APRIL 1973

BM/E

BROADCAST MANAGEMENT ENGINEERING

Instrumentation "Tells All."

Broadcasters push for radio deregulation.

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TV CAMERA PICKUP TUBE

This is the tube
that was in the camera
that revolutionized TV broadcasting
seven years ago.

This is the line, the only line that includes all four types of one-inch camera tubes currently used in today's TV cameras.

Amperex, who gave the TV industry the Plumbicon camera pickup tube seven years ago, is the only manufacturer of all of the four types of one-inch pickup tubes used in today's TV cameras.

Recognizing the obligations that have accrued to us as the number one source for the component that is the heart of the TV camera, we extend an invitation to anyone who is contemplating the purchase or the design of a TV camera system to discuss his specific requirements with us, with complete confidence in the objectivity and validity of our recommendations. Whatever the application —color or black and white, telecasting or video-taping, CCTV or CATV, industrial, educational or medical, surveillance security or military reconnaissance.

Electro-Optical Devices Division,
Amperex Electronic Corporation,
Slatersville, Rhode Island 02876
Telephone: 401-762-3800

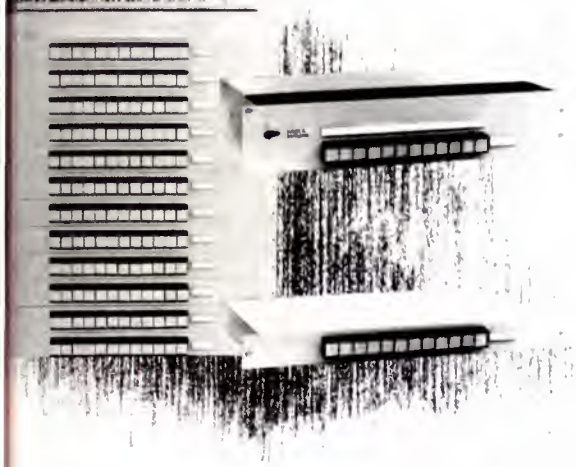
Amperex®

TOMORROW'S THINKING IN TODAY'S PRODUCTS

Sold through
North American Philips Electronic Components Corporation

*Trademark of N.V. Philips of The Netherlands

DYNAIR's price catalog describes these new products and over 150 others.



NEW "PATCH CABLE ELIMINATOR"

DYNAIR's new Series X Video Audio Switchers eliminate the custom fabrication usually required for routing switchers. These units are totally modular, allowing off the shelf assembly of almost any input output configuration, either video only, or audio follow video. And, expansion is easy too . . . you simply add input or output expansion modules as required.

The basic unit is video only, with options including audio, sync mixing and tally provisions. Illuminating pushbuttons are standard, with provisions for easily labeling the individual inputs and outputs. The new Series X provides exceptional performance at prices which are, in many cases, much less than our earlier version of the Series X.

EW SPECIAL EFFECTS GENERATORS

NAIR's new SE-70A and SE-70A-R Special ects Generators allow basic effects to be easily l inexpensively added to any television system. ese broadcast quality units operate equally well color or monochrome signals, with either broad- t or industrial sync. A quality locking-type gear- ven effects mechanism is used, allowing effects be easily implemented.

The units provide horizontal and vertical wipes, erts from any corner with diagonal expansion, l internal and external keying and matting. The -70A is self-contained for console mounting and SE-70A-R is an electrically identical remote- ntrolled unit, the control panel of which may be ily mounted in custom panels.

NEW DYNAIR "PRICE CATALOG"

DYNAIR's new price catalog has been designed to provide you with a quick look at the large variety of equipment we manufacture and our current price on each item. We think that you will appreciate the convenience of this new catalog/price list combination . . . it's a very handy reference guide to DYNAIR's world of television.

Request your copy today . . . we think you'll like what you see.

DYNAIR ELECTRONICS, INC.
6360 FEDERAL BOULEVARD
SAN DIEGO, CALIF. 92114 U.S.A.
TELEPHONE 714-582-9211

DYNAIR

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BM/E
BROADCAST MANAGEMENT/ENGINEERING

APRIL 1973/VOLUME 9/NUMBER 4

Coming Next Month: NAB 1973 Show-In-Print

CM/E MAGAZINE: For those with cable interests/Following page 34.

How to use the telephone (in unusual ways) and the spectrum analyzer (in new ways) are suggested. See articles on pages 24 and 28 for more information.

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Editor
James A. Lippke

Associate Editor
Robin Lanier

Contributing Editor
M. L. H. Smith

Assistant Editor
A. E. Gehlhaar

Art Director
Gus Sauter

Production Manager
Arline G. Jacobs

FCC Counsel
Pittman Lovett Ford Hennessey and White

Advertising Director
Charles C. Lenz Jr.

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A NEW GENERATION OF VIDEO SWITCHERS
THE GVG 1600 SERIES

MAJOR FEATURES

● Soft Wipe (VIDEO VIGNETTE) ● Linear Chroma Key ● Linear Matte Key ● Automatic Black Burst ● Complete N/S Inhibit ● Separate Pattern Generators ● Borderline* ● Wipe Pattern Borders ● Color Background ● Quad Split* ● Downstream Keyer* ● N/S Fade to Black ● 16 or 24 Input

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BROADCAST INDUSTRY NEWS

Standards Proposed For Antenna Sampling

The FCC has issued a rule making and inquiry notice on minimum standards for equipment used in sampling antenna currents and phases in directional systems, to make sure the monitors required are reading the pattern correctly. The inquiry resulted in large part from representations to the FCC, during hearings on the new antenna monitoring requirements, that much of the sampling equipment in use was of poor design, had aged out of alignment, or was poorly maintained. Among the proposals are requirements that the sampling lines be of equal length and subject to equal environmental conditions; have solid outer conductors proportioned to produce minimum phase/temperature change; and with identical electrical characteristics. Sampling elements are proposed to be rigid, single-turn, unshielded loops, with all loops mounted at same height, and with other requirements to insure uniformity. The FCC invited comments and suggestions by May 7, 1973.

New Video-Film Process, Chromatran I, In Use

Another process for transferring color videotape material to 16mm and 35mm film, called "Chromatran I," has been put into use by its developer, Video Tran, Inc., Chicago. Calling its process the "fourth generation" of video-film transfer technology, with the EBR electron-beam process as the third generation, the firm announced the Chromatran I development late in February with great fanfare and extensive claims for superb quality, but did not reveal a single fact about technical operation of the system. Preliminary line on how results compare with those of the EBR and CBS laser-beam systems (the latter not mentioned in the Video Tran publicity) must wait for some months of user experience.

Video Tran, Incorporated principals, left to right: David Bell, vice president, engineering; David Hartman, marketing manager; L. J. (Jack) Cook, president.

Canadian Cable Group Attacks Bell Pole Restriction

The Canadian Cable Television Association in February urged the Canadian Transport Commisssion, national regulatory body, to rule that Bell of Canada abandon its restrictive rules on access to poles for cable systems. CCTA spokesmen said that Bell had refused to discuss an acceptable pole access agreement with cable companies, thus depriving many Canadians of cable service they would otherwise have. CCTA said that the poles constituted a public resource that should be available to all recognized services on reasonable terms, as they are in many parts of Canada and the United States.

New Non-Prescription Drug Rules Adopted by NAB

In another action aimed at tighter regulation of television advertising, the Television Code Review Board of the NAB adopted new rules on non-prescription drug ads which are to go into effect September 1, 1973. The intent of the new rules, said the NAB, is to encourage advertising which gives factual information about the products, advises users to read the label, and avoids representation that the product will alter the user's mood or otherwise perform beyond what can reasonably be expected. Barred under the new rules are: on-camera taking of pills; drug ads in or adjacent to children's programs; using children in ads for drugs intended for adults; personal testimonials on drugs by celebrities or authority figures; approaches which imply a casual attitude to the use of drugs; reference to a non-prescription drug as "non-habit forming" or "non-addictive." Code Board Chairman Max Rice said: "In taking these actions, the Code Board demonstrated again that voluntary self-regulation machinery can protect the public interest by dealing effectively with difficult issues." Mr. Rice said that the NAB will hold a workshop for broadcasters to discuss the new drug rules, date and place to be announced later.

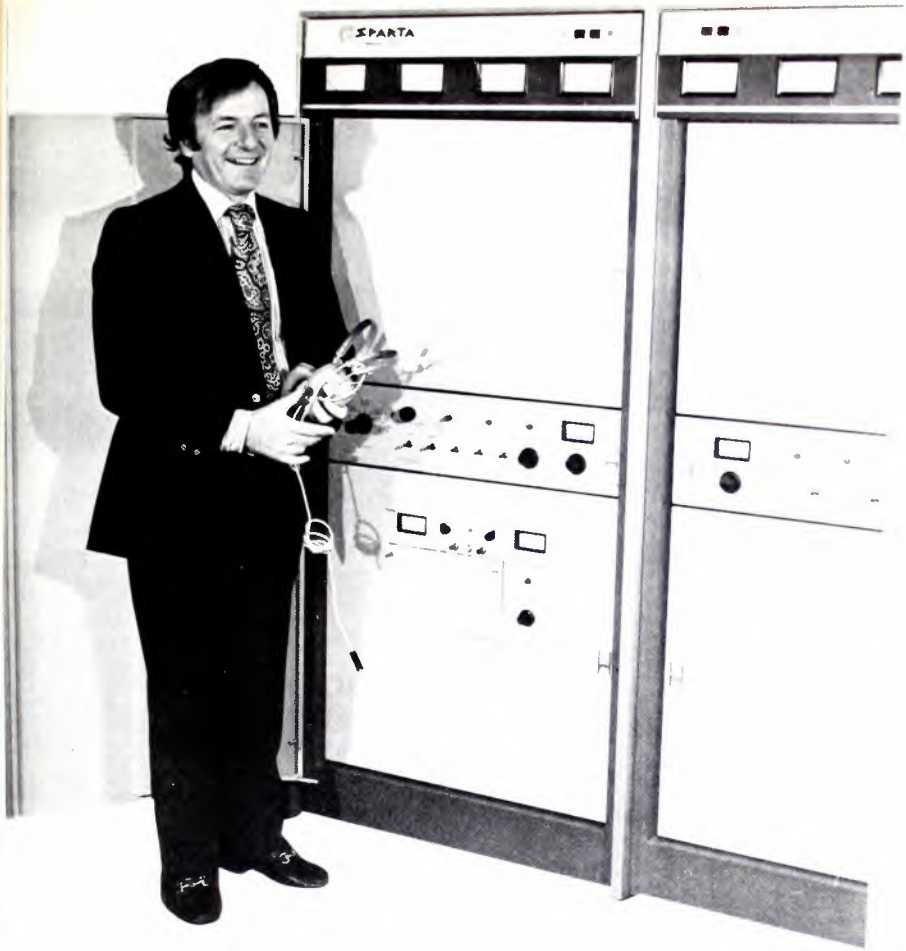
Television Viewing Reached Record High in 1972

Television viewing per home reached the all-time high figure of six hours, 12 minutes per day in 1972, up from six hours, two minutes in 1971, according to a report from the Television Bureau of Advertising. The figures are based on findings of the A. C. Nielsen Company. They show ten months in 1972 at all-time high levels for each month, with January 1972 at seven hours one minute, the highest month on record.

New Rules on "Clutter" Adopted by NAB

New and tightened restrictions on the advertising of multiple products in a single announcement were adopted by the Television Board of the NAB in the attempt to reduce "clutter" on the air. To take effect September 1, 1973, the new rule provides that a multiple product announcement cannot be put in a time unit of less than 60 seconds, unless it is integrated to appear as a single message. A "single message" is one in which the products or services are related and interwoven into the framework of the announcement (related products or services have a

continued on page 8



Mr. Ralph Guild, President of ASI Communications, Inc., shows his pleasure while inspecting the Sparta Model 620 FM Transmitter as installed at KFAC, Los Angeles. Other ASI stations include WERE, Cleveland; WRYT, Boston; KROY, Sacramento, KJTV, Bakersfield.

L.A. GETS 'JUST RIGHT' SOUND

KFAC-AM/FM is THE classical music station in Los Angeles. Recently KFAC decided that the magnificent sound and superb workmanship of the Sparta Model 620 FM Transmitter, coupled with Sparta's personal service, was the combination needed to give L.A. a fine new signal from atop imposing Mount Wilson. If the KFAC Model 620 provides million in the Los Angeles Basin with the finest FM sound, surely it will prove 'JUST RIGHT' for YOUR high-power FM signal. Other Sparta FM transmitters from 10 to 40,000 Watts. AM transmitters from 50 to 25,000 Watts.

SPARTA, the 'just right' company . . .
small enough to be first name friends . . .
big enough to supply EVERYTHING.
Call us. Collect.

SPARTA
ELECTRONIC CORPORATION
5851 Florin-Perkins Road, Sacramento, Ca. 95828
916 383-5353 TELEX 377-488 CABLE SPARTA
A DIVISION OF COMPUTER EQUIPMENT CORPORATION

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NEWS

common character, purpose, and use); and the voices, setting, background, and continuity are used so as to appear to the viewer as a single message. The NAB Television Board voted unanimously for the amended rule.

ComSonics Design, Service Cable Installations

A new firm, ComSonics, Inc., announced that it is offering a wide variety of services for cable operators. Included are repairs and rebuilding of equipment, head-end upgrading, analysis and reworking of antennas, propagation studies, testing and analyzing system performance, and a number of other related services. Address is Box 1106, Harrisonburg, Virginia 22081.

FCC Commends NAB Re-Regulation Effort

The NAB's working group on re-regulation was commended by the FCC Task Force on re-regulation for initiating a new concept in federal regulation. At a meeting between the two groups in Washington, FCC Commissioner Richard E. Wiley said that the FCC recognizes the contribution NAB has made to the re-regulation effort, and that NAB has "really initiated the whole concept of closer industry-FCC cooperation."

NAEB Members Resolve To Keep Program Control; New Group Formed

The Board of Directors of Educational Television Stations, television arm of the National Association of Educational Broadcasters, resolved in a January meeting that program control for public broadcasting must continue to be exercised by local communities, the "licensees themselves and their publics." The resolution was clearly in response to the earlier Corporation for Public Broadcasting announcement that it planned to assume control of national programming for public television. The resolution, however, saying that first consideration must be given to continuity of programming, advised that for the time being cooperation should be given to the CPB staff toward that end.

In March, 52 stations met and agreed in principle to form a new association to represent them before Congress, OTP, CPB, and the public. What is now PBS and NAEB's ETS group would merge into the new group. Ratification by the other 179 PTV stations was taken up at a March 28 meeting.

CPB Lists Main 1973 Program Plans

Meanwhile, CPB was evidently proceeding with its plans to continue and develop national public programming. The government agency released a preliminary list of major programs for 1973, including "Sesame Street" and the "Electric Company;" a science series to be produced by WGBH in Boston; a new "Theater in America" series; "Mr. Rogers' Neighborhood;" "Black Journal;" "WNET Opera;" and "Advocates." According to the announcement, plans were based on expectation of receiving about $35 million from Congress for the year.

Later, the CPB said it was going to Congress to increase CPB funding. It also acted to increase interconnection capability.

Freeze On AM Lifted; New Rules Set

Prohibited since July 1968, applications for new AM stations will again be accepted starting April 10, 1973, the FCC announced in February. At the same time the Commission issued new rules for legitimacy of applications. Among them: an AM applicant must provide a first service to at least 25% of the area or population getting primary service. An alternative is supplementing existing "inadequate" service, defined as a situation in which 20% or more of the area or population gets less than two interference-free aural services. Service by existing FM stations will be considered in determining acceptability. Stations more than 50 miles from a community do not count. Complete rules are available in Docket 18651.

Signetics Markets New Integrated FM Detector

A new method of demodulating FM signals, using linear gating, has been put on the market in monolithic integrated form by Signetics, semiconductor maker of Sunnyvale, California. Designated Model ULN2111, the new device includes a three-stage limiter and balanced detector, and is available in quantity, according to Jack Mattis, Signetics' manager of consumer products

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AUTOCUE®

THE VISIBLE MEMORY LIGHTING CONTROL SYSTEM

AUTOCUE is the *only* computerized memory system for stage and studio lighting control with complete and simultaneous display of all dimmer settings, library storage of cues on magnetic cassettes and hard-copy printout. For complete details, write for Bulletin ACU-173.

SKIRPAN LIGHTING CONTROL CORPORATION

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marketing. Some features claimed for the new device are: simplified tuning, with only one, low-cost coil with a single adjustment; frequency range 5 KHz to 50 MHz; output of 0.6 v at less than 1% distortion; limiting threshold 400 microvolts rms; voltage gain 60 dB.

Combined Communications, Pacific-Southern Will Merge

Boards of directors of Combined Communications Corporation and of Pacific and Southern Broadcasting have approved in principle the merger of the two firms, with P&S to become a part of CCC's broadcast division, a company release says. The merger still requires stockholder and FCC consent. It would be consummated by issuance of CCC stock at an agreed value of $24 a share, to P&S stockholders.

A Panegyric To Radio—"Open Forum for Community."

William O'Shaughnessy, president of radio stations WVOX in New Rochelle and WGHQ in Kingston, New York, recently paid this tribute to the medium: "Having gone beyond its jukebox phase, radio is now closer to the people than any other medium. It approaches its highest state when it resembles a community platform, a corner soapbox, an open forum—where many different voices are heard in the land. Radio's greatness lies in its ability to amplify the diverse viewpoints in a local community."

IITA Takes Over Merged Industrial TV Groups

The International Industrial Television Association has become the official successor to the Industrial Television Society and the National Industrial Television Association, two groups which voted last year to merge into one. As were the predecessor groups, IITA is an association of persons in business, industry, government, and education, who are specialists in the professional use of television and related techniques for communication, training, observation, and documentation. The new organization had its

continued on page 44

Video becomes as mobile as film with the Norelco PC-100A and PCP-90B."

says Warren G. Stitt, President Mobilimage Corporation, Hollywood, California

Warren G. Stitt

When Mobilimage put a complete TV production studio into a small van, they didn't want to compromise on picture quality. So they turned to Norelco.

First for the PCP-90B . . . the world's first and finest hand-held color television camera. Its three-Plumbicon* design produces uncompromised studio-quality color pictures. Operating with pencil-thin triax cable, it weighs just 18 lbs. It can operate anywhere, self-powered from a battery back-pack; and can transmit direct live broadcast by microwave . . . no cables needed.

Second, Mobilimage chose the Norelco PC-100A. It's today's most advanced studio and field camera.

Naturally the PC-100A uses triax cable too. Our exclusive ACT (anti-comet-tail) Plumbicon tubes eliminate the comet-tailing so commonly encountered in remote work.

Warren Stitt says, "Both cameras give immediate registration. They eliminate costly set up and strike time. They enable Mobilimage to meet the strictest requirements for perfect tape-to-film transfer. And they produce the best color pictures on television today."

Now you can combine the go-anywhere versatility of film with the instant replay, crisp imagery, and electronic control advantages of videotape.

For information on how you too, can get aboard the new-generation mobile TV production band wagon, call your nearest Norelco field representative, or write, today.

* Reg. T.M. N.V. Philips of Holland

Norelco®
PHILIPS BROADCAST EQUIPMENT CORP.
A NORTH AMERICAN PHILIPS COMPANY

One Philips Parkway,
Montvale, N.J. 07645 • 201/391-1000

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INTERPRETING THE

FCC RULES & REGULATIONS

AM "Freeze" Lifted: Thaw Sets In

The Commission, by Order released February 28, 1973, has lifted the AM "freeze" which has been in effect since July 1968.

Under the new rules, broadcasters will once again have an opportunity to apply for new or changed standard broadcast facilities in the United States.

The new AM rules are considerably more restrictive than prior rules and, for the first time, provide for the consideration of FM service in determining whether or not new or changed standard broadcast facilities will be permitted in a given community.

A seminar held recently in Washington, D.C., for members of the Federal Communications Bar Association, revealed that there are many unresolved questions regarding the new AM rules. Indeed, the seminar clearly indicated the astonishing number of different questions that can arise concerning the new rules and how they apply to a specific situation in a particular community. This article is not designed to be exhaustive with respect to all considerations and phases of the newly-adopted AM rules. Rather, it is designed to provide a quick and ready reference for determining whether or not you would have an opportunity to apply for new or changed facilities.

A look at each of the pertinent provisions of the rules follows. It should be noted that there are separate rules for 1) new daytime-only facilities; 2) change in frequency of daytime-only facilities; 3) new unlimited-time facilities; 4) change in frequency of unlimited-time facilities; 5) night-time facilities by authorized daytime facilities; and 6) other changes by authorized facilities.

A look at each of the pertinent provisions of the rules follows. It should be noted that there are separate rules for 1) new daytime-only facilities; 2) change in frequency of daytime-only facilities; 3) new unlimited-time facilities; 4) change in frequency of unlimited-time facilities; 5) night-time facilities by authorized daytime facilities; and 6) other changes by authorized facilities.

I. Initial Showing In Area To Be Served

A new paragraph has been added to Section 73.24 of the Commission's Rules ("Broadcast Facilities, Showings Required"). The following qualification must be met for new or changed facilities:

> (j) that the 25 mv/m contour encompasses the business district of the community to which the station is assigned, and that the 5 mv/m contour (or, at night, the interference-free contour, if of a higher value) encompasses all residential areas of such community.

II. Showing Required In Application For 1) New Daytime Station, or 2) Change In Frequency Of Existing Daytime Station

Application for a new daytime standard broadcast station, or for changes in the frequency of an existing daytime station, must meet either of the following criteria:

> (i) That at least 25% of the area or population which would receive interference or "free" primary service from the proposed station does not receive such service from an authorized standard broadcast station, or receive service from an authorized FM broadcast station with a signal strength of 1 mv/m, or greater;
>
> *OR*
>
> (ii) that no FM channel is available for use in the community designated in the application and that at least 20% of the area or population of the community re-

continued on page 14

Sensitivity 10 mV

Stabilities to ±5 parts in 10^{10}/24 hrs.

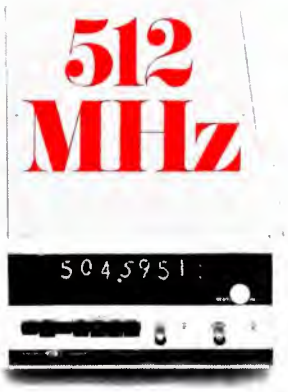
Battery option

$770 up, delivery 30 days

All models frequency expandable
Resolution to 9 digits or 0.1 Hz
Small size, 3½″ H, ½ rack W
BCD output for systems use
Remote programming

$770

$1,050



$1,395

$2,295

Now choose from the industry's widest selection of **frequency counters!** For details or a demo, contact your Scientific Devices office or Concord Instrument Division, 10 Systron Dr., Concord, CA 94520. Phone (415) 682-6161. In Europe: Systron-Donner GmbH Munich W-Germany; Systron-Donner Ltd., Leamington Spa UK

SYSTRON DONNER

The Systron-Donner Instruments Group:
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FCC RULES

> ceive less than two daytime aural services. For the purpose of this showing an aural service shall be deemed to be provided by an interference "free" ground wave signal from an authorized standard broadcast station of a strength of 5 mv/m, or greater, or by . . . a signal from an authorized FM broadcast station of a strength of 70 dbu (3.16 mv/m), or greater.

Thus, under the new rules, applications for a new daytime station, or for a change in the frequency of an existing daytime station, *must show that at least 25% of the area or population which would receive interference "free" primary service from the station proposed in an application 1) does not receive primary service from an authorized standard broadcast station; or 2) receive service from an authorized FM station.* For the purposes of this paragraph primary service from an FM service is 1 mv/m.

If these criteria are not met, the possibility exists that an application for a new daytime station, or for a change in frequency of an existing daytime station, may still be made provided that no FM channel is available for use in the community designated in the application, *and* that at least 20% of the area or population of the community receive fewer than *two daytime* aural services. For purposes of this paragraph, the primary FM signal strength is 3.16 mv/m "city grade" service. In making a determination of aural services to the community from standard broadcast or FM stations, service provided by any standard broadcast station or FM broadcast station whose transmitter site is located *more than 50 miles* from the nearest boundary of the community designated in the application shall be *excluded* from consideration. Additionally, an FM channel will not be considered available for use in the community provided that 1) no channel is assigned to the community for commercial use in the FM Table of Assignments; or, 2) if assigned, is occupied by authorized facilities, and no unoccupied channel can be utilized to serve the community pursuant to the 15-mile rule in Section 73.203 (b).

Remember, if you cannot meet one of the two criteria set forth above, it will be impossible to obtain a construction permit for a new daytime AM station or for a change in frequency of an existing daytime station.

III. Application For 1) New Unlimited Time Station, 2) Change In Frequency Of Authorized Unlimited Time Stations or, 3) Night-Time Facilities By An Authorized Daytime Station.

The following rules are pertinent to applications for a new unlimited time station, for a change in the frequency of an authorized unlimited time station, or for night-time facilities by an authorized daytime station.

Regardless of any other consideration, the application for facilities in this category must show the following:

> That objectionable interference at night will not result to any authorized station, as determined pursuant to [engineering standards] in Section 73.182.

In addition to the above showing, it is necessary for applications in this category to make a showing

continued on page 19

RCA

PRIME TIME

The Automatics. Comes the evolution.

The age of the Automatics in broadcasting has already begun.

As you'll see in this issue of Prime Time, there's a whole array of computer-oriented automatic equipment the broadcast manager can use to keep ahead in the profit race.

New needs emerging

In today's business environment the requirements of technical operations are just about as varied as the individual stations themselves.

We at RCA see automatic operation applied in many ways. Generally these applications will fall into three categories or groups.

One group (small today, but growing) is represented by "full computer control" of all equipment, programming and business functions.

Another can be characterized as "automatic programming" of segments of varying lengths, from station breaks to the late movie to an entire weekend schedule.

Still another is concerned with "automatic performance" of equipment. It's equipment that saves time, eliminates operational complexity, and generally will pay for itself in terms of better-quality programming and production.

New for NAB

At this year's convention RCA is showing systems of automatics designed to the needs of all three categories of operation.

A perfect illustration is the new TK-45 Color Camera System. Besides everything the TK-44 had, the new system includes four new fully automatic features for faster setup time and better pictures than ever.

Another instance is the TK-28 Telecine System, which corrects for a variety of film base errors automatically. It's constantly on the job, even on a scene-to-scene basis.

Also fitting this automatic performance pattern are the new "F" line VHF transmitters, which incorporate a number of "hands-off" functions.

Expansion of the "cartridge" philosophy

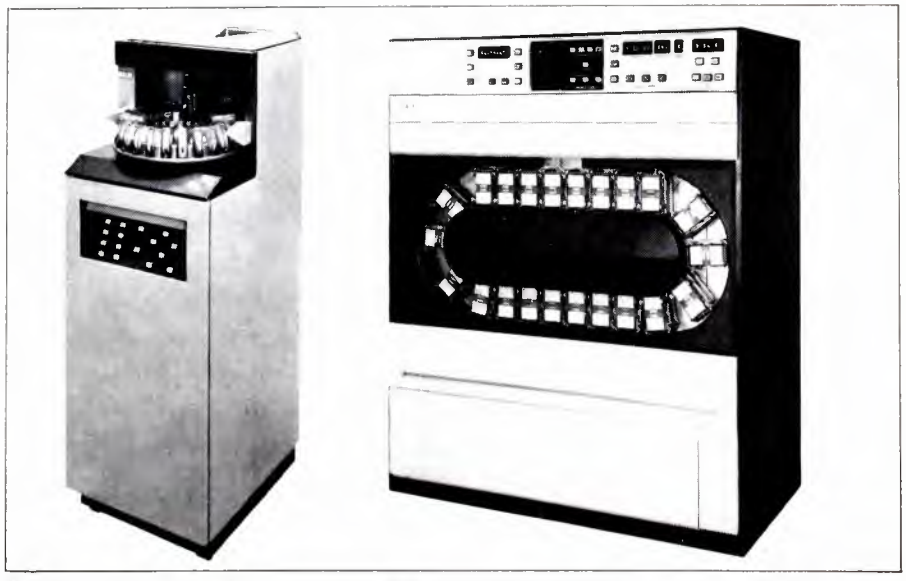
Our TCR-100 Cartridge Tape Recorder ushered in the age of Automatics. Its profit-preserving performance features fit ideally into computer-oriented thinking.

Additional far-reaching news for 1973 and beyond is the RCA TCP-1624 Cartridge Film System. It'll do for your film segments what the "Cart" Machine does for your video tape spots. And combined with the "Cart", it's a system of the future.

Automatic control functions

Command and Control Systems, which RCA is announcing at this time, also exemplifies computer-oriented automatic operation. These systems can integrate a mass of assorted video equipment into a

(Continued on last page)



Partners in automatic operation: The new TCP-1624 joins the TCR-100 in an RCA system of automatics.

TCR-100 Box Score

Number delivered	90
Number of commercials broadcast	2,051,000*
Present rate (commercials/day)	9,100*
Man hours saved	84,888*

*Estimate

TCR-100's Delivered

KARD-TV, Wichita, Kan.
KATU-TV, Portland, Ore.
KBTV, Denver, Col.
KCEN-TV, Temple, Tex.
KFSN-TV, Fresno, Calif.
KHQ-TV, Spokane, Wash.
KIRO-TV, Seattle, Wash.
KMGH-TV, Denver, Col.
KNOE-TV, Monroe, La.
KNTV, San Jose, Calif.
KOB-TV, Albuquerque, N. M.
KOCO-TV, Oklahoma City, Okla.
KOMO-TV, Seattle, Wash.
KOVR-TV, Stockton, Calif.
KPLR-TV, St. Louis, Mo.
KPRC-TV, Houston, Tex. (2)
KPTV, Portland, Ore.
KRON-TV, San Francisco, Calif. (2)
KSD-TV, St. Louis, Mo.
KSLA-TV, Shreveport, La.
KSTP-TV, St. Paul, Minn.
KTBS-TV, Shreveport, La.
KTRK-TV, Houston, Tex.
KTSM-TV, El Paso, Tex.
KTVW, Tacoma, Wash.
KVRL-TV, Houston, Tex.
KWGN-TV, Denver, Col.
KWTV, Oklahoma City, Okla.
KYTV, Springfield, Mo.
NBC, Network, Burbank, Calif. (2)
NBC, Network, N. Y. C. (4)
WAFB-TV, Baton Rouge, La.
WAPA-TV, San Juan, P. R.
WATE-TV, Knoxville, Tenn.
WBAL-TV, Baltimore, Md.
WBAP-TV, Fort Worth, Tex. (2)
WBAY-TV, Green Bay, Wisc.
WBNS-TV, Columbus, O. (2)
WBRC-TV, Birmingham, Ala.
WBRE-TV, Wilkes Barre, Pa.
WBTV, Charlotte, N. C.
WDAF-TV, Kansas City, Mo.
WDAY-TV, Fargo, N. D.
WDCA-TV, Washington, D. C.
WEAT-TV, W. Palm Beach, Fla.
WECT-TV, Wilmington, N. C.
WFMY-TV, Greensboro, N. C.
WGN-TV, Chicago, Ill.
WGR-TV, Buffalo, N. Y.
WISN-TV, Milwaukee, Wisc.
WJAR-TV, Providence, R. I.
WKBW-TV, Buffalo, N. Y.
WKRC-TV, Cincinnati, O.
WKRG-TV, Mobile, Ala.
WKYC-TV, Cleveland, O.
WMAL-TV, Washington, D. C.
WNCT-TV, Greenville, N. C.
WPTV, W. Palm Beach, Fla.
WRAL-TV, Raleigh, N. C.
WRC-TV, Washington, D. C.
WSAV-TV, Savannah, Ga.
WSB-TV, Atlanta, Ga.
WSOC-TV, Charlotte, N. C.
WSPA-TV, Spartanburg, S. C.
WTAE-TV, Pittsburgh, Pa.
WTAF-TV, Philadelphia, Pa.
WTNH-TV, New Haven, Conn.
WTOP-TV, Washington, D. C.
WTVC, Chattanooga, Tenn.
WTVN, Columbus, O.
WUAB-TV, Cleveland, O.
WUTV, Buffalo, N. Y.
WWL-TV, New Orleans, La.

Austarama TV, Melbourne, Australia • CFRN-TV, Edmonton, Alberta, Canada • CFTO-TV, Toronto, Ontario, Canada •
CHAN-TV, Vancouver, B. C., Canada • London Weekend TV, London, United Kingdom • TIMSA, Mexico City, Mexico •
TV-Q, Brisbane, Australia • Venevision, Caracas, Venezuela • YTV, Yorkshire, England •

Our "Cart" Machine. An automatic philosophy.

At RCA, we believe in automatic operation. Not for its own sake, however. But to serve the user's needs better, faster, more economically.

So we avoid the kind of automatic operation that makes things more difficult in favor of the kind that makes things easier.

Take our TCR-100 Cartridge Video Tape Recorder. Since its major purpose was complete automation of station breaks and other medium-length program segments, we included all the features really necessary for this purpose.

We feel needless sophistication means that you leave yourself vulnerable to needless complexities.

In sequencing, for instance, we opted for a "ready access" system rather than random access. This means individual carts are located at the front of the machine where they can be instantly identified and changed quickly when necessary.

The automatic TCR-100 "Cart" Machine at KVRL-TV, Houston.

It means you can see exactly which segments are ready to play and in what order. Without ever having to refer to a special log (actually a log of a log) that's subject to errors.

The cartridge itself expresses our view of user benefits. Tape is totally enclosed when it's not actually in use in the machine, for protection against dust, fingermarks and other damage. It's always in a rewound state, ready for instant use.

And there are only two oxide contacts for longer wear.

Speaking of wear, you'll find both our cart tapes and headwheels have an unusual record for long play. Users have reported more than 3,000 plays for carts and over 1,000 hours for many headwheels.

And when it comes to the recording sequence, the "Cart" Machine's simplicity is especially apparent. There are only seven steps in the total procedure.

So when you need the TCR-100's help in production work, it's likely to be available, and not involved in time-consuming preparations such

(Continued from preceding page)

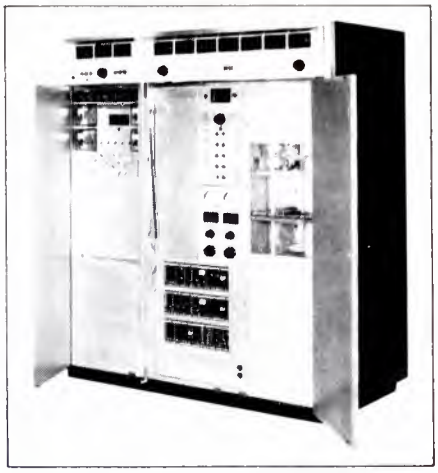
is loading, locating, checking, log-ing and programming for some fu-ure break.

And there's more. Exclusive eatures like the optional EPIS Electronic Program Identification System), play recue, audible cue ones and an error-preventing "last vent" warning, to name just a few.

Your RCA representative can how you literally dozens of addi-ional ways the TCR-100 is designed or day-to-day use.

Or ask the owners of the 90 "Cart" Machines we've already delivered.

"F-line" VHF Automatic Transmitters. The future is here.



The automatic TT-25FL VHF Lowband Transmitter.

RCA F-line transmitters have evolved to the point where "hands-off" operation is now a reality.

From the 15 kW Type TT-15FL to the fully redundant 50 kW Type TT-50FH, these transmitters take the fullest advantage possible of solid-state technology (most have only six electron tubes of only two types).

They also take full advantage of the most sophisticated metering and switching equipment for remote operation and maintenance of signal during emergencies.

What this means to you now is the utmost reliability, because human error is virtually eliminated. One operator is all that is needed for logging and monitoring functions.

Automatic transmitter functions include the following: Automatic turn-on sequencing, pedestal level control, exciter switchover, current-limiting power supplies, automatic shutoff if air falls below safe levels, automatic overload sensing and self-protection circuits.

Ask your RCA representative to give you the details of how an F-line transmitter can save you money now . . . and in the future.

The TK-45. It sees things your way. Automatically.

When you try to see things from the broadcaster's point of view, as we do, one trend of recent years stands out clearly.

And that's the shift to more and more local production.

So we feel that any camera improvements we make, should help you do this more effectively.

That's the reason behind the TK-45 Color Camera System. It does everything the TK-44 did. But automatically.

What we've done is to equip the TK-45 with four new fully automatic features specifically developed with an eye to production.

Starting with automatic black level. It's accomplished every time the TK-45's lens is capped.

Next: automatic white level. Doing this is simplicity itself. Just focus on a white reference card or a white area of the scene being shot, and press a button. Variations in scene-to-scene colorimetry are corrected instantly.

Then there's the automatic iris. It responds to changes in subject lighting faster than any human could. And it has a special memory circuit that holds the aperture during lens capping to avoid damage from too much light hitting the pickup tubes on uncapping.

The fourth new feature is automatic centering. All the engineer has to do is push a button, and he has automatically compensated for the centering limitations of pickup tubes. So what used to be a tedious procedure is now a snap.

The automatic TK-45 Color Camera.

These features are all integral to the control console, not add-ons, so they don't add to cable clutter.

And of course, all of them are in addition to features that have been standard on the TK-44. And helped make it a standard of the industry.

Your RCA representative can tell you more about the TK-45.

Just ask him about the new color camera that produces more than just profits.

(Continued from first page)

smoothly operating, efficient entity.

Specifically, they can (1) interface tape with film machines and (2) interface either of these with network feed or live studio signals.

So you can program automatic sequences to practically any length you choose.

And that's just the beginning.

In production, they can act as a "computerized scratch pad", memorizing the segments that the producer has created, and through switching, re-create the effects in the proper sequence with precise timing.

The automatic evolution

So there they are. The Automatics. And we're calling it an evolution because we've structured both new and existing RCA equipment so you can fit them to your needs, your style of operation, even as it may change.

You can select just the degree of computer control you want at any particular time. Without having to worry about premature obsolescence. Because all the new RCA equipment is future compatible.

And present profitable.

The TK-28 Film Camera. Our automatic movie critic.

One benefit of automatic performance features is consistently high picture quality.

For example, take our TK-28 Telecine System. It doesn't like color film errors any more than you do. Its color-balancing circuits continuously sample and balance, correcting for errors caused by film aging, improper exposure or incorrect processing.

So you get true blacks and true whites in color film.

And of course, manual control can be reestablished at the push of a button.

For other color problems—such as accurately matching the TK-28 to the colorimetry of other cameras, compensating for commonly encountered variations in film stock, correcting low-color-saturation film or adjusting for scene-to-scene variations caused by improper printing—there's Chromacomp.

That's a color-masking system that was developed for the TK-44 Live Color Camera and adapted for the TK-28's special needs.

All you do is determine your most frequently encountered problems and set up their solutions, which are activated as the need arises by a preset knob on the TK-28's operating control panel. Luminance (gray scale) is not affected by Chromacomp.

Other automatic controls include automatic white level, by means of a neutral-density disc that reacts to a 2:1 overexposure in less than 100 milliseconds.

And there's automatic black level, also automatically achieved in milliseconds. And also easily converted back to manual control.

One last annoying problem the TK-28 solves automatically is system flare, caused by dust in the optics or too-contrasty film. So contrast, like color, stays true and vivid.

Ask your RCA representative for more information on how the TK-28 can help you deliver a better-quality product.

Announcing the TCP-1624. It does for film spots what the "Cart" does for tape spots.

People who are sold on the TCR-100 may have wondered why something like it hasn't been created for film.

Well, now it has.

The TCP-1624 Cartridge Film Projector and a color film camera will present a completely automated all-film station break.

And in conjunction with the TCR-100, it permits a totally automated break using both film and tape.

Here's how it works.

The TCP-1624 is a two-projector system. Up to 24 segments, from one second to two minutes in length, can be loaded into its carousel.

So while one projector is running a film, the other is automatically rewinding the previously shown spot and cuing the next.

This eliminates all the work of manually threading individual film segments onto conventional projectors. And changing film after each has played.

It also ends the drudgery, the lack of flexibility and the possibility of film damage that come from splicing segments on one reel and resplicing later to put spots into a new sequence. Because the carousel is ready-accessed.

The automatic TCP-1624 Cartridge Film Projector.

This means you can quickly rearrange the sequence of the spots just by shifting cartridges, without splicing.

And you can easily preload a carousel and slip it into place as soon as the previous carousel has finished playing.

Once the film is threaded, the projector automatically detects whether each film's sound-track is optical or magnetic, and plays it properly.

And the system is flexible in another way. It can be programmed either to play one segment and then stop, or to run continuously until given a stop cue, at which time a TCR-100 can take over with a sequence of tapes.

In addition, since the new cartridge projector is used in combination with a TK-28 Telecine System, you get the benefit of that machine's ability to correct color film errors.

And the TCP-1624 also frees up conventional projectors for production work, like inserting filmed segments into taped programs.

This new cartridge projector is part of a system of automatics which points up our policy of using automatic performance features for the user's sake.

satisfactory under *either* of the below-listed criteria:

(ii) That at least 25% of the area or population which would receive interference-free primary service at night from the proposed station does not receive such service from an authorized broadcast station, or service from an authorized FM broadcast station with a signal strength of 1 mv/m, or greater.

OR,

(iii) that no FM channel is available for use in the community designated in the application, and at least 20% of the area or population of the community receive less than two night-time aural services. For the purpose of this showing, an aural service shall be deemed to be provided by an interference-free ground wave signal from an authorized standard broadcast station with a strength of 5 mv/m, or greater, or by . . . a signal from an authorized FM broadcast station with a strength of 70 dbu (3.16 mv/m), or greater.

V. Application By Authorized Stations Proposing Changes In Facilities (Other Than Change in Frequency)

All other AM applications by authorized stations (other than Class IV stations) proposing changes in facilities, other than a change in frequency, must make a satisfactory showing with respect to the following:

(i) For a change in night-time facilities that the proposed change will not result in objectionable interference to other stations as determined pursuant to engineering standards set forth in Section 73.182.

Additionally, an authorized station seeking a change in facilities other than a change in frequency) must make a satisfactory showing under *either* of the following two criteria:

(ii) For an increase in power, either daytime or nighttime, that the authorized operation, during the portion of the broadcast day for which the power increase is sought includes less than 80% of the area or population of the community to which the station is assigned and within its 5 mv/m, ground contour (or within its interference-free ground wave contour if of a higher value);

OR,

(iii) for an increase in power, that at least 25% of the area or population which, as a result of the power increase, for the first time would receive interference-free primary service from the station is without primary service from any other standard broadcast station.

V. Conclusion

The Commission has finally lifted its "AM Freeze" and, effective April 10, 1973, will once again begin accepting applications for new or changed standard broadcast facilities. As can be ascertained from the above, the new rules are much more restrictive than the original AM rules. Under the newly-adopted rules, consideration must be given to all aural services, *including FM.*

In sum, most metropolitan communities in the United States will be precluded from having additional AM service granted; however, smaller communities and rural areas presently under-served will have an opportunity to obtain new and changed AM stations.

It is difficult, but not impossible, to now obtain AM grants for new or changed facilities. It should be noted, however, that if the Commission is inundated with applications, they may declare that they will accept applications only during specified times of the year, and that there will be interim "freezes" to lessen the administrative work-load. **BM/E**

What Instrument Would You Like? The Choice Is Yours.

By Robert J. Horak

IT MAY BE INDEED TRUE that fundamental research has slowed, but the use of technology continues—even at an accelerated rate. In fact, the recent "technical depression" and the accompanying tighter times have forced equipment suppliers to become more clever since they must fight harder to achieve sales.

The time is nearly at hand for the user to really buy based on *need* rather than what is available. The supplier is not lamenting this "buyers' market." The reason is simple enough—involvement by both supplier and user leads to a marriage of capability and use. The broadcaster benefits immensely because he can now get the instrumentation of his choice. It's possible to order "custom-made" (or at least custom-modified) gear for a reasonable cost.

It's the semiconductor and the IC that have forced the instrument world to change dramatically. Test equipment users should realize the total effect the semiconductor has had on the designer of equipment.

In particular, it has become possible to be microscopically wasteful. The kind of circuitry you might call "control" as opposed to "power" doesn't in itself consume any power, and it has been proven possible to begin to put an awful lot into a little can for not very much money. One of the best examples is shown in the development of the "op amp." Before the advent of the semiconductor, the operational amplifier was essentially only known in the application that had given the name to it—as the basic element in the analog computer. In the fifties you could get amazing little beasts 1 in. X 2 in. X 6 in. that, with a little bit of feedback, could do all the "tricks" of electronic math that the textbook said could be done. They consumed a few watts of power and sold for $50.

Today? You can get four operational amplifiers every bit as good (maybe even quite a bit better) than that old radio-tube marvel in a can no bigger than a typewriter key. It will consume power in the sub-milliwatt region and cost 75 cents! The designer of 20 years ago wasn't about to use a whole bunch of op amps, but the designer of today is a damn fool if he doesn't use a whole bunch of them. He doesn't have to think about amplifier circuitry—all he has to do is select some external feedback circuits to "form" the action of interest.

What may not be immediately obvious is that the role of the circuit designer has shifted from the equipment designer to the semiconductor physicist. These physicists can make one circuit available to millions of users for a very little bit of tooling. And the physicists compete with one another by introducing a variety of "typewriter keys" that all try to do the right things for the equipment designers. These days the equipment designer spends his time in keeping up, *not by reading more textbooks, but by reading more catalogs.*

There are innumerable alternatives to choose from. Thus it is not surprising that quite different designs result not only from different designers, but from just slightly different requests from the customer or the marketing department where the designer holes up. Take a look at some of the instruments available to the broadcaster today.

Want an oscilloscope? What do you want it for? To look at modulated IF? To examine detail of pulse form very carefully, for a nanosecond class of parasitic? For this you can buy a beaut such as the scope in Fig. 1. And it can come with built-in line and frame sync. But now wait a minute, Joe still has to lug that old monster scope with him every time he goes out to try to get the trailer to work just one more time for dear old wzzz. So let's get him a scope before he breaks his arm. How about the one in Fig. 2? It's battery operated, it's good to 20 MHz, and it doesn't really cost all that much.

Mr. Horak is manager of Test Equipment Products, AILTECH, City of Industry, California.

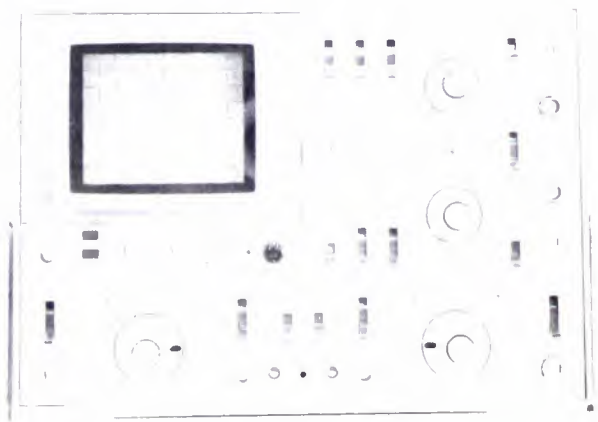


Fig. 1. Wide-band scope. (Photo courtesy N. A. Philips Co.)

Fig. 2. Battery-operable 20 MHz scope. (Photo courtesy Vu-Data)

Want a function generator? What's that? Well then, isn't it about time you got a new audio oscillator, a new gadget for checking sweep circuits, and an RF source. Well, you can get all of that in one box. Referring to Fig. 3, that box generates sine waves, triangles, square-waves, pulses, ramps, etc., at frequencies from 0.02 Hz to 20 MHz. And it doesn't cost much either. But let's not forget Joe again. Why not fix him up with the battery-operated job of Fig. 4. While it doesn't do all the things the big one does it sure goes well with the scope you just got for Joe.

The point to all this is that even now you can be mighty selective in your choice of instrumentation equipment. If you want a standard for regulatory reasons, an instrument for reasons of operational integrity or improvement, or a tester for reasons of troubleshooting and testing—they're all there. But while selection of best-equipment-for-your-use may be the challenge of the moment, this act of selection begins to define your needs—even starts to lead to equipment standards for general broadcasting use. Today the designer can produce what you need. He can't be expected to be as expert in your field as you are, so you must tell him of your needs.

Even without a lot of user-supplier technical interchange in the area of equipment specifications, specialty or custom equipment (without the automatic corollary of high price) is becoming available. Just for one example, the supplier of the function generator mentioned previously is in that business because he knows how to make function generators. He thinks the generator is more "powerful" as a general laboratory instrument than the oscillator. Yet he also produces an ultra-low distortion oscillator for "proof" testing, and an oscillator with dual metering for return-loss line measurements (see Fig. 5). Why does he produce these instruments? Because he can—and you told him that you needed them.

You no longer have to wait for the various peripheral industries to develop something you need. You can get what you need if you'll just figure out what you need. The time for industry/supplier synergism is here how. Use your societies; use the resources of your profession—NOW! **BM/E**

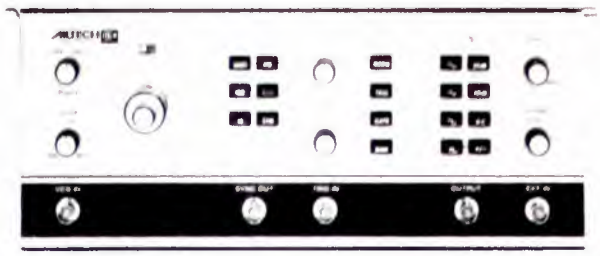


Fig. 3. Wide range laboratory function generator.
(Photo courtesy AILTECH)

Fig. 4. Battery operated function generator.
(Photo courtesy Krohn-Hite)

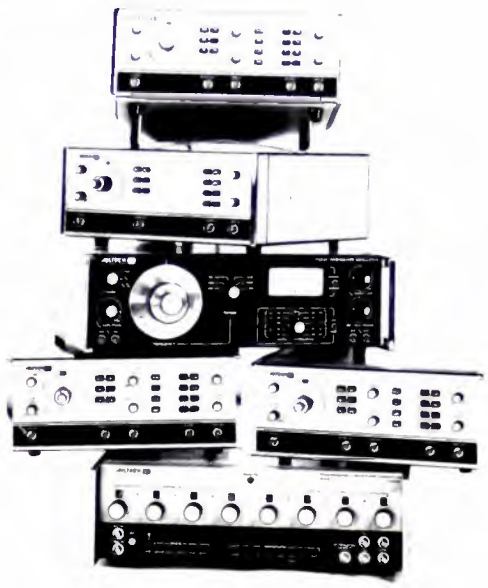


Fig. 5. Variety of signal source products.
(Photo courtesy AILTECH)

Simplified Negative Tower Measurements

By Charles S. Wright

OVER THE YEARS, most station engineers have evolved their own favorite method for measuring "negative" tower impedance. Yet one of the simplest methods, requiring only a standard operating impedance bridge, is usually overlooked. This may be due, in part, to a lack of confidence in the measuring technique used with the operating impedance bridge. The purpose of this article is to explain the simple measuring procedure and mathematically demonstrate its validity.

Mr. Wright is vice president of Delta Electronics.

Operating principles

The simplified diagram illustrates the essential components of the operating impedance bridge. The coupling box of the bridge consists of a primary line carrying the RF energy through the bridge and a center tapped secondary line lightly coupled to the primary line. The coupling between the two lines consists of capacitive and inductive components indicated by the capacity C, and the mutual inductances, m, for each half of the line. The voltage, E, applied to the input of the primary line will cause the current, I, to flow to the unknown load, Z_L. Of course,

$$I = \frac{E}{Z_L}$$

The center tap of the secondary line has an ammeter to ground indicating the total induced current, i. This current is the sum of three components: i_c, the current through the capacity; and i_{m1} and i_{m2}, the currents induced in each half of the secondary line by the primary line current and the mutual impedances. These currents have the following values:

$$i_c = +j\frac{E}{X_c}$$

$$i_{m1} = +j\,I\,X_m\,Y_s = +j\frac{E\,X_m\,Y_s}{Z_L}$$

$$i_{m2} = +j\,I\,X_m\,Y_b = +j\frac{E\,X_m\,Y_b}{Z_L}$$

Y_b is the complex admittance of the variable bridge standards (driven by the R and X front panel dials); and Y_b is the complex admittance of the bias components (internal components used to zero the bridge).

As the arrows indicate, the total meter current is:

$$i = i_c - i_{m1} + i_{m2}$$

Substituting the calculated values of the currents and letting i equal zero for a null condition gives:

$$O = j\,E\left(\frac{1}{X_c} - \frac{X_m\,Y_s}{Z_L} + \frac{X_m\,Y_b}{Z_L}\right)$$

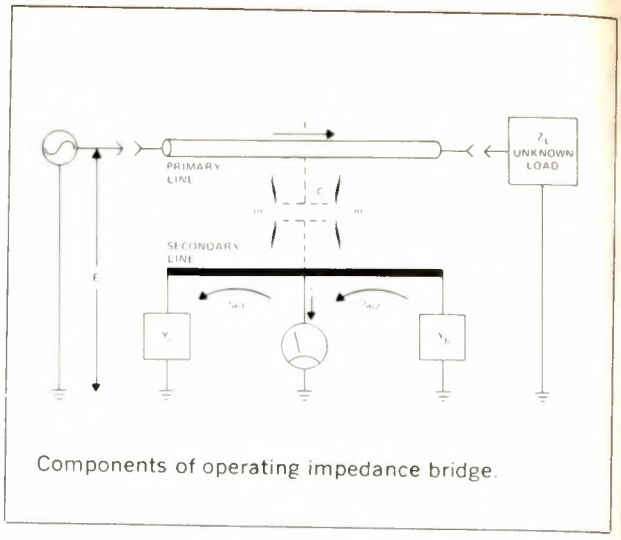
The terms in the parenthesis must be zero, therefore:

$$\frac{1}{X_c} = \frac{X_m}{Z_L}\,(Y_s - Y_b)$$

which may be restated as:

$$Z_L = \frac{X_m}{X_c}\,(Y_s - Y_b)$$

The term $X_m X_c$ is a constant fixed by the physical parameters of the bridge. Y_b is set at the factory to calibrate the bridge and remains constant. Therefore, the dials of the shunt variable resistor and variable capacitor making up Y_s can be calibrated directly for the R_L and X_L components of Z_L.



Components of operating impedance bridge.

Negative measurements

Now consider what will happen when the bridge connections shown in the diagram are reversed. The source voltage, E, is exchanged with the unknown load, Z_L. The i_c current continues to flow in the same direction; but the currents i_{m1} and i_{m2} are reversed since the current flow in the primary line, I, is reversed. Under these conditions, the total meter current is:

$$i = i_c + i_{m1} - i_{m2}$$

With the meter current equal to zero and solving as before:

$$O = j\,E\left(\frac{1}{X_c} + \frac{X_m\,Y_s}{Z_L} - \frac{X_m\,Y_b}{Z_L}\right)$$

$$\frac{1}{X_c} = \frac{X_m}{Z_L}\,(-Y_s + Y_b)$$

$$Z_L = \frac{X_m}{X_c}\,(-Y_s + Y_b)$$

Which may be restated as:

$$-Z_L = \frac{X_m}{X_c}\,(Y_s - Y_b)$$

It should be noted that the final equation is identical to the equation derived with the bridge in a forward direction; with the exception that Z_L is now negative. As a result, the bridge dials will now indicate the *negative* of R_L and X_L. If R_L is negative, as for a "negative" tower, a normal bridge balance is obtained.

If this technique for measuring a "negative" tower seems overly simple, it should be noted that the measurements were made with an operating impedance bridge rather than a conventional bridge. The conventional bridge is a two-terminal device, looking in one direction and measuring the equivalent resistance and reactance seen in that direction. The operating impedance bridge is a three-terminal device measuring the complex ratio of voltage and current. This by definition is the operating impedance of the unknown load. **BM/E**

An Automatic Television Monitoring System

THE ECONOMIC BENEFITS OF REMOTE CONTROL and monitoring of transmitters has been recognized by the broadcast industry for a considerable time and many of today's transmitters are equipped with the necessary control facilities. Until recently, most systems provided information relating to the operational status of the transmitter rather than an assessment of the transmitted signal quality and the impairments which cause signal degradation.

Marconi Instruments offers an automatic monitoring system which will assess picture quality, display out of limits conditions of basic signal parameters or faults, and provide automatic executive control. The Marconi Instruments' system is illustrated in Fig. 1. It is comprised of two units, an Insertion Signal Analyzer, Model 2914 (top unit), and a Data Monitor, Model 2915.

The analyzer permits the simultaneous measurement of up to 24 parameters of a previously introduced VIT signal. Some of the basic parameters measured are: the amplitude of bar, sync, 2T pulse; chrominance luminance gain, delay, and cross talk; luminance non-linearity, noise, LF error, bar tilt, differential gain and phase, etc. These parameters are expressed either in units of mV, nSecs, degrees, or as a percentage.

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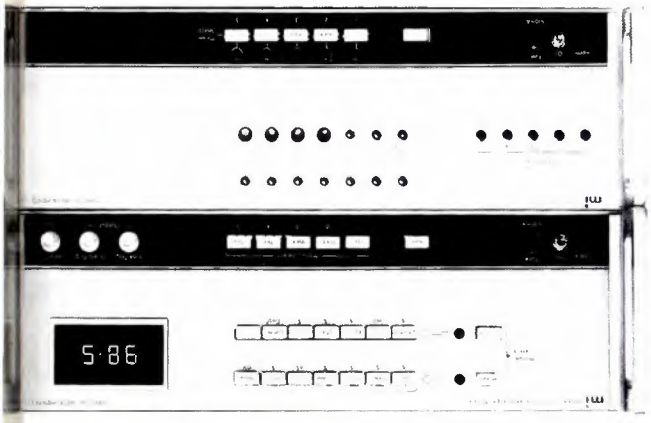


Fig. 1. Insertion signal analyzer (top) and data monitor (below).

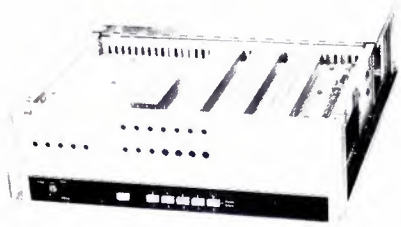


Fig. 3. Limits are set by plug-in buttons under hinged cover.

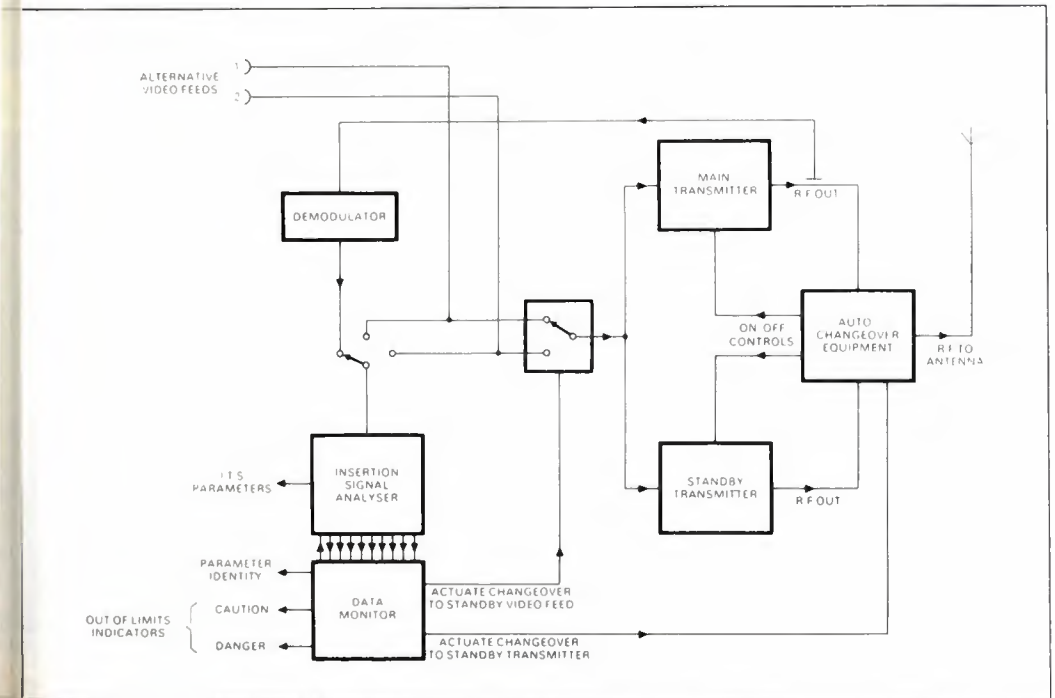


Fig. 2. A possible configuration of the monitor system.

Spectrum Analysis Of The TV And FM Signal

By Linley Gumm and Morris Engelson

Pulses, burst, chroma signals, harmonics, and deviation are just a few of the measurements that can be made with a spectrum analyzer.

BROADCAST ENGINEERS are increasingly turning to spectrum analyzers as a solution for some of the more difficult measurement and monitoring problems. The spectrum analyzer can be used to check the output spectrum for harmonics, spurious responses, and general spectrum shape; for monitoring in-service functions such as spurious signals from serrasoid modulators and aural carrier frequency deviation; and initial system calibration such as setting the peak deviation of the aural carrier to 25 kHz. The purpose of this paper is to discuss some of these measurements.

Spectrum of broadcast TV signal

The spectrum of a typical television station transmitting program material is shown in Fig. 1. The visual carrier is the large signal to the left and the aural carrier is the large signal to the right. The smaller signal between the visual and the aural carrier is the chroma subcarrier. From this photo we can determine several pertinent characteristics of the signal. First, the aural carrier has two spurious responses fairly close in and 55 dB down from the aural signal. These are probably serrasoid modulator spurs.

The performance of the vestigal sideband filter can be approximated by comparing the upper sideband response with the lower sideband response, the difference being the filter's response. One can also see the action of the video low-pass filter in the rapid fall-off of spectral components just below the aural carrier.

As the CRT readout indicates, the resolution bandwidth in Fig. 1 is 30 kHz. With this bandwidth the display will show the *average* value of the spectral components making up the TV signal instead of the peak values. Since the TV signal is made up primarily of pulses and bursts in the 4 to 10μs length range (sync, blanking, etc.), a resolution bandwidth of 300 kHz is necessary to observe peak values.

Fig. 2 shows a typical TV signal with a 300 kHz resolution bandwidth. The wider bandwidth allows the analyzer to reach peak amplitude during the on-time of pulses such as sync tips and bursts such as multiburst. (Note that chroma burst is too short, 2μs, for the analyzer to reach peak amplitude.) The short pulses and bursts show up in the display as signals with a "feathery" appearance instead of being solid. Note the visual carrier. It now has both a solid bottom and a feathery tip. The solid bottom is the carrier signal from the blanking level to peak white. The feather is the carrier signal from blanking up to the sync tips. Blanking is 75% or −2.5 dB of sync level. Note that in Fig. 2 the height of the feather is about 2.5 dB (the vertical scale factor of the display is, as indicated in the CRT readout, 10 dB/div).

The chroma signal with 300 kHz resolution bandwidth is more complex. The chroma signal is made up of two main components, the burst and the chroma content of the picture. The burst is the same regardless of picture content, so it results in a stationary spectrum while the chroma content of the picture varies around it. In Fig. 2 the broad, feathery signal is the burst while the more solid carrier is the chroma information.

Anyone who has looked at a TV signal on a spectrum analyzer knows that the spectrum of the signal varies with picture content. Another effect that shows up is that the spectrum of the vertical interval is strikingly different than the rest of the picture.

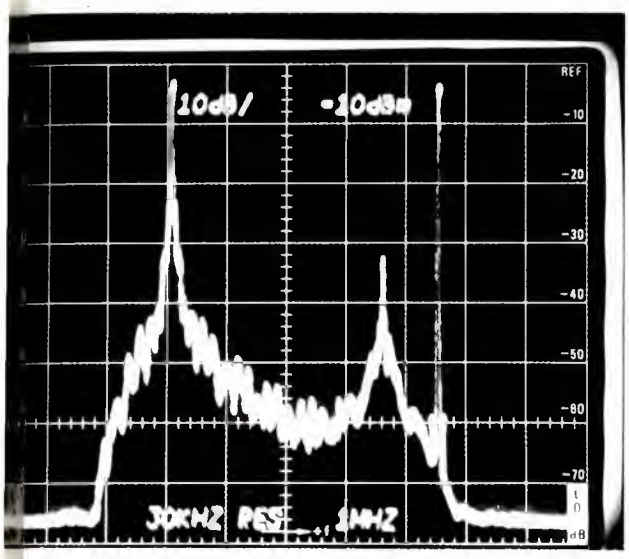
During the time that the spectrum analyzer sweeps across the TV signal's spectrum, the TV signal continues to scan out the picture. If the sweep time of the spectrum analyzer is similar to the vertical frame rate of the TV signal being viewed, the spectrum of the vertical interval will roll through the spectrum analyzer display. Fig. 3 shows this effect. The upper display is the spectrum of the TV signal. The lower display is the demodulated TV signal from a demodulator. Both displays use the same time base. Note the notch in the spectrum during the vertical interval.

Far from being an annoyance, the vertical interval spectrum phenomena is very useful for in-service measurements. The usefulness stems from the realization that in the spectrum analyzer display one is viewing the energy at each frequency at the

Messrs. Gumm and Engelson are engineers at Tektronix, Inc., Beaverton, Oregon.

ime the analyzer is tuned to it. This means that if e watch the vertical interval roll through the spec-rum analyzer display, the spectrum of the VIT test ignals can be identified and measured. Referring gain to Fig. 3, at the right-hand edge of the ertical interval, the long line up from the spectrum display is indicating the amplitude of the multiburst signal at that frequency.

Fig. 4 shows the entire multiburst spectrum. This particular transmission had two different multiburst signals with slightly different burst frequencies. Peak white carrier power is visible as a light line across



Typical TV spectrum with narow resolution bandwidth.

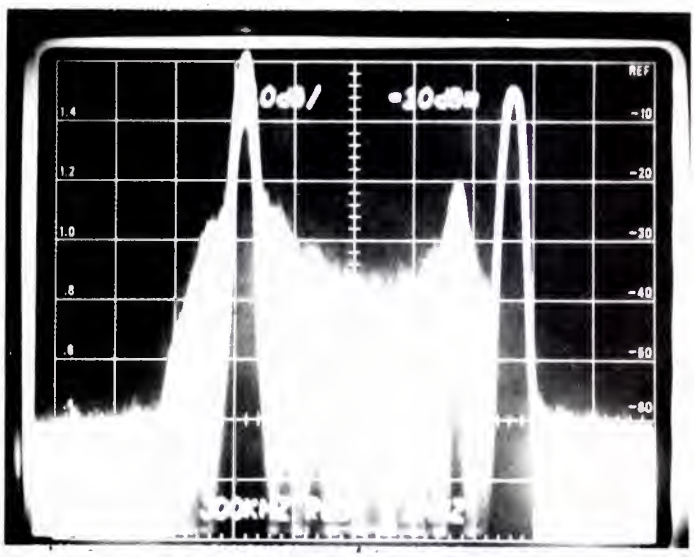
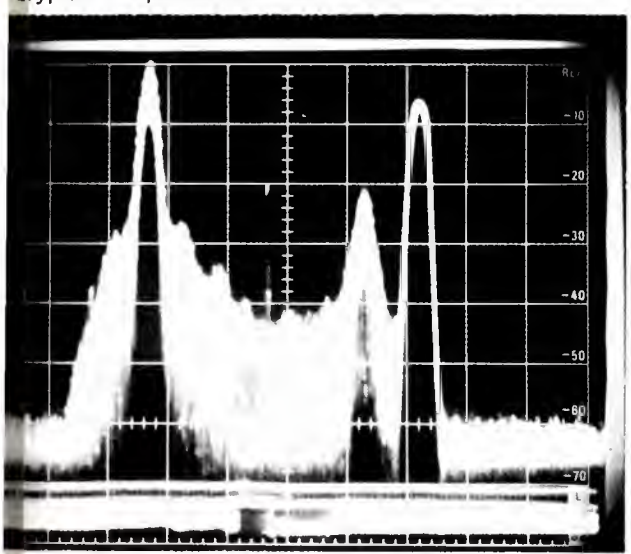


Fig. 2. Typical TV spectrum with wide resolution bandwidth.



TV spectrum with video display. Note relationship of
l interval and notch in display and VIT signal.

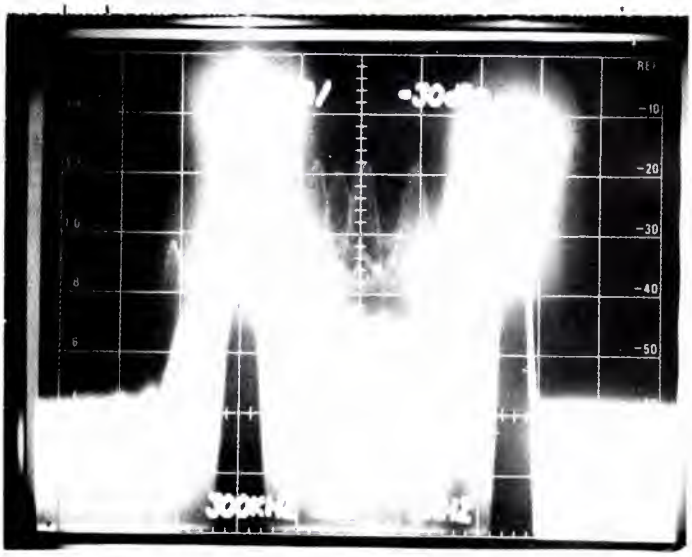
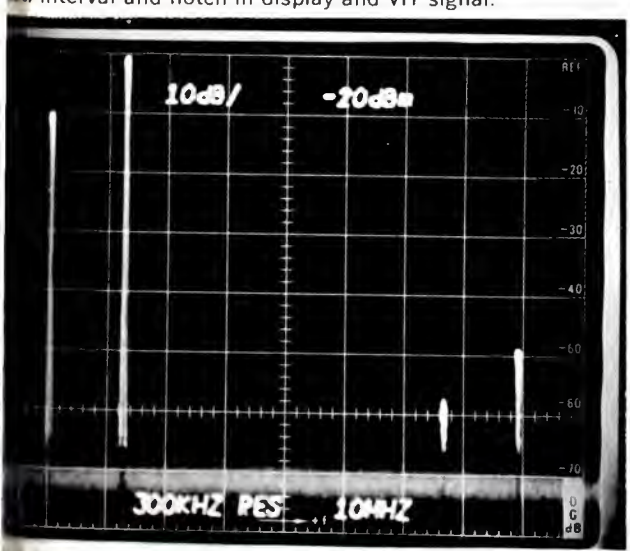


Fig. 4. VIT signal spectrum.



Double exposure photo illustrating harmonic level
rement. Vertical scale is 10 dB per division.

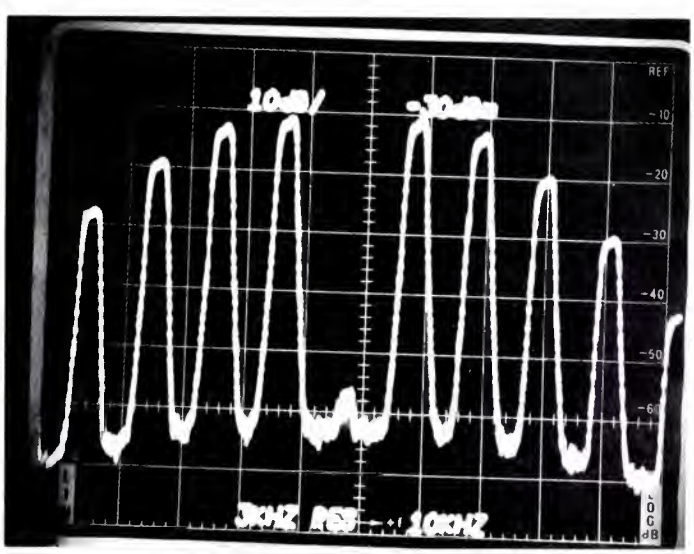


Fig. 6. Bessel null method of FM deviation adjustment.

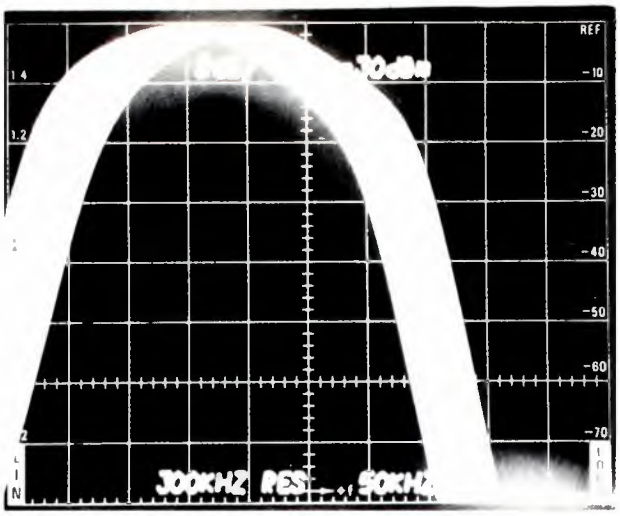


Fig. 7. Estimating FM deviation by direct observation.

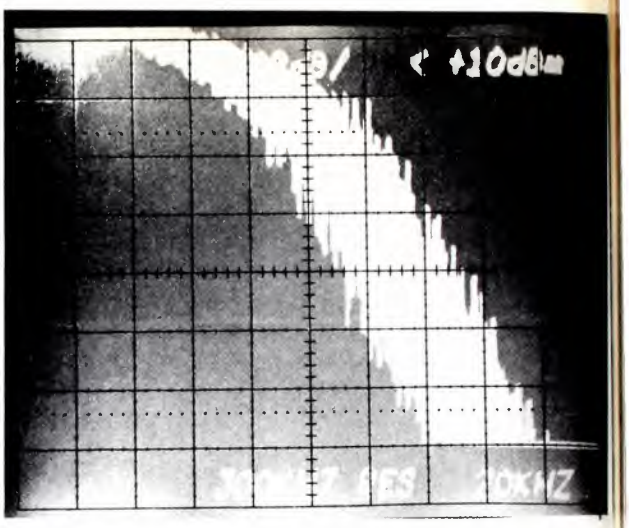


Fig. 8. Estimating FM deviation from on-the-air observation.

the visual carrier 16 dB down from sync TIP power.

Measuring harmonic level

Harmonic measurements are illustrated in Fig. 5. This is a double exposure photograph showing a 67 MHz signal and its second harmonic. The second harmonic amplitude appears to be 48 dB below fundamental at both −20 dBm reference level and with 10dB more attenuation at a −10 dBm reference level. This test shows that spectrum analyzer nonlinearities are not contributing to the harmonic level and the measurement is valid. The harmonic amplitude would change with a change in input level if it were generated by the spectrum analyzer.

Frequently there is a need to measure harmonic levels beyond the dynamic range capabilities of the spectrum analyzer. The easiest solution is to reduce the amplitude of the fundamental by means of either a high-pass or band-reject filter. Such a filter was used in this measurement. This filter has a 40 dB loss at 67 MHz and a 2 dB loss at 134 MHz. Consequently, the second harmonic amplitude is 48 + 40—2 = 86 dB below that of the fundamental.

FM measurements

There are three related parameters in frequency modulation (FM). These are the modulating frequency (f_m), the deviation (ΔF), and the modulation index (β). The measurement of prime interest is that of deviation. This, however, cannot be measured directly to the desired degree of accuracy. Hence, the modulating frequency and modulation index are measured and the deviation is computed from $\Delta F = \beta f_m$. The reason it is difficult to observe the deviation directly is because the FM spectrum has, theoretically, an infinite number of sidebands. When the modulation index is large (e.g., 50), the sideband amplitudes outside the deviation fall off very rapidly and direct observation is quite accurate. But for small indices (e.g., 2), the sidebands outside the deviation are significant. While methods for making direct deviation measurements have been reported in the literature, these are not sufficiently accurate for setting up a broadcast transmitter. Let us consider initial transmitter alignment first, and then we will take up the problem of in-service monitoring.

Initial transmitter alignment

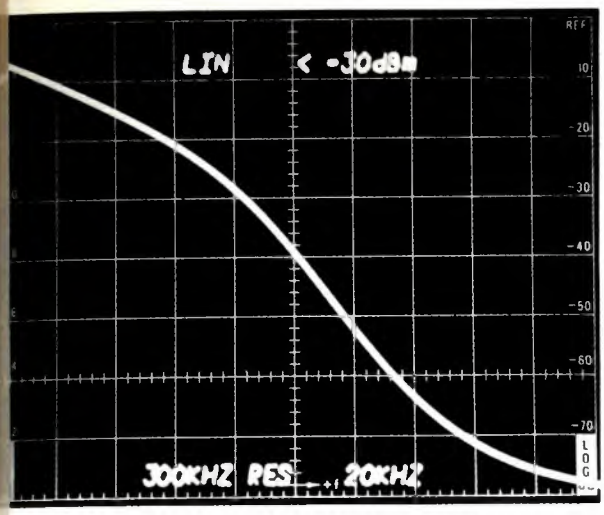
The FM spectrum consists of a carrier and sidebands spaced at the modulating frequency (f_m) to either side of the carrier. The relative amplitudes of these are given by a set of Bessel functions of the first kind [$J_p(\beta)$]. Where the order (p) is the sideband number, p=0 represents the carrier. The argument (β) is the modulation index. The most accurate method of deviation adjustment makes use of the fact that the amplitude of each of the spectral components, including the carrier [$J_n(\beta)$], goes to zero at specific values of β. These are known as "nulls." A list of the first five carrier nulls is given below.

Carrier null number	1	2	3	4	5
$\beta = \frac{\Delta F}{f_m}$	2.4048	5.5201	8.6531	11.7915	14.9309

To determine what input voltage will produce a desired deviation, we proceed as follows: First, we compute a modulating frequency which corresponds to a carrier null. In television the maximum permitted deviation is 25 kHz, resulting in a first carrier null at

$$f_m = \frac{25 \text{ kHz}}{2.405} = 10.4 \text{ kHz}$$

For broadcast FM the permitted deviation is 75 kHz so the first carrier null occurs at 30.7 kHz. This is beyond the system frequency range so one would have to use the second null at a frequency of 13.59 kHz. The transmitter is now modulated at the computed modulating frequency and the modulating voltage adjusted for a carrier null as observed on the spectrum analyzer. Fig. 6 shows such a measurement. The vertical is 10 dB per division so that the carrier amplitude is more than 50 dB below the level of the first sideband. With the modulating



g. 9. Calibrating resolution curve for discriminator ensitivity.

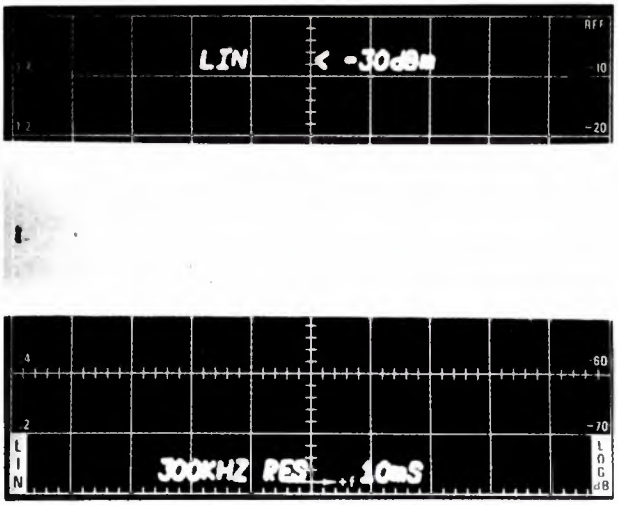


Fig. 10. FM deviation measurement by using resolution curve as discriminator.

equency set to 10.4 kHz with a counter, the modlating voltage corresponds to a 25 kHz deviation ithin a fraction of a percent.

n-the-air monitoring

The Bessel null method is probably the most ccurate technique available for determining FM eviation. However, it requires the use of specific redetermined modulation frequency. The modulatng frequency cannot be controlled nor is there a ngle frequency when dealing with program materil. Yet, it is useful to be able to monitor the deviaon while the transmitter is operating.

As indicated before, the major error in the direct bservation of FM deviation comes from the fact iat sidebands extend beyond the deviation freuency. These sidebands are only apparent when ie spectrum analyzer resolution bandwidth is less ian the modulating frequency so that the sidebands re resolved. However, constant deviation signals ave the same frequency width when the individual idebands are not resolved. Such measurements ave an accuracy of about 5%, which is sufficient for n-service monitoring. This method is illustrated in ie following examples.

Fig. 7 shows an unresolved FM spectrum. The eviation was set to 25 kHz by the Bessel null ietho d. The resolution bandwidth is set to 300 kHz /hich is much wider than any possible modulating requency. As the signal frequency swings plus and ninus the deviation about the carrier, we get a ignal width of 2 ΔF. This 2 ΔF swing is distorted by ie shape of the resolution filter so that a different /idth will be observed on a different part of the isplay curve. Thus, at 50 kHz/div, the signal is iore than a division wide two divisions from the op and almost exactly 50 kHz wide on the bottom. he steeper the resolution filter shape factor, the ess the difference in apparent deviation at different eights of the display. This error is, however, of no onsequence provided one precalibrated the spec-um analyzer with a known deviation and subseuent measurements are made on the same level /ith respect to signal peak. Fig. 7 was standardized for a full-screen display and signal width was measured on the bottom graticule. Accuracy is improved by reducing the frequency span (e.g., 10 kHz/div) for easier viewing. A span of 50 kHz/div was chosen for Fig. 7 so that the peak as well as the bottom of display could be shown in one photograph.

Fig. 8 is an off-the-air photograph of the audio from one of the local television stations. The display was observed for one minute using a storage oscilloscope to increase the chance of observing the peak deviation being transmitted. The baseline was raised by one division to eliminate obscuring the 20 kHz/div readout. Signal width at the bottom is 40 kHz; hence, the peak deviation is 20 kHz.

Another monitoring method is based on the use of a calibrated discriminator to detect the FM signal. Any device that has a non-zero voltage-out versus frequency-in transfer function can be considered a discriminator; this includes the slopes of the spectrum analyzer's resolution amplifier response curve. Fig. 9 shows one side of the 300 kHz resolution amplifier response. It is obtained by feeding a CW signal into the spectrum analyzer. The gain of the spectrum analyzer was adjusted to give a full-screen display for ease of calibration. At 20 kHz/div frequency span, the transfer characteristic taken around the central portion of the curve is 4.4 vertical divisions per 80 kHz horizontally. This is 0.55 divisions per 10 kHz. Fig. 10 shows the detected FM signal. This display is obtained by taking a full-screen display, such as in Fig. 7, and reducing the frequency span to zero. The spectrum analyzer center frequency is adjusted to bring the demodulated signal onto the central portion of the resolution curve corresponding to the previous calibration. Here the detected FM signal is 2.8 divisions high which corresponds to 50.9 kHz for 2 ΔF. This differs by only 2% from the previously set value of $\Delta F = 25$ kHz. **BM/E**

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2. "Spectrum Analyzer Measurements, Theory, and Practice," Tektronix Publication 062-1334-00.
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Broadcasters Can Get All Kinds of Return Signals Via the Telephone

The telephone can be more than a call-in device. With memory, it becomes a vote counter, an opinion recorder, and much more.

WE NORMALLY THINK OF THE TRANSMITTER and the airwaves as the broadcaster's channels of communication. But the broadcaster has another essential piece of communications equipment: namely, the telephone. The telephone is more than a means for day-to-day business or editorial communication. Used creatively, it can be made an auxiliary means of communication with listeners of the station. Management can use the telephone to establish its desired demographic image, stimulate exciting interest in its programs, and to adjust its programs more responsively to the desires and needs of its audience.

One of station's more popular programs is this combination music/talk show, with listeners telephoning in requests and comments direct.

Program director Norman H. Brooks, right, and station engineer Doug Bartram check over telephone-answering circuitry component.

Radio station WFBR, serving the Baltimore, Maryland, area, is using the telephone to provide a new and exciting way of reaching for new listeners and holding them, once reached. In so doing, it has modified the demographic composition of that audience in accordance with a pre-designed plan.

The latter objective has been accomplished fairly recently, during the latter part of 1972. To achieve that purpose, the station created electoral contests, with listeners casting the votes. The telephone, in conjunction with a device called a "Code-a-phone," was the communication medium used for recording those votes.

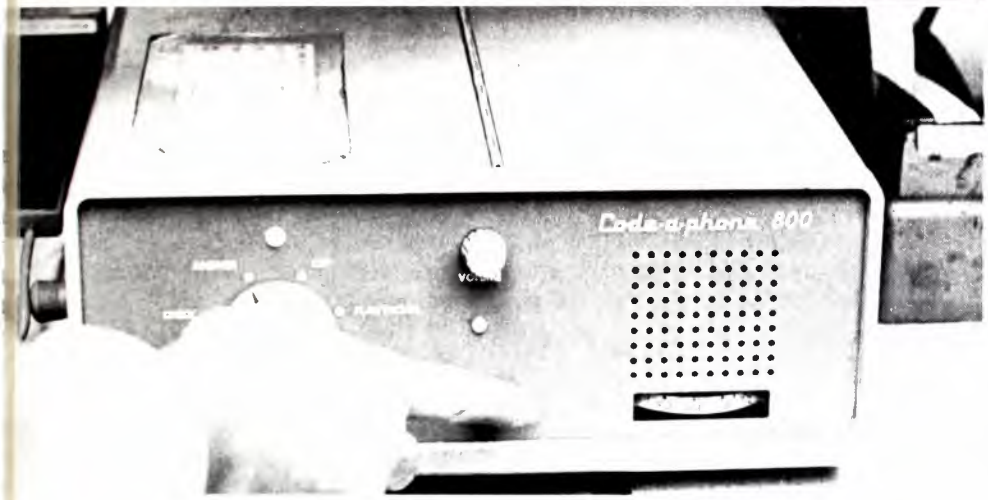
This is just one of the many ways the telephone is being used by WFBR, program director Norman H. Brooks points out. For years one of the most popular radio programs in the Baltimore area (population: approximately 2,800,000) has been the station's "Conference Call" program. Also popular are music/talk programs, with conversation between listeners and the announcer. The station and the telephone company are currently working on technical improvements designed to make this kind of program even more effective. Listeners also have telephone access to the "ear" of the station at any time of the day or night on any subject they want to talk about, and know that it will be recorded and considered in program decisions.

Contest goal: A younger listener

The idea of a contest, with listeners functioning as the electorate, was developed in part as a means of attracting a younger audience, Brooks relates. The first contest accordingly pitted performer Donnie Osmond against the Jackson Five. Beginning Saturday at 6:00 a.m. the station played one selection by each group every half hour, and invited listeners to call the station to vote their preferences. This contest, as have the others, concluded Sunday at midnight. The station selected weekends for its contests as this is otherwise the slowest part of the week.

At first, listeners were asked to call the announcers to give them their votes personally. Station WFBR received about 1200 calls the first day, and this represented only a fraction of listeners who tried

Two Code-a-phone Model 250 units. Connected to telephones on weekends, a call to one records a vote for one "contestant;" a call to the other for the opponent. Count is kept by automatic counters shown here on top of machines and connected to them.



This Code-a-phone answers telephone automatically and receives messages from callers in return. Many requests for musical selections come in on this machine, which is also promoted (by telephone number) on station programs several times throughout the day.

o get the station. The telephone company reported hat they had over 4000 other calls backed up and hey were sure that there were many others who ried without success to get the station. "Obviously, eceiving the calls personally took far too much me," Brooks said.

Before the next weekend, the station installed two utomatic telephone answering devices with counters ttached. Each "Code-a-phone" was connected to a elephone with its own telephone number. As exlained on the radio, a call to one number indicates vote for one performer, while a call to the other umber records a vote for the other group. Each nachine answered the telephone automatically, vith a recorded announcement. While these "Code--phones" have a duration of three minutes, they an be adju ted to any length, and the station made his as brief as possible. It simply announced that he caller's selection for that performer had been ecorded and immediately disconnected.

This method of recording reduced the time to just fraction of that formerly required. The very first veekend after installation of the machines the staion received 40,000 calls, almost equally divided etween the two competing performers. Even that lid not represent the total of interested listeners, Brooks points out, since it took unusual perseerance for a listener to record the vote. Many had o call as many as 10, 15, even 20 times before heir choice was recorded.

One weekend contest even had to be cancelled ecause the number of calls "wiped out" one of the elephone company's main exchanges. "The utility called us explaining that a number of vital services, ncluding hospitals and fire departments, were without telephone service as a result. Naturally, we cancelled for that weekend," he recalls.

The degree of interest stirred up by the contest took the station by surprise. A number of those participating took time to call the station directly to point out a degree of unfairness they had observed due to the greater length of time it took to dial one of the numbers. One of the voting numbers took about three seconds longer to dial due to having higher digits than the others. To compensate, the station made an announcement acknowledging the vote on the other line to be three seconds longer, and explained this to its listeners.

The winner of each weekend contest is announced the first thing Monday morning. The degree of listener interest is also indicated by the large number of calls received during the week asking the identity of the contestants for the following weekend. The first contest started in October and was followed by other contests up to the end of the year, approximately 12 weeks in all.

All of those contests were musically oriented, and all elicited a good response. Although they didn't maintain the high of the second week, they did not thereafter fall below the 10,000-to-12,000 level.

The device can be used for other types of contests as well, Brooks points out. When the Baltimore Colts fired their coach in the middle of the football season, for example, the station asked its listeners to vote their approval or disapproval. The voting time for this covered a 24-hour span in the middle of the week, and did not interfere with the weekend contest.

continued on page 34

Broadcasters Give Radio Re-Regulation A Big Push at NAFMB Meetings

Executives of more than 500 stations air their specific complaints about existing rules, at meetings in 21 cities.

THE FCC IS HARDLY LIKELY TO COMPLAIN any more that the broadcast industry has injected too few of its own ideas into the re- or de-regulation of radio, now in full swing. At one-day meetings in 21 cities, organized by the National Association of FM Broadcasters and held on February 22, a total of more than 500 broadcasters met to tell what bothered them in the present FCC rules and regulations on radio.

And if the New York meeting, which *BM/E* observed, was fairly typical, the assembled broadcasters did in fact let loose a full-fledged barrage that should at least give the FCC plenty to think about. Transcripts of all the meetings will be forwarded to the Commission's Task Force on Radio Re-Regulation. The result will certainly be an acceleration and broadening of the re-regulation process, whatever the decisions on specific suggestions and requests.

As detailed in *BM/E* in February and March, two batches of rules changes and eliminations were announced by the FCC in November and December, to take effect April 4, 1973. These changes, most of them individually fairly minor, in total take off the broadcaster's back a considerable load of burdensome regulation in the area of inspection, logging of meter readings, reports, notification on emergency operation, etc. For example, the old rule that the operator must have "visibility" of the transmitter and monitor meters, often interpreted to mean that all the meters must be in front of the operator—obviously a difficult rule for many broadcasters—has been reinterpreted to allow meters 360 degrees around the operator, "so located that deviations from normal indications of the instruments can be observed."

Welcome as these changes obviously are, broadcasters—again taking the New York meeting as a good sample—are deeply disturbed by a number of rules, and FCC practices, of broader importance. With Steven Crane of the FCC, who attended, inevitably handed the roles of complaint-receiver and policy explicator, the broadcasters present gave a thorough going over to, especially: ascertainment of community problems; quotas for non-entertainment program segments as pre-requisite to renewal; citizen challenges to renewal; cost of political advertising and announcements; extension of the license period; and renewal forms.

Moderator of the meeting for NAFMB was Chuck Bailey of WCBS-FM. He gave Steve Crane first crack, and Crane reported that, as of that date, the FCC had received 611 letters on re-regulation, 200 of which said, in effect, they didn't believe it, but hooray anyway. He assured the group that re-regulation was real, and that the FCC would benefit greatly from direct feedback from broadcasters. He said that, in addition to the changes announced in November and December, the FCC was studying a large number of other possible points of change, among them the rules on frequency monitors, retention of records, renewal forms (possibly a "short form" would evolve), automated transmitters, and others.

The discussion that followed impressed *BM/E* greatly with its earnestness, with the sense of responsibility and thoughtfulness evidenced. The following is a brief skimming of what was literally a day of talk; included are just some main points made on the main topics.

Ascertainment

The main complaints centered on the difficulty a small station staff faces in interviewing enough people to make up a sample of the community. In a medium to large city, 300 people, say, might be considered an inadequate sample, but the interviews would constitute a heavy burden for the staff. In addition, there was the hazard of acknowledging problems mentioned by listeners and then not being able to do anything about them. Uncovering the problems, as one man put it, "puts a gun at the station's head."

On the question of what constitutes "doing something" about community problems, Steven Crane pointed out that the FCC had no formula: it sought evidence that the station was broadly responsive to the community's needs, and this generally meant some programming in the area. He suggested that several stations might join to hire a professional research team to survey the community; this would

olve, among other problems, that of the community eaders who would be interviewed over and over gain, if each station did the job separately. Or the ob could be divided up among the local stations.

Several station managers won praise for their escriptions of the use of taped ascertainment interiews on the air, in some cases with station comnent, plus a number of five-minute community reorts, eight to 12 a week. Speaking against the proessional research approach, one broadcaster said e found the ascertainment interviews "refreshng" and gave them as much time as they needed.

There was general agreement on two points. The rst was that a continuing dialogue would be better han a single frantic effort a few months before enewal—it would tend to keep the station on its oes and might also give potential protesting groups chance to blow off steam away from the renewal ssue. Second, most agreed that general guidelines, s at present, were better than a formula of some ind that would lock the station into a particular vay of handling community problems.

rogram quotas

On the related problem of program quotas on enewal applications, there was opposition to the dea of fixed "percentages" on several counts. Some f those present held that, if a station's audience vanted 100% music, giving it to them should be onsidered "serving the public interest, etc." But thers felt that a broadcast station has a responsibily to supply its audience with basic news and comnunity coverage. And a number doubted that a wall-to-wall music" station would survive: the narket imposed its own quota system on the broadaster.

Steve Crane said that the FCC was moving way from the idea of fixed quotas in any case, and oward a more general requirement simply called substantial service to the community." A number f those present agreed that a mostly-music station sually should get its news and public affairs mateial into about five minutes in each hour, to hold the udience. But even this formula was not a universal ne; the broadcasters wanted room for each to find workable pattern, and apparently FCC thinking is n the same track.

hallenges to renewal

As could be expected, this topic caused the oudest outcries of distress. Crane in large part assed the buck to Congress, which is mulling over everal bills on the subject. He said the FCC was ot, he believed, in a position to put limitations on hallengers, without specific Congressional authority. He advised broadcasters to reach their Congressmen ndividually and through industry groups, such as NAFMB and NAB.

icense period

On the related question of whether a five-year or en-year period was better than three years, a conensus emerged that longer periods would be disinctly better if there were no new protection forthcoming against renewal challenges, but that if the renewal process were given more stability, the extension of license period would have less importance. With reasonable assurance of going on beyond the three years, a broadcaster would have a chance to build a viable operation; three years alone is too short. The serious discouragement the present situation gives to major investors, thus cutting down a station's chances for enlargement, was just one of the evils the broadcasters saw in being wide-open to challengers.

Renewal form

Complaints against the complication of the renewal form were silenced by Crane's report that the FCC was, in fact, considering a short form, somewhat analogous to the income tax form 1040A, which could be used by many stations. There was no indication as to if, or when, this might become reality.

The 90-second editorial

One station manager got praise for his description of one form of public affairs programming developed for his station: 90-second guest editorials. It was agreed that this constituted valid public affairs coverage, and had the attraction of giving voice to many different viewpoints. In favor of such "programs," as against a half-hour on Sunday night, is the expectation that the audience will stick with the 90-second bit, with a longer public affairs program having a much higher turn-off risk.

On the *third-class exam*, some complained that applicants could pass without learning much about how to run the station. Crane admitted there was a gap between passing the exam and the real expertise expected, and said the FCC was considering the problem. However, he said this seemed largely a training problem which the industry itself, or each station, must attack.

On *performance specifications*, several were strongly in favor of more complete performance requirements for *studio equipment;* the consensus was that a majority of the poor-equipment problems these days are in the audio units that do not have to meet such rigid requirements as the now generally reliable transmitting equipment. The feeling was that the FCC should sharply upgrade the requirements for audio equipment.

On the *cost of political broadcasts*, Crane said this was one of the most frequent complaints in the letters received by the FCC, and pointed out that the problem was before Congress in several proposed bills. Those at the meeting agreed that there was a major complaint here.

At the end of the meeting, it was obvious that everyone present felt better for having blown off some steam and participated in some constructive criticism. The ball passes to the FCC: but broadcasters cannot afford to relax into total silence. Reinforcement on many issues is needed; a continuing dialogue is the thing, through letters, and personal contact at the FCC (warmly invited by Steven Crane). **BM/E**

Computer Monitored Microwave System Serves Pacific Northwest TV Stations

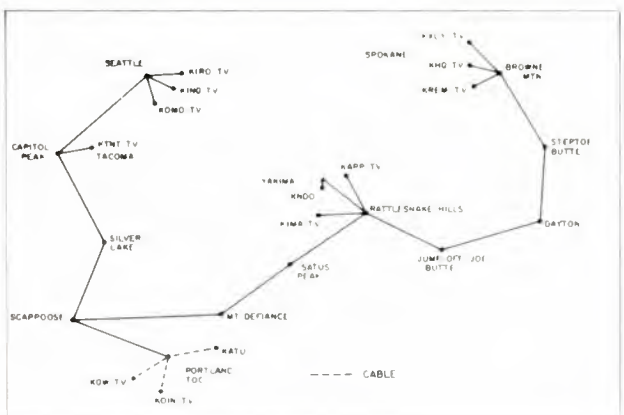
By David N. Corbin

THE NEW VIDEO MICROWAVE SYSTEM serving 13 television network (ABC, CBS, NBC) affiliate stations in the Pacific Northwest uses computerized monitoring to maintain reliability. The system, owned and operated by Western Tele-Communications, Inc., brings network TV programming into Tacoma, Seattle, Yakima, and Spokane from Portland, replacing existing telephone company service. The stations served by the new system are: KINT-TV (Tacoma); KIRO-TV, KING-TV, and KOMO-TV (Seattle); KAPP-TV, KNDO, and KIMA-TV (Yakima); KXLY-TV, KREM-TV, and KHQ-TV (Spokane); and KGW-TV, KOIN-TV, and KATV (Portland). Western Tele-Communications, a specialized communication common carrier, is the largest contract carrier of video in the country serving the CATV and TV broadcast industry.

The system is operated and controlled from the WTCI Technical Operating Center at Portland. The network video and audio signals are picked up at Portland by interconnection with another carrier. The three Portland stations are then fed by coaxial cables. Separate microwave radio channels for each network carry the video and audio from the Portland TOC to Scappoose Mountain. From there the signals are split to feed the Seattle and Yakima-Spokane legs.

Outbound from Portland, the system consists of the three network channels, an occasional-use channel for special event distribution, and a protection channel. The inbound system provides one occasional-use hot standby channel for special event feeds to other locations; 436 route miles are involved with equipment installations at 13 sites other than the local studios. More than 100 separate transmitter and receiver units are involved.

Mr. Corbin is manager, technical services, Western Tele-Communications, Inc.



Pacific Northwest microwave TV network.

Technical Operating Center at Portland showing alarm status and mini-computer at the right.

System configuration

Receive automatic baseband protection is provided at each studio with channel monitoring for all channels remoted to the receive protection switching logic located at the terminal repeater. At each terminal city the final repeater power-splits the protection and occasional-use channels and combines them with the associated network channel for transmission to the respective studio locations.

Two independent switching sections are provided on the Scappoose, Yakima-Spokane system: Scappoose to Jump-Off-Joe Butte, and Jump-Off-Joe Butte to Spokane. The channel monitoring equipment is remoted to the switch logic at Jump-Off-Joe Butte.

A single non-protected return channel is provided from each of the studios to the terminal repeater for the city. At the terminal repeater any one studio can be patched into the common return channel. A hot standby heterodyne return channel is provided from Seattle to Portland; and a single, non-protected, heterodyne return channel extends from Spokane to Portland. IF switching at Rattlesnake, with remote control from the Portland Technical Operation Center, permits interconnecting the return channel from Yakima with the return channel to Portland and with the occasional-use channel to Spokane. Origination of both video and audio traffic at any studio is therefore possible.

Microwave equipment description

The basic system consists of the Raytheon KTR-3A heterodyne equipment with KTR-2A 11 GHz

quipment utilized from studio to terminal repeaters. This equipment is completely solid state except for the traveling wave tube final amplifiers in the transmitters. Frequencies in the 6 GHz band are used except when frequency coordination requires 1 GHz channels, such as in the Seattle, Spokane, and Portland areas.

Each channel is equipped to originate video and audio programming at the Portland TOC. A 10 MHz pilot is injected on the baseband of all channels, and a network identity pilot is injected on all channels except the protection channel. These pilots are used to monitor channel status at receive switching locations and for switching functions.

A noise monitor is also provided at the receive switching locations. The noise and pilot monitors furnish the input to the 1 for N switch logic at the receive end of the switching sections. The protection channel will carry the network or occasional-use audio and video program in the event of failure of the respective network channel as indicated either by loss of pilot or high noise.

Pilot and noise monitoring equipment on all channels is provided at each studio. This information is remoted to locations of receive 1 for N switch logic. The presence or absence of the network I.D. pilot on the protection channel is also monitored. When a switch is performed at the transmit end of the 1 for N switching section, an I.D. pilot appears on the protection channel. The presence of this I.D. pilot will initiate a switch to protection at the appropriate studio.

Hot standby operation is achieved using a diode switch at RF. Control of the RF switch is provided from monitoring: *1* the receive carrier level; *2* the transmitter power; *3* the receive local oscillator AFC; and *4* the transmit local oscillator AFC. A non-redundant SSB service channel system is provided over the hot standby channel. The receive section of the SSB system is normally connected to the A channel of the hot standby system, but switches to B on failure of the A receiver.

The transmit section of the SSB service channel is split and applied to both A and B transmitters. The hot standby receive terminal is located at the Portland TOC. Switching is performed at baseband. This switching is controlled from monitoring: *1* the receive carrier level; *2* the local oscillator phase lock; and *3* the receive program audio carrier.

To achieve the best frequency coordination and help prevent future interference problems, high performance antennas are used. Andrew UHX 10-foot 6 GHz antennas provide a 75 dB front-to-back ratio with gain of 43 dB. The high performance with low sidelobe radiation is achieved by the use of a "shaped pattern feed" which reduces illumination of the reflector edge.

Control and alarm

Independent service channel drops for the Seattle and Spokane sections provide: *a.* switch control channels, *b.* a local order wire facility; and *c.* fault alarm injection. The supervisory control is achieved by a dual tone multi-frequency (DTMF) encoder at the Portland TOC and decoders at the controlled locations. The tones are transmitted on the service channel.

Baseband Spectrum Allocation

Nominal Bands

0 - 4.3 MHz		Video
5.8 MHz	± 300 KHz	TV audio
8.2 MHz	± 100 KHz	Portland-Seattle Service Channel
	± 200 KHz	
8.3	± 25 KHz	Occasional-Use Channel Identity Pilot
8.35	± 25 KHz	NBC Channel Identity Pilot
8.40	± 25 KHz	CBS Channel Identity Pilot
8.45	± 25 KHz	ABC Channel Identity Pilot
8.70 to 9.3 MHz		Noise Monitoring Slot
9.75	± 100	Portland-Yakima-Spokane Service
	± 200 KHz	Channel
10 MHz		Channel Pilot

The alarm system is computer controlled for rapid and efficient monitoring of the entire operation. A 16-K word PDP-11 computer, with one interrupt level, controls the entire alarm monitor operation. A Moore 800 ALC Master, with remotes at each station site, feeds alarm data to the computer. Up to 128 alarm points can be monitored at each location. These include unauthorized entry, RF equipment condition and faults, power failure, etc.

Computer interface is provided by a standard ASR 33 Teletype. The operator can load software, delete or restore remotes, and request reports with the ASR 33. The system will print a real time log which includes data points going into and out of alarm as they occur, a current alarm log, and a month-to-date summary log. The month-to-date summary log consists of a system summary, a network summary, and a station summary.

With this system problems can be immediately pinpointed and corrected. Trends or recurring conditions can be spotted for preventive maintenance investigation. The result is a highly reliable service to the network user.

Added communication services

To achieve maximum usage of the RF frequency resources and equipment, Western Tele-Communications is engineering the addition of PCM carrier to unused portions of the system baseband. The T compatible PCM carrier will provide data, voice, and general communication service for many users between these cities. These added services will be integrated into the specialized communication common carrier systems recently authorized to WTCI by the FCC. This PCM service WTCI calls "MOVE"—Messages Over Video Economically. It will be used on other video microwave systems for customer communication channel requirements on low density routes.

This new WTCI video system with its potential for maximum reliability, and with added PCM carrier, demonstrates the ability of the "specialized" non-telephone common carrier to provide highly reliable, yet economical, services to the communication used. **BM/E**

Much of this material originally appeared in the January issue of "Telecommunications" *magazine.*

TELEPHONE Continued from page 29

"We obviously have to introduce variety into this to maintain interest, like anything else," Brooks says. "This should not be any problem, since the device lends itself easily to many subjects including some of community-wide interest."

Listener participation always strong

Listener participation programs have a special durability of their own, he points out. Interest in the "Conference Call" program has never flagged. This program starts at noon, with a conference of four members of the WFBR staff, including Brooks, discussing questions called in by listeners earlier that day. Calls are received by the station, starting at 9:00 a.m. until 11:00 a.m., by a station employee over the telephone. The most interesting questions are selected, and background information is researched before the conferees go on the air at noon. Subjects raised even include comments unfavorable to the station. Their conference starting at noon lasts until 12:30 p.m. Meantime, listeners are telephoning their own comments on the opinions expressed by the conferees. These are taped, and the best comments are selected for playing back during the last half of the program from 12:30 until 1:00 p.m.

In all these programs, enlisting the active participation of listeners whets interest in the station. In the musical contest, it causes them to listen more critically and attentively to the music.

In addition to the Model 250, the station has used a Model 800 "Code-a-phone" (manufacturer is Code-a-phone, Box 06459, Portland Oregon, 97206) for over two years for the sole purpose of providing listeners with a sympathetic ear for the comments they may want to make on any subject. Most often, though, listeners use it to request musical selections, usually for a specific station program. Station WFBR is first of all a music station, although some of its programs do combine music and talk. One of the more popular programs is exactly that kind, with the announcer talking back and forth with the people calling in on the telephone throughout the program. Three times daily, the station tells listeners the telephone number to call to leave requests or voice opinions.

The engineering department of the station is working closely with the telephone company for developing better fidelity through the telephone, to bring this up to par with radio tone quality. They are also working to develop equipment which will permit the announcer to chat with the callers so that both can be heard simultaneously, without one overriding the other. "This will make the conversational interplay more natural and spontaneous as well as faster and more interesting," Brooks states. **BM/E**

AUTOMATIC SYSTEM Continued from page 23

The Data Monitor digitizes each analog parameter and compares the results with programmed limits, which in turn can initiate executive action such as changing the transmitter or video feed.

Four inputs are provided to the Analyzer, two for transmitter feeds and two for video. Illustrated in Fig. 2 is one possible configuration of the monitoring system.

In the automatic mode, the Data Monitor cycles the Analyzer through all parameters. Information on each parameter is then transferred to the monitor for limits comparison. Four limits can be set up for each parameter consisting of a high and a low limit of two grades. Red limits are used for transmitter output and tighter amber limits are used for video inputs to the transmitter. Alternatively, these limits may be assigned cautionary or urgent levels so that trends may be indicated prior to failures. These limits, which are changed by plug-in buttons, are accessed via a hinged panel of the Data Monitor, 2915, as shown in Fig. 3.

Operation in the manual mode is also possible. In this case, a 3½ digit panel meter on the Analyzer displays the parameter in its natural units—voltage, delay time, degrees of phase shift, or as a percentage.

In the automatic mode, when an out-of-limits condition is detected, a separate scan counter monitors that condition for several measurement cycles and an indication is only given when it continues to exist over a pre-set number of these measurement cycles. The visual display of a fault condition is by the extinguishing of a normally lit LED on the monitor. When a fault condition is found, the system also automatically cycles the monitor—first to the main video input, then the reserve, then the transmitter outputs—in order to detect which section is faulty. The result of this search operation is displayed by extinguishing one or more of five LEDs on the monitor. These LEDs represent the four possible feeds plus transmitter failure. At the same time, a signal is provided by the executor which can switch the transmitter or video input as necessary to maintain transmission, or report remotely transmitter failure or complete station failure.

In order to prevent false reporting during a re-start or initial warm-up period, an inhibit facility is provided on the system.

Although primarily intended for broadcast transmitters, this system may find other applications in real time monitoring of TV picture quality throughout the transmission network. This monitoring system can be supplied in a bench configuration or rack mounted, and internal plugs convert the standard unit from 525 to 625 line systems to meet national and international standards.

Further details on this monitoring system can be obtained from Marconi Instruments, 111 Cedar Lane, Englewood, New Jersey. **BM/E**

Automatic Systems at NAB Convention

Both CBS Laboratories and Tektronix unveiled at the NAB Convention last month systems that could use a VIR reference to automatically correct for transmission line degradation of video gain, chrominance/luminance gain ratio, burst phase and burst gain, set-up level and sync gain.

BROADCAST EQUIPMENT

bw-cost microphone stand has grip utch and scuff-resistant, triangular sel base. Model MS-50 adjusts from in. to 63 in., has a base 14½ in. a side. $8.75. ATLAS SOUND. **277**

hone patch comes with 15-foot telephone leads, has built-in VU meter, gin control and locking push-to-talk

lr. Realistic Phone Patch has a free-foot transmitter lead. $19.95. ADIO SHACK. **282**

terface unit intended to optimize mbined performance of multi-chanl microwave and CATV systems ovides an additional 12 dB of autoatic gain control beyond the range the AML system. AML/CATV terface also generates and inserts lot carriers required by the cable stem, raises all signals to the usual tput level of a trunk amplifier, and ovides tilt control when needed. HETA-COM. **275**

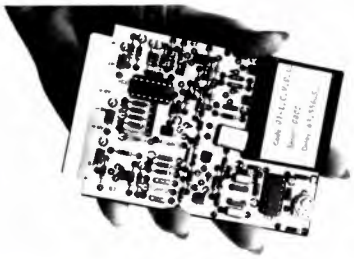
ew cesium beam tube in primary freuency standard raises absolute acury for frequency from ±1 part in 10^{11} ±7 parts in 10^{12}. Improved Model 061A retains long-term stability bet-

r that ±5 X 10^{12}, and compared ith earlier model has greater immuty to effects of external magnetic lds, vibration, rotation, and rapid mperature changes. $18,860 (with w tube). HEWLETT-PACKARD. **276**

ideotape for ¼-in. helical scan is signed for close-circuit video rerding in education, business, and ofessional fields. The 160 Series has bricated back coating, gives head life of about 1000 hours with Alfesil heads. $10.30 for half-hour, $20.15 for one hour, $43.37 for two hours. AMPEX. **278**

Automatic telephone dialer for alarm systems records numbers to be called, plus voice messages. Model R2 Dialtronic calls the recorded numbers and delivers messages on activation by fire or burglary sensor. Adjustable time delay (0-30 seconds) puts off activation until constant alarm is indicated. MOUNTAIN WEST ALARM SUPPLY CO. **279**

Compact video delay modules for dropout compensation and image enhancement use glass delay lines. Series have both input and output at video



frequencies, provide delay of 63.5 microseconds, 4.5 MHz bandwidth, 55 dB s/n ratio. CORNING GLASS WORKS. **283**

Low-cost table-top optical multiplexer sends any of three projector inputs to camera. Model OM 300T has a transfer time of 175 milliseconds, is self-

dousing, can use optional remote control. $930. KALART VICTOR CORP. **284**

Cordless battery wall clock has easy-reading 24-hour time dial, operates for a year from a C-size flashlight battery. The Langhorne has a separately marked inner circle to show hours, outer circle for minutes. With 8-in dial, $22.00; 12-inch, $25.50. FRANKLIN INSTRUMENT COMPANY. **280**

New small decorative sound baffles include wide range of styles and shapes. The 4+ Series can be had with bi-directional or surface mounting, and a variety of finishes. SOUNDOLIER, INC. **281**

Voltage controlled audio amplifier has linear voltage/decibel gain range from −100dB to +30 dB. Model 202 has input noise of 6 microvolts, peak signal up to 100 volts, flat frequency response to 20 KHz, distortion 0.07%. DBX INCORPORATED. **285**

Remote start/slate system for hand-held cameras allows cameraman to start a remote recorder by pushing button on camera. System uses transmitter on camera, miniature receiver on recorder, has range greater than 100 yards, cues tape at start for picture/sound sync. $510 to $650, depending on camera. STUART R. CODY CO., INC. **286**

Paneling for television studio backgrounds provides easily-erected textured surface. Marlite panels give

cable operators or other small studio users quick, attractive "rear-wall" for camera room. MARLITE. **287**

Portable digital multimeter has instant auto-ranging. Model 4444 DMM has four-digit display, and automatic setting of decimal, polarity sign, units annunciator, overranging, overload protection. Common mode rejection is 130 dB for DC measurements, DC accuracy is ± 2% ± 1 digit ± 10 microvolts. $575. WESTON. **288**

Noise and signal measuring set covers +23 dBm to −95 dBm, and +113

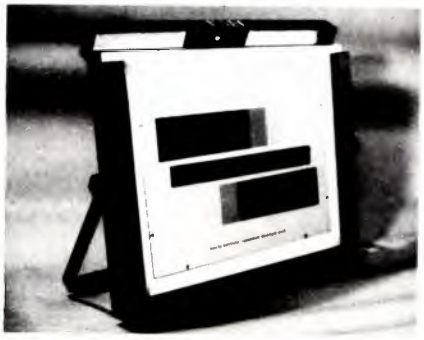
dBrn to −5 dBrn. Model 510 has flat response from 30 Hz to 20 KHz, or can be modified for C-MSG, high pass, 3 KHz or 15 KHz weighting.

continued on page 36

PRODUCTS

It maintains over 85,000 ohms across the line, with close tolerances when bridging or terminating. Battery pack or AC. $385.00. TM SYSTEMS. **289**

Set of TV test patterns is mounted in aluminum case, which can be stood on table or held by microphone or light stand. "Porta-Pattern" includes resolution, registration, ball and chip



charts, with chart in use simply moved to front of case. $180. TELECOMMUNICATIONS INDUSTRIES. **290**

Low-light-level photo-detection assembly uses a 10-stage photomultiplier tube. The PF1023 Series can include a variety of optical filters and signal conditioning amplifiers, user specified, with all units in a RFI and magnetic shielded, insulated housing. Gain can be remotely controlled from about 10^2 to 10^7, by voltage or resistors. RCA. **291**

Single-channel yagi antennas have 5 elements, for any VHF channel or the FM band. EY Series have 6 MHz response, gain typically 7 dB over a tuned dipole, front to back ratio up to 16 dB, beam widths 56° to 65°. Ten-element versions are available for higher gain (10 dB) on any channel, 7 through 13. BLONDER-TONGUE LABS. **292**

Digital incremental readout system measures and displays position, angle, or other variables. Model DIR Incremental Readout consists of an optical encoder and a counter-display unit. Single or dual axis systems are available, with 5, 5½, or 6 digit readout. Resolution is 0.0001 inches, 0.001 millimeters, or 0.001 degrees. SEQUENTIAL INFORMATION SYSTEMS. **293**

Magnetic disc drive for data storage will hold from 25 million to 100 million bits per drive. DPX Series can be daisy-chained up to four units, for 400-million bit storage. Access time is 10 ms track to track, 35 ms random. Data rate is 2.5 MHz at 2400 RPM. PER DATA. **294**

continued on page 38

The New CP-16/A (with Crystasound). A Cameraman's Kind of Camera.

…d of the daily struggle with backbreaking …braces, unwieldy tripods, and heavy, …on balanced cameras? Tired of dangling …w… and sound cables? Encumbered by …cly exhausted battery packs? Frustrated …a noisy camera movement? Annoyed with …ction" sound equipment? Feeling crushed …the weight of it all?

…at Cinema Products, believe that we have …signed a unified camera and sound system …t will solve all of these problems.

…e backaches, for instance. Backaches …y sound funny to some people. To a TV-…ilm cameraman they're no joke. More …ore TV-newsfilm cameramen have been …ing severe and crippling backache con-…o… as a result of carrying heavy and poorly …aced cameras, mounted on …cofortable body braces, …many long …un… …CP-16/A …camera …een de-

…d and specially …ed for convenient …-*shoulder* shooting.

…hs a little less than 17 pounds when fully …ped. And "fully equipped" means *fully.* …00-ft. magazine loaded with 400 feet of …Vith a 12-120mm Angenieux zoom lens. … plug-in Nicad battery pack. With a criti-…accurate crystal-controlled DC servo-… for single and double system sync …. Plus the Crystasound recording system …uilt-in amplifier. That's right. Less than …nds!

…or noisy camera movement problems, … got to "not hear" the CP-16/A to believe …uietly it runs. Our sound tests show …ximately 31 dB at 3 feet. But the real sound test is your professional ear, and the actual quality of the sound recording.

Out-of-sync problems? Our CP-16/A is crystal-controlled to the extremely critical tolerances required by *cordless* double system recording, with a frame rate accuracy of ±15 parts per million over a temperature range of 0-140° F. And if something should go wrong, the easily visible out-of-sync warning lamp, located at the front of the camera, will instantly light up.

As for magazine capacity, the CP-16/A accepts standard 400-ft. and 1200-ft. Mitchell-type magazines, and we even designed a special locking stud so that magazines can be easily and instantly snapped on and off the camera.

Then there is the power supply problem. There are no lost shots with our rechargeable plug-in Nicad battery pack. It snaps instantly in and out of the camera body, and drives from 3200 to 4000 feet of film on a single charge. That's a lot of footage from a little battery pack which weighs a mere sixteen ounces. It is so compact—a spare, fully charged battery pack will slip easily into your shirt pocket. And it also powers the CP-16/A sound system.

Lately, more and more TV-newsfilm and documentary cameramen have had to "go it alone," with the responsibility of capturing *both* picture and sound. Designed and engineered from an overall total systems approach, our CP-16/A with Crystasound makes it seem almost easy.

The Crystasound amplifier is part of the camera, and it is powered from the same battery pack. Switchable, variable compression Automatic Gain Control let's you concentrate on filming the event. The headphone monitoring channel automatically switches from live mike to playback when the camera is turned on. We've even provided a special line feed to a tape recorder for those instances where the cameraman is recording simultaneously for TV and radio. The built-in amplifier has two microphone inputs and one line input, all with independent volume control. Other features include automatic bias level, with no adjustment required, preview switch, VU meter, and low power consumption.

Our Crystasound recording system features a special record and playback head, encapsulated in the same module to guarantee absolute alignment for its entire life.

Should you need an auxiliary mixer, our Crystasound auxiliary mixer features: four channels of mike input, one channel of line input, and one condenser mike channel. It also features individual and master volume controls as well as switchable AGC.

For the TV-newsfilm cameraman, the name of the game is lightweight, extremely mobile and reliable equipment, so that he can capture the spontaneous *live* feel of a news event as it happens. We are confident that the CP-16/A provides just that.

With no backaches.

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PRODUCTS

High-output, low-noise tapes for studio and mastering applications are available with 1.5 mil or 1 mil polyester backing, and come in ½, ½, 1 and 2-inch widths. Type 2506 (1.5 mil) and 3607 (1 mil) have new oxide, new binder, and the "Cushion-Aire" backcoating for handling and storage reliability. AUDIO DEVICES. **295**

Switchers for audio machines give push-button control of two open reel recorders, two turntables, or four cart

machines. Custom units are available for almost any other combination of studio sources. DYMA ENGINEERING. **296**

Digital multimeter has 5½ digits, with autoranging and autopolarity. Model 8375A measures DC, 1 microvolt to 1100 volts, AC from 10 microvolts to 1100 volts, and 100 microohms to 12 megohms. Also: broadband noise rejection filter, variable sample-rate control. $1995. FLUKE. **297**

Cassette alignment tape provides tests for azimuth, frequency response, speed and flutter. Model AT-200 also has primary and secondary reference levels. Each test is announced by voice, recording is full track, running time 15 minutes minimum. NORTRONICS. **298**

Telemetry system uses a phone line to read remote meters. Model RD230 sends back up to eight variables in sequence after number is dialed; read-

ings are displayed on "home" meter, with channel identified. Recorder output is included. METRODATA SYSTEMS, INC. **299**

Color TV modulator has a phase-lock system to allow CATV operation on same channel as a broadcast TV signal. Model CTM2 thus eliminates co-channel bars, or beats; in addition to

continued on page 40

You wouldn't have to make good if you didn't send bad.

Every time a heavy dropout burst from your VTR causes lost sync, your viewers might as well be watching the radio.

And if it happens during a commercial, you know the ad agency is going to be right in there demanding another "make-good."

But it doesn't have to happen at all, because with the 3M Brand Color Dropout Compensator (DOC) you can solve the problems caused by dropouts.

Our DOC works with any quad VTR and replaces lost video information, in color or monochrome, with correct video.

Fill-ins are undetectable because they're perfectly matched in brightness level, and chroma.

Horizontal sync and color burst are correct, so there's no color flashing. Servo lock and color lock are automatically maintained so you get full color interlace and VTR stability even through multi-generation dubs.

There's just nothing else that works like the 3M DOC.

It replaces the lost video information in full color within the video signal itself. Luminance and color are processed through separate delay lines, with the color phase-inverted to achieve color interlace with the stored signal. When dropouts are detected, our unique self-balancing switch replaces the lost signal with stored information from the previous scan line of the same field. It does this without introducing switching transients, or white flashes.

The 3M DOC comes with an adjustable dropout replacement threshold, with rf agc to maintain the level set; a chroma auto-phase corrector; and a built-in dropout simulator for alignment without a test tape. All standard features, not expensive options.

You'll find that the 3M Brand Color Dropout Compensator works better and is easier and less expensive to use than anything else you've tried.

For the name of your nearest dealer, contact: Video Products, Mincom Division, 3M Company, 300 South Lewis Road, Camarillo, California 93010. Telephone: (805) 482-1911. TWX: 910-336-1676.

We've been there.
And brought the answers back.

3M COMPANY

Circle 121 on Reader Service Card

PRODUCTS

CATV transmission it provides rel tively simple "in-house" monitorin (along with CTD1 demodulator

ELECTRONIC INDUSTRIAL ENGINEERIN (RCA). **30**

High-power RF tubes use improve grid material, "Pyrobloc," for power of more than 25 kW at above 100 MHz. Vapor-phase cooling, plus Pyro bloc grid, reduces size of broadcast ing tetrodes at powers above 500 kW by a factor of 2 or 3. THOMSON CSF. **30**

Coaxial attenuators allow adjustmen of signal level at input or output o headend and at set-top converters. At tenuator is 2.75 in. by .4375 in., ha a "T" network of 75 ohms impedance comes with 3, 6, 10, 12, 16, and 2 dB attenuation. AMECO. **30**

AM broadcast transmitter puts out u to 55 kW, has dual selectable oscil lator circuits. Model AM-50KD i in a three-section cabinet, uses high level plate modulation into 4CX35000C tetrode in a high effi ciency circuit; has oil-filled modula tor and reactor. All audio and low level RF circuits are solid state AMERICAN ELECTRONIC LABO RATORIES. **30**

Monitoring and controlling instru ment for two-way radio systems goes in transceiver antenna lead. "Base Command" measures SWR, transmit ter power, modulation level, monitor audio quality, field strength of re motes. A TV interference filter is in cluded. PATHCOM, INC. **30**

Very compact dual trace oscilloscope weighs 3.4 pounds, is 3 × 5½ × 5 inches. Model 212 has 500 KHz

bandwidth and 1 mV/div vertical sensitivity. Included are rechargeable nickel cadmium batteries. $725. TEKTRONIX. **30**

"Cartridges are our lifeblood. We have some of the most sophisticated cartridge-handling equipment in the country. We are converting to the Audiopak® Model A-2 cartridge exclusively."

—Eric Small,
Chief Engineer,
WXLO 98.7
stereo New York.

We've tested other
artridges. A lot of
ther cartridges. Our
ests showed no
artridge superior to
ne Audiopak A-2 in
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r (most important of
ll) consistency in
hase stability."

"What you're looking at here is what we call the DTC. That's short for Disc Tape Cart Transfer system. It's as close to completely automatic cart making as the state of the art permits. Control logic is solid state."

"We make 50 to 150 carts a week. We've got to be able to rely on them. That's why we have standardized on the Audiopak A-2."

nce all our music is
carts, they must be
endable. Without
oubt, the A-2 gives
the reliability we need."

Shown here with Mr. Small is John Bailie, Maintenance Supervisor.

New Audiopak® A-2 Broadcast Cartridges

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NEW LIT

For copies of these literature offerings, circle number for appropriate items on Reader Service Card.

Patching devices, switching systems, connectors, cable for CATV, TV, telephones, telemetry, etc., are covered in new 60 page catalog. Trompeter Electronics. **200**

RF and AF test oscillators and generators are detailed in eight-page brochure. AIL Tech. **201**

Sales Bulletin 97, a 32-page catalog, shows thousands of items including **micro-wave/waveguide, electronic test instruments, coaxial connectors and switches signal generators,** many others. Lectronic Research Laboratories. **202**

Radiofacsimile converter is covered in two-page data sheet, with complete specifications. Alden Electronic and Impulse Recording Co. **203**

Catalog covers full line of **studio, theatre, and television lamps,** including operating information on tungsten-halogen, incandescent, and arc-discharge lamps. GTE Sylvania. **204**

Data sheets for cable operators show levels vs. volts, CATV channels by frequency in MHz, and potential O-beats of all cable channels from T-7 to T. Magnavox CATV Division. **205**

Line of **RF current probes,** for measurements up to 1 GHz, are covered in detail in 42-page book with application notes, electrical and physical specs, and transfer impedances. Singer Instrumentation. **206**

Audio control systems with integral computer, the 700 series, are described in eight-page color brochure. International Good Music, Inc. **207**

Four-page brochure covers **dual-magnet stereo phono cartridges,** including models designed for discrete-quad playback. Audio-Technica. **208**

A "Guide To Selection and Use of Diesel Electric Systems" covers specifications for various requirements, cost estimation, and other aspects of choosing and using a diesel system. Allis-Chalmers. **209**

Full line of land mobile antennas with all electrical and mechanical specifications, including pattern coverage, is shown in 72-page catalog. Phelps Dodge. **210**

General catalog shows complete line of **microwave components and test instruments** in 30 pages, with applicati notes and specs. Singer Instrumen tion. **2**

"Telephone Cables For Inside Plan covers **terminating cable, switchboa cable, inside wiring, and connect cable** for internal applications. Gene Cable. **21**

Line of **instrumentation products**- multimeters, recorders, counters, et —is fully described in new catalo Simpson Electric Co. **21**

RF power modules MX 7.5 and M 12, handling up to 14 watts, designe for 12-volt broadband UHF applic tions, are described fully in new da sheet. TRW Inc. **21**

Cable tapes and sealing materia connectors and tools, splicing an blocking accessories are shown in 2 page color catalog, "Outside Plant 3M Company. **21**

Home-study electronics technolog programs are the subject of new cat log of mail courses. International Co respondence School. **21**

"Pioneer News" is a bi-monthly new letter carrying topics concerning Pi neer's **high fidelity products.** Pionee **21**

Line of low-cost character generato for television is covered in a series c two-page spec sheets. Datavision, In **21**

More than 500 symbols used in elec tronics are shown and defined in a ne pocket-sized handbook. Cleveland In stitute of Electronics. **21**

"Selection and Use of Kodak an Eastman Motion Picture Film" is new 56-page book on the **technic aspects of films, film emulsions,** an film use, covering the selection of filr for different applications, and on usin film properly. Eastman Kodak. **22**

Catalog covers wide variety of **cabinet and equipment racks,** and accessorie Stantron. **22**

Report on the EIAJ-Type 1 ½-inc open-reel VTR lists 52 models, of dif ferent manufacturers, discusses th history of the standard, its technica operation, the development of colo Available for $1.00 from National In dustrial Television Association, P.C Box 297, Summit, N.J. 07901.

Eight-page brochure shows full operat ing characteristics and applications o the **7L12 spectrum analyzer,** coverin 0-1800 MHz. Tektronix. **22**

Catalog covers line of **waveform an function generators** with complet specifications and application notes AIL Tech. **22**

Save from One Third to Two Thirds on Central Studio Background Music

You can turn your unused FM side channel into a moneymaker by offering a background music service. But why take the profit out of it by paying more than you have to...and getting less than you should? Competitive sources usually charge rates averaging 10% to 20% of your gross. Ours usually averages only 5%.

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Circle 125 on Reader Service Card

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first annual convention at the Shoreham Hotel, Washington, March 28-30, coinciding with the NAB annual at the same spot. Membership is spread through the U.S.A., Canada, and Europe. The headquarters address of IITA is P.O. Box 297, Summit, New Jersey 07901.

CCTA Convention Set For Toronto in May

The Canadian Cable Television Association has set its 16th annual convention and trade show for the Sheraton Hotel in Toronto, May 21-25, 1973. General themes on the agenda will be business aspects of the industry, the latest technical developments, and refinements in local programming. All sessions will be videotaped for later viewing. The industry exhibits will be open throughout the convention.

New Firm To Supply CCTV Equipment and Services

Videco is the name of a new firm, a division of Image Communications Inc., which has been set up to supply all needs for closed-circuit television users, including primary and accessory equipment items, the design and installation of studios, maintenance, rentals, leasing, and engineering consulting services. Headquarters of Videco is 528 North Michigan Ave., Chicago.

Highest-Power FM Station Slated for Ohio

With an agreement to buy three 25 kW FM broadcast transmitters from CCA Electronics of Gloucester City, N.J., Station WDBN, Medina, Ohio, is setting the stage to become the most powerful FM broadcaster in the United States. The three transmitters will be used together to put 75 kW into the low-gain, high-power antenna system for a planned saturation coverage of Medina, Akron, Cleveland, Canton, Elyria, Lorain, and Mansfield.

New Chemo-Optical System Promises Flat TV Screens

An optical switching system which uses crystals that become opaque to polarized light in an electric field has been patented by two professors at the University of Mis-

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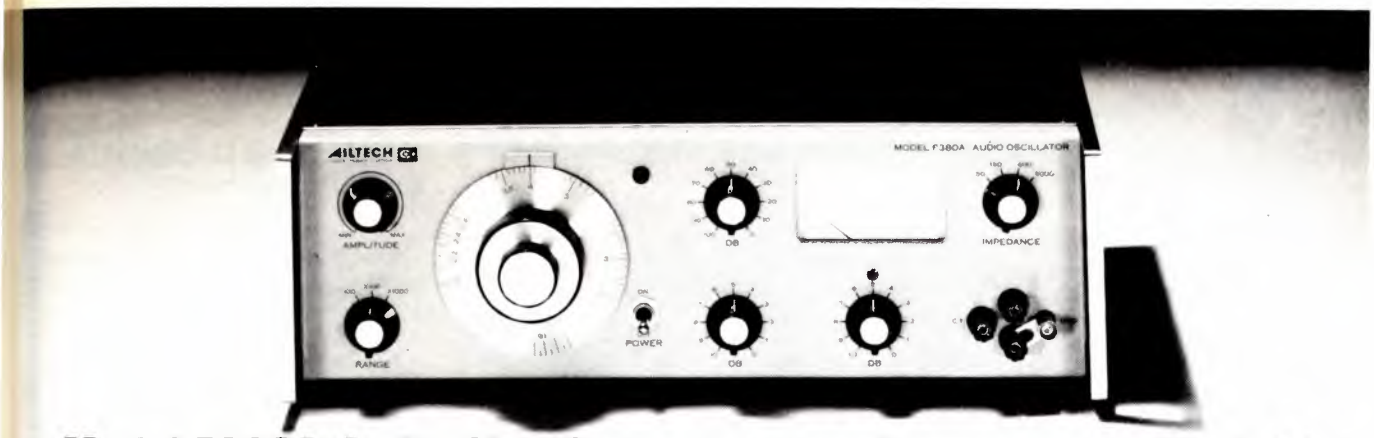

Model F380A Audio Sine Generator. Proof accuracy in one box.

- **Total distortion less than 0.1%**
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Model F380A—the ultimate in broadcast test instrumentation. With Model F380A, complete station speech, network and transmission equipment can be accurately tested, monitored and maintained. Featuring a low distortion balanced output with a hum level 100 db below zero, Model F380A is calibrated at 110 db output attenuation. Selectable impedances eliminate the need for matching transformers. The price for all this? $925.00. Write today.

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ERFECT YOUR CCTV SYSTEM WITH COSMICAR® LENSES

TV-COSMICAR-EE 16mm F/1.6

he TV-COSMICAR-EE 16mm f/1.6 is a high-speed E lens specially designed for 2/3" vidicon cameras. maintains image luminance 100 lx against sub- ct brightness between LV11.3 ~ 17 (350 ~ 18,000 d/m²), about 1,800 ~ 96,000 lx.

The automatic electric-eye diaphragm close down completely provided that subject brightness exceeds approx. LV20 (144,000 cd/m²), 768,000 lx. In case the camera is switched off and not in operation, the automatic diaphragm closes down, completely shutting off the light for protection of the vidicon camera.

The "Change-over Switch" in front of the lens controls the operation of the diaphragm.

When the switch lever is turned on to "EE", the lens diaphragm operates as fully automatic electric-eye, and is brought on to "OPEN", the diaphragm stays fully opened condition.

Be sure to get the finest image recording results with quality Cosmicar lenses.

Also available are scores of other lenses, ranging from 8.5mm to 1,000mm telephoto, zoom and those motordriven among them, for immediate delivery, after being tailored to your specifications.

COSMICAR

COSMICAR OPTICAL CO., LTD.

424, Higashi-Oizumi, Nerima-ku, Tokyo, Japan Cable Address: "MOVIEKINO TOKYO"

Circle 129 on Reader Service Card

NEWS

sissippi, according to an announcement from the University. Drs. T. J. Klingen and J. R. Wright, who assigned their rights to the University, say the process could be used to make "picture-thin" TV screens, or for applications in laser switching and high-speed computer data processing. The rearrrangement of molecules which changes the light transmission of the crystals takes place in about a trillionth of a second, the developers say.

Houston Firm Starts MDS For "Private TV"

A new firm in Houston, Texas, the Houston Multipoint Television Co., inaugurated in March what appears to be the first on-air application of the new Multipoint Distribution Service (MDS), private point-to-point television system described in *BM/E's* February news column. MDS provides private television by scrambling broadcasts, with unscramblers at the subscribers' receivers, using channels in the 2150-2160 MHz band. The Houston firm offers broadcasts from its headquarters or from the subscribers' premises, for intr company communication, marke ing, training, new product introdu tion, etc.

Oral Roberts U. Gets RCA Color Production Studio

Oral Roberts University, in Tuls Oklahoma, has installed a comple color TV production studio, usin RCA equipment, at a cost of abo $650,000. The studio will be use to produce the Oral Roberts telev sion programs, formerly put toget er in Burbank, California. Th studios will also provide a laborat ry for students in telecommunica tions, said Ronald R. Smith, execu tive vice president of Oral Robert University.

Swiss Cable Association Formed in Zurich

Operators of major cable systems i Switzerland have formed a nationa association, with objectives simila to those of the United States NCTA, including provision of "unified stand on matters of licen ses, franchises, copyright laws, loca origination, and similar matters." I its French form, the name of th group is "Association Suisse des Ex

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ploitants d'Antennes Collectives (ASEAC)," and is addressed "Care of Rediffusion AG, Zurich, Switzerland."

Penn University To Expand Two-Way TV Courses

Use of two-way television for teaching courses in engineering and other subjects has proven so successful at the University of Pennsylvania that the program will be expanded, according to an announcement from the University. Initially designed to help engineers get graduate credits by study at or near their place of work, the system is being enlarged to include undergraduate physics and courses leading to degrees in business administration. Lessons learned from the experiment, according to Dr. Octavio M. Salati, director, include the need to tighten course content because television covers material much faster than traditional classroom teaching. The system included broadcasts to special receivers on the 2500 MHz band, plus two-way FM radio and telephone talk-back.

New York Area CCTV Net Near Programming Start

The Metropolitan Regional Council, organization of municipal and county governments in the New York metropolitan area planning a CCTV net for intra-region governmental communication, announced a variety of programs in final stages of preparation. With nearby counties of New Jersey and Connecticut, as well as New York City and nearby New York counties, as members of the net, the MRC will disseminate a variety of training programs for professional municipal and county staffs, a series of pollution-control workshops, courses in law enforcement, and many others of interest to the governments. Construction of the net was to be completed early in 1973.

NCTA Awards Will Be Made At Anaheim Meeting

The National Cable Television Association announced its Cablecasting Awards contest for 1973, with the awards to be given at the annual convention in Anaheim, California, June 17-20. The awards will be made at a cablecasting session, along with a showing of outstanding cable programs. Last year's con-

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test drew 175 entries and 35 awards were made. The contest rules are available from the NCTA, 918 16th Street NW, Washington, D.C. 20006.

Taft's WDAF Forfeits $4000 For "Hidden" Ads

The FCC announced that station WDAF-TV, Kansas City, Mo., licensed to Taft Broadcasting Co., has apparently forfeited $4000 for failing to log any commercials on a program called "Let's Get Growing," aired a number of times in March, April, and May 1972. The FCC separately admonished Taft for broadcasting "program-length commercials" and for failing to require John Paul Tobin, host of the show, to identify himself as a full-time salesman for Gordon Corporation, maker of fertilizers and pesticides. Tobin recommended Gordon's products, as well as others, on the show. Taft had 30 days from the notice (February 21, 1973) to pay or contest the action. In a related action the Commission defined programs which interweave entertainment or information with product promotion as "program-length commercials." Broadcast of such a program is a "serious dereliction of duty," and sanctions will be imposed, if necessary, to prevent it, said the FCC.

Certron Announces Magnetic Tape Advance

Certron Corporation has released a new magnetic tape for cassettes with, the company says, greatly improved low-noise, high-output characteristics. Called "gamma powered," the new tape does not require a different recording bias from standard tapes, but is claimed to "outperform" chromium dioxide and cobalt doped high energy tapes. The maker is aiming for the video, as well as audio, cassette markets.

Kent U. To Produce Local Shows for Cable System

The Kent and Ravenna (Ohio) Cable Company has entered an agreement with Kent State University, under which the University will produce a wide variety of locally-originated programs, using the University's own television studio. Among the cable programs coming from the University will be regular

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local newscasts, University sports coverage, campus events, music, lectures, and others. The University hails the plan because it gives it more contact with the community, and provides good experience for students in telecommunications.

Mexican-American Committee Offers Free Radio, TV Material

The National Mexican American Anti-Defamation Committee, Washington-based group devoted to improving the economic status and image of the Chicano, has the following material for local media outlets: "Confetti," a one-hour weekly radio program, aired by WRC in Washington; "La Raza En DC," eight half-hour color TV public affairs programs, produced on WRC-TV; "The Emerging Minority," two half-hour color TV programs on Spanish-Americans, produced on WTTG-TV; and "The Mexican-American and the Administration of Justice," two half-hour color TV programs produced on KRMA-TV, Denver. Broadcasters or cable operators can get any of the programs free by sending in video or audio tape for dubs; address Director, Public Broadcast Service, NMAADC, 1605 Connecticut Avenue NW, Washington, D.C. 20009.

Syracuse U. Contest Teaches TV Scripting

A contest, jointly sponsored by Syracuse University and the Syracuse Board of Education, drew more than 300 scripts for public-service TV ads from students 8 to 17 years old in the Onondaga County public schools. Given the theme "commercials for a better tomorrow," the students produced highly varied and creative scripts. Called "Tell-A-Vision," the contest will include actual production on Syracuse TV stations of the winning scripts, and also of a 30-minute documentary showing how a TV script is turned into a "live" program. Among the objectives of the contest was illustration of potential careers in television.

Business Briefs

Tocom, Inc. reported an increase in sales and earnings for the six months ended December 31, 1972; sales were $1,339,000 and earnings $229,000, against $909,000 and

NEWS

$95,450 for the 1971 period . . . **Ampex Corp.** announced a sale to Storer broadcasting stations of ACR-25 video cart systems worth about $2 million . . . **Vicon Industries** said that sales for 1972 were $1,201,336, up 25% over 1971, and earnings per share .094 cents, compared with .014 cent in 1971.

Eastman Kodak Company sales and earnings were at record highs in 1972, the company said: worldwide sales were over $3.4 billion, earnings $546,250,000, 17% and 30%, respectively, over 1971 . . . **Conrac Corp.** reported 1972 sales at $58,329,222, net income at $2,383,824, up from $48,931,000 and $1,925,922 in 1971 . . . **Oak Industries** said 1972 income was $2,998,149, highest in history, on sales of $97,231,396.

Scientific-Atlanta: Sales $8,780,000 (up 15%), earnings $293,000 (1971 $83,000) for six months ended December 31, 1972. **American Television and Communications Corp.:** Sales $9,608,387 (up 41%), earnings $1,011,214 (up from $547,435), for six months ended December 31, 1972. **Metromedia, Inc.:** Revenues $181,880,025 (up 18%), earnings $12,534,429 (up 63%), for year 1972. **Cohu, Inc.:** Sales $11,378,987 (1971, $9,059,383), earnings $539,350 (1971 $232,531), for year 1972. **Burnup and Sims, Inc.:** Revenues $62,812,800 (1971, $41,195,300), earnings $3,548,800 (1971, $1,855,700), for nine months ended January 31, 1973.

Cox Broadcasting Co., WSB Television, and **WSB Radio** announced a joint grant of $25,000 to Clark College, Atlanta, in support of a Mass Communications Center being set up by the college . . . **Broadcast Products, Inc.** will be a distributor of Dolby noise reduction systems to the broadcast industry . . . **AEL Communications Corp.** was awarded a turnkey contract for a 200-mile cable plant in New Bedford, Mass., for the Athena Division of Gulf and Western; the two-way system will have 27 forward channels.

FM station WFMT, Chicago, got a special 1973 Ohio State Award for its live, four-channel broadcast in September 1972 of opening night at the Chicago Lyric Opera, a production of "Semiramide" by Rossini . . . **WRTV,** television outlet in Indi-

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anapolis, is conducting a "race to thinness," in which overweight viewers join a campaign to lose weight, with diet guidelines supplied by the station and prizes for the "winners."

Hotel theatre system of **Athena Communications Corp.** has been installed in the new 1000-room International Tower Hotel at O'Hare Airport, Chicago: guests can choose (and be billed for) current feature films shown on the TV screen in each room . . . **Jerrold Corporation** opened a new 100,000-square foot headquarters building in Horsham, Pa., for executive, sales, research, and supporting groups.

Western Telecommunications, Inc., Denver-based supplier of television, voice, and data transmission for private subscribers, opened a Los Angeles sales office at 12636 Beatrice Street; the company also appointed Ray Campion as sales manager-communications services.

Multiplier Industries Corp. is a new firm at 224 North Fifth Avenue, Mt. Vernon, N.Y., which will supply safety equipment to the cable industry, specifically aiding in compliance with the new OSHA, Federal safety law. Principals are Walter Heim, long-term maker of safety equipment for public utilities, and Walter Ulrich, cable executive and member of the NCTA OSHA Committee . . . **National Teleproductions,** Chicago, announced comprehensive facilities for video production, including creative, directorial, and technical personnel, a large sound stage, VTR equipment, Norelco color cameras, remote trucks, computer editing, 16/35mm film chain.

L-W Photo, Van Nuys, Calif., maker of stop-motion film projectors, bought a new headquarters site in the Warner Center Business Park . . . **Time and Frequency Technology Inc.** moved to a larger plant at 3000 Olcott Street, Santa Clara, Calif., in response to tripled sales and expanded product line . . . **John C. Ranck,** Indicia Inc., New York, announced agreement with COFCI, video production firm in Paris, for Ranck to market COFCI services to U.S. users who need production facilities in France.

Allan Sands Productions, New York, has a recorded radio series, "Boating Tips," consisting of 260 45-second spots on the handling and maintenance of pleasure boats . . . **WLS,** ABC-owned Chicago station, in a two-day "Blood Vigil," with frequent on-air appeals for donations, collected well over 1000 units of blood.

New Jersey Public Broadcasting Authority and film producer **John Drimmer** won a DuPont-Columbia broadcast journalism award for the 30-minute television program, "Towers of Frustration," first aired on WNJT-TV, Jersey public station in Trenton.

WRCH-FM, Farmington, Conn., went on the air with a new 50 kW FM transmitter, increasing coverage about 50% in the Hartford, New

ritain, New Haven and Springfield rea . . . **Fairchild Industries** has ought from Peoples Broadcasting o. stations WYOO (AM) and RAH (FM) in Richfield, Minn.; rmerly WPBC and WPBC-FM. ne two stations are being complete- reprogrammed by the new owner . . **Edison Electronics,** division of IcGraw-Edison, has set up a parts nd service operation for the Daven nd Measurement product lines; ad- ress is c/o Richard Smith, Box 309, Ft. Wayne, Indiana; phone, 19-747-5621.

The annual meet of the **New Eng- nd Cable Television Association** ill be April 18-19, Sheraton-Regal nn, Hyannis, Mass.; data from ill Kenny, P.O. Box 321, Tilton, .H. . . . **Gotham Audio,** New York upplier of broadcast and recording quipment, moved to larger quar- rs, the "Gotham Building," at 741 Vashington Street, New York . . . **Ic Martin Industries** has bought an dditional building in Omaha, and ill relocate to it initially metal brication and printed circuit oard production.

CBS Radio Network releases its rst sales report for 1973, showing ales to 30 major advertisers, in- luding Ford, General Motors, oodyear, Gulf Oil, Howard John- on, AT&T, Pennzoil . . . **Warner ommunications** announced record arnings at $2.20 per share in 972, compared with $1.89 per hare in 1971 . . . **Cox Cable Com- unications** reported record sales nd earnings of $15,798,422 and 1,692,110 in 1972; earnings were p 32% and sales 17% over 1971.

Hughes Sports Network has lated a number of major golf tour- aments in 1973, among them: the emper Open, Charlotte, June 2; ne Sealy-Faberge Women's, Las egas, same date (later in the day); Western Open, Chicago, June 30; lemphis Open, May 19; Westches- r Classic, Harrison, August 4 . . . **merican Television and Commu- ications Corp.** and **Cox Cable** an- ounced that the antitrust trial con- erned with their proposed merger ould start in Atlanta on June 25.

E. J. Stewart, video production rm of Broomal, Pa., announced in- tallation of high-band RCA color ideotape equipment for their TV tudio facility, which handles both roadcast and cassette productions . . A new firm, **TV Cable Supply ompany, Inc.** of Carlisle, Pa., is ne result of purchase of an older V Cable Supply Company by

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Russell Brong, president of Lightning Electric of Pennsylvania. The new TVC will concentrate on serving the cable industry.

PEOPLE

John J. Kope, Jr., was appointed vice president, marketing, for Tele-Mation, Inc. . . . **Jack Forde** became manager of MSO sales for Jerrold Electronics Corp. . . . **Dennis G Christensen** is the new national sales manager, broadcast products, International Video Corp.

James D. McKunney was named director of purchasing for Television Communications Corp. . . . **James Fazio** joined Television Microtime Inc. as project engineer for design of time base corrector accessories; and **Joseph L. Stickley** was named senior applications engineer.

Albert L. Cavalieri is the new director of engineering of AEL Communications Corp. . . . **Salvatore L. Raia** was named national sales manager of Vicon Industries . . **H. Lou Woosley** became assistant director of engineering, Springfield Broadcasting Co. . . . **Darrell Hunter** was appointed chief engineer of WKEF, Dayton.

Jonathan Ward was named director, program services, for the CBS Radio Division . . . **Vincent J. Conroy, Jr.** became national manager, record advertising sales CBS/FM. . . . **Larry Fry** was promoted to customer service supervisor for the CATV division of Anaconda Electronics . . . **Leonard Hedlund,** vice president in charge of research for McMartin Industries, attended the the CCIR conference in Geneva as a delegate from the U.S. . . . **Tom Donahue** became vice president and general manager of KSAN, Metromedia FM station in San Francisco.

Robert F. Ennist, Sr. was named manager of turnkey project operations for Jerrold Corp. . . . **Andrew F. Tresness** became marketing systems manager, Magnavox CATV Division . . . **Kenneth Owen** was named vice president and general manager of McLean operations for Telcom, Inc.

Dr. George Bahder was elected vice president and director of research and development for General Cable Corp. . . . **Ivan Curtis** became CATV sales representative for United Video, Inc., microwave subsidiary of LVO Cable . . . **W. A. Gossett** joined Harmon and Co. as vice president, to aid in development of "Cablevision Bingo," program to be leased to cable companies.

Paul W. Lancaster joined Goldmark Communications Corp. as director of cable TV engineering . . . **Philip D. Marella** was elected a director of LIN Broadcasting Corporation; he was already president of WAVY-TV, LIN subsidiary . . . **A. James Ebel** became president of stations KOLN-TV, KGIN-TV, and KMEG-TV.

Charles A. Batson, president of Cosmos Broadcasting Corp., Columbia, S.C., was named chairman of the Television Code Review Board, NAB . . . **Carol Outhton** joined TelePrompTer Corp. as research director of new department of community development . . . **Frederick C. Rueckert** was appointed director of

orporation planning for Oak Industries.

Suchet Potewirantananond joined Communications Transistor Corp. as senior engineer in RF transistor development . . . Roy Schaub became western sales manager; George Hierisch, Great Lakes sales manager; and James Razor, southeastern sales manager; all for the cable and telecommunications marketing of Scientific-Atlanta, Inc.

Gene Bidun was named eastern sales manager for Broadcast Electronics, Inc. . . . George Allison became vice president of William B. Tanner Co., in charge of the TV media department . . . Helen Psaros is the new executive producer of the CBS AM stations' Private Line News Exchange (PLNX).

Frank Drendel was named manager of the Comm/Scope division of Superior Continental Corp., maker of cables, connectors, and related equipment. . . . Alan F. Culbertson, president of Culbertson Industries, was re-elected to a second term as president of the IEEE Communications Society.

BM/E

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DISPLAY CLASSIFIED ADVERTISING: $22.50 per inch 1x; $22.00 per inch 3x; $21.00 per inch 6x; $20.00 per inch 12x. ALL OTHER CLASSIFIED ADVERTISING 25¢ per word; minimum $3.00. BLIND BOX NUMBER: No extra charge. Replies sent to address below will be forwarded to you. PAYABLE IN ADVANCE; send check with order. CLOSING DATE: 5th of 2nd month preceding issue date.

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Rapidly expanding company selling and servicing (nationwide) world's finest television equipment is seeking high caliber, thoroughly experienced Sales and Service Engineers to staff 5 regional offices in the U. S.

Send letter and resume, stating salary requirements to R. F. Goodspeed, Manager

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WANTED: Instructor—Broadcast Engineer Technician—Two Year College. Southeast Ohio—Challenging and Rewarding Position. Salary open. Contact Dean of Education, Hocking Technical College, Route 1, Nelsonville, Ohio 45764. (614) 753-3514. The College is an Equal Opportunity Employer.

We are looking for additional Reps to sell our products. Must already be in broadcast equipment sales field. Send photo and resume to Box 473-2, c/o BM/E, Blue Ridge Summit, Pa., 17214.

Established station in all U market needs maintenance supervisor with experience in VTR's and color cameras. Salary commensurate with experience. Equal Opportunity Employer. Send resume to Box 473-1, c/o BM/E, Blue Ridge Summit, Pa. 17214.

WANTED IMMEDIATELY, Video Tape Engineer. Excellent Salary. Live near the top ski areas of the Rocky Mountain West. America's cleanest air. Contact collect: Scott Tipton, Opr. Dir., KYCU-TV, Cheyenne, Wyo. (307) 634-7755.

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RECORDING STUDIO CONSOLE

Ideal for sophisticated TV audio. 18 microphone or high-level inputs with EQ & echo on each. EQ on each of the 4 output channels. Built-in multi-freq. oscillator. Group submastering; channel masters, grand master. 4 reverb devices. 4 dual-60 watt amps. Intercom while recording; talkback (mic's. included). Audition any input while recording. "Silence" button prevents performer ruining audio by disturbance during echo "overhang" at end of "take". Producer's desk; all audio in accompanying rack. Very compact! Slightly used, guaranteed. Sacrifice for half of new value.

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SEC CUSTOM AUDIO CONSOLES at prices comparable to manufacturers' standard units. Modern styling with vertical slide potentiometers and "soft" audio switching. Completely assembled or save even more on console kit. Call or write for custom quotation. Also, plug-in audio modules, distribution amplifiers, preamplifiers, active combining networks, monitor amplifiers. Write or call for brochure. S. E. Company, P.O. Box 49224, Atlanta, Ga. 30329. 404/631-3586.

EQUIPMENT FOR SALE (Cont'd)

FOR SALE

Complete FM System except antenna: One Federal FM Transmitter, type 13BA, 5 to 10kW tuned to 101.5; Federal Micro Match Model 412 F; GE FM transmitter BT-B 2kW tuned to 101.5; GE Modulation Monitor-Freq. Monitor combined unit; GE limiter; CBS FM Volumax Control Model 410; RCA Console Six Channel Mono with talkback Type 76B5; Gates Console Ten Channel Mono, needs some work. *Contact: Robert A. Clark, KFLY Radio, P.O. Box K, Corvallis, Oregon 97330 (503) 753-6633*

Ampex 602-04 Tape Recorder Player, KRS-SB1-RFP Cartridge Recorder Player. Dage 520 Solid State Camera Viewfinder type with control console and cable. CATV cameras, small studio type with external drive and special effects, lenses, motorized pedestals, coaxial cable, etc. Call or write. Central Television Systems, 809 Court Street, Utica, N.Y. 13502. (315) 735-6474.

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NEW Papst hysteresis synchronous motor HSZ 20.50-4-4701D as used in series 400 and 500 machines. Price $39.00 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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CARTRIDGE TAPE EQUIPMENT—Rebuilt. New paint, heads, flywheel, pressure roller, belts etc. Spotlessly clean and thoroughly tested. 30 day money-back guarantee, 90 day warranty. Also contact us for possible discounts on new equipment and accessories.

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Solid-state audio modules-console kits, power amplifier kits, power supplies. Octal plug-ins—mic, eq, line, disc, tape play, tape record, amplifiers. Audio & tape bias oscillators. Over 50 audio products. Send for free catalog and applications. Opamp Labs, Inc., 172 So. Alta Vista Blvd., Los Angeles, Calif. 90036. (213) 934-3566.

SCULLY TAPE RECORDERS: Mono, 2, 4, 8, 12, & 16 track models plus 270 automatic players. Some models in stock now. W.A.L. custom audio control console & console modules. Solid state 120 Watt power Amps. We buy and rebuild Scully lathes. WIEGAND AUDIO LABORATORIES, INC. R.D. 3, Middleburg, Pa. 17842. 717-837-1444.

EQUIPMENT FOR SALE (cont'd)

AMPEX VR660C two inch helical broadcast quality color VTR with electronic editing. Colorcon, alignment tape, manuals, three extra pairs matched heads factory sealed, three hours tape. List price over $11,100.00. Purchased February 1972, less than 31 hours, $6,000. Channel One Videotape, Inc., Box 763, Miami, Fla. 33133 (305) 947-2044.

CONRAC MONITORS CVA series, GE Color camera PE Series encoders, boards, control cables, etc. Houston-Fearless, Quick-Set tripods. Riker Color Processing Amplifier Systems 5300L. Limited quantity, priced to move items. Call or write. Central Television Systems, 809 Court Street, Utica, N.Y. 13502. (315) 735-6474.

U.S. GOVERNMENT SURPLUS. Save 75% on video tape! De-gaussed, guaranteed! Top brands—Scotch, Ampex, Memorex. ½" x 7200', $12.50; 1" x 3600', $10; 2" x 3600', $15. Brand New Ampex 779, 2" x 3600', $25; 10 $225. FOB Houston. GENSCO, Box 14628, Houston, Texas 77021. (713) 748-3350.

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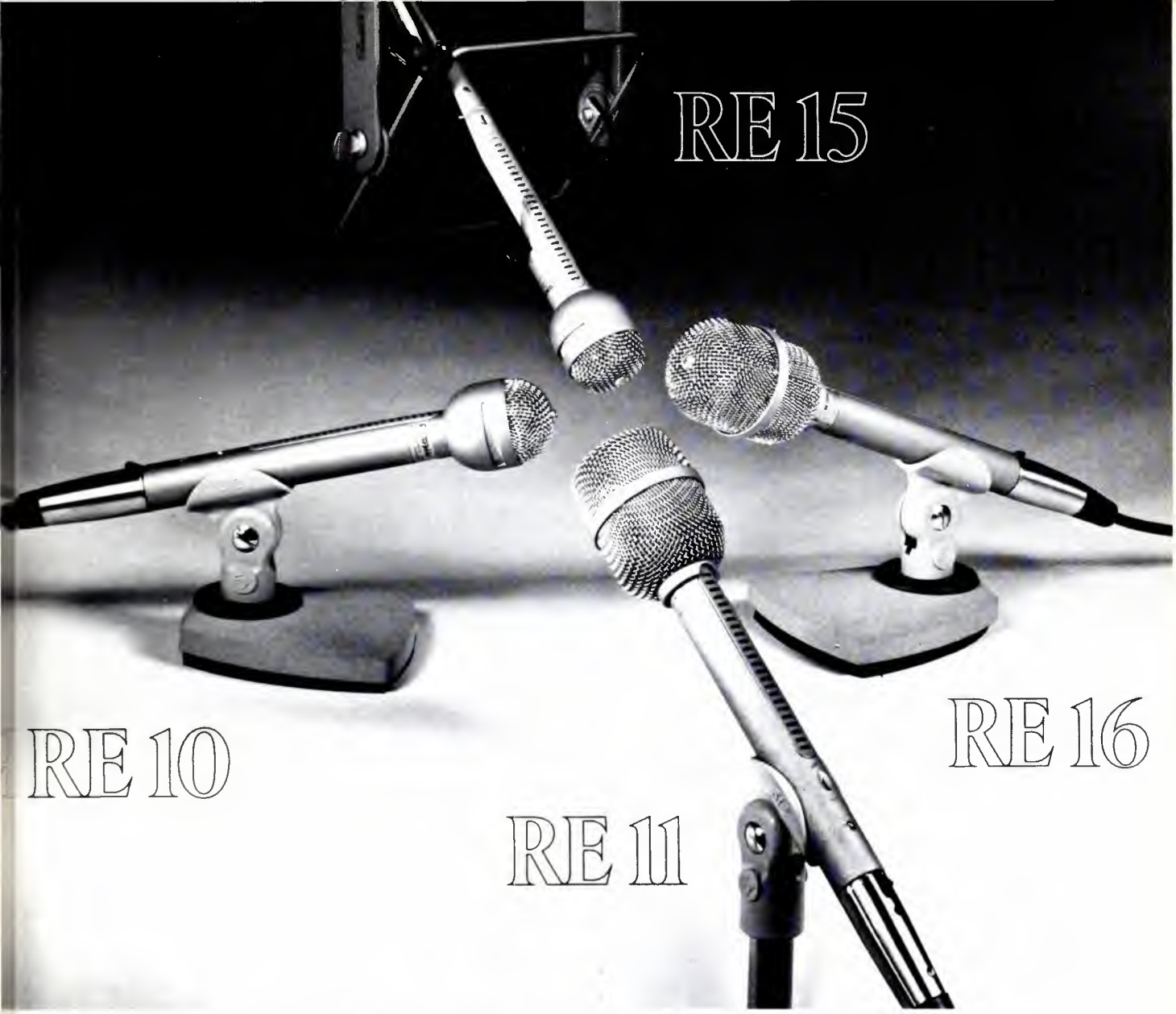

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