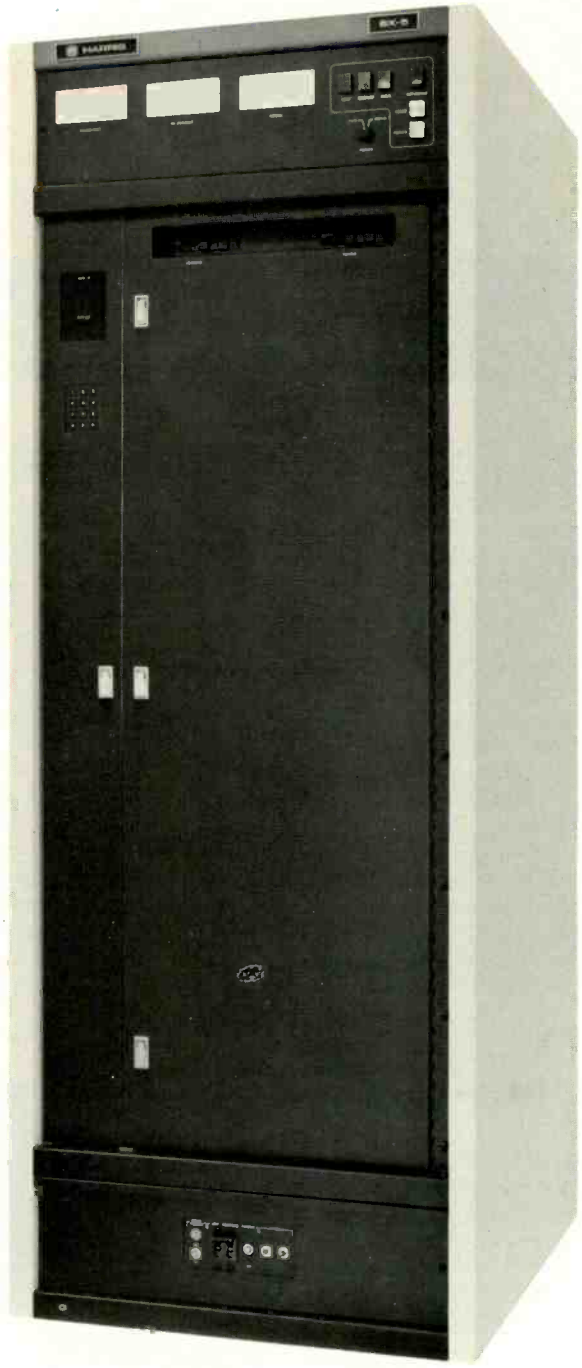

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HARRIS

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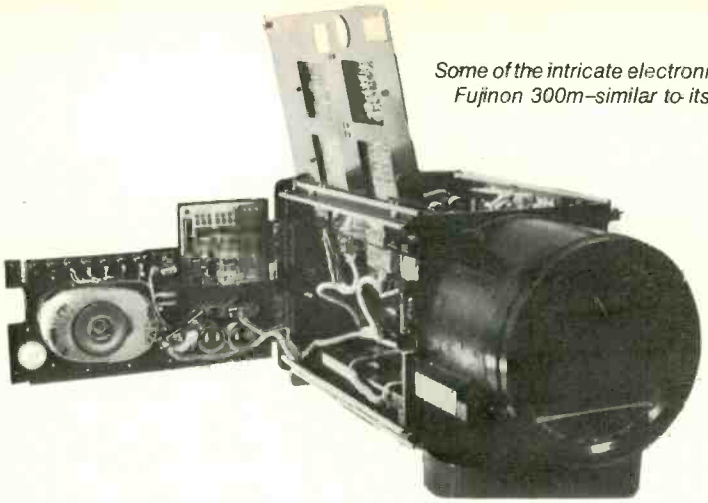

Some of the intricate electronics involved in a Fujinon 300m–similar to its lens for HDTV cameras.

bits that transfer all machines in the system from an idle to an active state; two eight-bit words are then used for actual addressing, followed by the command signals.

All together, eight working and study groups met at the conference. The HDTV group, which attracted a record-breaking 82 attendees, may shortly change its status from a study group to a working group that would begin standards-setting explorations;

Donald Fink, chairman of the SMPTE study group on HDTV, asks a pointed question during a session.

the group has split into four subgroups to study such parameters as the psychophysical nature of TV-watching, including aspect ratio; compatability with existing TV systems including the possibility of defining an NTSC 3; the potential for HDTV transmission; and the development of hardware for producing HDTV images. (For more details on HDTV activities, see p. 97 in this issue.)

Audio standards, too, were the subject of close scrutiny—both at the study group level and also in several major papers. Six members of SMPTE are working with the AES in digital audio standards-setting efforts to assure that the digital audio standard developed by AES will be compatible with SMPTE's digital video standards.

Other papers concentrated on some of the technology that has gone into recent product developments. Richard Taylor of MCI/Quantel analyzed the development of the Digital Paint Box art system. Jack Dawson discussed developments leading to lenses for HDTV. Robert Thomson of RCA laid out the RCA/Matsushita Hawkeye recorder format (see *BM/E*, Mar. 1982, p. 192). Representatives from Philips and Amperex presented data on the new half-inch Plumbicon tube. Rounding out the picture of lightweight camera developments, Sony presented a rundown on its BVP-110 single-tube ENG system.

As mentioned, the equipment exhibit was small, completely integrated with the conference themes. Major news was made by Ampex, which showed a component-coded version of its ADO

NEWS FEATURE

Ikegami's EC-35 camera with various CP accessories at the Camera Mart booth.

digital effects system using 13.5 MHz sampling—a first.

Audio companies were more in evidence than is usual at SMPTE meets. Harrison, for instance, demonstrated its TV-3 audio post-production console. Otari showed both its multi-track recorders and its synchronizer. Ampex had both two-track and multi-track ATRs. Adams-Smith demonstrated its ATR/VTR synchronizer, which uses vertical interval time code—readable from still frame through 40X play speed. 3M was the only company on hand, however, with a digital audio recorder.

Rupert Neve's digital console is the first to use all-digital control and digital audio processing.

There was also considerable interest in camera systems. Cinema Products and Camera Mart had working models of the Ikegami EC-35 electronic cinematography camera, both offering a line of accessories manufactured by CP. Thomson-CSF featured a major display of its TTV-1125 field camera system with extensive remote control and setup capabilities; the camera features 2/3-inch tubes for R and B signals and a one-inch tube for luminance. The Ampex Digicams and the Hitachi SK-110, also displayed, are described in detail in the story on digital control of field cameras, p. 63.

Video processing was also in evidence everywhere, with Microtime, MCI/Quantel, Digital Video Systems, Thomson-CSF, NEC, and Fortel all showing various combinations of error correctors/noise reducers/framestore synchronizers/TBCs. In the same light, there was considerable interest in digital imaging systems, including special effects units from Quantel, Ampex, and the four-channel Vital Squee-Zoom. Grass Valley showed the new two M/E version of its 300 series switcher with Mark II digital effects. Chyron put on display its Chyron IV character generator, not yet equipped with the new framestore addition promised for NAB.

A significant digital processing system was also demonstrated by NEC, which showed its compression system that allows two video signals to be squeezed into a single raster for transmission.

Digital control was the subject of several equipment exhibits. 3M, for instance, showed its 6500 microprocessor-based machine controller. Utah Scientific displayed its digitally controlled routing switcher. **BM/E**

TAX TIPS

FOR STATIONS

Reducing Property Taxes

By Mark E. Battersby

THE TAX REVOLUTION is here. California long ago cut its property taxes 57 percent and placed a limit on future increases. Massachusetts has followed suit, and other states are reportedly about to follow. The future of property taxes couldn't look better from the standpoint of those who must pay them—with the notable exception of commercial property owners and tenants.

To date, the owners of commercial and industrial real estate have been carried along by the homeowners for whom most of these cuts—real and proposed—have been intended. Now, politicians and voters are questioning whether business deserves or needs tax breaks—indeed, whether business shouldn't be made to assume more of the local tax burden.

No matter what the future holds, however, it is likely that the present property tax assessment you have is too high or wrong. Do you automatically assume that whoever valued your station's property was qualified to do so? Do you assume that the bill is fair if the tax value is below the property's market value? Or, most important, do you assume that you can't do anything about the assessment even if it is too high?

You are probably wrong if you assume *anything* about property taxes. Experts have labeled the property tax as the worst-administered tax of all. Further, there are actually 51 sets of property tax laws—one for each state and the District of Columbia—each different and divided into more than 13,000 separate property tax districts. Not too surprisingly, the laws are not always applied uniformly even within a state.

The only factor these property taxes have in common is that they can frequently be legally changed in the favor of the property owner. Often you can get an assessment reduced without a formal protest.

But you must find suitable grounds for a reduction in the tax on your property. A positive answer to one or more of these questions may provide the grounds for just such a reduction:

- Did the assessor make mechanical errors? Finding a mistake in the tax authority's version of building size or in simple computations—and there are always plenty of mistakes—can put you in line for a quick reduction.

- Is the assessment of the station's property out of line with assessments on similar properties in the area? Politicians sometimes feel that they can win votes by deliberately setting assessments below market value. Unfortunately, if assessments are low, then the tax rates must be increased to collect the needed revenue; the same amount of tax is collected, but the home-owning taxpayers get by at the expense of the business community.

The guideline to fair assessment should not be the relationship of assessed value to market value but rather whether the tax is fair in relation to assessments on other properties in the area. For instance, if you have land worth $800 per acre on the market and your assessment is based on an appraisal of $600 per acre, you may feel that you are getting away with something. But if neighboring property similar to yours is typically appraised at only $200 per acre, your station is paying three times as much real estate tax as it should.

- Is the assessor's work in accord with the valuation

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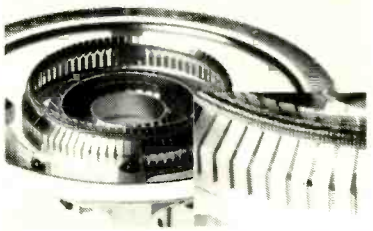

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Circle 183 on Reader Service Card

INTERPRETING THE

FCC RULES & REGULATIONS

Deregulation 1981: All That Glitters...

By Harry Cole

LIKE IT OR NOT, we find ourselves in the middle of the age of deregulation. And although it took several years to get started, it looks as if it's now in high gear, moving forward with an intensity few could have predicted 18 months ago. Indeed, the initial deregulatory changes that became effective just about a year ago—at the time, viewed by some as the most the broadcast industry could expect—have been left at the gate as both the Commission and the Reagan administration seek to implement their version of what Chairman Fowler prefers to call "unregulation." On this first anniversary of the arrival of the age of deregulation, we review where the deregulation trend has taken us so far. Next month we look at where that trend may possibly lead.

The best starting point for a retrospective on deregulation is probably the Commission's 1981 decision to deregulate certain aspects of commercial radio. Several efforts had been made during the late 1970s to achieve some form of broadcast deregulation, all to no avail. In 1979, however, Congress began to pay serious attention to a proposed bill that would have substantially deregulated many areas of broadcasting and would have, as a result, reduced much of the Commission's authority. The Commission had not, up to that time, been particularly responsive to any efforts to loosen up on broadcasters. Nonetheless, when Congress started talking about cutting back the Commission, the Commission reacted. This may have been a self-defensive reflex, or, viewed more charitably, it may have been an astute reaction to the then-prevailing political winds. Whatever the case, the Commission embraced deregulation in the summer and fall of 1979, issuing its proposal for deregulating commercial radio in September of that year. Congress, perhaps sensing that the Commission could handle the job, lost interest in the deregulatory bill, leaving the ball in the Commission's court.

Fifteen months later, in January 1981, the Commission adopted the September 1979 proposals, thereby eliminating program logging and formal ascertainment requirements and guidelines for commercial and nonentertainment programming, at least as far as commercial radio stations were concerned. Television and noncommercial radio licensees were not included among the beneficiaries.

These changes were easy to swallow, since they reduced much of the detailed paperwork requirements previously imposed. Further, they did not create any new requirements. Some adjustments, of course, were necessary. For example, some alternative record-keeping system had to be adopted to permit accurate billing for spots aired if logs were abandoned. Also, to permit licensees to complete their annual "interests/programs" lists, those licensees had to keep some record of how they learned of the community problems they sought to address and also of how they actually addressed them. In other words, the much-vaunted deregulation of commercial radio in 1981

With this issue, "Interpreting FCC Rules and Regulations" is being prepared by Harry Cole, a partner in the Washington, DC, law firm of Farmer, Wells, McGuinn, Flood and Bechtel. On staff a year and a half at the Broadcast Bureau of the FCC, Cole has devoted his private practice to communications-related matters. His clients have included commercial and noncommercial licensees as well as a trade association of radio broadcasters.—Ed.

did not so much deregulate the industry as reduce the extent to which the Commission dictated the various details of radio licensees' paperwork. But at the very least, it was a start.

Other, ostensibly deregulatory, actions in 1981 had a similar flavor. Take the short-form renewal, for instance. Certainly, the reduction in the time and effort necessary to fill out a renewal application was significant. But what actual regulations were in fact eliminated in connection with the paperwork reduction? The answer is not many. Indeed, such licensees, according to the postcard renewal for commercial radio licensees, had to certify that they had fully complied with all the rules relating to the placement of documents in their local public records files—a wholly new certification requirement and clearly a troublesome one. After all, notwithstanding consistent, good-faith efforts, any licensee could inadvertently fail to file a document or two in its public file. Thus certifying as to complete compliance with the public file rule is *not* something one should necessarily be eager to do.

Yet another example of deregulation 1981 involved the elimination of the first-class radiotelephone operator license and the related elimination of most of the restrictions on the operation of broadcast stations by individuals holding certain types of operator licenses. Again, on paper, this appeared to be a boon for those broadcasters who either couldn't find or couldn't afford first-class ticketholders. But look again. Broadcasters are still subject to the same technical rules, and they must still make sure their stations comply with those rules. Now, however, they cannot simply hire a first-class operator and assume that he or she can assure such compliance. Instead, the broadcaster must make his or her own independent assessment of the ability of the station's technical staff to maintain and run the equipment properly, even if the broadcaster has no technical background with which to make that judgment. Failure to take adequate precautions in this connection could mean trouble for the broadcaster.

Of course, this is not to say that the deregulatory changes effected in 1981 were but a cruel hoax, creating more rules than they eliminated. Obviously, licensees before and since have been required to maintain public files and to meet technical performance standards. Similarly, licensees have always had to maintain some records of their programming and, particularly, commercials so that accurate bills could be prepared. The difference is that now the licensee is being forced to bear a much more direct burden as the Commission shifts various responsibilities away from itself and back to the broadcasters. This is not inconsistent with the basic concept of deregulation: the effect of competitive forces—the so-called miracle of the marketplace—can and should replace governmental regulation. But it is important to recognize the crucial factor that, notwithstanding the rosy picture of a deregulated landscape some would paint, broadcasters must still jump through a variety of hoops, many of which have now been left to the broadcaster to design.

It may at first seem surprising that life in a purportedly deregulated industry represents so slight a change in many respects from the way things were. There are two explanations for this. First, the deregulatory steps taken thus far

have been aimed more at paperwork than at substantive obligations. As a result, although broadcasters may now be spending less time filling out forms, they still must worry about the same types of operational questions that confronted them before deregulation.

Second, the face of the broadcast industry may still not change a lot, even if more substantive deregulatory steps are taken. The reason is that, in theory, the competitive forces of the marketplace generate the same type of regulatory pressures as does governmental regulation. Thus elimination of governmental involvement will not eliminate the pressures themselves but will instead eliminate one of two independent sources of those pressures. Deregulation may be viewed by many as total freedom, but such a view is probably inaccurate. It is safer to say that deregulation represents greater freedom from governmental oversight, intrusion, and second guessing.

A caveat relative to deregulation as it has developed thus far is this: what the Commission gives, the Commission can take away. This simple and relatively obvious principle is of major significance because of the frequently changing composition of the Commission. Only four votes are necessary to reverse Commission policies. Because of this, the permanence of any Commission-created rule or policy, including deregulation, is far from assured.

It is for this reason that congressional action is preferable to Commission action. Even though congressional actions may be reversed, the number of votes usually required to cause such a reversal is far greater than four. Since deregulation has thus far occurred only at the Commission and not on Capitol Hill, it is still subject to the Commission's pleasure, whatever that might be. Of course, given the clear commitment of the current Commission—and the current administration—to the principles of deregulation, it is unlikely that the Commission will be changing its mind in the foreseeable future, but, then, one never knows.

Further, the Commission's deregulation of commercial radio is now being appealed before a federal court in Washington. A ruling against the Commission could send everything back to the starting point.

The bottom line on all this is that the deregulation that broadcasters have achieved thus far is fairly limited and unlikely to have any sweeping effects on the industry, although it will nonetheless be welcome on several counts. All licensees are still subject to substantial regulation, and all must still be careful to adopt and implement systems and procedures geared to protecting the licensee from running afoul of the Commission's various and sundry rules.

The future holds the prospect of further changes of more fundamental importance. These include not only the possible extension to television and noncommercial broadcasters of the limited deregulation secured thus far but also the possible adoption by the Commission and Congress of measures designed to remove the government from much, if not most, of its current regulatory functions. The result could be substantially greater freedom from governmental oversight, coupled with a greater degree of license security. **BM/E**

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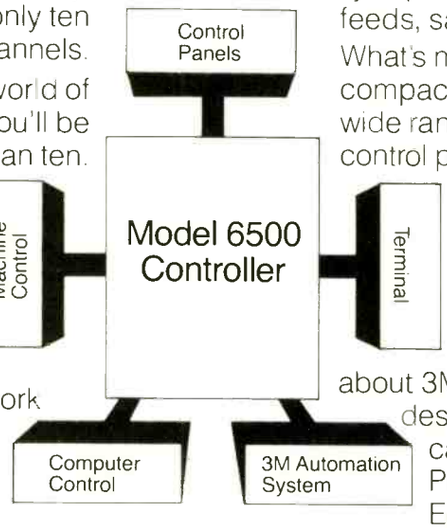

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Here's a chance to share your own personal solutions to some of broadcasting's most vexing engineering needs . . .

Each month, *BM/E* presents two engineering problems and invites you to submit solutions complete with diagrams. *BM/E's* editors will read the entries and select the best for publication—giving readers an opportunity to vote for the idea they consider best by using the ballot area on the Reader Service Card.

We will pay $10 for each entry printed. In addition, the solution in each month's competition receiving the most votes on our Reader Service Card will win an engineering slide rule calculator. So put on your thinking cap and submit an answer to either of the problems outlined below . . . and be sure to watch this section for the solutions.

Problem 5: RF Protection*

Recording of miscellaneous RF signals on the audio tracks of VTRs and ATRs is a frequently-encountered problem, particularly in crowded urban environments and when news crews are operating in high-rises. What is your solution for keeping RF interference out of portable recorders?

Solutions to Problem 5 must be received by April 15, 1982 and will be printed in the June, 1982 issue.

*Suggested by Greg Lafevre, news director, KSEE-TV, Fresno, CA. If you have an unsolved problem, let us know.

Problem 6: Automatic Switchover to Back-up Transmitter

Most modern dual transmitters include automatic switchover to a back-up unit if the on-air unit fails, or automatic transfer of the load to one transmitter if both are ordinarily combined. However, broadcasters buying a new transmitter will often keep a serviceable older transmitter as a back-up. And, in such cases, a system is needed to cut automatically to the old transmitter if the new one fails. This circuit may include repeated trials of the new transmitter, with some time limits, and also warning signals activated by a failure. What would be your proposed design for such a system?

Solutions to Problem 6 must be received by May 15, 1982 and will be printed in the July, 1982 issue.

CONTEST RULES

1. **How to Enter:** Submit your ideas on how to solve the problems, together with any schematic diagrams, photographs, or other supporting material. Entries should be roughly 500 words long. Mail the entries to *BM/E's* Great Ideas Contest, 295 Madison Avenue, New York, NY 10017. Use the official entry form or a separate piece of paper with your name, station or facility, address, and telephone number.
2. **Voting and Prizes:** *BM/E's* editors will read all entries and select some for publication; the decision of the editors is final. Those selected for publication will receive a $10 honorarium. Each month, readers will have an opportunity to vote for the solution they consider the best by using the Reader Service Card. *BM/E* will announce the solution receiving the most votes and will award the winner of each month's competition an engineering slide rule calculator.
3. **Eligibility:** All station and production facility personnel are eligible to enter solutions based on equipment already built or on ideas of how the problem should be solved. Consultants are welcome to submit ideas if they indicate at which facility the idea is in use. Manufacturers of equipment are not eligible to enter. Those submitting solutions are urged to think through their ideas carefully to be certain ideas conform to FCC specs and are in line with manufacturers' warranty guidelines.

Mail Official Entry Form to:

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295 Madison Avenue, New York, NY 10017

Solution to Problem # _____

Your Name: _____

Title: _____

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Address: _____

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

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SOLUTIONS to problem 3: Elapsed Time Indicator

Tape recorders and cassette decks (both audio and video) often lack elapsed time or remaining time indicators. What is your design for a device that will provide this information, have instant manual reset, be readable from a distance, and start automatically when the recorder is turned on? Here are three solutions to this problem submitted by *BM/E's* readers.

SOLUTION A

Mike Wilson, Videotape Maintenance Engineer
NBC-TV, Burbank, CA

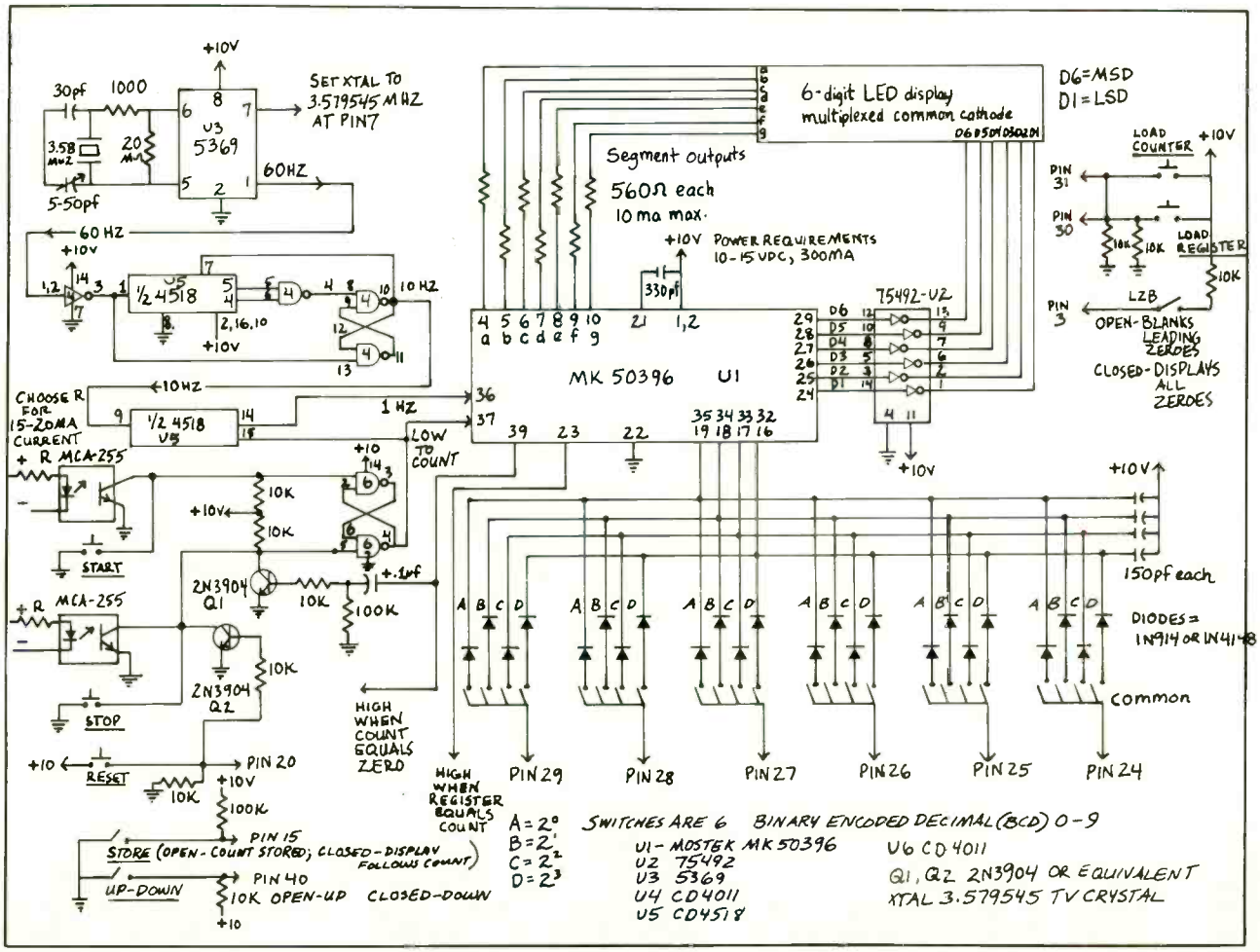
My proposed design for an elapsed time indicator includes the following features:

- crystal controlled timekeeping;
- instant reset to zero;
- up or down counting—counts elapsed time or time remaining;
- presettable time counter;
- six-digit resister compares time count to preloaded value, logic high provided when equal;
- logic high available when count equals zero;
- momentary contact closures start and stop counting; optically isolated input can be driven from recorder run and stop tally lamps, or relay power;
- LED display can be held in memory while count continues and can be instantly updated to current value;
- uses only six integrated circuits; power requirements 10-15 V DC at 300 mA;
- battery operation possible;
- unwanted features easily deleted.

I built a similar counter previously using TTL IC's—nearly 20 in all. Since then, I discovered the Mostek 50396 and 50397 chips. The 50396 is programmed to count time to 99 hrs. 59 min. 59 sec. For stopwatch use, the 50397 counts to 59 min. 99.99 sec. (Single lot prices in early 1980 were $12.00.)

Interface to the chip is explained in a publication, *Industrial Counters*, available from Mostek, 1215 W. Crosby Rd., Carrollton, TX 75006. The timebase and control circuits shown are my original design. The MM5369, U3 generates 60 Hz pulses, divided by 6 in the first half of U5, and by 10 in the second half. Flip-flop U6 retains the momentary start or stop pulses. Transistor Q2 prepares the counter to be restarted after a reset. Q1 stops the count when pin 39 goes high. This prevents the counter from down counting past zero.

Pins 39 and 23 go high when count equals zero and count equals register, respectively. These could be buffered, and used to drive external relays and/or lamps. In a



TV station, the timer could be loaded with the running time of a tape, with the register set to 10 seconds. As the counter decremented to :10, the equal pulse could preroll the next VTR; when the count equaled zero, it could drive a switcher to take it on air. Or this could cue studio talent to the impending end of a commercial break.

SOLUTION B

Allen Kass, Chief Engineer
WISP/WQDW Radio, Kinston, NC

Three electrically identical time indicator units were built here for use in our two production rooms and in the live-assist control room. Based on the MA-1026 digital LED alarm clock/thermometer module made by National Semiconductors and sold by many companies including Radio Shack (Radio Shack #277-1006), this timer will upcount to 9:59 then reset to 0:00. The price of the module ranges from $18 to $25 making this a reasonable alternative to some of the commercially available units that cost around $100 or more.

The schematic shows two input connectors J1 and J2. Not all inputs are used in all three rooms but were included, nonetheless, to make all units alike. The timer is normally free running and is reset by one of four different methods, not all of which are used in any one application: (1) manual front panel pushbutton; (2) from a "master start" button when used in production; (3) from a foot switch when timing news wire copy; (4) from automation "step now" pulse when used in the live-assist control room to uptime music intros (Schafer 903E automation).

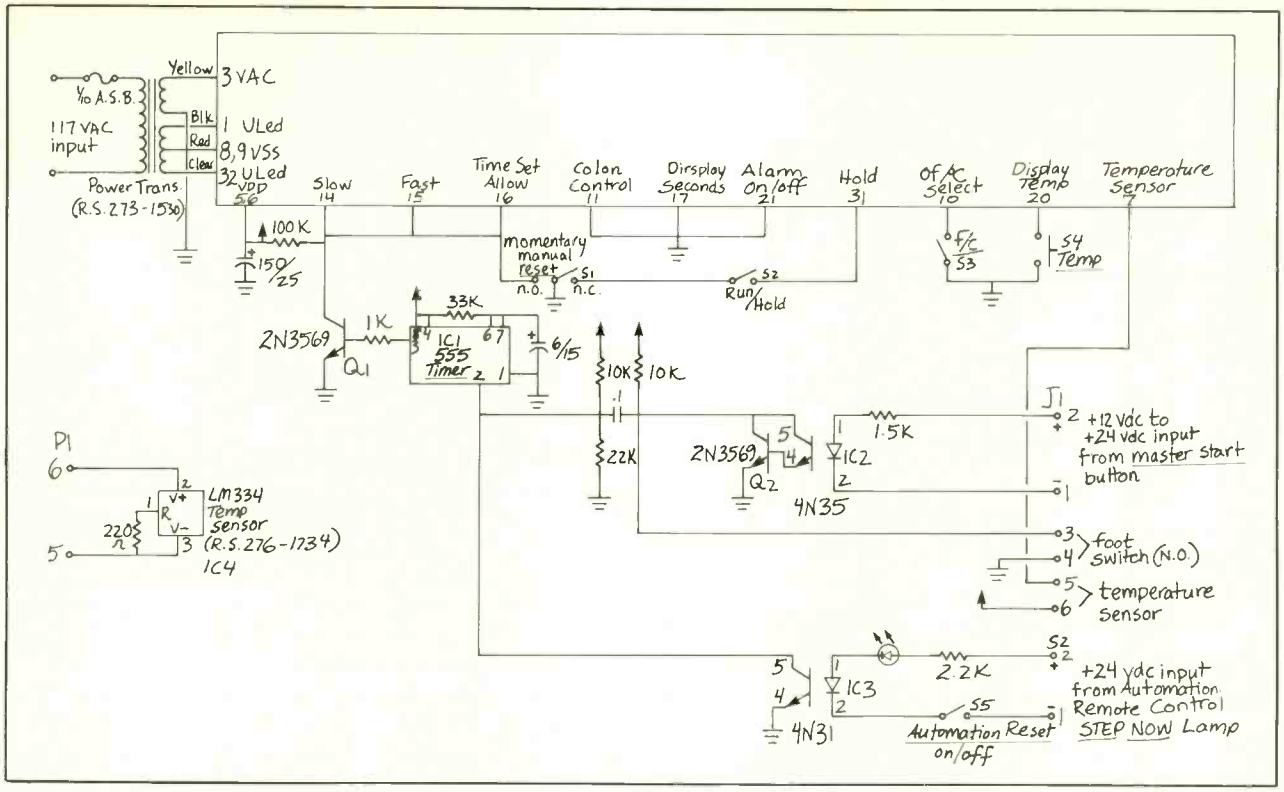
Operation

Reset to 0:00 of the timers occurs when pin 14 (slow), pin 15 (fast), and pin 16 (time set allow) all simultaneously go low. This, in all cases except the manual reset, occurs when the 555 timer is triggered and turns on Q1. The 555 is used to provide a pulse that extends all the way down to ground and lasts long enough to reset the module. The 555 is triggered three ways: by the foot switch, by the master reset both through a half-monostable network, and by the automation "set now" pulse. Switch 55 is included to turn off the automation reset if necessary. The timer can be stopped after timing an event by closing switch 52 (run/hold switch).

Another feature of this timer is its use as a thermometer; there are two switches provided on the front panel to operate this feature. Switch 53 selects the temperature in degrees Fahrenheit or Centigrade. If 53 is open, temperature is in degrees Fahrenheit when 53 is grounded, degrees Centigrade are selected when switch 54 (temperature display) is grounded.

The input at pins 1 and 2 of J1 are set up for +12 to +24 V DC input from what I call a "master reset" button in our production rooms. The master reset consists of a group of solid state relays that are connected to our cart, open reel, and turntables to start one or more machines simultaneously along with resetting the timer.

Pins 3 and 4 of J1 are for connection to a foot-operated switch. Pins 5 and 6 of J1 are for connection to a temperature sensor consisting of a resistor and an LM334 con-



nected as shown on the left-hand side of the schematic diagram. Pins 1 and 2 of J2 are set up to be connected directly across the "step now" lamp in the Schafer 903E automation remote control that is in operation in the live-assist control room. The LED will flash when 55 is closed

and the automation steps to indicate that the timer has just reset. Opto-isolators are used on two of the inputs to protect the module and to prevent any possibility of ground loops. The transformer used for this timer is a special unit available from Radio Shack (#273-1530) and the LM334 temperature sensor is available as #276-1734.

The LED digits of the timer module are 0.7 in. high and are quite legible from a distance. The connections to the MA/1026 module are very close together so care should be taken when soldering to them.

SOLUTION C

William Howe, Chief Engineer
WEIV Radio, Newfield, NY

The elapsed time indicator described here is a system that has been in use in our station for a few months now and has operated almost problem-free. The heart of this system is an MA 1012 clock module by National Semiconductor. (I believe that this module is no longer in production but most other clock modules of this sort—the MA 1023 or MA 1020—could easily serve the purpose.) This module makes the system very cost effective in that the clock can be purchased for less than $15 complete with transformer. The entire system was built for less than $50. The clock counts elapsed time up to 9 minutes and 59 seconds and recycles and counts up upon starting of the turntables, cart playbacks, and record cart started in the record mode. The reel-to-reel tape recorders were not included as the Ampex ATR-700's we used already have a tape counter that counts in minutes and seconds. However, these or other tape recorders could be implemented with proper interface to the system.

The circuit operates as follows: The clock module is strapped to operate in the seconds mode by the jumpers on pins 24, 14, and 7. This gives the readout of the last digit of the minutes and seconds. Relay K1 is connected to pins 19 and 20 which are the fast and slow set. In the seconds mode activation of these functions together set the clock at 12 a.m. giving a display of 0 minutes 00 seconds. When K1 releases, the clock will start to count seconds and minutes until recycled. Relay K2 is connected to the hold function on pin 21 and holds count as long as it is energized. IC1 and IC2 are connected to the 25 V points on the console that activate the remote start relay for the two turntables and momentarily activate in series with the inputs during the charging of the capacitors. The outputs go low and recycle the clock count by momentary activation of K1. IC5 gives isolation to the different inputs of the system.

Cart 1 is a record/playback and Cart 2 is a playback-only cart machine. Both units are UMC Beaucarts type 10. J1 is the remote playback jacks on the machine and the N.O. relay contacts of the internal relay that activates from a ter. cue tone on the cart being played are across pins 12 and 13 of this jack. The clock count is recycled by a ter. cue which is recorded on each cart at the beginning

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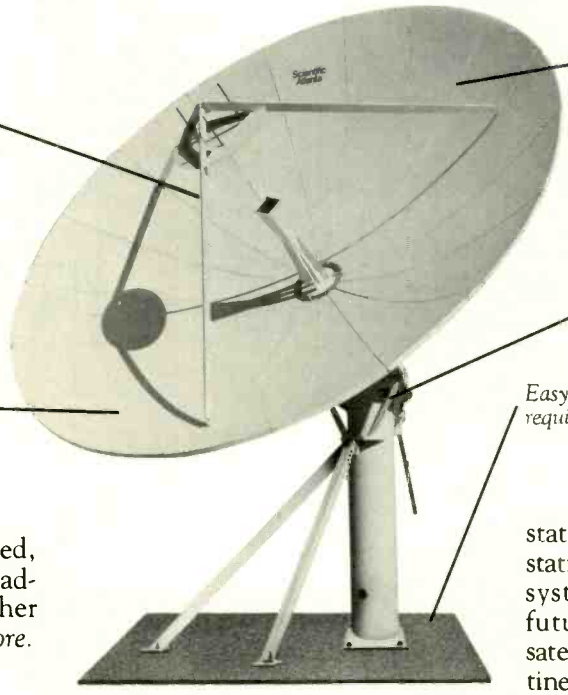

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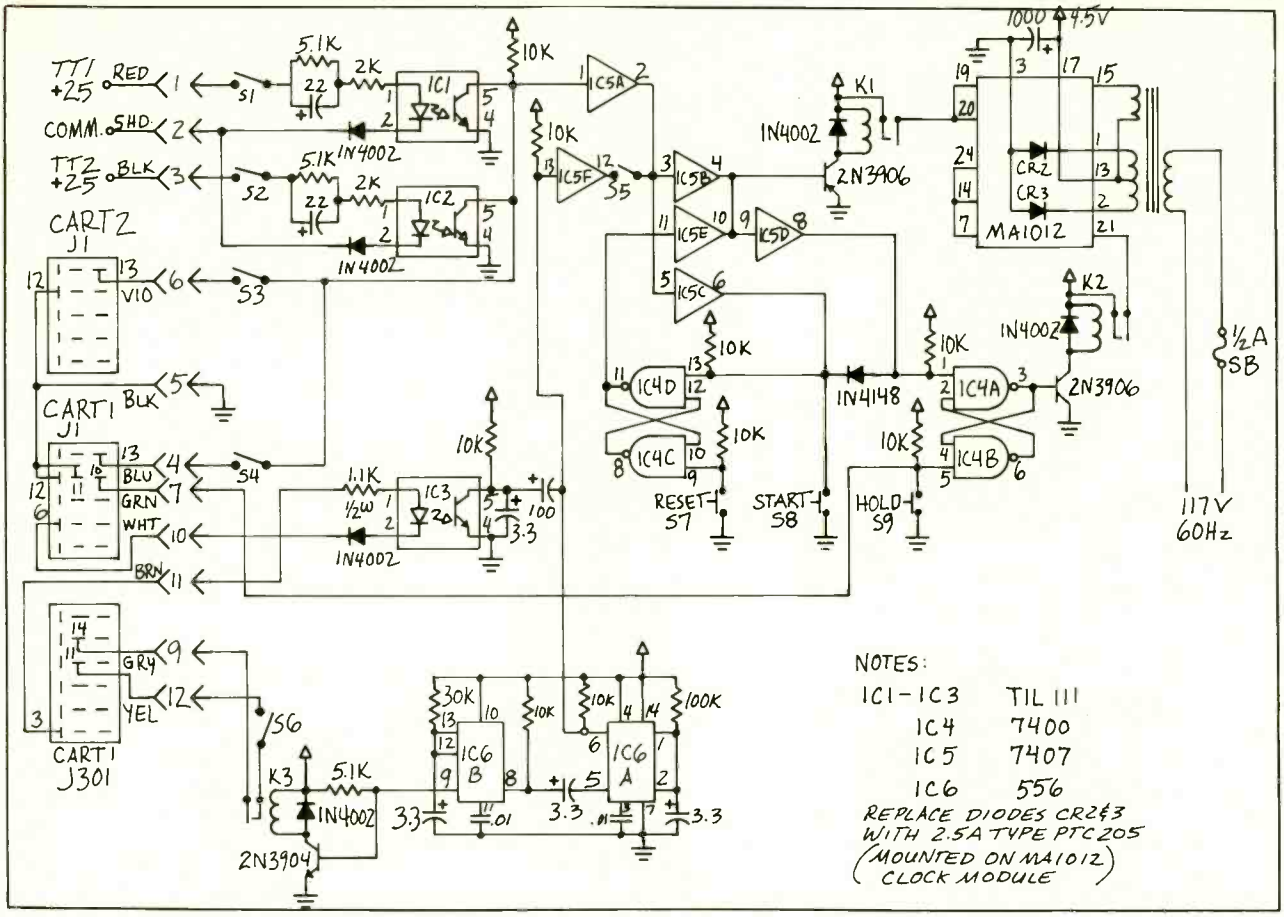

of each cut. This cue tone is automatically inserted by the system during recording in the following manner. IC3 is activated by 24 V across pin 6 of J1 and pin 3 of J301, which is the remote record jack of the record machine. The diode in series here is essential when the machine is stopped, the polarity of this voltage is reversed and the Opto-Coupler will not tolerate this high reverse polarity across its input. On IC1 and IC2 they are there just in case they might get hooked up with the polarity reversed. IC6A is activated by the charging of the capacitor on the output of IC3 and this also causes recycling of the clock through IC5F. Pin 5 of IC5 goes high for about a second and IC5B is activated when it returns low. Pin 9 of IC5 goes high for a short duration activating K3. K3 puts a ter. cue tone on the cart being recorded through pins 11 and 14 of J301 a half second after the cart machine is started in the record mode. This delay allows for the slight coast of the tape when it stops in playback. Switches S1 through S6 allow any of these features to be switched out when it is not desirable for the particular production being done.

IC4A and IC4B is a flip-flop that locks the clock in hold by pressing hold button S9. IC4C and IC4D is also a flip-flop and locks the clock at 0:00 by depressing S7. S8 takes clock out of reset or hold mode. These three switches provide manual operation of the clock. Any activation from the automatic recycle functions will override the manual functions.

A similar system which recycles from the turntables and cart machines is used in the on-air studio. This has been very helpful to the announcers because about 90 percent of our music is played on carts and this allows them to easily keep track of the intro and running time of the cuts so they are not caught by surprise.

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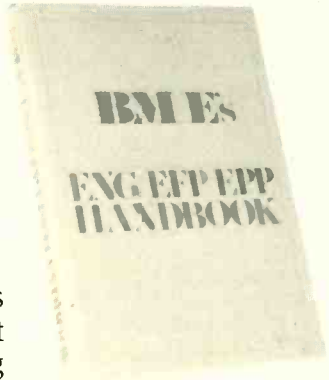

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BROADCAST EQUIPMENT

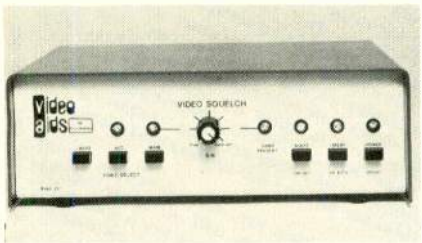
Tascam Four-Track Portastudio 250

The new Model 244 is a more versatile unit than its popular predecessor, the 144. The new unit has four-track simultaneous recording capability that, together with the four-channel tape out-

puts, permits cassettes to be copied from one unit to another. Each of the four inputs has a two-band parametric sweep equalizer and dbx noise reduction, with peak overload LEDs on each input and on left and right mixing buses. The auxiliary mix is now four in by two out with pre/post/off switching for use on an echo/effects send or for additional cue feed. A remote punch-in/out jack accepts optional RC30p foot switch. TASCAM, TEAC CORP.

VAC Announces Video Squelch 251

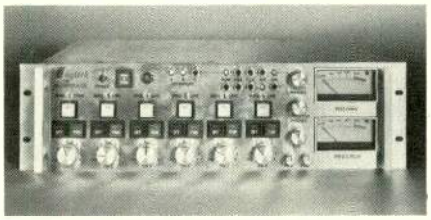
Video Squelch, an automatic fault monitor and signal switch, monitors either a main video feed for S/N degradation below a customer set level, or for



complete loss of valid video signal. If either fault occurs, an alternate video source is selected and built-in visual and audible alarms operated. An automatic 110 V switched power source removes power from auxiliary equipment when a fault occurs. The unit resets automatically when acceptable video transmission resumes. Time delays from 0.5-30 seconds for either defect are customer adjustable. Applications include unattended control of remote repeaters, automatic alternate best feed selection in cable and satellite distribution systems, and continuous signal monitoring in industrial broadcast applications. Stand alone unit, under $700; a rack-mount adaptor is available. VIDEO AIDS OF COLORADO.

Audiorack from Logitek252

The console is a complete studio quality unit designed primarily for ENG, newsrooms, or editing booths. The 5½-inch high rack mounted unit features audio rack feeds to independent output channels from six inputs, five of which can



be either mic or line level. The sixth can be switched between mic level source and an internal tone generator. Audio follow and remote start capability are also included as well as cueing, distribution outputs, and full two-channel metering. Options include 12 Vdc powering capability and carrying case for remote use. LOGITEK ELECTRONIC SYSTEMS, INC.

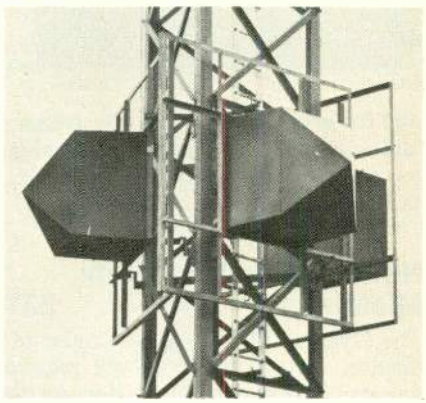
MCI Unveils New Mixer 253

The new JH-800 general purpose audio console, to be previewed at the AES convention in Montreaux, is suitable for broadcast, production, sound reinforcement, or location recording. The small, lightweight 12-channel mixer offers specifications similar to MCI's bigger studio consoles and contains 12 input modules capable of both mic and line inputs. Each input includes a three-band equalizer with high-cut and low-cut filters as well as dual stereo mix and four sends. Level control is done with 83 mm VCA controlling faders with four groups selectable. Each input module includes a line output for multi-track recording or auxiliary feeds. Metering on vacuum fluorescent displays is provided for each mix pair, the four sends, and the built-in compressor limiters. MCI, INC.

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

Broadband Panel Antenna from Shively Labs 254

This new FM CP antenna is designed for multistation requirements and has a VSWR of 1.1:1 or better across the entire FM band. A variety of directional



patterns are available, maintaining a circularity of ±2 dB. The antenna consists of a series of panel modules assembled into levels that are added one on top of the other to achieve the desired gain. Although designed for severe climates, the Model 6010PB is available without radomes in a low windload version. SHIVELY LABS.

TV Studio Memory Control from PAC 255

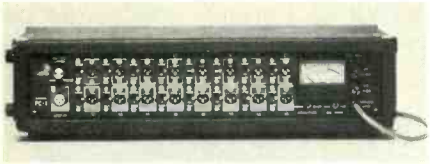
Faster setups and automatic positioning repeatability are possible with this new TV studio machinery control using a

microprocessor memory. Up to 240 separate, motorized winches can be positioned, as well as lighting and scenery risers with fingertip control. Ninety-nine cues can be placed in memory and can be recalled as required. Every cue can store up to four separate machine numbers, each with preset speed and position. PETER ALBRECHT CORP.

Broadcast Equipment

Bonneville Audio Distribution System 256

The PC-1 distribution amplifier offers state-of-the-art electronic design that features the 990 op-amp and Jensen transformers. Each of the 16 outputs is selectable for line or mic level, and the unit is suitable for use in mobile vans



and for interfacing large audio systems and isolating feeds in applications when ac ground currents present problems. BONNEVILLE PRODUCTIONS.

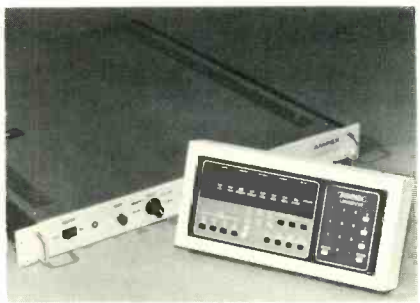
Noise Reduction from MicMix 257

The Dynafex D-2B is a new noise reduction system that does not require any encoding or decoding, allowing the unit to reduce noise on any audio source. The D-2B is a two-channel system that is capable of reducing noise by up to 30 dB or more. Each channel has a threshold control that determines at

what signal level maximum noise reduction occurs. The unit can be adjusted for reference levels of +8, +4, 0, or −10 dB, permitting interface with broadcast, recording studio, and consumer equipment. MICMIX AUDIO

"Unisyn" Synchronizer from Ampex 258

This synchronizer for audio tape and videotape transports is a modular system with one Unisyn required for each controller and transport to support any post-production requirement, locking up to 16 transports in sync. The intelligent interface software automatically adapts to transport dynamics for optimum cuing and fast lock up and is



adaptable to any VTR or ATR with a remote control port. It has been designed with a digital serial communications port that permits interconnection to all standard mini- and microcomputers. It will also interface with the Ampex ACE editing system. The control panel can also be remoted. AMPEX CORP.

Animation System from Lyon Lamb 259

The VAS III, a new ¾-inch video animation system, incorporates the latest advances in VHS cassette formats for

the testing of animation, special effects, puppets, and pixilation. It can also be used as a production tool for shooting storyboards and animatics. The frame-by-frame recording system

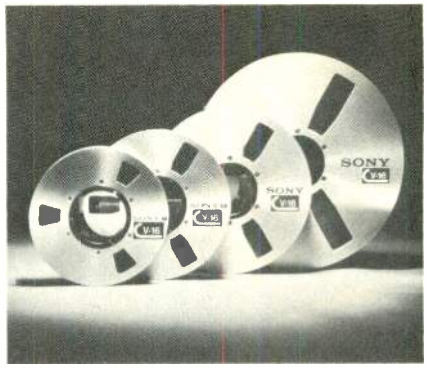
provides an instantaneous method of viewing stop-action tests before committing to final production. VAS III has switchable recording speeds of 24 or 30 fps and selectable frames per recording from 1 to 99. The complete system includes recorder with built-in microprocessor, B&W camera with 5:1 zoom lens, and nine-inch B&W monitor LYON LAMB.

Fluke Oscilloscope Calibration 260

Along with calibration generator software, the Fluke 7410A system includes procedures for three popular scopes: the Tektronix 465B, 475, and the Philips PM 3212. In a single day the system can be installed and begin functioning with its extensive software package. It automatically prompts the user through turn-on, procedure writing, calibration location, and adjustment and verification instructions. It can be geared to any level needed—from unskilled operator to qualified technicians. A procedure generator/editor software package is included, helping the operators to translate manual calibration routines into working automated procedures. JOHN FLUKE MFG. CO.

New Recording Tape Lengths from Sony 261

Sony's V-16 High Band Master Videotape Series has been expanded to include two new products that offer 18- and 188-minute recording lengths. The series uses high-energy cobalt dioxide magnetic particles for wide frequency response, and the binder system improves durability in demanding applications. The V-16B tape is wound on Sony's aluminum flange with NAB standard hubs. The 18-minute length has a reel size of eight inches, and the 188-minute length designed for Sony's BVH-1180 VTR, uses a 14-inch reel. SONY CORP.



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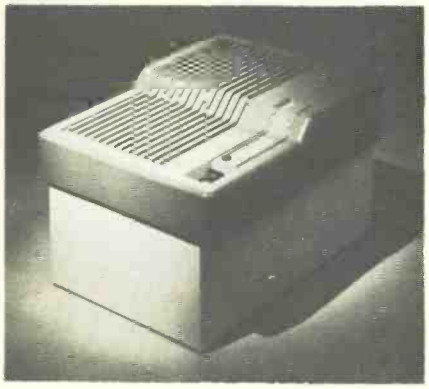
Standby Power from Topaz 262

The Source 2, a new standby power system with sine wave output, is a portable compact backup power supply that provides sine wave ac power to meet the full power requirements of sensitive computer-based equipment. The unit is installed between the power line and the user's equipment and automatically provides a steady supply of ac power when line voltage drops lower than 15 percent below nominal. Actual backup time depends on equipment but typically exceeds one hour, allowing suffi-



cient time to attend to computer shutdown. Topaz standby power systems are available in rating of 200 VA and 400 VA, with short-circuit protection. The 60 Hz models are also available. TOPAZ, INC.

Sencore Waveform Analyzer 263

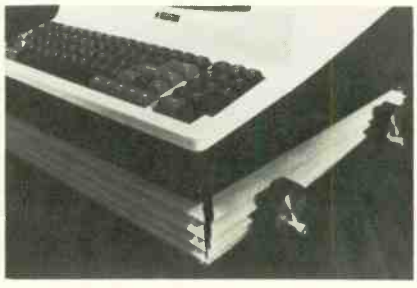
The SC61 is, according to the manufacturer, the first instrument to fully integrate a digital readout with the waveform analyzing capability of a high-performance oscilloscope for measurements that are 10 times faster and more accurate than with a conventional scope. The unit makes all measurements through one probe, including digital readout of dc volts, peak-to-peak volts, frequency, and time. The display portion of the analyzer is a post-deflected dual-trace CRT that has a dc to 60 MHz (±3 dB) bandwidth, useful to 100 MHz. SENCORE, INC.

Speed Search Module from AVR 264

The VSM-1 Speed Search Module is a new accessory from AVR Engineering for Sony 2860/2260 series U-Matic editors and RM-440 controller. This compact module allows searching for edit points at five speeds in both forward and reverse, from one-twentieth to three times normal. The VSM-1 can be installed easily in less than an hour and comes with comprehensive instruction book. AVR ENGINEERING.

Polyform Adjustable CRT Platform 265

This new platform easily adjusts height, tilt, and direction of any CRT terminal. The Tilt/Swivel Ergonomic Platform features infinitely variable two-dial adjustment that optimizes the CRT-operator interface. Offered in two sizes, the platform provides up to 18-degree biaxial tilting to reduce glare, 360-degree swivel, 5-inch elevation, and 250-pound capacity. POLYFORM CORP.



New Design for Bal Cases 266

The new Bal case is molded from Aero-Lan with integral ribs for strength. Recessed steel handles and latches, piano hinge, and aluminum

tongue and groove closure further assure long case life. Internal contour-cut cushioning envelopes the camera or recorder in soft polyurethane foam. The cases also come with removable swivel wheel casters that store neatly inside the case during shipment. Several case sizes are available with different interiors to fit many of today's cameras and VCRs. WILLIAM BAL CORP.

New Company Offers New Cartridge 267

Megasonics, Ltd., a newly established company under the direction of Dr. Sao Zaw Win, has introduced the MC-10 moving coil cartridge. Its first product, the MC-10 has unique features such as

the cut and shape of the diamond stylus, along with other changes in the cantilever, core, and armature design. Suggested price, $400.00. MEGASONICS, LTD.

New 70-Input Matrix 268

Utah Scientific has developed a new version of its AVS-1 routing switcher that accommodates up to 70 inputs. It has ten outputs audio and video in each 10-½ inch card cage. It also utilizes the company's PD-8/PS-2 redundant power supply system. UTAH SCIENTIFIC.

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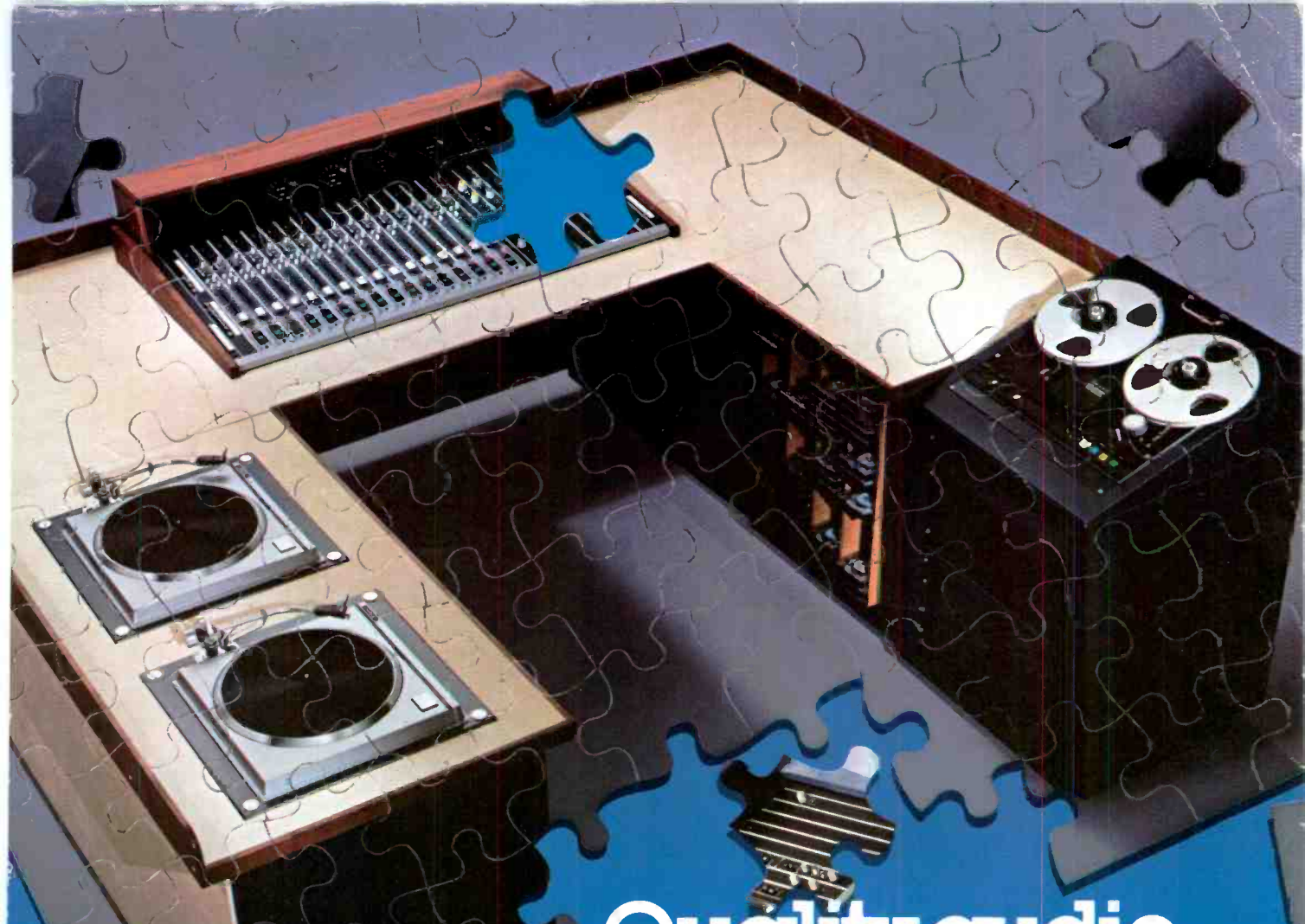

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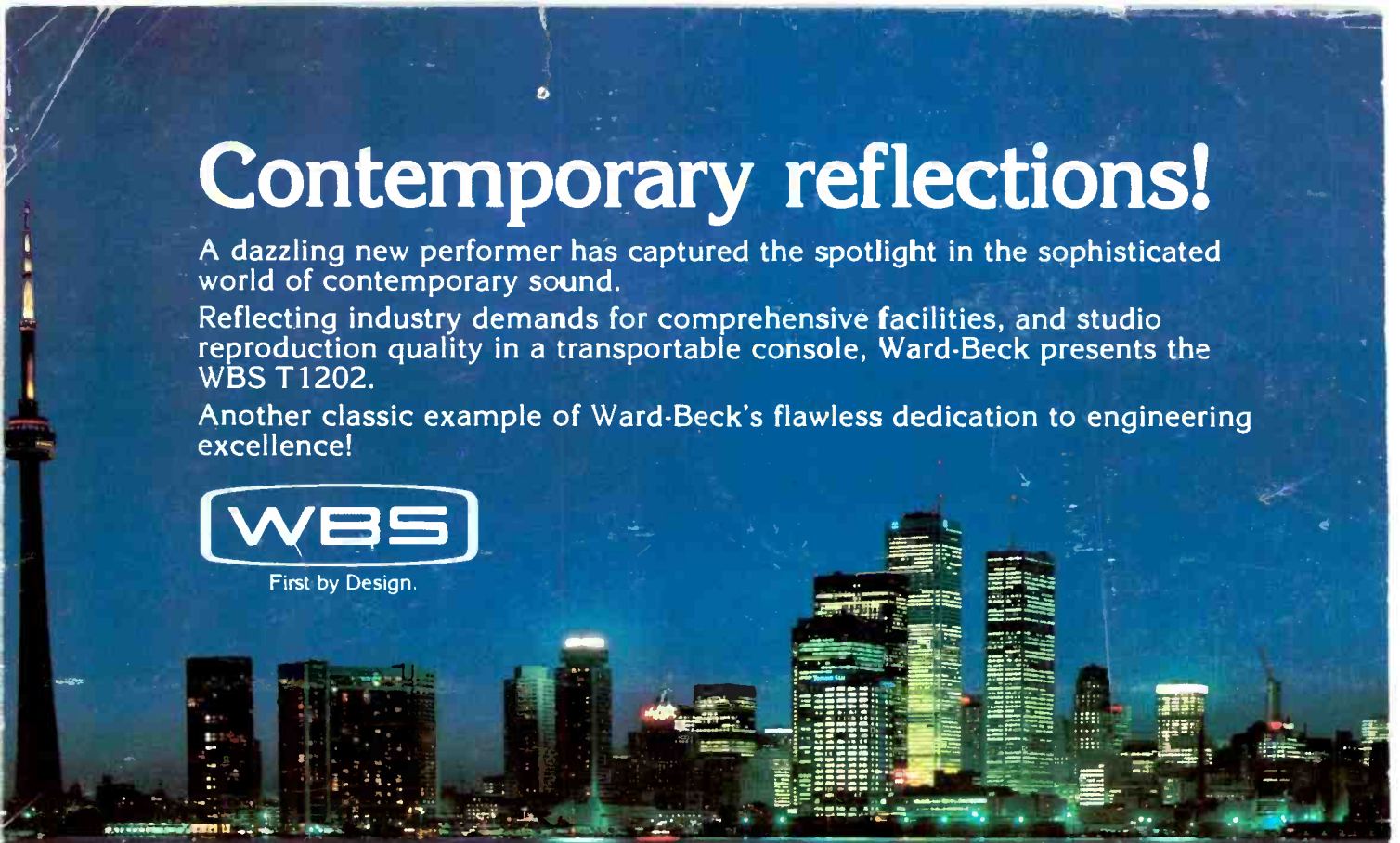

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