

MARCH 1975

BME

BROADCAST MANAGEMENT/ENGINEERING



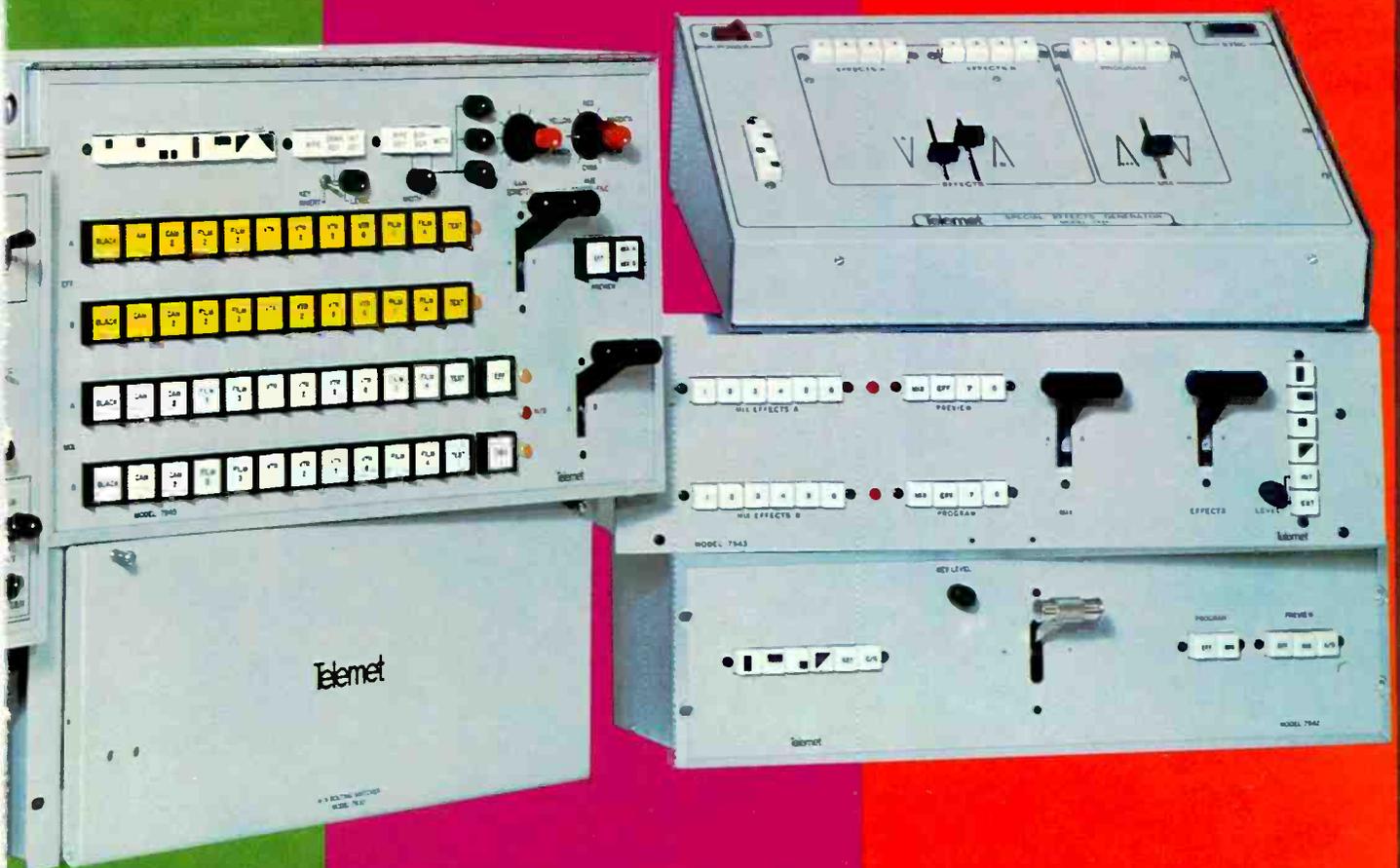
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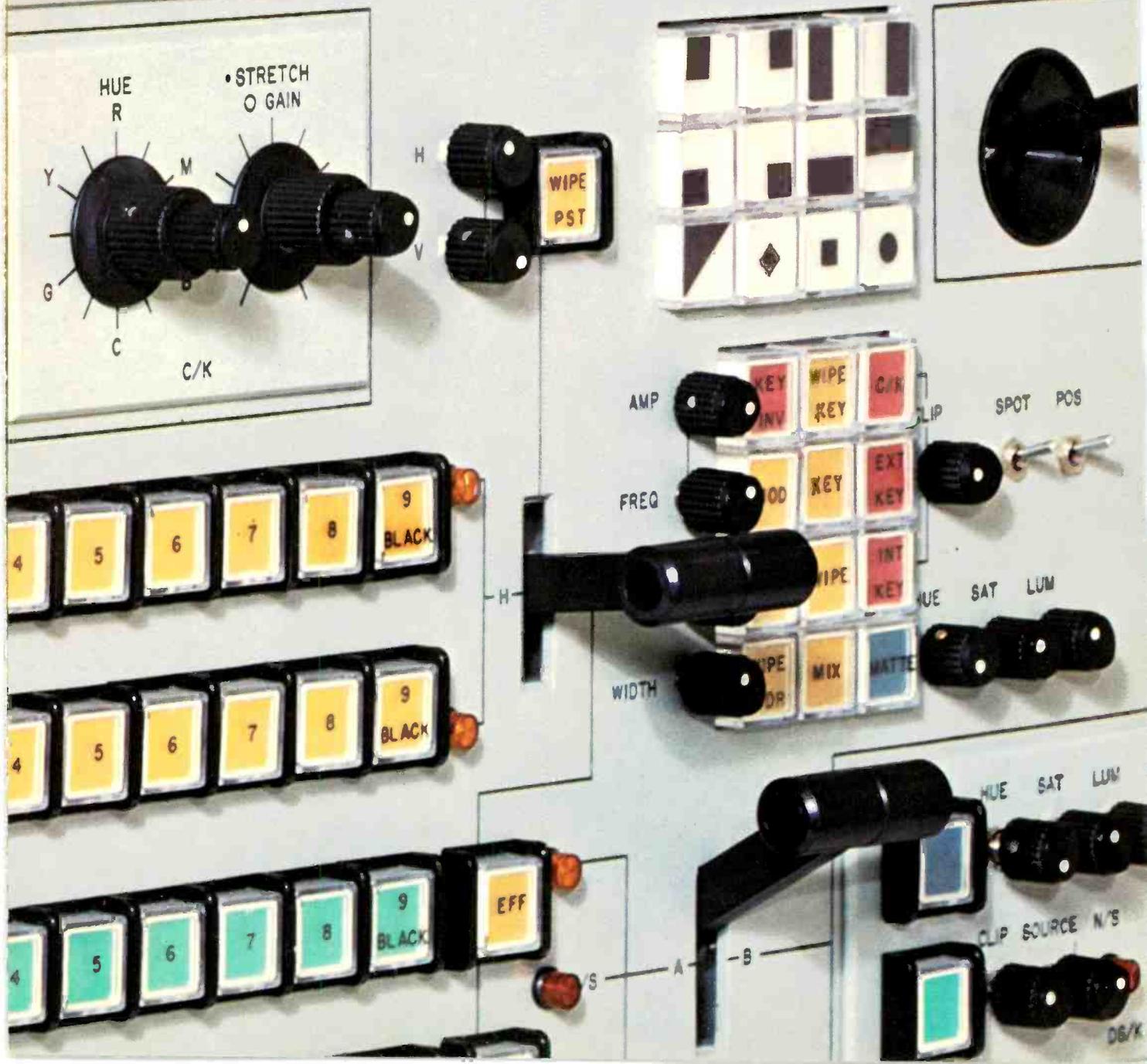
Model 4704A1 RGB Chroma Keyer
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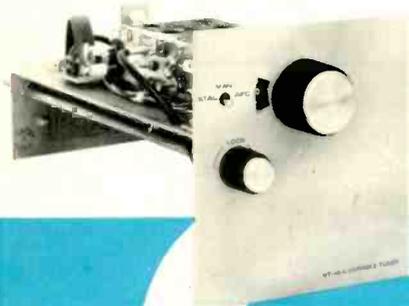
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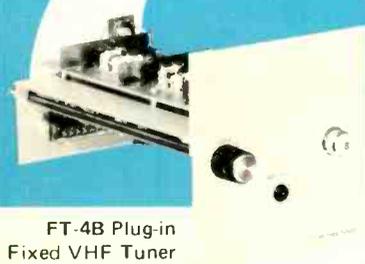
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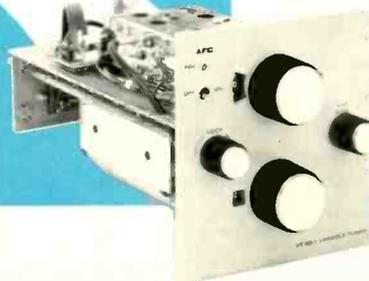
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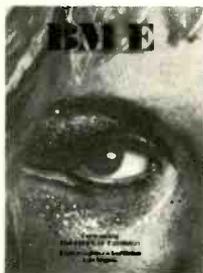
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BROADCAST MANAGEMENT/ENGINEERING

MARCH 1975/VOLUME 11/NUMBER 3



The NAB 53rd Convention at Las Vegas, in a setting of stage shows and casinos, will be a star attraction in its own right . . . prominent speakers, vital workshops, and breakthrough equipment. For a preview, turn to page 31.

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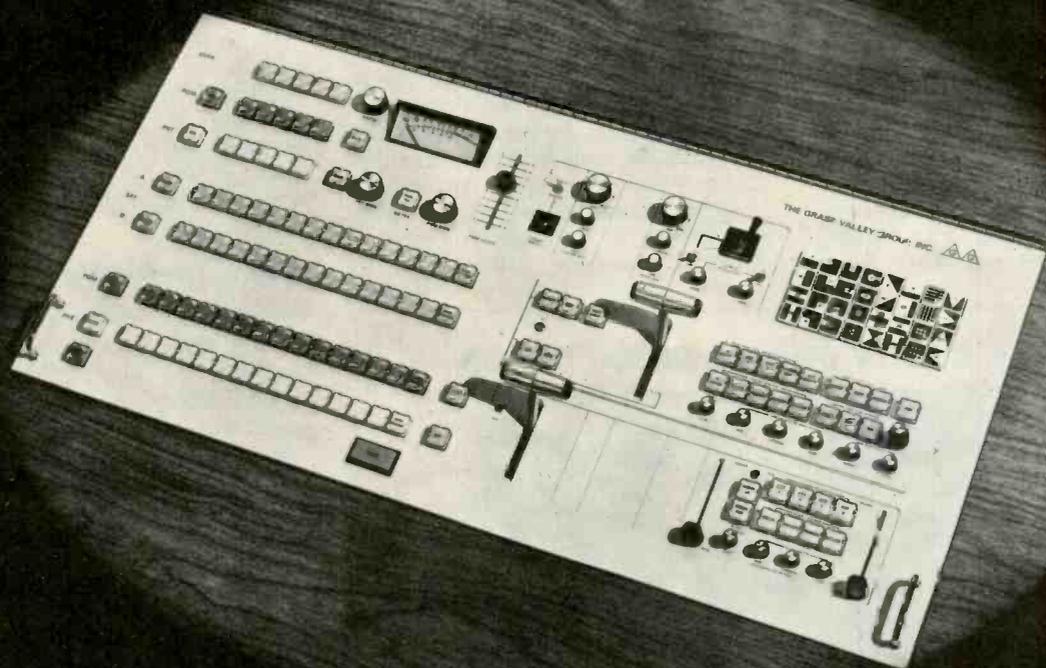
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BROADCAST INDUSTRY NEWS

"Beautiful Music" Tops in FM Says NAFMB Report

"Beautiful Music" is up, "Middle-of-the-Road" is down in FM, according to the 1974 Survey of FM programming practices issued at the end of the year by the National Association of FM Broadcasters. Based on questionnaire answers from 1296 licensed commercial FM stations, the Survey showed Beautiful Music as the acknowledged program format of nearly 30% of the respondents, the largest category, up from 19% in the 1972 survey. Middle of the Road, second largest, was the style of 12.2%, down from 19% in 1972. Next came Country and Western, 11.5%; Contemporary, 8%; Progressive Rock, 5%; Oldies, 3.3%; Top 40, 3.3%; and others down

to Classical, 2.1% (2.8% in 1972); Soul/Rhythm and Blues, 1.5%; and Talk-News, a miniscule .08%.

Other findings: 76% of the respondents are stereo; 14% also use quad, with half of those using quad only 1 to 4 hours a week; 25% are fully automated and another 25% partially so; 33.6% use syndicated programming.

The Survey also affirmed that FM is still the (comparatively) "uncluttered medium," since total commercial time per hour was reported as 8 minutes, number of spots per hour, 10. As to target audiences, there was evident increasing interest in the young adult group, 18-34, with 36% of the stations aiming there. The report lists all individual stations that replied, according to format. It is available free to NAFMB members, \$10 a copy to

others, from NAFMB, 420 Madison Avenue, Suite 803, New York 10017.

NAB Asks for Oral Hearings on Cable Non-Duplication

Alleging that cable operators seeking relaxation of the non-duplication rules have had far more contact with the FCC than the interested broadcasters, the National Association of Broadcasters asked the FCC to institute oral argument in the proposed rule-making on non-duplication. NAB said that non-duplication is "the key to the continuation of a system of localized broadcasting service," and that a "few extra weeks for purposes of fuller understanding of the true facts is perfectly in order."

Over-The-Air Pay TV Slated for Los Angeles

Station KWHY, Channel 22 in Los Angeles, has won FCC approval for pay-TV operation, with the system to begin early in 1976, according to an announcement by Wiley D. Bunn, president of the station. Joining in the announcement was Robert S. Block, president of Telease, which holds licensing rights to the Teleglobe pay TV system, one of four approved by the FCC, which will be used by KWHY. Bunn said that even after the pay TV system is in full operation, about 70% of the station's programs would still be "free." Surveys by Block's organization in several cities have indicated large potential audiences for pay TV programming.

Panasonic Introduces Fast Copying of Tape Carts

A "transfer-signal" system for fast copying of half-inch videotape on carts was introduced in January by Matsushita Electric, under the Panasonic brand. With an overall time ratio of about 10 to 1, the system uses two units: a master recorder, which takes program material from a camera, or from another recording, and puts it on tape, in a cart, in "mirror image" form; and a printer in which the actual duplication takes place.

For printing, the mirror-image master and the slave tape are wound tightly together, in bifilar mode, and a

Tubeless, CCD TV Cameras Shown by RCA



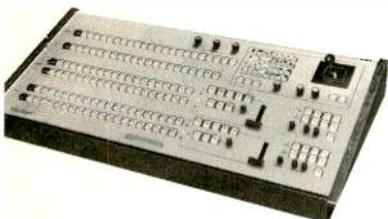
A series of TV cameras which scan a photosensitive solid-state array by using the charge-coupled principle, eliminating evacuated tubes and electron scanning beams, was shown at a press conference late in January by RCA Corporation. In contrast to earlier CCD cameras which have been announced, according to RCA, their new series is designed to operate with the American 525-line black and white and color TV standards. The sensor, which is also being sold separately as an "SID," or silicon imaging device, has an array of 512 x 320 elements, for a total of more than 163,000, the largest such device, with the highest resolution, so far offered, RCA said. The maker claims overall resolution comparable to that of 2/3 inch Vidicon tubes, with the added advantages of CCD devices—high reliability, low power requirements, low size, ruggedness, long life, highly stable and precise picture geometry, no lag or image retention. RCA is aiming the cameras, TC1150 and TC1155, initially at the CCTV and industrial TV market. Although broadcast-quality CCD cameras are an obvious objective of their CCD development, RCA made no forecasts as to when such cameras might be available.

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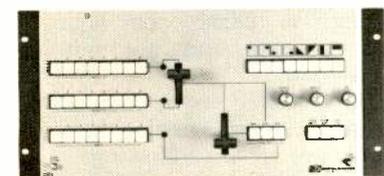
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NEWS

momentary field is applied to transfer the signal to the slave. The slave is then automatically wound onto a cart, ready for use. Called the VTP-1000, the system is priced at around \$29,000 for the two units, and deliveries were slated to begin in February, after this issue went to press.

Prime-Time Rule Gets "Tough" Modifications

Saying it continued to put high importance on the prime-time access rule as a limit on network dominance of station time, the Federal Communications Commission has modified the rule toward tougher restrictions, but with new exemptions. Under date of January 16, with the effective date set for September 1st, 1975, the FCC put back under the rule the initial half-hour (removed by modification of January, 1974), and also put under the rule, feature movies that have been shown before on a network.

The rule applies to stations in the 50 top markets, and covers the prime-time hours 7 to 11 p.m. for stations on Eastern and Pacific time, 6 to 10 p.m. for Central and Mountain time stations. During these periods the stations are restricted to three hours of network or off-network (previously on network) programming, to create one hour nightly of "cleared" time for non-network material.

Categories that need not be counted as network programming (freeing them of the restriction) are the following:

- children's, public affairs, and documentary material;
- special news programs dealing with fast-breaking news events, on the spot news events and other material related to such events; and broadcasts by or for legally qualified candidates for office;
- regular half-hour network news programs when immediately adjacent to a full hour of locally produced news or public affairs;
- runovers of sports events, started in good faith to fill a non-prime-time slot;
- international sports events, New Years college football, or other "specials" when the station is giving a full evening to the broadcast;
- in the Mountain and Pacific zones, stations may count sports or other live broadcasts as though they fill no more of prime time than they do in the other zones.

The FCC said that the rule had provided an "... impetus to the development of local programming efforts, and this is one of the principal reasons for retaining it in a form close to the original 1970 rule." The Commission emphasized that stations sub-

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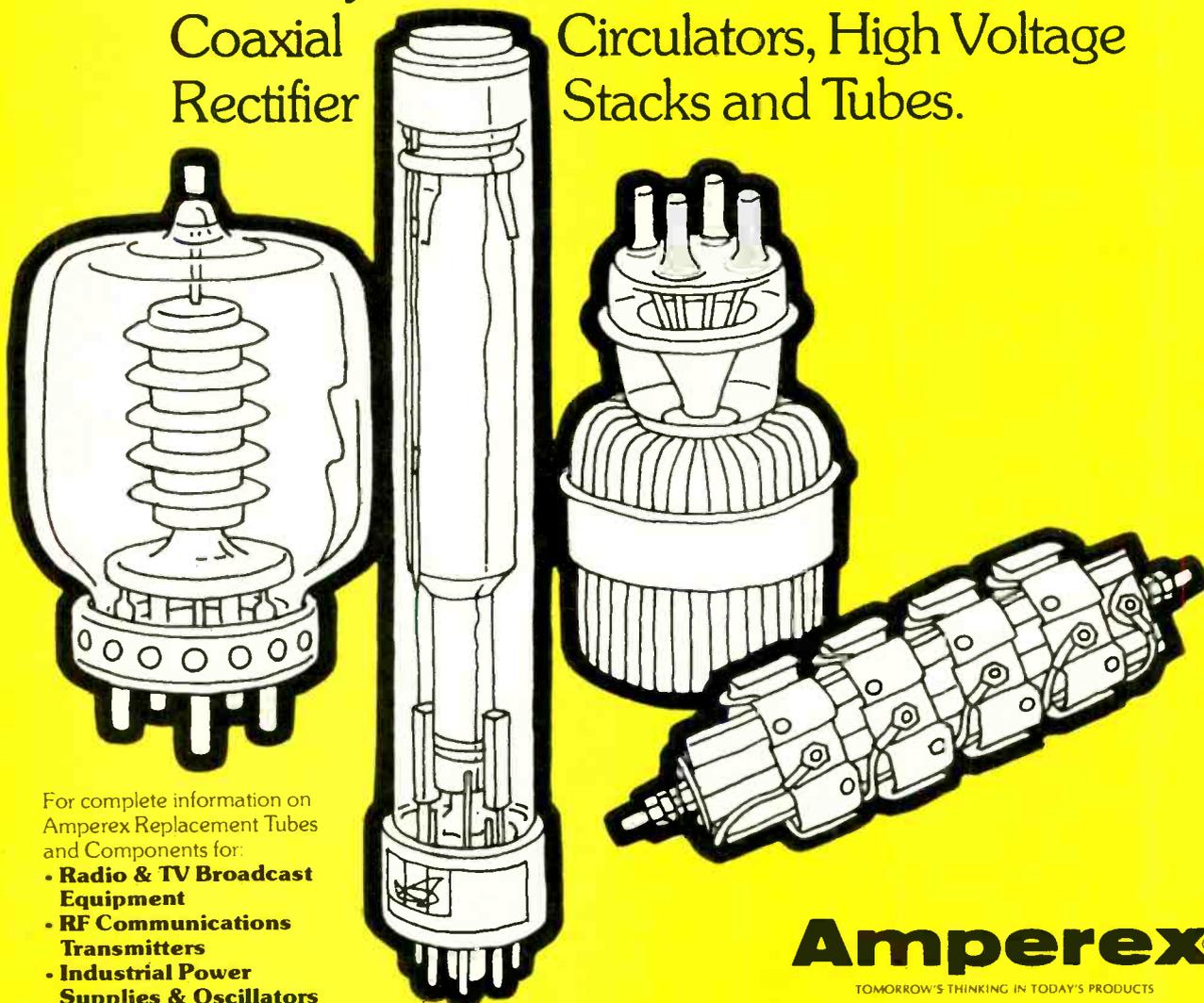
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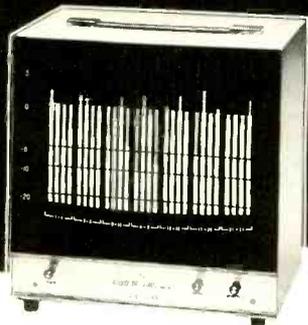
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NEWS

ject to the rule were expected to devote an appropriate part of the cleared time to material directed to the needs and problems of the community, including material especially for minority groups.

Editors note: As this issue was being prepared these PTARs have been challenged in two District Courts.

IR Chief Suggests Moves To Turn Economy Around

Agreeing with the general prediction that sales volume would be "flat" for many electronics firms in 1975, Eric Lidow, president of International Rectifier Company, put a lot of the blame on the tight money policies of the administration, saying that the high interest rates had a "domino" effect on building activity, appliance markets, electronic component markets, and finally, capital good markets. Speaking to company executives, he said the economy could be turned around by wage and price controls keyed to a liveable inflation index, say 6%; increase in the money supply to assure 4% annual GNP growth; a gasoline or horsepower tax to reduce gas consumption, cut the \$20 billion for imported oil; new tax incentives for plant modernization; and similar incentives for small investors.

Cable Development in CA—Legislative Committee Report

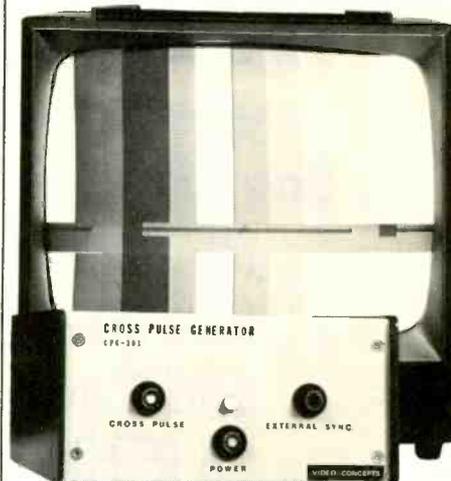
California Legislature's Joint Committee on Telecommunications does not advocate state-level regulation of cable TV at this time. The committee says to do so "would only introduce the possibility of further restriction on the industry from a third tier of government." But the Committee says that the state should watch closely new federal action that may impinge on state authority. This stand is part of the Joint Committee on Telecommunications Report, "Telecommunications and the Public Interest." In addition to cable, the Committee's areas of investigation included public TV and radio, television translators, ITFS, satellite communications and interconnection.

The Committee does recommend the formation of a state agency to / handle certain functions in relation to cable in a state educational network; 2 provide a mechanism to support the development of new cable services, including programming (but avoiding content control); 3 to act as a watchdog on the FCC and other federal communications

continued on page 12

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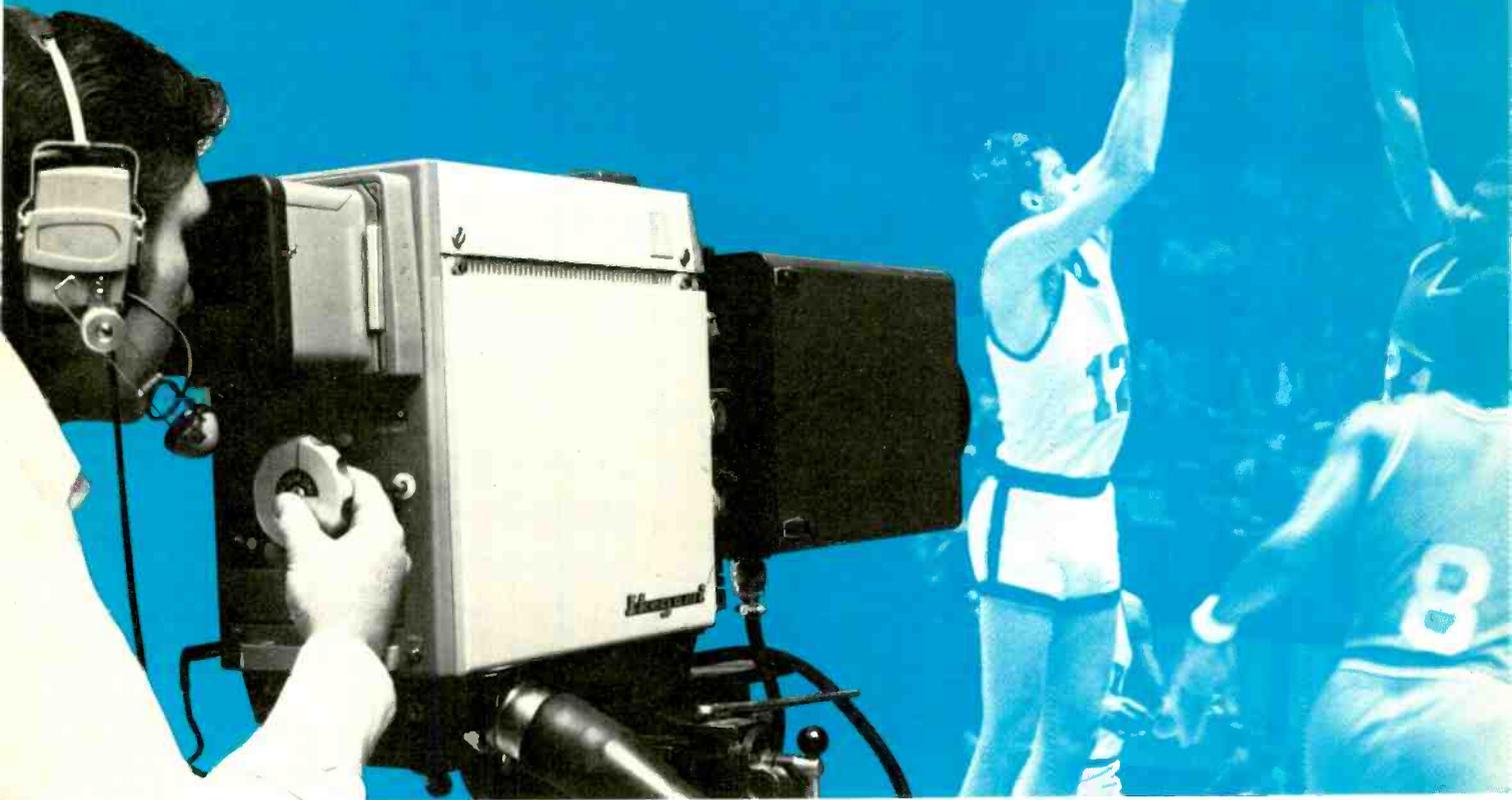
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**Len Zaller, Operations Manager
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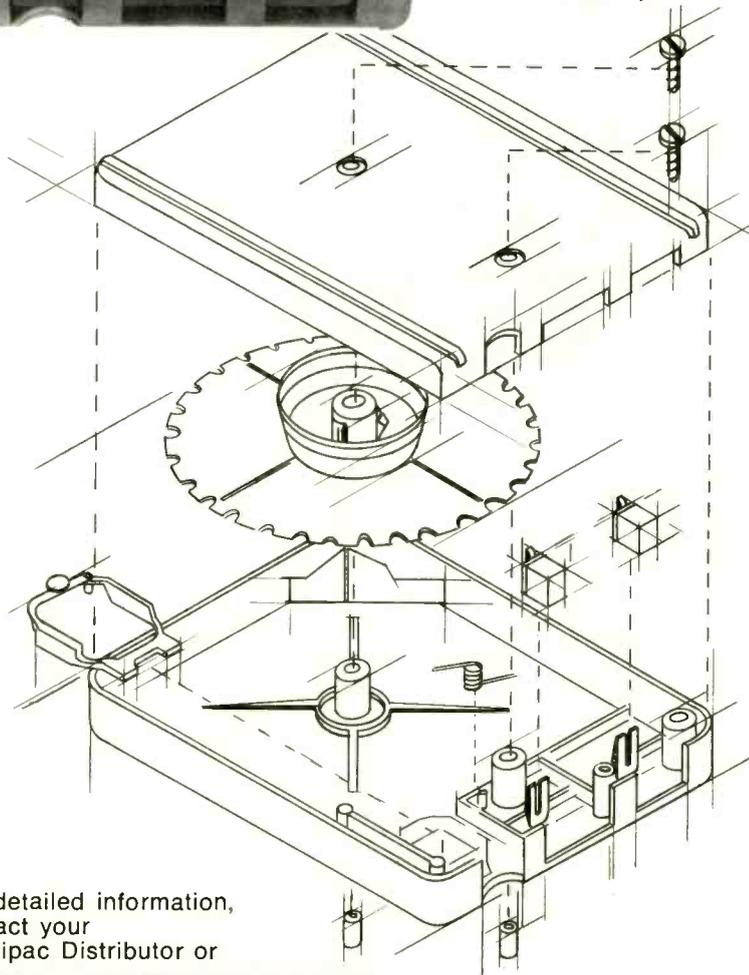
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NEWS

policy bodies, in order to protect the state's interests and to represent the State on the federal scene; 4 to offer assistance to local governments in enforcing their franchise requirements; 5 to keep abreast of cable industry development in California, and of technology development, with an eye towards interconnection.

Noting that state regulation in some areas may be necessary at some point in the future, the Committee recommends that "Not until CATV has essentially supplanted broadcast as the public's main source of information—and this may never happen—should rate regulation be considered."

According to the Report, "California now contains the nation's largest number of cable subscribers, the largest number of CATV systems engaged in local production activities, and over one-third of the country's twenty-five largest systems."

Wiley Says Cable Is Overregulated

FCC Chairman Richard Wiley must have lightened the hearts of many a cable operator when he indicated a shift in FCC policy—to ease regulations on cable TV. Speaking before the Illinois/Indiana Cable Television Association convention in January, Wiley said that cable TV, at this point in its development, "is overregulated" and that some requirements on cable which may have been "well intentioned when enacted, may now be either unrealistic or unnecessary."

Wiley indicated an easing of the non-duplication rules and of some of the requirements that were established to be met by 1977—such as access channel requirements, 20-channel capacity, and two-way capability. Wiley suggested that some of the dreams of the wired nation may be just that—dreams—for now. Furthermore, he said, "The public interest is in no way served if our regulatory standards so far exceed public need or demand that the surplus becomes a leaden weight slowing the growth of the industry."

Cable Sound Investment in Canada

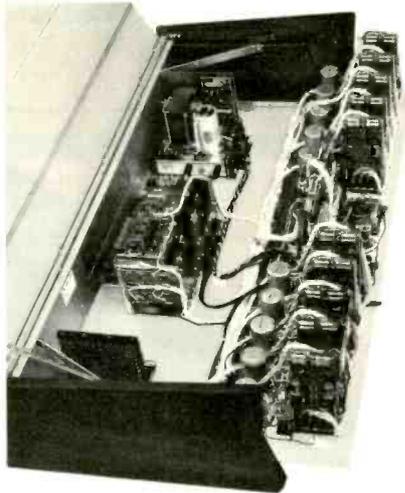
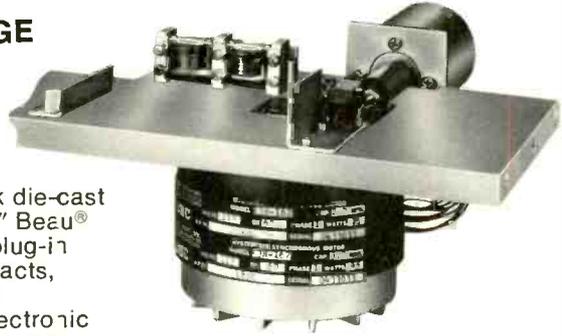
According to an item in the January *CCTA News* (monthly publication of the Canadian Cable Television Association), cable TV in major Canadian urban markets is a sound investment. The outlook is from a study of the communications industry by Dominion Securities Harris (DHS), a Toronto investment company.

While forecasting economic slow-
continued on page 14

Ampro makes them better. And we've got the guts to prove it.

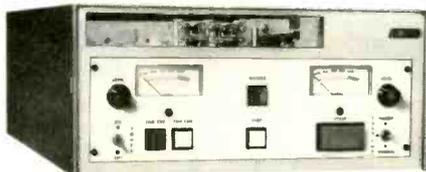
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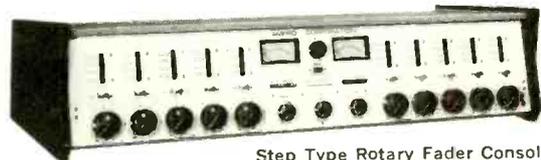
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NEWS

down and major recession as fairly high probabilities impacting some other communications industries, DHS says cable companies will "prosper in the upcoming year because of increasing subscriber levels and improved rates in some areas . . . The cable industry remains a strong growth industry."

The December issue of *CCTA News* includes forecasts for cable TV 1975 technical developments in Canada. H.J. Vander Laan, chairman, Technical Committee, CCTA, says that converter services will spread across the country, and that cable channels will be "filled by rather imaginative type information systems tied into computers." He sees little likelihood for pay cable at this time, however.

Other predictions are: improved monitoring systems, utilizing a standard monitoring frequency to be developed and installed in many systems; improved headend processing equipment; and a shift towards shorter trunks and hubbing of systems by means of broadband intra-city microwave and/or supertrunks. Further forecast is for more research and development, including establishing working models of optical communications.

National Warning System Announced

The Office of Telecommunications Policy has announced the designation of a government operated radio system for communicating attack or disaster warnings directly to the public. The system chosen was the National Weather Service (NWS) VHF/FM Tone Alert System. NWS, an agency of the National Oceanic and Atmospheric Administration (NOAA) already provides warning services, which millions of Americans use and trust.

"Acquisition and use of the home warning system should be a voluntary decision by each citizen," said the OTP in reiterating its policy. John Eger, acting director of OTP, stated that "Under no circumstance should the Government require or legislate a warning receiver into the private home."

Several warning systems had been studied by the federal government in establishing its policy. Originally chosen as the most desirable was the Department of Defense's Decision Information System (DIDS), but that was back when there was at least consideration of mandatory home ownership of a warning receiver. The DIDS has specific characteristics that are unattainable by the NOAA system, and is

thus still being tested and evaluated for institutional uses.

The NOAA system is designated as the sole government-operated warning system to be used for communicating warnings directly to the public. It was chosen because: 1 It provides routine daily weather services, specifically tailored for localities, thus enhancing its marketability; 2 It will cost less than other systems, in federal investment, to complete coverage of most populated areas, and can be accomplished sooner; and 3 "Inexpensive commercial receivers for this system are already on the market."

The Warning Steering Committee, chaired by OTP, will coordinate efforts to develop plans and procedures to incorporate the civil defense siren systems into the consolidated warning system, and will continue to provide warning information to radio and TV stations, and to cable systems.

FCC Actions—Use Tax, Subscriber Complaints and Line Extension

. . . The FCC has encouraged firms that are affected by "use" taxes on cable TV to take the issue to the courts. Commission action was in response to

continued on page 16

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DAM-1 DIGITAL ANTENNA MONITOR — FCC type approved. Provides digital readout of amplitude, ratio and phase. Also available: DAMA-1 Base Current Adapter for remote digital readout of antenna base currents; DAMA-2 Analog Converter to Interface DAMA-1 Monitor with existing analog remote control systems; DAMX-1 to extend capacity of DAM-1 to arrays up to 12 towers.

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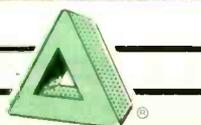
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NEWS

requests from Big Valley Cablevision, Inc., in Stockton, California and by the Florida Cable Television Association, for a declaratory ruling that user or excise tax on cable violates FCC rules on franchise fees. In denying the request, the FCC said that the tax did not violate franchise fee rules of the Commission, but the FCC indicated its strong opposition to the taxes. Advising the petitioners to go to the courts if the states would not reconsider the

taxes, the Commission indicated that if neither of these actions took place, then it may see fit to step in. Reasons: It "is amply clear" that a use tax of the sort authorized in these cases could have the same damaging impact as an excessive franchise fee. In the Florida case, moreover, the tax would seem to discriminate against cable, as the law does not affect radio and TV broadcasting. . . . Local government units are now ordered to share in responsibility regarding "investigation and resolution of all complaints regarding the quality of service, equipment malfunctions,

and similar matters . . ." as stated in the Commission's Cable Rules. The local government must establish complaint procedures, identify an authority to handle the complaints, and inform the cable subscribers of both.

The new cable subscriber complaint amendment (Docket 20024) does not dictate procedure to the cities, as some municipalities and cable operators had feared. The ruling goes into effect August 1, 1975.

. . . The Commission's line extension rule (Docket 20020) requires that franchisees accomplish significant construction within one year after receiving the certificate of compliance, and that service should be extended to a substantial new percentage of franchise area each year. Full public proceeding will be necessary before development of any policy that requires less than complete wiring of the franchise area. The Commission did not prescribe specific standards for every situation, leaving to the franchising authority the right to determine what criteria would be set. The new line extension amendment goes into effect August 1, 1975, and will apply only to franchises granted after that date.

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Newest OTP Draft Bill On Cable

OTP has submitted a new draft bill on cable TV to the Office of Management and Budget on the road to presenting it to Congress. The bill, like others before it, reflects a great difference in philosophy from that of the FCC, and in fact would vastly reduce the FCC's authority over cable.

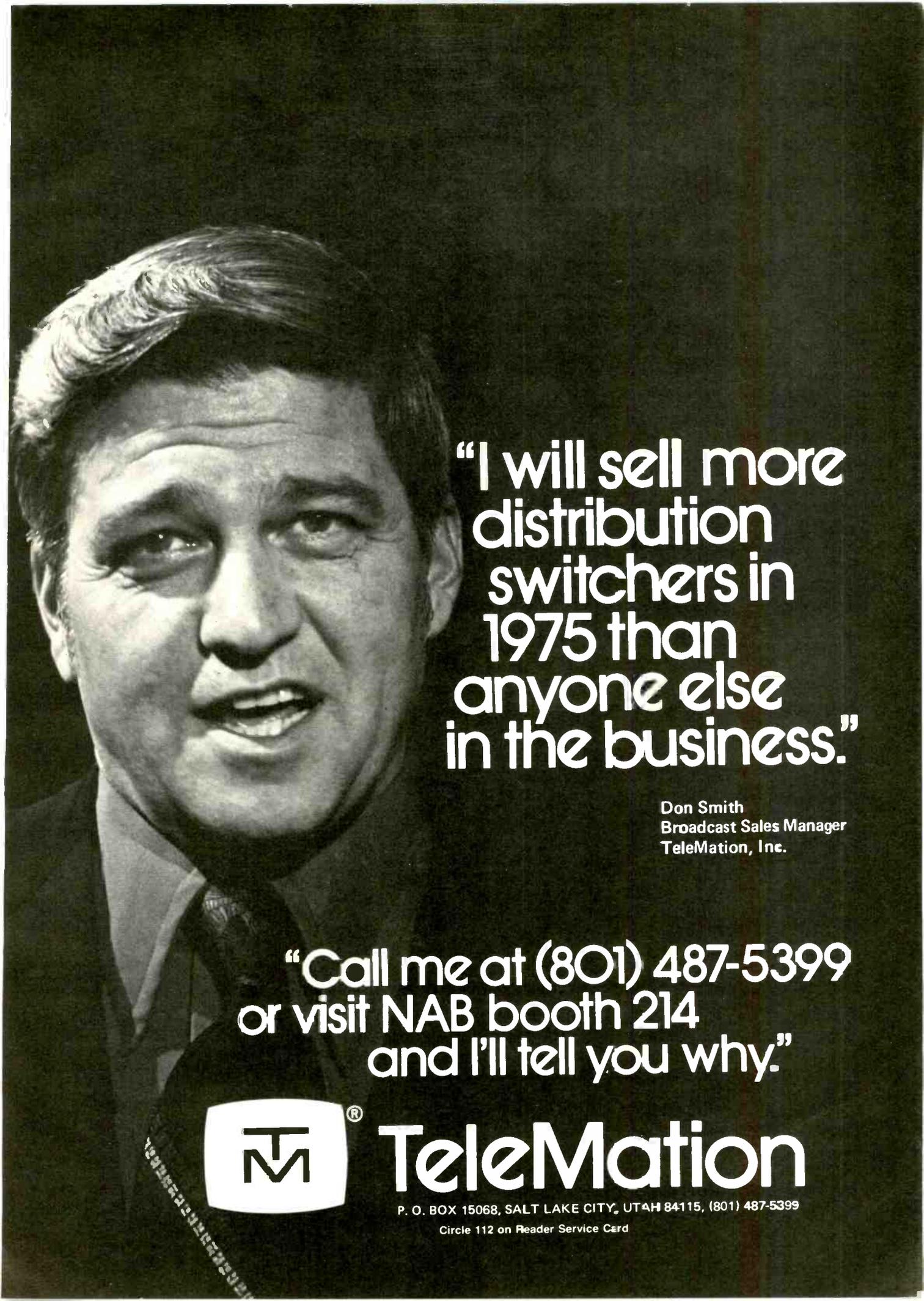
While there may be minor adjustments before the bill reaches the Hill, the main provisions will most likely remain unchanged. As one TOP spokesman said, "the substantive changes have been made" from prior drafts, according to consideration of the suggestions of other agencies.

Philosophical differences with FCC concern of the bill's reliance upon the courts and the marketplace to solve problems and conflicts, and on the rejection of the principle, voiced by FCC, that cable should be regulated in relation to other media. Both issues point to a lessening of FCC authority, which the bill's philosophy indicates as being too restrictive on cable's development.

The FCC appears to be aware of a developing public and governmental dissatisfaction of "ham-stringing" cable, as witness FCC chairman Richard Wiley's speech to the Illinois/Indiana Cable Television Association mentioned earlier this issue.

The OTP draft bill would severely limit local as well as federal authority. The FCC would have limited authority to set technical standards—only as they

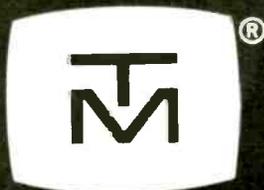
continued on page 18



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NEWS

affect interconnection and other wide-spanning concepts. Local authorities essentially would not be able to regulate technical standards.

Other provisions include: a ban on the regulation of leased channels for 10 years at least; prohibition of vertical integration; elimination of fairness doctrine provisions; requirement for only one free access channel; allowance for only one local regulatory authority, be it city or state; principle of leaving regulation of fees primarily to be settled by the courts to determine "reasonableness."

The bill is expected to reach Congress this session, where it appears to have generated a great deal of interest.

CTS Satellite Experiments

Among the experiments that Canada's Communications Technology Satellite (CTS) will conduct this year will be potential uses of communications satellites for surveying and fighting forest fires and for police work. Two "dish" antennas will be portable and can be used to aid communications needs in remote areas for fire fighting and other special assignments.

Video Technology and the Arts

An exhibition of video technology as it affects the arts was demonstrated in the library of Lincoln Center, in connection with the annual meeting of the American Association for the Advancement of Science in January. The exhibit was technical in scope, with divisions into four categories: pickup, storage, transmission and display. There was heavy emphasis on projection TV devices.

Included also were a historical exhibit tracing the development of video technology, and the presentation of prototype devices that may appear on the market in the next five to twenty years—particularly disc recorders.

The exhibition was presented by the Lincoln Center's Media Development Department.

NAE Studies Metropolitan Communications

The National Academy of Engineering has begun a study to determine what a metropolitan communications system might look like 10 to 15 years from now, if it were rationally and systematically planned and developed.

Later this year the NAE will issue a report on a study of experimental uses of computer communications systems for city functions. The study is taking

continued on page 20

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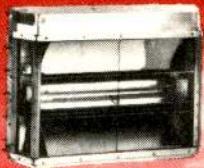
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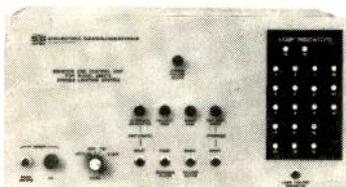
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place in five cities: Charlotte, N.C.; Dayton, Ohio; Long Beach, CA.; Reading, PA.; and Wichita Falls, Texas. Issues being addressed are: How useful the systems are; how transferable; at what price; what implications they have for privacy rights of individuals; and how they would interface with systems in other cities, counties, and states.

Another NAE study, which was scheduled to begin this month, concerns electronic mail. The project will study the potential of telecommunications electronics, and information technologies, as they may aid in the mission of the U.S. Postal Service.

Arts Endowment, NYU, Grants Eight Cable Learner Awards

Apprenticeship awards for work in the cable television industry went to eight young people in January, under joint sponsorship of the National Endowment for the Arts and New York University's School of the Arts. The winners will work for a year in specific cable jobs, gaining experience of great value to their careers in video and film. Local cable companies also contribute support to the program, and the selection of individuals is initiated by NYU's Alternate Media Center. "Our aim is to place apprentices where they can participate actively in the production and planning of new programs, work toward building new audiences for cable TV, and advance their technical skills," said George Stoney, co-director of the Media Center. Apprentices went to cable companies in California, Minnesota, New Hampshire, Pennsylvania and Wisconsin.

Wiley Asks For "Calm Dialogue" Between Stations and Public

FCC Chairman Richard E. Wiley, addressing a workshop in Richmond, Va., of public groups, organized by the United Church of Christ, called for "a continuing dialogue, conducted in a calm, dispassionate, and non-accusatory manner" as the way to resolve disputes between broadcasters and public groups. He said that the FCC recognizes "and indeed supports the role which members of the public can play in improving the quality of broadcast service." But he condemned the "inordinate amount of time and money now being spent both by broadcasters and citizen groups on petitions to deny." He said citizen groups should address the problem sufficiently early in the license term to allow ready re-

sponse by the licensee, in this way avoiding ill will on both sides, and having a better chance of improving the quality of broadcasting.

Proxmire Bill Would Limit FCC Program Power

Senator William Proxmire, Democrat of Wisconsin, said in Washington that he would introduce a bill to remove the power of the Federal Communications Commission to control program content in broadcasting. Among the FCC rules eliminated under the bill would be the requirement for equal time for political broadcasts, and also the Fairness Doctrine now applied by the FCC. "I am introducing this bill for one purpose," said Proxmire, "to make sure that all citizens of this country enjoy the protections of all the freedoms granted in the First Amendment of the Constitution."

Briefs

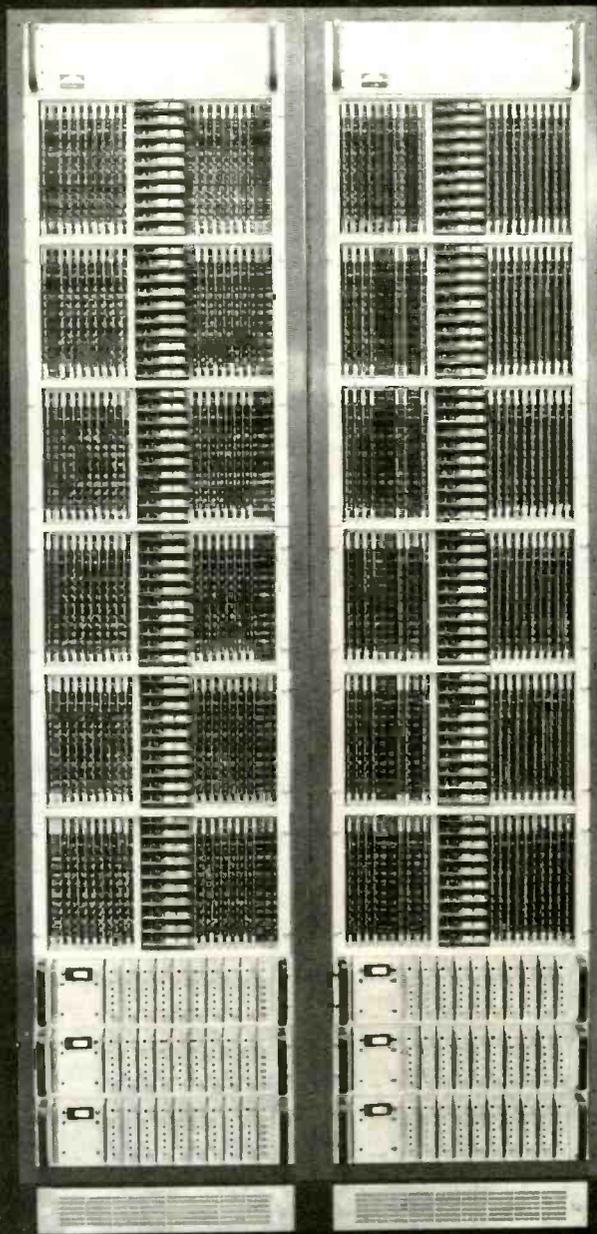
Crown Communications has bought cable systems in Union and Gaffney, South Carolina, from Communications, Unlimited . . . **Kliegl Brothers** announced formation of a sales agency, Peterson and Vine, to represent Kliegl in California and Nevada, with offices at 6453 Independence, Woodland Hills, Calif.

Cohu, Inc., will celebrate its 25th anniversary in the television industry in 1975, according to R.J. Schlicht, vice president . . . **Marconi Electronics** has sold about three million pounds worth of color TV equipment to the Egyptian TV agency, including 22 Mark VIII color cameras . . . **Koenick Electronics**, Tempe, Arizona, has a contract for turnkey installation of microwave systems linking five cable systems in northern Michigan.

C-Cor Electronics will supply all electronic equipment for a cable system for Televents, Inc., in Redlands, Calif. . . . **Teac Corp.** has obtained an order from U.S. District Court in New York, restraining S&M Stereo Center and Ultralinear Sound Corp. from selling Teac products for less than the fair-trade price . . . **RCA** has sold TCR-100 cart machines and TK-28 film islands, with a total value of \$500,000, to KWTX-TV, Waco, Texas, and associated stations.

Cavox Stereo Productions, of Inglewood, Calif., program syndicator for automated stations, announced seven additional stations started taking its programs on January 1st, bringing the total served to 75 . . . **WDAE**, Tampa, Florida, AM station going back to 1922, rejoined the CBS Radio Network January 13 after an absence of

continued on page 22



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NEWS

ten years **James Lloyd**, has formed an executive placement and recruiting firm, James Lloyd Executive Search, with particular background among television equipment manufacturers, and offices in Santa Ana, Ca.

A **Catholic Television Network** has been formed by ten Catholic educational stations in the ITFS; exchange of programs and joint program production are two main purposes; headquarters is One Wacker Drive, Chicago

60606

TA2, television production firm in Palo Alto, CA, has added storyboard service to its offerings, which include production consultation, shooting, post-production editing, duplication (including Sony cassette duplication)

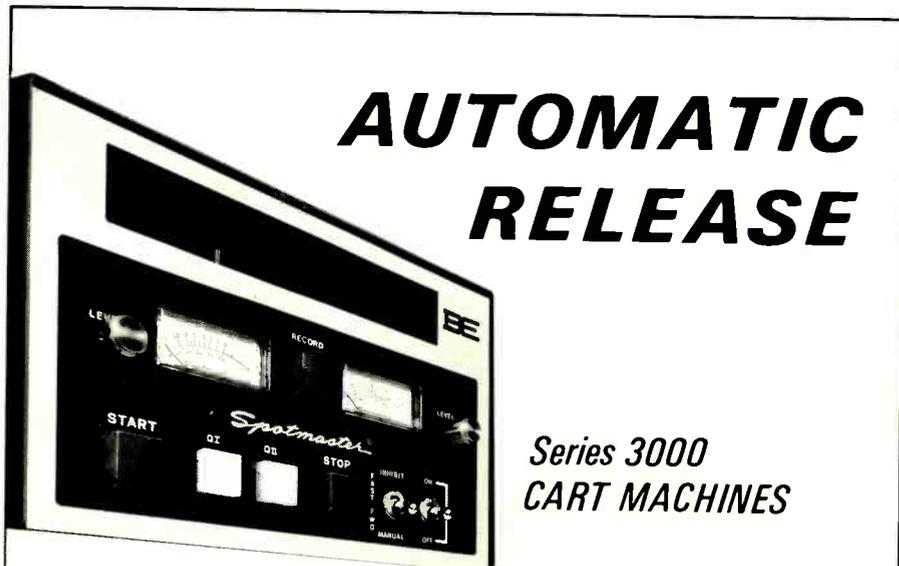
. . . . **Laser Link Corp.** has bought Western Electromotives, Inc., of Culver City, CA, manufacturer of switches, circuit breakers, and related equipment **Iowa Educational Broadcasting Network** has put on the air two of highest-powered public stations: KRIN, Waterloo, five mega-

watts; and KSIN, Sioux City, four megawatts.

United Church of Christ, leading battler in license renewal disputes, has issued a booklet, "Parties in Interest" telling citizen groups how to proceed with maximum effect to "improve" broadcast service **Triangle Industries, Homdel, N.J.** has merged two subsidiaries, Triangle Conduit and Cable, and Plastic Wire and Cable, into a single division, Triangle PWC., Inc., which will make more than 5,000 items in the wire and cable field **Ampex Corp.** announced the sale of the 100th time base corrector, TBC-800, which went to station CFCM-TV in Quebec City, Canada.

Camera Mart, New York film and video tape production company, announced addition of two sound stages said to be the largest in the city, in the old Fox Film building: one is 95x75x40 feet high, the other 78x71x23 feet high **Goldmark Communications Corp.** will buy back the equity interest of Warner Communications in Goldmark, so that GCC and its employees will own 100% of GCC stock "Driving with FM," the jingle package produced by the National Association of FM Broadcasters to help promote FM listening in cars, is available in a 1975 version from NAFMB, free to members, \$10 to others: from NAFMB, 420 Madison Avenue, NY 10017.

Hervic Corporation has been appointed the exclusive U.S. distributor for Silma, Italian projector brand



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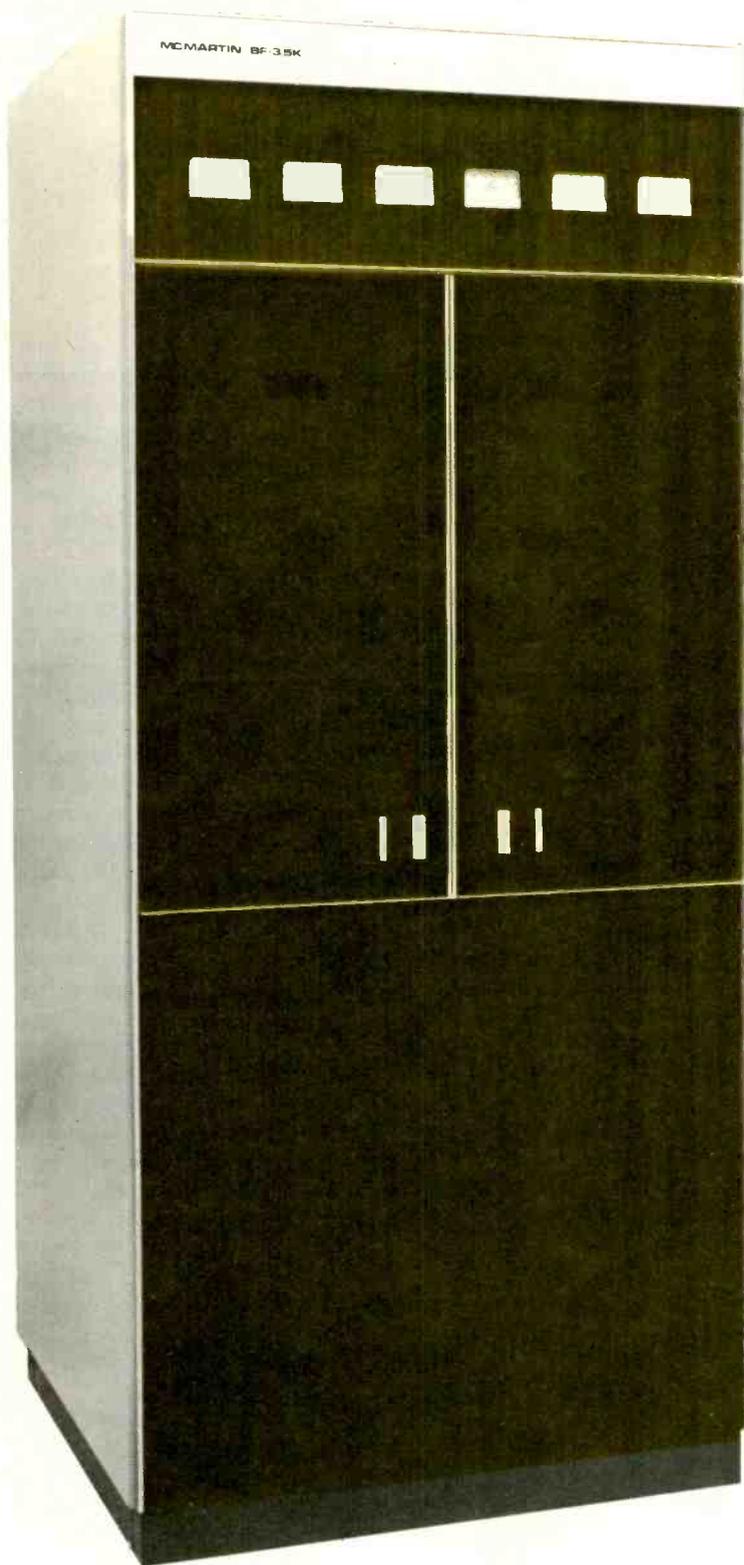
Financial Briefs

Teleprompter Corp: Loss for third quarter, 1974, \$2,042,000, said to be result of high interest cost, depreciation and amortization. . . . **GBC Closed Circuit TV Corp.** For six months ended November 30, 1974, record sales and earnings of \$4.4 million and \$126,278, respectively. . . .

RCA: Reported sales of CATV equipment up 50% in 1974 over year before. **Conrac Corp:** Reported a \$10 million, 15-year loan arrangement replacing debts of much shorter maturity, for substantial improvement in cash flow. **Altec Corporation**—For year ended September 29, 1974, record sales and profits of \$57 million and \$2.6 million, respectively.

Telepro Industries For nine months ended September 30, 1974, sales of \$15,925,656 and income of \$1,614,064. **Comtech Laboratories, Inc.** For year ended July 31, 1974, record earnings of \$723,425. **Scientific-Atlanta, Inc.** Year

continued on page 149



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INTERPRETING THE **FOO** RULES & REGULATIONS

National Environmental Policy Act Rules

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

The Commission has recently enacted rules¹ to implement the National Environmental Policy Act² (NEPA). All Federal governmental agencies are required to participate in consultations with, and solicit comments from "expert" Federal agencies before taking any *major* action significantly affecting the quality of the human environment. A detailed environmental impact statement must thereafter be prepared and made available to the Council on Environmental Quality and to the public. The completed statement must be associated with any and all Commission proceedings relating to major communications facility construction.

The new rules require applicants seeking authority to construct certain communications facilities to submit a *preliminary* environmental report or, if the proposed construction would have a *significant* environmental effect, a detailed impact report. Immediately, a problem arises. What proposed construction activities constitute "major" action that is deemed to significantly effect the environment and require an impact statement? The Commission's new rules are aimed at clarifying this problem.

The Rules

The Commission's rules identify seven types of facilities, construction of which are considered to be major on the basis of their probable impact upon the environment. An applicant seeking authority to construct such a facility must submit certain specified information to the Commission with its application for a construction permit. The Commission's processing staff will then assess the environmental consequences of a CP grant. If the environmental impact is deemed to be significant, the staff will discuss the matter with (1) the applicant, (2) concerned individuals, and (3) governmental and lay experts to formulate alternative courses of action which may be less objectionable. The applicant will then have the option of (1) withdrawing his application, (2) amending the application to *eliminate* its adverse environmental impact, or (3) amend the application to reduce its adverse environmental impact. If the application is still deemed to have significant environmental impact by the staff, a draft environmental impact statement will be prepared. Comments from the public and appropriate governmental agencies will be solicited. The full Commission will thereafter consider the impact statement. From that point on, the statement accompanies the CP application through the existing agency review processes.

Major Actions

The Commission takes the position that no class of action will *always* or even *usually* require a draft of an

environmental statement. It is conceded, however, that three specific classes of action would require preparation of an impact statement in certain circumstances, including: (1) legislative proposals, (2) rule making, and (3) actions authorizing "major" construction. The Commission shied away from identifying what other actions might require impact statements, and insisted that they be determined on a case-by-case basis.

In the area of legislation and rule making, the Commission would only say that an impact statement would be prepared if the legislation or rule "appears to carry with it significant environmental consequences." The one exception to this policy is in the area of frequency allocation rule making proceedings. Such frequencies tend to be used to significantly affect the physical environment. An example is a communications facility designed to warn of forest fires. The Commission will prepare an impact statement before a rule significantly *adversely* affecting such facility is *adopted* or before a rule significantly *beneficially* affecting the facility is *rejected*.

While adhering to the view that determining what is a major action significantly affecting the environment must be made on a case-by-case basis, the Commission has singled out as "major" those actions which, on a *relative basis*, are believed more likely to have significant environmental impact. Environmental impact statements must be submitted with applications seeking construction authorization in these matters, and the "Commission will make an environmental judgment before taking action." The criteria utilized by the Commission in making the threshold determination of what construction actions are "major" included: (1) the size of the facilities to be authorized," (2) "their geographic extent," and (3) "their typical location and the activity involved in constructing them."

These criteria yield the following "major" classes of facilities:

(1) **Underground cable and aerial transmission lines.** Underground cable routes are deemed "major" because they entail "swath" construction which is often long distance and which can permanently scar the landscape. The laying of new cable over existing cable routes is excluded from this category because to lay new cable does not require clearance of a new swath through unspoiled landscape. Neither is submarine cable considered a major action because of its negligible environmental consequences. The Commission approves of applicant efforts to utilize existing cable routes, farm lands or fields

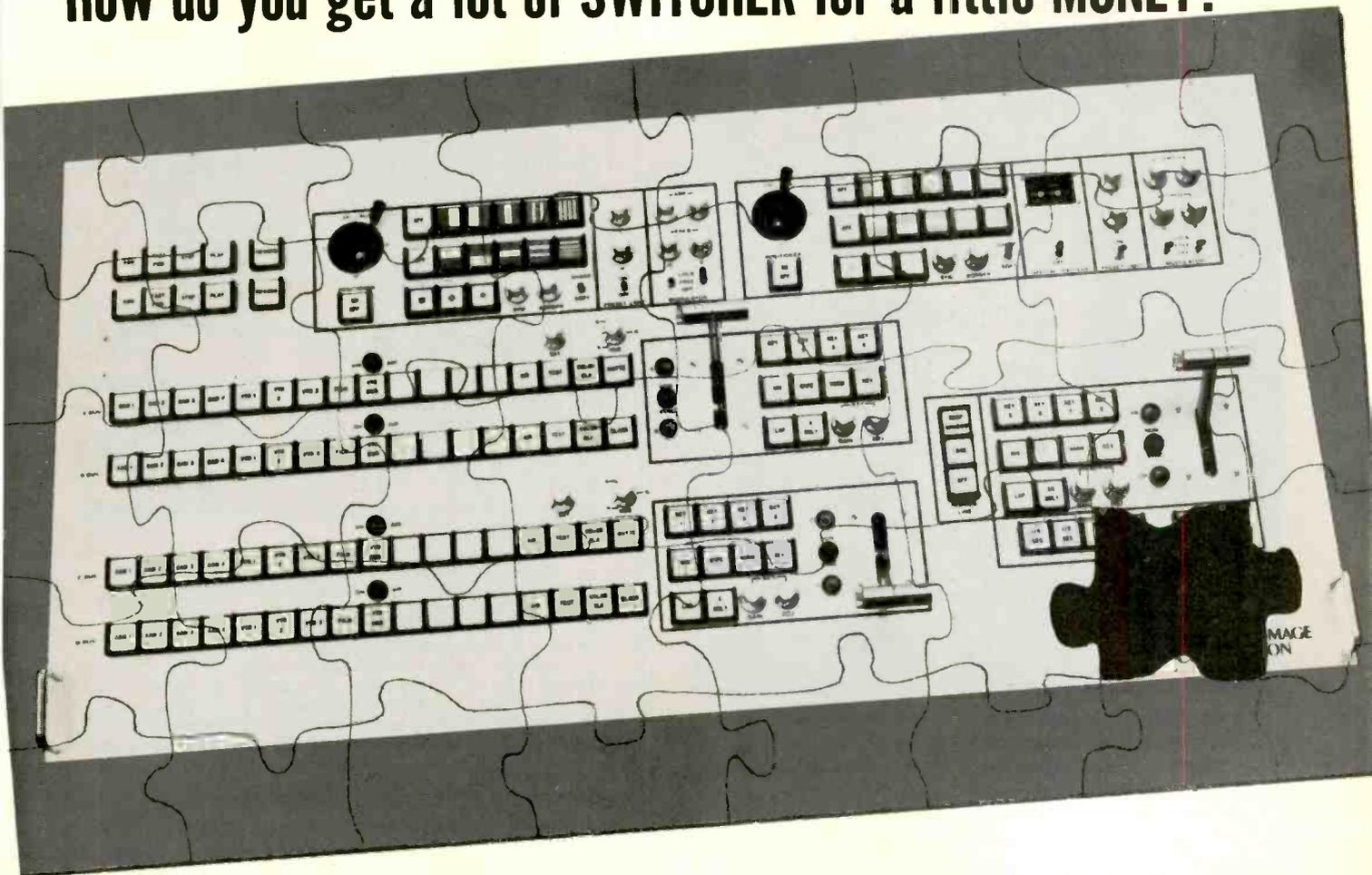
¹Report And Order, 32 RR 2d 181 (1974).

²42 USC §§4321-4347.

continued on page 26

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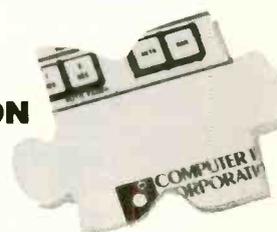
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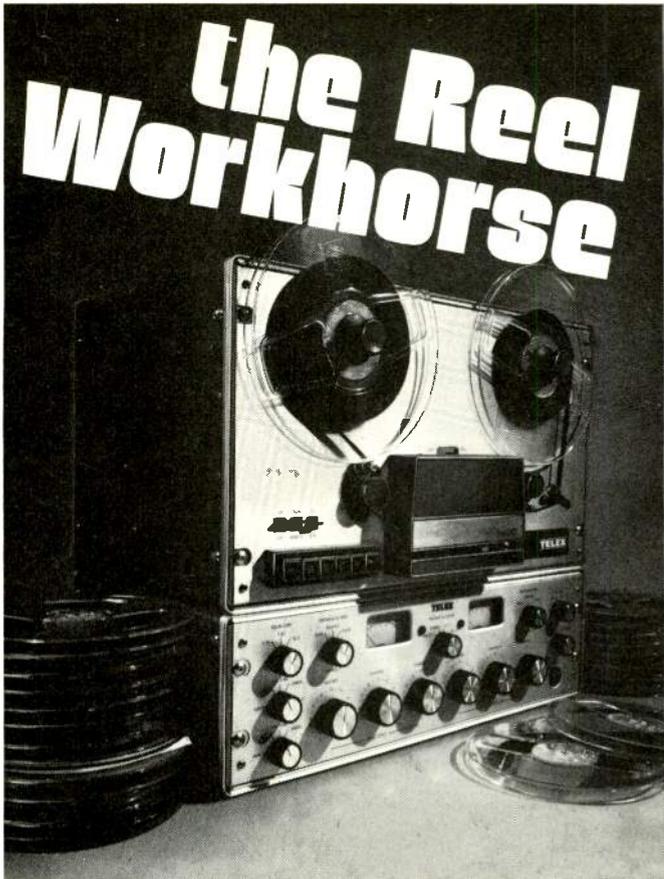
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which have already been cleared. The dominant consideration here, as with nearly all other communications actions, is the *visual* impact of construction on the environment. In cable facility construction applications, the Commission expects the applicant to describe:

... the terrain to be traversed and its uses, ... environmental and other considerations which led to selection of the particular route, ... the nature and extent of any unavoidable adverse effects along the route selected, ... efforts made to minimize such effects, and (where adverse effects are present) ... whether alternative routes were considered, why they were rejected, why the alternative of cable was decided upon.

(2) **Private and common carrier microwave relay antenna towers or support structures exceeding 100 feet in height.** The microwave tower is considered "major" because its height and bulk have significant visual impact upon the environment. Towers of less than 100 feet in height are excluded from this category. These towers are characteristically less bulky and therefore less visually prominent. The Commission expects the applicant for authority to construct microwave facilities to discuss the following:

... environmental and other considerations which led to selection of a particular route, ... the height and any special design features of the tower at each relay point, ... the site of each station and ... the reasons for its selection, ... any special features of the site which distinguishes it from the surrounding countryside or which would be helpful in assessing its environmental value, ... the nature and extent of any unavoidable adverse effects, ... efforts made to minimize such effects, and (where adverse effects are present) ... whether alternative routes or sites were considered and (if so) why they were rejected.

(3) **Broadcast antenna towers.** This category includes standard (AM), FM, television and international broadcast antenna towers or support structures which exceed 300 feet in height, and all AM broadcast directional arrays without regard to height. The major exception to this category is the mounting of an FM or television antenna on an existing building or tower, which obviously has no significant environmental impact, visual or otherwise. Another exception is an application for authorization to construct a new tower in an antenna farm (i.e., an area containing several existing antenna structures). An additional antenna is likely to have little effect upon the character of such an area. The Commission expects applicants for such "major" facilities to discuss:

... environmental and other considerations which led to the selection of a particular site, ... the surrounding area and its uses, ... any environmentally noteworthy buildings or features of the immediate area, ... the nature and extent of any unavoidable adverse effects, ... efforts made to minimize such effects, (where adverse effects are present) ... whether alternative sites were considered and (if so) why they were rejected.

(4) **Other antenna towers or supporting structures including pole mounted microwave antennas which exceed 300 feet in height.** This category primarily relates to pole mounted microwave antennas, broadcast translator stations and base stations associated with land or maritime mobile operations. A major exception to this category is a tower in excess of 300 feet in height which is located in an area devoted to heavy industry or to agriculture. Again, the emphasis is upon visual impact to the environment. Tower construction in highly industrialized areas is deemed to have little adverse impact. Applicants for authority to construct "major" antenna towers as

continued on page 28

REACH THE UNREACHABLES WITH ACRODYNE

TV TRANSLATORS

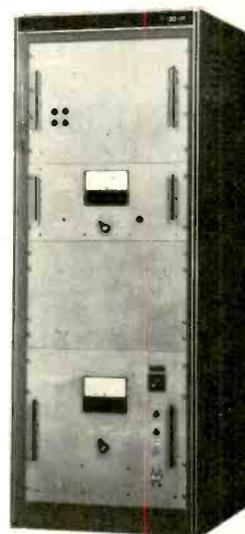
With its full range of high reliability TV Translators, Acrodyne helps you get the message to hard-to-reach areas, such as small isolated communities and those in mountainous areas. In addition, the automatic broadcasting techniques of Acrodyne TV Translators are providing low cost, high quality TV service to localities which cannot support a TV station or beam educational programming to rural school systems.

Acrodyne TV Translators with solid state integrated circuit design are available from 1 watt to 1000 watts. All units meet or exceed FCC requirements.

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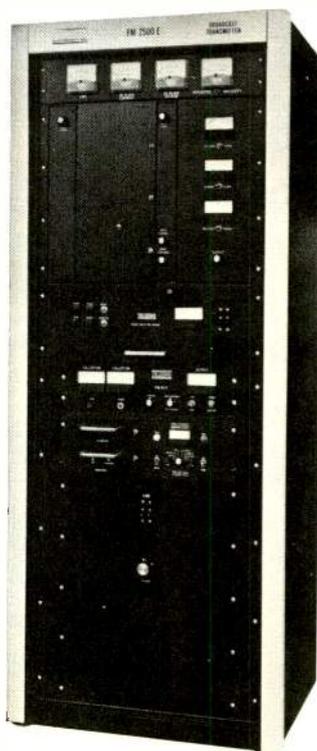
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defined in this category are expected to submit with their applications substantially the same information required of broadcast station applicants. (See (3) above.)

(5) **Satellite earth stations with antennas of 30 feet or more in diameter.** These facilities are deemed "major" because they are substantial in size and because microwave relay towers or cable facilities are necessary adjuncts to such stations. The Commission expects applicants to furnish the following information with satellite earth station applications:

... a description of the facilities, the site and its uses, ... any environmentally valuable features or uses of the site which would be intruded upon by the facility, ... the environmental and other considerations which led to selection of the site, ... measures taken to minimize any adverse environmental effects, if they are present, and (if there are adverse effects) ... any alternative sites considered and the reasons for their rejection.

Other Matters

The Commission addressed the problem of the interrelating roles of local, state and federal land use authorities. Persons objecting to construction of specific communications facilities on environmental grounds are directed to:

... voice their objections first to responsible local, State, or Federal land use officials (if any) so that the Commission may have the benefit of their views and of their insight into the matters at issue.

Further, where the issuance of a construction permit by the Commission is conditioned on prior issuance of the land use permit by another agency, the Commission expects that agency to prepare an environmental impact statement, if one is deemed necessary. Only after consultation with, and specific request from the other agency will the Commission undertake preparation of the statement.

Finally, the Commission emphasized that, should an environmental impact statement be deemed necessary, its purpose is to "assess environmental consequences, and not balance them against other considerations or make a public interest determination. . . ." The decision making process is the proper forum to evaluate the impact statement in light of such public interest considerations.

Conclusion

The new National Environmental Policy Act Rules adopted by the Commission impose new responsibilities upon applicants for authority to construct a broad range communications facilities. This column has outlined those construction activities that the Commission considers "major." Applications to construct such major facilities must include certain environmental impact information specified by the Commission to enable it to decide the necessity of preparing a formal environmental impact statement. All other construction permit applications (i.e., deemed "minor") are less likely to significantly affect the environment and thus are less likely to require preparation of an environmental impact statement.

Broadcasters, cable operators, and all others contemplating construction of communications facilities should thoroughly familiarize themselves with the Commission's *Report And Order* and new Rules.³

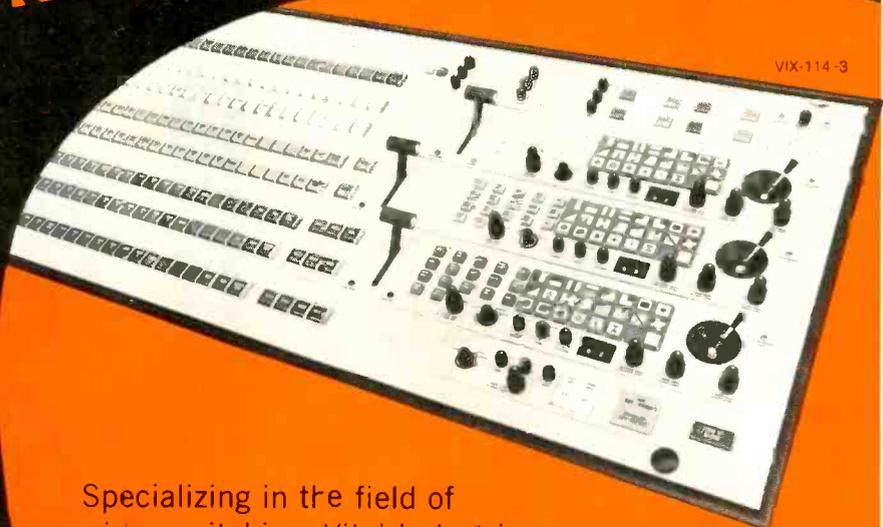
³47 CFR §1:1301 *et seq.* (New Subpart I)

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The NAB Show Hits Jackpot:

Payoff In New Exhibitors And New Developments

The 1975 NAB Convention exhibition floor is going to have its firsts. There will be two solid state transmitters on display vying for the title of the industry's first, or better yet, the world's first. Harris chose February 19 at the Gates equipment plant in Quincy, Illinois, as the official time and place to announce its 1 kW solid-state transmitter. Westinghouse stole some of Harris' thunder without fanfare by letting it be known that they have a 5 kW solid-state AM unit that would be unveiled at the show and possibly be installed for on-air tests before that at the Chicago Westinghouse station, WIND.*

At the time this issue was being prepared, very little in the way of details was known and we can't draw comparisons. Needless to say, to get 5 kW of power, many transistors have to be paralleled and some technique must be

used to split the current evenly amongst the paralleled devices. We hope to report details soon.

There is some more excitement on the transmitter front. Collins Radio is introducing a new line of FM transmitters which it calls "state-of-the-art." These transmitters, Generation 4, use a new exciter (Phase 4) which has a guaranteed low IM distortion of only .50% in stereo and half that in mono. The exciter is able to handle four discrete channels with good separation.

Last year one of the big surprises of the show was the unveiling by Ampex of a small modular quad VTR, the AVR-2 ready for immediate delivery. Since then, Ampex has sold over 100 such units so it was truly a significant first. Whether there will be anything comparable this year is hard to tell.

The other big news at Houston was

the number of cameras on the floor designed for electronic journalism and the unveiling of a bevy of time base correctors. The TBC's made it possible to record the news on inexpensive portable helical VTRs and then dub to quad—or go directly on the air with helical.

Since NAB 1974, the move to electronic journalism, or Electronic News Gathering, has swept the industry. The big winners in terms of equipment sold so far have been Ikegami for top quality cameras followed by Fernseh and at the other end, Akai for a low-priced camera/portable recorder combination. Sony who did not even exhibit at the Houston convention has emerged as the principle supplier of VTRs with two video cassette recorders: the Master VO 2850 recorder capable of editing and the companion battery-operated portable video-

* At press time BM/E learned that the new Harris unit has been in regular use at KXEO, Mexico, Miss., for two months.



The Ikegami HL33 ENG camera.

Brand new ENG camera from RCA, the TK-76.



CEI's Minuteman back-pack color TV camera.



New Sony DXC-1600 camera and VO3800 VTR.

cassette recorder, the Model 3800.

The stampede to ENG which is still gaining momentum, caught the big American camera manufacturers—RCA, Philips, and IVC—without an ideal product. This year we'll see some moves taken by the studio camera giants to get into the race. RCA has announced it will show a camera specially designed for news gathering, the TK-76. IVC has come up with a small version of its 7000 studio camera for ENG, the 7000P, and it is rumored that Philips will have made an alliance with Asaca to get that miniature camera modified so that it

will satisfy broadcasters' demands. It's expected, too, that Ampex will be showing a system using a camera developed in Japan. Both Editel and CEI will be showing portable cameras, so plenty of action is in the offing. The ENG unit shown by Hitachi has gone underground—it's likely to resurface somewhere at NAB. Solid-state charged-coupled device cameras have been announced as the ultimate answer, but we don't expect to see any marketable product at Las Vegas.

Something competitive to Sony may pop up in the VTR area—but it's likely to use Sony's U-matic format. Right now editing systems used with the videocassette system are Sony or Datatron. Las Vegas should be reveal-

ing some alternative systems. And we don't know whether there will be any new TBC surprises. The only thing for sure at pre-NAB show time is that Television Microtime will have a new line. Its new digital unit is supposed to out-perform everything shown in 1974. But more on TBC's later.

Certainly this year information will be available on microwave systems for ENG. Both Microwave Associates and Nurad will be showing their systems.

New competition in studio cameras

There will be some new developments in studio cameras even though most visitor's interest will be aimed at ENG cameras. Ikegami is

continued on page 34

A New Approach To Distribution Switcher Packaging

By Lyle O. Keys, President, TeleMation, Inc.

Distribution—or "routing"—switchers have demonstrated their advantages to the extent that they are specified for incorporation in nearly all new teleproduction plants, despite the considerable bulk and expense involved in available systems. They have found a far lower level of acceptance as additions to existing facilities, not only because of the expense and size but also because of the substantial disruption during installation.

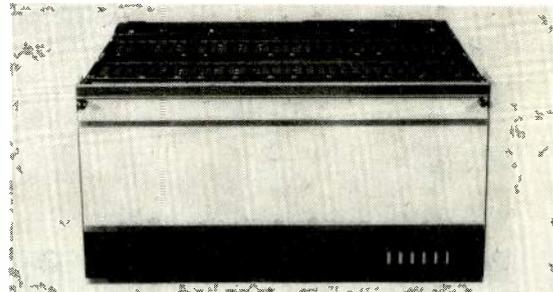
TeleMation's new packaging concept for video and audio distribution switchers provides a size reduction in the order of five or ten times when compared to most other present day systems. This size reduction is brought about by incorporation of a number of techniques not previously used in television switching systems. The design not only reduces the size of the switching matrix itself but eliminates the need for external control and latching circuitry, distribution amplifiers and external control cables.

The crosspoint matrix itself constitutes a relatively minor portion of distribution switchers. On the other hand, distribution amplifiers, external latching circuits, complex BCD or per-crosspoint control wiring and the myriad control and signal cables required to make up a complete system have been the principal contributors to the size, cost and complexity of the as-installed systems. Criteria for a new design were therefore established with the hope that all or most of the disadvantages of existing designs could be overcome. These criteria are listed herewith under the heading "Design Objectives." For the video oc-

- To develop a basic building-block consisting of a 10-input x 10-output switching matrix on a single circuit card.
- To incorporate crosspoint latching on the same card with the switching matrix.
- To provide electrically-controlled switching crossover at nanosecond speeds irrespective of type of electrical or mechanical control used.
- To be able to mount 10 matrix cards in a single chassis feeding common outputs in order that switchers of up to 100 inputs could be built without need for additional output combining or switching circuitry.
- To provide input impedances to crosspoint circuitry sufficiently high to permit expansion to at least 100 outputs without using distribution amplifiers while maintaining input return loss in excess of 40 dB.
- To limit differential timing errors from any input to any output in small and large systems alike to less than 1° at 3.58 megahertz.
- To provide add-on expansion capability without requiring rebuild.

Objectives for the audio distribution switcher included:

- To be architecturally, physically and functionally com-



TeleMation's TVS-TAS switching system.

patible with the video switchers.

- To provide balanced bridging inputs with high common mode rejection.
- To use solid state crosspoints for maximum reliability.

Among the control and systems objectives were these:

- To permit intermixing of audio and video switchers in the same card frame in small configurations.
- To incorporate all necessary inter-chassis video, audio and control cabling into the basic system limiting cabling requirements upon installation to input and output cables only.
- To make the as-installed system as compact as possible permitting installation in existing facilities with minimum disruption.
- To provide a basic control system capable of expansion to maximum size configurations without changing or expanding the control system itself.
- To minimize expense and complexity of control cabling.
- To provide a variety of control station configurations to meet various user requirements.
- To provide crosspoint status monitoring at remote locations.
- To provide crosspoint memory during power failure, with automatic reinstatement upon power recovery.
- To permit status monitoring in order to determine from a remote location the active crosspoint of any output buss.

In the TVS/TAS-1000 switching system, these design objectives were all met while maintaining performance equal to or better than that of existing competitive designs. The crosspoint card to our knowledge, represents the first successful attempt at incorporating 100 video crosspoints on a single circuit card. In addition to the crosspoint matrix, each video crosspoint card includes: a two-transistor input buffer in each input line; a combination output crosspoint and output buss driver at each output; latching circuitry for

continued on page 34



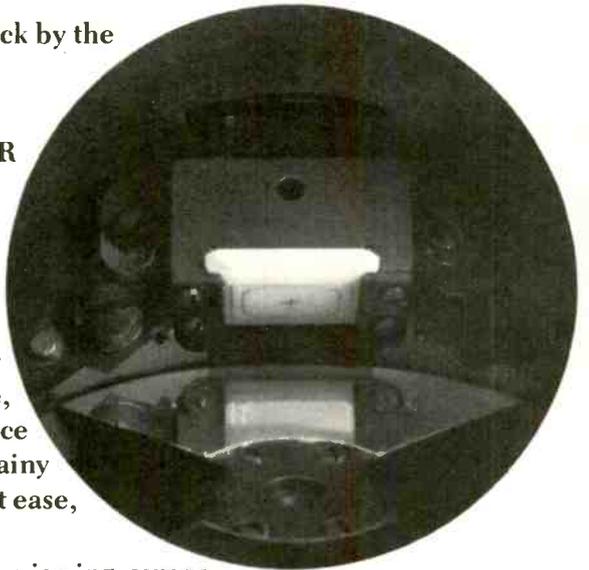
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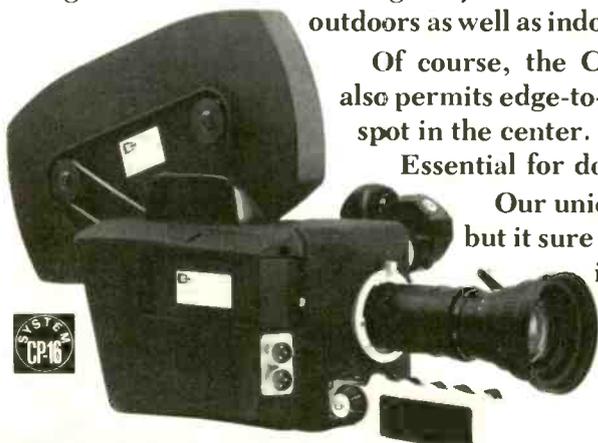
Its image enhancing properties make it a vital part of the CP-16R reflex viewing system — the most advanced viewing system available on any 16mm camera on the market today.

Our fiber optics viewing screen has the same image stopping properties as conventional ground glass. But without the same loss in light transmission. You will be truly amazed at the picture definition, the sharpness of detail in the image you get, whether the camera is running or not. Even in the brightest ambience, when the lens iris is stopped down. Since there is no ground surface on the fiber optics viewing screen, there is no dark, coarse and grainy image. And critical focusing may be accomplished with great ease, outdoors as well as indoors.



Of course, the CP-16R fiber optics viewing screen also permits edge-to-edge critical focusing over the entire field of view. No ground spot in the center. No guessing at the depth of field. Ideal for TV-news filming. Essential for documentary and studio* filming.

Our unique fiber optics viewing screen may look like a "little" thing — but it sure makes an important difference. And it is but one of the many innovative engineering features that make the CP-16R reflex the most outstanding 16mm camera system ever.



*The new CP-16R reflex was recently used by Wolper Productions in the filming of the prestigious six one-hour TV specials on Sandburg's "Lincoln" at Paramount Studios in Hollywood.

For further information, please write to:

cinema E products
CORPORATION

Technology In The Service Of Creativity

2037 Granville Avenue Las Angeles, California 90025
Telephone: (213) 478-0711 ■ Telex: 69-1339 ■ Cable: Cinedevco

pressuring its distributors to buy its studio camera, the TK-355, for the right to sell its hot portable, the HL 33, so it will be promoted prominently. The biggest studio camera news, however, comes from Europe. Thomson-CSF has decided its triax and modular camera, the TTV 1515, which is selling well at other places in the world, ought to be available to U.S. broadcasters. The French manufacturer will be at Las Vegas to show off its equipment in a way that's sure to be remembered.

If you've noted Thomson-CSF ads

you will detect an indirect dig at Philips Broadcast Equipment's slowness in getting the PC-100 in the field. Well, Philips has decided to leapfrog that problem by abandoning the American-designed PC-100 system in favor of the quite similar Dutch-made LDK series which has been extremely successful in the international market. The LDK permits direct mixing of feeds from local and remote cameras and should be of special interest in this day of complex productions.

Plenty of Business Automation Systems

Each NAB Show sees the computer a little further entrenched. Unlike the

situation several years ago, those offering computer services know what they are talking about when they describe control and traffic services and broadcasters are beginning to understand them. Business automation systems are well integrated into many TV station operations—and on hand to prove this will be BIAS, Cox Data Systems, Jefferson Data and Kaman Sciences. Now the big push is to bring the computer to radio. Compu/Net and Paperwork Systems have shown that computer services can help radio broadcasting even small and medium sized ones. This year BIAS will be stressing BIAS radio. Since TV automation systems

continued on page 39

Distribution Switcher Packaging cont

both the matrix and output crosspoints; and input address decoding circuitry.

Audio crosspoint cards are functionally identical to the video cards except that operational amplifiers are used for input and output buffers and the crosspoint used is an off-the-shelf integrated circuit.

Each card frame includes its own power supply, a control card and at least one 10-channel output amplifier card. Each video amplifier panel provides two source-terminated outputs while audio outputs are intended to drive 600 ohm loads.

System input connectors are type BNC. Interchassis video bussing is by means of factory installed subminax coax using miniature precision connectors. Compensating inputs are used on large systems to provide in excess of 40 dB guaranteed input return loss with 46 dB available on special order.

System control uses a time-sharing party line technique. RG-59 cable is used for interconnection between the switcher and the various control and status monitoring stations. In operation, the Polling and Control circuit card generates interrogation codes sequentially addressing 127 separate control stations. Bit transfer rate is sufficiently slow to permit settling of reflections from unterminated control lines at distances up to one-half mile. This permits the user to "throw away the book" in installing the control system. Multiple cables can be connected to a single input, tees and stubs added at any point in the system and all cables are operated unterminated. This provides additional immunity from control system failure that otherwise might be caused by multiple terminations or mistermiation of control lines. Five separate input control lines are incorporated in order to provide maximum isolation for the most critical circuits. Each input circuit is capable of driving any desired number of control stations up to the maximum of 127, with 2,500 feet maximum aggregate control cable length. Each control station is interrogated approximately 15 times each second. Thus, the data transfer that takes place upon the operator pressing his TAKE button occurs in a time period that is essentially instantaneous.

In addition to addressing the 127 control station addresses each 15th of a second, the Polling and Control card also generates output buss numbers from 00 to 99. On systems incorporating the Refresh Memory option, the memory card responds to each output buss number with the selected active crosspoint number. This output/input data is transmitted over the party line to both refresh the crosspoint latching circuitry and to provide status monitoring information to those control stations equipped with status indicators.

A variety of rack-mounted and desk-mounted control stations are offered employing either ten-key, lever-switch or multiple-button controls. The CP-1000 desk top control

has a calculator type keyboard and LED readouts. It can control all 10,000 crosspoints of a 100 × 100 system or, if strapped for single buss control, the 100 inputs available to a single output buss. On systems equipped with the Refresh Memory option, the CP-1000 control station also acts as a status monitor where entry of an output buss number followed by operation of the STATUS key provides an indication of the active input for that particular output buss.

Selective control of audio-only, video-only or audio-follow-video switching is also provided by the CP-1000 panel. With the Refresh Memory option, confirmation of execution by input number and output number is provided, while on systems without the Refresh Memory option a confirmation is indicated by a light on the control panel actuated by an input from the crosspoint card.

Several different control panel configurations are offered employing dual lever switch input preselection with an accompanying TAKE button. These various configurations are useful for VTR input selection, production switcher input expansion or any single or multiple buss remote control function requiring selection from up to 100 inputs for each output buss. There are also multiple lever switch configurations that permit vertical interval cuts between the various preselected sources. This type control is particularly useful in applications such as VTR editing.

Still another control configuration features 24 separate buttons on a single rack mount panel. Each button is factory programmed to control any of 100 inputs on a single output buss.

Two types of status monitoring are provided. The first utilizes the same LED readouts that are used for input crosspoint selection. The second type employs a character generator that mates the input number into the video signal of the associated output buss. The numbers generated by this source identifier can either be matted into a video line used only for monitoring purposes or can be matted into the program line video prior to airing with automatic dousing provided by tally control.

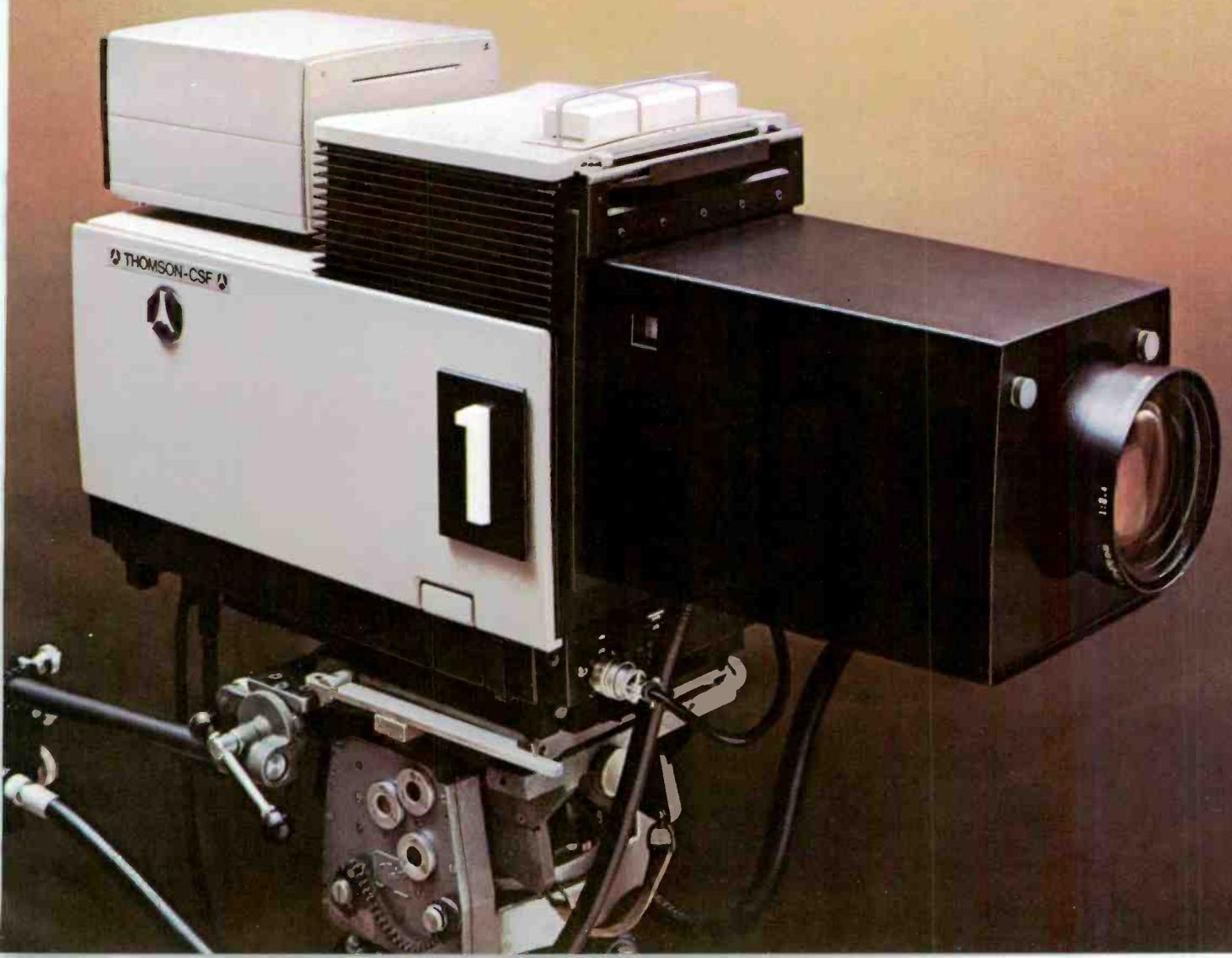
The most notable feature of the TVS/TAS-1000 system is its small physical size. With each card frame handling up to 1,000 crosspoints, most small to medium size switchers are limited to one or two cross frames for audio and video combined. In addition to the high crosspoint density, the system conserves rack space by including power supply, crosspoint latching and all required control circuitry in the same card frame as the crosspoints. The elimination of distribution amplifiers in all systems regardless of size is another important feature. This conserves power and rack space while increasing system reliability and eliminating the hundreds of coaxial cables and associated timing problems otherwise found in large systems.

While the initial system design is based upon a maximum of 100 inputs and 100 outputs, provision has been made for custom configurations of up to 200-inputs × 200-outputs.

**Triax Color
comes of age**

THOMSON-CSF TTV 1515

*Now used
in the CBS Television
mobile units*



PROVEN TRIAX

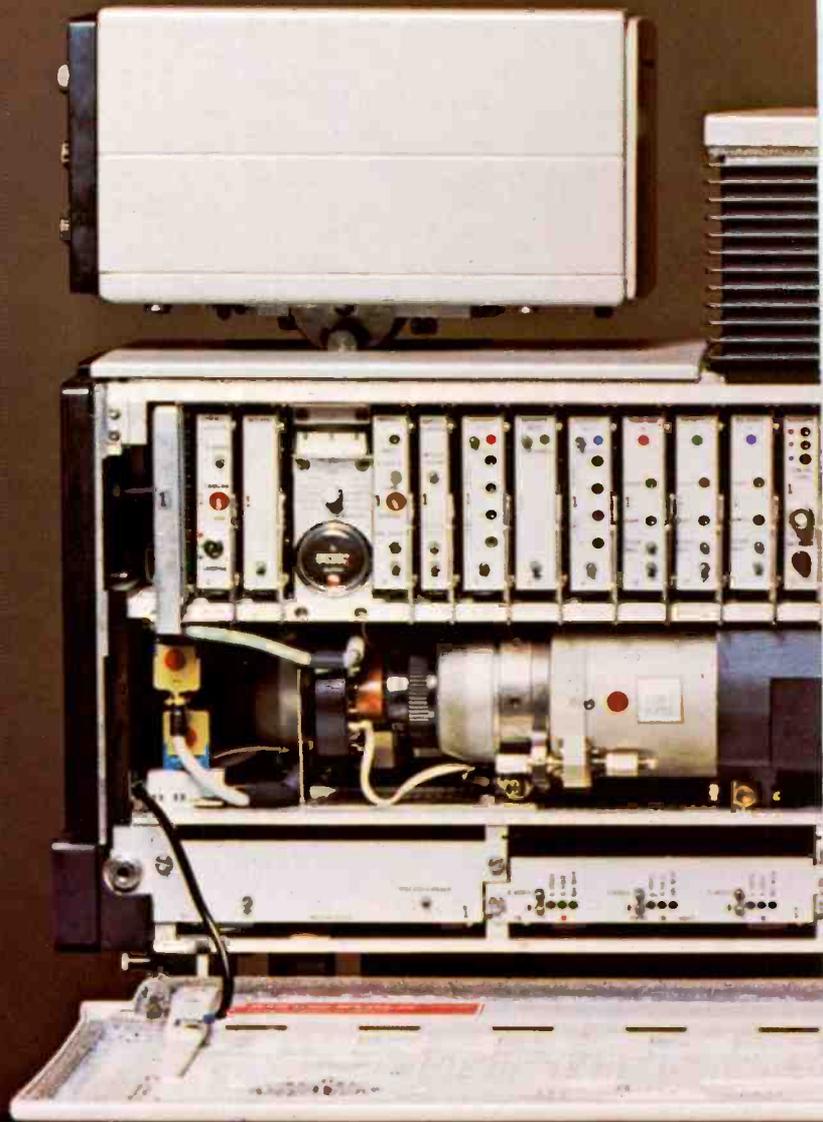
THOMSON-CSF TTV 1515

- Over 3 trouble-free years of field service
- Over 300 now in service
- Used by CBS to cover field events

Thomson-CSF has been one of France's major electronics companies since 1893. Today, it's the largest corporation in France for professional electronic equipment, with over 48,000 employees. The parent corporation, Thomson-Brandt, has over 98,000 employees.

Thomson-CSF took a leadership position early in triax color cameras. Its first patents on circuits for this camera were granted in 1964. Before the end of 1971, the TTV 1515 was already the world's most field-proved triax color camera. Today, over 300 are in service.

It all adds up to be the most successful camera in triax color TV. Join the Thomson trend. Win the economy, reliability and picture quality of the true third-generation color camera. The one that works. The TTV 1515 by Thomson-CSF.



Features:

Uses triax cable . . . 1/5 the weight of TV-81. Your mobility zooms. Set up and strike time drops way down. Van space suddenly holds many times more cable footage. You start with dramatic cost cuts on cable and connectors . . . then continue with years of manpower savings.

Converts from triax to 1/2 inch multiconductor cable with a five minute switch of plug-in circuit boards.

Automatic synchronization. A miniature sync generator built into CCU restores,

from mixed sync only, all signals usually derived from external sync . . . blanking, drive, etc.

Three 30 mm. separate mesh tubes, along with dynamic focus correction, provide excellent corner to corner resolution.

Pick-up tubes removable from rear without disturbing deflection yokes.

Head amplifier surrounds target for full shielding. The quietest picture you've ever seen.

Continuous automatic registration. A unique concept: reference windows in the optical path continuously correct vertical and horizontal centering and size.

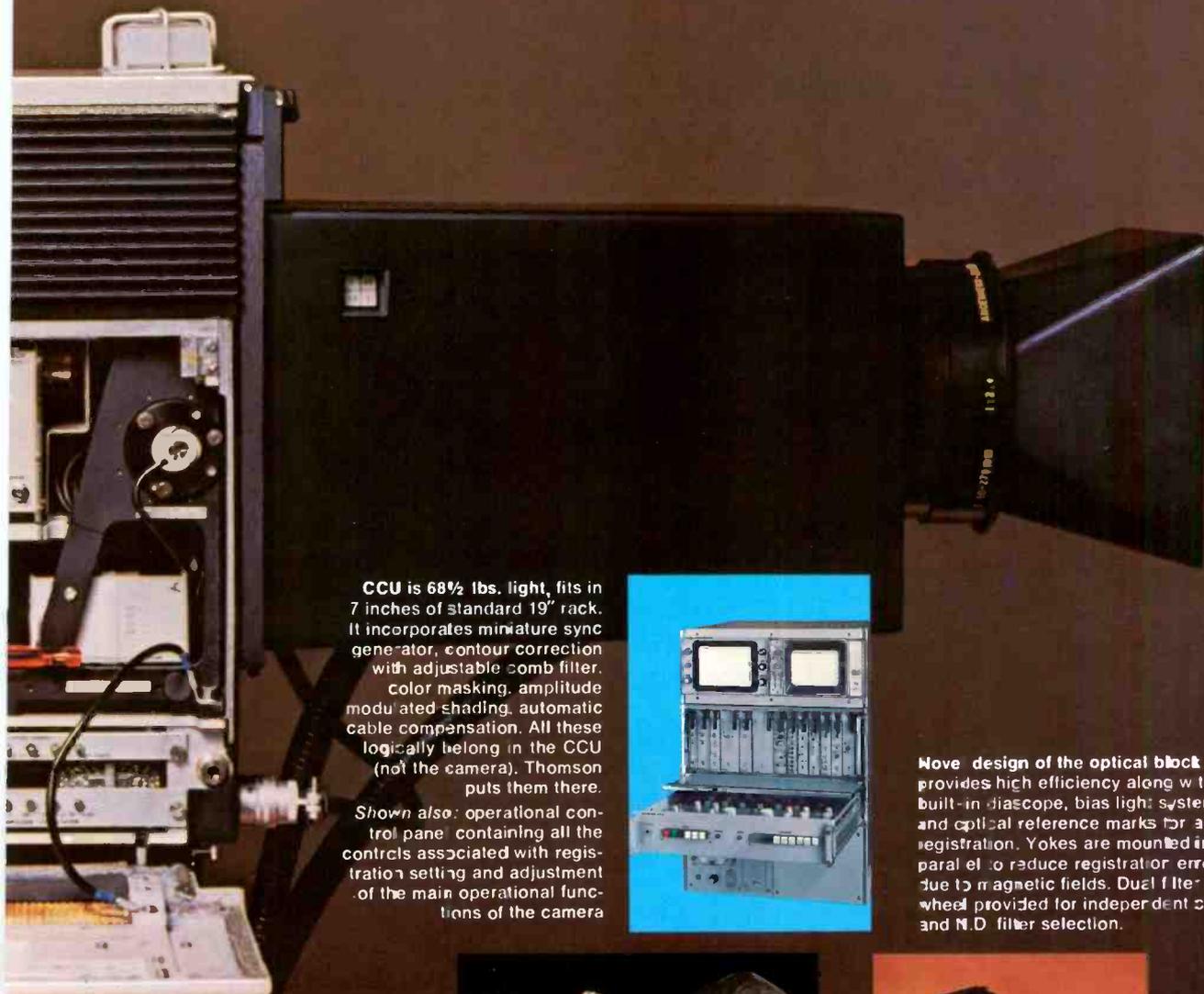
Superb low-light picture capability . . . lighting levels down to 10 foot-candles.

Automatic cable compensation with up to 1 1/4 miles of triax.

Contour correction with adjustable comb filter.

Separate RGB outputs, enabling color coding in all existing systems: SECAM, PAL,

RELIABILITY



CCU is 68½ lbs. light, fits in 7 inches of standard 19" rack. It incorporates miniature sync generator, contour correction with adjustable comb filter, color masking, amplitude modulated shading, automatic cable compensation. All these logically belong in the CCU (not the camera). Thomson puts them there.

Shown also: operational control panel containing all the controls associated with registration setting and adjustment of the main operational functions of the camera



Novel design of the optical block provides high efficiency along with built-in diascope, bias light system and optical reference marks for auto registration. Yokes are mounted in parallel to reduce registration errors due to magnetic fields. Dual filter wheel provided for independent color and N.D. filter selection.



Downtime virtually eliminated. Instantly-accessible plug-in circuit boards can be changed in seconds. No trouble-prone multi-layer circuit boards.



NTSC . . . or all three simultaneously for world-wide live broadcasts.

Ultra-stable digital and RF multiplexing.

Wide range of zoom lens packages with manual or servo controls.

Unique built-in diascope . . . no add-on "black boxes" in front of lens.

Viewfinder tilts, swivels, locks and operates remotely.

The light one: camera only 77 lbs., viewfinder 11 lbs.

DRAMATIC SAVINGS IN SET-UP AND STRIKE TIME

In just three hours of strike time, a TV crew had their TTV 1515's on the road after covering a professional football game. The next morning they were set up in a city 100 miles away to cover an awards banquet. That's triax mobility and economy in action!



Thomson-built mobile van shows the dramatic compactness possible with TTV 1515. Van carries four cameras, all control equipment, enough triax cable for most events, plus crew!

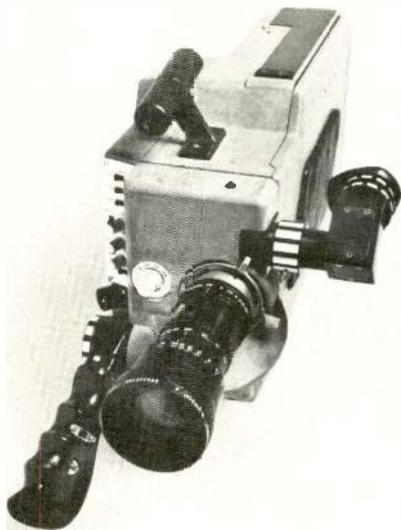


THOMSON-CSF

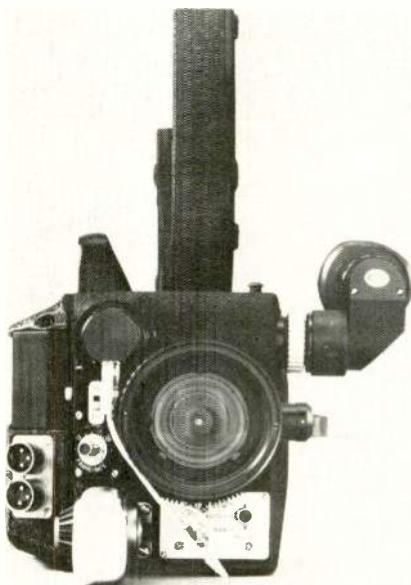
THOMSON-CSF, Inc.

Broadcast Products 750 Bloomfield Ave., Clifton, N.J. 07015/(201) 779-0216

Corporate 75 Rockefeller Plaza, New York, N.Y. 10019/(212) 977-2200



New news camera TGX from General Camera to compete with ENG approach.



The CD-16R/A reflex news camera with automatic exposure control.

may be better known than radio systems, a comparison of BIAS TV with BIAS Radio follows:

- The BIAS sales contract will be printed-out more on a weekly basis for radio because radio business tends to be more short-term oriented than television. Furthermore, radio stations prefer having the order schedule broken-out by week, rather than by the entire life of the contract, as TV presently does.
- Skim Avail in BIAS Radio differs from the TV version in that there are some options which will be of interest to sales managers. A sales manager can choose which segments of time he wants to show his sales force—instead of the entire print-out which is the case in TV. With the radio skim, sales man-

continued on page 40

The Mod One Is The Flexible One

Start With The Console Format You Need Now, Expand Later.

Modular design lets you select a wide range of input modules and plug-in amplifier cards as you grow. 10 mixing positions with up to 30 inputs. Modern vertical faders; silent operating switches; state-of-the-art circuitry.

Custom features and options with off-the-shelf availability. Monaural, stereo, or quad. Meets all FCC - AM and FM standards. UREI quality, of course.

Available through your UREI dealer.



UREI "Instrumental in Audio"

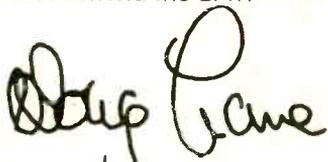
11922 Valerio Street, No. Hollywood, California 91605 (213) 764-1500
Exclusive export agent. Gotham Export Corporation, New York

Results

PSI "BAT" Billing, Accounting, Traffic, and Payroll Systems now get results for over 100 stations nationwide. Here's what two have to say:

WWDL, Scranton, Penna.:

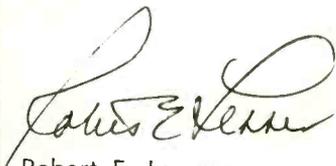
"Payroll's a timesaver, Accounting is easy, Traffic is simpler. At the end of the month, it just 'chugs' out! For a well-run operation of any size, I would heartily recommend the BAT."



Douglas V. Lane
President & General
Manager

WBNR, Beacon WSPK, Poughkeepsie, N.Y.:

"It's generated more sales, reduced accounts receivable. PSI has shown how efficient a station can be with the BAT."



Robert E. Lessner
President & General
Manager

Radio or TV, large market or small, there's a BAT system just right for your station. Write or call for a free analysis of your station by a paperwork pro from PSI. No obligation, of course.

PSI PAPERWORK SYSTEMS INC.

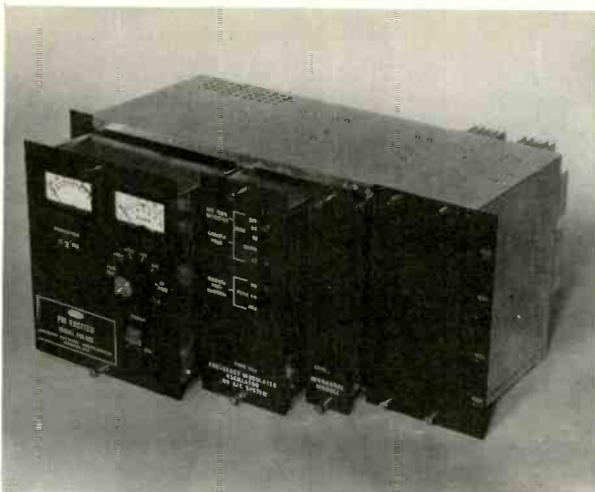
P. O. Box 38 2000 'A' St. Bellingham, WA 98225 (206) 733-8510

See Us at the NAB—Booth #509 South Hall

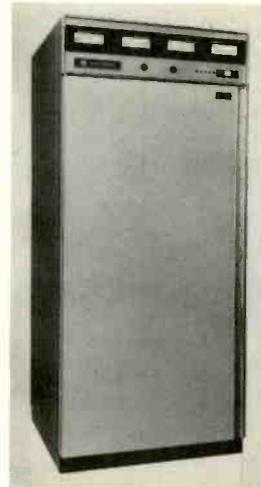
Circle 128 on Reader Service Card



New low distortion Phase 4 Exciter is heart of new Collin's transmitter line.



AEL will be promoting its FM Exciter.



World's first 1 kW solid state transmitter.

agers will have the ability to over-ride the set avail parameters and determine just how much time they want to show.

- Another new feature of the radio skim avail has to do with wide time frames, such as "drive time" segments. When a salesman is dealing with a four hour block of morning drive, for instance, he might have several car dealers in there—with a goodly number of commercial breaks within that four hour block. The radio skim avail will give inventory information relating to product conflict. If you exceed a certain number of one type of product, say, for example, a certain number of auto dealers in one avail parameter, the system will list for you,

on the day that problem has occurred, exactly what has transpired. The problem is spelled out for you by product category.

- Radio broadcasters will be happy to know the BIAS Radio system includes a two-break separation between spots in any given saturation campaign. This function is accomplished during spot placement, and is a function of the new "PLACE-A-SPOT" program. The main idea with the two-break spot separation is that radio commercial breaks come closer together than do TV breaks, so with radio you might have an advertiser who had ordered four spots an hour to give him maximum separa-

continued on page 42

YOU'RE ABOUT TO GET SOMETHING FOR NOTHING.

Fuji Videotape

350 Fifth Avenue, New York 10001 (212) 736-3335

- () I'm interested. Tell me more about H701 High Band Videotape and your special offer.
() How can I lose? Call me about an order.

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

TELEPHONE: () _____ EXT. _____

Lower chroma noise.
Lower dropouts.
Lower abrasion.
Better consistency.
Better slitting.
Better winding.
Even better packaging.

... All without spending a cent more on videotape (in fact, you'll probably spend a few dollars less!).

The reason is Fuji's new H701 High-Band Videotape, and it's really something remarkable.

But don't take our word for it... send for complete specifications and prices. We'll show our appreciation with something more—a special introductory offer you'll find hard to resist.



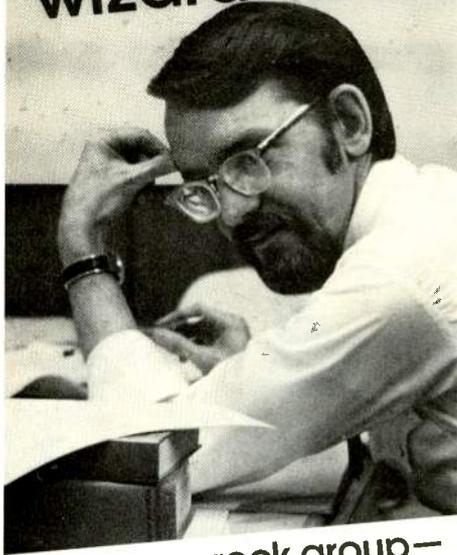
FUJI

VIDEOTAPE

See us at the NAB—Booth 607, South Hall

Circle 129 on Reader Service Card

Nick Solberg and his wizards...



not a new rock group—
just the sharpest
design team
in automation



**BILL
HAMELIN**
a real artist with
state-of-the-art.



**LARRY
WILSON**
puts the magic
into beautiful
packages.



**MARV
GANSLER**
he talks and the
machines listen.

Under Nick's guidance, Bill, Larry and Marv design in the leadership and lasting value that IGM products are famous for. You'd expect the automation company with the most experience in the industry to have people like Nick and the wizards behind our products. Together, they do make beautiful music, and that's what makes IGM...

the best there is!

IGM

A Division of NTI
4041 Home Road
Bellingham, Washington 98225
(206) 733-4567

See what they've been up to at
NAB Booth 804 South.

Circle 130 on Reader Service Card

NAB 1975

tion in a campaign. PLACE-A-SPOT will be used in order to give him not only break within the break conflict protection, but it leaves a break between each competitive product. In other words, if you have an auto dealer at 6:06 am and there's a break at 6:09 am, the system will not put another auto dealer there unless you manually override the system. The computer would put it in the next break. Two-break separation was designed to give the client better protection from competitors.

● BIAS radio provides for double protection through use of a dual conflict code. In other words, you can give SEARS, for example, a department store conflict code—plus another conflict code for whatever product they are presently pushing. If it happens to be tires, you give it one conflict code for "department store" and one for "tires." With this double protection, Sears is protected from Penneys and Goodyear.

Today's radio station is faced with mounting operational problems, such as rotation of spots within time frames, i.e., drive times and non-drive time segments; maintaining accurate sales avails; production of lengthy logs; and

at month-end, the chore of getting out the invoices. In September 1973, WMC-AM in Memphis, Tennessee (Scripps-Howard Broadcasting) became the first radio station to convert their manual operation over to the BIAS system. Opinions regarding automation after 16 months of operation are discussed by the WMC general manager in an accompanying box.

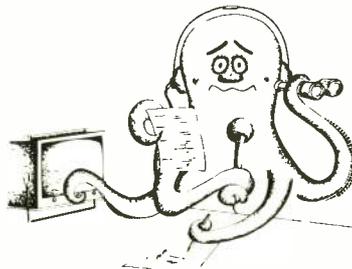
The best audio machines in history

Radio broadcasters gave audio tape machines the No. 1 spot on their "wanted" list, in our pre-show shopping survey. The manufacturers are obliging them with more, and more high-quality, machines than we ever had before. The outstanding characteristic of these machines is easy operation, noted in greater detail in our survey of audio machines in the February issue. Semi-automatic modes give the operator a lot of help, reduce his time and effort drastically. DC servo control for the capstan motor has brought very flexible and precise speed control; motion sensing, plus switching logic, allow shift from any mode to any other with no spill or break problems. Automatic rewind to editing points is another great time saver. And the specs are better than ever, too.

continued on page 44

SPORTSCASTERS —

ISN'T IT TIME YOU GAVE YOURSELF A HELPING HAND ???



Hands-free communication is within your reach. Television Equipment's well-proven Sportscaster headset, with integral dynamic boom mike, gives you complete freedom of movement — just right for those tense moments when you need to consult your references.

The headset has a...



Dynamic Boom Microphone; 400 OHMs, frequency range 50-15,000 Hz, sensitivity 2mV (loaded) for close speech.

Double Headphones: independently wired, 200 OHMs each, frequency range 50-15,000 Hz.

Ventilated foam cushions eliminate perspiration and let you hear ambient sound (optional ear-enveloping cushions).

Weight: 6½ oz. Practically unbreakable components. Optional cough switch.

Price: \$ 75.00
Delivery from stock

For your helping hand phone today...

In Canada call:
Conway Electronics Enterprises, Ltd.
416 • 742-6631
See it at NAB,
Booth 701,
South Hall

Television Equipment Associates, Inc.

BILL PEGLER 516 • 628-8068

Box 1391 • BAYVILLE, N.Y. 11709

Circle 131 on Reader Service Card

Discover Single System Sound Super-8 Movies with the New Beaulieu "5008S"

For the last 10 years, Super-8 film has been "silent". Without sound, your Super-8 movies were "incomplete".

Today, there is "Ektasound" film, a revolutionary film which provides the means to record sound (directly on the film) as you're filming. You, therefore, can shoot "complete" movies.

With the new Beaulieu movie camera, you will go even further in Super-8. The "5008S" benefits from the advanced technology provided by Beaulieu: an image with a professional touch, and now sound with a high quality level.

Professional Sound Quality

Pop in a new Super-8 sound ("Ektasound") film cartridge. Focus. Then, plug in the mike. That's all the preparation you need. With the Beaulieu "5008S", you're now ready to start filming professional quality Super-8 single system sound movies.

An amplifier is built into the camera which records the sound directly onto the magnetic stripe of your sound film. The camera records high fidelity sound, both in treble as well as bass (*frequency response*: 50-12,000 Hz \pm 1.5 dB; *distortion*: less than 0.75%; *signal-to-noise ratio*: 57 dB; *wow and flutter*, attenuated peak: less than 0.4%).

The "5008S" modulates the single system sound recording automatically. However, there is also a "manual" setting so that you can modulate the sound as you are filming (by using the VU meter).

"XL" (Existing Light) Filming Capability

The "5008S" has "XL" (Existing Light) filming capability which is provided by: a *super-fast* lens (f1.2, 6-80mm Angenieux zoom), a longer exposure time for the image (1/40 second), and a through-the-lens metering system that sends 100% of the available light to the film.

Since many of your sound movies will be filmed indoors, this feature will enable you to shoot films in the available light of your scene (whether that "light" is bright or not).

From the "Widest" Wide Angle Shot . . . To the "Closest" Close-Up

For the lens, Beaulieu turned to the professional and technical "know how" of Angenieux (which supplies NASA for all their space missions).

Angenieux succeeded in creating a new zoom lens that covers all the focal lengths from 6-80mm (a 13.3 to 1 zoom ratio).

Imagine such a lens in 35mm still photography. It would go from a 35mm wide angle to a 500mm tele.

In addition, the lens opens to f1.2 (an *unprecedented feature* on a zoom lens with such a wide focal length range).

New Dolly Shot Style

The power zoom of the Beaulieu "5008S" is continuously variable. You can travel the full focal length range in 4 seconds, or 12 seconds (*for any speed in between*).

Macrocinematography — Without Touching the Subject

To film macrocinematography with the "5008S", just zoom to 80mm and focus. At the minimum focusing distance of 2 feet, 8 inches, you get all the light available since the lens doesn't actually touch the subject. For example, at this distance, a postage stamp

(1½" x 1-1/5" in size) completely fills the viewfinder (and consequently, the screen—when projecting).

Forget the Exposure

With the "5008S", you can concentrate totally on framing and sound recording. The diaphragm operates automatically and stops instantly at the right aperture. (This feature has "Manual Override".)

Lens Interchangeability

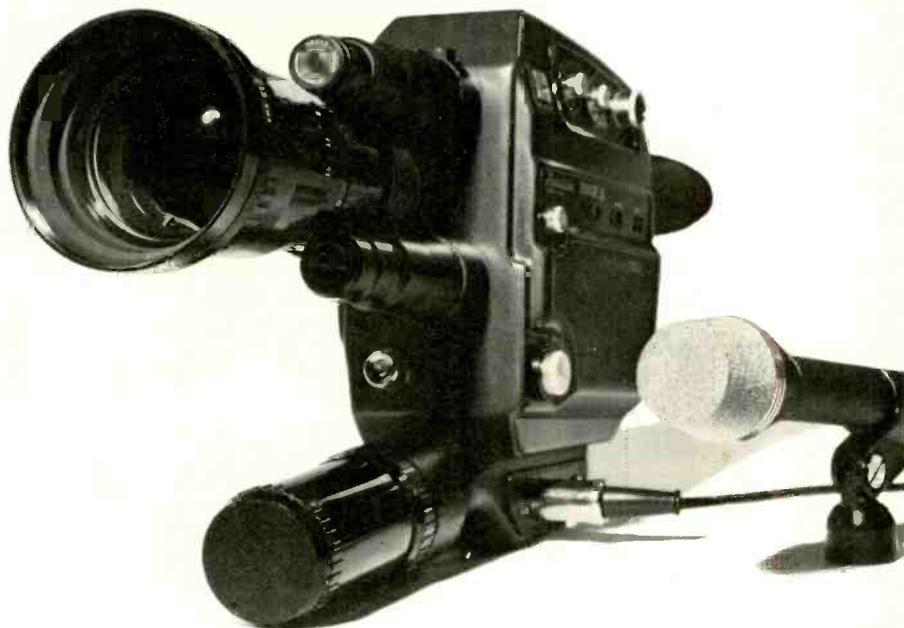
The "5008S" is the only single system sound camera with an interchangeable lens. It accepts 35mm still photography lenses (by means of an adapter), as well as all 16mm "C" mount lenses.

The choice is yours. You can interchange an unlimited amount of different lenses in order to create a certain "feeling" or effect in your films.

For full information on the new Beaulieu "5008S" Super-8 Single System Sound Camera, please write to:

HERVIC CORPORATION

14225 Ventura Boulevard
Sherman Oaks, California 91403



The Beaulieu "5008S" Sound Movie Camera

Circle 132 on Reader Service Card

One Tota-Light covers three walls from the fourth wall.

One Tota-Light covers four walls from the corner of a room.

Gull-wing reflector design provides exceptionally wide, even, bright light pattern.

Lights behind itself—220° maximum vertical beam angle.

Delivers up to 150 fc at 10 ft., over a wide 90° square beam angle.

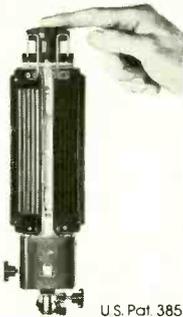
Reflector doors compensate for "fall-off" in cyc lighting.

Interchangeable 500, 750, 1000 watt quartz lamps.

Soft, bright umbrella locks into light without accessories.

Wide range of durable, pre-cut gels for diffusion, daylight conversion, special effects.

Tota-light.* More than just a new light.



U.S. Pat. 3852582

Gel frame locks directly into Tota-Light. Mounts atop doors, open or closed, as well as on stands and clamps.

Gaffer-tapes to walls and windows.

Up to 8 Tota-Lights stack on one stand or clamp for "single" source.

Tota-Light pans and tilts 360°.

Snap on, flexible shafts attach small flags and reflectors to Tota-Light, clamps and other components.

Snap-together flags and reflectors "grow" for precise light control.

Lightweight components fold up to a fraction of their in-use sizes.

Tota-Light "system" components are available individually and in a broad variety of unusually compact kits.

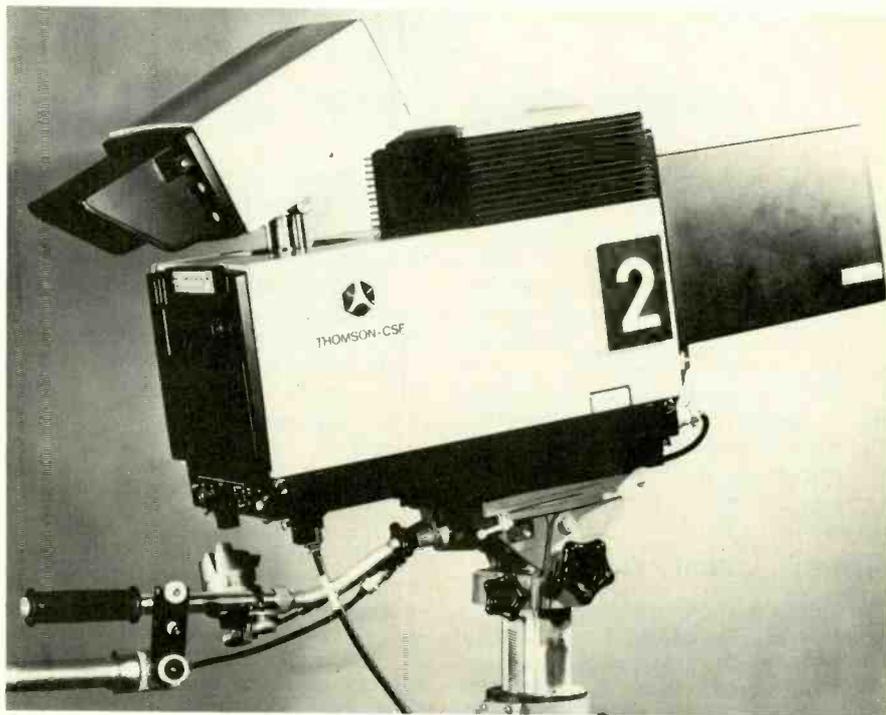
For information, see your Lowel dealer or send for our brochure.

lowel

421 West 54th Street, New York, N.Y. 10019 (212) 245-6744
West Coast 3407 West Olive Avenue,
Burbank, Ca. (213) 846-7740

Circle 133 on Reader Service Card

NAB 1975



Thomson-CSF invades the U.S. market with its triax color camera, the TTV 1515. It will do battle with . . .



. . . the LDK series from Philips replacing the PC 100.

Nearly all the brands mentioned in our February survey will be on display in Las Vegas. They are the Ampex 440C, Scully/Metrotech 280B, 3M 79 series, Telefunken M15, Electro Sound ES 505, ITC 850, Studer A80, Autotec, Telex, and probably several others. Thus the finest group of audio tape machines ever available to the broadcasters can be inspected at first hand.

In addition there will be some of the brands in the just-under-the-top price bracket. Otari will introduce a new series, with many of the automatic conveniences of the top-bracket machines, with versions for one, two, four, and eight tracks, and prices from about \$1300 to \$7200. Also in this category will be the very popular Revox machines, and a showing by a new-

comer, Pioneer.

Time base correctors: the production models are here

As prefigured at last year's show in Houston, the time base corrector field has broadened into a highly competitive arena, with honest production models to be on hand this year from most of the companies that showed prototypes last year. In addition, the old originals, Television Microtime and Consolidated Video, will have new or improved models. So the television broadcasters, who put time base correctors at the top of their shopping list in our "Panel of 100" survey, can do a thorough comparison job. Ready for them, in addition to the new units from

continued on page 48

Farinon Makes It...



Portable, Tunable and Superior

The new FV Portable Microwave Series for Video Transmission from 1.99 to 13.25 GHz

- **Tunable across the band without narrow-band preselection** — For example, the FV(13)P system for TV broadcasters is tunable from 12.7 to 13.25 GHz, with up to 12 crystal-referenced operating frequencies, with no filter changing.

- **Direct frequency-generation at output frequencies** — No energy-wasting, noise-producing multiplier stages.

- **Plug-in units provide baseband options** — Up to three subcarrier channels, clampers, video monitors, modulators and demodulators.

- **Up to 500-foot cable separation of RF and remote units at each end** — without video roll-off or need for equalization.

and these performance characteristics:

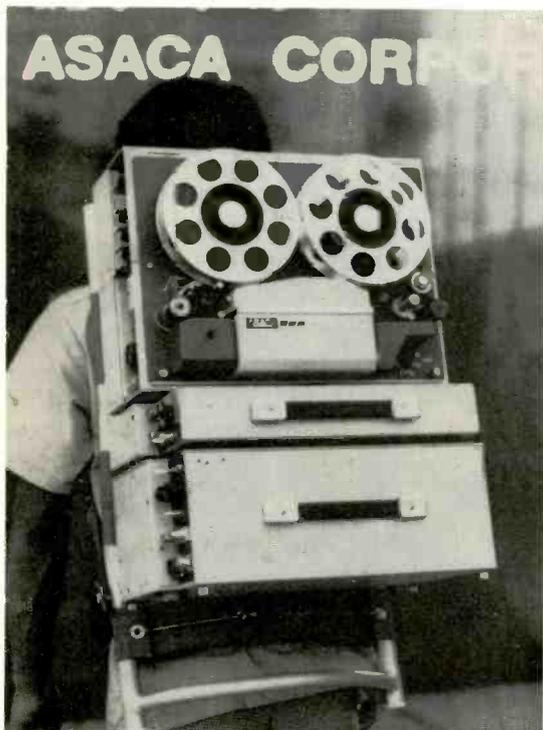
- $\pm .002\%$ frequency stability
- 60 dB signal-to-hum ratio from dc to 10 kHz
- 70 dB signal-to-noise ratio from 10 kHz to 5 MHz
- 1 watt RF output from 6.875 to 13.25 GHz;
5 watts output from 1.990 to 2.110 GHz

See Farinon's new portable microwave in Booth 1005-S at the NAB Show.

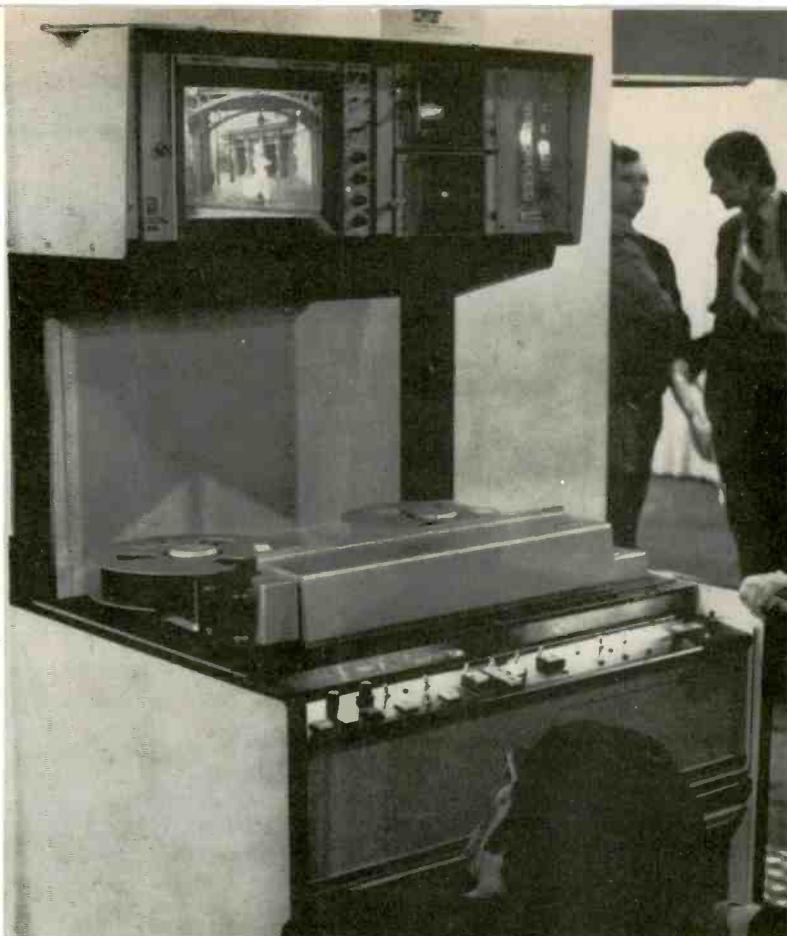
Farinon Electric (DISC), 1691 Bayport Ave., San Carlos, CA 94070, U.S.A. Tel. (415) 593-8491. Telex 34-8491.
... in Canada: Farinon Electric of Canada, Ltd., 657 Orly Ave., Dorval, P.Q. H9P 1G1, Canada.
Tel. (514) 636-0974. Telex 05-82-1893.

Farinon

Circle 134 on Reader Service Card



Asaca will show new back-pack recorder.



Ampex will feature, again, the modular AUR-2.

continued on page 48



PLC-4 Magazine

From Cinema Products — the newest, most advanced design in 16mm 400 ft. magazines.

FEATURES

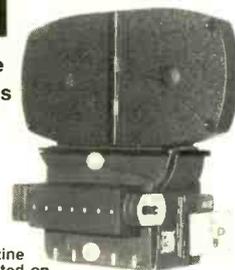
- Made of extremely lightweight, glass-filled Lexan®, a material with greater impact strength than magnesium, the molded plastic PLC-4 magazine completely eliminates the problem of film spotting (caused by particles of magnesium adhering to the emulsion and reacting in the developing bath).
- Compartment-type magazine design permits the use of either 200 ft. or 400 ft. darkroom cores or daylight-load spools.
- Hinged magazine doors provide quick access for fast loading and unloading.
- A triple-step light trap on doors prevents light leaks.
- Magazine toe is a removable aluminum insert, easy to repair or replace.
- Magazine may be fastened to the camera by conventional screw-down methods or the unique Cinema Products snap-latch technique.
- PLC-4 magazines are extremely silent in operation.

MAGAZINE COMPATIBILITY

PLC-4 magazines are compatible with all 16mm camera systems which accept standard 400 ft. Mitchell-type magazines.



PLC-4 Magazine shown with CP-16R Reflex Camera.



PLC-4 Magazine shown mounted on Auricon Cine-Voice Camera (400 ft. conversion model).

For further information, please write to:

cinema E products
CORPORATION

Technology In The Service Of Creativity

2037 Granville Avenue, Los Angeles, California 90025
Telephone: (213) 478-0711 ■ Telex: 69-1339 ■ Cable: Cinedevo

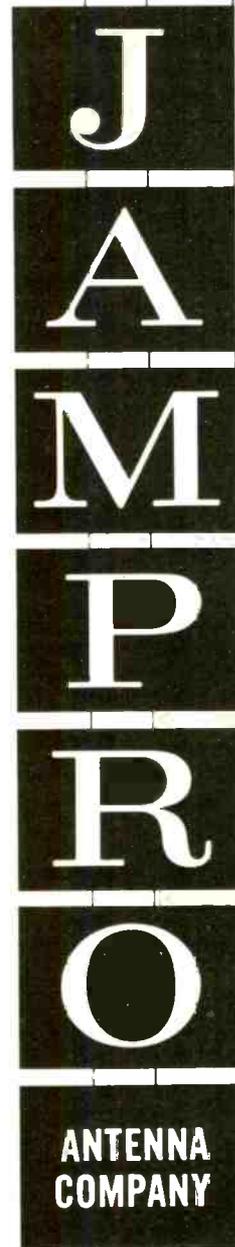
COMPARE FM ANTENNAS BEFORE YOU BUY!

Compare all elliptically or circularly polarized FM antennas and you'll find JAMPRO'S PENETRATOR leads the others in 19 important categories. It has more outstanding performance features than any other comparable FM antenna on the market today. The PENETRATOR has the widest VSWR bandwidth for best stereo now, and quadraphonic sound when you are ready! It is unique, it has a patent for five features not found in any other FM antenna. Only the PENETRATOR made by JAMPRO insures maximum power gain by using internal transformers together with phase and amplitude tests. It has the lowest windload, with and without deicers! It comes with a 2 year warranty, a first for the industry. Compare these six bay high power antennas offered for 50 KW and 100 KW ERP stations, taken from printed company literature in February, 1975.

SUPPLIER	JAMPRO	RCA	GATES	COLLINS	SHIVELY	PHELPS DODGE	CCA
1. Antenna Type Number	JSCP-6	BFG 6A	FMS-6	37CP6	6810-6	CFM HP-6	FMC-HP-6
2. Safe input power rating	40 KW	36 KW	40 KW	40 KW	40 KW	30 KW	40 KW
3. Power gain ratio DB	5.05	5.06	5.05	5.00	5.18	5.2	5.2
4. Trimmed 1.1/1 VSWR bandwidth	±200KHz	±100KHz	±100KHz	±110KHz	±150KHz	±100 KHz	NS
5. Axial ratio-polarization	2DB	NS	NS	NS	NS	NS	NS
6. Impedance match at each bay?	Yes	No	No	No	No	No	No
7. Factory VSWR plot in I.B.	Yes	No	No	No	No	No	No
8. Factory phase/amplitude checks.	Yes	No	No	No	No	No	No
9. Tuned on customer tower?	Yes	No	No	No	No	No	No
10. Antenna factory pre-tuned?	Yes	Yes	Yes	Yes	Yes	No	No
11. Quadraphonic capability?*	Yes	No	No	No	No	No	No
12. Manufactured by seller?	Yes	No	No	No	Yes	Yes	Yes
13. Dual Deicer wattage?	Yes	No	No	No	No	No	No
14. Antenna shop painted?	Yes	Yes	No	No	No	No	No
15. Weight with mtg. bckts.	498.5#	381#	496#	512#	NS	404#	404#
16. Wind load 50/33 PSF, EIA	673#	920#	883#	1301#	727#	780#	780#
17. Deicer wind load, 50/33 PSF	770#	1040#	NS	NS	NS	NS	NS
18. Warranty - guarantee	2 Yr.	1 Yr.	1 Yr.	1 Yr.	1 Yr.	1 Yr.	1 Yr.
19. Antenna List Price	\$7,250	\$7,642	\$7,245	\$6,900	\$5,505	\$5,000	\$6,545
20. Antenna price with deicers	\$8,750	\$11,421	\$8,820	\$8,400	\$6,303	\$5,660	\$7,670

*Quad Sound requirements proposed by NQRC NS = Not Stated

Other exclusive reasons for choosing a PENETRATOR include dual wattage deicers for energy conservation, FAA color painting for longer antenna life, and a 15 page complete instruction booklet with measured factory VSWR!



A DIVISION OF
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CORPORATION
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SACRAMENTO, CALIF.
95828

NAB 1975

TMI and CVS, are TBC's from CBS Laboratories, Ampex, International Video Corporation, and Kansas State Network.

We outlined the characteristics of the new TBC's in detail in our survey in the January issue. The major trend, as continued on page 50



The 700-lb. TR-600 from RCA is now ready for delivery.

BIAS I—The Type of System Broadcasters Have Been Looking For

By Dean Osmundson, General Manager, WMC-AM

The biggest problem we've faced through the years is in the development of a fool-proof traffic system. Traffic has always been a hang-up for broadcasters. It's an essential part of any operation because when an order is brought in, if it isn't handled properly in the traffic department, then we know it isn't going to be billed properly, and that just leads to billing discrepancies, which leads to bad client relations.

By having the salesman write up their own orders, verbal communication between the salesman, the sales service secretary, and ultimately the people in traffic is eliminated. When the salesman sells the time, he comes in and fills out the order form himself as he sold it, and then submits it to traffic in order to have it entered in the system. The contract is printed, and he can, at that moment, review the order to see if it is ship shape: that scheduled correctly, and if the amount of the investment the advertiser has made correlates with what he sold him. Once the order has been set in the computer, the salesman has a copy of the contract, the traffic director has a copy of it, the sales manager has a copy of it and I get a copy of it. This way we have cut down on the number of spots that are missed, either over-run, or deleted, or what have you. BIAS is the most fool-proof system that I have ever had the privilege or working with in my 25 years of broadcasting. So naturally, I'm pleased about that because it has cut down on the number of discrepancies and we seldom have one anymore.

A station's spot inventory is one of the most perishable commodities in the business world today. If a 30 second spot is available at 9:00 am, Monday morning and it isn't sold, you have just lost the cost of that spot.

BIAS gives us instantaneous knowledge of inventory that we have for sale, whereby we can very creditably go to a client and say "look we are in a virtual sold-out position. If

you are planning a campaign for a specific period of time, we would recommend that you place the schedule as soon as possible—because this is the extent of our inventory at this time." This approach does two things: Number one, there is always something psychological about the possibility of not being able to get on. I think it would tend to get orders firmed up a little earlier, and, secondly, we're living in a period of time when the order for time is shorter than I have ever seen it. In other words, a call on Friday to an account may produce a Monday start order. Advertisers are not giving you the lead time they once did—particularly in a tight economy. They sort of take a wait and see attitude as to whether or not they want to release the funds or not. When they do decide to go, they want on quickly.

There was a time when I hired a person full-time to do nothing but avails. A large ledger book with spaces for every hour of the broadcast day, 365 days of the year was maintained. When we would get an order, that person would manually write in those announcements on the specific days that order called for, so we could go to the ledger for avail questions. That system was somewhat effective, but not nearly as effective as the total control I feel we have with the BIAS system. For example, we do program 18 minutes per hour maximum commercial load—that gives you 72 minutes of time you can sell between 6:00 and 10:00 am, which is your prime time in radio, your morning "drive time" period. The computer will tell us exactly how many minutes per day we still have available, or whether or not we are sold out. This is a tremendous advantage.

The system helps the Sales Department and it also makes our Traffic Department more relaxed. It has saved a lot of "after hours" work.

Fuji To Introduce New Videocassette Tape

A new videocassette tape for 3/4-inch U-Matic units, Fuji Beridox iron oxide tape, is being introduced at NAB by the Videotape Div. of Fuji Photo Film U.S.A., Inc.

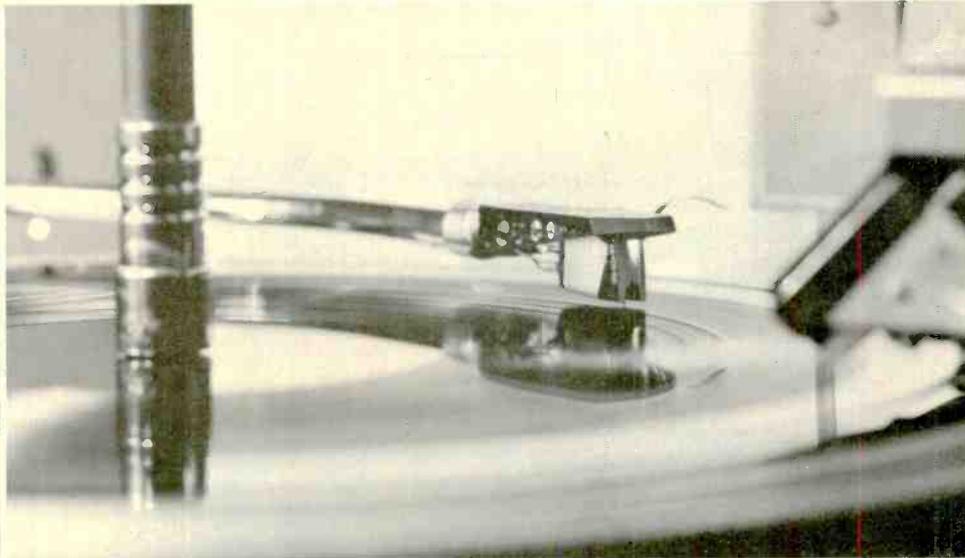
According to Fuji, the new tape offers greatly improved color performance, higher resolution for sharper images, low headwear, outstanding stop-motion performance and full compatibility with all U-Matic video tape systems. It will be available in five playing-time sizes.

The new tape uses a unique coating called berthollide iron oxide. A specially sensitized high-density magnetic particle dispersion is employed.

According to Fuji, Beridox Videocassette Tape is also superior in chroma level, video sensitivity and signal-to-noise when compared with tape coated with chromium dioxide. Stop-motion life of Beridox is said to be 60 minutes or more.



Fuji executives show-off new videocassette tape.



Stanton.

Benchmark for an Industry.

Stanton's 681 Series is the Calibration Standard to recording engineers such as Robert Ludwig.

Whatever the requirements for recording and playback, Stanton's Series 681 cartridges are the Calibration Standard. And there is a 681 model engineered specifically for each of these critical applications. That's why Stanton is truly the Benchmark for the industry.

The Stanton 681A — For Cutting Head Calibration. With Stanton's Model 681A, cutting heads can be accurately calibrated with the cartridge, for it has been primarily designed as a calibration standard in recording system checkouts. Frequency response is factory calibrated to the most rigid tolerances and the flattest possible response is assured for precise alignment of recording channels.

The Stanton 681EE—for Critical Listening. Stanton's Model 681EE is designed for low-distortion tracking with minimum stylus force, regardless of the recorded velocity or the distance of the groove from the disc center. High compliance, low mass and low pressure assure perfect safety even on irreplaceable records.

All Stanton Calibration Standard cartridges are guaranteed to meet the specifications with exacting limits. Their warranty comes packed with each unit—the calibration test results for that individual cartridge.

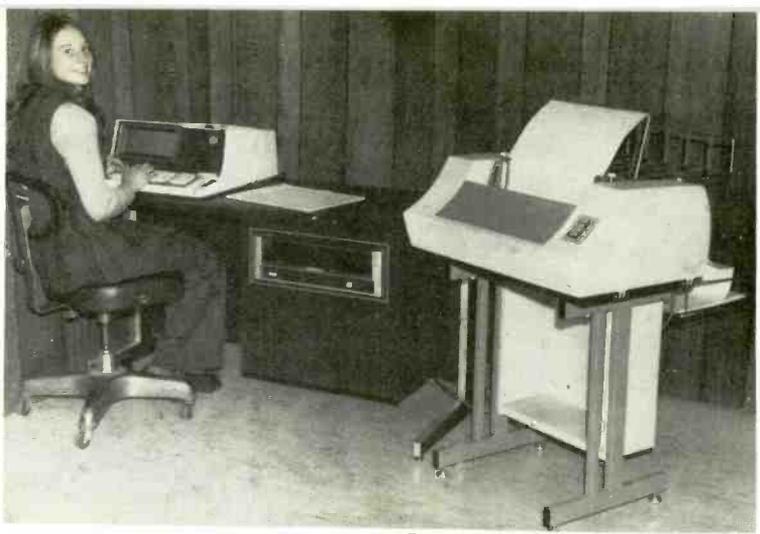
For complete information and specifications write Stanton Magnetics, Inc., Terminal Drive, Plainview, L.I., New York.



All Stanton cartridges are designed for use with all two- and four-channel matrix derived compatible systems.

Circle 137 on Reader Service Card

shown there, is to digital operation, which allows acceptance by the TBC of a wide variety of VTRs, based on the wide input "window" of ± 1 to $1\frac{1}{2}$ horizontal lines. In many cases versatility is further increased by built-in, or optionally added, capability for various color configurations. Television Microtime's new Model 640, for example, shows this movement, with a window of $\pm 1\frac{1}{2}$ horizontal lines, and adaptability to nearly all available VTR con-



Paperwork Systems, Inc. has simple system.



figurations.

But analog design remains in two TBC's at the show, that of Kansas State Network and the TMI Model 610. The aims in these two cases were totally different. The Kansas State TBC is intended for a number of activities with stability requirements a little under those for broadcasting: CCTV, CATV, industrial communications, hotel pay-TV, etc. The TMI 610, on the other hand, is for the most demanding broadcast level jobs, when the VTR has pretty fair stability to start with.

Character generators are strong and steady

Last year was the time for the big explosion in character generators, with new units appearing all over the show floor. This year, the number of CG's on display is lower, but they look like stayers. Their chances of staying are good, if that depends on demand: television broadcasters put character generators right behind time base correctors on their "wanted" list for this show.

On hand for several years and due back again are two highly sophisticated systems, the CBS Vidifont and the Chiron II Graphics system. Also scheduled to reappear, with some improvements, is Datavision's highly popular medium-priced system. And TeleMation is bringing its medium to low-priced systems. If this line-up represents the results of shake-out in the character-generator industry, there is plenty of logic in it: all these systems are excellent performers. The broadcaster should find what he wants.

Video switchers: more versatile and plentiful

Broadcasters at the show to shop for video switchers (as a lot will be, according to our "Panel of 100" survey), will see a very large array from all the companies established as suppliers, with many introducing new versatility, new special effects, new ease in interfacing and control. American Data

continued on page 52

SEE
US AT
BOOTH
307
NORTH

YOU'LL FLIP

OVER OUR NEW PRECISION AM, FM and TV MONITORS!

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Recortec R-Mod will
Upgrade your present
VTR to provide**

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- HANDLING OF TWO HOUR REELS
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- AUTOMATIC END-OF-TAPE SENSOR
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R-MOD is a modification package which can be easily installed in the field to provide constant tension for your quadruplex VTR.

R-MOD is derived from reliable hardware used in other proven Recortec products such as

VIDEO TAPE CONDITIONER
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VIDEO TAPE TIMER

Recortec has handled your tape cleaning for years—now, with R-MOD on your VTR, we'll handle your tape cleanly for years.



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- For All Color Cameras

Canon

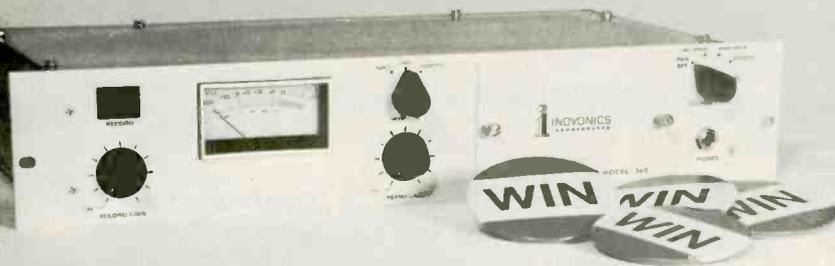
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For Ampex owners only:



inflation fighter

Don't spend \$3000 or more to replace that old reliable Ampex tape recorder. Save money with Inovonics' Model 360 Tape Recording Electronics. A mere \$690 for the Model 360 gives you plug-for-plug replacement of the Ampex tube electronics.* And brand new performance equal to (and in some cases better than) many new recorders. Features of the Model 360 include fully regulated internal power supply; reliable solid-state circuitry; remote control options; and plug-in cards to simplify maintenance.

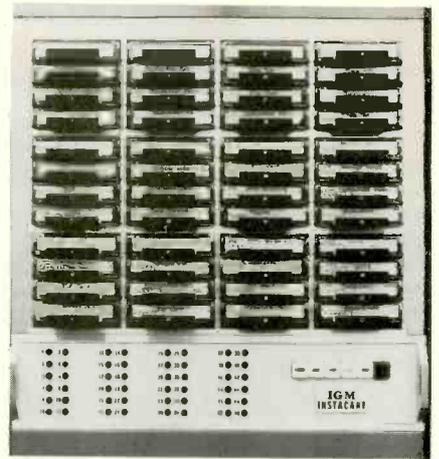
*Plug-for-plug replacement for Ampex 350/351 and 354. Adaptable to Ampex 300 and most other professional recorders.

INOVONICS
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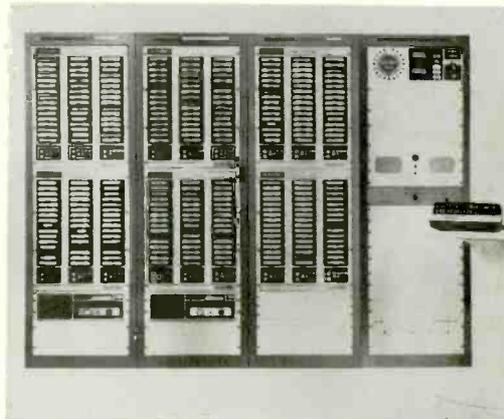
1630 Dell Avenue, Campbell,
CA 95008 (408) 374-8300

Circle 141 on Reader Service Card

NAB 1975



IGM will stress virtues of Instacart.



Schafer's 903 system uses all-cart Autofile system.

Corp. has a new production switching system, the Model 558 "Dual Key," (details in booth listings below). Central Dynamics will demonstrate "live" their VSP-1246 audio/video switcher as a companion to their PEC-102 tape editing system. Computer Image has a whole new line of video controllers with comprehensive special effects built in.

Datatek will show its line of video/audio routing switchers. Dynair has a new series, the 1400, with 10 or 20 video inputs in a basic module, expandable, adaptable to remote logic control. Dynasciences will have their widely-known line of video processing and switching equipment. Grass Valley will have their comprehensive line of switching and special effects units. TeleMation will have a compact video/audio distribution switcher, Model TVS/TAS 1000 unveiled at last year's NAB.

In other words, there is no supply problem for switcher buyers. The shelves are full.

continued on page 54



Unretouched monitor photograph of an off-the-air ABC network program, November 26, 1974, at 2:20 P.M.

Electronic Video Compression is no Big Thing!

It's just another little first from CVS. It lets you shrink a video picture and place it where you want it.

Video Compression is a capability optionally available with the CVS 600 Digital Video Synchronizer. Now you can not only lock an incoming asynchronous signal to station sync automatically but reduce that video signal to one-fourth size and locate it in any one of six positions on the CRT. The output of the Video Compressor is keyed for mixing with other signals.

The basic CVS 600 does the synchronizing job with less than half the power, one-third the weight, and less than one-third the rack space of the only other synchronizer available. And the price—compared to the other unit, it will save you about \$15,000.



The CVS 600 and the Video Compressor are now in production. If you would like some literature on the products or would like to see a video tape of what it's all about, just let us know.

See you at the NAE '75
Booth 109, North Hall.



Consolidated Video Systems

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The No. 1 number for
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A collect call to the above number will bring you all the facts you need to know about tape cartridge equipment. One call will establish a working relationship between you and our broadcast oriented people...a relationship that delivers dependable performance at a truly competitive price. The relationship will last as long as you use ITC equipment...in the selection of equipment, proper servicing, and adaptation of machines to your broadcast requirements. If you're thinking tape cartridge equipment, find out why hundreds of stations depend on ITC.

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The TRI EA 5 Movieola-like editor.



Datatron Vidicue 5050 is big in ENG.



Central Dynamics will have low cost EDS-2—editor and this computer-controlled PEC 102 unit.

**Automatic Color Balance
Corrector is Back Again**

As long ago as NAB Convention time 1971, CBS Labs announced an automatic color corrector that would operate unattended, on line, and real time. Several such units were installed (BM/E, June 1971). Unfortunately the unit would occasionally "correct" flesh tones to green if there weren't some totally black and white scenes present to properly establish a reference. Now CBS Lab engineers delivered a paper on the subject at the International Broadcasting Conference in London last September and will expand further on the subject during one of this year's NAB engineering sessions.

What follows are a few highlights as drawn from the presentation in London. In effect, the unit duplicates the decision-making process of a human operator. This takes quite a bit

of electronics but IC's and logic make it possible.

The starting point is a properly encoded signal:

- A true black signal that does not have any luminance level other than set-up and no chrominance components.
- A true white signal that has a maximum luminance level and no chrominance component.

If a chrominance component is present, its relative phase and amplitude is determined and a signal generated to cancel it out of the incoming encoded signal. In practice, the top six or seven IRE units (94-100) are established as white and the lower five IRE units as black.

In the past, it was the extremes of the B - Y axis and either deep dark blue or high pastel yellow that created the trouble. In order to cope with these signals, CBS designed a circuit which

continued on page 56



More than just a pretty face...for a lot less!

This is the new Amtron AM-12... a compact color video monitor with no-nonsense features for a wide variety of professional uses in broadcasting, cable operation, education, business and government.

Features such as the ultra-dependable single-gun color system which displays pictures of superb colorimetry... sharper, brighter and inherently free from moire and convergence problems.

The AM-12's handsomely styled, too... only 26.7 cm (10.5 inches) of standard 48.3 cm (19-inch) rack space. All operating

controls are neatly recessed on panels flanking the picture tube. Separate R-G-B gun switches are standard, permitting "blue gun" set up of hue and luminance. Also standard are switchable underscan and internal/external sync. There's even a talley light. No extra charge.

There are options also... A-B selection of video inputs and independent horizontal and vertical scan delay (pulse-cross display).

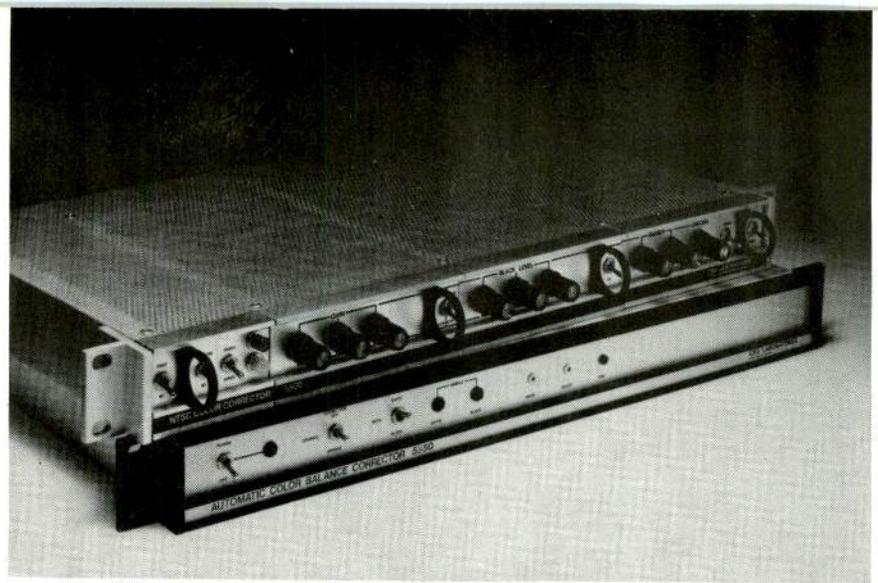
But perhaps the nicest feature of the Amtron AM-12 is the low price... only \$975.

The honest-value compact color monitor

AMTRON AM-12

detected the extremes at either side of the R - Y and B - Y axis. In this manner, a limit logic for these extreme colors was established. The corrector is instructed to ignore certain colors in the high or low luminance area. An important reason why in practice one can operate successfully with colored objects at white or black is that the ACBC has four feedback sampling loops each containing an integrator that stores all of the samples taken over the whole frame and acts on the average to determine the proper correction. A more serious problem is that one can not assume that there will always be white in the picture, or that the white will not rapidly come and go. If the incoming signal levels are not properly maintained, the unit may never detect white. If the level is too low there is not much you can do about it because this might have been the intention all along. (If you increase the gain of the signal so that the unit has an average white, it could make a major mistake.)

A sampling gate level in proportion to the white level, that is "AGCing" gate, allows CBS Labs to track whites above maximum level. This floating gate will follow the video if the levels are too high and as such will guarantee that sampling is in the right part of the signal. If the level falls below the minimum video level to be samples (93 IRE units), all further white color



The new CBS automatic color balance corrector.

balance correction stops.

Changes in corrections due to the loss of white sampling or acquisition of sampling should not result in immediate correction since fast responding corrections in these cases lead to color flashing. However, holding correction until a new sample comes along, regardless of how long, can lead to serious errors—particularly if the new film is switched in. Therefore, a compromise mode was selected in which an error correction is made and maintained for a certain length of time after which a slow return to zero will follow.

In the actual equipment, demodulated R - Y and B - Y are sampled and the result enters an op amp integrator. The integrator stores all of the samples for the frame. Also contained in the integrator is a digital

sample and hold which is updated by a clock whose rate is programmable. The clock rate is changed, depending on whether or not samples are being accumulated in a field. This allows independent selection of the correction clock or "attack time" and the return to zero clock or the "release time." If the return to zero clock jumper is left out, the corrector will hold the last correction and only update, as new corrections are received.

The outputs of the four digital samples and holds are DC voltages representing the residual chrominance existing in the highlights and lowlights. These control voltages are then fed back into the DC inputs of the manual corrector in a negative feedback manner. The loop is stable due to the relatively long time constant of the digital sample-and-hold.

Complete Listing of 1975 NAB Exhibitors

AKG Microphones (Booth 215)

Full line of dynamic microphones.

Acrodyne Industries (Booth 711)

Will show a 1 Kw translator for television; a 1 Kw rf amplifier; a 10 watt linear amplifier for a variety of functions in television; a mini-transmitter for television for both tape and live video within a local area on standard VHF channels.

Alford Manufacturing Co. (Booth 119)

Will be showing TV antenna systems, FM antenna systems, ITFS antennas, diplexers, coaxial switchers, filters, and rf measuring equipment.

Allied Tower Co. (Booth 1008)

Various tower models for broadcasting antennas; complete tower service.

Amco Engineering Co. (Booth 813)

Will show styled cabinets, consoles and small instrument cases for the broadcast industry.

American Data Corp. (Booth 329)

Will introduce a new video production switching system, the Model 558 "Dualkey," which can chroma key and title key over A/B transitions on each mix/effects amplifier and has quad split, pattern modulation, and a large repertoire of special effects. Also showing: the Model 900 routing switcher with multi-controls; the 1100 Series VIR test sets; the 1200 master clock and econoline terminal systems.

American Electronic Laboratories (Booth 404)

Will feature a new FM exciter, Model FM-20E. Also showing the complete line of AM and FM transmitters.

American Electronics Inc. (Booth 905)

Products include remote pickup microphone amplifier and control unit to work with standard telephones.

Ampex Corp. (Booth 207)

New equipment is under wraps until show time, but company is expected to unveil a surprise in electronic news gathering area AVR-2 will be a central attraction however. The ACR-25, time base correctors, and studio cameras will also be shown. New U-matic cassette will be shown.

Ampro Corporation (Booth 910)

Will introduce a new line of audio consoles—mono-, dual mono, stereo, dual stereo, and simulcast, in rotary and slide fader versions and all modular plug-in circuitry. Also showing an

continued on page 60

The Art of Sound

Experience new dimensions in sound. With console configurations embodying a comprehensive series of new high performance modules. Trend setting systems combining operational flexibility with aesthetic appeal.

Ward-Beck continues to move ahead with dynamic designs, performance standards approaching theoretical limits, and uncompromising quality, to bring you the kind of equipment that you always hoped might happen.



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290 Larkin Street,
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Ward-Beck Systems Ltd.,
841 Progress Avenue, Scarborough,
Ontario M1H 2X4
Telephone (416) 438-6550. Telex 06-23469

NAB 1975

update of electronic splice finder for Ampro cart recorders.

Andrew Corporation (Booth 323)

Will exhibit a line of rigid coaxial transmission lines, coaxial switches, semi-flexible Heliac transmission lines, microwave waveguides, antenna for S-T-L.

Angenieux Corporation (Booth 321)

The feature will be the **Angenieux 15 to 1 zoom lens**. Also shown will be the **18 to 1 turreted remote lens**.

Asaca Corporation of America (Booth 600)

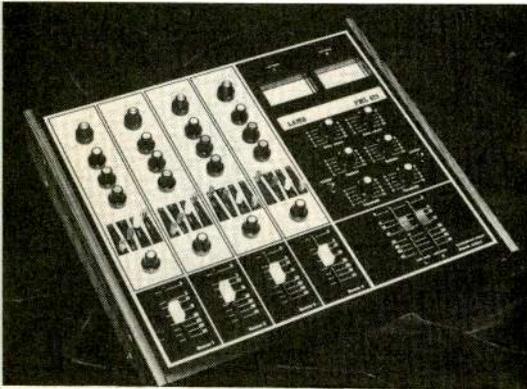
Showing the **portable color cameras**, Models ACC-3000 and ACC-5000. Introducing a **four-head portable VTR for 1" Tape**.

Audio Designs and Manufacturing, Inc. (Booth 205)

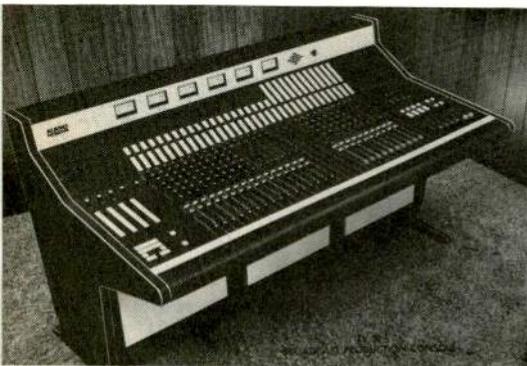
Theme is "Audio is Alive and Well." Will show a new line of **audio consoles** designed specifically for broadcasters; also a **station intercom**, **audio distribution amplifiers**, and various components.

Audio Services Co., Inc. (Booth 915)

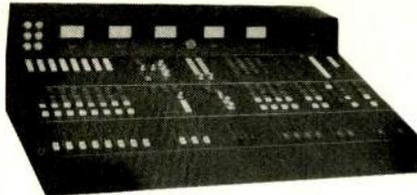
Custom audio consoles, **Network Q system** that will turn on equipments as result of audio tones sent over UPI wire, and new EBS encoder-decoder.



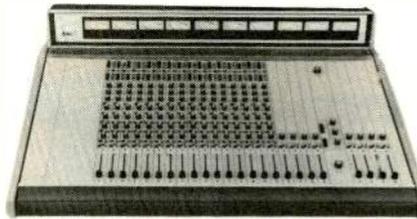
Audio Designs will show this TV production console.



New Lamb mixer will be at Revox exhibit.



Automated Processes' broadcaster console.



Cetec console will be in Sparta exhibit.



Robins/Fairchild Model 1632 console.

Auditronics, Inc. (Booth 1014)

Will display modular professional recording/remixing/on-air **audio control consoles** that will accommodate up to 24-track recordings for broadcast production and on-air applications. Also showing Model PEQ-82 program equalizer for modern signal processing.

Autogram Corporation (Booth 1015)

Will feature three major products: the Autogram **automation system**; the AC-10 console, 10-channel mono/stereo/dual; and the AC-8. console, 8-channel, mono only.

Automated Processes, Inc. (Booth 810)

A new exhibitor this year; will show a new **audio control console**, Model 1604, with modular components; the Maglink synchronizer, for synchronizing audio and video tape machines; the full line of audio plug-in units.

BASF Company (Booth 1208)

Line of magnetic tapes for audio.

Ball Brothers Research Corp. (Booth 213)

Will show **monochrome and color monitors** for broadcast television; digital display monitors; waveform monitors; video processing amplifiers.

Belar Electronics Laboratory (Booth 307)

New products are the AMM-2, AM

modulation monitor; and the **antenna monitor**. Also shown: full line of AM, FM and TV frequency and modulation monitors and accessories.

Berkey-ColorTran, Inc. (Booth 416)

Showing the Memory Center, **automated lighting control**; a new **lensless spot**, the Colorspot, which has double the light output of comparable units; also complete lighting systems, studio and portable; including the European style grid system.

Bird Electronic Corporation (Booth 110)

High-power digital watt-meter for coaxial lines, measuring to 520 MHz and 1 kW. Also showing: range of RF watt-meters, loads, Moduload terminating systems, heat exchangers, power monitor/alarms, VSWR indicators.

Robert Bosch Corp.

(See Fernseh Group)

Boston Insulated Wire and Cable Co. (Booth 414)

Will feature TV camera cables and connectors.

Broadcast Electronics, Inc. (Booth 235)

Will introduce the new series 3000 and 4000 **cart recorder/players** designed to exceed updated NAB 1975 specs (both incorporate automatic decks with an air-damped solenoid and direct tape drive); also showing Spotmaster single and double cart machines; Spotmaster audio consoles; Modtech monochrome video monitors.

Burwen Laboratories (Booth 1018)

Showing the line of **dynamic noise filters**, including the DNF-1100 for automated FM systems and for disc playback, the DNF-1500A for telco line feeds, optical sound tracks, etc.; the DNF-1500D for telephone talk shows, remote broadcasts, etc. Also showing the UN-201 universal mixing amplifier; the MP-2-2 microphone preamp, and the VU-306 peak detector for VU meters.

CCA Electronics Corp. (Booth 319)

Full line of broadcasting equipment for AM and FM operations will be shown from studio to transmitter. Also featured will be TV transmitters for UHF and VHF. A new line of **FM transmitters** will also be shown.

Cablewave Systems Inc. (Booth 611)

Line of transmission lines and coaxial cables. Both rigid and flexible types will be shown plus coaxial switching equipment.

Canon, USA, Inc. (Booth 114)

New lenses being introduced include
continued on page 62

**Here's the real lowdown.
Low noise at a new low price.**



With the new Mark IV Image Enhancer in your system you'll have an unbeatable signal-to-noise ratio working for you. Better than 55 dB. That means quiet enhancement like you've never seen!

Best of all, better enhancement now costs you less. We've just reduced prices!

So whether you're buying a new live camera or telecine, or updating your present system, don't settle for less. It just doesn't pay to fool around with imitation units. Specify Image Enhancers from CBS Laboratories, the people who created image enhancement. Available for NTSC, PAL or SECAM installations.

For technical information on the Mark IV series, write for Marketing Bulletin 74-01, contact your local distributor, or call us. We'll give you the real lowdown.

CBS LABORATORIES

A Division of CBS Inc.
227 High Ridge Road, Stamford, Connecticut 06905

NAB 1975

the **super-wide angle 10X** (12mm to 120mm, f2.0) for 1-inch hand-held television cameras; a new **25X double zoom** (16mm to 400mm, f2.1) for 1-inch color TV cameras; and a **34X field zoom** (24mm to 800mm, f1.8) for 1-inch and 1¼-inch cameras. Also showing are Canon Scoopic film cameras and lenses.

Capitol Magnetic Products Division (Booth 112)

The theme will be the multiplicity of

professional products offered. New products are: Audiopak A-2 SP **broad-cast cartridge**, which has a critical guidance system ensuring stability of stereo phasing. Other products: Audiopak A-2 broadcast cartridge; Audiotape studio mastering tape; audio film.

CBS Laboratories (Booth 103)

The feature attractions will be the Vidi-font **character generator system** and the new **automatic color correction system**. Will also show the line of **video processing equipment**—image enhancer, chroma insert keyer, sync generator, processing amplifier, color

test generator, distribution amplifier, time base corrector. The audio product will be in two sections, one for AM and one for FM broadcasters. Included: Audimax, Volumax; the dynamic presence equalizer; the audio distribution amplifier.

Central Dynamics Corporation (Booth 204)

Main attraction will be **TV station automation system**, including the CDL System 100, operating the Ampex ACR-25 automatically with random access capability (first time at NAB). Also in live demonstration: the PEC-102, **computer controlled tape editing system**, controlling three Ampex AVR-2's, including the CDL VSP-1246 video/audio switcher with special effects; also the EDS-200 Micro-computer videotape editor. Other products include the complete line of video master, production, and routing switchers, pulse distribution systems, chroma keyer, processing amplifiers.

Cetec Audio, Div. of Cetec Corporation (Booth 312)

Will introduce two new **consoles**, the Series 10 Quad Console, and the Series 20 LM, Love Media control console, which handles up to 30 mic or line input channels, with 4-channel, 2-channel and mono output.

Chiron Telesystems, Inc. (Booth 703)

Will feature the Chiron II **character generator system**, with capacity for any type font or wide range of graphics material, including logos, symbols, etc.

Cinema Products Corporation (Booth 617)

Will feature the CP-16R reflex **16mm camera** with automatic exposure control and illuminated information display in viewfinder. Also showing **crystal wireless receiver** for 16mm sound; Angenieux 10-150mm zoom lens; lighting kits, tripods, other camera accessories.

Cohu, Inc. (Booth 219)

Feature item is the new Model 1550 **color film camera**; other items are the sync generator, sync changeover, distribution amplifier, dot bar generator, encoder/enhancer/balancer.

Collins Radio (Booth 300)

A **new line of FM transmitters** will be shown for the first time. Known as Generation 4, the new line is built around a brand new direct FM exciter, the Phase 4, has four unique distinctions: it is the only exciter with IM distortion guaranteed to be as low as 0.5%; it has a frequency stability guaranteed to be not more than ± 100 Hz; stereo separation

continued on page 64

Cool kits for hot camera crews.

Only famous laniro lighting fixtures, (the ones you get in Strand Century lighting kits), give you cool-to-touch fiber glass housings, for safe, comfortable handling at any time. And only Strand Century kits give you superbly rugged carrying cases for years of trouble-free use.



Strand Century kits offer the best kit value available anywhere. Light weight. Sturdy, durable stands. Easy to adjust during use. Smooth, even light distribution. Quick heat dissipation for fast pack up.

For use on location, and in the classroom, or wherever rugged portables are needed, insist on Strand Century lighting kits. Write for details to National Director of Television/Motion Picture Sales,

Strand Century Inc
20 Bushes Lane,
Elmwood Park, N.J. 07407.

STRAND CENTURY INC

A COMPANY WITHIN THE RANK ORGANISATION



See us at the NAB. Booth #605

New Sony U-matic news team... from action to broadcast in 30 minutes.



Or even less time. With less equipment. And at less total cost than you're probably paying now for news-gathering and teleproduction.

The major networks, ABC, CBS, and NBC, and many stations nationally are using the new Sony U-matic VO-3800/2850 Videocassette System.

All your work is done on economical, reusable videocassettes. After location taping, either microwave the signals or send the cassette to the studio for quick and accurate editing. Or go right on the air with the use of a time base corrector.

You eliminate film cost and processing time, especially when important events break close to air-time deadlines.

You start with the Sony VO-3800 portable VideoRanger™ recorder and a color camera, such as the Sony hand-held DXC-1600. The VO-3800 can record three 20-minute cassettes on a single battery charge. It has NTSC color and EIA monochrome standard signals, remote control, two separate audio tracks, automatic power shut-off, and on-the-scene playback capability.

Accurate electronic editing is achieved with two Sony VO-2850 mastering recorder/editors and the Sony RM-400 Remote Automatic Editing Controller. The RM-400 provides search, pause, and automatic back-spacing. The VO-2850 has a signal-to-noise ratio in excess of 45 dB for video and audio, also separate editing capability for video and two audio tracks.

Of course, the VO-3800 portable VideoRanger™ or the VO-2850 editor can be used independently of each other. In addition to electronic news gathering, these versatile new videocassette units can add new capability and economy in production of documentaries, on-site retail spots, and general studio use.

For complete information and/or a demonstration write us today. Sony Corporation of America Video Products Dept. BME-035-210 9 West 57th Street New York, New York 10019

Sony. The proven one!

Sony  **Color Videocassette System**

TV reception simulated.

See us at the April
NAB Show in Las Vegas



NAB 1975

is 35 kB min; it is the only exciter that will handle *any* of the proposed discrete broadcasting systems. Highlighted will be the 2½ kW model 831D-2, but the line extends from 10W to 45 kW. Also shown will be audio consoles.

Commercial Electronics, Inc. (Booth 105)

The main attraction will be the new Minuteman **back-pack color camera**, CEI-290 with camera weight of 19 pounds, back-pack operable up to 600

feet from camera. Also showing: the CEI-280 broadcast color TV camera, with full remote control, 600 lines of luminance resolution, using 3 Plumbicon tubes; the CEI-435 medical/industrial TV camera, operable in most available-light situations, also with full remote control.

Compu/Net (Booth 511)

Automation systems which indicate availabilities, inputs for automatic scheduling, and automated billing will be demonstrated. Systems for both

radio and TV will be shown.

Computer Image Corporation (Booth 1106)

Will introduce a new line of **video controllers**, incorporating vertical interval switchers with compatible control, mix/effects amplifiers, linear keying, parallel video processing; pattern generator with more than 105 special effects.

Computer Magnetics Corporation (Booth 1009)

Will show **video discs** and **heads** for slow-motion; refurbished Mark Z (for the first time) and Mark XX video head assemblies; audio stacks and audio heads.

Comrex Corporation (Booth 1013)

Will feature the 450 MHz **broadcast remote system** for electronic journalism applications, providing pickup of sports and news events. Also showing: cue transmitters and receivers, mobile repeater systems and TV off-air receivers.

Conrac Division, Conrac Corporation (Booth 108)

Main attraction will be the **Colormatch Theatre**, with a videotape presentation showing colorimetry differences, featuring the RHB monitor. Also showing the line of **color and monochrome monitors** for broadcast, industrial and educational applications.

Consolidated Video Systems (Booth 109)

The CVS 504 digital video signal corrector for time base correction will be shown. Highlighted will be the CVS 600 **digital video synchronizer** designed to automatically lock a non-synchronous NTSC broadcast TV signal to station sync. Mixing and switching without a glitch is possible.

Continental Electronics Manufacturing Co. (Booth 302)

Will show 5 kW, 10 kW AM **broadcast transmitters**. Will have a graphic display of a 2-megawatt transmitter under construction for Yugoslavian radio system.

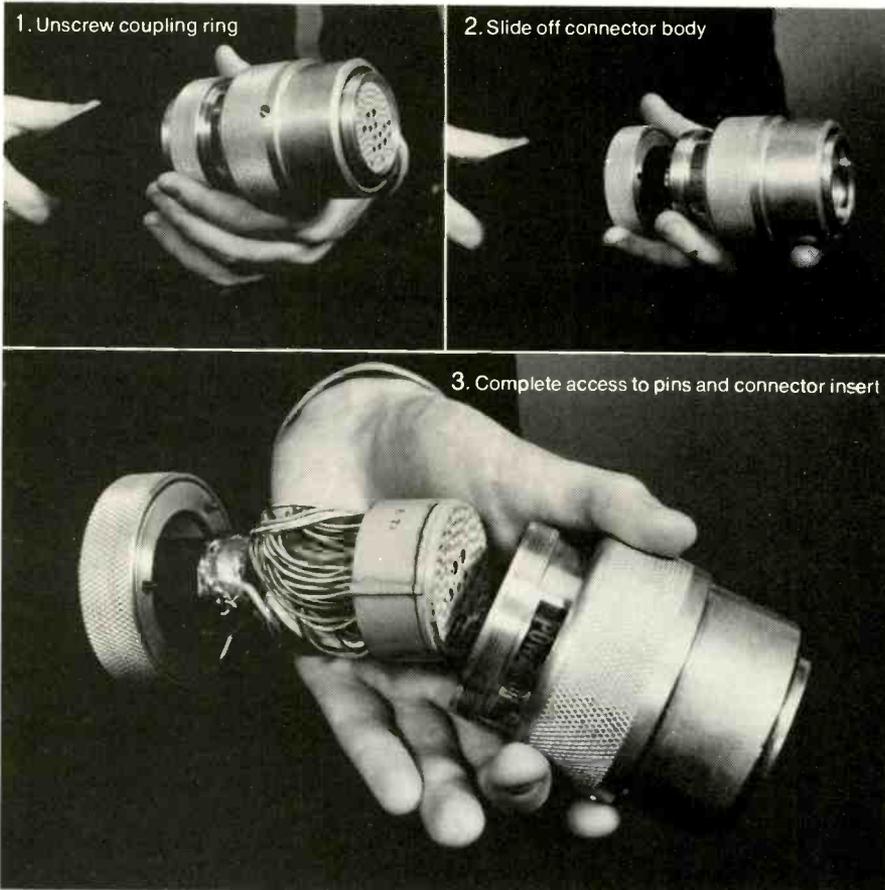
Control Design Corporation (Booth 1006)

Will introduce the new CD80L **English-text logging system** with 80-character solid-state encoder, 30 cps printout; also the new CD-10-P **reel-to-reel reproducer** with internal 25 Hz sensing, designed for broadcast automation systems. Also, the entire line of modular automation equipment.

Cooke Engineering Company (Booth 709)

Will show **time distribution equipment**; also the Dyna-Mite line of audio,

continued on page 66



Field-repairable

A damaged TV cable connector can put a camera out of action just when you need it most. But BIW cable with the new #85C Field-Repairable Connectors can be fixed on the spot. These unique connectors are easily disassembled for fast access to damaged pins or other

problems. No special tools required. Available in mini and standard sizes. Both East and West Coast facilities assure prompt supply and fast service on BIW cable and cable assemblies—the line preferred by local TV stations and every major TV network.

Boston Insulated Wire & Cable Company

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See us at NAB—Booth #414



the ultimate in **Turn-Key** construction

The McCurdy approach to engineering and construction of a packaged system allows the user to easily locate his new equipment without the added burden of wiring to auxiliary equipment.

All aspects of the broadcast function, from news booth to music production center, can be assembled into a unique and functional package.

Each system is fully pretested as a total functional unit and will meet or exceed all broadcast specifications.

FEATURES OF THE SYSTEM SHOWN ABOVE

- All inputs and outputs to the system are normalled through jacks and wired to blue ribbon connectors, (for convenience of service and transportation).
- Audio and D.C. interface to an automation system.
- Remote control of reel, turntable and cartridge machines.
- Program routing switcher to delegate audio to telco lines.
- Switchable A.G.C. control on all microphone mixers.
- Equalization can be delegated to any mixer or program channel.
- Included in the package are tone and digital information generators which are used in the production of tape and cartridges for playback in automation systems.

McCURDY RADIO INDUSTRIES INCORPORATED

1051 CLINTON STREET, BUFFALO, N.Y. 14206 (716) 854-6700

108 CARNFORTH RD., TORONTO, ONT. M4A 2L4 (416) 751-6262

See us at NAB, Booth 408



NAB 1975

video, and pulse distribution amplifiers.

Corning Glass Works (Booth 1209)

A new line of image enhancers will be shown.

Cox Data Systems, Inc. (Booth 815)

Will display a new total in-house **broadcast information system** for sales, traffic, accounting and operation.

Data Communications Corporation (Booth 909)

Showing the "**BIAS**" data processing system for broadcast stations, in an updated version of higher capacity (BIAS 2), using the Burroughs 6700 computer. Also, designs for interfacing data processing systems with automated switching systems, for total automation.

Datatek Corporation (Booth 715)

Will display **transmitter color phase equalizer** and **waveform corrector systems**; video/audio routing switch-

ers; envelope delay measuring sets; video/audio/pulse distribution amplifiers.

Datatron, Inc. (Booth 602)

Will introduce a new **three-machine electronic editor** capable of working either with quad or helical VTRs, expandable to include computer capability. In general, emphasizing their modular SMPTE time code electronic video editing systems, allowing purchase of needed elements with later expansion as wanted, including completely automatic computer control. One system on dynamic display will be for use with two Sony 2850 VTRs in electronic news gathering.

Datavision (Div. of Mincom, 3M) (Booth 706)

Feature is the Model 3400 **video titling system**, now with a 1000-page random access disc memory and multiple-style fonts.

Delta Electronics, Inc. (Booth 217)

Will show digital antenna monitor and remote control system; field sync meters; operating impedance bridge; receiver-generator; current transformers; meter jacks.

Dielectric Communications (Booth 1016)

A new line of RF instrumentation will be shown including RF wattmeters. RF loads will also be shown as well as tower strobes.

DiPol Electronics, Inc. (Booth 1001)

Line of custom audio consoles.

Duncan Electronics Inc. (Booth 1104)

Continuous resolution potentiometers for audio level control.

Dyma Engineering (Booth 2002)

The main attraction will be the new TVR-77 **fourteen-mixer audio console**, which has capability for complete remote control for audio-follow-video; inputs changeable from mike to line or vice versa by changing input cards; full motion tape machine controls; digital clock and elapsed-time timer.

Dynair Electronics Inc. (Booth 303)

Will introduce the new Series 1400 **video switching equipment**, with 10 or 20 video inputs on basic module and 20 video outputs, with optional binary decoder and memory system allowing use of zero to 5 volt logic coded outputs for control.

Dynasciences Corporation (Booth 619)

Will introduce three new **image enhancers**, Models 834, 854, 877. Will also show line of **video processing and switching equipment**; video, pulse and subcarrier distribution amplifiers; sync generators; text equipment; auto-

continued on page 68

Automation...

**MORE PEOPLE TODAY
ARE BUYING SMC
AUTOMATION THAN EVER
BEFORE . . . WHY?**

- Control of air quality
- Ease of operation
- Control of payroll
- Investment credit
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**Phone or Write
For FULL FACTS!!**

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for a good sound reason

Send complete information and prices on SMC DIGITAL.

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Fewer parts... fewer problems with **audiopak® A-2** broadcast cartridge

*Ribs are molded into the flange —
no pencil leads
to break and jam.*

*No top wire.
Reloading's easier.*



*Tape guide is
an integral part of
the cartridge base
— not glued in —
to insure accurate azimuth control.*

Try one free

In the broadcast cartridge world, the simpler the better. That's why the design of the audiopak A-2 eliminates parts that can give you trouble.

The lessons learned from our years of experience developing the world's leading 8-track cartridge have been applied to our audiopak A-2. The result is a more durable, more reliable broadcast cartridge. And because we manufacture the entire product — from tape to packaging — we can assure you of the highest possible quality control.

We're so sure we have the best product on the market, we want to prove it... at no cost to you. For

your free sample and more information on the audiopak A-2 broadcast cartridge, write on your company letterhead to: Capitol Magnetic Products, Division of Capitol Records, Inc., 1750 North Vine St., Los Angeles, Calif. 90028. Attention: Marketing Manager, Professional Products.

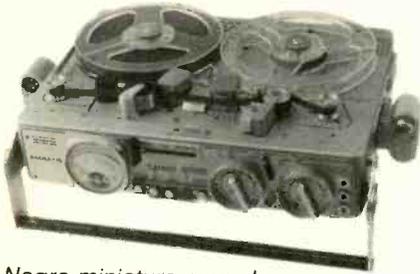


CAPITOL MAGNETIC PRODUCTS
A DIVISION OF CAPITOL RECORDS, INC.
LOS ANGELES, CALIFORNIA 90028



TM OF EMI LIMITED

Circle 152 on Reader Service Card



Nagra miniature recorder.

matic programming systems.

**Eastman Kodak Company
(Booth 206)**

The theme is "Film as a Television Medium"; the feature will be a **film chain** using Eastman 16mm and 8mm projectors and the RCA TCP-1624 cartridge film projector. Other products: the Supermatic **film videoplayer**; new Eastman news film.

Editel Productions, Inc. (Booth 806)

Showing the ENC **hand-held camera** for NTSC or PAL color operated directly from back pack; also their custom-built mobile vans for video pickup.

Electro Sound, Inc. (Booth 1007)

The main attraction will be the **ES-505 recorder-player** series of open-reel machines. New product to be shown is the ES-2000 two-track mono/stereo tape duplicating system especially designed for broadcast, program syndicators, and production facilities. Also shown: the Electro Sound patented capstan idler, available as replacement part for other tape machine brands.

Electrohome (Booth 1110)

Line of black-and-white and color monitors featuring low price.



New ITC professional recorder.



New Ferrograph recorder in Elpa booth.

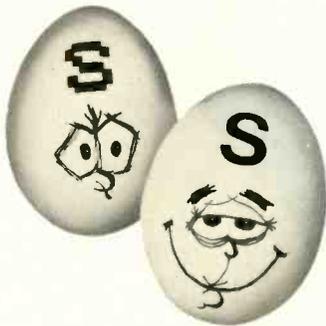
Electronics, Missiles & Communications, Inc. (Booth 410)

UHF and VHF TV translators, 1 watt to 1 kW; TV antennas, ITFS systems, multi-point distribution systems.

**Elpa Marketing Company
(Booth 917)**

Will feature the Ferrograph Studio 8 professional **tape recorders**. Record-ers have dc servo capstan drive, inter-

continued on page 70



Datavision D-3000 Generates Characters ...Smooth on the Curves!

The most significant feature of any character generator is the quality of the characters it generates. Simple. Character quality shows in the smoothness of curved letters and numerals. An obvious "stair-step" tells you that the manufacturer skimped by using less elements in the matrix.

The Datavision D-3000 has 1120-element character resolution, as good as the most expensive equipment on the market, and at significant cost saving. Plus, the D-3000 is loaded with other features: two character sizes; two independent output channels; 3 speed roll and crawl; character edging; word flash; automatic centering; and optional D-4000 Random Access Storage System.

For all the facts, and a free on-site demonstration, phone (301) 948-0460 or write: Datavision Video Products, Mincom Division, 3M Company, 15932 Shady Grove Road, Gaithersburg, MD 20760.

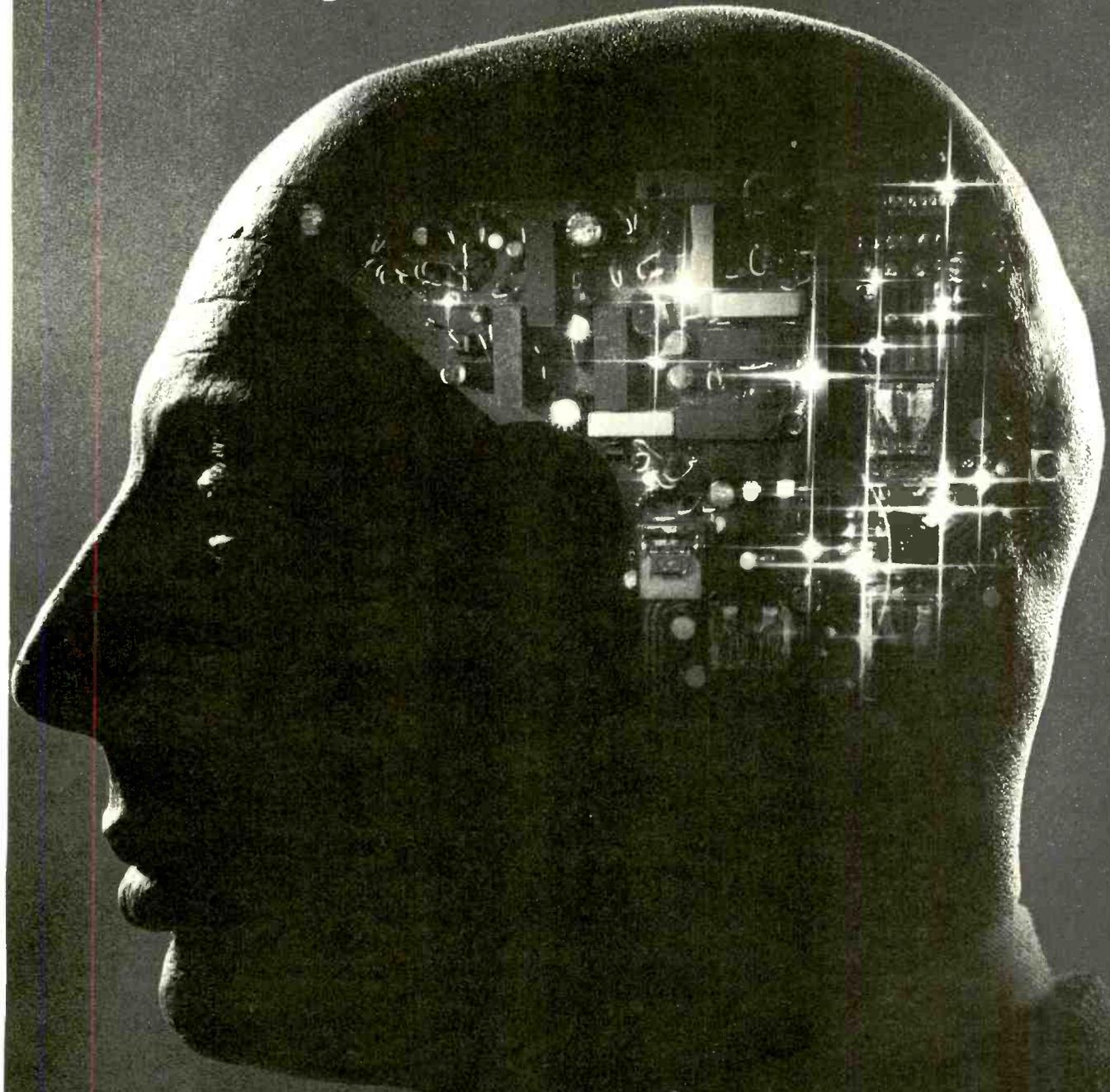


D-3000...you're a smoothie!

Datavision Video Products **3M**
MINCOM DIVISION COMPANY

See us at NAB 1975, Booth 706-S

Can a chief engineer afford to think only like an engineer?



Put a good picture on a TV set.

That's always been the first thing a chief engineer has to think about.

But it doesn't seem to be the only thing anymore.

Today, more and more chief engineers are thinking more and more like station managers.

They have to. They've got staff meetings to go to, they've got equipment to buy, they've got cameramen to keep happy, they've got program directors to keep happy.

Now they've got this whole new thing of electronic journalism to think about.

How can their station adapt?

Most agree the way to do that is with one of those little portable color videotape systems.

But what about the chief engineer who doesn't agree. What is he thinking about.

Probably not about the guy sitting

at home in front of his TV set—who doesn't know anything about film or tape or any of it.

All he knows is that he sees the news or he doesn't.

If there was a fire downtown at 4 o'clock and he hears about it on the radio driving home, he wants to see it at 6 o'clock. Instead of hearing about it. Again.

And if one station can get that kind of news on the air consistently, chances are the guy at home will be watching that one station. Consistently.

And chances are that station will be using the Akai VTS-150, the portable color videotape system that's being used by more stations in more states than any other system.

If you'd like to find out why, just write us and we'll send you a brochure.

If you'd like to see why, just write us and we'll come and show you.

It's something to think about.

AKAI™

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Circle 154 on Reader Service Card

NAB 1975

changeable head blocks, automatic return-to-zero in any mode. Also showing: Ferrograph Super 7 tape recorders; Ferrotester; EDItall splicing equipment.

Emcor-Ingersoll (Booth 802)

Line of enclosures racks and cabinets for radio and TV equipment featuring **modular construction**. Also desks and pedestals.

ES Enterprises (Booth 1210)

Line of digital clocks and accessories for programmers.

Farinon Electric (Booth 1005)

Will show new **microwave systems** for the 900 MHz band, including the TR-900 for 6/24/60 channels, in narrow-band applications; and the SS900 for 24/60/120 channels, in medium-density applications. Also showing: other units in the complete line of microwave equipment.



Chiron character generator.

Fernseh Group (Booth 211)

The featured product will be the KCN **electronic-journalism camera**, with camera unit weighing 15 pounds, backpack separable up to 50 feet; and total weight of portable system, about 50 pounds.

Fidelipac, Div. of Telepro Industries (See TelePro)

Imero Fiorentino (Booth 606)

IFA color contrast evaluator kits will be shown. On hand will be lighting and studio design experts to discuss studio design and planning.

Flash Technology (Booth 1206)

Strobe lighting for towers including complete systems.

Fuji Photo Film USA, Inc. (Booth 607)

Emphasis on the H-701 **two-inch video tape**, and the U-Matic cassette with Fuji tape. Introducing Beridox, a new formulation for 3/4-inch cassette tape.

Fujinon Optical, Inc. (Booth 603)

Will introduce the line of **electron-beam-coated lenses**, available in the United States for the first time.

Gates Radio Company

(See Harris Corporation)

General Camera Corporation (Booth 1212)

Will feature the Model TGX-16mm, single system **sound motion picture camera** (new at the NAB), with new electronics, drive system, other features, weighing 13 pounds.

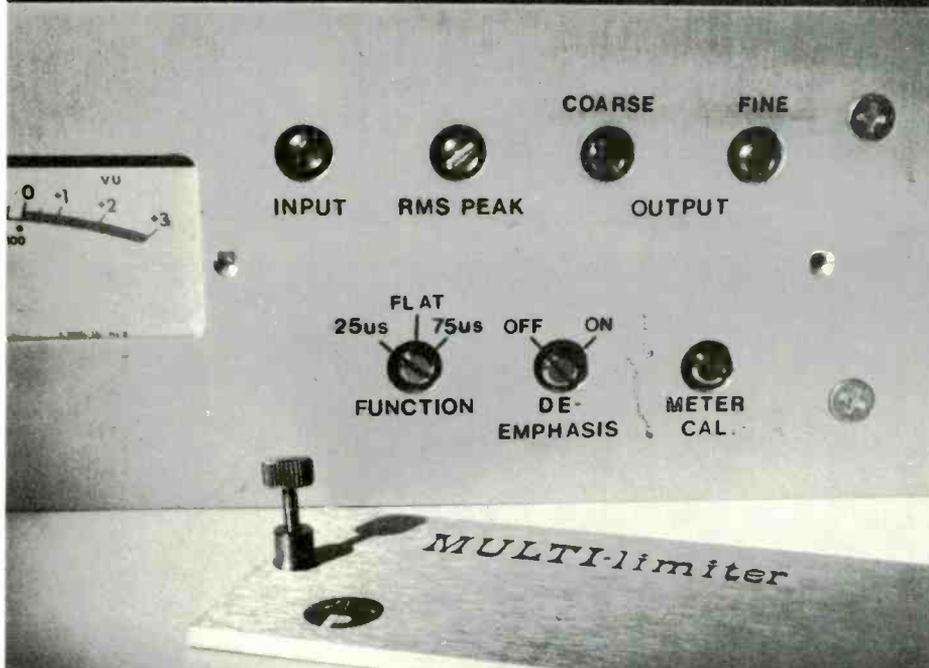
Gotham Audio Corporation (Booth 122)

Will introduce the Telefunken Magnetophon M12 **studio tape recorders**, with tape tension servo system and heads guaranteed for 15 years. Other products: EMT **turntable systems**; Neumann condenser microphones; Faylon console.

continued on page 75

LISTEN!

there is a difference...



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45 out



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RCA

records. Subjecting SQ records to the suggested encoding procedure will cause them to be double encoded so that they will not be optimally decoded in the receiver. It is desirable, therefore, for the station to provide a switching box that will allow the operating personnel to switch the equipment to conform with the type of program being broadcast, as shown in Fig. 5.

The SQE-2000 places in the hands of the program

manager a new and versatile tool for augmenting the available SQ record programs. With it he can broadcast four-channel tapes, live concerts, panel discussions, quadrasonic announcements, etc. Importantly, he also can bring to bear the resources of his existing stereophonic library, converting it readily into a pleasing and effective quadrasonic program fully compatible with the needs of the stereo and monophonic listener.

The New Sansui Encoder: QSE5B Goes To Many FM Stations

By Jerry LeBow

Since the invention of the first four-channel decoder four years ago, it became inevitable that FM stations would be broadcasting in this mode. The first decoders were outboards, an indication that the manufacturers of tuners and receivers weren't quite sure about public acceptance. That situation has now changed and outboards are now giving way to four-channel decoders built in tuner and receiver circuitry.

The question that now remains is which four-channel system to use and how to implement that decision.

There are definite limitations as to what can or cannot be done under current FCC rules and regulations: it is neither possible nor legal to add additional subcarriers to the existing FM spectrum without FCC action to change the rules. Five systems that do that have been proposed and were studied by the National Quadrasonic Radio Committee which will make a report to the Federal Communications Commission early this year. However, it will be sometime before the commission will complete its studies and will be in a position to make a decision.

There is, however, an alternative solution. Matrix broadcasting fits completely within current FCC standards and further is state-of-the-art four-channel broadcasting. The first use of the QS four-channel system took place in 1973 over WFMT in Chicago. This station broadcast an encoded version of the Boston Symphony Orchestra and began to produce their own four-channel material. However, it was not until the latter half of 1974 that a large number of major FM stations in this country decided that four-channel sound was a here and now proposition.

As a move in this direction, Sansui Electronics developed a special broadcast encoder called the QSE5B, specifically designed and engineered for FM stations. Design in this case means simple installation and extremely easy operation.

The availability of Sansui's QSE5B, of course, did not solve completely the problems of FM broadcasters. The need for software was still the major consideration and in most formats there just wasn't enough material for an FM station to make a major full-time commitment to four-channel. We constantly receive letters and telephone calls from stations asking our assistance in helping them to supplement their four-channel broadcasting activities with a synthesizing system using their current two-channel set up. In August 1974 Sansui showed its quadrasonic synthesizer at the Billboard Programmers Convention in New York with its need evidenced by substantial orders.

Mr. LeBow is a consultant to Sansui Electric Company.

Today there are more than 50 stations broadcasting QS on a 24-hour day basis. Each station uses the Sansui encoder in a slightly different way, depending on the format and the amount of four-channel material that is available. In supplementing programming with two-channel synthesized material, the QSE5B creates a surround effect which, when decoded through any four-channel decoder, results in a new sound dimension for the home listener. The stereo separation is enhanced by the creation of certain out-of-phase components resulting in sound that seems as though it emanates from beyond the speakers as well as from between them. Consumer reaction to this form of enhanced stereo has been nothing short of phenomenal and has been an added bonus for those stations broadcasting quad. This reaction, it should be noted, depends on having adequate separation between channels inherent in the matrix system, to give the program material the full sense of location and spread.

When a station plays encoded matrix records it is only necessary to switch the QSE5B encoder out of the circuit to let full quad effects be transmitted. If a matrix encoded record is broadcast through the encoder the only net effect is a slight reduction in four-channel and stereo separation but there is no major dislocation of instruments nor loss of information.

Quad broadcasting isn't restricted to the engineers at a radio station but is properly the concern of program directors, sales and general managers. This new broadcasting art form offers exceptional opportunities for individual expression by encoding live concerts, through the creation of four-channel commercials and promotional spots, and anything that can be evolved by the imagination of the program director.

From a sales viewpoint, quad broadcasting offers new revenue possibilities to radio stations through sponsorship by high-fidelity dealers, record companies, and manufacturers. From a promotional point of view, it offers a broadcaster an opportunity to build a market promotion around this new and exciting aspect of the station's profile. Many stations have developed outdoor television campaigns, newspaper campaigns, and others, around the fact that they are the first or the only four channel station in their market area.

Four-channel sound is here and is growing every day. Any station that wants to be broadcasting in quad can do so today, and can do so effectively with maximum audience participation. It is just a matter of time until four-channel broadcasting will have as much penetration and acceptance in the FM broadcasting market place as multiplex stereo today.

BM/E

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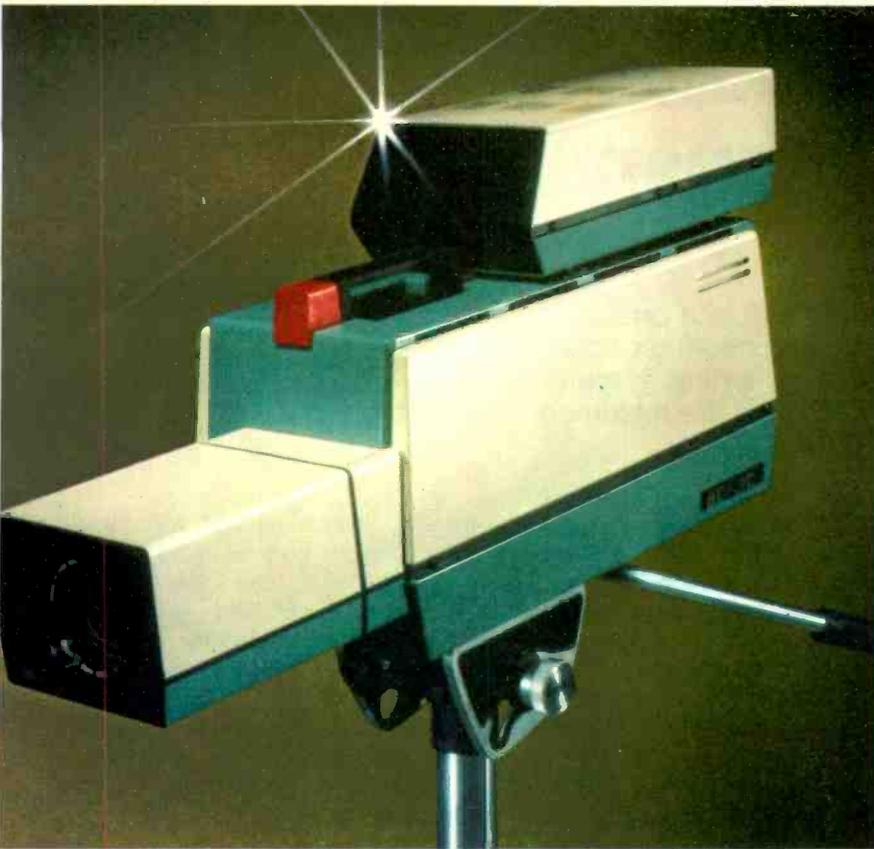
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How To Broadband A Television Transmitter

By Robert M. Crotinger

Tuning the transmitter for efficient broadband operations is one of the most important functions of a TV engineering department. It can't be done by "seat-of-the-pants" stagger tuning. Here is a step-by-step tuning procedure that will get the maximum transmitter power into the spectrum it must cover.

A quarter of a century ago, when the author made his first attempt at broadbanding a television transmitter, it was done with somewhat the same philosophy as "stagger-tuning the IF's of an All American Five." In the intervening years there has been very little written about the procedure. The people who make these very important adjustments have widely differing procedures varying from considerations for the expensive tubes involved, down to pure groping in the dark.

The tuning of a television transmitter is a *very* important part of the work expected from a station's engineering department and it is anticipated that this article may shed some light on a very "shadowy" subject. The attempt here is to outline some of the actual principles involved and relate them to the different variables that are being manipulated.

Making Power

To start the discussion, let us analyze one of the final results we hope to achieve. That is, namely, that we be able to obtain full sync peak power into a dummy load with 10% pedestal. The measured RF power is read on a peak-reading voltmeter, the maximum peaks occurring only during the time interval occupied by the sync pulses. However, looking at the frequency domain, this RF power will come from the sidebands produced by the sync pulse. In order to know the significance of the power reading to our broadbanding job we must know where the sidebands are in the spectrum that we are observing on the oscilloscope.

To do this we must know the Fourier series for a sync pulse. This can be found by assuming the sync pulse to be a square wave of one complete period, as shown in Fig. 1. The series is found for only one period, as shown, and the sine waves that we derive will be present for this particular time interval. The period consists of the five microsecond active pulse interval and the five microsecond "base." The first term of the series would be a constant representing the average, or dc, level of the pulse. In our case, the pulse being transmitted by amplitude modulation, this dc level is conveyed by the carrier. Since we are primarily interested here only in the sidebands, we can neglect this term entirely and devote our attention to the remaining terms.

We could solve for the exponential series and possibly show the relative amplitudes of the upper and lower sidebands. However, it is felt that the trigonometric

series is more generally understood and will clearly demonstrate the point. Merely keep in mind that the relative amplitudes shown in the "line spectrum" will represent the sum of both upper and lower sidebands.

There are several ways to determine the series; by integration of the pulse function for each of the two parts of the period, using the Fourier integral, or by graphic integration. However, this pulse is actually one of the simplest functions since it consists only of a constant during the active interval. The end result will be the series:

$$f(t) = \frac{4v}{\pi} (\sin \omega t + \frac{1}{3} \sin 3\omega t + \frac{1}{5} \sin 5\omega t + \frac{1}{7} \sin 7\omega t + \dots)$$

As might have been expected, the series consists only of odd harmonics. If we let $v = 1$ and plot the amplitudes of the significant terms as a line spectrum, we see that most of the power is contained in the first few terms. The succeeding terms will primarily contribute to the betterment of the rise time of the transmitted pulse.

For the purpose at hand, the thing to be gleaned from all this is that almost all the power that we will read on the reflectometer is coming from the sync sidebands lying within $\frac{3}{4}$ MHz of the carrier. These sidebands will be carried in the double-sideband part of the vestigial sideband response curve. Therefore, it is important that there be no "sag" in the response immediately above the carrier, and that a "shelf" be maintained in the response for $\frac{3}{4}$ MHz below the carrier. This is where we "make power" during calibration, and during normal programming.

The Response Curve

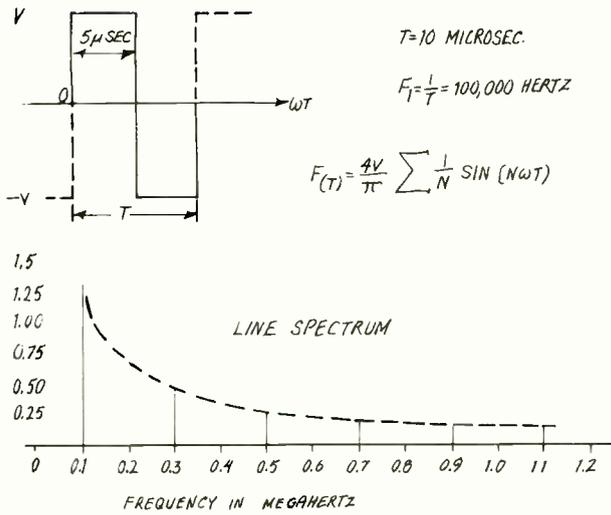
The usual method of broadbanding is to use a sideband response analyzer. It's internal oscillator generates a sine wave, the frequency of which moves across the passband. A good policy is to always check this "sweep" output with the scope to insure that its response is flat.

The receiver portion of the sideband analyzer is following the spectrum position of the sweep oscillator and detecting the received level. The sweep rate is 60 H and the detected dc level drives the vertical amplifier of the oscilloscope.

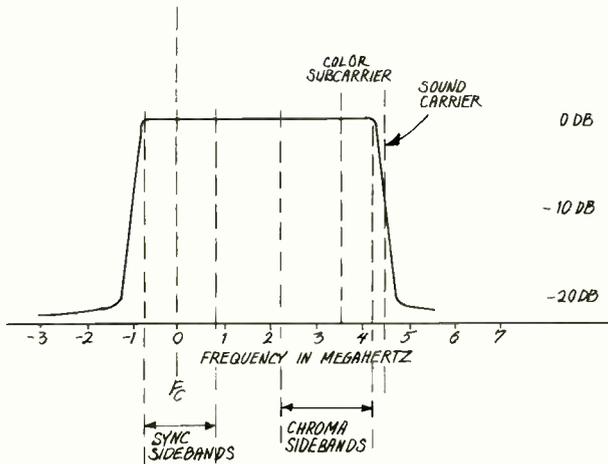
If it were possible to obtain, the ideal overall transmitter response would appear as in Fig. 2. The position of the sync sidebands and the chroma sidebands are shown.

While tuning, the thing to keep in mind here is that the curve represents the "power capability" of the trans-

Mr. Crotinger is Technical Director, KFMB-TV, San Diego, Calif.



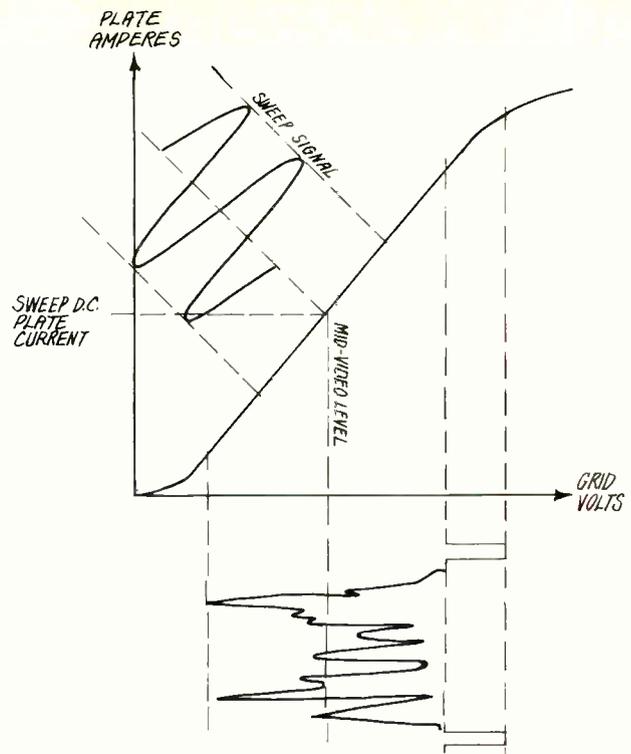
Sync pulse shown upper left is expanded into power series with Fourier formula to right; power carrying information will be in sidebands at odd harmonics of 0.1 MHz carrier, as shown in frequency plot below.



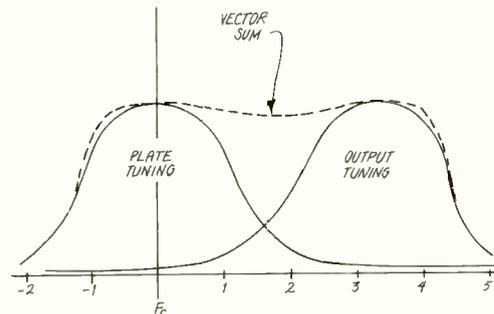
Ideal response curve is shown above. Goal in tuning for maximum power is to obtain as much area as possible under curve between the limits indicated; power at frequencies outside those limits is wasted.

mitter. It is best to decide on a setting for the vertical and horizontal gain controls for the scope and leave them untouched during the entire tuning operation. Since the area included under the curve is a direct indication of the efficiency of the stage under observation this can provide a valuable comparison. Normally broadbanding is done under CW conditions and as long as the plate input current is maintained constant the more area under the curve the better.

At this point it would be appropriate to mention the author's preference for CW conditions as compared to inserting the sweep on a pedestal level with sync. The reason for this preference is that I prefer to be concerned with only one sweep frequency at a time. If sync and blanking are present, the sweep signal passes through spectrum occupied by their sidebands. The sweep signal passes over the passband at a 60 cycle per second rate. However, time intervals must be taken out for the sync and blanking periods during which time the sideband series for the sync and blanking pulses are present in the passband. Unless the sideband analyzer receiver is disabled during these periods, it will respond to any of these to which it is tuned. Therefore, this method appears to be



Placement of sweep signal on linear amplifier stage transfer characteristic, for proper accommodation of composite video signal.



Overall resonance curve for broadband response is indicated above. Arriving at a proper curve requires very careful succession of adjustments, as detailed in story.

an unproductive complication.

The goal in tuning is to obtain as much area as possible between the limits of ¼ MHz below carrier and 4.25 MHz above carrier. There is no need to waste power amplification above and below these frequencies. However, notice that the response must fall 20 dB from 4.25 MHz to 4.75 MHz (the channel limit). At this frequency, this represents a slope of 336 dB per octave. This obviously cannot be attained by tuning the few broadband stages involved and removal of possible video sidebands in this area will be up to the sideband filter. Just bear in mind that flat response to 4.25 MHz is essential, and "pull in the curve" as much as possible above that. The same is true for the curve beyond ¼ MHz below carrier.

The Tube

From the standpoint of the tube, certain allowances must be made. Since most of the tubes involved will be operated as linear amplifiers (excluding grid modulated stages), let us consider the transfer characteristic for such a stage.

continued on page 145

Morning Coffee Thoughts On Sideband System Noise

By Clifford B. Schrock

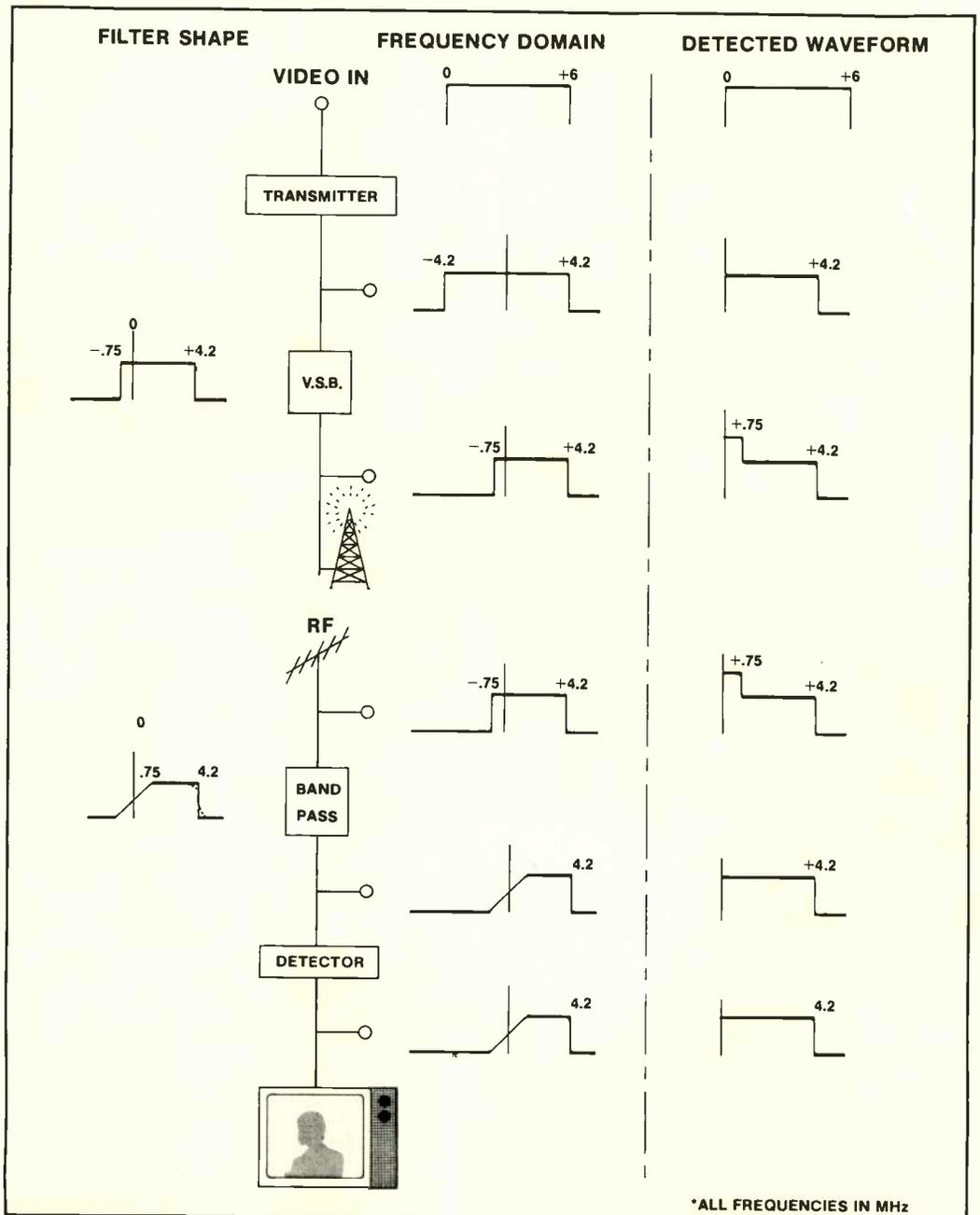
Within the vestigial sideband A.M. (television) transmission system, noise will be encountered and must be considered. Although many sources of noise can exist, we are going to limit this discussion to the noise normally encountered in the transmitting and receiving chain, termed 'white' or 'Gaussian' noise.

At first glance, it would appear that flat white noise (attributed to thermal noise) could be encountered at either baseband (video) or RF, and would arrive flat at the receiver terminals. This is, however, an *incorrect assumption*.

The Coherent Case . . .

Consider noise to be an infinite, random frequency source. In a specific case (Fig. 2) consider two instantaneous "specks" of noise at baseband. One is a .5 MHz and one is at 3 MHz for our example. After modulation, the noise would appear

Mr. Schrock is spectrum analyzer Program Manager, Tektronix, Inc.



Frequency-domain plot of video signal passband at various points in television transmission system, from video input through detector in receiver.

(Far right) Effects on two "specks" of noise of TV modulator, sideband filtering, recover nyquist slope and receiver detector.

*ALL FREQUENCIES IN MHz

as sidebands above and below the carrier. Passing through the vestigial sideband filter (VSB) the lower 3 MHz noise sideband would be attenuated to zero. The important point to be made at this time is that the + and - .5 MHz noise "specks" are COHERENT about the carrier at RF.

The Incoherent Case . . .

Now consider white noise encountered at RF. Although noise would cover the entire spectrum at any given instant, "specks" of noise would be random with relation to the carrier. Noise encountered at RF, in this case, can thus be considered to be INCOHERENT. Following the Coherent and Incoherent noise through the receiver chain, after bandpass and nyquist slope filters, the noise would still maintain the same apparent shape for each case.

The Inconsistency . . .

The detection process is where we discover the incon-

sistency. Coherent signals are detected as the sum of the products:

$$a + b = c, \text{ detected signal.}$$

Incoherent signals are detected as follows:

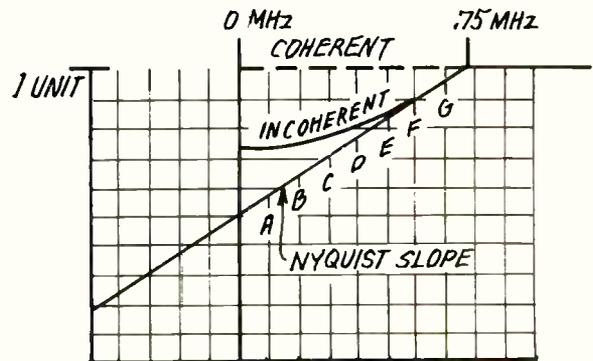
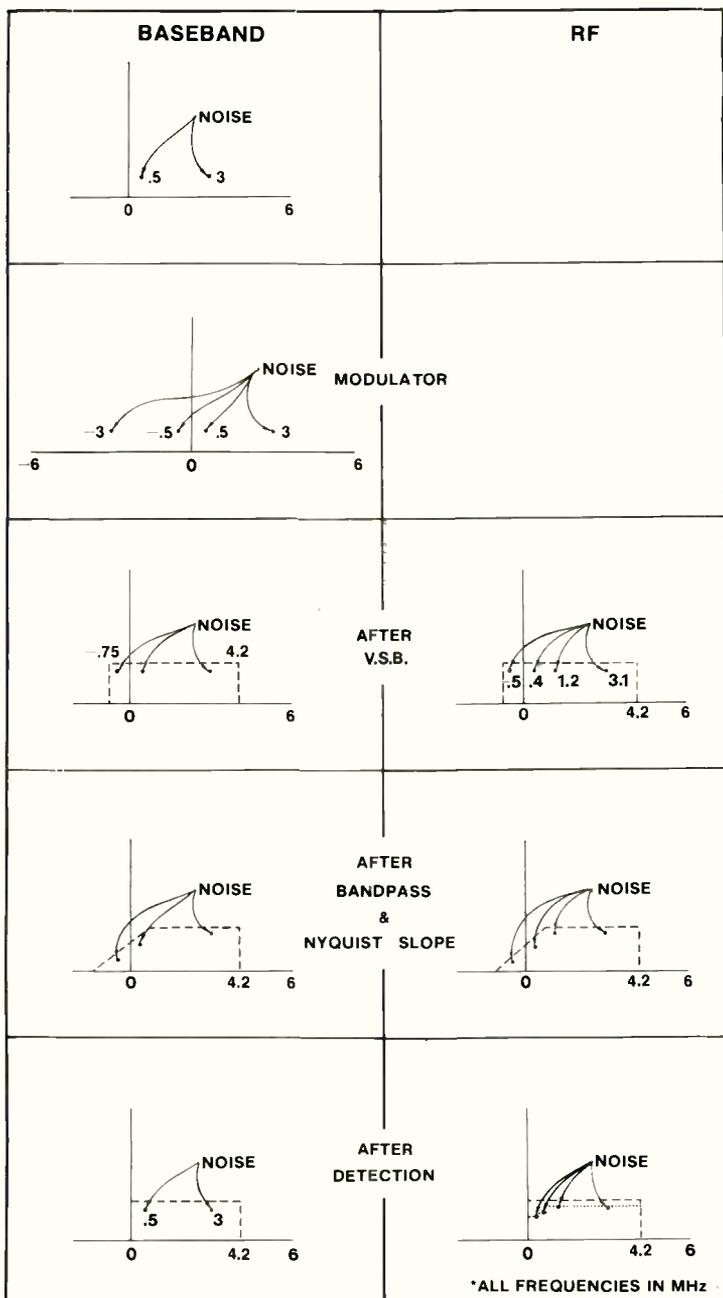
$$a^2 + b^2 = \text{detected signal.}$$

The results are illustrated in Fig. 2. To continue and do a series of approximations for both bases, the results would appear as in Fig. 3.

In practice, other variables may be encountered that can affect the results of the previous discussion. Envelope delay due to filter response is the most significant problem. Most filters in common use today exhibit a non-symmetrical delay about the zero carrier axis. This will affect the coherent noise case by causing the power to add vectorially to some value less than the ideal.

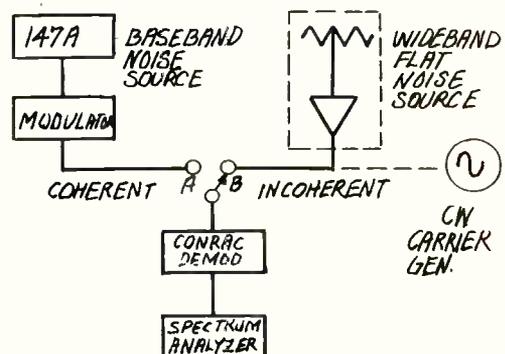
The Proof . . .

I attempted to substantiate the results of this discussion using a spectrum analyzer to display the average

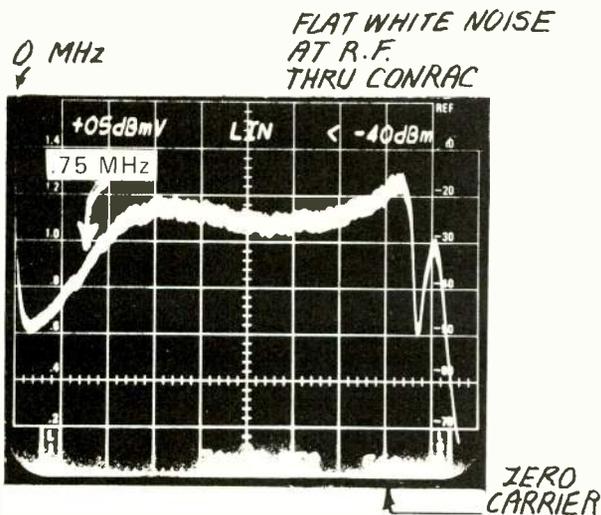


	Coherent $a + b = c$	Incoherent $\sqrt{a^2 + b^2} = c$
O	.5 + .5 = 1	= .707
A	.56 + .44 = 1	= .712
B	.63 + .37 = 1	= .730
C	.7 + .3 = 1	= .761
D	.76 + .24 = 1	= .796
E	.81 + .19 = 1	= .831
F	.9 + .1 = 1	= .905
G	.96 + .04 = 1	= .960
H	1 + 0 = 1	= 1.00

Effect of detection on coherent and incoherent noise is shown graphically, at top, and in the table as computed from formula shown in story.



Test set-up used to substantiate the analysis of noise handling in single sideband systems.



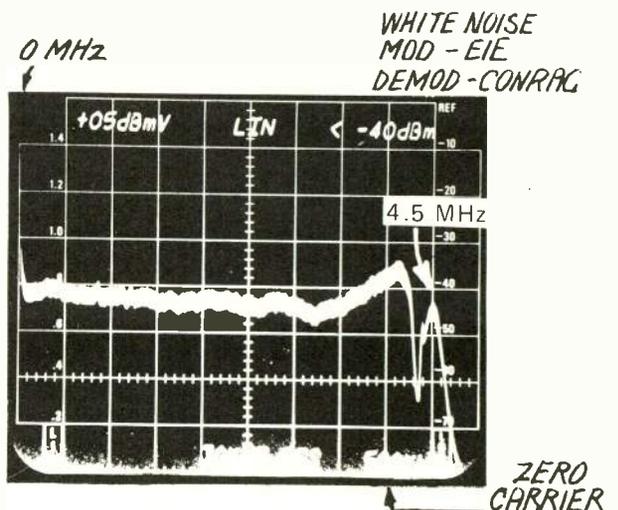
Frequency spectrum of flat white noise at RF, as received, through Conrac demodulator.

noise floor. Equipment was set up as shown in Fig. 4.

The results are shown in photos Fig. 5 and Fig. 6. Errors can be attributed mainly to the alignment of the Conrac demodulator.

The Real World . . .

It appears when comparing Fig. 5 to Fig. 6 that the inconsistency can, in fact, manifest itself in real life. How much will this really affect noise measurements and noise performance? If we consider an unweighted situation, then the maximum difference between the two cases could be .3 dB. Relatively insignificant!



White noise as modulated, then demodulated, showing effects of sideband filtering.

However, the eye is more sensitive to the lower frequency noise distributions, and the notch occurs below 750 KHz in the most sensitive area. Using a weighting curve (the CCIR standard curve was used) to more closely approximate the performance of the eye, one finds that the maximum difference between the two cases could approach .8 dB.

Again, in real world measurements, .8 dB is a small amount. However, this exercise just helps to point out one of the many tricky little demons lurking in the shadows when one starts to investigate the area of noise.

BM/E

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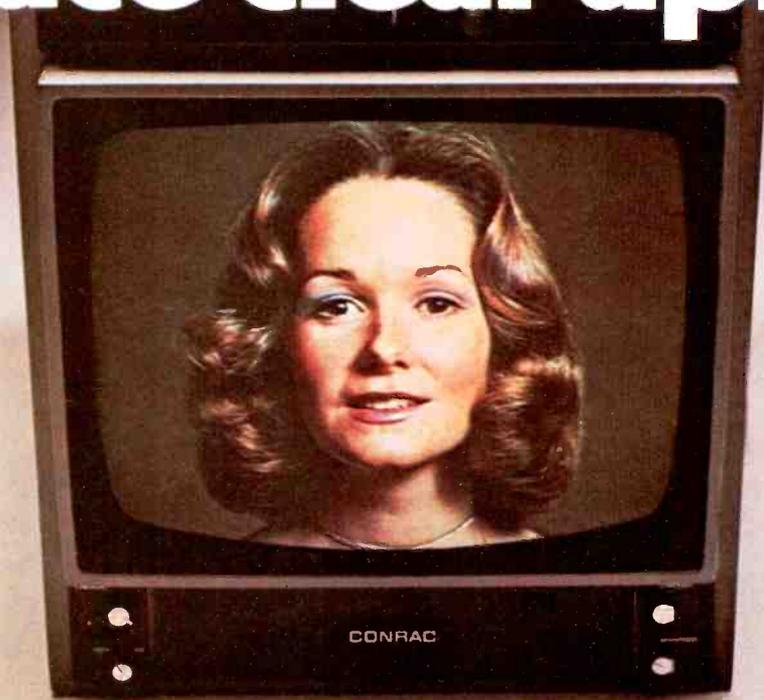


Tired of blue halos, chroma crawl, clients who forgot to tell the talent not to wear blue? Somebody should invent something so that all you have to do is light the talent or art work, since that's all you want to key, and eliminate all the set up time, critical lighting on blue backgrounds, etc.

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And finally, there's our

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Price/Quality Approach To Color Camera Design

By James Fadely

This is the first of a series of articles featuring recent camera designs.

The design of a color television camera begins with the choice of the type and number of pickup tubes, the optical components, and the color separation techniques. The primary factors effecting this choice are the target price of the completed product and the desired quality of the video produced.

Because the tubes may be the most expensive components used, it would appear that the camera cost would be proportional to the number of pickup tubes. This is in general true, but there are special circumstances when an unwary designer may be surprised.

The value that the camera owner receives for his money is determined by the tradeoff decisions made by the camera designer at this time. For the owner there is no "perfect" color TV camera design. This, however, is fortunate for the designer or he would be looking for work in another profession. This article will discuss the design decisions in the development of the CEI-280 color TV camera.

Design Goals

The design goals are primarily determined by the marketing department. They like to specify a perfect camera which will sell for well under the competitor's price and will be completely reliable. These specifications are then discussed with the engineering department to decide what parts are easy, what parts are difficult, and which ones are impossible. After a mutually satisfactory design goal is determined serious work begins. There seemed to be a vacancy in the available color TV camera market between the inexpensive low performance types and the expensive high performance ones.

The marketing goal for the CEI-280 was for a middle priced color TV camera which would produce video as well as the high priced cameras yet sell for considerably less money.

High quality video dictates the use of three Plumbicon¹ pickup tubes. This will surely change in the future as tube technology is continually evolving but for the present there is no other serious contender. The only economization the designer can do is use smaller tubes which not only cost less money but also allow the use of smaller, less costly optical components. High quality optical components sell by the pound!

Color Separation Selection

Here we are at the big decision. Should the optical system be a prism or not a prism? Once again it is fortunate, or unfortunate depending upon your point of view, that neither prisms nor plate splitting systems are clearly

superior. The purpose of the color separation system is to separate the incoming image into three colored images as efficiently as possible and to otherwise perturb the images as little as possible. Color theory dictates the shape of the color separation in order to achieve accurate colorimetry. Compromises could be made in the shape of these curves to allow more light to fall on the pickup tubes. However, the effect on the colorimetric response is unacceptable for a high quality color TV camera. Given efficient modern multilayer coatings, prisms and plate separation schemes are essentially equal in efficiency. Both systems as commonly implemented degrade the resolution of the image. Plate systems use the relay lens to provide the optical path length necessary to separate tubes and yokes. The relay lens detacuses the image at the spatial frequencies utilized in television. This requires the use of more high peaking in the video processing circuitry. This lowers the signal-to-noise ratio.

The degradation of the image through a block of glass (prism) is about the same as the degradation of the image through a relay lens.

CEI-280 Color Separation

The color separation in the CEI-280 is a variation on the plate splitting system. In this system (Fig. 1) the primary image from the zoom lens falls directly on the green tube. This gives as sharp a picture on the green tube as a black and white camera. Because the wideband signal is taken entirely from the green tube the high peaking required is minimized.

The green light passes through the red/blue reflection layer which is deposited on a glass plate of about 1/16" thickness. This angled glass plate by itself would introduce an objectional amount of astigmatism in the green image. This astigmatism is corrected by element 2, the astigmatic corrector.

The red and blue light is reflected from the front surface of element 1. A red and blue image is formed at the mask and field lens assembly. Light passing through the mask then hits element 6, the UV/IR stop. Visible red and blue light passes through this element to the blue reflector. As expected the blue light is reflected to the blue relay lens and imaged on the blue tube. The de-astigmatizer element corrects the blue image for the astigmatism introduced by element 2 and also trims the green edge of the blue transmission to lower the blue/green crossover point.

The red light passes through the blue reflector which is set at an angle that corrects for the astigmatism introduced by element 2, the astigmatic corrector. The red relay lens forms the red image on the red tube.

Camera Sensitivity

With this system all of the green light gets to the green tube, all of the blue to the blue tube and all of the red to the red tube. Thus the light efficiency is as high as possible commensurate with good colorimetry.

¹Trademark of N.V. Phillips

Mr. Fadley is Vice President of Engineering CEI, Mountain View, California.

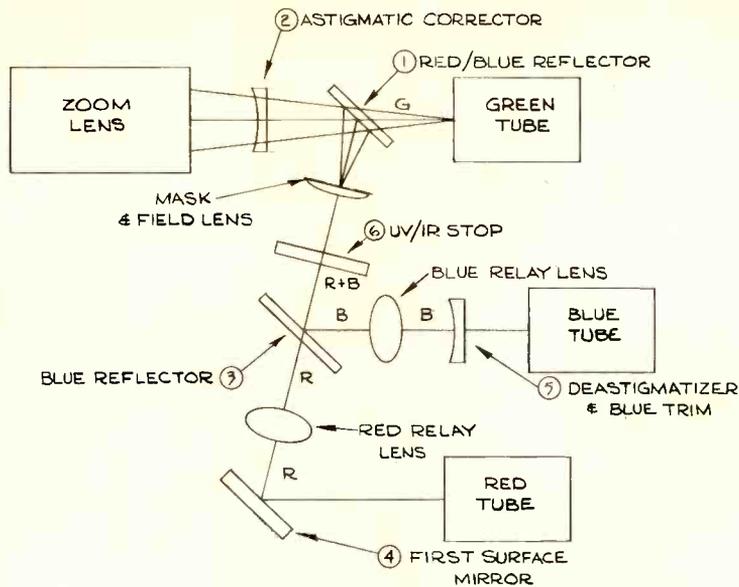
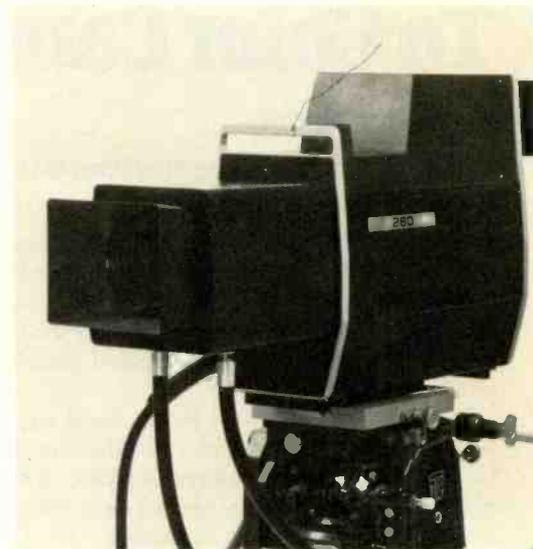
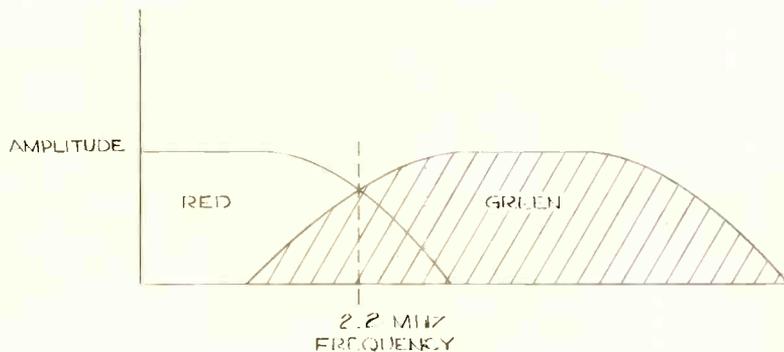


Fig. 1 The color separation system used in the CEI-280.



The CEI 280 in a studio.

Fig. 2 Red video signal at the output.

The only way to get more sensitivity is to increase the "f" number of the main zoom lens. With the relay lens type of system the cost of the optical components increases dramatically with "f" number. The relay lenses used limit the optical speed.

This is not as severe an operational restriction as one might suppose. There are very few production requirements where the loss in depth of field at the lower "f" numbers would be tolerated. Perhaps the main exception to this would be the use of an extender to give a long focal length. The CEI-280 with an f/20 Schneider lens is stopped at f/25 when the x2 extender is not in place. Insert the extender, which would normally give two times f/2.5 or f/5.0, and the iris is allowed to open to f/2.0. Now twice f/2.0 is f/4.0 and full use of this faster lens is permitted.

Other Advantages

The red and blue relay lenses are identical and each minifies its image by 0.75. Therefore the area of the red and blue images is about one half of the green. This has two very important advantages. First the dark current is one half what it would be if the full size raster were scanned. For Plumbicon dark current is not a real problem. But if a silicon vidicon tube is used in the red this helps to overcome one of their most significant shortcomings. The second advantage of minification is equalization of lag. In the Plumbicon tube, the lag is primarily capacitive discharge lag.

This type of lag is proportional to the target voltage swing. Compressing the light onto a smaller area of the

tube increases the target voltage swing and thus reduces lag. The CEI-280 has red and blue lag which is very nearly equal to the green lag. This results in color-free lag, which is not nearly as objectional as differential lag. Therefore the CEI-280 would not benefit appreciably from the addition of bias light.

This optical system, because of its distributed layout, allows the designer to design in light baffles which prevent any light outside of the field of vision from striking the target. These baffles prevent the red and blue pictures frequently seen when a football sideline camera is pointed too close to the field lights.

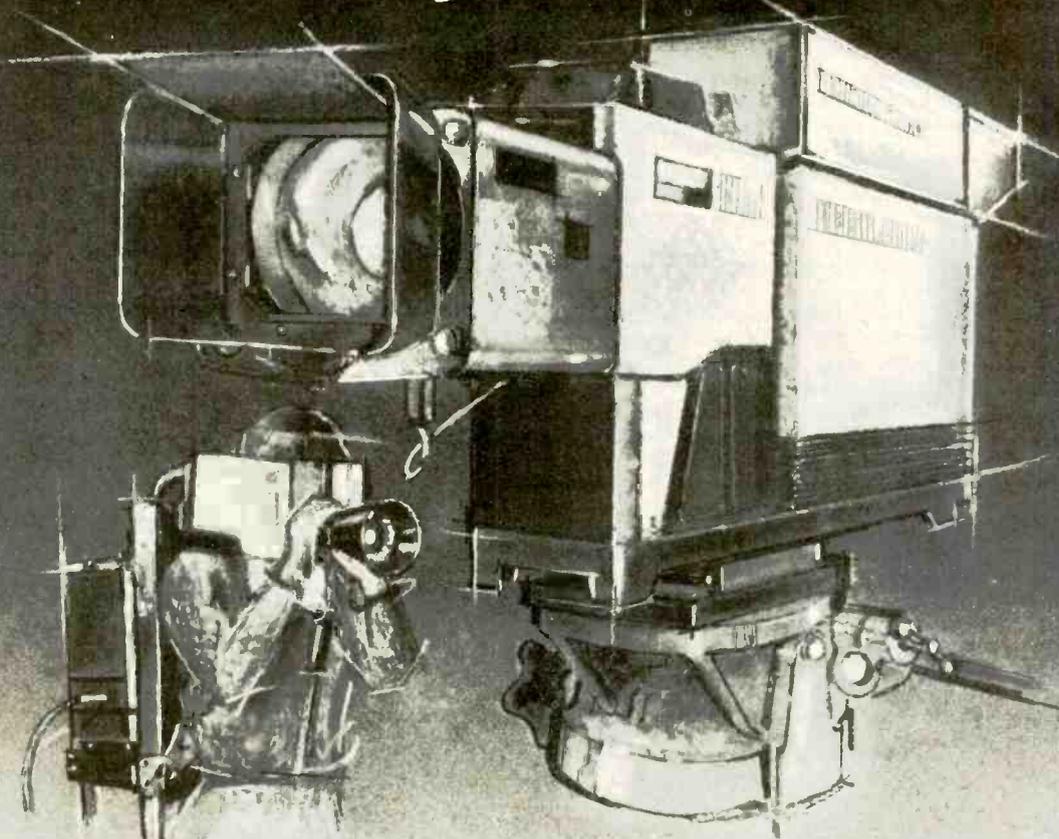
The CEI-280 video processing is unlike that of other cameras. The red and blue video signals are low passed to 2.2 MHz. The green signal about 2.2 MHz is added to the red and blue video signals. Figure 2 shows the makeup of the red video signal as a function of frequency. This technique has two significant advantages. One, the frequency response is not particularly sensitive to horizontal misregistration. And second, small blemishes in the red and blue tubes are low-pass filtered to the extent that they do not appreciably degrade the composite color picture. This allows the use of industrial grade tubes in the red and blue channels for all but the most critical uses.

The optical system of the CEI-280 results in a small, low cost, high quality color TV camera with an outstanding performance-to-cost ratio. Modern circuit design utilizing a large number of standard integrated circuits results in a reliable and stable electronics design which compliments the quality of the optical system.

BM/E

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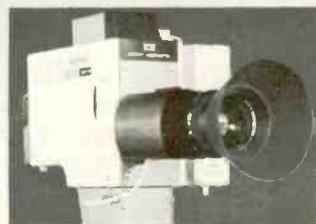
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Update On Experiences In Electronic News Gathering

By Bob Paulson

Our May 1974 "NAB Show-in-print" issue reported on ten new electronic journalism cameras and systems that were star attractions at Houston. The accent was more on cameras than systems. We found little to report on how their outputs would get back to the studio for editing, program, program integration and broadcasting. The microwave system manufacturers weren't yet identifying themselves with the latent EJ market, now more commonly known as the ENG market. In the VTR area, the focus of Ampex and RCA was on lower priced quads to compete with IVC's helical unit designed for teleproduction purpose. Portable VTRs were not in the limelight.

Broadcasters immediately seized the EJ initiative, however, and began to design and install custom systems to satisfy their own defined needs. In our "Special Report on Electronic Journalism," January 1975, we ran brief descriptions of ENG Systems and EJ techniques then in use at a dozen local stations and the networks. This report, which we expect to be part of a continuing service, looks at some brand new stations. In other cases, closer detail of the practices of some of the stations mentioned in January is provided. ENG is winning several converts per week so the saga will continue.

Our February issue carried a technical article by Bob Paulson on Sony's VO-2850 and VO-3800 Editing and Portable U-matic Videocassette VTRs. Their integration into teleproduction and broadcast playback systems including time base correctors and the Sony RM-400 Automatic Editing Control Unit was discussed.

This article focuses on how a few broadcasters are using these products in mobile, portable, studio production and broadcast playback systems, in combination with microwave relay systems, SMPTE Time Code Editors and TBCs. Following the 1975 NAB exhibit in Las Vegas, we will be reporting on many other competitors offerings. In May we plan to publish a special Electronic News Gathering Handbook as a separate edition.

One important point to remember: ENG isn't the only broadcast application. Mini cameras and portable recorders are equally useful in on-location production of commercials, documentary features, sports, and musical entertainment productions. We believe the industry is in the opening months of its third revolution, following the 1950's explosion of the quad VTR and the 1960's blossoming of color.

The Editors

News Item: ENGcrew Beats Engine to Fire!

An alert weekend news crew at WWL-TV New Orleans recently made a videocassette tape which contains a shot of fire engines roaring up to a burning building. "So what!" you say. "Film crews have shot lots of footage of roaring fire engines too."

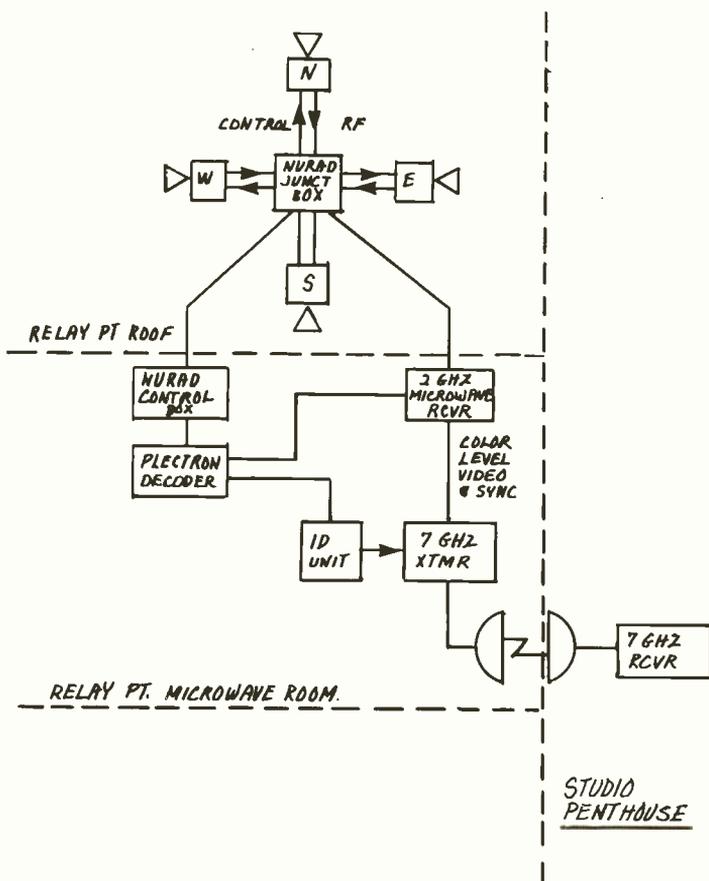
True, but how many film or ENG crews have discovered the fire, called the fire and police departments, taped their arrival and firefighting efforts, and put the on-the-scene picture report on the air within fifteen minutes? That's the real import of this news item.

According to WWL-TV Chief Engineer Hugh Burney,

Mr. Paulson, a former TV marketing executive, now manages AVP Communication, P.O. Box 454, Westborough, Mass. 01581. His firm was asked by Sony Corporation to prepare this report on noteworthy applications of products in broadcast operations.

the initial justification for purchasing two VO-3800 Portable VTRs, plus two editing rooms each equipped with two VO-2850 Editing VTRs and an RM-400 Automatic Editor, was to eliminate the costs of film stock and processing. Delivering the news as it's developing was a bonus he didn't expect to receive quite so quickly. At the time of the fire neither the microwave relay system nor the VO-2850 editing rooms were ready for use. So the 20-minute VO-3800 Videocassette tapes were dubbed to quad through a CVS-504 TBC for editing and airing.

WWL management built its ENG operating plan around the Sony VTRs for several reasons. The cassette format in a battery-powered portable VTR was an obvious advantage. The ability to edit in the cassette format provided economic relief from the alternative of editing on the station quads. And CBS' success in using the two VTRs on the Nixon Moscow trip was the clincher—it proved their reliability and broadcastability.



Material for use on weekend newscasts is now shot almost entirely on videocassettes by two-person news crews plus reporters assigned to individual stories. Editing of their up-to-six-stories-each is done in the News Department by their own people. Completed stories are fed to the Operations Department for dubbing to quad or on-air playback, as dictated by convenience.

As this report was being prepared, Mardi Gras was taking place and WWL-TV put a lot of special events and the parade on live. Both the Ikegami portable and standard PC-70 studio cameras were used. Burney says even the most perceptive viewer would not be able to distinguish which camera was producing which picture. There was also a bus strike on in New Orleans and the ENG system has been used for live coverage of negotiations at city hall. Burney has operated both his Ikegami and microwave system for up to two hours on battery power only.

Another use for the portable gear has developed in New Orleans: production of commercials. Retailers and car dealers both have jumped on the opportunity to produce instant on-location commercials to tie in with sale specials.

Chief Engineer Burney is considering an SMPTE time code generation and distribution system and editors for installation sometime in the future. "It would give us more precise editing control on both our quads and the Sony VO-2850s," he says, "but it represents a pretty healthy capital equipment budget we're not yet ready to commit."

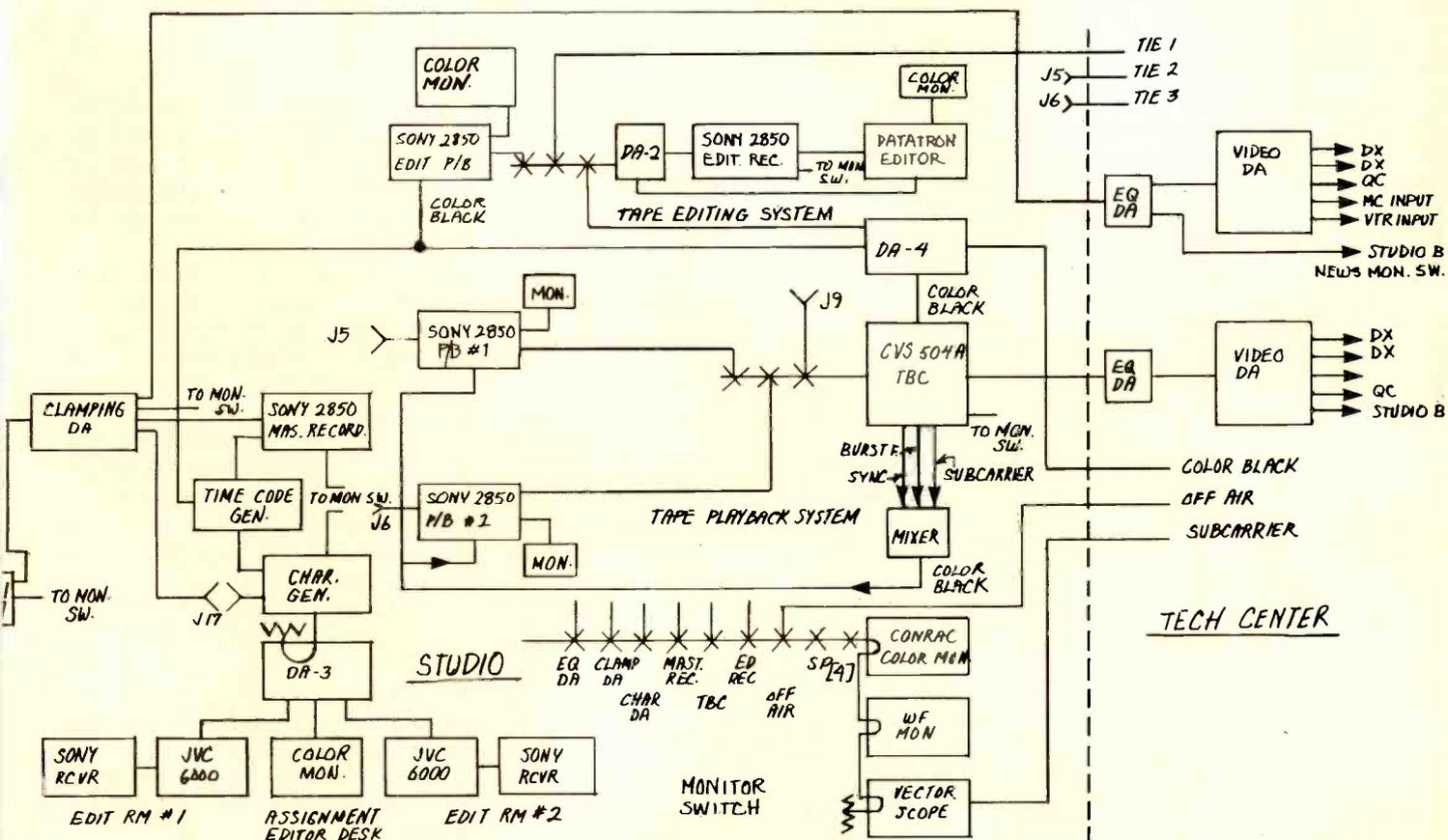
WLAC-TV Develops a Winner—Live Action Camera

Nashville's CBS affiliate has a well-planned, completely—equipped, smoothly functioning ENG system with 3 VO-3800 Portable VTRs, 5 VO-2850 Editing VTRs, Ikegami cameras, Microwave Associates communications gear, a Nurad remote control receiving antenna, CVS TBC, and a Datatron time code editor.

WLAC-TV Vice President Ralph Hucaby and his staff's evolution of the final system design was reported in the January 1975 BM/E overview article on ENG. The utilization of the system components other than the VTRs is straightforward. Most interesting in this system are the decisions on how many VTRs would be needed, where they would be installed, and how and when they would be operated and by whom.

Two compact vans are each equipped with a VO-3800 Portable. The third is a floater back at the studio. But the VTRs are not provided to make tapes which are sped back to the studio for editing and airing. Van to studio transmission is the mission of the microwave system. The 3800s are used only when the crew cannot bounce a solid signal back to the Nurad receiving site on a downtown building. As quickly as possible after such recordings are made, they are microwaved back and re-recorded on a VO-2850.

The vans are on the road six days a week from 6 A.M. until 11 P.M. with one crew change, and are dispatched from story to story by radio. The three-person crews



This simplified flow diagram was prepared by BM/E from WLAC-TV's Video Functional Diagram, ENG System. For live airing of tape from vehicle, a patch can be made from J17 to J9.

ELECTRONIC NEWS GATHERING



Ambulance chasing with Sony ENG equipment.

include a reporter, cameraman, and driver-operator assigned from the News Department pool; no engineers. One person per crew has acquired an FCC 2nd class license operate the microwave and radio relay systems.

At the studio the five VO-2850s are permanently assigned to three functions. One is in the news control room operated by a studio engineer who is the only Engineering Department technician assigned to the LAC system. This unit records every incoming feed as received, with SMPTE time code recorded on the second audio channel.

Two VO-2850s are installed in an editing room, interfaced to the Datatron 5050 and operated by any one of several News Department people.

Two VO-2850s located in News Room Control handle on-air playbacks under the control of the Newscast Director. Fed through a 2 by 1 switcher to a CVS 504 TBC, the broadcast-stable signal can then be aired directly or integrated with live studio feeds through the special effects switcher.

Other $\frac{3}{4}$ U-matic VTRs are also integrated in the LAC system for monitoring story developments and edit decision making. The Assignment Editor and other News staff people see all incoming video/audio feeds with SMPTE time code supered over picture. They can therefore either make edit decisions live, by seconds, or tape a feed to make the decisions later, specified to the frame.

Ralph Hucaby and Director of News and Public Affairs Chris Clark are well satisfied with the functioning of the LAC System. Hucaby says, "Productivity of the field Electronic News Gathering crews, and the news content

NBC Newscenter 4 Puts Man-On-The-Street On Air

Taking advantage of ENG flexibility, NBC in New York has added a talk-back dimension to their one-hour long local evening news show. They put the portable high-sensitivity Fernseh camera on the street and get viewers reactions to the news developments of the moment. It's live two-way: viewers can ask further questions of the newsmakers on the show or anchormen. Split screen techniques are being used.

of their pickups, are both far higher than film or tape crews operating out of touch with the studio once they leave for an assignment." Clark adds, "At the studio our news production people quickly learned how to edit the field feeds into exciting, interesting stories with superb communications quality. Live Action Cam is a Winner—it has won us an increased audience share in this very competitive market."

ENG Is the Beginning of U-matic Product Applications in Broadcasting

WISN-TV, Milwaukee leads the way in Wisconsin with its innovative use of an all-Sony DXC-1600 TRINICON Camera/VO-3800 VTR ENG system. Crews working from 7 A.M. to midnight concentrate on fast-breaking news events. They assemble video, natural sound and voice-over/on-camera commentary into segments ready for airing as they're received at the studio.

Regular programming is interrupted for all important stories. Tapes are aired from a Sony VO-1800 VTR through a CVS TBC, and dubbed to quad for further editing and newscast playback.

"We're the first Wisconsin station with an ENG system," says News Director Ron Scott. "We beat our film competition by several hours on at least one story a day from downtown Milwaukee or anywhere."

Chief Engineer Gerald Robinson says, "The pictures are superb under daylight conditions, and equally good on properly lighted interior setups. We record natural sound from the on-the-camera mic on one track and voice on the other, either simultaneously or later."

General Manager Jim Butler predicts rapidly expanding reliance on ENG in the future: "We'll be adding VO-2850s with RM-400 editors for studio editing. Within a year we'll be shooting most of our news on four or five tape systems."

KSTP-TV, St. Paul Chief of Engineering Operations George Merrill bought three 3800 and six 2850 VTRs. Outside productions other than news have included a $\frac{1}{2}$ hour tour of the Governor's Mansion conducted by his wife, a $\frac{1}{2}$ hour visit to the St. Paul Zoo, and commercials for area clients.

ENG operations are innovative, also. During a recent blizzard, one crew did the weather report from the local weather bureau. Another crew visually reported on the progress of another storm from an outdoor location in Hiawatha Park.

Merrill comments, "Even though we have a lot of tape equipment, we try to broadcast most of our news pickups live first. Our Microwave Associates and Nurad System is operating all the time. We use three-person crews, with a reporter, news photographer and engineer, trained to feed in video and audio material that's ready for airing without editing. The non-technical people caught on quickly to operating all the electronic gear. We were operational two months after we started receiving equipment."

The six 2850s are allocated one to the microwave receiver console for recording all incoming feeds, one in master control for edited tape playbacks, and there are four in two separate editing booths in the News Department. Playbacks are occasionally made direct to air, but more often dubbed to quads or the TCR-100 for convenience, through a CVS TBC.

Editel backpack cameras, "heavier and costlier but

continued on page 96

First Family



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ELECTRONIC NEWS GATHERING



Hugh Mulhollam, KSTP-TV, homing-in microwave at receiving center.



Al Carlson editing KSTP's Action cam tapes.



Action cam cassette tapes get transferred to 2-in. quad by Ben Vogel. TBC to left.

Broadcaster-Oriented Features of the U-matic Product Line At NAB

At the 1975 NAB Sony is formally introducing to the broadcast industry its broad product line of U-matic Videocassette VTRs, "freeze-frame" Videocassette tape, the DXC-1600 TRINICON™ portable color camera, editing and remote control accessories, and special effects generators, monitors, microphones and audio gear. They have diverse applications in both studio and portable mobile operations. Many broadcasters are already using this equipment in Electronic News Gathering Systems and program and commercial production systems, and the accompanying article summarizes some of their applications.

Particularly appealing in the compatible Sony portable and editing VTR systems are three unique operating capabilities:

Two wide-band audio channels—On the VO-3800 portable VTR the second channel may be simultaneously or separately activated to record voice-overs, background sound, music and effects bridges, or voice, tone or digital cues. On the VO-2850 editing VTR either channel is separately available for these purposes with the VTR in its Insert Edit Mode. The second channel may also be used to record SMPTE time code, for either automatic or manual cueing and editing;

Vertical Interval Insert Editing—The VO-2850 switches record/reproduce modes cleanly in the next vertical interval after command, timed to ± 0.1 second under control of the RM-400 Automatic Editing Control Unit, or accurate to a frame when interfaced to an SMPTE time code editor;

Freeze Frame and Edit Point Preview—The RM-400 Unit provides 1/5 speed SEARCH of recorded material to select edit points. Freeze frame playback of a selected field to verify an edit decision can be commanded from either the RM-400 or the VTR PAUSE button. The RM-400 PREROLL button then backspaces and parks the tape five seconds ahead of this point, as the next step in an editing operation.

very high quality," Mr. Merrill adds, are used in the two "Action Cam" Vans. They are also adding a Datatron Editor to one of the 2850 systems.

Hubbard Broadcasting, Inc., owner of KSTP-TV and stations WTOG, St. Petersburg and KOB-TV Albuquerque, has purchased well-equipped U-matic format systems for these stations as well. WTOG Assistant Chief Engineer Emerson Ray, speaking for his boss, Chief Engineer George Orgera, Jr., indicates that their application of the ENG System is not conventional at all. As a UHF independent in a VHF network affiliate market, they don't try to compete with hard news coverage. News features are generally extensively researched, elaborately produced documentaries. Their mobile unit already has two Editel cameras and an VR-3000 quad. Both 2850s and 3800s have been added to the van, and a 2850/RM-400 editing system is located at the station.

A remote crew of 2 or 3 people, used for commercial production, is increased to 6-7 for program production. Of his new equipment, Mr. Ray says, "None of it is being used to its full capabilities yet. You're going to see lots of changes in production techniques in the next few months."

KOOL-TV, Phoenix Vice President of Engineering Albin Hillstrom reports that his ENG system has two compact "Minicam VTR" vans equipped with VO-
continued on page 98

PAN HEADS

Vinten MK. VI Lightweight Head. Economically designed and ideal for C.C.T.V. use. Capacity 115 lbs.



Vinten MK. IIIA Heavy Duty Cam Head for broadcast use. The Industry standard. Capacity 500 lbs.

Vinten MK. V Intermediate Weight Cam Head. Little sister to MK. IIIA. Capacity 165 lbs.

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Vinten 739 Heavy Duty Field Tripod. Weighs only 26 lbs. Capacity 200 lbs.



Vinten 719 Heavy Duty Tripod Dolly with alternate low-level pan head mounting.



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Vinten 514 Lightweight Tripod Dolly.



Vinten 729 Remote Field Dolly with air counterbalanced elevator and separate folding base. Capacity 200 lbs.



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Vinten 741 Pedestal. Air counterbalanced design with Standard 20" range. Capacity 250 lbs.



Vinten 677 Intermediate Lead counterbalanced Pedestal for C.C.T.V. use. Capacity 150 lbs.



Vinten 715 Lightweight Lead counterbalanced Pedestal for C.C.T.V. use. Capacity 100 lbs.



Vinten 702 Deluxe Fulmar air counterbalanced pedestal with 38" extended range. Capacity 350 lbs.



Vinten 723 Low Angle Dolly for two-man studio operation. Capacity 350 lbs.

T.V.P. P-50 Super-Ped air counterbalanced Pedestal with 36" extended range. Capacity 250 lbs.



T.V.P. P-10 broadcast standard air counterbalanced Pedestal with 30" range. Capacity 250 lbs.



T.V.P. P-20 Lightweight air counterbalanced Pedestal with standard 20" range for broadcast and C.C.T.V. use. Capacity 160 lbs.



CRANES

T.V.P. P-30 Lightweight air counterbalanced Pedestal featuring 30" extended range. Capacity 100 lbs.



Vinten 743 Kestrel Crane for studio/remote use. Two-man operation with manual or powered jib elevation. Capacity 500 lbs.

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3800s. They turn in material for 4 to 5 documentaries a month, in addition to concentrating on special reports for the 10 P.M. news. One van is microwave equipped.

A reporter and photographer from the News Department staff the vans on a one-shift schedule so far. At the studio the VO-2850/RM-400 Editing System is operated by the News Department also, a 2850/ CVS-504 TBC System in Master Control plays the edited tapes.

Editing is complex, because the ENG crew generally tapes the main story first, and then shoots color and cover afterwards. A typical 2-3 minute story will have upwards of a dozen edits and require two hours of editing, rearranging takes and integrating bridging material recorded on the VO-3800 second audio channel. A/B rolls to dub the final edit to a TCR-100 are not uncommon. The management is "very pleased" with system video/audio quality.

Economic impact of the cutover to videocassettes from an all-film operation is equally pleasing, according to Hillstrom. "Since we went operational in November, we've reduced our film usage by 25 percent, and our goal is 50/50 film and tape. Since we shoot a million feet of film a year, that translates into real dollar savings!"

"On election night in November, for instance, we carried 18 local stories during the network cutaways. Half of them we taped as they broke, and some were edited and on the air ten minutes later. We couldn't have done any of them on film."

WDSU-TV, New Orleans Chief Engineer Eddy Tong immediately put his VO-3800 and a portable camera in the field to improve his station's competitive position in sports coverage. Audience-generating basketball games are carried live by a competing station using its mobile unit. But WDSU's two-people ENG crews have the mobility of film crews plus a microwave link back to the station. They therefore can also carry pre-and post-game activities live, and excerpt highlights of the videotaped game for playback on the wrapup and the following newscast.

Collective Summary

Users' collective comments attest to the broadcasting usefulness of these capabilities and the overall systems design:

Field operations—The VO-3800 can go anywhere, it's rugged and reliable. Cassette format minimizes down time for reloading. Second audio channel is most useful for voice-overs and effects. Don't need an engineer to operate either the VTR or portable cameras;

Studio operations—RM-400/VO-2850 Editing Systems can be conveniently located in the News Department, away from on-air operations or production control rooms. SMPTE editors are straightforward to add, if frame-accurate editing is needed. The new operating situation with videocassette tape displacing film and interfacing quads hasn't created either people displacement/retraining/replacement problems or jurisdictional hassles that couldn't be solved quickly;

Video/Audio/Editing Performance—Pictures are a little noisier than studio cameras and quads (but look at the 10:1 or better price ratio!). Quality is competitive with the best 16 mm film, plus it looks "live," and can be processed, enhanced and color-corrected electronically. Sound quality is so good that nobody thinks to mention it.

Like every other station contacted, Tong said "We put our 2850 editing system into the news room, where stories are edited for airing by the remote crew or News Department staffers." A CVS TBC stabilizes the VTR output for dub to quad or broadcasting. An Ikegami camera is operated on the remotes by a news photographer.

KPRC-TV, Houston Assistant News Director Larry Weidman described an unanticipated application for KPRC-TV's first VO-3800, shortly after its arrival. Completion of an important news story required integration of some important visual material already on film at another station. A VO-3800 plugged into the station's film chain produced an immediate copy. Dubbed to quad at KPRC, the playback was then integrated with live studio commentary, and the rounded-out story ran on time.

The station is adding a VO-2850/RM-400 Editing System this spring, at which time all news editing will be moved out of tape central to—where else—the News Department. The Austin News Bureau will also add VO-3800's and portable cameras to its present complement of film sound cameras. Immediacy in reporting state-level events will be the result. Same second, same hour, and same day broadcasts will all be possible: a private microwave link from Austin to Houston will be used for the hottest stories, and background coverage tapes will be messengered back without delays for film processing.

As is the practice in many other stations, Larry Weidman reports that edited tapes are dubbed to a cart machine through a CVS TBC, where they are called up for on-air playback.

How Does a Station Take the First Step Toward an ENG System?

NAB is upon us again, and most if not all of the manufacturers mentioned in this report and many others will have operating exhibits in Las Vegas. But three days isn't enough time to evaluate all the competitive products which are needed in even a simple, "Let's get started" ENG system. There are differences in light sensitivity, resolution and ruggedness, not to mention operational refinements. And verifying that there are no interface problems among selected products is almost impossible.

This underscores the TV broadcaster's emerging need for a local sales/engineering/service organization which can take over these roles in the "long, long time from May to December." Some manufacturers can offer direct field help. Some of the broadcast reps. are very experimental. Many A-V dealers are now meeting this need, offering complementing product lines needed to make up complete ENG systems. They are hiring competent systems engineers, sales representatives and service technicians, and sending them to manufacturers' training schools. They are investing in inventories of spare parts, accessories, tape, demonstrator equipment and broadcast quality test equipment.

Perhaps you should also consider retaining a knowledgeable production systems consultant to study your long-term ENG and other teleproduction system requirements, to help you establish a time-phased system procurement plan before you buy anything. Some of the systems described in this article cost \$300,000 or more. But if they're well planned, they can be more appropriately considered as investments with a realistic three-to five-year payoff.

AT KY-3-TV, THE BRAND OF REPORTING AND THE BRAND OF FILM HAVE A LOT IN COMMON.

When the people in this picture wave 3 fingers in the air, what they're saying is, "We're number one" at Springfield, Missouri, Chanel 3. Thanks to hard-nosed reporting and hard-hitting promotion, KYTV is the undisputed broadcast king in the Queen City of the Ozarks. By a margin of 3 to 1.

In addition to top-notch journalism, smart programming has meant using plenty of film. And the film they use is Eastman film.

Over the past year, Channel 3 news cameras unlocked the secret of behavior modification programs in a Missouri federal prison; dug up a problem in the underground water supply; whooped it up at a genuine hoe-down; and made friends with a mountain hermit whose only other visitors dropped in by UFO.



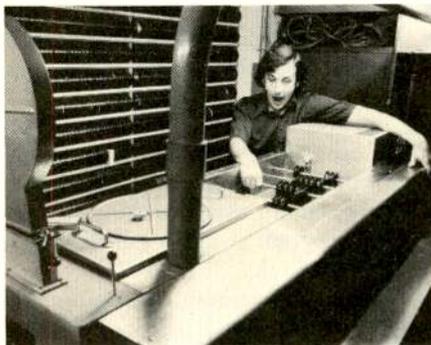
Besides winning viewers, their documentaries have won a silver gavel from the American Bar Association, a certificate of achievement from the state medical association, and an Emmy nomination.

When the KYTV cameras aren't recording news, the KYTV people are busy making it, through locally produced sports and entertainment shows. Take Virgil Ward (front row left) and the capable assistant you see perched on his lap. You can catch their weekly fishing show on 87 markets in the U.S. and Canada. And when Virgil packs his rod and reel, he includes a reel of

Eastman film.

Then there's Promotion Director Clarence Martin (front row right). His 10-second-film ID spots for the station not only built awareness, but they helped develop a new market for locally produced commercials.

In the words of News Director Bill Williams (2nd row, 4th from right), "Film is essential to everything we do. After all, TV is *the* visual medium, and it wouldn't do to have a person on camera merely reading a piece of paper. We use film to tell our story. And, besides, our anchormen just aren't that pretty."



Automated TV Transmitter/Network Operation At CBC, Montreal

by G.A.B. Byrne, P. Eng.

Transmitter and network feeds at Montreal's new broadcast center are automated. Pre-events schedule can be readily edited.

Programming for the Canadian Broadcasting Corporation's English and French services emanates from two separate booths at Montreal's Broadcasting Center. These feed programs to the local transmitters as well as to the East and West networks. The operations of the feed booths are fully automated. The equipment for these rooms was designed by Ampex and the facilities developed together with CBC's Studio Systems Engineers and Operations personnel.

Layout designed for one-man operation

The booths are adjacent to one another but are located away from the Master Control area. Fig. 1 shows the layout. Located in the monitor bank are 14-inch monochrome monitors for the transmitter and Network "next events" and 19-inch color monitors for the "on-air" events. Readouts over the monitors automatically indicate the sources selected. Quality audio monitoring is provided using Tannoy speakers and Quad amplifiers in cabinet enclosures developed by CBC as a standard package. An additional color monitor and speaker enables the operator to monitor all sources available to the booth. A jeeped 17-inch Sony color receiver permanently monitors the transmitted "off air" signal.

The console has been arranged such that a single technician can operate the system. In the centre is the main control panel and on each side of it are 14-inch monitors which display the Transmitter and Network schedules. Also located in the console are picture and waveform monitors and various monitoring facilities. See Figs. 2 & 3.

To the side of the technician is located a teletype which is used for computer system communications and editing. Fig. 4 On top of the teletype is a monitor which displays either the Transmitter or Network schedules.

Behind the technician is a reel-to-reel tape machine and an IBM Selectric Typewriter which logs all the on air events, Fig. 5.

Adjacent to each studio is an Announce Booth which

may be equipped with a color camera.

Manual Operating Controls

Machines have to be assigned from Master Control and this is done by means of a remote control cluster similar in appearance to a teletype push-button unit. Thus a selection of TO161A followed by a "take" command will assign Telecine I to studio 61 position A. The commands from the cluster activate Automatic Electric stepping relays which establish the necessary circuits for complete machine assignments. This includes pulse, intercom, mimic board display and analogue and digital control systems. The analogue circuits are on a wire-to-wire basis and enable Telecine camera functions to be remotod. The digital functions i.e. VTR and T/C machine control, are encoded by Ampex MC-100 units which enable up to 32 commands and 32 return tallies to be transmitted via a pair of wires.

Once a T/C or VTR has been switched to remote control, and assigned by Master Control it can be operated from the booth.

Audio and video crosspoint selection is done separately in the booth by means of a cluster which addresses the main program or routing switcher. The selection is made to correspond to machines assigned from Master Control. In addition the program switcher enables open access to all studios, remotes, etc.

LED readouts on the main operating control panels indicate the assignment of sources to the booths. Rear projection readouts in the monitor bank display the next events, on air and preview'd sources.

Program schedules are entered into memory using standard 80 column cards which are loaded into a card reader. The Operator can now manually operate the system and observe the schedule on the CRT displays.

The main control panel is arranged with switches in columns and divided into Network and Transmitter sections. Each section has three buses i.e. Next Event, On Air and Preview buses. Switching is done by selecting a source on the Next Event bus and "Taking" it on air.

Three transition modes are available i.e. CUT,

Mr. Byrne is a senior engineer, Studio Systems Dept., Canadian Broadcasting Corp., Montreal.

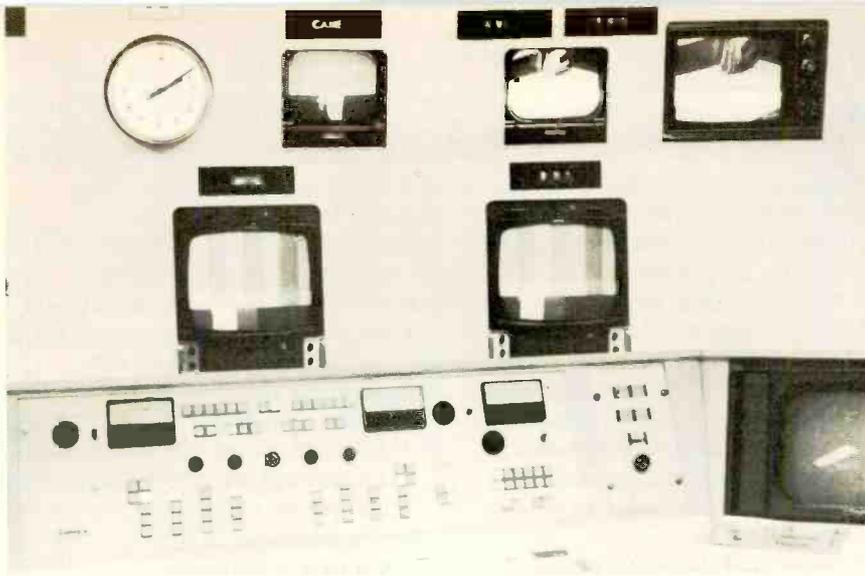


Fig. 1. Monitor bank and section of control console. Right-hand monitor as part of console displays the transmitter signal.

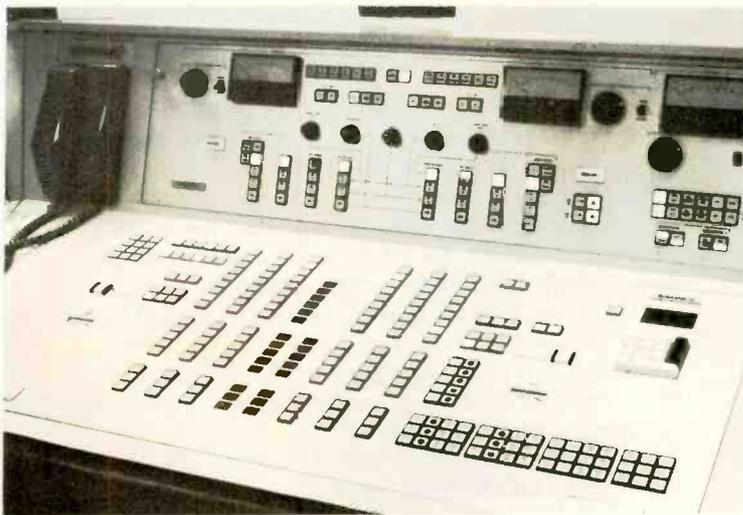


Fig. 2. To left of main control console is network CRT display and monitoring facilities shown here.

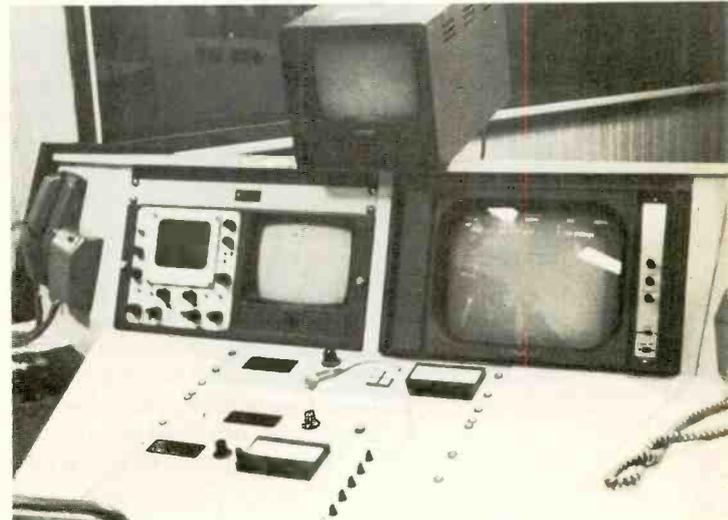


Fig. 3. Closeup view of main operating control panel.

Fig. 4. Teletype and editing monitor is immediately to right of control panel.

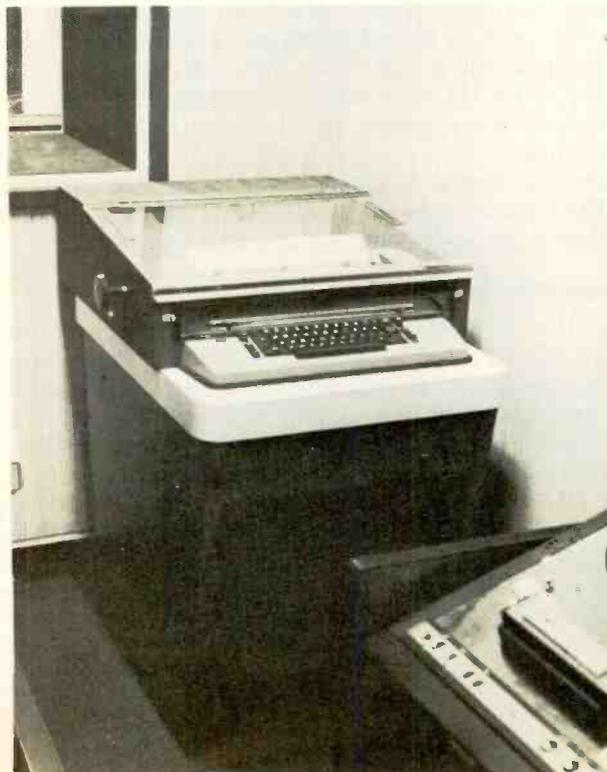
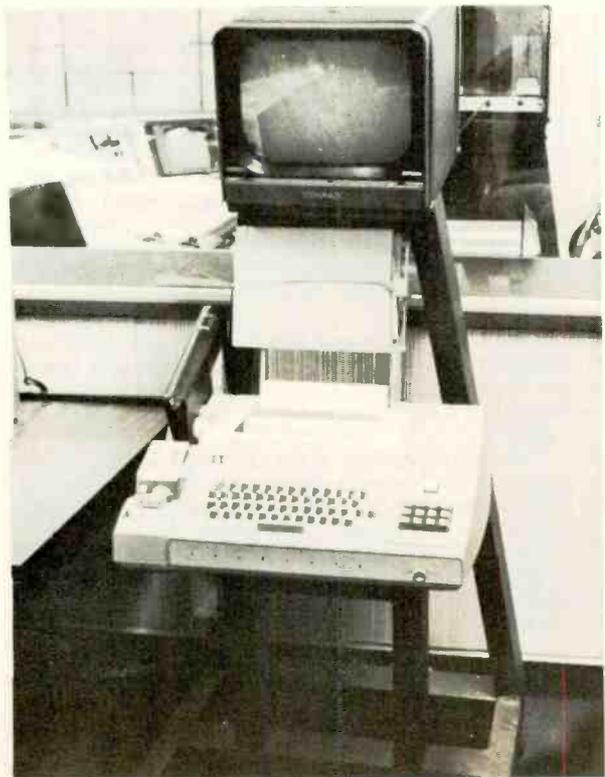


Fig. 5. IBM automatic logging typewriter is to rear of control panel.



AUTOMATED TV

V-fade, or V-fade and can apply to the audio or video or both. The bottom of the V-fade occurs 1½ seconds after commencement. Once a transition has been started it will be performed automatically by an autofader.

Each booth can have assigned to it at one time up to 3 T/C's and 5 VTR's. Only the start/stop VTR functions are removed. For each T/C, however, the start, stop, forward and reverse functions for 2 TP 66 projectors plus slide change forward or reverse for one TP7 projector is available. Additional switching enables the operator to select magnetic or optical sound with front or rear focus, and to switch the encoder for either color or monochrome operation.

All "on air" Transmitter and Network events are logged by an IBM Selectric typewriter which prints out the on air transition time, details of transmission, technical facilities code and the type of transition.

One additional transition is available and is useful in case of an event under-run or a failure. Activating the "F/H" button enables the operator to fade to black and silence and hold until the next event is ready.

The upper portion of the main panel enables control of the audio sources dedicated to the booth. This includes the feeds from the announcer, cartridge and reel-to-reel tape machines. The operator can set up any combination of audio "over" or "under" events.

In addition to selecting separate audio from the announcer or tape machines it is also possible to have a T/C video feed with audio from a VTR, studio, remote, etc.

By placing the panel in the "combined" mode the same sources are set up for the Next Event on the Transmitter and Network sides.

Automatic Operations

Once sources have been assigned, events loaded into memory and the AUTO mode selected the system will provide for the following:

- a) Separate Transmitter/Network schedule displays

Maison de Radio-Canada

The Headquarters for the French Services Division of the Canadian Broadcasting Corp. is located just East of the downtown section of Montreal. This modern Broadcasting Centre, which accommodates some 3000 people, provides Television and Radio programming for local and network services in both English and French. It also houses the CBC's International Radio Services operation. Maison de Radio is made up of a 23-story hexagonal office tower and a three-level tower structure which houses the program production area. The complex occupies 25 acres.

The Broadcast Centre consolidates into one location Departments and Services that were previously scattered around Montreal. It provides Radio and Television facilities that are among the most modern and sophisticated in the world and which first went into operation in 1972.

The centre provides some 30 radio studios, 9 TV studios, 2 TV Transmitter/Network Booths, Telecine and VTR facilities, Film Theatres and Sounding Dubbing facilities, Kine Recording and Viewing Rooms, etc.

The TV systems include the largest audio/video routing switcher in Canada, vision mixers, pulse and test systems, and in fact all facilities required in a modern Broadcast Centre.

- b) Set up of audio/video Transmitter/Network next events

- c) Pre-roll and control of T/C's and VTR's

- d) Initiate audio/video transitions

- e) Log "on air" events

A means of checking, controlling and editing is provided by an ASR-33 teletype which is used as an interface between the Operator and the System.

Basically, checks are provided for the following:

- a) Validity checks on input data.

- b) Equipment checks to ensure machine assignment and machine switched to remote control

- c) Equipment failure. To do this return tallies from the machines and program switcher are monitored, and in the event of a failure an error message is printed out on the Teletype. In addition, failure of the cardreader, logging typewriter and clock system will cause error messages to be printed out.

Instructions can be entered to load events into memory or to cause a printout of the Transmitter and Network schedules.

In the Edit mode the Operator can "roll" events on the CRT display and replace lines 6-18 with any continuous group of events in memory. These events can be edited, changed or deleted.

The Operator can manually override the automatic system and change the next event sources and transitions. When this is done a corresponding message is printed on the Teletype and the log will be printed based on the return tallies received.

The following push-buttons (which are located at the top of the control panel) gives the Operator considerable flexibility in controlling the system:

Delete Next will delete the Next Event and advance the subsequent event to Next Event status.

Start Transit will cause the Next Event time to be advanced to within 11 seconds of the "on air" transition time. Machines will be pre-rolled and the event will be placed on air regardless of the schedule.

Hold Transit will prevent the audio/video transition occurring at the scheduled time in the case of an event overrun. Machines will, however, be started at their scheduled time.

Hold will prevent the audio-video transition, and next event machine pre-roll, from occurring i.e. the existing program will be kept on air. When this occurs the duration of the Hold is added to all subsequent events.

Release will terminate the Hold and Hold Transit operations.

Overrun Cancel will subtract the time added due to the Hold operation from the following events which would then occur at the originally specified time.

Schedule Displays

Two 14-inch monitors are used to display separately the Network and Transmitter schedules. The monitors display up to 18 lines of 72 characters. The top line indicates whether the display is for the Transmitter or Network and whether the system is in the Automatic, Manual or Edit mode. The real time is also displayed.

The lines 2-18 display the upcoming scheduled events. In the Edit mode it is possible to replace lines 6-18 with any continuous group of events stored in the computer memory. Lines 2-5, which display the audio and video sources for the "on air" and "next events,"

continued on page 104

Satisfy the FCC and your monitor budget ...and still get the best



TV (UHF&VHF)

Model 701: Frequency and Modulation
(FCC Type Approval 3 187)

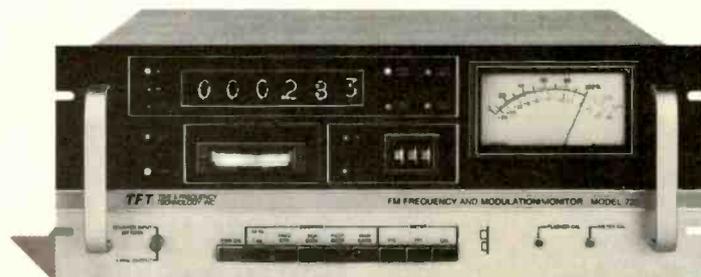
Model 702: Modulation only
(FCC Type Approval 3 189)



AM

Model 713: Frequency and Modulation
(FCC Type Approval 3 195)

Model 732: Modulation only
(FCC Type Approval 3 209)



FM/STEREO /SCA

Model 723: Frequency and Modulation
(FCC Type Approval 3-202)

Model 734: Modulation only
(FCC Type Approval 3-214)

Model 724: Stereo Model 730: SCA
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**NAB BOOTH 902
SOUTH HALL**

Circle 183 on Reader Service Card

will be retained on the monitor and not affected by the "roll" facility.

The following indicates the content of the columns:

- 2-7 Scheduled time
- 9 Priority i.e. automatic, manual or "cue" initiated event
- 11-15 Duration time
- 17 Color or Monochrome program i.e. C or M
- 19-20 Details of Transmission i.e. Whether the event is Transmitter, Network East or Network West or any combination thereof.
- 22-30 Video Input Routing. This specifies VTR's, ACR's, T/C's, Studios, Remotes, etc. i.e. TO902** would indicate T/C No. 9 Film Projector No. 2. Columns** are not presently used but in the future could specify a spot on a particular cartridge of a Cassette type VTR. (The "-" at the end indicates that the outgoing machine should be stopped; it is possible to keep it running.)
- 32-41 Audio Input Routing. In an "S" is specified the audio source is the same as the video source. Other sources that can be specified are an announcer, reel-to-reel tape or cartridge tape machine.
- 43-46 Telecine controls as follows:
Col. 43 specifies sound source i.e. optical sound with front or rear focus or magnetic sound with track selection.
Col. 44 specifies either normal sound or hold sound.

Col. 45 specifies positive or negative image.
Col. 46 specifies transitions within a T/C island i.e. C-cut, X-cross fade, Y-super.
(Note: Cols. 45 and 46 are for future requirements.)

- 48 Type of Transition i.e. Cut (c), V(V) fade, or fade and cut (V) to next event. In addition the next event *audio* can be specified to be "over" (O) or "under" (L) the "on air" event.
- 50 Cue Dot initiation
- 52-71 Columns used for program titles.

Other Aspects

The booth is controlled from the master clock system in the station which provides for a BCD input. However, a back up internal clock is also provided to operate the system in the event of a failure of the master clock.

In the event of a power failure the system will be restored in a controlled manner. It will be switched to Manual with "black" and "silence" selected on the outputs, and the program will be brought up to date.

Plans are already underway to develop the system further. Later this year programs will no longer be loaded from card readers but rather from another computer.

A new booth is presently being installed which will automate programming to the Atlantic areas of the CBC's French viewers via the ANIK satellite.

Expansion has been allowed for in the CRT and Input Card format for future developments in systems or equipment i.e. Dissolving between Telecine projectors or locating particular spots within video cassettes. Eventually it is intended to start next events automatically following Network feeds.

BM/E

CURRENT REAL TIME	SCHEDULE START TIME	DURATION	VIDEO INPUT ROUTING	AUDIO INPUT ROUTING	STATION	
					TRANSMITTER	STATION
094027						
TIME TO NEXT EVENT	000428	-	C 13 VO1		V	PROGRAM A
SCHEDULED TIME OF NEXT EVENT	094455	-	C 13 VO9		C	SPOT 1
	094600	A	C 13 TO109	L	C	CBC IDENTIFICATION
	094700	D 20	C 13 VO9		V	SPOT 2
		C	C 13 VO1		C	PROGRAM A
	095853	-	M 13 VO9		C	SPOT 3
	100000	-	C 10 VO6		C	SPOT 4
	100100	-	C 10 VO3	V	C	PROGRAM B
	101400	-	M 13 TO901	F2	V &	SPOT 5
	101500	+	C 10 VO3	V	C	PROGRAM B
	102600	B 100	C 10 VO9		C	SPOT 6
	CONT				C	
	102900	-	C 10 TO101	F2	V	SPOT 7
	103000	-	C 13 TO102	F1	V	PROGRAM C
	103500	D 100	M 13 VO9		V	SPOT 7
		D 100	M 13 VO8		V	SPOT 8
		C	C 13 VO1		V	PROGRAM D

Format of the CRT display. Program A is on-air event. Spot 1 is next on-air event.

Neve has a baby!

New in the Neve family is little Kelso. Just look at what 24.8 inches of transportable, top quality mixing console gives you:

- 10 fully equalized inputs with conductive plastic faders
- 4 buses (2 program and 2 auxiliary) all of the same high performance standard
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Of course the handbook, spares and mating connectors are included. All this for under \$10,000.

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Circle 184 on Reader Service Card

Getting A Standby Antenna With Minimum Dollars

By Glenn Winter, P.E.

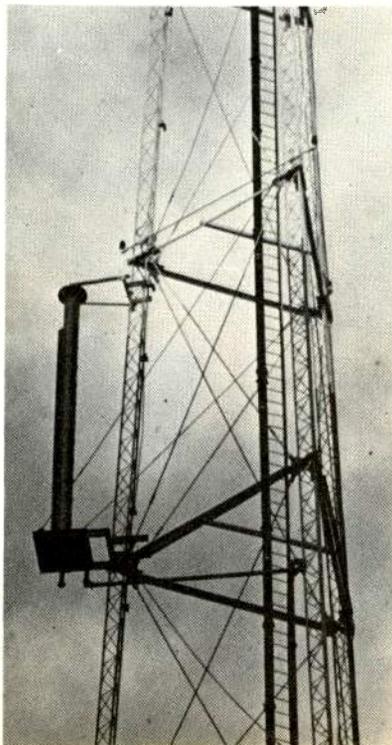
WSBA, Channel 43, York, Pa., eliminated coax and antenna down time with a standby system that is almost as good as the main system.

Like other broadcasters we've been plagued with more antenna down time than we would like. A standby or back up system seemed like a desirable move but one considered too costly. WSBA has come up with a solution drawing on the ingenuity and services of a small company, SWR, Inc., Goffstown, N.H. I'd like to share our experiences with other broadcasters. Hopefully some of you might be able to adopt some of our "answers" to your own needs.

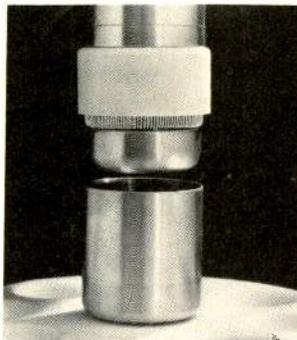
In this day of disappearing critical resources and tight money, I'm pleased to report that the solution taken by Jack Kruger of SWR was to recycle some 3 1/8-in. coax transmission lines which had been saved from an earlier system. Use of this old coax enabled us to come up with a standby system at a low dollar figure. The low final cost was partially due to the fact that we could add on to our existing tower. More on that in a moment. The important thing was that we whipped inflation and increased reliability at the same time!

Using the materials at hand, SWR proposed an alternative antenna which would be less than 20 feet in length and weigh less than 1000 pounds. It would have a power gain of 14dB at Channel 43's frequency allocation (638-644 MHz). The antenna would be designed to handle half (30kW) our rated output power

Mr. Winter is Director of Engineering, Susquehanna Broadcasting Co., 140 East Market St., York, Pa. 17407



Standby antenna is twenty-foot section added to one leg of WSBA tower. It's easily adjustable in field for proper pattern.



Unusual bullet connector from SWR catches wear particles in cup so they won't contaminate dielectric. Also instead of fingers that wear irreparably, contact action is confined to a replaceable wristband spring contained by Teflon sleeve. Photo shows lower half of transmission line before it is pushed upward to mate.

with the same directional pattern as our present antenna systems.

WSBA and SWR, Inc., approached the problem methodically and first determined what the existing tower could handle. The initial step was to run a stress analysis on our 380' self-supporting tower to see what the highest point was that could safely take the weight and wind loading of the proposed antenna. When this information was obtained, it was forwarded to the antenna fabricator along with the tower prints so that mounting brackets could be designed for the tower. Since these did not have to be field designed, the installation costs were decreased. It was determined that the antenna could be safely mounted 120' below the present system's center of radiation. Thus the auxiliary system would be 25% below the present antenna.

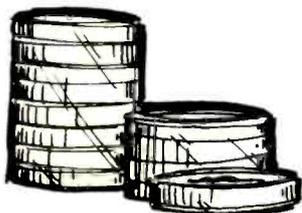
This height was determined as suitable based on the knowledge that the antenna plus brackets would weigh 1000 lbs. and be subjected to a wind force of 900 lbs. The final antenna (called the SB-10) weighed only 460 lbs.—with the brackets it came to a little less than 900 lbs.

Because of the directional pattern, we had to determine which leg of the tower to mount the antenna for minimum pattern distortion. The antenna was fabricated to allow for in-field orientation. These are important considerations even with omni systems because a typical omni pattern has plus or minus 1 1/2 db scalloping (nulls). If a broadcaster erects what he feels is an omni antenna he must still consider where these nulls will occur, taking into account his critical coverage areas.

Unusual bullet connector used

One of the unique design features of the new transmission line feeding the new antenna is the connector it incorporates. It is not the standard configuration with split fingers at each end. Rather there is a bullet-like probe that is an integral part of the inner conduc-

continued on page 109



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provide your own program interconnecting links. All solid-state aural studio-transmitter and remote pickup links are available to fulfill almost every requirement. Moseley Associates, Inc., has pioneered many STL and remote pickup concepts — solid-state systems, true direct FM modulation, and composite operation (FM stereo on a single link) . . . just to name a few. Front-panel metering of all important parameters is included on all Moseley STL and remote pickup transmitters and receivers.



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FM Stereo (Dual)
- PCL-505/C — Composite Stereo — 148 to 960 MHz
(Single Link for Stereo)

AURAL REMOTE PICKUP LINKS

- RPL-3 — 2 microphones, 1 line — 148 to 174 MHz
- RPL-4 — 2 microphones, 1 line — 450 to 470 MHz
- AMP-3 and AMP-4 Companion RF Power Amplifiers



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on unproven transmitter *remote control* systems. Moseley Associates Remote Control Systems are field proven at numerous installations. Two basic types of systems are available — analog and digital. Both systems can be operated in either a wire or wireless mode.



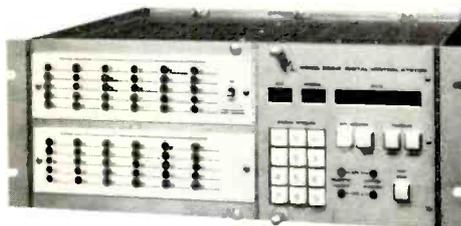
ANALOG REMOTE CONTROL

- TRC-15A — 15 Channels — Push-button Channel Select

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- DRS-1A Digital Remote System —
 - Up to 30 Channels
 - Companion 24-Channel Status Subsystem
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- DCS-2 Digital Control System —
 - Up to 90 Channels
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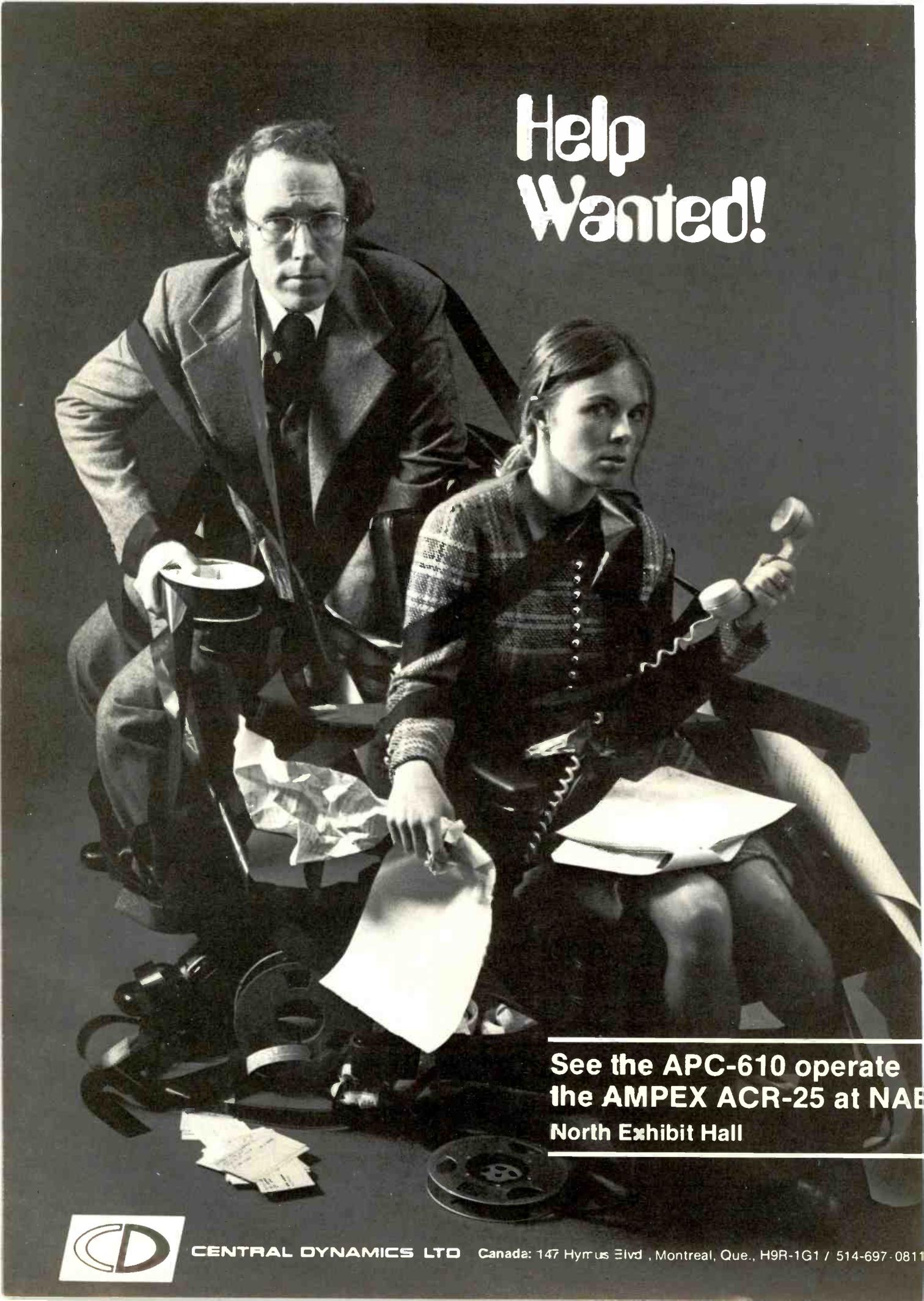
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You've heard that these "future systems" will perform an impressive variety of real-time and on-line tasks required by the typical TV broadcast station, such as:

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- Retrieve and display or print repetitive program formats, alternative programming and run sheets.
- Print FCC log with exact "aired" times, and variance reports for easier reconciliation.
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STANDBY ANTENNA

cont. from page 106

tor facing downward toward the bottom of the transmission line. It has a contact surface consisting of a recessed wrist band spring partially enclosed by a Teflon sleeve which when plugged into its female counterpart at the top of the transmission line could not be misassembled. When daily differential expansion and contraction takes place the particles of wear that develop are totally captivated in a cup facing upward. Copper chips cannot fall where they will to contaminate the Teflon disc as is in conventional line. (See photo). SWR informs me that instead of replacing a \$35 or \$40 bullet every 10 to 13 years we could replace the wrist band spring for about \$10. The result was that we now have a standby transmission line that is far superior to the original one for less than half the cost by utilizing our old refurbished outer conductors.

The antenna mast, slots and flanges, are made of aluminum. It consists of an internal power splitter and feed cables (to feed each individual slot). Power splitter is constructed of aluminum; feed cables are aluminum with copper-plated aluminum inner conductors. Since all materials are similar, there should be a minimum of differential expansion between all components. The input adaptor at the base of the antenna is an aluminum reactive "T" with a sliding short circuit to heat sink the inner conductor. This "T" has a cadmium input flange to mate up with the standard copper and brass transmission line. Also provided is a broadband, high power SWR tuner. The tuner takes out any unpredictable reflections caused by side-mounting the antenna. The tuner does away with slugging out these reflections, which is time consuming and costly since riggers are involved. The total system was installed in seven days, two of which were lost because of weather.

The dummy load part of our 7-pole patch panel was used for our standby SB-10 antenna system. In doing so, the water-cooled dummy load was slightly displaced so that a back-to-back elbow "U" return could be removed quickly and reassembled when we had to use it, which is normally twice a year for calibration of power measurements. This meant that if our main antenna system failed, by pulling one patch and replacing another, we could be quickly operating into the standby antenna system.

From an engineering point of view, using this configuration has a two-fold advantage. Since both antenna patterns are the same, if our diplexer fails we could go from visual transmitter directly to main antenna system and from the aural transmitter to the standby antenna without reducing the output power.

Results satisfactory

A telephone survey made after installation indicated the standby antenna works well. Ten out of 12 CATV systems reported picture quality comparable to that from the main antenna. The general consensus is that even though the SB-10 standby antenna is 120' lower than the main antenna, the picture is sharp and sufficiently stronto cover our market area. We achieved our main objective which was to eliminate down time and increase station reliability on a budget.

BM/E

Digital Transmission: It's Getting Ready To Take On Video

Digitizing voice and data for transmission is widespread today, and a lot of work is going into refining systems that do the same for video signals. Here is an account of digitals' early moves into video.

Digital techniques are all around the broadcaster, in his studio equipment, control systems, in his time base corrector, antenna monitors, etc. If he is using computerized data processing, he is likely to have digital communications links with computers in other cities.

Other applications of digital technology are spreading rapidly through all sections of today's telecommunications, especially including the developing satellite linkages. Thus digital transmission is right around the corner, and it behoves us to become familiar with this new world.

Comsat, in fact, has a fully developed digital transmission system for video signals. Called Ditec, it is not in use regularly as this was written, but clearly prefiguring things to come.

A spokesman there told BM/E that Ditec was probably too expensive for regular intercity video right now, but predicted wide networking use in three years or so. Ditec uses a 36 mb/sec rate. Comsat's system for data transmission digitally, called Digisat, is in use on several satellite circuits.

Builders of earth stations for satellite links are using digital techniques, or preparing to, on a broad scale. Scientific-Atlanta has been building stations for several years for military communications networks that use PCM. The technique will be extended to digital transmission for voice and data in the "Marinsat" net now being set up, which will link commercial ships at sea to land and to each other via satellite. The shipboard "earth" stations (we clearly need a new name here, perhaps "ship terminals"), have been developed by Scientific-Atlanta to take full advantage of digital technology; about 200 of them will be built in the first phase of the program.

Another earth-station builder, Fairchild Industries, announced that three of its stations, designed for exclusively digital handling of voice and data, had gone into operation. They are part of a network set up by American Satellite Corporation, a Fairchild subsidiary, for a Department of Defense communications network, and Fairchild said they were the first stations used in a domestic satellite net by the military.

Builders of microwave equipment, for intercity nets, STLs, and other specialized communications, are heavily into digital transmission too. Microwave Associates reports their equipment for transmitting voice digitally is widely used; their digital video is highly developed, but still in a prototype stage, until a market develops for it. Farinon Associates is on the verge of marketing data-for-voice equipment.

Also very telling as to the impact of the digital idea on

broadcasters is the experience of several makers of analog/digital and digital/analog converters, and other units of digital systems. The existence of a body of separate converters fully capable of handling top quality video is one of the main forces in fast expansion of digital technology.

The makers have been aiming their product largely at an OEM market, including microwave systems, time base correctors, etc. But Don Brockman of Computer Labs, in Greensboro, North Carolina, says that a surprising number of those who ask about, as well as those who buy his converters, are broadcast equipment manufacturers. A similar experience is reported by Biomation, of Cupertino, California, which reports gratifying strong interest in both OEM and broadcast fields. A third company, Comtech Laboratories of Smithtown, New York, reports high market activity for its digital multiplexer, digital data-over-voice units, and digital interface equipment.

This is obviously a partial sampling. A digital system that should be mentioned (though for voice only, not video), is DATE, the system developed jointly by the Public Broadcasting Service, and the Data Communications Corporation of Gaithersburg, Md., to put audio onto the video channel in network transmission. BM/E described the technology of DATE in detail in the January 1974 issue, with excerpts from a comprehensive paper by Evans Wetmore of PBS, one of the developers.

The objective of DATE, as recounted in the earlier issue, is to raise far above its present low level the quality of television audio transmission in nationwide networking. DATE does this by multiplexing *four* high-quality audio channels onto a subcarrier at 5.5 MHz, easily accommodated in the 20 MHz bandwidth of intercity microwave. The sampling rate is 35 KHz, the bit code count is 13, and with four channels the result is an overall rate of about 1.8 mb/s.

As this was written DATE was undergoing tests along with regeneration units designed to recover the original signal/noise ratio and other characteristics at points along the line; in very long hauls it had proved somewhat vulnerable to interference.

An excellent summary of some of the main problems in using digital transmission for video is provided by a recent paper on an experiment about to begin: the sharing of educational programs between Carleton University, in Ottawa, Canada, and Stanford University in Palo Alto, California. Joining as technical guide is the Ames Research Center of NASA, at Moffett Field, Calif.

Ames Research Center (ARC) and Carleton University (CU) will be linked through the Canadian Anik satellite,

using a system for digitizing video signals, with special earth stations at each end. ARC will be connected to Stanford University by a dedicated 14 GHz microwave link. Teleconferencing equipment will be available at all three points.

A main value of the experiment is the demonstration of sharing of educational programs over a wide distance, a sharing that would be prohibitively costly for educational institutions if done by either land-line or microwave nets. With the lowest possible cost as one main objective, the experimental equipment is designed to compress the video signal to reduce the bit rate, and thus the necessary bandwidth, substantially. A full technical explanation of how this is accomplished appears in the accompanying article extracted from a technical paper by Dr. Joseph Heller of the Linkabit Corporation, developers of the

system. Some of the terms and definitions may be strange to broadcasters, but they are likely to be increasingly present in his future.

The plan is for two modes of operation. In one there will be two-way video teleconferencing between any two of the locations, for sight-and-sound interaction between teacher and pupil without restriction. In the second mode, classes can be conducted simultaneously from Carleton to Stanford, and from Stanford to Carleton, with audio feedback only.

In preliminary trials the system worked well, and the year-long full-scale experiment is due to start later this year. It represents an important bringing together of the most advanced digital technology and of satellite transmission, to supply educational television with great reach at low cost.

Video Compression System Using Frame-To-Frame Differencing Makes Digital Transmission Practical

By Dr. Jerrold A. Heller

The hybrid Hadamard transform frame differencing algorithm is a viable technique for efficient transmission of digital video signals via satellite. With the rapid decline in cost/bit of semiconductor memory, this video compression technique will soon be practical for use with small, low-cost receive-only satellite communication ground terminals. The paper below, with minor deletions, was delivered at the 1974 National Telecommunications Conference.

Transmitting television signals digitally has several advantages over more conventional analog transmission, especially on power limited channels such as satellite communication links. A TV signal sampled at the Nyquist rate, with PCM encoded quantized samples, requires a lesser received signal power-to-noise ratio than conventional analog transmission. On a satellite link, this can mean smaller receive antennas or less costly receivers.

Unfortunately, going digital and using efficient binary (2 level) modulation requires a large transmission bandwidth. For example, sampling black and white NTSC video at 8.064 megasamples per second (30 frames per second, 525 lines per frame, and 512 samples per line) and quantizing the samples to 8 bits results in a data rate of about 64 Mbps. Even under ideal conditions, with quadra-phase modulation, a transmission bandwidth in excess of 32 MHz would be required.

However, the 64 Mbps data rate generated by sampling and 8-bit quantizing a TV source may be reduced by using any of a number of data compression techniques. The principle objectives and considerations in developing a video data compression algorithm and hardware for satellite transmission between Carleton University and Stanford Research include:

- The resulting video should be of a quality acceptable for commercial or educational purposes.
- A compression ratio of 8:1, resulting in a transmission rate of about 8 Mbps, was desired. This allows for a binary modulation transmission bandwidth comparable to that of a standard commercial TV channel.

- The selected algorithm should allow for relatively simple and economical implementation.
- Quality should be not overly sensitive to channel errors.*

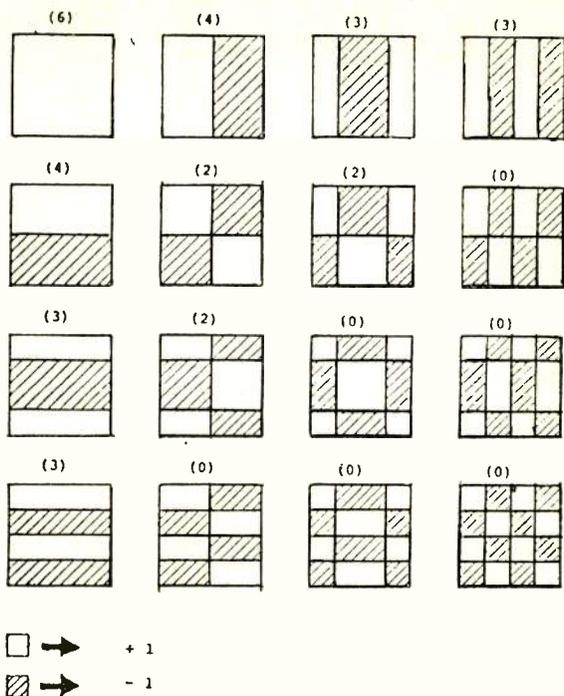
Background on video compression schemes

The more successful and efficient video compression techniques developed to date have taken advantage of both statistical redundancy and human psychovisual response [1]. Special statistical redundancy manifests itself in terms of correlation between nearby picture elements (pels) within a frame and the nonuniform first order pel grey level distribution. Although about 30 frames/second are required for apparent flicker freedom, the number of changed pels in successive frames is usually small. There are a number of psychovisual phenomena which can be exploited to allow for source compression. For example, the eye is relatively insensitive to absolute brightness but is sensitive to relative brightness in small areas, and brightness response is approximately logarithmic with source intensity. These facts make non-uniform grey level separation effective. Greater compression ratios are attainable using techniques which exploit frame-to-frame correlation because the eye's spatial acuity drops rapidly as motion (frame-to-frame pel differences) increases. In fact, a change of scene is accompanied by a loss of spatial acuity which takes several frame times to progressively reacquire [2].

Many familiar performance measures such as mean square error are quite unreliable as measures of visual "quality." For example, since there is a relatively tiny

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*Channel error is the decoding of a 0 when the bit should be a 1 and vice versa.



The 16 Hadamard subpictures used in the compressed video system described, which reduces the overall rate to about 8 mb/s.

proportion of high frequency "energy" in a typical scene, a minimum mean square error compression scheme might simply ignore the "highs." This, of course would cause ringing on the edges in the scene, which is a particularly objectionable form of distortion to the viewer.

Among the video compression techniques which can be considered are the following. They are described generally in order of increasing complexity and attainable compression ratios.

Buffer Free Techniques: Since scene activity is rarely uniform within a frame, many compression techniques generate data at a nonuniform rate, while the scene is being raster-scanned at a uniform rate. In these cases, a buffer is required to smooth the data stream for transmission. Here, we consider buffer free systems where compressed data are generated at a fixed uniform rate.

One buffer free technique is differential coding. Differential PCM involves the digital coding of differences between adjacent pels. A compression ratio of 2:1 has been attained using this technique with nonuniform difference quantization in early Picturephone work [3]. Differential PCM with nonuniform quantization is more effective than ordinary PCM because small pel-to-pel variations are represented accurately by fine gradations whereas large changes (edges) are much more coarsely quantized. An approximately equivalent PCM system would need the finest gradation of DPCM throughout its dynamic range.

Although one dimensional buffer free compression techniques allow only modest compression ratios, they are interesting because of their simplicity and relative insensitivity to channel errors. The latter is true because there is always a fixed number of bits generated for each pel. These bits contain information on pel amplitude only—not pel location as is the case in most buffered schemes. Channel errors appear as a few noisy picture elements and will not cause loss of line or frame sync.

Polynomial Interpolators and Predictors: The so-

called zeroth and first order prediction and interpolator algorithms seek to fit portions of a line of pels with straight lines such that the difference between the true pel value and the interpolation or prediction line is less than some aperture value. Data, which includes pel location as well as amplitude, is generated at a nonuniform rate by these algorithms; therefore, a rate smoothing buffer is required. In addition, certain controls are required to make certain that the buffer neither overflows during intense scene activity, nor underflows. This usually takes the form of variation of the error aperture width as a function of the buffer fullness.

Compression ratios of from about 4:1 to 2:1 are attainable with predictors and interpolators [4,5]. These rather low compression ratios are partly due to the fact that pel amplitude and location data must be sent. Like all buffered systems, predictors and interpolators are quite sensitive to channel errors. An error in a location bit means essentially a loss of sync. Resynchronization after each line is probably necessary, and a lower channel error rate is required than in buffer free systems.

Two-Dimensional Methods: The compression schemes described thus far have taken advantage of statistical and psychovisual properties in only one picture dimension. Techniques which are potentially more effective—or simpler to implement—use information in both spacial dimensions.

One such technique is contour coding [6]. Here the high and low spacial frequencies in a frame or subframe are treated separately. The very low frequency information is transmitted using PCM. The PCM rate is quite low because the spacially lowpass filtered scene is sampled only at the lowpass Nyquist rate. The high frequencies or edges are obtained and transmitted by following contours located by detecting connected pels with large gradients associated with them. "Synthetic highs" formed from the received contours are added to the lows to reconstruct the frame. Contour coding requires a reference memory of up to one frame. In addition, access to this memory is directed by the contours in the scene, and hence is not well structured. A buffer is also required to smooth the data generated by the algorithm. Potential implementation complexity is partially offset by the large compression possible (5:1 to 15:1). However, attainable compression is very sensitive to the number of edges in the frame and hence the type of scene.

A very promising class of techniques involves performing a two-dimensional transform of part or all of a frame. One such scheme generates the Hadamard transform of small portions of a frame [7]. For example, consider 4 by 4 squares of pels in a frame. We may represent these 16 pels as a linear combination of 16 orthonormal 4 by 4 squares of pels. Almost any set of orthogonal squares—which includes the uniform (DC) square—will be nearly optimum from a mean square error point of view, since almost all of the energy in 4 by 4 pel arrays in typical scenes is in the DC component. One basis which is simple to implement as well as psychovisually natural is the Hadamard basis. This basis is natural because only three vectors are required to represent the great majority of effects meaningful to the eye. One vector (the DC square) represents a constant grey level. Two other vectors represent a horizontal and vertical edge.

Compression ratios of from 3:1 to 4:1 can be attained [7] by quantizing the coefficients of these three vectors relatively finely and the remainder coarsely. The pels are reconstructed from the received basis coefficients. Even

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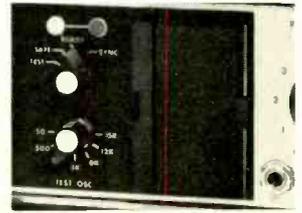
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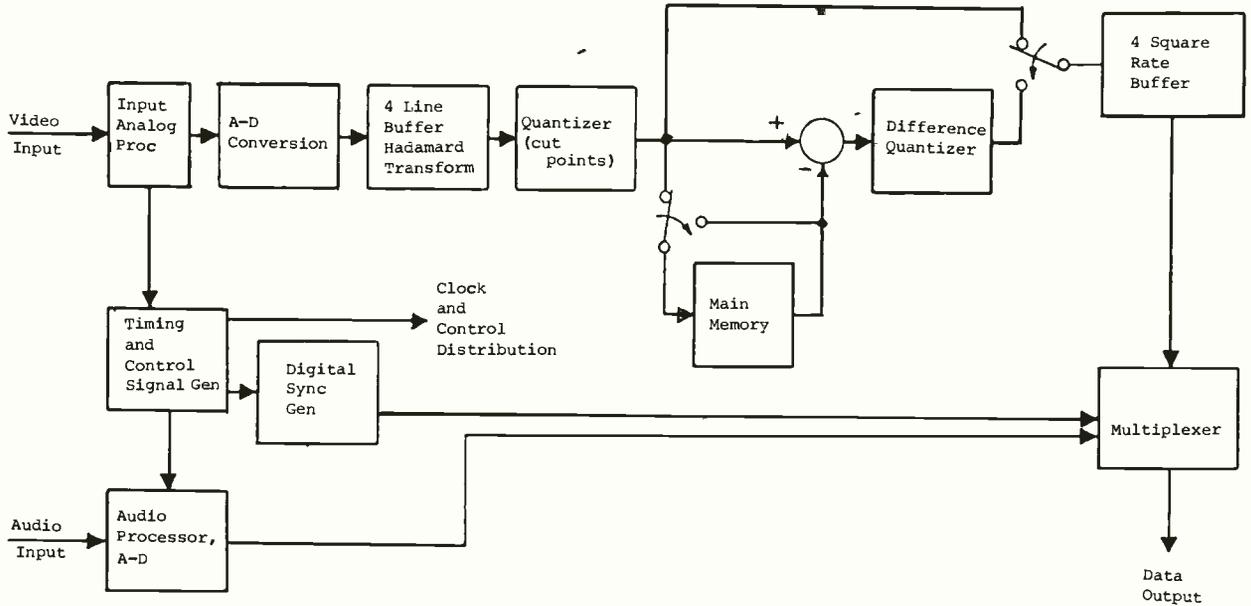
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though the 4 by 4 Hadamard transform technique yields only a 3 or 4 to 1 compression ratio, it has several advantages. First, it is a buffer free technique; secondly, it is quite naturally adaptable to compression techniques which take frame-to-frame redundancy into account.

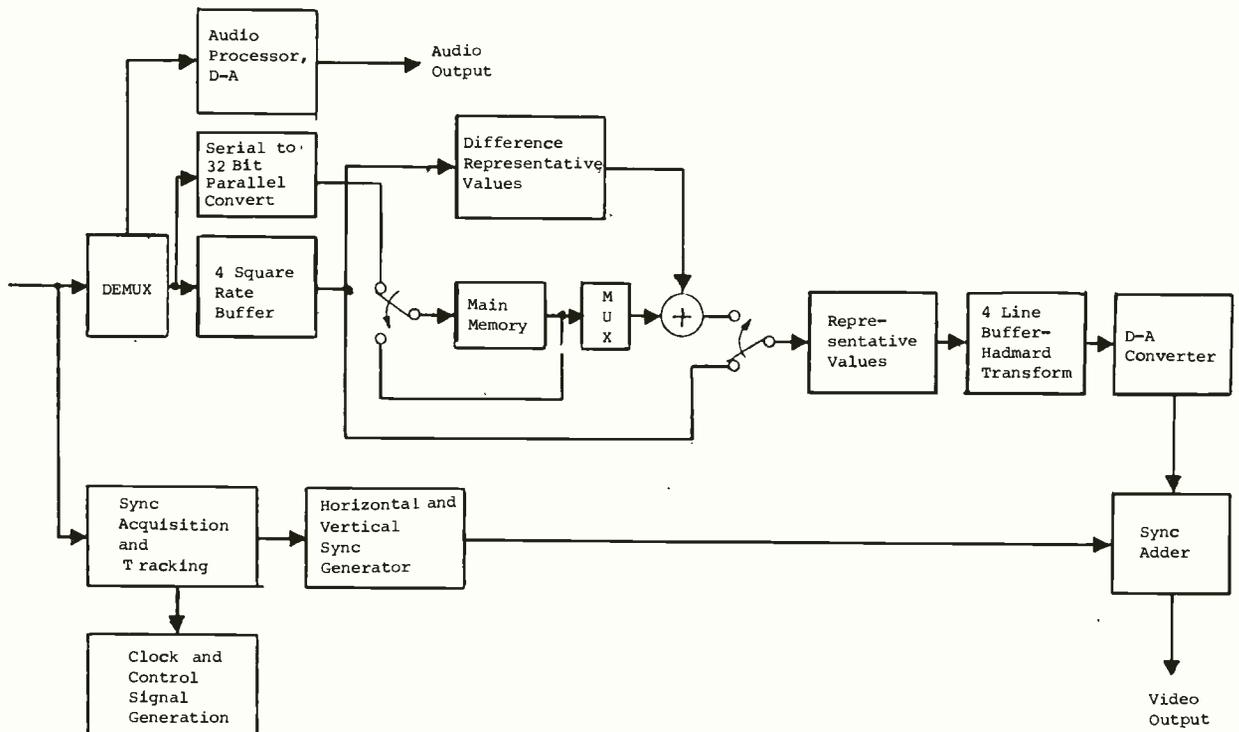
Frame-to-Frame Redundancy Reduction: In real time television applications, it is also possible to exploit frame-to-frame correlation for further data compression. The major problem here is that a reference memory of at least one, and possibly many frames worth of data, must be stored in the source coding process. Although presently available, IC technology makes memories of this size

feasible, an important measure of practicality for any frame-to-frame technique will be the size of the encoder memory.

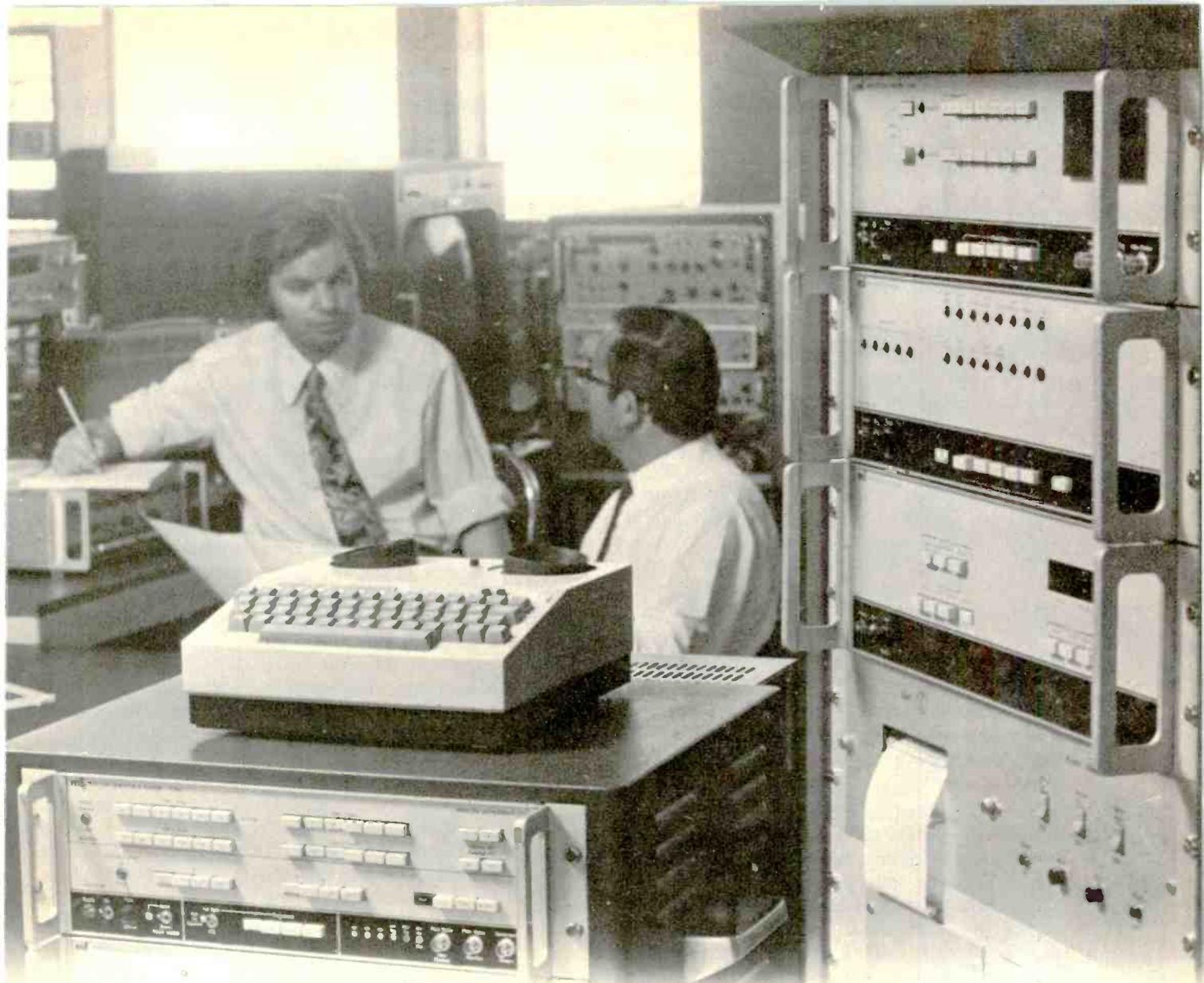
One promising approach is to transmit information only concerning these pel which have changed from one frame to the next [8]. Since significant pel changes tend to occur in connected areas near the edges of a moving object, it is more efficient to code runs of pel changes than individual changes. A smoothing buffer is necessary in this type of system since source activity is variable depending on the amount of scene motion. It has been found that a buffer of about one frame is sufficient to yield



Block diagram of video compression encoder; the A/D converter feeds 8-bit encoded material to Hadamard transformer.



The decoder for the video compression system is essentially the inverse of the encoder operation, providing video output in analog form.



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compression ratios of from 6:1 to 8:1 with Picturephone type scenes [8]. An important consideration is the transient response of the system at scene changes. Violent changes in many pels will require several frames to portray accurately in any high compression frame-to-frame system. This is offset by the fact that visual acuity drops temporarily during scene changes.

Another frame-to-frame technique involves three-dimensional (2 spacial, 1 temporal) transforms. For example, a three-dimensional Hadamard basis might be used to represent $4 \times 4 \times 4$ cubes of picture elements. The arguments for the efficiency of the Hadamard basis can be extended to include the time dimension. Edges of objects in motion can be approximated by planes, which will code efficiently using the Hadamard basis. An advantage of this technique is that it does not require a rate smoothing buffer. However, a reference memory of several frames is necessary.

Combinations of Source Coding Techniques: There are a large variety of potentially attractive hybrid combinations of the compression techniques. In fact, some of these techniques are really multidimensional combinations of the simple schemes. One combination of techniques— 4×4 pel Hadamard transforms with transmission of coefficient frame-to-frame differences—was found to meet our quality, compression ratio, and implementational simplicity criteria. This technique has been studied in detail, simulated and implemented.

A practical solution: hybrid hadamard transform and frame differencing

The hybrid Hadamard transform and frame differencing algorithm technique has many of the advantages of other three-dimensional algorithms but considerably less memory is required and there is no rate buffering due to variable scene activity.

Conceptually, this scheme can be thought of as transmitting the compressed two-dimensional Hadamard transform coefficients for the first frame. The two-dimensional quantization is performed according to Ref. [7]. Fig. 1 shows the 16 Hadamard subpictures (basis vectors). The numbers in parentheses above each subpicture is the number of bits of quantization allocated to the corresponding coefficients. The total number of bits for 16 pels (the sum of the number in parentheses) is 32, or 2 bits per pel.

For three frames after the first (reference) frame, only quantized *differences* between the compressed transform coefficients of a subpicture, and the corresponding subpicture in the past frame, are transmitted. Actually, only differences on three of the 16 coefficients are sent for a total of 11, 11 and 10 bits sent per 16 pel array in the second, third, fourth frames respectively. This results in an average of one bit per pel. This procedure is repeated by again transmitting a compressed two-dimensional frame independent of previous transmissions. The additional compression over that obtained with a two dimensional Hadamard transform scheme is possible because the difference coefficients can be quantized much more coarsely than the two-dimensional transform coefficients themselves. The smaller memory is possible because it is sufficient to store a compressed rather than an uncompressed form of the reference frame.

Even though significant distortion is visible on single frames that are generated using coefficient differences during rapid motion, this distortion is barely perceptible during real time playback.

The final system

LINKABIT has designed and fabricated a real time video compression encoder and decoder using the hybrid Hadamard transform and frame differencing algorithm.

The fully self-contained encoder and decoder are implemented in separate 8 $\frac{3}{4}$ " high standard rack mountable enclosures. The encoder accepts as input a standard composite NTSC black-and-white video signal. The outputs of the encoder are a compressed 8.064 Mbps data stream and its associated clock. The received 8.064 Mbps compressed stream and its recovered clock form the input to the decoder. The decoder output is a reconstructed NTSC composite video signal. Two audio channels, sampled and 8-bit quantized at the video line rate (15.75 KHz), are multiplexed into the compressed video data stream during the horizontal sync pulse time. The encoder also inserts a sync word in the output data stream every 4 frames. Circuitry is provided in the decoder to acquire and track this sync word.

Figs. 2 and 3 are block diagrams of the video compression encoder and decoder respectively.

Operation of the encoder proceeds as follows: The composite video input signal is amplified, DC restored and 8-bit A/D converted. The 4-line buffer stores quantized samples on 4 video lines and serially provides the Hadamard transformer with sets of 16 samples within 4 by 4 square arrays. The transform coefficients are further quantized with the number of bits per coefficient given in Fig. 1. The quantization is non-linear following Ref. [7].

To minimize data rate smoothing, quantized Hadamard coefficients are sent for one fourth of the 4 by 4 pel arrays in each frame (these are called *refresh* arrays). Quantized coefficient differences are sent for the remaining $\frac{3}{4}$ of the 4 by 4 arrays. For *refresh* 4 by 4 arrays, the switches are in the positions shown in Fig. 2. The quantized coefficients are stored in the Main (frame) Memory and are sent through the Rate Buffer to form the output data. For differenced 4 \times 4 arrays, both switches in Fig. 2 change positions. The Quantizer outputs are subtracted from the corresponding refresh array coefficients at the Main Memory output. These coefficient differences are further quantized and forwarded to the Rate Buffer.

All timing signals and control signals are derived by phase locking to the horizontal and vertical sync stripped from the composite input signal.

The decoder of Fig. 3 performs essentially the inverse functions to those of the encoder. Inverting the encoder quantizing operations involves assigning "representative values" to quantization intervals. The decoder also acquires synchronization and regenerates composite sync which is added to the reconstructed video signal. **BM/E**

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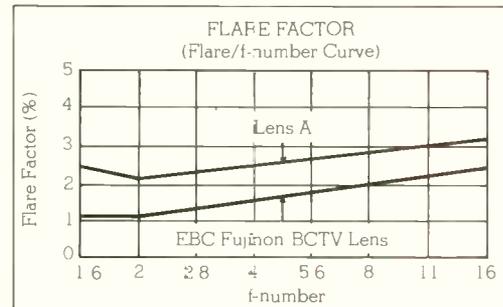
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4	81	92	98	99.2
6	73	88	97	98.8
10	59	81	95	98.0
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Studio Lighting And The Energy Problem:

Panel of Experts Discuss Causes and Solutions Part I

When the gasoline lines ended last year, the then energy czar William Simon said that we no longer had an energy *crisis*; we had an energy *problem*. Call it what you like, crisis or problem, the fact is that today, more than ever, broadcasters have to be concerned. Already in some metropolitan areas, television stations are being faced with power brownouts and blackouts. And we can presume that the worst is yet to come. What can be done?

To find some answers, BM/E recently convened a panel of experts in television lighting—a major consumer of power. The panel included Joe and Moe Tawil, president and chief engineer, and Tom Pincu, product manager, all of Berkey Colortran, a division of Berkey Photo, Inc., and Jim Davis, market planning manager for the theatre, TV, film and studio visual lighting products group of GTE Sylvania. The interview was conducted for BM/E by Don Kader, president of Captial Communications Company, a Los Angeles advertising and public relations firm specializing in video and audio/visual markets.



The panel: from left, Don Kader asking questions for BM/E; Tom Pincu, Moe and Joe Tawil, product manager, chief engineer and president, respectively, of Berkey Colortran; and Jim Davis, market planning manager for GTE Sylvania.

BM/E: Well, gentlemen, let's get right at it. Is there an energy problem in respect to TV lighting? And if so, what can be done to improve the situation?

Joe Tawil: There most certainly is a problem. A big one. I think we ought to divide our discussion into three major areas of concern: First, I think that many broadcasters are using more energy than they need to light their studios. Second, there's the question of equipment maintenance. I don't think that most people realize the waste caused by poor maintenance habits. Third, there is the question of proper equipment selection. Substantial reductions in power usage could be realized if people would do a better job of selecting lighting equipment.

Tom Pincu: Very often a light level in the studio is established arbitrarily. Somebody turns on a light, and if it happens to be a 5,000-watt unit, it becomes the

key and everything else works up to that.

Moe Tawil: I agree. Many broadcasters are over-lighting now, because the cameras they're using are generally low light level cameras. And they're equipped with units and habits from a previous time.

Tom: There are also two schools of thought on lighting technology. One says pour on so much light that you've got your camera stopped down to f 8 or smaller so you have extreme depth of field. The other says, no, we want very limited, selective focus. So you're operating at f stops of 4 and 3.5 and the director is able to control the focus in a much more effective manner. Add to that the problem of the engineer riding video who says, "give me some more light—there isn't enough light!" He wants the picture to be sharp. *Nothing* can be out of focus. That works against the whole idea of the conservation of energy.

Joe: I think the primary problem is that lighting isn't thought out in the first place. If you're doing a news show at a fixed desk, your depth of field problem isn't too severe. If you have action and movement, you don't want a higher light level. So the first thing to think through is what you're going to be doing. The first thing to determine is what the light level should be instead of arbitrarily turning on the brightest light you have in the house and scaling everything up to it.

BM/E: What's involved in the way of energy use: Is there really a lot of energy involved in lighting a studio? What are the dimensions of the kind of savings we're talking about?

Moe: 25 watts per square foot for black and white and 40 for color is a rule of thumb. But it's not just the lighting load to consider in the studio. If you turn on all those lights you need air conditioning to get the place cool enough to work in. A small studio, 15 by 20 square feet, typically uses 32kw per hour. Which, by the way, the average home uses in a month. That's just for the lights. In addition, the air conditioning load is probably another 40 to 45kw. So, by the time you finish, you're using about 100kw per hour in production, which is phenomenal usage.

Joe: The problem is that nobody really thinks about it. It's like everything else. Before the energy crisis was brought home to us, no one worried.

Tom: I think what happened in TV is just as Joe says. No one cared. Everything just runs. A little thought and a little planning and you could probably cut the energy levels substantially.

Moe: The way to do that planning is to come back to the key light and start with a level that you know you're going to need for your camera and particular production requirement. In other words, the key light establishes the basic light levels.

Joe: If you start with a key light that's too bright, 400 foot candles instead of 200, you'll need more fill and the back lights are also going to have to be brighter.

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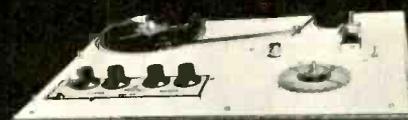
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As these ratios start to go up, the light level compounds and the amount of energy being used multiplies. So, if by accident, you choose a 400 foot candle key, because there happens to be a 2,000 watt fresnel hanging there, you boost the light level of the entire set.

Jim Davis: Right. From the point of view of economy, decide where you're going to go with your light level in advance. The two critical things, I think, are key light and background. Some of the networks have reckoned with this fact by lamping down across the board. Just by changing their lamps in their fixtures.

Moe: That happened in New York first before there was a national energy challenge. Broadcasters there were told by the city and Con-Ed "we haven't got power for you" years ago.

Jim: The network outlets in Los Angeles were also lamping down a long time ago. In fact, five years ago, a west coast network facility was running between 450 and 600 footcandles and now they're down to 250 and below.

BM/E: What you're saying is also that camera technology has allowed for a downgrading of wattage.

Jim: Yes.

Moe: But the Europeans were ahead of us. Some of the European stations, like the BBC, started talking 100 and 80 footcandles in studio operations when we were 350 to 450 here. Part of it was the newer cameras. Plus, they were just more careful. They approached it more scientifically. They watched the balance. They were not arbitrary.

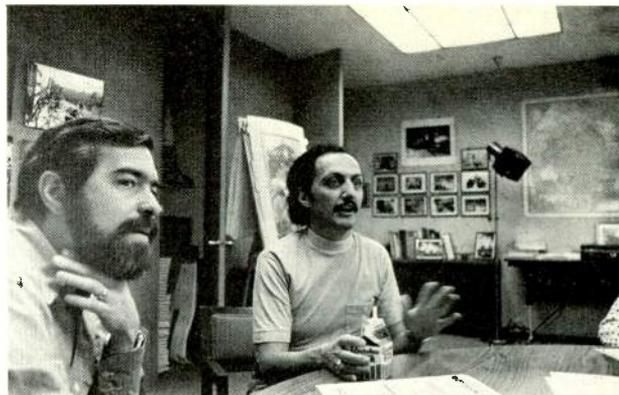
Jim: The interesting thing when you talk about lamping down is, that some people fear getting into a bind when they need a lot of light. They feel if they lamp down, they're locking themselves out of that capability. But you can always lamp back up.

BM/E: Is lamping down and up capability true of all fixtures in the industry?

Joe: Pretty much. Most can be lamped down. You can get 1,000, 1,500 or 2,000 watt lamps in exactly the same housing. Even 650's will take a 200 or 300.

BM/E: Let's go back for a moment to discussing the magnitude of the problem. You said earlier that just the lights alone in an average studio per day can equal the amount of power needed to operate a home for a month. Is that a big problem?

Moe: You bet it is. Remember, we aren't just talking about commercial broadcasting stations now. There are also PBS's, cable, and who knows how many TV



Tom Pincu, left, listens as Moe Tawil discusses ways to lower the footcandles used to light studio sets.

stations operated by the military and private enterprise; at hospitals, insurance companies and so on. I'd guess there are now at least 5,000 TV studios in this country. And more are opening all the time.

BM/E: Could you estimate what percentage of these studios were adequately equipped with lights before cameras started to become more sensitive?

Joe: That's one of the big problems. And it started with the big switch to color. Everybody was going to color. And most studios went out and bought bigger, more powerful equipment. Pushed the light levels up. Tripled them in some cases. But within four or five years, the light levels tumbled down to where they were in the first place.

Tom: The guys that are over-lighting the most are probably the most likely to be at broadcast facilities which went to color early and brought in more power. However, that really doesn't cover the entire problem. As we said earlier, a guy just may choose the wrong reference point to start with. Generally, the problem begins with lighting the cyclorama. You start with a reference point that is so bright that you now have to lay in more key light, more fill or back light, and so you push up your light levels in the entire studio. Even if you're not over equipped, you may be pulling more power than you need.

Joe: If a lighting designer gets into the habit of pulling out 5K fresnels or, say, 2K fresnels which is more common, when he doesn't need them, that pushes everything else up out of proportion.

BM/E: What are the lighting manufacturers doing to accommodate the user as far as energy conservation goes?

Jim: First of all, the "family" concept of lamps was developed so you can lamp up or down, depending upon your requirements, so you can use fewer fixtures. As far as education goes, we've published a lighting handbook and continually present seminars on proper light usage. One of the other things we're trying to do is convince studio managers to use 3200° Kelvin lamps instead of 3000° Kelvins.

BM/E: How come?

Jim: You get higher lumens per watt. You can get more light with less power consumption and you can always dim if you don't need 3200°.

Moe: With the latitude in cameras today, I think you can go $\pm 200^\circ$ Kelvin without too much sacrifice. There's quite a range of video control.

Jim Davis, far right, points out that lamp manufacturers have made some dramatic improvements in efficiency.



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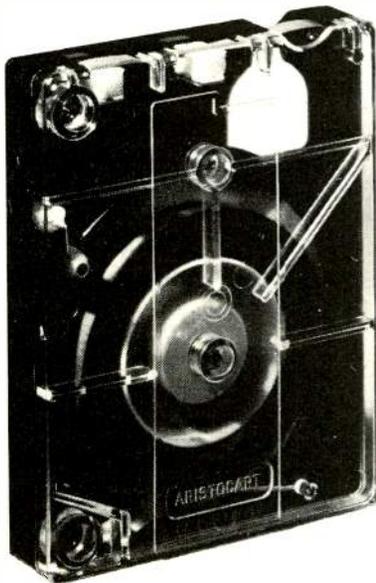
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Interactive Pay TV Making It In Hotels

While cable TV operators strive to capitalize on premium television, one model of an interactive system for movies, data services, and security alarm has quietly gone on line unhindered by regulatory uncertainties nor lack of a ready investor. The system is Telebeam Corp.'s hotel/motel plan called Paytel, Gardtel, Chargtel, Roomstate, and Wake-up/Message. Under development is Datatel.

As these names imply, the system offers entertainment, security surveillance, management information, and later, information services, directly to hotel rooms or hotel personnel over two way connection to a TV receiver. Telebeam's investment source is Quasar Electronics Corp., Franklin Park, Ill., which since its association with Telebeam late this summer has had an option to acquire the entire operation. (Quasar is formerly Motorola's Entertainment Products division, itself acquired last summer by Matsushita Electric in Japan.)

The Telebeam system has been installed in guest rooms on 18 of the 45 floors at the Americana Hotel in New York City via MATV cable. Eventually services will reach some 1800 rooms. There are only about 69 hotels of this size in the world and the Telebeam/Quasar combo wants to land at least 10 of them in 1975. This won't be easy as there are about a half dozen competitors with free and pay movie plans including First Cine-Tel, N.Y., N.Y. (free); Inn-Room Movies, Cherry Hill, N.J. (free) Inflight Services, Inc., N.Y., N.Y. (free); First Commercial Systems, Irvington, N.J. (free); and Computer Cinema (pay). MGM's Metro Vision, a free movie operation, has dropped out of the running.

However, Telebeam, Paramus, N.J., is banking on the relatively sophisticated two-way capability its plan offers hotel operators. Significantly, the company expects to branch out once it's established in the lodging industry. Plans are already underway to hook up a large cooperative apartment house cluster in New York using a self-contained cable line. Later, the equipment and



Above: plastic card attached to room key is inserted in set-top converter to unscramble movies, activate security sensors. Below: info readout for hotel administration.



the services may be offered to CATV operators and by then costs will have been reduced considerably.

The present interactive system is rather elaborate. A minicomputer controls the entire operation, linked to in-room TV set-top "converters" and information display terminals located throughout the hotel's administrative points. (For smaller hotels, a shared-time operation can be arranged). To "unlock" the converter, a guest gets a special encoded plastic card attached to the room key. This card engages the room's security sensors and opens the pay TV channels. It also disconnects the security alarm when the occupant is in the room. Here's how the various services work:

- **Paytel.** The scrambler, converter has five channels for premium television, usually movies. Guests get a brief unscrambled preview period during which they decide on one of the movies. But once the channel has been on beyond the preview period, the computer automatically records the transaction. In the future, hotels will have specialized programs available, such as golf tips for resort lodges, or gambling tips for Las Vegas, etc.

- **Gardtel.** Once every second, the computer scans the entry-way sen-

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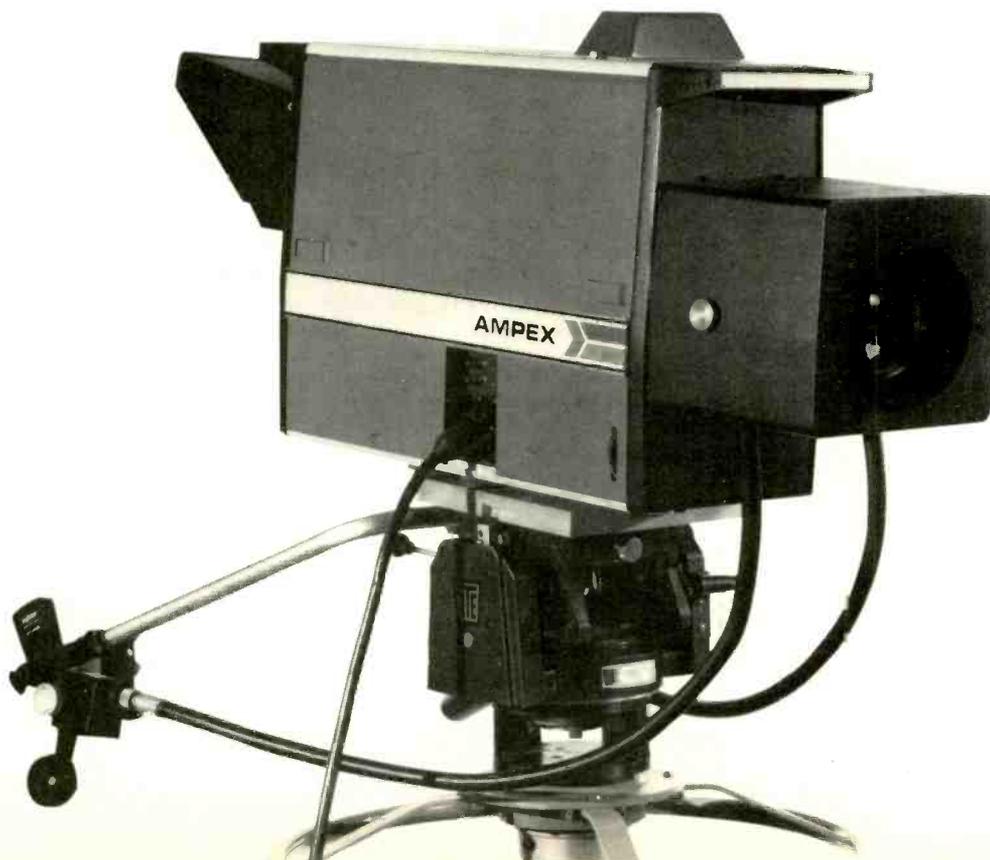
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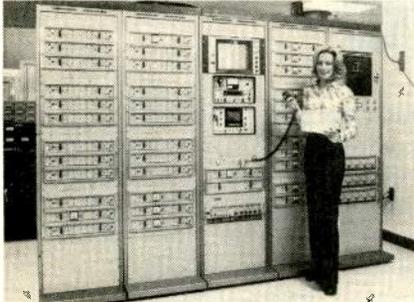


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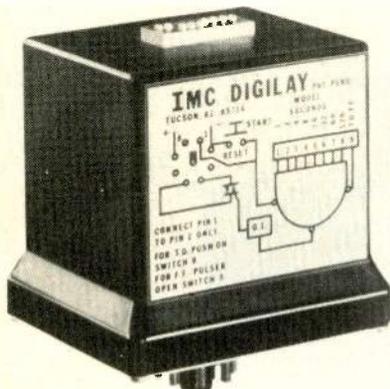
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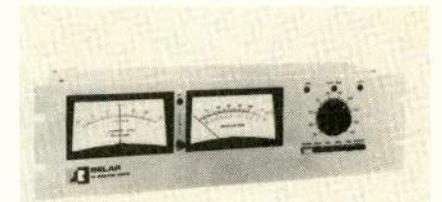
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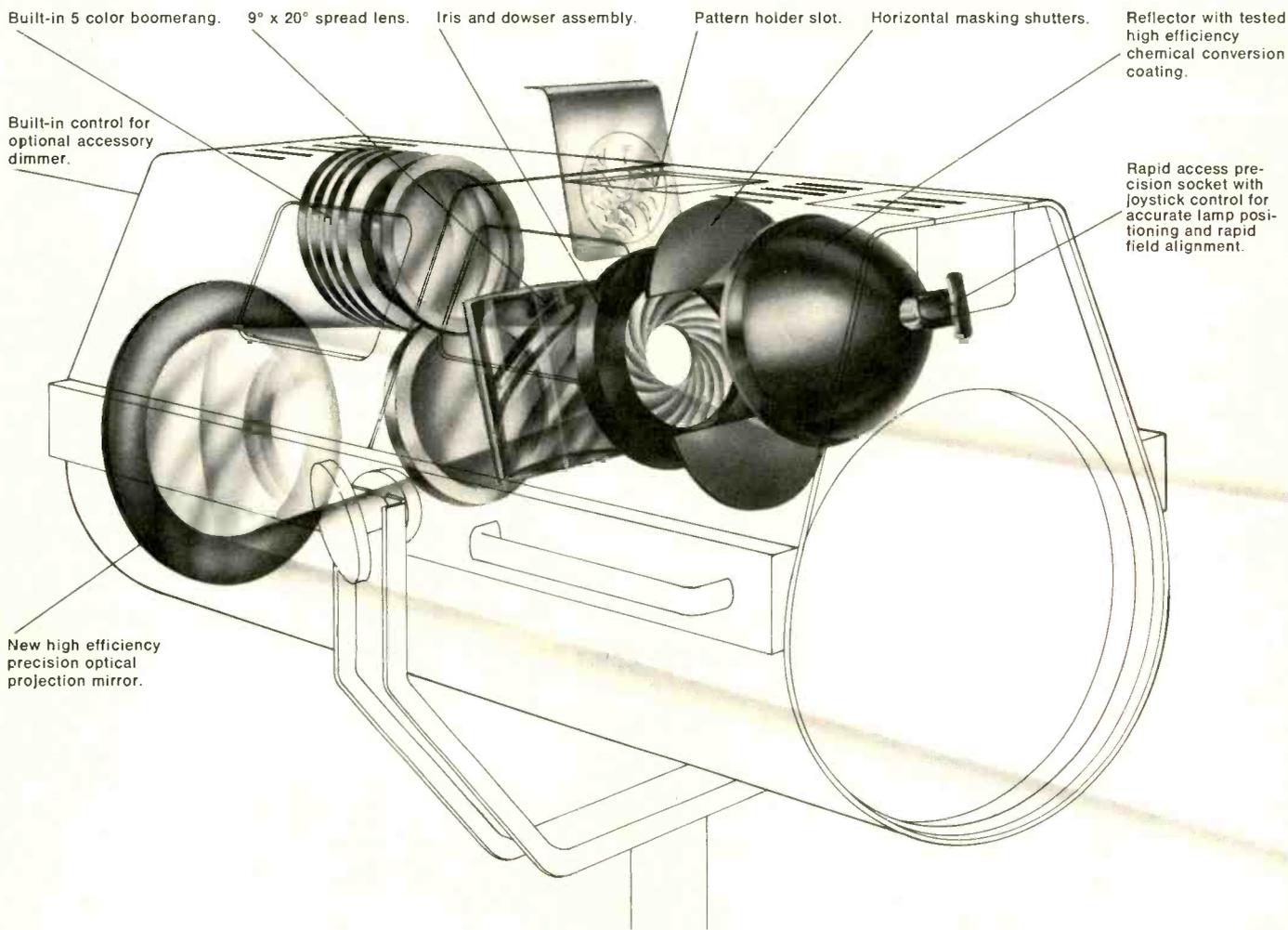
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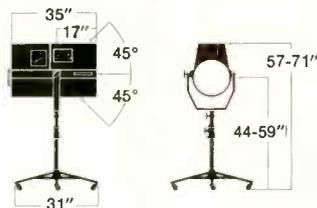
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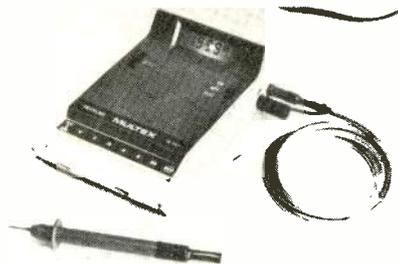
Transceiver for remote status monitor and alarm system for cable systems sends digital "inquiry" signal to transponders and monitors the replies. Model 4-SSC has adjustable scan rate, visual position display, audio alarm, built-in level meter, accommodates up to 254 transponders, can be switched to additional series. MAGNAVOX CATV DIVISION. **318**

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Thermal spot tester directs flow of air at 260°F. at individual components, to find malfunctions that appear when circuits are warmed. Unit can also provide quick drying of epoxies, or of components after cleaning. WAHL CLIPPER CORP. **321**

Digital multimeter uses "Transflective" liquid crystal display, readable in bright sunlight or in poor light. Model TQ-357 has $3\frac{1}{2}$ digit display;



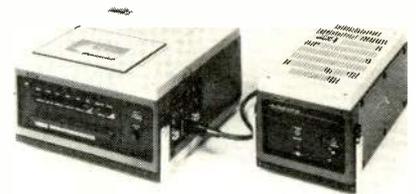
accuracy .05% of full scale plus 0.1% of range; 27 DC and AC voltage, current and resistance ranges, including leakage current down to 10 picoamps. \$179.00. TEKELEC, INC. **322**

Low-cost RF sweeper covers 1 to 400 MHz with maximum output of +10 dBm. Model 1050 responds ± 0.25 dB over range, PIN diode levelling, harmonic and non-harmonic spurious signals - 30 dB. Up to six crystal-con-

trolled marker plug-ins can be used. \$495. WAVETEK INDIANA, INC. **323**

Lightweight black-and-white video camera (five pounds) with six-to-one zoom lens has $1\frac{1}{2}$ -inch viewfinder-monitor. Model HC-100 uses $\frac{3}{8}$ inch Vidicon, rates 350 line horizontal resolution, two-to-one interlace scanning, s/n ratio 40 dB. \$870. TEAC CORPORATION. **324**

Portable color VTR usable with new camera (preceding item) has small, 20-minute cassette with $\frac{3}{4}$ " tape, compatible with full-sized cassette machines such as Sony U-Matic. Model VT-1000 has optional leather case, runs on rechargeable batteries or other 12-volt source, or from AC



power with adaptor, has full-interlace, 525-line recording; 240-line resolution in color, more than 300 line monochrome; weighs less than 30 pounds. \$2,925. TEAC CORPORATION. **325**

continued on page 128

Electronic Journalism System with One Inch Quad?

All your 2 inch Quad and Helical problems solved—by ASACA, convinced that the portable systems of the future will have $2/3$ inch pick-up tubes, 1 inch tapes and Quad VTRs!



Features:

ASACA ACC-3000 CAMERA

- * $2/3$ inch low lug Chalnicon tube incorporated.
- * Standard C lens mount system with 3 changeable field lenses.
- * 5.8kg (12.7lbs) camera head with VF and an 8.5kg (18.7lbs) back pack.
- * Static focus and magnetic deflection system.
- * Automatic iris, auto white balancing and power zoom which can be speed controlled.
- * The cable between the camera head and the back pack is extensible up to 100ft.

ASACA AVS-3200 VTR

- * 1 inch high band portable VTR.
- * The 6-inch reel enables recording as long as 30 mins.
- * Compact (390 x 300 x 220mm) and lightweight (16kg/35lbs).
- * Long life ferrite head.
- * Performs erase, fast forward and rewind.
- * Instant on-air is made possible by connecting the playback adapter (APA-300) and the TBC (ATC-300).
- * Features perfect interchangeability with the studio use VTR (AVS-3300).



ASACA CORPORATION, TOKYO, JAPAN
3-2-28 Asahigaoka, Hino-City, Tokyo, Japan
Phone: 0425-83-1211, Cables: ASACA HINOTOKYO
Telex: 02842338 A/B ASACA*J



ASACA CORPORATION OF AMERICA
1289 Rand Road, Des Plaines, Illinois 60016, U.S.A.
Phone: 312-298-4380
Telex: 72-6351 A/B ASACA DSP

We invite you to take a look at our new Electronic Journalism System at NAB, Booth 600, South Hall.

Circle 195 on Reader Service Card

CMC is matching product excellence with the best delivery service in the TV industry.

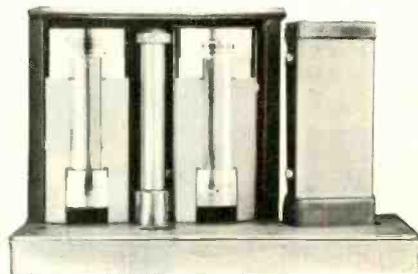
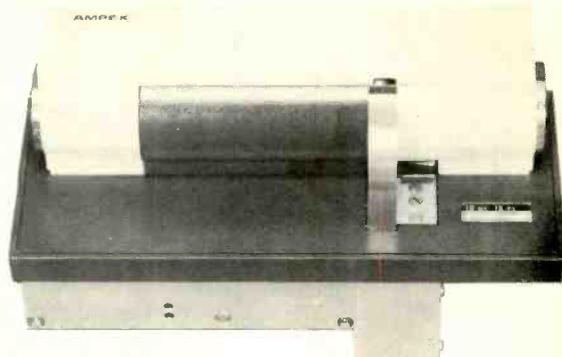
COMPUTER MAGNETICS CORPORATION has emerged as a major source of quality video tape equipment.

We are a specialty company providing the TV industry with technically superior products, refurbishing capabilities, and very fast delivery.

For refurbishing **MARK X Video Head Assemblies**, our turn-around time is normally within one week. Our turn-around time for **MARK XX Video Head Assemblies** is two weeks maximum. **VIDEO DISCS** and **HEADS** for Slow-Motion applications are in stock and ready to ship. **AUDIO STACKS** are rebuilt with superior quality heads, and they are in stock for IMMEDIATE delivery. Our **dual track AUDIO** record/playback heads are used for producing stereo sound or bi-lingual tracks on the same tape. We also manufacture special **HEADS** for high speed duplication, and for digital applications.



Stations and studios throughout the world have tried CMC when other suppliers failed to produce quality merchandise or to provide speedy delivery. They have not gone back.



For more information, please write:

Computer Magnetix Corp.
125 W. Providencia Ave.
Burbank, Calif. 91502
(213) 849-2356

Glentronix, Ltd.
160 Duncan Mill Rd.
Don Mills, Ontario
Canada
(416) 444-8497

Color Cassettes, S.A.
Calle America 173
Mexico 21, D.F.
Mexico
(905) 549-3100

Please visit us at NAB Booth 1009.

Circle 196 on Reader Service Card

Precision



TeleMation's new modular **BROADCAST** terminal products are designed to meet or beat the competition.

But for those who want the ultimate in audio and video terminal equipment, we offer our instrument grade **PRECISION** series.

See them at NAB booth 214 —
22 audio, video and pulse products,
all designed for interchangeable
mounting in our "525" rack frame.



TeleMation

P. O. Box 15068, Salt Lake City
Utah 84115 (801) 487-5399

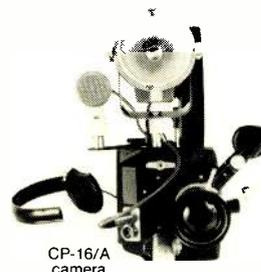
Circle 197 on Reader Service Card

Mike/Lite Bracket for CP-16 Reflex and Non-Reflex cameras.

An ideal accessory for the "one-man-band" TV-newsfilm/documentary cameraman. The new Mike/Lite Bracket is easily mounted on all CP-16 camera models, and is supplied with interchangeable 1/2" and 5/8" studs for mounting microphones and lighting fixtures.



CP-16R/A camera is shown with Mike/Lite Bracket, RE50 microphone, and Cinema Products' new *Sturdy-Lite* quartz focusing spot (operating at 600 watt-120 volt AC/DC or 250 watt-30 volt DC).



CP-16/A camera

A specially designed locking pivot-arm on the bracket permits maximum flexibility in positioning the microphone and light fixture in relation to each other.



For further information, please write to:

cinema E products
CORPORATION

Technology In The Service Of Creativity

2037 Granville Avenue, Los Angeles, California 90025
Telephone: (213) 478-0711 ■ Telex: 69-1339 ■ Cable: Cinedevco

Circle 198 on Reader Service Card

PRODUCTS

Three-mode power-line surge protection is provided in protector assembly. Model TII-412 has a three-electrode gastube surge arrester, and a circuit breaker, to ground out lightning or switching transients on either or both sides of the line, and open the circuit on sustained overcurrent. TELECOMMUNICATIONS INDUSTRIES, INC. **326**

Video compressor electronically reduces a video picture to one-fourth its original size. Model 600-2 is an op-



tional add-on to the Model 600 Frame Synchronizer, allows operator to put reduced picture in any of six positions in frame. \$15,000. CONSOLIDATED VIDEO SYSTEMS. **327**

Microphone has its own line-level amplifier, peak limiter and battery built-in to housing, puts out line-level

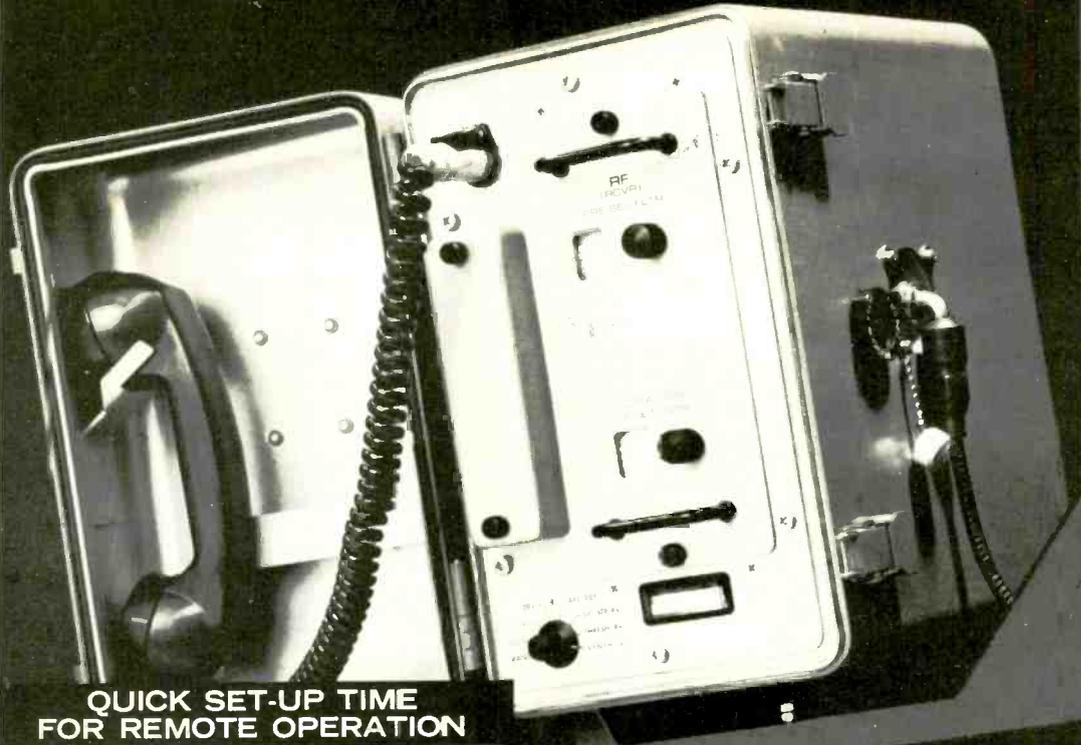


signal usable with up to a mile of unshielded cable. Model SM82 is unidirectional, has built-in pop and wind filter, 40 Hz to 15,000 Hz response, \$165. SHURE BROTHERS, INC. **328**

Zoom lens for 16mm cameras covers 12 to 120mm, has zoom ring allowing racking of focus from near to far objects, in addition to standard zoom action. Model C10 Macro Zoom thus

continued on page 130

Circle 199 on Reader Service Card →



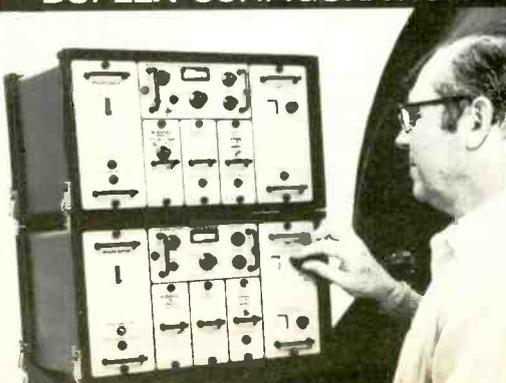
QUICK SET-UP TIME FOR REMOTE OPERATION



COMPLETE REMOTE SIMPLEX SYSTEMS



TRIPOD MOUNTED DUPLEX CONFIGURATION



TCM-6 SERIES PORTABLE MICROWAVE RADIO ... the accepted standard

- All Frequency Bands, 1.7 to 15 GHz
- Continuous Frequency Tuning
- .005% Stability
- Built-In Test
- Automatic Fault Indication
- All Mounting Configurations
- Solid-State Modular Design
- Internal Sub-Carrier Program Channels

This universal remodulating microwave radio gives high quality performance for up to 1200 FDM voice channels, NTSC video, or high bit rate digital data transmission. Major common carriers and many other leading communicators are using the TCM-6 Series in rapidly increasing numbers.

The TCM-6 Series has been designed for easiest possible operation, testing, and servicing. Quick and simple maintenance stems from a built-in test system, automatic fault isolation indication, plug-in modules and detachable boards. The comprehensive maintenance manual includes a complete list of locally available parts. High reliability is afforded through simple design, high derating of parts, and rugged construction.

TerraCom TCM-6 Series Microwave Radio is available for simplex, duplex, hot standby and diversity operation. Convertible mounting configurations allow rack installation, simplex or duplex tripod mounting, stacking, or vehicular mounting. In each configuration, the RF Unit plug-in modules can be remoted hundreds of feet in weatherproof enclosures at the antenna—eliminating waveguide.

Our customers praise our service. At TerraCom you can rely on personal attention, quick resolution, and fast turnaround. Write or call Bruce Jennings: 9020 Balboa Avenue, San Diego, California 92123, (714) 278-4100.

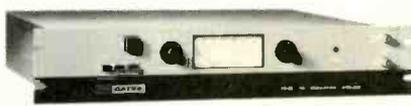


See it at
NAB, Booth 412

Here's what's new in FM monitors



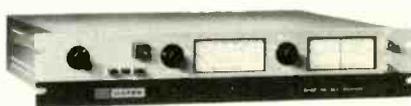
Frequency Monitor FF-80



Modulation Monitor FT-80



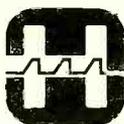
Stereo Monitor FS-80



SCA Monitor FC-80

- GREATER ACCURACY
- LONG TERM RELIABILITY
- COMPLETE FLEXIBILITY
- EASE OF OPERATION

These are just a few of the reasons it makes sense to contact the only major manufacturer of FM transmitters that also designs and builds FM monitors. To learn more about Harris' "new generation" of FM monitors, write Harris Corporation, Broadcast Equipment Division, 123 Hampshire Street, Quincy, Illinois 62301.



HARRIS
COMMUNICATIONS AND
INFORMATION HANDLING

Circle 200 on Reader Service Card

PRODUCTS

allows dolly effect with stationary camera, maintaining constant field size. \$1,795.00. CANON USA, INC. **329**

Line of studio cabinets has modular construction, is adaptable to most



broadcast applications. Construction is high density particle board, with Formica surfaces in all colors. DYMA ENGINEERING. **330**

Automatic and semi-automatic exposure control system for CP-16R reflex 16mm cameras is based on through-the-lens elliptical center-weighted silicon sensor. Seven LED's in viewfinder indicate ASA half-steps, with center one showing correct exposure. In fully automatic mode, iris is driven by quiet servo motor. Fully automatic, (semi-automatic switchable) \$1350; semi-automatic only, \$850. CINEMA PRODUCTS, INC. **331**

Wide-band variable attenuators have continuous control up to 10 dB. MVA series cover frequencies to 500 MHz in three ranges, are flat to ± 0.5 dB, have VSWR of 1.5 to 1. \$65. MU-DEL ELECTRONICS, INC. **332**

Solid-state cartridge lamps are available in yellow, green, amber, red. The 900 Series uses gallium phosphide LED's, are 1.14" long, .33" diameter, operate on 3.6vDC to 20 vDC. \$0.98 to \$1.16. LITTELFUSE, INC. **333**

Flat-pack microwave amplifier provides up to 34 dB of gain in the 2 GHz band. Model AFT-2500 can be mounted directly onto a PC board, is flat ± 0.5 dB, 1700 to 2500 MHz, noise figure 3.7 dB max., intermod -64 dB with two -10 dB output signals. \$395. AVANTEK, INC. **334**

Remote control unit for editing material on Sony, JVC, Panasonic and Concord videocassette systems provides instant pause, still frame, cue control and motor shut-down control. R-Matic Remote Controller allows operator to edit out part of incoming signal simply by pushing pause control; recording machine starts again instantly when wanted. There is no video breakup when sequence is used. VIDEO CONCEPTS, INC. **335**

Comquip



NOW...USE FAMILIAR CINE LENSES FOR VIDEO

INTRODUCING COMQUIP'S EXCLUSIVE 35mm FIXED LENS ADAPTER

Permits the Use of Fixed Focal Length Lenses with Color TV Cameras

- No Light Loss
- Built-In Iris
- Focusing Mount
- Provides wider angles, macro focusing and special effects not possible with conventional zoom lenses.
- Use Standard CINE or SLR lenses
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- 25mm & 30mm Formats Available

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Circle 201 on Reader Service Card

STREAMLINE your Video Tape Handling

with Hamilton Cartridge Storage and Transporting Systems.

Modular Carrouseis, Transport Carts, Stationary and Oscillating Storage Racks*
for RCA TCR 100A Television Cartridge Recorder



Illustrated is 7-tier Carrousel (140 cartridge capacity) on a CS-16 Ball Bearing Base, and VTS 16-18 Stand; and CTC-128 Transport Cart (capacity 128 cartridges).

Installation photograph courtesy of Station WHIO-TV, Dayton, Ohio, Cox Broadcasting Corporation. Demonstrating the equipment is Mr. Harold Bussey, Control Room Supervisor.

The equipment is crafted from custom satin anodized extrusions and gunstock walnut laminated wood. Our products are sturdy, functional and striking

in appearance. They will help you to obtain maximum efficiency from the finest video tape system you already have.

VTC-20 Carrousel Tier with four posts,
capacity 20 RCA cartridges **\$28.00**
VTS 16-18 Carrousel Stand 18" high **\$38.00**
VTS 16-24 Carrousel Stand 24" high **\$42.00**

SC 16 Ball Bearing Swivel Base **\$42.00**
CTC 128 Transport Cart (128 capacity) **\$390.00**
CTC 96 Transport Cart (96 capacity) **\$360.00**
CTC 72 Transport Cart (72 capacity) **\$320.00**

Note: All carts have a 16" bottom shelf clearance for vertical storage of video tape cannisters. Cannister supports included. Vertical dividers in carrousel are removable.

**Information on Hamilton Stationary and Oscillating Storage Racks available on request.*

Address orders and inquiries to

**A. BRUCE CROCK, INC., 8286 WINTON ROAD
CINCINNATI, OHIO 45231 PHONE 513 521-5040**

NEW LIT

For copies of these literature offerings, circle number for appropriate items on Reader Service Card.

Full line of **video products** is covered in new catalog, including video-cassette player/recorders, accessories, monitors, etc. JVC Industries, Inc. **250**

"Pocket Media Guide" lists about 300 **major media** in the United States, including wire services, radio and TV networks and stations, and trade and general magazines. Media Distribution Services. **251**

"Display Monitors" is a 20-page

booklet describing parameters for **choice of monitors** for many kinds of systems, with extensive technical background. Tektronix. **252**

Solenoids in thousands of variations are subject of 72-page catalog, including extensive technical background on solenoid design and choice for different applications. Guardian Electric Mfg. Co. **253**

Brochure described **CATV installation tools**, including pullers, benders, reel trailers, winches, etc. Jackson Communications Corp. **254**

Three series of **high-voltage power SCR's** are covered in full technical detail in brochure; ratings are from 400 to 1700 volts, capacity 660 to 860 amperes. International Rectifier Corp. **255**

"Desoldering for Any Budget" is a four-page folder, describing a variety of desoldering systems using controlled, heated air. Pace, Inc. **256**

Specifications of 177 **microwave diodes** are in condensed catalog, Bulletin No. SF-365. Raytheon Co. **257**

Full line of electric **power outlet strips** is shown in Catalog No. 100. SGL Waber Electric Co. **258**

New model 1550 **telecine** is described fully in 8-page technical bulletin. Cohu, Inc. **259**

Catalog covers **alarm-security wire and cable**, including more than 100 individual designs. Belden Corporation. **260**

Complete line of television lenses for low light levels as well as general use, is in catalog, including high speed zoom models, auto iris controllers, radiation resistant lenses. Lenzar Optics Corporation. **261**

Bulletin describes series of **remotely-programmable, phase locked, microwave signal sources**, covering 0.5 to 18 GHz, output 0 dBm. Communications' Techniques, Inc. **262**

Winter issue of "SCAN," newsletter, discusses the **care and storage of videotape**. Memorex Corp. **263**

Catalog (24 pages) shows complete line of **professional audio products**, including microphones, mixers, phono pickups, accessories. Shure Brothers, Inc. **264**

Line of linear and rotary **audio controls** is subject of new catalog. Waters Manufacturing Co. **265**

Eight-page condensed catalog shows complete line of **wiring components** — cable ties and markers, wiring duct, terminals, splicers, disconnects, wiring tools, etc. Panduit Corp. **266**

TRI-LOC[®] CONNECTORS

A complete series of quick disconnect triaxial connectors specifically designed for the telecast industry!

KINGS' TRI-LOC connectors have been designed to the interconnect requirements of digital color cameras. Their unique design offers a matched impedance that insures low loss transmission between cameras and control units.

Camera crews, with the use of triaxial cable and TRI-LOC connectors, can now work at distances 20 to 30 times further from the van than had previously been possible.

These connectors are extremely rugged, and are completely weatherproof when mated. This, combined with Kings' durable TR-5[®] weather resistant finish make them ideally suited for outdoor use. TRI-LOC connectors quickly and accurately terminate 3/8" (9.5mm) and 1/2" (12.7mm) cables.

For further information and literature on these and other connectors for the telecast industry, write, wire or phone today.

KINGS
ELECTRONICS COMPANY, INC.

40 MARBLEDALE ROAD/TUCKAHOE, NEW YORK 10707/(914) SW 3-5000/TWX 710-562-0110/TELEX 1-37449

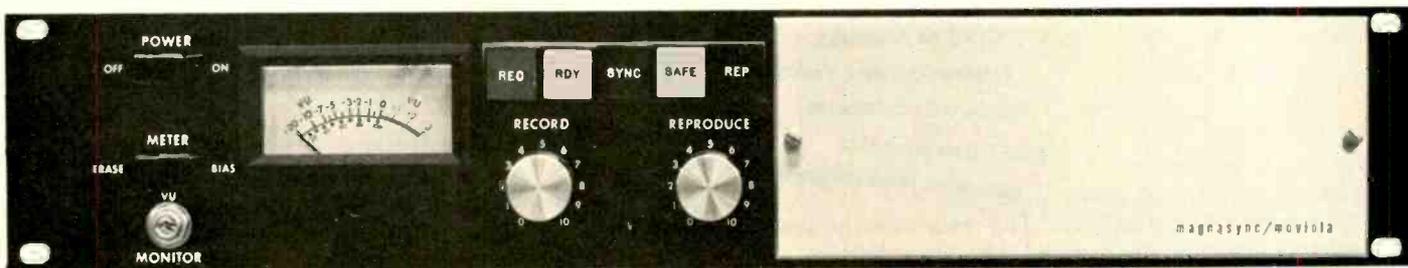
TRI-LOC and TR-5 are registered trademarks of Kings Electronics Company, Inc.

NAB SHOW
BOOTH 1211



THIS IS NOT JUST AN ADVERTISING CLAIM
...IT IS ABSOLUTE FACT:

**THE SOUND QUALITY OF OUR NEW
SERIES 3000 IS SO VERY FAR SUPERIOR
THAT IT OBSOLETES ALL OTHER
SPROCKET-DRIVE RECORDING
AND DUBBING EQUIPMENT.**



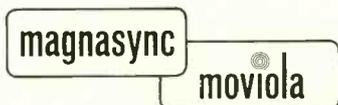
FACT: The Series 3000 is the result of a genuine electronics breakthrough by our own research and development.

FACT: Series 3000 sound quality is the nearest existing to original tape recording.

FACT: With the Series 3000, there is *no* discernible generation loss; the 3rd, 5th or 7th dubb is the same quality as the first!

You can't possibly realize the vast difference in sound quality until you hear it yourself . . . and, once you've heard it, there's no way you will ever again be satisfied with anything less than the new Magnasync/Moviola Series 3000.

NOTE: Present owners of our Series 2200 equipment — Write for full information on how to adapt easily and economically to new Series 3000.



magnasync/moviola corporation

A Subsidiary of Craig Corporation

5539 RIVERTON AVENUE / NORTH HOLLYWOOD, CALIFORNIA 91601 / (213) 877-2791

Circle 204 on Reader Service Card

Off-line computerized video tape editing with the CMX System/50 is now on-stream at:



Forum III Films (New York City)
WGBH (Boston)

Off-Line Inc. (Burbank)
CFTO (Toronto)

CFI (Los Angeles)

Teletronics (New York City)

Premore (Los Angeles)

KCET (Los Angeles)

Milestone Productions (Hollywood)

Off-line computerized video editing made its bow last year. The results can be seen at prime production houses and television stations 'round the country.

For the first time, the economy and convenience of a standard video cassette has been successfully introduced to the industry. Off-line editing means substantial savings in relieving your quad work load or in upgrading the creativity of your edited product.

Off-line editing means speed and deliveries not possible by conventional film or video editing techniques.

A CMX System/50 option provides storage of 999 editing decisions—more than enough to satisfy most feature productions.

Off-line editing now offers a special frame advance feature (jogging) to further speed up productivity.

To sum it all up . . . practical, off-line computerized video editing is here in a big way.

See you at the NAB. Or, if you can't wait, contact us for a personal demo.

cmx systems

CMX Systems, an ORROX company,
635 Vaqueros Avenue, Sunnyvale,
California 94086, (408) 245-8450

Circle 205 on Reader Service Card

NAB 1975

cont. from pg. 75

broadcast use, the IVC 9000, will be feature attraction. Also showing quality broadcast color TV camera, the IVC 7000, and production tools including an automatic programmer.

JVC Industries (Booth 805)

Will introduce a new studio color camera, DU-1003-B. Will also show the portable color camera, GC-4800-U; the video cassette recorder/player (freeze frame), CR-6300-U; video cassette play only, CP-5200-U; and the 19" color monitor receiver, 7830-UM.

Jamieson Film Co. (Booth 803)

Color film processing equipment.

Jefferson Data Systems (Booth 913)

Business automation system for TV

traffic and accounting.

Kallman Associates Inc. (Booth 308)

Kaman Sciences Corp. (Booth 313)

The main attraction will be the **BCS System** for computerized radio and television traffic and accounting. Will show automatic availability updating, on line. Also microfilm billing reports.

Kansas State Network (Booth 912)

Low cost **time base correctors** will be shown as well as page format character generator.

King Electronics Company (Booth 1211)

Will introduce a new series of **connectors for triaxial cable**, TRI-LOC, with quick connect and disconnect, and weatherproof with interface retention over 100 pounds and cable retention over 200 pounds.

Kliegl Brothers (Booth 104)

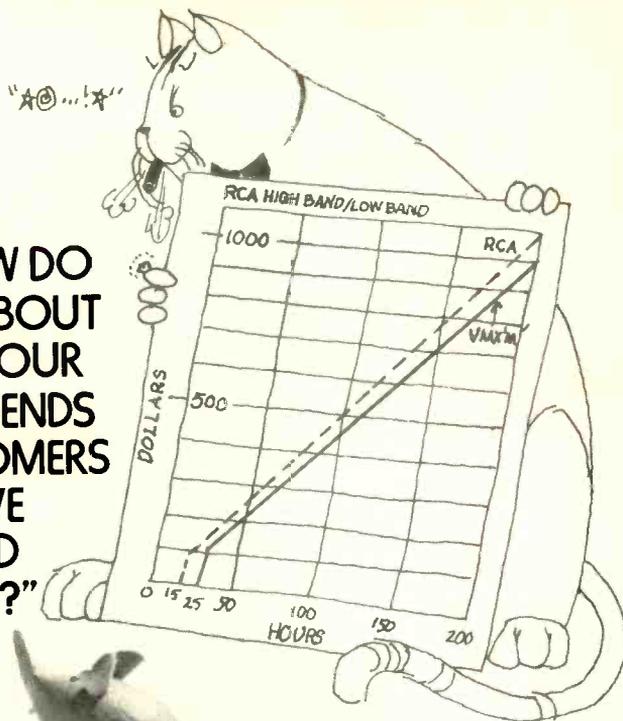
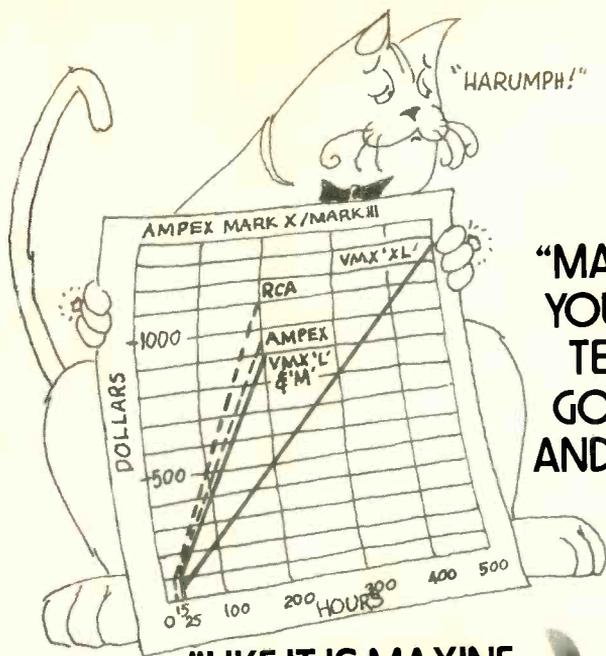
Latest in **lighting control memory systems (Q-Level)** shown. Demonstrations will be given at regular intervals. Also featured will be a new line of Fresnels and the new portable **KLIEGLKIT 5-Q** for television lighting.

Lenco Electronics (Booth 613)

Sync distribution systems, sync generators, encoders, distribution amplifiers, proc amps and color bar generators will be shown.

Listec Television Equipment Corporation (Booth 218)

Will introduce the Model 743 **Kestrel camera crane** and E.D.S. **Portaprompt television prompter**. Also showing: complete line of camera mounting equipment—dolies, tripods, cam heads, pedestals.



“MAX, HOW DO YOU GO ABOUT TELLING YOUR GOOD FRIENDS AND CUSTOMERS YOU’VE RAISED PRICES?”

“LIKE IT IS MAXINE, LIKE IT IS.”



You know, we could hem and haw a bit. Or claim coffee machine costs have risen 200%. Or a number of other excuses. But we'll simply tell it like it is.

Frankly, we raised prices because we had to. So, here's what we've done.

At your option, you can buy our basic "L" Series (Ampex Mark III/X) with a 200 hour warranty for \$900. Or you can buy the "XL" Series (the X stands for X-tended Warranty) with a 500 hour warranty for \$1,250. The head is exactly the same, the only difference is the warranty and the cost per warranty hour. You also should know that the "M" Series (Ampex Mark III/X) now costs \$900 with a 200 hour warranty. The RCA "M" Series now costs \$990 with a 200 hour warranty.

Well, we're glad that's over with. No one likes to raise prices.

One thing that hasn't changed is our leadership in cost-per-warranty-hour. It stays the same, low and way ahead of the fat cats.

Check the Charts.

See you at the N.A.B., or, if you can't wait, contact us.



Videomax Corporation

An ORROX company

154 San Lazaro Ave., Sunnyvale, CA 94086. Ph: (408) 739-5391

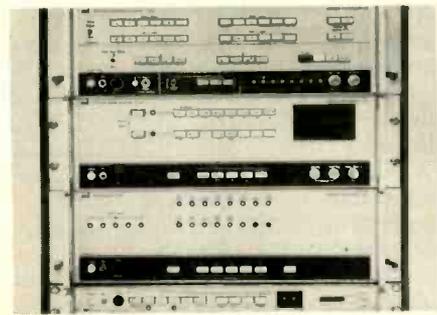
Circle 206 on Reader Service Card

LPB Inc. (Booth 809)

Production consoles will be central attraction with mini-studios in operation. Also shown will be low powered AM and FM transmitters.

3M Company, Magnetic Products Division (Booth 208)

Will show the full line of video tape in cartridges and cassettes for Ampex and



Automatic system tester from Marconi.

RCA quad machines; the new #420 quad tape, and the #250 audio mastering tape. Also: the #400 video tape and accessories. The theme of the exhibit is "Total Capability."

Marconi Electronics, Inc. (Booth 212)

Will introduce a new TV picture monitor. Also showing the automatic TV monitoring system which includes the VIP signal analyzer with a data selector, Model TK2916. The data selector providing storage and interface to a teleprinter, and connectors to a modem for sending data to remote monitor or control point. The data unit also permits access for interrogating the monitor, or measuring any parameters.

Marfi Electronics Inc. (Booth 309)

On display: solid state remote pick up transmitter/receiver, a 950 MHz aural STL remote control and telemetering system, amplifiers, and accessories.

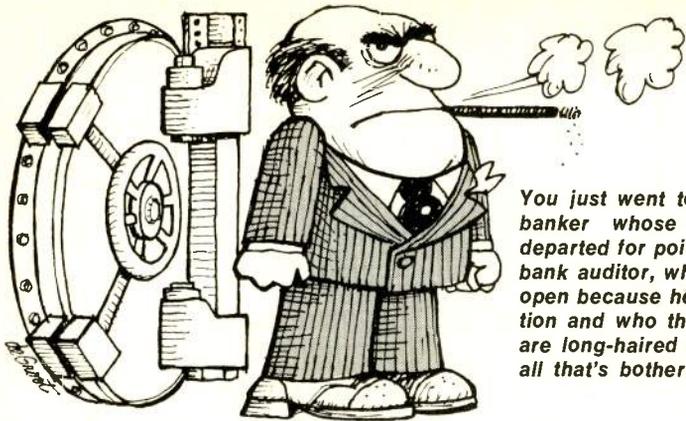
McCurdy Radio Industries, Inc. (Booth 408)

Will emphasize pre-wired audio packages for radio and TV. New products to be introduced: turntable assembly with Panasonic SP-10; compressor/limiter; variable oscillator; intercom system; digital timer; digital clock; remote gain amplifier. Also showing a complete line of audio consoles and accessories.

McKay Dymak Company (Booth 1219)

McMartin Industries, Inc. (Booth 301)

Introducing a new 3500-watt FM broadcast transmitter, the BF-3.5K, which uses the previously-released B-910 10-watt exciter, a pair of parallel connected 4CX250B pentodes in the IPA stage, and a grounded-grid 3CX3000/A7 triode power amplifier. Other new products to be introduced



You just went to your neighborhood banker whose chief cashier just departed for points unknown with the bank auditor, whose vault door won't open because he forgot the combination and who thinks all radio people are long-haired weirdos . . . if that's all that's bothering you...

... FORGET IT!

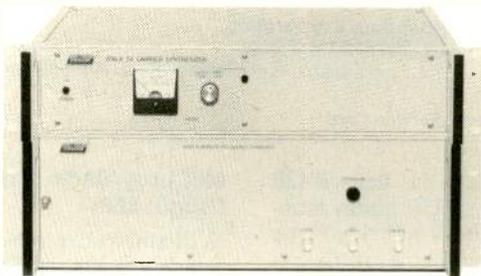
control design corporation has the answer to your problems. You can lease our state-of-the-art audio automation equipment with no cash up front and terms to fit your cash flow picture.* We have many plans available for 14 day delivery of the most sophisticated and the most easily operated audio automation control equipment—both for new systems and as replacements for older ones—you'll find anywhere. For complete information, call your **control design corporation** rep, or the factory, today. *subject to buyer qualification and applicable state and federal lending regulations.

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 106 s. pickett street
 alexandria, virginia 22304
 (703) 751-5650

a company devoted to new ideas and service to Broadcasting and Allied Industries.

Circle 207 on Reader Service Card

IT KEEPS MANNIX FROM SHOOTING MARCUS WELBY.



Tracor Model 6500 Visual Carrier Generator. Reduces co-channel interference. Increases TV coverage area.

It's 100 times more stable than any crystal oscillator system. Ends routine monitoring, standardization procedures, adjustments. Eliminates much external test equipment. Combines the 304D Rubidium Frequency Standard with the 650A TV Carrier Synthesizer. Just plug the 6500 system into the transmitter socket previously occupied by the quartz crystal. Without further attention, unaffected by environmental conditions, it will keep your station's carrier frequency stable within .05Hz per year. The 6500 is FCC approved and already in wide use. Write or call for full technical and application information.

Tracor, Inc. Industrial Instruments
 6500 Tracor Lane • Austin, Texas 78721 • AC 512/926-2800
 In Canada: Glentronix

Circle 208 on Reader Service Card

NAB 1975

include: a remote pickup; system consisting of the TBM-1100R FM receiver and B-1100T 35-watt transmitter, for the 148-174 MHz range; a system for transmitting teletype signals via FM-SCA equipment, on live demonstration; a new **FM/SCA educational receiver**, for the visually handicapped who want such programs as the "Radio Talking Book"; and the new EBS-2, monitor unit for the two-tone emergency broadcast signal.

Memorex Corporation (Booth 118)

Video and audio magnetic tape; tape cartridges.

MICMIX Audio Products, Inc. (Booth 1207)

Will introduce the new Studio B Master Room **reverberation unit**, providing "natural room" sound, with internal/external mix selection, remote control unit, peak type EQ selection plus 10 dB of variable EQ gain, variable decay. Also showing line of other reverberation units.

Micro Communications, Inc. (Booth 906)

RF switching combiners, filters, duplexers, switches, loads; TV and FM antennas.

Microwave Associates (Booth 216)

Will show **microwave communications equipment** in three areas: for electronic journalism, the MA-13 CP portable video system and MA-3 BP remodulating radio system; for STL use, the MA-2G total solid-state remodulating radio system and MA-6G, for same application; and for intercity links, the MA-12H solid-state system on 13.25 GHz for video transmission.

Mohawk Wire and Cable, Inc. (Booth 704)

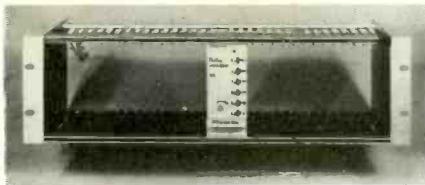
Slim Line series 85 pin **connectors** for camera cable assemblies for color TV cameras; other connectors and camera cables.

Mole-Richardson Co. (Booth 223)

Quartz studio lights, low-power and high-power; stands, many accessories.

Moseley Associates, Inc. (Booth 305)

Introducing the new **aural studio-transmitter link**, Model PCL-505 using direct FM modulation, and available for 150-174 MHz, 215-240 MHz, 300-330 MHz, 450-470 MHz, and 890-960 MHz; new AFC circuit allows 100% duty cycle; frequency stability, better than .0005%; capability for handling quadrasonic signals. Also showing the line of **digital control systems** and logging systems; and a new stereo generator, Model SCG-9.



Matthey variable delay at TEA.



New MICMAX reverb unit.



VIF program timer.

Nagra Magnetic Recorders, Inc. (Booth 1004)

Introducing a new series of **intermediate-sized recorder/players**, weighing ten pounds with tape and batteries (about two-thirds the size and weight of the Nagra standard series). Included are synchronous and non-synchronous versions. Also showing: complete line of Nagra recorders including the standard Model 4.2, the SL stereo and the Mini SN.

Rupert Neve Inc. (Booth 1010)

Will show three **consoles**: Model 8301 "Kelso" production console; the Model 5302 "Melbourn" production console; and the Model 5303 broadcast console.

North American Philips

(See AKG)

Northwestern Technology, Inc.—The New IGM

(See IGM)

Nortronics Company, Inc. (Booth 402)

Will show full line of **recording heads** for broadcast applications; also the line of tape equipment quality maintenance accessories.

Orrox Corporation (Booth 107)

Quadruplex video head rebuilding/refurbishing for RCA and Ampex heads with warranties.

Otari Corporation (Booth 1112)

Will introduce a new line of **tape recorder/players** with the five models, all having motion sensing, optional dc servo capstan control, built-in test and cue oscillator, front-adjustable bias and equalization, other features.

Pacific Recorders and Engineering Corp. (Booth 1012)

Will introduce a new **multi-purpose limiter**, the Multi-Limiter, for AM, FM, FM Dolby, and Television. It has automatic polarity correlation and adjustable symmetry for AM; selectable pre-emphasis for FM; independent adjustment for RMS and peak limiting.

Paperwork Systems, Inc. (Booth 509)

Will introduce a new BAT 1500 **data processing system** for broadcasters, which can provide full availability information for 52 weeks, including mul-

ti-ple-station operations. Shown in addition will be several other systems: BAT 1000, for smaller AM-only and FM-only operations; BAT 1250 for medium-market stations; BAT 2000 for the largest market stations with special availability requirements.

Paulmar, Inc. (Booth 615)

Will exhibit film inspection and editing equipment.

Pentagon Industries, Inc. (Booth 901)

Will demonstrate the Pro-Series of high speed **duplicating systems** for cassette and open-reel tapes, in two and four

Reel-to-reel... for real

Exciting things are happening in the reel-to-reel market. And it's all caused by a new machine called the ITC 850 Series. Here is the result of a long series of consultations with broadcasters to determine what they most desired in a reel-to-reel machine. Then we added a few innovations of our own. Truly, the 850 Series is equipment designed specifically with the professional broadcaster in mind. Some 850 features: motion sensing, multi-function edit mode, super quiet operation, automatic tape lifters, TTL logic circuitry, capability of handling dissimilar size reels. . . and more too numerous to mention here. If you're in the market for something new and vastly improved in reel-to-reel, a **collect** call to us will reveal an interesting story that you may have been waiting to hear. Make the real move to reel-to-reel. . . ITC. Collect number 309-828-1381.

itc INTERNATIONAL TAPETRONICS CORPORATION
2425 South Main Street • Bloomington, Illinois 61701
Marketed exclusively in Canada by McCurdy Radio Industries Ltd., Toronto

tracks; introducing the new high-speed Super C-1 cassette copier, operating at 16 times normal speed, with automatic rewind.

Phelps Dodge Communications (Booth 609)

Antennas for FM will be feature attraction.

Philips Audio Video Systems Corp. (Booth 202)

A new line of studio cameras the **LDK series** as successor to the PC-100 series will be unveiled. Also a new system for Electronic News Gathering is expected to be revealed. The PC-70 line of cameras will be shown as well as telecine equipment. Also: the new motion feedback loudspeaker system with integrated bi-amplification.

Potomac Industries, Inc. (Booth 807)



New lighting kit from Kliegl.

The Model FIM-71 VHF field strength meter, a portable unit covering the range 47 MHz to 225 MHz, and having an internal calibration oscillator will be shown. The SD-31 RF bridge synthesizer and detector providing signals and detection for RF impedance measurements will also be shown.

Power-Optics, Inc. (Booth 106)

The main attraction will be a **digital remote control system** for broadcast television cameras. Also showing telemetry control for broadcast and CCTV cameras over long distances.

Q-TV/Telesync (Booth 327)

Emphasis will be on Video **Prompter systems**, including the VPS-100 console transport and the VPS-300 conveyor transport.

Quick, Set, Inc. (Booth 335)

Camera pedestals, dollies, tilting heads, cam-link heads, accessories.

RCA Broadcast Systems (Booth 200)

Will introduce a new light-weight **portable color camera, the TK-76**, designed for electronic news gathering, weighing 17 pounds, using three 5/8 inch pickup tubes. Also: a new light-weight control unit for the TKP-45 camera, allowing camera to operate up to 5000 feet from taping unit or microwave unit; also the full line of video tape, film, switching and transmitting equipment, and the studio/transmitter line for radio stations. Another new product is an accessory for the TK-28 color film system providing automatic color correction. The light-weight **TR-600 quad recorder** will also be a feature.

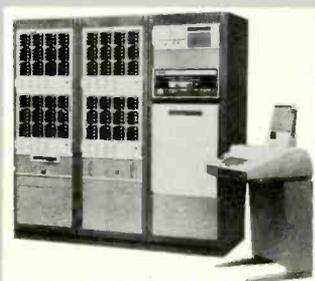
RCA Electronic Components (Booth 102)

Vidicon and Vistacon **camera tubes** will be shown as well as beam power tubes and other tubes and cavities.

Rank Precision Industries (Booth 112)

Featured will be the Varitol 30 and continued on page 140

SCHAFFER IS RADIO AUTOMATION!



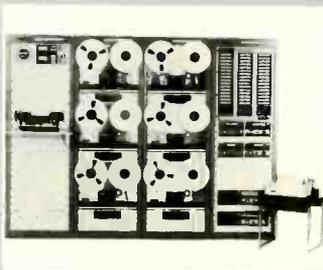
700 SERIES COMPUTERS

You can't outgrow a Schaffer/NTI 700 system with integral computer! Each 700 is totally modular and may be expanded at any time to provide virtually unlimited storage and programming control. From the smallest 730 to the ultimate 770, each Schaffer/NTI computer system offers standard features not available on any other system at any price. To prove it, we have a new brochure that outlines the capabilities of all the 700 computer models. Why not send for it and see for yourself . . . YOU CAN'T OUTGROW A SCHAFFER/NTI 700 COMPUTER.

900 SERIES CONTROL UNITS

Pictured is the Schaffer 903 time-oriented MOS Memory system with 24 hour (or up to 7 days) advance programming capability. More features are standard equipment on the 903 than on any other comparably priced system. Automatic Memory loading and Verified Encoded Logging are available, too.

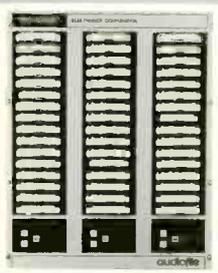
The Schaffer 902 is the goof-proof system. 48 format sequence thumbwheels make the 902 the ultimate in simplicity. Add a Random Access 2000-step MOS cartridge programmer, and you have the most flexible low-cost automation system in the world.



THE AUDIOFILE

THE random-access cartridge system you've been waiting for! The AUDIOFILE is all solid-state, fast, and has audio quality equal to the best single-play cart machines. Use it in your automation system, or with DJ control in your studio. THE NEW STANDARD IN MULTIPLE CARTRIDGE MACHINES . . . The AUDIOFILE. Exclusively from Schaffer.

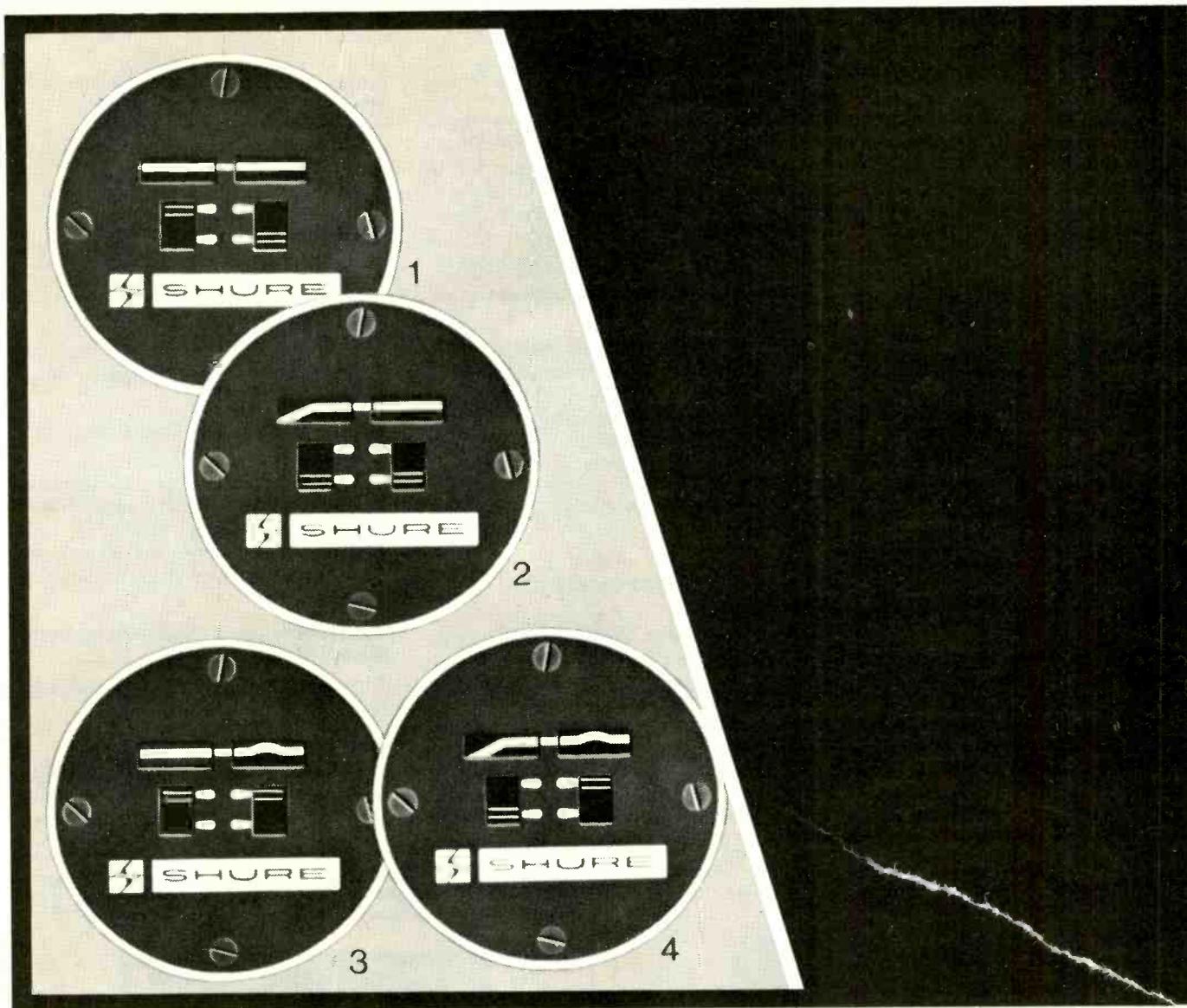
Don't forget . . . Schaffer is the one-stop source for all your equipment requirements. When you need studio equipment or transmitting gear, automation or Audiofiles, reel-to-reel or cartridge recorders, consoles or turntables, transmitters or antennas, remember . . . SCHAFFER HAS IT ALL.



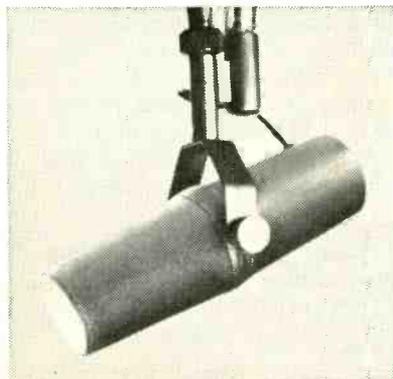
SCHAFFER

SCHAFFER ELECTRONICS CORPORATION
75 Castilian Dr.
Santa Barbara Research Park
Goleta, California 93017

Name _____
Station _____
Address _____
City _____
State _____ Zip _____



What you see is what you get.



The extraordinary Shure SM7 professional microphone features something you've never seen before: a *built-in Visual Indication Response Tailoring System* that offers you four different frequency response curves—and shows you the curve you've selected with a graphic readout (see above) at the back of the microphone! Choose: 1. flat response; 2. bass roll-off; 3. presence boost; 4. combination of roll-off and presence. And there's more: the SM7 delivers exceptional noise isolation with a revolutionary pneumatic suspension mount . . . an ultra-wide, ultra-smooth frequency response . . . an integral "pop" and wind filter . . . and a cardioid pickup pattern that looks "text-book perfect." The Shure SM7 Studio Microphone was extensively field-tested in recording studios and broadcasting stations! Write:

Shure Brothers Inc.
222 Hartrey Ave., Evanston, Ill. 60204
In Canada: A. C. Simmonds & Sons, Ltd.



Circle 211 on Reader Service Card

NAB 1975

Varitol 20 lenses. A full selection of 10X1 lenses will also be shown.

Recortec, Inc. (Booth 907)

Introducing a modification kit for incorporating **controlled tape tension** into quadruplex videotape recorders. Also showing tape cleaners, tape eval-



Vinten camera crane at Listec.

uators, and tape timers.

Revox Corporation (Booth 713)

A700 stereo tape deck with crystal reference speed control, full logic transport control, etc., will be feature attraction. The Lamb PML 422 **mixer** will be displayed for the first time. Also showing the Revox A 77 tape deck, Beyer dynamic ribbon microphones, and other dynamic mikes and headphones.

Robins/Fairchild Corporation (Booth 911)

Will introduce the new Model 1632 TV **audio mixing console** with 16 inputs, 2 outputs with submasters. Also showing: the 30000 series broadcast consoles, 5 and 8-channel; FPC-50 portable mixing console; Reverberation system; DA 1520 distribution amplifier; new "rotary slider" attenuators; op amp plug-in modules.

Rodelco Electronics Corp. (Booth 1108)

Exhibiting new VHF and UHF translators, from 1 watt to 1000 watts.

Rohde and Schwarz, Inc. (Booth 310)

Will introduce a new tracking unit for frequency response measurements on VTR and RF links. Feature attraction will be a **demonstration of dynamic transmitter performance measure-**

ments, including full field swept frequency response simultaneous with program transmission. Also demonstrating VTR performance testing; and showing TV demodulator, video sweep generator and sideband analyzer; video noise meter; other video test equipment.

Russco Electronics (Booth 1017)

Audio consoles, turntables and audio accessories will be featured.

Sarkes-Tarzian, Inc. (Booth 203)

The featured product will be the STARCOM **data processing** — automation system.

Schafer Electronics Corporation (Booth 306)

Will emphasize **large automation systems**, particularly the Schafer/NTI series 900. Will also feature an "all cartridge" studio in actual operation, with random access Audiofiles and DJ control.

Scully/Metrotech, Div. of Dictaphone (Booth 908)

A professional line of reel to reel tape recorders for broadcasting.

Shure Brothers, Inc. (Booth 317)

Emphasis will be on new Model SM82 **microphone**, which has an amplifier

continued on page 142

THE BEST



And because that's the way things are, the EMT-930st is also the most expensive turntable you can buy.

In the short run.

In the long run, you'll own precision-made equipment that really slashes maintenance costs, because it's virtually trouble-free. For years. Ask anyone.

Other features? Low rumble; $\pm 0.035\%$ rms ANSI flutter; and you can cue to any beat or syllable with a wow-free start from the world's only remote-controlled turntable.

You pay for what you get. And here, you get the winner.

For more information, write:

GOTHAM
AUDIO CORPORATION

Headquarters: 741 Washington Street, New York, NY 10014

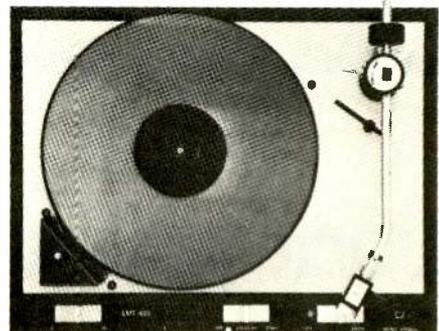
(212) 741-7411

West Coast Sales Office: 1710 N. LaBrea Ave., Hollywood, CA 90046

(213) 874-4444



THE SECOND BEST



We won't kid you.

The EMT-928 doesn't have all the ruggedness of our friend across the way.

On the other hand, the EMT-928 costs 40% less.

And it's self shock-mounting, so that you can drop it into an existing console desk. Also, it has a front panel speed adjustment trimmer our "neighbor" doesn't have.

A proven concept augmented for professional use, the EMT-928 stands second to none in construction, durability, and performance. Except for you know who.

Well, we can't win 'em all. But you can. Just take your choice.

For more information, write:

GOTHAM
AUDIO CORPORATION

Headquarters: 741 Washington Street, New York, NY 10014

(212) 741-7411

West Coast Sales Office: 1710 N. LaBrea Ave., Hollywood, CA 90046

(213) 874-4444



Circle 212 on Reader Service Card

Circle 213 on Reader Service Card

See them at Booth 122, North Hall, NAB Convention

The state of the art in film sound just took a giant step forward. In Speed, Flexibility, Safety, and Ease of Operation. For sound transfers, looping, re-recording, double-system screening and telecine interlock.

Magna-Tech's new 600 Series is the reason. This versatile new system features electronic interlock, foolproof IC logic and improved mechanical and electrical design. Incorporating traditional Magna-Tech reliability and durability, the MTE 600 Series provides expanded capabilities and superior performance in any application from the most compact studio to the largest mixing complex.

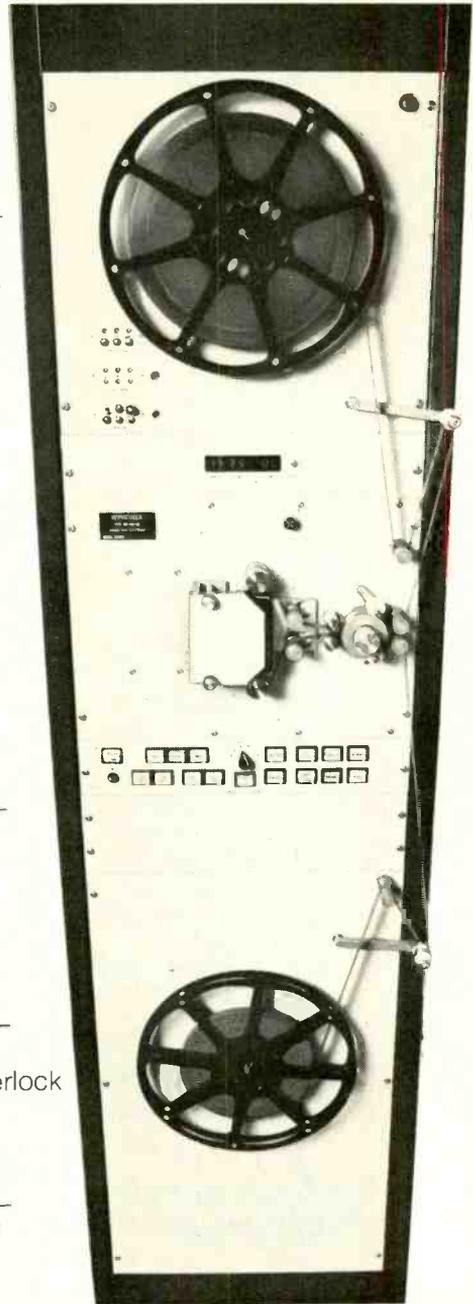
Among its many features are:

- stepping motor sprocket drive
- optical/electronic high-speed interlock system
- local or remote advance/retard of individual films in interlock
- operates at 6-times-sync speed through sprocket in interlock with Magna-Tech high-speed intermittent projector, via optical encoder
- operates 10-times-sync speed in interlock with video tape recorder
- operates local at sync and 10-times-speed through the sprocket
- 115/220 volt—50 or 60 Hz operation

- flywheel accelerators for rapid start
- film retracted from heads in all modes except sync speed forward
- servo-controlled film take-up tension provides gentle handling of spliced tracks
- automatic safety shutdown

- compatible with conventional interlock systems
- multiple machine operation—as many as desired—in interlock via distribution amplifier
- 6-buss interlock selector switch for studio delegation
- can be cued on and off buss while running in interlock

- pushbutton-selected 16 or 35 speed and 24 or 25 frame rate, forward or reverse
- local inching forward or reverse
- plug-in head assemblies for play-only or erase/record/play, interchangeable for 16, 35, 17½ and multi-tracks
- multi-track pick-up recording with selective erase
- 3000-foot (1000-meter) reel capacity



HIGH-SPEED ELECTRONIC INTERLOCK IS NOW A PRACTICAL REALITY

MAGNA-TECH ELECTRONIC CO., INC.

630 NINTH AVENUE/ NEW YORK, N.Y. 10036

- QUAD-EIGHT, 11929 VOSE ST., NORTH HOLLYWOOD, CA. 91605
- CINESOUND INTERNATIONAL, LTD., IMPERIAL STUDIOS, MAXWELL ROAD, BOREHAMWOOD, ENGLAND
- MAGNA-TECHTRONICS (AUST) PTY., LTD., 49 WHITING ST., ARTARMON, N.S.W., AUSTRALIA 2064

Circle 214 on Reader Service Card

NAB 1975

built into the handle for line-level output. Also shown: microphones, sound system units.

Sintronic Corporation (Booth 1003)

Will show the 3kW FM transmitter, Model DFM-3K-A; and the 25 kW FM transmitter, Model DFM-25K-B.

Skirpan Lighting (Booth 707)

Studio lighting control systems will be the feature attraction.

Soll, Inc. (Booth 904)

Engineering and consultation on design and installation of all broadcast facilities; station planning; design, construction and installation of RF switching system.

Sonex International Corporation (Booth 827)

Will introduce **R-MATTE**, a new way of combining foreground image having noise-free shadows with a background image, eliminating blue halo, chroma crawl and matte line. Also showing the Lum-A-Key, also for combining foreground and background signals; and the Digital Dissolve, for precision transitions starting at first line of field one,

proceeding to frame set by thumb-wheel control.

Sony Corporation (Booth 601)

The new hand-held color camera the DXC-1600 will be shown for the first time. This unit will be demonstrated in conjunction with the VO-3800 battery-operated portable video cassette recorder for Electronic News Gathering. Also featured will be the VO 2850 mastering video cassette for teleproduction work. The R-400 editing control system for the 2850 video cassette system will also be shown.

Sparta Electronic Corporation (Booth 312)

Will introduce a new line of **audio consoles**, with the first unit, a mono model with 28 inputs to ten mixers, optically-coupled audio switching, very flexible input switching. Also showing the 2000 series consoles, 1 Kw AM transmitter, high-power FM transmitters, related audio equipment, and the new 900 series of limiter-amplifiers.

Stanton Magnetics, Inc. (Booth 811)

A brand new line of **turntables** will be featured, plus a full line of magnetic phono **cartridges** and **pickups**. Dynamic **headsets** will also be shown.



Vega's wireless mike.

Storeel Corporation (Booth 507)

Will emphasize **storage systems** for television and audio-visual applications. Will introduce a new high-density storage system for Ampex ACR25 cassettes, and RCA TCR100 cartridges. Also showing storage systems for VTR reels and 16mm film.

Strand Century, Inc. (Booth 605)

Introducing the **MMS programmable lighting control system**, which has a modular solid-state memory, capacity for up to 320 lighting channels and up to 400 lighting cues, and instantaneous manual override. Also introducing the Janiro HMI metal halide **Fresnel lenses** which duplicate sunlight spectrum without gels, with efficiency of 85

continued on page 144

PERFECT YOUR CCTV SYSTEM WITH COSMICAR[®] LENSES

A rich variety of COSMICAR CCTV lenses will ensure you to satisfy any of your technical purpose.

Be sure to get the finest image recording results with quality COSMICAR lenses.

EE lenses:

- F.L. 16mm F/1.6 for 2/3" Cameras
- F.L. 12.5mm F/1.4 for
1" & 2/3" Cameras
- F.L. 25mm F/1.4 for
1" & 2/3" Cameras
- F.L. 50mm F/1.8 for
1" & 2/3" Cameras

Also available are scores of other lenses, ranging from 4.8mm to 150mm telephoto, zoom and those motordriven among them, for immediate delivery after being tailored to your specifications.



COSMICAR OPTICAL CO., LTD.

424, Higashi-Oizumi, Nerima-ku, Tokyo, Japan

Cable Address: "MOVIEKINO TOKYO"

Representative & Service Office: Asahi Optical (America) Inc. 15 East 26th Street, New York, N.Y. 10010, U.S.A.

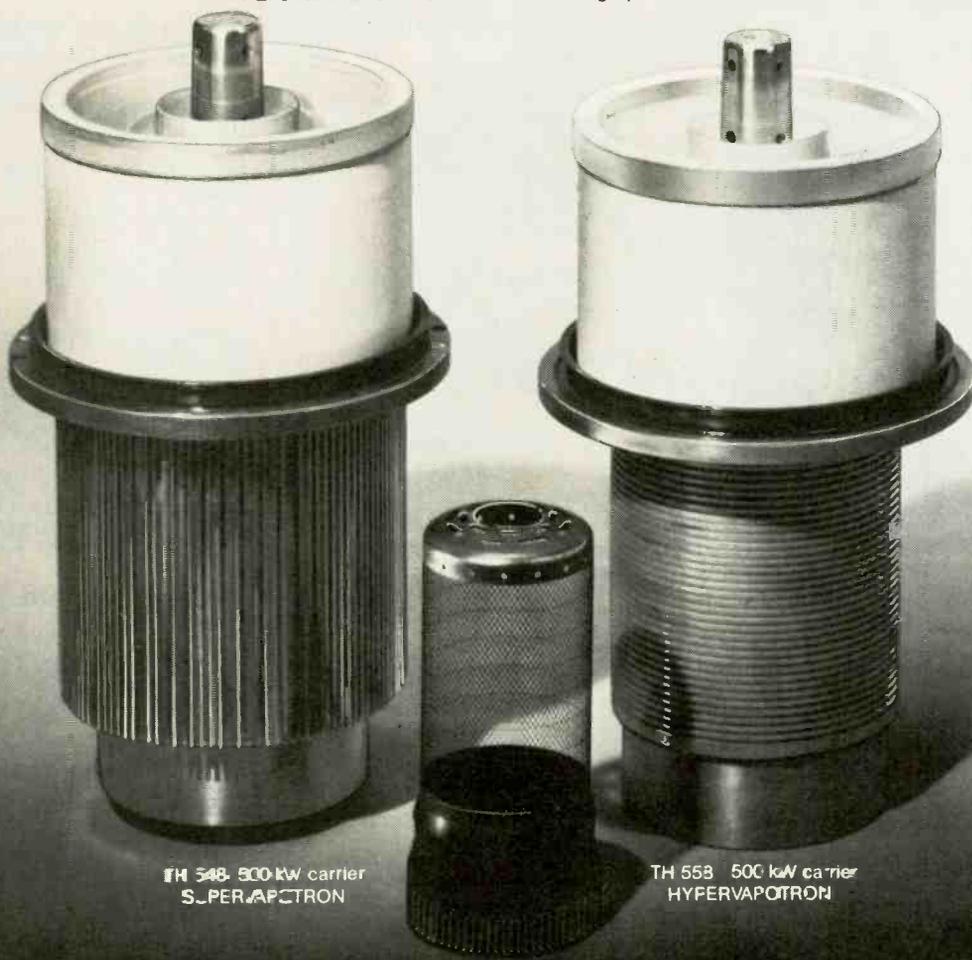
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Super grids for superpower tetrodes

There is still nothing like these patented **Pyrobloc®** grids for an unmatched combination of performance, size and reliability.

Check out our complete line of highly stable new superpower tetrodes, for broadcast transmitters rated up to 1 MW!

- SUPER or HYPERVAPOTRON® anode cooling
- Field proven during more than 5 years of operation
 - Now more than 100 tubes in use
- Life far in excess of conventional high power tetrodes.



TH 548 500 kW carrier
SUPERAPOTRON

TH 558 500 kW carrier
HYPERVAPOTRON



THOMSON-CSF

THOMSON-CSF ELECTRON TUBES, INC. / 750 BLOOMFIELD AVENUE / CLIFTON NJ 07015 / TEL. (201) 779-1004 / TWX: 7109897149

France - THOMSON-CSF Tubes Electroniques / 8, rue Chasseloup-Laubat / 75737 PARIS CEDEX 15 / Tel. (1) 566 70 04

Germany - THOMSON-CSF Elektronenrohren GmbH / Am Leonhardsbrunn 10 / 6 FRANKFURT/MAIN / Tel. (361) 76 20 99

Italy - THOMSON-CSF Tubi Elettronici SRL / Viale degli Ammiragli 71 / ROMA / Tel. (3) 28 14 53

Japan - THOMSON-CSF Japan K. K. / Kyosho Building / 1-9-3, Hirakawa-cho / Chiyoda-ku / TOKYO 102 / Tel. (3) 264 6341

Spain - THOMSON-CSF Tubos Electronicos SA / Alcalá 87 / 7ª Dcha / MADRID 9 / Tel. (1) 26 76 59

Sweden - THOMSON-CSF Elektronrör AB / Box 27080 / S 10251 STOCKHOLM 27 / Tel. (08) 25 58 15

United Kingdom - THOMSON-CSF Electronic Tubes Ltd. / Ringway House / Bell Road / Dareshill / BASINGSTOKE RG24 / OGG / Tel. (0256) 29 155

Circle 216 on Reader Service Card

NAB 1975

lumens per watt.

Willi Studer America (Booth 702)

Will emphasize **reel to reel tape mastering equipment** specifically suited to radio and television broadcasting. Also: reintroducing a complete line of **modular condenser microphones**.

Systems Marketing Corp. (Booth 817)

Feature will be a line of **automation systems** for AM and FM broadcasters.

Details of various sequencer systems will be shown. The "Caroussel" automatic cart system will be demonstrated along with other cart players.

Systems Resources Corp.

(See Chiron Telesystems)

Taber Mfg. and Eng. Co. (Booth 705)

New **replacement heads** for RCA VTRs and also the line of professional audio heads.

Tapecaster TCM, Inc. (Booth 400)

Audio cartridge recorders and players will be shown.

Tektronix, Inc. (Booth 209)

The new **waveform monitor**, the 1480, capable of precision amplitude measurements will be introduced. The exhibit will also put emphasis on closed-loop **correction systems** for application with transmitters and VTRs. A full line of signal generator equipment and picture monitors will be shown as well as general purpose test equipment including spectrum analyzers. AM-FM and audio proof of performance demonstrations will be conducted.

Tele-Cine, Inc. (Booth 801)

Schneider **zoom lens** and line of camera tilt and pan heads and camera pedestals.

Teledyne Camera Systems (Booth 210)

TV tape-to-film **transfer equipment** for color and monochrome.

TeleMation, Inc. (Booth 214)

Main interest will be on compact **video-audio distribution switcher**, Model TVS/TAS 1000. Other products: color film cameras, frame synchronizer, processing amplifier, character generator, sync generator, color encoder.

Telemet, Div. of Geotel Co. (Booth 304)

Will feature **video switching and test equipment**. Introducing the following new products: Model 7960 expandable audio/video production switcher; Model 4504 synchronous detector; Model 4240 stabilizing amplifier system.

TelePro Industries Inc., Fidelipac Div. (Booth 221)

To feature a new **automatic tape cartridge** using natural flow patterns to eliminate erratic tape behavior. Also:



ColorTran's new colorspot.

for only
\$4500

you can make
your own
type fonts
and logos

if you have the

CHIRON II

(pronounced Ky-ron)

the most advanced,
versatile, easy-to-use
graphics system made.

This easy-to-use plug in system includes:

- a. The required computer program.
- b. The camera interface board.
- c. One Vididisc diskette.

here's how:

Step 1.

Select desired artwork such as type styles, line drawings or other graphics.



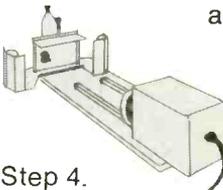
Step 2.

Transfer artwork to Chiron Repro Card.



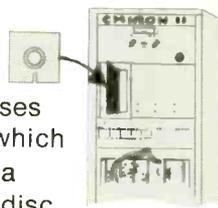
Step 3.

Place card on Copy Easel and adjust camera and lighting.



Step 4.

Camera feeds information via Chiron II camera interface to Central Processing Unit under keyboard control.



Step 5.

CPU processes information which is stored on a Vididisc. Vididisc is ready for immediate or future use.

For complete information send for brochure.

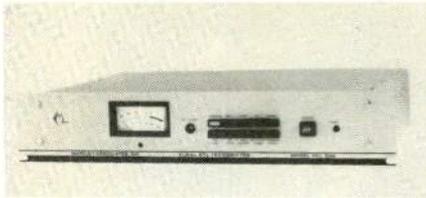
CHIRON telesystems

A Division of The Computer Exchange Inc.

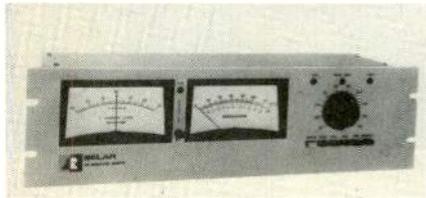
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cartridge labels; head cleaner.

Television Equipment Associates (Booth 701)

The feature will be the Matthey **automatic video equalizer**, which corrects for most wave-form distortion in a transmission network. Other products: Magnetek tape cleaner, and evaluator; Matthey video delay package (new); the IRT color monitor comparator.

TV Microtime (Booth 700)

Brand new **time base correctors** will be unveiled including the Model 640 digital TBC as a universal unit and the 610 as an analog type for demanding narrow-window applications.

Television Research International (Booth 1019)

Will introduce the EA-5 **editing system** for helican VTRs which has frame-accurate video editing repeatable preview, animation and matched frame editing.

Telex Communications, Inc. (Booth 124)

A new line of **tape recorders/players**, the 1400 series. New **headsets** for cameramen, and new IC-10 **intercom system**. Also: the full line of other communications headsets and tape accessories.

Thomson-CSF, Inc. (Booth 314)

Will feature the TTV-1515 Triax **color camera**, the TTV-2705 **color slide scanner** and the TTV-1550, a lower cost broadcast quality color camera.

Time and Frequency Technology, Inc. (Booth 902)

The Mode 724 phase-locked-loop stereo monitor will be displayed. Featured will be the complete line of frequency and **modulation monitors** for TV, AM, and FM; also a master clock, remote clock/bi-directional timer, digital remote display. WWV/WWVH standard time and frequency receiver, a one-second impulse clock.

continued on page 146



Model 601



Model 602

FAST FRAME-ACCURATE EDITING NOW POSSIBLE

without expensive equipment...

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- No modifications required on the transport modules or control circuit of the VTR with the Beta Edit Timing Control.
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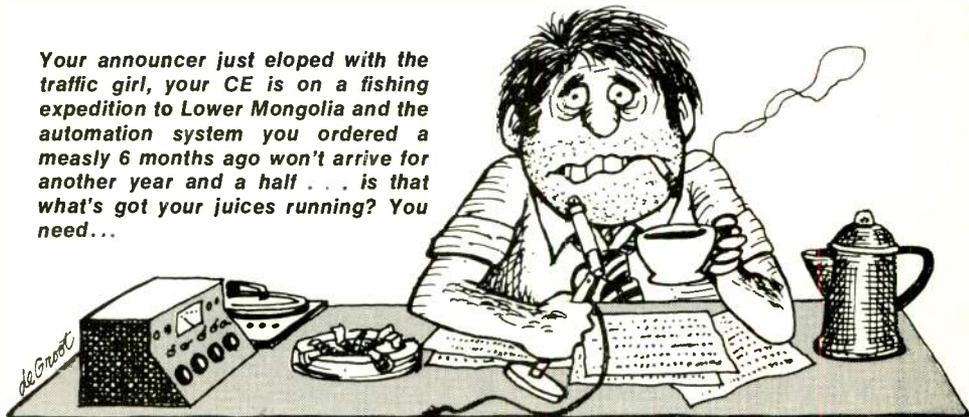
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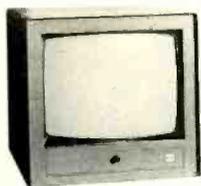
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NAB 1975

United Press Intl (Booth 503)

The theme is the broad array of services UPI offers the broadcaster. Included are the **audio network, newspicture network, broadcast wire**, etc.

United Research Laboratory Inc. (Booth 1000)

Will introduce a new **solid-state conversion record/reproduce amplifier**, Model C5, for Ampex 300, 350, 351, 354; a new low-distortion multi-frequency oscillator, Model 275-B; and the Model 1048A operational amplifier. Also showing: Autotec of recorders.

U.S. Pioneer Electronics Corporation (Booth 1116)

AM/FM tuners, **tape decks**, turntables, speaker systems.

Utility Tower Co. (Booth 406)

Antenna towers for radio, TV, and microwave will be shown.

Varian Associates (Booth 120)

Latest in **power tubes** including triodes, tetrodes, penodes, and klystrons will be shown.

Vedco, Inc. (Booth 1205)

Will show a line of audio, video, and pulse distribution amplifiers; a video routing switcher.

Vega, Div. of Cetec Corp. (Booth 312)

Will introduce the new Model 58 receiver and the new Model 54 hand-held microphone; also a miniaturized microphone, the "Mini Mic." Also showing complete line of **wireless microphone systems**.

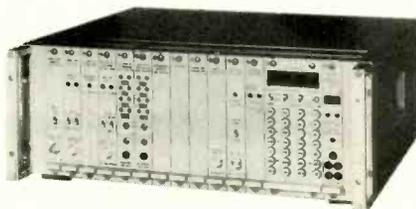
VideoMax Corporation (See Orrox)

Video Tape Company (Booth 912)

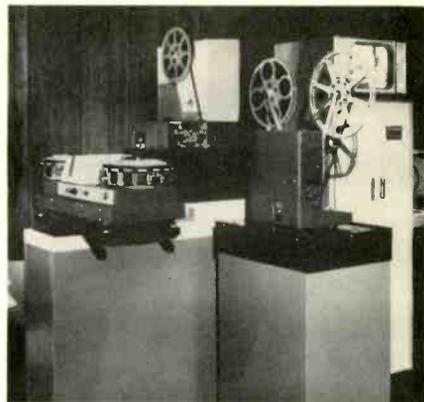
Will show reprocessed 3M and Memorex 2-in. quadruplex tape. Also showing equipment for cleaning and testing videotape.

VIF International (Booth 401)

The featured product will be the Model 3000 stereo **intermix automation system**; new product to be introduced is the Model 9959 video program timer. Also showing: logging recorder, time code generators, audio limiters and limiter/optimizers, tape machines replacement electronics.



Video distortion meter from Rohde & Schwarz.



Film chain from Cohu.

Visual Electronics Laboratories (Booth 210)

Will feature full line of Rapid-Q **cartridge tape equipment** with emphasis on the RQ-3232 dual record/play. Video switchers will also be shown.

Vital Industries, Inc. (Booth 116)

Showing the all-digital VIX-114 Series of **video production switching and special effects systems**, with such effects as rotary patterns, key edging, quad split, all digitally produced.

Ward-Beck Systems, Inc. (Booth 1201)

Will introduce a new **television audio console** using the new 400 series of plug-in modules, including an amplifier equalizer, input module, compressor/limiter, reverb module, equalizer, submaster, and many others. Also showing: the 600 Series of distribution amplifiers and monitor amplifiers; the 700 Series of television intercom modules.

Westinghouse Electric Corporation (Booth 1100)

Will introduce an all solid state 5 kW **AM broadcast transmitter**.

Wilkinson Electronics, Inc. (Booth 311)

Showing a new **100-watt FM transmitter**. Also showing the 25 kw FM and AM transmitters; mono and stereo consoles; limiters; AGC amplifiers; FM exciters, SCA and stereo generators; stereo demodulators; FM receivers; AM monitors.

World Video, Inc. (Booth 505)

Introducing a new rack-mounted **9-inch color monitor** taking only 8¾ inches of vertical rack space; and a new rack-mounted tuner/demodulator available in either single or dual configuration. Also showing the new 6210A series color monitor, and the RK6700 k7-inch rack-mounted color monitor.

Nurad, Inc. (Booth 1225)

Antenna systems for live ENG.

Dimensionally the transfer function is in mhos and represents a plot of plate current change per grid voltage change, with all other variables (voltages) held constant. There are myriads of things you can do with this mathematically, but all we require here is to determine where to place the operating point while broadbanding.

Fig. 3 shows where the composite video components fall, and since we are concerned here with picture elements primarily, we should strive to complete our tuning procedure within the average range of picture elements. I use the word "complete" because it may not be desirable to start there.

The Tuning Procedure

With an AM transmitter only one frequency is involved and the variables with which you deal are tangible and relatively small in number. With the aid of an RF bridge it is possible, if you like that sort of thing, to find through the use of loop and nodal equations the precise values of the currents and voltages for each element of the tuned circuits. What is going on can be quantitatively understood.

Unfortunately, with a television transmitter we are limited to a qualitative understanding, or an educated guess. We do know several things however.

In order to obtain a broadband response, several tuned circuits must be used and coupled together to form a uniform load impedance across the passband. When this load impedance matches the equivalent dynamic impedance of the driving tube, maximum power will be transferred and maximum efficiency realized. Each of the tuned circuits will have a Q which will vary according to the portion of the load resistance or tube dynamic resistance reflected into it.

We can mentally view the response as in Fig. 4, where the output circuit of a stage is assumed to consist of "plate tuning" and "output tuning" cavities or line type resonant circuits. The coupling between these circuits will broaden their individual resonance curves by reflecting more of the load resistance into them.

The broadbanding job should begin at quite lower power, say 10%. This permits a search for "destructive conditions." Examine all possible standing wave ratios between stages and correct them first. They may require a preliminary matching and tuning operation. Also, look for high screen currents in the various stages involved and preferably meter these continuously during tuning. The manufacturers recommended maximum screen dissipation should be checked and the screen current reading for this dissipation borne in mind.

Start the tuning operation by determining just where each of the tuned circuits is in the passband, or out of it. Then, with a small amount of coupling between them, start positioning the plate tuning in the vicinity of the carrier. Keep an eye on the output power and reduce it with the bias or drive control (20% of full power is reasonable) to keep the tank circulating current down. The "plate tuning" will provide the shelf for the lower sync sidebands.

Now bring the output tuning into a position around the upper limit of the desired curve, trying to maintain am-

continued on page 148

What's New at NAB-75? Booth 810S!

Every time NAB comes around, you go in the hope of seeing something new... better... useful.

As it turns out, you've seen most of it before! Right?

This year Automated Processes is going to change that. It's our first time at NAB, even though we are one of the leading builders of audio consoles and components in the recording industry.

We are now manufacturing equipment for broadcasters suitable for production or on-the-air... both fixed and mobile; also a comprehensive line of tape machine synchronizers for audio-to-audio and audio-to-video applications.

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Bring a test tape to NAB, Las Vegas for evaluation on the Magnetek — Booth 701S.

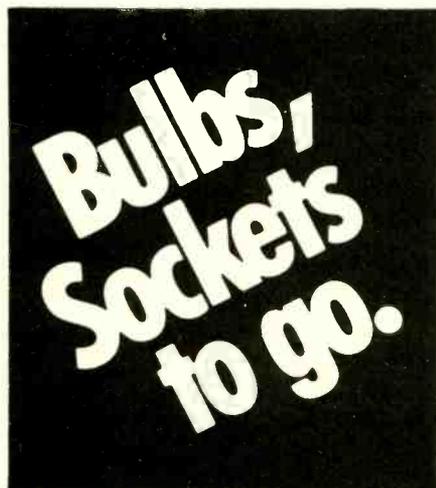
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TV TRANSMITTER

cont. from page 147

plitude at 4.25 MHz. If the coupling between the circuits is too low you will observe a "saddle" between the two "visualized" resonance curves. Increase the coupling and slightly reposition the tuned circuits until a flat top and acceptable "skirts" are realized.

Bring the drive and/or bias up until operation is in the mid-video range to make the final adjustments. It may be desirable to make the response of intermediate stages more broad than the final, if they are operating well under their rated power.

The final test is for power and efficiency. If your transmitter will take it (the new ones will) you may be able to achieve 100% CW power and observe the value of final plate current necessary. For your particular transmitter you should establish a value of final plate current which will result in a prescribed RF power level under CW conditions and represents acceptable efficiency. **BM/E**

PAY TV

cont. from page 122

sors of each room armed with the security system. If an intrusion occurs, the computer pinpoints the exact room and flashes the room number on a monitor viewed by security personnel. It's also possible to control the individual room's electrical system through Gardtel to turn down heat and air conditioning when the room is vacant. When the alarm is activated, the guest has 20 seconds from the time he enters the room to disengage the sensor before the computer will establish that the entry is unauthorized intrusion. This is done by merely inserting his own encoded card into the TV converter.

- **Roomstat.** This system helps the hotel operator keep tabs on the status of rooms and guest billing. CRT terminals, show clerks current room availability. And to eliminate the common problem of last-minute charges, there are terminals at key spots such as restaurants to transmit billing information to the computer.

- **Datatel.** One of the more ambitious of the services, this plan calls for display of computer-stored information about shops, restaurants, airline schedules, theatre tickets, etc. on the hotel room TV set. It will be possible for guests to make reservations

and even purchases from the room. At a later time, it may also be possible to place an off track bet from the hotel in cities that have OTB.

"The average use of pay television in equipped rooms in New York City runs 3 to 4%," says Sy Grodner, president of Telebeam. "Our figures show that Telebeam is used on the average of 12 to 15% because we offer multiple-channel selections with up to five movies to choose from. It's also easy to use."

What's Quasar's role in this operation? Primarily as a marketing and bank rolling aid, according to Robert G. Connors, product manager for interactive systems and services.

He adds that Quasar is also working on a series of new adult-level interactive games that will be incorporated in the Telebeam system. These will be on the order of playing chess with the computer or gambling type tests of luck. Simulated driving to test skill is a possibility too.

In any case, Connors makes it clear that Quasar is firmly in the two-way TV business—at least for the hotel application. But it's quite likely that entry into CATV hardware and software supply is not many years away.

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NEWS

cont. from page 22

ended June 30, 1974: record sales and earnings of \$26 million and \$935,000 respectively. **International Video Corp.** for year ended July 31, 1974, sales of \$28.5 million, net income of \$645,000.

People

Bryan McMurry became general manager of the cable division of Summit Communications (formerly Triangle Broadcasting Corp.). . . .

H.L. Hadden retired in November after 47 years at WOR and WOR-TV, where he was a frontline witness to a string of historic events—Lindberg's return in 1927, dedications of Lincoln Tunnel and George Washington Bridge, many others.

Nathan Safir was elected president of the Texas Association of Broadcasters for 1975; he is a radio executive going back to the 1930's, currently vice president and general manager of KCOR and KQXT, San Antonio. . . .

Allan Eisenberg was named vice president and general manager of WQIV-FM, New York (formerly WNCN). . . . **Robert A. Castrignano**, general manager of TV technology at CBS Laboratories, was elected to fellowship in the Society of Motion Picture and Television Engineers.

Howard G. McClure became general manager of the Electronics Division, Lenco, Inc. . . . **John Cardozo** was named marketing manager of EIP, Inc. . . . **Joel A. Linsider** is deputy counsel to the New York State Commission on Cable Television.

Daniel E. Denham was elected chairman of the International Tape Association for 1975; he is vice president of the 3M recording materials group. . . . **Richard P. Walters** was promoted to Product Sales Manager, AML; and **R.N. O'Hara** to product sales manager, CATV, both for Theta-Com, Inc. . . .

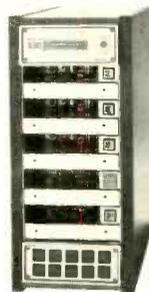
William H. Keller, Jr. became president of Clearview Cable TV, a division of Westinghouse Broadcasting Company operating in seven Florida and Georgia cities. . . . **Guy Roney** is technical support specialist for Conrac Corp. . . . **Henry J. Smith** was promoted to director of information, research and development for the New Jersey Public Broadcasting Authority.

Don B. Curran, president of Kaiser Broadcasting Corp., was named a vice president of Kaiser Industries Corp., which is majority owner of the Broadcasting Corp. . . .

continued on page 150

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NEWS

Don Shuler was elected a director of the National Cable Television Association, representing District 7 (Illinois, Indiana, Michigan, Ohio, Wisconsin); he is president of Cypress Cable TV of Dayton. . . . **Dale L. Morell** was promoted to be assistant chief engineer of KAKE-TV and radio, Wichita, Kansas.

Herb A. Hammer became corporate news manager for Ampex Corporation, based in Redwood City, CA.

. . . **David A. Dodd** was named vice president of operations for Dynair Electronics, Inc. . . . **James A. Smith** won appointment as western regional manager for the professional products department of CBS Laboratories, Inc.

Irving Candiotti became national sales administration manager for JVC Industries, Inc. . . . **Moses Shapiro** retired in November as chief executive officer of General Instrument Corporation; and **Frank G. Hickey** simultaneously became president and chief executive officer of the firm.

Dr. Sam Goodman was appointed vice president and chief financial officer of the Ampex Corporation; he was formerly vice president and controller of the Nestle Company.

Matthew W. Plonsky was promoted to the post of product manager at Anixter-Pruzan, responsible for marketing to the CATV industry, especially the products of Sony, ITT Cannon, and Blonder-Tongue Laboratories. . . . **John Howe** assumed duties as director of news and public affairs for the Donrey station, KOLO-TV, Reno, Nev.

Alexander M. Kizyma became manager of manufacturing for Blonder-Tongue Laboratories, Inc.

. . . **Harold L. Kassens** retired December 31st from his position as assistant chief of the Broadcast Bureau, FCC; he will stay in the Washington

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area as a consulting engineer. . . . **James P. Somich** has been appointed chief engineer of WHK and WMMS, Cleveland, Ohio.

E. Carlton Winckler, senior production consultant of Imero Fiorentino Associates, became secretary-treasurer of the New York section, SMPTE. . . . **John Borger** was named regional distributor sales manager of Telemation, Inc., assigned to the Midwestern U.S.

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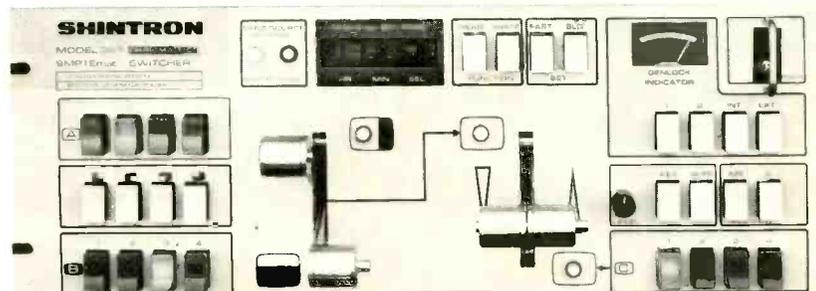
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one Lo-Band \$12,000.00
2 ea. Shibaden FP1200 Extended Red Plumbicon Studio Color Camera w/10-1 zoom lens \$14,900.00 ea.
4 ea. Conrac CYA-17 Color Monitors \$750.00 ea.
1 ea. Conrac CYM-21 RGB Color Monitor \$750.00
3 ea. Television Products Pneumatic Pedestals P-10, \$2,900.00 ea.
3 ea. Vinten MK III Cam head w/wedge plates \$1,075.00 ea.
1 ea. C.E.I. Model 280 Broadcast Camera w/Schneider F2.5 15:150 zoom lens, 2x extender; Image enhancer, extended red plumbicon tubes—\$32,000.00

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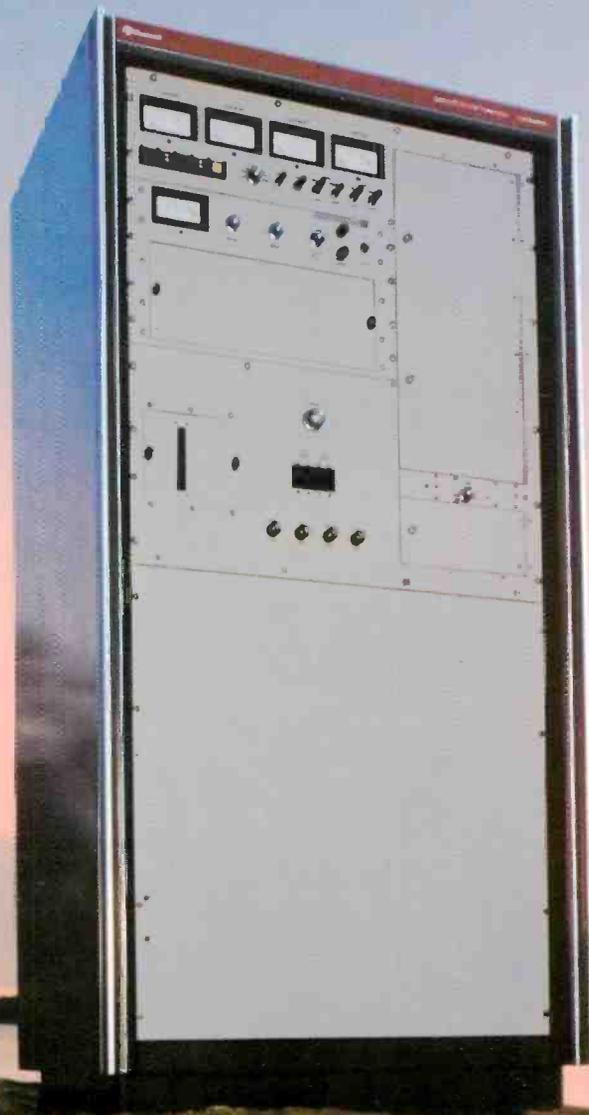
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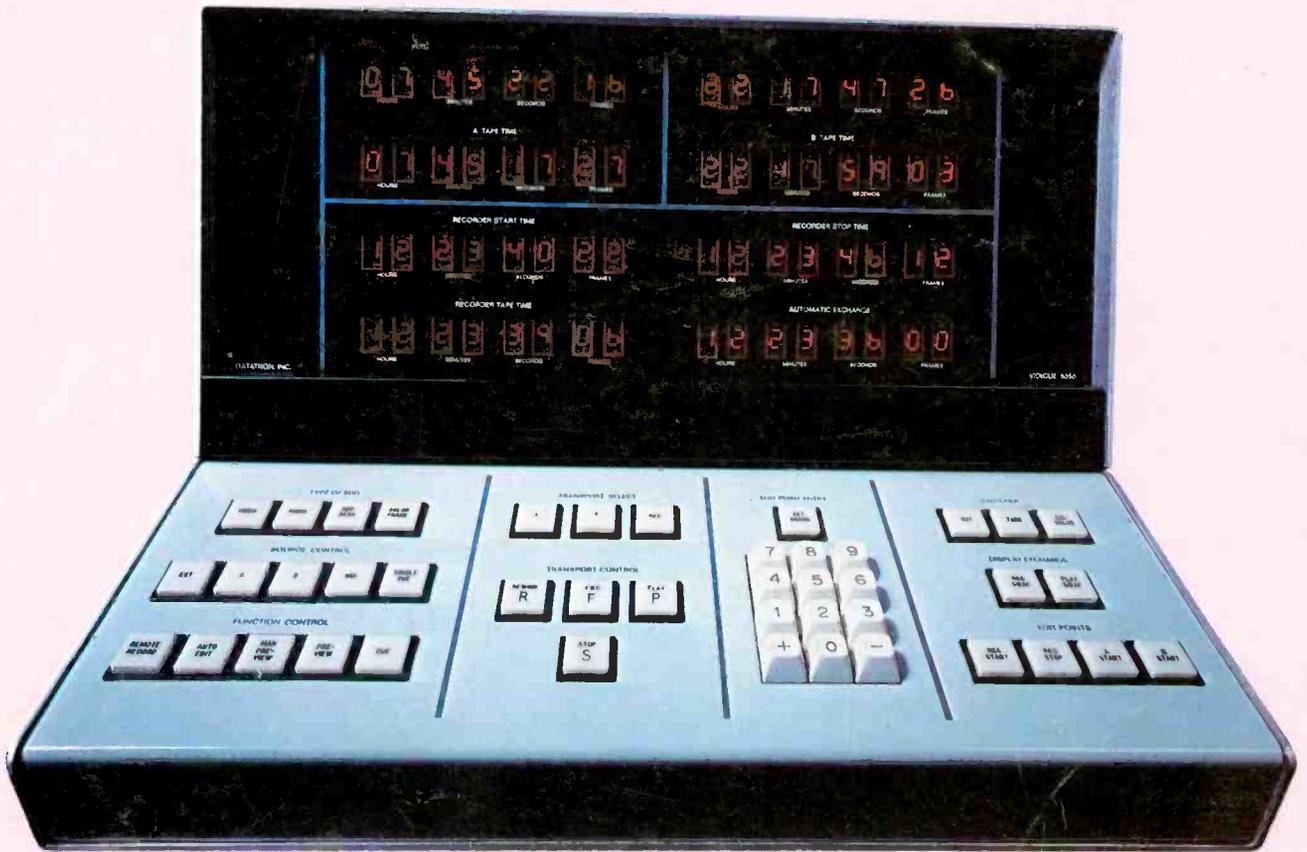
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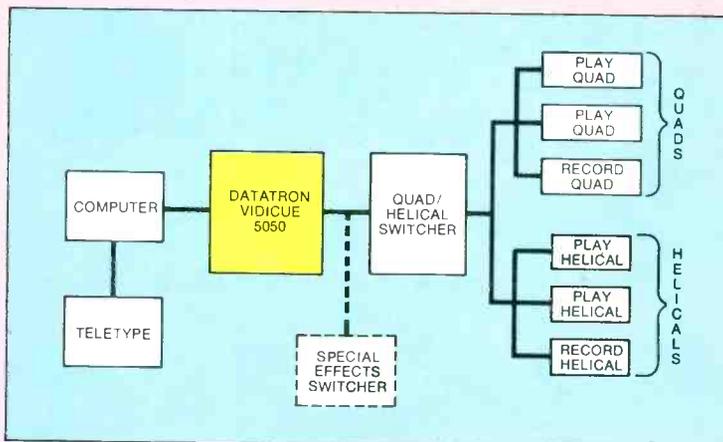
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