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March, 1978/\$2.00

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CONVENTION CENTER

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ENGINEERING
WELCOMES
NAB-78

NAB convention issue

NAB Locator Guide
AM stereo studios
1-inch VTR Update



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**"We move
our tails for you."**

"Meet Max & me at
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For More Details Circle (4) on Reply Card

BROADCAST[®] engineering

The journal of the broadcast-communications industry

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About the cover

Our cover photo shows the front of the Las Vegas Convention Center, location of this year's NAB convention. (Photo by Joe Roizen.)

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Recalls them later, EXACTLY.

At the touch of a button!

It makes switching easier,
good operators better.

E-MEM; creative assistance for video production.

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DIRECT CURRENT FROM D.C.



March, 1978/By Howard T. Head & Harold L. Kassens

It's NAB time again and NAB is looking forward to another highly successful convention in Las Vegas. This has advantages not only for serious convention registrants, but also for readers of this column. You can either go downstairs and put a few chips on the roulette wheel or, if you want to take a real chance, you can ponder our 1978...

Pompous Predictions

VHF-TV drop-ins

The commission now has received all of the paper work involved in proposals for short-spaced VHF-TV drop-ins and has closed the docket to any further filings. The commission's staff is studying a blizzard of paper work generated five years ago by an off-hand remark at a press conference held by the director of the Office of Telecommunications Policy (soon to be dissolved by Executive Order).

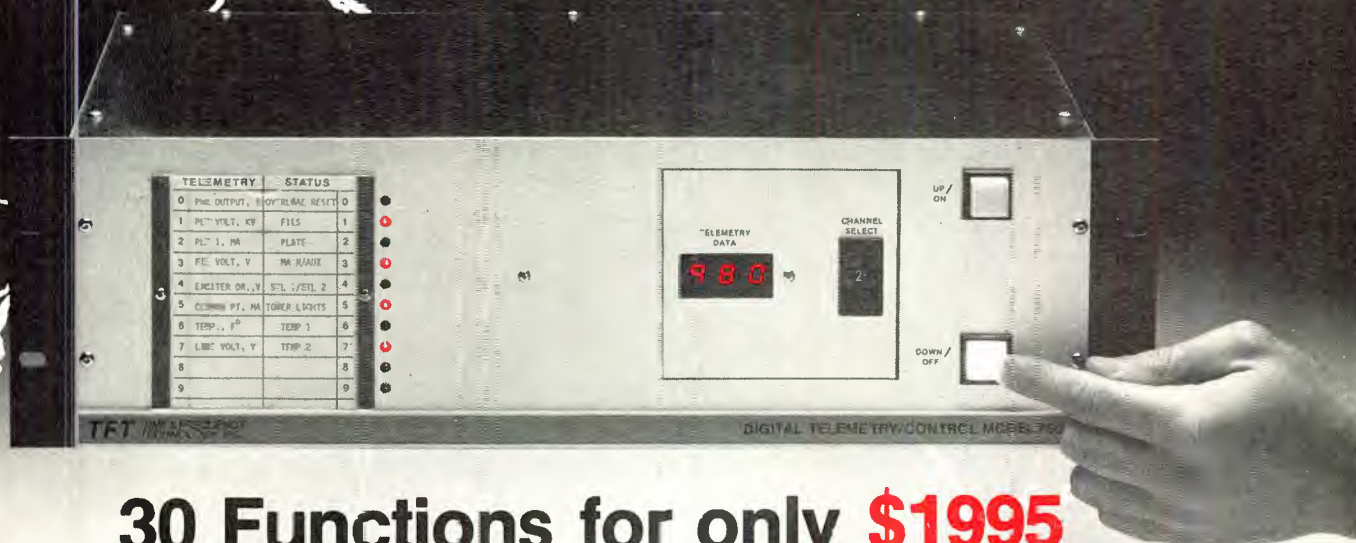
Short-spaced VHF-TV drop-ins have been urged in five markets: Charleston, West Virginia; Salt Lake City, Utah; Knoxville, Tennessee; Johnstown, Pennsylvania; and Albany, New York. Although there has been some support for each of these proposals, it is surprisingly less than expected and opposition has been vigorous. Look for one or more parties to ask the commission for oral arguments in the case which can hardly take place before the end of the summer. A final decision is unlikely during the coming year.

FCC application processing

Anyone filing a broadcast application at the commission can only expect longer delays even before the application is given a cursory examination. These delays are increasing and are going to get worse in spite of the determination of new FCC chairman, Charles Ferris, to improve the situation. The commission has announced a program which would expand the use of high-speed computers, especially in processing AM applications, but much work remains before this can be put into regular operation. The problem is complicated by the fact that all other North American countries are also involved. Don't expect any speed-up in the processing of broadcast applications during the coming year.

continued on page 6

INSTANTANEOUS Digital Command



30 Functions for only \$1995

TFT Model 7601 represents a major breakthrough in remote control systems. Now, you can get 20 channels of digital command functions plus 10 channels of digital telemetry functions for less than \$2000! And it's the same high quality, reliable design that has made TFT equipment a standard in the broadcast industry. Just check this line-up of features:

DATA SECURITY ASSURED

Full command-code redundancy, *plus* odd/even parity check, makes digital data errors virtually impossible. A TFT proprietary feature. Even lightning induced noise has no effect on integrity of command functions.

INSTANTANEOUS COMMAND

Less than 0.2 second marks the time for a complete command/execute function with the new TFT high speed data modem.

ONE MAN CALIBRATION

The front panel of the Model 7601R (Remote Terminal) has a DVM and scaling potentiometers so that just one man, on-site, can perform the FCC required weekly calibration. A studio lock-out switch provides complete operator safety for on-site work.

CHOICE OF TRANSMISSION METHODS

Model 7601 interconnection can be either telephone lines or radio links which include STL, TLS or SCA.

MINIMAL SERVICE DOWNTIME

Quick-disconnect rear barrier strips allow fast removal of the 7601 from the rack without disconnecting any of the interface wiring between the remote terminal and the transmitter or alarm sampling points.

TEN OPTIONAL STATUS CHANNELS

In addition, 10 status indicator functions may be factory or field installed to provide instant status display and alarm.

The Model 7601 is just one of a full line of field-proven, reliable, fail-safe remote control systems offered by TFT. Other remote control systems designed for AM, FM and TV include the Model 7610, 120-channel digital telemetry/status/control system, the TELESCAN* auto-logging multi-channel CRT display and tolerance alarm system, and a complete line of remote control accessories. They're all available now from TFT. Call or write:

*Trademark pending

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DIRECT CURRENT FROM D. C.

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AM stereo

Three competing systems have been tested in the laboratory and in the field by the National AM Stereophonic Radio Committee, and the results of these tests have been filed with the commission. Two other systems not tested by NAMSRC have been proposed and test results of these systems should be filed with the commission soon. During the coming year, the commission will issue a notice of proposed rule making inviting comments on all five systems looking toward the eventual standardization of a single system.

Automatic transmission systems

We goofed on this one a year ago when we predicted the commission would expand the authorization of fully automatic transmission systems, now confined to FM and non-directional AM, to include AM directional antennas and television stations. However, the paper work for this one is at least in the commission's mill and the expansion to include all broadcast stations should happen within the next few months.

The Television "Receiver of Tomorrow"

Texas Instruments has delivered a prototype of an improved television receiver to the commission's laboratories where it has been tested. A report of these tests will be given to the commission and then be made public. Texas Instruments claims the new receiver eliminates the UHF taboos involving oscillator radiation, image interference, and IF beat, and that it greatly improves the other taboo restrictions as well as that of adjacent-channel interference both at VHF and UHF. The commission must now decide what steps (if any) it should take to encourage receiver manufacturers to use these or other techniques in actual production models. A lot will depend on whether these improvements do any real good in increasing the number of available channel assignments, and on this point a lot of people are going to be disappointed.

1979 World Administrative Radio Conference (WARC)

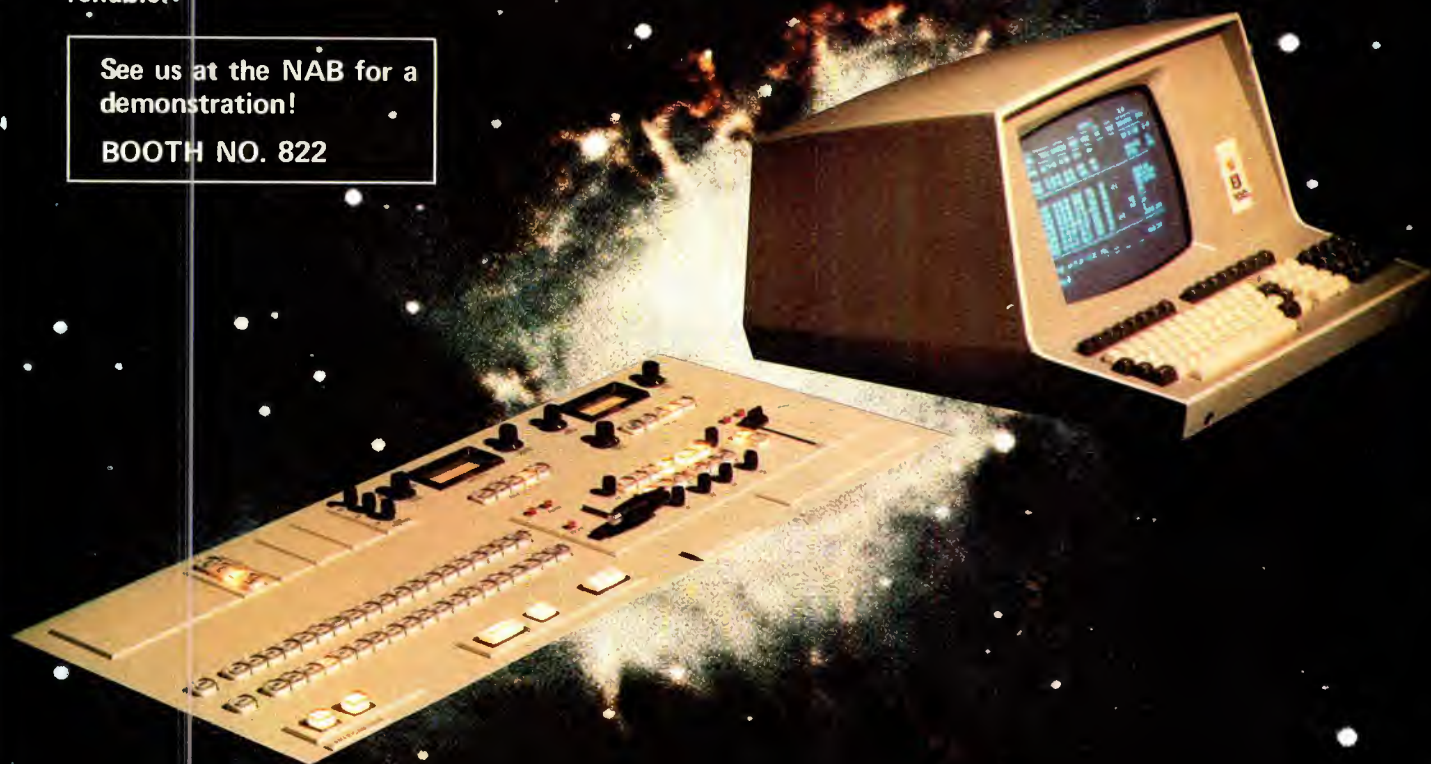
The United States continues to develop its position for the 1979 World Administrative Radio Conference (WARC) which will establish the framework for all frequency allocations worldwide throughout the year 2000. Former FCC Commissioner Glen O. Robinson, a law professor, will head the United States delegation to the conference subject to Senate confirmation. Among the key issues yet to be resolved is the matter of sharing television broadcast channels with the land mobile services. This sharing was recently turned down by a four to three vote, but the proponents of sharing will make a vigorous effort to reverse the vote to permit land mobile sharing of all television channels.

American Data, innovator in fourth generation production switching, now introduces the first fully programmable computer controlled television switching system.

The 3100 Series Automatic Control Television Switcher (ACTS) will meet any initial requirement and maintain the capability of improving or expanding the system as future demands are made. Modular expandability justifies its application in the smallest or largest broadcast facility. From basic manual operation to complete automatic control of event scheduling, the 3100 remains flexible, cost effective, and reliable.

See us at the NAB for a demonstration!

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North Hollywood, CA 91604
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industry news

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RCA announces 1000th TK76

At NAB in Las Vegas, RCA will announce the sale of the 1000th TK76 color camera. This announcement reflects the full impact of the ENG revolution that now dominates news broadcasting.

Introduced in 1975 at both the NAB and Montreux Exhibition, the TK76 found quick acceptance among studios looking for a lightweight, battery-operated portable that could be integrated with small VTRs and window microwave units to form the

nucleus of the minicam package designed for ENG operation.

In their short careers, TK76s have already been used at the Montreal Olympics, the major political conventions, and fast-breaking domestic and international network news stories. However, their major roll has been with local TV stations which want to bring viewers the Instant Action or Eyewitness News that characterize the current television theme.



Five elected to NAB Radio Hall of Fame



Fibber McGee & Molly (Jim and Marian Jordan) entertain the audience during a radio broadcast in April 1939.

Jim and Marian Jordan, better known as Fibber McGee and Molly, are among five radio greats who will be inducted into the National Association of Broadcasters' Radio Hall of Fame at the NAB's annual convention in Las Vegas, April 9-12.

Also being inducted into the Radio Hall of Fame are Arthur Godfrey, wireless inventor Guglielmo Marconi, and journalist and radio broadcaster, Walter Winchell.

Jim and Marian Jordan starred in the vaudeville-style hit radio series

"Fibber McGee and Molly," which went on the air in 1935, and in six years topped both Jack Benny and Bob Hope in the ratings.

Arthur Godfrey, whose success as a radio personality has been attributed to his spontaneity and informal style, began his radio career in 1929. It wasn't until 1945, however, that the show which made him famous, "Arthur Godfrey Time," first aired.

It was 75 years ago on January 18, 1903, that Guglielmo Marconi supervised the first two-way commercial radio transmission between Europe and the United States—a Morse code greeting between President Theodore Roosevelt and King Edward VII.

Walter Winchell is remembered best for his famous opening line, "Good evening Mr. and Mrs. North and South American and all the ships at sea, let's go to press—FLASH." His Sunday night show, "Walter Winchell's Journal," began in 1932 and aired for more than two decades.

Future of broadcast automation looks good

The future of broadcast automation is looking good, despite newly released statistics which show only a small percentage of radio and

television stations presently automated.

At least that is the conclusion of a survey conducted by the National

Association of Broadcasters and the Broadcast Financial Management Association.

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The Best.

New 5315/24 Console for Television
Affordable 5402 Console for Radio
Standard Consoles to 40 Channels
Custom Designed Consoles
NECAM Computer Audio Editing



Our business is sound. Sound of the highest quality and reliability, for Television and Radio. Our standard and custom consoles need no color advertising or fancy words to convince you of our quality. Neve consoles are built to last. Frame construction is of heavy gauge aluminum and steel. Most electronics are housed in metal enclosed plug-in modules for maximum RF rejection and ease of maintenance. We give you the finest reputation, reliability and performance. Call our customers. They'll tell it to you straight. Neve is the best!

Take the 20 channel Model 5305 console pictured above. This is one of the most successful sound production consoles ever built by any console supplier. From Boston to Los Angeles, from Toronto to Austin, this range of consoles is widely used by network and independent broadcast facilities. And now we are introducing the 5315/24P, an expanded version with 24 input channels, 4 auxiliaries, 4 subs and stereo output. With these and other consoles, Neve offers you a real choice to suit your requirement. Standards, modified standards or custom consoles. Give us a call or drop us a line. You'll be working with the best!

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BROADCAST AUDIO DISTRIBUTION SYSTEMS

FROM



DA504

- Standard DA504 systems are supplied with up to six active, balanced AT310 distribution amplifiers, c/w self contained PS855 power supply.
- Each amplifier is supplied with 12 600 ohm output splits.
- Remote, D.C. or computer ramp gain control available.



DA505

- Standard DA505 systems are supplied with up to six AM487 self powered amplifiers.
- Input and output transformer coupled with the output strappable for 4, 8, 16, 150 or 600 ohm impedance.
- Each amplifier capable of driving a maximum of 75 output splits, 600 ohm, or delivering 20W into 8 ohm load.
- Remote controlled mute circuit in each AM487.
- Front-mounted power heat sinks provide a cool interior operation.
- Larger audio distribution systems are also available.

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news

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According to the study, 10% of all commercial radio and television stations in the United States are either completely or partially automated. These results differ from those contained in a study by **Broadcast Engineering** (November 1977), which found more than twice as many radio stations reporting that they had automated their programming.

At that time, Ron Merrell, *BE* editorial director, wrote, "Prospects for radio automation, whether it be programming, logging, traffic, or equipment control, are good. They aren't so good that all stations will totally automate. But the prospects, especially for AM/FM combinations, have never been better."

Although the NAB study included both radio and television stations, unlike the *BE* study, it agreed with Merrell's prediction that nearly every station in the country will eventually install some form of automation.

At the larger outlets, the NAB study concludes, this conversion to automation will involve the entire station, and include both business and programming operations. This will help eliminate revenue-losing errors, such as make goods for commercials that were not shown or improperly aired.

Also forecast are nationwide ties between station computers and automation systems in related industries, such as station representative firms and advertising agencies. The study predicts the use of mobile units by salesmen who will be able to dial their station's computer to check the availability of particular time slots for advertiser clients.

Some additional facts contained in the study include:

- Broadcast automation has increased strikingly since 1973, the year minicomputers became generally available.
- Although a small number of stations have developed their own computer systems, most obtain theirs through one of the 13 computer service companies specializing

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Log Entries

April

3-8—Salon International des Composants Electroniques. France.

5-8—National Honorary Broadcasting Society, Alpha Epsilon Roh, annual convention. Alladin Hotel, Las Vegas.

6—EIA/DPD, central region meeting. Chicago.

8—Midwest Acoustics Conference, 12th annual conference. Norris Center, Northwestern University, Evanston, Illinois.

9-12—National Association of Broadcasters, annual convention. Convention Center, Las Vegas.

12—EIA/DPD, eastern region meeting, New York.

19-21—Kentucky Broadcasters Association, annual convention, Louisville.

24-26—Electronics Component Conference & Design Engineers Electronic Components Conference. Anaheim, California.

30-May 3—National Cable Television Association, annual convention. New Orleans.

May

10-12—Synergetic Audio Concepts, Los Angeles area sound engineering seminar. Los Angeles.

22-23—Worcester Polytechnic Institute, Project Management seminar. WPI campus, Worcester, Massachusetts.

24-27—National Association of Broadcasters, radio programming college. Hyatt Regency Hotel, Chicago.

25-27—Music '78 convention. Pick-Congress Hotel, Chicago.

26-June 3—European Broadcast Union and UNESCO, 8th international television competition for children's and youth programs. Building of Bayerischer Rundfunk, Munich, Germany.

CMX is showing the same old stuff at NAB

CMX is the industry standard for editing. The most flexible, versatile, accurate, dependable, innovative and cost effective system in the world. Not one CMX system introduced over the last seven years has ever been taken out of service.

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Since this is a competitive world, you'll have to drop by to see what we've come up with this year — you can be sure you won't see flashy options or complicated consoles. CMX innovations must improve the human operability of the system or they don't become CMX. See us at booth 801.

cmx systems
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If you already have a complete production/editing setup, you probably don't need a lot of accessories for your AVR-2. Order it with basic manual controls, and it's ready to go to work.

You might want Super High Band Pilot. It comes with optional switch selection to augment the standard High Band Color circuits, and it adds valuable depth to your multi-generation production work.

If you're just now growing into more advanced production work, then you're going to want the EC-2 Edit Controller.

This complete, sophisticated stand-up time code editing accessory can put you in command of as many as seven additional (similarly equipped) machines working in any combination of master/slave for production or multiple dubbing service.

Modular construction means an easy fit for your AVR-2, no matter where you want to use it—at a remote location, in your tape room, or out in the mobile van.

AVR-2 is the quad recorder that grows. Every accessory for this machine is available upon initial purchase or at any time in the future when you're ready. Tell us what it has to do, and we'll recommend the model that suits your needs.



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the 3 WATT TRANSMITTER with 100,000 WATT CAPABILITY



RPU-1103

When you use a remote pickup transmitter for a live feed, your station's full power is behind the portable. You'd better have a unit you can trust.

What McMartin has learned about performance and reliability from building full-power AM and FM transmitters, it has put into the "New Breed" RPU-1103 (150 MHz) and RPU-1403 (450 MHz) remote units.

- 3 watts
- Built-in compressor
- Only six pounds
- Rechargeable battery
- Line level and Mic inputs
- Exceeds all FCC requirements
- Dual frequency operation (optional)

We'd love to demonstrate our complete line of RPU equipment. (50 watt fixed or mobile also available) **Call McMartin or see us in Booth 302 at the NAB.**

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"Shoot all day without the need of any external power source." **Frezzi Belt battery packs** run **RCA TK-76, Ikegami HL-77 or 37 or Hitachi* SK-80 or FP-1020 (and others)** about **2 hours**, or power **Sun Gun or Mini-Pro** lights.

*Hitachi Belt available only from Hitachi Denahi America, Ltd.

For information call (N.J. 201) 427-1160 (N.Y.C. 212) 594-2294



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news

continued from page 10

in broadcast systems.

• Approximately 40% of the respondents have a complete computer system on their premises rather than sharing time through a computer located elsewhere.

Maximum Service Telecasters to meet in Las Vegas

The Association of Maximum Service Telecasters will hold its 22nd annual membership meeting in Las Vegas on April 9, in conjunction with the NAB convention.

Franklin C. Snyder, chairman of the association and vice president of The Hearst Corporation, will preside at the meeting, which is scheduled for 1 p.m. in Meeting Room 4 of the Las Vegas Convention Center. It is being held just prior to the 3 p.m. opening session of the convention.

Special reports will be given by Snyder and Lester Lindow, association president, as well as legal and engineering counsel. In addition, the annual election of the board of directors will be held.

Prior to the general membership meeting, a special meeting of the present board of directors is scheduled for Saturday, April 9, at 2 p.m. in the Directors Room of the MGM Grand Hotel.

Phase tolerance rules proposed

The FCC has proposed amending its rules to require AM stations using directional antennas to maintain the relative phases of their antenna currents within 3 degrees of licensed values unless more stringent limits have been specified.

Although not actually specified in the rules, for many years FCC policy has required that the relative phases of the currents in the antenna elements be within 3 degrees of specified values. This policy has been applied in program tests for new stations and modifications to existing ones, in applications for license renewals and transfers, and in field inspections.

The commission noted that the inclusion of phase tolerance requirements in its rules had been considered in 1969 (Docket 18471) but not adopted due to then-existing inadequacies in phase monitoring and sampling systems. □

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See us at NAB Booth #605 For More Details Circle (14) on Reply Card A member of the GEC-English Electric Group of Companies

of Peter Onnigian, who continues as president of Jampro. The new address for Cetec Jampro TV Products is Point West Plaza Building, Suite 144, P.O. Box 13850, Sacramento, CA 95813; (916) 920-0600.

Cetec Jampro opens new offices

Jampro Antenna Company, a subsidiary of Cetec Corporation, has opened new offices in Sacramento, California, for engineering and marketing its circularly polarized and other TV transmitting antennas. The offices and TV-antenna technical staff will remain under the direction

RCA receives contract for Space Shuttle data

A one-year contract for wideband data communications services via satellite has been awarded to RCA American Communications, Inc. for support of NASA's Space Shuttle program. High-speed data trans-

mission will be provided between the Goddard Space Flight Center in Greenbelt, Maryland and Edwards Air Force Base in Southern California. The award calls for a 168 kilobits-per-second data channel to go from Edwards to Goddard around the clock, and for a 56 kilobits-per-second channel to go full time in the reverse direction beginning in November 1978.

INTELSAT IV-A satellite launched

The fifth in the series of INTELSAT IV-A global communications satellites was launched successfully from Cape Canaveral, Florida. It replaces a smaller satellite which has served the Indian Ocean region since mid-1975. The new satellite has over 50% more capacity than satellites in the earlier INTELSAT IV series. The next INTELSAT IV-A satellite, scheduled for launch next month, will serve as the spare for the Indian Ocean region.

National reduces microprocessor prices

For the first time, National Semiconductor's 8080A microprocessor is available for under \$10. In quantities of 1-24, the INS8080AN is now listed at \$9.98, reduced from the previous \$15.50. The 8-bit device has been marked down by one-third in 100-up quantities, going from \$10.80 to \$7.10. Howard Raphael, National's microprocessor marketing director, contributed the price reduction primarily to the overall volume delivery of the microprocessors.

Alan Gordon Enterprises sold

Alan Gordon Enterprises Inc. recently was sold to three of the company's top executives. The new owners are company president Grant Loucks, and senior vice presidents Don Sahlein and Robert Kuha-gen. Each has been with the company for 25 years.

Heath signs microcomputer contract

Heath Company signed a multi-million dollar contract with Digital Equipment Corp. for Digital's LSI-11 microcomputers and related products. The microcomputers, to be delivered over a three-year period, will be used in Heath's H-11 computer kits. The contract includes a licensing arrangement providing use of assembly and higher level programming languages such as PAL-11, ED-11, FOCAL and BASIC with the H-11 computer. □

AMPRO announces the maintenance free, no noise, reliable Audio Digital Delay System.

We call it ADDS for short and it's going to make you forget all about conventional tape delay systems.

ADDS delivers a high quality 6½ second audio delay with full digital storage capacity.

ADDS offers lower distortion, greater dynamic range and less noise than tape delays. No preventive maintenance, head cleaning or tape replacement required.

ADDS converts wideband signals into digital impulses, while utilizing a digital memory system that provides consistently good audio reproduction. It operates on a 15 kHz bandwidth, at a frequency response flat within $\pm .25$ dB and a total harmonic distortion of less than .5%.

When you think about all the benefits that Ampro's electronic technology can bring to your broadcasting, you'll find it all ADDS up.



For the unveiling of this unique new system,
visit us at Booth No. 100, NAB Show.



AMPRO BROADCASTING INC.

850 PENNSYLVANIA BLVD., FEASTERVILLE, PA 19047 • (215) 322-5100
Professional Equipment for Broadcasting Professionals

For More Details Circle (15) on Reply Card



Introducing a monitor with beauty and brains.

Behind the beautiful image, there's cool, calculating logic.

Logic circuits built into Conrac's new 6100 monitor represent a breakthrough in video performance.

They make it possible to enjoy all the significant advantages of a Comb Filter Separator* which provides full bandwidth capability. Even a non-professional could see the difference this state-of-the-art development makes. But to the professional, it's obvious.

So are the results of our Beam Current Feedback System. It samples each gun in the CRT and corrects color temperature to a set reference, and

maintains stability for long periods of time.

Another important feature is fully active convergence, even in corners. And there's a pullout drawer plus front access to all circuit modules.

See the Conrac 6100. It's a real beauty, and a smart buy.

Conrac Division, Conrac Corporation, 600 North Rimsdale Ave., Covina, CA 91722, (213) 966-3511



CONRAC

We're more than meets the eye.

*Optional

Presenting now TV switching



10x10 to 1000x1000 is standard
high performance hybrid video switching.



Refresh memory scans the switch each field; change a switch mode and the refresh sets it automatically; battery backup preserves memory during power failure.



Microprocessor control; self-diagnostics for fast troubleshooting; constant status output keeps tabs on where you are.

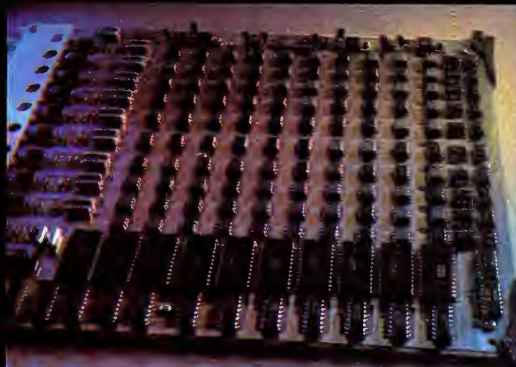


It's a big memory machine with total switch preset-take; single command salvo switching; up to 8 separate control levels with simultaneous follow or breakaway.

System 21: has come of age.



It's a neat package; compact enough for 180x10 to 270x15 in a single module frame.



Air quality, "pop-free," integrated circuit audio switching; 30 dBm at 150-ohm output available.



A single line for multi-station, serial data control; choose from CRT, touch pad or alphanumeric controllers.



System 21 — the director's choice... let's you realize the full potential of today's technology.

System 21 is a very mature routing switcher. Highly intelligent, it gives you the flexibility and capability you need to fill constantly changing systems requirements. It's what other switching systems would like to be when they grow up.

21 is a major milestone in anyone's life. That's why as we turn 21 years of age, DYNAIR, America's most experienced manufacturer of switching gear, is pleased and proud to present System 21.

It marks a significant stage in the development of broadcast switchers, by combining technologies brought to maturity over a 21-year period of innovation and progress with the sophisticated capabilities of microprocessors and integrated circuitry.

With automation-compatible control, and plug-in video, audio, hard contact and data switch modules that are instantly replaceable — with power on — it delivers performance unmatched in the industry. From video specifications like 0.15% differential gain and 0.15° differential phase, to incredibly low power consumption.

There are many reasons why you should look into System 21. So if you're ready for the mature system, we're ready to show you that DYNAIR's System 21 stands head and shoulders — a whole generation — above other routing switchers. Why fool with the minors when you've got a major job to do!

SYSTEM 21 *the mature generation*

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**people
in the news**

Federal Communications Commission

Robert R. Bruce, an attorney with Hogan and Hartson law firm, was named general counsel for the FCC. Bruce joined Hogan and Hartson in 1972 after serving as director of Communications Planning for the Public Broadcasting Service.

Herman Garlan, chief of the RF devices and experimental branch, office of chief engineer, was elected a Fellow of the Institute of Electrical and Electronic Engineers. The Fellow grade is reserved (less than 1% of the total membership) for professionals who have made outstanding individual contributions.

The new chief of the policy analysis branch of the broadcast bureau's policy and rules division is **Larry D. Eads**, senior economist. He joined the FCC in 1968 as a research economist with the former Research and Education division.

Clarence C. Dill, 93, the "Father of the Communications Act," died January 14 in Spokane. The former U.S. senator from the state of Washington was the co-author of the Radio Act of 1927 that established the Federal Radio Commission, the predecessor of the FCC.

Radio/Television

Georgia Crawford has been inducted posthumously into the Nebraska Broadcasters' Hall of Fame. Crawford, who died February 3, 1977, was long associated with KCNI Radio in Broken Bow. Also admitted to the Hall of Fame was **William Wise**, who retired in 1966 from WOW-TV, Omaha.

James Tandy became vice president and general manager of WXII-TV in Winston-Salem, North Carolina. Tandy was formerly vice president and general manager of radio stations KAAY and KEZQ, Little Rock, Arkansas.

Edythe Goodridge has been appointed a part-time commissioner of the Canadian Radio-Television and Telecommunications Commission. Goodridge is currently the curator of the Memorial University Art Gallery and assistant director of extension services.

William Frey and **Ronald Longinotti** joined station KOLO, Reno, Nevada as account executives in the sales department. Longinotti attended Stanford University, and majored in communications and psychology. Frey has been in advertising sales for 13 years, most recently with KKTU-TV, Colorado Springs, Colorado.

Preston R. Weaver, chief engineer of UMC Electronics' broadcast products division, was recently appointed chairman of the National Association of Broadcasters

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IF YOU'RE A PERFECTIONIST YOU'VE MET YOUR MATCH



WJZ-TV, Baltimore, Maryland

If you're really hard-nosed about audio quality, you'll see our perfectionism in our equipment. We're really demanding about our engineering, manufacturing and quality control standards. Correction. Make that read "downright finicky."

We're insistent about maintaining complete in-house design and manufacturing operations and about our painstaking quality control methods. These factors help maintain our position as the innovator, the one others look to for leadership. They assure you of the finest, the most reliable and advanced audio equipment.

You'll probably want to read every word of our excellent 5-year warranty, the most comprehensive in the industry. And while you're at it ask for our customer list. We're proud of it and we think you'd be proud to have your name on it some day.

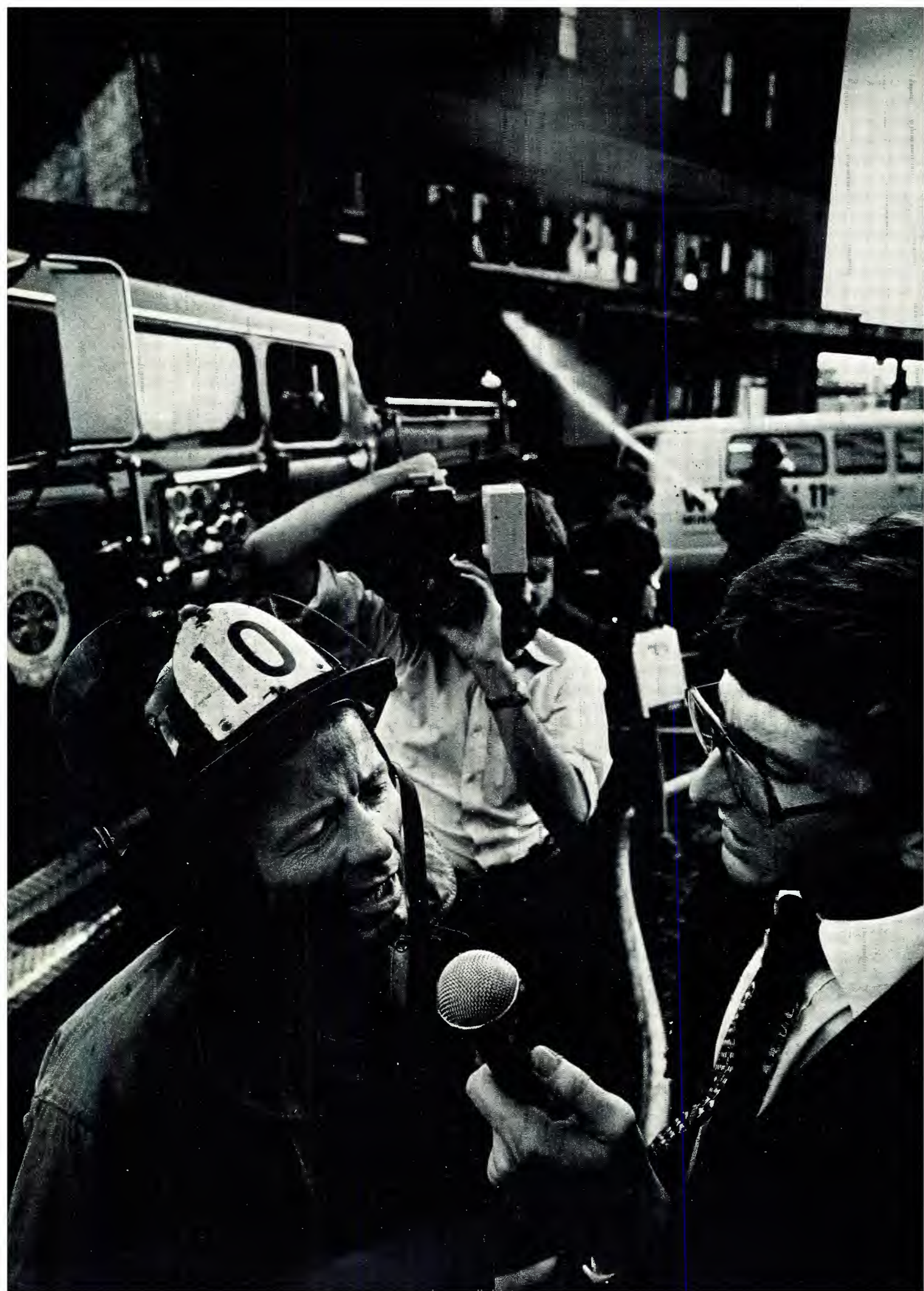
For our complete catalog contact Audio Designs and Manufacturing, Inc., 16005 Sturgeon, Roseville, Michigan 48066. Phone (313) 778-8400. TLX-23-114.

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The Audio Company

See us at booth 435.



ONE THING ABOUT THE NEWS BUSINESS: YOU NEVER GET A SECOND TAKE.

Here's a videocassette made for the people who make the news.

It's the new "Scotch"® Brand Master Broadcast U-Matic videocassette. MBU for short. The first $\frac{3}{4}$ " videocassette designed specifically for tough ENG recording and the repetitive stress of editing.

We took the same high energy oxide videotape you've used for years and fused it to an incredibly strong backing. The result is a videotape that won't twist, tear or jam in the field. An unyielding videotape that won't stretch under the strain of tape editing's shuttling modes or degrade in extended stop motion.

And to protect it even under the worst conditions, "Scotch" MBU videotape comes packed inside a high impact cartridge.

Of course, "Scotch" MBU videocassettes have the same high signal-to-noise ratio and low headwear and dropout rates of our superb quad tapes.

So if you've ever worried about a good story and a videocassette breaking at the same time, record on "Scotch" Master Broadcast U-Matic videocassettes. They'll always back you up.



"Scotch" MBU Videocassettes.

"Scotch" is a registered trademark of 3M Company, St. Paul, Mn. 55101, © 1977, 3M Co.

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people in the news

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continued from page 20

(NAB) Tape Machine Standards Committee. In his new capacity, Weaver will oversee the work of several subcommittees whose job it will be to update and maintain the technical level of cart machines produced in the United States, and to act as a liaison with non-domestic machine producers.

After a 56-year career in broadcasting, **Herb Hollister**, 78, retired from radio station KBOL, Boulder, Colorado. Hollister began his radio career in 1921 at station WAAZ in Emporia, Kansas.

Also announcing his retirement from radio broadcasting was **Norval Deines**, 65, of KMMJ, Grand Island, Nebraska. Deines began his career at KMMJ in 1934, when it was located in his home town of Clay Center.

Manufacturers/Distributors

Ruth K. Witkin, recently appointed advertising manager at Chyron Corporation, will be responsible for the development of media advertising programs and the creation of promotional material for the firm's marketing division.



WITKIN



STRAND



HOFFMAN

J. D. Strand has returned to the Nortronics Company as sales manager for the recorder care division. Strand was a Nortronics salesman until 1973, and has spent the intervening years with Ampex Corporation.

Jos. Schneider & Co. named **Gilbert Hoffman** president of its U.S. subsidiary, Schneider Corporation of America. Hoffman previously served in senior management posts for Berkey Photo Inc.

John F. Cameron became vice president and general sales manager of Sound Dynamics. Cameron, former manager of technical operations for NBC in San Francisco, brings 25 years of broadcast and technical experience to the company.

Elmer Ellsworth Smalling III has established a consulting engineering firm. He recently worked in the engineering department of ABC Television.

International Tapetronics Corporation has made several personnel changes. **John Abdnour**, formerly sales engineer, has been promoted to direct sales coordinator. He joined the sales department in 1976. **John Schaab** has joined the sales department as

continued on page 26



\$1895

one good sync gen
leads to another...



\$750

When it comes to good performance, people identify with VAC's model 5000 sync generator... operating in Alaska in its rough climate synchronizing cameras to monitor ecology around the pipeline; or genlocking to a computer; or in a studio genlocking to a helical color VTR in still-frame.

But let's face it, a lot of people like you don't need all that power. That's why we developed a new ENG/EFP color sync generator that's powered with rechargeable batteries so you can synchronize 2 or more cameras in the field without a long yellow power cord. It has all the outputs you need with full NTSC/R3170 specifications. You get more performance for less money than you thought possible because at VAC you can't get too much of a good thing.

Manufacturer's of:

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Cablewave Systems

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people in the news

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continued from page 24

broadcast salesman. Schaab, with ITC for six years, was promoted from shipping manager. **Karen Ryder** has been promoted from the sales staff to administrative sales coordinator. She has been with the company since 1973.

The British Society of Cinematographers presented **Garrett Brown** with its "Bert Easey" technical award. Brown invented the Steadicam™ film/video camera stabilizing system manufactured by Cinema Products Corporation.

James M. [Mike] Richardson returned after two years to TeleMation as field sales engineer for the Southwestern United States. Prior to rejoining TeleMation he was executive vice-president for Systamatics, Inc.

As product manager for Philips Professional TV Test Equipment, **Bob Grassi** will be responsible for the introduction, application and sales of all TV test equipment in the U.S. and Canada. Grassi recently was field service manager with Panasonic.

H. Edward Shulman joined California Microwave, Inc. as director of programs and systems for satellite communications products. Shulman comes to the firm from Warner Cable, where he was technical director, responsible for technical efforts and capital investment.

Ken O'Neil was named vice president, export sales, at Farinon Electric. O'Neil, who joined the company in 1963, had been vice president, domestic sales. **Don Savage** will replace O'Neil in that position. Savage joined Farinon in 1971 as sales manager.

Frank Zeman, president of Minneapolis Magnetics, died January 26, 1978, at the age of 55 of a long-term deteriorating heart condition. For years, Zeman had been keenly interested in sound recording: first with disc and then with magnetic wire and tape. He began making replacement pole-pieces for old Magnecord PT-6 and PT-63 recorders 14 years ago; and, these pole-pieces are still a part of the company's product line. Zeman's philosophy on life was that our existence on earth is just the start of a long, exciting adventure; that death of the earthly phase is birth into a new phase. He will be missed by friends and relatives.

W. Arnold Taylor moved from Ampex to Sony Corporation of America, where he becomes assistant vice president/general manager of Sony Broadcast. Taylor was with Ampex for 12 years.

Peter P. Ruese has been appointed general manager of IGM. He has been with the company since 1968, and recently served as production manager.

Video City, Incorporated's new marketing director is **Roger C. Harvey**, a veteran radio and television commercial producer. Harvey previously served as vice president, radio-TV, for Warwick and Legler Advertising. □

IMAGE ENHANCERS.



The Model 6220 In-Line Image Enhancer provides overall signal enhancement and detail gain, as well as level dependent aperture equalization. It also features a built-in RGB decoder for chroma key applications.

The Model 6210 RGB Image Enhancer allows the operator to adjust

black region noise and background activity which can particularly improve tape quality in film transfer work.

For more information, circle our reader service card number.

3M Video Systems. Watch us in action.

3M
COMPANY

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Today's performance requires the best in an audio test source. That's the new Sound Tech 1410A.



No question about it, the new Sound Tech 1410A is the finest audio test source available. It provides both sine wave (10 Hz - 110 kHz) and SMPTE intermodulation test outputs.

We classify it as an ultra-high-performance audio signal generator. Here's why:

Besides providing an ultra-pure test signal (typical distortion is **less than .001%** over most of audio range), the test signal is adjustable by precision output attenuators. And you have an exceptionally large output level range: from +26 dBm to -89.9 dBm in 0.1 dB steps. That +26 dBm can be a powerful help in line testing (no pun intended).

The output system on the 1410A is Sound Tech's special circuit. For minimum distortion, it has no output transformer, yet **it's both fully isolated and balanced**. That means **you can connect to any load: balanced or unbalanced, floating or grounded**.

INTERMODULATION TESTING

For intermodulation measurements, the 1410A provides the standard 60 Hz signal combined with a 7 kHz signal. You can vary the LF/HF ratio over a 100:1 range. The IM signal is provided from the same flexible output system discussed earlier.

With the high performance possible in today's audio systems, the 1410A

(or its relative, the 1710 system) is what's needed for adequate testing.

CALL FOR DATA

Call Mike Hogue/Larry Maguire and get our literature on the industry's most advanced audio test source.

They can also arrange a demo for you almost instantly.



REMOTE TESTING

In broadcast work involving remote transmitters, you can test by using the 1410A with the Sound Tech 1710A Distortion Measurement System. With its 1/2 watt of audio power, the 1410A can be used, say, at the studio to test studio-transmitter links, amplifiers, etc., while the 1710A is measuring at the transmitter.



SEE AT NAB

You can see the new 1410A at our Sound Technology exhibit at NAB.
I'll be at booth number 1308 to demonstrate the 1410A.
See you there.

Rosemary.

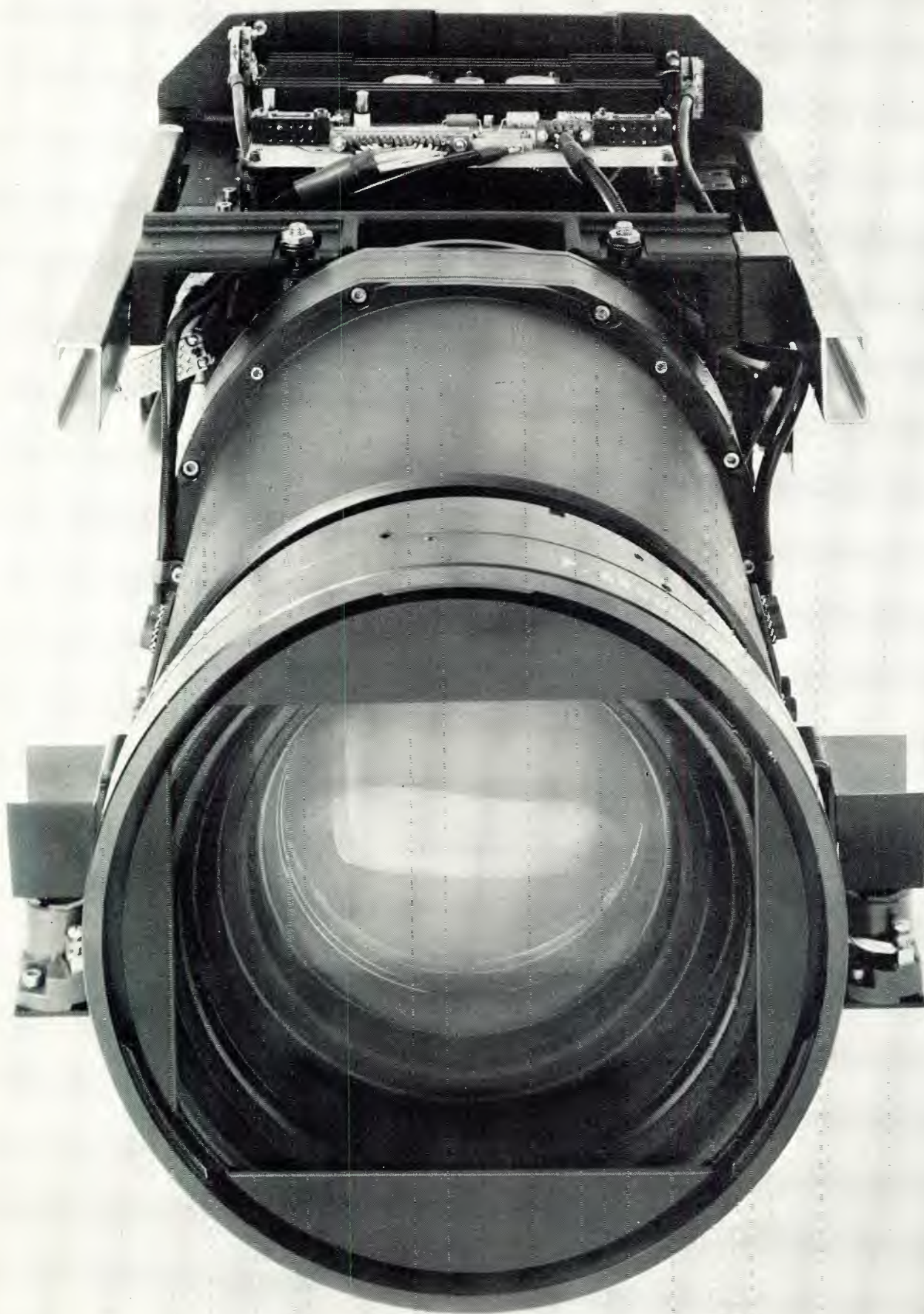


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(408) 378-6540

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angénieux 42x

Just imagine, what you could produce with it!



Photos courtesy of Compact Video Systems, Inc., Eureka, CA

The High Speed Continuous Zoom Lens for Studio and Field applications

Just imagine, capturing panoramic scenes with an extremely wide horizontal shot (56°) from 117 feet away, (as shown in the above photos taken at the L.A. Music Center). Then, zoom in continuously for a tight close-up, filling the screen with a detailed view of an individual or object. We call it the ultimate in flexibility, you'll call it the most versatile lens in your studio or on location. Imagine what you could do with a Variety Show or Drama, a Sports Event or a Commercial. Imagine using the 42x for more effective shots, significant time savings and reduced costs.

Yes, just imagine, you with a 42x.

NAB booth 812

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www.americanradiohistory.com

The 12th annual SMPTE television conference

By Joe Roizen

The SMPTE's winter conference held in Atlanta in February followed the same proven theme formula that characterized the San Francisco conference last year. The basic idea was to choose two topical subjects for the daily sessions—in this case 1-inch VTRs on Friday and digital video on Saturday. Every session was packed, with standees at the rear.

The exhibits, which were limited to products related to the technical sessions, drew considerable attention from delegates who wanted to see the hardware that performed the analog and digital magic described in the papers.

The conference also served as a convenient rendezvous for the semi-annual Governors meeting, SMPTE engineering committee conferences, and various standardization committee sessions that continually are contributing to the advancement of the industry the society serves.

One-inch production

If there was a single message that emerged loud and clear from the first day session, it was that the users of the new 1-inch VTRs, regardless of make, were emphatically endorsing these new entries into the TV production arena.

The recurrent comments by the

speakers from such diverse production entities as gigantic CBS with seemingly limitless facilities, and Tricommm Productions on Hilton Head Island with a single mobile van, expressed satisfaction with the capabilities of these VTRs and with their reliability and economy.

Dave Fibush of Ampex presented an excellent tutorial paper illustrating the technical details of the continuous field VTR. Fibush gave credit to the wide interest, faithful attendance, and hard work of some 13 companies and 13 network users (both broadcast and CCTV) for the emergence of a compatible Type C format.

He explained the reasons for a six-head drum structure and how the burst amplitude is increased 6 dB in the record mode so that it can have a better S/N ratio in playback.

With that background, the next three papers dealt with some of the new hardware. Hans-Peter Maly of Bosch-Fernseh described the capabilities of the digital store that permits the BCN (Type B) segmented VTR to produce slow- and stop-motion images for program production and post production. In addition, he showed examples of digital video effects that could be obtained from this digital store as a beneficial fallout from its basic VTR applica-

tion. Maly's contention was that while a segmented VTR such as the BCN does require a digital store accessory to achieve slow- and stop-motion images, it adds great flexibility in image processing which is not available directly from continuous field recorders.

Mr. Morizono, who has recently been elevated to managing director of Sony, gave a concise explanation of the Sony BVH 500, a portable Type C VTR which can be used for ENG or EFP applications. Morizono concentrated on the work his firm has been doing to improve interchangeability and reduce gyroscopic effects on this Type C format portable.

Denis Ryan, a mechanical design engineer from Ampex, provided a rather intricate review of the stresses and tensions encountered by a 1-inch tape as it progresses across the transport from the supply to the takeup reel. The object in this three-dimensional tape path is to keep the twist angles at a minimum, according to Ryan. On the VPR 1 it is only .9°.

All the technical papers gave ample evidence of the extended theoretical analysis and precision mechanical design considerations that have gone into these 1-inch VTRs. Perhaps this is why they are not quite as inexpensive as one would expect when comparing them to the larger, more complex quad machines.

One-inch at WNEW

Norman Ritter of 3M Company chaired the afternoon session which began with William Kelly of WNEW-TV, New York, who gave the strongest affirmation of 1-inch efficacy at the conference.

WNEW has 5 BCN-type recorders which have been in service more than nine months. They have racked up 500 hours on the studio version and 350 hours on the portable, all without any service problems or head replacement. Kelly commented

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The panel discussion on 1-inch helical VTRs included a cross section of manufacturers and users. Shown here (left to right) are Dave Fibush (Ampex), Denny Fussell (Tricommm), Grey Hodges (Jefferson), Bill Connolly (CBS), Howard Steele (Sony), and the moderator, Joe Roizen (TELEGEN). Henry Zahn (Fernseh), Bill Kelley (WNEW), and Ichihiko Hishida (TBS) completed the panel.

AFA saved them \$2,500,000 on 2" VTR's

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MGS Services New York, NY
AMPEX VR-1200
**Studio Television Services
Los Angeles, CA**
AMPEX VR-1200C

MANUFACTURERS

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Recortec, Inc. Sunnyvale, CA
(2) AMPEX VR-1200's
Spin Physics, Inc. San Diego, CA
AMPEX VR-1200
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AMPEX VR-1200

Our customers know value when they see it. If they bought 'em new, those VTR's would have cost \$5 Million. But our "pre-owned" VTR's are fully rebuilt and good as new. In fact . . . with our custom options added, they're probably "better" than new. If you don't believe us . . . ask someone else who knows . . . our customers.



They saved...how about you?

AFA can fill your need with a customized, fully rebuilt video tape recorder. Call us today for complete information.

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news feature

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that postage for quad parts replacement has exceeded his BCN component replacement charges.

Bill Connolly and Bill Nicholls, both from CBS headquarters in New York, gave consecutive papers on their use of Sony BVH 1000 recorders for program production and editing.

Connolly described in detail the Studio City set-up, where a trailer full of Sony 1-inch VTRs and a control center is used in conjunction with a film-style electronic shooting stage to do current sitcoms. Connolly also emphasized the high reliability and versatility of the 1-inch VTRs, which he credited for the major reduction (up to 30%) in program production costs.

Bill Nicholls went into further detail on a dedicated editing system developed by CBS as an overlay to their basic CMX Systems editors.

Both CBS authors reenforced other statements about general reliability, lower operating cost, and superior editing ability of these 1-inch machines over the standard quad recorders that CBS uses in considerable numbers.

Denny Fussell gave a description of the Tricomm mobile unit, built into a commercial van using an Ampex VPR 1 for recording purposes. Fussell echoed the other speakers in saying this 1-inch format was adequate for the EFP work they do and the economy permits them to compete in a small market.

Grey Hodges of Jefferson Productions claimed that they are the only operation in the country (other than CBS) using the new 1-inch helical machines for production of nationally broadcast material. Their system combines the Sony VTRs with a CMX 340 X and produces broadcast quality on a par with quad VTRs.

Special panel feature

At the end of the papers session

another popular feature of past winter conferences was repeated. This was the panel session, which included one speaker from each organization presenting a paper and a few invited guests. The panel was moderated by Joe Roizen of Telegen and the two guests were Howard Steele and Charles Urban.

Steele, who until recently was the director of engineering for the IBA in the United Kingdom, gave a short review of digital VTR developments that had been spearheaded at Crawley Court, the IBA's engineering headquarters near Winchester. He predicted that an all-digital VTR will emerge only when it has some significant operational or economic advantage to offer potential broadcast users. He also indicated that the IBA was experimenting with both segmented and continuous field recorders for conversion to all-digital operation. Currently, only the segmented VTRs (IVC 9000 and BCN) have been modified and demonstrated.

Charles Urban, of the BBC's London headquarters, reported on Type C format activities of the EBU's G2 working group. Urban, chairman of the working group, explained why the EBU had not directly accepted the SMPTE ratified Type C format.

Urban said that as a result of a questionnaire circulated to EBU members, the working group discovered these broadcasters wanted something different than their American counterparts. In Europe, because of the language problems, they need three high-quality audio tracks: two for mixing originals, and the third serving as the dub-down final copy. Therefore, they did not want to give up Audio 3 to time code usage. Instead, they wanted a dedicated separate longitudinal track for the frame addresses.

There were also some discussions about the most useful application of the space on the tape allocated in the U.S. to the vertical interval sync track. EBU members did not see an

immediate or mandatory requirement for a sync track. Currently, the Type C format in Europe is identical to the SMPTE recommendations from the control track to the top edge of the tape (i.e., Audio 1, Audio 2 and Video).

One questioner wanted to know if the slow/stop motion feature on the Type C recorders could be used on the air or just for editing and preview. Nicholls answered that in their set-up with Sony machines they could only use them for preview purposes, and only the Ampex machines with AST could be used on the air. Steele then remarked that Sony would be offering this kind of accessory for their VTRs as well.

Other questions from the audience related to the specifics of head exchange, tape savings, editing ease, and operational experience. The answers from various panelists pointed toward improved head longevity and simpler exchange procedures than are typical with quad VTRs. The new helicals consume approximately 38% as much tape as a quad (at 15 IPS) and handle the tape itself more gently, resulting in more passes. The editing features on the Type C machines, which include high-speed shuttle with picture retention and low-speed jogging on a frame-by-frame basis, make this operation an editor's dream. Even the BCN with the digital store is considerably faster than a quad.

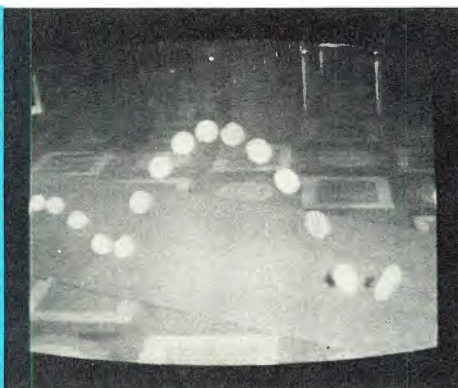
The digital video day

The morning session, chaired by Bob McAll of Vital, went by the topic title of "Digital Video for Production Use." A dichotomous set of papers was presented that could be classified as tutorial and pragmatic. Bob Hopkins of RCA began the day with a paper which reviewed SMPTE activities on digital video standards, and the topics discussed by the working group created by the society. Because of the recent proliferation of digital video devices, the working group has been trying to draft a standard as quickly as possible.

The next six papers extolled the virtues of various field and frame-store synchronizers, with or without digital video effects. Mr. Matley of Micro Consultants (Quantel) defended the previously maligned field-store (as compared to framestores), and showed where non-production applications can benefit from the smaller, lower-cost units. As an intermediate device with an infinite window for time base correction and other features, it may fill many

continued on page 36

The closeup on the monitor clearly shows the path the tennis ball took in its diminishing bounces. Controls permit the sequence rate to be changed or the keying-in of the moving image over other backgrounds.



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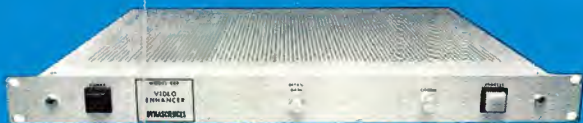
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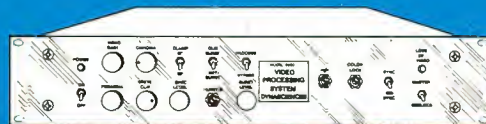
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Model 888 - Video Enhancer

The Model 888 video enhancer is specially designed for use with low-cost color cameras, video cassettes and small projection systems and is particularly effective with the $\frac{3}{4}$ " U-Matic format, especially for enhancement during dubbing.

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Model 6600 - Video Processing System

The Model 6600 restores the input video and to correct levels, reinserts sync. The system includes a sync generator, which may be genlocked to a wide variety of signals and will lock to both EIA and 2.1 industrial sync. Included in the sync generator is a clock, permitting use as either a master or genlocked sync source. For More Details Circle (30) on Reply Card



Model 7400/A - Program Switcher

The Model 7400/A program switcher has all the features and capabilities of the full-size, four-bus Model 7400, plus two additional wipe patterns, yet the control panel is only one-fourth the size of the Model 7400. The

unique numeric keyboard provides selection of video inputs, wipe patterns, buses and special effects by number, which are displayed in easy to read LED readouts. Ideally suited for ENG/EPG and post-production applications. For More Details Circle (31) on Reply Card



Model 9200 - Video Source Identifier

Dynasciences Model 9200 identifies transmissions from ENG mobile units, as required by FCC regulations. A row of characters showing station call sign and unit number is inserted in the microwaved video's vertical interval, where it may be viewed on a pulse cross or underscanned monitor.

For More Details Circle (32) on Reply Card



Model 7220 - Downstream Linear ChromaKeyer

With the Model 7220 it is possible to key through glass, smoke or other transparent materials, or a "hard" key may be selected. A controlling key sensitivity, hue, dissolve from a key, key mode and for disabling the key.

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studio needs where a framestore may be too much. Since Matley's company supplies both types of digital stores, he was on pretty safe ground.

Tom Gurley of RCA covered the production capabilities of their digital framestore and showed slides of digital effects that included picture compression and positioning, hall of mirrors, horizontal repeats and others.

Eric King of Vital seemed to combine two previous presentations by showing how a switcher/framestore combination can produce a range of digital video effects that makes Disney's *Fantasia* seem like an animation primer. TV images vanish to infinity while gyrating or pulsating; they split, turnover, invert, slide in all directions, and expand or contract at the touch of a joystick.

Action Track

There was one paper during the morning session which was perhaps the "frame grabber" of the day, so much so that at least 50 people stayed past the session closing time to have the developers show them another round.

Ken Moore from the CBS Technology Center demonstrated a new wrinkle in digital signal manipulation which goes by the generic name of "Action Track." Essentially, the result looks like those familiar multiple exposure stroboscopic pictures made famous by Dr. Edgerton in the late 1940s.

Action Track allows the TV director to select a scene where there is a moving object of considerable interest to the viewing public, and present that object (football, golf ball, race car, etc.) as a series of frozen images which define its trajectory, while the static background remains the same.

We saw it used first for the Super Bowl for a few field goals, but it's undoubtedly destined for rapid acceptance by the sports-minded TV producers and directors as an invaluable aid to programming.

The paper was accompanied by a live demonstration on a piece of green astroturf where a succession of golf putts and tennis balls were frozen into strings of balls or diminishing amplitude bounces. A single board added to a digital noise reducer performed all these miracles and delighted the observers. They had to shut down the demo before the group would disperse.

The two closing papers in the morning session were worthy of special note. The spectre of an all-digital VTR suddenly obsoleting the current models certainly must keep a few managers among the VTR manufacturers awake nights. It probably also worries a few buyers of what is presently available.

If any of the major VTR makers are working on such a device, they have kept it a well-guarded secret, and the profit margin in analog machines will inhibit any premature disclosure. But an organization actively working on a digital VTR is the IBA at Crawley Court in Winchester. John Baldwin, the project manager, is the same man who got a gold medal in Montreux last year for developing Digital Intercontinental Conversion Equipment, a device that improved international program exchange.

Baldwin was invited by the SMPTE to repeat a presentation made recently in London where he unveiled a modified BCN recorder operating in an all digital mode. By Baldwin's own admission, it is a far cry from a saleable product, but the technique is interesting. The secret of the machine is a drum that turns at twice normal speed, and a signal processing system which reduces the digital sampling during the A/D conversion.

Baldwin showed a short tape of digitally recorded still and moving pictures which covered about half the screens of the display monitors. They have produced full frame images for short periods, but there's still some work to be done to expand the memory. Nevertheless, Baldwin believes a commercial digital VTR will be available late in 1980. Baldwin may have sent a lot of videotape engineers scurrying back to their R&D labs, but he did not seem to worry Joachim Diermann of Ampex. Diermann took a very methodical approach to outlining all of the choices still open in selecting parameters for an all-digital VTR.

The afternoon session chaired by Al Chismark of WTVH was more operation-oriented, covering the recent advances in video still store and slow motion. It began with Bob Mausler of NBC claiming that new digital video technology can replace the familiar slide or film insert for graphics or backgrounds. He expects this technique will change much of the daily news production; he illustrated this with some examples used at his network.

Frame storage devices

The three following papers de-

scribed hardware dedicated to the same ends outlined by Mausler. The Ampex ESS digital recorder was covered by Bill Justus. This device can call up a virtually unlimited number of still images (via disc pack storage) on a random access basis.

Ampex had an ESS on display in their commodious exhibit; incidentally, it was billed as the only all-digital VTR at the winter conference.

Lee Stratton of Arvin/Echo then updated the delegates on what his firm has been doing in making floppy discs more versatile. The success of their discassette framestore device led to the development of a slow- and stop-motion version using round sheets of magnetic tape contained in a protective plastic holder.

A newcomer to this field, ADDA Corporation, whose president, Bill Hendershot of CVS fame, helped develop this device, claims that the ADDA Electronic Still Processor (ESP) is more economical for a TV station than handling 35mm slides in the long run. Jesse Blount, the company's vice president of marketing, presented a documented argument in favor of this assumption and explained some of the capabilities of their disc pack digital recorder. Both Arvin/Echo and ADDA had operational machinery on display at the exhibition.

The last speaker, Akito Iwamoto of Toshiba, described a complex holographic picture filing system with high-speed retrieval. The images (over 200,000 of them!) are stored on photographic sheet film. Average access time is 0.4 seconds and the light source is an Argon laser. The system has been tested on the air near Osaka.

While on the subject of film, it should be mentioned that Kodak provided an opening slide presentation that had to be one of the most ambitious and intricate ever assembled. For 12½ minutes, 16 Carousel projectors with a Cinemascope style screen presented a salute to the broadcast industry which must have given many television old timers in the audience a few goose bumps. About 600 separate images gathered from broadcasters in 100 stations across the U.S., Canada, and Australia showed the contributions made by those who work in front of and behind the cameras and microphones.

Synchronized with an upbeat sound track, the show fostered a spontaneous warm round of applause from the SMPTE members who saw it. □

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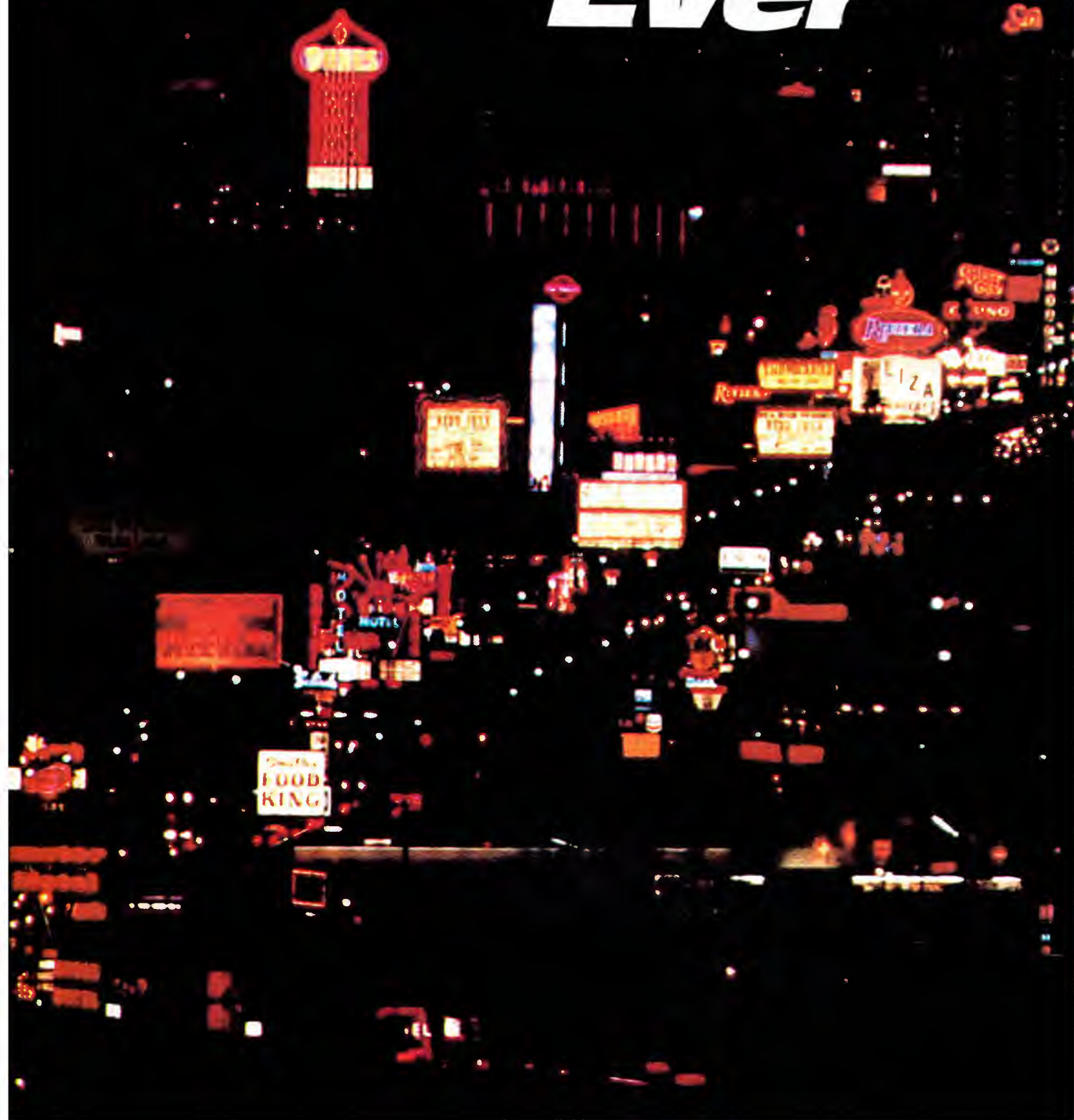


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For More Details Circle (34) on Reply Card

NAB '78:
***Odds say
"Best Show
Ever"***



By Ron Merrell, Editorial Director

It's a safe bet that this year's NAB will set industry records for attendance and exhibit space. And the odds are even better that those attending will be treated to a show full of surprises, imaginative hardware, and improved sessions.

While the country is swinging on rusty economics, the convention will mirror the good times the broadcast industry has been experiencing for the past two years. Although financial wizards and industry prognosticators are predicting good things for 1978, few have given it a chance for more than a 5 to 7% increase over 1977. Despite this, the pressure will be on the FCC and the manufacturers to supply the industry with the rules and the equipment for a battle between AM and FM, where AM is shaping up as the underdog.

Over the last five years there has been a numbers game quietly developing between AM and FM. What happened is that FM, in total installation numbers, pulled within striking range of AM. AM is parked at just over 4,500 stations, while FM has moved past the 4,000 mark. And the fact that FMs are growing in the black has a lot to do with the sudden push for acceptance of some kind of AM stereo system standard.

Meanwhile, there ought to be some very tough cards on the table for the programming game. Or, are listeners turning to FM only because of stereo?

Grab the brass ring

As the NAB prepares to take its chances on Las Vegas, there will be a lot of talk about how and why TV viewing took a discernable dip in '77. And there will be excitement (among the AM crowd) over the prospects for AM stereo. Meanwhile, the new champs (FM stereo) will do more browsing in the exhibits than ever. Stereo manufacturers are sure bets to report floor sales.

Way out on the consumer end, the 8080 and 6800 microprocessor chips have taken tremendous price drops. One company has just announced they'll sell the 8080 for about \$10. These "computer on a chip" devices are the heart of many

consumer products, and you can expect them to back into the new broadcast equipment. In general, the broadcast industry has been slow to take advantage of microcomputers and microprocessors. While it's true that some automation, switcher, and character generation manufacturers have been integrating the microprocessor, the real invasion will take place in '78 and '79.

The Washington scene

The more we change, the more we stay the same. The FCC has a new chairman, and a new commissioner. Overall, you'd have to say that the new look at the FCC won't help the broadcaster (at least not in the way he thinks of help!). Every time you notice it, the FCC is changing its makeup, and with few gains for the broadcaster.

In Congress, the industry seems to be losing more friends than we thought it had. Ever notice how we're always slipping downhill, yet a definite improvement is apparent at this end?

The FCC's new chairman, Charles Ferris, stepped into the commission's top job on the wrong foot. First he announced that he wanted everyone to work standard hours that would coincide with the working day of the industry the agency serves. After the dust settled, Ferris announced his main goals. They look like this:

- Increase the FCC's capacity to make long-range forecasts of new trends.
- Investigate whether broadcasters are doing a good job of self-policing children's programming.
- Set up an office for a chief economist. He would tell the commission how its decisions will affect the economy.
- Start a major study of networks not now licensed to see how they affect the local stations and the society in general.
- Develop a speedy adjudicatory process.

It's disappointing to see these as the FCC's priority list. One day we'll have a committee to study the effect

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(Photo courtesy of Las Vegas News Bureau.)

Best show ever

continued from page 39

of studies! Or do we already have one?

Out in the lobby

With a sort of nebulous line drawn as a jumping off place for Ferris, let's take a look at his counterpart at the NAB. Vince Wasilewski didn't waste any time letting the new chairman know where the NAB stands on what it sees as the issues. You'll hear more about this at the convention, but let's see what Wasilewski thinks should be acted upon first:

- fee refunds;
- action plan for UHF development;

- radio allocations policy for World Administrative Conference (WARC);
- ATS for directionals and TV;
- easing restrictions on rebroadcasts;
- tax certification proposal; and
- radio signals and syndicated exclusivity on cable.

Other recent NAB positions include requests for stiffer technical licenses, and quick action approval of systems for AM stereo and FM quadrasonic.

It's award time

Best known for his achievements in STL systems, John A. Moseley gets the nod this time as the NAB engineering award winner.

Moseley's broadcasting career be-

gan at WBAA, West Lafayette, Indiana, while he was a student at Purdue University. Following service in the Army Signal Corps, he entered the University of Southern California where he received his B.E. degree in 1947 and his M.S. degree in physics in 1951.

He then joined the Missile and Radar Division of Raytheon Manufacturing Co. where he worked in the telemetry field. In 1954 he joined Lear, Inc., and worked on commercial RF aviation equipment. Two years later he joined D & R, Ltd., and designed several flutter meters which were used for instrumentation recorders. During this time he also worked with a local weather

continued on page 44

Send my engineer to Las Vegas? You gotta be kidding!

By Chris Payne, Assistant to the Vice President for Engineering, NAB

"You think we're made of money around here? You want me to pay your way to Las Vegas so you can go to the girlie shows, gamble and goof off? You're nuts," says your general manager. And you sink down into the carpet and crawl back to the shop and to the warmth of the soldering iron.

The mere mention of Las Vegas evokes images of decadence and dollar signs. And it is a fun town, but more and more organizations are realizing that Las Vegas provides excellent convention facilities and hotel space ideal for spending time productively. So, if you anticipate a "forget it" from your general manager, here are some tips to help get you to the National Association of Broadcasters' April 9-12 convention.

For engineers, the NAB convention is not only a trade show but an opportunity to hear experts discuss what's new in the field. This year the program features more workshops than ever before. For television, there will be sessions on "Implementing the VIR Signal," "Living With Digital Broadcast Equipment," "A Review of TV Circular Polarization," an SMPTE session on the 1-inch VTR, and more. For radio: "Satellite Distribution of Program and Wire Service Signals," "AM/FM Quality vs. Coverage," and "Getting Ready for AM Stereo." In addition, technical papers will be delivered on—just to mention a few—"Advancing to the 'Intelligent' Program Automation System," "Library Storage Systems for Audio Tape Cartridges," "Improving Microwave ENG Coverage," and "A Low-Cost Modernization Program for UHF Klystron Transmitters."

If your station needs new equipment, there's no better, more efficient way to evaluate the potpourri of broadcasting equipment available. After all, when the wrong equipment is purchased, money is wasted and the frustration of being "stuck with it" can be overwhelming. Because every station is different, it takes key personnel and direct exposure to the equipment to make the right choice.

On the convention floor, a walk down one aisle will produce more sales literature, technical information and answered questions than \$100 worth of phone calls. And

there's nothing better than being able to question—face to face—the president or chief engineer of a company or the designer of a particular piece of equipment.

The NAB convention is your chance to ask maintenance or modification questions about your existing equipment. The experts are right there and waiting to help. They are also intensely interested in what you think about their equipment, so many conversations result in products on display the following year.

Broadcasting is more competitive than ever before. And in many cases, the competition is done with broadcasting hardware—whether it be the latest ENG camera or AM stereo. You may compete with more loudness, or less ghosting, but no matter how you do it, the station that has it first, has the advantage.

And don't discount fellow broadcasters as a valuable source of information. Just sharing common experiences about cameras, transmitters or audio processing equipment can make the trip well worthwhile. You may, for example, find that a problem you've been grappling with for years has been solved by the person standing right next to you on the convention floor.

And don't forget the FCC Technical Panel when staff and members of the Federal Communications Commission discuss the latest commission proceedings and rule interpretations. Don't be afraid to ask specific questions regarding your station operation. Got a complaint about FCC inspections? Most everybody has! Let them know, because if Washington *doesn't* know, it can't be fixed. Even if you don't have the nerve to stand up and ask that pointed question, chances are somebody else will. So be there for all the action.

While the general manager is grumbling about his latest P and L statement, you might suggest that knowing when and what equipment to buy can make that crucial difference between the red and the black. Point out that Las Vegas hotel rooms start at \$26 per night, and the NAB member registration fee of \$95 includes two luncheons. Forms have been mailed, but additional ones may be obtained by writing to the NAB Station Services Department, 1771 N Street, N.W., Washington, DC 20036.

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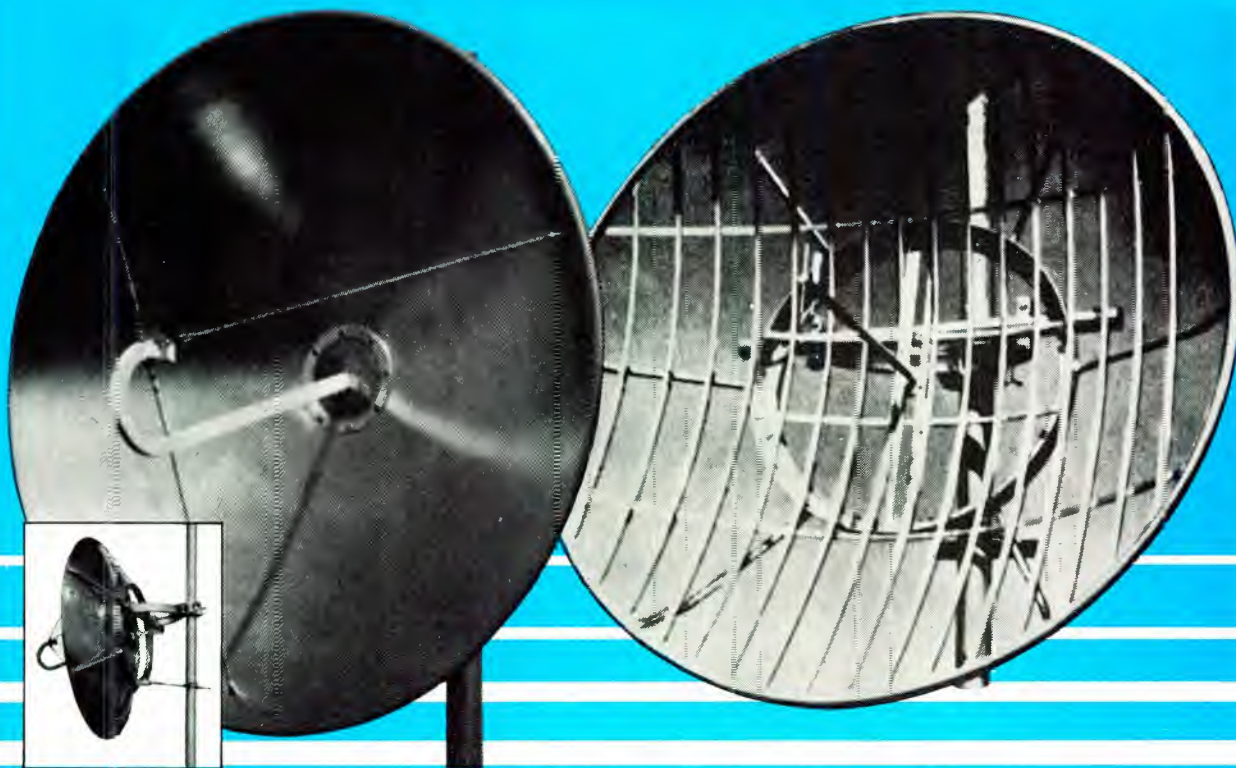
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Best show ever

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modifying company on specialized radio-controlled cloud seeding generators.

In 1959, he started his own firm, Moseley Associates, and worked primarily with radio stations designing special control systems. His new company was devoted exclusively to products serving the broadcast industry, such as aural studio transmitter links (STL), remote control systems, computer-assisted digital control systems, and subcarrier stereo generator equipment. In addition, his firm developed composite STL for FM stereo.

Moseley also submitted a report to the Federal Communications Commission leading to the allocation of dual STL assignments for FM stereo, assisted NAB in field tests leading to adoption of rules for TV remote control, and proposed the use of low frequency spectrum for wireless control systems for standard broadcast service. The activities of Moseley Associates have grown steadily and have recently expanded into the industrial communications field.

Moseley is a senior member of the Institute of Electrical and Electronics Engineers (IEEE) and helped found the Santa Barbara section. He is an associate member of the Association of Federal Communications Consulting Engineers, a sustaining member of the Society of Broadcast Engineers, a member of the Science and Engineering Council, and an associate member of NAB.

Distinguished service

J. Leonard Reinsch, chairman of the board of Cox Broadcasting Corporation, has been named recipient of the National Association of Broadcasters' 1978 Distinguished Service Award.

The award, established in 1953, is presented to a broadcaster who has made "a significant and lasting contribution to the American system of broadcasting by virtue of a singular achievement or continuing service for or in behalf of the industry."

Since joining the Cox organization in 1934, Reinsch has served as communications advisor for several political conventions and campaigns. He worked on every Democratic convention from 1944 to 1960; and was active in the presidential campaigns of many Democrats from Roosevelt and Truman in 1944, to Kennedy and Johnson in 1960. The famed televised debates between

Kennedy and Nixon were arranged by Reinsch.

A true broadcast pioneer, Reinsch began his 54-year broadcasting career with WLS, Chicago, the year that station went on the air.

The broadcasting executive has authored one book, *Radio Station Management*, and was featured in *The Executive Breakthrough* which was published in 1967.

Reinsch currently serves or advises 12 boards of directors including the First National Bank of Atlanta; the Educational Foundation of American Women in Radio and Television, Inc.; Atlanta Arts Alliance, Inc.; School of Journalism Advisory Board of the University of Georgia in Athens; Carnegie Commission on the Future of Public Broadcasting; and the Atlanta Opera Association. He is a former member of the boards of directors of the NAB, Broadcast Music, Inc., and the National Community Television Association.

BBC engineering chief to speak at convention

Dr. James Redmond, director of engineering of the British Broadcasting Corporation (BBC), will address the Tuesday, April 11, engineering conference luncheon.

Dr. Redmond, who has been director of engineering since 1968, joined the BBC in 1937 and the following year became involved in its television operation. From 1939 through 1945 he was a radio officer in the Merchant Navy; he rejoined BBC television in 1946. He was employed in various departments planning and developing new facilities, including telecine, film recording, remote broadcasts, and videotape recording.

He was president of the Society of Electronic and Radio Technicians from 1970 to 1975, and has been elected president of the Institution of Electrical Engineers for this year.

See you in Las Vegas

In other sections of this issue, you'll find an exhibit floor plan. If you forget to bring your issue to the convention we'll have lots of extra copies there, along with additional exhibit floor plan guides.

Also in this issue you'll find a complete roundup of exhibitors and their products. The new product section includes descriptions of several new items that will be introduced at the show.

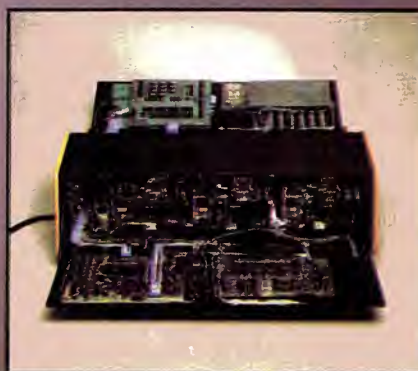
This will be an excellent convention. If you can't join us in Las Vegas, **Broadcast Engineering** will recreate the scene for you in the June issue. □

A new dimension for electronic field production.

The new EFP-1 Portable TV Production Console is designed for use on multi-camera remote telecasts, to replace or back up a large mobile van, to complete

Video sources, such as cameras, VTRS, and character generators, can be timed at the console without the need for waveform monitors or vectorscopes. The

the front and rear panels are hinged, giving direct access to plug-in PC boards. The micro-processor controller greatly simplifies the operation, puts all



a shoot in poor access locations, handle low-budget remotes, and to provide additional in-house studio facilities.

It provides all the necessary audio mixing, video switching, intercom, system timing, test signals and monitoring for remote broadcasts at a very reasonable price.

monitors are set up using the integral color bars and stairstep signals. The audio mixers are set using a 1000 cycle tone and a 4" illuminated VU meter.

All components are greatly derated to ensure stability and reliability. Service is a snap . . .

routing, wipes and script assistant functions under simple key pad control.

These are just a few of many great features, all in a compact, rugged unit that fits in a station wagon. Get full details now. The EFP-1 is the console of the future — for a price that makes sense today.



**Consolidated
Video
Systems, inc.**

1255 E. Arques Avenue, Sunnyvale, California 94086 (408) 737-2100 Telex: 35-2028

For More Details Circle 39 on Reply Card

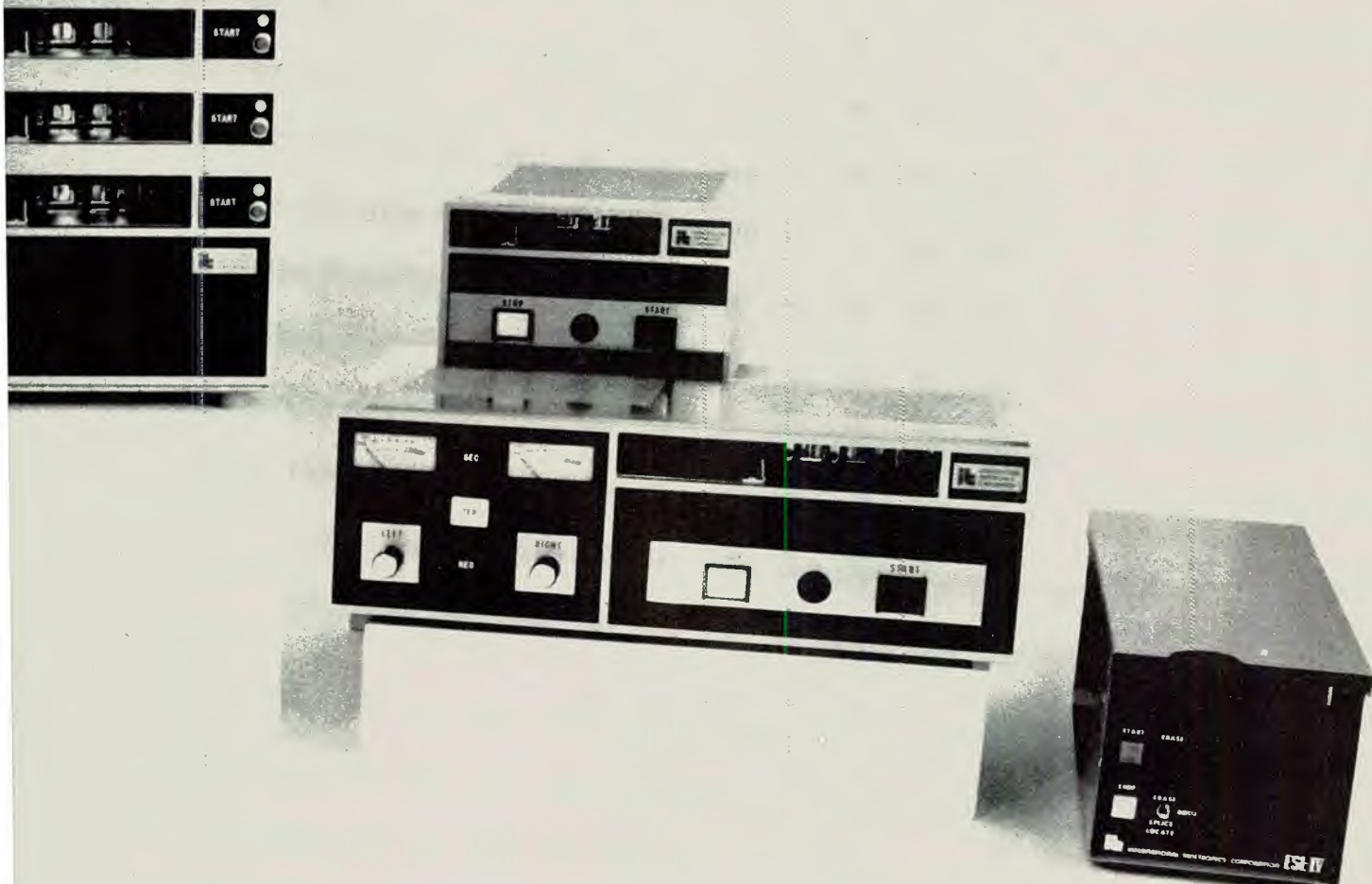
Look what's the "Old



**The faces are familiar...
and these engineering
updates have kept this
generation on top, year
after year:**

- New program recording and reproducing amplifiers provide less distortion, more headroom.
- +18 dBm audio output (optional).
- Improved 450 RPM capstan motor with less heat, less wow and flutter, higher reliability.
- New, long life Nortronics Duracore® heads. Ten times longer head life.
- Improved head mounting blocks provide better stability.
- Improved air-damped solenoid with Teflon® coated plunger for quieter operation.
- Motor-driven recording head azimuth control to compensate for variations in cartridges (optional).
- Self-aligning top capstan bearing in 3 Deck Reproducer.
- Improved, high-reliability meters.
- Field-selectable 600 or 15k ohms balanced audio inputs.
- Improved solid-state recorder logic control for better reliability.
- Improved tone detectors for fail-safe high-speed operation.
- Improved equalization technique on Recording Amplifier smooths high end response.
- RP Delay machine for program delay and cartridge production (optional).
- New IC Voltage Regulators with thermal and short circuit protection provide improved regulation.
- Two year warranty on parts and factory labor.

new: Faithfuls™



No Risk Trial Offer

Try ITC tape cartridge equipment in your own station for 30 days. If it doesn't outperform the competition, return it. No cost. No obligation. To place a trial order call us toll-free. Ask about our attractive lease-purchase plan and trade-in allowances.

**CALL TOLL-FREE
800-447-0414**

In Alaska, Hawaii or Illinois
call collect: (309) 828-1381.

it Quality
Improves With Time

**INTERNATIONAL TAPETRONICS
CORPORATION** • Bloomington, Ill. 61701

Marketed exclusively in Canada
by McCurdy Radio Industries Ltd., Toronto

See The Entire ITC Product Line
BOOTH 431—1978 NAB

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www.americanradiohistory.com



(Photo courtesy of Las Vegas News Bureau.)

NAB EXHIBITS ROUNDUP

This section of our convention special issue is a roundup of exhibiting manufacturers and a preview of the products they will have on display in the exhibition area of the Las Vegas Convention Center.

Along with the products to be shown, some companies are listing new products. These are products that will be shown for the first time at the NAB convention. A quick scan of the exhibitors will give you an idea of the variety of new products that will be on display.

If you're not going to the convention this year, this section will make the trip for you. Put this together with our special new products sections, and you'll be up to date on what's new.

This section can be especially

helpful. Circle the booth numbers of companies showing new products you'd like to see for yourself. If the manufacturer advertised in this issue, there will be a color line running under his product information that says "See ad on page ____." If you'll take the time to turn to the ad, you probably will have a good idea of whether or not the product will be interesting enough to warrant a trip to his booth in the exhibition area. And, if you'll mark these booth numbers on the exhibit floor plan, you'll be sure not to miss anything. This is one of those rare convention centers where booth numbers and aisle numbers really help the attendee. In Las Vegas, they are well-marked, making your search a lot less painful.

Exhibitors

Accurate Sound Corporation

New: Cassette recorder, transport systems, high-speed tape duplicating system, and control boxes. **Booth 202.**

[see ad on page 235](#)

Acrodyne Industries

1 kw UHF IF diplexed TV transmitter, 1 watt to 1 kw TV translator equipment, and automatic reset circuit breaker. **New:** 5 kw VHF IF diplexed TV transmitter, and 25 watt UHF SS amplifier for IF diplexed TV applications. **Booth 1011. Hospitality Suite:** Hilton, rooms 1710/11/81.

[see ad on page 157](#)

Adcom Communications

New: Portable production console, and frame synchronizer. **Booth 1300.**

ADDA Corporation

Electronic still processor. **Booth 524. Hospitality Suite:** MGM Grand, suite 607.

A. F. Associates

Refurbished 2-inch VTRs, and gated video circuit. **New:** Pictorial display on Systems division accomplishments. **Booth 449.**

[see ads on pages 31, 183](#)

Alford Manufacturing Company Booth 733.

AMCO Engineering Company

Cabinets and consoles for broadcast equipment. **New:** Small instrument cabinets and audio-visual desks. **Booth 441.**

American Data Corporation

Production switchers, control switchers, routing switcher, distribution amplifier, and modular distribution equipment. **New:** Large and small production switchers; 4-level audio/video distribution switcher; computer automated master control; business automation system. **Booth 822.**

[see ad on page 7](#)

continued on page 60

First in a new advanced class of digital processors!

The DPS-1
by Digital Video Systems.



The DPS-1 is the new third generation Time Base Corrector conceived to operate at standards significantly higher than those previously adopted by the television industry, and born through years of dedicated research by a team of experts.

This all-digital processing system, using computer circuitry operating at four times subcarrier, adapts its parameters automatically to incoming video feeds as input sources are changed.

Features include a super-wide 32 line window, digital test signal generator, microprocessor

control, digital burst processing, and a full range of circuit board options to satisfy all operating requirements, including Farre Store.

The DPS-1 offers substantially improved production capability to both broadcasters and industrial producers. Authorized dealer and customer service representatives, strategically located throughout the United States and Canada, will be happy to demonstrate the versatility of this new advanced system to you.

Ask us for full details.



digital
video
systems

...and what have we done for you lately?

14 years ago we delivered the original 30mm Plumbicon® camera tube that revolutionized TV broadcasting...

9 years ago we introduced the 1-inch Plumbicon tube that permitted the design of more compact broadcast cameras...

4 years ago — the 2/3-inch Plumbicon tube brought broadcast quality to portable cameras and gave us ENG...

Today, we bring you two of these popular pickup tubes with further improvements in performance.

Ever since the original Plumbicon tube won the Emmy Award for having revolutionized color TV broadcasting, we've been keenly aware of the importance of the name Plumbicon to the TV industry which has come to depend on it as its assurance of consistent performance and quality. There's no disputing the fact that contemporary Plumbicon tubes outperform their original versions by a wide margin.

Two of the most recent improvements in the Plumbicon pickup tube line, (the 30mm XQ1410 and the 2/3-inch XQ1427) are described here. These tubes, like all Plumbicon TV camera tubes, offer unmatched resolution and sensitivity, superior color rendition... excellent highlight handling... low and steady dark current... high signal-to-noise ratio... minimal lag... stable operation over a wide temperature range... and long life.



Type XQ1427: Offers significantly higher resolution than earlier versions; modulation depth is 60% typical at 320 TV lines giving sharper, clearer pictures and allowing operation at lower light levels. New gun design and 1500-line mesh construction result in improved registration and geometry, reduction of flare by a factor of 3 and reduced beam landing error.



Type XQ1410: The XQ1410 gained immediate acceptance by the television industry as a significant advance over all previous 30mm tubes. This recognition is based on the XQ1410's dramatic reduction in lag (typically 37% below that of our XQ1020.) The XQ1410 ends color-fringing, greatly reduces picture-smear and gives better dynamic resolution — even under poor lighting conditions. With its internal bias lighting, all three channels can now be balanced for identical lag characteristics. New gun construction gives improved resolution, 60% typical modulation depth at 400 TV lines. New mesh construction results in better geometry and registration and significantly reduces microphony.

Make no mistake — these are vitally important improvements on vitally important camera pickup tubes... but these developments are only part of the answer to — "What have we done for you lately?"

...and now the next generation of Plumbicon TV camera tubes: with them begins the age of Electronic Cinematography.



"Cinematography" once meant the creation of motion pictures on film, and film alone. But no more.

The next generation of Amperex Plumbicon TV pickup tubes, in combination with recent advances in new camera design and videotaping systems, is destined one day to reduce to near-zero the use of film in broadcast cinematography and in motion picture production. Now, indeed, begins a new era...and a new art form: Electronic Cinematography. All-electronic production will offer a technically superior product, and will permit shorter lead times between production and broadcast...and it allows motion picture directors to combine the creative aspects of single-camera film production with the immediacy of live-on-tape TV techniques.

All this has been no accident, of course. We, for instance, have been working toward this moment for fourteen years, ever since the introduction of the original Plumbicon tube...right through the advent of ENG, first brought to reality by our 2/3-inch version of the Plumbicon tube.

This steady stream of advances in TV pickup tube technology now culminates in a new generation of Plumbicon tubes that offers major advances in resolution and lag performance...advances that were prerequisite to the dawn of the age of Electronic Cinematography.

Type S45XQ: Developed for use in new studio cameras that will accept 30mm tubes, has limiting resolution of 1600 TV lines, with modulation depth of 95% at 400 TV lines and 40% at 1000 TV lines. Nothing like it has ever been offered in a broadcast quality tube. The S45XQ provides for external bias lighting; but decay lag, even without bias light, is typically only 7% after 50 milliseconds.

Type S73XQ: Physically interchangeable with conventional 1-inch broadcast Plumbicon tubes, can be used in existing studio and field production cameras with only minor circuit modifications. Typical limiting resolution of the S73XQ is 1000 TV lines, with modulation depth of 65% at 400 TV lines. Overall signal-to-noise ratio can be maximized in the S73XQ by a low-capacitance target contact. A revolutionary gun design in the S73XQ reduces lag; decay lag is typically 2% at 50 msec. with bias lighting.

Both of these new-generation tubes inherit all the finer qualities of the original Plumbicon pickup tube: near-zero dark current...high sensitivity...resistance to burn-in, even in highlights...precise geometry and registration...and long life. You can expect from them what you have learned to expect from Amperex Plumbicon tubes; performance at the edge of tomorrow.

For more information, contact: Amperex Electronic Corporation, Slatersville Division, Slatersville, Rhode Island 02876. Telephone: 401-762-3800.

Amperex®

TOMORROW'S THINKING IN TODAY'S PRODUCTS

A NORTH AMERICAN PHILIPS COMPANY

See us at NAB, Booth 819

For More Details Circle (42) on Reply Card

www.americanradiohistory.com

NAB Exhibitors

continued from page 48

American Electronic Laboratories
Transmitters. **Booth 306. Hospitality Suite:** Hilton.

Amperex Electronic Corporation
Transmitting tubes, monitor CRTs, RF circulators, rectifier stacks, TV pick-up tubes, deflection components, projection CRTs, viewfinder CRTs, and terminal CRTs. **New:** High-resolution Plumbicon tubes,

light-biased Plumbicon tubes, and reduced-flare Plumbicon tubes. **Booth 819.**

see ad on pages 58, 59

Ampex Corporation
Portable teleproduction recorder, and helical videotape recorder. **Booth 603. Hospitality Suite:** Hilton, rooms 460-61 (AVSD), 370-71 (International), 560-61 (MTD).

see ad on pages 12, 13

Ampro Broadcasting
Cartridge tape equipment, and

audio consoles. **New:** Audio digital delay system, phase protector, and cartridge reproducer. **Booth 100.**

see ads on pages 16, 209

Amtron Corporation
Five-inch, 12-inch, and 17-inch color monitors. **New:** 8-inch, 13-inch, and 19-inch color monitors. **Booth 1321.**

see ad on page 71

Andrew Corporation
Earth station antennas, heliax coaxial cables, STL microwave antenna systems, ENG antennas, UHF-TV transmitting antennas, rigid coaxial lines, and pressurization equipment. **Booth 808.**

see ad on page 143

Angenieux Corporation of America
Studio lenses, studio/field lenses, and ENG lenses. **New:** 12X studio lens. **Booth 812.**

see ads on pages 28, 29, 105, 106, 107, 238

Anixter-Mark
Grid parabolic antenna, and solid-spun parabolic antenna. **Booth 110.**

see ad on page 41

Arvin/Echo Science Corporation
Radar timer, and remote control. **New:** Slo-Mo-1, accessories for EFS-1 [radar timer], and dual Chyron. **Booth 906. Hospitality Suite:** MGM Grand.

see ad on pages 68, 69

Asaca Corporation
Chroma noise meter, envelope delay measuring set, color bar generator, test signal generator, 14-inch resolution monitor, and 20-inch color monitor. **New:** Portable color TV camera for EFP, video sweep generator, automatic distortion meter, digital pattern generator, and oscilloscope. **Booth 800.**

see ad on page 113

Audi-Cord Corporation
Cartridge tape reproducers, cartridge record-reproducers, mod-quad reproducers. **New:** Network delay record-reproducers, and 3-head program delay recorder-reproducers. **Booth 335.**

see ad on page 237

Audio Designs and Manufacturing
Distribution amplifiers, speakers, patch bays, audio processing equipment, equalizers, and spectrum analyzers. **New:** Consoles modules, intercom system, and new console format. **Booth 435. Hospitality Suite:** MGM Grand.

see ads on pages 21, 159

Audio-Video Engineering Company
Video hum stop coil. **Booth 1216.**

see ad on page 191

continued on page 64

See us at NAB
Booth No. 210.
Las Vegas
Convention
Center.

Beaucart 4D.



When we first introduced our four-slot Beaucart® 4D cart machine, it was, frankly, with some trepidation. Sure, our 4D had enough product advantages to knock the standard three-slot machine right out of the running. But could we counter the headstart they had on us, we wondered?

Well, we needn't have worried at all. Our 4D, with its individual tape drive motor for each slot, has become a runaway best seller. Broadcasters have been quick to recognize that the single motor and shaft of a three-deck machine make operating specs impossible to maintain from slot to slot. And the 4D's 25% extra capacity means that three slots are still on-the-air if one machine is down for service.

There's a lot more to the Beaucart 4D story. Built-in recorders, stereo, fast forward, and on and on. For the whole picture, write today for Bulletin 102 or call us at (203) 288-7731. We're the Broadcast Products Division, UMC Electronics Co., 460 Sackett Point Road, North Haven, Connecticut 06473.

UMC®

For More Details Circle (43) on Reply Card

The Thomson-CSF Laboratories Microcam[®] is the lightest broadcast-quality portable color television camera in the business. And if your business is covering news, sports or special events, you want to make sure it all gets covered. While other cameramen are pausing for a breather, you're still going strong.

Total system weight is:

- Camera head (with 6:1 lens) and viewfinder 8½ lbs.
- Shoulder pad 6.3 oz.
- Electronics pack 3 lb. 8 oz.
- Interconnect cable 1 lb. 2 oz.

Microcam will go anywhere. Capture anything. Live or on tape. And Microcam's ability to operate at extreme low-light levels makes it especially valuable for ENG.

Microcam's low power consumption of 24 watts provides a full hour of operation from a 2½ lb.

built-in battery pack. And for extended operation, a 4 lb. silver-cell battery belt operates Microcam 5 hours on a single charge.

With a two line vertical image enhancer and comb filter as standard equipment, Microcam will effectively upgrade your present system. And Microcam is priced lower than most portable cameras.

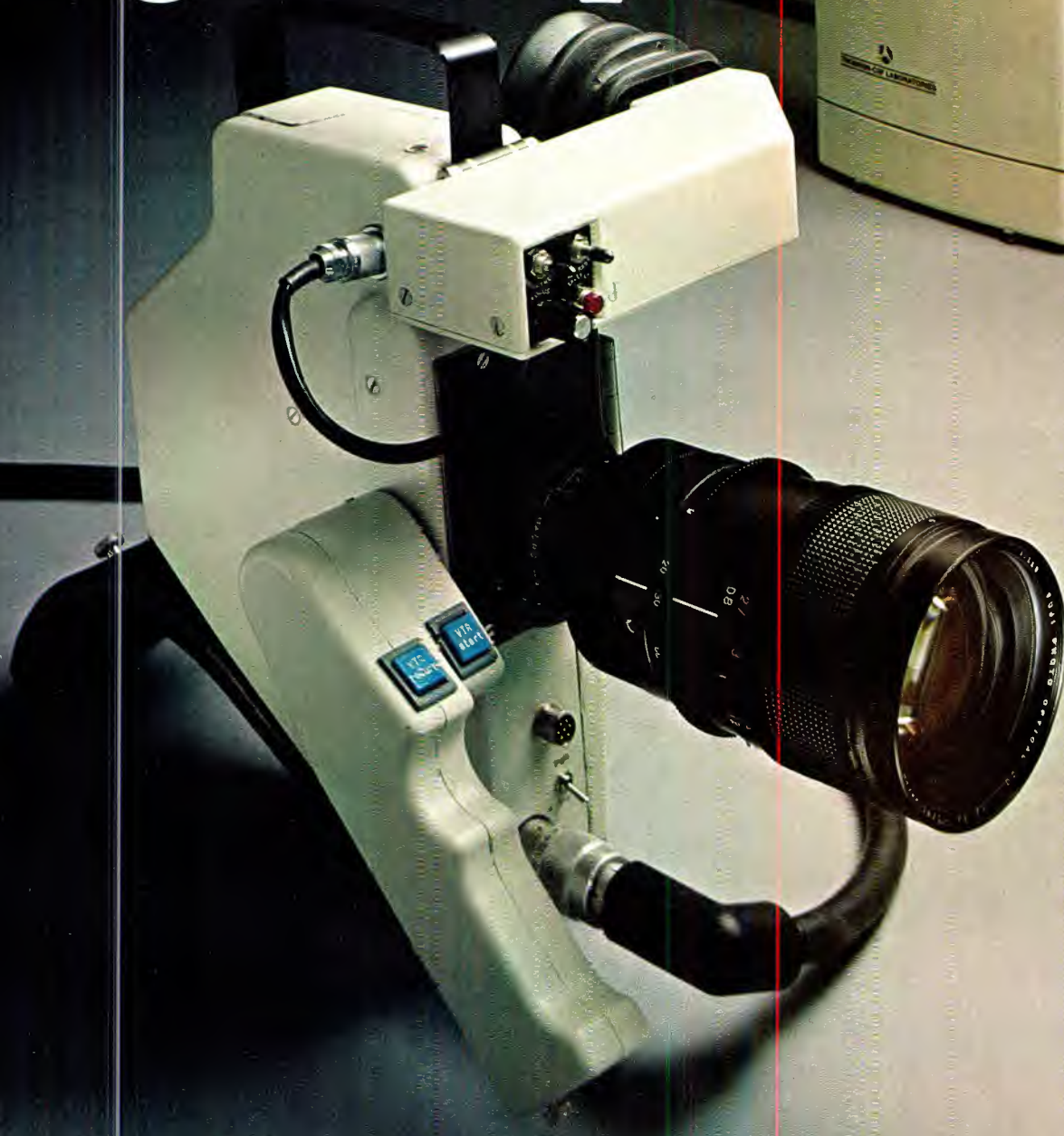
The Thomson-CSF Laboratories Microcam. Less weight. Less power consumption. And less on your budget.



THOMSON-CSF LABORATORIES, INC.

37 Brownhouse Road, Stamford, Connecticut 06902
(203) 327-7700 / TWX (710) 474-3346

Lighten Up.



For More Details Circle (44) on Reply Card

NAB Exhibitors

continued from page 60

Auditronics

Mixing consoles. **New:** 18-in/4-out console with VU and peak level indicators. **Booth 106.**

[see ad on page 83](#)

Automated Business Concepts

Booth 328.

Automated Processes

Production and on-air audio consoles; audio processing modules;

and audio amplifiers. **New:** Micro-processor-based intercom, and console programmer. **Booth 731.**

Automation Industries

New: Color weather radar with six-level color presentation. **Booth 1403.**

BTX Corporation

SMPTE time code generators, edit code generators, and edit code readers. **New:** Tape recorder synchronizers. **Booth 1208.**

Bardwell & McAlister Inc.

Booth 1606.

Bayly Engineering Ltd.

[AEG-Telefunken]

FM transmitters, digital and analog STLs (mono and stereo), monitor receivers, and studio accessories. **New:** Audio mixer consoles. **Booth 337.**

[see ad on page 211](#)

Beaveronics

Clocks, information systems, terminations, audio equipment, and bucking coils. **New:** Video switching systems; custom and standard routing; master control; production; and broadcast and closed-circuit applications. **Booth 1216. Hospitality Suite: MGM Grand.**

Belar Electronics Laboratory

FM monitors, AM monitors, TV monitors, RF amplifiers, and loop antennas. **Booth 520.**

[see ad on page 189](#)

Berkey Colortran

1k/4k softlight, battery belt kit, lighting kits, colorspot followspots, cyclorama lights, effects lighting, and Gelatran. **New:** Pantograph systems, fresnels, electric dimming, and computerized lighting control. **Booth 912.**

[see ad on page 115](#)

Beston Electronics

Automatic light controls for film chains, and low-cost character generators. **Booth 1105.**

[see ad on page 208](#)

Bird Electronic Corporation

Hi-power FM coax filters, Thruline^R RF wattmeters, Termaline^R dummy loads, 4 kw RF attenuators, standby (reject) loads, and RF power and VSWR monitors. **New:** Water-cooled RF line terminations, self-cooled RF terminating systems, digital 1-80 kw RF calorimeter, and 10 kw air-cooled RF loads. **Booth 1109.**

[see ad on page 172](#)

Bogner Broadcast

Equipment Corporation

Low- and medium-power slot-type TV transmitting antenna, UHF-TV high-power emergency antenna, MDS transmitting and receiving antennas, and high and low VHF dipole transmitting antennas. **New:** TV high-power UHF slot transmitting antenna—convertible to circular polarization at no initial premium. **Booth 907A. Hospitality Suite: MGM Grand.**

[see ad on page 127](#)

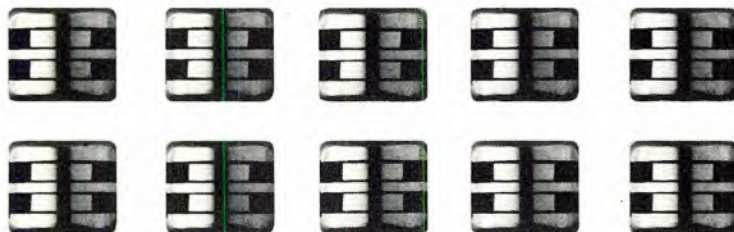
Bosch-Fernseh

BCN 20 Type B 1-inch portable VTR.

continued on page 66



Ten heads are *not* better than one When the one is DuracoreTM



New from Nortronics

Each time a magnetic head needs replacing, you're faced with recorder downtime, electronic adjustments and costly service time. Now Nortronics has a way to reduce these profit-slicing problems...Duracore direct replacement heads.

Several years of extensive research and rigorous testing led Nortronics to the discovery of a mu-metal type material that has *ten times* the life span of conventional mu-metal heads. This material is Duracore.

In addition to providing less wear and longer operational life, Duracore heads will directly replace conventional heads without requiring electrical or mechanical changes. They're available for all formats of reel to reel, cartridge machines and tape duplicators. Their performance throughout the entire frequency range is identical to mu-metal. Best of all, Duracore's life expectancy makes it more cost efficient than standard mu-metal replacements.

If you're interested in finding out more about Duracore direct replacement heads, contact your local Nortronics distributor. You'll see for yourself why Duracore is the state of the art in magnetic tape heads.

See us at NAB Booth #319

Recorder Care Division



NORTRONICS

Nortronics Company, Inc.
8101 Tenth Ave. North, Minneapolis, Minn. 55427
Telephone (612) 545-0401, Telex 290304

For More Details Circle (47) on Reply Card

Orban Perfects AM Radio: Introducing OPTIMOD-AM



(Hear it at NAB LAS VEGAS Booth 402.)

orban

Call Toll Free (800) 227-4498

Orban Associates Inc. 645 Bryant Street San Francisco, CA 94107 In California (415) 957-1067

For More Details Circle (48) on Reply Card

NAB Exhibitors

continued from page 64

New: KCA hand-held self-contained camera, color monitors, BCN CN50 Type B 1-inch VTR, and frame still store units (adaptable to any source of video). **Booth 924.**

see ad on page 117

Boston Insulated Wire & Cable
Booth 921.

Broadcast Electronics

Cart machines, tape cartridge ac-

cessories, audio consoles, audio programming equipment, and studio accessory equipment. **New:** Cart-ridge machines, audio consoles, and program control equipment. **Booth 304. Hospitality Suite: Hilton.**

see ad on page 72

Broadcast Programming International

Syndicated radio formats, including: Country Living, Personality M.O.R., Adult Contemporary, Adult Album-Oriented Rock, Bright 'N' Beautiful, Easy Listening, Personality Easy Listening, Beautifully Yours, Rock

Gold, and Spectrum. **New:** Unannounced Country Music. **Booth 325.**

CCA Electronics

AM transmitters; FM transmitters; TV transmitters; mono and stereo consoles; high-speed limiters; and FM optimod. **New:** Audio, AM, FM, and TV products. **Booth 307. Hospitality Suite: MGM Grand, room 1462a.**

CMX Systems

[Orrox Corporation]

Expandable computer-assisted videotape editing system. **New:** SMPTE/EBU master time code generator, SMPTE/EBU time code generator, and time code reader display. **Booth 801. Hospitality Suite: Hilton.**

see ad on page 11

CSI Electronics

AM and FM broadcast transmitters and accessories. **Booth 318.**

see ad on page 187

Cablewave Systems

Transmission line, elliptical waveguide, and cable hardware. **New:** Pressurization equipment. **Booth 100A.**

see ad on page 25

California Switch & Signal
Booth 313.

The Camera Mart

Video cameras, and support equipment. **Booth 1137.**

Canon USA

Zoom and fixed lens; and scopic 16 MS. **New:** 13:1 ENG lens. **Booth 918.**

Capitol Magnetic Products

Audiopak broadcast cartridges. **Booth 423. Hospitality Suite: Hilton.**

Cases Inc.

Booth 1409.

Cavox Stereo Productions

Adult MOR contemporary, beautiful music, good music, conservative tempo, standard pop, contemporary MOR, easy listening, and Cavox country. **No Booth. Hospitality Suite: Hilton.**

CECO Communications

Transmitting tubes, camera tubes, and microwave tubes. **Booth 404.**

Central Dynamics Corporation

Studio production switchers, compact/self-contained production switchers, downstream keyer, quadruplex generator, video distribution amplifiers, processing amplifier, digital sync decoder, video transmission amplifier, and editing

continued on page 70

MULTILIMITER MULTIMAX



THE BUILDING BLOCKS OF GREAT BROADCAST SOUND



PACIFIC RECORDERS AND ENGINEERING CORPORATION
11100 ROSELLE ST., SAN DIEGO, CALIFORNIA 92121
TELEPHONE (714) 453-3255 TELEX 695008

exclusive export agent: Sierra Audio Burbank, Calif.

For More Details Circle (49) on Reply Card

CP means stronger coverage in FM broadcast.

And Jampro is the CP leader.

Circularly polarized broadcast antennas deliver the strongest signal to any randomly polarized FM receiving antenna. That's because CP transmissions are radiated in both the horizontal and vertical planes.

Achieving high CP performance in practical FM broadcasting antennas is a sophisticated engineering task and a demanding manufacturing feat.

Even though Cetec Jampro is the world leader in high-performance CP antennas for FM broadcast, there's nothing routine about any Jampro antenna. Even our standard models are customized to each installation.

There are ten models in our "Penetrator" high-power line; ten more multi-station high-power models; still ten more in our "Brute" series. We also produce ten elliptically polarized antennas in a low-power, low-cost range, specif-

ically for Class A and educational applications.

We back up state-of-the-art engineering know-how with computer testing and pattern adjustment, and rugged, all-weather construction of high-strength brass. Jampro antennas are designed and built for high-performance under the toughest conditions.

The bottom line is that Jampro leads the way in CP antennas for FM broadcast. The proof is in the field, at radio stations around the world.

For technical specs and performance data, write or telephone collect today to Andy McClure, (805) 968-1561.



Cetec Broadcast Group

The Broadcast Divisions of Cetec Corporation
75 Castilian Drive, Goleta, California 93017



**See CBG in action
at NAB!
Booth 429**

For More Details Circle (50) on Reply Card



YOU CAN TAKE

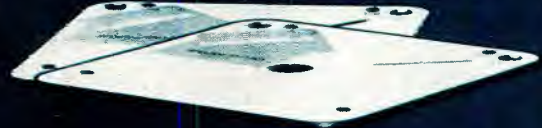
You can take us to the Super Bowl, you can take us to a local sporting event. You can take us to the Merv Griffin Show, you can take us on air in a commercial. We're at home with the independent broadcaster, and with all the major networks...we're even comfortable on a mobile van. We've been on Satellite/weather assignments, and we've recorded important news events.

We're the Arvin/Echo family of professional video products.

High-Band Slo/Mo-1...replaceable Discassette® makes maintenance easy and inexpensive. It takes only a couple of minutes to install...and only \$50. Each Discassette provides 20 seconds of record time with variable speed playback, stop action and reverse.

EFS-1 Frame-Stor™ Recorder...stop-action, freeze-frame...all directly recorded on interchangeable Discassette Records. Stores 200 frames on-line. It's EC-100 Remote Random Access Controller makes it an indispensable versatile machine.

EFS-1 Frame-Stor™ Recorder \$14,980
New & versatile production tool for instant stills and animation. So versatile you'll use it as a second source telecine or camera.





ANGEL CORDERO, JR.

CAREER WINS: 2,830
MOUNTS EARNINGS: \$280,000
WON KENTUCKY DERBY IN 1981
SHOARD CANNON'S D



US ANYWHERE

EFS-1 with Single or Dual Chyron Interface...the one you've all been asking for!

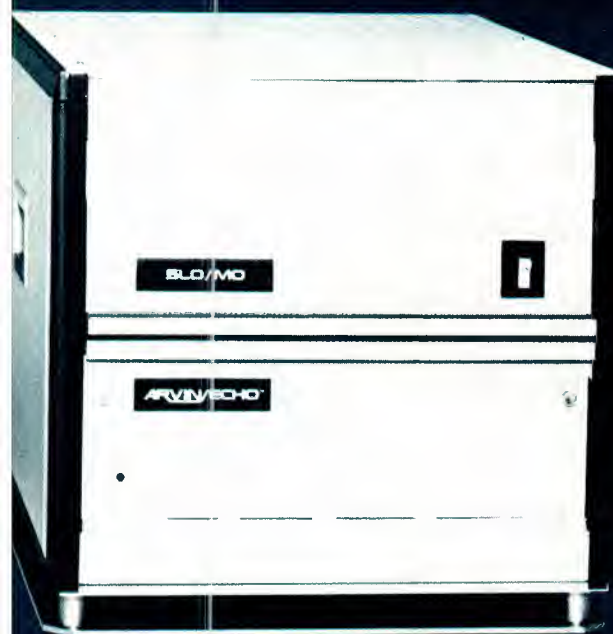
We're all compact, lightweight, affordable, and rugged enough to go anywhere you want to go, anytime you're ready.

See you in Las Vegas...Booth #906.

For More Details Circle (51) on Reply Card

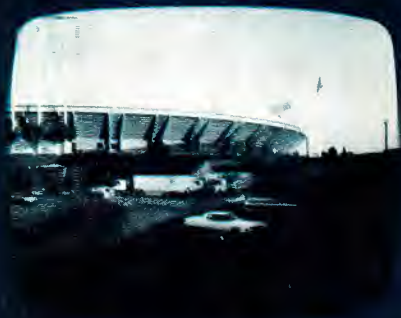
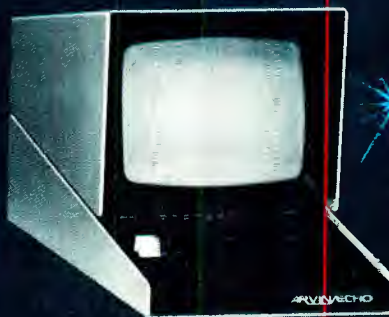
ARVIN/ECHO™

ARVIN/ECHO SCIENCE CORPORATION an ARVIN SYSTEMS, INC. company
15 E. Middlefield Road, Mountain View, California 94043
Tel: (415) 961-7145 TWX: 910-379-6499

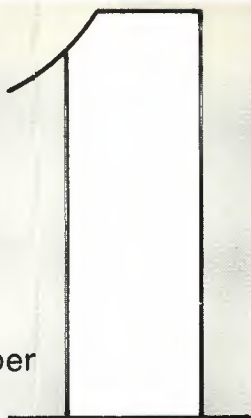


High-Band SLG/MO-1

Introductory Price: \$47,750
Professional Studio at an affordable price. Built in T1C...8 bit 4X subcarrier with DDC...Digital comb filter and digital field store... Auto-Cue™ System.



Number



in design, performance
and features

Spotmaster®

5300A

MULTI - DECK

The cart machine with features competitors can't match...

FEATURES

Single Connector Plug-In Decks
Companion Record Amplifier
Low-Voltage Solenoid
Independent Azimuth Adjustment
Shielding Above & Below the Head
LED Service Aids
Tapered Cartridge Guides
Companion Audio Switcher

Do the decks lock in place to a bulkhead
permitting operation with the front panel down?

<i>Spotmaster</i> ® 5300A	ITC 3D	HARRIS CC-III
YES	No	No
YES	YES	No
YES	No	No
YES	No	No
YES	No	No
YES	No	No
YES	YES	No
YES	No	YES



Plug-in removable decks and superb electronics make this the most up-to-date monaural or stereo three deck cart machine available. Rugged machined deck, quiet air-damped solenoid, unique cartridge guidance system, drop down front panel and run lights next to each deck.

For information call or write:

BROADCAST ELECTRONICS, INC.
4100 North 24th St., Quincy, Illinois 62301
Telephone (217) 224-9600



A FILMWAYS COMPANY

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NAB Exhibitors

continued from page 70

Cohu

1550 Telecine in an operating film island. **New:** Single-tube color Isocon TV camera. **Booth 908.**

Colorado Video

Compressed video for transmitting 8 kHz still pictures over FM subcarrier channels, microwave, or satellite links for special programming purposes. **Booth 911.**

see ad on page 237

Comark Industries

Demodulators, directional couplers, diplexers, power combiners, side-band filters, coax components, RF consulting and remote control. **Booth 1113. Hospitality Suite: Sands.**

Commercial Electronics

Incorporated [CEI]

CEI-310 professional broadcast color television camera (in portable, studio systems and self-contained configurations). **New:** Portable EFP broadcast camera. **Booth 1102. Hospitality Suite: Hilton.**

see ad on page 173

Communication Projects (COMPRO)
Booth 1402.

Computer Concepts

Booth 355.

Computer Image Corporation

Caesar computer video animation; Scanimate animation; and TV and radio promotional animation. **Booth 1107.**

Computer Image Video Controller (Dytek)

Video switchers, routing switchers, digital tape timers, digital clocks, switching systems, and 12-input/1-output audio-video routing switcher. **New:** Keyboard switching programmer. **Booth 1227.**

see ad on page 145

Computer Magnetics Corporation

Refurbished video heads, refurbished audio heads, refurbished special video heads, video discs and heads, auto equalizers, velocity error correctors, and differential gain adjustment. **New:** Velocity error corrector, and differential gain adjust. **Booth 449. Hospitality Suite: MGM Grand.**

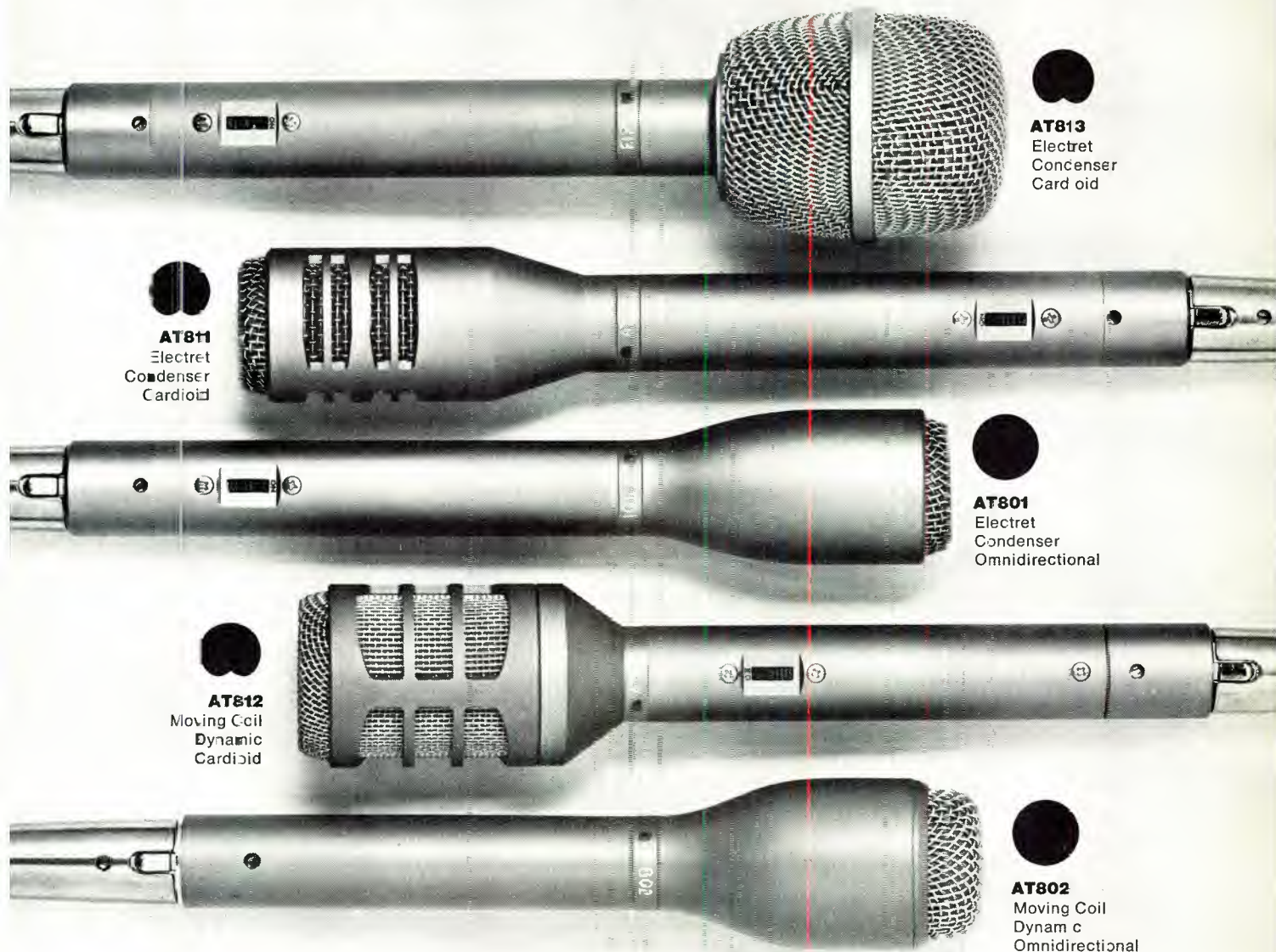
see ads on pages 210, 212, 214

Comrex Corporation

Wireless microphones; TV aural monitors; and cue transmitters and receivers. **New:** LX line extenders,

continued on page 194

Audio-Technica introduces five new microphones... and a pleasant surprise.



Take a close look at these new Audio-Technica microphones. Three electret condensers and two dynamics. Plus two clip-on miniature electrets (not shown). All are superbly finished. Carefully thought out in every detail. With the right "heft" and feel. Professional A3M Switchcraft output connectors, of course.

Then listen in your studio. Full-range, peak-free, clean and crisp. With

no distortion even when used close-up to high-level performers. And the balanced, phased Lo-Z (600 Ohm) output matches pro and semi-pro mixers alike.

Now for the surprise. The price. Both omnis are nationally advertised at just \$60, for either dynamic or electret condenser element. The two basic cardioids are just \$80, while the AT813

electret condenser with integral wind-screen is pegged at \$95. All complete with full one-year warranty.

Once you've seen and tried these new Audio-Technica microphones we think you'll welcome them. Not just because they cost so little...but because they do so much. Available now from your Audio-Technica Professional Products dealer.



audio-technica® *Great sound, right from the start!*

AUDIO-TECHNICA U.S., INC., Dept. 38BE, 33 Shiawassee Avenue, Fairlawn, Ohio 44313 • In Canada: Superior Electronics, Inc.

www.americanradiohistory.com

**How to get TV station quality
even if you're not a TV station.**



Introducing the Panasonic AK-920.

There are many ways of getting TV station quality from a Plumbicon® color camera. You can either own a TV station. Own a lot of money. Or better yet, own Panasonic's new Plumbicon color camera, the AK-920.

Not only does it give you TV station quality in the studio, it gives you TV station quality almost everywhere else. That's because it's fully self-contained, with the YI/Q encoder and the RS-170 sync generator built into the camera head.

But perhaps the best part about the AK-920 is the technology that has been put into it. Like a new color-trap circuit in the encoder and level-dependent circuit for reduced color noise, which is particularly important under low-light conditions. And for excellent edge detail and high frequency

response, there's an adjustable horizontal aperture circuit built into the camera head.

And since the AK-920 is a Plumbicon camera, you get performance that's hard to beat. Like low noise, low dark current and lag, high sensitivity, as well as the capability to reproduce high brightness details without burn-in or blooming.

The result of all this very impressive technology is equally impressive performance. Like horizontal resolution of more than 500 lines at center. A S/N ratio of 48 dB with recommended illumination of 150 footcandles at F/4. And a +6 dB gain switch for minimum illumination of just 15 footcandles at F/1.8.

You also get precise stability of alignment as well as the reliability that you expect from Panasonic. Because the prismatic optical system, the three one-inch pickup tubes, and the deflection coils are mounted on an aluminum die-cast chassis.

Also included are removable camera head side panels for easy maintenance. A self-contained, multi-function viewfinder. Color bar generator. And focus-wobble and saw-tooth-generator test circuits. Plus some rather impressive options. Starting with the AK-9220 remote control unit. To a 10:1 zoom lens with built-in 1.67X and 2.5X lens extenders for versatility in location shooting. To a vertical aperture corrector, AK-9620. To the AK-9720 cable equalizer for the RGB signals.

There are also three different versions to choose from. The AK-920ST with studio-grade Plumbicon tubes. The AK-920IT with industrial grade Plumbicon tubes. And the AK-920 without tubes.

So before you buy any color camera, audition the AK-920. It's Panasonic's way of giving you TV station quality, even if you're not a TV station.

For more information, write: Panasonic Company, Video Systems Division, One Panasonic Way, Secaucus, N.J. 07094.

In Canada, contact Panasonic Video Systems Department, 40 Ronson Drive, Rexdale, Ontario M9W 1B5

Plumbicon is a registered trademark of N.V. Philips of Holland for TV camera tubes.

Panasonic®

Just slightly ahead of our time.

Visit Panasonic at NAB at Booth #417

For More Details Circle (55) on Reply Card

New products and their technologies will be convention hits

As we head for Las Vegas and the 1978 version of the NAB convention, innovative hardware looms as the real hit of the show.

Microprocessors that went so quickly to consumer products are rebounding in broadcast products. The reason for the excitement is that chips such as the 8080 and 6800 are down to throw-away prices. One company is quoting 8080s at \$10 for single purchases. Prices also have dropped on the F8 family and its 3850 CPU.

Looking over the products we know will be on display at the convention, it's obvious the invasion of broadcast equipment by the new microprocessor chips is underway. When the unit price gets under \$20, you don't need to be overly concerned with the design costs. What will happen is that discrete component logic circuits will give way to exotic chips. As these chips replace the discrete components, the overall cost drops. And as the chips are sold in volume, their price also drops.

The advent of the microprocessor, and its large drop in cost, has made possible an entirely new approach to control systems for routing switchers, as well as a number of broadcast related uses. For example, Dynair will show their System 21 at the convention. It's an example of how microprocessors can be used to replace large quantities of discrete components.

A small number of standardized control elements, each containing a microprocessor, can be distributed throughout the system from the central switching matrix to the operator control panels, allowing wide variations in system configuration without requiring large custom efforts. The Dynair system uses this distributed processing concept. The switching matrices—audio, video, data and hard contact—are connected to a central computer-style parallel bus which is generated by a central microprocessor-based controller. Each matrix is a 10-input/10-output module containing a bus interface which automatically senses the matrix address and provides data storage latches.

There also will be other examples of microprocessor-based circuits at the convention.

And, as this issue of *BE* was on its way to the press, New York radio station WINS took delivery of a contact machine addressable parallel processor controlled actuality retrieval terminal (Whew!). The system records, dubs and sorts wire-service stories on cartridge tape.

The UMC design includes 20 cart decks, a common recorder amplifier, an equalizer for input to Telco terminals, four silence sensors, and a 16 touch-tone tone-decoder circuit. All this is controlled by first-responder circuitry.

This is a "walk away and let the machine do it" type of unit that will be of special interest to All News and news-oriented stations. The cart being recorded and the carts still available are displayed on two front panel digital readouts. Tally lights keep the operator aware of the state of each cart (including malfunctions). An aural and visual alarm circuit alerts the operator when the system needs reloading when only two unrecorded carts remain in the machine. Contact closures are available for remote reel-to-reel, cassette, or other back-up machines to ensure that a feature is never lost. UMC says the system can be configured to work with fewer than 20 carts, or double or triple that number.

Well, this sort of product introduction is what the NAB is all about. Some companies give us this kind of last minute information, while others prefer to make an announcement of something really new at the convention. But this section of *BE* should get you started on knowing what will be available at the show this year.

Following each of the products described, a number will be included for use with our Reader Service Card at the back of the issue. When you find a product that interests you, turn to the Service Card and circle the appropriate number.

By Ron Merrell

Introducing Action Track

One of the interesting new products was developed by Ken Moore, Arthur Kaiser, and Hank Mahler. During the SMPTE Winter Conference, our video editor (Joe Roizen) talked with Ken about the development of Action Track. The following is a summary of that interview.

Having worked on the digital noise reducer which includes motion detector circuitry, its inventors at CBS Technology Center realized that by a little additional processing they could electronically recreate a stroboscopic effect.

The first demos were made internally to CBS management in mid-1977, and patent applications were made so as to establish a firm proprietary position. The CBS network decided to unveil it at the Superbowl even though football is not the easiest way to use this device, which was dubbed Action Track.

Moore indicated that it takes good camera techniques to produce the diagramming effect that is so spectacular. As an example, an overhead camera looking down at the action can render some very interesting results.

It was introduced to viewers by Pat Summerall in a pre-game kickoff toward the goal post. The football hit one of the posts on this demo and the Action Track reproduced this faithfully. Summerall remarked with a little poetic license that this had been done on purpose to better demonstrate the Action Track function.

Currently CBS is using the operational test unit for a variety of sports, the most applicable of which is golf. Action Track will be seen more and more as additional units become available.

Potential applications for Action Track include track and field, swimming, diving, and horse racing. Moore also felt that training, teaching, advertising, and even the dancing field would benefit from the application of Action Track technology, and he hinted that some new developments to be announced later this year will further enhance this device.

Action Track uses a little ad-
continued on page 78



You're covering live news. Capturing a story as it unfolds. Ready for a shift in emphasis at a second's notice. In a situation like this, the last thing you can afford to be concerned with is power failure... because no news is bad news.

The revolutionary Christie Reflex 20 charger and battery give you the reliability you need, as well as provide **full recharge of completely discharged battery packs in 12 to 20 minutes**. Even faster recharge of partially discharged battery packs. And there's more.

90 to 97% net charging efficiency keeps the batteries cool during charge and **extends battery cycle life up to 10 times** that of conventional ni-cads. Patented "Negative Pulse" **minimizes capacity fading (memory)**. Christie's unique "Trough Voltage Sensing" assures charge turn-off at **precisely the right moment**. To insure long life, the

Reflex 20 System: battery-temperature-lockout **automatically delays recharging of overheated batteries** due to high current discharge. The system includes a **state-of-charge indicator**. The net result is the **least expensive battery** on a cost per cycle basis.

Contact Christie for complete information on the Reflex 20 line. For dependability in DC power supply, Christie is the source.

CHRISTIE

ELECTRIC CORP

The Source. Since 1929.

3410 West 67th Street
Los Angeles, California 90043
(213) 750-1151

From outside California, call toll-free
(800) 421-2058
TWX 910-321-3867



When every second counts, count on Christie.

The charger/battery system that gives you full recharge in 12 to 20 minutes.

(Now Shipping from Stock)

For More Details Circle (56) on Reply Card

Visit us at NAB Booth 1115.

New Products

continued from page 76

ditional circuitry that is added to a digital field store, and therefore is not significantly more expensive than the basic field memory. Moore pointed out that with the cost of solid-state memory coming down, the eventual price tag should be reasonable.

Moore suggested that where color was not a factor, monochrome Action Track pictures could be done very economically. Action Track will add a new dimension to many television programs which can benefit from this kind of image manipulation. Like slow and stop motion, or the more recent digital video effects, Action Track is one more step toward an instant electronic capability previously reserved to film.

For More Details Circle (260) on Reply Card

Editing control system

Convergence Corporation's ECS-1BVU Joystick Editing Control System makes the Joystick operation available on the Sony BVU-200 broadcast videocassette recorder and other lower cost Sony and Panasonic VCRs.

Optional accessories include the plug-in TT-6 digital LED tape timer with individually presettable digits. The plug-in PC-3 program computer adds automatic bi-directional tape search in fast forward and rewind, frame accurate scene duration timing and automatic frame accurate insert editing. The LL-7 Liplock audio pitch control microprocessor plugs into the ECS-1BVU and permits rapid selection of exact audio edit points by making audio intelligible at various Joystick speeds. The ADR-8 automatic dialogue replacement module provides the capability to automatically replace precise words or sentences with a live microphone.

For More Details Circle (261) on Reply Card

Remote pick-up transmitter

McMartin Industries announces the latest addition to its RPU transmitter line: the RPU-1403, a 3-watt, portable, 450-MHz transmitter. The new unit joins the RPU-1103 150-MHz transmitter to complete the company's portable line.

The RPU-1403 features dual-frequency operation, all solid-state, rechargeable eight hour battery, and 3 watts output at 450 MHz.

The unit provides the broadcaster with the portability and power not available before in a 450-MHz transmitter. Two-channel operation on frequencies separated up to 1 MHz can be provided with no deterioration in performance.

Two high-quality audio inputs are provided. One is a microphone input and the other is a line input for use with a cassette recorder. An audio compressor functions on both line and microphone, allowing simple talk over line operation.

For More Details Circle (262) on Reply Card

Switching system

American Data Corporation's model 558-4 fourth-generation production switching system features a 4-channel video processor. This allows the operator to perform multiple functions on a single mix/effects amplifier.

A linear control logic system gives the unit its ability for chroma keying through water, glass, and smoke without tearing or loss of shadow detail. Also standard is a 100-pattern waveform processor which includes rotational and "windshield" wipes.

continued on page 80

Innovation in editing technology

That's what sets Datatron editing products apart from the competition. You already know us for our state-of-the-art Tempo 76 Editor — the first videotape editing system that combines both SMPTE Time Code and Control Track Technologies in one unit. But the innovation doesn't stop there. We've added new options to the Tempo 76 which make it even more versatile than ever:

- High-speed Peripheral Capability
- Extended Memory
- Expanded Interface Capability
- System Debug
- And More To Come!

Our Multiple Interface Unit (MIU) allows you to interface up to nine VTR's to the Tempo 76 system. With features like an optional code routing switcher and optional remote VTR selection and display, the MIU can add new dimensions to your editing capability.

We've developed new peripheral equipment too. In addition to our already large array of fully-compatible add-ons, we now offer time code generators and readers with user-defined bits, a new jam sync generator, and more.

To see these products and other new Datatron editing system developments, visit booth 1223 at the NAB Convention, April 9 thru 12 in Las Vegas. Find out why innovation makes the difference at Datatron.

datatron, inc.
EDITING SYSTEMS DIVISION

1562 Reynolds Avenue • Irvine, California 92714
(714) 540-9330 • TWX 910-595-1589 • Cable RELIABLE



For More Details Circle (57) on Reply Card

IT'S GOING TO SPOIL YOU!

The NEW MARK IX Family of Color Cameras



SEE
THEM FOR
THE FIRST TIME
AT NAB
BOOTH 605

- 
- Studio/Remote/Portable • Multiple Configurations • Standard or Triax Cable • Low Power Consumption (400 Watts) • 110/220 VAC or 24 VDC
 - Manual or Automatic Registration/Operation • Over 1/2 mile with Standard Cable, up to 1 mile with Triax • Compact, Lightweight CCU • Select from choice of view finders 1", 3" or 7" • Selection of pick-up tubes includes Bias Light and HOP
 - Remote Control Operation up to 500 ft. ... and much more!

Arconi Electronics, Inc.

100 Stonehurst Court Northvale, New Jersey 07647 (201) 767-7250

For More Details Circle (58) on Reply Card

www.americanradiohistory.com

New Products

continued from page 78

The model also features two 4-channel video processors and a downstream flip-flop mix/key system. The frame-accurate auto-fader enables the operator to wipe or mix between sources at any rate from 1 to 999 frames.

For More Details Circle (263) on Reply Card

Ellipsoidal spotlight patterns

A new catalog from The Great American Market features patterns designed for use in ellipsoidal spotlights. The Great American Pattern is photo-etched in a 4-inch x 4½-inch stainless steel matt, with a pattern 3 inches in diameter. It can be cut with scissors and will stand up under intense heat.

The patterns include: Double Hung Window, Wrought Iron Fence, City Skyline, Clouds, Starburst, and many others. The company also will cut patterns from submitted designs to the customer's specifications.

For More Details Circle (264) on Reply Card

Digital tester

Tektronix has a new digital tester (model 851) which combines many of the functions of a DMM, counter,

timer, logic, probe, thermometer, and an oscilloscope into a single, easy-to-operate package weighing 13 pounds.

The 22 functions of the 851 enable the operator to perform a wide variety of tests and measurements. Eleven functions measure timing; two register plus and minus peak voltages; three carry out DMM measurements through separate leads; and one reads line voltage at the outlet. Another function allows temperature readings to be taken with an optional temperature probe.

The 851 also makes four self-measurements to adjust each of its four input thresholds to the logic levels of the equipment under examination.

For More Details Circle (265) on Reply Card

Audio consoles

LPB will exhibit the Signature II series audio consoles at the NAB convention. A unique feature of the consoles is the mono/stereo input switch located behind the front panel which enables a mono source to be split to the left and right program buses. These selectors are provided for each microphone-capable channel and one high-level channel.

Other features include an output director switch; internal cue system (5-inch speaker and 1-watt power amplifier); muting and tally relays; a power transformer; modular electronics; and dual-line level outputs.

For More Details Circle (266) on Reply Card

ENG/EFP camera

The MNC-71CP by Cinema Products Corporation is a lightweight, self-contained ENG/EFP camera covered by a one-year warranty.

Manufactured by NEC, the camera features the ability to balance the MNC-71CP to match the colorimetry of other cameras in the field and in the studio, external genlock, master pedestal control, and servo-iris control. The use of LSI micro circuits reduces the number of individual components in the camera.

Other features and options include: Saticon® or Plumbicon® 2/3-inch tubes; high-transmittance prism optics (maximum aperture f/1.4); built-in linear matrix for high-fidelity in tracking colors from high-to-low levels; three-position gain control; 51 dB signal-to-noise ratio; automatic white and black balance circuits; fast set-up facility

continued on page 82

ENG POWER ENG POWER ENG POWER



PORTABLE-MOBILE TRANSMITTERS RPT-25 and RPT-40

★ FCC Type Accepted

- ★ Continuous subaudible tone encoding (optional)
- ★ Broadcast quality Compressor-Limiter
- ★ 115 V AC or 13 V DC operation
- ★ Four mixing inputs
- ★ Continuous duty operation

BATTERY POWERED PORTABLE RPT-1/150 and RPT-1/450



★ FCC Type Accepted

- ★ Continuous subaudible tone encoding (optional)
- ★ Broadcast quality Compressor-Limiter
- ★ Battery capacity 3½ hours continuous duty
- ★ Three mixing inputs

MOBILE REPEAT RECEIVER RR-30/150 and RR-50/450



- ★ Internal subaudible decoder
- ★ 115 V AC or 13 V DC operation
- ★ Audio de-emphasis, filtering and equalization provides broadcast quality for line feed, recording or automatic repeat through RPT-25 or RPT-40

BROADCAST QUALITY RADIO
REMOTE SYSTEMS FROM . . .

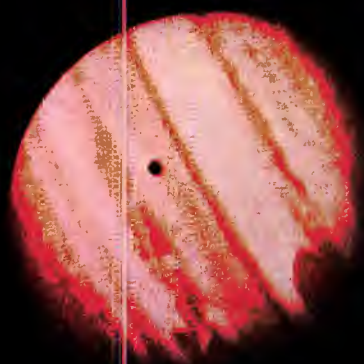
MARTI *Electronics, Inc.*

Box 661, 1501 N. Main
Cleburne, Texas 76031
Phone: 817/645-9163

SEE US IN LAS VEGAS, BOOTH #314

For More Details Circle (60) on Reply Card

BROADCAST ENGINEERING



Broadcast Slow Motion and Slide File Disc Recorders

This is the same basic machine
that was used by NASA
for televising the Apollo Moon Landings,
the Jupiter Fly-bys, and
more recently the Mars-Viking Missions.

See us at NAB, booth 1131.

 **Oktel Corporation**
Campbell, California 95008
(408) 374-1811

For More Details Circle (61) on Reply Card

Watch what we can do for you now... with our new models and our faster delivery.



As manufacturers of solid state video equipment, Electrohome has gained worldwide acceptance with reliable, high-performance 9", 11", 14", 17", 23" monochrome, 19" and 25" color monitors. Built to NTSC and PAL standards, these monitors are specifically designed for broadcast, educational, industrial, commercial, medical, security and data applications.

Now, we have added the new 2000 Series to our product range. Developed to meet high standards of the broadcast industry, the 2000 Series color monitor is modular for easy adaptability to RGB/NTSC/PAL encoded signals. Available in 19" case and rack and 25" case, the 2000 Series maintains Electrohome's high standard of engineering.

In addition to an expanded line, Electrohome has a new west coast distributor network to provide fast delivery. For complete information on all our video equipment, contact Electrohome Limited at one of these offices:

Electro-Visual Corporation of America

3617 West Macarthur Blvd., Suite 508, Santa Ana, Calif. 92704
(714) 545-6991

Electrohome (U.S.A.) Limited

182 Wales Ave., Tonawanda, N.Y. 14150
(716) 694-3332

Electrohome Limited

809 Wellington St. N., Kitchener, Ontario, Canada N2G 4J6
(519) 744-7111
Telex: 069-5449

ELECTROHOME

... an extra degree of excellence in video equipment for every application.

New Products

continued from page 80

for converging the camera; complete accessibility of circuit boards and pickup tubes.

Audio signal processor

Inovonics Incorporated's new audio signal processor incorporates an automatic gain control, compressor, and limiter. The gated gain-riding AGC amplifier in the model 221 audio level Optimizer II compensates for long-term variations in program input levels over a ± 10 dB range at a correction rate of 0.5 dB per second.

Control over program dynamics is provided by a gated "open loop" compressor. A fast peak limiter prevents overmodulation with program-controlled phase inversion and adjustable limiting symmetry for AM; a separate 25-/75-microsecond high-frequency limiter is provided for FM.

Model 221 is within 1 dB of flat from 20 Hz to 20 kHz. Noise is less than 70 dB below the 100%-modulation output level with distortion below 1% THD (10 dB compression and 10 dB limiting of steady-state signal).

For More Details Circle (267) on Reply Card

Film inventory program

Kaman Broadcast Computer Service (BCS), Kaman Sciences Corporation, has introduced a film inventory and amortization program. The program offers station management a tool to maximize usage and control over valuable syndicated series, cartoons, and feature films. The program also is available to stations not on any BCS traffic system.

Listings can be called by title; producer; date produced; length; motion picture ratings (GP-R-X); station rating; past demographics; stars; type of film; last play date; expiration date; holiday codes; target audience; usage restriction; BIB \$; daily news or other quality ratings; prizes and awards; or color or black and white. The entire library may be searched, or just specific areas.

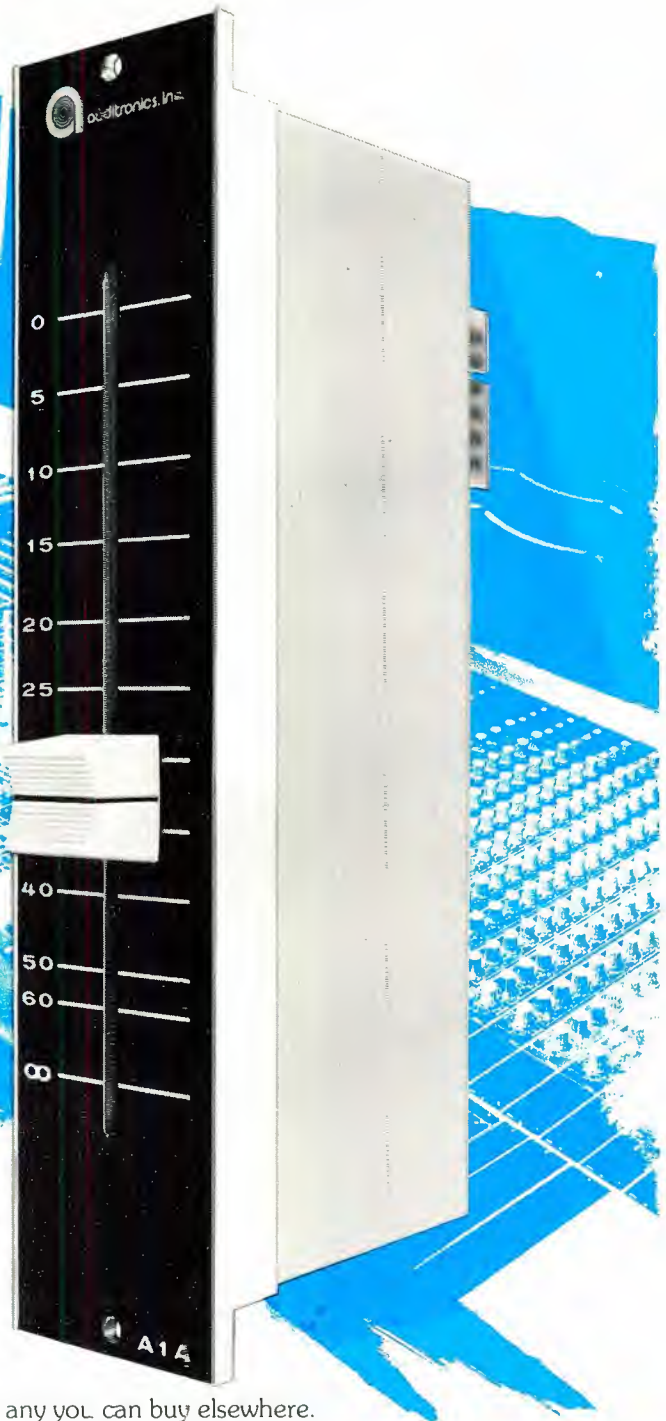
The program also provides feature film and syndicated series programming detail report, scheduled titles report, future availability report, title activity report, and expiration report. Accounting and automated amortization also are featured.

For More Details Circle (268) on Reply Card

continued on page 213



Some people buy us for our fader



because ours is better than any you can buy elsewhere. Ours has all the features you need, like smooth action, accurate tracking, long life and low noise, plus a full 85 dB attenuation. And ours is coffee proof. It's just one more reason an Auditronics mixer is a better investment for the long haul. To learn more, circle reader service number or write to us for complete information.



It's coffee proof

auditronics, inc.

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For More Details Circle (63) on Reply Card

Good color may not
be what you think—

Five myths about TV color

Myth 1—All you have to do to consistently insure good color fidelity is to make certain that camera colors fall within their specified vectorscope parameters.

Myth 2—By carefully and objectively analyzing the actual color of objects in front of a TV camera, and then seeing that these exact colors are accurately reproduced on a TV screen, viewers will agree that you have achieved the most desirable color reproduction.

Myth 3—A good color picture is a good color picture, regardless of the conditions under which it is viewed.

Myth 4—The CIE color rendition system is the last word in desirable color reproduction.

Myth 5—TV engineers and a cross-section of home viewers will regularly agree on good TV color.

(Photo by Ron Whittaker.)

Color reproduction is not an exact science

By Ron Whittaker

The whole business of color TV fidelity is anything but an exact science.

Of course, such a conclusion is not enthusiastically endorsed by some color experts who have devised numerous methods and formulas to try to reduce the whole business to complete predictability. It hasn't worked.

The reason it hasn't worked centers on a myriad of intervening variables in the whole TV process, the most variable of which is human color perception.

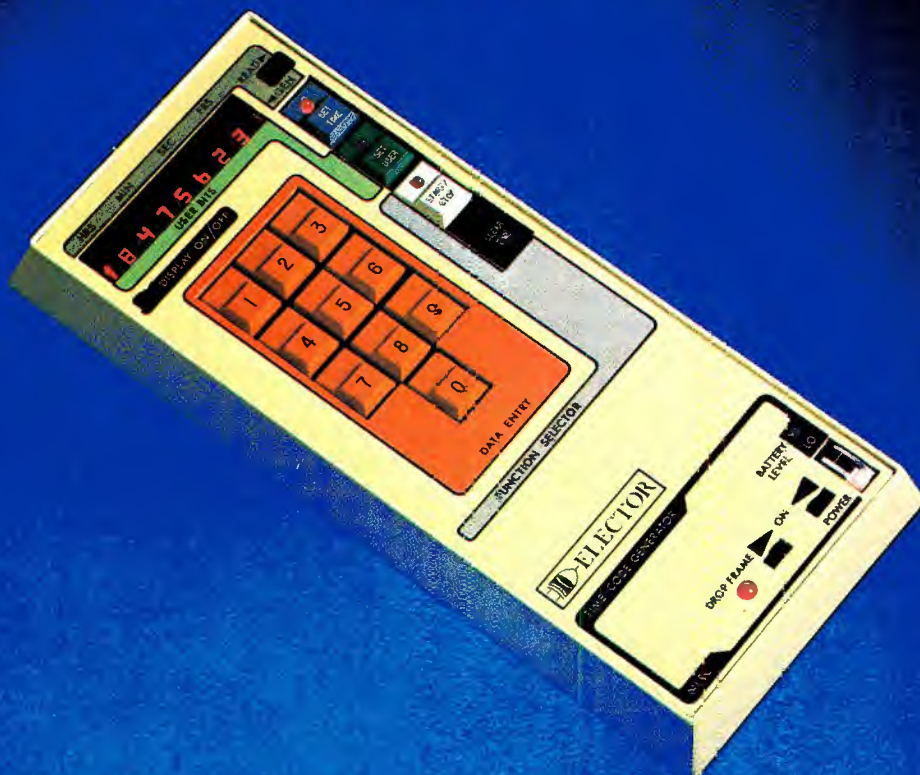
This article will look at two sides of this issue. First, we'll take a look at some important human perception problems; then we'll go on and examine some "equipment perception" problems.

The human mind and body are wonderful things, but there are a few things they are not. They are not at all consistent in making judgments about color (due to the many uncontrolled, and often uncontrollable, intervening variables). And, even among the

continued on page 88

Elector

introduces the first completely portable
SMPTE/EBU Time Code Generator.
(Including keyboard entry of user bit data)



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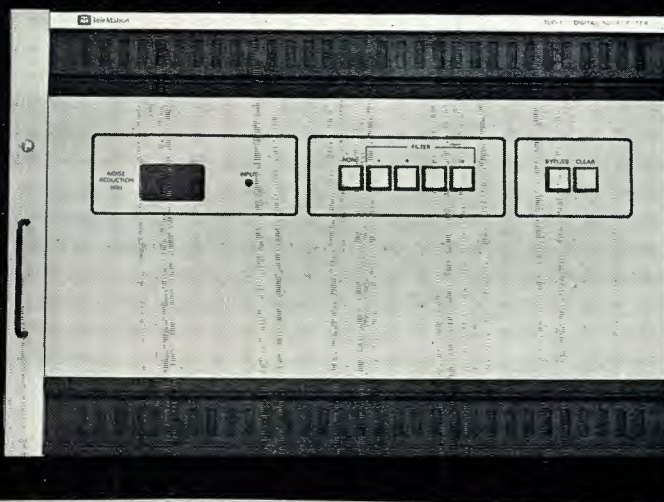
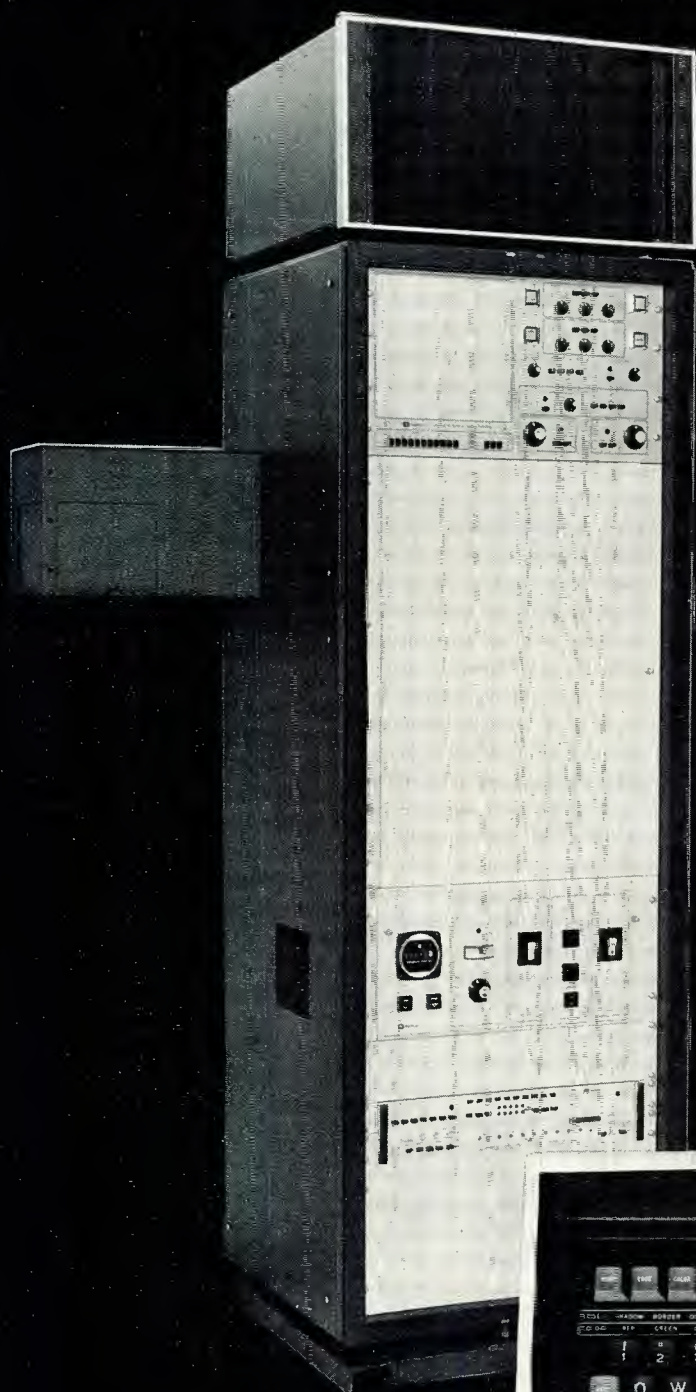
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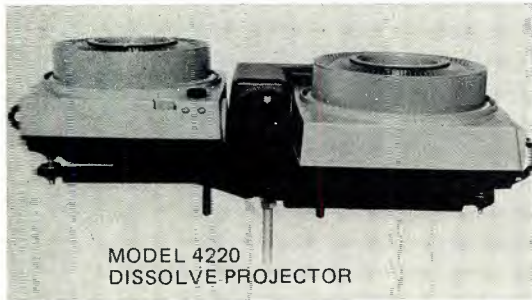
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Color reproduction

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consistencies in perception there are biases which are not programmed into most of our test equipment.

Approximate color consistency

Unlike some of our test instruments, the human mind and eye have no built-in crystal frequency reference. Consequently, such standards as "reference white" are free to drift up and down the Kelvin color temperature scale. More accurately, we should say that they vary according to viewing conditions.

If you are outside in average daylight you will have an approximately equal mixture of all the wavelengths of light between 400 and 700 millimicrons. A color temperature meter will register about 5,000°K, depending on the time of day, the season, etc. If you look at a familiar object that you know (remember) is white, you will adjust your internal color balance for this standard. And you will normally be able to judge all colors very accurately from this standard.

If you then go inside where there is standard incandescent illumination (2,800 to 3,200°K) you will be viewing things under comparatively "yellow" light. No problem. You again find something that you remember as white and readjust your internal color balance. Once again you can accurately judge colors.

The problem comes in when you photograph or televise something. If you color balance a picture under sunlight and then try to view this picture under tungsten light, the two "white standards" end up being 2,000°K apart. As long as the tungsten light standard around the picture influences perception, the picture balanced to sunlight will look blue by comparison.

You can solve the problem easily by letting approximate color consistency take over. Just turn out all the lights so you will only be able to see the TV screen. Very quickly the colors in the picture will look normal. In fact, your eyes will adjust to a TV picture which is seriously out of color balance—as long as it is displayed in a relatively dark surrounding where you can't see any reference colors.

You can do some interesting experiments to prove this point. Put a good color monitor in a room and turn out all surrounding illumination. Then alternately display two color slides which are significantly different in color balance. Let's say one has the proper color balance and the other has been shifted toward the green. In the darkened room most viewers will not be able to tell which slide is "off." If you show the green one first, the second one will look (at first) to be decidedly off, and vice versa.

If you add a second color monitor so you can show both of these color slides at the same time, viewers will say that neither is correct, that the correct balance lies somewhere between the two slides.

And, if you show two color slides which are both off, but in the same direction, viewers will say that the true color balance lies in between the two slides.

But once you add some room illumination a color standard is established. If the surrounding illumination is 2,800 or 3,200°K, your standard will be "yellow" compared to sunlight, or compared to the normal 6,300 to 6,500°K color temperature of picture tube phosphors. (Some phosphors reach 10,000°K.)

Fluorescent illumination, with its irregular spectrum response, causes even more unpredictable variations. This illumination causes more than just uniform shifts

continued on page 92

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Lightweight and compact (no backpack), the MNC-71CP is ideally balanced for on-the-shoulder operation.



camera as well as a broadcast-quality, versatile field production camera (with sophisticated remote production control capabilities, such as the ability to balance the MNC-71CP to match the colorimetry of other cameras in the field or in the studio).

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Extensive use of LSI micro circuits developed uniquely by NEC dramatically reduces the number of individual components in the camera. As a result, the MNC-71CP is significantly more stable in performance, 7 to 14 times more reliable in circuit operation, as well as considerably lower in its power consumption.



MNC-71CP with 5" viewfinder, mounted on Universal 2030 fluid head tripod (equipped with double handles). Also shown: Remote Production Control Unit and Remote Control Panel ("Paint Box" camera case and related accessories).

Logical functional design

Everything about the MNC-71CP has been designed from the ground up for simple operation and easy maintenance. It is therefore logical and simply laid out in terms of control placement, fast set-up and registration, and accessibility of parts.

For example, merely opening the camera sideplates exposes all internal circuit boards without requiring the use of a module extender, and the removal of just six screws permits access to the pickup tubes for quick replacement even in the field.

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Behind the MNC-71CP is Cinema Products' outstanding reputation for after-sales service. The same consistent and dependable backup we have always provided for our CP-16 line and Steadicam™ — an extensive dealer organization and full factory support.

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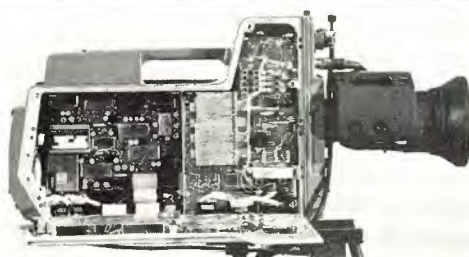
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The MNC-71CP (Universal Model) enhances MNC-71CP production capabilities in the field: providing utmost flexibility and fluidity as well as saving time and reducing costs. It is ideal for TV specials, documentaries, and commercials.



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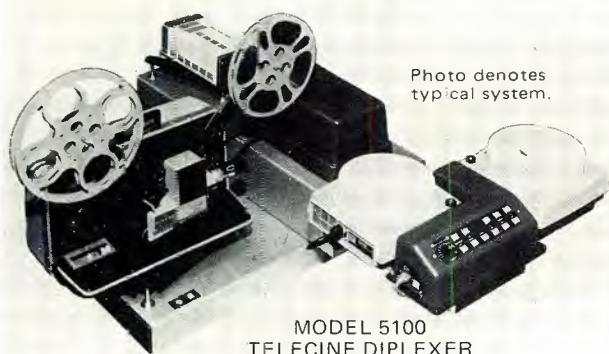


Photo denotes typical system.

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Color reproduction

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up and down the color temperature scale. Because of very abrupt "bumps" and "valleys" in the spectra of many fluorescent lights, colors within the spectrum will appear to "wander" in both hue and brightness from their true relationships. Human approximate color consistency does a poor job of dealing with such broken spectrum sources, since intra-spectrum corrections are required.

What can you trust?

It should be obvious at this point that a television engineer cannot trust his eyes, alone, in setting up a color monitor. A color temperature meter is the only accurate way to set up a monitor. Anything else just represents your best guess at the time.

Some time ago a network television engineer in Los Angeles set up a tape playback by the normal vectorscope approach. When the tape rolled, the chief engineer noticed that the flesh tones had a decidedly purple twinge. After he ran down to the VTR engineer and demanded an explanation, the engineer quickly pointed to the vectorscope which was showing perfect color phase for each color. Somewhere after the profanity, the chief was heard to proclaim, "Viewers don't have vectorscopes!"

There are too many intervening variables in TV production and equipment to be able to assume that the vectorscope will always represent the last word in good color rendition. Nothing can substitute for a good, stable color monitor which recently has been checked against a color temperature meter.

Inventors take note

Before we leave this particular area, it might be well to suggest an invention which should improve color balance on TV sets.

As you know, the eye judges TV picture brightness on the basis of surrounding illumination, and a picture on a TV screen will look "too bright" or "too dim," depending upon surrounding illumination. This is why some deluxe sets have automatic brightness regulators which respond to the level of room illumination.

Although it would be more complex to devise, there would be something to be said for sets with circuitry which would balance colors according to dominant room light—the existing reference white. The sensor, of course, would have to be placed somewhere it didn't "see" a blue wall or a red rug, and it would have to be able to cope with fluorescent light sources.

Personal color preferences

One of the myths at the beginning of this article related to the reproduction of colors exactly as they are in the original subject matter. Studies have shown that the public frequently does not want colors in photographs or on TV to be totally accurate. When asked, they will say they do, but when given a choice between different renditions they will normally prefer slightly more contrast than normal, and skin tones which are "healthier" than they actually should be. (The latter sometimes causes saturated reds to fluoresce as a consequence.) "Healthy" skin tones mean added chroma, and this tends to exaggerate overall color saturation.

So, don't be surprised if your "perfect color picture" is rejected in favor of a somewhat less-than-perfect picture, but one which fits into a viewer's personal expectations, biases and particular viewing situation.

continued on page 94

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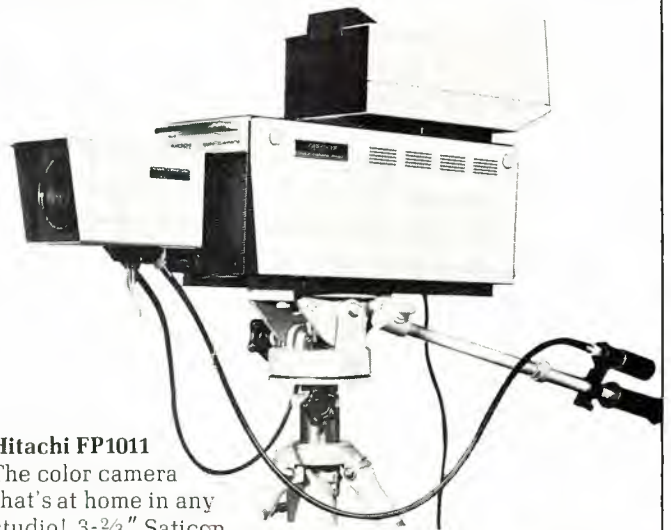
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Color reproduction

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Perception problems with equipment

Thus far we have discussed mainly human perception problems. As complex as they might be, the whole issue doesn't even end there. TV equipment also has "perception problems."

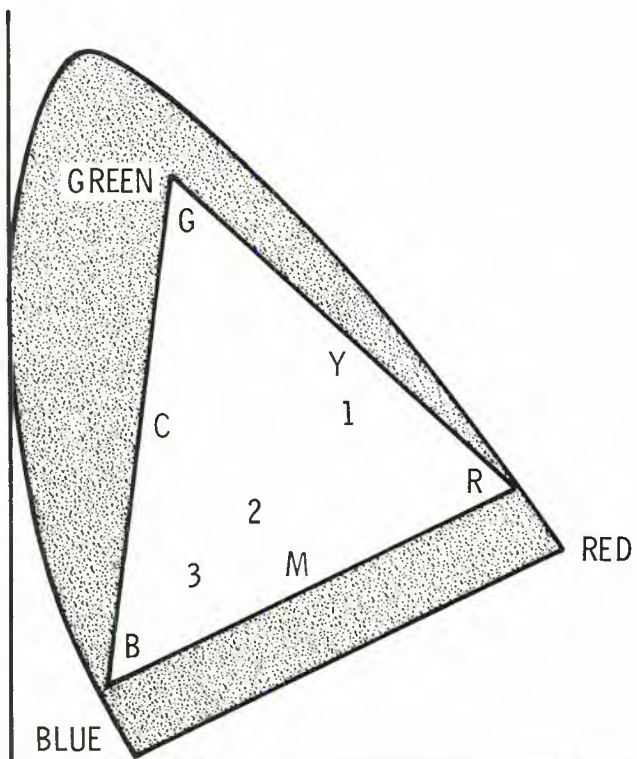


Figure 1 Standard color TV phosphors will reproduce most colors within the inside triangle. However, the highly saturated colors which would fall in the shaded portions of this chromaticity diagram cannot be accurately reproduced by television, even though they can be perceived by the eye. The numbers represent "white light" standards.

Figure 1 illustrates one such problem area. The triangle inside the horseshoe-shaped diagram represents the area of color which can be reproduced by standard TV phosphors. Although the colors in the outside shaded area can be distinguished by human vision, these highly saturated colors cannot be accurately reproduced by standard TV processes. And here is where many disappointments originate in color TV production.

Recently, an extensive color TV study was published in a two-part **Broadcast Engineering** series (July, August 1977). This Tornberg-Whittaker study systematically analyzed more than 500 individually prepared colors through standard TV processes.

First of all, it was found that colors which are very light (desaturated with white) will not reproduce accurately. These are found in the top-central part of the cone in Figure 2. Colors in this region tend to pale out and disappear into light gray or white.

At the other extreme, dark colors also quickly become indistinguishable. These would be color mixes which appear toward the pointed end of the

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HITACHI SK-70

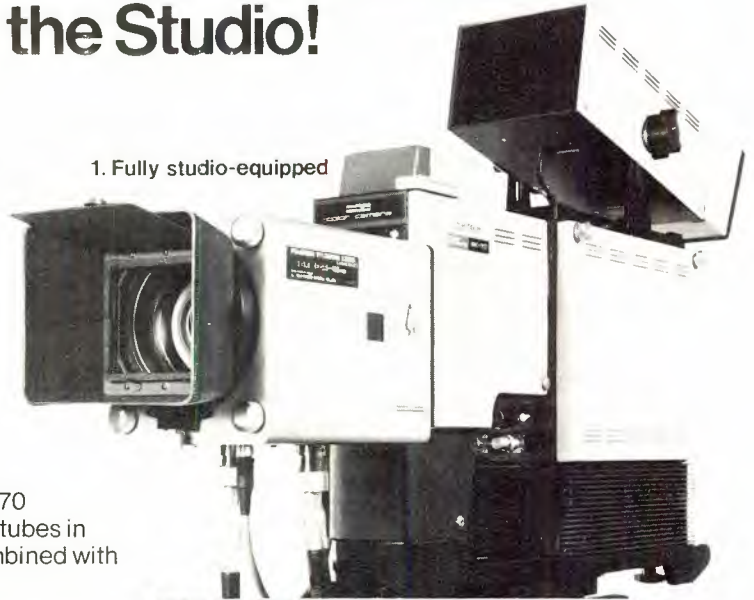
The One Camera That's Right for Both Field Production and the Studio!

The modular SK-70 converts easily from a fully equipped, self-contained color studio camera to a modified studio camera. In the field, the studio version of the SK-70 can be connected directly to a VTR with only a co-axial cable. And for hand-held portability, the camera head features a shoulder mount, an auto-iris portable zoom lens, and a 1.5" viewfinder, along with a DC and process pack. The Digital Command Unit (DCU) with up to 3000 feet of single co-axial cable strongly enhances the capability of the SK-70. Another striking option is a 22:1 zoom lens that can be used for the studio version of the SK-70 in the field.

No matter which configuration you choose from those shown in the photo and three diagrams, the Hitachi SK-70 offers the precision and reliability of three 2/3" Saticon tubes in the camera head to insure excellent picture quality, combined with all the latest advances in broadcast camera technology.

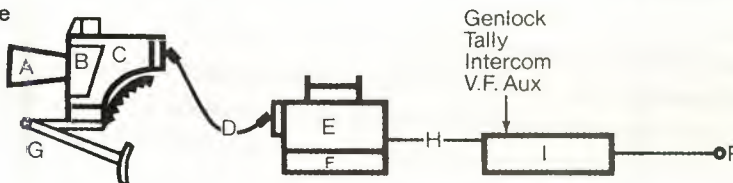
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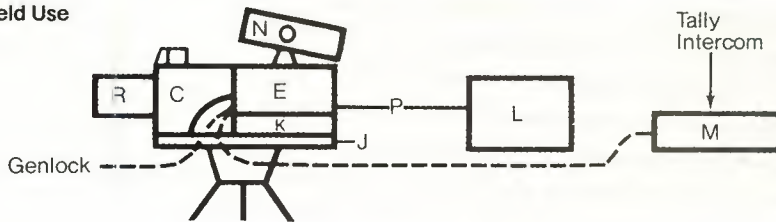


Digital Command Unit (DCU)

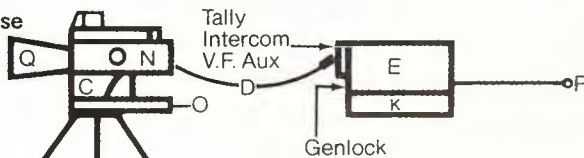
2. Portable Use



3. Field Use



4. Modified Studio Use



A)	Portable lens
B)	1.5" viewfinder
C)	Camera head pack
D)	Camera cable (300 ft.)
E)	Process pack
F)	D.C. pack
G)	Shoulder Mount
H)	Co-axial cable (3000 ft.)
I)	DCU
J)	Mount adapter
K)	A.C. pack
L)	VTR or FPU
M)	Operation panel
N)	5" viewfinder
O)	5" V.F. Mounting Plate
P)	Co-axial cable (video)
Q)	Portable lens w/conversion adapter
R)	Studio lens



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Color reproduction

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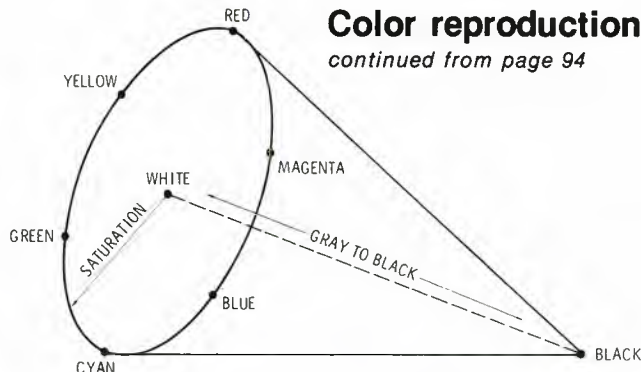


Figure 2 This three-dimensional cone illustrates hue-luminance relationships. Colors in the pointed end of the cone tend to merge into dark gray, and colors in the middle area of the wide end of the cone are typically lost in the color TV process. (See text.)

cone in Figure 2. Colors in this end are rendered as a dark, colorless gray by standard TV systems, even though the color distinctions are quite obvious when viewed directly.

Problems with specific colors

Beyond these findings, there are specific color areas which were found to cause problems. The Tornberg-Whittaker study found significant hue compression in two specific areas: in the red region between 100 and 130 degrees on a vectorscope, and in the violet region between 330 and 350 degrees. This simply means that colors between red-orange and magenta, and violet and blue will not reproduce with as many nuances in hue as will other areas of the spectrum.

So, if an artist wanted to highlight (shade) a red area—an apple, for example—with red-orange, the findings of this study indicate that the red-orange shades would be indistinguishable; they would reproduce as identical hues on a color television set.

One of the most dramatic color shifts found in the Tornberg-Whittaker study involved violet. What appeared to be violet to the human eye actually registered as "television blue" on a vectorscope.

The study also found some rather unpredictable TV colors can emerge from mixing paints, results that do not correspond to logic in using the subtractive color process.

For example, with some paints, if you wish to create a vibrant TV blue, you would use a mixture of violet and magenta instead of blue. Suffice to say, it is wise to check the colors on camera before starting any big painting project.

And don't forget color compatibility

With all this color thinking, it is easy to forget about color compatibility. Many colors which show excellent visual separation on a color TV screen will be muddy, and indistinguishable on a black and white receiver. Remember that no matter how much color contrast there is in subject matter, it will not be color compatible unless you have adequate tonal or gray scale contrast.

Color compatibility remains a major problem in broadcast television because the majority of TV receivers in use (counting second and third sets) are black and white.

Color compatibility considerations, of course, are especially important in titling, where three or more gray scale steps are desirable for legibility. □

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John Keller, chief operator of the Ampex VPR-1 helical video production recorder for the ITV Network at the University of California-Davis, reviews the tape of a lecture preparatory to editing. (Photo courtesy of Ampex Corp.)



1-inch VTRs clear their biggest hurdle

Part 2/By Joe Roizen, Video Editor, Broadcast Engineering, and President, Telegen

Last month we reviewed the three 1-inch formats in the helical VTR field that have been standardized by the SMPTE. They are labeled Type A, Type B and Type C. For all practical purposes, the Type A is categorized as a non-broadcast format, intended for CCTV and other television applications.

In effect, the Type B and Type C formats are the major contenders for consideration by TV studios, post-production houses, and EFP program companies which want quad picture quality, better multiple audio channels, and maximum editing and operational flexibility.

This article will deal with the similarities and differences of the

Type B and Type C formats in order to outline how they apply to industry needs.

In case you didn't read Part 1 of this series, let's repeat the basic format descriptions that were given last month.

Type B

This is a 1-inch helical format using two video heads which segment the image into 52-line sections on the NTSC standard. There are three high-quality audio channels and a control track. This format, developed by Bosch-Fernseh, is called the BCN. It is being built and sold by them and by Philips. It also is being marketed by IVC and RCA.

Type C

This is also a 1-inch helical format, but the similarity to Type B ends abruptly. Type C records the full video field on a single video head track and uses an auxiliary head to record the vertical interval between lines 5/15 and 267/277. It generally is called a non-segmented recorder; the official term is "continuous field."

While there are two video heads on the scanner, the minor role played by the second head is emphasized by the description of this system as a 1.5 head configuration. There are also three high-quality audio tracks and a control

continued on page 102



That's a 'no-strings' invitation from Hitachi's amazing FP3030 color camera. It's the first time a self-contained portable camera has packed so much quality into a lightweight, compact housing that, better yet, goes for such a pairless price.

No wonder, then, that the FP3030 has received such an enthusiastic reception from corporations, schools and hospitals. They find it gives them unrestricted mobility in all their communications and training programs. Broadcasters also are utilizing the FP3030's unique capabilities for everything from at-the-scene news gathering to field documentary production.

The FP3030's diverse current user list reflects the camera's ability to deliver results that meet the high standards of America's top communicators...in broadcast, industry, and education. And we think that's quite an endorsement for a camera that runs less than \$5,000!

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A few key features of the FP3030's design: • Easy to use. Just point and shoot. • Featherweight portability; weighs only 8½ lbs. complete. • Exclusive single Tri-Electrode Vidicon tube for registration-free color. • Internal NTSC, or external sync for multi-camera system use. • 3-way power—uses AC line, battery, or external DC (12V). • Can be used with any video tape recorder from cartridge to quad.

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mini-portable, of course, but then it has twenty times the output. And you could use the new package as a *relay station* for the mini-portable. (The 60515 amplifier requires only one to two watts drive.)

The two units take up only five mounting spaces in a standard ENG rack (that's just 8¾ inches). And because they need only 24 volts, they'll go anywhere you can bring

or find two regular 12V batteries.

An important point: the combination accepts either negative or positive ground power, making it adaptable to a wider range of vehicular power systems. (Consider the other way to get 20 watts of power: a big remote unit, interconnecting cable, a big RF head, a big motor generator.) You can also use 110VAC if you have it. The FV-2MF has other advantages. Like our mini-portable, it's frequency-agile. And when you're transmitting a signal through a tricky downtown path challenged by high-rises, you can move the aural sub-carrier from the top of the baseband to 4.83 MHz, assuring that your audio will arrive at the other end. It's a remote-controlled function.

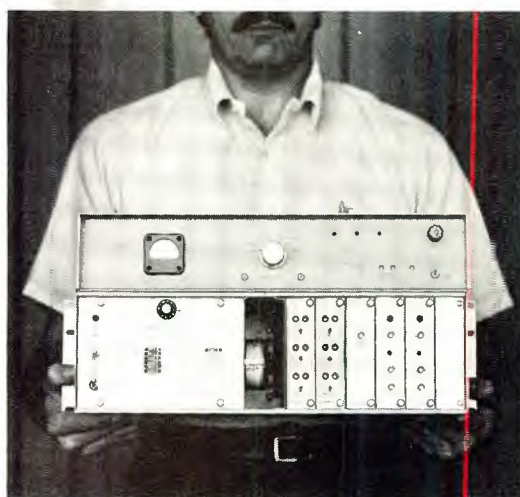
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inon

continued from page 98

Type C recorders currently are available from Ampex, Sony and

Type B and Type C tapes do not interchange with each other; therefore, the selection of one format or the other by a TV operation will require some specific decisions and coordination with affiliates in order to create interchangeable tape networks. Of course it will be possible to transfer one format to another by re-recording from Type B to C or

It seems inevitable at this point that both Type B and Type C will continue to coexist, and that the business of transferring tapes from B to C, or from C to B will flourish. Perhaps there should be a warning label on these 1-inch VTRs which says, "The Inspector General has determined that the selection of a

continued on page 104

[illegible]

The diagram illustrates the cross-section of a 1-inch Type C Helical Scan Videotape. It shows the following components and dimensions:

- Audio Tracks:** Three red tracks labeled AUDIO 2, AUDIO 1, and AUDIO 3.
- Video Tracks:** Two green tracks labeled VIDEO.
- Control Track:** A yellow track labeled CONTROL.
- Synchronization:** A white track labeled SYNC with two rectangular pulses.
- Dimensions and Labels:**
 - M, L, K, J, H:** Vertical dimensions for the top section.
 - P, Q, R, S, Z:** Various dimensions and labels for the video and control tracks.
 - G, F, E, D, C, B, A:** Vertical dimensions for the bottom section.
- Direction of Travel:** Arrows indicate the DIRECTION OF TAPE TRAVEL (left) and DIRECTION OF HEAD TRAVEL (right).
- Reference Edge:** A line labeled REFERENCE EDGE at the bottom right.

For Type C dimensions shown see V16.22/4 (Draft) American National Standard Dimensions and Locations of Records on 1-inch Type C Helical Scan Videotape

For Type C dimensions shown see V16.22/4 (Draft) American National Standard
Dimensions and Locations of Records on 1-inch Type C Helical Scan Videotape
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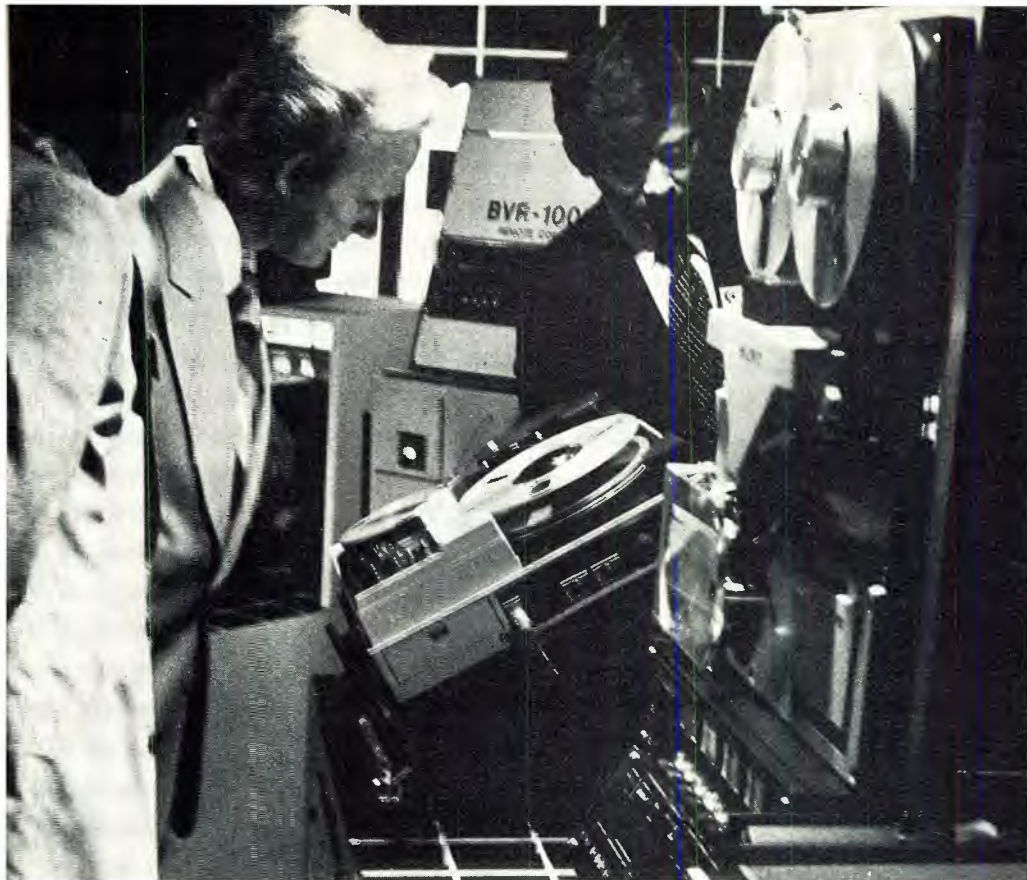
Model 3100

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1-inch VTRs

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The new generation of 1-inch videotape machines commanded a great deal of attention at the Montreux exhibition. These machines now offer "quad quality" and, in addition, have important features such as slow motion and still frame, heretofore unavailable in any standard videotape format. Here observers look at the new Sony line of 1-inch machines. (Photo by Ron Whittaker.)



The Bosch-Fernseh BCN Digital Store (bottom module) interplugs to any BCN cassette or open-reel editing VTR to create unique BCN Special Systems. Those demonstrated at the SMPTE conference featured film-style search/slow/freeze editing, slow/freeze instant replay, random-access electronic picture storage, and electronic animation. (Photo courtesy of AVP Communication.)

1-inch format is hazardous to your sanity."

A physical comparison

Presently, there is no great difference in the volumetric or weight characteristics of the studio, mobile or portable models of either Type B or Type C VTRs, with the exception of the cassette version that currently exists only in Type B. Both formats have full-blown production versions that include a console housing; built-in waveform and picture monitoring; time base correctors; and basic editing accessories. They range between 200 and 350 pounds, take up about the same amount of space, and cost between \$50,000 and \$80,000, depending upon how many bells and whistles are ordered. (By comparison, a fully loaded quad recorder weighs at least four times as much at approximately double the cost.) The portable models for field acquisition, such as the BCN 20, BVH 500 and VPR 10, all have similar dimensions and weights (around 44 pounds).

There are, of course, a wide variety of in-between configurations for various applications. As mentioned earlier, the Type B format also has a cassette version available, called the BCN 5. This 20-pound, 20-minute recorder is scheduled for production this year.

It will be interesting to see if the Type C manufacturers feel inclined to introduce this type of recorder as well.

Modularity is a significant feature of both Type B and C machines, with some variations in what each manufacturer considers to be a useful separation of components and functions of the VTR they offer. The recorders range from two to five modules, and the potential user might examine the applicability of the various features offered. As an example, a common control center for a group of VTRs could benefit from the ability to remote the control panel when this section is available as a separate module.

Tape consumption on both formats is almost identical at about 240 square feet per hour (quads use 750) with commensurate savings of reel weight, size and storage space as compared to the quad VTRs operating at 15 IPS. However, there is little difference between the B and C format in this area, as all the 1-inch recorders specify similar record times for equivalent models: over 90 minutes for studio/mobile units, and 60 minutes for portable machines.

Power consumption for both Type B and C machines, in studio versions, ranges from 650 to 850 VA,

continued on page 108

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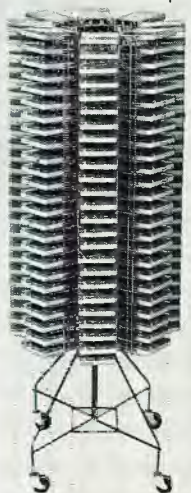
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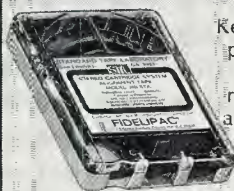
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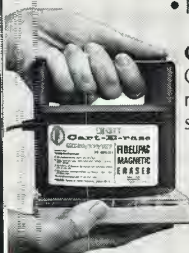
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1-inch VTRs

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well under the 2000 to 5000 VA that a quad may need. The portable VTRs work from batteries or AC and have very low input power requirements.

It is obvious from the foregoing that there is not enough difference in the basic physical characteristics to warrant any overwhelming reason for the selection of one format over the other, and that most of the beneficial factors are in relation to the widely used quadruplex VTR. The real dilemma surfaces when we examine the two diverse scanning methods used to record and replay the video images on Type B and Type C.

Scanning techniques

Even a cursory examination of the video head scanners on the Type B and Type C formats will quickly show where the major difference lies. The drum diameter on the B machines is 26.7 cm (1.1 inch), while this same dimension on the Type C machine is 135 cm (5.3 inches). Since the video head writing speed is about the same (approximately 24m/s, 950 IPS), there has to be a significantly smaller track angle for the larger drum since the tape width is identical. The Type B track angle is 14.4° while Type C is 2.5°, and this is precisely where the track geometry is established.

The Type B format with the steeper track angle must segment the video signal into 52-line sections (quads use 16-line segments), thus requiring two video heads to provide a continuous video signal. There is enough overlap in the scanning to permit non-visible switching between heads; however, the two heads must be closely matched to minimize any differential banding effects between segments. The Type B format is, therefore, one which combines the quad principle of segmentation with helical scanning, thus gaining the benefit of a short tape scanning area while accepting the problems inherent with two-head operation.

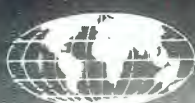
The small drum diameter and reduced tape helix path contribute to good interchangeability between Type B tapes made on different machines, and there is an advantage to the smaller, lighter head drum from a gyroscopic standpoint. However, segmenting the image imposes another basic disadvantage besides potentially visible banding.

A segmented video output cannot

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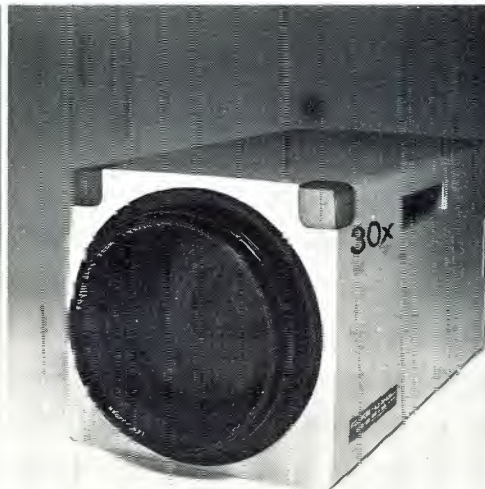
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1-inch VTRs

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be shown on a television monitor in any but normal play speed. To create the stop, slow or accelerated images that are useful for searching, editing or instant-replay purposes, it is necessary to add a digital framestore device to the basic recorder. Digital framestores are neither inexpensive nor simple, but they do provide some additional options to the Type B VTR, including picture compression and manipulation, which are similar to those possible with stand-alone digital video-effects generators.

From a practical standpoint, the Type B format provides high-quality video images, with high band performance specs; and, when fitted with the accessory digital store and the usual picture correctors (TBC, DOC, VEC), it can operate with virtually all the flexibility of a non-segmented helical machine.

The continuous field recorder

Helical recorders became practical and popular because a single head recorded and replayed a full field of television information with each scan. The loss of a few lines of vertical sync information, while the video head crossed from one edge of the tape to the other, was an accepted deficiency by the thousands of closed-circuit TV users who operated these machines.

As these helical VTRs began to improve their performance characteristics, they came under the scrutiny of broadcasters as alternates to the quad machines, but these professional users did not want the vertical interval gap. The Type C format reflects this desire. While the full video image signal is recorded and replayed by a single head, there is an additional short track at the same angle (but positioned separately) which is recorded by a second video head. This sync track contains from 10 to 15 lines of information depending upon tape playback speed. At normal longitudinal tape velocity, lines 5 to 15 on field one and lines 267 to 277 are recorded while the main video head is traversing its signal drop-out period.

In slow or stop motion the drop-out period increases to a maximum of 15 lines, and this effect is compensated for by the sync head. There is sufficient overlap of heads so that switching between heads can be done without visible effects in the picture. This technique has a further advantage of

continued on page 114

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1-inch VTRs

continued from page 112

recording the VITS and VIRS signals on the same head that is handling the picture information. Since there is no drop-out in the sequence of video and sync information from this type of helical recorder it is called a "continuous field VTR." The advantages of the Type C format are fairly self-evident, and are as follows:

- The full image portion of the television field is scanned by a single head which eliminates any differential banding effects.
- Slow, stop or accelerated motion for editing purposes are easy to achieve without using an external accessory such as a digital frame-store.
- Slow and stop motion can be put on the air and broadcast from this format if a tracking accessory is added. (Ampex now offers this under the name of AST.)

The Type C format also uses high-band recording techniques and yields a video quality commensurate with quadruplex recorders; and, like the Type B machine, this format provides users with lower acquisition cost, lower operating cost, and greater flexibility than the current quads.

The major networks in the United States have already adopted the Type C format for a variety of operational uses; and, both manufacturers have agreed to supply modifications for their 1-inch continuous field recorders made prior to the SMPTE ratification.

Audio capabilities

Both the Type B and Type C offer improved and expanded audio capabilities over those that were available with quad VTRs. The basic reason for this is that the 2-inch quad tape has its magnetic particles oriented for optimum video signal performance, resulting in an inherently poorer audio signal characteristic. In addition, the nature of the transverse scanning process with the four video heads penetrating the tape across the audio track(s) produces a 960 Hz buzz that is difficult to avoid. As a result, any complex audio production associated with the quad VTRs often was done on separate synchronous multi-track audio recorders, then transferred back to the quad tape for distribution.

Types B and C each have three high-quality audio tracks located at the edges of the tape. In Type B, Audio One and Two at the top edge

continued on page 116

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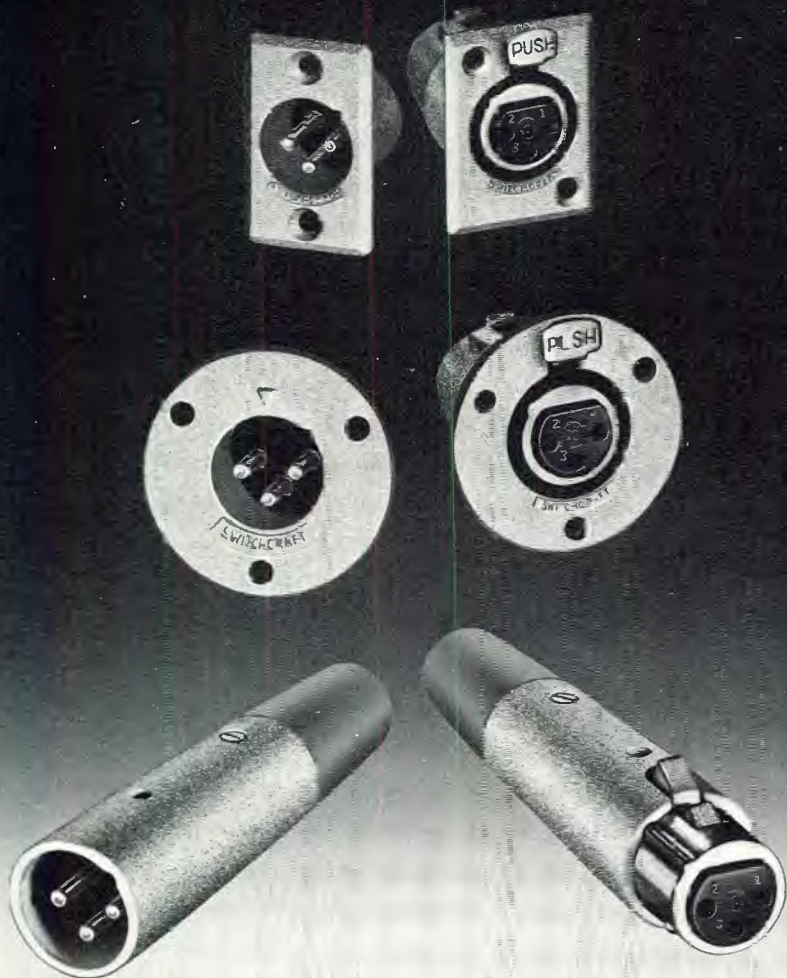
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1-inch VTRs

continued from page 114

are separated by the control track, and Audio Three is at the bottom edge. Type C has Audio One and Two at the top edge, but the inner track is specified as Audio One to give it maximum immunity from tape edge damage. Audio Three is at the bottom, and the control track is between the main video and the sync track.

Since the tape is longitudinally oriented, it provides optimum audio performance; and, most users of the Type C machines have expressed satisfaction with the superior audio performance. The Type B format also incorporates a Dolby noise reduction system in the audio channels.

One only needs to scan the audio specs of these new 1-inch VTRs to realize the advantages gained by the sound portions of the recorded program.

Summary

The Type B and Type C 1-inch helical VTRs both produce high-quality, multi-generation video signals and, if needed, three channels of excellent audio. The Type B, with the right accessories, and the Type C, as it stands, can facilitate editing by providing rapid search, precise image location, and very flexible operation. The pros and cons of each format are well documented in the avalanche of advertising material that describes the basic parameters, then emphasizes the features or advantages offered by each manufacturer.

The only approach to the selection of either format must be based on an in-house analysis of the needs of a particular operation, and the format features that best satisfy these. For any completely internalized production requirement, the choice of B or C could be a purely technical or economic decision. For any network situation where syndication and distribution are an important aspect, the choice will have to be integrated with what other members or affiliates are doing.

The upcoming NAB show in Las Vegas will be the first exposure of the SMPTE standardized formats, with each of the manufacturers having a wide gamut of B and C VTRs on display. This should be a good opportunity for the critical comparisons that must precede such an important decision. Whichever way you go, there undoubtedly will be a 1-inch helical VTR in your future. □

BROADCAST ENGINEERING

The VTR Format of Tomorrow. While others are still talking about it... Bosch already has it: the BCN System.



BCN scanner shortens tape path, minimizes environmental and mechanical tracking error

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Simplified threading of the BCN 20

The four basic requirements placed on a new VTR format:

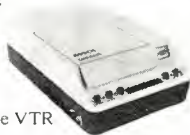
- Top broadcast quality for all TV standards.
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The BCN System is not only a broadcast VTR:

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The BCN System is offered by four leading manufacturers of "broadcast" equipment, and it is produced in both Europe and the USA.

The BCN System offers two different portable versions: the portable BCN 20 with a tape capacity of more than 60 minutes on one reel—and the BCN 5, the 20-min. cassette recording and play-back version. Both versions operate under all conditions with full broadcast quality. In the future, the BCN cassette version will also be used in an automatic multi-cassette VTR.



BCN 5 cassette VTR

The BCN System meets these four basic requirements for a new VTR format today: The compatible and economical BCN 1" format produced by Bosch guarantees broadcast quality in all TV standards and color systems (PAL, PAL-M, SECAM, NTSC). For all fields of telecasting and VTR applications. It is adaptable to future developments in video tape and video head technology. The segmented-field process makes purely electronic switching of writing speeds possible. As a result, the BCN is already an economical and universal VTR with a guaranteed future today.



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The BCN System features electronic editing with:

Single-picture display—for an unlimited time with no danger to the tape.

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The BCN System is designed for both basic tape-handling methods: reel-to-reel and cassette handling in full broadcast quality, in both portable and stationary VTR's.

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STEREO STUDIOS for AM

Part 2/By Dennis Ciapura

If you caught Part I of our series last month, you will remember that we decided to look at AM stereo studio design as a specialized project with specifications tailored to meet the performance parameters that can be expected from AM stereo transmission and receiving systems. We made an educated guesstimate of what the AM stereo audio performance is likely to be, and discussed selection and application of various input sources. This month let's resume our investigation and take a look at the next link in the program chain: the console.

Console selection is both objective and subjective. It is objective in that one can readily determine value based on cost vs. performance and construction quality. "Hands-on" experience with the console that you are interested in before purchasing can be a valuable asset, but don't limit yourself to equipment types and brands that you and your friends have experience with.

Some manufacturers, like Ramko Research Inc., will even lend you the console you are interested in for a couple of weeks at no cost so that you can try a new

approach. As a matter of fact, Jack Ducart at Ramko tells us that his company expects a lot of AM stereo interest in their new DC38 series consoles which include a six digit timer/clock option built right into the front panel. And that brings us to the subjective aspects of console selection: How will the unit work with **your routine** and **your format** at **your station**?

The subjective and objective considerations should probably bear about equal weight in the decision-making process; this is way **we recommend investigating as many different types of consoles as you can** until you find the one you fall in love with. It's like finding the right girl; you'll know which one turns you on! All the quality and performance capability in the world won't be worth anything if it won't do what you want.

In general, AM stations run more active formats than FM stations. There are often lots of live and recorded news sources, remote broadcasts, and interview programs; and, this means that the AM stereo console is likely to be required to have more input capability and flexibility than its FM stereo counterpart.

Console headroom

One performance factor you might want to pay more attention to than you have in the past is headroom. If a console's normal output is +8 dBm and its maximum output capability is +18 dBm, there is only 10 dB of available headroom. Many announcers exhibit a very asymmetrical speech waveform and it doesn't take long to eat up 10 dB of peak reserve. Since AM stereo transmission systems will not be subject to the severe signal-to-noise requirement that FM has, it would probably be a good idea to ask the manufacturer of your new AM stereo console to set the internal VU meter calibration so that the nominal output level is 4 dB lower, thus allowing 4 dB of additional headroom. After all, a console with a 61 dB signal-to-noise ratio instead of 65 dB is more than adequate for a transmission/reception loop that hits 50 dB S/N under best conditions.

The improvement in clarity afforded by the additional headroom could be quite audible, however, particularly on the new wide-band receivers that we expect to see. We also must remember that hard-driving AM jocks have been "pinning the board" for years, and while the old narrow-band receivers softened the clipping, these hatcheted waveforms will be just plain irritating when reproduced with good fidelity.

Out to the transmitter

Once out of the console, we need to get the signal to the transmitter; and that means some sort of STL, either telco or microwave. AM stations that already have two equalized telco loops in service are in an

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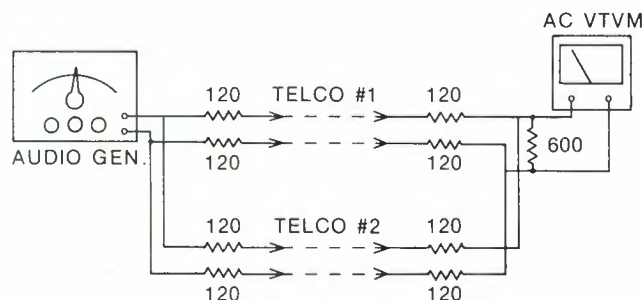


Figure 1 If you have a spare telco loop of equal quality to your main, you can check the phasing to see if they will be satisfactory as a stereo pair by doing the following simple test. First, connect the equipment as shown above and send a 1 kHz signal at normal program level down the lines. If the lines are totally out of phase, the meter at the receive end will read nearly zero. If that happens, reverse the connections to one of the pairs at either end and try again. When the pairs are in proper static phasing, the meter will indicate the audio generator output level minus the line losses and 6 dB for the splitter and adder networks. Next, mark the connections so that they can always be connected in proper phase. Now vary the frequency of the audio generator across the audio band and record the response across the 600-ohm resistor. Assuming that the lines have flat response, the phasing is satisfactory up to the frequency where the response begins to roll off. If you're not sure of the lines, record the response of each line individually into a 600-ohm load before phase testing.



"Not the loudest sound in town, but the best quality" claims WXRT, Chicago, longtime Stanton user. . .



Daniel Lee, President and General Manager, discussing Stylus Replacement Policy with Howard Williams, Chief Engineer and Ken Rasek, Audio Engineer.

WXRT is a progressive rock, FM station that is unique in many ways. Its whole operation, including Administration, Sales, Engineering, Programming, Broadcasting, Transmitting (even the tower itself), is located in one place . . . a highly unusual set-up for a major market.

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Since WXRT uses no limiters and no compression to magnify the level of their signal, their turntables and cartridges are absolutely crucial to the quality of their sound.

For over 10 years, the station has used the Stanton product in its turntables. Today, it even uses the 681 Triple-E for disc-to-air playback and, although this stylus was not designed for back-cueing, the engineers and announcers report no problem (they even use them on their AM operation, WSBC).

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John Bell hands new record to Scott McConnell.



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Stereo studios for AM

continued from page 120

ideal position for the stereo conversion, since they can use their main line for one stereo channel and their back-up line for the other, with the contingency of going back to mono if one of the lines is lost.

Be sure to check the lines for phasing before you attempt to use them for stereo audio transmission. Figure 1 illustrates a simple test procedure for determining static phasing of two pairs and also phasing vs. frequency. If your main and back-up lines are about the same length, their phase characteristics

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Golden West plans now for AM stereo

When the Golden West Broadcasters Group decided they needed to update their AM and FM facilities, the timing was perfect to consider AM stereo. As this service suggests, there are many ways to get ready for the changeover. Obviously, there's a lot more to consider than a stereo generator.

Golden West recognized that their systems would need reworking, so they started by buying modular consoles. As Ed Herlihy, director of engineering, said, "Using modular consoles will give us flexibility. If we want format changes, we can add modules. We can start out with a standard or minimum layout and work up to more modules as we need them. Or we may even want to plug in modules so we can do more production work. But it's flexible. That was a big consideration."

Golden West owns a number of TV and radio stations, including five AM stations. They selected the new modular series from Ward-Beck. The Ward-Beck console systems may be supplied for stereo, monaural, or stereo-plus-mono program operation. According to Herlihy, the flexibility of the modular approach, during a switch to AM stereo, was especially important.

But even as Herlihy plans for the Golden West switch to AM stereo, he anticipates some problems. "Stereo on cartridges, stereo phasing ...now that's a heck of a problem," added Herlihy, "but that's a problem for the manufacturers." That's a problem that won't be settled at the convention. But the exhibit floor will abound with quality consoles. Whether you select standard or modular consoles, your choice will be available for a hands-on demo. That's a sure bet for NAB convention attendees.

Meanwhile, few AM people want to discuss it openly, but programming on FM probably has as much to do with FM's popularity surge as stereo. While stereo is not the only answer for AM, it may offer a big step up the competitive ladder.

The Editor

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Options: B C D J K L P Q R S W

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ES 142 (12 hr.) and ES 144 (24 hr.) are MOS, solid state digital clock/thermometers. Displays 6 digits of time (hours, minutes, seconds) and 3 digits of temperature (-50°F to +150°F or -45°C to +66°C) in planar, gas discharge displays 55" high. Temperature sensor on 25 ft. cable included; attaches to rear-mounted connector.

ES 240 Digital thermometer is available as separate unit, calibrated for °F or °C.

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Electrical: 12W max, 117V AC 60 Hz
Options: B C D J K L P Q R S W



SIX DIGIT CLOCK TIMER
ES 500 (\$160)

ES 500 is a 12 hour clock or timer with 5 front-mounted controls: Start, Stop, Reset, Fast Advance, Slow Advance. Will run continuously to 12:59:59. Advances to 1:00:00 and continues as clock unless stopped or advanced. After use as a timer, time of day must be re-established. Can drive Jumbo Slaves.

Dimensions: 2½" High x 8" Wide x 5-5/8" Deep
Case: Etched Aluminum
Electrical: 117V AC 60 Hz 12W max
Options: B C D J K L P Q R S W



CONSOLE MOUNT CLOCKS AND TIMERS, 70 SERIES

All units have access to control inputs on rear-mounted connector. Displays are 3" red LEDs.

ES 172 Six Digit, 12 Hour Clock (\$134.00): Three setting controls—Fast Advance, Slow Advance, and Hold. Four line multiplexed BCD's present on the rear connector. Options are C, D, J, M, and V.

ES 174 Six Digit, 24 Hour Clock (\$134.00): Otherwise identical to the ES 172.

ES 370 Four-Digit, One Hundred Minute Up/Down Timer (\$171.00): Six controls—Count Up, Count Down, Stop, Minutes Advance, Seconds Advance, Reset. Options are B, C, D, J, M, and V.

ES 371 Up/Down Timer (\$267.00): Similar to the ES 370 except with Leverwheel Preset capability for faster setting of the desired time. Option D is an integral, separately mounted part of this unit. Options are C, J, and V.



JUMBO CLOCKS AND TIMERS, 80 SERIES

Displays are 1" planar gas discharge.

ES 182 Six Digit, 12 Hour Clock (\$230.00): Three rear-mounted setting controls—Fast Advance, Slow Advance and Hold. Options are B, C, D, J, P, Q, R, S, and W. When option Q, panel mount, is specified digits will be separated by colons.

ES 184 Six Digit, 24 Hour Clock (\$230.00): Otherwise identical to the ES 182.

ES 380 Four Digit, 100 Minute Up/Down Timer (\$267.00): Displays minutes and seconds, with rear-mounted connector to allow remote wiring of six momentary SPST controls—Count Up, Count Down, Stop, Minutes Advance, Seconds Advance and Reset. Other features similar to ES 300. Options are B, C, D, J, N, P, Q, S, T, W, Y, and Z.

ES 381 Up/Down Timer (\$353.00): Similar to ES 380, except that leverwheel preset is used instead of pushbutton preset. Option D is supplied as part of this unit. Options are B, C, J, N, P, Q, S, T, W, Y, and Z.

ES 570 Four Digit, Sixty or 100 Minute Timer (\$134.00): Select 60 or 100 minute mode on rear connector. Start, Stop and Reset controls. Runs continuously unless stopped. Reset will return all displays to zero. Unit will run if reset while running or will stay at zero if reset when stopped. Options are B, C, D, J, M, and V.

ES 572 Six Digit, 12 Hour Clock or Timer (\$160.00): Five controls—Start, Stop, Reset, Fast Advance, Slow Advance. Will run continuously to 12:59:59. Advances to 1:00:00 and continues as clock unless stopped or advanced. After use as a timer, time of day must be re-established using Fast Advance, Slow Advance and Stop Controls. Options are C, D, J, M, and V.

ES 574 (\$160.00): A 24 hour version of ES 572.

Dimensions: 2.16" High x 4.5" Wide x 4.13" Deep
Electrical: 117V AC, 60 Hz

ES 580 Four Digit, 60 Minute Timer (\$193.00): Displays minutes and seconds. Rear connector allows remote wiring of three momentary SPST controls—Start, Stop and Reset. Runs continuously unless stopped. Reset returns all displays to zero; and timer will continue to run from zero if reset while running. Options are B, C, D, J, P, Q, S, T, and W.

ES 582 Six Digit, 12 Hour Clock or Timer (\$267.00): Five control inputs (SPST momentary) brought to rear connector—Start, Stop, Reset, Fast Advance and Slow Advance. After use as a timer, time of day must be re-established using Fast Advance, Slow Advance and Stop controls. Options are B, C, D, J, P, Q, S, and W.

80 Series slaves are also compatible with other ESE clocks and timers. ES 112/124, 300, 301, 302, 400, 510, and 500.

Dimensions: 4.45" High x 10.38" Wide x 6.58" Deep
Electrical: 117V AC, 60 Hz



ES 512/524 FOUR DIGIT CLOCK TIMER WITH MEMORY (\$200)

Combination four digit 12 or 24 hour clock and 60 minute timer with memory, allowing the user to set the clock to the correct time of day, switch to timer mode, then switch back to time of day by pushing one button, time of day will be correctly displayed, in hours and minutes.

Electrical: 117V AC, 60 Hz, 8 watts Max
Mechanical: 8" Wide x 2-3/4" High x 5-5/8" Deep
Case: Etched Aluminum
Display: Four digits of 55" Planar Gas Discharge Display
Options: B, C, D, J, P, Q, R & W



THREE DIGIT 10 MINUTE TIMER ES 400 (\$105)

The ES 400 has three controls—Start, Stop, Reset. Runs continuously unless stopped. Reset returns display to all zeros. Can be reset while running or stopped. If reset while running, timer will continue to run. Can drive Jumbo Slaves.

Dimensions: 2½" High x 6" Wide x 5-5/8" Deep
Case: Etched Aluminum
Electrical: 117V AC 60 Hz 8W max.
Options: B D J K P Q R S T W



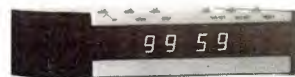
FOUR DIGIT 60 MINUTE TIMER ES 510 (\$134)

ES 510 is a four digit, sixty minute timer (59:59) with Start, Stop and Reset controls (Single pole, momentary, push-button). Runs continuously unless stopped. Reset returns display to all zeros. Can reset while running or stopped. Can drive Jumbo Slaves.

Dimensions: 2½" High x 6" Wide x 5-5/8" Deep
Case: Etched Aluminum
Electrical: 117V AC 60 Hz 10W max.
Options: B D J K P Q R S T W



ES 300 (\$180)



ES 301 (\$198)



ES 302 (\$254)

100 MINUTE UP/DOWN TIMERS

ES 300 is a four digit, one hundred minute timer (99:59) with six controls—Count Up, Count Down, Stop, Minutes Advance, Seconds Advance, Reset. Controls are single pole, momentary, push-button switches. When "Stop" control is pressed the four digit display is held. Counting direction (up or down) can be changed or time can be reset for zero without stopping the count. It will continue to register elapsed time beyond the zero setting unless stopped. The ES 300 can drive Jumbo Slaves.

Dimensions: 2½" High x 8" Wide x 5-5/8" Deep
Electrical: 117V AC 60 Hz 10W max
Options: B D J K P Q R S W Y Z

The ES-302 is similar to the ES 300, except that planar gas discharge displays are used in the ES 301-302. Display height is 55".

All the ES 300 features are included in the ES 301. Additionally, with the ES 302, the user can preset times

much faster than with the ES 300 or ES 301, because lever-wheel type switches are used for the preset feature. The ES 301-302 can drive Jumbo Slaves.

Dimensions: ES 301 2½" High x 8" Wide x 6" Deep
ES 302, 2½" High x 10" Wide x 6" Deep
Electrical: 117V AC 60 Hz, 7 W max
Options: 301—B D J K N P Q R S T W Y Z
302—B D J K N P R S T W Y Z



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(Trademark Patent Pending)

The biggest improvement in stage/studio luminaries in years. Look at these features:

- **Highly Efficient**—the computer designed re-reflector has more light output per watt than any ellipsoidal spot.
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Stereo studios for AM

continued from page 122

will probably be satisfactory for AM stereo. If the simple test in Figure 1 indicates they are not, you will have to go back to the local telco people and request that your lines be converted to a stereo pair.

While many AM mono stations already are utilizing 15 kHz loops, most AMs have 8 kHz service, which is quite adequate for mono and today's typical receivers but not up to par if top-notch AM stereo is anticipated. Although 15 kHz service embodies some degree of overkill, in terms of frequency response, these wideband loops are likely to be more phase linear in the 7 to 10 kHz region where it counts. Some day perhaps the telco system can be persuaded to offer a 12 kHz service for AM stereo broadcasters.

For many stations the advent of AM stereo may herald the switch from telco to microwave STL. Bob Richards at MCI (Micro Controls Inc.) reports that his company is already prepared to deliver two systems that are adaptable to AM stereo. Although it's a little early in the game to tell what the future holds for AM STLs, even the most basic approach of transmitting two audio channels on two separate transmitters on two frequencies and two receivers is still used by some FM stations. The most popular FM stereo STL scheme is to microwave a complete composite stereo signal from the studio to the transmitter. This system

continued on page 126

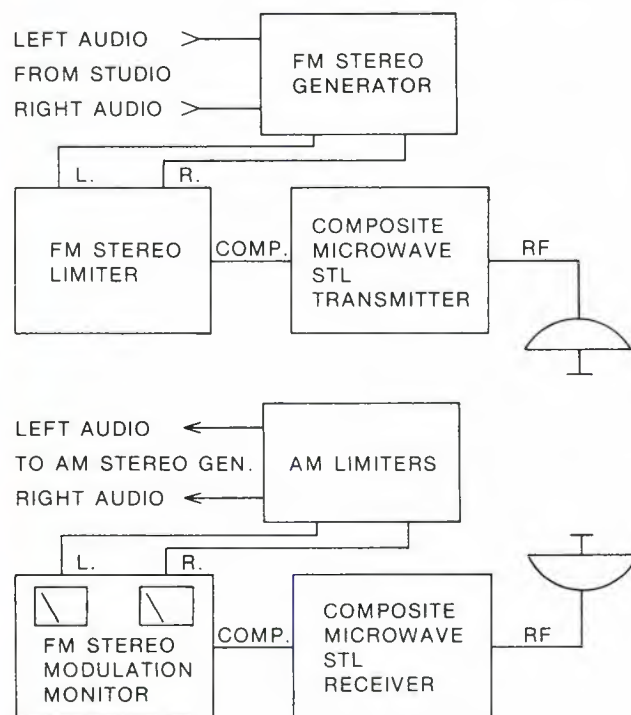


Figure 2 This is one method that could be used to send a stereo signal out to the transmitter with easily obtainable equipment on a single frequency. A standard FM stereo generator is used for encoding and with an FM stereo limiter protecting the STL transmitter from overmodulation. The composite output of the STL receiver is fed into the composite input of a stereo modulation monitor which is used as a high-quality decoder. The de-emphasized 600-ohm output from the monitor is fed to the AM limiter for asymmetrical modulation if desired. This scheme would yield 15 kHz bandwidth, a 55 dB S/N ratio, and about 1/2% total harmonic distortion. Channel separation would exceed 30 dB easily.



PROGRAMMER/ COMPARATORS 750 SERIES

For flexibility and economy with up to ten events ESE has designed the 750 Series of Programmer/Comparators. Rugged thumb-wheel programmers coupled with an ESE clock or timer to provide single pole form A contact closure (1 Amp contact rating) for the length of time program matches display. All this on a 3 1/2" high 19" relay rack mounting panel. Power required: 117V AC 60 Hz; 220V AC 50 Hz may be specified.

If required control function involves a count other than timing, these products can be adapted to your needs.

Thumbwheel Comparator Systems:

ES 750—ES 112 and one 6 Digit Program
ES 751—ES 124 and one 6 Digit Program
ES 752—ES 500 and one 6 Digit Program
ES 753—ES 112 and two 4 Digit Programs
ES 754—ES 124 and two 4 Digit Programs
ES 755—ES 500 and two 4 Digit Programs
ES 756—ES 510 and one 4 Digit Program
ES 757—ES 300 and one 4 Digit Program
ES 758—ES 510 and two 4 Digit Programs
ES 759—ES 300 and two 4 Digit Programs



ES 1296 (\$150)

For Off-Air taping, or operating tape recorders when nobody is there, ESE has created ES 1296 Presets up to 96 hours ahead.

ES 1296 is a six digit, twelve hour clock with LED displays and a programmable, 300 watt, 117V AC outlet on the rear.

Once the rear outlet is activated, it will remain on for 66 minutes, unless manually terminated, or an optional Record Duration switch is set to a different time interval. This Record Duration option allows the user to select one of four time intervals for recording. These four time intervals are either 16, 33, 66 and 138 minutes, or 33, 66, 138 and 250 minutes. Price \$25.00.

An additional option is Sequential Turn-on, for those machines that require Power, Play, Record in sequence, for proper operation. This option costs \$25.00.



ES-251 (\$250)

ES 251 SMPTE Time Code Reader ES 251 is a six digit SMPTE Time Code Reader displaying Hours, Minutes and Seconds. Receives the standard SMPTE Time Code through rear mounted BNC connector, converts it into six digits of clock time. Source of the code is normally a SMPTE time code generator but the unit will read the time code directly from a tape machine running at playback speed. This unit produces an extremely accurate time of day display when driven from a time code generator which is locked to a color sub-carrier frequency. The momentary hold switch allows holding of time on display. Releasing hold switch updates display to correct time.

The input code is AC coupled to two stages of amplification and level shifting to obtain a ground reference. The input circuit requires between 1 and 20 volts peak to peak of input signal and presents an input impedance of 50 Kohm. ES 251 is a CMOS design which operates from a single power supply.

Dimensions: Aluminum Case 2 1/4" High x 8" Wide x 5-5/8" Deep.
Electrical: 117V AC 50/60 Hz 6W Max.
Options: BJPOW

ES 252 SMPTE Time Code Reader: Exactly like ES 251, but displays Minutes, Seconds and Frames.

Perfect Timing



MASTER CLOCKS

ES 160 (\$750.00): Mounted in a 5 1/4" relay rack panel and chassis, displays six digits of time information on large, easy to read .3" LED displays, in 12 or 24 hour format, as specified. ES 160 has its own internal timebase, with three second per month accuracy. Its standard output is serial BCD, CMOS compatible, and can drive 20 ES 161, 166, 168 or 171 Remote Displays without buffering. All inputs and outputs are through rear-mounted connectors.

Dimensions: 5 1/4" High x 19" Wide x 15" Deep

Electrical: 117V AC 50/60 Hz.

Options: B (CMOS Compatible), J, One PPS Output, Relay Closure on hour and half hour, Battery/Charger (ES 163) Impulse Driver (ES 162), External Timebase-1, 5 or 10 MHz.

ES 160/1 (\$900.00): One second per month version of ES 160

ES 190 (\$900.00): The ultimate in accuracy! A digital clock, similar to ES 160, with special circuits for receiving and decoding a 1000 Hz tone at the start of each minute. The decoder output resets the seconds' counters in the clock each minute except the first minute of every hour, when a 1500 Hz tone occurs. These tones are transmitted by Radio Station WWV, with an oscillator accuracy of ± 1 part in 10^{11} . ES 190 has an antenna and internal WWV receiver with audio-output. Its crystal timebase is accurate to ± 1.7 seconds per day, used when WWV is not received. A battery and charger (ES 163) is available to protect against power interruptions. Displays are .3" red LED's. Serial output drives ES 161, 166, 168 or 171 Slaves.

Dimensions: 5 1/4" High x 19" Wide x 15" Deep

Electrical: 117V AC 50/60 Hz

Options: B (CMOS compatible), J, One PPS Output, Relay Closure on hour and 1/2 hour, Battery/Charger (ES 163)

ES192/194 (\$275.00): The most economical Masters, ES 192 (12 Hr) and ES 194 (24 Hr) are constructed using ES 112 or ES 124 digital clocks and adding the ES 167 Serial Time Code Generator to provide the output needed to drive Remote Serial Displays ES 161, ES 166, ES 168 and ES 171. 60 Hz timebase is derived from the power line. Displays are .6" incandescent type.

Dimensions: 2 1/2" High x 8" Wide x 5-5/8" Deep.

Electrical: 117V AC 60 Hz

Options: BCDLPOR, Time Pulse Outputs, Battery and Charger, Impulse Driver. Unit mounted on a 3 1/2" High panel when certain options are specified.

ES 196 (\$650.00): Time and Temperature Master—Basically the same as ES 192, with gas discharge displays, panel mounting and separate serial BCD outputs for time and temperature. Displays either 12 or 24 hours and °F or °C, as specified.

Dimensions: 3 1/2" High x 19" Wide x 8" Deep

Electrical: 117V AC 60 Hz

Options: BCDJR, Time Pulse Outputs, Battery/Charger.

ACCESSORIES

ES 161 Remote Digital Display (\$140.00): Designed to function with any ESE Master Clock, decodes serial time data and displays six digits of clock time on large .55" Gas Discharge Displays, in either 12 or 24 hour format as specified.

Dimensions: 8" Wide x 2 1/2" High x 6" Deep.

Electrical: 117V AC 50/60 Hz.

Options: JPQW.

ES 162 Impulse Driver (\$170.00): Plugs into the ES 160 chassis, can drive 20 Impulse Clocks. Designed so that, if power fails, impulse always comes on with the same polarity when power is restored. Drives minute or second clocks as specified.

ES 163 Battery and Charger (\$140.00): Plugs into the ES 160 or ES 190 chassis. Fast charge, 12 hours continuous use. When operating on battery, displays are automatically blanked and may be viewed by actuating Display button on the front panel.

ES 164 Remote Digital Impulse Display (\$170.00): Similar to the ES 161 except that the ES 164 derives its count command from the ES 162 Impulse Driver, or any impulse clock drive circuits already installed. Choice of 12 or 24 hour display and available either as desk top unit or panel mounted.

Dimensions: 8" Wide x 2 1/2" High x 6" Deep.

Electrical: 117V AC 50/60 Hz.

Options: BJPOW.

ES 166 Jumbo 1" Clock Display (\$215.00): Features six digits of one inch high planar gas discharge displays in 12 or 24 hour format as specified. Receives serial time code input from any ESE Master Clock or serial time code generator.

Dimensions: 10 1/2" Wide x 4 1/2" High x 6 1/2" Deep.

Electrical: 117V AC 50/60 Hz.

Options: JPQW. If Q is ordered digits are separated by colons.

ES 167 Serial Time Code Generator (\$125.00): Offers a low cost answer to a master timing system. An integral part of ES 160, 190, 192/194 and 196 Master Clocks, this unit can be added to many other ESE products, including ES 112, 124, 182, 184, 500, 582, 750, 751, 752, 753, 754, 755, and all 780 Series Time Programmers. The ES 167 fits inside the case so that no extra space is needed. Drives 20 ES 161, 166, 168 or 171 Remote Displays. ES 167 provides CMOS compatible serial BCD output and operates from the logic supply voltage.

ES 168 Remote Electromagnetic Display (\$388.00): 4" HEIGHT! Used wherever large size at low cost is essential. Receives the serial time code from any ESE Master Clock, displays the time on four bright, yellow-green digits in 12 or 24 hour format as specified. Designed to mount on wall or ceiling. When time changes, audible "click" is heard.

Dimensions: 6" High x 16 1/2" Wide x 6" Deep.

Electrical: 117V AC 50/60 Hz.

Options: JW

ES 169 Temperature Slave (\$125.00): Receives serial BCD temperature code from ES 196, displays it on .55" Gas Discharge Displays.

Dimensions: 8" Wide x 2 1/2" High x 6" Deep.

Electrical: 117V AC 50/60 Hz.

Options: JPQW.

ES 171 Console Mount Display (\$134.00): Newest of the 70 series console mount clocks and timers, ES 171 receives the serial time code generated by any ESE Master Clock, or any ESE product containing the ES 167 serial time code generator, and displays it on bright red .3" LED's.

Dimensions: 2 1/4" High x 4 1/2" Wide x 4" Deep.

Case: High Impact Black Plastic.

Electrical: 117V AC 50/60 Hz.

Options: JW.



RAM TIME PROGRAMMERS 780 SERIES

The ES 780 Series Programmers provide 32 events (expandable to 96) in 5 1/4 inches of rack space. Ten minutes is all that is required to install, set the clock and program 32 events. Bright .3" LED displays and all controls are on the front panel, outputs and battery test are on the rear. ES 167 Serial Time Code Outputs can be specified as an option. Line frequency time base with backup crystal time base, 72 hour battery/battery charger are standard. External time base can be used, 60 Hz is preferred, others may require additional internal circuitry.

Eight Digits of Programming Capability:

ES 780—10 Days, 10 Outputs, Hours, Minutes, Seconds

ES 781—100 Days, Hours, Minutes, Seconds

ES 782—16 Outputs, Hours, Minutes, Seconds

Six Digits of Programming Capability:

ES 783—Hours, Minutes, Seconds

ES 784—100 Days, Hours, Minutes

ES 785—100 Days, Minutes, Seconds

ES 786—16 Outputs, Hours, Minutes

ES 787—16 Outputs, Minutes, Seconds

Four Digits of Programming Capability:

ES 788—Hours, Minutes

ES 789—Minutes, Seconds

ES 782, 786, and 787 have 16 isolated outputs. Any of the 32 events can be programmed to activate any of the 16 outputs. ES 780 has 10 outputs. The other units have a single output.

ES 784, 786, and 788 have a one minute contact closure. The others have a one second contact closure.

Displays:

REAL TIME: An eight digit display when day selection is required as on the ES 781, 784, 785, seven digits for ES 780, and six digits for the others.

NEXT EVENT: A two digit display of next event number.

NEXT EVENT TIME: An eight digit display when ES 780, 781, or 782 is specified, a six digit display when ES 783, 784, 785, 786, or 787 is specified, and a four digit display when ES 788 or 789 is specified.

Dimensions: 5 1/4" high x 19" wide x 10" deep.

Weight: Approx. 20 lbs. varying with model number.

Front Panel: Brushed, etched, anodized aluminum.

OPTIONS

Please Note: Some combinations of options are not compatible. Consult factory if in doubt.

B BCD Output

C Crystal Timebase: A $\pm 0.002\%$ crystal is employed in an oscillator for those applications requiring independence from the power line frequency. Trimmer included for greater accuracy.

D Remote Connector, 6' Cable and Control Switch Set: This option consists of a rear-mounted connector wired for all control functions, a mating connector, wired to six feet of cable, the other end of which is connected to control switches which are mounted on a 1/8" anodized satin finish aluminum plate suitable for mounting on most surfaces.

L .55" Planar Gas Discharge Display

M Front-mounted pushbutton controls: available on 70 Series except for ES 371.

N Available on ES 301, 302, 380, 381. Provides a change in count direction from down to up at zero when the unit has been counting down from a preset time.

P 19" Front Panel, 3 1/2" high.

Q 9" Front Panel, 3 1/2" high.

R Remote Connector

S Slave/Remote Display: User must specify option B (BCD Output) on master when ordering a slave.

T Tenth of Seconds

V DC Operation (Includes crystal timebase)

W Three Wire Cord

Y Relay Closure at Zero: Available on ES 300, 301, 302, 380 and 381 only.

Z Relay Contact Closure and Stop at Zero: Available on ES 300, 301, 302, 380 and 381 only.



505-1/2 Centinela Ave.
Inglewood, CA 90302
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For More Details Circle (96) on Reply Card

MODEL CMR ANTENNA MONITOR F.C.C. Type Approval No. 3-242



Digital and fully remotable, the CMR is a state of the art design of unequalled accuracy and stability, at a price comparable with analog monitors. With typical modulation, the CMR's True Ratio readout is a factor of ten more stable than instruments that measure normalized amplitude, and the CMR's phase readout is rock solid. Phase sign is automatic — no extra operation. Practically, these features mean quick, accurate log or remote cal. readings.

Designed for long, maintenance free life, the CMR is ideal for new DAs or existing stations wanting backup or upgrade to digital.

Price: \$1990, two towers. Extra towers, \$35 each.

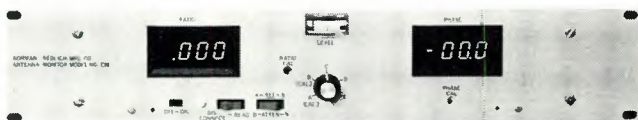
MODEL CMR-1 HARDWIRE REMOTE CONTROLLER-REPEATER



The CMR-1 may be used for hardwire remote control and readout of the CMR monitor. The two units are connected by a multi-conductor cable up to 1500 feet long. Readings of the CMR-1 exactly duplicate those of the CMR. A switch on the CMR transfers control between CMR and CMR-1.

Price: \$450 including cable connectors.

MODEL CM ANTENNA MONITOR F.C.C. Type Approval No. 3-239



The CM has the exceptional stability of the CMR but is not remotable. Ideal for attended DAs or as backup for remote DAs. CMs in service have an outstanding reliability record, and the CM's price means really substantial savings.

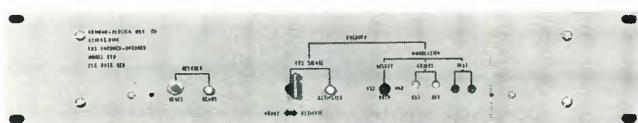
Price: \$1390, two towers. Extra towers, \$20 each.

EMERGENCY BROADCAST SYSTEM EQUIPMENT

MOD. CEB ENCODER-DECODER,

MOD. CE ENCODER, MOD. CD DECODER

Encoder F.C.C. Type Accepted, Decoder F.C.C. Certified



The CE or the encoder section of the CEB generate the 853 and 960 hz. EBS attention signal. A loop through relay substitutes attention signal for programming when encoder is activated.

The CD or the decoder section of the CEB work with a receiver tuned to the station being monitored (any stable receiver will do). An EBS alert demutes the receiver and closes auxiliary alarm terminals.

Hundreds of these units in service have an excellent reliability record.

Prices: CEB, \$225, CE, \$159, CD, \$100.



6 Curtis St., Athens, Ohio 45701
(614) 593-3150

Stereo studios for AM

continued from page 124

has several advantages in that the signal processing and stereo generator are conveniently located at the studio. Dual transmitters and receivers can provide stereo redundancy on a single licensed frequency.

This system works for FM stereo because the composite signal simply frequency modulates the transmitter, but all the proposed AM stereo systems involve a combination of amplitude and phase modulation. An easy way around the problem using existing equipment, provided of course that the FCC would not object, would be to transmit the stereo audio from the AM studio via a conventional FM stereo generator/composite microwave transmitter, then retrieve the stereo channels by feeding a standard composite microwave receiver into the composite input of an FM stereo modulation monitor. This technique would require only one microwave frequency and would provide excellent 15 kHz bandwidth, low-distortion audio to the AM stereo generator. Figure 2 illustrates this proposal. In any case, it is a good idea to locate an appropriate limiter ahead of the microwave so that it is also protected from over-modulation.

Signal processing

Signal processing for AM stereo is likely to be a very exciting arena into which many of the broadcast equipment manufacturers will dispatch new versions of existing equipment for dual-channel AM. Where AM has primarily been processed to survive in "the land of the loud," good-fidelity AM receivers will demand more from the AM broadcaster (like quality audio). Signal processing will undoubtedly be the most challenging aspect of AM stereocasting.

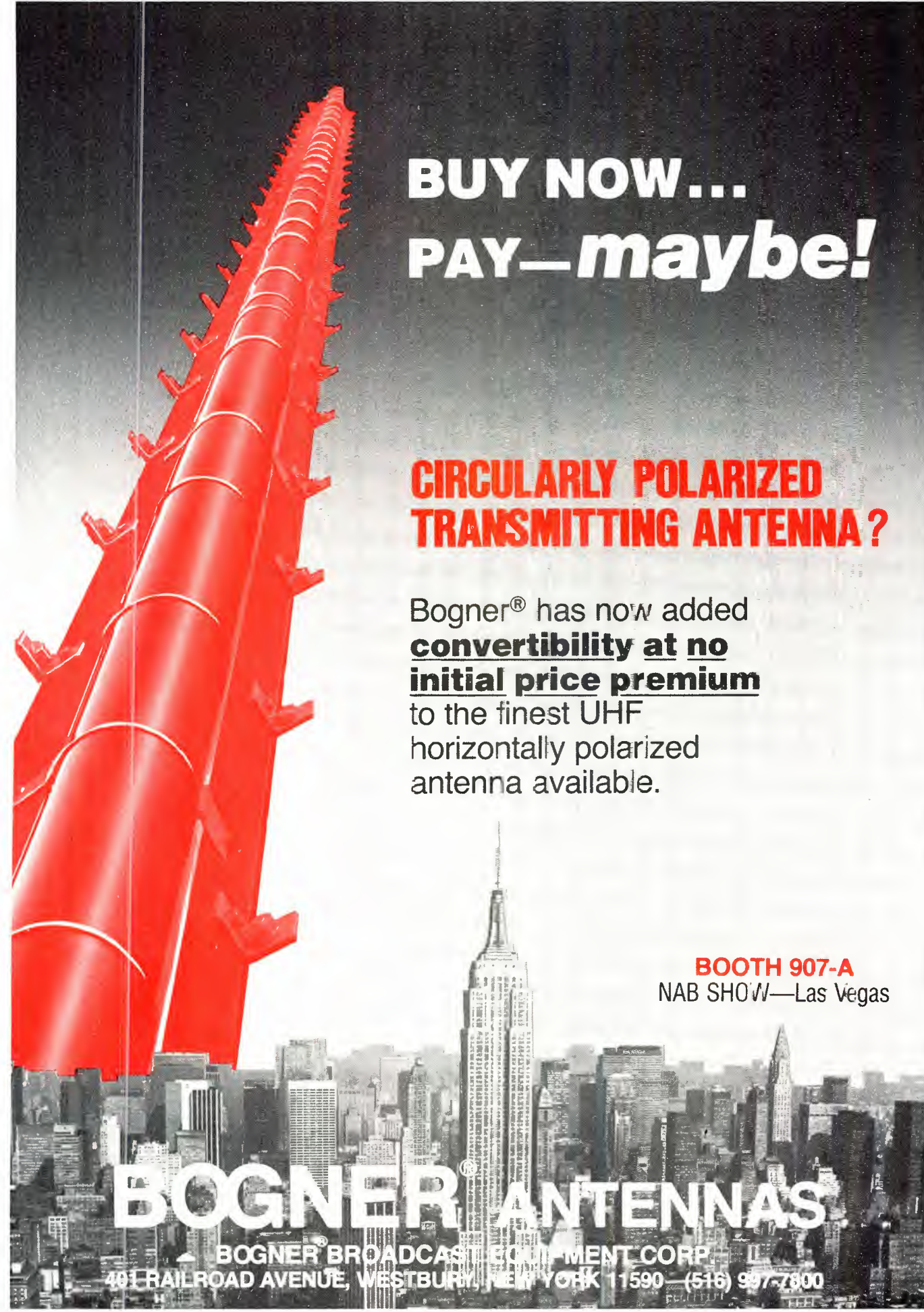
To keep a competitively loud signal-level on the air, stereo AMs will probably be forced to employ quite a bit of compression, which will be most audible on wideband receivers as a fluctuating noise level. In light of this, you may want to consider something like the Burwin or Inovonics noise filters to reduce this effect.

Many excellent limiters and AGC amplifiers, both single-band and multi-band, are available, and the introduction of AM stereo into your market place might be just the incentive your station management needs to provide the budget for new processing gear. Although it would certainly be easier and less expensive to add on a second channel of the same equipment you already have, the challenge of AM stereo will probably dictate a complete rethinking of your audio processing strategy.

One thing is for sure, however: now is the time to write for brochures and call on your local broadcast sales reps for equipment data so that you can base your decisions on the broadest possible knowledge of what is available and how it works.

As we all more or less patiently wait for the FCC to decide on a standard AM stereo transmission system, it is obvious that more and more stations are quietly equipping for the day when the AM broadcaster can actually place his order for a new stereo generator.

On "announcement day" broadcast equipment salesmen will probably be among the most popular creatures walking the face of the earth, but the best signals on the air will belong to the broadcasters who started planning early. So, even if you're not ready to order your equipment, at least start the thought processes rolling so that a definite plan of action is on the back burner when the light turns green. □



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For More Details Circle (92) on Reply Card

ALPHA-NUMERIC: It all starts at a keyboard

By E. Stanley Busby, Jr.,
Engineer, Ampex Corp.,
Redwood City, California

It is difficult these days to avoid seeing letters and numbers displayed on a TV screen. They go on the air regularly as part of the news, weather, and sports. Years ago they were produced by scanning cardboard artwork with a live camera, or a slide of the artwork with a film chain. These days they are most likely generated electrically from stored data, and injected into the video output without necessarily entering the video switcher as a separate source.

Inside the studio, it is common to find letters "punched in" on a video feed not intended for air. Videotape cassette machines can be equipped to do this to verify the contents of a cued-up cassette (Ampex's "IDA" and RCA's "EPIS"). Automated stations dedicate a monochrome monitor to the display of the next few items on the schedule.

Display monitors are used in airports, banks, offices, and homes.

Your TV set can be made one. In any event, whatever you see had to start somewhere and get sent to where you are. It starts at a keyboard.

At the keyboard

An electrical keyboard is an array of simple single-pole switches with marked finger caps. Most are arranged in the familiar pattern used for typewriter keys. To each letter, numeral, and punctuation mark there is assigned a binary number. Bashing a key generates that number and a strobe pulse which alerts the world to come look at the number before another key gets whacked.

To avoid the problem the tower erectors had at Babel, the assignment of numbers to letters is well standardized. The most popular is the American Standard Code for Information Interchange (ASCII)¹

continued on page 130

BIT POSITION											
7	6	5	7	6	5	7	6	5	6	7	5
0	0	0	0	0	1	0	1	0	0	1	1
NUL	DLE	SP	0	@	P			p	0	0	0
SOH	DC1	!	1	A	Q	a	q		0	0	0
STX	DC2	"	2	B	R	b	r		0	0	1
ETX	DC3	#	3	C	S	c	s		0	0	1
EOT	DC4	\$	4	D	T	d	t		0	1	0
ENQ	NAK	%	5	E	U	e	u		0	1	0
ACK	SYN	&	6	F	V	f	v		0	1	1
BEL	ETB	'	7	G	W	g	w		0	1	1
BS	CAN	(	8	H	X	h	x		1	0	0
HT	EM	)	9	I	Y	i	y		1	0	0
LF	SUB	*	:	J	Z	j	z		1	0	1
VT	ESC	+	:	K	[	k	{		1	0	1
FF	FS	,	<	L	\	l			1	1	0
CR	GS	-	=	M	]	m	}		1	1	0
SO	RS	.	>	N	^	n	~		1	1	1
SI	US	/	?	O	_	o	DEL		1	1	1

NUL	Null, or all zeros
SOH	Start of heading
STX	Start of text
ETX	End of text
EOT	End of transmission
ENQ	Enquiry
ACK	Acknowledge
BEL	Bell, or alarm
BS	Backspace
HT	Horizontal tabulation
LF	Line feed
VF	Vertical tabulation
FF	Form feed
CR	Carriage return
SO	Shift out
SI	Shift in
DLE	Data link escape
DC1	Device control 1
DC2	Device control 2
DC3	Device control 3
DC4	Device control 4
NAK	Negative acknowledgment
SYN	Synchronous idle
ETB	End of transmission block
CAN	Cancel
EM	End of medium
SUB	Substitute
ESC	Escape
FS	File separator
GS	Group separator
RS	Record separator
US	Unit separator
SP	Space
DEL	Delete

Figure 1 American Standard Code for Information Interchange (ASCII).

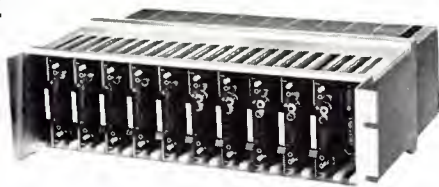
Figure 2 Names of control characters shown on ASCII code.

THE BETTER WAY

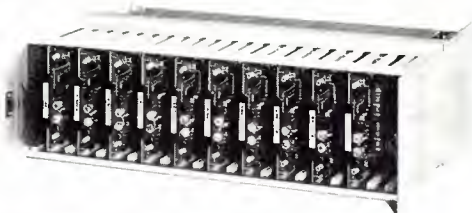
DATATEK

DAS

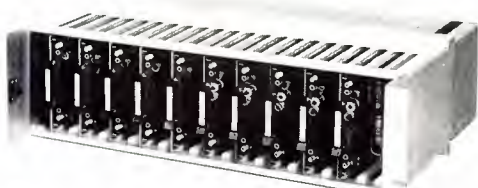
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D-603 Video Distribution Amplifier, individual P.S., 6 outputs, optional continuously adjustable cable equalizer for up to 1,000 feet coaxial cable



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DF-603 Rack Frame, 5 1/4", for up to ten D-603, D-604, D-606, or D-507.

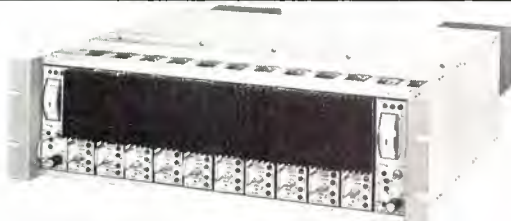
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D-507 Audio Distribution Amplifier, individual P.S., 6 outputs, +30 dBm



D-501 Audio Distribution Amplifier, 6 outputs, +24 dBm, up to nine D.A.'s with redundant common P.S. in 3 1/2" rack frame



D-509 Audio Distribution Amplifier, 6 outputs, +30 dBm, up to ten D.A.'s with redundant common P.S. in 5 1/4" rack frame

NEW PRODUCT!!!

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DF-603H Rack Frame, 1 3/4", for up to three D-603, D-604, D-606, or D-507.

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and its European counterpart standardized by CCITT². It uses seven binary data bits which have 128 possibilities; 32 of these are reserved for control of printing machinery or other aspects of message handling that don't put ink on paper.

Of the remaining 96, all but one represent a visible character. (Think of "space" as an inkless letter.) This last one is called "rubout" and generates all "1"s. On punched paper tape, a hole is a binary "1". If you make a mistake it can be rendered harmless by backing up the tape and generating a "rubout" so that all holes are punched. All machines and computers are trained to ignore rubouts.

Figure 1 shows the ASCII code with abbreviated control characters, and Figure 2 gives the full name of the control characters⁵. In Figure 1, notice that each lower case letter is only one bit different from its upper case brother. Many

printing machines and TV displays do not provide for lower case letters. If you send a lower case code to one of these, most of them will convert it to upper case with this logic: if bit seven is high, force bit six low.

Also note that if only the least significant four bits are retained, the numerals are already coded into BCD. A recommendation about Figure 1: with a hot iron and a piece of plywood, burn yourself a copy. Epoxy it to a load bearing wall of your building. Then, unlike coax tees, 75-ohm terminations and scope probes, it will be there when you need it...and you will need it someday.

Figure 3 shows the general scanning principle used by most electrical keyboards. At each intersection of the 8x8 matrix, a key switch can be placed. A free-running six-bit counter (in this illustration) has its least significant three bits driving a decoder which, one at a time, grounds each horizontal wire of the matrix.

Meanwhile, the most significant three bits drive a data selector

which, once for each full scan of the horizontal wires, examines one vertical wire. If a button is pressed, sooner or later the data selector will "see" the ground and make an output. This freezes the counter and generates a strobe pulse. You can now buy a keyboard encoder IC which combines these functions.

If the keyboard output is going to a nearby device, it is enough to send the seven bits on seven wires. For longer distances, the bits are sent one at a time. The most popular way of doing this is with a standardized format called *serial asynchronous communication*.

This is "serial" because it's one bit at a time and "asynchronous" because there are no strobe pulses or any other way to predict when something is coming. Figures 4 and 5 show two ways to connect a sender and receiver. Both are popular.

By convention^{3,4} the resting state of the current loop is a steady "one," represented by current in the loop. This is also called "marking." A zero happens when the

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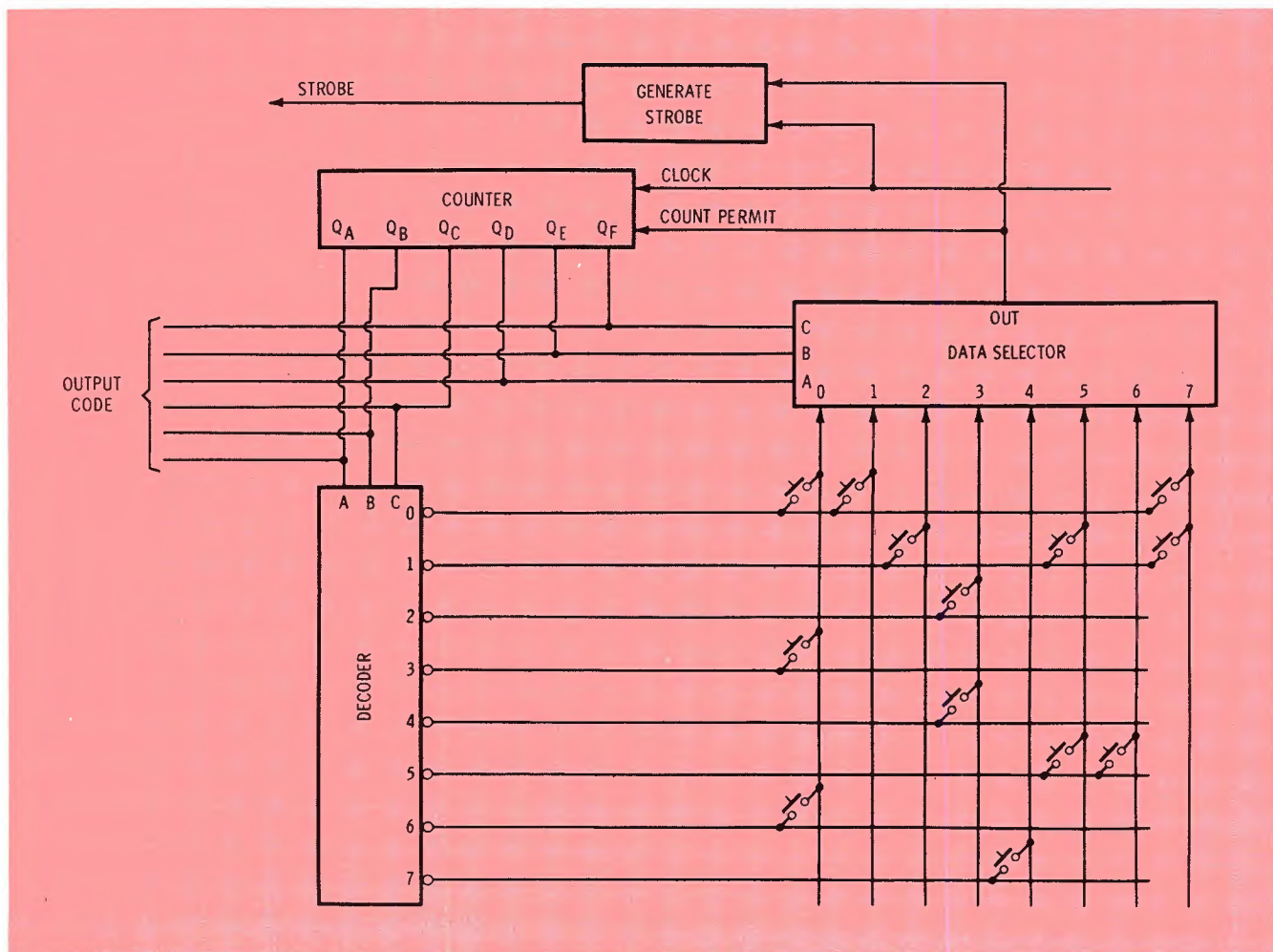


Figure 3 Basic scanned keyboard: 64 (max.) keys.

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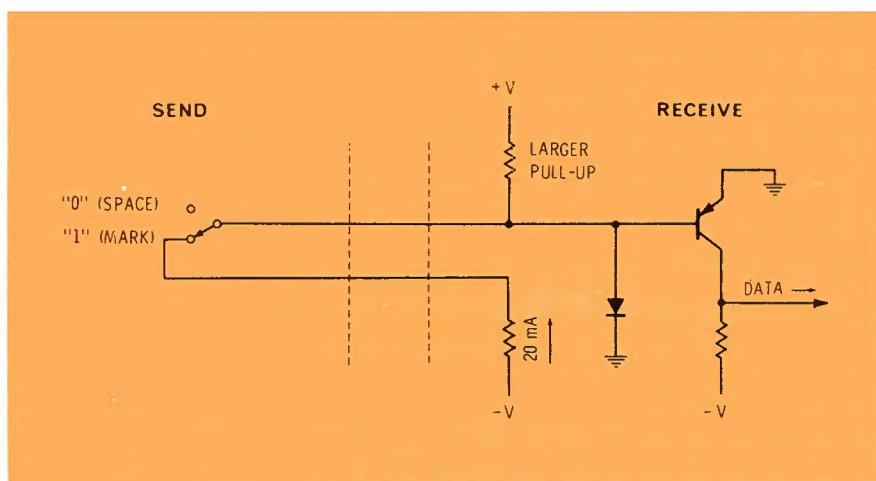


Figure 4 Serial current loop interface.

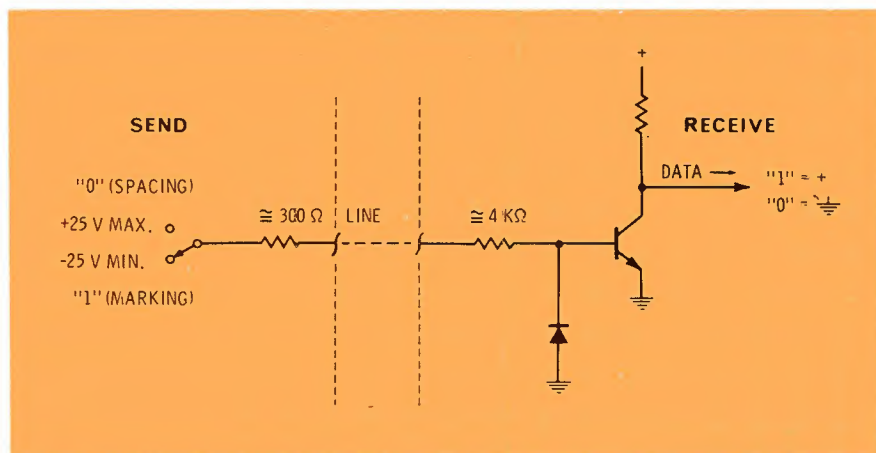


Figure 5 Serial voltage interface.

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current is interrupted, also called "spacing." The current is usually supplied by the receiving device. In the voltage loop, the sending device supplies the voltage and the resting state is with the output returned to the negative supply. The convention of having the resting state "active" makes it easier to tell if the circuit has been disconnected.

Sending a character

To start the sending of a character, the resting state is reversed for one bit period (see Figure 6). Then follow the seven data bits, least significant first. Next comes a parity

bit. The parity bit is generated so that there is always an even number of ones in the eight bits (even parity) or always odd (odd parity). The receiving end can total up the number of ones and tell if one of the bits was mangled during transmission. On short hauls, it is usual to forget parity checking and leave the parity bits always high or always low.

Finally, the circuit returns to its resting state for a minimum of one or two bit periods before doing anything else. Some teleprinters require two bit periods to get their wheels and gears stopped, others only one. The standard allows for both. When there is no machinery involved (as with CRT terminals), it

is usual to use only one stop bit to save time.

Full speed ahead

The speed of transmission is sometimes set by printing machinery, or limited by the frequency response of the line. The unit of signaling rate is the baud, which is equal to one signaling element per second. (Do not say bauds and do not say baud per second; the baud, like the knot, is already a unit of speed.) Baud rate is not the same as data rate.

A system using 10 bits per character (one start, one stop, one parity and seven data) running at 1200 baud has a data rate of $0.7 \times 1200 = 840$ data bits/second. Older teleprinters operate at 110 baud (11 bit code $\times$ 10 char./sec.). Newer devices and all-electronic systems tend to use one of the following standard speeds: 300, 600, 1200, 2400, 4800 and 9600 baud. One computer-driven editing system talks to its VTRs at 26,400 baud so it can get enough said within one TV frame tie.

If you send information across town or across the country, using phone lines which can't pass DC, it is necessary to use the serial signal to frequency modulate an audio carrier, which is sent down the line and demodulated at the receive. On two-way circuits, the originator sends on frequency A and receives B, while the answerer sends on B and receives your A.

Whenever a circuit has separate paths for simultaneous send and receive, it is called *full duplex*. If a single two-way path is used, only one device can talk at a time. This is called *half-duplex*. If it is a one-way path, it is called *simplex* circuit.

Converting the parallel output of a keyboard to serial is just a matter of loading a 10-bit shift register broadside with the data and other junk, and pumping it out edgewise 10 times. There is a dandy IC available which is designed to do the whole job of transmitting and receiving. Called a UART (Universal Asynchronous Receiver-Transmit-

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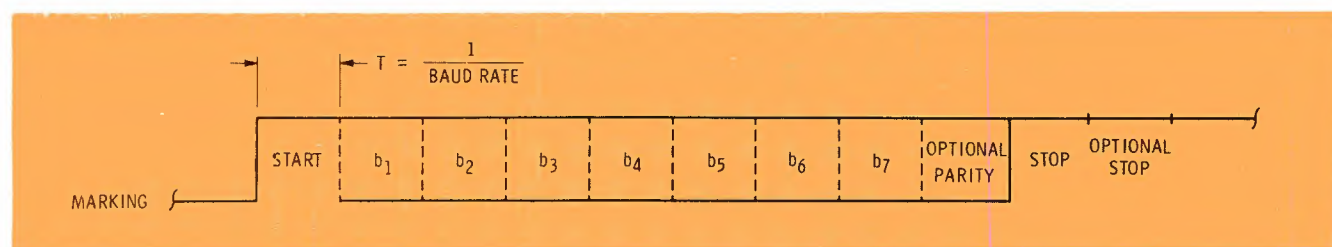
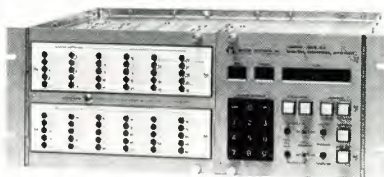


Figure 6 Asynchronous serial transmission.

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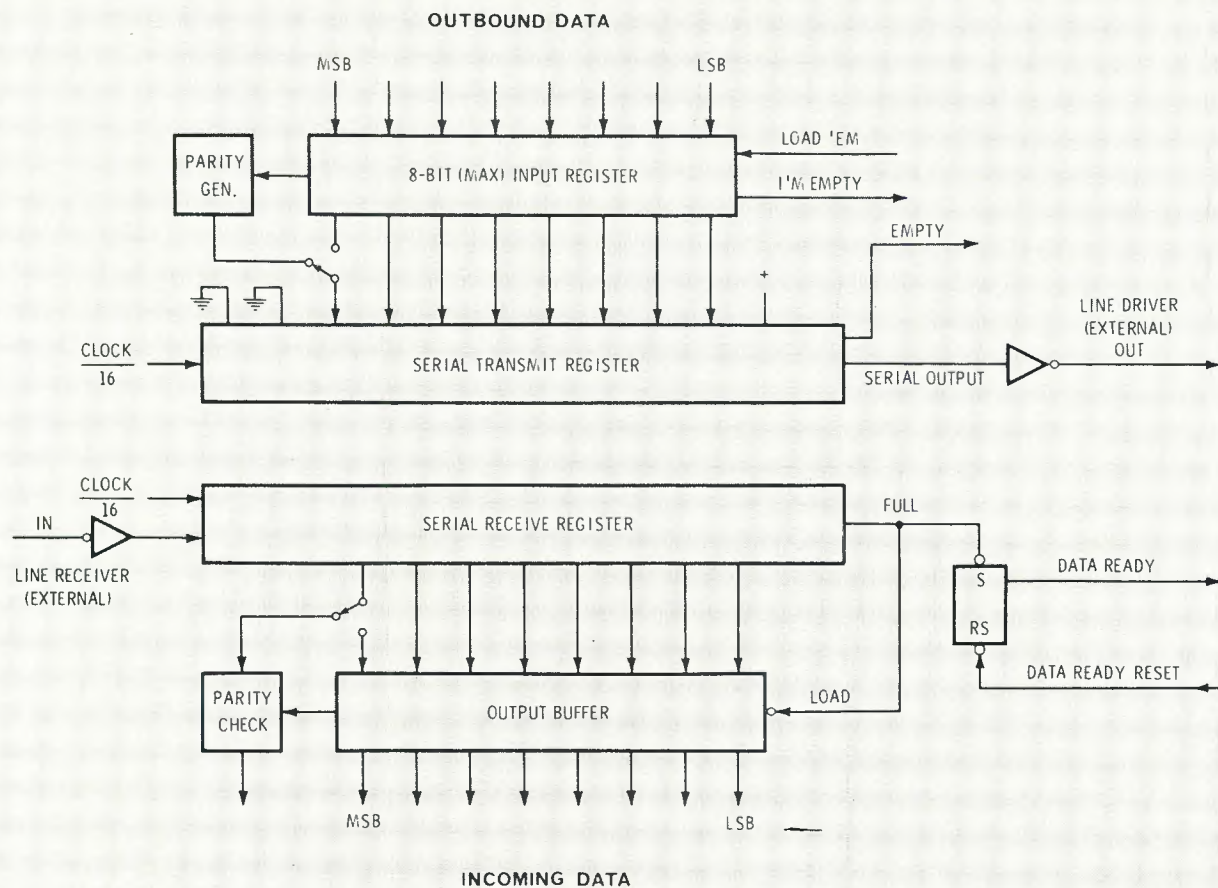


Figure 7 Partial block diagram of UART.

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ter), it has eight parallel inputs, a serial output, a serial input, and eight parallel outputs. It also offers a number of status flags (pins which change state). (See Figure 7.)

The output shift register has a flag to tell you if it is empty, so does the input buffer register. The receive buffer has a flag to tell you it has something for you and a pin to reset this flag so you can see it go up next time. If you fail to come look and another character arrives, a separate flag goes up to let you know you missed something. The device will also generate and check parity. Other pins allow you to select the number of data bits, the number of stop bits and whether or not to do the parity thing.

The UART is usually clocked at 16 times the desired baud rate. On the leading edge of the start bit a counter ticks off eight clock pulses and peeks at the input to see if the start bit is still there or was just noise. If it is still there it looks at the input each 16 clocks after that, sampling and shifting in the data.

Along about the middle of the first stop bit, the data is transferred to the output register and the "data available" flag is raised. If the stop bit fails to appear on time, yet another "get nervous" flag is raised. For a good summary of UART, see Reference 6.

Eventually that which somebody typed gets to a display monitor. It may have been edited, truncated, appended to, punched onto paper tape, recorded on magnetic tape, massaged by a computer...but in the end it resides in a memory organized to show these characters lit up on the end of a vacuum tube.

There are graphic display monitors that draw lines and write things entirely by controlling the deflection of the beam. They can draw pictures with much more resolution (especially of sloping lines) than can ordinary TV using raster scanning. They require precision wideband deflection yokes. Obviously, around a TV studio we will use raster scan monitors like all the other equipment around the place.

To make letters, etc. with raster scanning, we will simply turn the

scanning beam on at the right time as the beam goes scanning along in its standardized, interlaced way. Imagine a little square which is just as wide as a scanning beam is thick. There would be about 484 of them top to bottom and about 644 horizontally, allowing for blanking. Call this a pixel, short for picture element. Imagine a square made of four pixels. Call this a blob. The screen can then be divided into 242 blobs vertically and 322 blobs horizontally (about 290V and 386H in 625 land). Scanning along left to right we could generate about 5 megablob/sec.

Now imagine a rectangle five blobs wide by seven blobs tall. By coloring in the various 35 blobs you can make a recognizable representation of capital letters, numerals and the important punctuation marks. Using a rectangle of seven by nine blobs you can even do a poor version of lower case letters. Using 13x13 blobs you can do most of man's written symbols.

Figure 8 shows the letter F done in a 5x8 matrix. (Row zero is always blank and serves to separate strings

continued on page 136



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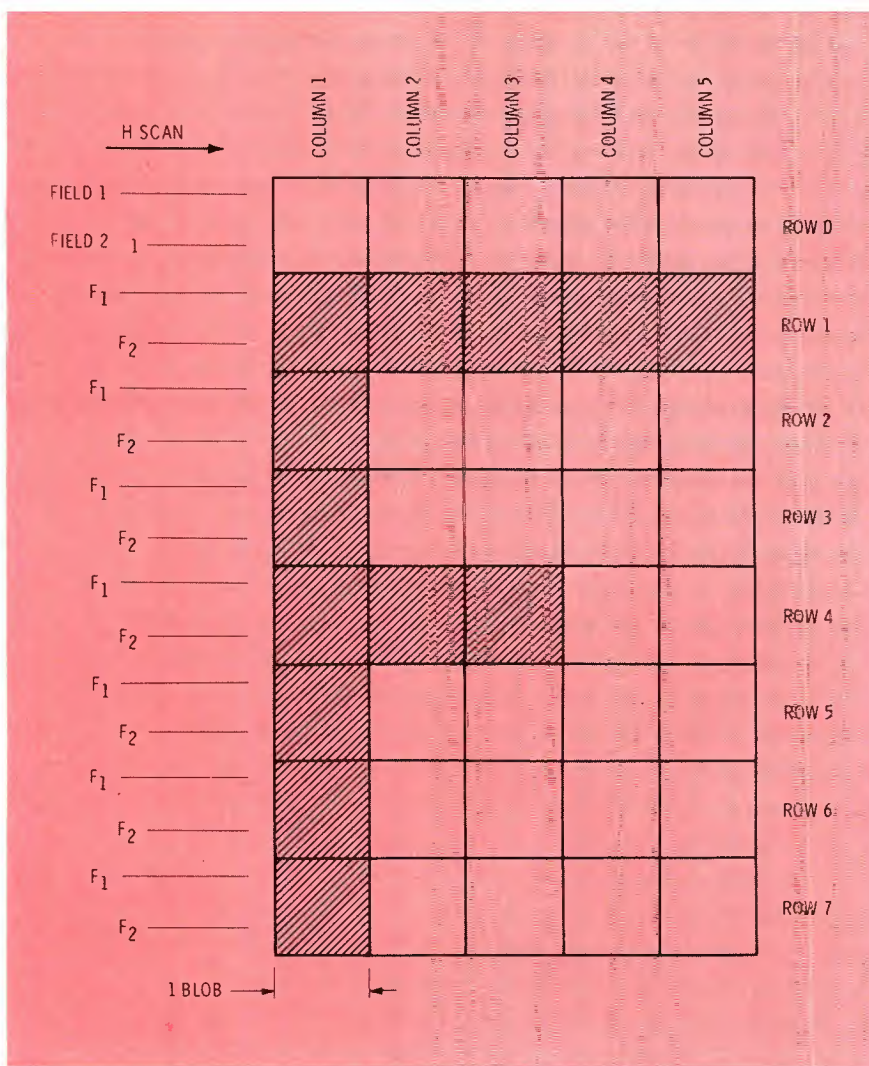


Figure 8

Alpha-numerics

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of characters.) If this letter were put in front of a camera and positioned just right, it could be scanned in exactly 16 scanning lines, eight in each of two vertical fields, with each square two lines tall and two pixels long.

To generate the video electrically, we can divide horizontal scanning by eight with a three-bit binary counter. This is one input to a read-only memory to tell it which row of the 5x8 matrix to create on this scan. Six more bits are furnished by memory to tell which one of 64 characters is involved. The ROM has five outputs which represent the columns of the 5x7 matrix. Most ROMs are a little too slow coming up with a stable output, so it is customary to load the ROMs output into a high-speed shift register, then give the ROM a new input. While we spend seven blob times (five for the character and one border blob on each side) emptying the register, the ROM has time to come up with its next set of five outputs.

Keep it moving

Figure 9 shows a rudimentary block diagram of a 960 character display (24 strings of 40 characters each). The five megablob oscillator

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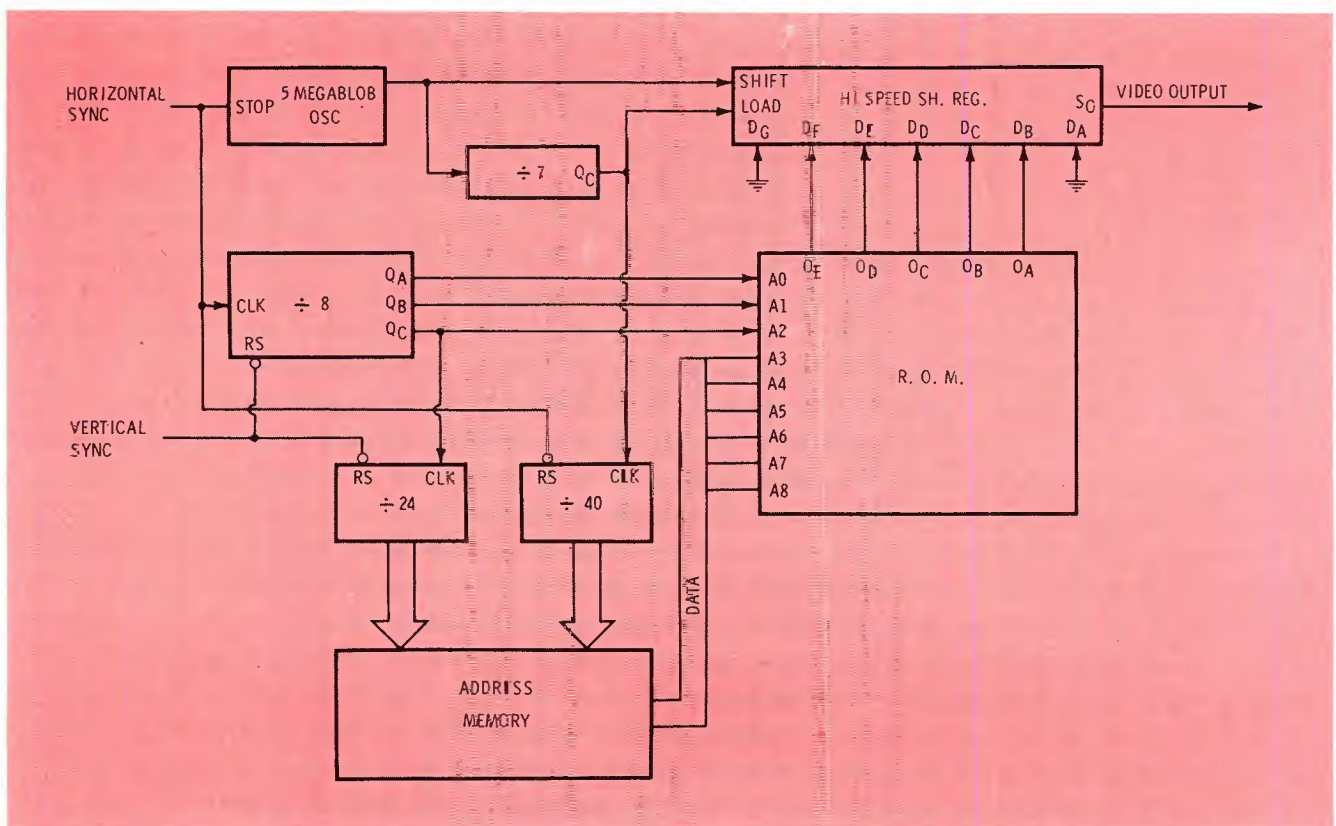
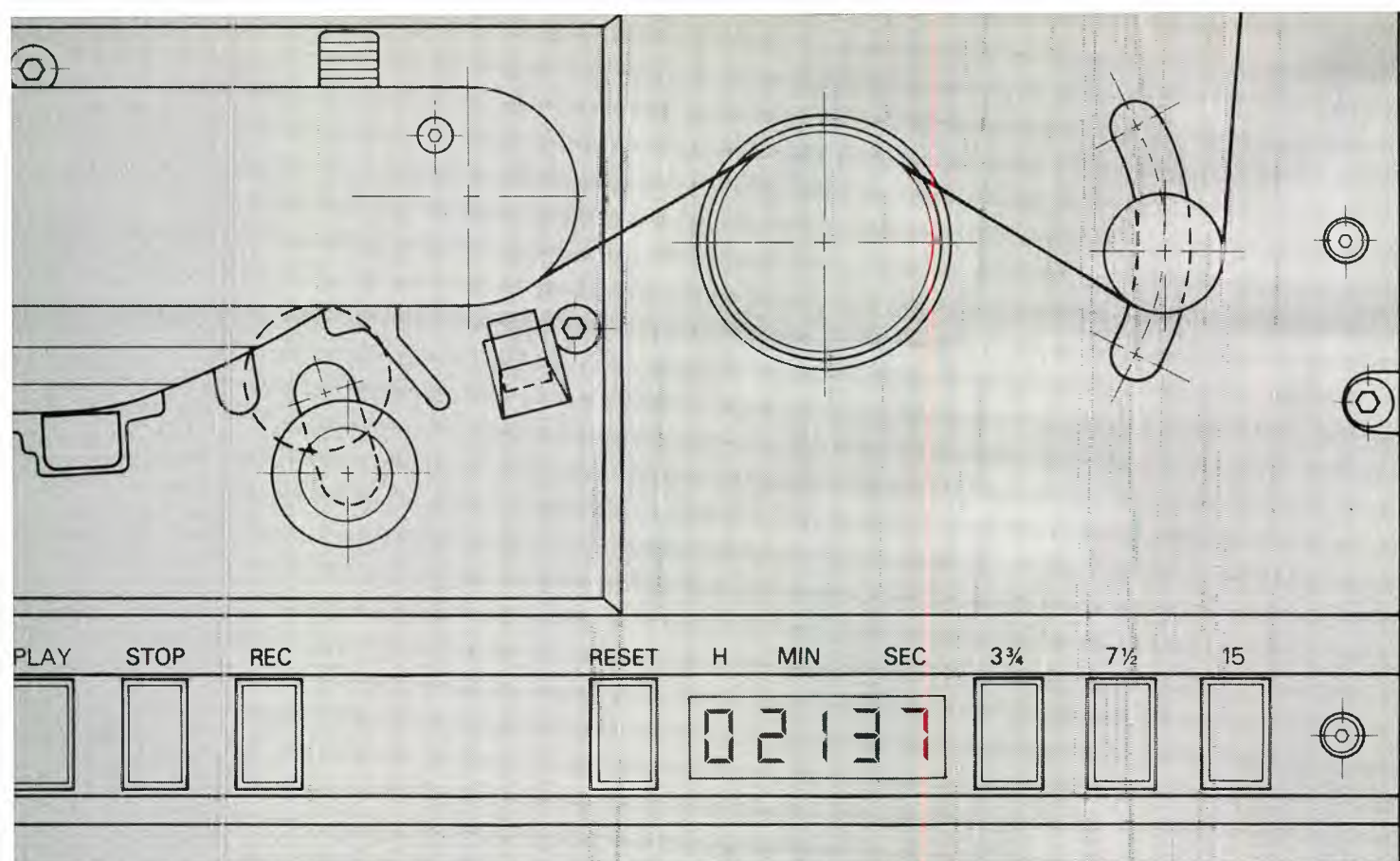


Figure 9 Basic organization of a character generator. (Means of writing into memory not shown.)



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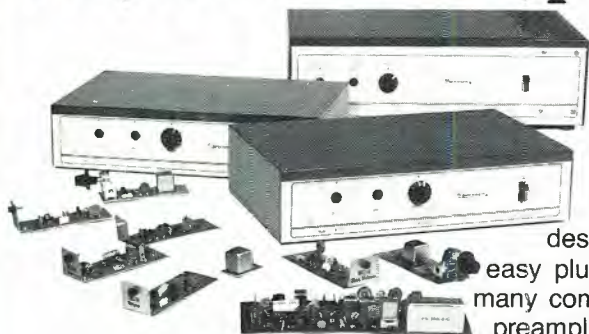
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Alpha-numerics

continued from page 136

is stopped and restarted each horizontal pulse so that it maintains a constant phase relationship with horizontal scanning. Each seven blobs the shift register is loaded and the character counter advanced one. This tells the memory which character comes next. The character counter is reset each horizontal pulse. After eight scans, the horizontal counter cycles and ticks over the string counter. (The word string is used to avoid confusion with "row" and "line" which are used elsewhere.) This identifies the next batch of 40 characters. The output of the shift register, shifted at the blob rate, is the video output. Invert it and you have black letters on a white background. Vertical retrace resets everything.

A system using a 7x9 matrix would have different dividers, a larger ROM, a longer shift register, and seven bits of memory for each character instead of six. Three extra bits of memory can define one of eight colors for each character. Other memory bits can be used to cause brightness change, polarity reversal, or blinking.

You can cause sloping characters by causing the horizontal divider to alter the time the blob oscillator gets kicked off. The fancy titling machines use random-access memory instead of ROM to define the character font. A number of fonts can be stored (typically on a floppy disc) and loaded into the RAM at the press of a button.

In Europe, a system has been developed⁷ which transmits many pages of text, using some time during the vertical retrace. An equipped TV receiver can be set to detect and grab a desired page of text, load it into memory and display it. It amounts to a daily video magazine generated at the studio and updated frequently. Those who can't read can still watch the movie. □

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6. *ibid.*, Appendix D.
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Progressive Maintenance: A fresh approach

By Peter Burk

It's no secret that preventive maintenance (PM) is an important part of any successful radio station, yet frequently PM becomes postponed maintenance. When the control room has smoke pouring out through the sound lock, it's hard to think about lubricating the bearings in the old turntable.

Weekly, or even monthly, maintenance gets done most of the time, but blocking out enough time to perform three-month and six-month operations can be a real struggle. The method we're about to propose eliminates that problem by spreading out the work load so that PM becomes a small, but constant task. If diligently applied, this method will eliminate many of those crises that spoil weekends and keep you away from fun projects.

We're not going to tell you what maintenance should be performed at each interval...you're better able to determine that for your own equipment. We'll just show you how to put it all together in an efficient manner so that less effort is expended. Most stations will be able to perform all necessary preventive maintenance in eight to twelve hours a week, using the progressive system.

Getting organized

A five-step procedure will be used to set up a progressive maintenance plan:

1. List all equipment to be included in the plan.

2. Assign each operation to one of five levels.
3. Prepare maintenance forms.
4. Group equipment into twelve balanced groups.
5. Set up a twenty-four week table.

The equipment list will include all items that need periodic attention: cart machines, turntables, consoles, etc. Using the instruction manual for each device, list all required maintenance items in five levels: daily, weekly, monthly, quarterly, and semi-annual.

Now prepare a set of forms that will be used to record the results of each test performed. A ring binder can be put to good use here. Use one divider for each unit. Each time maintenance is performed, put the appropriate form in the binder so that you'll have a good history on the performance of each machine.

It may be helpful to use different colors for each level of maintenance: white for weekly, yellow for monthly, green for quarterly, and blue for semiannual. (Save red for emergency repair forms.)

The next step may seem confusing at first, but it's really the key to evening out the work load. Group the equipment into 12 groups, each group containing several devices from the same area of the station.

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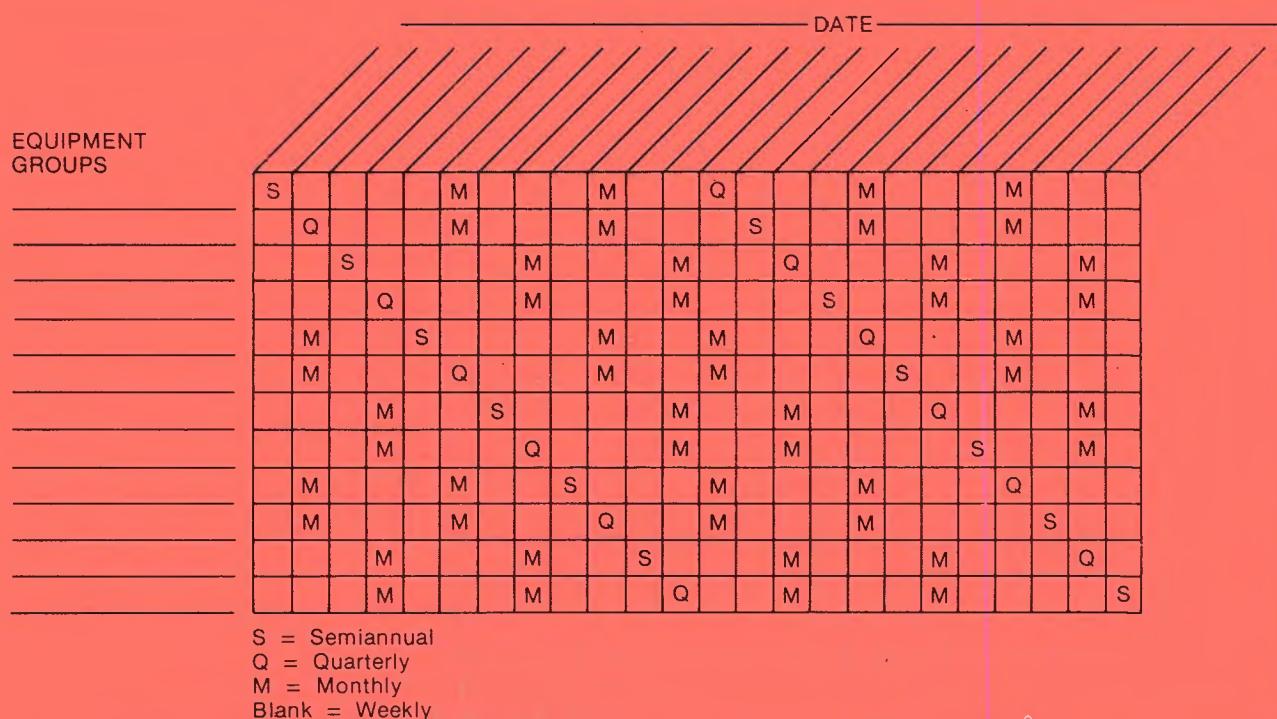


Figure 1 Progressive maintenance format. Cycles rotate through 12 equipment groups in 24 weeks.



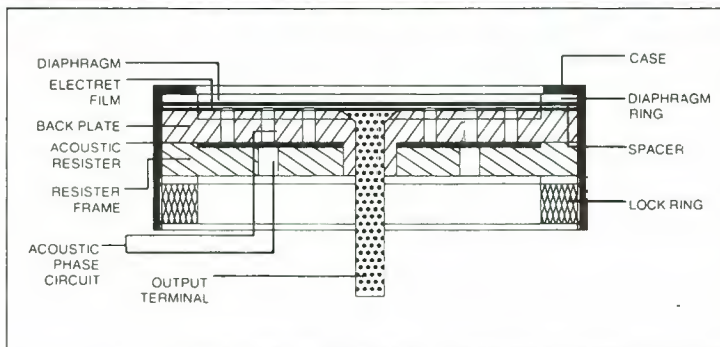
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ation in the upper frequency range. The low mass diaphragm means better transient characteristics over the entire frequency range.

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maintenance

continued from page 140

Each group should represent approximately the same amount of time for the highest level of maintenance as any other group.

Fill in the blanks

The final step is simple. Just fill in the blanks on the table in Figure 1. The table pulls everything together so that each group receives each level of maintenance on schedule.

In order to distribute the load more evenly, several liberties have been taken in the table. Notice that semiannual maintenance is actually performed every 24 weeks, and that monthly maintenance will in some cases be done at an interval of three or five weeks instead of four. The reason for this last bit of sleight-of-hand is to allow scheduling of monthly maintenance only during weeks where no semiannual work is scheduled.

Each level of maintenance supercedes all lower-level operations. That is, monthly maintenance includes all weekly operations, etc.

If it's not readily apparent, here's what the table does for you:

- High-level maintenance is done exactly when a lower level would otherwise be performed. It doesn't make much sense to perform monthly maintenance on a machine the week before (or after) a six-month overhaul.
- The work load is evenly divided from one week to the next. Typically, the time involved might break down like this:

First week:	11 groups weekly at 15 min.	2:45
	1 group semiannual at 6 hrs.	6:00
	weekly total	8:45
Second week:	7 groups weekly at 15 min.	1:45
	4 groups monthly at 1 hr.	4:00
	1 group quarterly at 3 hrs.	3:00
	weekly total	8:45

The toughest part of any PM program is actually taking the time to do the work. The progressive system will make that easier, but further improvements in efficiency can be made to streamline the program even more.

Don't overdo it

Analyze each item on your list to make sure it's really necessary. Some operations do more to reduce reliability than improve it. Rotating transmitter tubes, for instance, probably does more to reduce socket life than it does to improve tube life.

Edge connectors are another touchy item. They aren't designed for repeated insertions. Try to eliminate the need for pulling PC cards out during weekly maintenance.

If you go through an azimuth adjustment week after week, only to find that it was right on every time, you're not only spending more time than is necessary, you're putting needless wear and tear on the head assemblies.

Don't quit checking azimuth each time...it's too important. Just use a method that doesn't require turning the screws to verify alignment.

On a reel-to-reel machine, you can lightly skew the tape with your finger between the heads and the capstan while playing the azimuth alignment tone. If the meter goes down no matter how you skew the

continued on page 144

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maintenance

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tape, you can keep the tools in the tool box.

Another way to verify playback alignment is to record a tape with three azimuth adjustment cuts. Cut one is recorded with the record head intentionally misaligned a few degrees to the left; cut two is perpendicular; and cut three is a few degrees off to the right. When you play the tape, the center cut should produce the highest output (or best lissajous for stereo). This method is better suited for cart machines. Just be certain that the center cut agrees perfectly with your master alignment cart.

Set standards

Every manufacturer publishes specs for their equipment. While you may prefer to set tighter tolerances, the important thing is that you work with an established set of tolerances.

This accomplishes two things: First, you are assured that any machine not meeting your specs is repaired or adjusted until it does. Without specs, it's too easy to rationalize that a machine is "good enough." Performance becomes inversely proportional to time available.

Second, you can improve efficiency by adjusting to a range of values rather than constantly twiddling for some magic value. If your specs are set properly, any value within the tolerance should produce results that you find acceptable.

Hardware

Look closely at your maintenance routine. If you spend a good share of your time hooking up cable or running around looking for your allen wrench, it is time to organize.

Keep one set of tools together with cleaning supplies and alignment tapes, just for preventive maintenance. Get allen wrenches and nut drivers with screw driver handles for each different type of adjustment screw, and mark them so you can grab the right one quickly.

Test cables should be planned so that a minimum amount of effort is expended switching from one device to another. The elegant approach is a roll-around test cart with a big connector on a cable that plugs into each room like the Volkswagen analyzer. If this is a bit too elaborate for your taste, at least make up cables that connect directly to your test equipment without clip leads.

Since most of your time is spent taking care of tape equipment, it's worthwhile to prepare efficient test tapes. When you have the opening announcement on the test cart memorized, you can probably dispense with that portion of the tape. Reel-to-reel test tapes can be put together on one reel to minimize the number of tapes you have to put up each time. Separate each cart, azimuth adjust, response, run, flutter test, etc. with generous chunks of white leader to make each section easy to find.

Using the data

If you review the results of your maintenance program from time to time, you can refine your system even more. You'll find some items that can be reduced to a less-frequent schedule and some that need closer attention. You'll know when to order replacement parts and even be able to determine when a machine should be replaced.

Give progressive maintenance a try. Chances are you'll find yourself with more time to work on fun projects and fewer spoiled weekends. □

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Calculating TV aural subcarrier modulation

By Dane E. Ericksen*

With more and more television stations employing aural subcarriers, the ability to accurately measure the amount of subcarrier modulation is a problem facing many chief engineers. This article will give a simple formula for accurately calculating subcarrier modulation using a spectrum analyzer.

FCC rules currently allow aural subcarriers from 20 to 50 kHz, with a maximum modulation level of 10%. Although there is no requirement to measure subcarrier modulation on a scheduled basis, all licensees are expected to take steps to insure that their subcarrier modulation does not exceed 10%.

Most television aural modulation monitors will not accurately measure subcarrier modulation, due to insufficient frequency response. If main-channel modulation is reduced

to zero while the subcarrier is present, the modulation monitor will indicate a residual modulation due to the subcarrier, but will show substantially less subcarrier modulation than is actually being transmitted.

However, if the subcarrier modulation can be determined accurately by some other method, it would be possible to note the relative reading of the modulation monitor, and use that relative indication for quick future checks of subcarrier modulation.

The frequency domain

One method of accurately measuring subcarrier modulation is to view the aural carrier in the frequency domain. This requires a spectrum analyzer and a knowledge of Bessel functions (see Figure 1).

Most stations can borrow, rent, or purchase a spectrum analyzer. The hard part is generally interpreting the significance of the display seen on the analyzer.

Therefore, the following formula should be of interest to the busy TV

chief engineer desiring to measure accurately his subcarrier modulation:

$$M_{\text{sub}} = \frac{8(f_{\text{sub}})}{\text{antilog}(\Delta\text{dB}/20)}$$

where

M_{sub} = subcarrier modulation in percent

f_{sub} = subcarrier frequency in kHz

Δ db = difference in dB between aural carrier and sidebands

This formula is accurate within 0.3% or better for subcarrier modulation levels of 10% or less. And, the error will always be on the conservative side (that is, the formula will show more subcarrier modulation than is actually present.)

The worst case approximation will be when the largest modulation index exists. The largest modulation index will exist when the lowest possible subcarrier frequency is used. Under these conditions the modulation index X equals 2.5 kHz

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*FCC Senior FM/TV Specialist, Western FM/TV/CATV Enforcement Unit, San Francisco

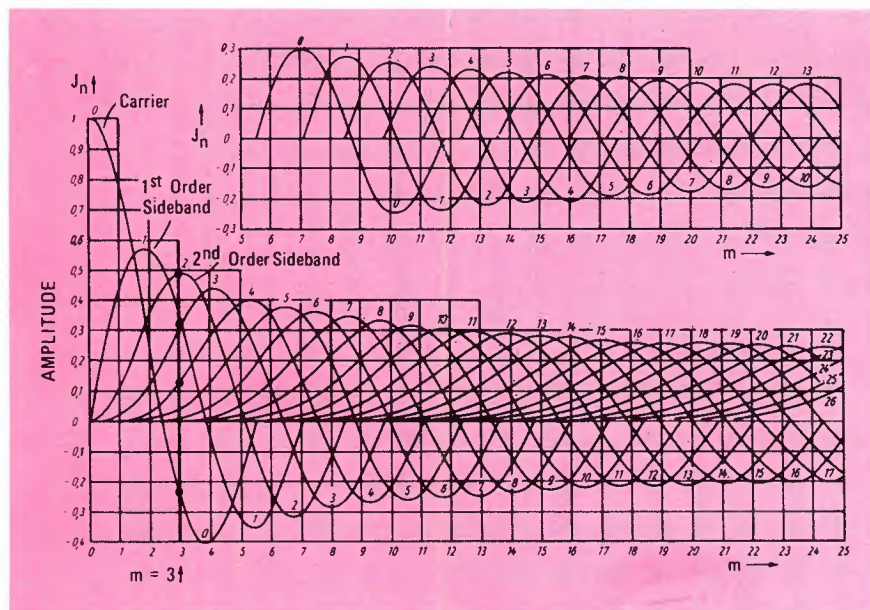


Figure 1 Graphs of Bessel functions of the first kind. Note that for small modulation indices, $J_0(x)=1$ and $J_1(x)=0.5x$. Also note that the higher order Bessel functions are insignificant. This is why there is only one pair of significant sidebands for very small modulation indices. (Courtesy of Hewlett-Packard.)

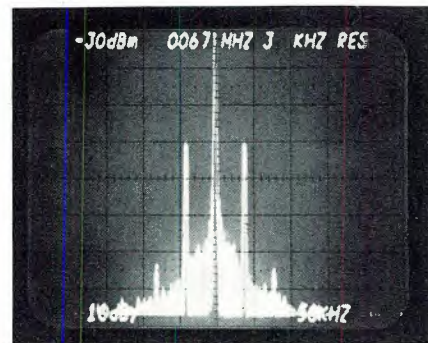


Figure 2 Frequency domain view of an FM signal, being modulated by a 39 kHz subcarrier at 10% injection. UHF stations can view their aural carrier at Intermediate Frequency (IF) rather than UHF, if their spectrum analyzer will not tune to their aural carrier. Frequency response of the IF stages must, of course, be adequate to pass all of the subcarrier energy or a problem similar to that of the poorly responding modulation monitor occurs.

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Calculating

continued from page 146

deviation (10% modulation) divided by 20 kHz (subcarrier frequency), or 0.125. For $X = 0.125$, $J_0(x) = 0.9961$ and $J_1(x) = 0.0624$. Then $J_1(0.125)/J_0(0.125)$ equals 0.0626, or -24.06 dB. If we place 24.06 dB into our formula, we get a subcarrier modulation level of 10.03% rather than 10%. This is an error of +0.3%.

Let us examine how this simple but accurate formula is obtained.

On the spectrum analyzer

What you see on your spectrum analyzer when you view your aural carrier with just the subcarrier present (that is, with main-channel modulation reduced to zero) is the aural carrier and two sidebands. The decibel difference between the aural carrier level and the level of the sidebands is mathematically equal to $20 \log_{10}(J_1(x)/J_0(x))$, where X is the modulation index and J_0 and J_1 are zero and first order Bessel functions of the first kind.

If you examine the first three terms of the power series for $J_0(x)$ and $J_1(x)$, you get the following equations:

$$J_0(x) = 1 - 0.25x^2 + 0.0156x^4$$

and

$$J_1(x) = 0.5x - 0.0625x^3 + 0.0026x^5$$

Since we are only interested in the values of $J_0(x)$ and $J_1(x)$ for small modulation indices (that is, for X less than 0.2), the higher-order terms are insignificant.

The actual power series defining $J_0(x)$ and $J_1(x)$ are:

$$J_0(x) = 1 - \frac{(0.5x)^2}{(1!)^2} + \frac{(0.5x)^4}{(2!)^2} - \frac{(0.5x)^6}{(3!)^2}$$

$$J_1(x) = 0.5x - \frac{(0.5x)^3}{1!2!} + \frac{(0.5x)^5}{2!3!} - \frac{(0.5x)^7}{3!4!}$$

You can approximate $J_0(x)$ by the constant 1, and $J_1(x)$ by the simple first order formula $J_1(x) = 0.5x$.

The ratio actually measured on the spectrum analyzer, $J_1(x)/J_0(x)$, can be accurately approximated by the simple formula $J_1(x)/J_0(x) = 0.5x$. But $J_1(x)/J_0(x)$ is equal to $1/\text{antilog}(\Delta\text{dB}/20)$, where ΔdB is the difference between the aural

carrier and the upper or lower sideband.

Solving for the modulation index X , you get $X = 2/\text{antilog}(\Delta\text{dB}/20)$. Once the modulation index is known, you can calculate the deviation of the subcarrier by multiplying by the subcarrier frequency. (Remember that the modulation index is defined as the ratio of the frequency deviation to the modulating frequency.)

If this is divided by 25 kHz (which is defined at 100% modulation for television), and multiply by 100, you finally obtain the subcarrier modulation in percent, or

$$M_{\text{sub}} = \frac{8(f_{\text{sub}})}{\text{antilog}(\Delta\text{dB}/20)}$$

Using this formula, you can see that for a 39 kHz subcarrier, the subcarrier sidebands as viewed on the spectrum analyzer must be at least 29.9 dB down for 10% or less modulation.

Remember that this formula is accurate only for small modulation indices, and for this reason main-channel modulation must be reduced to zero and gross subcarrier over-modulation ($M_{\text{sub}} > 20\%$) must not be present. □

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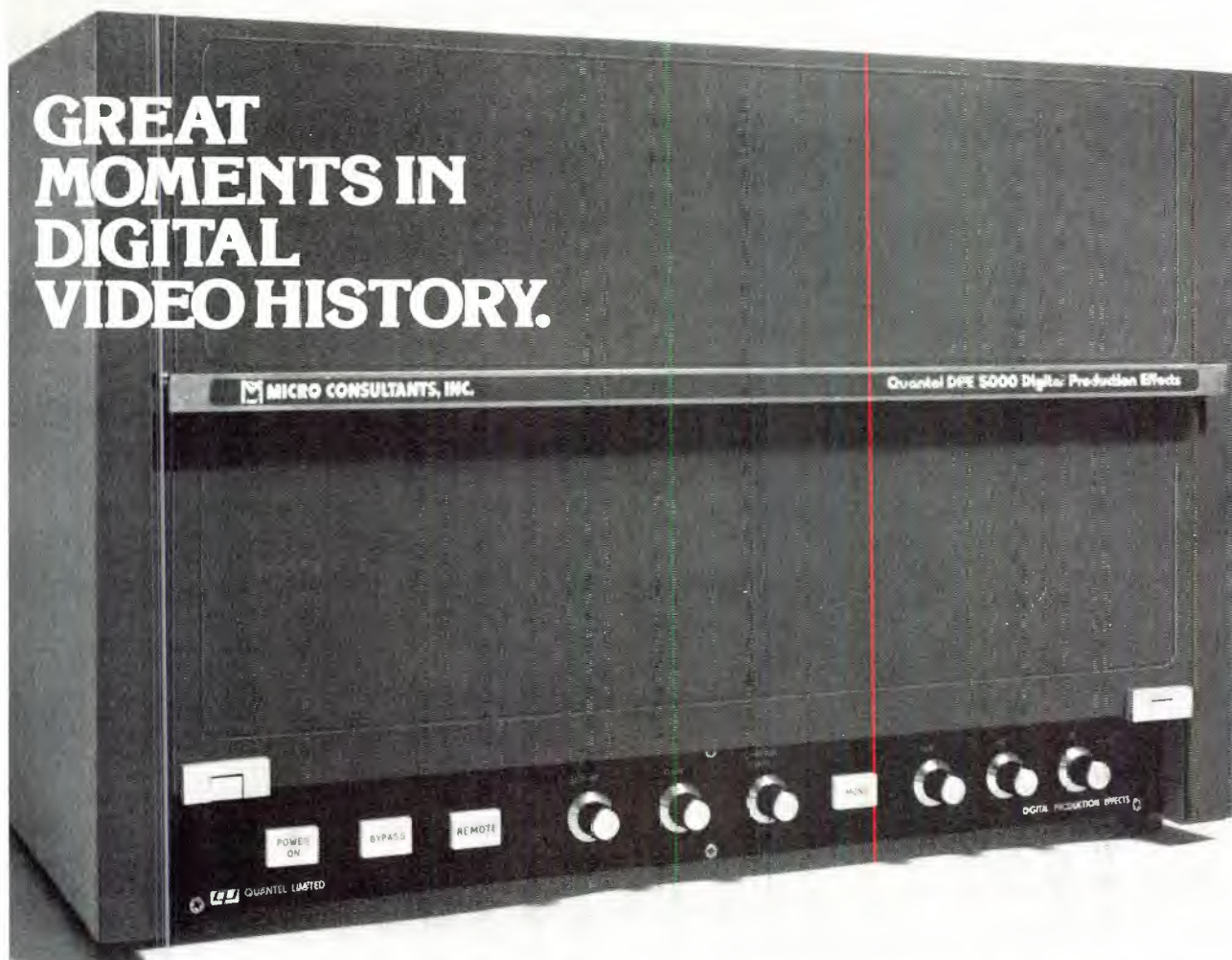


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Anatomy of a TV frame synchronizer

By R. S. Hopkins, Jr., RCA Corporation

The TV frame synchronizer, although a relatively new device, has already become familiar to most of us. There have been several papers introducing synchronizers, and they usually have dealt with the basic concept of a synchronizer and have described preferred system imple-

mentations. However, they have not, in general, discussed the internal operations of a synchronizer.

This article will take a closer look at the operation of a synchronizer, especially the memory. After examining the basic operation, we'll look at present synchronizer options

and describe what happens in the memory to make these special effects possible.

Synchronizer blocks

Figure 1 is a typical block diagram of a synchronizer. Three
continued on page 152

Figure 1 Block diagram of a typical TV frame synchronizer.

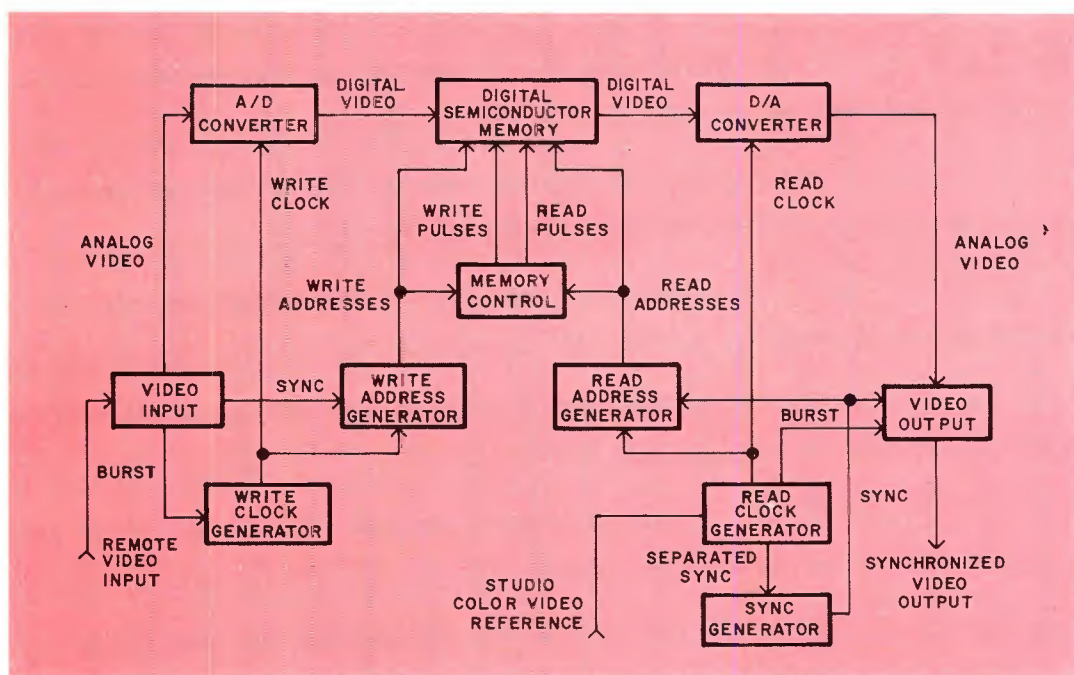
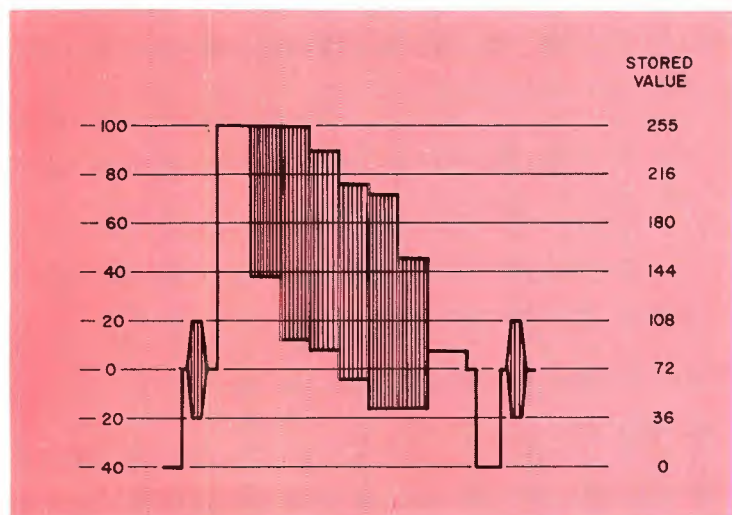


Figure 2 Color bars showing value stored in memory as a function of brightness level.



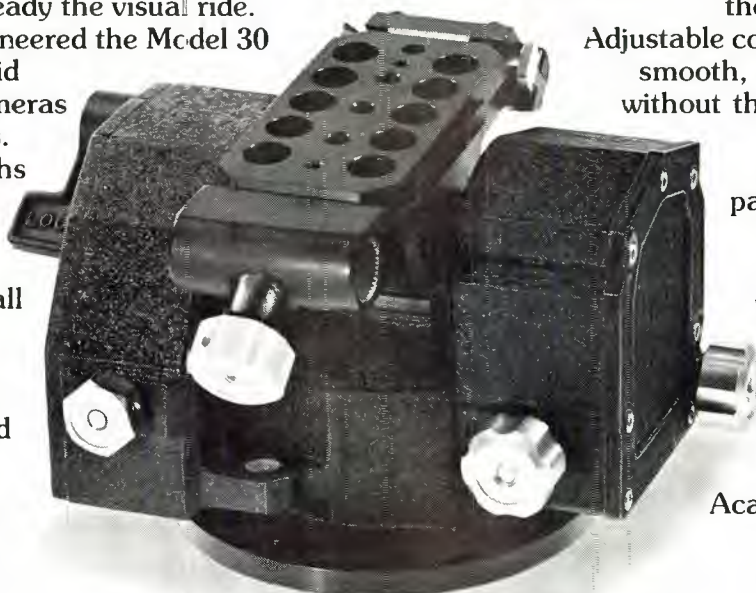
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Synchronizer

continued from page 150

video signals are shown: the remote video input, a studio color video reference, and a synchronized video output.

The remote input and the synchronized output are identical except the output is timed precisely with the reference rather than the input. The synchronizer has been described as a variable delay line where the delay is precisely that which is necessary to phase the output horizontally and vertically (including subcarrier phase) with the reference. This is accomplished by writing the input video in a memory and, after the proper delay, reading the video out of the memory.

The remote video signal is received by an input video processor whose primary functions are to clamp the analog video prior to being converted into a digital signal by the A/D converter and to extract sync and burst from the video signal. The extracted burst is presented to the write clock generator whose function is to provide a series of sampling pulses to the A/D converter for digitizing the video signal. The extracted sync (after processing) is delivered to the write address generator, enabling that circuit to generate unique addresses for storage of the digital video in the memory.

The studio video reference is received by a read clock generator whose function is to extract sync and burst from the reference video. The extracted sync is delivered to the sync generator which gen-locks to the reference video and delivers processed sync to the read address generator. The read address gen-

erator causes digital video to be read from the memory by producing the same sequence of addresses that was generated by the write address generator.

The read clock generator uses the extracted burst to generate a series of re-sampling pulses which are delivered to the D/A converter for purposes of converting the digital video signal back into an analog video signal. The output video processor accepts this analog video signal, inserts proper levels of sync and burst, and delivers the processed signal to the output terminals of the synchronizer.

The memory control is responsible for looking at the write addresses and generating a write pulse at the proper time, causing the digital video arriving from the A/D converter to be stored in the memory at the specified address. The memory control is likewise responsible for looking at the read addresses and generating a read pulse at the proper time, causing the digital video to be read from the memory at the specified address and then delivered to the D/A converter.

Memory operation

One frame of the video signal in the memory is composed of 393,216 picture elements stored as a discrete number. The discrete number refers to the brightness level. For example, the discrete value of 0 would be the blackest video encountered and the discrete value of 255 would be the whitest video encountered. All other numbers refer to some gray level. This is illustrated in Figure 2 with color bars.

To be able to store these 256 different values requires 8 bits of memory for each and every picture element. The entire memory then

requires 3,145,728 bits of storage. The addresses given by the write address generator specify the location in the memory into which each picture element will be placed.

To illustrate the address scheme, assume the address generators count from 1 to 393,216 in one frame, and that the address of 1 occurs at the beginning of active video in the odd field. In this way, the memory is "scanned" by using digital IC counters in exactly the same way a picture monitor is scanned by an electron beam.

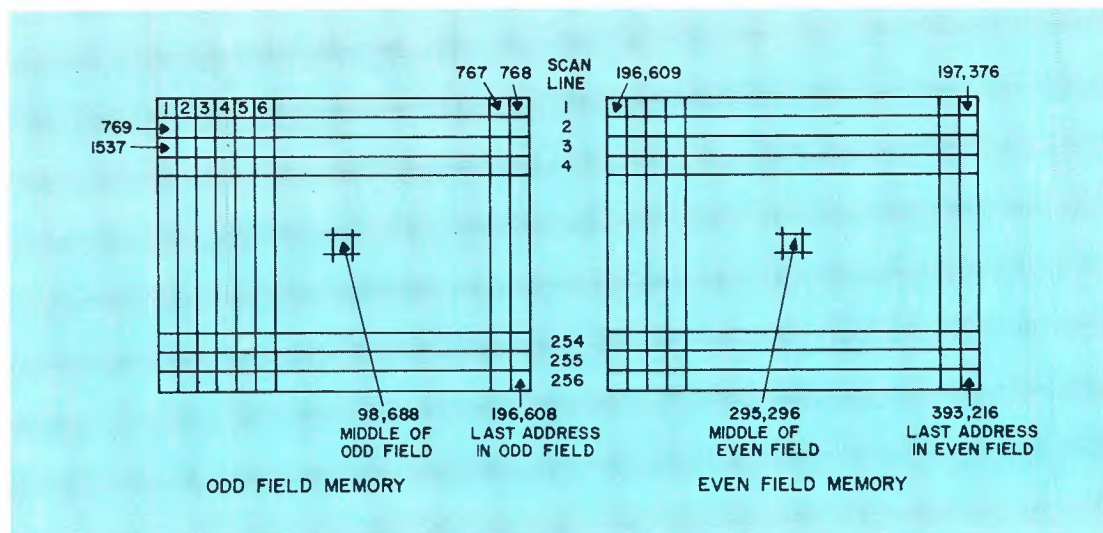
Figure 3 represents the memory storage of both an odd field and an even field. In this figure there is a one-to-one relationship between the scanning of a raster and the 393,216 addresses in the memory. The numbers on this figure are the addresses generated by the address counter. As the input video scans the raster, it is also scanning the memory except a number value is assigned to the brightness level of the video and that number is stored in the memory just as a number value is stored in a digital computer. Synchronization can then occur, because the stored numbers can be read from the memory after the necessary delay time has elapsed. The read address generator makes addresses for reading the digital video in precisely the same way the write address generator made the storage addresses, except these addresses are referred to the sync of the studio reference rather than the remote video.

Picture freeze

Once this frame of storage is available, there are other things besides synchronizing that can be done. For example, to freeze a picture it is only necessary to

continued on page 154

Figure 3 Correspondence between scanning raster and memory addresses for both fields. Each small box stores one picture element.





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Synchronizer

continued from page 152

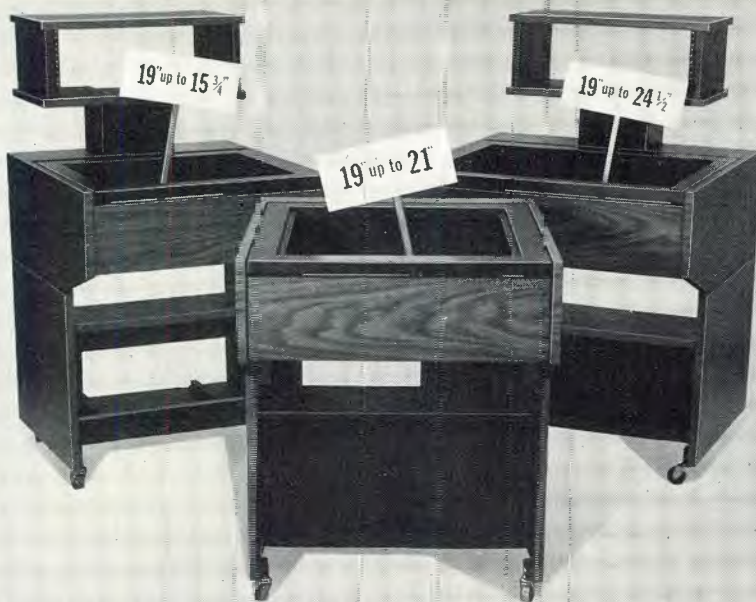
terminate the storage of new video in the memory. This is done by eliminating the write pulses from memory control that were forcing the memory to store new video. At the same time, however, the read circuitry continues to generate read addresses and read pulses. As a result, the output video will be the stored video repeated over and over until storage of the input video resumes. The stored or frozen picture will not deteriorate with time because the semiconductor memory can hold the stored numbers as long as desired in the same way a computer can hold stored numbers.

There is one detail that should be mentioned. When continually reading the stored numbers from memory during a freeze, because of the frame-to-frame color subcarrier phase differences, it is necessary to use a chroma inverter to have proper color phase. Figure 4 illustrates the necessary modifications of the synchronizer block diagram to accomplish picture freeze. A gate is used to interrupt the write pulses and at the same time turn on the chroma inverter during the fields designated by the read address generator. The chroma inverter could be either a digital chroma inverter or an analog chroma inverter.

A similar application of a synchronizer is to "clean-up" any non-synchronous switches of the input video. The typical synchronizer will have circuitry which constantly monitors the input video. If the sync of the input video suffers a sudden unexpected change, the memory control write pulses can be eliminated just as they were for picture freeze.

Once the input video circuits have been able to gen-lock to the new input, the write pulses will resume storing the digital video in the memory at the next vertical interval. During this time interval, the read pulses will have continued to read the digital video that was held in the memory. As a result, there is a synchronous vertical interval switch at the output of the synchronizer even though there was a non-synchronous switch at the input of the synchronizer. By detecting whether the non-synchronous switch occurred during the storage of an odd or even field and forcing the read addresses to specify only the opposite field, there will be no

continued on page 156



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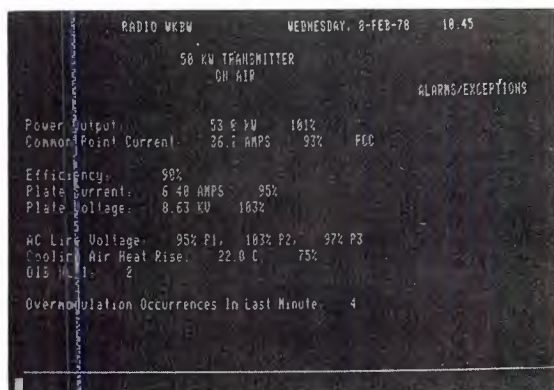
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Synchronizer

continued from page 154

visible tears in the output video.

The synchronizer can even perform as a super drop-out compensator as a result of its ability to handle non-synchronous switches. If the input video totally disappears, the write pulses will again be eliminated, causing the synchronizer to produce a frozen picture. When the input is re-established, the frozen picture will disappear and the live picture will continue. A situation like this occurred during the televising of the "Great American Celebration" from Baltimore when a microwave feed from San Diego was lost temporarily. Because a synchronizer was used at the receiving end, there were no break-ups in the picture even though the input was totally missing for a moment. Because sync and sub-carrier are referenced to the studio,

and because they are properly established at the output of the synchronizer, the only effect of a loss of input is the frozen image seen at the synchronizer output.

Picture compression

Picture compression is another special effect which can be done with a synchronizer. A simple way of explaining the technique of picture compression can be seen by again examining Figure 3. Suppose every other picture element produced by the A/D converter during the first scan line of the odd field is literally thrown away and the remaining picture elements are placed next to one another in the memory.

For example, the first picture element is placed in address 1, the second picture element is discarded, the third picture element is placed in address 2, the fourth picture element is discarded, the fifth picture element is placed in address

3, etc. Note that the first scan line of the input video will be located in the first half of the first line of the memory.

Suppose that the second scan line of the input video is completely discarded. The third scan line of the input video then is placed in the memory in a manner identical to that of the first scan line and in the memory locations normally occupied by the second scan line. This procedure is followed throughout the entire field; and, as a result, a smaller picture is stored in the upper half and the left half of the memory as shown in Figure 5. The picture elements in Figure 5a marked with an X are discarded and the remaining picture elements are stored as shown in Figure 5b.

If this stored data is read from the memory with the normal method, the original picture will have been reduced to precisely one quarter of its normal size. This

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Figure 4 Modifications to synchronizer block diagram to add picture freeze.

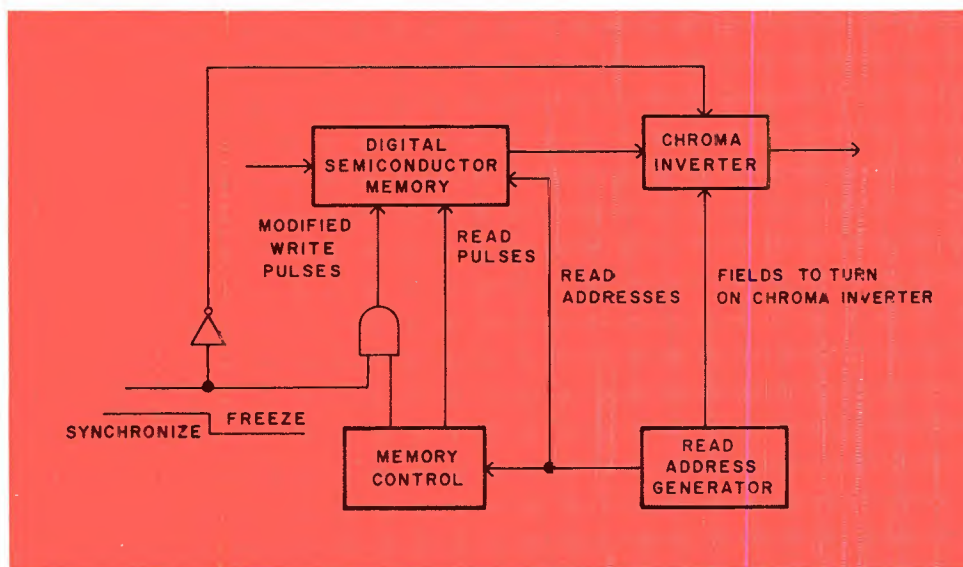
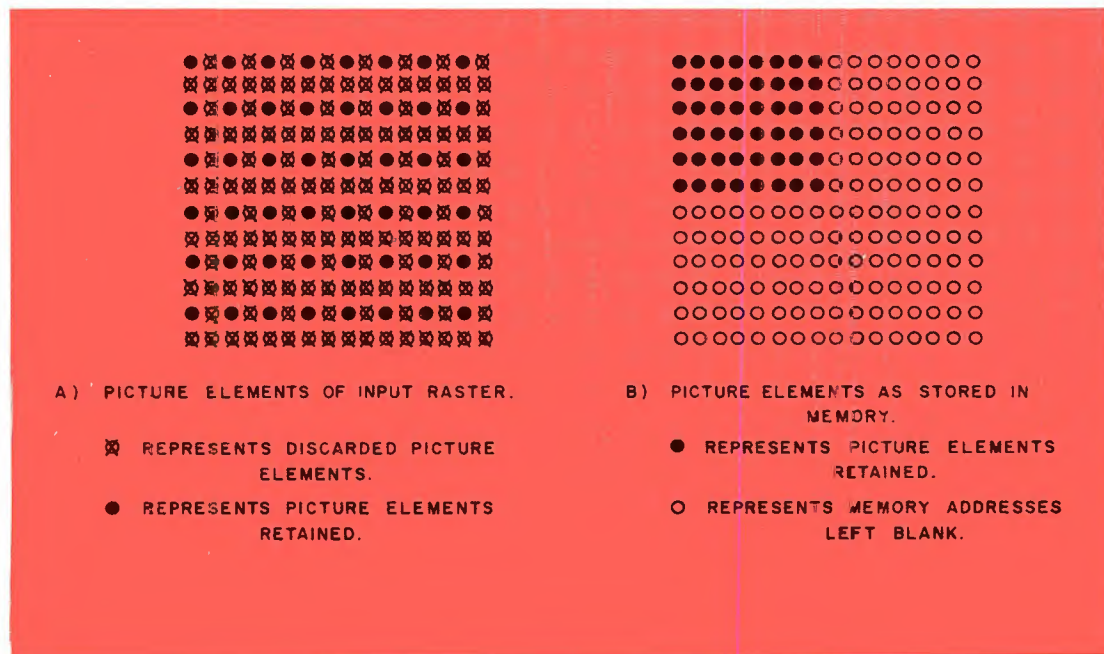


Figure 5 (A) Model illustrating picture compression where picture elements of the input are discarded. (B) Retained picture elements are placed next to one another in the memory.



The Added Dimension in TV Broadcasting

Broadcasting professionals know that the business or marketing value of their productions is ultimately dependent upon audience coverage. In this regard, industry leaders have been confronted with problems such as how to economically achieve total saturation of an existing broadcast target area, and how to extend the range of quality transmission without costly equipment purchase or modification.

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Synchronizer

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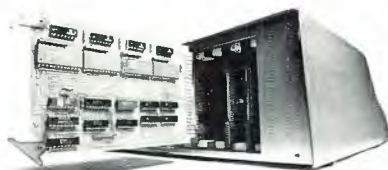
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technique does have some problems if implemented in the way described, however. This type of reduction would cause the color subcarrier to be lost. The resulting picture could also have considerable moire patterns. Procedures used to correct each of these undesirable effects are much too complicated to be described in detail in this article.

Correction of the moire patterns can be effected by applying digital filtering techniques to the digital video signal. Rather than discarding picture elements as described earlier, they are used to find average values of the video; the resulting average values are stored in the memory. To eliminate the loss of color subcarrier, the digital video can be decoded into its Y, I and Q components prior to averaging, and then re-encoded. An alternative method is to average picture elements having the same phase of subcarrier. In this latter case, the subcarrier is automatically retained.

Picture positioning

Referring again to Figure 3, the relative ease of moving a picture around the TV raster, and even completely off the raster, can be seen. Normally, video of the odd field is stored with the top edge of the picture in addresses 1 through 768. Likewise, the left edge is stored in addresses 1, 769, etc. In other words, the top left corner of the picture is stored at the top left corner of the memory.

However, the top left corner of the picture could have been stored at the center of the memory. In this case the picture element normally stored in address 1 is stored in address 98,688, the center of the memory. The picture element normally stored in address 2 is stored in address 98,689, etc. This would cause the top left quarter of the picture to appear in the lower right quarter of the output video picture. In a similar manner, the top left corner of the picture can be stored at any point in the memory. Or, the top left corner could be moved off the top of the raster, or off the left of the raster, or any combination.

By using a conventional positioner to specify the desired location of the picture, the normal address given by the write address generator can be modified in such a way that the picture can be moved around in the memory to any desired location. By generating a keying signal timed with the picture location, and using

this key as the external key input to a production switcher, any other synchronous picture can be inserted into the area vacated by the synchronizer picture.

In describing picture compression, the first picture element of the odd field was placed in address 1. By using the positioner, this address can also be modified to cause the compressed picture to appear at any desired location on or off the raster. In this case the keying signal is timed with the picture location and size.

This effect is one which is possible only since the advent of synchronizers. Now, rather than wiping from one signal to another, a full picture can be moved off-screen in any direction unmasking another picture that was hidden behind the original picture. In the same way, a picture can be moved from off-screen over top of the original picture. This new picture can be brought on-screen from any desired location.

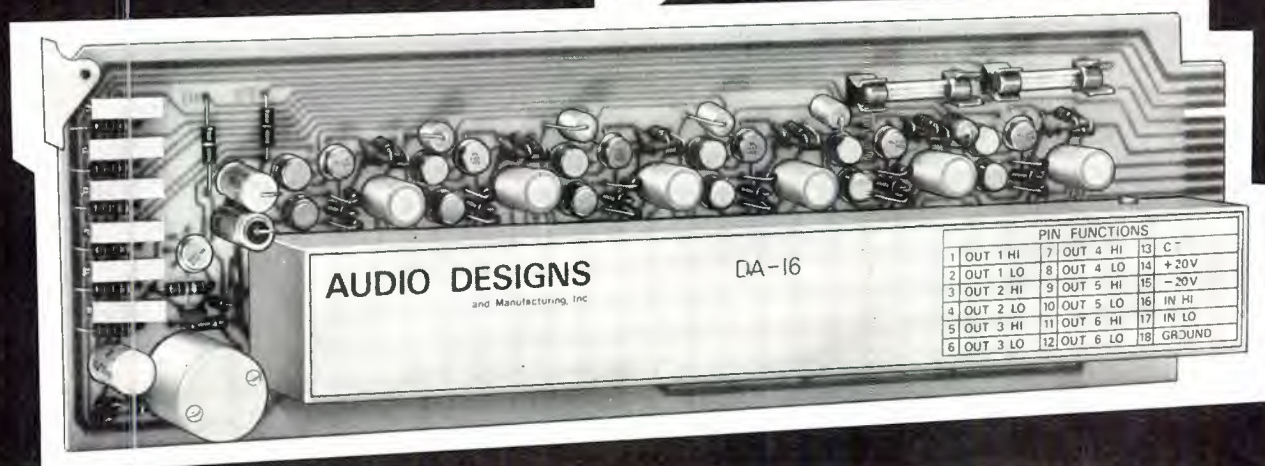
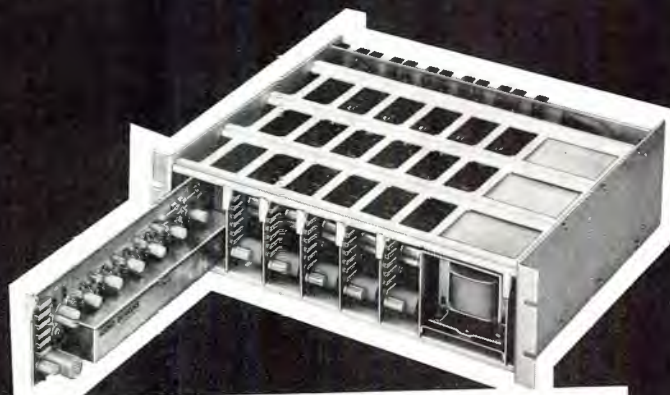
Summary

Each of the effects described was accomplished by modifying the normal sequence of writing the digital video into the memory. For picture freeze, the writing of digital video was stopped. For picture compression, the digital video was averaged and some picture elements were deleted before writing data into the memory. For picture positioning, the write addresses were modified with a positioner. In each of these cases, reading data from the memory was not affected except for the use of a chroma inverter whenever data storage in the memory was stopped.

In the short time that synchronizers have been with us, we have already seen great changes occur. The latest synchronizers are one-tenth the size, one-tenth the weight, and consume one-quarter the power of the earliest synchronizers. The synchronizer was originally made possible by accomplishments in digital integrated circuit technology. As that technology has advanced, it has made possible the great changes we have seen in synchronizers.

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THE QUAD-SPLIT: **Bringing artistic control of film to videotape**

By Ron and Susan Whittaker

"I hated videotape. I never wanted to work with it, but I was forced to." These are the words of Danny Arnold, a Hollywood film and television director with a long list of impressive credentials, including the hit comedy series, *Barney Miller*.

These negative sentiments toward videotape are shared by many film directors. However, in the case of Danny Arnold, when network requirements forced him to go to videotape, he decided not to abandon his basic film approach—an award-winning approach developed over 18 years as a successful film director. What was needed was a way of bringing the precision and creative control of film to the medium of television.

"As someone who had grown up

continued on page 162

Danny Arnold is an accomplished producer, director, writer and actor with 18 years of film and television experience. His credentials include such popular series as *That Girl*, *Bewitched*, *The Real McCoys*, *The Wackiest Ship in the Army*, and *My World and Welcome To It*. The latter series won him an Emmy in 1970. Arnold is currently producing *Barney Miller* and *Fish*, and he recently signed an exclusive contract with ABC for several feature films, series pilots and mini-series.

Since he does his directing right in the studio, it is easy for Danny Arnold to step into the *Barney Miller* set and walk through a sequence with the actors. Taping sessions may extend up to 18 hours for a single, 30-minute show. However, the fatigued looks (so evident here) will quickly disappear when Arnold rolls the five tapes for another "take." (All photos by Ron Whittaker.)

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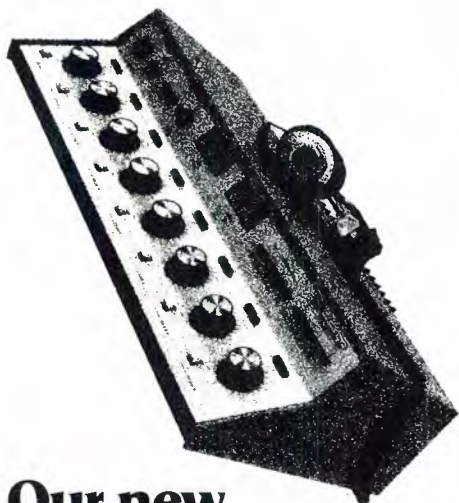
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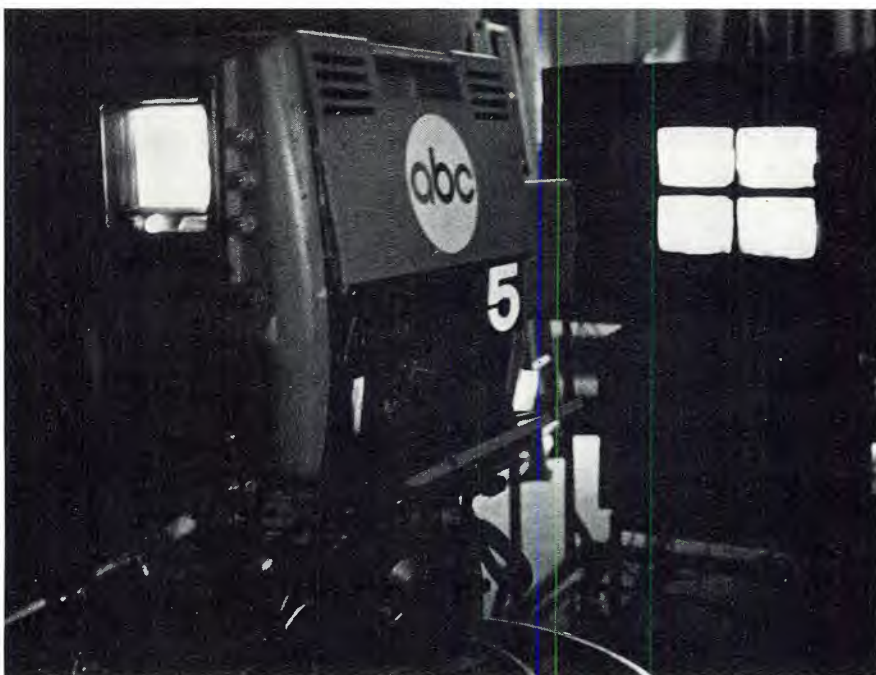
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For the "quad-split" system, the images of four color monitors representing the four studio cameras are taped with SMPTE time-code information by means of this camera-monitor set-up. Since all edit decisions are made in post-production from the quad-split record, total editing control can be retained throughout the post-production phase.

Quad-split

continued from page 160

in film as a writer, actor, and cutter, I knew that pictures could be made or destroyed in the cutting room. Given the script and cast, and assuming that everything you get on film is good, from then on you are at the mercy of the cutter. A bad cutter can kill you; a good cutter can save a picture, even if it's not as good as it should be.

"I have always been in film and been used to the editorial control it allows, investing a lot of time in the script, and investing a lot of time in the actors.

"I was used to cutting the picture in my head as it was shot with a film camera. That way I knew exactly what to expect when I got to the cutting room; I knew exactly where I could control a performance; I knew exactly how I could control a scene. So the editing phase has always been important to me."

But it wasn't only the editorial control that Arnold wanted. True to his reputation as an artistic perfectionist, he wanted a better "look" from videotape.

"Most tape shows have a really shallow look to them. You don't get a great deal of depth because of the flat lighting; you don't have any real dimension.

"The sense of immediacy as-

sociated with the tape image that a lot of people liked was worthless to me. I wasn't doing sketch comedy where all that was necessary was to throw a lot of light on a scene and listen to the jokes. I wanted to create a sense of reality, and tape looked totally unreal to me.

"Then I found one man, George Dibie, who had spent a lot of years trying to translate film values to television by using cross lighting and so on. We did things that nobody else would do with lighting. Nobody else would do them because economically it was crazy (with all the extra time and effort involved). Nobody went into tape to be artistic. If you wanted to be artistic you used film. I was forced into it (tape) and I decided I would bring the artistic values of film with me."

And so Arnold hired George Dibie, one of Hollywood's well-known lighting directors, as a lighting consultant. Dibie brought the artistic control of "film lighting" to videotape. (In a future **Broadcast Engineering** article Dibie's approach to television lighting will be examined.)

The quad-split system of editing

To achieve total control in post-production, Arnold went to a system

continued on page 164

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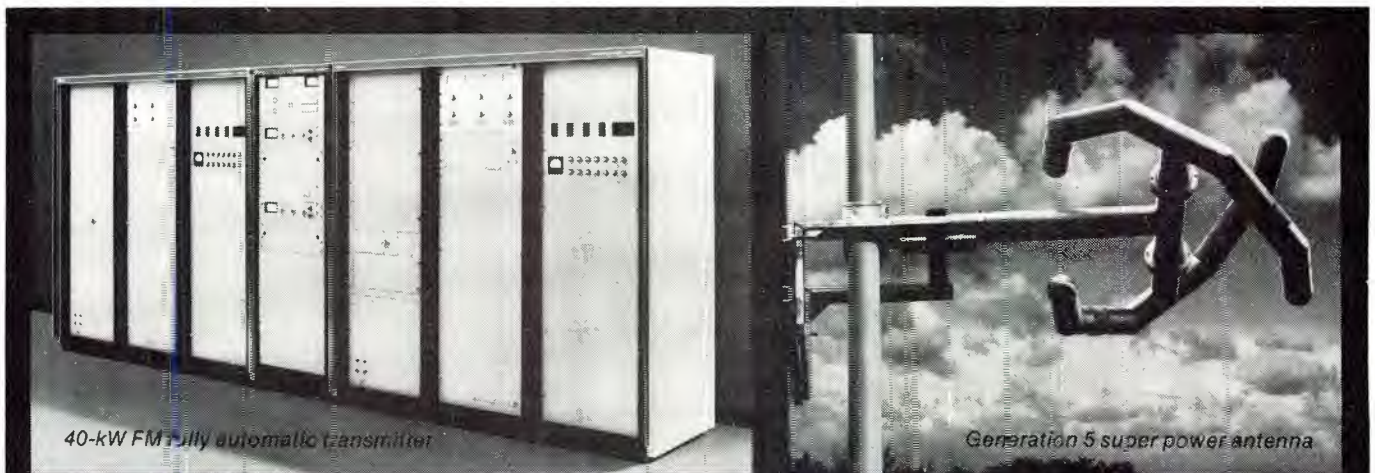
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Quad-split

continued from page 162

he calls "quad split." This is a far more costly process than the "switch feed" method generally used in television production.

The system uses five color cameras. Four are used on the set; and, one is used to record a cluster of four monitors, displaying the output of the four studio cameras. (See Figure 2.) The outputs of all five cameras are individually recorded on 2-inch videotapes with common SMPTE time code.

To move to this system, Arnold's Four-D production company initially had to invest \$100,000 in new hardware. This included a special computer editor built by Datatron and three, 1-inch tape machines.

It would probably be easiest to explain the quad-split system by tracing a typical production session of *Barney Miller*, as observed by the writers. The setting is the ABC studios on Vine Street in Hollywood. It is Friday morning—taping day. The whole week has been spent in rehearsing and blocking to prepare for what may well be a grueling, 18-hour shooting session. (There aren't too many crews with the dedication required to keep going for 18 hours for a single, 30-minute TV show. Arnold's crew is one of the best and most dedicated.)

With the studio crew and the

actors (and actress) in place, Arnold walked out into the studio and sat at a director's chair in front of a bank of four, 21-inch color monitors. Why wasn't he in the control room "calling the shots?" Because the outputs of all the cameras were being recorded anyway, and all editing will be done in "post-production" (if that term is still valid).

The director-in-the-studio approach is obviously "film," and it affords the creative control of a director working directly and personally with both cast and crew. Arnold is probably the most demanding director in television today. (It is said that one top star even offered to reduce his normal fee, just for the opportunity of working with him.)

During the course of the day's taping, the writers saw Arnold repeatedly redo short segments, sometimes 20 or more times, to draw out the most precise and subtle nuances of meaning in performances. Arnold's perfectionist approach to directing means that shooting ratios will sometimes reach an incredible 100-to-one: 100 minutes of 2-inch videotape recorded for every one minute used. For up to 18 hours, five, 2-inch quad tape machines are repeatedly started

continued on page 166



Homer Powell, editorial supervisor for the *Barney Miller* series, is shown editing a segment of the series using the quad-split technique. (Note the four images and time code on screen.) Powell, who has been a film editor for 35 years, received an Emmy nomination last year for his work on *Barney Miller*. With the quad system, according to Powell, "We are working to achieve the classic motion picture technique with videotape."

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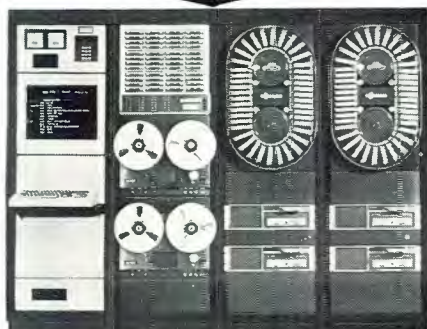
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Quad-split

continued from page 164

and stopped, as each segment is re-shot until Arnold is satisfied.

When he does see a successful take, Arnold has his assistant log it for Homer Powell, his editorial supervisor (see Figure 3).

Finishing at 5:30 a.m.

It is not unusual for the cast and crew to finish taping in the wee hours of the morning, as they did during the session observed.

Post-production begins with all five sets of 2-inch tapes being dubbed down to one inch for post-production work. This dub-down is done so that Movieola-style editing control is possible.

"The way I shoot a show, the cuts are obvious in terms of which camera to use when. I have a supervising editor, Homer Powell, whose instincts are excellent. Homer and I have been friends for 35 years. We have worked together on a lot of shows. And when I shoot something, he knows what I want, and he knows what I'm going for.

"Homer will put up the chosen quad splits of that take, and he will choose the particular camera shot

and put together the initial assembly...and I'll take a look at it. Then I'll say to him, 'You used the wrong camera here. I want a master shot or a single shot here. Tighten this up, etc'."

By using both the quad-split record and the individual tapes from each of the four studio cameras, Power can assemble a 1-inch version of the show and log the time codes on each of the more than 200 edits in a typical show. (It is important to note here that Powell won an Emmy nomination last year for his editing on *Barney Miller*.)

"Once we put the first cut (version of the show) together, the only time we have to go back to the quad splits is if we are unsure of a sequence and we need to go back and see all four cameras at once. What we are doing, in effect, is replacing the four-headed Movieola."

Once Arnold is satisfied with the 1-inch version of a show, Powell uses the SMPTE time codes to have punch tape cut for the final 2-inch editing.

continued on page 168

By directing in the studio instead of the control room, Arnold is able to maintain direct, personal control over both cast and crew. Arnold, a perfectionist from the Hollywood film tradition, will often shoot a short scene dozens of times before he is satisfied. Shooting ratios have reached 100:1.



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Quad-split

continued from page 166

Film vs. tape in post-production

What is it like for a veteran film director to change to videotape? Well, first of all, Arnold misses the physical contact with film during editing—the visible image you can hold in your hand and examine. And then there are the relative editing times involved with each approach. Arnold was asked about this during a brief break for supper.

"Post-production time in film was faster, but the overall time is probably the same because with film we had to wait for prints. Now tomorrow we'll have these tapes. It used to be two days for the dailies and four days for the answer print. But actual cutting time is less (with film) because physically...you're not always programming computers. We could cut the average film show...in 40 hours. We have taken as much as 160 hours for a tape show. In all, we take a good two weeks from the time we finish shooting to the time we ship the show."

What about comparative cost? "In some cases it (the quad-split approach) costs less than film, in other cases it costs more. It cost more in the beginning because of my initial investment (for hardware). If I had gone off the air after the end of 13 shows, it would have been a disaster. I now have a \$400,000 investment. But with Barney Miller, Fish, and my upcoming projects, I can amortize it and be ahead."

What about the advantages of the quad-split method over the switch-feed method? The primary advantage rests in precise creative control over the moment. "With the switch-feed system, 80% of the show is assembled at the time of the taping. Most of these shows will have only one isolated camera for backup. It isn't possible to easily and effectively change the timing of a cut, once the decision is made in the control room." According to Arnold, "The switch-feed cannot handle the fine editing that is needed for subtle performance and the relationships between many characters...within a given story."

So it appears that Danny Arnold and his quad-split method of editing may bring to videotape much of the precision and artistry traditionally associated with film. Although expensive and time-consuming by television standards, the Arnold approach appears to represent a meeting point between the film and tape traditions. □



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station- to-station

Gated external VITS insertion for Tektronix 147A

By Seth Davis, Engineer, KAKM-TV, Anchorage, Alaska

At KAKM we wanted to operate our Tektronix 147A Test Signal Generator (VITS inserter) in the process mode where it would regenerate sync and burst on the incoming signal. However, to comply with the FCC rules we also had to

insert an external VITS signal on Line 17, Field 2 (color bars). (The 147A does not generate the bars signal.) When this was attempted, we found that we got double amplitude horizontal sync. The 147A

continued on page 172

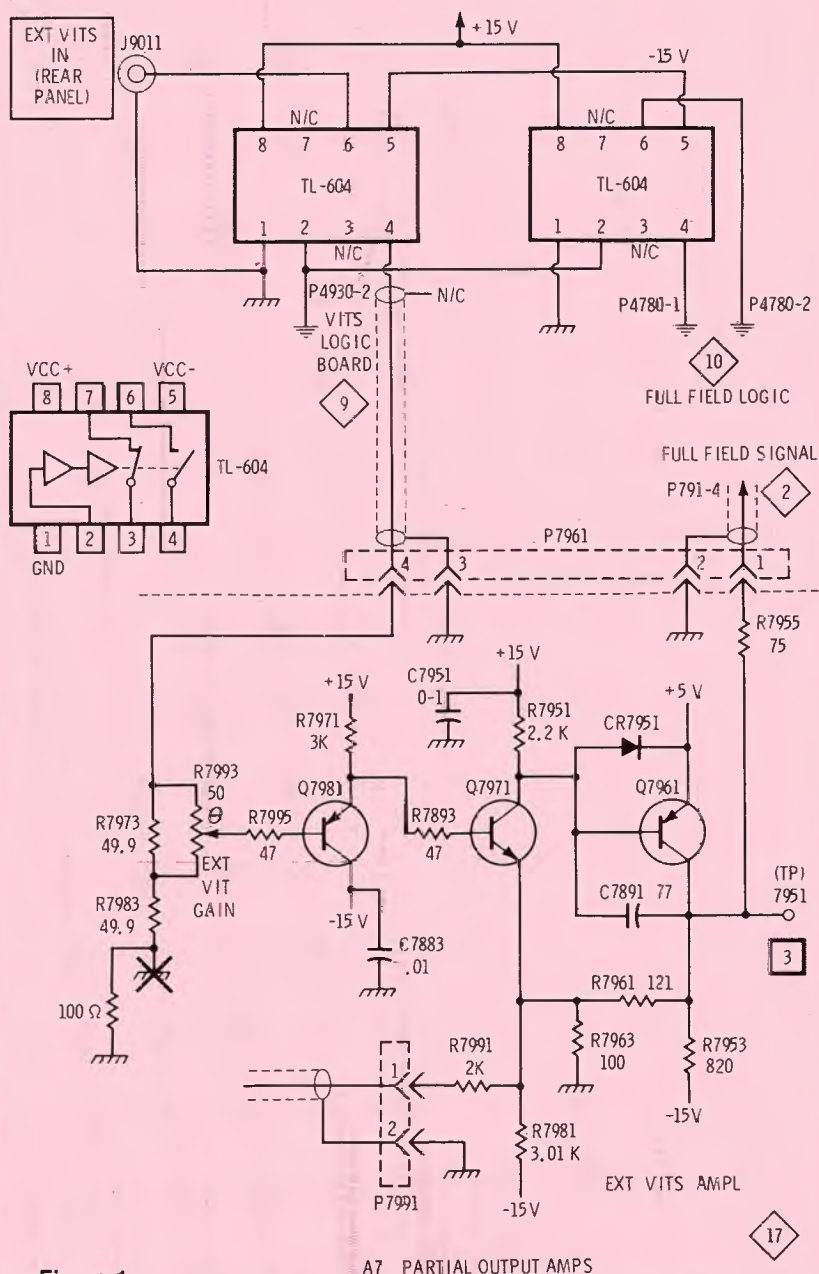
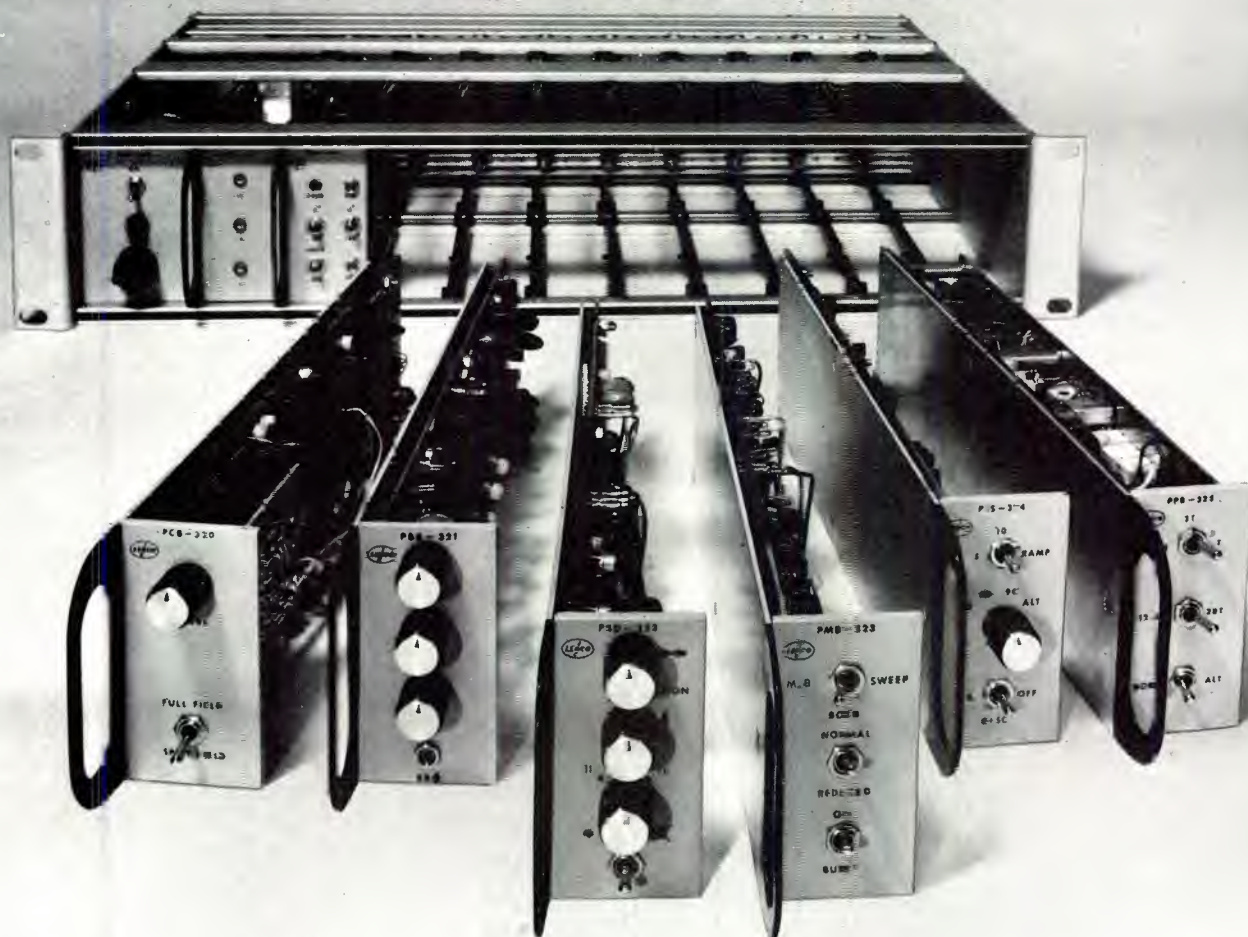


Figure 1

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was adding the external VITS sync to its internal sync.

A solution was found with the help of a suggestion from Fred Seitz and David Walters of Tektronix. A modification of the external VITS amplifier and the addition of two ICs solved the problem.

We used the Texas Instruments' TL604 P-MOS analog switch to gate the external color bar signal to the 147A. As shown in the diagram, the only modification to the Tektronix 147A output amplifier (A7) is the addition of a 100-ohm resistor in series with the input to match the 100-ohm series impedance the TL604 switch adds to the circuit.

Power to the switches is found within the 147A by using the +15V and -15V supply. The second switch is used to turn off the regenerate sync/burst mode when the external color bar signal is gated to Line 17, Field 2 (to avoid double amplitude sync on that line).

To turn off the regenerate mode, it is necessary to short pins 1 and 2 on P-4780 on the VITS logic board. As shown in Figure 1, the logic pulse to do this is the same as the one to gate the other switch (from P4930-2). The two ICs were mounted in one 16-pin DIP socket so that the common signals, +15V, -15V, logic pulse, and ground could be easily jumpered together for ease of installation.

Although we use these switches to put color bars on Line 17, Field 2, any video signal (FCC legal, of course) could be inserted on any vertical interval position by proper programming of the 147A. This modification will also work with the Tektronix 149A. The Texas Instruments' TL604 switch also could serve a variety of other switching applications in the television system. It is capable of switching or routing any analog signal (up to $\pm 10V$) from a TTL or similar logic source.

Change-over ideas

By Jordan Roderick, WDCR/WRFD-FM, Hanover, New Hampshire

Multiple-studio operation in many stations means a lot of patching. So it was with WDCR and WRFD. With three studios and two stations, the collection of disasters related to inter-studio patching was almost humorous: anything from creating a main channel of left minus right, to going off the air altogether could (and did) happen. By the summer of 1976 it was clear that the time had come for a change-over system.

Number one on the list of speci-

cations for the system was that it should be as inexpensive as possible. Depending upon your requirements, costs can be anywhere from \$1.50 to \$3.00 per crosspoint.

Second, the change-over must be reliable. It must be able to withstand the staff, power failures, voltage surges and temperature changes. Should it fail, however, it must be easy to understand and repair. Downtime on a piece of equipment that routes all your audio

continued on page 174

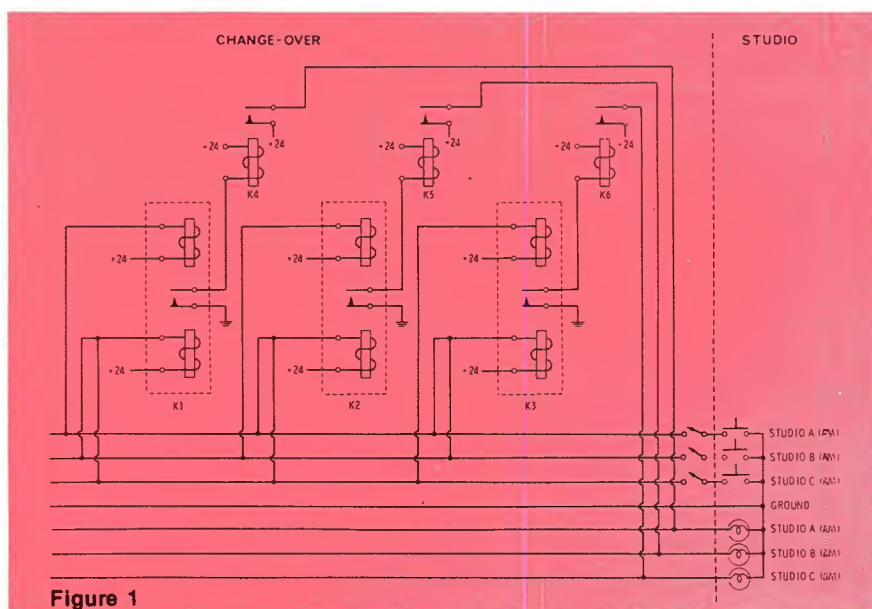


Figure 1

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Station-to-Station *continued from page 172*

and control lines to the transmitters has to be kept to a minimum.

Finally, the system has to be easy to use or you are right back where you started from.

There are no commercial switchers that meet these criteria for the signals we wanted to route, so we built our own. In each studio there are six lighted buttons. The lights constantly display which studios are on which stations. If you want to change, just hit one of the buttons.

The circuitry is quite simple. A series of magnetically latching relays, K1-K3 in Figure 1 (which shows only the control circuitry in the AM portion of our change-over), are energized by the change-over

buttons in the studios. These hold the crosspoint relays (K4-K6) closed. The actual bridging is done by the crosspoint relays.

Transmitter control and metering, audio, the change-over lights, EBS-send control, and whatever else you can think of can be switched. Your imagination and the number of spare relay contacts are the only bounds to what can be done.

In one and a half years, our change-over has been down only once (it was hit by lightning). It has never made a mistake. Our system has become an integral part of the station's operation, for it allows us to use the full flexibility of our facility.

A better talkback system

By Ernie Dachel, Chief Engineer, WOBL Radio, Oberlin, Ohio

The various manufacturers of audio consoles have devised several methods of building a talkback facility into their products. Unfortunately, many of those schemes exhibit drawbacks which make them less than ideal.

In some, the level of cue audio transmitted to the remote site depends upon the setting of the control console's monitor volume control. In others, several switches must be activated in order to contact the remote site. And, in those which make use of the console's cue speaker as a talkback microphone, the quality of the talkback audio may be unintelligible.

The simple system shown in Figure 1 inexpensively gets around many of these drawbacks while at the same time offering several advantages. It consists of two small audio transformers, one repeat coil, two potentiometers, one multiposition switch, one fixed pad, and a Shure M63 equalizer. The equalizer is not essential; any line amplifier of sufficient gain can be used, although it should have a couple of high impedance inputs and a 600-ohm line level output. The equalizer function is helpful in cleaning up the sound of the incoming remote audio.

Here is how it works: With the switch S1 in the "Mid" position, incoming remote audio is coupled from the telephone voice coupler to input #1 of the equalizer through contacts S1-d. The equalized and amplified audio is taken from the output and coupled to the console input through contacts S1-e and the fixed pad. The pad is used to reduce the +4 dBm level of the output to a

level comfortable to the console input.

When the switch S1 is moved to the "Down" position, the output of the equalizer is connected to the voice coupler through contacts S1-d; and, a sample of "air" audio from the modulation monitor (or some other non-varying source) is switched to input #2 through contacts S1-c. This, in effect, "turns the system around" and feeds "air" audio at a +4 dBm level to the remote site. Pot R2 is used to vary the level of the "air" audio into the equalizer.

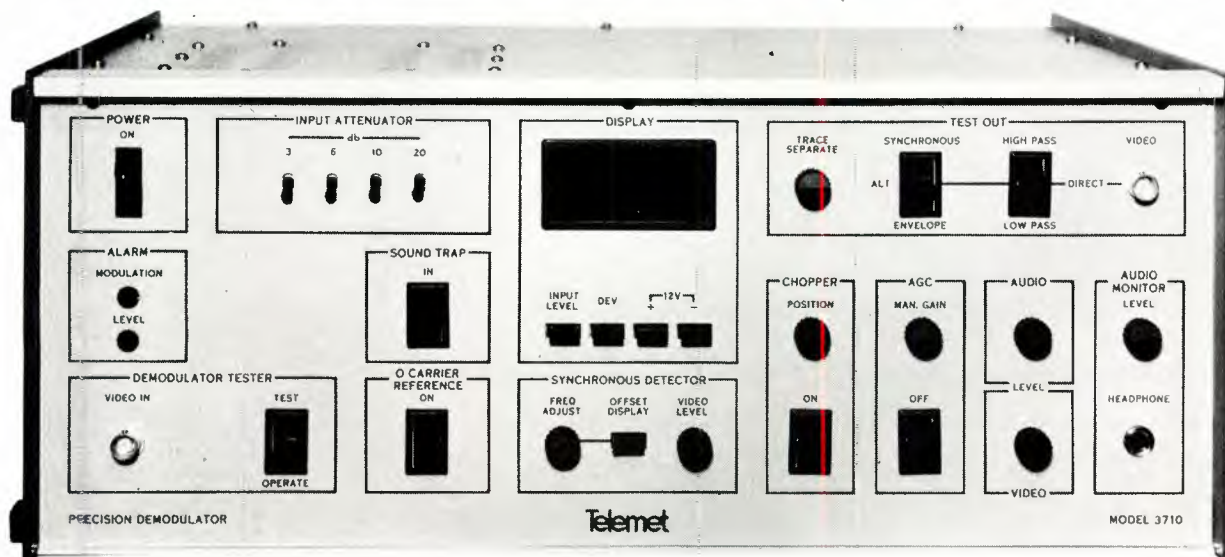
In the "Up" position, the output of the equalizer is again connected to the voice coupler, this time through contacts S1-b. However, in this mode the input #2 is coupled to the output of the control room microphone preamp through contacts S1-a. The "Up" position is a spring return position and allows the board operator to talkback to the remote site. R1 is used to vary the level of the microphone preamp output to the system input.

In operation during a remote telephone broadcast, the switch would be in the "Mid" position and the equalized remote audio would feed into the console input and onto the transmitter. Normally, during a commercial break, while spots are being played at the station, the switch is in the "Down" position; thus operators at the remote site can hear the spots. When the feed stops they know they are back on the air.

If the board operator wishes to talk to the remote personnel, he or

continued on page 176

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Station-to-Station *continued from page 174*

she waits for a commercial break then puts the console pot into "cue" and raises S1 into the "Up" position. Now, by talking into the control room microphone the remote site can be contacted. Releasing the switch to the "Mid" position allows the board operator to hear the remote response in the console's regular cue system. When the commercial break is over, the switch is left in the "Mid" position and the console pot is brought back up to its normal setting. If talkback isn't necessary during a break, the switch needs only to be moved from "Mid" to "Down" and then back to "Mid." The console pot can stay at

its previously established level.

Aside from the fact that the system can simplify the board operator's job during a remote, it allows the remote site to monitor during all commercial breaks, news-casts, etc. This can be reassuring to remote personnel, for if they don't hear the cue feed during a spot break, they merely hang up the phone and redial. This means if you are out of your station's range and your line is disconnected, the remote will be lost only for the time between breaks at the longest.

The system has performed perfectly during our many long-range out-of-town sports broadcasts.

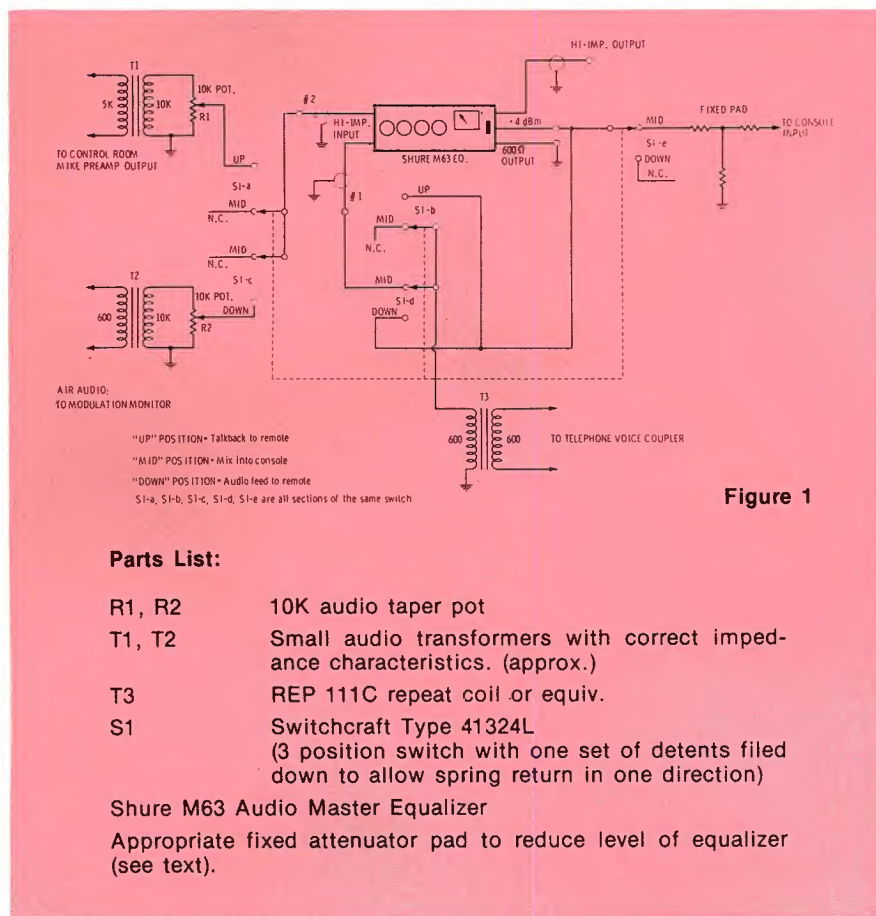


Figure 1

Parts List:

- | | |
|--------|---|
| R1, R2 | 10K audio taper pot |
| T1, T2 | Small audio transformers with correct impedance characteristics. (approx.) |
| T3 | REP 111C repeat coil or equiv. |
| S1 | Switchcraft Type 41324L
(3 position switch with one set of detents filed down to allow spring return in one direction) |

Shure M63 Audio Master Equalizer

Appropriate fixed attenuator pad to reduce level of equalizer (see text).

Disabling the cue tone generator for quick edits

By John Eppler, WCNX, Middletown, Connecticut

Disabling the cue tone generator in the Tapecaster X700-RP cart recorder is used in our news studio for quick edits. It allows the newsman to dub reel-to-cart and edit at the same time.

To modify the X700-RP:

Add a 10K, 1/2-watt resistor to the main relay control board at terminal #16. There is adequate room on the edge of the board for the resistors.

Connect that 23.5V supply point to the base of TR-12 on the record board, through a dpdt toggle switch which may mount on the front panel.

Other contacts are used to power a hi-brightness LED mounted under the toggle switch; a reminder to the production person that he is in the "edit" mode.

continued on page 178

“C'mon guys, you really didn't think we'd miss the 1978 NAB did you?”

Frankly, 1977 was not one of our better years.

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And our introduction of the new IVC 1070 VTR has brought to the industry an extraordinary new production recorder.

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We'll see you at the NAB in Booth #741.

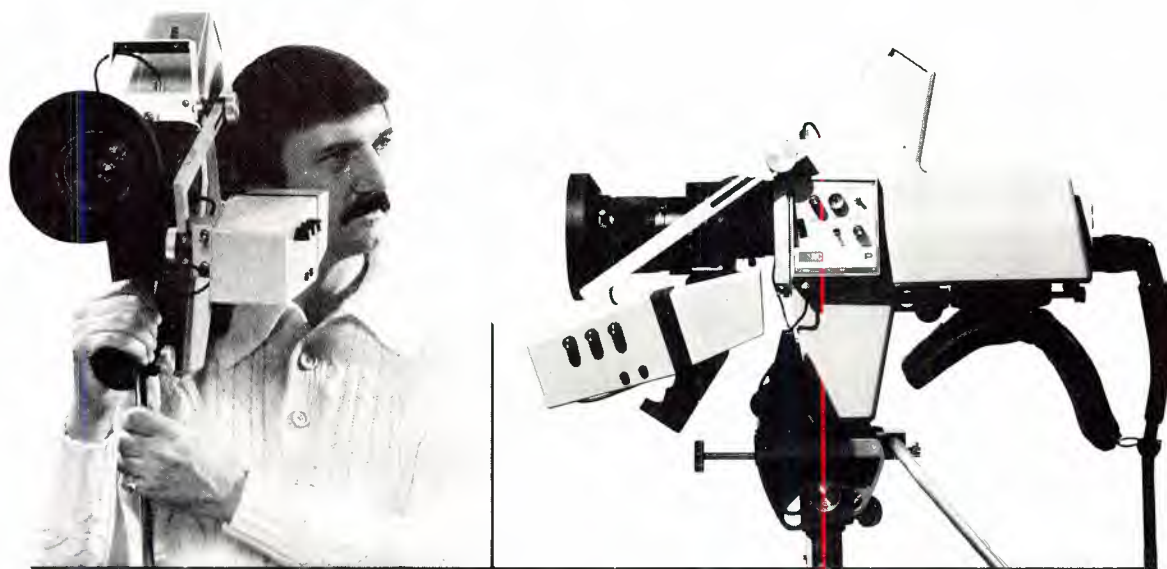
Last brief comment: This is one NAB we're really looking forward to.



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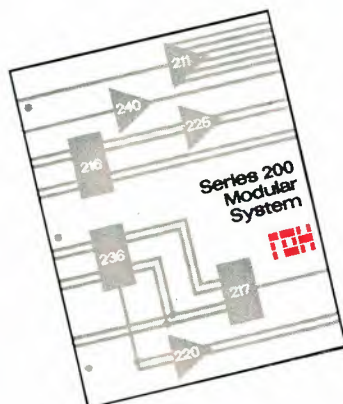
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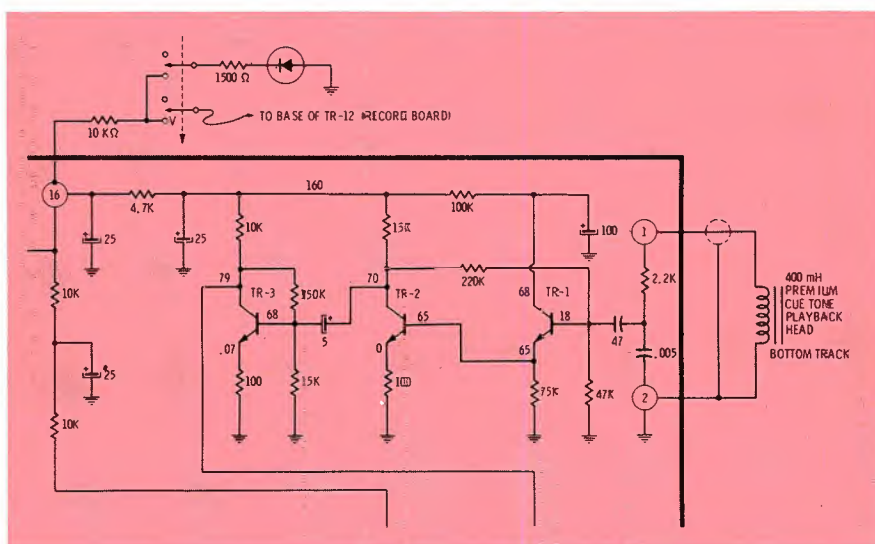
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Building an audio failure alarm

By E. A. Slimak, Chief Engineer, WRUF, Gainesville, Florida

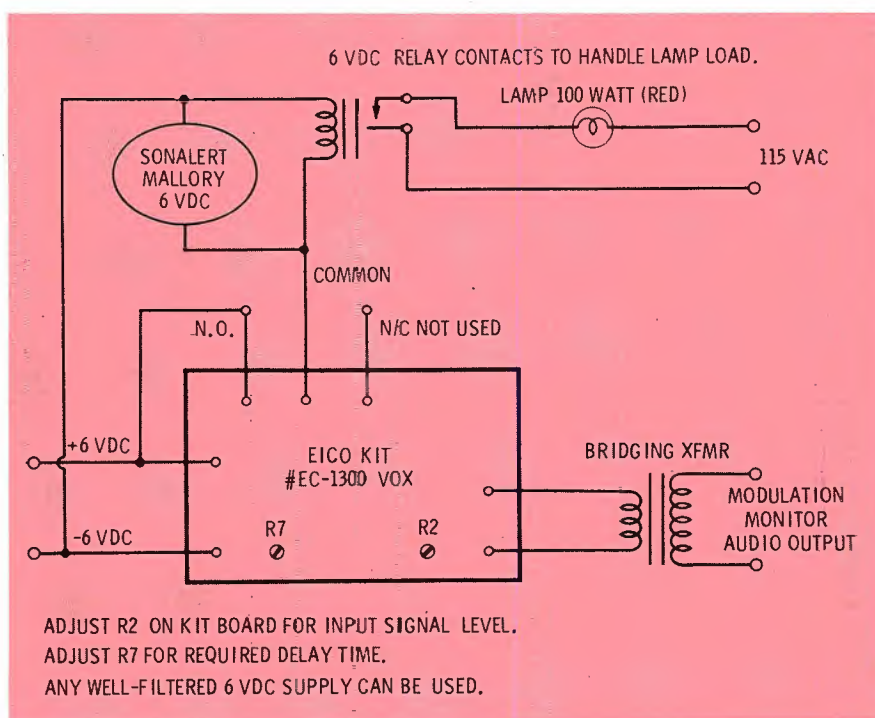
Here is an audio or carrier failure alarm which can be built in a few hours for about \$15. The EICO VOX unit is available from most local radio supply outlets. Other VOX units can be used, also.

As received, the kit has a small relay which must energize a relay with larger contacts to flash a lamp alarm. If you use aural alarm only, the relay in the VOX unit will handle the Sonalert. For audio failure alarm only you can feed the VOX from any audio line. For carrier alarm, it is fed from the audio output of the station modula-

tion monitor.

If the audio feed to the transmitter is broken, the alarm will sound after a preset delay. If the carrier goes off, the alarm goes off again as the modulation monitor has no audio output.

A unit like this could be used at several points along the audio feed circuit with different color lamps to indicate at which point the signal has been interrupted. If there are any questions about this unit, write me at P.O. Box 14444, Gainesville, FL 32601. ☐



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Annual membership meeting scheduled for Las Vegas

All SBE members are encouraged to attend the annual membership meeting, scheduled for Sunday, April 9, at the Las Vegas Hilton. It is being held in conjunction with the

NAB convention.

The membership meeting will begin at 3 p.m.; a reception starts at 2 p.m.

Don't forget April 9! This meeting is an opportunity to make your ideas known, as well as to meet other SBE members from around the country. When making plans to attend the

NAB, include plans to attend this annual SBE event. Your support of SBE is important; SBE leadership needs your input to make the Society a better organization.

Patricia "Pat" Satter of the national office also invites all SBE members and non-members to stop by the SBE booth during the NAB convention, April 9-12. She is looking forward to meeting you and discussing any SBE matter that may be of interest to you.

SBE files comments in FCC operator licensing proceeding

The SBE has filed its comments in the Radio Operator Licensing Proceeding which the FCC has under consideration in Docket 20817. This is a summary of the SBE's comments in this matter.

The SBE generally supported the proposals made by the FCC to change the Operator licensing program and to divide the licenses into two groups: a Technical series of license and an Operator grade of license. The intent of this change is to permit operation of radio and television stations with an Operator license which requires a minimum of technical knowledge or background. At the same time, the Technical series of license will be upgraded.

The FCC proposed that the Broadcast Operator license could be obtained without taking any type of examination to demonstrate a basic knowledge of regulations applying to radio communications, or station operations or procedures.

The SBE in its comments objected to this and proposed that a Broadcast Operator pass at least the FCC's Element 1 examination. This would assure some knowledge of the FCC's Rules and Regulations as well as a basic understanding of broadcast operating practices.

The SBE also proposed that the Technical series of license be re-titled and redefined as follows:

- **Radiotelephone Technician**—This license would directly replace the old Radiotelephone Second Class license.
- **Broadcast Technician**—This license would permit operation, maintenance and adjustment of all FM transmitters and all non-directional AM transmitters.
- **Broadcast Technician With Directional Antenna Endorsement**—This license would permit all work of a broadcast technician plus the maintenance and adjustment of AM directional antenna systems.
- **Broadcast Technician With Tele-**

continued on page 182

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SBE

continued from page 180

vision Endorsement—This license would permit all work of a broadcast technician plus maintenance and adjustment of television transmitters.

The SBE further proposed that applicants for these new licenses pass the appropriate elements of the FCC examinations.

The FCC proposed to take measures to upgrade the quality of the examinations and to protect the integrity of these examinations. The SBE wholeheartedly supported this proposal and suggested that a new series of updated examinations be developed and that they be changed at frequent intervals to prevent compromise.

The SBE proposed that present holders of the Radiotelephone First Class license be grandfathered and that upon renewal, they would receive the Broadcast Technician license with both the Directional Antenna and the Television endorsement.

Also, the SBE supported the FCC's proposals for five-year renewal terms in order to update and purge records, but not to require a showing of satisfactory service for such a renewal. The FCC would retain the prerogative of requiring re-examination for those license holders whose actions had indicated questionable technical ability.

CHAPTER REPORTS

Chapter 2—Northeastern Pennsylvania

Representatives from Philips Audio-Video Systems demonstrated some of the firm's equipment at the February 6 meeting in the WVIA TV/FM studios in Pittston. The demonstration included the LDK-25 studio color TV camera, VHF and UHF TV transmitters, and the Philips installations in New York's World Trade Center.

Chapter 3—Kansas

Forest Commings, design engineer for Collins radio in Dallas, presented a program on pulse width modulation in AM transmitters at the January 10 meeting at KEYN in Wichita. He illustrated the advantages of the PWM system over other forms of amplitude modulation.

Chapter 9—Phoenix, Arizona

David Van de Water gave a tour of the Western Electric Cable plant at the January 24 meeting.

continued on page 184

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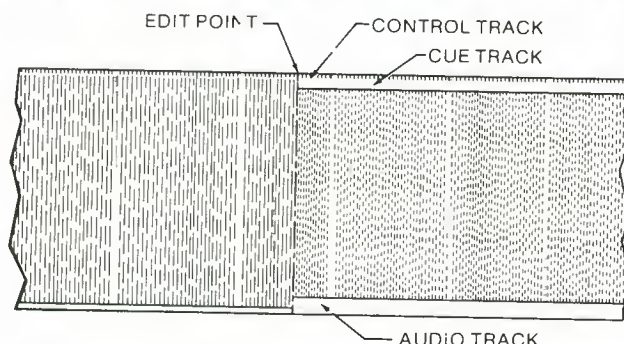
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SBE

continued from page 182

Chapter 16—Seattle, Washington

At the January 11 meeting in the Black Angus, Bob Dietsch of the FCC presented an update on FCC status on AM stereo, FM quad, and proposed licensing rule changes. Lee Pinski of RCA presented a paper and slides on antenna systems using circular polarization.

Chapter 22—Central New York

Dave Harry of Potomac Instruments discussed and demonstrated innovations in audio test equipment at the January 19 meeting in Syracuse. The equipment included oscillators and distortion analyzers which measure noise, distortion, and stereo phase; and a VHF signal strength meter.

Chapter 28—Milwaukee, Wisconsin

At the January 17 meeting in WTMJ auditorium, Larry Ehnstrom of TeleMation presented the Compositor 1 character generator. Bruce Krogstad of WTMJ-TV then explained how the system was interfaced in the WTMJ-TV set-up.

Chapter 33—Southwestern Ohio

Dave Newborg and Dave Grover of RCA Broadcast Division discussed RCA's solid-state 5 kw transmitter and AM stereo at the January 10 meeting at WXIX-TV.

Chapter 46—Baltimore, Maryland

At the January 18 luncheon/seminar in the Looking Glass Restaurant, William L. Sien and Ted Bennett from Systems Wireless Ltd. discussed the design and use of Vega's wireless microphone system. Equipment demonstrated included the model 77 transmitter, the model 58 receiver, the "Performance" wireless microphone, and various other products.

Chapter 47—Los Angeles, California

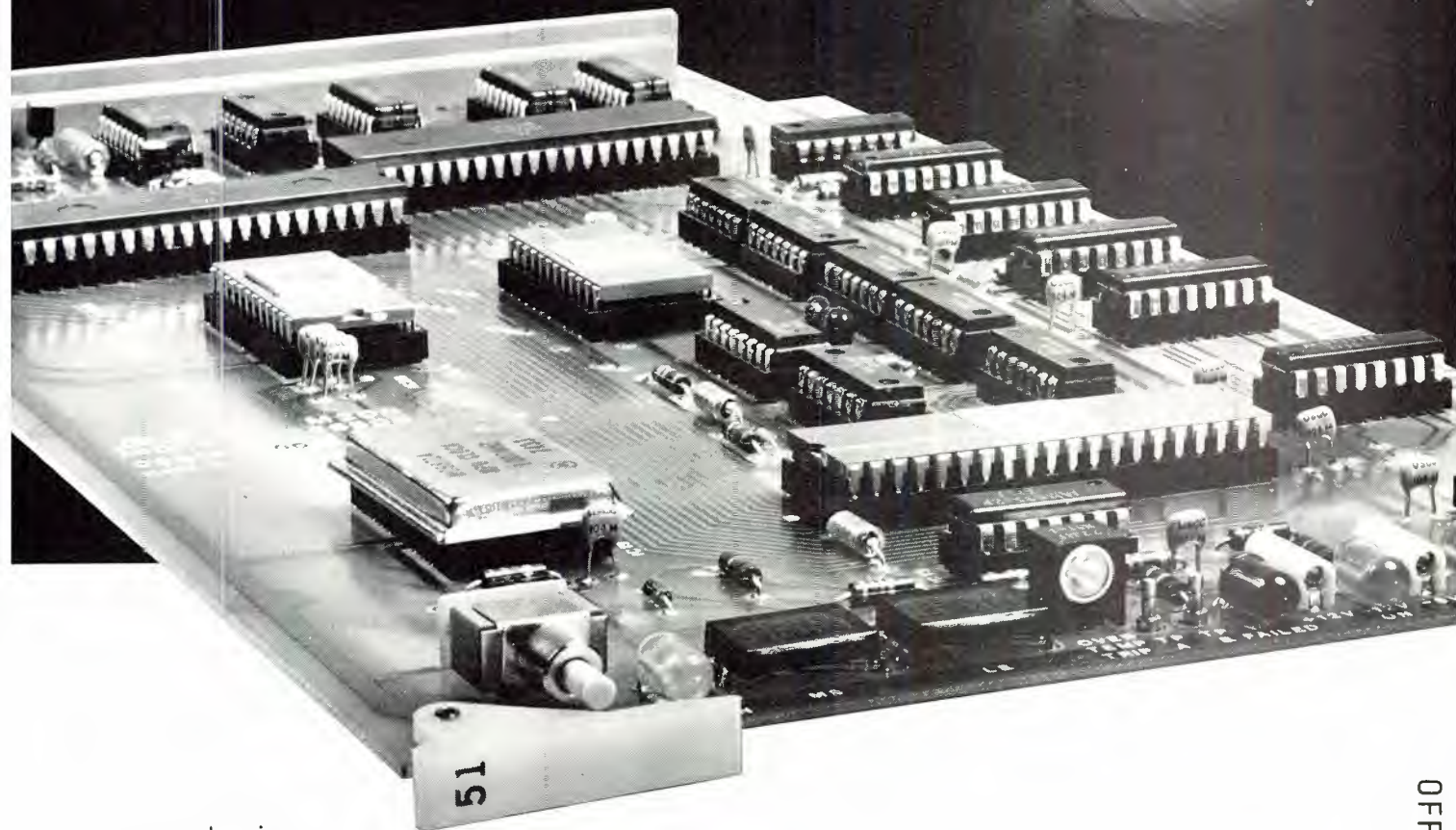
Rick Stevens of Harris Corp. described the Harris MS-15 exciter and stereo generator and the MSP-1 audio processor at the February 2 meeting in the KCET-TV conference room.

Chapter 48—Denver, Colorado

The January 3 meeting in the Federal Building featured James Wadiak, the bureau chief of the FCC Denver office, who spoke on FCC operations. He also discussed the FCC's philosophy and the avoidance of citations through proper logging and correction of problems when they take place. □

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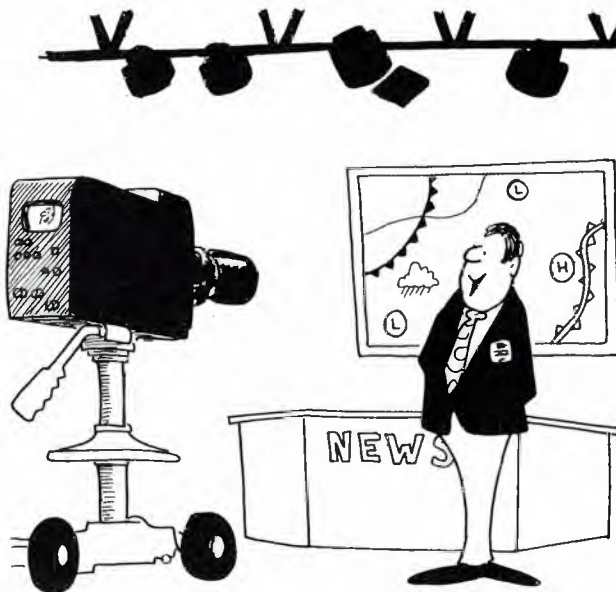
The script read: "The noted British poet, Stephen Spender, will appear at the College of Holy Names in Oakland and read some of his own poetry. The evening promises to be an aesthetic treat."

With one eye on the studio clock and the other on the badly printed script, the final line of the message came across: "The evening promises to be an anaesthetic treat."

The host has been hiding out from the wrath of Spender ever since!

Incidentally, KRJB is located in the wild and wooly country of the Russian River resort area of Sonoma County, and occupies a 42-acre hilltop estate. Being the only place for vultures to roost, we occasionally get VSWR shutdowns. Usually the vulture can be

continued on page 188



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from blue bananas to sag tails

.....
continued from page 186

enticed off its perch by sending our engineer out wearing a piece of meat on his head. The vulture always comes back though. Bill Bohlen, KRJB, Monte Rio, California.

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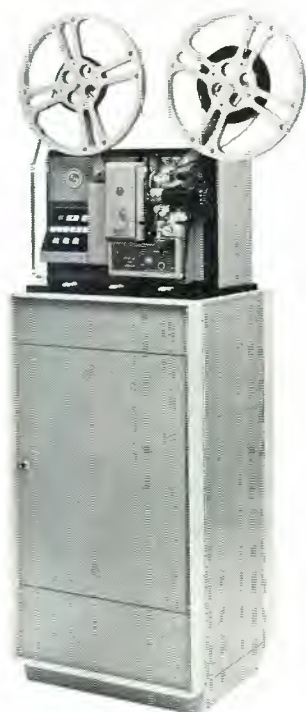
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from blue bananas to sag tails

continued from page 188

Walking on water?

The Baptist church in town presents a Christmas Cantata each Christmas season. I was asked to set up a microphone in the choir loft so that it would have an adequate pick-up for the remote broadcast transmitter being used to feed the studio. Upon arriving at the church, I found that no one was around, and began looking for an upper floor level, above the pulpit. Discovering a dark hallway behind the pulpit, I felt my way up a stairway to the choir loft.

However, at the top of the stairs I found a locked door. Hoping there might be another way, I retreated down the stairs, and found another door in the darkness. Here was another stairway, but this one went down. Just in case, I decided to go a few steps to see if this was a way to my destination.

A couple of steps down, I noticed water underfoot. Thinking it was a water leak, I took another step and found myself in inches of water. This was certainly a startling situation. All of a sudden, I realized what had happened, and before I realized what I was doing, I yelled, "OH GOD, I'M IN THE BAPTISMAL," and immediately baptized my own feet. James Cate, Keokuk, Iowa. □

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Take 1...Whatever happened to TV?

As an answer to the above, one might (without thinking) respond that TV is bigger and better than ever, as all the ads and promotionals keep reminding us. The pundits might say that "TV is alive and well in Hollywood." The cynics (who used to tell us that color TV was just a "pigment of the imagination") might answer by saying TV is just going the way of economic trends.

But are any of these explanations what we in the industry can really accept as accurate? Or, might there by another way of describing what network TV has evolved into? Might we not be correct in describing the network operation as just one big jukebox?

At the risk of being repetitive, we would like to borrow a portion of one of our BE columns of recent date. We pointed out that approximately 80% of network programming was film production made by studios such as Warners, 20th Century, MGM, and on and on and on. The viewer is being treated to made-for-TV movies in small doses or TV serials in large doses. Whether you call them police stories, sitcoms, or the "let's play doctor" variety, they are conceived by the film-oriented, written, directed and produced by the film-types, and "shot" on film cameras by film personnel on the film-studio lot.

The finished products are then (after auditioning by the appropriate agency and sponsor reps) delivered to the networks where they are "placed in the jukebox, the coins inserted, and the buttons pushed." Voila! Another grand and glorious evening of *I Love Genie* or some other monumental epic begins.

When the networks present films such as *Roots* or *The Godfather* or *Gone With the Wind*, one cannot help but say that this is superior entertainment. However, it must be kept in mind that these are specials; they are not presented as Monday through Friday viewing (or even regular weekend fare). And, the majority of these productions were made as theatrical productions, not specifically produced for television.

For various reasons, it would appear that the film-fare produced primarily for the theater is far superior to that produced for the TV screen. We are sure there are many of our readers who have, from time to time, pushed themselves away from the TV screen to go and "stretch their legs," and then come back in time to catch the commercials (which were better produced and more entertaining than the show itself).

Mind you, we are not speaking of programs produced by the networks themselves, such as the

continued on page 192

A NEW APPROACH TO TELECINE LIGHT CONTROL THAT IS . . .

FASTER

QUIETER

SMOOTHER

and MORE EFFECTIVE.

FROM THE WORLD'S LARGEST SUPPLIER OF TELECINE EQUIPMENT.



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MODEL 5050
AUTOMATIC LIGHT
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STOP GROUND-LOOP HUM!

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Will ELIMINATE HUM and other INTERFERENCE in Video Lines caused by differences in Ground Potential.

- For Color and Black and White.
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- Passive Device - Failure Free-Low Price.
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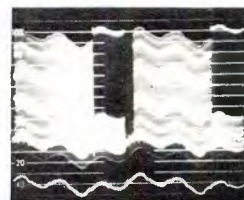
ELIMINATES HUM AND INTERFERENCE:

IN STUDIO

- Between Buildings
- On long runs in Buildings
- Between Studio and Transmitter
- On Incoming Telco circuits
- On Outgoing Telco circuits

IN FIELD

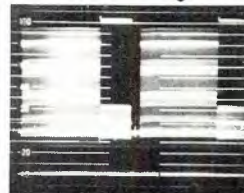
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- For Monitoring Lines



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**\$140
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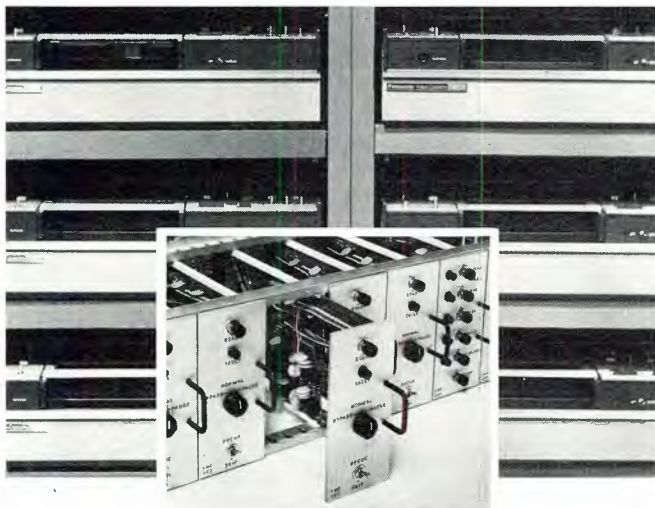


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For More Details Circle (161) on Reply Card

Automate your station breaks for under \$50,000



Videomedia's VMC-100 professional sequencing system

Now small and medium sized stations can afford automatic sequencing of up to six $\frac{3}{4}$ " tape machines for spot and station break play. All for about one-fifth the cost of a quad video cart machine.

Less than \$50,000 includes six tape units, switchers, TBC, waveform monitor and hardware. Smaller systems (two or more tape machines) are also available. The VMC-100 is an ideal back-up for quad video cart machines.

The system is made for pros who demand not only simplicity and precision, but virtual failsafe performance from their equipment.

To prevent loss of commercial air time, VMC-100 features individual control cards for each video machine, 100% redundant circuitry, and a by-pass capability in case any individual machine malfunctions.

Accuracy is ensured by counting control track pulses, so expensive time codes are unnecessary. A tone encoder plug-in card allows precise, automatic tone placement for tape cueing.

The VMC-100 is completely modular, expandable, and adaptable for future microprocessor control. For more information, please call or write for our free VMC-100 brochure.

Videomedia
Total Video Systems

250 North Wolfe Road, Sunnyvale, CA 94086
(408) 733-6500

zoom in!

news and special events, sports, specials, etc. We are speaking of the inane productions film-types have fed us for far too long.

It's time now to go back to in-house TV productions that the networks are indeed capable of doing, should they so choose. Back to productions like the *Hit Parade*, the *Berle Show*, *Robert Montgomery Presents*, *Sing Along with Mitch*, and all the other fine dramatic and musical shows that originally made television the great live medium it once was, and can be once again.

PS: Big riddle—do they really believe that the home TV audience is any less intelligent or selective than the theater-going public? What do you think?

Take 2...Panning & Scanning

Bob Brooks, ASTVC SE regional director, reports from WPEC-TV that he has attended the IES/TTFL (lighting) symposium held in Miami as a representative of the ASTVC.

Attending the seminar with Brooks was Mark Ryan, long-time ASTVC member from WAST-TV, Albany, New York. Brooks also reports meeting with some of the guys from Mississippi ETV in Jackson.

BE readers might recall that Mississippi ETV was the first broadcast establishment to sponsor the membership of their camera personnel. (We might add that they also keep us posted on upcoming job opportunities which we gratefully pass along to all interested ASTVC members through the *Job Hotline*.)

Gerry Gander, director of the Schools Liaison Group, writes en route to California to tell us he is enjoying seeing the U.S. before putting "camera to shoulder" once again for Warner Communications.

Vince DiPietro, NBC Emmy winner, tells us that he had great results using the Fujinon lens-effects adapter while taping the Brooklyn Archdiocese production of "Hello Dolly." He also promised to send in a description of the apparatus, complete with pictures of the production.

Happy to report that Jack Dorfman, ABC cameraman, has recovered from recent illness which laid him low while on a field assignment. We missed him and his charming wife who were supposed to be on hand for the second annual ASTVC Awards Dinner.

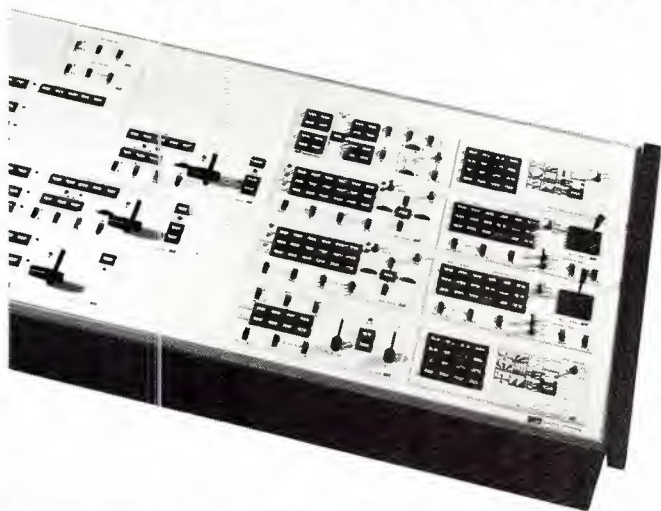
Anthony St. John had better have some pictures for us from the seminar he's planned in cooperation with Sony and the people at KRON-TV (San Francisco).

Have you heard the rumor that Dean Martin might be the next invited nominee for the upcoming third annual ASTVC Awards Dinner? With that, we'll just

Fade to black....



**the CD-480 has never limited
your creativity...**



**now introduce yourself to the
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For More Details Circle (163) on Reply Card

NAB Exhibitors

continued from page 72

TV ENG van package, and radio ENG repeater systems. **Booth 1004.**

Conrac

Color and monochrome professional television monitors. **Booth 721.**

see ad on page 17

Consolidated Electronic Industries

New: CUERAC automation system, tape cartridge players, professional reproducers, and a reel-to-reel tape recorder. **Booth 409.**

Consolidated Video Systems

Time base correctors. New: Computer-controlled VTR editor, and image enhancer/noise reducer. **Booth 917.**

see ads on pages 45, 165

Continental Electronics

Manufacturing

AM transmitters. **Booth 312. Hospitality Suite: Hilton, rooms 1249-50.**

see ad on page 234

Convergence Corporation

New: Commercial post-production, and ENG/EFV videocassette editing systems. **Booth 1007.**

Crosspoint Latch Booth 1143.

Data Communications Corporation [BIAS]

Micro BIAS, satellite system, accounting system, and automated switching. **Booth 919. Hospitality Suite: Hilton, room 2922.**

Datatek Corporation

Video/audio routing switcher; TV transmitter color phase equalizer; video sweep generators; video and pulse DAs; and audio DAs. New: SMPTE time code switching system, SMPTE time code distribution amplifier, audio routing switcher, and video envelope delay measuring set. **Booth 705.**

see ad on page 129

Datatron

Multiple interface unit, standard code reader, standard generator, character inserter, generator with user bits, and portable field code generator. New: Jam-sync generator, code reader with user bits, code switcher, and hi-speed peripherals for tempo editor. **Booth 1223.**

see ad on page 78

Delta Electronics

Operating impedance bridges, an-

tenna monitors, digital remote control systems, toroidal current transformers, meter jacks, amplitude modulation controller, automatic power controller, and receiver/generator. New: RF ammeter products. **Booth 206.**

Dielectric Communications

RF loads and wattmeters, RF coax switches, and broadcast waveguide and accessories. New: Voltage spike protectors, and RF sampler. **Booth 901A.**

Di-Tech

Video DA with clamp and equalizer, audio DA, pulse DA with delay, audio/video routing switchers, touch-tone control system, audio monitor amplifier, video presence detector, and video source identifier. New: Audio/video routing switcher, audio DA, video source identifier, and video presence detector. **Booth 1219.**

see ad on page 89

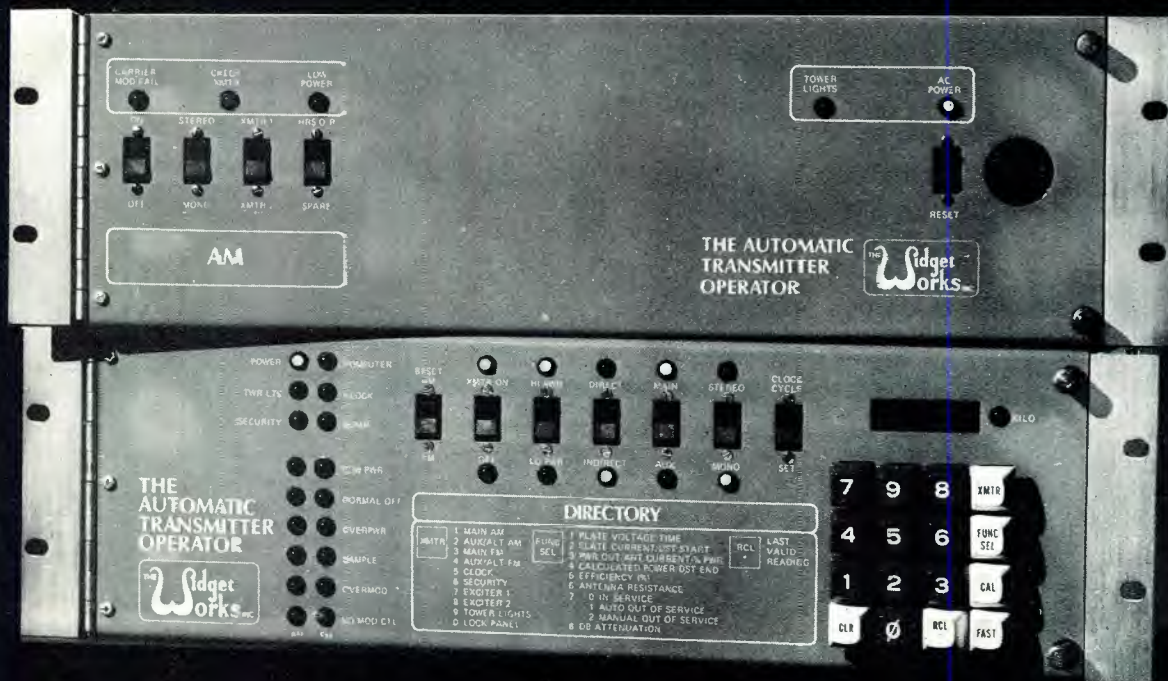
Dolby Laboratories

FM broadcast unit, professional A-type noise-reduction unit, and line of FM system consumer receivers. **Booth 514. Hospitality Suite: Hilton.**

Duca-Richardson Corporation

Production switchers. New: Master

ATS THE ONLY SURE BET IN LAS VEGAS



SEE THE AUTOMATIC TRANSMITTER OPERATOR AT THE N.A.B.

See us at Booth 104

THE WIDGET WORKS INC. P.O. Box 79 Medina, Ohio 44256 (216) 336-7500

For More Details Circle (164) on Reply Card

control system. **Booth 1301. Hospitality Suite: MGM Grand.**

Dynair Electronics

Distribution equipment, and demodulator. **New:** Routing switchers, sync generator module, and genlock module. **Booth 914.**

see ad on pages 18, 19

Dynasciences

Image enhancer, production switcher, processing system, video distribution equipment, and routing switchers. **New:** Video graphics system, compact production switcher, and downstream soft chroma keyer. **Booth 818.**

see ad on pages 34, 35

Dytek

(See Computer Image Video Controller.) **Booth 1227.**

E. G. & G.

High-intensity obstruction lighting equipment for antennas. **New:** Omni-directional antenna, and obstruction light. **Booth 1203.**

ENG Manufacturing Company

New: ENG van, ENG sedan, EFP carts, and microwave carts. **Booth 1235.**

ESE

Digital clocks, digital timers, master clock systems, and time programmers. **New:** Timer with display freeze, thermometer displaying degrees Centigrade and Fahrenheit, and 6-digit clock/timer with memory. **Booth 333.**

see ads on pages 123, 125

Eastman Kodak Company

Films, chemicals, processing procedures, and hot-pressed ferrite video head refurbishing service. **New:** Shortened newsfilm process. **Booth 916.**

Edco Products

Broadcast audio cassette, Rapid-Q tape cartridge equipment, stereo phase enhancer, and Dyna-mite series video/audio DA. **Booth 107.**

Edcor (Calrec)

Booth 1407.

Edutron

New: CCD 1H time base corrector. **Booth 1312.**

Eigen Video

Slow-motion disc recorder. **Booth 1225.**

Electro and Optical Systems Ltd.

SMPTE time code generator, SMPTE hi-speed bi-directional reader, and

peak program meters. **New:** Portable SMPTE time code generator, mini switcher, minimixers, and monochrome monitors. **Booth 1222.**

see ad on page 85

Electro Controls

Playmate. **New:** ILS, Plexus-1000, Playmaster, and Parellipsphere. **Booth 1601.**

see ad on page 124

Electro Impulse Lab

Catalog #890, and RF calorimeters line. **New:** 15 kw calorimeter with digital readout. **Booth 103.**

Electrohome Ltd.

Monochrome video monitors, 25-inch color receiver/monitor, and installation hardware for monitors. **New:** 19- and 25-inch color monitors. **Booth 1204.**

see ad on page 82

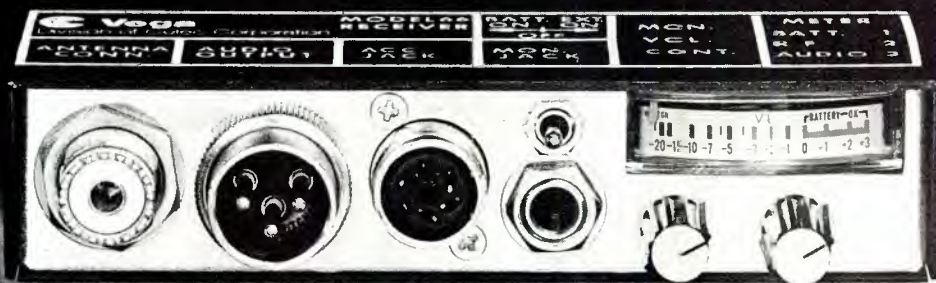
Electro-Voice

Professional dynamic microphones, and studio monitor loudspeaker. **New:** Professional condenser microphone system and miniature condenser tie-clasp microphone. **Booth 1307.**

Electronics, Missiles and Communications

continued on page 196

The Ultimate PORTABLE RECEIVER for wireless microphones



Vega now offers the most advanced portable receiver in the industry. The Model 66 provides operation superior to the highly successful Vega Model 55, but in a rugged single unit that is much smaller. (Dimensions: W 5.4" x H 1.3" x D 6.7"). Designed for the professional sound user, the 66's compact size makes it suitable for mounting to leading portable recorders, both audio and VTR's. The unit operates from either internal 9V batteries or an existing D.C. voltage source. Contact Vega for complete specifications on this exciting new unit or the Model 67 Portable Diversity Receiver.

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Division of Cetec Corporation

P. O. Box 5348 • El Monte, California 91731 • Telephone: (213) 442-0782 • TWX: 910-311

For More Details Circle (165) on Reply Card

NAB Exhibitors

continued from page 195

10-watt MDS transmitter, 100-watt MDS amplifier, 10-watt UHF translator, and 10-watt VHF translator. **New:** 1000-watt UHF television transmitter. **Booth 907. Hospitality Suite:** MGM Grand, room 1197A.

see ad on page 230

English Electric Valve [EEV]

Vidicons, Orthicons, and Leddicons. **New:** 2/3-inch Leddicon, 30mm Leddicon/variable light, TV klystrons, and RF products. **Booth 805.**

see ad on page 15

Farinon Electric

Microwave radio system for ENG/EJ applications, portable microwave radio for short-range TV transmission, audio/video diplexer, 2 GHz preamplifier, and 20-watt power amplifier. **Booth 1111.**

see ad on pages 100, 101

Fidelipac

Master cart, studio on-air light, cartridge racks, alignment cartridges, alignment gauges, cartridges eraser, cartridge labels, splicing accessories, and hot tape. **New:** Wow and flutter meter. **Booth 415.**

see ad on page 108

Filmways Radio

20/40 format, Wolfman Jack program, and record report program. **New:** Radio country format, country concert, country news, and Charlie Tuna program. **Hospitality Suite:** Hilton, room 1450.

Flash Technology Corporation of America

FTB-Z05 Beacon, FTB-300 Beacon, master controller, and FTB-106D. **New:** FTB-405 Beacon, Super Controller, and optical link. **Booth 1209.**

see ad on page 202

Fuji Photo Film USA

2-inch tape, 3/4-inch tape, fire-retardant shipping cases, reel-to-reel audio tape, and videocassette tape. **New:** 1-inch tape. **Booth 900. Hospitality Suite:** Hilton.

Fujinon Optical, Inc.

Triple-range field zoom (up to 55x), twin-range field zoom (up to 60x), 4-range wide angle zoom, close-focusing wide angle zoom, high-resolution wide angle zoom. **New:** ENG lenses/studio conversion kit/travel case; 30x15 F/2.0 zoom (15-450mm) for 1 1/4-inch format; 30x11.5 F/1.6 zoom (16-330mm) for 1-inch format; and 22x12.5 F/1.6 twin-range zoom (12.5-275mm, 25-550mm) for 2/3-inch ENG/studio use. **Booth 528. Hospitality Suite:**

There are few things in life

Take any one of our Audio Recording Instruments.



as dependable as a Scully.

The quality of sound is extraordinary...the rugged design is built to last. The performance is classic.

Built by Scully...one of the first names in broadcast history. Equipment you can trust, by a company you've come to depend on.

For complete details, write or call Scully Recording Instruments, Division of Dictaphone Corp., 475 Ellis Street, Mountain View, California 94043 (415) 968-8389. TLX 34-5524

▶Scully

Recording Instruments

For classic performance.

NAB Booth #305



Hilton.

see ad on pages 110, 111

GBC CCTV Corp.
Booth 1302.

GTE Sylvania
Booth 711.

Garner Industries

Bulk eraser for videocassettes, bulk eraser for audio tape, and high-speed reel-to-reel tape duplicator (1/4-inch audio tape). **Booth 1217.**

see ad on page 138

General Electric

Lighting advice. **New:** Improved Quartzline[®] studio lamps, catalog, and lamp-to-equipment guide. **Booth 1211.**

Glentronix

Image video routing switcher, and ACR-25 logic analyzer board. **New:** Telcom's T-10,000 time code center, and ElectroVisual's color monitor. **Booth 1604.**

see ad on page 180

Alan Gordon Enterprises

Wind screen, and shock mount. **New:** Diversity antenna system, MXR mixer, and cassette recorder. **Booth 1201.**

Gotham Audio Corporation

Telecom noise reduction system, Neumann condenser microphones, NTP video projected PPM, Lyrec tape timer, Klein & Hummel monitor loudspeaker system, EMT flutter meters, EMT micro impedance meters, and Woelke flutter meters. **New:** Telefunken tape recorders, EMT turntables, and Neumann pop-proof cardioid microphone. **Booth 909.**

The Grass Valley Group

Production switchers, master control switcher, frame synchronizers, linearity correctors, sync change-over system, and routing switchers. **New:** Frame-selectable auto transition option for production switchers, effects memory system, expanded automation system capability, and AFV routing switchers and expanded variable equalization modules. **Booth 813.**

see ads on pages 3, 185

The Great American Market

Lamps, stands, and special effects. **New:** Lighting equipment, scenic projector, patterns, and custom service. **Booth 1319.**

see ads on pages 139, 226

Groton Computer

New: Logging, reporting and accounting system. **Booth 421.**

continued on page 198

How About That!

A Back Pack TV Camera Battery With 250% More Power Output

(At No Increase In Weight)

Specify

silvercel

By Yardney

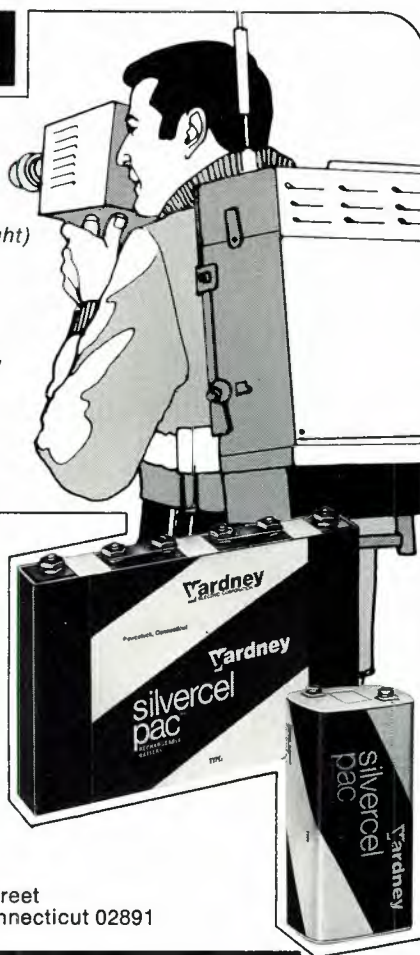
Or, If Your Present Battery Is As Powerful As You Want It . . . How Would You Like To Have It At 1/3 rd Its Present Weight?

Silvercel rechargeable batteries pack the most useable power into the smallest and the lightest modular package. Used by all major manufacturers of TV Back Pack Cameras as original equipment, they offer the added advantage of a QUICK CHARGE without battery damage by the use of a quick pulse charge.

Silvercel (silver/zinc) rechargeable batteries — the recognized standard of excellence in power output for back pack TV cameras. Our technical assistance and catalog are yours for the asking.

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Mark IV-T Metric Weatherminder

The original weather console designed especially for the announcer's table. Now equipped with dials reading Metric or combination U.S./Metric. The basic instrument cluster for local programming. Professional equipment at modest cost.

Department B

Texas Electronics, Inc.

P. O. Box 7225

Dallas, TX 75209 (214) 631-2490

Metric or U.S./Metric Readings for
Wind Direction & Speed
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Remote Temperature

Also, a complete line of weather instruments, recorders, sensors, controllers, etc.



For More Details Circle (169) on Reply Card

Through these terminals pass some of the best sounds around.



Install Shallco attenuators for reliable performance. Replacements available for most all consoles.

Request catalog 102

Shallco

Shallco, Inc. P. O. Box 1089
Smithfield, N. C. 27577 919/934-3135

For More Details Circle (170) on Reply Card

NAB Exhibitors

continued from page 197

Hallikainen & Friends

New: Program logging system, time announce controller, digital telemetry adapter, and modular TV audio control system. **Booth 518.**

Harris Corporation

Color prism camera; television antennas; system for AM stereophonic broadcasting, compative phase multiplex; AM transmitters; FM exciter; audio processor for AM/FM/TV; FM transmitters; one- and two-deck tape cartridge machines; modular audio consoles; transcription turntable; and micro-computer automation system. **New:** Transmitter/antenna system for circularly polarized television transmission; television transmitter; live color television camera; and a three-deck tape cartridge machine. **Booth 301.**

Helios Elec. America
Booth 443.

High-Lite Corp.
Booth 1310.

Martin Hilbern Ent.
Booth 1405.

Hitachi Denshi America, Ltd.

2/3-inch Saticon studio color cameras; 2/3-inch Saticon EFP hand-held color cameras; 1-inch PbO studio color cameras; and 2/3-inch Saticon convertible camera. **New:** 2/3-inch Saticon convertible color cameras; tri-electrode Saticon hand-held cameras; 2/3-inch Saticon EFP broadcast camera; and tri-electrode Vidicon studio type camera. **Booth 815. Hospitality Suite:** Hilton, room 2910.

see ads on pages 93, 95, 97, 99

IGM [NTI]

Instacart 48-cart tape playback; Go-Cart 42 and 78 cart tape playback; Marc VII DJ manual assist remote control and time announcer. **New:** Audio control system (Basic A). **Booth 208.**

see ad on page 166

Ikegami

New: Smaller ENG camera; portable EFP camera with 650 feet of super-flexible cable between camera head and control unit, and removable remote-control unit; color monitors; remote control device for HL77A and HL79 using either a wireless link or 4,000 feet of triax cable; and microprocessor 45-second auto-setup computer which operates six cameras sequentially. **Booth 1013.**

see ad on page 147

Industrial Sciences Incorporated [ISI]

Terminal equipment, and master control. **New:** Video production switcher. **Booth 1127.**

Innovative Television Equipment

Dollies, pedestals, tripods, and pan/tilt heads. **New:** Studio pedestal, fluid heads, wood tripods, and metal tripod. **Booth 821. Hospitality Suite: Hilton.**

Interand Corporation
Booth 1104.

International Communications & Control
Booth 1505.

see ad on page 232

International Microwave Corporation
ENG microwave system, STL links, AM microwave system, FM microwave system, tunnel diode amplifiers, and impatt amplifiers. **Booth 1218.**

see ad on page 108

International Tapetronics Corporation

Reel-to-reel rec/play tape machines, RPD cartridge delay system, eraser/splice locator, cartridge machines, cartridge equipment, and reel-to-reel reproducer. **New:** 1k mass cartridge storage/retrieval system; and up/down cartridge timer/counter. **Booth 431.**

see ad on pages 46, 47

International Video Corp. (IVC)

7000 studio camera, 7000P remote/studio camera, and 9000 production video recorder. **New:** 1-inch series of video recorders. **Booth 741.**

see ad on page 177

Ivie Electronics

Octave analyzer, distortion analyzer, and noise generator. **New:** Audio analysis system. **Booth 1401.**

JVC Industries Company

¾-inch ENG-type color portable videocassette recorder, and ENG/EFP portable/studio color camera. **New:** ¾-inch professional editing system. **Booth 925. Hospitality Suite: MGM Grand, room 907.**

Jampro Antenna Company [Cetec]

Side-mounted CP TV antenna for all VHF and UHF channels. **New:** Top-mounted CP TV antenna for all VHF and UHF channels. **Booth 1135. Hospitality Suite: MGM Grand.**

see ad on page 67

Jefferson Data Systems

Television business automation system, and radio business automation system. **Booth 108. Hospitality Suite: Hilton.**

continued on page 200

Your TV Studio may as well be a radio station without the right lighting.

At Kliegl, we want your video to be up to par with your audio. Or even better. That's why we have a team of seasoned engineers who design studio lighting systems that meet your exact requirements.

Thanks to our experience in dealing with studio lighting, we have designed six standard TV lighting packages that meet normal needs for standard-sized studios. And since these are complete systems already engineered and in stock, ready to ship, they offer substantial savings.

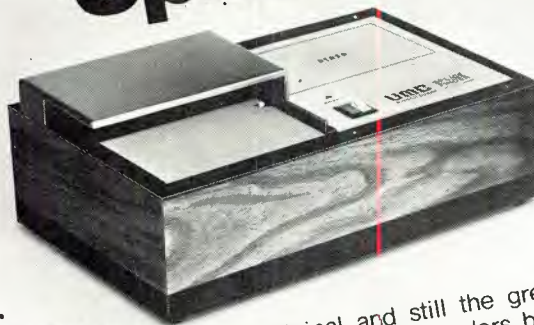
So, if you don't want your viewers to turn on their radios, turn to Kliegl. For complete information on our TV packages or anything else, please write or call:

See us at NAB, Booth #805
For More Details Circle (171) on Reply Card



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Beaucart Splice Finder.



Model SFE-1 Splice Finder with bulk eraser: **\$420.00.**
Model SF-1 Splice Finder without eraser: **\$395.00.**

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Las Vegas
Convention
Center."

U.S. PATENT
3,854,643

The original and still the greatest in broadcast audio cartridge splice finders bears the Beaucart® name. Our patented design saves countless studio manhours of splice search time. The payback is fantastic! But we still keep erase and splice-finding functions separate to protect the recorded material. And Beaucart Splice Finders can be used on all NAB standard A, B, C-size cartridges. If you aren't using one, write today, or call (203) 288-7731 for the whole story. We're the Broadcast Products Division, UMC Electronics Co., 460 Sackett Point Road, North Haven, Connecticut 06473.

UMC

A BIT DIFFERENT

Time Code Generators, Readers & Comparators

Skotel specializes in counting and controlling bits, and that's why our products provide you greater flexibility and reliability for video tape production and programming...and that takes a big byte out of your costs.



Our products give you the flexibility and convenience you've wanted for User Data bits, and they reliably **generate, read and compare** every Time Code bit.

Standard features...also a bit different...include: transformer isolated inputs and outputs for simpler installation, AGC, compatible with other SMPTE equipment, remoteable controls, and plug in options that include...a unique Video Character Generator/Insertor, and Jam Sync.

For more value, Skotel makes the difference...so call or write

North: Mike Dyer (313) 478-2157 East: Jim Landy (609) 424-4660 South: Gene Sudduth (214) 785-5764 West: Dave Hill (415) 573-2157

skotel

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Brossard, Que., Canada J4W 1Z3
(514) 676 1813

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NAB Exhibitors

continued from page 199

Kaman Sciences/BCS

BCS 1100 system (AM/FM/TV), BCS 800 system (TV), and BCS 100 system (radio). **New:** Karts inventory program, news inventory program, and films inventory and amortization system. **Booth 445. Hospitality Suite:** MGM Grand.

Kings Electronics

Booth 1008.

Kliegl Brothers

Memory lighting control console; portable dimming system with interchangeable 2.4 kw and 6 kw dimmer-pacs, and 9-channel and 18-channel two-scene preset control consoles; 2 kw and 4 kw Soflite; 575-watt and 1250-watt HMI; telescoping hanger; and Fresnel and ellipsoidal spotlight fixtures. **New:** Scintillator panel and portable remote unit for Performance^R MLC console, HMI "TV Booster," and studio spotlight and floodlights. **Booth 805.**

see ad on page 199

Knox, Ltd.

Titler for slates, and character generator. **New:** Character generator, font styles, and disc memory system. **Booth 739.**

see ad on page 158

TAPE



3/4 INCH VIDEO CASSETTE-1/2 HOUR

\$9.50

Unconditionally guaranteed, brand new, sealed factory fresh 3/4" high-energy chromium dioxide polyester backed, Sony-type KCA-60. Stop-frame.

Nobody, but nobody, knows tape like us. And nobody, but nobody, sells it at a lower price. For a catalog listing ALL brands and formats of audio and video tape, call or write:

DIMENSION 3 RECORDING CO.
Box 326 NEW MILFORD, N.J. 07646
(201) 265-5599

For More Details Circle (174) on Reply Card

LPB

"Signature" series audio consoles, distribution amplifiers, compressor-limiters, transcription equipment (turntables, tone arms, and pre-amps), studio furniture, studio systems, educational broadcast equipment (FM), and educational broadcast equipment (AM-carrier current). **New:** "Producer" series audio consoles, turntable preamp, and 10-watt educational FM transmitter. **Booth 508.**

see ad on page 201

Still the industry's MOST DESIRED

VIDEO TAPE EVALUATOR



- Tape evaluation at 16 times speed
- Cleans and winds tapes
- Standard in the industry
- World wide customer base
- Leasing program available

RECORTEC, INC. 777 PALOMAR AVE., SUNNYVALE, CA 94086 TEL: (408) 735-8821 TWX: 910-339-9367

For More Details Circle (175) on Reply Card

L-W International
Television film chain and broadcast projectors. **Booth 1000.**

see ad on page 188

Laird Telemedia

Optical multiplexers, TV slide projectors, TV film projectors, telecine accessories, TV titlers, character generators, time/date generators, and production "Q" boards. **New:** Automatic light control, dolly-up multiplexer, dissolve slide projector, and character generator accessories. **Booth 1306.**

see ads on pages 88, 92, 191

Lee-Ray Industries
Booth 1602.

Leitch Video

Distribution and processing amplifiers; color test generator; clocks; sync assignment and genlock video switchers; and automatic change-over. **New:** Master sync generator, slave sync generator, color bar generator, and master clock system. **Booth 1301A.**

see ad on page 131

Lenco

Video distribution, pulse distribution, sync generation, video test sets, video delay amplifiers, encoders, and decoders. **New:** Video processors, video bridging switchers, black-and-white monitors, and test signal generators. **Booth 406. Hospitality Suite:** MGM Grand, penthouse.

see ad on page 171

Lightning Elimination Associates

Dissipation arrays, surge eliminators, transient eliminators, and lightning warning systems. **New:** Tri-axial surge eliminator, hi-frequency transient eliminator, very hi-frequency transient eliminator, hi-frequency power transient eliminator, and design hemispherical dissipation array. **Booth 516.**

see ad on page 237

David Lint Associates
Booth 341.

Lipsner-Smith Corporation

New: Micro-Perfect film cleaner. **Booth 1006.**

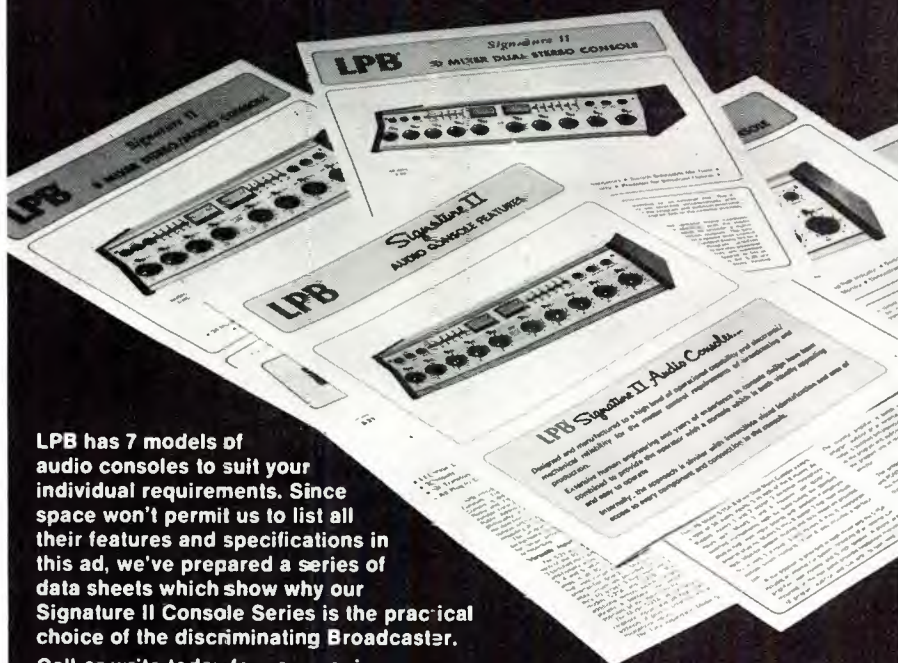
Listec Television

Equipment Corporation

Studio pedestals; Kestrel crane (powered); PortaPed and TriTrack; cam heads and lubricated friction heads; low-angle dolly; tripods; outdoor broadcast dollies; petrel pan and tilt head; and adapter plates and mounting accessories. **New:** Vintens "Fluic" head line, Richmond Sound Design portable broadcast console, Telecue monitor prompting

continued on page 202

4, 5, 8, 10- Mono, Stereo!



LPB has 7 models of audio consoles to suit your individual requirements. Since space won't permit us to list all their features and specifications in this ad, we've prepared a series of data sheets which show why our Signature II Console Series is the practical choice of the discriminating Broadcaster. Call or write today for your copies.

LPB®

LPB Inc.

520 Lincoln Highway, Frazer, PA 19355 (215) 644-1123

See us at NAB Booth #508

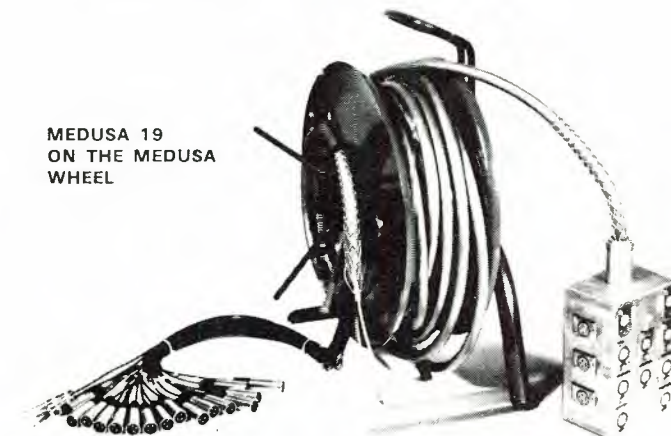
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• WHIRLWIND MUSIC • WHIRLWIND MUSIC • WHIRLWIND MUSIC • WHIRLWIND MUSIC •

CHECK ONE:

- ☐ A. Good electronic cable, cords and connectors are hard to get.
- ☐ B. Once I get them, they are expensive.
- ☐ C. There is no one I can call for custom made, guaranteed wiring systems at fair prices.
- ☐ D. NONE OF THE ABOVE; I've discovered WHIRLWIND MUSIC AUDIO PRODUCTS. (At my favorite Music Store.)

MEDUSA 19
ON THE MEDUSA
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whirlwind music Dist. Inc.
P.O. Box 1075 Rochester N.Y. 14603 (716) 663-8820

Available in Canada through
GHI Music Sales, Ltd.
5000 Buchan, Suite 506
Montreal, Quebec

• WHIRLWIND MUSIC • WHIRLWIND MUSIC • WHIRLWIND MUSIC • WHIRLWIND MUSIC •

For More Details Circle (177) on Reply Card

NAB Exhibitors

continued from page 201

system, and BAL video delay lines.
Booth 700. Hospitality Suite: Stardust.

see ad on page 203

Lowell-Light Manufacturing
Booth 322.

McCurdy Radio Industries

Radio consoles, intercoms, audio switchers, audio DAs, turntables, speakers, tape machines, extended range VU meters and phono pre-

amps. **New:** Television production and recording console. **Booth 410. Hospitality Suite:** Hilton.

see ad on page 10, IBC

McMartin Industries

FM/SCA receiver; FM transmitter; FM exciters; mixers; FM frequency and modulation monitor; FM stereo monitor; FM SCA monitor; FM relay receivers; EBS equipment; power amplifiers; AM/FM stereo receiver; stereo/SCA generators; and portable consoles. **New:** 10,000-watt AM transmitter; 5-channel rotary and linear consoles; 8-channel rotary and linear consoles; and RPU and

rebroadcast receivers. **Booth 302. Hospitality Suite:** Hilton.

see ad on page 14

3M Company

High audio quad videotape, master broadcast U-matic videocassettes, graphic video generators, production switchers, routing switchers, and in-line enhancers. **New:** 1-inch master broadcast tape. **Booth 807.**

see ads on pages 22, 23, 26, 103

MCI, Inc.

Automated recording/remixing consoles; multi-track recording systems; 3-speed broadcast recorders and reproducers; and related accessories. **Booth 101. Hospitality Suite:** Hilton.

see ad on page 149

Marconi Electronics

Studio cameras; portable cameras; telecine; standard converters; audio equipment; video switchers; color and B&W monitors; FM TV antennas; mobile units; videotape recorders; and VTR editors. **Booth 605.**

see ads on pages 33, 79

Marti Electronics

AM stereo STL package, remote control, digital status-control, mobile ENG repeater, battery-powered ENG transmitters, transmitter encoders, mobile ENG transmitters, FM stereo STL, subcarrier equipment, compressor-limiters, monitor amplifier, program amplifier, automatic transmitter switcher, and automatic receiver switcher. **New:** Remote control system, and automatic repeater. **Booth 314.**

see ad on page 80

Memorex Corporation

Videotape, audio cassettes, audio reel-to-reel, and instant recording cassettes. **New:** ¾-inch videocassettes. **Booth 814. Hospitality Suite:** MGM Grand.

Merlin Engineering Words

Custom quad VTRs and accessories. **Booth 1129.**

Charles Michelson Inc.

New: Radio drama program series on 7½ IPS audio tape. **Booth 353.**

MICMIX Audio Products

Reverb chambers, and LED panel meters. **New:** Audio flanger, and audio delay line. **Booth 345.**

see ad on page 220

Micro Communications

UHF TV combiner, high-power TV diplexers, FM triplexers, low-power TV diplexer, coax switch, C/P FM panel antenna, and circular-polarized modification equipment for TV.

MARK AND PROTECT YOUR TOWER WITH CONFIDENCE!

A HIGH INTENSITY LIGHTING SYSTEM offering

Reduced Weight and Windage
Easier, Lower Cost Installations
No High Voltage Conduit Runs
Improved Reliability and Serviceability
Fully FAA Approved

Now, over 160 reliable ElectroFlash Systems are in operation. The FTB-205 systems mark and protect America's **NEWEST BROADCAST TOWERS.*** Many more towers with ElectroFlash protection are operating in **CANADA.***

These numbers do not include the ElectroFlash Systems on Microwave communications towers or the "HOT" tower systems, one on a ½ mega-watt radio navigation radiator and others on combination AM radiator-FM towers in the United States and Canada.*

TIME TO REPAINT YOUR TOWER? Many of the systems installed are replacing surface paint and night lighting on older towers: *

Why the FTB-205 ElectroFlash Beacon System from FTCA? Simple! When you add considerations such as:

- Superior Design
- High Quality Construction
- Lower Installation Cost
- Proven Reliability
- Long Life
- Outstanding Warranty Coverage

to other exclusive features, the results are benefits obtainable only with the FTB-205 ElectroFlash System.

NEW!!

See a demonstration of our **NEW FTB-405 ElectroFlash System** at NAB, **Booth #1209**

* for system locations and station calls or for additional information on the marking of your tower.

WRITE OR TELEPHONE,

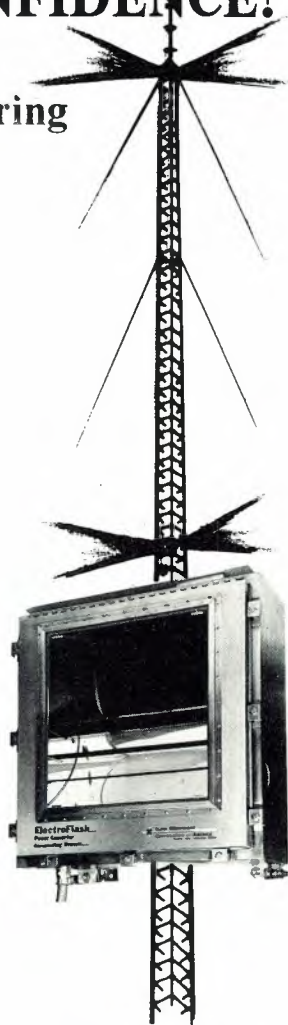
FLASH TECHNOLOGY



CORPORATION of AMERICA

55 LAKE STREET, NASHUA, NEW HAMPSHIRE 03060

TEL. (603) 883-6500



New: Circular-polarized TV antenna, multi-channel TV combiner, and broad-band FM antenna. **Booth 737.**
Hospitality Suite: Sahara.

Micro Consultants

Digital time base corrector, digital framestore synchronizer, and digital fieldstore synchronizer. **New:** Digital production effects device, and digital standards converter. **Booth 1001.**
Hospitality Suite: Hilton.

see ad on page 149

Micro Control Associates

Subcarrier generator and receiver. **New:** Aural studio-transmitter links; remote control systems; automatic transmitter systems; and remote pickup amplifiers and preamplifiers. **Booth 152.**

see ad on page 164

Micro-Trak Corporation

Audio consoles, remote audio systems, system D production audio systems, phono preamplifiers, tone arms, turntables, tape cartridge racks, studio furniture, audio power amplifier, automatic antenna heater controls, and disco systems. **Booth 506.**

Microtime Inc.

Time base correctors, zero studio delay device, and automatic video-cassette programmer. **New:** Image enhancer. **Booth 902.**

see ad on page 169

Microwave Associates

ENG links, ENG microwave line, STL microwave, intercity microwave, power supplies, accessories, battery packs, and chargers. **New:** ENG microwave portables, ENG multi-channel receiver, satellite receiver, and ENG maxi-control unit. **Booth 809.** **Hospitality Suite:** MGM Grand.

Minneapolis Magnetics Booth 133.

Mole-Richardson Company

HMI Solar-Arc line; Molequartz Baby Solarspot family; lighting kits; grip equipment; hangers and adapters; and special effects. **New:** 2500- and 4000-watt HMI Mole Solar-Arc spot; Molepower 30-volt battery pack; and 2000-watt Molite kit. **Booth 433.**

The Money Machine [Audio Sellers]

The Money Machine sales library, Music Explo/production library, and Success & You sales training. **New:** Sunday at the Memories weekly nostalgia show, and country sales/production library. **Booth 343.** **Hospitality Suite:** Hilton, rooms 2629, 2630, 2631.

Moseley Associates

continued on page 204

Get Aligned Stay Aligned with STL precision magnetic test tapes

These dependable tapes are used by broadcasters, recording studios, equipment manufacturers, governments and educators throughout the world. They are available in two basic types . . . (azimuth, level set and frequency alignment) and (flutter and speed). Three basic formats are offered . . . reel to reel, cartridge and cassette.

Most catalog items can be shipped from our inventory the same day we receive your order. Write or phone for fast delivery. Write for free catalog.

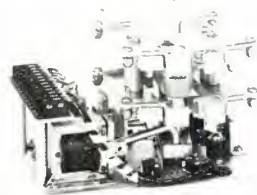


STANDARD TAPE LABORATORY, Inc.

26120 Eden Landing Road / #5 / Hayward, CA 94545
 (415) 786-3546

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Geleco Electronics, Inc.



Now in U.S.A.

Address: 1051 Clinton St.
 Buffalo, N.Y. 14206
 PH. (416) 421-5631

For More Details Circle (251) on Reply Card

BUILD A BETTER STATION

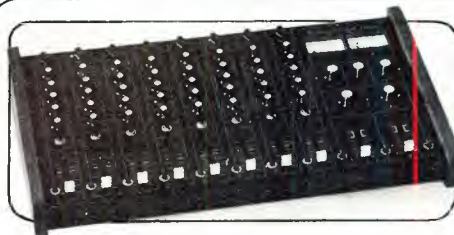
Call Aderhold Construction Company. A complete construction management team of architects, builders, engineers and designers. No problem too large or too small. 404/233-5413.



**Aderhold Construction
Company**

3384 Peachtree Rd. NE / Atlanta, Georgia 30326

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Richmond Sound Design

Portable Broadcast Console



**Listec
Television
Equipment Corp.**

LISTEC
 39 CAIN DRIVE, PLAINVIEW, NEW YORK 11803
 (515) 694-8963 TELEX 640470
 (WEST COAST)
 4527 SAN FERNANDO ROAD, UNIT 1, GLENDALE,
 CALIFORNIA 91204 (213) 244-0838

"SOUND CHOICE"

- 8 input channels, expandable to 24
- 2 independent program channels
- complete equalization, monitoring and cueing throughout
- individual and master foldback and echo send controls
- switchable line inputs/microphone attenuation
- rugged, compact, lightweight
- \$2,465.00 • options available

NAB BOOTH #700

For More Details Circle (180) on Reply Card

NAB Exhibitors

continued from page 203

Aural STLs; remote pickup links; audio limiter; remote control system; digital control system and computer option; stereo generator; and tele-control system. **New:** Telecontrol system, AM stereo STL system, and satellite earth station remote-control system. **Booth 310.**

see ad on page 133

Motorola Communications and Electronics

Car telephones, pagers, portable FM radios, and mobile FM radios. **Booth 308.**

Mutual Broadcasting System

Television programs. **New:** Satellite distribution system, small-aperture receiving terminal, and 10-foot diameter receiving antenna. **Booth 407.** **Hospitality Suite:** Hilton, rooms 2964-65.

NEC America

Time base corrector, ENG cameras, automatic video delay line, U-matic editing system, frame synchronizer, and telephone video system. **New:** Digital video compressor; FM and VHF-TV transmitters; digital noise

reducer; and Domsat earth station. **Booth 1009.**

NTI America

Booth 1600.

Nagra Magnetic Recorders

"E," stereo SL, ISL recorder, SNN recorder, DSM, 4.2L recorder, QGB 10½-inch adapter, and assorted accessories. **Booth 323.**

see ad on page 122

National Courier Systems

Booth 116.

Rupert Neve

TV sound console, and radio console. **New:** Computer audio editing. **Booth 405.**

see ad on page 9

Nortronics Company

Tape heads, head relapping kit, bulk tape erasers, head demagnetizers, and broadcast alignment tapes. **New:** Cassette eraser, and VCR videocassette recorder maintenance kit. **Booth 319.**

see ad on page 64

Fred A. Nudd Corporation

New: Model communication towers. **Booth 351.**

see ad on page 218

Nurad

Golden rod, dual rod, omni-directional antennas for helicopters, and ENG/EJ antenna systems. **New:** Superquad with microprocessor remote control system, dual-channel 20 QP2 quad polarized antenna system, 2.5 Ghz antenna systems for ENG, and 2.0/7.0 GHz antenna systems for ENG. **Booth 910.**

see ad on page 223

O'Connor Engineering Laboratories

Conventional tripods; hydrolic tripod; fluid pan and tilt camera heads; and fluid zoom control. **Booth 1202.**

see ad on page 151

Oktel Corporation

New: Slo-motion disc recorder, slide file disc recorder, and teleproduction disc recorder. **Booth 1131.**

see ad on page 81

The Olesen Company

Booth 1309.

Optek

Bulk tape degausser, and visual transmitter demodulator. **Booth 1304.**

see ads on pages 225, 226

Orange County

Booth 317.

Orban Associates

Split Second Time Machine

The Telex/Magnecord 1400 recorder. Split second timing with a grid of 524 lines passing a quartz crystal control reference each capstan revolution. This senses, and corrects the speed of the DC servo drive some 4000 times per second*. Speed stability is so accurate the National Weather and the Environmental Satellite Services selected Telex/Magnecord 1400's over all others to record meteorological display data. Of course, broadcasters also favor the 1400 for the rugged stability of the die cast main frame, DTL logic and exceptionally clean electronics. Compare our speed, specs, and price. We invite you to make a split second decision.

*At 7½ ips, adjustable $\pm 1\%$ to compensate for tape thicknesses and mechanical wear.

PRODUCTS OF SOUND RESEARCH

TELEX
COMMUNICATIONS, INC.

9600 ALDRICH AVE. SO. • MINNEAPOLIS, MINN. 55420 U.S.A.
Europe: 22 rue de la Legion-d'honneur, 93200 St. Denis, France
Canada: Telak Electronics, Ltd., Scarborough, Ontario



For More Details Circle (182) on Reply Card

Optimod-FM, parametric equalizer, dual-spring reverb, stereo synthesizer, de-esser, and stereo limiter/compressor. **New:** Optimod-AM. **Booth 402. Hospitality Suite:** Hilton.

[see ads on page 65](#)

Otari Corporation

Professional and broadcast recorders, including models MX5050-FL, 2SL, 2SH, DP4050, DP1010, and MK II. **Booth 400. Hospitality Suite:** Hilton.

Pacific Recorders & Engineering

System 1 fully digital logic controlled audio console; limiter and AGC systems; and custom studio cabinetry. **New:** BMX-12 high-performance audio console for general radio applications, and production timer system. **Booth 102.**

[see ads on pages 66, 88](#)

Packaged Lighting Systems

Quartz cyc strips; modular strip lights; quartz follow spotlights; light trees and telescopic power bridge; remote electronic dimming systems; miniature quartz photo floods; modular illuminated dance/stage platforms; and assorted special effects and special effects controls. **New:** Quartz studio TV packages; dimming systems; electrical power and rigging track; and portable TV lighting kits. **Booth 905A.**

Panasonic (Audio Engineering)

Booth 330.

Panasonic [Technics]

Quartz-controlled, direct-drive turntable; linear phase speaker system; flat system components; and portable cassette deck. **New:** Isolated loop reel-to-reel tape recorder for broadcast applications. **Booth 419.**

Panasonic [Video Systems]

Studio broadcast camera, 3/4-inch portable VCR, 1/2-inch VHS cassette recorder, 3/4-inch editing system, time-lapse VTR, studio camera, ENG portable color camera, portable b&w camera, production switcher, sync generator, chroma key, production switcher, and miscellaneous monitors. **New:** Self-contained ENG video camera. **Booth 417. Hospitality Suite:** Sahara.

[see ad on pages 74, 75](#)

Paperwork Systems

Full line of BAT billing, accounting, and traffic minicomputer systems. **New:** BAT 1750 system interconnected to radic and TV switchers in other NAB booths to collect data during show. **Booth 316.**

Phelps Corporation

Communications Company

[continued on page 206](#)

NEW

From
**WILKINSON
ELECTRONICS**

NOW

From
**WILKINSON
ELECTRONICS**

the All Solid State 1 KW FM Transmitter

Our 14th Year of Progress with
260 Transmitters In Service and
6436 Clients from
Abu Dhabi to Zambia

"See in operation at NAB"

Booth #303

**WILKINSON
ELECTRONICS, INC.**

P.O. BOX 738 • CHESTER, PA. 19013 (215) 497-5100 • TWX 510 669 3188

New as Tomorrow... Reliable as Today

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**For NAB booth locations,
see Exhibitor Guide on Page 49**

NAB Exhibitors

continued from page 205

Transmission lines, FM antennas, harmonic filter, and directional couplers. **New:** Super-power FM antennas. **Booth 327.**

Philips Broadcast Equipment Corporation

Multi-conductor studio and field camera; triaxial-cable studio and field camera; portable ENG/EFP camera; convertible color camera and modular production system; portable production color camera; telecine camera chain; UHF and VHF television transmitters; color synchronizing pulse generator; and 1-inch video recorder. **New:** Studio camera in an ENG/EFP package, and improved full-sized studio color camera. **Booth 719. Hospitality Suite:** MGM Grand, Suite 2161A.

Potomac Instruments

Antenna monitors; AM field-strength meters; FM field-strength meters; TV field-strength meters; frequency synthesizer; video jacks and plugs; RF jacks and plugs; remote metering equipment; automated transmitter; and system for directional antenna arrays. **New:**

Stereo audio generator/gain set; automatic distortion analyzer; inter-modulation distortion analyzer; and wow and flutter meter. **Booth 427.**

see ads on page 219

Power-Optics Booth 820.

QEI Corporation

FM automatic transmitter system, AM monitor, AM RF amplifier, FM monitor, FM RF amplifier, stereo monitor, VHF TV monitor, FM exciter, 10-watt FM transmitter, stereo generator, SCA generator, AM + FM peak limiters, AGC amplifiers, and composite STL system. **Booth 329.**

QRK Electronic Products

Tone arms, furniture, turntables, remote mixers, disco mixers, and audio consoles. **New:** Omega audio consoles, alpha mini system, electronic speed control, direct-drive DC turntable, and digital clock. **Booth 104.**

see ad on page 238

QSI Systems

Time date generator, and 24-hour video/audio logger. **New:** Digital master clock; frame and field counter; test monitoring switcher; and video source identifier. **Booth**

1500.

Q-TV

VideoPrompter systems. **Booth 735.**

Quick-Set Inc.

Pedestals, tripods, dollies, and assorted heads. **Booth 1110.**

RCA American Communications

Audio and video services. **Booth 707.**

RCA Broadcast Systems

Studio and field cameras; ENG and EFP cameras; videotape recorders; film systems; frame synchronizer; TV transmitters; TV antennas; and radio and audio products. **New:** TV cameras, and videotape editing systems. **Booth 601.**

see ad on page 215

RCA Electro Optics & Devices Booth 701.

RE:DB Company Booth 320.

Ramko Research

Audio consoles; audio distribution amplifiers; Mic/line amplifiers; turntable preamps; portable mixer with limiting line amplifiers; mike distribution amplifiers; equalized line amp; monitoring amplifiers;

WE'VE TAUGHT A LOT OF PEOPLE HOW TO EDIT VIDEOTAPES WITH CREATIVE FREEDOM.*

*(Some even learned enough to imitate us).

The TRI EA-3 Edit Control System offers the latest state-of-the-art approach to editing with frame accuracy between U-format recorders. Human engineered for simplicity and pin-point edit decisions in true still-frame mode. It is the most comprehensive low-cost Control Track Editing System available, with over 1,000 originals in daily use. Fully complemented by a line of accessories that gives you as much freedom as your talent can create.

A Dual Digital Timer, the DDT-1 can be added to an EA-3 Editing System to provide accurate numeric reference to tape locations. Independent Play and Record counters have separate Set and Preset features.

An End Insert Timer, the EIT-1, allows you to preview and rehearse an insert with frame accuracy until you are satisfied with the In and Out points; then it does it all for you.



For editing decisions, the FF-1 frame finder provides VTR remote control, Pre-roll cue, Variable Speed search, and a Single Digital Timer which offers accurate reference to edit events in minutes, seconds and frames.

For "on-air" application, or control of VTR's with associated time code readers, the FF-3 is a simplified frame finder without the Digital Timer.

So, if you are serious about your business, don't settle for imitations. Demand creative freedom from TRI.



Television Research International
1003 Elwell Ct.
Palo Alto, CA 94303
(415) 961-7475

For More Details Circle (184) on Reply Card

turntables; reel-to-reel recorder; portable stereo cassette decks; parametric equalizers; speakers; and tape cartridge equipment. **New:** 16x12 stereo/mono audio routers. **Booth 112.**

see ads on pages 44, 109

Rank Precision

New: Portable MRL for LDK-15; Varotal multi-role lens; MK3 flying spot telecine; and pre-programmed color correction and machine control. **Booth 922.**

Recortec

R-Mod reel servo modification, video tape timers, and video tape evaluator (1-inch). **New:** Videocassette evaluator, and quad tape cleaner. **Booth 803.**

see ads on pages 200, 218

Rockwell International [Commercial Telecommunications Group]

AM and FM transmitters; audio console; audio studio; and satellite communication capabilities. **New:** Video relay microwave system. **Booth 300.**

see ads on pages 162, 163

Rohde & Schwarz

Color TV monitors, switchable standard color TV receiver monitors, and automatic VIT analyzing systems. **New:** Color TV bridge monitor, precision TV demodulators, and remote controllable AM/FM tuner amplifier. **Booth 817.**

Ross Video Ltd.

New: Video switcher. **Booth 1301A.**

Russco Electronics

Turntables, preamps, consoles, and speakers. **New:** Phonomate preamp, disco unit, and 8-channel console. **Booth 200.**

see ad on page 96

SWR

Booth 1215.

Scientific Atlanta

Video earth stations, and video demodulator. **New:** Small-diameter audio receive-only earth station, and automatic antenna position control unit for 10-meter diameter earth stations. **Booth 1205.**

Scully Recording Instruments [Dictaphone]

Tape recorders/reproducers, tape reproducers, and broadcast logger recorders. **Booth 305.**

see ads on pages 196, 197

Sescom

Audio modules audio transformers, multi-box, direct boxes, mic-splitters, snakes, cables, and audio accessories. **New:** Mic-line driver,

stereo balance box, input balancer, output balancer, and line-level splitter. **Booth 105.**

Sharp Electronics Booth 744.

Shintron Company

Switchers. **New:** SMPTE-EBU code generator, SMPTE/EBU code reader, encoded chroma keyer, color bar/background/black generator, and BP switcher. **Booth 1123.**

Shure Brothers

Audio equalizer; equalization analyzer system; microphones; audio

consoles; portable sound system; and professional broadcast microphone mixers. **New:** Telephone acoustic coupler. **Booth 309.**

Sintronic Corporation

New: FM exciter/transmitter, AM transmitter, and FM transmitter. **Booth 512.**

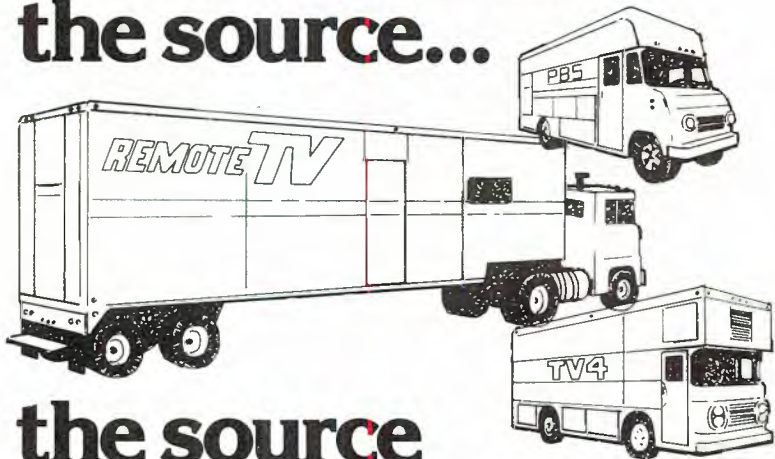
see ad on page 184

Eric Small and Associates

Peak program meters, Denon professional turntables, and tower lights monitor (LiteAlert). **New:**

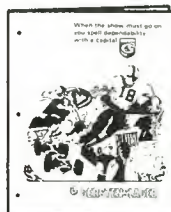
continued on page 208

When you cover the action from the source...



the source for mobile studios should be Gerstenslager.

In a van or trailer, your most modern, best equipped studio could be your Gerstenslager. It all starts when you tell us what you need. The job to be done. Then we'll work with your engineers and principal equipment suppliers. Develop the plans. Detail placement of every piece of equipment, generators, wiring, climate control, consoles. Exactly as you want it. Then, build the unit from the frame up. A studio on wheels that is actually a dependable broadcasting station comparable to conventional studio systems.



How we do it with examples of work we have done for others is included in this brochure. It's yours for the asking. Write or call: (216) 262-2016.



GERSTENSLAGER

The Gerstenslager Company, Wooster, Ohio 44691

NAB Exhibitors

continued from page 207

Autologger/remote control/ATS.
Booth 413.

see ad on page 155

Soll

Design and construction of broadcast facilities; design, fabrication, and installation of RF switching systems; and station planning.

Booth 816.

Sono-Mag Corporation

Carousel, Carastat, automation programmer, super clocks, cartridge recorders and players, time announcers, tone sensors, tone generators, and silence alarms. **New:** Programmable remote control, and automation programmer. **Booth 403.**

Sony

1-inch VTRs, video cameras, and monitors. **New:** Portable video camera. **Booth 1005.**

see ads on pages 42, 43, 141

Sound Technology

Harmonic distortion analyzer, intermodulation analyzer, FM stereo generator, and oscilloscopes. **New:** Audio signal generator, and stereo test panel. **Booth 1308.**

see ad on page 27

Spectra-Vision

Editor programmers. **New:** Video-tape editor programmer with random access and time code. **Booth 1315.**

see ad on page 182

Stanton Magnetics

Magnetic cartridges, styli, and headphone. **New:** Cartridge and headphone **Booth 211.**

see ad on page 121

Storeel Corporation

High-density tape and film storage mode, and "Room Stretcher" by RCA. **New:** High-density audio cart storage, and high-density tape and film storage mode. **Booth 903.**

see ad on page 236

Strand Century

MMS memory system, Multi-Q memory system, Ianiro quartz link, and portable packages. **New:** Micro-Q memory control system, Ianiro HMI link, Multi-Q memory control system, and axial leko. **Booth 624.**

Studer ReVox America

Portable tape recorders, and mixing consoles. **New:** Tape synchronizer system, tape recorders, and broadcast monitors. **Booth 114.**

see ad on page 137

Studio Tape Exchange

New and reprocessed tape, film, and editorial supplies. **New:** Video source identification unit, omni-link, and drop-out monitor. **Booth 1212.**

see ad on page 225

System Concepts

NTSC production titler, monochrome production titler, and NTSC production titler. **New:** Variable-font character generator, and automated character generator/machine control system. **Booth 1125.**

see ad on page 217

Systems-East Division [Conrac]

New: Eidophor color 5170 large-screen television projector. **Booth 821.**

see ad on page 192

Taber Manufacturing and Engineering Company

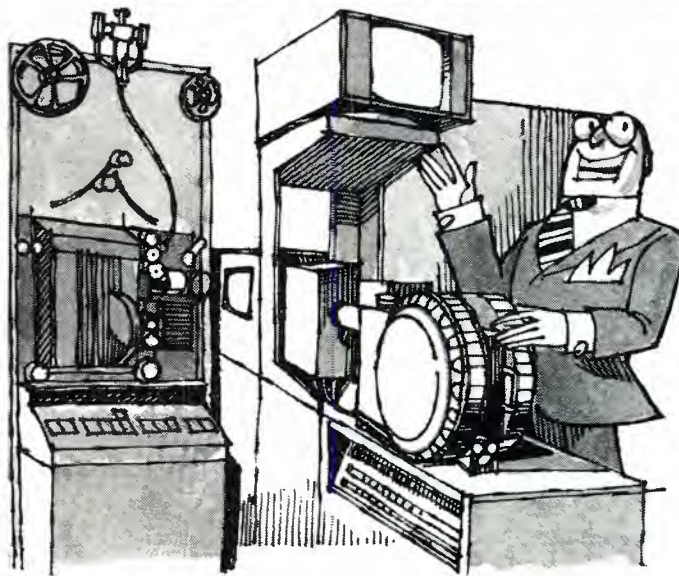
Audio heads, audio head reconditioning, audio recorder overhaul service, and Taberaser bulk tape eraser. **New:** Stereo VTR audio head, and stereo VTR audio conversion. **Booth 510.**

see ad on page 168

William B. Tanner Company

New: Syndicated services, station IDs, production packages, and promotion packages. **Booth 349.** Hos-

Put "yesterdays"
film island
in touch with
"tomorrows" needs
by using the
BEI-709 A.L.C.



The BEI-709 Automatic Light Control eliminates the electronic and mechanical problems associated with light level control on "yesterdays" film islands.

The BEI-709, make it work for you "today", quickly & simply.

BEI

P.O. BOX 106-A • OLATHE, KANSAS 66061 • (913) 764-1900

For More Details Circle (186) on Reply Card

pitality Suite: Hilton, room 1669.

Tayburn Electronics

New: Modem controller, antenna system, video receiver, and transmitter line. **Booth 1200. Hospitality Suite:** MGM Grand.

Technology Service

Weather radar TV converter, electronic map overlay, and color weather radar system. **New:** Time lapse unit, and computer/communications interface. **Booth 1501.**

Tektronix

Spectrum analyzers, and precision demodulator. **New:** Answer system. **Booth 811.**

see ad on pages 62, 63

Tele-Cine

Schneider TV lens and accessories. **New:** FNG lenses. **Booth 804.**

see ad on page 234

Telecommunications Industries Ltd.

Porta-pattern line, including: test charts, test-chart systems, slides, films, transparencies, transparency illuminators, and custom optical test media. **New:** Electronic field production 3-chart system, Porta-pattern/BBC flesh-tone reference slide, monitor gray scale reference unit, and "stand by" slide systems. **Booth 1206.**

TeleMation

Graphics system, video/audio distribution switcher, color film camera, optical multiplexer, sync generators, video distribution amplifiers, pulse distribution amplifiers, subcarrier distribution amplifiers, black burst generator, digital color encoder, video/audio switchers, audio distribution amplifiers, and audio monitor amplifier. **New:** Digital noise filter. **Booth 920.**

see ad on pages 86, 87

Telemet

Envelope delay test set; TV transmitter sideband analyzer; multi-function test set; fiber optics transmitter and receiver; RGB chroma keyer; NTSC chroma keyer decoder; stabilizing amplifier system; demodulator; demodulator tester; synchronous detector; variable-tuned demodulator; audio DA system; audio-visual routing switcher; and audio monitor. **New:** Demodulator; modulator; pulse distribution amplifier; video distribution amplifier; video DA with equalization and clamper; and pulse DA with delay. **Booth 709.**

see ad on page 175

Telescript

The Level Principle®, Telescriptor, Telecue, and lightweight MPS. **New:** Monitor/promoters, and transports. **Booth 806.**

Television Equipment Association

Matthey products, including: video delay, pulse delays, video filters, chroma corrector, auto video equalizer, and line selector; IRT color monitor comparator, intercom headsets, headphones, hi-noise headsets, super-lightweight headsets, and link intercom system. **New:** Chyron 3/4-inch magnetic tape cleaner/evaluator, and sportscaster headset. **Booth 703.**

Television Research International

Signal system, editing system, time code generator, readers, and character generator. **New:** Microproces-

sor-based time code editing system, end of insert timer, search control unit, and digital color sync generator. **Booth 1303.**

see ads on pages 179, 206, 224

Television Technology Corporation

VHF translator, FM translators, solar-powered translators, and translator/power amplifiers. **New:** UHF translator. **Booth 1502. Hospitality Suite:** Monaco Motel, Suite A.

Telex Communications

Reel-to-reel tape recorders, cartridge tape recorders, headphones, headsets, tape transports, and

continued on page 210

It takes a tough cart to survive in this business. AMPRO TOUGH!

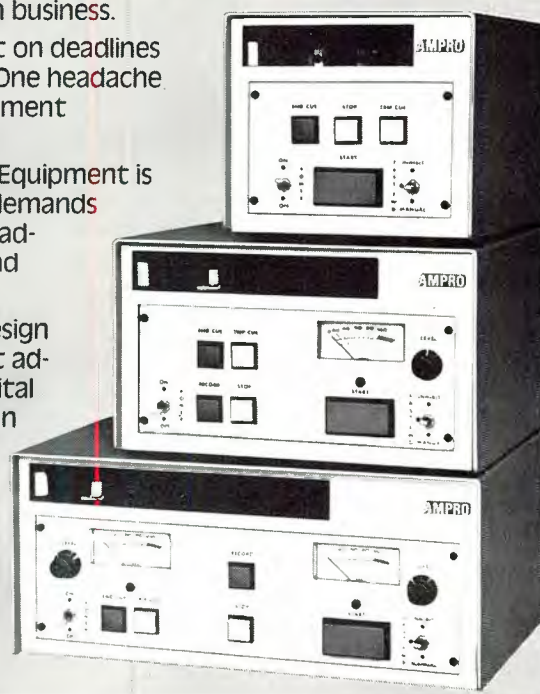
Broadcasting is a rough business.

It's long on hours, short on deadlines and big on headaches. One headache you don't need is equipment breakdowns.

Ampro Cartridge Tape Equipment is designed to meet the demands of the professional broadcaster. It's built to sound better and last longer.

Our superior system design makes use of the latest advances in linear and digital integrated circuit design to give you superior system performance and reliability.

Get smart.
Get tough.
Get Ampro.



AMPRO BROADCASTING INC.

850 PENNSYLVANIA BLVD., FEASTERVILLE, PA 19047 • (215) 322-5100
Professional Equipment for Broadcasting Professionals

VISIT US AT BOOTH NO. 100, NAB SHOW

For More Details Circle (187) on Reply Card

NAB Exhibitors

continued from page 209

amplifiers. **New:** Hear Defender headsets, and reel-to-reel tape logger. **Booth 311.**

see ads on pages 204, 228

Tentel

Tape tension and diagnostic gauges for all audio and video applications. **New:** Tape tension gauge for Sony BVU 100 and BVU 200. **Booth 1119.**

see ad on page 229

TerraCom (Conic)

ENG microwave radios, video protection switch, satellite earth stations, microwave systems, and microwave antennas. **Booth 1233.**

see ad on page 153

Thomson-CSF Laboratories

Digital noise-reduction systems, portable TV cameras, character generator systems, color correction systems, telecine systems, RF microphone systems, microwave system, VHF transmitter, UHF transposer, automatic level controller, and automatic peak controller. **Booth 727.** **Hospitality Suite:** Hilton.

see ad on page 61

Tiffen Manufacturing Company

Filters, including: star effect; fog effect; double fog effect; diffusion and half-diffusion; and split-field lenses. **New:** Multi-image lenses, vari-burst filters, center-spot filters, and coral filters. **Booth 1101.**

Time & Frequency Technology

AM modulation monitor; tunable AM RF preselector; FM modulation monitor; tunable FM preselector; stereo monitor; SCA monitor; expandable remote control system; direct on/off control monitor system; telemetry/control system; and TV frequency and aural modulation monitor. **New:** Remote control equipment, and dual composite STL transmitter/receiver. **Booth 212.**

see ad on page 5

Toshiba International

New: Automatic color TV camera for studio, portable color TV camera, carrying-sub production equipment, and wipe-pattern generator. **Booth 1015.**

Townsend Associates

UHF IF modulated solid-state exciter, and external cavity klystron amplifiers. **New:** Integral cavity klystron transmitters, solid-state 1 kw VHF driver/transmitter, vacuum con-

tactors, RF impedance plotter, and EEV external cavity klystrons. **Booth 802.**

see ad on pages 118, 119

Track Audio

New: Discriminate Audio Processor II, digital multi-purpose audio tester, and photo preamp. **Booth 326.**

Trompeter Electronics, Inc.

RF connectors; patching and cable assemblies; and subminiature twinax-triax series. **New:** Audio patching, and patented wrench crimp. **Booth 1305.**

see ad on page 214

Tuesday Productions

Formats, including: Mellow Music, News People, Sunshine, Good Country, We Are The Music, Sales Plus, The Mellow Sound, and It's Your Country. **New:** Superstars, The Great 8, and Whisper Guns. **Booth 331.** **Hospitality Suite:** MGM Grand.

UMC Electronic Company

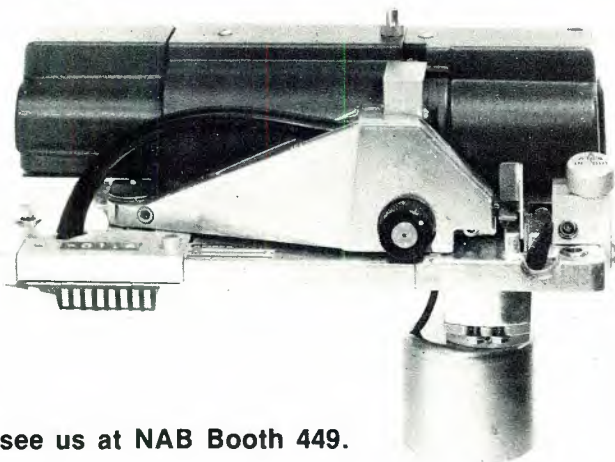
Audio tape cartridge machines, splice finder/bulk eraser, audio heads, and replacement motors. **New:** Automated news recording system. **Booth 210.**

see ads on pages 60, 199

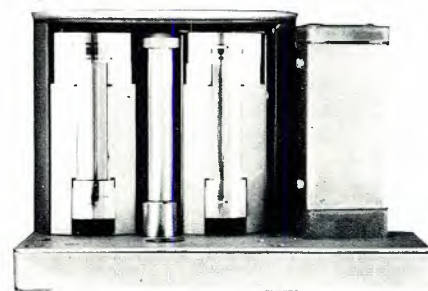
Ultra Audio Pixtec

CMC Provides Unexcelled Services For:

- Refurbishing Video Head Assemblies - Mark III, Mark X, Shibaden Mark X, Mark XV, Mark XX and RCA.
- Refurbishing Audio Heads for Ampex & RCA VTR's.
- Immediate Delivery - Video Discs & Heads for HS-100.
- Line-by-Line Auto Equalizer for VR-1200 & VR-2000.
- Velocity Error Corrector for VR-1200 & VR-2000.



Please see us at NAB Booth 449.



For more information, please write:

COMPUTER MAGNETICS CORP.

125 W. Providencia Ave.
Burbank, Calif. 91502
U.S.A.
(213) 843-6674

For More Details Circle (188) on Reply Card

Audio/video monitoring bridge for U-matic VCRs, radio broadcast remote amplifier and mixer; ultra-compact audio power amplifier; and audio interfaces for VCRs and videocassettes. **New:** Waveform monitor, vectorscope, audio console, and color bar/sync generator. **Booth 1133.**

Unarco-Rohn

New: Solid rod towers. **Booth 339.**

Uni-Set

[Kniff Woodcraft Corporation]

Uni-Set studio system. **Booth 1311.**

United Press International

Broadcast Datanews, Nevada broadcast newswire, UPI audio network, and computer terminal editing. **New:** Satellite delivery of audio and news wire, and Newstime (slow-scan video-audio news show). **Booth 1121. Hospitality Suite:** MGM Grand.

United Research Lab Corporation

Auto-Tec tape recorder; replacement parts for professional recorders, including coated pinch rollers and motors; Auto-Tec audio op-amps; Ampex/MRL/Nortronics test tapes; and Ampex/IEM/Nortronics head stacks and recorder care products. **New:** Solid-state conversion amps for tube-type amplifiers; and ball-bearing, self-adjusting pinch roller. **Booth 425.**

United States Tape & Label

Booth 204.

Utah Scientific

New: Audio and video distribution switchers. **Booth 1213.**

see ad on page 70

Utility Tower Company

Lighting and tower. **New:** Actual tower material. **Booth 411.**

Thomas J. Valentino, Inc.

New: Sound effects, and production music. **Booth 315.**

Van Ladder, Inc.

Microwave antenna carrier and camera platform. **New:** Microwave antenna carrier. **Booth 1139.**

Varian Associates

UHF TV klystrons, and power grid tubes. **Booth 913.**

Video Aids Corporation of Colorado

Video line isolators, electro optical isolators, burst phase meter, phase meter, color sync generator, party lines (audio intercom), video switch, black burst generator, and video color distribution amplifier. **New:** Editor controller, battery-operated ENG color sync, and low-cost VDA. **Booth 1106.**

see ad on page 24

Video Data Systems

New: Titlers, master marquee, character generators, and weather systems. **Booth 1210. Hospitality Suite:** Caesar's Palace.

The Video Tape Company

Videocassettes, duplication services, and VTC 1000 quadraplex 2-inch tape. **Booth 1108.**

Videographix

35mm chroma-key news graphics. **Booth 1400.**

Videomagnetics

Refurbishing Ampex video head

assemblies, and RCA head panel assemblies. **New:** RCA high-band, ball-bearing head panel assembly for mobile use, and Ampex rotary transformer assembly for Mark Xs. **Booth 1220.**

see ad on page 135

Videomax [Orrox Corporation]

Will refurbish video head wheel assemblies for RCA high-band and low-band; Ampex Mark XV, Mark X and Mark III; and will convert RCA low band to high band. **Booth 801. Hospitality Suite:** Hilton.

see ad on page 1

continued on page 212



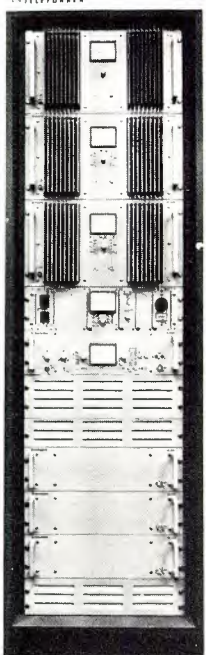
"ON THE AIR"

FM PROBLEM SOLVERS



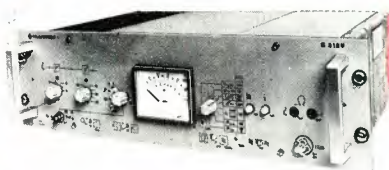
COST PROBLEMS

- 1 Equipment
- 2 Hydro
- 3 Spares
- 4 Maintenance
- 5 Program Loss



COST SOLUTIONS

- 1 Standardization
- 2 High Efficiency Design
- 3 Fully Solid-State
- 4 Maintenance Free Modules
- 5 Maximum Protection & Redundancy



- 1 Standardization — a family of electronic building blocks beginning with a complete 50W self-contained station which is also used as an exciter. By mating with one or more family modules we can build-up power to 10kW.
- 2 Solid-State "overdesign" in the transmitters has resulted in high power efficiency, low power consumption.
- 3 No moving parts — means no wear, no replacement, no spares.
- 4 Easily removed, maintenance-free modules "slide out, slide in".
- 5 Telefunken design parameters means — maximum on air time — no program loss.

SEE THE FM
PROBLEM SOLVERS
IN BOOTH No. 337
AT N.A.B.

BAYLY ENGINEERING LTD.
a member of the AEG-TELEFUNKEN group
167 Hunt Street
AJAX, ONTARIO, CANADA. L1S 1P6
Telephone: 416-683-8200 Telex: 06-981293

For More Details Circle (189) on Reply Card

NAB Exhibitors

continued from page 211

Videotek Inc.

New: Dual 8-inch color monitor, and 8-inch receiver/monitor. **Booth 1117.**

Vital Industries

TV automation; video switchers, master control switchers, audio DAs, frame synchronizer, production switcher, and automation system (PSAS). **New:** Squeezezoom, sync generator, routing switcher, and production switcher. **Booth 723, Hospitality Suite:** MGM Grand.

see ad on BC

Ward-Beck Systems

Transportable consoles, TV recording consoles, custom TV console, TV intercoms, monitor amplifiers, distribution amplifiers, portable extended range VU meter, and rack-mounted extended range VU meter. **New:** Radio and TV consoles. **Booth 923.**

see ad on IBC

Western Union Telegraph
Booth 905.

The Widget Works

New: Production model automatic transmitter operator. **Booth 104.**

see ad on page 194

Wilkinson Electronics

15 kw air-cooled dummy load, 25 kw air-cooled dummy load, 15 kw air-cooled AM dummy load, direct Thyatron replacements, silicon rectifiers, and line surge protectors. **New:** 1 kw solid-state FM transmitter, 2 kw solid-state FM transmitter, 20 kw single tube FM transmitter, and 250 watt solid-state AM transmitter. **Booth 303, Hospitality Suite:** Hilton.

see ads on pages 20, 205

The Winsted Corporation

½-inch videocassette cabinets, stands and storage systems; and video consoles. **New:** Editing consoles, high-density tape storage systems, tape transport trucks, and ¾-inch dubbing racks. **Booth 1313.**

see ad on page 92

Wolf Coach

3-camera mobile EFP unit. **New:** ENG/EFP mini module. **Booth 1100.**

World Video

Professional and utility color monitors, and color RF monitors. **New:** 8-inch AC/DC rack-mount color monitor for EFP and EJ, and portable AC/DC color monitor for field applications. **Booth 904.**

see ad on page 229

Zei-mark Corp.
Booth 1507.

Late additions:

Inovonics
Booth 202.

see ads on pages 44, 174

Spin Physics
Booth 916.

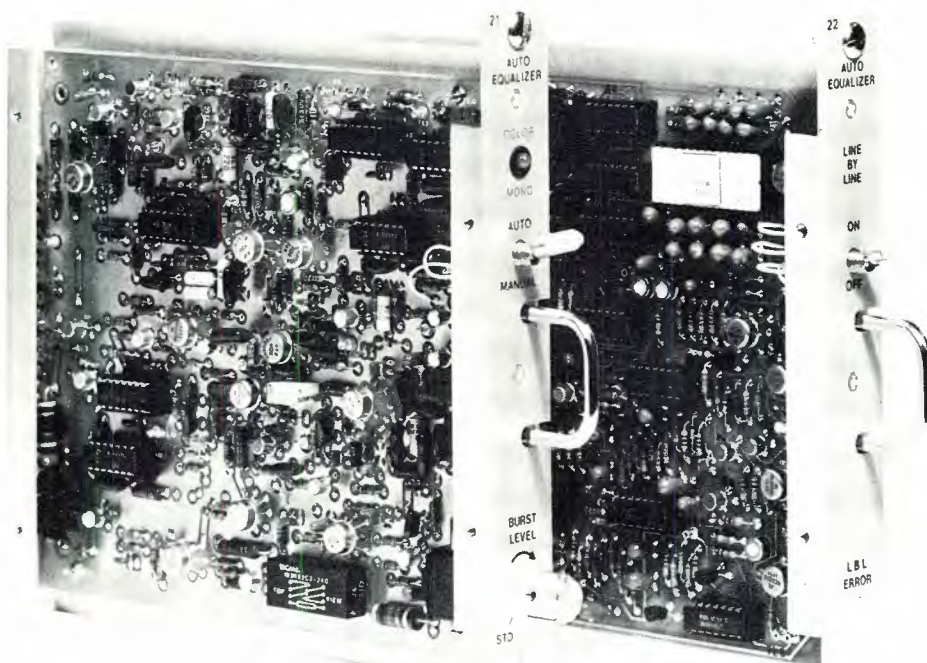
see ad on page 261

Video Associate Labs

Modification kits for existing video equipment. **New:** DC drum servo modification kit for Sony VO2850A; field framer modification kit for Sony VO2850A; and de-fopper for the Ampex AVR2. **Booth 1404.**

see ad on page 216

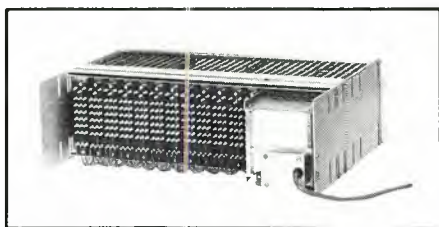
Easily update your VR-2000 & VR-1200 to obtain full AUTOMATIC Line by Line and Channel by Channel Chroma Level Adjustment.



COMPUTER MAGNETICS CORPORATION

125 W. Providencia Avenue, Burbank, California 91502, USA: TEL: (213) 843-6674

For More Details Circle (190) on Reply Card



AUDIO DISTRIBUTION AMPLIFIER PACKAGE

The SA-200 DA, is available in two basic packages. Shown is the wiring side of the 12 card frame which contains a Dual Regulated Power Supply and rear mounted Terminal Boards for ease of installation. Provides 12 Inputs and 72 Outputs at a cost of \$2,495.00. Other products include: Custom Audio Consoles, Studio Intercom Systems, Studio Monitor Systems, Video and Pulse Distribution Amplifiers Systems, **SCIENTIFIC SYSTEMS, INC.**, 5 Donsen Lane, Scotch Plains, New Jersey, 07076, (201) 756-0889.

For More Details Circle (191) on Reply Card

PULTEC®



EQUALIZERS & FILTERS

Twenty years of **capable, dependable** service in radio & TV stations and recording studios. U.S. and overseas. Picture is solid-state Model MEQ-5 Audio Mid-range Equalizer.

PULSE TECHNIQUES, INC. 1411 Palisade, Teaneck, N.J. 07666. Tel. (201) 837-2575
Cable: PULTEC TEANECK, NEW JERSEY

For More Details Circle (192) on Reply Card

SOLID STATE TOWER FLASHERS



A new series has been added to SSAC's line of "B-Kon-Flash". The new devices with a load current rating of 300 Amperes Inrush will operate up to four beacons at 230 VAC, two beacons at 120 VAC. Also available are auxiliary units for synchronous operation of additional beacons on separate lines or for alternating flashing of beacons.

Lamp Life is increased by approximately 10 X due to Zero Voltage Switching. Device measures 2 x 2 inches and is completely encapsulated. Price in 1-9 quantity, \$34.60 each, FOB Factory. For more information call John Arnold at (315) 622-1000.

SSAC Inc.

PO Box 395, Liverpool, NY 13088

For More Details Circle (193) on Reply Card

New Products

continued from page 82

Video switchers

Solid-state remotely-controlled video switching is now part of Dynair Electronics' Series 5900 broadcast distribution equipment family.

Switching configurations of 5 in by 1 out, 10 in by 1 out, and 5 in by 5 out are available. The switching components are comprised of six basic assemblies which provide the three optional system sizes.

The basic element is the plug-in module, model SW-5905A Video Switch Module, which provides high-quality vertical/interval FET switching of five sources to one output. On-board control latching and tally drive are included on the module.

Five "frame adapter" assemblies allow the choice of input-output size and signal connector interface. These units also serve to adapt the plug-in module(s) to the Series 5900 module frame assembly.

This complement of assemblies form a solution to switching requirements such as source selection to videotape recorders, transmitters, quality-control monitors, and client rooms.

For More Details Circle (269) on Reply Card

Cassette cleaner/evaluator

Recortec's video cassette evaluator (VCE) provides high-speed cleaning and evaluation of 1/4-inch videocassettes. The unit is factory installed on a new Sony VP-2000. With the VCE installed, the VP-2000 can still be used as a normal cassette player and also will clean tapes.

As the player moves the tape in the fast forward mode, the VCE first cleans the tape, then the evaluation head records a longitudinal signal on the tape and reads it back to locate tape defects via amplitude detection. Surface defects and edge damage are totaled on two LED numeric counters. Maximum tape length is indicated in 10-minute increments up to 60 minutes. An optional digital printer provides a test record showing the location of each tape defect.

For More Details Circle (270) on Reply Card

AM transmitter

The BA-10K, McMartin Industries' new 10 KW AM transmitter, incorporates a state-of-the-art solid-state circuitry in all stages up to the final modulators, and RF amplifiers.

continued on page 214

Budget Turntable Package

Russco Cue-Master
Ramko MP8E
Microtrak 303
Stanton 500-AL

\$349

Studio-Pro Mono Package

Russco Studio-Pro
Microtrak 6400
Microtrak 303
Stanton 500AL

\$399

Studio-Pro Stereo Package

Russco Studio-Pro
Microtrak 6401
Microtrak 303
Stanton D-680EE

\$453

For News Use...



\$119
Sony TC-1108\$119
EV 635A Mike\$49.2/\$96
Shure 50AC Coupler\$27
Shure M67 Mixer\$169
Telex CS-9J HSet\$104

Sennheiser MD-421



\$209

Cart Prices

Length	Fidelipac	Audiopak	Mastercart	Aristocart
Empty	\$1.39	\$1.70	\$1.39	\$3.00
20 Sec	1.60	2.20	2.15	3.05
40 Sec	1.70	2.30	2.20	3.10
70 Sec	1.75	2.35	2.25	3.15
100 Sc	1.80	2.40	2.30	3.20
140 Sc	1.90	2.45	2.35	3.25
2.5 Mn	2.00	2.50	2.37	3.25
3.5 Mn	2.10	2.60	2.47	3.30
4.5 Mn	2.25	2.70	2.55	3.35
5.5 Mn	2.35	2.80	2.66	3.40
7.5 Mn	2.50	3.00	2.81	3.50
10.5 M	2.90	3.27	3.05	No

Prices are cash with order and expire 5-1-78
Satisfaction Unconditionally Guaranteed
Write for details of Loyalty Discount Plan.

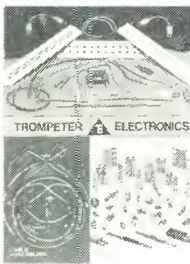
davidgreen
broadcast consultants corporation
703-777-8660
Leesburg, Virginia 22075

For More Details Circle (194) on Reply Card

NEW FREE CATALOG

TROMPETER ELECTRONICS

has just published a new 40 page catalog T11, illustrating a complete line of coax, twinax, triax and quadrax connectors, patch panels, plugs, jacks, patch cords, cable assemblies, networks and accessories. The catalog includes an eight page technical discussion of noise in cable systems.



**SEND FOR YOUR
FREE COPY TODAY.**

**TROMPETER
ELECTRONICS, INC.**

8936 Comanche Avenue, Chatsworth, CA. 91311
(213) 882-1020/TWX: 910-494-1210

For More Details Circle (195) on Reply Card

New Products

continued from page 213

Tubes used are EIMAC type 4CX-5000A, which offer conservative operating characteristics at 10,000 watts plate modulated output power.

The transmitter features dual-crystal oscillators; 125% positive peak modulation capability; oil-filled modulation transformer; power supply design for 1% ripple with no filter choke; fully remote-controlled operation with no adapters required; and solid-state indication of primary control circuits.

The transmitter is capable of power cutbacks to 5 kilowatts and/or 1 kilowatt for two power station operation. It is designed with modular exciter construction use for easy adaption to AM stereo.

For More Details Circle (271) on Reply Card

Battery sync generator

Video Aids Corp. of Colorado's new battery sync generator is designed for running two portable color TV cameras in ENG/EFP applications, greatly reducing past editing.

The model 100 ENG will operate up to four hours on battery power

before recharging is required.

The generator provides all the EIA/RS-170 outputs, plus burst flag, color subcarrier, and black burst.

The portable unit weighs only 6½ pounds.

For More Details Circle (272) on Reply Card

Communication towers

The Fred A. Nudd Corporation offers custom fabrication of communication towers designed to EIA specifications. All components are hot-dip galvanized after fabrication to guarantee the tower's longevity.

After the surfaces are properly prepared, an acrylic paint which meets the FAA five-year minimum code is applied by airless spray, brush or glove.

Servicing includes regular inspections, relamping, repairs, new equipment installation, ground systems installation, and 24-hour emergency service. The firm also offers consultation services on new towers, tower modification, tower equipment, changes in equipment, and ground systems.

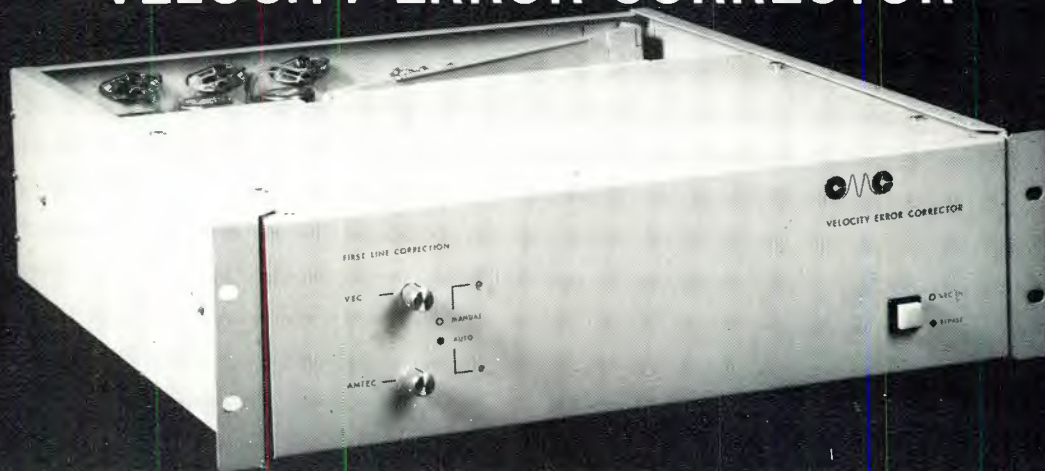
For More Details Circle (273) on Reply Card

TV SCA monitor

Time & Frequency Technology's

INTRODUCING VEC-1200 & VEC-2000

VELOCITY ERROR CORRECTOR



- A self contained unit.
- Plug compatible with the VR-1200 & VR-2000 VTR's.
- Improves interchange playback signal of standard & non-standard recordings.
- Selectable automatic or manual first line correction.
- Improves useful quad head life.

COMPUTER MAGNETICS CORP., 125 W. Providencia Ave., Burbank, Calif. 91502
Tel: (213) 843-6674. Telex: 69-6279.

For More Details Circle (196) on Reply Card

new TV SCA monitor is designed to provide both SCA channel monitoring and proof-of-performance measurements on SCA carriers. These measurements include injection level, S/N ratio, modulation and cross-talk. For added convenience, a 50 dB pushbutton meter attenuator is included, and a wideband input is provided to allow unrestricted distortion and response measurements at the transmitter. Pushbutton selection of either ± 4 kHz or ± 6 kHz as the frequency deviation to represent 100% modulation is a standard feature of the new model 730B.

Other features of the new model 730B include digitally-selectable peak flashers which can measure plus or minus peak FM modulation of SCA carrier and filtered sub-carrier FM output from the rear panel for frequency measurement with external counters.

For More Details Circle (274) on Reply Card

Half-inch videocassettes

Sony Corporation of America has introduced three new Betamax $\frac{1}{2}$ -inch videocassette units, expanding this product line to five.

The new units are the SLP-300/RM-300 portable player with auto-search control, the SLO-320 re-

corder-player, and the SLO-340 portable field production unit.

The Series 300 uses Betamax cassettes in the K-series (in either 30- or 60-minute lengths), providing interchangeability between the SLP-100 player and SLO-260 recorder-player, released earlier this year.

For More Details Circle (275) on Reply Card

Earth station antennas

Anixter-Mark is offering a full line of satellite earth station antennas up to 3.5 meter diameter at any frequency through 14.5 GHz. Earth station antennas are available for both downlink and uplink communication.

Ground mounts come either in the stationary or with remote motorized fine adjust in both elevation and azimuth. Mounts are constructed of heavy-wall aluminum.

For More Details Circle (276) on Reply Card

Demods and DAs

Several new products will be introduced by Telemet at NAB '78. Heading the list is a precision demodulator (model 3710-A1) incorporating many new features, such as both synchronous and envelope detectors; multiplex output, enabling

simultaneous viewing of both synchronous and envelope outputs on a single trace oscilloscope; built-in hi-lo filter; input attenuator; and digital display to measure power supply voltages, input level and audio deviation. A built-in all new demodulator tester enables the user to make a quick check on the demodulator's frequency response, envelope delay, and differential phase and gain.

A complete line of distribution amplifiers, each with six outputs, is headed by standard video DA 3310-A1. VDA 3315 equalizes up to 1000 feet of 75-ohm cable (10 dB loss at 10 MHz). A clamping circuit features feedback and back porch clamping simultaneously. A vernier gain control enables fine gain settings.

Telemet's optical transmission system transmits video signals via a single glass fiber. Consisting of an optical transmitter and receiver, the system has a 10 MHz bandwidth and excellent phase response. Most importantly, the signal is unaffected by electrical fields as it traverses the length of the glass transmission line. This system will meet the rigorous standards of the broadcaster, according to the company.

continued on page 216

Since you're already aware of RCA quality, it makes sense to find out what's inside this custom audio console.

What's inside is what you want inside. After all, the RCA BC-50 is a custom console. But at an off-the-shelf price, because of our unique interconnecting Unimodules.

Each Unimodule has 5 inputs, not 2 or 3. Unimodules can function as input mixers, submaster mixers or echo send/return level controls. Input facilities are almost unlimited. And BC-50 provides a wide range of outputs—mono, stereo, even quad or multi-channel—all with easy expansion. In a configuration you design.

We'll build your BC-50 for surprisingly little. Or you can assemble it for even less.

To design one, just ask your RCA Representative for our 20-page workbook. It has complete BC-50 specs and work sheets. If you prefer, send the coupon. See us at NAB, Booth 601.



RCA Broadcast Systems
Radio Station Equipment Product Management
Building 2-5, Camden, N.J. 08102

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RCA Broadcast Systems

For More Details Circle (197) on Reply Card

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For More Details Circle (198) on Reply Card

New Products

continued from page 215

The model 4420-A1 modulator incorporates a SAW filter (surface acoustic wave filter). It meets FCC specifications for upper and lower sidebands. It does not require an extra video filter plug-in.

For More Details Circle (277) on Reply Card

Production switcher

A studio production switcher with built-in microprocessors to provide event memory and simplified operation will be introduced by 3M Company's Mincom Division at the NAB convention.

The model 9000 video production switcher's built-in memory allows preparation and storage of up to eight panel set-ups for recall during difficult production sequences. The use of microprocessor technology allows for simplified control panel design and layout.

More than 20 effects are selected by a 10-key input bank. Twelve inputs, including black burst and color background, are available.

Effects are generated in hard-switch, soft-switch or border-wipe form; a chroma-key feature is optional.

Capabilities of the new switcher include wipes behind key; dissolves or cuts to key; dissolves to effects; fades to and from black; and dissolves behind chroma key.

For More Details Circle (278) on Reply Card

TV transmitter data sheet

A new data and specification sheet on a 12 kw VHF TV transmitter, model TT-447, utilizing two hybrid combined but totally independent transmitter assemblies to achieve 12 kw output, is available from Acrodyne Industries.

The data sheet describes how low-level IF modulation is used to ensure performance stability at the highest possible levels of program quality. A description of automatic failure sensing and optional modular switching features, along with the inherent broadcast service qualities of hybrid combined power amplifiers, is included.

Described in detail is the visual output amplifier assembly which incorporates a logic status display



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Model U-1 The remarkable little machine that thoroughly cleans 3/4" videotape while it detects tape hazards that cause video dropout, poor image quality, and clogged VTR heads. Hazards like surface and edge damage, scoring, dimples, and oxide voids.

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For More Details Circle (199) on Reply Card

BROADCAST ENGINEERING

panel along with a fault memory system which displays faults by sequentially illuminating light emitting diodes.

For More Details Circle (279) on Reply Card

Film chain camera

The Ikegami TKC-950B broadcast film-chain TV camera focuses 44mm in front of the field lens, so that dust is never in focus even if adhering to the field lens surface.

The camera also features: a prism beam splitter to separate the images to the three 1-inch Vidicon tubes; broad compatibility with existing equipment; a servo controlled neutral density filter disc; a system of foolproof alarms; and a stable color encoder.

For More Details Circle (280) on Reply Card

Color signal system

TRICHROMA-U by Television Research International is an advanced recording and reproducing color signal system designed to provide 3/4-inch recorders with multi-generation capabilities.

TRICHROMA-U, as a new electronic format for 3/4-inch VTRs,

offers improvement in the area of chroma noise, system linearity, and multiple-pass erasers. Color signals are recorded using a proprietary color-under FM process which purposely avoids the recording on tape of NTSC and coded signals, thus minimizing the sources of velocity errors, chroma noise and non-linearity, and carrier eraser.

The product is available for incorporation into any 3/4-inch U-format recorder, and it becomes an integral part of it, retaining the existing signal systems for capability with modified unit and existing libraries at the slip of a switch.

TRICHROMA-U allows the use of 3/4-inch VTRs in mastering, editing, distribution, and on-air applications, without sacrifice in the quality of the multi-generation materials displayed.

Initially unit upgrades will be done at the factory in Palo Alto, California, but later will be available for field installations.

For More Details Circle (281) on Reply Card

Radiotelephone test assembly

Rohde & Schwarz has produced a compact RT test assembly by com-

bining the radiotelephone model SMDU 06 of its signal-generator family SMDU with the power test adapter SMDU-Z2 in a single cabinet. The assembly, designated SMDU 56, is fitted with the synchronizer option SMDU-B1 as standard equipment, and is suitable for almost all measurements on radiotelephones required during development, in the test department or in the service workshop.

Further options are available to extend the basic 140-kHz frequency range as far as 1 GHz. The SMDU 56 can be transported easily and may be installed readily in test vehicles. Since all necessary instruments are built into the test assembly, only oscilloscope and a stock of RT spares are needed to complete the mobile service engineer's equipment.

For More Details Circle (282) on Reply Card

Video filter catalog

The new Matthey video filter catalogs, available from Television Equipment Associates, contain new ranges of improved filters and filters specifically designed for A/D

continued on page 218

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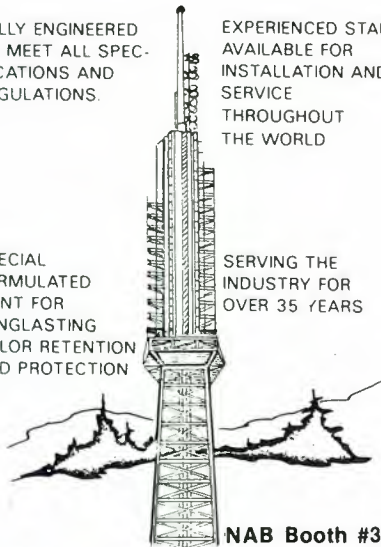
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For More Details Circle (201) on Reply card

New Products

continued from page 217

and D/A converters.

Other types include HFM range with zeros at harmonics of NTSC or PAL color subcarriers. The SFLM range has the pass-band shaped for sin x/x correction. More versions of the low-pass phase equalized type are described in the newest catalog.

For More Details Circle (283) on Reply Card

Consoles and recorders

MCI will exhibit its entire line of products at the NAB convention. This will include automated recording/remixing consoles, as well as the complete line of master recorders (mono up to 24 channels).

The exhibit also will include the newest addition to MCI's product line: the 3-speed (7½, 15, 30 IPS), 1-inch 8-track recorder. This recorder features JH-36 return-to-zero, cue-up function, and minute-and-second counter. A high-profile cabinet is optional.

For More Details Circle (284) on Reply Card

Videotape editor

Consolidated Video Systems (CVS) is entering the videotape editor

market with a new, computer-based system. The editor is designed for on-line or off-line control of all types of VTRs, from quadruplex and 1-inch units to ¾-inch cassettes.

According to CVS, the software-oriented system results in performance and flexibility superior to earlier units while giving users significant cost savings.

For More Details Circle (285) on Reply Card

Audio jacks

Trompeter Electronics is introducing a complete line of audio jacks, panels, patch cords, and looping plugs. These are available in three, four, and six circuits, all in one plug.

The four- and six-circuit jacks are used for audio and digital communications or where space is limited. A standard 19"x3½" panel can accommodate 50 two-, four-, or six-circuit jacks.

For More Details Circle (286) on Reply Card

ENG camera lens

Fujinon Optical will display their A14x10. It's a lens that maintains f/1.9 for the first 11 times of the zoom range. This lens is designed to work with the RCA TK-76 and

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AVR-2

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TR-70

TR-22

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For More Details Circle (203) on Reply Card

compatibility with PAL, SECAM and NTSC color systems.

For More Details Circle (288) on Reply Card

Playback unit

The ITC 1K by International Tape-tronics Corporation provides cylinder storage for 1024 cartridges, 5-second random access to any cartridge and back-to-back program capability through the use of 1-20 playbacks.

Designed for addition to the systems and programmers of major automation manufacturers, benefits include: reduced cart handling, greater control of program format, unlimited segue, easy control of complex formats, simplified format adjustments, and space saving.

For More Details Circle (289) on Reply Card

FM/SCA educational receiver

McMartin Industries' TR-E5B crystal-controlled receiver features a PTD (Precise Tracking Decoder) and hybrid IC, allowing the receiver to track the modulated signal from the FM transmitter.

The PTD will lock-on and recover the composite signal identical to the original transmission. This design

continued on page 220

TK-760.

Lens features include a built-in 2x range extender, and 31-inch close focusing. These features were especially designed into the lens for ENG.

This 3 pound unit includes electronic beam coating for higher contrast and transmission. A momentary iris engage switch is included to get correct exposure for high back light conditions.

For More Details Circle (287) on Reply Card

Large screen projector

Systems-East Division, Conrac Corp., is introducing the Eidophor color 5170 large screen projector.

The projector is said to project bright television pictures measuring up to 30'x40' in dark locations, or 20'x26' when the ambient illumination is reduced slightly.

The 5170 can be used with color television cameras (CCTV); videotape recorders; telecines; professional television receivers; and graphical data and character generators with TV compatibility.

The electronics unit of the 5170 can be installed at up to 26 feet away from the projector unit. Another feature is the projector's

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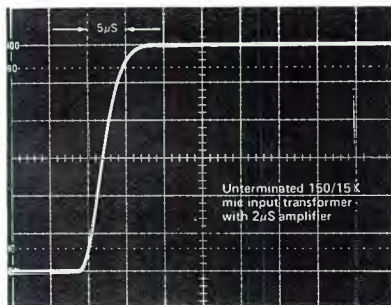
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For More Details Circle (204) on Reply Card

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For More Details Circle (205) on Reply Card

New Products

continued from page 219

provides 1.5% distortion and -50 dB crosstalk between regular and the SCA program channel.

The TR-E5B has an audio output of 1 watt, and comes with an auxiliary jack for recording off the air.

For More Details Circle (300) on Reply Card

Compositor font selector

TeleMation, Inc. has announced the release of its "Compositor 1 Font Selector." The font selector is a booklet containing monitor photographs of font styles currently available for the Compositor 1 graphics system. All alphabetic, numeric, and symbolic characters are included for each font style.

For More Details Circle (301) on Reply Card

Electronic still processor

ADDA Corporation's ESP-100 electronic still processor is a sound investment, according to the company, for stations using more than 125 slides in daily operation.

Picture quality may be improved because fingerprints, dirt, misposi-

tioning, fading, breaking, and slide loss are eliminated. Original artwork and props can be recorded directly onto a magnetic medium through a television camera. The photographic process is bypassed, while the artist selects the framing, perspective, size, color, and lighting for any still, and magnetically records it.

For More Details Circle (302) on Reply Card

Computer management system

Automated Business Concepts is offering a radio station management system to go with A.O. Smith Corporation's Mesa II small business computer. Designed to handle station sales, traffic, continuity, programming, logging, billing and music selection, the system is integrated with the computer's library of business management and accounting programs.

Using non-technical personnel, the system will process concurrently the daily activity of an AM and an FM station. Additional data storage and processing devices may be added to handle all the stations of a group.

The hardware consists of a 165 characters per second printer, central processor with 64,000 memory

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For More Details Circle (206) on Reply Card

positions, an input station capable of showing 1,752 characters on its screen, and a 10 million character storage unit. The programs include security features and audit trails allowing additional management control without using data processing technicians.

For More Details Circle (303) on Reply Card

Radio series

Charles Michelson Inc. is offering the original network radio series, "The Shadow," with complete half-hour programs. Fifty-two half-hours on tape are now available for immediate broadcasting, with five commercial breaks in each half hour.

For More Details Circle (304) on Reply Card

Audio consoles

McMartin Industries is now delivering the B-1000 series of audio consoles. Five basic units are available in this new line, including an 8-channel mono and stereo with rotary attenuators; 8-channel mono or stereo with vertical attenuators; and a 5-channel stereo vertical attenuator version.

All units feature Mu-metal, high-quality audio input transformers;

military-grade type G-10 printed circuit board material; flat cable computer-type wiring harnesses and inter-connecting cables; gold-plated contacts on PC board connectors; tantalum output, 30 watts for stereo.

Important specifications are program amplifier output level of +8 dBm nominal +28 dBm maximum.

For More Details Circle (305) on Reply Card

Computer interface

Marconi Instruments has introduced a computer interface model SA1142, which has been designed to interface Marconi model 2370 spectrum analyzer with commonly used computers.

Data and control signals derived from the digital memory display of the spectrum analyzer are routed to the computer interface. The interface converts the information into a form suitable for manipulation by the computer, either in 8-line or 16-line format.

For More Details Circle (306) on Reply Card

Character generators

Knox Ltd. has announced that for the first time it is possible to add five distinct font styles in a single option to both new and existing

machines.

With 246 individually different letters and symbols, this multifont option also increases the fine resolution of the existing font on the K128 series. Two of the styles (Century Schoolbook and Horatio) have both upper and lower cases, while the third (Eurostile Bold Extended) has upper case only. Each style has two sizes; a full screen display may be slanted to an italic mode.

To these styles has been added the capability for nine Western European languages as well as an expansion of the present special character set. The multifont option is available for both new machines and those already being used.

For More Details Circle (307) on Reply Card

Projectors

Athena®, L-W International's 4000 and 5000 projectors, can be used for production, editing, or on-line broadcasts. Both units freeze-frame and stop/start instantly, and can operate at slow speeds without application bar.

The 5000, unlike the 4000, incorporates automatic dual projector and exciter lamp change-over;

continued on page 222

The Under — \$700 Reverb

Orban/Parasound's dual-channel 111B combines solid, industrial-quality construction with unique signal processing and an unmatched pedigree. Since the first Orban/Parasound reverb was introduced in 1970, the line has been acclaimed for its outstanding cost/performance ratio. The fourth-generation 111B reflects every year of our experience in its combination of sound and features.

Standard are built-in bass and "quasi-parametric" mid-range equalizers, our exclusive "floating threshold limiter" that minimizes spring twang and eliminates overload distortion, dual outputs (use the 111B regardless of whether your mixer has echo send/return facilities), and 115/230 volt AC power supply. Standard also are the sophisticated electronics that provide bright, super-clean sound with extraordinarily low noise. We reduce "flutter" to the vanishing point by using four (not just two) springs per channel. And special mu-metal shields eliminate the hum that usually

plagues low-cost spring reverb. As always, you can count on Orban/Parasound's reliability and prompt service.

Although the 111B interfaces perfectly with "home-studio mixers," its quality makes it equally at home in professional studios, radio stations, and travelling shows. Its rugged construction stands up to the rigors of the road, and many top acts carry Orban/Parasound Reverberation with them on tour.

If you're serious about sound and quality, the 111B is your only choice below \$700. And if your cheaper consumer-quality reverb doesn't quite cut it any more, now is the time to step up to Orban/Parasound's professional performance.

For more information on the 111B Dual Reverb, see your local Orban/Parasound dealer or contact



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For More Details Circle (207) on Reply Card

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New Products

continued from page 221

servo-controlled 5000-foot film capacity (vs. 2000-foot for the 4000); automatic loop restorer; tension sensor; and integral pedestal. Both projectors can be operated by remote control, or can be externally programmed or computer-controlled.

For More Details Circle (308) on Reply Card

Studio production switcher

A studio production switcher with built-in microprocessors to provide event memory and simplified operation will be introduced by 3M Company's Mincom Division at the NAB convention.

The 3M model 9000 video production switcher with microprocessors offers a departure from traditional switcher design. The use of microprocessor technology allows for simplified control-panel design and layout. A built-in memory allows preparation and storage of up to eight panel set-ups for recall during difficult production sequences.

More than 20 effects are selected by a 10-key input bank. Twelve inputs, including black burst and

color background, are available. Effects are generated in hard-switch, soft-switch, or border-wipe form; a chroma-key feature is optional.

Capabilities of the new switcher include: wipes behind key; dissolves or cuts to key; dissolves to effect; fades to and from black; and dissolves behind chroma-key.

For More Details Circle (309) on Reply Card

Tape delay system

The audio digital delay system (ADDS) by Ampro Broadcasting Inc. offers a 6½-second audio delay including a full digital storage capacity. No preventive maintenance, head cleaning or tape replacement is required. ADDS converts wideband signals into digital impulses while utilizing a digital memory system.

For More Details Circle (310) on Reply Card

Audio cassettes

Fuji Photo Film USA, Inc., has introduced the FX-I and FX-II premium audio cassettes. FX-I is a pure-ferriox formulation designed for operation with standard recording bias and 120 microsecond equalization.

Digital Time is at the heart of the Cenchron master control system. It offers the greatest flexibility on the market, at an exceptionally low price!

The Cenchron System starts with a digital master clock. With it, you can set up an entire digital time control system accurate to within two seconds per month.

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For More Details Circle (209) on Reply Card

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The FX-II is designed for use with high-bias, 70 microsecond equalization. The tape used in the FX-II cassette utilizes the company's Beridox formulation. The unit gives an increased maximum output level (MOL) of 4 dE, improved high- and low-frequency response, and 61 dB signal-to-noise ratio.

For More Details Circle (311) on Reply Card

Routing switcher

The Di-Tech series 5500, 5501 and 5502 routing switchers provide a compact approach to routing any input signal to any output buss without disturbing other inputs.

The standard control panels which house the momentary illuminated pushbuttons are located separately from the electronics. Should other means of addressing the switcher be required, thumbwheel switches with readouts or touch-tone control (Di-Tech model 5700) can be used.

The video inputs to the switchers are in groups of four; BNC-type connectors are used for all inputs and outputs. Inputs are high-impedance; bridging and output expansion is accomplished by the loop-thru method. The switching pulse for video is vertical interval. (This

feature is standard with models 5500 and 5501.)

An optional feature for models 5500, 5501 and 5502 is the tally relay. Each time a crosspoint is taken, a relay closure is provided for applications, such as camera tally, machine control, or other control functions.

For More Details Circle (312) on Reply Card

Digital effects device

Micro Consultants' Quantel DPE 5000 features up to four times picture expansion. Other features include variable reduction or compression from full frame to postage stamp size, variable picture positioning, and picture freeze. Automatic noise reduction minimizes moire and noise.

For More Details Circle (313) on Reply Card

Telecontrol system

A new telecontrol system (model TCS-2) from Moseley Associates Inc. is designed to provide independent command, telemetry and status reporting capabilities. The TCS-2 can be used in other applications, including operation of electronic news gathering (ENG) equipment. Each

continued on page 224

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The REVERBERTRON Model #659-00 is designed to enhance broadcast/production or recording studio sound. It features solid state electronics in separate removable enclosures to isolate from ambient noise. Also contains high performance electro-mechanical delay lines, continuous reverb mix controls, VU metering, 3 band equalization, remote controls and selectable decay time. All in 7" of vertical rack space.

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For More Details Circle (212) on Reply Card

NAB Exhibitors

continued from page 223

command channel functions independently of all other channels, and independent operation of status and telemetry channels is provided.

The system requires radio links or a single telephone circuit for interconnection. Provisions to allow operation of two TCS-2 systems over a single interconnecting circuit, or to combine the TCS-2 and the Moseley TCS-1 telecontrol system on the same circuit are made.

For More Details Circle (314) on Reply Card

Tape cleaner/evaluator

Chyron Telesystems has developed a new unit for automatically cleaning and evaluating ¾-inch videocassettes. The CCE model U-1 cassette cleaner and evaluator is a self-contained system which operates ten times faster than real time without altering the recorded signal. The CCE removes dirt and embedded particles from tape surfaces, and detects surface and edge damage which cause VTR head clog and video dropout.

A one-hour cassette can be processed in less than six minutes. Two

LED indicators and eight messages displayed on the front panel reflect the tape and system status at each stage of the operation.

For More Details Circle (315) on Reply Card

Actuality retrieval terminal

UMC Electronics has developed an actuality retrieval terminal (ART) designed to retrieve, record and dub audio wire service stories on cartridge tape. The unit, to be shown at the NAB convention, consists of 20 Beaucart-type, 10-cartridge decks; a common recorder amplifier; an equalizer for input of the Telco signals; four silence sensors; 16 tone-touch tone-decoder circuit; and a specially designed computer logic system.

Access is through the control panel which provides three priority override routines for sequencing. The cartridge being recorded and the number of cartridges still available for recording are displayed on two front panel digital displays.

Through tally light indicator circuits, station personnel are kept informed as to the state of each cartridge inserted, including any aborts or loss of features due to malfunction of the machine.

LIKE EDGE NUMBERS ON FILM, ONLY BETTER. SUN TIME CODE.

The new PRO-SUN family of time code products allows you to put time code data on helical videotapes in the same manner that edge numbers are put on film. Thus, time code or user bits can be read in normal playback as well as still frame and search modes, without sacrificing the use of a longitudinal track.

Furthermore, SUN encoded video signals can be microwaved containing time code information, thus saving time and often a generation loss if time code must be added after the original take.

A **SUN/SMPTE Generator** module produces both time codes for extra versatility.

A **SUN Reader** provides still-framed as well as normal play speed reading capabilities. A **SMPTE Reader** accurately reads SMPTE Code over the speed range of 1/10 to 60x normal play speed, as well as providing SMPTE code regeneration for dubbing.

Finally, a **SUN Character generator** displays time code or user bit data from either SUN or SMPTE readers, right on the screen where it is most needed for editing decisions.



Television Research International
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(415) 961-7475

For More Details Circle (213) on Reply Card

An aural and visual alarm circuit notifies personnel if the system needs reloading when only two un-recorded cartridges are left on the machine. Automatic system shut-down is provided for when no unused cartridges are left. Contact closures are available for remote reel-to-reel, cassette or other back-up machine to ensure never losing a feature. Look-ahead and skip functions ensure that a cut never occurs due to overloading or recording over previously recorded cartridges that have not been retrieved.

For More Details Circle (316) on Reply Card

Teleproduction recorder

Ampex Corporation will demonstrate a portable version of the VPR-2 teleproduction recorder at the NAB convention. The SMPTE Type "C" VPR-20 is a 1-inch helical-scan high-band color unit with full record capability that fulfills the need for a field production recorder to complement the VPR-2, as well as for ENG and other remote production situations.

The unit provides record capability on all three audio channels, plus the video and sync channels. The system also has built-in assemble edit capability, and complete remote control capability.

It is full servoed, and can be operated while in motion. Record time is 60 minutes, with a rewind time of less than five minutes for a 60-minute reel. An AC power pack and quick charger for the self-contained batteries are standard. Other features include a built-in electronic tape time and a "confidence" playback system, permitting recording verification while in the field.

For More Details Circle (317) on Reply Card

Video noise meter

The new video noise meter (model 925C) introduced by Asaca Corporation can measure both luminance noise and chrominance noise.

Chroma noise can be split into AM and PM noise which can be measured separately by the meter. The 925C can also measure the several kHz color shading noise that is generated in helical videotape recorders.

For More Details Circle (318) on Reply Card

Audio analysis system

A hand-held audio analysis system that combines a real-time analyzer (both full-octave and $\frac{1}{3}$ -octave), and a precision sound-level meter was introduced recently by Ivie Electronics.

continued on page 226

DOM dropout monitor

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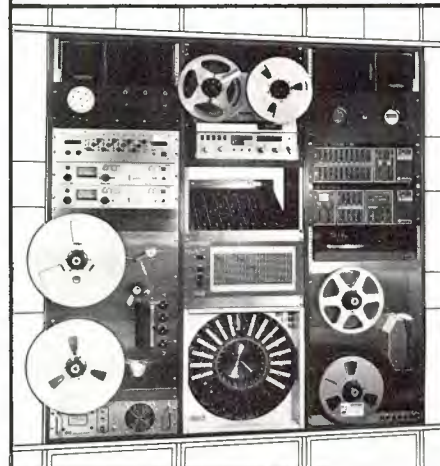


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For More Details Circle (215) on Reply Card 225

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- ★ Vertical interval chopper
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For More Details Circle (217) on Reply Card

New Products

continued from page 225

The portable, high-powered instrument is calibrated in both dB SPL and dB μ V. It measures a broad variety of simple and complex signals quickly and accurately, including amplifier gain; frequency response; output power; acoustic measurements; weighted or unweighted SPL measurements; peak accumulation; and impulse measurement.

Coupled with accessories, the IE-30A also will provide distortion analysis and reverberation time.

For More Details Circle (319) on Reply Card

Computer

IGM/NTI will show its new microprocessor-controlled system Basic A in conjunction with ITC's 1K playback unit. Basic A features a black and white or optional color CRT to display programming. The standard unit stresses the modular concept, so segments of a program can be given a label and recalled in their entirety as a bloc.

Basic A provides for 4000 schedule entries, expandable in groups

of 2000. The format control is limited by memory size. Features include real-time event control, conditional control, programmable audio on/off fade control for each audio source, and other capabilities.

For More Details Circle (320) on Reply Card

Resistors

Bird Electronic Corporation has a new line of 10 kw to 40 kw RF load resistors. The Econoload™ RF terminations for coaxial line transmitters are said to withstand shock; and, in the event of accidental burnout, they can be replaced on-site in 10 to 15 minutes without taking the load off the line.

Econoloads can be used without dedicated pumps in low-pressure environments, such as mountains and tall structures.

For More Details Circle (321) on Reply Card

RF ammeters

The TCA (transformer coupled ammeter) series by Delta Electronics uses a torodial current transformer to obtain a sample voltage proportional to the RF current flowing in a conductor. This sample is connected by a 50-ohm coaxial cable to a special rectified circuit where it is

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For More Details Circle (218) on Reply Card

converted to a DC current to drive the indicating instrument.

Some models also supply a DC voltage output for driving a remote indicating instrument which can be calibrated to agree with the primary meter and used for remote indication.

Frequency range is 0.5 to 2 MHz. Accuracy is better than 2% of full scale from 20 to 100% of full scale; accuracy may be reduced if RF currents induced by other stations are 5% or greater than the current to be measured.

For More Details Circle (322) on Reply Card

ENG identification unit

Dynasciences Video Products will introduce a video module ENG identification unit, called the 9200.

The 9200 allows ENG mobile units in the field to be identified at the base location. The identifying signal uses Alpha numeric characters (station call and mobile unit number) which are inserted in the vertical interval. The signal is readily visible at the base station when the unit's microwaved video is displayed on a cross pulse or underscanned monitor.

A proc amp will remove the identifying signal from the vertical

interval prior to program transmission. When no video is being transmitted by the mobile units, the identification signal appears in the center of active video field. Dynasciences has indicated that the price (to be announced at NAB) will be under \$1,000.

For More Details Circle (323) on Reply Card

Microphone

The Eddor/Calrec sound-field microphone is based on an application of the mathematical sampling theory in which a closely spaced array of capsules and associated matching electronic circuitry characterize the first-order directivity of the sound reaching the microphone.

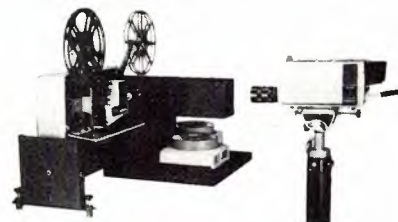
Four outputs are generated proportional to the sound-field pressure and to the three components of pressure-gradient (left minus right, front minus back, and up minus down). From these four signals any first-order microphone characteristic can be synthesized (any combination of omni-directional, cardioid, hyper-cardioid, or figure-of-eight).

Controls are provided which enable the angle between two microphones of a stereo pair to be varied, as well as the directivity patterns of

continued on page 228

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For More Details Circle (219) on Reply Card



The Time Tunnel



Digital Audio Delay System

The Time Tunnel should be considered dangerous to Tape Delay! It has already eliminated tape delay in many Radio Stations throughout the United States. Wow and flutter as well as distortion were reported missing and are now considered gone forever.

The Time Tunnel is almost impossible to find because of its extremely low noise and wide dynamic range. With a bandwidth of 15Khz and a flat response even the highest fidelity music will not detect its presence.

If you presently are using a tape delay system, contact Comex Systems for full details on the Time Tunnel.

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Attaches to
your present
VTR.

Patent Approved



For More Details Circle (221) on Reply Card

New Products

continued from page 227

the individual microphones (including the position of the nulls in the case of hyper-cardioids). The stereo pair can then be panned or tilted in any direction. These controls can be exercised either live, or in post-session processing of the tape.

For More Details Circle (324) on Reply Card

Automatic transmitter switcher

A solid-state automatic transmitter that will work with parallel or alternate AM, FM or TV transmitters has been introduced by CCA Electronics Corporation.

The switcher will automatically sense loss of RF, loss of audio, excessive VSWR, and programmed high or low power limits. It will initiate and complete a switchover from one transmitter to another—performing all necessary intermediate steps automatically.

It also will remove high voltage, reconfigure the antenna switching network, and remove a parallel transmitter from the circuit if one is used. In proper sequence it will reapply high voltage after determining that no faults still remain,

and ultimately put the remaining transmitter back on the air directly into the antenna.

For More Details Circle (325) on Reply Card

Circularly polarized TV antenna

An omnidirectional, circularly polarized television antenna, permitting tower-top mounting, has been introduced by Jampro. The antenna comes with a supporting cylinder; and, the antenna stem can be buried into the top of the customer's supporting tower.

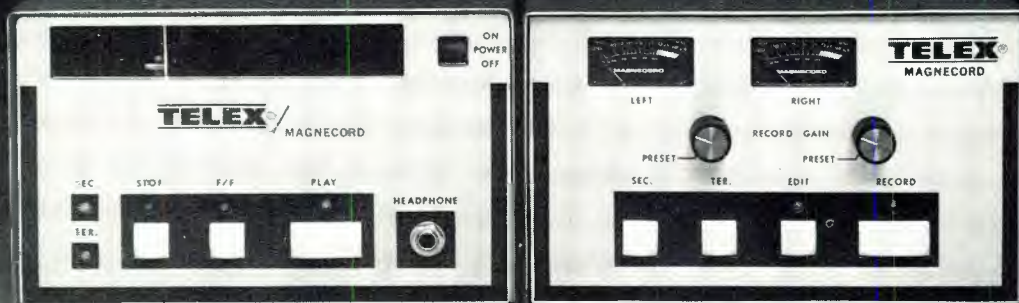
The antenna has an omnidirectional azimuth pattern, whose circularity is within 2 dB. The axial ratio is better than 2 dB. Capable of extremely high power operation, the antenna permits 100 kw ERP with 70 kw band VHF transmitters.

For More Details Circle (326) on Reply Card

Stereo generator

Harris Corporation has introduced the MS-15R FM stereo generator, designed to drive composite studio-transmitter links or wideband input of any FM exciter. The unit features digitally synthesized modulation (DSM) and dynamic transient response (DTR).

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Canada: Telak Electronics, Ltd., Scarborough, Ontario

The DSM generator features: digital circuitry, automatic pilot phase control, minimum separation of 45 dB from 30 to 15,000 Hz, and typical separation exceeding 50 dB over the entire band.

The filter, developed for FM stereo, holds overshoot to 2% or less, and may be used with any FM limiter. From 2 to 6 dB increased loudness can be achieved with no degradation of audio quality, according to Harris.

LED status indicators are used throughout to aid in troubleshooting. A peak-reading audio LED display aids in setting up the stereo generator, and serves as a peak program indicator.

A baseband compensator provides separate amplitude and phase compensation for STL or modulated oscillator deficiencies (defeatable).

For More Details Circle (327) on Reply Card

Automated broadcast system

Cuerac by CEI is a fully automatic, computer-controlled, air-program storage and reproducer unit for radio broadcasting. It has a capacity of 500 prerecorded magnetic tape cartridges, which may be selected randomly and can be expanded to 2500 cartridges. Pro-

gramming capacity for 4000 events is standard and can be expanded.

The unit enables the full format of a station to be automatically on "live" standby through software control. As instructed through a visual display unit, it will access the cartridge library automatically, coordinate reel-to-reel reproducers and introduce prerecorded time announcements.

Standard peripheral equipment includes: three visual display units if required, data terminals, automatic logging, interfacing to commercial software, selective dumping, masterclock for external functions.

For More Details Circle (328) on Reply Card

Disc recorder

Joystick control, fast cueing, and built-in signal enhancement are featured in the Eigen model 15 color disc recorder. Built-in signal enhancement improves chrominance signal-to-noise 3 dB and allows up to 6 dB edge enhancement in luminance. Luminance signal-to-noise is over 44 dB.

The joystick control is a fader-arm control for glitch-free, continuously variable speeds from 60 fields per second down to freeze, in

continued on page 230

VTR VIDEO PROBLEMS? WHAT'S THE TAPE TENSION?



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For More Details Circle (223) on Reply Card

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New Products

continued from page 229

forward or reverse.

A circle of 12 lights separates the 20-second capacity into sectors of 100 fields. This allows the operator to see at a glance the time remaining on the "loop" as well as at the position of key parts of a play. A touch of any light cues that segment rapidly. Typical cue time is under 2 seconds; maximum is 4 seconds.

The jog control allows recording images as either fields or frames. Frame operation pairs two fields in an odd-even sequence that is duplicated in playback, eliminating the chance of having a field each from two different images. The jog control plays back either fields or frames, allowing slide changes to music.

For More Details Circle (329) on Reply Card

FM exciter

The Sintronic SI-10-E FM exciter is a high-performance unit designed for use in the 88 to 108 MHz range, yet it uses only nine ICs and 13 transistors.

According to Sintronic, excellent low-noise performance and freedom from microphones is ensured by a special gain-stage pair configuration which includes the oscillator circuitry within a 100% negative feedback loop for audio and DC. This establishes optimum oscillator characteristics and produces approximately 40 dB reduction in noise.

For More Details Circle (330) on Reply Card

Audio mixer

A professional audio mixer designed for mobile and studio applications is now available from Bayly Engineering Ltd.

The mixer (SAM 82) is equipped with 8 inputs and 2 main output channels. Other functions included in the unit are two auxiliary outputs for reverberation and/or studio playback; reverberation return; monitoring; talk-back facility; test oscillator; and power supply for condenser microphones. The meters are PPMs with logarithmic scales.

For More Details Circle (331) on Reply Card.

Microwave doppler transceiver

Microwave Associates' new solid-state microwave doppler transceiver

For More Details Circle (239) on Reply Card

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features an integral antenna and is designed for any speed measurement or motion sensing application.

The MA-86503 operates at 10.525 GHz center frequency with a mechanical tuning range ± 25 MHz. It can be used to provide an audio output signal whose frequency is proportional to the velocity of an object moving toward or away from the antenna.

For More Details Circle (332) on Reply Card

UHF translator

Television Technology Corporation will introduce a 100-watt UHF translator (model UST105B) at the NAB convention.

This model features an uncomplicated, single-conversion frequency plan. Modification kits to incorporate the featured improvements of the UST105B are available to update older models in the UST10, UST20 and UST105 family of UHF translators.

For More Details Circle (333) on Reply Card

Color monitor calibrating unit

Telecommunications Industries has announced the availability of the new Color Monitor Gray Scale Reference Unit. This unit contains a

10-step gray scale transparency, manufactured on special film stock, which precisely matches the output of a standard 10-step signal generator.

The color monitor calibrating unit is designed for use in control rooms and other technical areas to match color monitor luminance characteristics to a standard that is independent of transmission system distortions.

The uniform illuminating source is a lamp calibrated at 6500°K. Maximum brightness is mechanically adjustable from 5- to 35-foot lamberts without affecting color temperature. Both 115 and 230 VAC models are offered.

For More Details Circle (334) on Reply Card

Film cleaner

Lipsner-Smith has developed a machine using the CF200 microscopically-perfect ultrasonic film cleaner with non-evaporative drying. The model is designed for use in film and microfilm libraries, media centers, television stations, and motion picture studios.

The process removes dirt and surface contamination from both
continued on page 232

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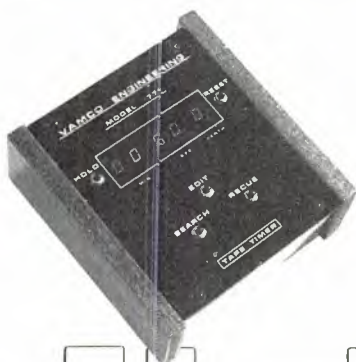
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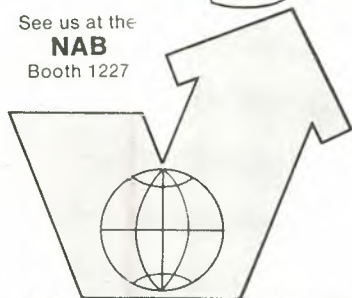


MODEL 771 VIDEO CASSETTE TAPE TIMER

The Model 771 timer is designed to be installed in minutes without tape machine modification on the SONY VO-2850, VO-2850A, VO-2860 and the BVU-200. The Model 771 enables precise times to be monitored for viewing, **editing**, and pre-roll **cueing**.

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For More Details Circle (228) on Reply Card

New Products

continued from page 231

cell and emulsion sides of film. Scratches are cleaned, increasing the effective use of the wet-gate technique.

The non-evaporative drying system results in clean, static-free film. Film is lubricated to decrease the possibility of damage during projection or editing. The model cleans 35mm and 16mm film, and microfilm (on either reels or flanges).

For More Details Circle (335) on Reply Card

Pan and tilt head

W. Vinten, Ltd., camera-support equipment, distributed by Listec Television Equipment Corporation, has introduced the Dunlin LF (lubricated friction) pan and tilt head for small cameras.

The LF dampening system, employed as drag controls in the Dunlin head, eliminates backlash commonly found in the "fluid" heads now available. Also incorporated in the head is the Vinten "true balance" tilt system which allows the user to dial the setting required to properly counterbalance

varying camera loads. No spring changes are necessary when changing cameras and lenses on the Dunlin LF head.

For More Details Circle (336) on Reply Card

Test monitoring switcher

The QSI-800BC test monitoring switcher from QSI Systems is designed to automatically sample color television video streams for quality-control monitoring.

The switcher is an automatic sequential vertical interval 8-input video switcher with an inserted seven-segment numerical character identifying each input. Sequencing dwell time may be varied from 1/2 second per input to over 30 seconds; any input also can be held at the output by momentarily selecting that input.

The eight inputs may be individually programmed to be in or out of the sequencing operation. A simple flip of a front panel switch either adds or deletes any input to the sequencing program. Should any input fail or be permanently deleted from the switcher it will automatically be ignored and bypassed.

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For More Details Circle (229) on Reply Card

any rate by momentarily bringing the triggered input to ground.

For More Details Circle (337) on Reply Card

Tape storage system

Winsted Corporation is introducing ball-bearing-mounted cabinets for tape and film storage. Lined up in ranks of up to five deep, the units (which glide on a low-profile steel track) can be rolled left or right to provide fast access to cabinets at the rear.

Both stock systems and custom designs are available, permitting a wide variety of configurations and arrangements. Installations can be expanded, altered or relocated easily as future storage demands dictate.

For More Details Circle (338) on Reply Card

Distribution switchers

Utah Scientific Inc. will display various configurations of a new audio and video distribution switcher line at the NAB convention.

Features of the AVS-1 are 20-in./20-out audio and video switchers in a single 10½-inch chassis; choice of either BCD or party line control; audio noise and crosstalk suitable for monaural or stereo production

requirements; built-in matrix refreshment memory with 24-hour battery supply; and matrix sizes from 10x10 to 160x160.

For More Details Circle (339) on Reply Card

Modular system

UNI-SET, a modular system used for stagings, studio settings and elevations, will be featured at the NAB convention. This system creates the featured news sets plus additional settings.

UNI-SET "studio system" is available for quality, "short-lead" productions. For maximum utilization of internal studio and staff time, a planning model of UNI-SET is included with the system.

UNI-SET is produced by Kniff Woodcraft Corporation.

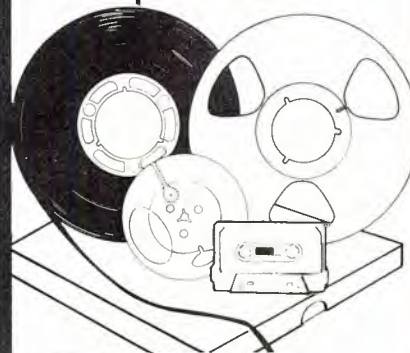
For More Details Circle (340) on Reply Card

ENG color camera

Panasonic Video Systems' ENG camera is a self-contained portable color camera, designed and engineered to operate with low power consumption. The three-tube camera offers the option of either ⅓-inch Plumbicon, Newvicon, Vidicon or Saticon tubes.

continued on page 234

Audio Tape for professionals



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For More Details Circle (230) on Reply Card

The End Of Pedestal Problems



The P-50 shown here is an extremely flexible television camera pedestal that allows an unprecedented range of vertical motion. From 21" low to 57" high (measured at the pan head mount), the P-50 provides 36" of height range.

This superior range is achieved by the use of a patented pneumatic counterbalance system. The principal design has been proven in use by the major networks for over twenty years.

Camera operators enjoy the ease of



operation made possible by dual eight inch wheels, overall light weight and smooth camera balance. Maintenance people enjoy the sealed ball bearings, permanently lubricated wheels and low maintenance requirements of the annual, one-point lubrication.

Available with a wide variety of options (shown here with cable guard side skirts), the P-50 is the ideal instrument for the modern television studio.

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New Products

continued from page 233

An optional 4.5-inch V/F and remote control unit for studio system application also are offered.

Features include an optical black and analog memory automatic white balance circuit for stable picture balance; three-way bias light which reduces after-image; resolution of 450 lines center (Plumbicon) and 500 lines center (Saticon); signal-to-noise ratio better than 46 dB (luminance signal); high-gain SW; four-position filter disc for color conversion; built-in color bar generator; built-in vertical aperture; YIO encoder; 1.5-inch detachable viewfinder with built-in level indicator and battery warning indicator; tally lamp; automatic cable compensation for optical RCU; VTR playback on viewfinder; VTR start/stop trigger on camera head; and standard C-mount adaptor.

For More Details Circle (341) on Reply Card

Broadcast antennas

Bogner has announced that every high-powered broadcast antenna the company supplies after April 1, 1978 will include provisions for future conversion to circular polarization at no initial price premium. This will allow the broadcaster to be prepared for future use of circular polarization without the need for any initial decisions or cash outlay.

For More Details Circle (342) on Reply Card

Logging, reporting and accounting system

The GC300 logging, accounting and reporting system by Groton Computer, Inc., can be used in a manual station or interfaced to an automated one.

The system includes a computer terminal (connected to the company's computer center) and a user's guide. The terminal is built by the General Electric Co. and incorporates a magnetic tape cassette. The cassette is used for both information storage while used as an input device, and as storage of up to 5 formatted logs (or other desired formatted information) as received from the computer center.

The terminal is hard-wired to an isolated telephone line. The computer then calls up and "talks" to the terminal to either receive the input or send requested information back to it. It is maintained by Groton Computer.

The user's guide incorporates the instructions for terminal operation,

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cassette tape editing, and all input routines. It is made up of 25 cards, spiral-bound, and mounted in a sheet-metal bracket on the face of the terminal for constant and easy reference. All elements of the system appear of these cards.

For More Details Circle (343) on Reply Card

Broadcast disc recorders

Two compact broadcast video disc recorders offering typical head/disc life of 10,000 hours have been introduced by Oktel Corporation.

The model BDR-400 slow-motion disc recorder provides 30 seconds of real time broadcast-quality color video with continuously variable slow-motion, forward and reverse. The unit also features switchable fixed rates for record and playback; single-field playback; and electronic display of elapsed time with two cue markers.

The model BDR-300 slide-file disc recorder stores up to 1200 frame slides, which provide full vertical resolution. The unit features a preset/reset address control that allows heads to be moved to any preselected track with a maximum search time of 3.8 seconds. Up to four fixed-head channels are avail-

able as options to provide program continuity.

For More Details Circle (344) on Reply Card

Audio processing system

Orban Associates announces its systems approach to AM radio audio processing: OPTIMOD-AM, model 9000.

Designed to be the only equipment between the console and the transmitter audio input, the OPTIMOD-AM processes the signal completely through a series of six basic blocks: an input conditioning filter, a broadband compressor, a program equalizer, a six-band limiter, a polarity follower, and Orban's own "Smart Clipper" peak-limiting circuit. When required, these functions can be bypassed for proof of performance.

The OPTIMOD-AM comes equipped with a rear-panel jack which will accept an adapter device for AM stereo.

For More Details Circle (345) on Reply Card

Camera tube

A TV camera tube having limiting resolution of 1600 TV lines was announced by Amperex Electronic Corporation. The tube, designated

continued on page 236

ZOLOMATIC

INSTRUMENTS

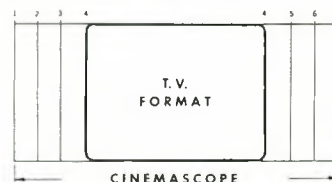
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New Products

continued from page 235

type 45XQ, is an extension of Plumbicon camera tube technology and may be used for motion pictures. Other applications include: flight simulation, TV fluoroscopy, and dynamic film and document scanning.

For More Details Circle (346) on Reply Card

Compressed video system

Colorado Video will exhibit their newest generation of compressed video systems at the NAB convention.

The 275 Video Expander has solid-state memory and resolution to 256 x 512 pixels. The 262 Video Compressor is designed for transmitting video signals at 8 kHz bandwidth over FM subcarrier channels, microwave, or satellite.

For More Details Circle (347) on Reply Card

Bulk eraser

Nortronics' QM-230 cassette bulk eraser is a self-powered, hand-held unit designed to erase cassette tapes without an external power source or batteries. The unit is supplied in a contoured Cyclocac® case with a wood grain finish.

For More Details Circle (348) on Reply Card

Tape lock system

The Studer tape lock system 2000 by Studer Revox America is a universally applicable synchronization system. It can be used to synchronize professional multi-channel machines of the Studer A80-type (audio-audio) and to synchronize an A80 multi-track machine through a video recorder (audio-video).

The SMPTE time code is used as the electrical link between the units being synchronized, and is recorded on an audio or cue track.

For More Details Circle (349) on Reply Card

Studio camera

Ikegami's HK-312 studio TV camera is now available with a plug-in multiplex adapter for operation with triaxial cable in lieu of conventional multi-conductor camera cable. Tri-

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axial cable extends the premissible separation between the HK-312 camera head and camera control unit (CCU) from under 2000 feet to a mile.

The triaxial cable adaption handles all signal, control, power and intercom functions between the camera head and camera control unit with virtually the same signal quality as obtained with multi-conductor cable. Digital techniques and frequency multiplexing accomplish the conversion.

For More Details Circle (350) on Reply Card

Sync generator

A color sync generator, model SY-5990A, and a companion genlock, model SY-5995A, add NTSC pulse capability to Dynair's 5900 Series distribution equipment.

The sync generator has an oven-stabilized crystal oscillator and meets FCC part 97 requirements over the temperature range of 0-50°C. Pulse rise/fall times as recommended by the proposed EIA-RS-170.

Lock-in range for the genlock is ± 20 Hz subcarrier, ± 150 Hz horizontal, assuring lock to signals well outside part 97 tolerances.

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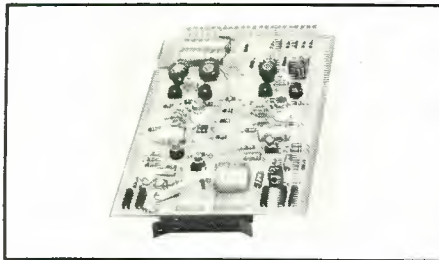


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Joseph & Donna Roizen

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GRANTHAM'S FCC LICENSE STUDY GUIDE—377 pages, 16 FCC-type practice tests, 1465 questions with answers and discussions—covering third, second, and first class license exams. \$13.55 postpaid. GSE Publications, 2000 Stoner Ave., Los Angeles, CA 90025. 10-77-tf

ELECTRONICS DEGREE by correspondence. No commuting to class. Study at your own pace. Begin with basics and continue, first for A.S.E.T. and then for B.S.E.E. For free brochure, write: Information Desk, Grantham College of Engineering, 2000 Stoner Avenue, Los Angeles CA 90025. 10-77-tf

SITUATION WANTED

I AM SEEKING PARTIAL OWNERSHIP OF AN AM AND/OR FM STATION IN RETURN FOR LONG-TERM MANAGEMENT AND ENGINEERING FUNCTIONS. Write: Dept. 412, Broadcast Engineering, P.O. Box 12901, Overland Park, KS 66212. 3-78-tt

SERVICES

FREQUENCY MEASURING SERVICE—WE'RE #2 —MONITOR REPAIRS—MOBILE UNIT—covers Northern 1/2 Ill., Eastern Iowa, Eastern Minn., Southern 1/2 Wis., Western Mich., and Western Ind., monthly. Radio Aids, 528 Ravine Ave., Lake Bluff, Illinois 60044, (312) 234-0953. 2-74-tf

COMMERCIAL RADIO MONITORING CO. Precision frequency measurements since 1932. Local and mobile service covering entire midwest plus. Test instruments, counters, monitors repaired and certified. Lee's Summit, Mo. 64063. (816) 524-3777. 9-74-tf

SERVICES (Cont.)

ONE STOP FOR ALL YOUR PROFESSIONAL AUDIO REQUIREMENTS. Bottom line oriented. F.T.C. Brewer Company, P.O. Box 8057, Pensacola, Florida 32505. 7-71-tf

BUILD YOUR OWN TV AND RADIO PRODUCTION EQUIPMENT. Easy, inexpensive, (mostly IC). Plans or kits: Special Effects Generator, Automatic Logger, Vertical Interval Video Switcher, Solid State Lighting Board, Preset Audio-Video Board, Preset Lighting Board, Crystal Controlled Wireless Mikes with Matching receivers. Subsonic Tone Control for audio tapes, 8MM SOF Cameras and Projectors, Distribution Amplifiers (Sync. Video, Audio), Audio Control Boards (Studio & Remote) Proc-Amp with compensation and regeneration for adapting Helical Scan VTR's to broadcast standards. PLUS specialized correspondence courses in TELEPHONE Engineering (\$39.50), and Integrated Circuit Engineering (\$49.50). Plans from \$5.95 to \$15. SUPER CATALOG plus years updating of new devices Air Mailed \$1.00. Don Britton Enterprises, P.O. Drawer G, Waikiki, Ha. 96815. 5-77-32t

CARTRIDGE RECONDITIONING SERVICE: CLEANING—NEW PARTS—NEW TAPE. 12 Years Experienced Personnel. Write for additional information & price sheet. MASTERTONE COMPANY, 1105 Maple, West Des Moines, Iowa 50265, 515-225-6122. 8-77-tf

SAVE HUNDREDS OF DOLLARS on high quality, dependable, American Made, MATV Head-Ends, V/V, U/V Converters, Camera Modulators, at factory-direct prices. Send \$5.00 (or your MATV Installers Letterhead). "Information," Box 809, Boynton Beach, Fla. 33435. 1-78 e.o.3

HAVING CRYSTAL OR OSCILLATOR TROUBLE or changing frequency on your TV, FM or AM transmitter? Call us for help at (817) 773-3901. Our many years in this field with crystals gives us considerable experience. We can probably save you time and money, and strictly first class. EDISON ELECTRONIC CO., Box 96, Temple, Tex. 76501. 3-78-3t

TOWER PAINTING AND LIGHTING: Service and maintenance contracts offered. Pioneer Tower Service, P.O. Box 253, Carrollton, Missouri 64633, (816) 542-0840. 9-77-tf

FREQUENCY MEASURING AND MONITOR SERVICE. Precision measurements at reasonable rates. Box 20098, Birmingham, Alabama 35216 205-822-2184. 2-78-4t

HELIX-STYROFLEX. Large stock—bargain prices—tested and certified. Write for price and stock lists. Sierra Western Electric. Box 23872, Oakland, Calif. 94623. Telephone (415) 832-3527. 1-73-tf

WANTED

THE INTERNATIONAL BUSINESS BROKERS needs listings on sales and purchases of AM, FM, TV stations. All sales and purchasing information will be kept strictly confidential. P.O. Box 10009, Bradenton, Florida 33507. 3-78-1t

WANTED USED UHF TRANSMITTER: RCA or Harris 30 or 50 KW. Must be no more than ten years old. Ph. (419) 225-3010. 3-78-2t

WANTED: 2-B/W vidicon Studio Camera Chains in good condition. Also Switcher - Gemlock - Keyer. Cash or Tax write off. Contact John Fiore, R.I. School of Design, Providence, R.I. 02903, or call (401) 333-3511, ext. 373. 3-78-1t

WILL PURCHASE FOR CASH ANY OF YOUR EXCESS TUBES—transmitting, camera types; anything in good condition, including lamps and electronic parts. Write to: S & M Associates, 1231 Waterview Street, Far Rockaway, N.Y. 11691. 4-77-eot-6t

WANTED: 250-500 watts FM stereo transmitter. WTAO-FM, Rt. 5, Box 286, Murphysboro, Ill. 62966. 1-78-1t

WANTED: Pre-1926 radio equipment and tubes. August J. Link, Surcom Associates, 305 Wisconsin Ave., Oceanside, Ca. 92054, (714) 722-6162. 3-76-tf

WANTED 300' tower, 3KW FM Transmitter, Studio used. Joy Broadcasters, 608-723-7628, Lancaster, Wisconsin. 2-78-1t

AMPEX 1200, prefer OH with EDITEC. Call D. Zulli 213-466-5441. 2-78-2t

LEGAL NOTICE

SEALED PROPOSALS will be accepted by the Secretary of the City Colleges of Chicago until 10:00 A.M. Tuesday, March 28, 1978 for the following:

EQUIPMENT FOR THE DEVELOPMENT OF AN EDUCATIONAL TELEVISION STATION CITY COLLEGES OF CHICAGO

Bid specifications may be obtained from the Office of the Vice Chancellor of Planning and Operations, 11th Floor, 180 N. Michigan Ave., Chicago, Ill. 60601, prior to the above date.

Specifications will be in five groups.

Group IA-I-Antenna	—One UHF Antenna, Pylon Design
Group IA-II-Transmission Line	—Approximately 13 to 20 foot lengths 9-3/16 inches, 75 ohms
Group IA-III-Main Transmitter	—One UHF, 110 KW, Channel 20
Group IA-IV-Terminal Equipment	—Necessary support equipment for transmitter site
Group IA-V-Special Instruments	—Necessary special instruments for transmitter site

Contractors and distributors are invited to bid on one or any combination of groups. Irving B. Slutsky, Vice Chancellor, City Colleges of Chicago, Board of Trustees of Community College District No. 508. 3-78-1t

EQUIPMENT FOR SALE

CARTRIDGE LABELS: New, non-smear pressure sensitive labels. Fits all cartridges. Comes white & 4 colors. Write for FREE sample—MASTERTONE COMPANY, 1105 Maple, West Des Moines, Iowa 50265, (515) 225-6122. 8-77-tf

BROADCAST CRYSTALS for AM, FM or TV transmitters, frequency change, repair or replacement of oven types. Also vacuum types for RCA, Gates, Collins, etc. transmitters. Quality products, reasonable prices and better delivery! Don't be without a spare crystal. Frequency change and service for AM and FM monitors. Over 30 years in the business. Eidson Electronic Co., Box 96, Temple, Texas 76501. Phone (817) 773-3901. 12-74-tf

TWO AVR-1's—one with editor. One Ampex VR2000 fully loaded. CMX 300 system with Grass Valley 1600 Switcher also available. For information write Dept. 413, Broadcast Engineering, P.O. Box 12901, Overland Park, KS 66212. 3-78-1t

SONY MV 10,000 high band two-inch helical scan videorecorder with CVS 500 timebase corrector. Machine has only 120 hours—in excellent condition. Contact Premore, Inc., 9336 West Washington Boulevard, Culver City, California 90230, (213) 870-6011. 3-78-1t

EQUIPMENT FOR SALE: 2 #8310 CBS/Thomson CSF Image Enhancers—\$3,895.00 ea; 3 #3100 CBS/Thomson CSF NTSC Encoders—\$3,960.00 ea; 1 #CDL1200 CBS/Thomson CSF Test Signal Generator—\$4,200.00 ea. ALL ABOVE LESS 30% DISCOUNT. Call Lerro Electrical Corporation, 3125 North Broad Street, Philadelphia, Penna. 19132. (215) 223-8200. Ask for Fred Dorn. 3-78-1t

BROADCAST AND STUDIO EQUIPMENT. New and used. Cart and reel recorders, consoles, limiters, monitors, mic's, turntables, preamps, speakers, racks, furniture, reconditioning services, parts (including PT6). Authorized Spotmaster distributors. Contact us for best prices and trade-in deals. AUTODYNE, P.O. Box 13036, Orlando, Fla. 32809, (305) 855-6868. 9-77-tf

28 FOOT CUSTOM MOBILE TRANSDUCTION VAN: 2 camera, color broadcast standard, 10x1 lenses; mics, turntable, R/R and cart tape, 11-in mixer; wave and V-scopes; SEG/chroma key; 1K-page character generator; 3/4" decks, editor, TBC; all accessories included. Write Dept. 411, Broadcast Engineering, P.O. Box 12901, Overland Park, Kansas 66212. 3-78-2t

TWO (2) RCA TR-5 Mobile Quad Recorders, records low band color. Compact roll-around units in good condition. \$3,500.00 for the two units. Bill Dorsey (212) 541-9295. 3-78-1t

MOBILE TV VAN—with air and generator, 27 ft. GM chassis, \$12,000 or best offer, will trade. Call E. J. Stewart, Inc., Penna. (215) 543-7600. Ask for Hal Lipman. 3-78-1t

A/V ROUTING SWITCHER—12 in X 8 out with remote controls. \$4,000, or best offer, will trade. Call E. J. Stewart, Inc., Penna. (215) 543-7600. Ask for Hal Lipman. 3-78-1t

EQUIPMENT FOR SALE (CONT.)

FOR SALE: Schaefer 800 automation controller, 4 Scully 270-2 stereo decks, 4 McCarta mono single play cart decks, 1 McCarta mono cart recorder, Marti STL-8 Dual STL transmitters and receivers, and 10-channel remote control system. Contact Steve Keating, (214) 369-1171. 3-78-1t

MICA AND VACUUM transmitting capacitors. Vacuum relays. Large stock; immediate delivery. Price lists on request. SURCOM ASSOCIATES, 305 Wisconsin Ave., Oceanside, Ca 92054, (714) 722-6162. 3-78-tf

RAZOR BLADES—Single Edge, Tape Editing, Raltec, 25884B Highland, Cleveland, Ohio 44143. 4-77-12t

COMPLETE T.V. PRODUCTION FACILITY—Wired, Air Conditioned Mobile Truck, Two VTR's, Two Color Cameras, Switcher, Studio Lights, Much More. Ready. In 50's. (804) 233-4178. 3-78-1t

NEARLY 300 operating/service manuals for color & B&S TV cameras, VTR's, monitors, video accessories, switchers, SEG's, etc. Covers IVC, Sony, Panasonic, Ampex, Magnavox, Shiba, Mincom & misc. others. H-P 330 B/D distortion analyzers, Tektronix 82 plug-in. Ron Zimmerman, Rte. 3, Franksville, WI 53126. 3-78-1t

RCA LOW BAND TR 3 w/spare headwheel panel, all modules except ATC, CATC. Two each, RCA TK42, working when removed from service w/two 100-foot cables. Two each, RCA TK 15 monochrome vidicon camera chains (one lens per unit). Numerous RCA WP 16B power supplies with and without centering modules. Two each Phillips PC 60 cameras w/Phillips encoders, cables, some spare parts. Write for details and prices to: University of Maryland, Radio-Television-Film Division, College Park, Md. 20742, Attn.: John Fleetwood, or phone (301) 454-2541. 3-78-1t

FOR SALE: Harris 20H3 FM transmitter with TE-3 solid statesman exciter. Stereo generator 67KHZ SCA, all modules. Presently tuned to 98.9 MHZ, 2 1/2 years old, less than 20,000 hours run time. As is, functional. Contact FJL Broadcasting, Oklahoma City for further information and price. (405) 478-2100. 3-78-1t

TURNTABLE—Technics SP10MKII—2 only. Excellent condition. Sell at \$500 from suggest price of \$700. Call (206) 838-4460. 3-78-1t

FOR SALE: IGM Series 500 broadcast automation system. 2 (24 cart each) Carousels Model 20 ARS. 2 Scully Transports Type 270-1. Model 90A Record Centre. Model 10A Playback Module. Model 382 A Time Announcer. Peg Clocks—Voice & Music Modules, etc. Monitor Panel, Silence Sensor, Power Supply, Music Timer, Instruction Books. For further information write P.O. Box 430, Flin Flon or phone (204) 687-3469, Flin Flon, Manitoba, Canada. 3-78-1t

CDL VS100 SWITCHER. Double Reentry, 12 x 4 with two Mix Amps, Special Effects Amp, Proc Amp, Black Gen, Power Supply, RGB Chroma Keyer, Tech Preview, Downstream Keyer. Contact Rod Hall: (213) 577-5576. 3-78-2t

RCA TV TRANSMITTER, Type TT5A, 5KW, air-cooled final amp. Tuned to Channel 6. No peripheral equipment such as control console, etc. Asking \$5,000. North Montco Voc-Tech School, Summerytown Pike, Lansdale, Pa. 19446. (215) 368-1177. 3-78-2t

VIDEO SALE on in-use equipment...VTR's, monitors, cameras, test equipment audio...Sony, Panasonic, Tektronix, Ball Brothers, Contrac, S.C., E.V., and Bogen. Offer on all or part, by letter or call: TelePatrol, 233 Atlantic Ave., Palm Beach, Florida, (305) 655-8570. 3-78-1t

KTR-1000G COLOR TV MICROWAVE LINK NTSC Color TV plus program audio microwave links for studio-xmtr, CATV, etc. Portable units, Mfr. Raytheon. As new condition. Radio Research Instrument Co., Inc., 2 Lake Ave. Ext., Danbury, CT. Tel. (203) 792-6666. 3-78-1t

ONE-THIRD OCTAVE FILTER SET, General Radio—#1925. Thirty filters, 20Hz-20kHz, each with 50dB attenuator (1dB/step), graphic display. Thirty Parallel outputs; and summed, weighted, or serial remote-controlled scan outputs. \$5500 new. Like new, \$4000 or best offer. Contact: R. Koziol, GAF Broadcasting, 1180 Avenue of the Americas, NY 10036. (212) 626-1043. 2-78-2t

COLLINS 733A, 3KW, FM transmitter with Collins A830-2 exciter and 786M-1 stereo generator. (319) 353-5665. 3-78-1t

EQUIPMENT FOR SALE (CONT.)

TWO SONY 2850A's AND TRI EA-4 AND EA-5 EDITING CONSOLE—One year old. VTR's are broadcast modified, XLR audio, RF, and SC jacks. Service manuals. Sony training tapes. Spare parts. \$9,500. Montana Media, Box 7093, Missoula, Montana 59807. (406) 543-6441. 2-78-21

TK-27 WITH ALL MODIFICATIONS. Three PC-70 Cameras, CDL Model VSA-102 audio-video switcher. Bill Orr, WBNS Stations, (614) 460-3912. 2-78-21

IMMEDIATE OPENING—First Class engineer for top radio station in northern Minnesota's Winter and Summer playground. We insist on top quality. Salary open. If you're our person call WKKQ, (218) 262-4545. 3-78-11

WANTED: Announcer-Engineer. First phone for full time announcer and backup engineer at 5 KW daytimer and Class C FM stereo in plains area of western Kansas. Contact KXXX, Box 27, Colby, Kansas, (913) 462-3305. Prefer mature person looking for place to settle. 3-78-11

AUDIO CONSOLE—New, stereo 9 input, 5 mixer broadcast console features a voice activated music override system. Ideal for remotes, disco's or production. Precision Gain Audio Systems, P.O. Box 2, Volant, Pa. 16156. 3-78-11

NORELCO PCP-90 with canon 6-1 zoom, scan reversal and film lens adapter. AMPLEX VR-3000 with cue channel and spare head. COMPUTER IMAGE 2061 SWITCHER with six inputs, audio follow video, 1 mix effect, chroma keyer, and downstream keyer with soft wipe. All equipment in excellent condition. Mr. Hamilton, (212) 759-0822. 3-78-11

COMPLETE SHINTRON 370 SWITCHER/SEG Sony PVM 5300 three screen color monitor. Dynascience color sync generator 6525. Model Number AVC 3250 key camera. Sony 1200 color studio camera with junction box and 32 ft. cable. Priced to sell. Call (505) 265-5689. 3-78-11

HELP WANTED

HELP WANTED (CONT.)

IMMEDIATE OPENING—First Class engineer for top radio station in northern Minnesota's Winter and Summer playground. We insist on top quality. Salary open. If you're our person call WKKQ, (218) 262-4545. 3-78-11

WANTED: Announcer-Engineer. First phone for full time announcer and backup engineer at 5 KW daytimer and Class C FM stereo in plains area of western Kansas. Contact KXXX, Box 27, Colby, Kansas, (913) 462-3305. Prefer mature person looking for place to settle. 3-78-11

TELEVISION—Help Wanted, Technical TV maintenance technician experienced with color, studio production equipment, including quad and helical VTR's. Studio and Eng. cameras, editing systems. Many benefits including 3 weeks paid vacation plus 10 holidays, free hospitalization insurance. Large TV production facility in Southeast. Dept. 415, Broadcast Engineering, P.O. Box 12901, Overland Park, Kansas 66212. **AN EQUAL OPPORTUNITY EMPLOYER.** 3-78-11

BROADCAST TECHNICIAN I—KHKE and KUNI, the University of Northern Iowa's dual service FM public radio stations, seek qualified first class licensed engineer to help stations move into new facilities. Engineer will also perform transmitter maintenance and carry out construction projects. Knowledge of solid-state broadcast equipment and radio broadcast technical experience preferred. Starting salary \$9,845 plus excellent fringe package. Apply before April 10, 1978, to Personnel Services, Baker Hall, UNI, Cedar Falls, Iowa 50613. UNI is an E.E.O./A.A. employer. 3-78-11

TV STUDIO BROADCAST ENGINEERS: Immediate openings for qualified first phone operators in a challenging, major East Coast VHF market. Send resumes and references to Waverly Foster, CE, WAVV-TV, P.O. Box 1600, Norfolk, Va. An Equal Opportunity Employer. 3-78-11

CHIEF ENGINEER—established Motion Picture/TV sound recording studio has opening for Electrical Engineer with heavy experience in audio equipment, maintenance, modification, design, and fabrication. Confidential interview. Send resume and salary history. Photo Magnetic Sound Studios, 222 East 44th Street, New York City, N.Y. 10017. 3-78-31

HELP WANTED (CONT.)

Broadcast Field Engineers

RCA Service Company has several immediate opportunities for field engineers with at least 3 years experience in the maintenance and repair of VHF and UHF television transmitters, television tape and/or color studio equipment. Successful candidates should have a 1st Class FCC radio-telephone license, plus a strong digital electronics background.

Positions offer salaries commensurate with qualifications and experience, plus outstanding benefits including:

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Relocation unnecessary if you are now located near good air transportation service

For immediate consideration, send resume to:

Mr. S.W. Geary
RCA Service Company
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TELEVISION SERVICES

OPERATION/MAINTENANCE ENGINEER

Modern facility provides unusual opportunity for individual who will share responsibilities for operation, maintenance, repair and installation of components in broadcast quality television systems. Must have solid technical training and from 3-5 years maintenance experience. Specific familiarity required with Quad/Helical VTRs, studio portable TV cameras, production, audio, and digital equipment. Individual must be able to work well both independently and under direction. Some travel probable.

VIDEOTAPE EDITOR/TECHNICAL DIRECTOR

We're looking for a creative "people-oriented" video-tape editor to operate a state-of-the-art CMX Quad and cassette time-code editing system. This editor must be able to support his creativity with the ability to maintain a high standard of quality control, and assume the responsibility for the daily set-up and operation of RCA TR-600 and TR-70C quads, Sony BVU-200s, HL-35 and TK-44 color cameras, and all of the additional equipment involved in production and editing. 3-5 years of professional quad experience is required.

Salary commensurate with educational background and experience. Please send your resume in confidence, including salary history, to:

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Careers In Television Engineering

RKO General, Boston Division, has immediate openings for the following positions.

ENGINEERING SUPERVISOR

For the candidate who can supervise technicians assigned to television production and maintenance. A solid technical background, FCC FIRST CLASS LICENSE and a minimum of 5 years of television broadcast experience is also required. Previous supervisory experience a real plus.

TECHNICIAN

Experience in studio broadcasting and an FCC FIRST CLASS LICENSE are required. A background in electronics is also desirable.

RKO General offers a liberal compensation package.

For prompt consideration, forward your resume including salary requirements to:

Personnel
Department

WNAC-TV BOSTON
A CBS AFFILIATE

RKO General Building,
Government Center,
Boston, MA 02114

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HELP WANTED (CONT.)

ENGINEERING POSITIONS (\$15,000-\$40,000)—Openings at all locations coast to coast—all levels and disciplines. Over 1,000 firms represented. To cover ALL your immediate job possibilities in the "unpublished" market, send your resume with salary requirements now. No fee, confidential, professional. **KEY PERSONNEL, NATIONAL HEADQUARTERS**, South Main Towers, Wilkes-Barre, Pa. 18701, (717) 822-2196. 1-78-TFN

TELEVISION—CCTV Video Maintenance Technicians. Full Benefits. Greater New York, Suffolk County or New Jersey Area. Send resume to: VPC, P.O. Box 268, New Hyde Park, N.Y. 11040. 6-77-tf

CHIEF ENGINEER. Career opportunity with Metromedia Radio. Formal electronics training required. Must be expert in AM/FM technology; have FCC first phone and show leadership ability. Salary open. Excellent benefits. Equal opportunity employer. Replies confidential. Send resume to Metromedia Radio, 565 5th Avenue, New York, New York 10017. Att: Mr. Paulsen. 3-78-1t

TELEVISION ENGINEER TRAINEE candidate for partially funded Minority Training Grant for television broadcast engineer. BSEE or Associates in Electronics desired. Equivalency in education with strong experience background in digital technology also considered. Contact: Roland Desjardins, WCBF, Lewiston, Maine 04240. 2-78-2t

ENGINEER - NETWORK CONTROL—Statewide educational telecommunication system. Operate computer controller for statewide video network. Operate and maintain videotape recorder. FCC First Phone license required. Minimum two years television engineering experience with operation and maintenance of broadcast-type videotape recording equipment. At least two years post-secondary education highly desirable. Contact Phyllis Gootee, Personnel Division, Indiana University-Purdue University at Indianapolis, 1100 W. Michigan St., Indianapolis, IN 46202. (317) 264-7617. EEO/AA. 3-78-1t

MICROPROCESSOR SOFTWARE/HARDWARE—Serve as Assistant Design Engineer for special technical development projects with statewide educational telecommunication system. Construct and test prototype systems. Degree in Computer Science, Computer Programming, or Electrical Engineering plus First Phone FCC license desired. Minimum two years experience writing computer programs. Know machine and BASIC languages. Experience with construction of digital circuits, knowledge of video systems and equipment desirable. Submit resume to: J. Potter, Indiana Higher Education Telecommunication System, 1100 W. Michigan St., Indianapolis, IN 46202. EEO/AA. 3-78-1t

LICENSED TV TECHNICIAN experienced in operation and maintenance of studio and transmitter equipment for commercial midwest market. Latest equipment, pleasant environment, full benefits. NBC network/heavy local production. Write Jerry Merritt, WICS-TV, 2680 E. Cook, Springfield, Ill. 62703 or call (217) 753-5665. 2-78-2t

MANAGER/SUPERVISOR of on-campus FM station. Supervise/train students in FM station facility. Teach radio/television courses. Graduate degree preferred. Salary range: \$11,000-\$13,000; 9 months. EOE application deadline 3/24/78. Position begins August, 1978. Send vita to Donald L. Loeffler, Head, Department of Speech and Theatre Arts, Western Carolina University, Cullowhee, North Carolina 28723. 3-78-1t

VIDEO ENGINEER—Hollywood production house needs engineer with good background in maintenance of studio color video equipment. Production experience an asset. Send resume to: Image West, Limited, 845 No. Highland Avenue, Hollywood, CA 90038. 3-78-1t

TV ENGINEER: Under supervision, maintain, repair, and operate Master Control equipment, TV camera film chains, studio video cameras, switchers, color Portapaks, video editing system and video distribution system. Design various needed TV systems. Assist in technical training of TV technicians. Assist faculty and students in the operation of TV studios and equipment. Other duties as required. First Class Radio-Telephone license required. Extensive professional color TV engineering experience required. College degree preferred. Willing to accede to variable work schedule. Salary \$1,683 per month. Send resume to: Joan Graham, Department of Theater Arts, UCLA, 405 Hilgard Ave., Los Angeles, CA 90024. Affirmative Action Employer. 3-78-1t

HELP WANTED (CONT.)

MAINTENANCE ENGINEER: THREE TO FIVE YEAR'S PRIOR MAINTENANCE EXPERIENCE will put you on this Up-To-Date facility's team. Excellent benefits and future with a #1 market, CBS southeast affiliate. Equal Opportunity Employer, M/F. Contact: Jack Becknell, V. P., Engineering, WCSC-TV, P.O. Box 186, Charleston, SC 29402. (803) 723-8371. 3-78-1t

BROADCAST ENGINEERS—Senior Technicians. 25 to 36K after six months apprenticeship. We have openings for highly competent self-motivated professionals with extensive background in digital and analogue circuits. You will have responsibility for maintenance of complex ship-board communications, electronics and navigational systems and handle all ship communications. A second class FCC radiotelegraph license is required. If you lack the FCC license but are otherwise qualified we will help. Liberal vacation and fringe benefits. Interested candidates submit resume in confidence to Radio Officers Union, ATTN: IME, 70 Hudson Street, Room 710, Hoboken, New Jersey 07030, or telephone (201) 659-7370. 3-78-1t

MAINTENANCE SUPERVISOR WANTED for California major market VHF located in one of nation's fastest growing areas. Requirements include—minimum 3 years maintenance experience, with strong background in VTR, ACR-25 experience preferred. FCC first class license. Electronics school graduate or equivalent technical education, including digital technology. Send resume to Personnel Director, KNTV, 645 Park Ave., San Jose, Calif. 95110. AEOE. 3-78-1t

EXCITING NEW GROUP is now expanding. This is your opportunity to get in on the ground floor and grow with the company. If you are experienced in TV maintenance, including quad tape, Sony helical and other ENG equipment, then this may be the opportunity you have been looking for. Enjoy the sunny south. Salary commensurate with experience. Contact Harold Johnson at (205) 533-4848. 3-78-2t

ARE YOU READY TO MOVE UP to Assistant Chief? If you are experienced with quad tape, helical tape, ENG equipment and understand RF this may be the position you are looking for. Enjoy the sunny south and grow with an expanding young group. Salary based on experience. Call Harold Johnson, (205) 533-4848. 3-78-2t

HELP WANTED—TV ENGINEER. Immediate opening for experienced engineer at its full color facilities. Position combines maintenance and production duties for broadcast and small format equipment. First Class FCC license and strong maintenance background required—salary commensurate, excellent benefits. Send resume with salary history to Doug Dunning, ETV Center, MVR Hall, Cornell University, Ithaca, NY 14853. Equal Opportunity/Affirmative Action Employer. 3-78-1t

VIDEO ENGINEER/OPERATOR—Experienced in maintenance & repair of quadruplex, helical, film chain and other related video equipment. Call or write to Byron Motion Pictures, Inc., 65 K Street, N.E., Washington, D.C. 20002, (202) 783-2700. 3-78-1t

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