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May, 1976/75 cents



NAB
Convention
Wrap-up

Page 24

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460

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- 50 **The VTR Revolution.** Part 2 of a 2-part series on the history of video tape recording, a subject of major emphasis at the NAB convention this year. **Joe Roizen.**
- 54 **Radio Workshop.** Our Small Market Workshop has been enlarged and given a new name. In this edition of a continuing series, our Workshop Editor continues his coverage of transmitter maintenance. **Peter Burk.**
- 58 **An Update On The New Phase Monitor Rules.** It's all in Docket 19692. Our Facilities Editor explains the new Rules. **Robert Jones.**
- 64 **Station Special.** Station-To-Station gets a facelift. The new version will include letters, pleas for hard to find parts or manuals, and maintenance and operating tips.

About The Cover

The NAB Convention coverage is the theme of our May issue. It's the creative effort of our Art Director, Dud Rose. Special NAB coverage begins in the news on page 8.

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EDITORIAL

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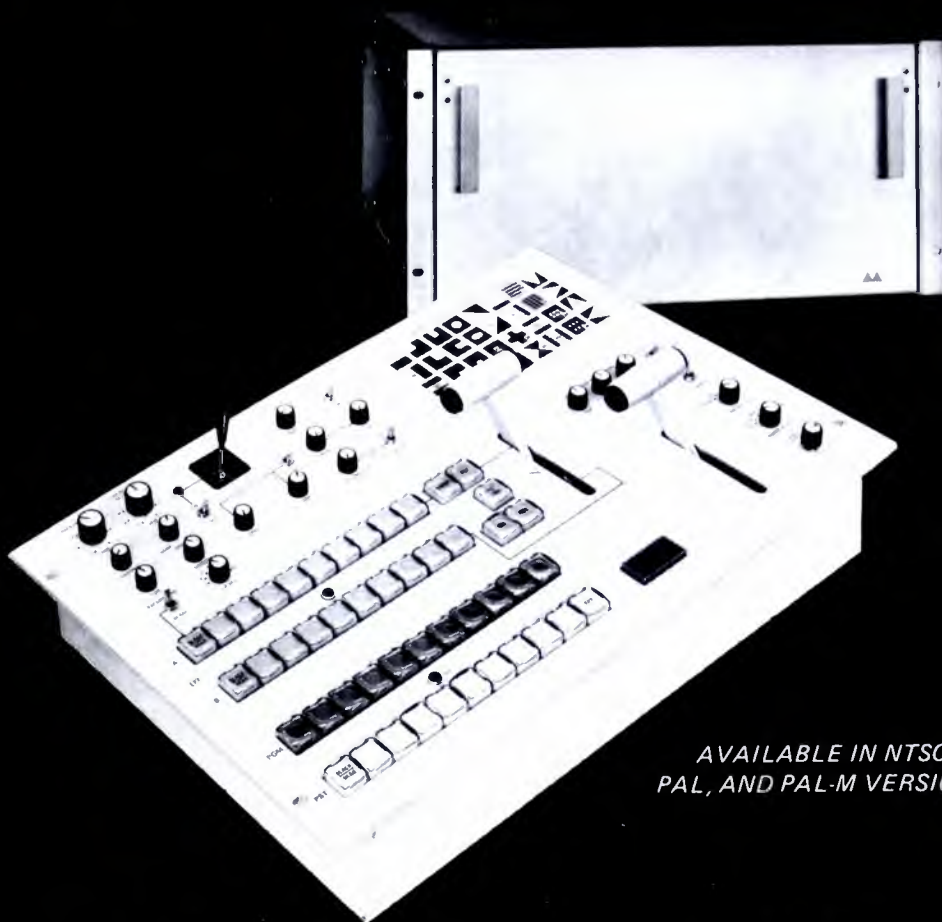
Robert E. Hertel, *President*

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May, 1976/By Howard T. Head and Harold L. Kassens

New FM Power-Height Policy Adopted

Section 73.211 of the FCC rules provides for maximum effective radiated power and height above average terrain for FM broadcast stations: 3 kW and 300 feet for Class A, 50 kW and 500 feet for Class B, and 100 kW and 2000 feet for Class C. When the height above average terrain is to be greater than that specified, the effective radiated power must be reduced by an appropriate amount. Until recently, the reduction was determined by reference to Figure 3 of Section 73.333 of the rules which gives permitted maximum power as a function of height above average terrain.

A problem arose, however, when the new FM (and TV) propagation curves were adopted last summer. The amendment to the rules (transmittal sheet #7) is just now being mailed out. Be careful when you use these curves, because the extra sliding scale supplied does not agree with the scale on the curves. A new corrected sliding scale will be forthcoming. If you are now operating with power reduced because your height above average terrain exceeds that specified for your class of station, it might be worth your time to see what this new policy will do for you. We know of one case where the station presumably can treble its power.

One word of caution: the Commission staff is actively working on a new Figure 3 and will, in time, replace the existing one. When that happens, all pending applications as well as future ones will have to comply. The new curve may be slightly less generous than the new policy now in effect. If you hurry, you might beat the Commission to the punch!

We gave you the good news first. Now we must report the bad news. Since Figure 3 is contained in both the Canadian and Mexican FM agreements, the new policy does not apply to stations within 199 miles of the Mexican border or within 250 miles of the Canadian border!

We haven't heard about a new policy yet for TV stations, but the principles are quite similar. Section 73.614 of the rules provides for maximum power and height and Section 73.699 has a Figure 3 (and Figure 4) for correction. And the new propagation curves for FM are the same as those for TV Channels 2-6.

(Continued on page 4)

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DIRECT CURRENT FROM D. C.

(Continued from page 4)

FCC Takes New CB Actions

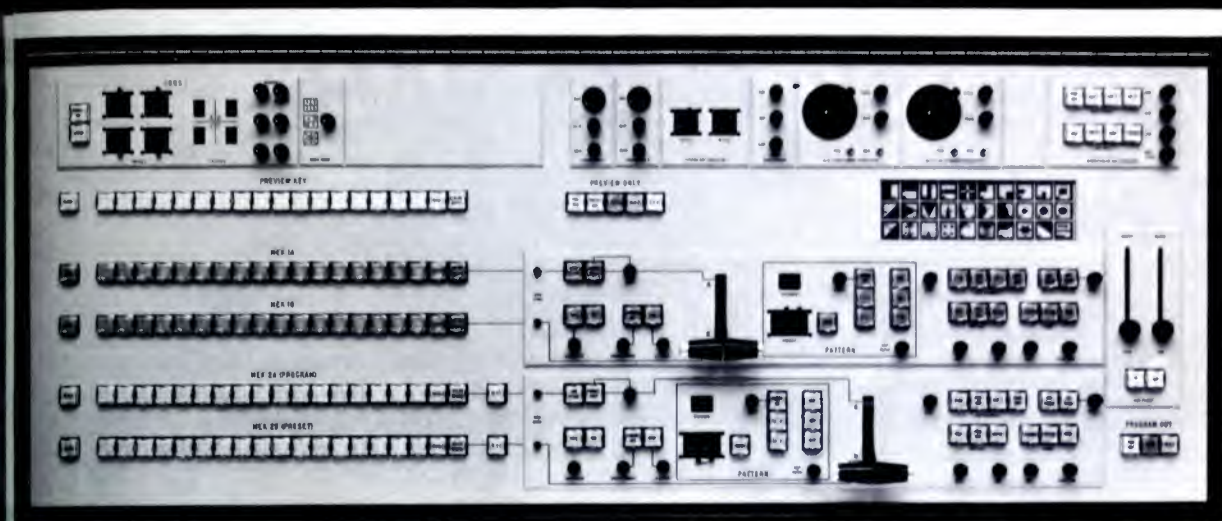
The Commission is making another effort to try to resolve its never ending CB headache. In July of 1974, it started a rule making (Docket 20120) which, among other things, proposed to expand the 27 MHz band from 23 to 50 channels. Apparently, they were about ready to conclude this proceeding when someone discovered that the new allocations would result in some channels 450 and 460 kilohertz apart, close to the 455 kHz, first or second I.F. of most CB transceivers presently marketed (and millions of AM receivers). A Notice of Inquiry and Further Notice of Proposed Rule Making has been issued to ascertain the severity of the potential intermodulation problem.

In a corollary action, the Commission has created a Personal Use Radio Advisory Committee (PURAC). It hopes to enlist from fifteen to twenty-five members as a cross-section of the Citizen's Band industry to assist in solving the critical problems which the explosion of the service has created.

Short Circuits

The Canadian Radio Television Commission has established a rule which prohibits cable systems from carrying all non-Canadian FM signals...The FCC has denied a petition to raise the power of FM and TV translators east of the Mississippi from one to ten Watts ...General Electric's 1976 color line of TV receivers will contain models which use the Vertical Interval Reference Signal (VIR) transmitted on line 19 to automatically adjust color and tint... The FCC has finally proposed rules for AM, FM, and TV Automatic Transmitters (Docket 20403)...Also proposed by the Commission is rule-making (Docket 19079) looking into expanded multiplex (SCA) operation by FM educational stations. One interesting question is whether these stations should be permitted to render non-educational subscriber services (e.g. background music) for profit...In one for the books, the FCC has dictated that if a certain female FM licensee in Kentucky marries a certain male FM licensee, their marriage will constitute a violation of Section 73.240 of the rules (overlap of 1 mV/m contours)...The Commission staff is working on an Order which would extend for one year its decision not to use the terrain roughness factor in FM and TV.

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- Wipe to a Preset Wipe
- Bordered Wipe to a Preset Wipe
- Mix or Dissolve to a Key
- Wipe to a Key or Wipe Key
- Mix to a Bordered Key
- A-B Mix Behind a Chroma Key
- A-B Wipe Behind a Chroma Key
- A-B Wipe with Borders Behind a Chroma Key
- Mix-Wipe or Bordered Wipe to a Preset Wipe Behind a Chroma Key
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- Wipe to a Luminance Key over a Chroma Key
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Wasilewski Calls NAB To Action

Getting Off Ground Zero

The president of the National Association of Broadcasters criticized the federal government for meddling in industry affairs and said "the time has come for broadcasters to become militant" and "match the influence of others in our society."

Vincent T. Wasilewski, speaking at the separate radio and television assemblies of NAB's 54th annual convention said "the day is over when a strong sales force, good engineering and imaginative programming is enough."

Government, he said, has become another department at stations and broadcasters must spend more time and money to become effective in combating its inroads.

In his two appearances, the industry spokesman also:

- Called for repeal of the law Congress passed banning broadcast advertising of cigarettes.

- Urged broadcasters to petition their Congressmen to oppose pending legislation to require payment of record royalties for artists.

- Described cable and pay cable as "two massive reefs upon which our free television system may become shipwrecked" and announced that broadcasters no longer are constrained by the 1971 consensus agreement with cable.

Wasilewski said government has become "over-responsive to negative elements in our society" and should take a clue from political contests where the most successful candidates have disassociated themselves from government.

"It appears" he said, "that people are sick and tired of big, sloppy, meddling, inefficient gov-

ernment."

The NAB president told the station executives that in the last few years government attitudes toward broadcasting have changed. The most dramatic turning point,

he said, came when Congress passed a law banning the advertising of cigarettes on radio and television. That law, he said, should be repealed.

(Continued on page 7)



"It appears that people are sick and tired of big, sloppy, meddling, inefficient government." NAB president Vince Wasilewski delivered his call to action at the convention in Chicago.

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NAB Takes On Justice Department

The National Association of Broadcasters has labelled as "pointless and unresponsive" arguments by the Justice Department that the Federal Communications Commission has failed to consider adequately the allegedly anticompetitive effects of the anti-siphoning rules for pay television.

In a reply brief filed with the

U.S. Court of Appeals for the District of Columbia, NAB said the Justice Department miscast the issues in stating that FCC has no statutory right to protect free broadcasting from siphoning by pay-television.

NAB's brief pointed out that the Supreme Court has ruled that the FCC was charged by Congress with the broad responsibility for the

orderly development of local television service that "is demonstrated as a principal source of information and entertainment for a great part of the nation's population."

NAB said Justice Department arguments that free TV and cable TV should be allowed to compete as free competitors "rest on a faulty factual premise" which in turn "destroys the validity of its own arguments" in the present case.

It said cable could be considered a true competition if it established its own facilities and competed in free broadcasting by providing its own programming or obtaining it from a program supplier or other work.

But there's no "true competition," it said, when a pay cable entrepreneur "piggybacks" on an existing cable facility, using the TV signals picked up by the existing operator, and then siphons off the films, sports and other programs that constitute the bulk of free TV's programming.

Noting that cable's free use of free TV's broadcast signals amounts to an "enormous subsidy," the NAB brief said:

"Obviously, true market competition never could exist where one competitor, free broadcast television, subsidizes its competitor, pay cable television..."

"The Commission's anti-siphoning rules are simply requirements with which the pay cable exhibitor must agree to comply as a condition of his concurrent carriage and exploitation of broadcast television programming..."

"When the real and substantial issue—the continued free availability of quality entertainment programming which only the broadcast industry is capable of providing—is divorced from the Justice Department's rhetoric, the Commission's goals of adopting anti-siphoning rules can be considered nothing more than fully legal."

Furthermore, it said, in view of the Supreme Court's decision, the FCC rules have been "mandated by the Communications Act" and that communications service will be available to "all the people of the United States."

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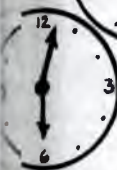
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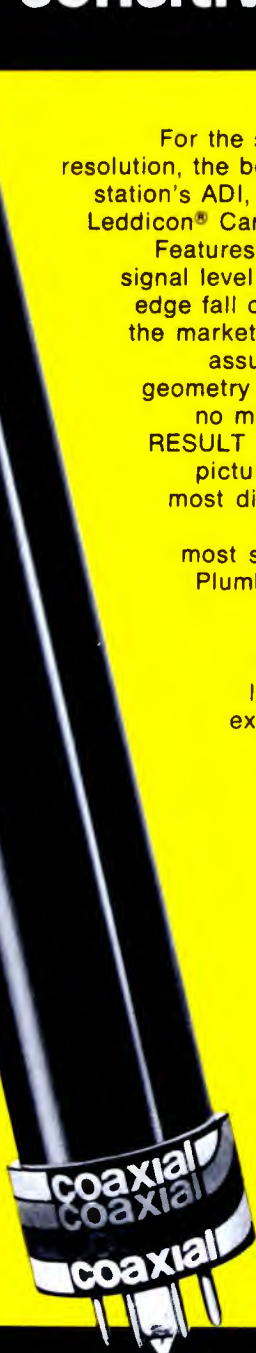
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More Pickup Channels Needed

The National Association of Broadcasters has asked the Federal Communications Commission to locate additional channels to provide more frequencies for retransmission television pickups.

NAB requested that the 65-68 MHz band be shared by television broadcasters on a co-channel basis with the common carriers. This band currently is allocated to the common carriers for the special purpose of providing TV pickup service for television broadcast service.

In its filing, NAB said that due to the rapidly developing interest in electronic newsgathering, a rapid acceleration in the need for television auxiliary channels will occur in the very near future.

In addition to this requirement, NAB said "there has been a parallel increase in requirements for conventional television retransmission pickup and television STL channels. Many stations that formerly leased such facilities from common carriers are now planning, in view of the tremendous increase in cost of leased facilities, to discontinue this practice and to install their own equipment."

NAB said that the availability of this band to television broadcasters for the same purpose for which it is allocated to the common carriers "would have no adverse effect on existing assignments in this band, nor would the proposal have any adverse effect on the future use of the band by the common carriers."

The Association also said that a review of the existing assignments in this service indicates that approximately 75 percent of the licenses have been issued to electronic System companies, or other wireless carriers with which the Bell System has working arrangements for the provision of television service.

"It is our belief that the common carriers plan little expansion in this area since it is no longer economically justifiable to maintain a large investment in equipment which is used primarily to meet spasmodic peak demands of broadcasters and closed-circuit television operators."

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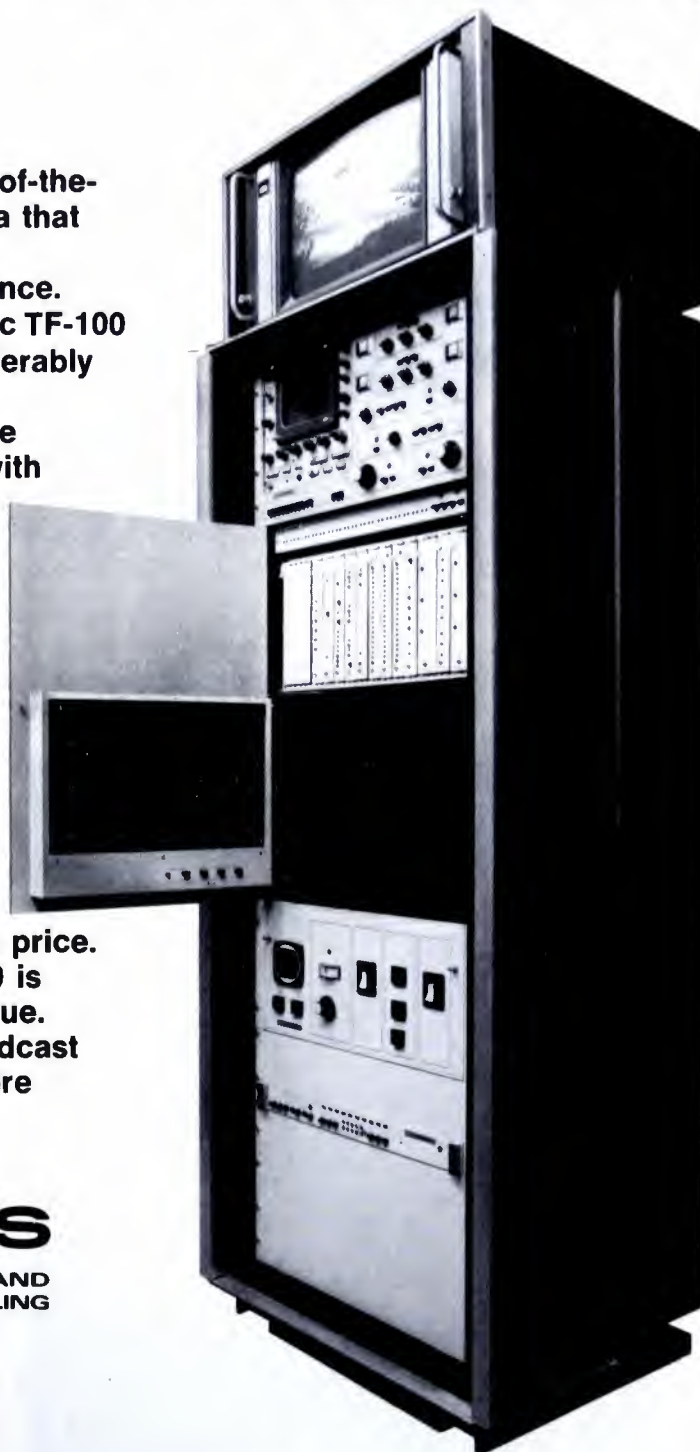
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SOCIETY OF BROADCAST ENGINEERS, INC.
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SBE Elects New Officers

The Society of Broadcast Engineers held its annual membership meeting at the Hyatt Regency Hotel in Chicago on Sunday, March 21, in conjunction with the NAB Convention. The following national election results were announced:

President—Glenn Lahman, KDKA/KDKA-TV, Pittsburgh, Pa.

Executive Vice President—Robert Wehrman, Cox Broadcasting Corp., Atlanta, Ga.

Secretary/Treasurer—James Hurley, WTAE-TV, Pittsburgh, Pa.

Directors: P. J. Ford, WISN, Columbia, South Carolina; Jack Grinnell, ABC Television, Chicago, Illinois; Albin R. Hillstrom, KOOL Radio-Television, Inc., Phoenix, Arizona; John Lyons, Station WWRL-AM, Woodside, New York; William Orr, WBNS Station, Columbus, Ohio; Ralph Thompson, Post-Newsweek Stations, Washington, D.C.

Membership Dues

Vincent Flanders acknowledges the enthusiasm with which members are sending their membership dues. However, he advises everyone to wait until billing notices are sent. This is especially important since membership dues were increased in this year's election to so amend the By-Laws. In order not to complicate the bookkeeping, wait until billing notices are received. This does NOT apply to new applicants sending their membership forms. They MUST enclose the \$15 membership fees (\$7.50 for students) with the application.

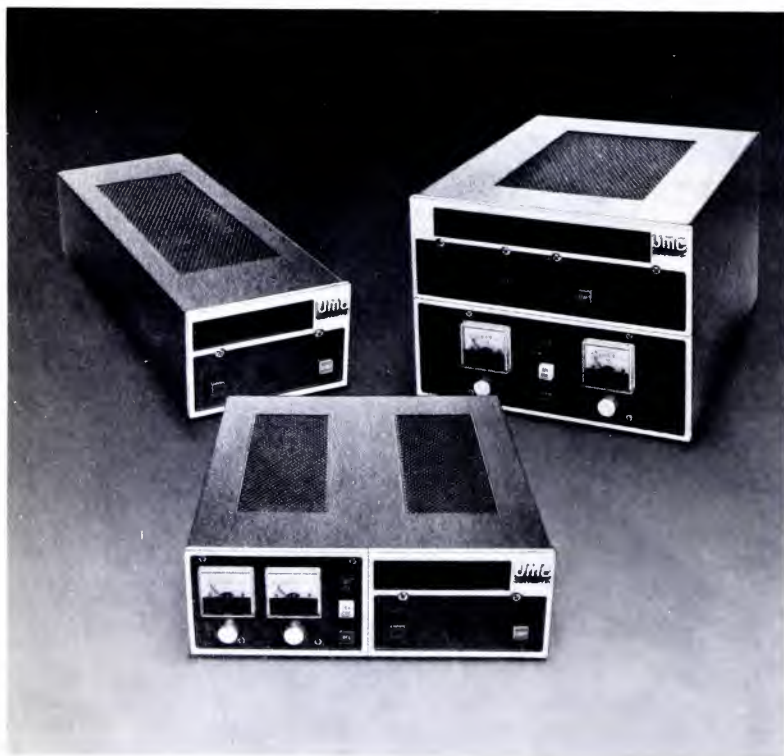
SBE Regional Conventions For 1976

**May 26-27, 1976,
Seattle, Washington**

Chapter 16 will be holding the first SBE Regional Convention of the year in Seattle at the Sherwood Inn, 400 N.W. 45th Street. The two-day Convention, Wednesday and Thursday, will include displays and papers by such distributors as Ampex, Ampex Audio and Video,

Stan Bennett Engineering, Central Video, CMS, Custom Video, CS, IVC, John B. Jolly & Co., Northwest Industries, John Nuttgren, Panasonic, Puget Sound Recordings, RCA, Sea-Tac Productions, Sony, Tektronix, Telemation, TRI, and Videomax. For more information write Chapter Chairman Bob Ingalls, 5441 N.E. 11th

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Coverage

"TFT gives us the extra edge we need so we can use our transmitter to maximum ability without worrying."

On Accuracy

"... very darn good when it comes to proof of performance. If I have an error, I look at the transmitter, not the TFT monitor... I have the utmost confidence my TFT is telling the truth."

On Design

"... they seem to be more easily operated as far as the way you set the thing up. And the fact that they can be located right here at the studio is one thing we really like."

On The Frequency and Modulation Monitor

"... FM was a new adventure for us, and I needed good readout of our pilot. The TFT 723 was right on the money then and we're using it all the time now."

On The FM Stereo Monitor

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SBE Conventions

Avenue, Redmond, Washington 98052, or call him at his office (206) 543-7774.

October 1, 1976, Syracuse, New York

Chapter 22 will hold a one-day Convention on Friday, the first of October. The location may be the Northway Best Western Inn, same as last year, but these plans are still tentative. For more details, contact Gary Hartman, Chapter chairman, at (215) 474-3911, or at WSYR, 1030 James Street, Syracuse, New York 13203.

October 15-16, 1976, Chicago, Illinois

Chicago Chapter 26 is still negotiating for space in the Chicago area for its convention so the site is yet to be announced. However, members are planning a two-day event with both papers and exhibits. For more definite information, call Convention Chairman Brad Anderson at (312) 996-7912, or write to him at the University of Illinois Medical Center, Office of Educational Resources, OER-Room 35, Pharm., P.O. Box 6998, Chicago, Illinois 60680.

October 22, 1976, Pittsburgh, Pennsylvania

Chapter 22 has picked Friday, October 22, as the date for its Regional Convention, to be held at the Howard Johnson's Motor Inn in Monroeville, Pa. Mr. Roy Hoover

did such a good job on Convention last year, that he reappointed as this year's convention chairman. He says preliminary plans are to have a display area for 50 booths, with exhibits open from 11 a.m. to 8 p.m. For further information please call him at (412) 391-1111 or write, KDKA, 1 Gateway Center, Pittsburgh, Pennsylvania 15222.

October 29-30, 1976, Boston, Massachusetts

Chapter 11 scheduled its Regional Convention on Friday and Saturday, October 29-30, at the Holiday Inn (located on Washington Street at Interstate 93) in Somerville, Mass. Mr. Frank Shufelt is convention chairman and can be reached at 5 Garden Street, Grafton, Massachusetts 01519. He can be called during the day at (617) 861-6800.

November 7-8, 1976, New York, New York

Winding up the 1976 Convention schedule is Chapter 15 with its Regional Convention set for Saturday and Monday, November 7-8, at the Holiday Inn in Hempstead, N.Y. Mark Schubin is Convention chairman, and he says that the convention committee plans on at least 50 exhibitors, several papers, a banquet on the first night and an exhibitor party the last night. For up-to-date information, call him at (212) 765-5100, or write to him c/o SBE, P.O. Box 607, Radio City Station, New York, New York 10019.

SBE Chapter Meetings

Chapter 2: Northeastern Pennsylvania

Mr. Terry Lloyd of Time and Frequency Technology was invited to the March 1 meeting of Chapter 2 at the WVIA FM & TV studios, Erie, Pa. Lloyd gave a slide presentation on the Emergency Broadcast System.

The April 15 meeting was a two-part program "Introduction to Microprocessors" and "Applications of the Microprocessor in Broadcasting." John Kowalchik, RCA solid-state design engineer, and Tony Pietrzykoski, Eastern microwave field engineer, covered the background, hardware and software, construction, and organization of microprocessors. Ed Karl, sales engineer for Harris Corporation, spoke on the application of the 8000 in the Harris Automation System. John Kowalchik, Chairman, RCA Solid State Division, Crestwood Road, Mountaintop, Pennsylvania 18707, (412) 474-6761, ext. 635.)

(Continued on
page 18)



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REDUCED OPERATOR ERROR

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The new 1710A is much more than a distortion analyzer. It's a system. It contains its own ultra-low-distortion generator tracked with the analyzer. It's a system that greatly simplifies measuring — gives you fast measuring with a simple operation that reduces operator error.

For example, push the frequency button and you set both generator and analyzer. Push "Distortion" and you have reading. Automatically. No slow, tedious manual null-searching.

Features in the new 1710A include:

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• a balanced (bridging) input

• a high-level +26 dBm signal

- +26 to -90 dBm attenuator
- distortion measurements to .002%
- fast 5-second measuring speed
- automatic nulling, optional automatic set level.
- both harmonic and optional intermodulation distortion measurements.

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In the 1710A you get a transformerless audio generator output that's balanced and floating. No transformer means no transformer distortion. Floating and balanced means you can connect to virtually any audio circuit regardless of configuration. And you can set the output from +26 to -90 dBm in 0.1 dB steps.

FAST, SIMPLE MEASURING

Automatic nulling and the automatic set level option (ASL) give you ex-

remely fast measuring and little chance for operator error. You can measure in 5 or 6 seconds. *With ASL you can measure distortion vs. frequency, and distortion vs. voltage or power without resetting level.*

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You may not know all the problems common-mode ground loop can cause - especially when using your video equipment in an unfamiliar remote location.

With your video equipment connected to one AC power source and your camera connected to another, you can get common-mode ground loop hum that tears up video signals. Dangerous voltage potentials due to faulty AC power distribution can damage equipment and be hazardous to personnel.

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A little knowledge can be a dangerous thing. Don't let what you don't know hurt you or damage your equipment. Play it safe with VACc's self-contained video line isolator.

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SBE (Continued from page 14)

Chapter 9: Phoenix, Arizona

The March 18 meeting, held at the studios, was an opportunity for members to learn more about digital video. The presentation, appropriately entitled "Digital Video Made Easy," supplied by the Ampex Corporation.

In April, the Chapter held its annual Pizz Beer party. This get-together, always after the Convention, gives members who attend the Convention a chance to report on the video activities and news items. The evening also marks the beginning of the year for newly elected officers (Leon Anglin, Chairman, SBE, P.O. Box 1100, Phoenix, Arizona 85001. (602) 285-7333.)

Chapter 11: Boston, Massachusetts

The March meeting of the Boston Chapter was held on Tuesday, March 16, at the WCVB facility in Needham. Members greeted Mr. Lloyd of Time and Frequency Technology spoke on both the manufacture of the TFT element and on the FCC Rules and Regulations regarding the new equipment. (Bob Molloy, Chairman, 66 Bellevue Street, Manchester, New Hampshire 03103. (603) 669-1250.)

Chapter 15: New York City

Chapter 15 welcomed Mr. William McCable Cablewave Systems, Inc., and Mr. Herb Holman, local representative for Time and Frequency Technology on March 11. The topics discussed were transmission lines and the new Rules and Regulations for the Emergency Broadcast System. (Lyons, Chairman WWRL, 41-30 58th Street, Woodside, New York 11377 (212) 335-1600.)

Chapter 16: Seattle, Washington

In Seattle, the March 10 meeting featured Tom Bowles, head of cable operations at KCTS. Mr. Bowles answered questions on all phases of cable operation from what a cable system is, how it's built, how it works, the hardware used, number of channels, amplifiers, coaxials) to the quality of the end result. He also brought some of the equipment for the members to view. (Bob Ingalls, Chairman, 5441-187th Avenue, N.E., Redmond, Washington 98052. (206) 543-7774.)

Chapter 17: St. Paul/Minneapolis

"The Radio Remote-Site Studio" was the topic of the April 21 meeting. The discussion centered on some of the problems faced at the site; the methods used in transmitting the signal to the studio, and so on. The problems faced in each of these situations were discussed. The evening also included a presentation/demonstration of some of the newest equipment on the market.

A special meeting is scheduled on Saturday, April 22. Mr. Mark Persons, director of engineering for KVBR Radio, Brainard, Minnesota, has invited members to tour the facility. Luncheon will follow at the Holiday Inn. The afternoon tour will include a visit to the KVBR-AM transmitter site, the TV head-end site, the television translator site. There will be a look at the future KVBR-TV transmitter. There will be a demonstration of various piece of telephone equipment used for sports remote broadcasts. (Lance Raygor, Chairman, Route 337, Chisago City, Minnesota 55013. (612) 4807.)

(Continued on p

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NAB Video Review

By Joe Roizen

It was an NAB with something for everybody. The engineers had exciting new technical gadgets to play with, the station managers came with loosened purse strings, the old timers could fall into VTR nostalgia and the exhibitors had "SOLD" signs on most of their displays. The consensus among the many marketing people interviewed was that NAB '76 was the best show from a business standpoint in the last decade.

There was plenty of reason for all this euphoria (inspite of the set-up problems) among the exhibitors. NAB '76 combined a noteworthy anniversary with some very significant product introductions that will greatly affect the future of Television operations. All this in an atmosphere of solid optimism among equipment buyers who came to NAB with check books at the ready, prepared to walk off with what they liked.

Surprises abounded in ENG cameras, new VTRs, editing gear, signal processing; factory fresh or refurbished, it was all there to be scrutinized, tested, compared and committed for so that the reels of progress could roll again in high gear. There was so much new video equipment on display that no single report could do it all justice without becoming unwieldy.

The 20th Anniversary

In honor of this double decade milestone that catapulted the '56 NARTB Convention into history, the NAB organizers put together an interesting program and handed out some commemorative scrolls. Addressing the special luncheon on Monday, March 22nd, Douglas Edwards, the CBC commentator who

was the first newscaster to be recorded and delayed by Ampex VR-1000 machines at Television City in Hollywood, reviewed his and other programs that switched from kinescopes to magnetic tape. His remarks were interspersed with short VTR segments that represented advances in recording technology such as editing, color, high band, slow motion, digital time base correction and others.

The tapes were also a chronology of important events that shaped television from the Nixon/Kruschev Kitchen Debate in Moscow (1959) to the Apollo Moon Landings and other space spectacles of more recent years. For the occasion CBS took out of service one of the original Ampex VTRs and had it on prominent display with suitable graphics on the NAB exhibit floor.

History aside, contemporary broadcast problems are being solved by a wide range of new and improved products that permeated the exhibitors' booths and many of them deserve comment and analysis.

Portable Color Cameras

Electronic News Gathering and LIVE journalism continues to be the focal point of broadcasters' attention and the camera manufacturers are catering to this booming market by providing an assortment of cameras dedicated to this application that staggers the imagination. At least 14 well known hardware companies had their own or OEM produced cameras that offered varying degrees of portability, price and picture quality.

One of the ENG cameras that attracted crowds was the Thomson-CSF Labs Microcam, a 7 lb. fea-

therweight that was dubbed "Womens Lib" camera. It is loaded with belt battery pack, zoom lens, the Microcam adds to 12.5 lbs.

To emphasize its portability Thomson had a woman operator for the camera who doubled as a model and a cameraperson. In fact she had a television opera background.

From RCA, the TK-76 camera is finally getting into production. This camera weighs 11 lbs., has no backpack and was according to RCA's Ed Hill, the star of their exhibit. They mixed the camera with their full studio cameras to show quality and make a point of showing the maintenance accessibility of this \$35,000 camera.

IVC were also now in production running with their ENG version of the 7000 color camera. Now in production, the 7000P weighs 14 lbs. (plus lens) and shows very good picture quality. It has an interesting structure with a tiltable viewfinder. Available in a PAL or SECAM version, the camera attracted much attention from visitors representing European, African and Middle Eastern TV studios. It is priced around \$50,000.

Sony introduced a new broadcast quality ENG camera called the BVP-100. It is a 3 plumbicon portable in the \$35,000 price range and is actually manufactured by Toshiba.

Ampex also added a new ENG camera, the BCC4, which uses three plumbicons, weighs 13 lbs., has a 6:1 zoom and needs no backpack. A 5.5 lbs. battery belt keeps the camera operational for 1.5 hours and is rechargeable. Cost is \$25,000.

Ami's entries in the ENG field was further enhanced by their new HL-37 which was the lightest such camera head (11.) at the show. With the lens and electronics pack it came up to 16 lbs. The price for the unit starts at \$26,000.

There were other lightweight cameras from Japanese, American and European manufacturers that had been previously shown or had specialized applications.

In the studio camera field, most manufacturers showed the familiar units with a few updated wrappings to improve picture quality or mobility. Most large cameras now come in normal or tri-axial versions. Harris Gates introduced what he claimed to be the first American-made tri-axial studio camera, the T-80. They had about a mile of cable coiled up out of the back on display and this option added \$1000 over the camera's basic price of \$56,000 plus lens and other peripherals.

The camera buyer at NAB this year had no end of choices from which to select a portable or studio camera in a very wide range of price and performance. Fundamentally, though, the basic format for broadcast quality cameras is three full sized plumbicons in the studio versions and the newer half-sized plumbicons in the 3/4" portable configurations. As yet, CCD versions or combined tube and solid state sensors were shown.

The VTR Scene

The VTR "Format of the Month" club peaked at this year's NAB with quite a few new entries into the field, and it takes more than a word to wade through all of the claims and counter claims of the competing systems. To make any sense of this burgeoning arena, it might be best to separate the VTR formats into distinct categories, then break these down by manufacturer. There are four basic systems:

- Quadruplex with 2" tape
- Helical reel-to-reel with 1" tape
- Laminated helical reel-to-reel with 2" and 1" tape
- Petite helicals with 3/4" tape

There are, of course, a few other units with 1/2" or 1/4" tape, and

even a 1" quad, but these are not in the mainstream of broadcast usage at the present.

The New Quads

Both major manufacturers of quad recorders, Ampex and RCA, have given this format a new lease on life by displaying their latest versions which eliminate most of the deficiencies (banding, etc.) that quads have exhibited up to now.

The fundamental secret to greatly improved quad performance is the combination of a super hi-band modulation system (9 MHz and up) and a pilot carrier at 1.5 times subcarrier which is used for continuous color correction. Quads so equipped and demonstrated at the show could virtually not be forced to exhibit color banding or first line hue shift, even with the female guide grossly misadjusted. In testing an Ampex AVR-2 equipped with the pilot carrier option, it required loss of tape/head contact before any picture deficiency became visible.

To further enhance the operational advantages of such a "hands off" machine, the quads now offer a 7.5 ips (half speed) mode which saves on tape costs. Both Ampex and RCA had similar new quad VTR configurations with some slight differences in modulating frequencies which will probably be ironed out in standards committees.

Ampex also introduced a new quad, the AVR-3, which could automatically detect the mode of the recording and switch itself into the complementary playback function.

Helical Reel-to-Reel Recorders

There are 4 major manufacturers that now make helical reel-to-reel 1" recorders being offered to the broadcast user; Ampex, IVC, Recortec and Sony. While only the Sony machine reported a new format, there were some innovations to the other recorders that are worthy of mention. A 1" single head helical machine was demonstrated by Ampex in their VPR-1 recorder which incorporated an automatic tracking system that not only eliminated the major disad-

vantage of long track helical machines, but also added a new feature hitherto unavailable—broadcastable, stop-motion and 1/5 slow-motion.

While Ampex were not revealing just how they accomplished this technological breakthrough, it was possible by piecing a few available facts together to surmise the technique employed. Their engineering department apparently abandoned the standard approach of stabilizing the tape position around the rather large scanning assembly and attacked the problem from the opposite end, i.e., moving the video head to follow any geometric distortion in the video track.

Since it would be impossible to physically displace a high-band revolving head drum, the only method left would be to somehow physically modulate the video transducer itself in a plane perpendicular to the track angle. This is apparently accomplished through mounting the video head on a piezo-electric wafer whose thickness is transformed through the application of 5 to 6 kilovolts to its control surfaces. A sensing circuit establishes tracking accuracy through the recovered RF envelope and then positions the head for optimum tracking accuracy. The results are quite unique for a helical recorder.

No noise bar is visible in still or slow-motion images, and even severe disturbances of the tape longitudinal motion (touching the reel, etc.) do not affect the reproduced image. This automatic tracking accessory adds about \$9000 to the basic VPR-1 price.

While this recorder has retained the existing 1" Ampex format and is therefore compatible with their regular 7000 series, it has one significant change which makes it far more mechanically reliable than their old machines. The movable guides have been replaced with a fixed guiding system which, although somewhat more difficult to thread, promises a far greater reliability in use.

The completely new 1" helical reel-to-reel VTR introduced at NAB was the Sony BVH-1000. This is a

(Continued on page 25)



When we promised a commitment to the industry, we weren't kidding.

BVH-1000 High-Band Production Recorder

This is the most significant high-band recorder ever made by Sony, or anyone else, for that matter. It incorporates amazing signal capability with the economy of one-inch tape. Its transparent picture quality is so crisp and clean, you might even think playback is E/E camera output.

The BVH-1000 is non-segmented. Which means its production capabilities are infinitely versatile. And unlike ordinary broadcast recorders, Sony's unit combines optimum broadcast performance with compact size. It has fast, accurate edit and bi-directional search logic. So it's really suited for the studio as well as remote locations.

No other direct color high-band recorder surpasses the picture quality and production capabilities of Sony's BVH-1000.

BVT-1000 Digital Time Base Corrector

Sony has combined a wide window of $\pm 2H$ with a unique moving window concept. This means your picture can hold its lock, even though you may have wide error excursions. The BVT-1000 assures you transparent picture quality. It also comes with full NTSC advanced sync, built-in processor and velocity compensation.

When it comes to time base correction, there's no better value than Sony's BVT-1000.

BVU-100 Portable U-Matic® Recorder

This light-weight unit can vastly improve your picture quality. Thanks to Sony's unique SMPTE address track and special comb filtering, your ENG broadcasts can become high-quality broadcasts.

Your picture is sharp and distinct. Sony's BVU-100 is compact, rugged and ready to go.

4. BVU-200 Editing Recorder

Why do so many broadcast engineers consider this unit to be the state-of-the-art U-Matic videocassette recorder? For one thing, it has frame servo editing as well as bi-directional search capability. It too lets you take advantage of Sony's new and unique SMPTE address track. But that's not all. Sony's BVU-200 comes with a stable DC servo system, too.

5. BVE-500 Editing Console

Designed for use with Sony's BVU-200, this new control unit lets you achieve insert and assemble editing too. It also lets you preview as well as review your edit, and trim frames at either end of the edit.

What's more, this system features two separate counters and remote controls. All of which means fast, accurate editing — anywhere, anytime.

6. BVP-100 3P Color Camera

This high-quality portable color camera can do double duty. It's ideal for ENG. And at the same time, it will give you excellent results in the studio.

It features three 2/3" Plumbicon® tubes. So it's capable of handling just about any assignment with optimum quality.

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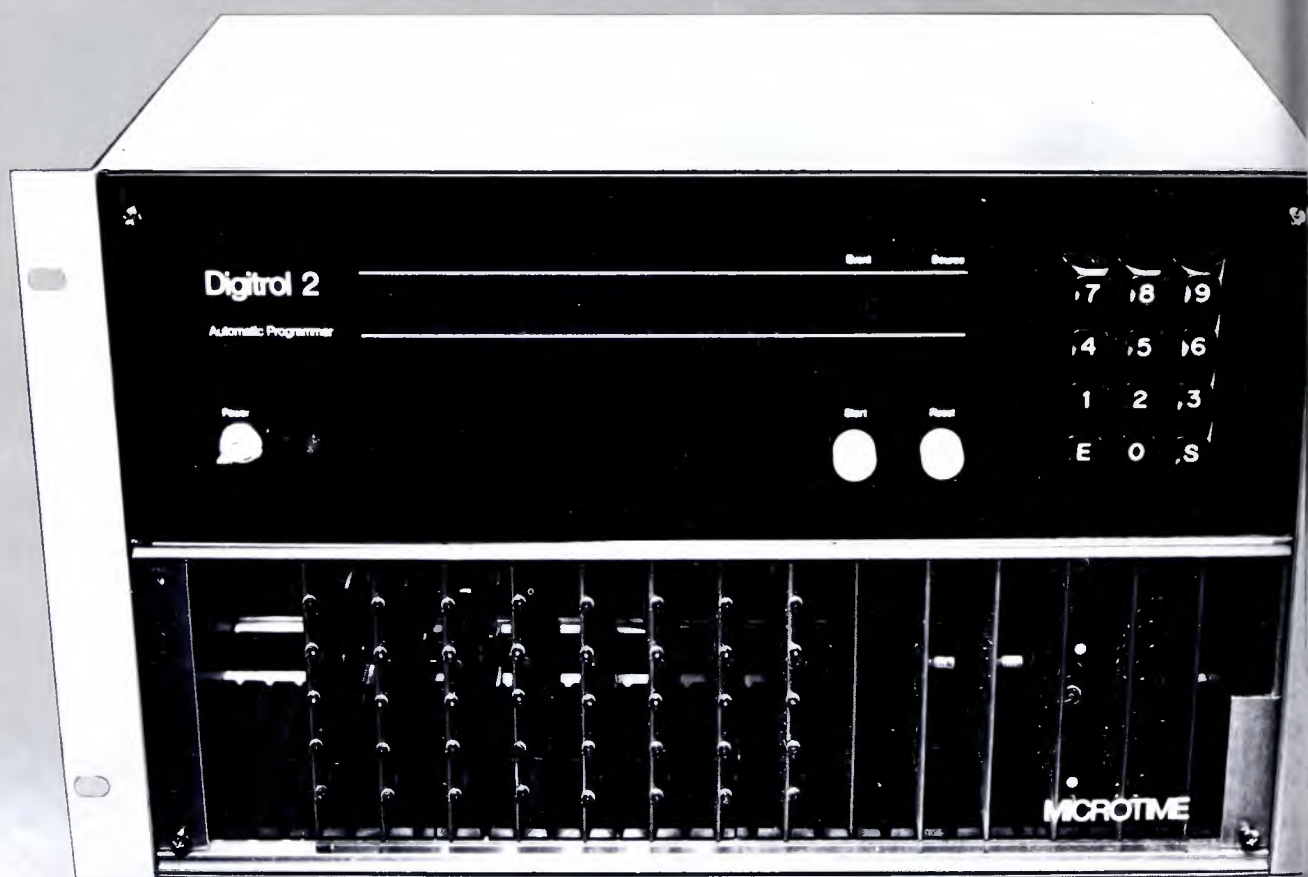
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MICROTIME

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well built machine with high-performance characteristics that follow a few old Sony principles that have proven useful. The video recording and backpack arrangement has a resemblance to their PV-120 using a 1.5 head structure on a drum. This means that one transducer is used for the pickup of the video signal and a second, slightly displaced video head for the vertical internal during the period of main head crossover from one edge of the tape to the other.

The Sony recorder was speeded at 4 MHz bandwidth with a 48 dB signal-to-noise ratio on chrominance dioxide tape. The basic machine is priced at \$32,000 and with digital TBC would run about \$500.

In writing speed, the Ampex and other machines are within .1% of the cloth (1000 ips vs. 1010 ips). In longitudinal speed, the Sony is 63ips as compared to the Ampex 61ips.

While the track geometry is different, it seems conceivable that a slight change in the Sony unit would make it compatible with the Ampex machine. Since Sony has built only a few of these recorders, such a move toward standardization would greatly simplify the potential user's problem with "reel-to-reel" helical machines of this type.

The video memory machine introduced at NAB last year, which was built around the standard Ampex 1" format, has now been taken over by Recortec and is being offered with some improved features at a lower cost alternative for studio needs. The basic price for the production model VM-1000 is \$1000 without the TBC. It features 3-head editing and erase capabilities and is fully compatible with the high-band 7900 series of recorders. It is, therefore, also compatible with the new Ampex P-1.

The IVC standard 1" line using the single head principle was also on display although IVC had several other VTR innovations which will be described in the next column. IVC has added some new, sophisticated circuitry to their standard 1" format to achieve

better performance characteristics from their machines which have always been limited by the relatively low head writing speed.

The fundamental question still to be answered by field experience with regard to the 1" single head helical recorders that are now being offered is whether they have now overcome the basic interchangeability problem that has plagued such long tape path machines in the past. Both Sony and Ampex claim that the scanning assembly is specially made with what is referred to as a "controlled roughness" that eliminates the stiction problems of the past. Furthermore, in the case of the Ampex machine, even the tape distortions produced by the elasticity of the medium are eliminated through the automatic tracking system. If this proves to be true in practice, then VTR's of this format with an adequate writing speed to accommodate high-band modulation systems will indeed begin to compete with the quads for serious studio applications.

Segmented Scan Helicals

Up until this year, the only segmented scan helical available to an NTSC user was the IVC-9000 in its 8 ips, 2" tape format. This recorder was again being offered by IVC for maximum quality production applications with another wrinkle being added, that of a 655 line, 24 frame format for video origination intended to be transferred to film and projected on large screens.

To further compete with the 7.5 ips quad feature which tended to undercut the 900 claim on tape economy, IVC introduced a new 9000 version which runs at 4 ips longitudinally and not only cuts tape cost in half, but extends playing time to beyond 4 hours for a single reel. Specifications for this machine are almost identical with the original version, except for a 2 dB reduction in video signal-to-noise ratio.

The most surprising VTR event in the show was the revelation that 4 machine hardware producers, Fernseh, IVC, Philips and RCA, have agreed to cooperate in producing and selling a new segmented scan helical machine which Fernseh

introduced at last year's Montreux conference in a PAL/SECAM configuration.

This recorder uses 1" tape on a small, two head scanning spindle which segments the image into 52 line sections. Machines of this type produced by Fernseh were on display in each of the other manufacturer's booths, apparently to emphasize the wide-spread introduction of this new format. The recorder has a high enough writing speed to encompass high-band frequencies and, therefore, claims performance characteristics equal to a standard quad. In addition, Hans Groll, Fernseh's Manager, explained during their press conference that the machine has an inherent advantage of being able to provide an acquisition configuration that is physically very small and would therefore apply itself well to ENG portability or mobile applications.

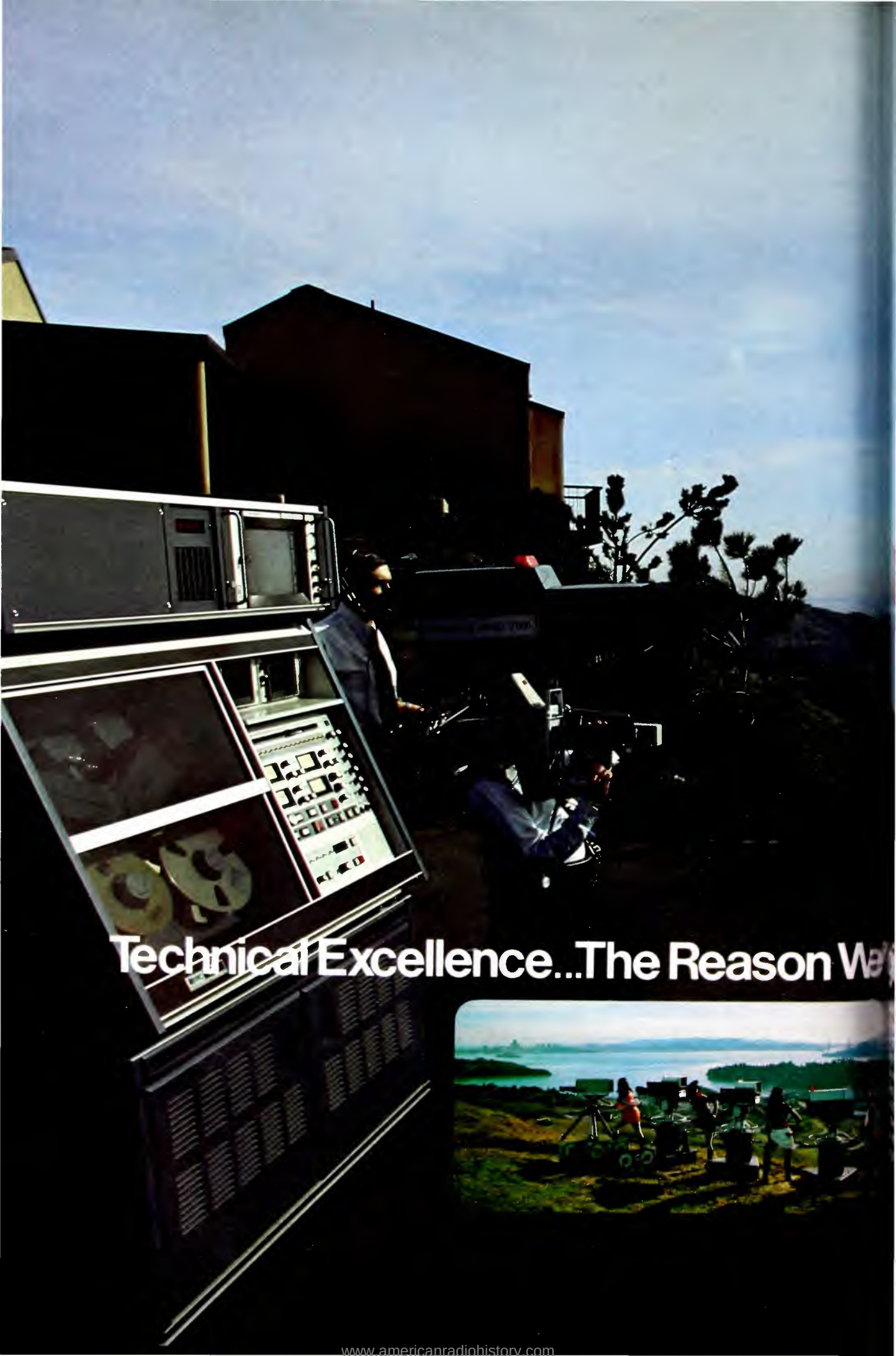
Philips have apparently abandoned their previous stand on the 1" format BCR and have now accepted the BCN in their product line. Both RCA and IVC verified that they would produce and sell this unit.

Echo Science, who have for several years now occasionally shown a very similar segmented scan machine (Pilot 1) were not actually at NAB with their version; but it seems likely that they could also enter this race by similarizing their almost identical segmented scan format to that of the Fernseh machine.

3/4" Cassette VTR'S

Perhaps the weakest link in every ENG system employing a portable VTR using the 3/4" cassette format was the recorder itself. While the portable cameras were capable of producing relatively good wide-band color images, the "color under" process on the cassette machine greatly reduced the luminance band pass and the overall quality of the reproduced image. In addition to that, most of the cassette recorders were essentially designed as closed circuit, semi-professional devices and were not usually intended for broadcast applications. However, in view of the massive use of these units in ENG work, there has been

(Continued on page 28)



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a world of change and progress. Remember the photo at the left? We used it in a broadcast ad eight years ago. It showed the IVC product line on a hilltop in California's Marin County. We returned to that hilltop with our 1976 broadcast products . . . to make an important point. ☐ There have been some dramatic changes in the industry. There's a home on that lot now. The San Francisco skyline has grown considerably . . . and so have we. Today we're firmly established as the nation's largest manufacturer of color videotape recorders and television cameras. The progress we have made stems from our commitment to technical excellence in broadcast television. Our new IVC-9000 Broadcast Videotape Recorder is unquestionably recognized as the finest teleproduction camera in the world, with well over 100 in use. The IVC-7000 has no peer as a studio camera. And watch the 7000 go. We think it's a better camera than most studio models. ☐ Indeed a lot of time has passed. And yet we began it has only been ten years.

Look at us now!



For More Details Circle (17) on Reply Card

a trend toward upgrading of the "4" format to a closer approximation of broadcast requirements. This was very evident in this year's NAB show from the number of completely new cassette machines which, while retaining the format, have added more rugged mechanics and more sophisticated electronics to achieve a higher performance characteristic.

Sony's entire exhibit centered on their commitment to the broadcast industry by the introduction of new versions catering to the more stringent broadcast requirements. Their U-Matic format cassettes included a BVU-100 field acquisition machine with a companion color adaptor for playback and an AC adaptor that would permit it to be operated in a mobile situation where power was available. To replay these cassettes or edit them in the studio, Sony has a new U-Matic machine called the BVU-200 which can be controlled by different editing devices, either of their own manufacture, or of the growing number of

outside suppliers.

Sony's U-Matics now offer SMPTE code operation for frame-to-frame editing and, of course, the new equipment has such features as regular broadcast-type connectors for audio and video and adaptability to Sony's own peripherals, digital time/base correctors, remote controls, etc.

Sony, of course was not the only company with upgraded U-Matic machines. Somewhat similar offerings were being made by Ampex, RCA, and Panasonic, either through cassette VTR's manufactured by themselves or as OEM's for well-known Japanese lines. Most of the U-Matics have been modified to enhance editing operations by permitting still frame scanning and low speed tape jogging in both directions for edit point searching.

Editing Systems

The buzz word in VTR editing this year is "microprocessors". No matter how complex or simple the editing device, it seems to depend

on one of these new solid ultraminiature circuits to do part of its function. As an example, George Swetland of EECO around the exhibit floor a device that looked like an old hand calculator which actually a portable SMPTE time generator with an LED read single chip produced the cop 80 bit code.

One interesting post-production editing system was being demonstrated by CMX. The heart of the CMX-340X system is a microprocessor that is dedicated to the or other device being controlled and is programmed to interface with the machine's internal characteristic. The unit is called Intelligent Interface (I²) and command information from a central computer which can control up to 32 devices (VTRs, ATF, no discs, switchers, telecines, etc.) eight of them simultaneously.

The 340X and its miniature configuration ENG version is

(Continued on page 10)

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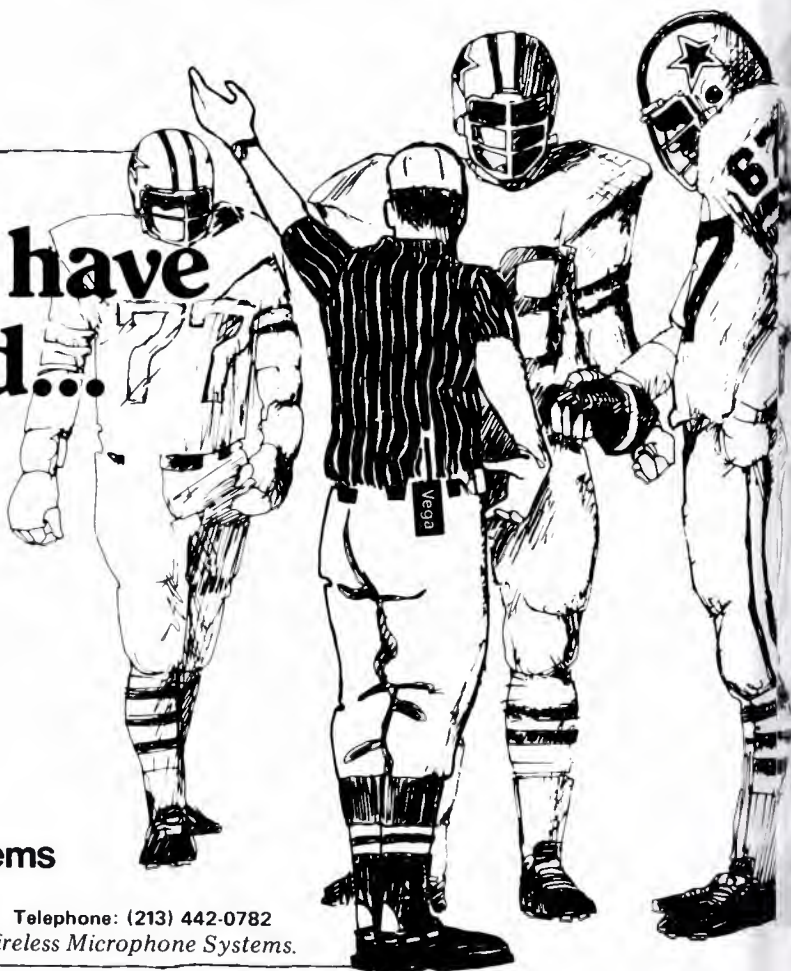
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Focal length	12-216mm	16-288mm
with 1.5x range extender	18-324mm	24-432mm
with 2x range extender	24-432mm	32-576mm
Maximum relative aperture	1:1.6 (f=12-172mm) 1:2.0 (f=216mm)	1:2.1 (f=16-230mm) 1:2.7 (f=288mm)
Zoom ratio	18x	18x
Image format covered	12.8 x 9.6mm, 16.0mm dia	17.1 x 12.8mm, 21.4mm dia
Minimum object distance from front vertex	0.7m (27.6")	0.7m (27.6")
Object dimension at minimum object distance Wide	103.2 x 77.4cm, 129.0cm diameter	
Tele	5.3 x 4.0cm, 6.7cm diameter	
Back focal distance	62.65mm (in air)	78.08mm (in air)
Glass compensation	69.2mm (BK7)	70.2mm (BK7)
Wavelength range for color correction	400-700nm	400-700nm
Weight	23kg (approx. 50lbs)	23kg (approx. 50lbs)
Dimensions	466.5mm length x 284mm width x 260.5mm height	
Focus and Zoom control	Manual, with plug-in interchangeable servos	
Range extender control	Plug-in servo / manual	

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The new Canon 18x series for major broadcast cameras. With the best relative aperture, superior wide angle and shorter M.O.D. Choice of manual or servo focus and zoom. Built-in servo/manual operated 1.5x and 2x extenders. And interchangeable, plug-in servo modules, for easier service. All at a competitive price.

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Ampex AVR-3. The

Two decades ago, Ampex introduced the first videotape recorder, and now Ampex opens a new generation of VTR capability with the all-new AVR-3, the machine that thinks for itself.

You'll want an AVR-3 for a couple of basic reasons: for the "intelligent" way it does an outstanding job for you, and for the superb pictures it makes. In any broadcast band it delivers superior picture quality. With Super High Band Pilot you have the most foolproof record/playback technology available.

"Intelligent." What does it mean? It's a lot of things, such as automatic sensing and switching of speeds and bands. It's an all-new optional Edit Controller for teleproduction capabilities that once seemed impossible. It's fast, efficient, gentle tape handling. And much more.

There isn't anything in the world like an AVR-3. It produces unequalled pictures; it protects you against errors in playback settings; it provides the easiest and best editing you've ever known; it's going to give you longer service life than any other VTR you've ever owned. AVR-3 is the best recording investment on the market.

Super high band pilot **The Mouthful** **That Becomes An Eyeful.**

How does a VTR compensate for signal irregularities introduced during the recording phase? In the past, those corrections were made on the basis of "average" information. In the

new AVR-3, with Super High Band Pilot, signal corrections are triggered on a continuous basis. Color velocity errors and other synchronization variables are "seen" and corrected before they can be displayed. The result? Perfect pictures. You can see the difference.



First "Intelligent" VTR



With Super High Band you'll get a picture at 7½ lines per second that's virtually as good as you've learned to expect from 15 ips High Band. The tape speed means half as much tape. It's a money saver.

Recording options

When you order your AVR-3, you'll be able to choose from the following pairs of recording bands: Super High Band/Pilot/High Band; High Band/Low Band Color; Low Band Color/Low Band Monochrome. And no matter which bands you specify, you'll get both 15 ips and 7½ ips capability.

"Intelligent"

...ing the Brain to Work.

The first thing you'll notice about your new AVR-3 is the way it "knows" how a given tape was recorded. It'll automatically sense the recording band and the band you used, and will switch to the right playing configuration. Intermixing won't be a problem, because the AVR-3 always knows how to sort them out.

The second feature you'll notice is the way your AVR-3 plays tape. Punch up a fast tape, and AVR-3 programs the tape to play from a gradual acceleration to a flying 375 lines per second. Then, as the tape approaches the end of a reel (or a cue point), the

program takes over again, producing a smooth deceleration curve to a precise, dead stop. You'll never damage a tape as you run it back and forth, time after time, on an AVR-3.

Editing

If You Can Imagine It, You Can Accomplish It.

The standard AVR-3 editor permits manual insert and assemble edits. If your needs are simple, you can stop right here.

The optional Edit Controller takes you the rest of the way. Using either time code or tape timer information, it includes search capability. This feature gives you separate video and audio edit points, and the keyboard control allows you to move or enter edit points at will.

There's more. An optional color framer eliminates all color ambiguities between edited segments. A time code generator and reader and a character generator are other handy options.

Housekeeping and computer control

What else does the AVR-3 do to make your life easier? Once the video and audio edit points are keyed in, Edit Controller takes over the housekeeping. It automatically computes and controls pre-roll addresses, acceleration/deceleration profiles, synchronizing information, and all switching

necessary for precise edits. An optional computer interface lets you work with any external editing system, such as the fully computerized Ampex EDM-1.

Economics

Good at First, Better Every Year.

Even the basic AVR-3 model will outperform most previous top-of-the-line VTRs. And no matter how you equip your AVR-3, it'll cost less than you'd expect and then pay for itself with many years of reliable, professional service.

Complete technical data and performance specifications are now available in our AVR-3



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NAB Sessions Help Update Engineers

Engineering Advisory Committee Report

Issues ranging from automatic TV program identification and TV subtitling to roadside radio and the VHF drop-in plan were reviewed for broadcast engineers by the NAB Engineering Advisory Committee.

Committee Chairman Robert W. Flanders, vice president for engineering, McGraw-Hill Broadcasting Co., Indianapolis, Ind., submitted the report during the Broadcast Engineering Conference being held in Chicago as part of the NAB's 54th Annual Convention.

Flanders reported that the FCC has finally deleted the commercial coding rules which NAB has opposed for years. The rules would have permitted the use of a corner of the TV screen to transmit blips and keep tabs on commercials. However, the Commission did include a proviso that such material can be used until Jan. 31, 1978.

Flanders also described a proposal filed by Public Broadcasting Service (PBS) with the FCC requesting that Line 21 of the vertical blanking interval be reserved for use of captioning for those with impaired hearing. The PBS proposal is now being reviewed by the NAB Captioning Subcommittee and appropriate comments will be filed by the Association by May 10, 1976.

Regarding the captioning of emergency messages, Flanders said that the Committee had suggested that no action be taken in this proceeding.

In addition, the Committee chairman reported that NAB has filed strong opposition to the VHF drop-in plan.

The EAC chairman said the Committee also reviewed reports on the status of satellites and a future system of direct-to-satellite-to-home method developed by COMSAT.

The Committee discussed plans for the 1979 World Administrative Radio Committee (WARC), but recognized that the WARC is a long-term effort and therefore, the Association should not be deterred from seeking additional auxiliary broadcast service frequencies for immediate use.

Tower icing remains a high priority, the Committee agreed, and the Tower Icing Subcommittee is being restructured under the chairmanship of Ralph Batt, vice president for engineering, WGN, Chicago.

The Committee noted the Association filing in opposition to roadside radio, the use of frequencies at the upper and lower end of the AM band for travel and weather information.

Regarding the Commission's Notice of Inquiry on interference from spark-type ignition systems in motor vehicles, the Committee voted to alert the Electromagnetic Compatibility Committee to this activity so that proper action may be taken.

New cartridge tape recording and reproducing standards have been approved by the EAC and the NAB Board of Directors.

NAB, in cooperation with the Electronic Industries Association and the Institute of Electrical and Electronic Engineers has formed the National AM Stereophonic Radio Committee to study the feasibility of AM Stereo broadcasting.

Committee members in addition to Chairman Flanders are: Charles F. Abel, manager of engineering, KFMB, San Diego, Calif.; Ernest L. Adams, vice president for engineering, Cox Broadcasting Corp., Atlanta, Ga.; Ralph F. Batt, vice president and manager of engineering, WGN, Chicago, Ill.; Albin R. Hillstrom, vice president for engineering, KOOL Radio and TV, Phoenix, Ariz.; Leslie S. Learned, consulting engineer, Mutual Broadcasting System, Inc., New York,

N.Y.; Martin Meaney, director of allocations engineering, National Broadcasting Company, New York, N.Y.; James D. Parker, staff consultant-telecommunications, CBS TV network, New York, N.Y.; LaVerne Pointer, director, broadcasting engineering, American Broadcasting Co., New York, N.Y.; and Benjamin Wolfe, vice president for engineering, Post-Newsweek Stations, Washington, D.C. James Ebel, president and general manager, KOLN TV, Lincoln, Neb., is the NAB Board Liaison Member.

Two-Way System Keeps News Flowing

How an all-news radio station established its own two-way communications system for on-air-taped broadcasts from almost anywhere in its community was described by Christopher Payne, chief engineer of KYW Radio, Philadelphia, a 24-hour-a-day, seven-days-a-week, all-news operation.

He said the remote pickup system, developed specifically for KYW, features UHF base stations arranged for automatic repeat and full duplex operation. Multiple receiver installations incorporate an automatic selection technique that permits reception from a portable transmitter anywhere in the city.

He said this special technique is a "voting" system whereby on the receivers of a multiple series out around the city locks onto the signal from a portable transmitter. The receiver receiving the strongest signal activates; the others, receiving weaker signals, pass.

Each of the "voting" receivers connected to the main studio kHz telephone lines, so that program quality voice connection made and can be broadcast directly or taped for later broadcast. Payne said that in this way



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RE20 Continuously Variable-D Dynamic:

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In the anechoic chamber, the RE20 exhibits the widest, most uniform response curve of *any* available cardioid dynamic. The RE20's cardioid polar patterns are almost identical on axis and 180° off. It has excellent transient response.

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This microphone's grandfather could drive nails into pine boards and continue to perform unabashedly. The RE20 adds the ability to handle very high inputs. That's durability. We back this claim with the strongest dynamic microphone guarantee in the business.

CS15 Single D Cardioid Condenser:

It's designed to be light, to reject off-axis sound, and to provide controlled bass boost. In the recording, broadcast and sound reinforcement jobs where a swinging singer has two mike positions, close and closer, or the bell of a trumpet is surrounding the mike, it's designed to deliver wide, smooth response. And we've developed an electret that can endure SPL's that would have blown the charge off earlier electrets.

Can It Deliver?

In the anechoic chamber, the CS15 exhibits the wide, uniform on-axis response characteristics of the most expensive condenser microphones. Its off-axis response is excellent also. The microphone can be powered remotely with from 8 to 48 volts.

And The Durability?

The CS15 condenser is every bit as rugged as our most rugged dynamic.

We back this claim with the strongest condenser microphone guarantee in the business.



Specifications

	RE20	CS15
Model Number	RE20	CS15
Element	Dynamic	Electret Condenser
Polar Pattern	Cardioid	Cardioid
Response	45 - 18,000 Hz	40 - 18,000 Hz
Output Level (0 dB = 1 mw/10 dyn/cm ²)	-57 dB	-45 dB
Max. SPL (1% THD or less at 1 kHz)	greater than 150 dB	141 dB
Impedance	50, 150, 250 ohms balanced	150 ohms balanced
Case Material	Machined Steel	Machined Steel
Sugg'd Resale Net Price (Slightly Higher in Western States)	\$300.00	\$198.00

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reporter covering a remote event can always get through to the main studio, despite terrain or man-made barriers.

He said an ingenious method of using a duplexer at two-way automatic mobile relay stations permits the use of closely-spaced 450 and 455 MHz frequencies for transmitting and receiving without interference.

The requirement for a good base station receiver, one with a high intermodulation immunity and a very good desensitization characteristic, was emphasized by Payne. Both are needed, he said, to overcome the potentially destructive interference from nearby transmitters in the mobile business and public safety radio services in the 455 MHz band.

Take A Tip From The FCC

Radio engineers were urged to emulate the inspectors for the Federal Communications Commission and check for overmodulation the way they do.

Joseph W. Looper, chief engineer of the Hampton Roads Broadcasting Corp., Newport News, Va., recommended use of a tunable receiver with a good IF strip and an oscilloscope of good quality.

FCC inspectors use such equipment when they monitor a station, he said, and broadcasters should follow suit.

Looper told the radio broadcasters that overmodulation can be cured in AM stations, albeit at high cost, by using plate-modulated transmitters with a line voltage regulator.

Alternative methods, he said, are to stabilize the modulator bias supply as well as the power tube filament supply. Both alternatives, he said, will extend the life of power tube filaments, and they thus will help pay for themselves.

Looper recounted tests that he has run at his station WGH that showed that overmodulation many times was caused by variations in power line voltages. Variations in the order of 5% to 10% are quite common, he said.

Severe cold winter weather or extreme heat in the summer also cause variations of from 10 to 15 volts on a 240-volt line. Many utility companies, he said, have a

problem with power line voltage variations.

Time-Delay Reverberations

Engineers also were told they'd better latch on soon to something audiophiles have known for a long time—a third-dimensional "time" element that improves high fidelity music.

Use of what he called "auditorium ambience" was encouraged by William Hall, vice president of engineering for MicMix Audio Products.

Sound no longer is merely two-dimensional, Hall emphasized, but has become three-dimensional—pitch and timbre, plus time. The last, he said, is the reverberation that comes milliseconds after direct reception and echoes from the stage.

The ear, he explained, is subject to the original sound not once but many times. It's the repetition, he said, that gives "the fullness and satisfaction to the direct sound that cannot be duplicated by any other means."

Such ambience, Hall said, can be synthesized through echoes from recording studio patterns or artificial chambers having good reverb characteristics.

Avoid Those 'Funny Things'

Engineers were given some tips on how to avoid "the funny things that happen to the signal on the way to the receiver."

William J. McCarren, associate director, AM Transmission Systems, CBS Radio Network, New York, said one example of problems with AM transmissions occurs when signals travel over multipaths due to reflections from earth objects or skywave propagation. One thing sure to occur, he said, is that the upper and lower sidebands can be expected to arrive at the receiving antennas at different times. They also will exhibit different ratios of sideband-to-carrier energy than when the signal was generated at the transmitter.

McCarren noted that if the carrier is canceled more than the sidebands, the signal becomes overmodulated. But if the sidebands are canceled more than the carrier, he said, the percentage of modulation

is lowered. The phase relation of the sidebands to the carrier will be shifted from their original relationship, he said.

The problems of directional antennas are special, this is particularly true, the CBS engineer said, in the null radiation pattern where the amount of attenuation the sidebands may well be more than of the carrier, or in cases more for one sideband than for the other.

The complexity of matching impedance of the antenna to the resistance of the transmission was also mentioned by McCarren. The matching is usually done at the carrier frequency, he noted, the sideband frequencies are usually not matched. Therefore the sideband load reflected back at the sending end of the line is something different than a pure resistance.

Pulser Saves UHF Power

Power savings amounting to \$14,000 annually in UHF transmissions were reported with use of an anode pulser to regulate the output of the station's power amplifier.

The system, using circuitry and techniques perfected at RCA's Missile & Surface Radar Division in Moorestown, N.J., was described by John B. Bullock of RCA's Mechanicsburg, Pa., facility during a television assembly at the Broadcast Engineering Conference.

Bullock noted that UHF stations can only obtain higher power output than VHF stations to provide an equivalent signal through use of vapor-cooled klystron power amplifiers.

He said the beam power needed for the klystron is considerably greater than actually required. The power is needed only when synchronizing TV signal is being transmitted—or 8 percent of the time.

The anode pulser is designed to let the system operate at reduced power during the other 92 percent of the time and to apply power only during the sync period.

Bullock said tests have resulted in a 13.8 percent savings in power input to a 60 KW transmitter. Based on power costs in the Jersey market and assuming

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hour broadcast day, he said, this would amount to an annual savings of about \$7,000. "Similar calculations made for higher power transmitters suggest that savings would increase approximately in proportion to the transmitter's RF power output," he said.

Eliminating Ghosts

Television viewers who sometimes have difficulty with pesky "ghosts" on their picture tubes can take heart. A method of overcoming most of these aberrations, caused by multi-path signals, is under way.

A circularly polarized antenna system capable of reducing ghosting, was described by R. E. Fisk and J. A. Donovan of Gates Broadcast Equipment Division, Harris Corp., Quincy, Ill.

The Harris engineers' report is an update of a previous paper delivered at a symposium held under the auspices of the Institute of Electric and Electronic Engineers in Washington last September.

It described an antenna configuration using a cavity backed radiator for the VHF frequencies. Two major features of the design are the exceptional pattern and impedance bandwidth capability, and the excellent on and off axial ratio. The latter is said to provide suitability for multiplexing.

The device can be mounted on triangular or four-sided towers and is independent of adjacent elements of the antenna system. It is enclosed in a special, low wind-load radome to protect the antenna from corrosive-causing pollutants in the air.

For channels 2-6, the cavity size ranges from 7.5 feet to 11 feet in diameter; for channels 7-13, the size is about 3.5 feet.

Authors of the paper said a special wideband flat dipole was developed to handle the required power levels and to excite the cavity. The development has separate 1 5/8-inch, 50-ohm coaxial inputs to the horizontal and vertical elements, permitting cavities to be fed for either horizontal, vertical or CP radiation.

Magnetic Digital Discs

The slide projection unit, a mainstay at many a TV station

since the beginning of television in the late 1940's, may be on the way out. In its place is an all-electronic, digital device, using magnetic discs, that provides instant random access to 1,472 still pictures.

The device is called the Electronic Still Store system (ESS).

"The operation of the telecine slide projector represents what is perhaps the most antiquated activity of a modern television plant," according to J. Dierman of Ampex Corp. and W. G. Connolly of CBS Television Network who authored the paper on ESS.

The authors noted that the average station carries from 2,000 to 5,000 slides. The slide assembly, they noted, requires assembly, cleaning and physical carriage to the telecine room where the slides must be manually loaded. This is "a laborious operation," they said, "with inherent possibility of error."

Describing the development of ESS by Ampex and CBS, the paper noted that the choice of standard disc packs was determined by the need for magnetic storage device that can transmit a continuous TV signal without the need for a buffer.

Each disc pack, with a capacity of 800 TV frames, can be loaded and unloaded from the drive in a matter of seconds. The entire range of 800 tracks per disc pack, they said, can be traversed in about 60 milliseconds. Moves between adjacent tracks take 10 milliseconds. They compared these times with the 200 milliseconds that is required for a telecine mirror flip.

The ESS system, they said, is set up to use two disc packs at one time.

With a mini-computer, they said, it can be used with up to eight remote access stations. Each station consists of a keyboard and a 32-digit alphanumeric display. Panel selections contain operating modes (play, record/delete, sequence assembly, etc.). Data entry keys are used to select channels, or select an individual still and to manipulate internal memory to establish play sequences.

Modified Half-Track

Economy and quieter performance was claimed for a modified

video tape recorder using half-width magnetic tape.

Donald E. Morgan, director of program management for the International Video Corp., Sunnyvale, Cal., said the 9000-4 recorder provides high quality pictures and is especially adaptable for deliv-

ing broadcasts and for storage. He spoke during the Engineering Conference being held here as part of the 54th annual convention.

Morgan said the modified IVC recorder has plug-in printed circuit boards and a new head drum that reads and reproduces on half-width tape moving at four inches per second. The redesigned head with clearly defined track widths is rigid and sturdy, he said, and will wear as long—typically 3,000 hours or a warranted 1,500 hours.

Morgan said a chief advantage of the modified IVC recorder is price economy.

He said the signal-to-noise ratio of the modified recorder is 4 dB compared to 50dB of the 9000-4 performance in this regard, he said. "agrees with the theory that halving the track width will reduce the signal-to-noise ratio by 3dB.

Computing Radio Coverage

Two government engineers described for broadcasters how the Department of Defense uses computers to determine line-of-sight and shielding factors in radio coverage between sites in the United States.

A joint paper by Charles Gettier and James W. Deterding of the department's Electromagnetic Compatibility Analysis Center, Annapolis, Md., was delivered by Gettier.

Gettier said ECAC has developed a family of automated telecine analysis models as well as an automated data base of digitized topographic information. Terrain elevation data based on longitude and latitude is stored in the computer.

In order to check the advantages or disadvantages of transmitting and/or receiving sites, Gettier said the elevations between two or more sites are brought up from the memory bank of the computer in a sequence of equi-spaced points along the great circle path between two known end points.

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Attendance was great, and sales on the floor were better than average. There wasn't any indication of the turmoil that took place trying to set up these booths in shorter than normal time. For attendees appreciate the transformation that takes place from crates and concrete to super exhibit. The exhibit designers this year deserve more credit and...more time.

BE Tours The Radio Exhibits At NAB

By Dennis Ciapura, *BE Audio Editor*



The press meets the exhibitor! Bud Carlson of Video Systems magazine gets a short course in cart machines from Sparta's Jay Cooke. Video Systems is a new sister magazine to Broadcast Engineering. It's published bi-monthly.

As each new year brings its technological advances, the character of the N.A.B. Show changes a little bit to reflect those advances and so, the show is always different, with the excitement of something new to look forward to. Although the convention is sometimes branded as a T.V. oriented affair, this year's event was packed with enough radio audio displays to keep a pack of radio broadcasters busy for better than a month of Sundays.

This review of the radio/audio exhibits is by no means complete, as space does not permit a complete wrap-up in a single issue, so look for more about the '76" radio exhibits in future issues. For readers who were there, perhaps this wrap-up will remind you of something you wanted to check out after the show, and for those of you who weren't able to make it this year, take the quick trip with us here and see what's new. The various exhibits are described here in the order that they appeared as we walked through the expanse of Chicago's McCormick Place in our semi-systematic wanderings.

One of the most notable features of the **R.C.A.** booth was the emphasis on stereo and quad suitability of the R.C.A. radio transmit-

ters. The AM rigs were "Stereo Compatible", while the FM transmitters were labeled "Stereo Compatible". An AM stereo demonstration was set up with a monitor quality speakers for assessment of audio quality; an impressive demonstration of the system's capabilities.

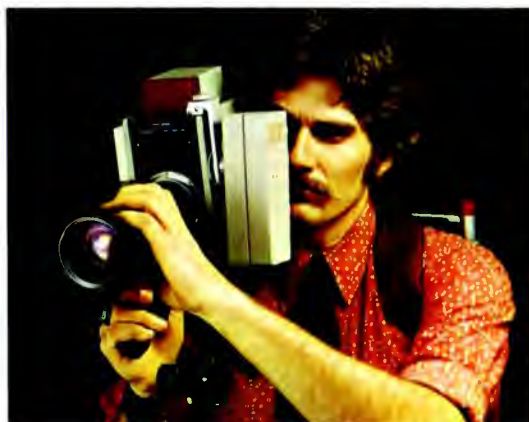
Harris showed its System Automation which boasts the use of micro-processor technology and one of the other digital marvels. The MW-1 all solid state AM transmitter was also on hand and (into a dummy load) for a demonstration of the transmitter's PSM, Progressive Series Modulation, audio system. Harris's Larry Looer was happy to demonstrate the rig for one and all, and seemed happy to have the press fondle its knobs.

Moseley demonstrated its remote control equipment and also showed the new SCG-9 generator which features low voltage shoot filter design. **Nortronics** had a new splicer to show and it generated a lot of interest. At the **Bird** booth we were get a look at the new Bird reject load, while the **Capitol**

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For More Details Circle (22) on Reply Card



EBS monitors were in demand because all stations needed them by April 15. Some manufacturers brought them to the convention in numbers and sold them off the floor.



Oh, it was nice to find a place to sit down. The exhibit area was so large this time that it really took days to see everything. Meanwhile, in the same building the Flower and Garden show was being held, and about 3500 people attended that one.

were on hand to talk about the Audiopak A-2 carts and Capitol's new Q15 and Q19 tapes for broadcast use.

At **AEL**, we found transmitters with meters at waist height and positive pressure cabinets to help fight dirt ingestion. AEL has added 5 and 10 kW FM transmitters for "76" and a new FM20E solid state FM exciter.

The **Marti** exhibit area bristled with remote pickup gear, S.T.L.s and digital remote controls for wire or S.T.L. applications and **Cooke Engineering** showed a line of audio pre-amps, distribution amps and monitor amplifiers in the "Dyna-Mite" series. At the **CSI** display, a new line of AM transmitters and a 1 kW FM were the big items, as CSI comes into its second con-

vention year with what is now a full line of transmitters. **IGM** had its automation and "Go Cart" demos ready for inspection. **Delta** showed its antenna monitors and digital control system, and **Belar** displayed their newest digital monitoring equipment.

The **CCA** exhibit boasted a complete line of transmitting equipment and a working demonstration of the audio fidelity capabilities of its new 40 watt all solid state FM exciter and stereo generator combination. The demonstration unit easily managed to generate a stereo signal with only 0.1% distortion and FM noise at -70 dB. A line of Bogner FM antennas also made its debut with CCA at the show.

Rapid Q had its line of cart gear to show off, as well as a Stereo

Phase Enhancer display. **Critical** had its see through demonstration transmitters on hand, including a 50 kW AM rig with screen and impedance high level modulation. The 5 and 10 W versions were all solid state to the final, which employs two tubes. **McMartin** tied its line of transmitters, monitoring and audio gear together with a single theme that was "It's only natural". **McMartin** showed S.C.A. gear and a new 2.5 kW AM and 25 kW FM transmitter. **Collins** came to the show complete with transmitters, consoles and the new "Phase 4" exciter. The DAP, Discriminate Audio Processor, could also be found on display at the Collins/Rockwell display area.

The **Cetec Broadcast Group**

At The FCC Booth....

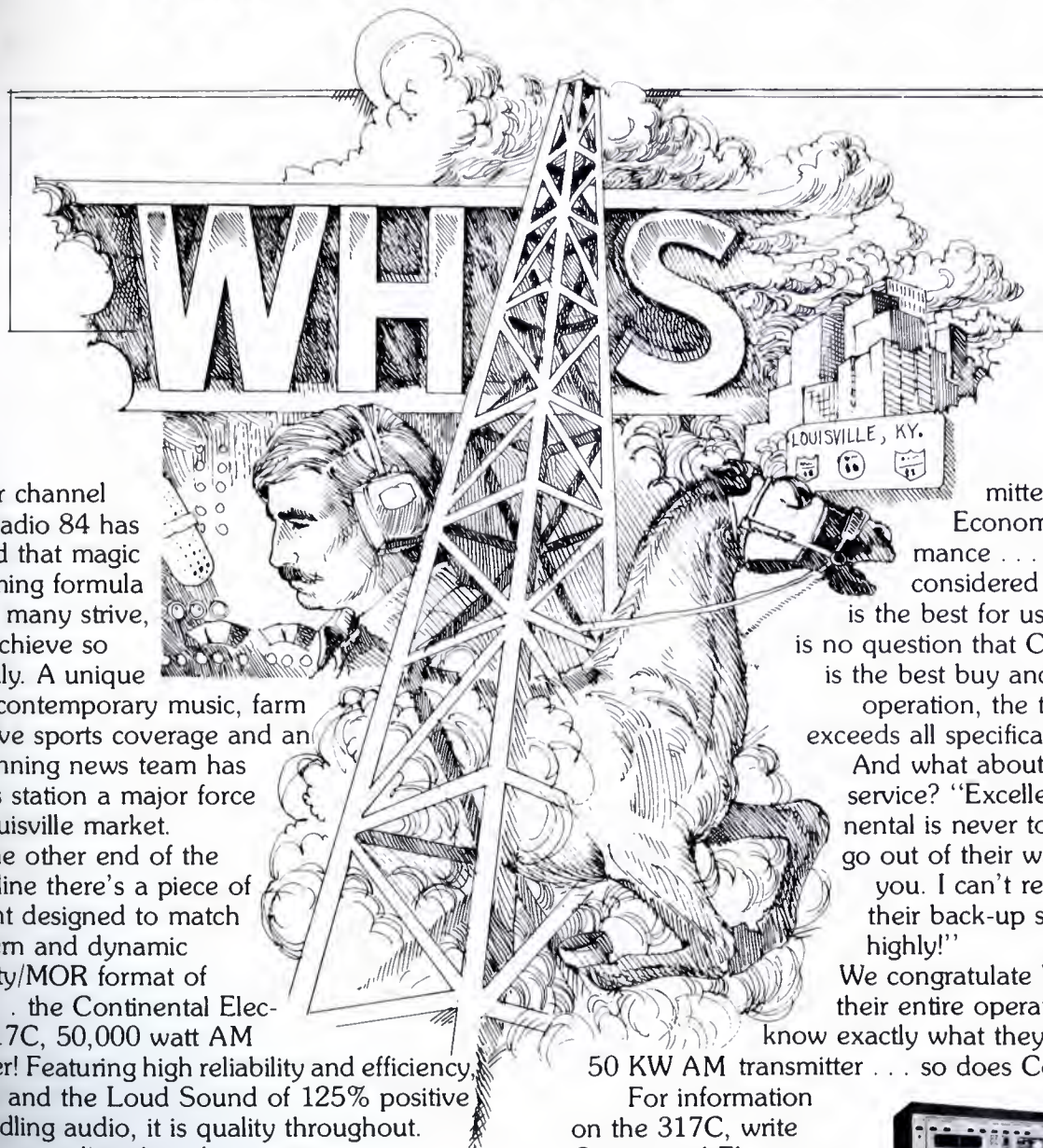
The FCC booth featured FCC personnel and a direct line to the Washington office, to allow broadcasters to check the status of various applications in the mill and discuss details with the guys from the hill. We talked to Dennis Williams of the Facilities Branch about the areas that were drawing most of the broadcaster's attention and questions at this year's show. Mr. Williams reported that the most popular inquiries had to do with the status of

applications for new facilities, the new rule governing AM sample systems and, of course, the new E.B.S. changes.

We also asked if any area dominated the problem inquiries the Commission was getting at the show and not surprisingly, the answer was "AM directionals...". The direct line to D.C. was very popular and the guys who manned the FCC booth were made to earn their keep as they fielded what must have been a million questions. If the Commission is working to improve its image among broadcasters, answer banks like the one at NA certainly seem like a step in the right direction.

WHAS KNOWS EXACTLY WHAT THEY WANT IN A 50 KW AM TRANSMITTER.

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highly!"

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brought everything from antennas to automation to transmitters to the show. The new Sparta 1 kW all solid state AM transmitter was the star of the Sparta transmitter display and we understand that the design will soon be extended to 2.5 kW and easily expanded from there to 5 kW. The new line of Sparta consoles was also on display to round out the Cetec story.

QRK had a very impressive display of turntable gear in its Reko-Cut line as well as Futura consoles. **LPB** had its consoles on display, including the S-20, along with cart machines and the Comp/limiter Audio processor. **Sansui** demonstrated the QS quad system and **Ampro** displayed cart gear and an interesting line of consoles that include peak indicators. **SMC** demonstrated its DP-2 automation programmer, automatic logging system and a new multiple play, random access cart device called the Caro-Stat, that plays the carts on end for reduced internal friction and smoother operation.

One of the most interesting units on display at the **Potomac Instru-**

ments exhibit was the FIM-71, solid state VHF field strength meter, which is priced to fill the void between an all out lab quality unit and the simple meters used for CATV maintenance. Transmitters, including a new 2.5 kW rig, monitoring gear, audio consoles and signal processing equipment were the name of the game at the **Wilkinson** exhibit, where the black wrinkle steel cabinetry served as pleasant landmarks. Meanwhile, at **Scully Metrotech**, the new 285B in 2 track configuration could be seen, along with a variable speed control. At the **Micro-Trak** booth there was enough professional quality phono gear on display to make a disc jockey think he had died and gone to heaven (or wherever they go).

The **Auto-Tec** display featured a dual capstan professional recorder and an electronics assembly for converting the older Ampex models to state of the art solid state decks with surprising performance. **Minneapolis Magnetics** joined the show for the first time this year with an array of tape heads for use in just about every popular tape

machine. **Mic Mix** had a re-chamber demonstration that allowed interested passers-by to in and sample the product awhile. **Automated Process** showed their model 1604, which definitely in the super con category. Monitoring equipment abounded at the **TFT** exhibit including a new Model 754 monitor that allows monitoring to four stations for those interested in keeping track of the competition. The **TFT E.B.S.** gear was also on display.

Pentagon featured tape duplication equipment for both reel and cassette formats and **T** showed a line of test tapes and heads. **Thomson CSF** set up a working display containing company's Audimax and Volux products, which could be conditioned through headphones connected to the display. **ITC** brought a working demonstration to the show in the form of a deck feeding test gear for a close specification check. Cart gear was also displayed at **ITC**. **McC** featured a very attractive st

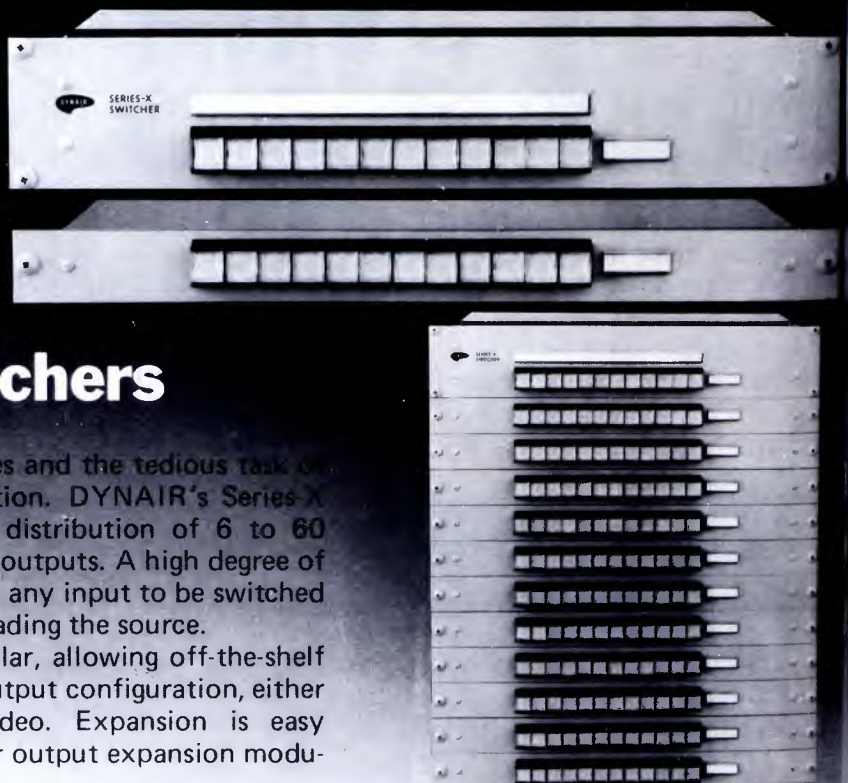
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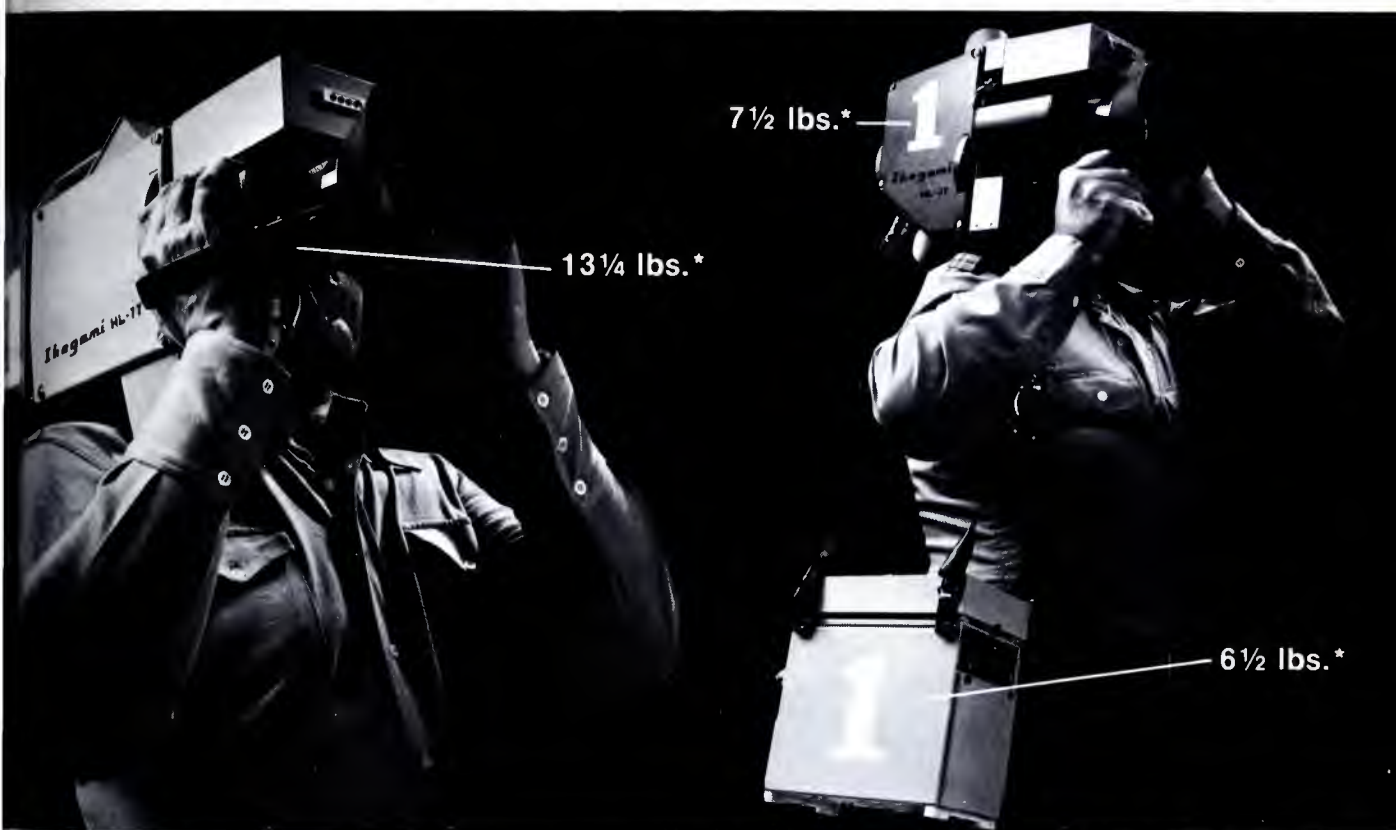


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ensemble featuring McCurdy audio consoles.

U.S. Pioneer, a name familiar to audiophiles, would like to be a name more familiar to broadcast engineers and demonstrated a line of tape decks and speakers for professional applications. **Audi-tronics** showed consoles and components and **Electro-Voice** put together a microphone display that just made you want to take them all home. Speaking of wanting to take them all home, **Pacific Recorders** displayed MCI tape equipment, a hypnotic timing device, Vari-Speed controller and a new signal processor called The Multi-limiter. **Control Design Corporation** introduced its new color and panel design for its line of automation equipment and a microprocessor brained unit called the CDC Time-Capsule with a real time capacity of up to 16,632 alerts per week. **Nagra** was also represented at the show and demonstrated a portable tape deck with 10" reel capacity.

Getting back to the equipment exhibits, we found a sharp little portable V.U. meter at the **WBS**

display and a chance to examine the new MX-5050 tape decks at the **Otari** booth. Consoles and audio gear at the **Ramko** display had an ultra modern look and solid state LED V.U. meters to boot. **Orban** **Parasound** demonstrated its Optimod signal processor, Parametric Equalizer, De Es'er, Stereo synthesizer and reverb system. The star of the Orban show, however, was the Optimod, which commanded much attention from the FM'ers.

Microprobe made its debut at the show this year in a combination display with **The FM100 Plan** a highly successful programming service. Microprobe demonstrated a simple, low cost automation system and The FM 100 Plan provided the programming for the demonstration. A see-through model of the system's sequencer was on hand for inspection. **Shure** displayed a variety of microphones and some very interesting audio gear, including the SR101 Audio Console, with EQ, slide pots and the works. **Motorola** featured communications equipment for news gathering, including the new MX 300 series. **Rank**

Audio Visual had an interesting wow and flutter meter as well 1742 console and **Camex** enjoyed a busy week showing off its Professional Automation. **W & G Instruments** joined the show for the first time this year with an impressive line of audio test gear including a set called System 300.

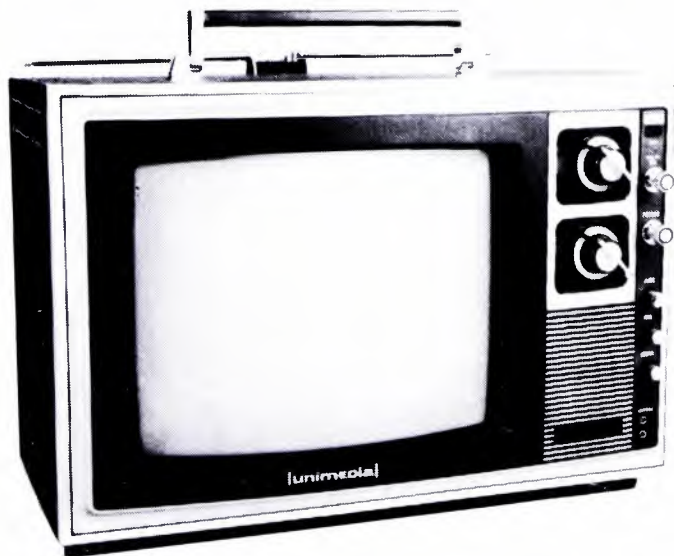
UMC and **Sparta** showed audio cart units. Of course, there was an all-new entry for UMC. Meanwhile **Fidelipac** introduced a delay cartridge. **International Teletronics** introduced their PD-II machine series and reel-to-reel producers. **Broadcast Electronics** showed their complete line of equipment, including the series 5000 triple and five deck machines. **Contel** and **Rapid Q** also showed professional cart units.

Tandberg introduced a 10 1/2" reel tape recorder, using 10000 motors and three heads.

And so the parade of new products went on and on. We'll keep you up to date in coming issues, but we suggest you visit the new products section of this issue as well.

Portability and Affordability

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ENG EDITORS REJOICE!

There are two great reasons you should be using the UMT Series Unimedia Monitors in your ENG operations. Firstly, the highest quality of these rugged monitors and matching receivers make them ideal for field use. With all the new lightweight cameras, VTRs and other ENG gear available, why be bothered with a heavy monitor? Secondly, if you think about it you'll find it hard to justify spending two to three thousand dollars for an ENG monitor. You can have up to five UMT's for that kind of money!

Unimedia's UMT Series Color Monitor/Receivers offer versatility and reliability usually found in more expensive monitors, but at a price you can afford. They're available in 9, 12, 15, 17, and 21 inch models, and priced as low as \$599. Yoke mounts, pulse cross, and demarcation audio and video output are available in priced options. Find out more from your Unimedia dealer, or direct from Unimedia at the address below.

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MARTIN



BA-2.5K shown

AM TRANSMITTERS
1000W • 2500W



BF-2.5K shown

FM TRANSMITTERS
10W • 100W • 1000W • 3500W
5,000W • 10,000W
27,500W • 55,000W

MONITORS • AM Modulation
FM Frequency/Modulation
mono
stereo
sca



TBM-300B shown

CONSOLES 5 and 8 Mixers



B-800 console shown

FM Relay and SCA Receivers
RF Amplifiers
Power Amplifiers

1956 twenty years serving the broadcast industry 1976

NAB New Product Review

After the hassel of exhibit setup, manufacturers were ready for a good convention, and they got it. Several thought they had the "hit" of the show. That's for you to decide.

Because of the wealth of equipment unveiled at NAB, we will continue our NAB products coverage in the next issue. And as a reminder, you can get further information and spec sheets on these products by using our Reader Service Card in the back of this issue.

Meanwhile, we hope you understand that when manufacturers are gouged at convention time, the extra costs will show up somewhere. This is why, in our March issue, we discussed some of the problems exhibitors would have at McCormick Place.

TV Production Switcher

Central Dynamics unveiled their CD-480 production switcher that's based on their unique CD-480 SFX sequential effects amplifier. Actually, it's a family of modules that can be configured to meet a tremendous variety of needs.

Within the switcher, a single CD-480 SFX amplifier gives complete control over four signal levels. Each level may be controlled independently or in conjunction with any or all the other signal levels (Key 2, Key 1, Background 1 and Background 2).

To get an idea of the level versatility, in level 1, Key 2 will allow you to cut, dissolve, wipe, soft wipe, and color border wipe to or from matte key, color border matte key, character generator key and blink key.

On level 2, Key 1, you can cut, dissolve, wipe, soft wipe and color border wipe to and from chroma key, luminance key, matte key, color border key, non-add insert,



split screen, spotlight and mask key. So, levels 1 and 2 are for keying, with full transition control to and from the processed signals.

Levels 3 and 4 are used for background video signals with the ability to cut, dissolve or wipe between them. The total on line effect of using four levels could be a reporters face, characters spelling out the 10 o'clock news and a split screen background of a fire and a fire engine racing to the fire.

For More Details Circle (133) on Reply Card

18X TV Zoom Lens

The new **Canon** TV zoom lens shown at the NAB convention came in two models.

One was called the PV18x12B2, and it's designed for use with a 1-inch/25mm Plumbicon. The other, called the P18x16B is for use with a 1½-inch/30mm Plumbicon.

These zoom lens are offered with a choice of manual or servo focus. Also, built-in servo/manual operated 1.5x and 2x extenders and plug-in servo modules for easy service. These lenses exhibit super-wide angle and M.O.D.

The CD-480 automatic program system keeps one step ahead of the operator, showing the complete result of the next transition. If a poor selection, the preview monitor will show it before he makes the transition.

In addition to the sequential effects amplifier, the CD-480 contains all the other features currently expected of a professional production switcher.

For More Details Circle (126) on Reply Card

Solid State 1kW Transmitter

Sparta has added a 1 kW model to its growing line of solid state transmitters. The Model SS1000A, shown for the first time at the NAB Convention in Chicago, combines modern solid state technology with conventional Class A modulation to provide a highly efficient, high performance unit.

Paul Gregg, Sparta Transmitters Products Manager, claims the SS1000A can pay for itself in less than three years in power savings.

(Continued on page 46)

Harris leads the way in transmitter engineering.

Progressive Series Modulation.

Another First—Harris Progressive Series Modulator in the MW-1, 1kW solid-state AM transmitter is highly efficient, is DC coupled, has excellent transient response, and requires no modulation transformer, reactor or filter inductor.

IF Modulation.

Introduced in Harris color television transmitters. Simplicity of IF MODULATION results in nearly perfect signal linearity for superb color fidelity.

Pulse Duration Modulator.

This exclusive, Harris-designed AM modulation system is nearly 90% efficient! This means the Harris MW-50 and MW-5 offer less power consumption than any other 50kW or 5kW transmitter.

Direct Carrier Frequency Modulation.

Harris was first with this FM design, where the oscillator operating at the transmitted frequency is modulated, thereby providing greater carrier stability and unsurpassed frequency response.

For complete information about any of these transmitter advancements, write Harris Corporation, Broadcast Products Division, Quincy, Illinois 62301.



HARRIS
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compared to conventional tube models.

The RF amplifier has a peak capability of 4 kW. Although one would do for 1 kW out of the SS1000A, two are used in the conservative Sparta design. Audio modulating power of 650 Watts is provided by a low distortion amplifier of novel design.

Other features include instantaneous high/low power switching, digital metering, and simple on/off operation. There are no operator-required tuning controls!

For More Details Circle (127) on Reply Card

New Time Code Editing System

During the NAB conference held in Chicago, CMX unveiled a totally new concept in SMPTE time code video editing.

The CMX 340X shifts the operational modes and edit functions away from the central control computer and delegates these activities to where they belong—an intelligent interface attached to each VTR or synchronous picture and sound source that is involved in the program assembly.

This novel concept is made possible through the use of the latest microprocessor LSI technology which was not readily available a few years ago. CMX has again advanced editing flexibility by pioneering this new approach to multiple machine control.

Watching a 340X system in operation, the qualified observer will immediately notice the lack of long searching or cueing sequences, the short precise pre-rolls and the utter flexibility of VTR assignment, switcher control and peripheral signal source integration. Up to 32 devices, each properly controlled through logic circuitry specifically designed for every individual type of TV hardware connected to the systems, can be interfaced with the 340X.

All of this is made possible by an optimum combination of a mini-computer and dedicated microprocessors that are controlled by the edit decisions fed into the system through a keyboard, a punched paper tape or other command medium.

For More Details Circle (128) on Reply Card



New Helical Recorder

A unique new helical videotape recorder with an exclusive automatic-scan tracking system (AST) that can provide broadcast quality slow motion and still-frame playback has been introduced by **Ampex Corporation**.

The VPR-1 teleproduction recorder was designed for professional broadcast, CCTV, and post-production users.

The VPR-1 was demonstrated for the first time at the National Association of Broadcasters convention in Chicago.

Teamed with AST, the VPR-1 eliminates the problem of tracking and interchange, the classic shortcoming of all helical videotape recording.

With the optional Ampex AST accessory, the special scanner assembly provides fully automatic tracking, still-framing, 1/5 speed, and manual frame-by-frame "jogging" for simplified editing.

To achieve accurate video track-

ing, the AST system employs a special video head assembly which can move in two planes. This technique allows the head to be electronically deflected over the actual video path during playback to automatically follow any deviation from the "ideal" path.

The sensitive AST system constantly adjusts to a tracking error or interchange problem during playback without causing any picture disturbance. The customary "noise bar" associated with high speed tracking operations has been entirely eliminated.

In the same manner, the VPR-1 with AST can also play back tapes which may have been improperly recorded and would otherwise be unrecoverable because of severe tracking errors.

In addition, the AST system provides full quality video synchronization. This feature allows the user to see a simultaneous production of a recording as it is being made.

For More Details Circle (129) on Reply Card

Solid State Audio Control

Ramko Research has unveiled a unique audio control console line that has taken solid state into all functions, including the VU meters.

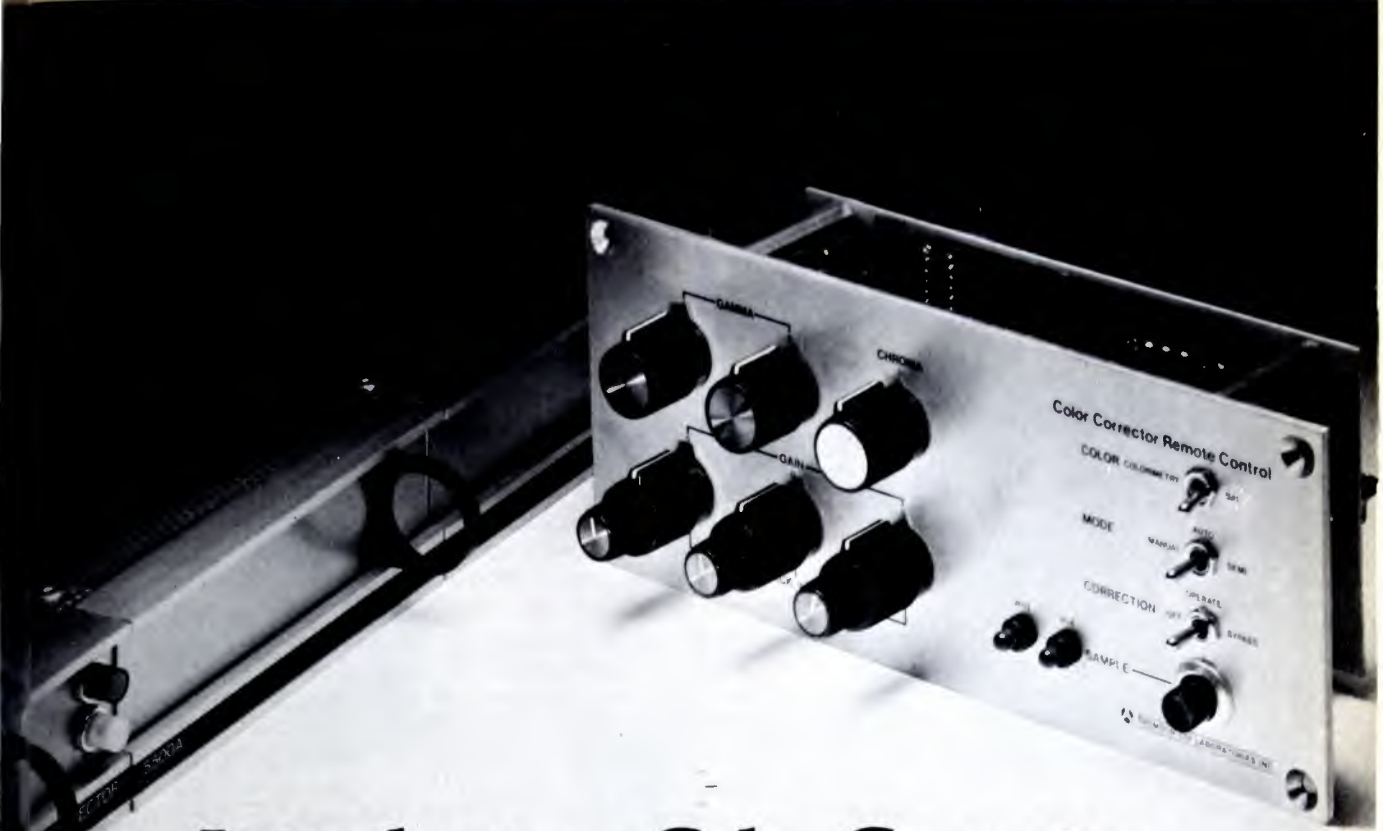
Behind the low profile front panel these units feature plug-in IC's, plug-in amplifier modules, patch panel gain select, and patch panel monitor and cue select.

Unique to the front panel is their

illuminated touch pad audio switching. LED's tell you which a function is on. And if you're on the air with input #3 but would like to monitor input #1, that's no problem. On the air or not, the operator can always simultaneously cue input on this channel.

For More Details Circle (130) on Reply Card

(Continued on page 32)



Introducing a Color Corrector for Electronic News Gathering.

Electronic News Gathering makes tough demands upon the broadcaster. Color imbalance and colorimetry problems are frequently encountered. Matching remote camera shots to indoor studio programs or assembling tapes from different locations or cameras is "chancy" at best. Often that fast-breaking story doesn't allow for camera rebalancing!

Thomson-CSF Laboratories now provides a solution to such difficult encoded signal color problems. With the Model 5500A Color Corrector, you'll be able to rebalance and match video signals *after* encoding. It can be used either after the play-back tape machine or following the microwave receiver during live coverage. In most cases, a noticeably improved color picture will result. For ease of operation, a Remote Control unit is included as standard equipment.

As an added feature, an optional automatic Sensor unit is also available to control the Color Corrector for telecine use.

Whether for Electronic News Gathering, tape production or telecine use, the Thomson-CSF Laboratories Color Corrector System should be working for you. Interested? Give us a call.



THOMSON-CSF LABORATORIES, INC.

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(203) 327-7700 / TWX (710) 474-3346

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The Videotape Recorder Revolution

PART 2

By Joe Roizen

In retrospect, all of the members of the small team that developed the Ampex VTR credit one individual for its eventual emergence. The accolade is not so much for his technical skills, which were considerable, as for his tenacity and purposeful single-mindedness in the face of every possible adversity that lack of time, money and technical precedent can impose. That man was Charles Pauson Ginsburg, a young obscure engineer who joined Ampex in late 1951, specifically to make pictures on tape and did so to the utter amazement of his peers in the rest of the industry.

For the group working on the project, the most stirring moment occurred in February of '56, and Ginsburg's own description of this event reflects the excitement experienced at that time.

"We gave a demonstration for what was originally supposed to be a very small management group, but turned out to be one attended

by 30 people. For all of us on the project, this was the most dramatic demonstration we were to make. The guests arrived; they were seated; a few words were spoken to the fact that we would show them what we had produced, and the machine was then put back in the playback mode and played back a program which we had recorded an hour earlier.

"The observers were quite intense as they watched the monitors. We then announced that we would record a sequence and immediately play it back. We recorded for about two minutes, rewound and stopped the tape and pushed the playback button. Completely silent up to this point, the entire group rose to its feet and shook the building with hand clapping and shouting.

"The two engineers who had done more fighting between themselves than the rest of the crew combined shook hands and slapped each other on the back with tears streaming down their faces.

"We had quite a few visitors during the next couple of weeks, including Bill Lodge of CBS, Frank

Marks of ABC and representatives of CBC and BBC. The visitors all sworn to absolute secrecy, they were ushered in and out separately so they would not see each other. As a result of Bill Lodge's visit, arrangements were made to use a demonstration model, a Mark IV machine which had not yet been built, for a surprise showing to the annual affiliates meeting which was to occur the day before the first opening of the NARTB convention."

With that goal now only a few months away, the work load of the group became almost unbearable. Demonstrations in house had to be given with crude looking consoles and partially filled racks. Management gently suggested that a VTR with a potential price range should be packaged more attractively.

Anderson designed the Mark IV console with its compact mounting arrangement. After having returned from the Army, '55 developed the multivibrator modulator and other signal processing circuitry, including a minute head switching scheme.

NAB Celebrates 20th Anniversary of the VTR

CBS News Correspondent Douglas Edwards was among those in attendance when the National Association of Broadcasters marked the 20th anniversary of videotape at a luncheon of television management and engineering executives at McCormick Place in Chicago, a major feature of the annual NAB Convention.

Among the 24 individuals honored with "Certificates of Appreciation" for their pioneering efforts in the development of videotape recording were four former CBS

Television Network executives: William B. Lodge, Vice President, Affiliate Relations and Engineering, retired; Howard A. Chinn, Director, General Engineering, retired; K. Blair Benson, former Staff Consultant, Advanced Technology; and Price E. Fish, retired, now contract engineer with the CBS Television Network Engineering and Development Department. They were also instrumental in arranging the first demonstration of videotape recording on April 14, 1956, at the CBS Television Network Affiliates Con-

ference in Chicago.

Douglas Edwards narrated a series of archival videotape segments, which were displayed on monitors throughout the luncheon area. Edwards also received a special "Certificate of Appreciation."

Presiding at the luncheon were Robert D. Gordon, Vice President and General Manager, WCP-TV Cincinnati, representing television management, and John Bowman, Evening Star Stations, representing the engineers.

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The inventors and the Vice President of Ampex surround a VRX-1000 which was about to be delivered. From left to right they are Phil Gundy, Shelby Henderson, Alex Maxey, Fred Pfof, Ray Dolby, Charles Ginsburg, and Charles Anderson.



Ray Dolby is shown here operating the VRX-1000 in the CBS suite in the Conrad Hilton in April, 1956. Dolby went on to form his own company which manufactures noise reduction systems.

hide the transients in horizontal blanking. Even the administrative members of the group shed business suits in favor of jeans, work shirts and along with engineers spent their evening weekends making cable assemblies, modifying mounting brackets, wiring redesigned electronic u

The orphan of the system, which had been summarily neglected up to now was also proved to at least approach professional standards.

The super hero of this period was Fred Pfof, who experimented heads up to the morning before his departure for Chicago. Working about casting the system in concrete before he could optimize performance, he tried various structures, core structures, different numbers of core windings, spacing, guide setting, and core settings. All this while also building new heads continuously. Altogether an unbelievable amount of work during this hectic period.

After the NARTB success, the company had to be built to meet the burgeoning orders, even while their work went on to achieve interchangeability, editing in color. The first 16 hand-built units called VRX1000's were shipped to users who had to save the tape with any tape made on it if they wanted repeated replays.

Finally.... On The Air

Television City in Los Angeles CBS' production and delay was the first to air a videotape recording on November 30, 1956. It was the daily Douglas Edwards News Show that came from New York three hours earlier due to time zones across America. Confidence at CBS in these new machines was not that high; for a month, they ran a backup telecine in case of a breakdown. Headhunting was a major problem that caused picture problems for home viewers with receivers that had horizontal AFC circuitry designed for fringe area reception. Viewer complaints instigated

program to alleviate this before CBS could make good threat to take the machines off air.

Ampex engineers literally slept in the VTR room to have access to the machines during non-broadcast hours between one and five a.m. After one go-around, when they found they had things fixed, they were rudely awakened by a self-denigratory telegram between CBS-Hollywood and New York headquarters which simply said, "The guys are restless tonight". A lot of midnight oil was literally burned to solve this problem.

NBC followed suit in early 1957, and ABC started delayed tape broadcasts at the beginning of day-evening time in April.

Television, being the highly communicative medium that it is, also came to publicize videotape to its benefit. New developments which came thick and fast, as not only the older VTRs were updated or improved but new formats invaded a great variety of applications.

Regardless of the seeming simplicity and wide usage of video recording today, the fact remains that most of the latter day breakthroughs (with a few exceptions) are due to Ray Dolby's description of "best competent engineering".

To the five men who each brought their spark of intuitive insight to bear on a seemingly insurmountable barrier, then applied a pious toil and sweat needed to create the working model, goes the credit for opening up this field to the benefit of those who follow. The personal satisfaction that must be theirs is one that all members of this society can appreciate.

The inventors themselves often had visitors or technical meetings with humorous anecdotes about their early efforts which were noted and seemed to verify the inventors' opinion of the "lucky dip" syndrome.

Where Are They Now?

In successful teams eventually formed, and, of course, the VTR

group followed that pattern. Their present commonality is that they all still work in some engineering capacity closely related to video recording even though some of them are with different organizations.

Ginsburg and Anderson have remained with Ampex. Ginsburg is vice president of advanced research in video, a post which he has held for some time. He has received almost every honor the television industry and the professional societies can bestow, including the Sarnoff Medal, the Valdemar Poulsen Award, the Zworykin Medal, and many more.

Charles Anderson has had a variety of engineering management positions with Ampex and is now in charge of long range video product planning, a task he is eminently suited for in view of his background and present activities.

Anderson's major contribution to the television industry after being dubbed the "Father of FM Recording" have been mainly in his standardization work with the SMPTE and the IEC. He is past chairman of the SMPTE VTR standards committee, where he helped formalize the standards and recommended practices on quadruplex VTRs.

Alex Maxey took one of his own best ideas, segmented helical scanning, and left Ampex in the mid-sixties to build a separate organization around it. Westel, the new company, did not achieve any penetration of the broadcast field, but the unique characteristics of this segmented helical VTR made it ideal for high altitude reconnaissance or military applications. Maxey remained with his new company as vice president of engineering through two acquisitions, which changed the name to Echo Science and the ownership from Dictaphone to Arvin.

Fred Pfoest also left Ampex in the mid-fifties and went into private consulting work. His unique and highly specialized knowledge about video heads became a critical element in video projects other

companies were pursuing in Tape Recorder Alley (a euphemism for the area around Redwood City). He contributed significantly to the first slow/stop motion discs made by MVR and later by DMI. He assisted another group in setting up a video head refurbishing business which is now Videomax Corp.

Ray Dolby has perhaps fared the best in terms of fame and fortune, none of which is directly attributable to Ampex. He completed his university studies at Stanford while working part-time. His brilliant academic record garnered him a Marshall Scholarship which brought him to England, where he obtained his doctorate in Physics at Cambridge.

He developed a noise reduction scheme in electron microscopy and later did the same in the audio recording field. His patented and proprietary audio noise reduction system was quickly recognized as a boon to the tape recording industry and Dolby built a substantial enterprise which both manufactures and licenses his process.

Acknowledgements

The compilation of this VTR history required more than the inputs of the original inventors since both the prior art and user experience helped to make a coherent story.

Prior art came from many sources, including: Dr. Peter Axon, Stoneplatt Industries; John Baldwin, IBA; Ted Barger, Echo Science; Blair Benson, Goldmark Communications; Peter Blaxtan, Rank Cintel; Yves Faroudja, Yves Faroudja Inc.; Jerry Grever, RCA; Hans Groll and Von Flegel Farnholz, Fernseh GmbH; and James Redmond, BBC.

References were made to: RCA Review, circa '54 and '56 Library; BBC Engineering 52, 72 E. Pauley; Handbuch des Bildtelegraphie, Dr. F. Schroeter 1932; Marzocchi Patent, 1948; Ginsburg et al. Patent, 1960; Schueller Patent, 1953; Wireless World 75 Years of Magnetic Recording; and SMPTE Journals, 58-60. □

What To Do Until The Doctor Comes

A continuing series/By Peter Burk, WQUA, Moline, Illinois

Intermittent problems in the transmitter control circuits can drive an engineer up the wall. Here's a sure-fire method for tracking these gremlins down, using a relay to "memorize" what happened when you weren't there (Figure 1).

If the transmitter starts popping off the air sporadically, put a test relay across the control circuit at some convenient point. Latch it closed with the reset button. The next time the failure occurs, turn the transmitter back on, then check the test relay at your convenience. If it's still closed, the intermittent is past the point where the test relay is installed. You can now reconnect the relay downstream from the original point, until you've isolated the intermittent component.

You can use a variation of this scheme to detect momentary power failures at a remote transmitter,

too. Use a spare position on your remote control system to remote the indication back to the studio and also provide a remote reset (Figure 2). Any time the transmitter drops, you can dial up the remote indication and quickly determine whether the power was momentarily dropped at the shack or whether the transmitter itself was at fault.

Okay, we have the transmitter on a proper diet, getting plenty of fresh air, and frequent check-ups, and we know how to diagnose at least most of its ailments. The only problem is, what happens when we don't have a spare for the component that's failed? Nine times out of ten, there's a way to get the transmitter back on the air at least temporarily, before we even call the manufacturer for emergency parts service. This is where we get a chance to practice our emergency room technique.

Let's take a look at some of the catastrophic failures that can occur and see what we can do. Transformers, being expensive and bulky, are not normally a part of the station's replacement parts inventory. However, in almost every instance, you probably have something that will do in an emergency right at your fingertips.

Most engineers live in constant fear of losing a plate transformer. It's fact that the transmitter won't operate without one, but there's still no need to panic. If you're lucky, one of several taps has opened, leaving the rest of the winding intact. You may be able to short across the bad winding and continue operating. If not, you'll have to replace the transformer, but not necessarily with an exact duplicate. Most local power companies will be happy to help you out of a tight spot by loaning you a couple of "pole pigs" which can be connected temporarily in reverse to provide you with plenty of B-plus.

If it's the filament transformer for the finals that goes up in

smoke, an automotive storage battery will do nicely in many cases but only for a short stint.

Although a similar scheme can be used for rectifier filament transformers, it's probably quicker stringing together a handful of capacitors eliminating the need for a filament transformer altogether.

Screen and bias transformers often be replaced with TV transformers from the junk box if you don't come up with exact voltage you're looking for, a filament transformer wired in buck or boost configuration in the primary (Figure 3).

Filter chokes will occasionally short to the case. The choke is usable if you just insulate them from ground. A couple of shorts by fours will work fine. I've used a stack of old operating tubes when nothing else was available. Don't forget that the case of the transformer will be at B-plus potential!

If the first choke in a power input filter shorts, you'll see a dramatic increase in B-plus. If you have no spare on hand, you can bypass the first capacitor and return the choke input filter to obtain peak voltage. Several transmitters employ transient suppressors across the filter chokes. What appears to be a shorted choke might be a suppression device external to the choke. Just lift the end of the suppression device and you're back to normal.

If your transmitter uses state rectifiers, they are much more prone to line-transient induced failure. However, you can lose three of the six sections on a phase supply and still keep the transmitter running at approximately fifty percent normal voltage. Do this by temporarily connecting three good rectifiers in half wave configuration as shown in Figure 4.

Filter capacitors in the power supply can frequently be eliminated completely for emergency run-

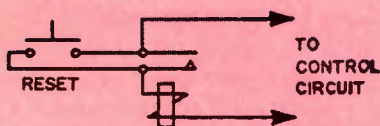


Figure 1

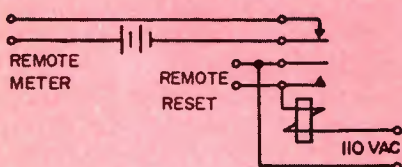


Figure 2

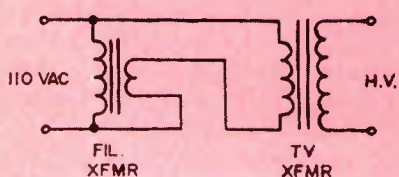


Figure 3

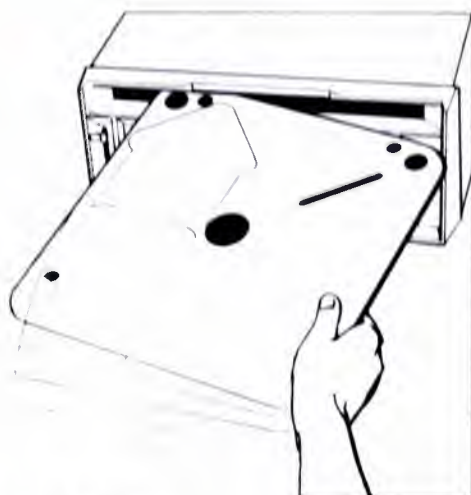
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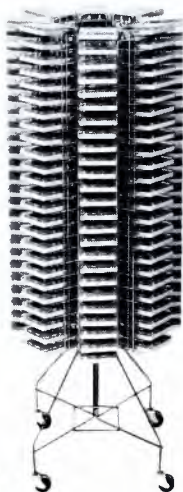
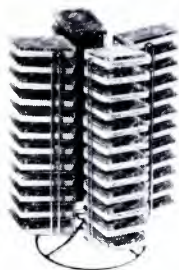


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Let's Get Some Modulation

Modulation iron has many engineers running scared. Actually, an AM transmitter can be modulated with practically nothing. Let's take each component separately and see what we can do to make the transmitter work. These circuits are from Harris Corporation's "Pride in Service" publication and really ought to be kept handy.

An open in the modulation transformer secondary is not really at all catastrophic. Disconnect the secondary entirely and connect the modulation capacitor between one side of the primary of the modulation transformer and the wire going to the P.A. plate circuit (Figure 5B).

If the modulation reactor opens or shorts, you'll have to drop back to one quarter power, but that's better than zero power. Remove the bad reactor and the modulation capacitor and strap the bottom of the transformer back to B-plus (Figure 5C).

A short or open in the primary of the modulation transformer makes the transformer completely useless, but the transmitter can still be made to modulate by connecting the circuit shown in Figure 5D.

If you'll have to run without the transformer for an extended period of time, parallel the two tubes and increase bias to achieve Class A operation.

Look Out Below!

We've covered most of the major

components in the transmitter what about the antenna system?

One of the ironic things about tower collapsing is that it's brought about by the very nasty weather that increases public service responsibility station. If the winds are sixty an hour, temperature below and power lines are on the ground everywhere, your station needs to be on the air. So what do we do if the tower comes crashing down?

Let's talk about AM systems first. Almost any length of wire can be made to radiate at least a little. A coil of wire doesn't take up much shelf space, so why not have a couple hundred feet handy in case? You can run it over a window, over to any convenient support, and load the transmitter into it the best you can.

You won't be able to radiate much power with it, but you'll be able to serve the majority of the people in your area quite effectively. You might even want to build a simple antenna tuner out of box parts, just to have on hand.

What about FM? The importance of keeping an FM on the air is greater than it used to be. There's no reason for an FM station to fail to keep us down for long if the tower is still standing, but if the antenna or transmission line is damaged beyond use, you can run some RG-8 up the tower and feed it into an improvised dipole. You won't win any DX contests, but if it's matched correctly, you can be able to run close to a thousand watts that way. Consult an antenna handbook for construction.

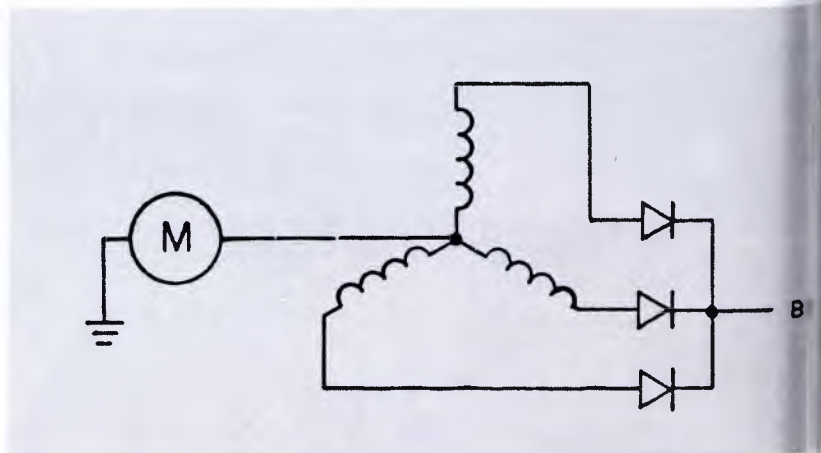


Figure 4

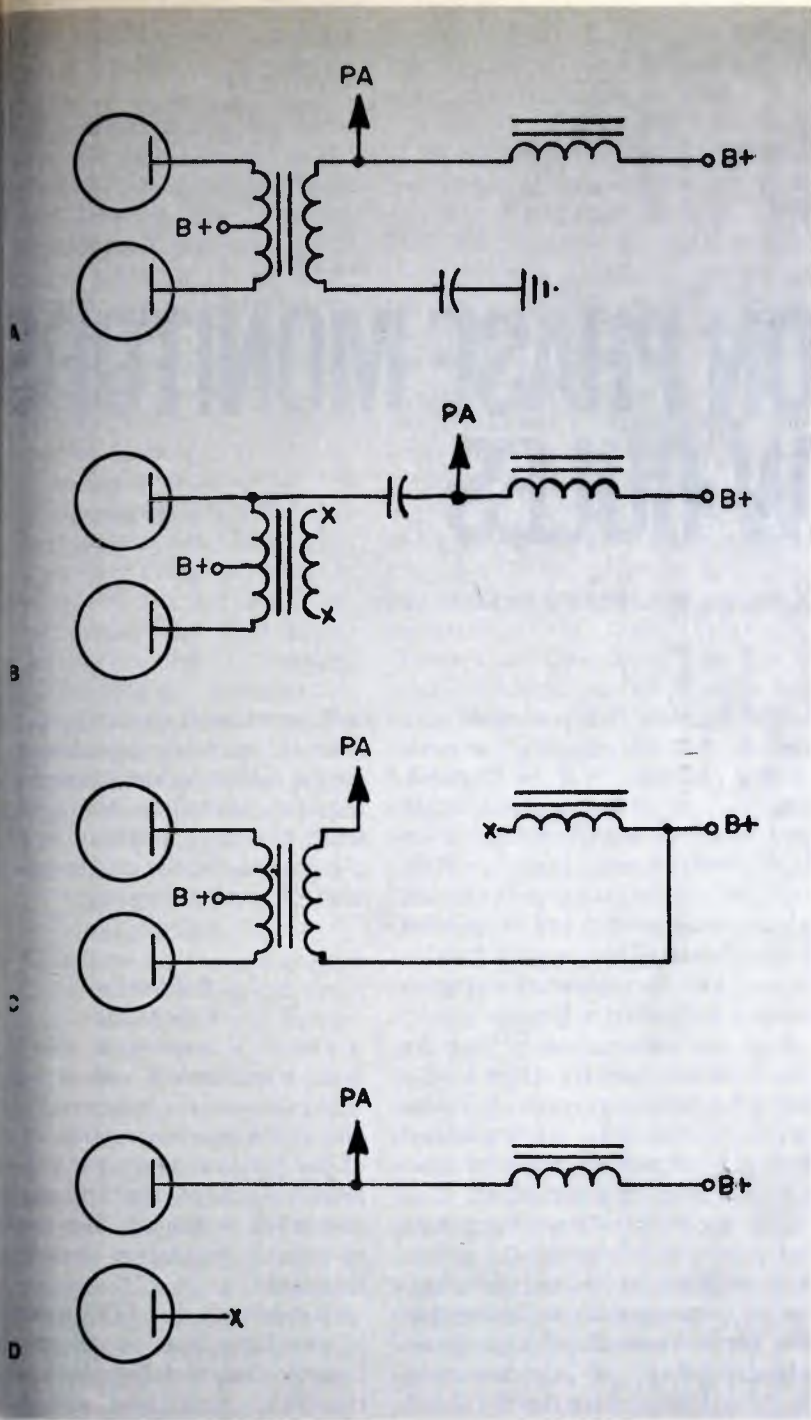
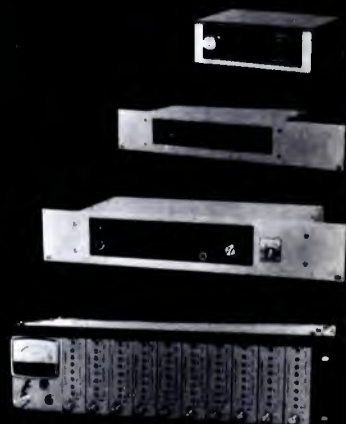


Fig 5

matching details. All you can get on the air is the exciter, feed it directly into the antenna. Even ten watts can do a lot if the transmitter is out in the country, and the tower has assumed the prone position, it might be better to take the exciter back to the tower and put up a temporary antenna. The point of all this is to administer first aid first, before you call the doctor. Do whatever you can to get some sort of signal on the air, then work out a permanent

solution. Watch physical fitness, diagnose and correct small problems before they become large, and prepare yourself for emergencies. Perhaps the doctor won't need to make that house call after all. I'd like to thank the following people for providing much of the information presented here in these early parts of this continuing series: J. S. Sellmeyer, Collins Radio; J. Fred Riley, Harris Corporation; and William Shibler, RCA. A special thanks to Eldon Kanago for leading the way.

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It's All In Docket 19692...

AN UPDATE ON PHASE MONITORS AND THE NEW RULES

By Robert Jones, Broadcast Consultant, La Grange, Ill., and BE's Facilities Editor

Prophetically, in the July 1973 issue of **Broadcast Engineering** we promised that if and when the FCC concluded their studies in Docket 19692, B/E would keep you informed.

These new Rules formulate specific standards for phase sampling systems, and the FCC believes they represent a reasonable consensus of all parties. The comments submitted were from parties having formidable expertise in all technical areas concerned.

In this proceeding the FCC undertook to determine what constitutes the basic elements of an **adequate** sampling system, and to promulgate minimum standards for its design and construction. Thirty-one timely comments and three reply comments were filed. Nearly one half of the total comments filed were by consulting engineers, practicing before the FCC. As the FCC pointed out, the combined experience of all these men can only be described as vast. Most thought the FCC efforts in this matter were necessary and laudable. In furtherance of those objectives, they have supplied a wealth of technical material pertinent to sampling system construction, operation and maintenance.

Many parties agree that meeting the new rules will impose little hardship on new stations, or on stations applying for major changes. There was concern with the expense for existing stations, whose sampling systems fail to meet the new

standards the FCC adopted. In reply to this fear, the FCC says (1) existing stations will be "grandfathered," or (2) that stations which have systems who comply, or so modify their existing system, will be tied to a relaxation of certain existing monitoring and inspection requirements. This would provide an incentive for voluntary improvement of individual systems.

It is interesting to note that the FCC adopted new regulations at a time when they are making major efforts to simplify the broadcast regulatory structure. This is certainly a philosophical conflict.

Only the NAB offered the opinion that "there is no general problem with existing sampling systems." The FCC noted that, in connection with license renewals of a considerable percentage of stations using directional antennas, the FCC has occasion to question antenna performance and to require corrective action. It is reasonable to believe that this has been a not inconsiderable contribution to their difficulties.

Many existing sampling systems evidently were installed without proper attention being given to techniques which contribute to the stability of the system, and which will minimize environmental effects. In many cases it may be likely that licensees' interest in minimizing costs, rather than aiming to maximizing long term performance, may have exerted a predominant influence on the system design. The

opinion of most engineers as to the need for adequate sampling system design is that, in the absence of required standards for such systems, cost may continue to remain a major factor for determining the kind of system installed.

A Flimsy Extension

The FCC contrasted the heavily built transmission system used to feed power to the antenna, with the almost flimsy construction of many of the systems used to monitor the performance of the antenna; and concluded thereupon that they had to extend regulatory control into this area.

Accordingly, the FCC stated that it was their aim to adopt rather broadly drawn rules. In addition, the FCC went into considerable more detail and into other related aspects of sampling system design. It was their hope that this effort would serve to establish requirements for such systems as well as to provide such guidance as may be desirable in the details of system installation. The required constructional features should be only those reasonably necessary to promote stability and repeatability in the antenna monitoring system and thus its ability to record accurately deviations from licensed operating parameters. Certainly properly constructed systems deteriorate much more slowly, and one of poor design. Thus those

conal details which contribute to long term stability are of primary importance.

Electrical deterioration may occur and may not be discovered in the field of inspection most engineers make. In some cases a review of a given station's logs may reveal the performance of its directional antenna is not satisfactory, and the reasons for its departure from proper adjustment may not be detected. Excessive phase or current may not reflect in abnormal antenna point readings, but do rather indicate trouble in the antenna monitoring system. Of course antenna monitoring points can have their own vagaries. Thus all station engineers must rely on both antenna monitoring and field monitoring for a reasonably complete picture of directional operation. It is reasonable to expect that the antenna monitoring system should be installed that it can be relied upon to give accurate data to the engineer.

Design And Installation

The FCC went on to discuss four basic areas that need to be considered and to draw conclusions from these four areas. One is **Sampling Lines**. The devices which extract the sample currents from each tower of the array to the antenna monitor. The second area is **Coupling Elements**. This is the apparatus used to extract samples of the tower currents to be fed into the sampling lines. The third area is **Maintenance of Sampling Systems**. Here the FCC talks about the measurement procedures used to detect any deterioration in systems performance. And the fourth area is what is called **Other Considerations**. This is a catch-all of the less important items to be considered sufficiently important to record for general reference, but not important for inclusion in rather broadly drawn

Sampling Lines

A point on which there was not entire agreement (this writer is not in accord) is that sampling lines should have a solid outer conductor. And that braided or foil shielded lines afford insufficient protection against unwanted fields. Braided lines are subject to

moisture contamination, and thus may represent the weakest link in many older sampling systems.

There was also almost unanimity as to the necessity for all lines in the system having identical physical and electrical characteristics. The FCC has decided to make exceptions where it may be necessary to use more flexible cable between sampling line end terminations and the antenna monitor.

The FCC found, as most of us already knew, that when the ambient temperature of a coaxial cable is raised, the metal expands, resulting in an increase in the phase delay of a cable. A temperature change will also affect the dielectric constant in the cable, resulting in a negative phase shift. To some degree, these two effects cancel. If a solid dielectric is employed, the latter effect is pre-dominant. If the lines are reasonably long, there will be a rather large negative phase change with temperature. If the inside dielectric is air or gas, it will exhibit a much lower coefficient. This is generally in the positive direction. Foam dielectric, while not as good as air, is superior to most cables having solid dielectric.

Since the phase of the R.F. signal presented to the antenna monitor is delayed by its passage through the sampling lines, and since the sampling lines can vary due to temperature, it is obvious this will result in an error in the monitor indication. But if all the sampling lines to all the towers are of equal length, and exposed to the same temperature conditions, the errors will cancel. This is because we are concerned with only the **relative** phase between the towers. Any changes in the electrical lengths of all lines will leave the relative phase indications unchanged.

The FCC notes that the employment of equal length lines insures that temperature changes will have the least effect on stability. Further they note that this expedient is quite expensive, since in many cases it necessitates the addition of hundreds of feet of sampling line to achieve this end. It is interesting that the FCC is cost conscious here, but not cost conscious between RG type cables and solid cables.

Equal length lines offer another advantage. That is, that the antenna monitor will more closely

reflect the true relative phases of the fields actually existing in the various elements of any given array. This simplifies the initial adjustment of an array, plus any subsequent adjustments. In many cases this advantage may be sufficient to justify the extra expense of equal length lines. Most consulting engineers, including this writer, regularly install lines of uniform length for systems they design. In cases where it is the consultant's goal to produce, at the antenna monitor, the specific phase relationship existing in the array, this degree of precision is desirable.

The FCC does offer an option to equal length sampling lines. This is to use lines that have no greater than a 0.5° temperature shift. The logic behind this limit is that most antenna monitors have a $\pm 1.0^\circ$ tolerance, and if the station's license (as most do) requires $\pm 3^\circ$ limits; then a 0.5° error would maintain the system within FCC limits. A reasonable basis for determining the tolerable differences in cable lengths is to ascertain the temperature variation to which the line would be subjected on a diurnal and on a seasonal basis. Then compute the difference between the longest and the shortest sampling lines required, based upon a temperature/phase differential, such that this maximum will not exceed 0.5 degrees of phase. Keep in mind that this phase shift with temperature is affected not only by the physical lengths of the lines involved but also by your operating frequency.

Many engineers prefer foam polyethylene dielectric type cables. They generally last longer and have fewer maintenance problems. They are satisfactory even in critical arrays, if practical measures are taken to minimize phase temperature stability.

Phase Stabilized Lines

Phase stabilized lines are coaxial cables which on being ordered by a customer, are heat cycled by the manufacturer to reduce semi-permanent stresses. This type of cable will initially have a much lower phase temperature coefficient than line not so treated. The FCC concluded that this extra degree of perfection (and expense) is not

system construction made easier with ROH



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needed when one employs lines of equal length. But if a system has **greatly** different cable lengths, the possibility exists that as lines "settle in", the phase indications may drift from those of the initial adjustment. In those cases, phase stabilized cables should be required. An acceptable alternative to phase stabilized cable would be **Phase-Compensated** line.

It is apparent that if the sampling cables between each tower base and the transmitter building are buried, not only are these portions of the system subject to less extremes in temperature, but are better shielded from troublesome ambient fields, better protected from damage, and of course less subject to deterioration from weather. Buried lines should be jacketed. However, soil conditions in some areas, or other factors, may make it impossible or undesirable to bury. In such cases it is desirable to run cables above ground between the tower and the transmitter house. When this is done, adequate support and protection of the cable is necessary. In addition, to avoid the build-up of troublesome R.F. currents in the outer conductors, the cable must be tied to the station ground system at periodic intervals through-out its horizontal run.

Coupling Systems

The majority of those filing suggested the use of a single turn, unshielded loop as the best coupling element. Such a loop should be rigidly constructed, and mounted on the tower at a point near the current maximum, but in no case closer than 10 feet above ground level.

The other type of loops commonly used is the shielded type. In this loop the shield is used to impart rigidity and to enclose the conductor. The shielded loop has a theoretical advantage by virtue of the fact that coupling to the tower field takes place only electromagnetically. The advantage, the FCC says, is generally held to be of no practical significance. The FCC says this is also outweighed by the fact that shielded loops can accumulate internal moisture, which results in a deterioration of performance.

Some thoughts were expressed

that if rotatable loops are omitted, in the course of time will be rotated, either inadvertently by high winds, by workmen on towers, or possibly by misg operators seeking to adjust monitor readings within their license.

While the majority of the engineers believe that the orientation of the loop with respect to tower should be rigidly fixed, suggested that the plane of the in all cases include the vertical center line of the tower, is restrictive. An alternative orientation with the plane of the including a tower face, should be permitted.

The FCC originally proposed all loops be of equal size and shape. Many engineers believe such a requirement leaves too little flexibility for adjusting the degree of coupling to each tower section. Sample voltages delivered at the terminations will be within a range of values which the antenna engineer can accept. Thus, while the FCC believes that the loops should be of the same general construction, they will not preclude adjustments of the effective size of individual loops as may be necessary to establish proper coupling levels.

There were many who held that base sampling, usually with a shielded current transformer, is an acceptable alternative for towers of limited height. The advantages of base sampling are that the element may be enclosed in the transmitter house, protected from the weather, from air contamination, and from rain or moisture; which may improve the short or long term performance of an exposed coupling loop. By having the coupling unit at the base, it is readily available for testing and maintenance.

Some parties noted that base sampling more closely "tracks" with the actual tower current. The importance of adequate shielding of such transformers is emphasized, particularly the need for an electromagnetic static shield between the antenna feed line and the transformer secondary.

Those who favor tower base sampling point out that a sample taken at or near the point where the tower current can be expected to be the greatest, will show a

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accurate reflection of the relative magnitude and phase of the field radiated by the tower than will a sample taken from the current in the antenna feed line at the tower base. The later sample can contain a reactive component representing current flow through the antenna capacitance to ground. The magnitude of this reactive current can be affected by ground moisture, height of weeds, and other variables. Towers of uniform cross section, up to one-quarter wavelength in height, usually have antenna base resistances that are sufficiently low, and shunt reactance that is sufficiently high, so that the error in the base is usually small. Self-supporting towers of any height would not be desirable, since they have lower shunt reactance. That this effect is real is illustrated by the difficulty frequently experienced in maintaining adequate correspondence between base and loop ratios in arrays having one or more tall towers.

Assuming reasonable precautions are taken, the FCC has determined that base sampling is an acceptable alternative to tower sampling for uniform cross sectional towers up to 110° in electrical height.

If one uses a single turn, unshielded loop, it may be operated either at tower potential or at ground potential. When operated at tower potential, the inner leg of the loop should be electrically bonded to the tower. The cable which descends from this type of loop should also be at tower potential, and should be bonded to the tower leg at frequent intervals, including the point at which the sampling cables leaves the tower. In order to transfer to ground, an isolation coil, consisting of many turns of sampling cable, wound on a cylindrical form, must be used. This coil should have sufficient inductance alone at the operating frequency, to present a high reactance. If it doesn't it should be tuned to resonance by use of a suitable capacitor.

If one uses a grounded loop, it should be installed on insulators, with the sampling cable so mounted. With an insulated loop, there is no need for an isolation coil. This type of installation is usually less expensive and more trouble free.

The FCC has concluded that the insulated loop is acceptable for all

towers up to 130° of electrical height. But for those using taller towers, all sampling loops must be installed to operate at tower potential.

Maintenance Of Sampling System Performance

The FCC had asked for suggestions as to a measurement procedure which might be prescribed to determine whether the electrical performance of a given sampling system remains at a satisfactory level. Their hope was that this could be a comparative type of measurement. The advantage of such a procedure is that it could show any deterioration in the monitoring system performance.

Most consultants presently conduct more or less elaborate tests of sampling systems. These include not only simple DC resistance tests, but also R.F. impedance measurements at selected frequencies. The FCC concluded that since complicated equipment is required to conduct R.F. impedance measurements, it is not practical for the average station to perform these tests on a yearly basis. For this reason the FCC did not adopt rules which would require such measurements to be made.

Other Considerations

The FCC suggests that loops be mounted on the tower at a point well removed from lighting conduits. Also they suggest the cable be brought down the tower inside one leg, for mechanical protection. This they suggest even in the case of insulated loops. The cable should be supported at sufficiently close intervals to provide substantial lateral restraint from "whipping" or displacement.

Also, where feasible, the sampling cables should be in a single length (without splices). Short lengths of more flexible cables (i.e. RG/U types) can be used to connect the sampling line to the monitor.

If isolation coils are used, they should be constructed of the same kind of cable which is used to make up the sampling lines. The coil form upon which this is wound should provide rigid support to the coil.

Where a sampling cable is to be buried, it is desirable to tie the

outer conductor to the ground system at the tower again at its termination with transmitter building.

Summary And Conclusions

These new rules went into effect on March 18, 1976. They of apply only to new stations authorized after that date, or to stations authorized to make major changes after that date. In the case of existing stations, they will be "grandfathered." But in instances where a particular station's monitoring system is patently inadequate or where its directional antenna exhibits instabilities in its operation, which may be attributable whole or in part to inadequate the sampling system, they will be required to meet these new rules.

As an incentive to all stations who do not now meet these new requirements, the FCC will now let stations (who comply) to be exempt from compliance with existing rules requiring the periodic reading and logging of base currents. The possibility of reading base currents should be retained for test purposes. This means that you have to calibrate your base current meters at the tower but you never have to read them.

The FCC as a further incentive will permit stations who have installed these new more accurate and accurate monitoring systems to less frequently read and log base monitor points. The new Rules prescribe a schedule of no more than once per month for such readings.

I appreciate the FCC's thought in providing these incentives to broadcast licensees who have installed sampling systems. This saves time and expense on the part of the chief to read and log base currents and monitor points, will, with arrays, completely pay for the installation of new loops and sampling cables in a year's time. Certainly the elimination of "logging" requirements is a step forward in the FCC's efforts to deregulation.

For those readers interested in a complete copy of the new Rules as well as the procedure to be followed in installing or repairing a sampling system, these will be printed in the new 1976 Edition, Volume III.

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We've had several requests to reopen Station-to-Station column, so let's get started this month with a couple of items that should give you some real help. Meanwhile, **Broadcast Engineering** pays for all tips type exchange items. That's right, we pay from \$15 to \$25. What's more, if you help, specialized hard-to-find parts, or what you get on the Station-to-Station line and we'll include them in the columns. Just address your correspondence to: Station-to-Station, Broadcast Engineering Magazine, 1014 Wyandotte St. Kansas City, Mo. 64105.

LED Indicators For Field Operations

By Don McGuire/KYW, Philadelphia

LED's certainly have much to recommend them as low voltage, low current consumption indicators. For example, the G.E. type SSL-22 requires only 1.8 to 2 Volts at a current drain of but 6 or 7 ma. to give an easily visible indication. So they are ideally suitable as battery power indicators, where the "wasted" current drain (which is that used for indication only and not available to the load itself) is required to be as small as possible.

Here are a couple of LED "tricks" I hope you'll find useful in your battery operated gear. The particular LED package I've used for these circuits is the Drake #5039-004-304, utilizing the G.E. SSL-22, with 6" pigtail leads. The same unit but with 3/8" pin terminals instead is Drake's #6039-005-304. They have a reverse break-down voltage of 3V., and forward

characteristics of 1.8 to 3.5V. at 25 ma. max. DC.

Voltage Indicator

The first idea is to combine an LED with a Zener diode as a battery voltage indicator, as in Figure 1. Because a dry cell battery gradually loses voltage as it approaches exhaustion, a practical feature would be to have the LED extinguish when the voltage decreases to a level that is detrimental to its particular application. For example, in powering an amplifier, it would be that supply voltage at which the gain decreases too much, or the distortion rises too high.

I built a battery powered so-called "loud mouth microphone" using a commercial p.c. amplifier assembly to amplify the mic to line level for feeding a Telco line back to the studio. It was very desirable

to have some indication to talent using the "loud mouth" as to when to return it to Engineering for fresh batteries before it became unuseable. The amp had a THD of 1% at +8VU output with new 9V. batteries. The distortion decreased 3 Db and distortion more than tripled when the supply fell to about 7.4V.

I chose to have the LED extinguish at 7.4V. also. The minimum LED current for adequate visibility was experimentally found to be about 6 ma. With the combined LED and Zener voltage required to be 7.4V., I selected a Zener rated at 5.6V. (1N4735). Resistor R was calculated to limit current to 6 ma. under "new battery" condition of 9V. I used 240 ohms in this particular case. Now when the batteries no longer lights, it's time for new batteries!

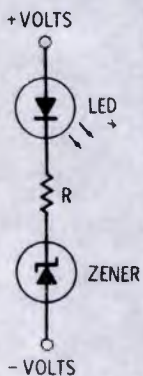


Figure 1

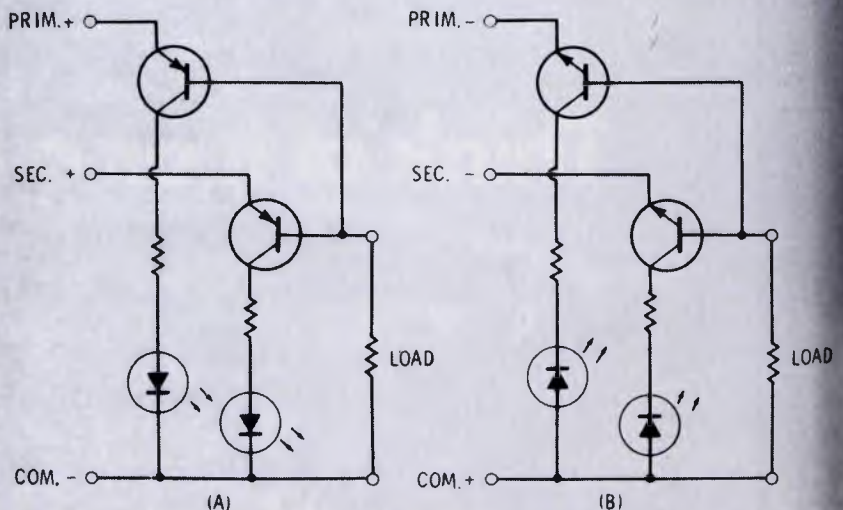


Figure 2

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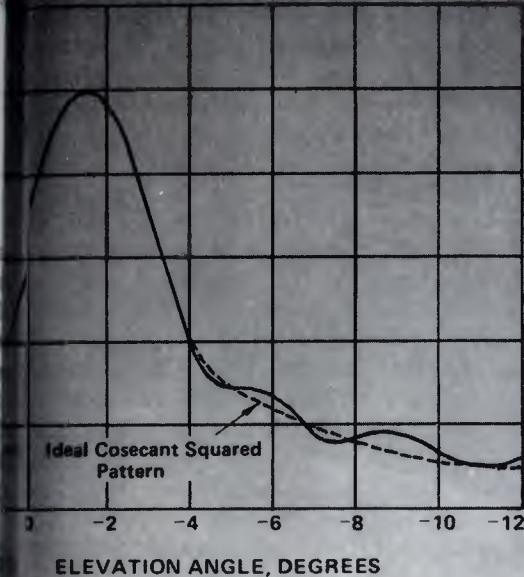
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To sum up Figure 1, Zener voltage rating equals lower voltage limit minus the LED cutoff voltage (1.8-2V.). Series R equals maximum operating voltage minus lower limit voltage divided by desired LED current (6-10 ma.).

Current Indicator

The second "trick" is to use the LED as, in effect, a **current** indicator rather than a voltage indicator. This is useful, for instance, where you have a piece of gear that uses a primary power supply and a back-up secondary supply. While the usual case is an A.C. primary supply and a battery secondary supply, each may be of either type. It is helpful to the operator to know from which supply he is working. If you combine the LED and dropping resistor with a suitable transistor, as in Figure 2, you'll have indicators showing when current is actually being drawn from which supply, not merely when a supply is turned on. And here again, at the minimum "wasted" current drain possible.

Figure 2A shows the arrangement for connecting two Common Negative supplies, requiring two PNP transistors. Figure 2B shows that for two Common Positive supplies using NPN transistors. Either circuit's operation is simple: When the higher voltage primary supply is on, its transistor's Emitter-Base junction is forward-biased and turns on. The Collector current then lights the LED, with the series resistor R, again chosen to limit saturation current to the desired level (6 to 10 ma. being optimum for most applications).

With primary supply on, secondary supply is turned off. The voltage at the load will be the primary supply minus the EB junction drop of .6V. for silicon, or .2V. for germanium. If the secondary supply is lower than the primary by more than that amount (say 1V. for silicon transistors), the secondary transistor is reverse biased, and thus turned off, by the supplies' differential less the junction drop. Of course, when the primary supply fails, or just de-

creases output sufficiently as case of batteries, the second transistor becomes forward biased and the secondary supply goes over. The primary LED goes out and the secondary LED turns on to indicate the changeover.

Handling The Load

You've noted that the full current drawn must pass through the Emitter-Base junction in these cases. You may be skeptical, was, thinking that junction is too delicate to handle the current. But in developing this circuit, I've used a 2N3906 for the "A" circuit, a 2N3903 or 2N3904 for the "B" circuit, at a constant load of 200 ma. through the junction with no overheating. In fact I've passed up to 500 ma. through their EB junctions to five minutes and, while they were awful hot, they weren't destroyed. So you can use any transistor with sufficient Beta so long as the current does not exceed the manufacturer's maximum continuous rating.

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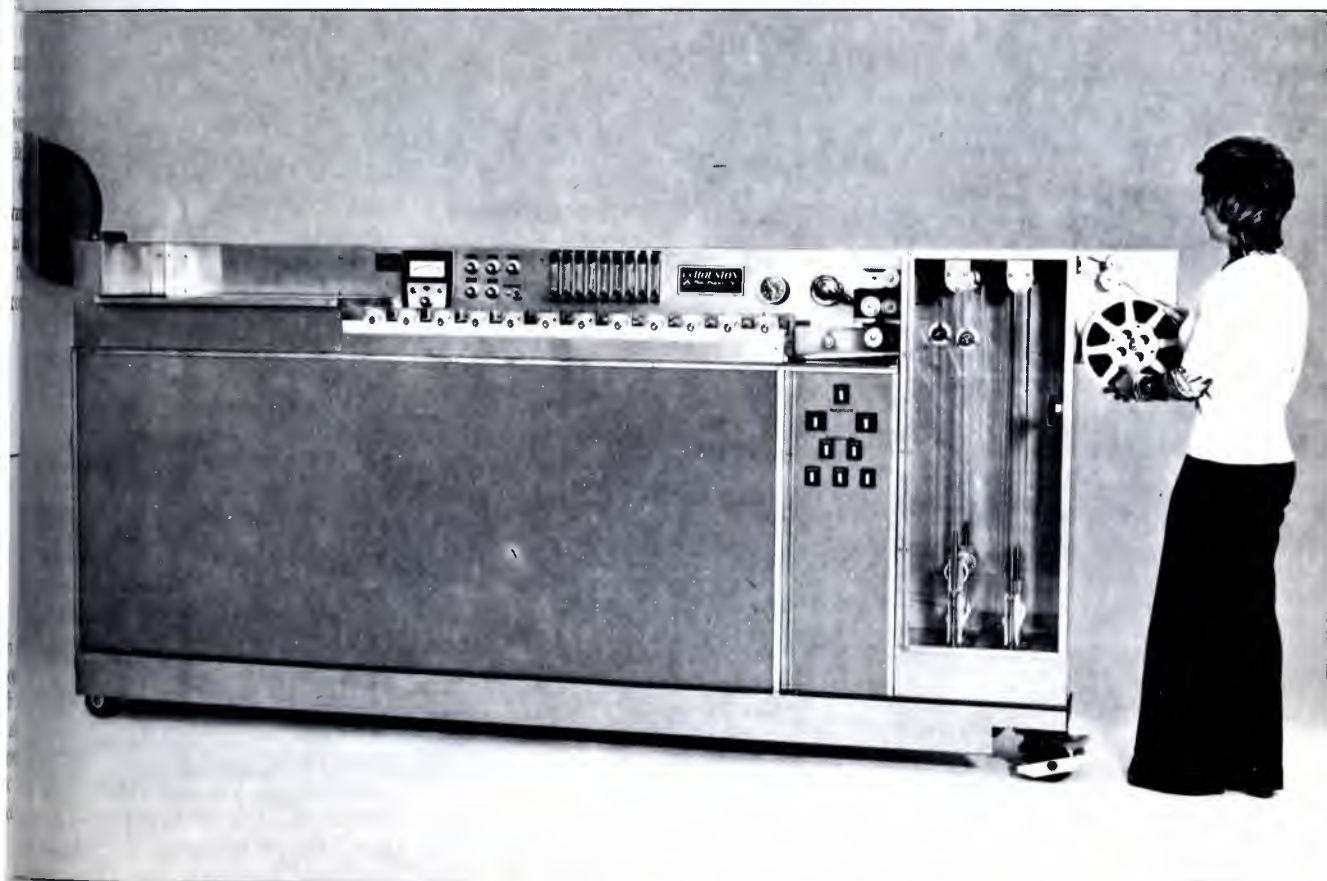
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Collector current rating.

What's The Limit?

We've seen that the two supplies' voltage differential must be about 1V. minimum (in the case of silicon transistors). There is also a **maximum** allowable differential as well. That is the other manufacturer's spec we are interested in: the Maximum Emitter-Base Voltage (V_{EB}). For the 2N3903(4) it is 6V., for the 2N3905(6) it is 5V. So in our example, the secondary supply must not be more than 5 or 6 volts below the primary supply. This presents no problem, as we usually want the supplies to be as close in voltage as possible.

However, if for some reason you do want the two supplies to differ by more than the V_{EB} MAX, insert a diode in the Base lead of the secondary supply. Connect diode

anode to transistor Base, cathode to load, in the circuit of Figure 2A. Or, vice versa for Figure 2B. The diode PIV rating must exceed the supply differential. The V_{EB} MAX rating. Collector current rating must exceed that required by the load.

Under reverse EB voltage condition, the diode will block current flow and prevent junction breakdown. But, under forward voltage, diode conducts load current completely with only the junction voltage drop.

So there you have two ideas. LED's you may not have considered. They may be able to be used in your battery operated circuit.

The obvious next step is to combine the two circuits so that when the supply switches from battery to battery, its LED will tell you when to replace the battery!

Monitor Adjustment of Burst Phase

If your 2" Quad or other phase Locked color VTR doesn't have a Vectorscope, here is an inexpensive way to monitor your adjustment of burst phase for a more accurate uniformity of playbacks and post editing duping.

A burst phase meter can give you this accuracy during play-backs and post editing duping.

The burst-phase meter has better than 1 degree resolution that reads on an analog meter requiring less time consuming tape to tape adjustments on your VTR.

A burst phase meter compares the burst on the composite Video from your VTR to the 3.58 reference subcarrier.

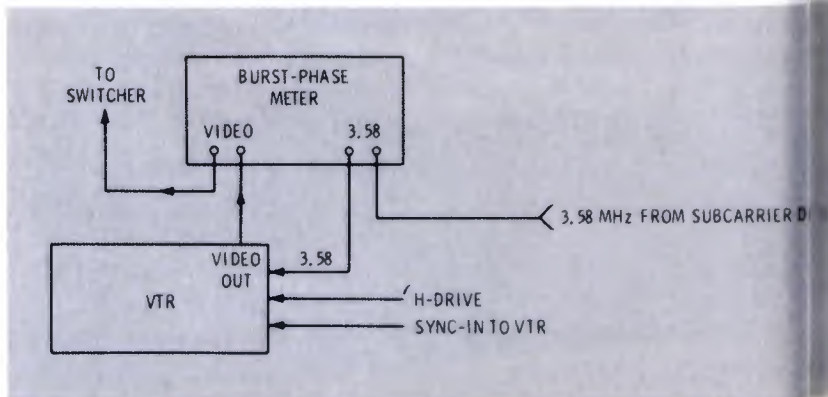
The following interconnection schematic shows the simple hook up.

To interconnect the burst-phase meter, loop the 3.58MHz subcarrier through the meter and then into the VTR 3.58 input.

The output of the VTR Video Out loops through the Video input of the burst-phase meter then to the switcher, monitors, etc.

This completes the interconnection.

To adjust for system calibration, play back a tape and adjust the proc. amp. and colortec, or coherent color recovery unit of your specific machine, to place the vectors normal on the screen of the vectorscope.



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When correct burst and vectors are set, adjust the zero adjust locking pot to read center scale or zero degrees on the burst-phase.

This zero control will adjust for only 180 degrees of phase. If zero center scale cannot be reached by this adjustment, a delay line (approx. 90 feet of RG-59U) inserted in the 3.58 MHz Line ahead of the burst phase meter should provide the proper delay.

Then recalibrate the proc. amp. and/or TBC as previously instructed. The burst-phase meter should now go through zero to calibrate.

When calibrated, lock the shaft on the zero pot. The calibration need only be rechecked occasionally to verify continued accuracy, if the proc. amp. and/or color tec type device both need quick recalibration. In playback you can reference the color to tape and adjust the proc. amp. to zero degrees, then switch to reference or automatic and rezero. This will return both the proc. amp. and coherent color recovery device to the original settings.

The burst-phase meter will also be useful in the record mode if the input video cable is cut to length or a delay line introduced at the VTR Video input to zero the meter in the EE or Record Mode. This can also be a means of a quick recheck of meter calibration when using the VTR monitor switches to select the input.

Jim French & Walt Skowron
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Emergency Hub Adapter

I feel you may be able to use the following idea since I have never seen anything about it in print.

If you are looking for an emergency adaptor for playing a 10½ inch metal tape reel on a standard hub tape recorder, there is a simple solution. Take a plastic reel, one with a large diameter (3") center, we get many of these with commercials on them, carefully remove one of the side flanges removing any remaining burrs. You now have

a hub that just fits the center of the 10½ inch metal reel. Slip the adaptor on the large reel with the remaining flange on the outside. Mount the assembly on the standard tape recorder and it will keep going until you can get a more substantial replacement.

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6XA/7007	550.00	1225.00	675.00
6C15,000A	400.00	825.00	425.00

Our prices average slightly less than 50% of new tube prices. These savings are even greater when you include sales tax on new tubes.

Service

Our prompt 30 day repair service coupled with fast UPS handling makes getting tubes repaired probably a better method than ordering a new tube from a distributor. Day delivery on new tubes is not uncommon now. Econco provides 7 day rush repair service and 1 day delivery for stations that find power output down and no good spare tube.

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To encourage stations which are continuing to buy new tubes, we consider selling their used tubes to us. A price list is available upon request. Save your packaging and when you get a new lot, send them to us for cash. We buy any amount of tubes you have if they are on our list.

Tube Testing

Rebuilt tubes are fully tested and must meet new tube specifications or we do not ship them. Tubes which do not meet specifications are repaired again or scrapped if not repairable.



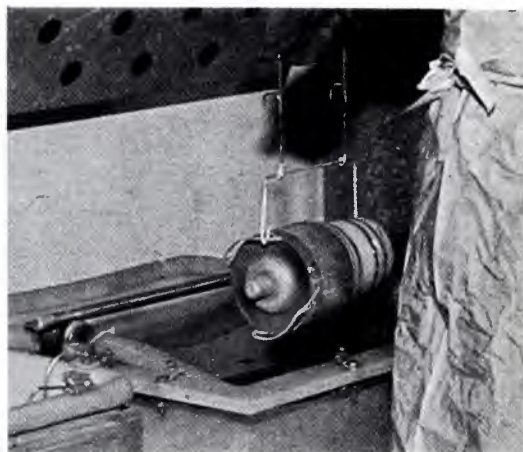
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Leak Detector

Leak checking tube prior to pump operation



Silver Plating

A rebuilt tube ready to be silver-plated



Tube Testing

A finished tube getting tested to factory specifications

NAB Called To Action

(Continued from page 8)



Action on the exhibit floor was good, and many exhibitors were recording record sales. Meanwhile, behind the scenes, it would curl your hair to hear about putting six union men into the act just to raise and mount a video monitor. Most exhibitors we talked with insisted they would never return to that situation again.

He also said the license renewal process should be stabilized and pointed out that of all the competing applications and petitions to deny filed with the Federal Communications Commission over the last six years, 60 percent were filed against radio stations.

The NAB president pointed out to the radio executives that Congress should not contain a provision requiring radio broadcasters to pay fees to recording companies and performers to air records.

"If anything," he said, "they should be paying us."

He said the bill also should prohibit cable systems from deleting television commercials and filling that time with advertising they sell themselves. He said such a practice would violate "every concept of fairness," and would not only damage local radio, but might even destroy it in some cases.

He urged the broadcasters to contact their Congressmen and let their views be known.

Format Intrusion

Wasilewski also attacked the courts and said that because of a misguided decision, the FCC has been forced to rule on format changes. This, he said, is an area

"totally outside its jurisdiction" and stated that "it is none of the government's business to prescribe programming."

To combat these intrusions, he

urged government officials to examine the Constitution and recognize that its purpose is to protect citizens against government.

The government, Wasilewski said, also seems to forget that citizens should be presumed innocent until proven guilty.

"Broadcasters," he noted, must defend themselves against accusations which have become accepted as truths, charges which become near-convictions."

Wasilewski charged that the government has become "over-sensitive to negative elements of society," that a few dissidents make their living by criticizing and "have become influential within government far beyond their numbers."

"Yet," he said, "the FCC and the Congress listen solemnly to every one. Little or no effort is made to find out if their grand claims that they represent the numbers of people have any basis in fact. Most of them, in fact, represent few but their own selves. Nearly all the people who claim to represent have never heard of them."

In his address to television and radio executives, Mr. Wasilewski

(Continued on page 10)



Julian Goodman, NAB's 1976 Distinguished Service Award winner (right), is presented his plaque by NAB Board Chairman W. W. Wearn.

There's News Out There...



Farinon's Portable, Frequency-Agile Microwave Is It On The Air!

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Farinon

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NAB Called To Action

(Continued from page 72)

said broadcasters no longer are constrained by the 1971 Consensus Agreement with cable owners.

He said cable and pay cable are "a great threat to broadcasters and two massive reefs upon which our free television system may become shipwrecked."

Explosive Cable

He cited as examples the explosive growth of pay cable, the "largely innocuous" cable sections of the copyright bill passed by the Senate, the "weak legislation" being considered by the House, and the House Communications Subcommittee staff report which promotes cable and "excoriates the FCC for the overprotection of free

television."

The FCC, he said, also is "enchanted" at the prospect of a wired nation and is "steadily eroding its own once-reasonably constraining cable rules."

Wasilewski stated that under the bill now in the House, copyright payments by cable are not to be determined by the give and take of free enterprise as they are in broadcasting, but are to be fixed by government and are set very low.

"We believe," he said, "that this compulsory payment should cover only local signals. If cable systems are allowed to bring in distant signals, they should have to negotiate those fees, just as all other users do."

Let's Open Up!

As he did with the radio broadcasters, he urged the television station executives to contact their

Congressmen and voice their objections.

Wasilewski said that now "crucial stage of the battle to preserve the American public's right to free television service."

"It is a battle worth joining. We must have all our soldiers on the line. This means that those who are being hurt by cable, and who are not, must be prepared to admit it for fear of additional hurt, must resolve the issue."

"You, who are being harassed by cable, must supply us with the facts that only you have. This means that the top-50 market broadcaster, as yet, sees cable only as a cloud no bigger than a man's shadow. He must join with his smaller counterparts to protect the public's right to free television in every part of the nation. We must resolve this most marvelous of the world's communication problems."

Senator Hartke Applauds Industry

Senator Vance Hartke praised the broadcast networks for reassessing the use of violence in programming and challenged all broadcasters to "maintain your preeminent influence on thought and opinion in our society."

The Indiana Democrat, who is in line to become Chairman of the Senate Communications Subcommittee if re-elected, addressed a television assembly at the 54th annual convention of the National Association of Broadcasters.

He emphasized the importance of radio and television as the major source of information and political stimulation in local communities and said Congress cannot overlook the threat of cable or any other broadband services to "effectively eliminate that basic local service."

And he suggested that regulations of the Federal Communications Commission "which do not assist you in serving the needs of your community should be stricken from the books as quickly as possible."

The Senator told the broadcasters that television is such a pervasive force in America that the industry has a special responsibility

to make sure programming is not designed merely to attract the largest audience but is also intended to enlighten and inform.

He expressed a desire for more variety and less violence, particularly during television's family hour, and praised the industry's own moves in that direction. It is reassuring, he said, "to see the networks begin to reassess the use of violence in programming, particularly where explicit violence...is presented as the only effective method of conflict resolution."

Saying broadcasters "stand alone in their influence and awesome responsibility to our nation," the Senator said he believes the industry "has told the average citizen more about what it means to be an American than any other medium...and I think the nation stands in your debt."

"Together," he said, "you give the nation the most extensive and creative information service in the world..."

"The broadcast industry," he said, "stands today at the pinnacle of thought and influence in our society...and can continue to maintain your preeminent influence...only if you continue to meet the future and its challenges."

He said broadcasters, as "vigorous defenders of the viewers' rights

to hear all manner of thoughtful opinions," must do more to ensure their independent news judgment. FCC regulations designed to achieve that purpose, he said, should be viewed as minimum, not maximum standards.

Senator Hartke said that many times he had disagreed with the actions taken or advocated by the broadcasters was when he thought the industry "was capable of doing more."

He said the "lifeblood of our society is the free flow of information" and Congress needs the cooperation of broadcasters and their expertise, fortitude, and will we can bring to the task.

Among the "most difficult policy questions" faced by Congress, he said, is the identification of coming technologies in communications and whether they will be integrated, will "further or frustrate our national goals."

"You in broadcasting," he said, "will have the difficult dual task of identifying your own interests and conveying them persuasively to Congress as well as conveying the substance of the debate to the general public..."

"The free flow of information is critical if the Congress is to

(Continued on

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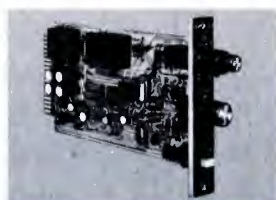
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rately reflect the needs and requirements of the public and the broadcast industry."

He said his door is always open to broadcasters and they should feel free to call on him at any time.

Broadcast engineers were urged to support moves to protect spectrum space allocated for use by the U.S. broadcasting industry at two world administrative radio conferences scheduled for 1977 and 1979.

James D. Parker of CBS-TV, New York, a member of the Engineering Advisory Committee of the National Association of Broadcasters, stressed the importance of the forthcoming meetings during the Broadcast Engineering Conference.

"The need for spectrum space for all types of services is growing by leaps and bounds," he said, and U.S. broadcasters will be competing

at the conferences with both government and private interests for a share of the available spectrum.

While the conferences may seem "pretty dull" in comparison to many technical advances displayed and on display at this year's meeting, he said, they are a major proportion because frequency spectrum is "the foundation of our entire industry."

He said all administrative regulations, including the international table of allocation, will be subject to review and possible modification at the 1979 world conference.

"The future course of all communications services," he said, "will be cast in cement possibly the next two decades to the year 2000..."

"The broadcasting industry will be competing not only with government users of the spectrum but also with government users," he said.

"Your interest and support in preserving the foundation of the industry are urgently needed."

Parker said the competition for spectrum space is of "serious concern" to UHF television because of "further inroads" on useful frequencies that appear to be facing in demands from mobile users and possibly the government.

He said requests for frequency requirements through the year 2000 already have been submitted to the Federal Communications Commission and will be made available after FCC's review.

"Informally," he said, "I've been told that these requirements may not all be satisfied even if we have a negative frequency spectrum; an imaginary frequency spectrum in addition to the available real spectrum."

Former Senator Sam J. Ervin of North Carolina became the recipient of the Grover C. Wherry Memorial Award for his efforts to improve broadcast-government relations.

A bicentennial slide show presented on three screens summarized U.S. political, economic, technical, and pop culture history 200 years before the Declaration

(Continued on p. 76)

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Antenna power gains vary from 2.2 to 7 for VHF channels with input power ratings of 35 and 100 KW. UHF power gains are 16 to 32 with safe input powers up to 220 KW. Its comparatively modest wind loading will permit replacing existing antennas without tower changes, in many cases. Write on your letter head stating your requirements. A quotation and a copy of the propagation test results comparing standard and circular polarization will be mailed to you without charge.

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Independence to the present.

A film from the Advertising Council previewed a new public service campaign to educate the American public on the subject of free enterprise economics.

Goodman, introduced by NAB President Vincent T. Wasilewski, was presented his award by NAB Board Chairman Wilson C. Wearn, Multimedia, Inc., Greenville, S.C.

In accepting the most coveted broadcasting award, Goodman urged his fellow broadcasters to

"show our detractors that we stand behind our beliefs and that we are prepared to work and fight to defend them."

He said a "Broadcaster's Declaration of Independence" would reaffirm the industry's determination to maintain journalistic freedom and would advance public interest and trust in the broadcast media.

The NBC executive was escorted to the stage by a committee of leading broadcasters—Jack Harris, KPRC-TV, Houston, Tex.; A. Louis

Read, WDSU-TV, New Orleans, La.; Harold (Hod) Grams TV, St. Louis, Mo.; Robertson, WTFB-TV, Wheeling, (all former chairmen of Television Affiliates) Cla Collough, WGAL-TV, La Pa., former NAB board chair and a past DSA winner; Elm WSB, Atlanta, Ga., (former man of NBC's Radio E Committee) and by Ancil KING-TV, Seattle, (current Affiliate Board Chairman).

The Award was created this year by NAB's Radio and Television Political Education Committee to honor the memory of former senior executive vice president for government relations who died March 7, 1975.

It is to be given annually to a broadcaster or public servant who demonstrates unusual dedication in improving broadcasting's relationship with the federal government.

The Award was presented to Senator Ervin by Jack Ros Harriscope Broadcasting, Cheyenne, Wyo., past chairman of the Federal Communications Commission's Education Committee.

AM, FM Translators

The National Association of Broadcasters has urged the Federal Communications Commission to initiate rulemaking proceedings to authorize use of FM translators modified to accommodate both AM and FM radio signals in sparsely populated areas.

Its comments, filed at the meeting of NAB's Board of Directors, called for speedy affirmative action on a longstanding petition from the Rocky Mountain Broadcasters Association seeking the use of FM translators with AM input in areas where regular radio station service is "gravely inadequate."

NAB said the modified translators could provide AM as well as FM service in so-called "transition areas" which now lack any type of broadcast service. In some instances, the AM input translator could be used to bring radio service to areas where the conventional FM translator is not technically feasible.

By careful placement, it said, translators would not "hamper or infringe" upon existing stations and could enlarge the markets they serve.

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Dictaphone's 400 Logging Recorder gives you a precise record of the exact words — at the exact time they were broadcast. That's why the 400 is standard equipment at major radio and television networks worldwide. Extremely slow speed and automatic reversing let you pack twice as many words on an inch of tape as any other logger. And the 400's performance is unequalled. The features speak for themselves:

- Dual system automatically transfers signal when tape runs out.
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SPEND LESS.

Another competitor boasts of video switching at less than \$30 per crosspoint. The TVS-1000 sells for as little as \$23 a crosspoint, and this price includes professional quality vertical interval switching, on-board electronic latching, and 100% computerized testing of all parameters through all crosspoints.



40 x 50 AFV Switcher

SPECIFY THE SWITCHER WITH PROVEN RELIABILITY.

The TVS/TAS-1000 is more reliable because its simple design requires fewer active components in the signal path. This reliability has been proven at installations throughout the world in configurations ranging from 1 x 10 to 80 x 50. To find out more about the one switcher offering compact, cost-effective signal distribution with true broadcast quality and reliability, contact your nearest TeleMation sales office.

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NAB Products

(Continued from page 48)

Video Spot Assembler

The **Recortec Video Spot Assembler (VSA)** is a microprocessor based system designed to provide the convenience and versatility of a cartridge system at a fraction of its cost. The VSA uses the same two VTR's used for A-B rolls for spot/spot sequences. Unless the VTR's are vacuum column buffered types,

each VTR must be modified with the Recortec R-MOD to give it full automation capability.

The VSA provides: random access for up to 100 spots plus additional VTR's; access to slides and film chains; no restrictions on spot length (even 2 second spots); playing of 10 second spots back to back; plays up to 100 breaks without reprogramming; program-

ming of up to eight event break; last minute spot change to the last break time.

Before air time, all spots used are dubbed sequentially on master tape. This tape is placed on the "A" deck and a "catalog sheet" made up. The microprocessor in the VSA automatically memorizes all the start and stop times with accuracy. The operator refers to the "catalog sheet" and "programs" the VSA by just keying in numbers of all spots to be played each successive break. When the operator has programmed a break (up to 100), the first break is assembled automatically from "A" to "B" in proper order. "B" is cued to air under control of "B" is passed to station master control.

Automated remote start of a break and a preroll is provided at 10 seconds from end of the last spot. After finishing playing the current break the next break is automatically assembled from "A" to "B". The operator can modify any break stored in the microprocessor with the simple keyboard control displays. Even last minute spot changes can be incorporated into program breaks by calling an external control placed under VSA control.

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Quad Polarized ENG Antenna

At the NAB Convention, **Inc.** exhibited a new quad polarized antenna capable of both simultaneous and independent operation at the 2 GHz and 7 GHz bands. The antenna is the key element in **Nurad's 20/70 QP1 Receiver Antenna System**, which provides the broadcaster flexibility in his Electronic News Gathering/Electronic Journalism operations.

The system embodies four dual-band antennas. Each antenna covers its own directional quadrant and is fully independent of the other three. Further, each antenna is quad-polarized, that is, it can be operated in clockwise-circular, counterclockwise-circular, horizontal-linear, or vertical-linear polarization modes.

These features provide the operator a number of very significant advantages.

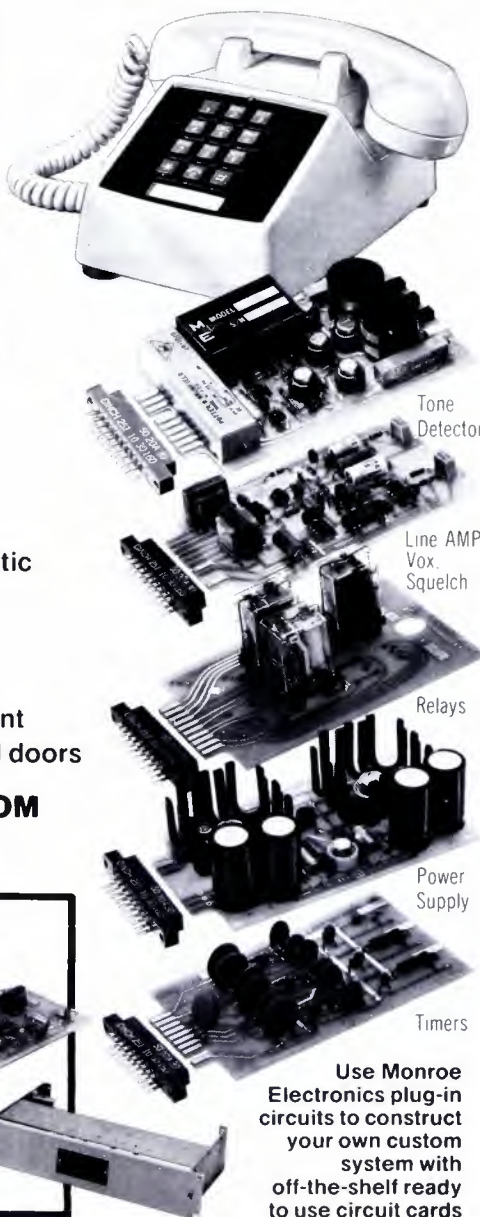
(Continued on page 49)

control by phone

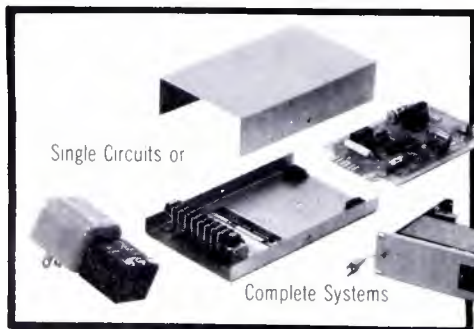
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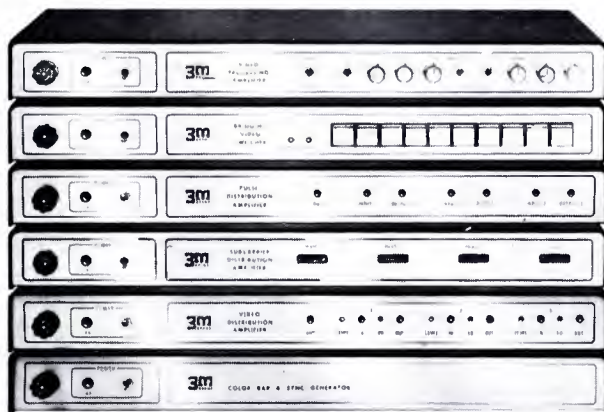
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SBE Reports

(Continued from page 18)

Chapter 20: Pittsburgh, Pennsylvania

Chapter 20 met March 18 to see guest speaker Bill Nichols of Echo Sciences demonstrate a video disc system—that is priced under \$1000. (Jim Hurley, Chairman WTAE-TV, 400 Arden Blvd., Pittsburgh, Pennsylvania 15230, (412) 4300.)

Chapter 22: Central New York

On March 18, Mr. Terry Lloyd from TFT gave an interesting program on EBS. Mr. Lloyd had a program explaining the interconnections and additional procedures of EBS and the manufacturing screening and circuit board testing. (Gary Harter, Chairman, WSYR, 1030 James Street, Syracuse, New York 13203, (315) 474-3911.)

Chapter 26: Chicago, Illinois

In May, Chapter 26 plans to visit the Commonwealth Edison/Westinghouse Nuclear Power plant in Zion, Illinois. This will be a reservation tour, so please call as soon as possible if you are interested. (Bob Churchill, Chairman, SBE, 1 Wacker Drive, Chicago, Illinois 60601, (312) 5215.)

Chapter 28: Milwaukee, Wisconsin

Chapter 28 had a big evening on Tuesday, March 30 at the University of Wisconsin-Milwaukee Cunningham Nursing Building. The subjects covered at that meeting were: instructional media operations, computer controlled learning systems, automated closed circuit tape distribution, Convention reports, and a discussion of the certification program. Invited speakers were Lindgren, Tom Tompter, and Jan Pritzl, UW-M, plus SBE members reporting on NAB. (Dezurick, Chairman, WRJN, 4201 Victory Avenue, Racine, Wisconsin 53405, (414) 634-3311.)

Chapter 35: Louisville, Kentucky

Chapter 35 met Thursday, March 18 at WKLE-TV. Mr. Bob Brock from Brock Electric was invited to discuss primary power circuits. (Robert J. Brock, Chairman, WKLE-TV, 600 Cooper Drive, Lexington, Kentucky 40502, (606) 233-0666.)

Chapter 37: Washington, D.C./Northern Virginia

The March meeting of Chapter 37 was held the last Wednesday of the month at WMAL-TV, Washington, D.C. The program was a roundtable discussion of the SBE engineering certification program. (Charles Riley, Chairman, Tele-Productions, 708 N. West Street, Alexandria, Virginia 22314, (703) 683-3203.)

Chapter 42: Orlando, Florida

Mr. Joe Lang, vice-chairman of Chapter 42, demonstrated the new ISI video switcher on March 23, and former assistant chief engineer of Channel 24, Aldo Vivons, showed members and guests the Channel 24 color remote unit. (John Weidner, Chairman, 5765-F Kingsgate Drive, Orlando, Florida 32809, (305) 857-3729.)

From BLUE BANANAS to SAG TAILS

Keep It Rolling

My local newscasts on television are far different from those of the mid-fifties when pictures came to my home town, a market of 40 and.

Contrast today's three-man news show, replete with color actualities, special effects, sets that move, analysis by people who have time to understand what they are talking about with the show of yesterday.

At station I remember frequently had a live show. The operator used to turn on the one camera (a black-and-white vidicon that made electrically and acoustically—whenever you turned the focus too fast). At the same time he would roll the opening-type announcement on reel-to-reel tape. Then, gathering up his news copy and turning the seconds to himself, he would run down from the control booth and walk calmly onto the news set.

Another man was supposed to be getting off shift at the same time at a radio station several blocks away. This man would saunter over in time to make the closing-type announcement on the audio recorder and prepare to switch to the next program at the appropriate time.

Naturally some problems would creep into the show, like the time the radio announcer felt playful. He picked up a bicycle which was waiting for him to make a commercial at some later date. He began to ride around the television man. The television man started to laugh and walked off the set and capped the camera. I understand the news show was cancelled until there was enough money to hire another man to run camera and help with switching.

John H. Wiegman
Chief Engineer
KWAL Radio
Mullan, Idaho

Guess What Happened On The Way To Church

I can't absolutely guarantee this one's true, but a Nebraska station network is being broadcast. The network is "taken" from the control room, and then control is transferred to master control,

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For More Details Circle (49) on Reply Card

Blue Bananas (Continued from page 85)

upstairs. When a studio feed is about to take the studio again "takes" sound and picture network, and control is transferred down again.

When Pope John XXIII died, Tom Brokaw of NBC news, was adjusting his tie and clipping his microphone, as the audio man in the studio checking out the sound instead of running radio. A floorman asked Tom what had happened as the master control man had transferred sound to the studio. The picture (a soap opera) continued, as Brokaw's voice broke in momentarily and said "The Pope croaked."

Jim
Ridgecrest,

Policing The Police

Commercial Broadcasting is not the only public-audience "broadcasting" medium, and a metropolitan Police Dispatcher can quickly tell you. And, having spent 20 years in that end of communications, I've been exposed to quite a few bananas (as well as intentional purple episodes). Somebody managed to fall down the elevator shaft of one of the now defunct hotels; it hit the "Man fell down the ambulance shaft, an elevator on the way."

B. J. H. Abraham
Indianapolis, Ind.

Perfect Timing



console mount clocks and timers

Reliable ESE clocks and timers are now available in compact (2" x 3.7" x 3.6") console mount enclosures with bright red LED's to read .33" red LED's. Provided with rear solder pins for connection to your own switching or the optional rear connector, 6' cable and pushbutton set. Other options include BCD Output; Crystal Timebase; 220V-AC-50Hz; and Kit for In addition the ES-370 is available with Stop and/or Relay Contact Closure at Zero.

ES-172 12 Hour Clock	\$125.
ES-174 24 Hour Clock	\$125.
ES-370 100 Min. Up/Down Timer	\$180.
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ES-572 12 Hour Clock/Timer	\$150.
ES-574 24 Hour Clock/Timer	\$150.



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Products

(Continued from page 82)

antages, including: (1) The ability to select one or more receive antennas to cover specific quadrants of interest; (2) The ability to use any antenna in either the 2 or 7 GHz band, or in both simultaneously; (3) The ability to obtain the best available signal by selection of the optimum polarization mode while rejecting other modes, thereby eliminating undesirable multipath effects and ghosting or smearing.

For More Details Circle (137) on Reply Card

10½-Inch Reel Tape Recorder

Tandberg of America has a new major, 3-head reel-to-reel machine available that they'll guarantee to have a minimum signal-to-noise ratio of 72 dB. Their 10XD machine combines the Tandberg field recording technique with Dolby™ B system.

The 10XD also features electronic speed control, electronic logic controls (including photo eye), echo, sound-on-sound, editing capabilities, and A and B

For More Details Circle (138) on Reply Card

ENG Color Package

Industries showed their new 4800 series, half-inch EIAJ-1 color video system for electronic journalism.

The heart of the system is their E-800U color camera. With a grip and lens, it weighs 8 lbs. It uses two electrostatic cathode ray/electromagnetic deflection vidicons, one for luminance, one for chrominance.

The 4800 series recorder will record for 30 minutes on one reel of tape. Slow motion playback is available at speeds from ¼ normal to full stop.

The series also includes the E-40U AC power adapter, E-1 Battery Pack, KR-200U RF Converter, and a GA-20U Camera Adapter.

For More Details Circle (139) on Reply Card

Delay Cartridge

A new delay cartridge, a continuing product of Fidelipac recording, was introduced at the con-

vention.

Utilizing standard Model 300 (NAB "A" Size) and Model 600 (NAB "B" Size) bodies, the new cartridge features curved pressure pads and special reel lubrication to minimize tape wear and assure extended life.

Available in both 8 and 10 second lengths for use with cart machines having delay head configurations. These cartridges are available from Fidelipac Distributors world-wide.

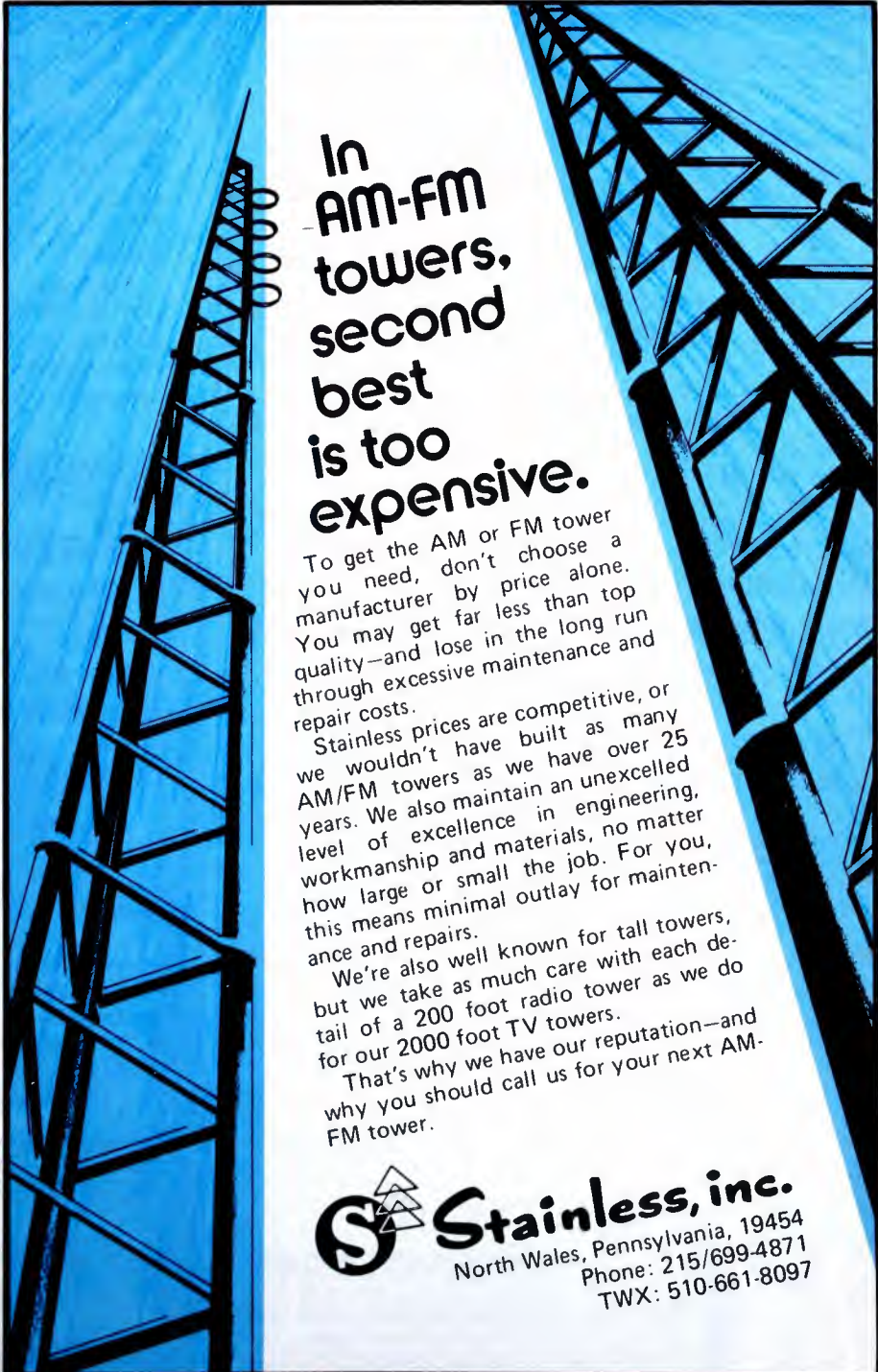
For More Details Circle (140) on Reply Card

Helical Program Computer

Convergence Corporation, Southern California designers and manufacturers of the ECS-1 "Joystick Videola" Editor and the SM-2 Joystick Search Module, has announced its new PC-3 Triple Function Program Computer.

The Convergence PC-3 provides automatic bi-directional tape search, continuous tape timing and insert duration timing—all programmable with a hand-held calculator.

(Continued on page 90)



In AM-FM towers, second best is too expensive.

To get the AM or FM tower you need, don't choose a manufacturer by price alone. You may get far less than top quality—and lose in the long run through excessive maintenance and repair costs.

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FCC Wants To Amend Non-Commercial Rules

The Commission has proposed amending its
relating to noncommercial educational FM b
cast stations.

The action was in part based on a rulem
petition filed by the Corporation for Public B
casting (CPB). Another petition, from Oper
Outreach, Inc., also dealt with one of the
mentioned by CPB.

CPB sought a series of changes in the rul
lating to the assignment and operation of non
mercial educational FM stations, and Oper
Outreach requested assignment of FM Channe
(87.9 MHz) to Washington, D.C.

In this proceeding, the Commission sa
intended to examine a wide range of issues re
to the most efficient and effective use of the
channels (201-220) reserved for noncomm
educational use. It noted that some of the p
raised by CPB already were under study b
FCC, and would be taken into account in this
ceeding.

Technical issues to be considered include
standards governing the classes of educat
stations, the facilities available to them and
protection to be afforded them; interferenc
educational FM stations to reception of tele

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BROADCAST ENGINEER

6; the establishment of a new FM Channel and treatment of 10-watt stations on a parity basis.

Technical issues to be considered include giving noncommercial FM stations to have a regular schedule of operation, and requiring them to demonstrate community needs. (On March 10, 1986, the Commission dealt in part with the latter point by adopting ascertainment procedures for noncommercial educational FM stations.)

The Commission said it hoped to be able to develop a system by which existing educational stations would be able to obtain more substantial protection, and to offer some protection for future stations.

It noted that some years ago it had examined a number of related questions as a part of the proceeding in Docket 14185. It said that proceeding was the adoption of a Table of Assignments for commercial FM stations as well as the resolution of a number of other issues relating to commercial FM stations. However, since most of the issues relating to educational stations still had not been resolved, the Commission said it would continue Docket 14185 and transfer those issues to the current proceeding.

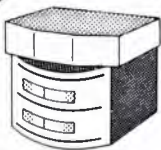
Table Treatment

The two principal issues carried over are the establishment of an FM table for educational stations and the treatment to be given to 10-watt stations. (Continued on page 109)



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For More Details Circle (55) on Reply Card

NAB Products

(Continued from page 87)

lator keyboard. Precision accuracy in the system is maintained by a unique "closed loop" system of counting control track pulses of normal videocassette tapes.

Convergence's PC-3 is designed as an add-on accessory to the Convergence ECS-1 Joystick Editor, and will be sold through Convergence's worldwide network of distributors.

For More Details Circle (158) on Reply Card

Tunable Demodulator

Telemet, a Geotel Company, announced at NAB 1976 that their Precision Demodulators Model 4501A1 and Model 4501A3 are now available with a push-button channel selector for all VHF channels.

The Telemet Precision Demodulator can now be obtained for use as a back-up unit for multiple station operations or as an auxiliary off-air pick-up for network feeds.

Additionally, a CATV version of this tunable VHF demodulator Model 4502B1 is available for cable installations. This unit provides backup unit for all VHF stations plus the quality, performance and dependability broadcaster can expect from any demodulator bearing the Telemet name.

For More Details Circle (141) on Reply Card

2.5 KW AM Transmitter

The **Wilkinson Electronic** 2500B is a heavy duty 2.5 KW broadcast transmitter contained in a single cabinet requiring 30 square feet of floor space.

All tuning and operating controls are on the front panel of the transmitter. After initial adjustment and tuning are completed, operation is by plate and filament push buttons used for normal operations.

The low voltage supplies, power ladder, and timing circuits, as well as the RF exciter, are housed in a middle drawer which can slide out for ease of maintenance, cleaning and servicing.

The solid state modulator is located on the shelf beneath the modulator final. The modulator finals and the RF finals are incorporated (2) 4-1000A tubes are located in the main air compartment, and operation of these tubes is visible through Lexan plastic window.

The high voltage power supply is located on the base of the transmitter along with the modulation transformer and modulator reactor. Access to these compartments can be achieved through the interior front panel doors or the interior rear door.

For More Details Circle (142) on Reply Card

Peak Maximizer

The **QEI Peak Maximizer** is a solid state peak limiter. It has been designed for the purpose of preventing overmodulation of the negative and positive peaks. The AM version, Model 100, prevents overmodulation on the positive peaks while maintaining maximum positive peak modulation.

(Continued on page 90)

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does your audio console, or the one you're talking about purchasing, have all these standard features:



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	YES	NO	YES	NO
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Modular plug-in amplifiers	☒	☐	☐	☐
2 location cue/intercom system with remote talkback	☒	☐	☐	☐
4 selectable monitor inputs	☒	☐	☐	☐
4 programmable speaker muting outputs	☒	☐	☐	☐
Step type faders with cue on all channels	☒	☐	☐	☐
15 watt rms protected monitor amp	☒	☐	☐	☐
4 selectable headphone inputs plus stereo cue	☒	☐	☐	☐
+ 18dBm transformer coupled outputs	☒	☐	☐	☐
Telephone grade lever keys	☒	☐	☐	☐
Shielded PC board mixing bus for extra RF immunity	☒	☐	☐	☐
Engraved panel markings	☒	☐	☐	☐
Extra cost hidden options	☐	☒	☐	☐
High purchase price	☐	☒	☐	☐

Ampro audio consoles are available in 6, 8, 10 and 12 channel rotary or slide fader versions in mono, dual mono, stereo or dual stereo/simulcast configurations. Priced from \$1,995.00 to \$5,275.00.

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For More Details Circle (56) on Reply Card

PEOPLE IN THE NEWS

Douglas I. Sheer, advertising and sales promotion manager of JVC Industries, Inc. has been elected to Bird of Directors of the National Audio Visual Association.....Recent nominations to the Institute of Electrical and Electronics Engineers, Inc. are **Dr. Robert M. Saunders**—president and **Robert D. McMan**—executive vice-president.

Avion Electronics, division of Apollo Lasers Inc., announces a reorganization in their Los Angeles office. **Donald T. Heckel**, formerly vice-president marketing, has been promoted to vice-president general manager, **Tom Miller**, previously sales coordinator moves into **Bob Milecki's** job as western regional sales manager. Mr. Milecki is now manager special projects, a newly created position; **Bob Miller** steps into Mr. Miller's job as sales coordinator.

RelMation, Inc. reports the appointment of **G. Elsaesser** as director of the firm's newly created national sales department.....**Abid Farooq** of the Coastcom staff as senior project engineer single sideband product development.....**Audion, Inc.** names **William R. Brock** manager of sales with responsibility for domestic sales of recording, broadcast, and sound reinforcement lines. **Michael Long** is now with General Cable Corporation as national sales manager.

J. Murray has been designated vice-president public affairs for Warner Cable Corp. while **Infic-Atlanta, Inc.** tells us of the appointment of **Jon R. Edwards** to the newly-created post of chief of administration and operations.

Audio Electronics Inc. announces the appointment of **Bill Herring** as East Coast Sales Manager. His offices in BEI's Kansas City headquarters.

The position of sales supervisor for professional recording and broadcast markets at the Magnetic Audio/Video Products Division of the 3M Company will be filled by **James M. Hollon**.....**Micro Consultants, Inc.** adds to their staff with **George Grasso** as vice-president of marketing and **Brian Matley** as vice-president of engineering and chief technical officer.

Chester P. Coleman becomes the exclusive System 700 sales specialist at IGM, a division of Northwestern Technology.....The resignation of **Bill Mansfield**, a Datatron founder, as a full-time Datatron employee has been announced.

In the radio and television section of the industry, **Eric Hauenstein**, vice-president and general manager of radio station KDKB has been named program chairman for NRBA's National Radio Broadcasters Conference and Exposition.

KMPH-TV, Tulare-Fresno assigns the position of national sales manager to **Gary J. Waller** while at **WTOL-TV** of Toledo, Ohio **Jack Sander** becomes their assistant general manager.....**Don Stafford** joins **KEVN-TV/KIVV-TV**, Rapid City, South Dakota as chief engineer and at the same station, **Jim Kozora** becomes assistant chief engineer.

Bird Electronic Corp. has established a regional sales engineering office in Pennsylvania for the eastern United States and a second office in California covering the western United States—**Richard Tanczos** is eastern regional manager and **George Churpek** will head the western office.....**United Systems Corp.** names **Richard Pitner** product manager for digital printers, thermometers and data acquisition systems and components.

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- ▶ OPTIONAL PRESET & SHUTTLE.
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- Portable ▪ Big 12" diameter face with 1 and 1/2" numbers and red-sweep second hand make it a cinch to read, even from a distance ▪ Works on 2 "C" batteries ▪ White or tan face, charcoal numbers; with woodhue case.

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SEATTLE 1510 Sixth Ave., WA 98101
WHEELING 599 S. Wheeling, IL 60090

For More Details Circle (58) on Reply Card

NAB New Products

(Continued from page 90)

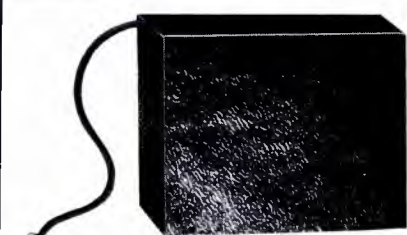
Positive peak enhancement is switch selectable and adjustable for various percentages of asymmetry. Circuitry is included to keep the greater modulation peak positive, thus raising the average modulation level.

The Peak Maximizer is manufactured in a standard 3 1/2 x 19 inch rack mount. Input, output and release time constant controls are located on the front panel. Positive peak switch and control, power cord, fuse and terminal block are located on the rear panel.

All QEI Maximizers have individual input and output level controls. Each control has a knob with a logging scale behind it. This feature gives the operator a memory device for setting the controls if they were disturbed for any reason.

The dynamic attenuator that controls the gain of the maximizer has a connection brought out on the rear terminal strip. This allows the operator to gang two mono Maximizers for stereo operation.

Nickel Cadmium BATTERIES for ENG.



ALEXANDER BP-20A

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For More Details Circle (59) on Reply Card

An FM station that has cl from mono to stereo operati update his audio processing g obtaining additional mono mizers and ganging them for with this feature. A single wi nection between two mono provides stereo operation.

For More Details Circle (143) on Reply

Studio Audio And Furniture

A totally new complete audio facility including fur and components has been duced by **Ampro Corporation** convention. This studio tu package can be tailored station's needs with the p audio console, turntables, machines and other equipmer wired for easy installation c sturdy modular furniture.

The furniture, construct heavy duty 3/4" and 1 1/2" ma and laminated with formi, available in turntable cabinet racks and console tables custom versions to order.

In addition, Ampro intro the SRC-1 Digital Sequencin mote Control for up to 6 / cartridge reproducers. Operat 6 individual remote start sw the desk mount unit has indi LED status readouts and in programming switch to allow automatic operating sequenc sequential playback or cluster as 3 and 3, 4 and 2, etc. An matic skipover is also pro which will play only the "ready" reproducer within th quenced program.

For More Details Circle (144) on Reply

Digital Antenna Monitor

Delta Electronics showed DAM-1 digital antenna mo that has been type approved FCC. The unit gives true readings and exhibits good st with modulation.

The DAM-1 will work with six towers DA-2 Standar towers with an extension u base current adapter is availa

Delta also manufactures a log antenna monitor calle AAM-1. It works with up towers DA-2.

The company also introdu new antenna current meas system. It has dual ranges f

BROADCAST ENGINE

light power changes, and it separate meter with lightning on switch.

More Details Circle (145) on Reply Card

Audio Cart Replacement Heads

Beaucart Division of UMC Electronics introduced a new line of replacement audio heads. You'll find that in recent months we have expanded our expansion into audio machines.

Our replacement heads are available from stock and may be used with most popular machines. Previous models include mono stereo record and mono and stereo playback.

More Details Circle (146) on Reply Card

VHF Solid State Field Strength Meter

Stanc Instruments' new field strength meter—the FIM-71—is a portable test instrument of laboratory quality. A quick look reveals it was designed for the field use.

Featuring a dipole and a highly accurate tuned voltmeter with a sensitivity of 140 dB, this instrument is suitable for practically all types of field strength measurements in the 45 MHz to 225 MHz frequency range.

Depending upon the characteristics of the signal measured, the user can switch select narrow bandwidth, peak or average value for pulse modulated signals, FM demodulation, and a dynamic range of either 20 or 40 dB.

More Details Circle (147) on Reply Card

Line-By-Line Auto Equalizer

Computer Magnetics Corp., which specializes in Video Discs and the refurbishing of video and audio heads, has introduced a line-by-line Auto Equalizer during this convention. The Auto Equalizer will update the VR-2000's and VR-210's to obtain full automatic line and channel by channel level adjustment.

Before, the Auto Equalizer enabled a user to improve the picture quality from a poorly recorded video tape, and to prolong the life by eliminating the wear of heavy female guide rollers.

More Details Circle (148) on Reply Card

ALL SOLID-STATE AURAL STUDIO-TRANSMITTER LINKS



■ MONAURAL AND COMPOSITE VERSIONS

All solid-state aural STL's to fulfill almost every requirement. Moseley Associates has pioneered many STL concepts — solid-state systems, true direct FM modulation, and composite operation (FM stereo on a single link)...just to name a few. Front-panel metering of all important parameters is included on all Moseley STL transmitters and receivers. Subcarrier capability enables wireless remote control, secondary program service, or intercom service.

OPERATION IN ALL STL BANDS — 890-960 MHz

- 450-470 MHz • 300-330 MHz
- 200-240 MHz • 148-174 MHz

TRANSMITTER REMOTE CONTROL SYSTEMS

Analogue



Fifteen telemetry and thirty command functions are provided by the TRC-15A. The **Model TRC-15AR**, when used in conjunction with a Moseley STL, or other radio link, will provide total wireless operation. The **Model TRC-15AW** is for use on leased telephone, or other wired circuits.

Digital

Fully digital remote control of a remotely located transmitter point is provided by the **DCS-2 Digital Control System**.

Multiple transmitter site operation—a standard option. **Command, telemetry, and status** provided in groups of thirty channels. **Automatic parameter logging** available. Computer-assisted operation of the DCS-2 is another standard option, and can provide **totally automated plant operation**. The **Model DRS-1 Digital Remote System** provides many of the features of the basic DCS-2 at an affordable price. Up to 30 telemetry functions and 24 status channels to a single transmitter site.



REMOTE PICKUP LINKS

Models RPL-3 and RPL-4 Remote Pickup Links provide unsurpassed audio performance for remote broadcasts. Two full-time microphone and high-level line audio inputs are standard.

The RPL-3 and RPL-4 Transmitters are only 4 inches high and weigh a mere 16 pounds—complete with audio mixing and AC/DC power supplies.



For 148 to 470 MHz operation

OTHER MOSELEY PRODUCTS...

- FM Subcarrier Generators and Detectors ■ Stereo Generators
- STL Accessories ■ Remote Control Accessories

Please contact us for further information.



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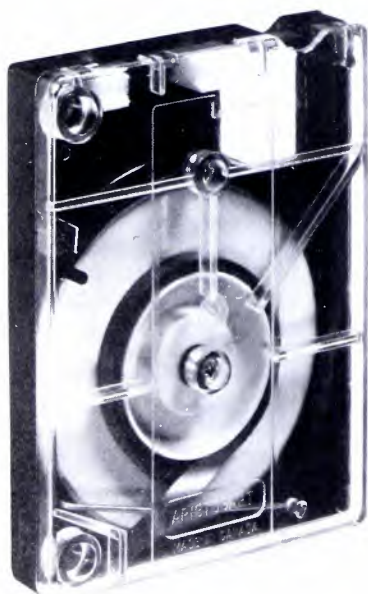
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For More Details Circle (61) on Reply Card

TV Sound Production

Rupert Neve Incorporated exhibited at NAB a large standard TV sound production console of which several have been built for a major U.S. network.

The 5305 system was designed for studio and on location or remote applications. A number of custom modifications are available to cover almost every sound production need.

For More Details Circle (149) on Reply Card

TV Audio Control Center

Ward-Beck Systems exhibited the Olympic designed WBS 75046 mobile audio control center. Four of these units will be used by the CBC for the Summer Olympics.

The control center includes a massive patch panel, several level meters, slide controls, integral mixing, switching, distribution, and monitoring facilities.

The center even includes two video monitors and monitor speakers.

For More Details Circle (150) on Reply Card

Refurbished Quad Heads

Videomax has announced that it can now refurbish the Mark XV. This raises the Videomax capability to the RCA high band and low band video heads and the Ampex Mark III, Mark X, and Mark XV heads.

For More Details Circle (159) on Reply Card

Production Switcher

Vital Industries showed their VIX-114 series video switching system. This design offers the operator a choice of over 80 patterns, patterns such as star, heart, binoculars, keyhole, and rotary clock-wipe.

The system also features Vari-key, for soft, hard, shadow, or see-thru key. In addition, it offers a digital quad split that allows the operator to wipe or dissolve in each quadrant! Also, there's electronic vignette for adjustable soft pattern edges, and it uses digital edge keying for border, shadow, and outline.

The VIX-114 has a new digital, drift-free and jitter-free proc amp on output. The unit comes ready to interface for computer operation.

For More Details Circle (160) on Reply Card

Professional Portable Console

Television Research International, Inc. introduced a professional portable production console convention.

The PPC-I System includes 5-inch color trinitron monitor, program monitoring, two monitors for multi-camera program monitoring, a high-quality six vertical interval switcher, an input audio mixer, sync generator, and all necessary intercomifiers, pulse distribution amplifier, etc.

The two preview monochrome monitors and single trinitron monitor are positioned for operator's viewing and are shaded by a neutral density shade filter to allow glare free operation in sunlight. The broadcast vertical interval switcher features the solid state cross-points, pre-clamping, mixing amplifiers, and duty fader bars, Clare-P switches and modular electronic construction. The two-bus, six switcher features build-in lock burst and top quality insert keyer for insertion of titles, etc. The switcher is capable of dissolving and from inserts. The key menu is selectable between mix, insert, and mat.

The PPC-I is totally self-contained in a rugged "3 suitcase" it may be AC or battery powered for field operation. It is easily handled and transported in car, airplane or by other common transportation means.

For More Details Circle (151) on Reply Card

Sony's New Broadcast Line

Sony Corporation of America introduced ten new products, specifically for the broadcast market, at the opening of the 1976 National Association of Broadcasters Convention at McCormick Place. The products, including video taping equipment and recording items, represent the largest production of equipment by a company in recent years.

Among the new products are the following:

A new portable U-matic recorder and a new U-matic system, both capable of S.M. code generation signals when

G-101 signal generator, also for the first time. Other models include a portable 3-tube E.N.G. camera, a time corrector and a new editing timer. Noteworthy too is the G-100, a new 1-inch compact hi-fi scan video tape recorder permits broadcasters and/or production companies to achieve helical recording capability offered previously in larger testlier equipment. Rounding out product line shown are monitors for both studio and mobile unit installation. Series of the new equipment begin in early summer.

For More Details Circle (152) on Reply Card

Ten Channel Stereo Console

The new S-20 is the sixth in the LPB console line. This 10-inch version features step attenuators, 30 switched stereo individual program channels, and a mixdown is available.

The S-20 has all-transformer stand output, and it uses solid electronic modules. It includes telephone-type switches and internal cue and monitor lines.

Frequency response is ± 1.0 dB from 20 Hz to 20 kHz. Distortion is below 1% from 20 Hz to 20 kHz. Noise is at least 74dB below 18dBm, with reference at the input level.

The S-20 also has muting and night relays on the first three channels.

For More Details Circle (153) on Reply Card

FM Transmitter

Howard Gelman, Vice-President and General Manager has announced that the Federal Communications Commission has issued acceptance on new CSI Electronic Inc., FM transmitters. The transmitters include models with output powers of 3, 5, 12 and 25 watts.

Transmitters exhibited at the show include design features such as increased efficiency, high reliability, and low maintenance.

Robust construction is used throughout with all RF components in shielded compartments. All conductive circuitry is low voltage AC for safety, provision for re-

mote control is standard, and all relays are front panel mounted for easy adjustment and maintenance.

The FCC accepted FM transmitters feature phase lock loop exciters and grounded grid triode output stages for stability without neutralization. All tuning and loading adjustments are made from the front panel, and output power is directly adjustable with a drive control without changing the loading.

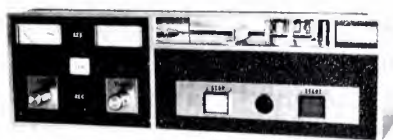
For More Details Circle (154) on Reply Card

Stereo Control Center

Technics by Panasonic Professional Series audio equipment was introduced at the National Association of Broadcasters convention at McCormick Place; showcased were the new SP-10Mk2 turntable, stereo control center, stereo amplifier, and universal frequency equalizer.

Model SP-10Mk2 is a quartz-controlled, direct-drive turntable without arm for professional and semi-professional applications. It is

it bench mark cartridge machines



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2. Better Sound Quality Than a Class AAA telephone line.
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1. A Dual-Channel costs less than a Composite.
2. Better Reliability than a Composite. "Built in Backup."
3. Greater Channel Separation than a Composite.
4. Less Signal Drive Required to Receivers means additional system Fade Margin.
5. Less Test Equipment Necessary and more Positive System Diagnosis.
6. Stereo Generator is away from Studio and Unauthorized Tampering.
7. Stereo Generator and Broadcast Transmitter Compatibility without Interface.
8. Having a Dual-Channel STL is like having a Spare Link.
9. Two Remote Control and Two Sub-Carrier Capability.

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2. Channel Response matched to 0.25 db.
3. Distortion less than 0.5%.
4. All Solid State.
5. A Simple, True Direct FM **Plug-in** Modulator.
6. Complete accessibility to Modules without removal from rack.
7. The Marti System Delivers Top Performance with Transmitter manufacturer's Stereo Generator.
8. Marti STL Systems Log over **TWO MILLION** (2,000,000) Broadcast Hours each Year.
9. **AVAILABLE FROM STOCK.**

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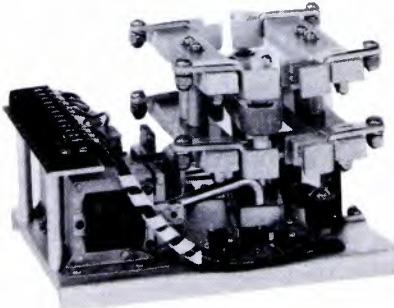
(Does not include cost of Antennas or Transmission lines).

MARTI Electronics, Inc.
Box 661 • Cleburne, TX 76031 • 817/645-9163

the successor to the Technics first direct-driven model, the hand-crafted SP-10, which is already one of the most prestigious and widely-used turntables in quality FM broadcast applications.

The SP-10Mk2 truly heralds a "new generation of turntables," chiefly because of its **quartz-controlled, phase-locked servo circuit**, adapted to maintain extremely constant, drift-free speed. The oscillation of a quartz crystal supplies a reference frequency against which the turntable's revolution speed is compared and, whenever necessary, instantly controlled.

Model SU-9600P is a solid state stereo control center with pre-amp. It provides an abundance of signal switching, control and connection functions which make it a veritable brain center for an audio system. Features include push-button input selectors, 4-stage direct coupling, 2 phono inputs with sensitivity/impedance adjustment, ultra-wide dynamic range in the phono equalizer for overload safeguard and 18dB/octave high/low filters with selectable turnover frequency.



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NEW GCR-201B CONTACTOR

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It also has separate rigged stepped bass and treble controls, bass/treble defeat and tuning frequency selectors, calibrated attenuator-type volume switch and rack mounting design.

For More Details Circle (155) on Reply

1-Inch Leddicon Camera Tube

The introduction of the P8022 series of one-inch con camera tubes was made a convention by **English Electric Valve Company, Ltd.**

Sharing many of the features that have made the 30mm Leddicon widely used throughout the world, the new one-inch tubes are available as replacements for the P8021 Plumbicon®. The P8021 series comprises one-inch diameter camera tubes of separate meniscus construction with lead oxide sub-conductive layers.

They feature very short lag, high sensitivity, low dark current and are interchangeable with one-inch diameter mesh vidicon tubes. The P8022 series is identical to the P8021, with the addition of internal light shielding to improve difficult lighting condition operation. Separately available in either series, are available in monochrome camera, luminescent channel, blue channel, green channel and red channel of various cameras.

Extended red versions are also available shortly.

For More Details Circle (156) on Reply

Video Tape Cleaner-Evaluator

A major cause of cassette tape maintenance—head clogging—can be substantially reduced if cassettes are cleaned on 1. The new video cassette cleaner/evaluator debuted at this year's N.A.S. machine will evaluate tapes to identify tapes with edge or physical damage without adversely affecting the recorded image.

The machine will clean and evaluate a one-hour cassette in three minutes—a 21-minute cassette in less than a minute. The wiping and honing tape cleaning technique will reduce video head wear by 75 percent and eliminate powder problems.

For More Details Circle (157) on Reply

CABLE engineering



NCTA Still Committed To Equal Employment Opportunity

The National Cable Television Association's Board of Directors has unanimously approved a resolution reaffirming its commitment to equal employment and ownership opportunity in the cable television industry and establishing an EEO industry committee to formulate a plan to meet EEO objectives.

The action followed a discussion of EEO status within the CATV industry at the board's meeting during the national association's 25th annual convention here.

The resolution stated that the Board recognizes the industry's legal and moral obligation to achieve equal employment and ownership opportunities within the industry with all deliberate speed, and directed the Chairman of the Board to establish a committee to prepare a program.

NCTA Board Chairman Burt I. Harris stated that the committee is in the process of being established and that a further announcement

would follow in the near future.

Following is the full text of the Board resolution:

"The Board of Directors of the National Cable Television Association reaffirms its commitment to equal employment and ownership opportunities in the cable television industry. The Board recognizes the industry's legal and moral obligations to achieve these goals with all deliberate speed, and accordingly directs the Chairman to employ a committee to formulate a program to meet these objectives."

NCTA Present Annual Awards

Daniel Aaron, vice president of Comcast Corp., Bala Cynwyd, Pa., has received the National Cable Television Association's Outstanding Committee Chairman Award for 1975-76.

Aaron received the award at luncheon ceremonies at the NCTA's 25th annual convention at the Dallas Convention Center. The award is presented annually to a member of NCTA who has contributed to the advancement of the association and industry through outstanding leadership of one or more of NCTA's 20 special or standing committees.

Aaron, who was elected vice-chairman of the Association in February of this year, was singled out for his outstanding performance during the past year as chairman of NCTA's Presidential Selection Committee and the Ad Hoc Committee on Multipoint Distribution Service (MDS). He was also lauded for his role in establishing and leading the activities of the Association's important Project 77 Committee in 1974-75.

During his years of involvement with NCTA, Aaron has also served

on NCTA's Legislative, Public Utilities, Public Relations and Community Services Committees. He was elected to the NCTA Board in 1973.

Aaron is vice-president and co-founder of Comcast, Corp., a Pennsylvania based owner and operator of CATV systems. Before joining Comcast, he was associated with Jerrold Electronics Corp., where he headed that firm's cable operations division.

Aaron holds a BA degree from Temple University and an MA in Economics from the University of Pennsylvania. He and his family reside in Elkins Park, Pa.

Boggs Award

Alfred R. Stern, senior vice president of Warner Communications, and a past NCTA Chairman, has been named winner of the Larry Boggs Award, the highest honor presented to a member of the cable television industry.

Stern received the award in ceremonies at the 25th annual convention of the National Cable Television Association. The Larry Boggs Award is presented by NCTA to an

individual who over the year made outstanding contributions to the advancement of cable television.

Stern has been involved in cable affairs for more than a decade. He was first elected to the NCTA Board in 1964 and later served as Chairman of the Association in 1966-67. He has more recently served as chairman of the NCTA Copyright Committee, and in 1974 was elected treasurer of the association.

Stern received NCTA's Outstanding Committee Chairman Award in 1969 and the industry's first recognition for "Outstanding Achievement in Inter-industry Relations" in 1971.

Formerly chairman of the board or chief executive officer of Warner Cable Corp., a wholly owned subsidiary of Warner Communications Inc., Stern is currently senior vice president, corporate affairs, of Warner Communications Inc. and is a member of the board of directors and executive committee of NCTA. Prior to founding WCC's predecessor company, TeleVision Communications Corp. (TVC), in 1964, Stern was with the National

Company (NBC) from 1952-
various executive capacities.
is a trustee of Kirkland
Clinton, New York; vice-
ran, Mt. Sinai Medical
chairman of the board of
Penix Theatre; a member of
boards of directors of the
rian Museum of Natural
the Starwood Corporation,
Gieve Corporation, and the
lf Overseers, Center for New
ity Affairs, New School for
Research.

Beisswenger Award
V. Schneider, CATV Vice
for the Times Wire &
Company, Wallingford,
has received the Robert H.
wenger Memorial Award.
he ward was presented during
ncies here at the 25th annual

convention of the National Cable
Television Association. The Beiss-
wenger Award is made annually by
NCTA to an associate member who
most typifies the "insight and
counsel and inspiring direction"
demonstrated by the late Robert
Beisswenger. Beisswenger, who died
in 1974, was NCTA national chair-
man from 1968 to 1969.

Schneider was cited for his spirit
of total involvement in and com-
mitment to the cable industry and
for his high standards of excellence
in aiding in its growth and develop-
ment for almost 25 years.

Schneider has been active in the
cable industry since 1952 when he
became system manager for the
Williamsport (Pa.) Cable Co. Two
years later he was named vice
president and general manager of
the system.

Pole Attachment Hanging On

pole attachment issue has
before the FCC for over a
but the most recent phase
controversy began in 1973
California telephone compa-
announced plans to double its
charge from \$3 to \$6 per con-
sumer year.

1975, NCTA and AT&T
an interim understanding
po attachment rates charged
System companies. How-
the meantime, the problem
been complicated as electric
panies and independent tele-
companies attempted to
rate increases for use of

their poles in an effort to generate
new sources of revenue.

Cable TV systems use more than
9 million telephone and utility poles
in the U.S. More than \$31 million
is involved at current fee levels.
Pole attachment fees are the "rent"
cable systems pay to telephone and
utility companies for the use of
their poles to string coaxial cable to
subscribers' homes. Use of poles
has been standard procedure since
the installation of cable TV by
other means is prohibitively ex-
pensive and some communities ban
the erection of additional poles
specifically for CATV use.

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EIAJ 8 pin jack (female)			
chassis/panel	E8JCM	1.71	1.53
EIAJ 10 pin plug (male)			
cable end	E10P	8.75	7.87
chassis/panel	E10PCM	7.70	6.93
EIAJ 10 pin jack (female)			
cable end	E10J	9.76	8.78
chassis/panel	E10JCM	7.28	6.55

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Chairman



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Laser-Optical TV Recorder

A new method of high-density recording that combines laser optical technologies to make it possible to store as many as 10,000 pictures on a single, 12-inch disc was unveiled by RCA for TV broadcasters.

The demonstration was described in a technical progress report" on varied recording techniques that initially could bring about drastic savings in TV studio operations.

Company officials said the method demonstrated was distinct from RCA "SelectaVision" Videocassette system which uses a capacitive pickup technology especially tailored for in-home use.

At the convention RCA engineers showed laboratory-built equipment that use mini-computer control to show the stored TV pictures can be randomly accessed and played in a fraction of a second. The demonstration recordings used one-inch band on the disc.

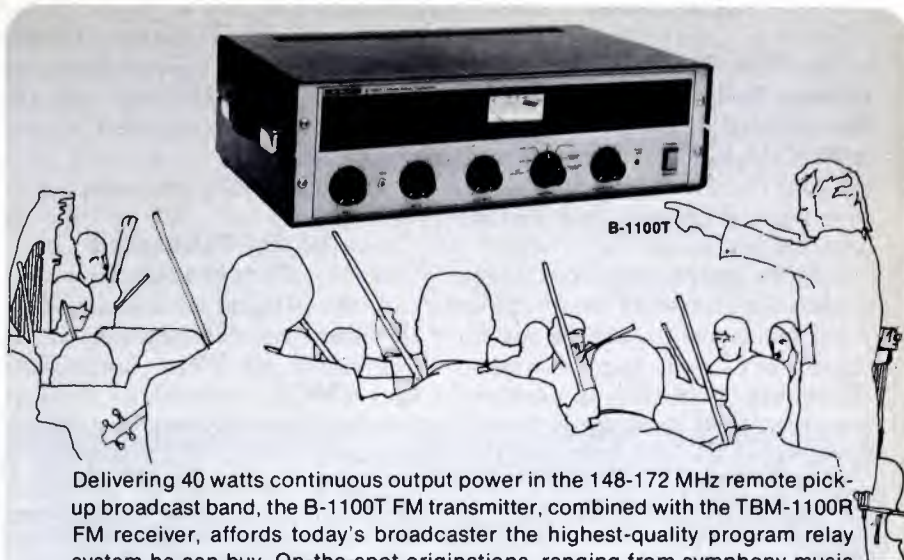
Mr. Vander Dussen, Division President, RCA Broadcast Systems, said the developmental unit can store one frame of TV picture in only three-thousandths of a square inch. This unit tracks on the disc for TV pictures occupy space only one-tenth as a human hair.

While the demonstration covered still pictures, Mr. Vander Dussen said the RCA technology was capable of recording pictures from film, video tape or other sources. "It is conceivable some years in the future a TV station could broadcast an entire program from disc recordings," he said.

In making a recording, the demonstration equipment employs a helium power laser, modulated by an electro-optic modulator, which is focused to a very fine spot on the disc, spinning at 1,800 revolutions per minute. The disc has a thin-film coating which, when affected by the laser, provides permanent recording of a single picture in one revolution of the disc.

For More Details Circle (165) on Reply Card

remote pickup broadcast systems



Delivering 40 watts continuous output power in the 148-172 MHz remote pickup broadcast band, the B-1100T FM transmitter, combined with the TBM-1100R FM receiver, affords today's broadcaster the highest-quality program relay system he can buy. On-the-spot originations, ranging from symphony music to emergency news-break coverage, puts the broadcaster "where it's at" ... quickly, economically and reliably.



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McMartin

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- Usable for Transmitting or Receiving Applications

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These circularly polarized omnidirectional antennas are designed to be employed in either transmit or receive operations. Their gain is 6.0 dB referenced to a like polarized isotrope. Coverage is a full 360° in azimuth and 19° in elevation at the half-power level.

Now through the use of Nurad's circularly polarized antennas, multipath signals that cause "ghosting" or "smearing" are greatly reduced or eliminated entirely.

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• 301-462-1700

For More Details Circle (64) on Reply Card

Solid State Quad-Stereo Exciter

The Phase 4 exciter produced by **Collins Radio Group, Rockwell International Corporation** not only delivers high-fidelity stereo sound, but also has the inherent capability of accepting discrete four channel broadcasting.

Collins guarantees that intermodulation distortion in the Phase 4 exciter is only 0.5% or less in stereo, and half that in mono. Harmonic distortion is normally less than 0.25% in stereo and 0.12% in mono.

Collins' Phase 4 exciter will accept a composite studio transmitter link (STL) input and will accept any of the proposed discrete quad systems.

The Collins unit was used last year in discrete four channel broadcast field tests supervised by the Electronics Industry Association (EIA).

Stereo separation typically runs 50 dB or more at midband, when measured with a properly calibrated monitor.

Collins' Phase 4 is a direct FM exciter employing a phase locked loop Automatic Frequency Control (AFC) to provide typical frequency stability of ± 100 Hz at any modulation level regardless of program material.

For More Details Circle (166) on Reply Card

Digital Framestore Synchronizer

A new Digital Framestore Synchronizer was demonstrated at the Convention by **Micro Consultants, Inc. (MCI)**, exclusive Western Hemisphere distributors of the product. Called the DFS-3000, the new unit is capable of storing 2 complete fields of video, and can synchronize any video source including VTR inputs. The source may be local or remote, fed by line or satellite.

The complete system occupies only 8.75 inches of rack space, weighs less than 60 lbs., and dissipates only 250 VA.

A number of options for the DFS-3000 were also demonstrated, all of which can be "plugged-in" to the basic system. These include an

Infinite Window Time Base rector that provides correction helical scan or quad VTRs, p sing either direct or heter color; a Video Compressor reduces the picture to 1/4 sta size and positions it in any c four quadrants on the scre Joystick Control that moves compressed image; Frame Field Freeze; and a Remote C Panel.

For More Details Circle (167) on Reply C

Discassette

Arvin Echo demonstrated new color frame stor™ that tronicly stores 400 slides-on-line—or, with the additi seven Discassette records, slides.

Each Discassette flexible r can store 400 frames. At \$ record, that's 20 cents per de Arvin Echo also offers ext DOC.

Called the EFS-1 Framestor unit has record and play capability.

For More Details Circle (168) on Reply C

Price & Performance that can't be matched!

DigiTec's full-function Universal Counter/Timers and Frequency Counters supply extended frequency ranges at a ratio of price to performance that can't be matched.

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150 MHz	...Frequency Counter	...8720A
150 MHz	...Universal Counter	...8520A
500 MHz	...Universal Counter	...8530A
600 MHz	...Frequency Counter	...8730A
1 GHz	...Frequency Counter	...8740A
1 GHz	...Universal Counter	...8540A

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For More Details Circle (120) on Reply Card

VTR Head Refurbishing

Computer Magnetics Corp. is prepared up to refurbish Mark video head assemblies.

The company offers one week turnaround on Mark III, Mark X, Mark XV, and Mark XX video assemblies. In addition, they refurbish audio stacks for VTR's. Discs and heads for slo-mo, and have immediate shipment. For More Details Circle (169) on Reply Card

Video Processing Amplifier

Industrial Sciences, Inc., ISI, has their model 550 video processing amplifier that was designed to raise quality to poor video pic-

ture. The 550 is a modular amplifier that removes hum and tilt. It also corrects new sync, while blanking and color burst give a completely new blanking interval with remote controlled blanking level.

Variable threshold white clip and level adjustments are provided. The horizontal timing control allows the output to be phased with the incoming video.

Color and white stretch modules are available options.

For More Details Circle (170) on Reply Card

Portable TV Camera

Audio version of the IVC-7000P portable television camera was introduced by International/Ideo Corporation.

Gold H. Fried, IVC President and Chief Executive Officer, said the new version features a special mounting configuration that includes a seven-inch viewfinder for focus. The camera head connects easily to the standard field

camera. The IVC-7000P camera uses seven-inch Plumbicon™ tubes, with performance identical to the studio camera which has a resolution of 51dB.

To convert the studio camera to the portable model the camera is detached from its mount, lens and viewfinder, and fitted with a remote control and small viewfinder in less than three minutes.

For More Details Circle (171) on Reply Card

Miniature Hand-Held Camera

A tiny hand-held electronic camera smaller and lighter than the traditional film cameras used in television newsgathering was shown for the first time at NAB.

Developed by Thomson-CSF Laboratories, Inc., in cooperation with the CBS Television Network, the portable camera—called Microcam because of its micro-miniature electronics—weighs eight pounds. A

companion three-pound electronic hip pack, which can be worn around the waist, makes it possible to operate the camera in any situation, such as fast-breaking news events, to beam high-quality color TV pictures. The camera's low power consumption of 20 watts enables it to operate on standard flashlight batteries in an emergency.

For More Details Circle (172) on Reply Card

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For More Details Circle (44) on Reply Card

ENG Signal Processor

Microtime, Inc., a subsidiary of Andersen Laboratories, Inc., of Bloomfield, Connecticut introduced a new development for processing and improving the video signal of helical VTR's.

Lower cost helical VTR's, particularly the popular U-Matic cassette machines, have enjoyed wide spread use by broadcasters, mostly

in Electronic News Gathering (ENG) applications. Expanded use, however, has been limited by signal to noise levels and picture "softness" when compared to traditional, but more costly VTR's. Annoying picture breakup caused by tape deck movement during recording has also been a problem.

Microtime's new unit, called Model 2020 Electronic Signal Processor, compensates for the

U-Matic picture limitations, as providing time base correction for house-locked NTSC playbackstan-servo'd VTR's.

The 2020 eliminates picture breakup, caused by moving recording deck, making use of new, integral AUTO-TR feature.

The correction range of the is $\pm 2H$ lines, approximately greater than prior units.

In addition, drop-out correction functions are available as plug-in options, for those speed helical formats requiring additional refinement.

The picture improvement provided by Microtime's 2020 applies to all non-segmented helical formats.

For More Details Circle (173) on Reply Card

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For More Details Circle (69) on Reply Card

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For More Details Circle (135) on Reply Card

Digital Clocks

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Series 1000 Digital Clocks are priced totally of CMOS circuitry. Their design is compatible with computer systems, and programmed to elapse or real-time with low power consumption at the lowest possible prices.

The Series 1000 Clocks offer standard computer compatible BCD 1248 data-serial by character or parallel by bit with digit address data and clock or calendar output line. Optionally, they are available with BCD 1248 parallel output data.

The standard Calendar Model 1010, displays Months, Days of-Month, Hours, Minutes, Seconds. A European version of the same basic design, Model 1011, also available, but with output display data in terms of the traditional European format.

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For More Details Circle (71) on Reply Card

program and 55 dB on monitor. The program frequency response is ± 0.5 dB, 20 Hz to 20 kHz. Harmonic distortion is 0.5%, 20 Hz to 20 kHz at 14 dBm.

For More Details Circle (175) on Reply Card

Oscilloscope Battery Pack

A new Philips universal battery pack—PM8901—has been introduced by Philips Test & Measuring Instruments, Inc., a subsidiary of North American Philips Corporation.

The new battery pack, the PM8901 can be used with almost any of the company's range of oscilloscopes, in 'free from line' situations.

Both high and low output are available, nominally 24 V and 180 V DC. The 'low' output is derived directly from the sealed lead-acid batteries, while the 'high' output is produced via the high-efficiency DC-DC converter.

This unit is fully protected against excessive input voltage, short-circuit and excessive dis-

Model 1020, the Julian Clock, displays and outputs time in terms of Year-of-Year, Hours, Minutes, and Seconds. The Day Clock, Model 1000, displays and outputs time in standard day format—Hours, Minutes, and Seconds.

For More Details Circle (174) on Reply Card

Reel Tape Switcher

Model 1020, the Julian Clock, displays and outputs time in terms of Year-of-Year, Hours, Minutes, and Seconds. The Day Clock, Model 1000, displays and outputs time in standard day format—Hours, Minutes, and Seconds.

Reel Tape Switcher. This unit is self contained, operating -20 dBm to +8 dBm 10 kHz. The front panel controls include a program selector, telco feed select, monitor input select, program gain control, two-way output select, and a monitor speaker is built-in.

Inputs and outputs are wired with phenol blue ribbon connectors at the rear of the unit. Maximum gain is 28 dB on

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charge and cannot be overcharged.

Connection to any of the Philips oscilloscopes (PM3232/3233, PM-3240, PM3240X, PM3244, PM3261 and PM3265) is achieved without previous oscilloscope modification. This facility is of special advantage to multiple oscilloscope users since it avoids tiresome pre-purchasing decisions and the extra costs of modifying individual units.

This 'high' output can be discharged into loads of 5 to 55 W. Typically, a 20 W load will provide 6.5 hours operating time. The 'low'

output can be discharged at rates up to 3 amperes. A discharge rate of 0.75 A will give 9 hours operating time.

Charging time of the pack (from a fully discharged condition) is 8 hours or less, to 90% rated capacity and 10 hours or less, to 100% capacity.

For More Details Circle (176) on Reply Card

Mono/Stereo Consoles

The new **Spotmaster® 4006** slide-mod is a complete, versatile, totally modular console for the broadcaster.

It accepts up to ten input and two remote modules (a total of 26 inputs) or 12 input modules (a total of 24 inputs). Each input module accommodates two high or low level (switchable) sources. In stereo modules, left and right channels of each input are individually level selectable. All inputs are balanced and specially RFI protected.

Each module is completely enclosed and shielded. Each module also contains its own voltage regulator to eliminate cross-talk and

externally generated noise "live" switching is performed fast, low-noise reed relays for and distortion-free operation mix-buss output of each mod balanced to eliminate the possibility of unwanted noise pick-up, talk, or ground loops.

The Slide-Mod consoles four muting/control relay miniature switch matrix and in 2 of the 10 input modules any relay to be programmed function when any combination of inputs and mix-busses are active (16 combinations for each module!). Monitor outputs relay contacts are brought out on each relay.

For More Details Circle (177) on Reply Card

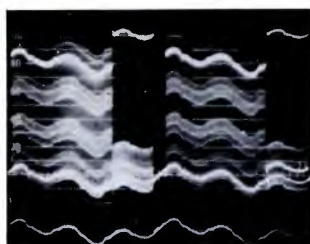
ENG Camera

Following their FP3030 and 70 ENG cameras, **Hitachi Shiloh** added to their line with an all lightweight color camera designed for ENG applications.

Totally self-contained, the S should be of interest to the ENG station.

For More Details Circle (178) on Reply Card

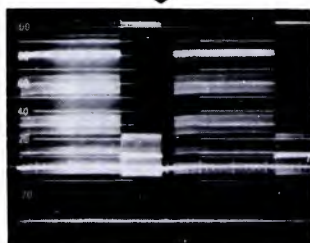
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For More Details Circle (73) on Reply Card

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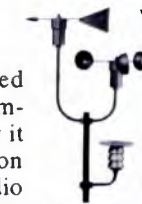
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BROADCAST ENGINEERING

ENG

Image Enhancer

television image enhancer for field cameras and portable tape recorders has been introduced by **Corning Glass Works.**

The Series 6100 ENG (electronic gathering) unit is designed for even minimal picture information is available at sub-frequency, a common circumstance at remote locations, Eng said. If presently available cameras are used, noise adversely affects the picture, the company said.

Eng also said that, like its other image enhancers, the Series 6100 ENG unit offers an excellent photo-noise ratio.

For More Details Circle (179) on Reply Card

Portable ENG Test Generator

E. G. news crews and engineers at remote locations can quickly and conveniently set up cameras, tape recorders, microwave and other equipment with a new lightweight signal generator manufactured by **Lab, Inc.** and distributed by

T.E.A., Bayville, New York.

The five-lb. generator, powered by eight C cells, supplies the NTC-7 composite test signal comprising a five-step Stair Step with color sub-carrier, a 2-T Sine Squared Pulse, a 12-T Chrominance Pulse, and a T-Window. It has its own digital color sync generator and video output meter.

To conserve batteries, the "power on" switch has an automatic shutdown which is internally adjusted.

For More Details Circle (180) on Reply Card

Helical VTR

Video Memory, a wholly owned subsidiary of **Recortec, Inc.**, introduced the VM-1000, a high band helical scan VTR, featuring servo controlled tape tension with vacuum chamber buffers. The VM-1000 video tape recorder is a new generation transport design which has a single capstan drive system with vacuum chambers and servo tape tension control that eliminates the belts, brakes, clutches and retrievable guides commonly associated with older generation video tape transports.

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For More Details Circle (76) on Reply Card

The VM-1000, one-inch VTR achieves interchangeability with other "omega" format helical scan VTR's. The signal quality of the 7-10 MHz high band signal system in the VM-1000 falls mid-range between the high performance 2-inch quad and helical machines and the lower performance one-inch and 3/4-inch video tape recorders. The VM-1000 boasts exceptionally low S/N ratio and reduced moire to provide post-production capabilities with multiple generations.

The VM-1000 claims excellent vertical interval editing and features independent audio and video editing with insert and assemble capability. The built-in remote control capability for all primary operating controls insures plug-in compatibility with all Recortec micro-processor-based VTR controllers.

For More Details Circle (181) on Reply Card

Lock-Down Reel Retainer

The VIF 1000, a brand new reel lock-down retainer, has been de-

veloped to provide a quick-loading, highly reliable method of securing both NAB and RETMA tape reels in place. This precision designed retainer, which works with either 1/4" or 1/2" reels on both rack and console mounted recorders, will stand up to the roughest handling and give years of trouble-free service.

When used with NAB reels, the VIF 1000 retainer can be permanently locked on the shaft. To secure the reel in position, simply align the retainer's protruding lobes, place the reel over the retainer onto the turntable, then lift and rotate the upper half of the retainer 60° in either direction, thereby locking the reel firmly in place.

For More Details Circle (182) on Reply Card

Font Compose System

The Thomson-CSF Font Compose System gives Vidifont IV users the electronic capability of developing their own distinctive video graphics.

This system enables TV sta- and networks to generate, w their own facilities. any log other special graphics desire any alphanumerical characte any type face. The Graphics P sor automatically incorporates characters into an existing gra repertoire.

All of the artwork set-ups electronic graphics composition performed by using the Re Control Panel and Imaging Fi The Processor itself can be mounted with the Vidifont S equipment.

In the Set-up Mode, e original artwork or a repro image is placed on the Im Fixture and copied by the n chrome copying camera. Moni is used for initial set-up focusing. Monitor B displays digitized version "seen" in Processor memory. Superim on Monitors A and B is a refe frame grid which allows the u define the final height, width, baseline parameters of the gra to be captured. Once these vari have been defined, the fi magnification ratio can be v over a 10 to 1 range to accor date the artwork being display

When this initial set-up is factory, the Processor is plac the Edit Mode, and the vid captured in memory. A signifi feature of the System is its a to modify any part of the cap video by means of an X-Y c display positionally controlled by means of a joystick, which is located on the Remote Co This feature, with the aid optional lightpen, even a graphics to be generated " scratch"—without using any ca at all. Since the display magni on Monitor B can be 10X size, it is easy to work individual video elements 4 wide by 1 scan line high, which enlarged to 450 ns x 10 scan high.

For More Details Circle (183) on Reply C

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For More Details Circle (161) on Reply C

BROADCAST ENGINEER

Video

(continued from page 78)

in mix machines such as the RCA quads with IVC and Sony U-Matics. Remote switchers and synchronous recorders can also be interlocked and all control functions are coordinated over a single twisted pair. CMX, of course, was not alone in exhibiting complex time editors.

RCA and Ampex offered packages which were combinations of their own manufacture and off-supplies such as EECO and RCA claimed the first quad (AE-600) with built-in microprocessor which could perform all editing functions with great precision. The AE-600 editing system also relied on PROMs* to do its editing in both manual and automatic modes, controlling two devices. Ampex offered the AE-600, an artistic editing system which combined a floppy disc memory with a computer controlled editor and interfaces for up to two video, audio or disc recorders. Datatron had a whole new line of editing equipment, called Tempo which used microprocessors in a control center and which permitted starting with a pulse count and at a relatively low price (AE-600) then upgrading to SMPTE code editing by the addition of appropriate generators and readers. Even previous Datatron systems, the control console was of very modern design and relatively easy to use.

Non-time code editors were also in evidence all around the show. Recortec's Edimatic 100, the EA-5, and Convergence Corporation's ECS-1 and others offered a wide range of broadcast editing on-broadcast applications. Simplicity and low cost are still main goals. However, even these are becoming more sophisticated in handling the pulse count approach. Recortec's unit can



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... LPB's S-15, 8-Channel, Dual-Output Mono Signature Line Audio Console with 19 inputs (shown) is one giant value. So is LPB's S-14, 5-Channel, Dual-Output Console with 15 inputs. In addition to moderate prices and excellent performance, both consoles feature:

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Beau audio heads are available from stock and may be used in Ampro, ATC, Beaucart, Collins, Garron, Gates, ITC, RCA, Sono-Mag, Sparta, Spotmaster, and other popular machines. Order as follows:

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For More Details Circle (81) on Reply Card

NAB Video

(Continued from page 105)

memorize 10 edit points and is applicable to helicals or quads with frame accurate precision. TRI continue to offer their EA-5 pulse count editing console which interfaces with most helical machines; but they also have developed a "SUN" television time code system which puts the address code into the video signal train without using up the audio or cue track. Peripheral accessories include portable time code generators (Porta-Sun), code readers SUN III and a tape search unit (TSC-1).

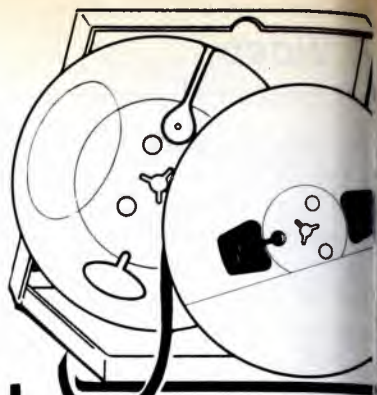
Convergence Corporation, a more recent entry into the editing field displayed a very compact console editor that interfaces with most helical recorders. However, their major application seems to be in the 3/4" cassette VTR field. A unique feature of their ECS-1 "Joy-stick Videola" editor is the pair of levers that permit easy manipulation of the VTR's to a particular frame through manual jogging in either direction.

The range editing equipment available covered virtually every level of operational complexity desired at prices that encompassed a \$5,000 to \$150,000 spectrum. For the studio or TV station needing an edit capability, it was only necessary to define it and select the price/performance package that applied.

Digital Time Base Correctors

Digital techniques in television signal handling saw their first major acceptance in the time base correction field. It seems hard to realize when looking at the wide assortment of TBCs now available that the Emmy given to CVS for this technical achievement is only five years old.

The NAB show hosted 12 different TBC's using digital techniques which were designed to stabilize video signals from quads, helicals and video discs. Three of the oldest manufacturers in the field - CVS, Quantel and TMI - had a few surprises to offer. Sony also entered this product line with a stand alone unit and Ampex, RCA, Digital



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For More Details Circle (82) on Reply Card



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BROADCAST ENGINE

KSN and others continue to use their standard TBC pro-

CVS-504 was augmented this with a pair of new TBC's that cover both the lower and higher end of the price scale. Their 510 model as a low cost digital TBC (\$6,000) and was aimed at the non-broadcast market. The features in this unit are scaled down to include a correction window and a 6 line sampling at 4 times subcarrier. It handles heterodyne color and black and white VTR's. The model 510 features features not found in the 504 at a higher price (under \$10,000). It included 9 bit 4 times subcarrier PCM sampling, line by line velocity correction, automatic tracking between direct and heterodyne color and access to the video signals through a rear panel connector. The packaging of the units was attractive with an anodized sliding strip that covered the exposed screw-driver adjustment for setup purposes.

Television Microtime's display had some notable innovations in their model 2020 digital TBC which was demonstrated to show the elimination of inertia problems encountered with portable cassette VTR used in ENG. Playing back a tape obviously made when the recorder was under-going severe physical movement, there was no indication of streaking or breakup. TMI also added an option for color signals which provides image enhancement and a 3 dB signal-to-noise ratio improvement to the output signal. An internally adjustable switch allows for group delay precision in 50 nano second steps, useful for multi-generation dubs. The Ampex stand alone TBC (model 800) is also available for Ampex VTR's and was being marketed on 3/4" cassette units. It can be fitted with extra options

(Continued on page 108)

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such as a sync pulse driver, velocity compensation and an FCC sync standard.

The Quantel 2200 (represented by IVC in the USA) was shown in its own booth and has the capacity to handle any type of VTR output including noncapstan servoed machines and produce a phase locked signal output that is held within ± 2.5 nano seconds. With a 3H correction window and a 5 line store, the Quantel TBC can cope with the gross errors produced by small VTRs used in ENG. Standard features on this unit include dropout and velocity compensation, sync pulse generation and genlock.

Digital Video Systems (formerly Digital Video Labs) showed their TBC equipped with a special digital interface that permitted unusual manipulation of the reproduced image. Their DVL 2002 could not only stabilize jittery signals by analog to digital conversion, but could also produce special effects that looked like the image was on a plane that was moving like a door opening and closing or turning over. According to John Lowry, the developer of this TBC, the potential manipulative possibilities for the digitized image signal are endless.

Digital Techniques

Digital techniques were also in evidence on a number of products other than TBC units, switchers, frame store synchronizers, disc recorders and standards converters to name a few.

The CDL 480 video switcher used digital conversion to provide image manipulation during switching that gave a 3D effect to the viewer. Their Sequential Effects (SFX) amplifier was claimed to be superior to a triple mix switcher and certainly attracted SRO audiences when they put on their show every 20 minutes.

If storing a frame is your game, then the RCA, Quantel (Micro Consultants) or CVS units could serve as synchronizers to any input NTSC signal providing mix capabilities between studio and all remote feeds. Options on these units allow for compressed images which can be positioned anywhere on the screen, multiple multiplexing of several non-synchronous remote

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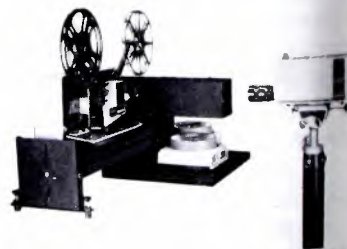


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Non-Commercial Rules (Continued from page 88)

the Commission pointed out. the establishment of such a table did not feasible, the FCC said it would consider any tion that could show that a Table of Assign- s for noncommercial stations was in fact . Commission pointed out that it previously proposed several possible ways of treating stations, but said a different approach was as the earlier ones were premised on the tainment of a noncommercial FM Table of gments. The Commission agreed to consider CPB's pol that noncommercial stations should be e protection in terms of coverage areas so that ould be able to improve their facilities and er more efficient coverage. To do this, the FCC ead a willingness to consider several possibili- ng from protection of stations to the

maximum facilities for their class, alteration of the present classes of stations, or changes in the facilities available to the stations of the various classes. It expressed concern that the current pattern of usage by 10-watt stations offering only limited service could reduce or even prevent the opportunity for the establishment of more powerful stations able to reach larger audiences.

The Need For Standards

While recognizing the argument that some 10-watt stations were engineered so as to have no significant preclusive effect, and that others are used to provide a needed service to a locality or neighborhood, the FCC decided that standards needed to be established that could provide the most efficient usage for all noncommercial FM stations.

AI Video Article starts on page 20

al that can be shown on the e screen in a split or quad ma and a non-destructive read- to freezing a field or a frame. er uantel unit is even small ug to carry in a standard tote e. The Marconi Communications ata included digital intercon- onal conversion equipment EE which permits 525/60 NTSC e andards translated into 625/ PA or SECAM and vice-versa. ay of the programs seen in eh America direct from Europe ymics, etc.) and conversely, rns originating in the USA li or delayed transmission in eo: (space shots, etc.), go ou such digital standards con- er to make the video signals ub in the recipient country.

If you can't make the best picture possible at the output of your device, then maybe it can be improved by synthetic means. A wide variety of image enhancers were on display covering various types of origination or reproduction units from cameras to VTR's. Corning, Dynasciences, 3M, TRI and Yves Faroudja, Inc. were among those offering enhancers for different applications and at various levels of performance and price. Corning's enhancers were directed mainly toward the camera end. Their Series 6200 RGB unit uses the signal from the green channel which has the best resolution to generate contour signals added to the red and blue channels. They also had in line composite enhancers on display. Dynasciences had a wide range of enhancers for

both RGB signal sources (contours from green) and for encoded signals in which comb filtering and vertical aperture correction is used to improve apparent image sharpness. Two new enhancers designed specifically for "color under" VTR's such as the Sony U-Matic were being shown by TRI and Yves Faroudja, Inc. The CRISP-MATIC unit made by YFI combined four functions to improve U-Matic type signals, edge enhancement by frequency synthesis, noise reduction through coring techniques, color crosstalk elimination with comb filtering and chroma delay correction that could be set to match the recorder being used. Stand alone enhancers range in price from approximately \$1500 to well over \$5000, depending upon their application and internal complexity. □



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WHATEVER YOUR EQUIPMENT NEEDS—new or used—check us first. We specialize in broadcast equipment. Send \$1.00 for our complete listings. Broadcast Equipment & Supply Co., Box 3141, Bristol, Tenn. 37620. 3-75-tf

MAGNECORD PT6-A RECORDERS. Rebuilt units and new and used Magnecord, Telex, Viking, and Spotmaster parts. Huge supply, lowest prices. **REBUILT CARTRIDGE TAPE EQUIPMENT.** Spotlessly clean and thoroughly tested. 30 day moneyback guarantee. **ONE YEAR warranty.** **REPAIR AND RECONDITIONING SERVICES** for cartridge equipment by factory trained technicians. Send for complete information: AUTODYNE, Box 1004, Rockville, Md. 20850, (301) 762-7626. 8-75-tf

BROADCAST CRYSTALS for AM, FM or TV transmitters. frequency change, repair or replacement of oven types. Also new 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 frequency monitors. Over 30 years in the business. Eidson Electronic Co., Box 96, Temple, Texas, 76501. Phone (817) 773-3901. 12-74-tf

A FEW COMPETITIVELY PRICED used Revox A77 and A700 decks available. Completely reconditioned by Revox, virtually indistinguishable from new and have the standard Revox 90 day warranty for rebuilt machines. Satisfaction guaranteed. Example, A77 with Dolby, \$675, plus shipping. Write requirements to ESS!, Box 854, Hicksville, N.Y. 11802 (516) 921-2620. 5-76-tf

MOTORS FOR SPOTMASTERS

NEW Paps hysteresis synchronous motor HSZ 20.50-4-470D as used in series 400 and 500 machines. Price \$49.00 each prepaid, while they last. 90 day warranty. Terms check with order only, no COD's. Not recommended for Tapecaster series 600 or 700.

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Rockville, Maryland 20851

1-72-tf

SPOTMASTER EQUIPMENT AND PARTS now in Texas from Sales Southwest, 4002 Houston Highway, Victoria, Texas 77901. 512-578-4323. 11-75-tf

FULL LINE TUNING and phasing components available, including contractors, also large supply separate contacts for E. F. Johnson contractors. Write: Geleco Electronics, Ltd., #2 Thornciliffe Park Drive, Unit 28, Toronto 17, Canada. Phone: (416) 421-5631. 2-75-tf

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. 3-76-tf

LOGGING SYSTEM, complete, English text with two teletypes, digital clock, encoder & decoder, prints hours, minutes, seconds and AM-PM. Nearly new \$4,800.00. Belar FM RF amplifier, new condition, \$275.00. Moseley RPL-2, \$475.00. Hewlett Packard Counter, Mod. 524, with time interval and 100 mc. plug in's, \$495.00. KSRN, Reno, Nevada 89501, 702-786-1045. 3-76-3t

GE PE-250 Color Camera, GE TY-106B helical antenna ch. 22, Collins stereo console 212S-1, more items on list. S. R. Cathrall, WEZF-TV, Box 22, Burlington, Vermont 05401, (802) 655-3663. 4-76-3t

350 FT. IDECO self-supporting, heavy-duty, galvanized, triangular steel tower. Dismantled, with two beacons, clearance lights, photo electric controls and flasher, bolts and nuts. Bundled, ready to ship, \$35,000.00. Have prints, (608) 784-7373, William Bruring, WWLA, La Crosse, Wisconsin 54601. 4-76-4t

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USED RCA TR-22B VTR—High Banded with Editor, DCC, Compressor, used Headwheel panel, Auto guide and Cue. Low hours, no problems. Call Lowell Shore, 616-775-3478. 4-76-2t

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AUXILIARY GENERATOR: KOHLER ELECTRIC PLANT, MODEL 15 RM62, 15KW SINGLE PHASE, NATURAL GAS, \$3,500.00. CALL RAY GARDELLA, (915) 544-7876. 5-76-2t

HELP WANTED

MAINTENANCE TECHNICIAN: An opening with a Hallmark Cards subsidiary in Crown Center, Kansas City, Missouri. We need a Maintenance Technician for a closed circuit color TV system. Cameras include both studio and ENG type equipment. Emphasis on 3/4 in. U-MATIC video cassette format. RF or MATV experience helpful, but not necessary. In addition to a good salary commensurate with experience, we offer outstanding benefits including company-paid hospitalization, life insurance and profit sharing. Call Virginia Kirlin, collect, 816-274-5663. Hallmark Cards, Kansas City, Missouri 64141. An equal opportunity M/F employer. 5-76-1t

WEST COAST SALES ENGINEER—Professional audio console manufacturer requires aggressive Sales Engineer to establish West Coast Office. Solid background required in professional audio sales and/or engineering with minimum of 5 years experience. All replies treated in confidence. Send resume & salary requirements: Dept. 353, Broadcast Engineering, 1014 Wyandotte St., Kansas City, Mo. 64105. 5-76-1t

AUDIO ENGINEER. Southeastern university-based 50,000-watt FM, with STL, SCA, remote, automation. First ticket required, degree desired. Salary open. Immediate need. EEO Employer. Contact Harold Baker, MTSU, Box 3, Murfreesboro, Tenn. 37132. 5-76-1t

TV SYSTEM ENGINEER WANTED. Graduate engineer, experienced in Microwave and CATV systems to work in system planning and installations for largest MDS operator. Approximately 25% travel. Contact Microband Corporation of America, 176 Broadway, New York, New York 10038. 4-76-2t

BROADCAST EXECUTIVE—Group Broadcaster seeking operations executive to serve as administrative assistant to the President. Duties include coordination of station day-to-day operations with home office, including the supervision of engineering projects with each station's chief. Man with good technical background preferred. Salary commensurate with experience and capability. Write in complete confidence detailing experience and general background to: Dept. 351, Broadcast Engineering, 1014 Wyandotte St., Kansas City, Mo. 64105. An Equal Opportunity Employer. 5-76-1t

TELEVISION TECHNICIANS—Excellent career opportunity in public broadcast station operated by West Virginia University, located 70 miles south of Pittsburgh, PA in scenic mountainous area. Experience in color studio operations and maintenance. First class FCC license required. Forward resume and salary requirement to: Mr. E. J. Podeszwa, Personnel Officer, West Virginia University, Morgantown, WV 26506. An Equal Opportunity/Affirmative Action Employer M/F. 5-76-2t

FM STEREO ENGINEER with technical ability and maintenance experience wanted. Must be willing to assume many departmental responsibilities. Good opportunity/Good benefits. Send resume and salary requirements to: Box 800, Sault Ste. Marie, Michigan 49783. 5-76-1t

OPPORTUNITY for salesman in growing FM spot sales market. Production experience helpful. Sales experience essential. Salary commensurate with experience and ability. Send resume to: Box 800, Sault Ste. Marie, Michigan 49783. 5-76-1t

TELEVISION STUDIO MAINTENANCE ENGINEER/TECHNICIAN—Corporate non-broadcast, b & w four camera, IVC studio with color potential seeks staff engineer/technician for all maintenance and some operational duties. Midtown Manhattan location. Five years relevant technical television experience. Degree helpful but not mandatory. Good benefits and working conditions. Salary \$15,000 to \$18,000 depending on qualifications. Resume to Box 666, Suite 1501, 183 Madison Ave., New York, NY, 10016. An Equal Opportunity Employer, m/f. 5-76-1t

HELP WANTED (CONT.)

CREATIVE, AGGRESSIVE number tv strong on all phases of transmitter and maintenance for full-time 5 KW AM and automated stereo FM. Opening in new facility, excellent working conditions. Reply in confidence to De Broadcast Engineering, 1014 Wyandotte, Kansas City, Mo. 64105.

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OT 157

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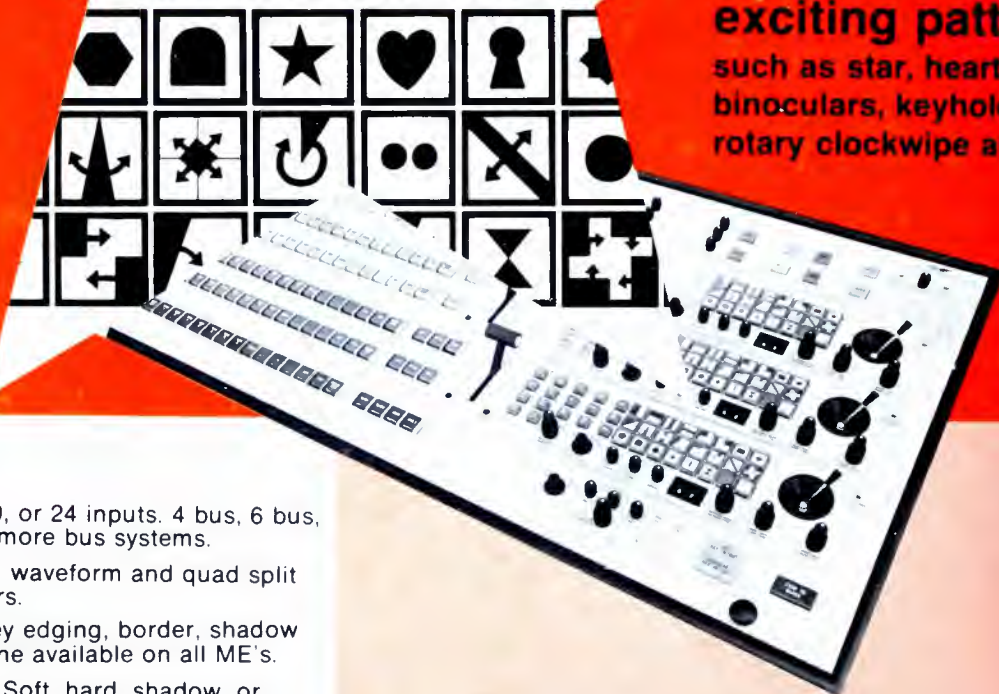
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