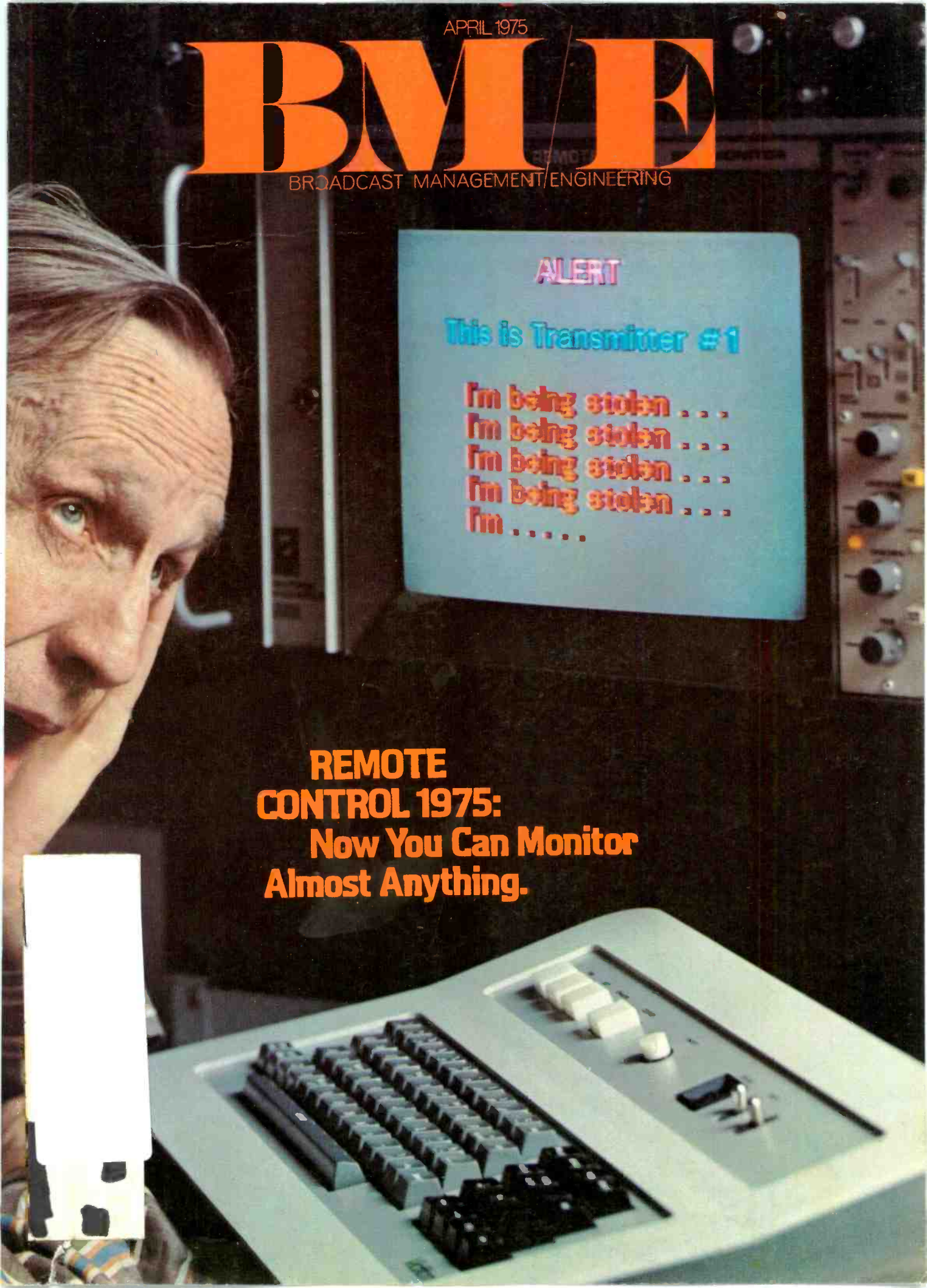
APRIL 1975

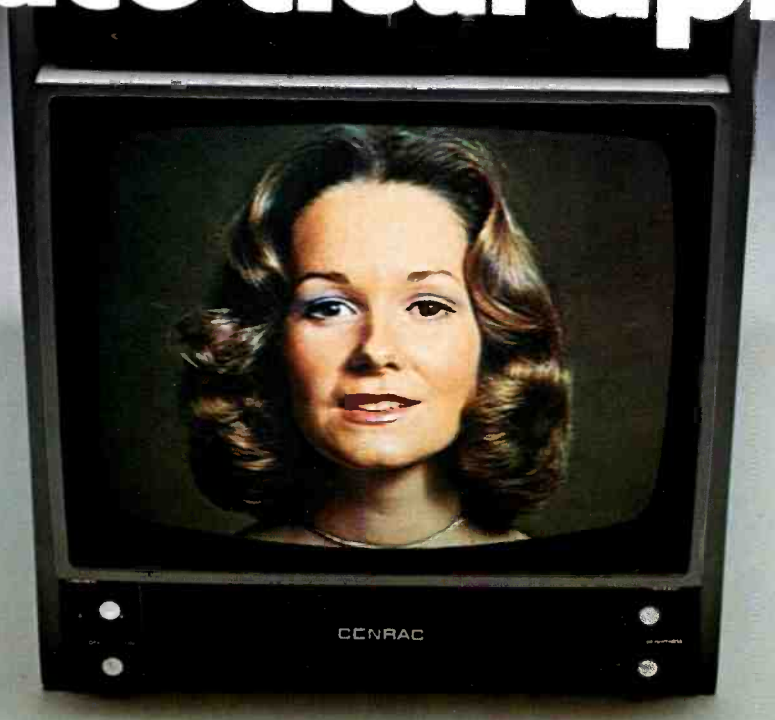
# BM/E

BROADCAST MANAGEMENT/ENGINEERING




## REMOTE CONTROL 1975: Now You Can Monitor Almost Anything.

# "From those wonderful folks who made my face clear up."




Models and actresses devote countless hours to making their skin as flawless and beautiful as possible.

But lines and glitches caused by videotape dropouts can make everything look ugly. And that's distracting and irritating to viewers.

So in 1965, 3M introduced a quadruplex color dropout compensator that has since become the standard of the industry. Today, all three networks and thousands of TV stations across the country rely on 3M Brand Color DOC's to bring viewers better picture quality.

But what have we done for you lately?

A lot. In fact, we've just developed five brand-new low-cost products for broadcast, industrial and educational needs.

First, there's a remarkably inexpensive Color Bar and Sync Generator that produces an NTSC 8-bar pattern and all sync signals.

Next, there are three Distribution Amplifiers (Pulse DA, Subcarrier DA and Analog DA) designed for any video application.

Our new mini Processing Amplifier has a full set of front panel controls, plus a built-in pulse-cross generator with automatic brightening that allows the use of any inexpensive monitor to examine the critical head switch area for tracking and skew adjustments.

Our new 10 input Bridging Video Switcher has momentary-contact illuminated buttons with an audio DA to eliminate loading, plus remote capability.

And finally, there's our advanced Digital Automatic Gain Control that can be used in any application where sudden and undesirable signal level changes occur, without incurring the unacceptable effects usually associated with AGC circuitry.

A lot of companies would be taking it easy if they were in our shoes. But we don't intend to as long as there are more problems to clear up.

**We don't quit when we're ahead.**

VIDEO PRODUCTS

**Mincom Division** 3M COMPANY

3M CENTER · SAINT PAUL, MINNESOTA 55101

Circle 108 on Reader Service Card

# NOW . . . we've added crystal-controlled off-the-air UHF tuning.

For those critical UHF requirements, DYNAIR's new crystal-controlled VT-4BU plug-in tuner assures frequency stability of 0.005% on any specified UHF channel. In addition, all channels from 14 through 83 may be manually tuned. An AFC lock may be used, if desired, for additional stability on these channels.

BROADCASTERS find the new UHF tuner and the RX-4B DYNA-TUNE Demodulator an ideal combination for remote broadcast monitoring, especially so when an optional video chopper is added for checks of modulation percentage.

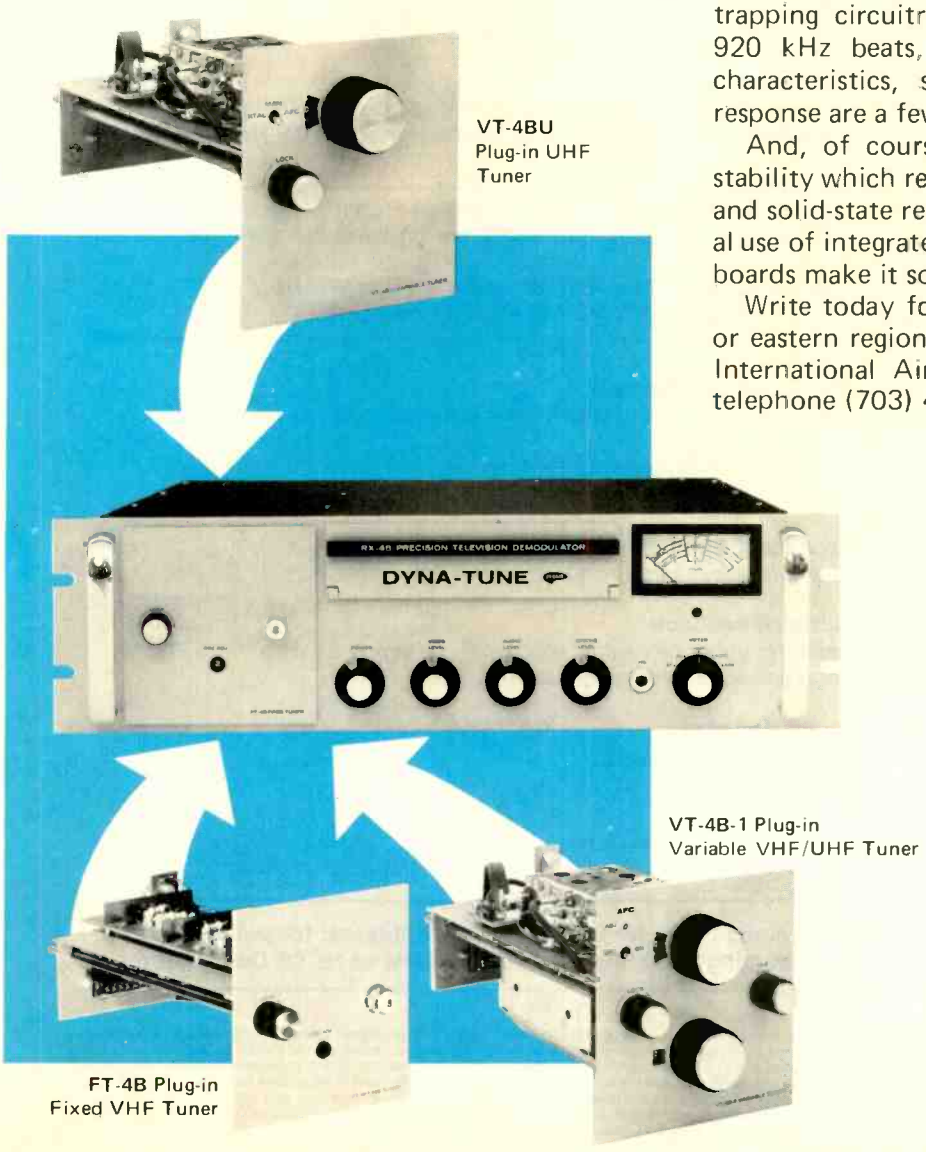
Adjustable color compensation results in a nearly ideal response curve . . . particularly important in client room applications where color quality is critical.

CATV OPERATORS find the RX-4B/VT-4BU an excellent choice for off-air UHF pick-ups and for measurements of systems performance.

Separate visual and aural IF strips, unique trapping circuitry to eliminate the possibility of 920 kHz beats, low differential phase and gain characteristics, standard receiver envelope delay response are a few of the performance features.

And, of course, there's the overall operational stability which results from DYNAIR's high-quality and solid-state reliability. Conservative design, liberal use of integrated circuitry and glass-epoxy etched boards make it so.

Write today for complete details to home office or eastern region office — P. O. Box 17342, Dulles International Airport, Washington, D. C. 20041; telephone (703) 471-4078.




VT-4BU
Plug-in UHF
Tuner

VT-4B-1 Plug-in
Variable VHF/UHF Tuner

FT-4B Plug-in
Fixed VHF Tuner

**PRICES:**

| | |
|---|---|
| VT-4BU Tuner | $ 300.00 |
| RX-4B/VT-4BU | 1750.00 |
| RX-4B/FT-4B | 1820.00 |
| RX-4B/VT-4B-1 | 1720.00 |
| Optional Chopper (CK-4B) | 150.00 |

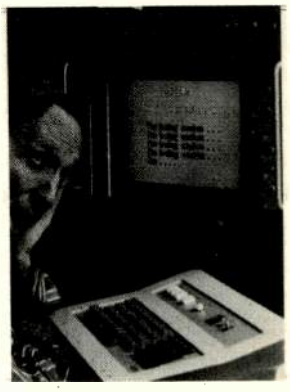
Also available for export standards.

DYNAIR

DYNAIR Electronics, Inc.
6360 Federal Blvd., San Diego, Ca. 92114
Phone: 714-582-9211; TWX: 910-335-2040

Circle 101 on Reader Service Card

BM/E
BROADCAST MANAGEMENT/ENGINEERING



*This month's cover is not as far fetched as it might seem since security data can be sent remotely. The message won't be styled quite so graphically, however, since we substituted a Vidifont system for the more typical CRT terminal, through the courtesy of Bob Estony of CBS Laboratories. Photographer was Joseph Gallagher of CBS Labs.*

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## APRIL 1975/VOLUME 11/NUMBER 4



**CM/E: A supplement for those with cable interest following page 74: Programming Ideas that Pay Off; Preview of NCTA Convention**

BPA
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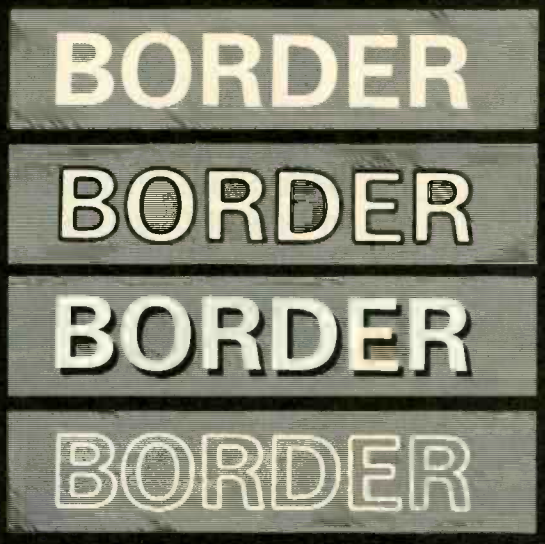
# BORDERLINE GENERATORS

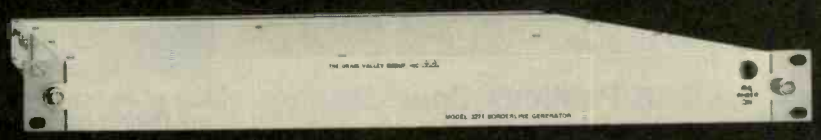



STARTING WITH A NORMAL KEY SIGNAL, THE GVG BORDERLINE WILL----------

PROVIDE A BLACK BORDER AROUND A MATTED TITLE OR ----------

PRODUCE A DROPSHADOW EFFECT ON LETTERING OR TITLING OR ----------

PRODUCE OUTLINE LETTERING FROM A SOLID TITLE SOURCE



## DESCRIPTION

Grass Valley Group Borderline Generators are used to add borders to captions and titles from camera video signals or character generators. The added borders greatly inhance the insert visibility, and are particularly effective in situations requiring a white insert into a predominantly white scene.

Model 3271 is for use with GVG 1400 Series switching systems and 900 Series special effects equipment. The keying circuitry in the special effects amplifier is utilized for the inserting function, thereby enabling effects such as wipe key between bordered inserts.

Model 3272 is for use with special effects equipment of other manufacturers. It provides a widened key signal output which can be connected to the external key input of most special effects systems. The widened key output, together with a slightly delayed (H and V) title video signal, is used to achieve the border effect.

Model 3273 is a complete system which provides bordered inserts into a composite video signal, such as at the output of a switching system. The unit is entirely self-contained and requires no horizontal or vertical driving signals.

Borderline Generators are available for NTSC, PAL, PAL-M, and CCIR standards.

**THE GRASS VALLEY GROUP, INC.**

*A TEKTRONIX COMPANY*

Station Plaza East
GREAT NECK, NY 11021
(516) 487-1311

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SHERMAN OAKS, CA 91403
(213) 990-6172

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ATLANTA, GA 30329
(404) 634-0521

P.O. Box 482
MABANK, TX 75147
(214) 887-1181

810 W Bristol Street
ELKHART, IN 46514
(219) 264-0931

# BROADCAST INDUSTRY NEWS

## Radio, TV, Cable—All To Grow Thru '85, Says Cox

Strong growth over the next ten years for radio, television, *and* cable, without serious competition between broadcasting and cable, is the consensus prediction of a large group of experts queried in a comprehensive survey by Cox Broadcasting Company, released late in February. Total ad volume, the survey predicted, will rise 7% to 8% a year, going from the present $25 billion to about $60 billion in 1985. The TV and radio shares of this amount will both rise, TV going from 19% to 22% of the total, radio's from 6% to 8%. Cable's share of the advertising dollar will rise too, but it will still be only about 0.7% of the total by 1985. Cable penetration will go from the present 13% of all homes to about 29% in 1985. The average cable system will get 60% of its revenue from subscriptions, 30% from pay cable, and only 10% from advertising.

## NAB Asks Court To Affirm Rule Vs. FCC on Fairness

The National Association of Broadcasters has strongly urged the U.S. Court of Appeals to reaffirm a decision which overturned a FCC ruling that the National Broadcasting Company violated the fairness doctrine in the program, "Pensions: The Broken Promise." A rehearing on the question has been granted by the Court at the request of Accuracy in Media, the organization that filed the original complaint against NBC. The NAB brief argues that the Court's original ruling was correct, in saying that the FCC should have limited itself to judging the reasonableness and good faith of NBC's decision to run the program.

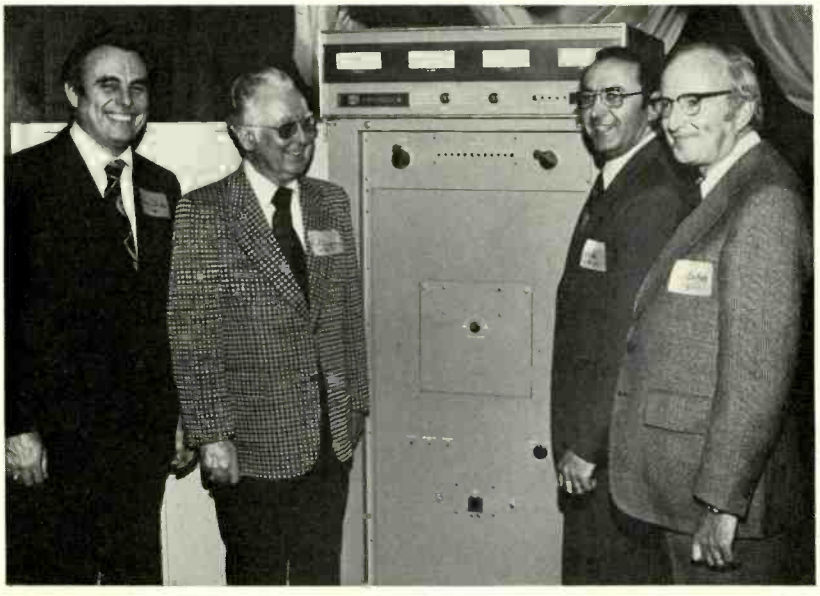
## NAB Petitions Court On Refund of FCC Fees

In another plea to the U.S. Court of Appeals, the National Association of Broadcasters has asked the Court to review the refusal of the FCC to refund annual fees and other charges paid by broadcasters since 1970. The NAB said in the brief that the Supreme Court decision of last year, which required refunds to cable operators, applies as well to broadcasters since the broadcast fees paid since 1970 are on the same legal footing—or lack of footing—as the cable fees.

## Westinghouse Solid-State Transmitter, In Use At Chicago Station WIND

*One of the two all-solid state AM transmitters introduced at the NAB convention in Las Vegas, the Westinghouse 5 kW AM unit shown has been in regular on-air use at Station WIND since the late fall of 1974. It uses six plug-in "trays" of transistors in the power amplifier, each tray holding 32 transistors, all in parallel. Up to 20% of the output transistors can fail without causing any reduction in power output. Both modulator and final amplifier operate in Class D, for extremely high efficiency. The final amplifier has 240 volts on the collectors of the transistors, which allows the current drain to be kept low, well within the current rating of the transistors.*

## All Solid-State Transmitter Unveiled



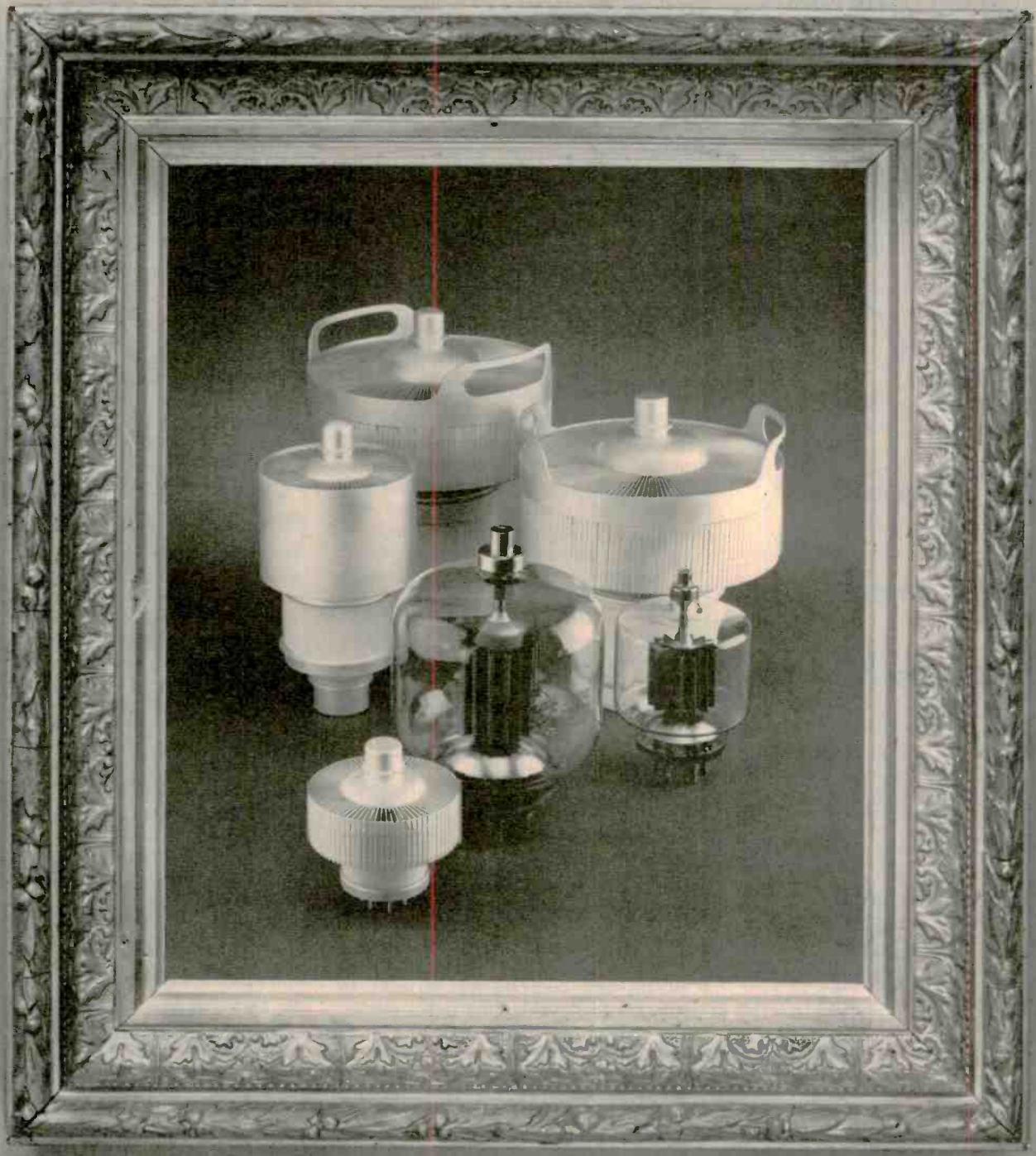
*At the introduction in Quincy, Illinois, of Harris Corporation's M-1, all solid-state 1 kW AM broadcast transmitter, were (from left) Gene T. Whicker, vice president and general manager of the Harris division; W. Earl Dougherty, president of station KXEO, Mexico, Missouri, where an MW-1 has been in regular on-air use since early December, 1974; Jospeh M. Engle, Jr., director of domestic sales, broadcast equipment division; and George W. Bartlett, vice president of engineering, NAB.*

## FCC Bars Cross-Ownership of Newspapers, Broadcasting

The Federal Communications Commission has finally made the long and heavily debated decision on cross-

continued on page 8

# First Family



Eimac®
division
varian

## NEWS

ownership, with an amended rule that prohibits newspapers in the future from buying radio or television broadcast stations located within their markets. The new rule further says that existing radio-newspaper and television-newspaper combinations must be broken up by January 1, 1980, if the only general newspaper in a community and the only radio or television station putting a city grade signal over the whole community are owned by the same persons or company. The FCC lists specific combinations in nine cities in the must-divest radio category, and seven in the television category. Under the rule, a radio station is considered in the same market as the newspaper if the normal service area (2 mV/m contour for Am, 2 mV/m for FM) completely encompasses the community in which the newspaper is published.

### Publishers, Broadcasters, Ask Court Review of FCC Divestiture Order

The divestiture order issued by the Federal Communications Commission on a number of newspaper-braodcast ownerships, has already stimulated four organization to request review of the order by United States Courts of Appeals in three Circuits. Among those asking the courts to set the FCC order aside are the National Citizens Committee for Broadcasting (District of Columbia Court); WJAG, Inc., owner of the Norfolk Daily News and Station WJAG, Norfilk, Neb. (St. Louis Court); Daily Telegraph Printing Company, publisher of Bluefield, W. Va. Daily Telegraph and licensee of WHIS-TV, Bluefield (Richmond Court); and the Ogden Newspapers, Inc., Wheeling, W. Va. (also in the Richmond Court).

### New Firm To Aid Satellite Use by Media, Public

A new company, Transcommunications Corporation, will supply consultant and coordination services to broadcasters, cable, the news media, government and industry, aimed at effective use of domestic satellites and their integration with local distribution facilities. Based in Greenwich, Conn., the company has been formed around two well-known figures in communications, Robert E. Button and Hubert J. Schlafly. Mr. Button, president, was formerly director of the Voice of America, and has held executive positions with NBC-Television, COMSAT, and Teleprompter. Mr. Schlafly, vice president and chairman, was one of the founders of Teleprompter in 1951, has been a leading figure in the cable industry for a long period, is the author of several books in telecommunications, and holds 14 patents in electronics and communications. "Unlike land lines or terrestrial microwave," said Mr. Button in the announcement, "satellites provide an 'anywhere to everywhere' capacity . . . . hasten the day when every community has a satellite port of entry."

### New FCC Rule Conforms To Federal Law on Lotteries

Because the U.S. Congress passed a law on January 2nd which says that broadcast stations can disseminate information on advertisements for lawful, state-run lotteries, the FCC has changed its rules to eliminate the prohibition against broadcasting lottery information in this special case.

The exemption also applies, under the Federal law and the FCC exemption, to stations adjoining the state where the lottery is held, if those stations are also in a state which runs a legal lottery. The FCC emphasized in the announcement that only this special kind of lottery is exempt from the general prohibition against braodcasting lottery information.

### FCC Says No To Refund of Fees Other Than Cable

Responding to numerous pleas for refund of fees and charges paid since 1970 by broadcasters, (see story on another page) the Federal Communications Commission has announced its position that no such refunds are required under the Supreme Court decision which led to the refund of fees paid by cable operators. The Court decision, says the FCC, was specifically addressed to the cable fees and cannot be extended to apply to broadcast and other fees. The FCC further said that the time for judicial review of the legality of the broadcast fees has passed and that this question could not now be reopened.

### New Fee Schedule Adopted by FCC

To bring its broadcast fees into line with the Supreme Court's reasoning in the NCTA case (see preceding story), the FCC set, effective March 1st, 1975, an entirely new schedule of fees for the broadcast industry, representing in most cases substantial reductions below those previously assessed. The new fees are computed, as the Supreme Court directed, to recover only the FCC's cost of providing the service for which the fee is collected. The overall reduction in FCC fee receipts will be from about $43 million a year to $16.5

continued on page 10

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

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

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

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

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

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

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

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

For complete information and/or a demonstration write us today.
Sony Corporation of America
Video Information Center, BME-045
P.O. Box 1594,
Trenton, N.J. 08607

## Sony. The proven one!

**Sony® U-matic® Color Videocassette System**

TV reception simulated.

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**Circle 106 on Reader Service Card for literature**

## NEWS

million a year, the FCC said, the latter being about 35% of the FCC's yearly operation budget.

### FCC Commended For New, Simplified Remote Rules

The NAB did, however, find something recently to praise in the FCC's activities: the simplification of the rules applying to pickup of remotes for broadcast. Very gratifying, said the NAB, is the elimination of the requirement for supervision of remotes by a licensed operator, and other similar "long overdue" modifications. However, the NAB called the logging requirements on remotes still "archaic," and called for similar revision. The brief to the FCC also attacked the efforts by the American Petroleum Institute and other land mobile users to share frequencies now exclusively assigned to broadcast remotes.

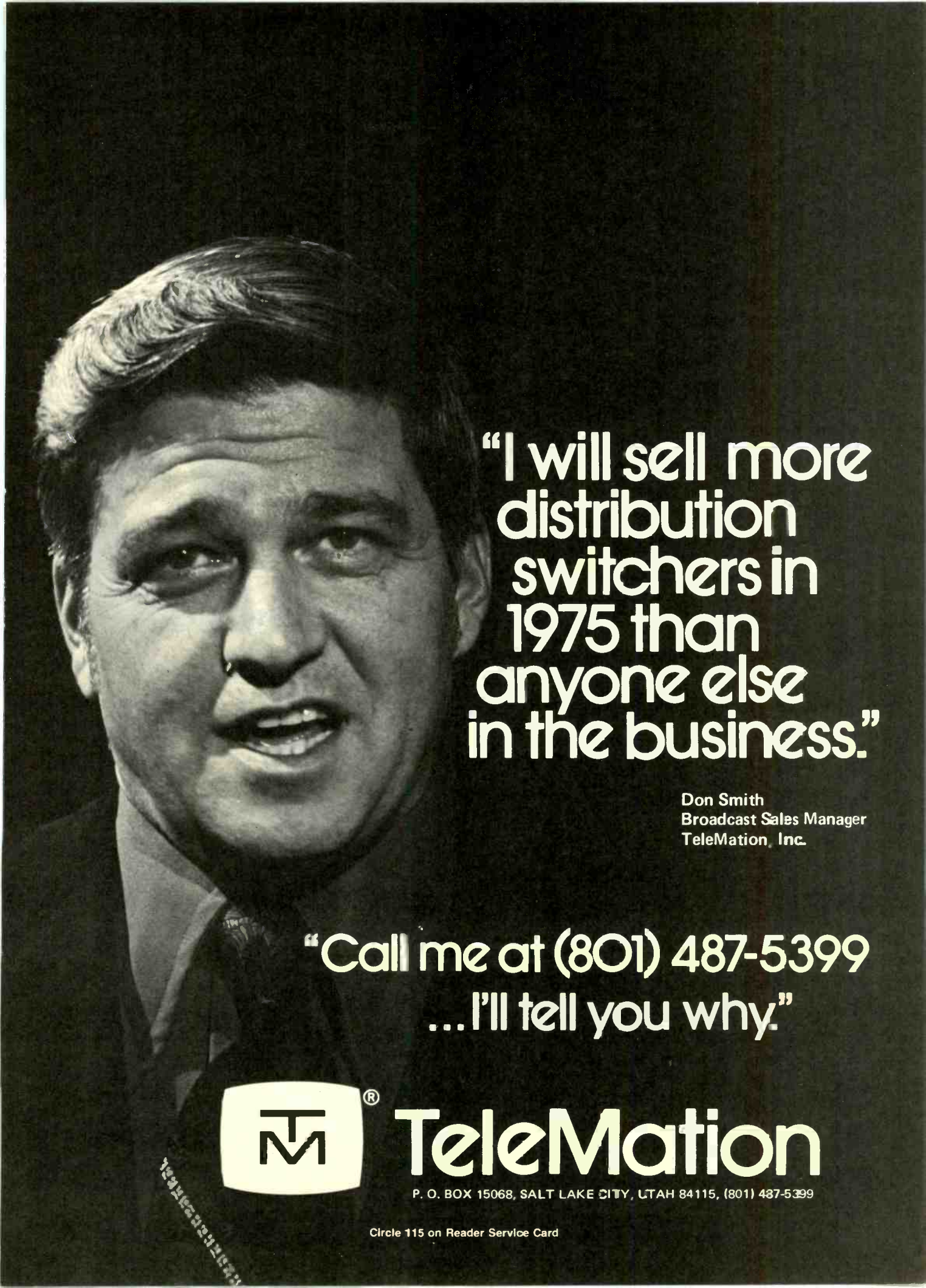
### EIA Issues New Standard For Mono CCTV Cameras

After six years of work, the Electronic Industries Association has developed a new standard, RS-420, titled "Electrical Performance Standards for Monochrome Closed Circuit Television Cameras, 525/60 Random Interlace." Because of the proliferation of varied units in the field, development of the standard was especially difficult, the EIA said. Carlos Kennedy of Ampex, chairman of the Working Group, remarked that they did not want to obsolete equipment in the field, ". . . but to be definite for future product development in this area." Copies of the standard can be had, at $2.50 each, from the EIA, 2001 Eye Street, N.W., Washington, D.C. 20006.

### NAFMB Sets Site For Sales Seminars and Conventions

The Board of Directors of the National Association of FM Broadcasters, in a recent meeting, has chosen the sites for future conventions, with 1975 to be in Atlanta (September 17th thru 20th), and 1976, 77, and '78 to be in Kansas City, Chicago, and San Francisco, respectively. The NAFMB Board also selected locales for four regional sales seminars to be held in May, 1975: Chicago, New York, Oklahoma City, and Los Angeles, with exact times and places to be announced later. The Board emphasized in the announcement a determination to give more and more aid to broadcasters in two areas: the improvement of selling techniques, and the checking of harmful trends in regulatory and licensing matters.

continued on page 14


"I will sell more distribution switchers in 1975 than anyone else in the business."
Don Smith
Broadcast Sales Manager
TeleMation, Inc.
"Call me at (801) 487-5399 ...I'll tell you why."
TeleMation
P. O. BOX 15068, SALT LAKE CITY, UTAH 84115, (801) 487-5399
Circle 115 on Reader Service Card

# YOU TOLD US SO

# AVR-2 one year later: over 200 in use.

Last year, we introduced AVR-2 at NAB, and industry response was startling.

You told us things that made us cross our fingers and hope you were right.

First comments came from broadcasters. Who would know more than they about what a VTR should be?

They told us AVR-2 probably would become an industry workhorse. Because it has something for everyone, regardless of need, objective, budget. At the right price.

They said it looks like a solution (finally) to their spiraling price/performance squeeze. Top quad performance at 1/3 less than the cost of a bigger machine. 15 or 7.5 ips. One second lockup for crisp cueing in tight situations.

Plus a wide-window digital time base corrector to give them a better on-air look. Even from those tapes that might otherwise frustrate their best operators.

Smaller broadcasters told us we must have designed AVR-2 just for them: a reliable, no- nonsense machine. You just plug it in and let it go to work. Low-cost operation, right from any standard AC outlet. Easy maintenance, even in operation.

Big or small, many buyers told us they were glad that somebody (finally) had designed a modular VTR. So that each could put together the configuration best suited to his own need—in the van or the studio—with any combination of features and accessories he likes.

Production houses told us AVR-2's modular design would be ideal for all kinds of recording, mobile or studio. They particularly liked the additional capability of editing, if required, and studio-quality playback on location. And, that same AVR-2 is compatible with their studio editing systems, no matter how sophisticated.

A few people were wrong.

They didn't believe us when we promised immediate delivery, but we delivered. Today there are over 200 AVR-2s in use, worldwide.

We're still taking orders for immediate delivery. Call your Ampex Sales Engineer for details.

AMPEX

**Ampex Corporation**
**Audio-Video Systems Division**
**401 Broadway, Redwood City, CA 94063**

## P.S. Thanks for being right.

## NEWS

### Maryland TV Education Has Largest Enrollment To Date

The Maryland "College of the Air," offering courses for college credit through the states Public Television Network, enrolled 919 students for the first semester of 1975, 50% above the total for the previous semester and the highest total in the project's history. The courses are prepared by ten educational institutions in the state, in cooperation with the Maryland Center for Public Broadcasting, and include study guides, and mid-term and final exams, in addition to the televised lectures. Students pay course fees averaging $35 each, and get the credits if they pass the exams.

### Seminars for 1975 Planned By NEC

Seminars on signal processing, minicomputers, and microcomputers will run April 13 to 18th at the Pheasant Run Lodge, St. Charles, Illinois, under sponsorship of the National Engineering Consortium. The seminars are part of the NEC's "Professional Growth in Engineering" series, aimed to help engineers update skills and learn the latest developments in their fields. Registration for each seminar is $395; for registration or further information, address NEC Registrar, Oak Brook, Ill, 69521, or phone 312-325-5700.

### Former Workers Enjoined From Competing With CCA

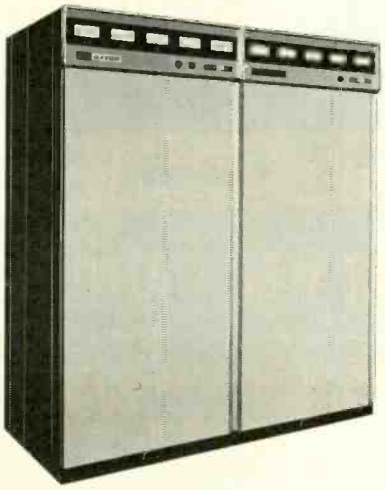
The new management of CCA Electronics Corporation announced at the end of January that an order had been issued by the New Jersey Superior Court enjoining certain former employees from competing with the Company. Named in the order were Bernard Gelman, Joseph Ponist and certain other former CCA employees, as well as the CSI Electronics Corporation, a company formed by them while still employed by CCA. Under the order they may not use or disseminate in any way confidential information received on the job, nor interfere with CGA contractual relationships with employees, dealers, or customers.

### NAFMB Asks FCC To Ban Cable "Radio" Programs

Claiming that aural entertainment programming delivered by cable systems in unfair competition for FM broadcasters, the National Association of FM Broadcasters has asked the FCC to prohibit such "cable radio" as a serious potential economic threat to the FM

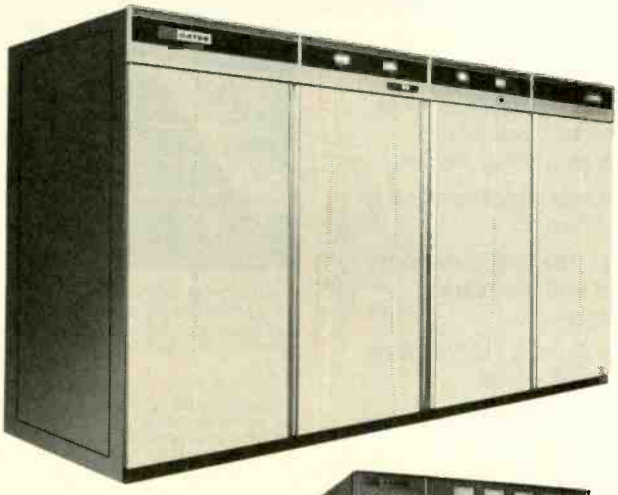
continued on page 16

# Three ways to spell leadership in transmitter engineering



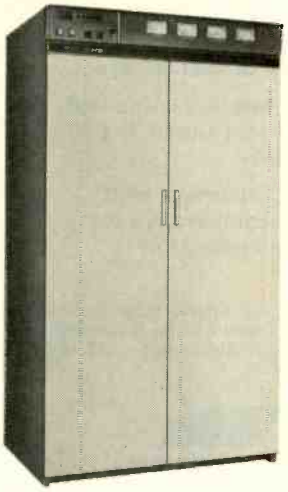
## IF Modulation

Another first — introduced in Harris/Gates' color television transmitters. Simplicity of IF MODULATION results in nearly perfect signal linearity for superb color fidelity.



## Pulse Duration Modulator

This exclusive, Harris/Gates-designed AM modulation system is nearly 90% efficient! Allows an overall efficiency of better than 60% in Harris/Gates' MW-50, 50 kilowatt AM transmitter.



## Direct Carrier Frequency Modulation

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

For additional information, write Harris Corporation, Gates Broadcast Equipment Division, Quincy, Illinois 62301.

HARRIS
COMMUNICATIONS AND INFORMATION HANDLING

Circle 112 on Reader Service Card

## NEWS

medium. The petition says that FM broadcasters carry a heavy burden of fees, costs and responsibilities which ware not shared by cable operators, who are able to operate "cut rate and free-wheeling." Cable radio operators, the petition for advertising at rates 75% to 85% less than those of broadcasters, which could be damaging to FM stations struggling to live in small markets.

### Research Council To Be Set Up by Public Broadcasters

A group representing many organizations in public broadcasting, met in Racine, Wisconsin. Under the sponsorship of the National Association of Educational Broadcasters, the Johnson Foundation, and the Corporation for Public Broadcasting, the group called for creation of a national Council to organize audience research, program evaluation, and ascertainment for broadcasters. The announcement pointed to the pressing need, felt in recent years as public broadcasting grew rapidly, for wide-rangeing coordination in program research areas. The objective would be to meet this need with wide distribution of research results, encouragement to those trying to improve such research, and integration of work among various agencies.

## Business Briefs

**Jerrold Corp.** sold its first Commander III universal signal processing system for cable to Jackson Community Antenna Inc., in Jackson, Tenn. . . . . **Frost and Sullivan,** electronics market research firm, predicts spending for all military communications will be $2.5 billion to $3 billion annually, 1975-1980.

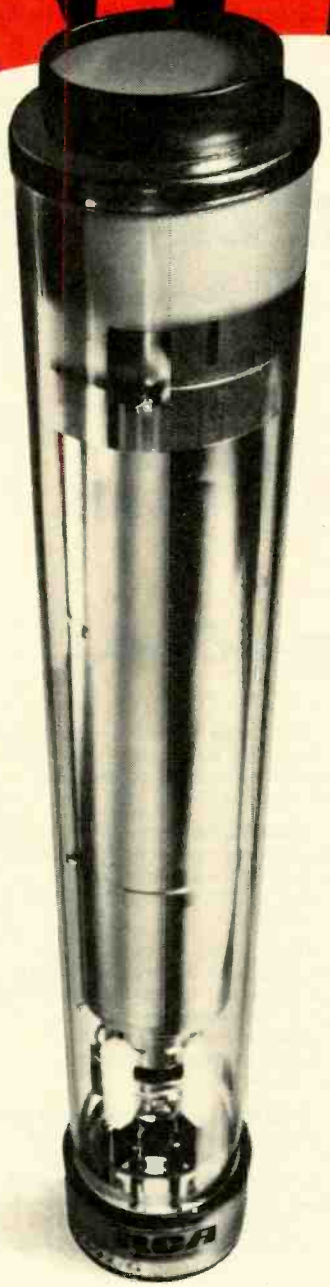
**Anixter-Pruzan** has been appointed national distributor of CATV coaxial connectors by **ITT Canon Electric** . . . . **Oak Industries** subsidiary **McCoy Electronics Co.** has begun high-frequency crystal production in a new plant in Mercersburg, Pa. . . . . **The Austin Co.** announced that they will design and build a $60 million plant in Algeria for the production of television sets and other entertainment products.

**Ampex Corp.** has agreed with **Ohmtec Corp.** to distribute the noise reduction units of **Burwen Laboratories,** Ohmtec Subsidiary, non-exclusively in the U.S. and exclusively throughout the rest of the world.

**Goldmark Communications**

continued on page 18

# EXTENDED RED



## RCA Vistacons NOW!

The RCA-4593 and 4594 extended red Vistacons are now available as direct replacements for the XQ1023 and XQ1025. They complement the RCA-4592 which is directly interchangeable with the XQ1020. For improved resolution, an extended green version is also available.

The RCA square design eliminates "pin cushioning," and makes for easier, faster registration with better tube-to-tube uniformity.

All RCA Vistacons have non-brittle base pins, and microphonic-free construction.

Use RCA Vistacons. You'll get the competitive value and the service you've a right to expect from the pioneering leader in TV camera-tube technology. For complete information call your RCA Representative or your RCA Camera Tube Distributor.

**RCA Lancaster — where people and technology make the difference.**

**RCA Camera Tubes**

**Corp.** has sold 24 of their Mark II automatic skew correctors, for video cassette machines, to **Wells National Service Corp.,** distributor of premium TV to hospitals; total Mark II sales are over 250, according to Goldmark . . . . **United Church of Christ,** leading battler for broadcaster response to community needs, announced a grant of $24,000 from the North Shore Unitarian Society to help in training community leaders for fostering broadcaster-community action.

**The E-Cam Corp.** said it would service and repair all models of **Eclair Cakeras,** including both the French-made and English-made models; inquiries to go to E-Cam at P.O. Box 3955, North Hollywood, CA, 91609 . . . . **Multiplier Industries,** maker of safety equipment for CATV, telephone and communications industries, moved to larger quarters in Mount Vernon, N.Y.



**International Video Corp.** announced sale of two IVC-9000 helical broadcast videotape recorders to WDCA-TV, Washing, D.C. . . . . **Meredith Corp.** sold station WOW-TV, Omaha to **Chronicle Broadcasting Co.** of San Francisco . . . . **Western Telecommunications, Inc.,** has put in service a microwave trunk between Omaha and Salt Lake City; it will provide full-time video service to all three major TV nets.

**Edcor,** wireless sound equipment maker, announced a contract for exclusive U.S. marketing of condenser microphones made by Calrec Audio, Ltd., of England . . . . **Harris Corp.,** Broadcast Equipment Division, sold a 50-kw color transmitter, and six-bay antenna, to KABC-TV, Los Angeles, for about $350,000, the sixth TV transmitter sold to ABC-owned stations in recent years.

**National Public Radio** will receive a U.S. patent on "NetCue," a system for alerting member stations, and automatically starting recorders, for fast-breaking news and emergency announcements; inventor is William Hetrich, NPR Senior Engineer . . . . **Consolidated Video Systems** announced receipt of a U.S. patent on its timebase correction system, issue date January 14, 1975 . . . . **Fidelipac,** division of Telepro, moved into larger quarters in Mt. Laurel, New Jersey.

**Filmways, Inc.** of Los Angeles put into one division two subsidiaries: **Broadcast Electronics** of Silver Spring, Md., and the Wally Heider Recording Studios in Hollywood: Andrew Szwagda, head of Broadcast Electronics, is vice president in charge of the division . . . . **GTE Sylvania** opened its largest distribution center, in the Centex Industrial Park, Elk Grove, Illinois, for handling lighting products, TV Sets, electronic components.

**Ampex Corp.** sold to American Broadcasting Company eight AVR-1 videotape recorders, for use at the 1976 winer Olympics, in Innsbruck, Austria, and summer Olympics in Montreal, Canada . . . . **RCA Corp.** has leased to the Canadian Broadcasting Corp. 20 type TR-600 videotape recorders, and seven complete TV film systems, for use in the Montreal summer Olympics in 1976.

**International Audio Visual** opened a new 6200-square-foot R&D facility in Van Nuys, California . . . . **Tele-Mation Inc.** sold seven audio-video switchers to the Australian government broadcast system, and three to independent stations in Perth, Adelaide and Melbourne . . . . **Magnavox CATV** Division has a turnkey contract for a 120-mile expansion of cable system of Gul Coast Cablevision in Pascagoula and Moss Poinx, Miss.

# Now You Can Own A JVC 4800 the First Truly Portable Color Video System

Other VTR manufacturers are still talking about bringing out a portable color system. JVC Industries has done it.

A skillfully crafted, simple to use, battery operated system that weighs less than 30 pounds! The camera, with a built-in mike and a viewfinder that doubles as a monitor, weighs less than 8 pounds. The rest of the system is carried slung over the shoulder: weight 21 pounds. And that includes a ½" EIAJ-1 open reel recorder/player, a camera control unit (CCU) and the battery pack.

But JVC didn't stop there. They made it compatible with *all* EIAJ-1 color systems; capable of recording directly into a ¾" cassette machine that the hand-held camera controls . . . or directly to a TV monitor. The color and resolution are unbelievable. You have to see it to believe it. Call today for a demonstration or write for literature.

JVC Industries, Inc., In Chicago: 3012 Malmo Drive, Arlington Hgts., Ill. 60005, 312-593-8997. In Los Angeles: 1011 W. Artesia Blvd., Compton, Calif. 90220, 213-537-8230.

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INTERPRETING THE

# FCC RULES & REGULATIONS

# FCC Adopts New Fees

The Commission has recently adopted an entirely new Schedule of Fees required to be submitted by broadcast permittees, licensees, and CATV system owners. These new fees are effective March 1, 1975.

### Background

In 1963, the Federal Communications Commission first adopted a Schedule of Fees for most of its applicants. The Fee Schedule was quite limited in scope and established merely nominal fees producing revenue that totalled approximately only 25% of the Commission's operating expenses.

Then, in 1970, the Commission adopted a new and comprehensive Schedule of Fees intended to produce revenues that would generally approximate the Commission's operating costs.

However, on March 4, 1974, the Supreme Court issued its decision in *National Cable Television Association, Inc.* v. *United States,* 415 U.S. 336 (1974). That case arose out of a number of petitions for judicial review of the Schedule of Fees adopted by the Commission in 1970.

While the case before the Supreme Court involved only cable television annual fees, the decision raised certain basic questions with respect to the manner in which the Commission computed the fees adopted in its 1970 Schedule. Therefore, in light of the Supreme Court's decision, the Commission proposed other revisions in the Schedule of Fees based upon the Court's statutory interpretation.

The Court clearly rejected the concept that the Commission's fee schedule should approximate its budget. The Court stated that since the Commission's activities benefit the public as well as the regulated industries, the Commission could not merely calculate the total cost of supervision and then contrive a formula that reimburses the Commission for that amount. The Court stated that the Congressional aim that franchisees pay some of the costs of necessary regulation can be achieved within the framework of "value to the recipient" as contrasted with the public policy interest that is also served.

Therefore, the Commission reasoned that a clearly reasonable interpretation that would result in a workable schedule of fees was to establish the fees "as a reflection of value to the recipients upon the costs of Commission activities that confer a benefit upon identifiable recipients."

In light of the foregoing, it is appropriate to examine each of the major areas in which fees have been significantly changed.

### Broadcast Series

The Schedule of Fees applicable to Broadcast Bureau applications has been significantly altered by the Commission. The Commission stated "It appears that in fact annual fees and assignment and transfer fees produce revenue somewhat higher than the costs of processing renewal applications and transfer applications, respectively, whereas the revenues from fees for applications for construction permits, major and minor changes, and other similar applications are considerably less than the costs of processing these applications."

Therefore, it is appropriate to note the new Schedule of Fees in the three primary categories: (*1*) Renewals, (*2*) Assignments and Transfers, and (*3*) Facilities Applications (applications for construction permits, major and minor changes, and the like).

The new Schedule of Fees for applications for construction permit for new stations, or for major changes in existing stations is as follows:

| Type of Facility | Filing Fee | Grant Fee |
|---|---|---|
| VHF-Top 50 markets | $10,000 | $67,500 |
| UHF-Top 50 markets | 2,500 | 22,500 |
| VHF-Next 50 markets | 4,000 | 27,000 |
| UHF-Next 50 markets | 1,000 | 9,000 |
| VHF-Balance | 2,000 | 13,500 |
| UHF-Balance | 500 | 4,500 |
| FM-Class A | 200 | 1,350 |
| FM-Class B and C | 400 | 2,700 |
| AM-Day- 50 kW | 1,000 | 6,750 |
| AM-Day- 25 kW | 800 | 5,400 |
| AM-Day- 10 kW | 600 | 4,050 |
| AM-Day- 5 kW | 400 | 2,700 |
| AM-Day- 1 kW | 200 | 1,350 |
| AM-Day-500 W | 100 | 675 |
| AM-Day-250 W | 50 | 340 |
| AM-Unlimited 50 kW | 2,000 | 13,500 |
| AM-Unlimited 25 kW | 1,600 | 10,800 |
| AM-Unlimited 10 kW | 1,200 | 8,100 |
| AM-Unlimited 5 kW | 800 | 5,400 |
| AM-Unlimited 1 W | 400 | 2,700 |
| AM-Unlimited 500 W | 200 | 1,350 |
| AM-Unlimited 250 W | 100 | 675 |
| AM-Class IV | 200 | 1,350 |

Moreover, fees for applications for a construction permit to replace an expired permit (FCC Form 321) have been changed to $250. Fees for applications for modifications other than a major change, submitted on FCC Form 301, (including applications to change antenna or transmitter site or increase antenna height, or change antenna pattern) shall be one-half the filing fee for an application for construction permit for a new station, but not less than $100. All other FCC Form 301 applications must be accompanied by a $100 filing fee.

It will now be more expensive for broadcast licensees to change call signs on their broadcast facilities. The new Commission fees are $200.00 per change. Similarly, all other fees for applications (not mentioned hereinabove) in the broadcast services have been raised to $100 per application.

### Sales or Exchanges

All broadcasters will be pleased to note that the new filing fees and grant fees for sales or exchanges of broadcast facilities have been substantially *lowered.* The new application filing fee for an assignment of license or transfer of control (FCC Forms 314 or 315) have been

continued on page 22


## New from EEV

# Announcing the 30mm Coaxial Leddicon.®

Utilizing a unique electrode structure and internal light biasing, EEV's Coaxial Leddicon* is a direct replacement for separate or integral mesh Plumbicon, Vistacon or Leddicon camera tubes. Now, no problem with camera tube orientation – exclusive coaxial construction assures consistently accurate geometry and optimum registration. Less spurious pickup than with integral mesh tubes is an added bonus. And look at this . . .

Less smearing, better camera sensitivity – exclusive internal light biasing reduces smearing, improves dynamic resolution even under 'low key' conditions. No costly tube inventory – stations having both separate and integral mesh equipment can use the same camera tube interchangeably. Built-in quick change switch permits instant in-station tube modification. No expensive camera conversions ever.

Add in extended red sensitivity plus fixed light bias and you will see why EEV's Coaxial Leddicon is destined to become the standard and top quality camera tube. For detailed technical data, call us today, collect.

*British Patent 31662/72

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Tel: 416 249 8548. Telex: 06 965864.

**EEV North America**

**P8130** Coaxial Leddicon with standard layer and fixed light bias.

**P8131** Coaxial Leddicon with standard layer and variable light bias.

**P8132** Coaxial Leddicon with extended red layer and fixed light bias.

**P8133** Coaxial Leddicon with extended red layer and variable light bias.

## FCC Rules & Regs

reduced from $1,000 to merely $200. The application filing fee for a *pro forma* "short-form" (FCC Form 316) has been lowered to $50.

The new grant fees, to be paid to the Commission immediately following consummation of the assignment or transfer, for AM stations or joint assignment or transfer of AM-FM stations, with a gross revenue of $400,000 or less, is now 0.9% of the gross revenue. The gross revenue is to be determined from an average of annual gross revenues for the three years immediately preceding the *filing* of an assignment or transfer application.

The grant fee for AM stations, or joint assignment or transfer of AM-FM stations, with gross revenues greater than $400,000 is now $3,600 plus 1.4% of gross revenue in excess of $400,000.

The grant fee for all FM stations is now 0.9% of the gross revenue (determined as indicated hereinabove).

For television stations with gross revenues of $800,000 or less, the new grant fee is 1% of the total gross revenue. For television stations with gross revenue greater than $800,000, the new grant fee is $8,000 plus 1.6% of gross revenues in excess of $800,000.

### Annual License Fees

Under the new FCC Fee Schedule, each broadcast station is required to pay an annual license fee, as in the past, to the Commission, based on the Station's rate card as of June 1, of each year.

For AM and FM radio stations, the annual license fee will be a payment equal to 8.5 times the station's highest single "one minute" spot announcement rate, but in no event shall the annual license fee be less than $25.

For television broadcast stations, the annual license fee will be a payment equal to 4.25 times the station's highest "thirty-second" spot announcement rate, but in no event shall the annual license fee be less than $100.

In the interim, fees due April 1, 1975, or later, for the preceding twelve months, are to be calculated as follows:

For the period through December 31, 1974, 6.7 times the applicable spot rate must be paid for AM and FM stations, and 3.4 times the applicable spot rate for television stations must be paid. For months after January 1, 1975, the multiplier of 8.5 times the highest applicable rate for AM and FM stations and 4.25 times the highest applicable rate for television stations will apply.

### Cable Television Fees

Following the Supreme Court's decision, the Commission has determined that cable operators must submit, by August 1, 1975, a fee of six cents per subscriber for the years 1973 and 1974.

Thereafter, an annual authorization fee shall be paid by each CATV system on or before April 1 of each year for the preceding calendar year. The fee for each system shall be equal to the number of its subscribers times 13 cents. The number of subscribers shall be determined by averaging the number of subscribers on the last day of each calendar quarter.

### Conclusion

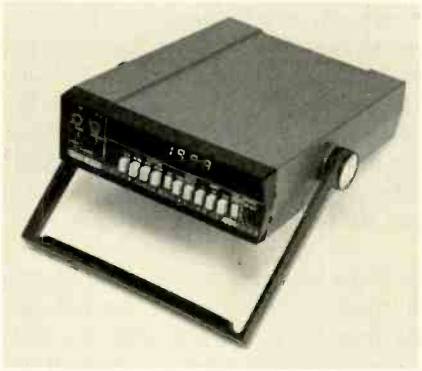
Additional new fees have been established for alien restricted telephone operator permits, common carriers, safety and special services, and industrial heating equipment by the Commission. However, the above broad overview should be most helpful to broadcast and CATV operators. Of course, you are advised to contact your counsel for full information regarding the new fees, as well as some of the more complicated computations which must be made in certain instances. **BM/E**

# Your VTVM is obsolete!

This may sound like a harsh claim, but it's true. Thousands of TV technicians are using instruments designed in the 1950's to trouble-shoot circuits designed in the 1970's.

And now, most color TV's have solid state circuits. So use of out-of-date test equipment just compounds the problem.

The generation gap has grown too big.



*The Fluke 8000A 3½ digit multimeter*

***Solid state calls for new performance standards.***

Your "old fashioned" test equipment simply doesn't measure up to today's requirements. For example, the typical VTVM gives you 5% accuracy and 2% resolution. In the old days, that was good enough. Not so today.

Now you need an instrument to look at the voltages at each pin of an IC with sufficient accuracy and resolution to determine proper IC operation.

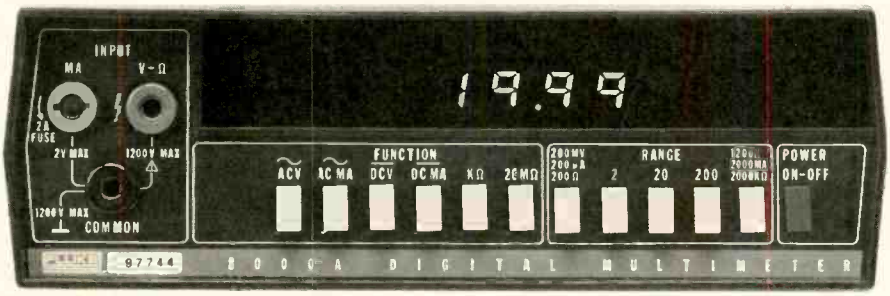
For example, a reading of "around 2.8 volts" is no longer sufficient. You must be able to distinguish between 2.80 and 2.82 volts.

You need a test instrument that gives you 0.1 ohm resolution so you can reliably measure resistance of switch contacts, circuit breakers, and low value resistors.

To do all this and more, you need the superior capabilities of the Fluke 8000A 3½ digit multimeter.

***An instrument designed specifically for testing solid state equipment.***

The 8000A gives you up to 50 times the accuracy and 20 times the resolution of a VTVM, so you can measure the various voltage levels in a solid state chassis with absolute confidence.




*Resolution is 100 microvolts, 100 nanoamps and 100 milliohms*

You get the sensitivity you need for low level dc measurements. The 200 millivolt range with 100 microvolt resolution tells you *exactly* what your values are.

The 8000A has an AC frequency response from 45 Hz to 20 KHz and, with accessory probes, to 500 megahertz. Resistance measuring capability ranges from 100 milliohms to 20 megohms. It offers a 15°C to 35°C accuracy temperature span. And a 1-year accuracy time span, meaning it seldom needs calibration.

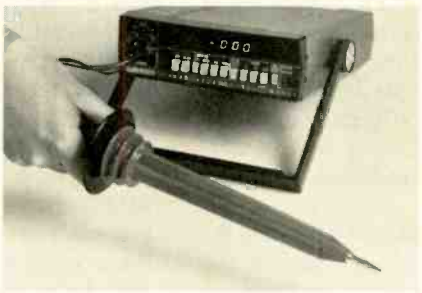
Unlike other DMM's the 8000A has fast response time—3 readings a second. And the bright, digital readout means that no interpolation is necessary.

***The 8000A measures high voltages, too.***

Our 8000A is designed to answer *all* the needs of an electronic service technician.

One very important (and talked about!) safety requirement is that the picture tube anode voltage must not exceed the maximum specified by the manufacturer. Our 8000A has an optional high voltage probe that gives you guaranteed accuracy of 1% at 25,000 volts. The probe also extends the capability of the 8000A to 40,000 volts to measure the high voltage in the new 32,000 volt chassis.

No other DMM's offer this feature.

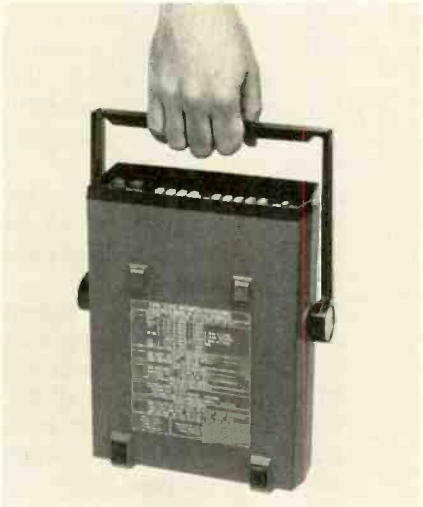


*High voltage probe accessory gives you 1% accuracy at 25,000 volts*

***Get the most up-to-date instrument available.***

Don't be caught in the typical trap. Many electronic service shops don't really update their equipment when they decide to update. Switching to a TVM or a FET voltmeter doesn't really give you the accuracy and resolution you need today, or for that matter, tomorrow.

But with the 8000A on hand, you know you have a *true* solid state testing device . . . an instrument that can do the job the way it should be done.



*Carry it anywhere. Use it on line or rechargeable battery power. Note the conveniently mounted specs on the bottom decal. They're always with you.*

The 8000A comes from Fluke, one of the largest instrument companies in the U.S.

It costs just $299 ($40 more with HV probe).* And it is far and away the largest selling, most rugged and reliable 3½ digit multimeter in the world.

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# Studio Lighting And The Energy Problem

**Last month Part I discussed general considerations. This part looks at maintenance to decrease energy consumption. Panelists are Joe and Moe Tawil, president and chief engineer, and Tom Pincu, product manager, all of Berkey Colortran, and Jim Davis market planning manager for GTE Sylvania.**

**MOE:** I'd like to talk about maintenance. I think it's tragic that so few studios have preventative maintenance programs. Light loss can be as high as 20%, and maybe worse, with improperly maintained equipment. And all it takes is some plain old Windex and a soft cloth to clean these reflectors and lenses.

**JIM:** That's not the only problem. Few people bother to check their reflectors for alignment with the lamps to see if they're set up for peak performance.

**BM/E:** How many people realize the importance of aligning lighting equipment?

**JIM:** Very few! Maybe 1/10 of 1%. But we have found that with the new coil configuration in every lamp, we can take any given fixture and get a gain of 15% to 20% in output by focusing.

**TOM:** The manufacturer spends a great deal of engineering time designing coils, arranging filaments and hanging them in there beautifully. And someone comes along and puts the bulb in with dirty hands, doesn't align it, clamps the socket improperly or whacks it with a pole and distorts the relationship between the reflector and the lamp.

**JIM:** From my own experience, very few people realize that equipment needs to be optically aligned. There are simple alignment techniques but I don't know if anyone has published the data.

**BM/E:** At all of these thousands of TV studios, how many actually have people who are trained to know what they're doing in the use of light?

**MOE:** More and more all the time.

**JIM:** But at the risk of incurring the wrath of some people, a big part of the problem is carelessness.

**JOE:** That's a good point. When you talk about maintenance and handling, it's interesting to note that the same people that will handle camera equipment like eggs, will take the lights and heave them into baskets, one on top of the other. The industry concept is that robust equipment is something you can jump on, bang and drop. The barn door control isn't what it should be because the equipment isn't in optical alignment. The efficiency of everything you use deteriorates.

**BM/E:** Are there other common maintenance problems?

**TOM:** We get fixtures back after two year's use and the sockets are obviously shot. People don't realize that sockets are like spark plugs. You've got to go in once a year and change them if the units get a lot of usage.

**JIM:** We do see a lot of lamps come back which we know have been abused. One thing about an incandescent coil is that it tells exactly what happens to it. You can certainly tell if it's met with vibration. You can see where it's had hot shock. And it's amazing the amount of cold shock we see. Which gets back to the practice of throwing them into the bins.

**TOM:** A person is more careful with a fluorescent tube he's replacing in his home than he is with lamps he's paying $20 to $30 each for.

**MOE:** The handling of equipment is one thing that has always shocked me. Sophisticated instruments should not have to be built for an elephant to step on. To do that, you'd have to compromise efficiency, light output, weight and cost.

**JIM:** Threre is one very important thing from a preventative maintenance standpoint: yes, we have the ability to "lamp up" or "lamp down" fixtures. But, be careful you don't take a 1K fresnel and put a 2K lamp in it. Because that will deteriorate your wiring as well. You have to note what the fixture is rated for and not exceed that rating. This is where we found most of the problems lie. Where someone has exceeded the rating of the fixture.

**MOE:** Aside from optical maintenance as far as alignment is concerned, there should also be mechanical maintenance. If you have a focusing mechanism and nobody bothers to keep it operating smoothly, every time you focus you'll shock the lamp and the filament and cause a failure.

**BM/E:** Why don't broadcasters take the maintenance of lighting equipment more seriously?

**TOM:** Some don't know how to maintain the equipment. Others don't want to bother. It's a cost thing. One thinks if he sets up a regular program it's going to cost him money. In the short run, it does. You have to take your fixtures down; look at them on the bench; go through the whole thing, and you do spend money. That's a direct charge that should be budgeted for. On the other hand, if a lamp fails, you've got to replace it. And that costs money. Look at a taxi cab. It'll do 250,000 miles despite its outward physical condition because it gets regular, constant maintenance. The normal auto in the U.S., if it lasts 60,000 miles is amazing.

**BM/E:** Are there simple housekeeping hints we can pass on, like cleaning?

**MOE:** As we said earlier, for the lenses, Windex and a soft cloth is fine. It's okay for reflectors, too. Even soap and water, with paper towels!

**BM/E:** What about cleaning contacts?

**TOM:** MEK can be bought commercially. That's not a trade name, it's a chemical name.

**BM/E:** Like carbon tet?

**TOM:** No. MEK's not as toxic.

**BM/E:** Is there any maintenance to keep contacts from pitting?

**MOE:** Probably not. You get pitting because of the fact you can't have two perfectly flat surfaces. So the initial surge when you turn on the lamp tends to arc and that constant on-off creates pitting.

**JOE:** But in general, people won't invest in maintenance. Because it's an intangible. They don't see the benefits directly.

**MOE:** But they *are* paying for it, because their equipment is deteriorating and has to be replaced. They're paying for it in extra lamp costs because they fail earlier.

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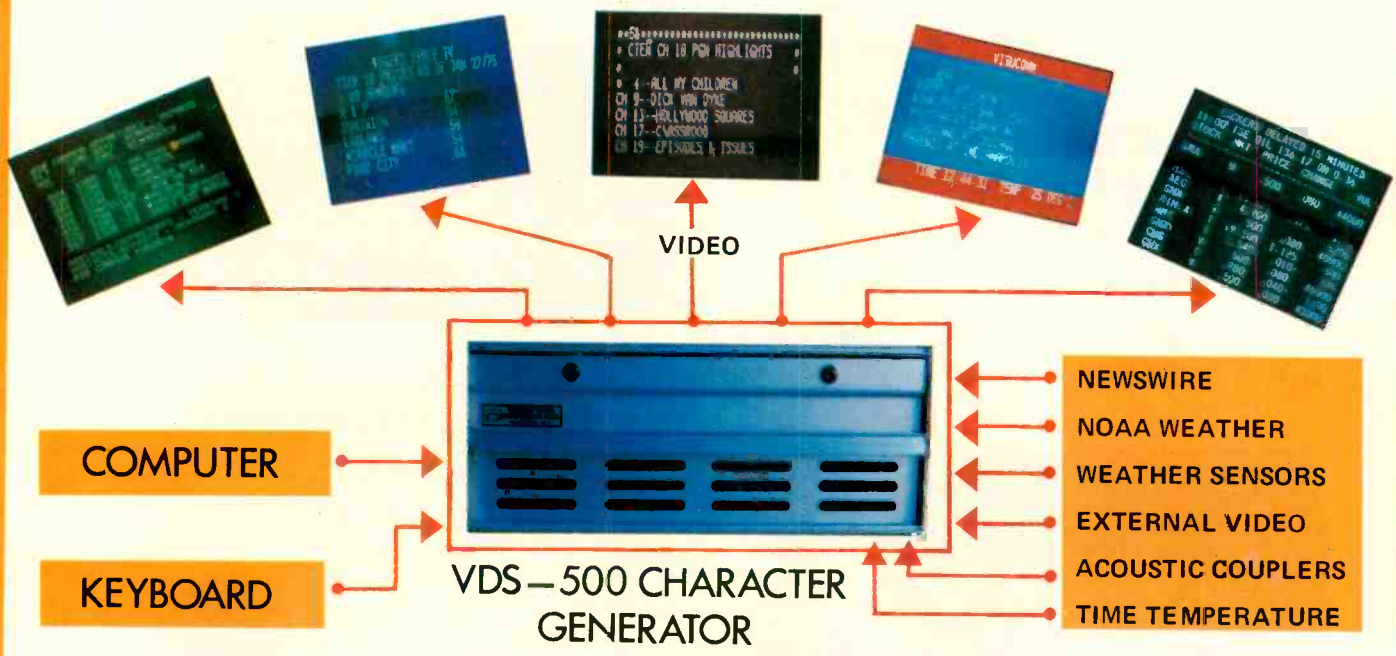
# 5 CHANNELS FROM ONE 7" CHASSIS

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# Picture a new high performance,

One picture couldn't begin to tell the whole story of how our new TR-600 compares with other "new" VTR's.

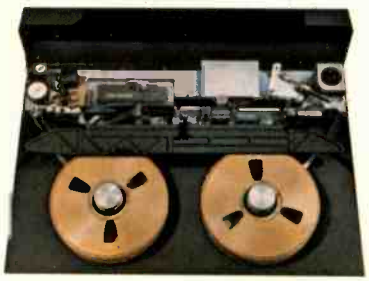
Nor would a hundred.

But, we felt that a number of different views would give you a good idea of what we mean when we say totally new tape technology.

Like the drop-on reels for instance.

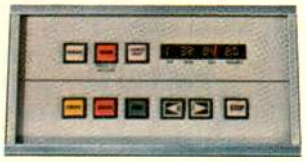
Then there's our unique straight line threading. It not only speeds loading, but once the tape reaches the take-up reel, the operator is also assured that threading has been accomplished properly.

The TR-600 utilizes a standard headwheel (featuring long-life Alfecon II poletip material) that's compatible with all other RCA highband recorders. You'll find this really keeps down the expense of spares.



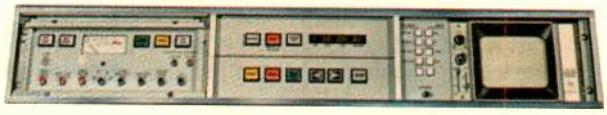
# tape technology, medium price.

We've added an electronic LED readout tape timer. And LED diagnostic indicators.

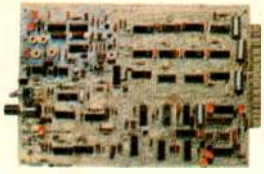


At the first sign of certain malfunctions or nonstandard modes, a control panel light flashes a warning, while individual lights inside direct you to the module that's in question.

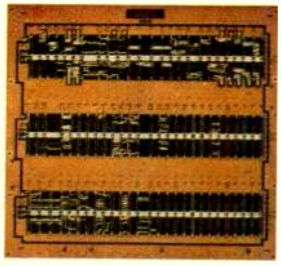
We've simplified the control panel for easy operation.



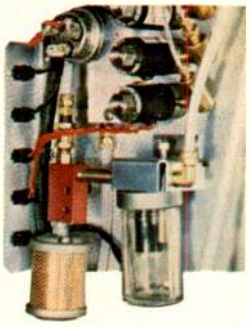
These module cards have the reliability advantages of computer assembly printed circuit wiring and automatic insertion of components.

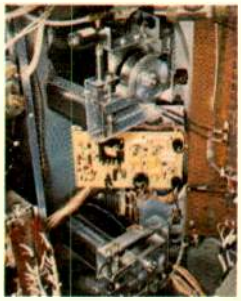


Another TR-600 innovation is the copper backplane which assures precise resting of modules. The backplane is wire wrapped under computer control replacing the past practice of using dense, bulky internal wiring harnesses.



Chimney cooling eliminates the need for blowers and a Venturi vacuum system replaces normally noisy vacuum pumps.





And for optimum playback performance our tape tension servo system features fast rewind and is gentle in handling of tape.

**Unfortunately, there are so many things we can't show you. Like all the TR-600's automatics. Because they're all built in. Like the splicer, too. Or the fact that its new integrated design reduces the number of components by 40%.**

**Nor can we show you the time and money the TR-600 will save you.**

**But, if what we've shown you so far looks good, we'd be glad to send you a more complete picture of the TR-600. Write RCA Broadcast Systems, Bldg. 2-5, Camden, N.J. 08102. Get the picture, then compare.**

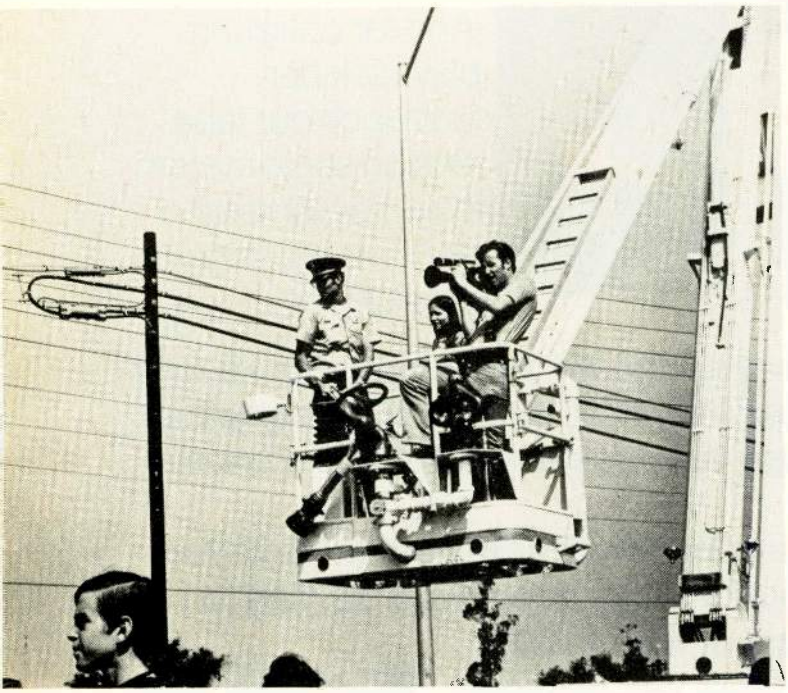
RCA

# Film Is Still In There

After all the stirring-up portable video camera VTR combos have been doing lately, we need a look at film in television if we want a complete picture. Film keeps on doing the things it does especially well.

Film, long the basic production medium for much of television's recorded programming, has been yielding large areas to videotape lately. But no one should get the idea that we are anywhere near a good-by* to film in television. The qualities that built film into our creative imagination for so long and made it highly efficient in many important applications, are still at work, keeping film on the job in many television stations.

*A cinematographer can be a one-man crew with modern cameras.*



*Film camera presents no problem in going almost anywhere.*

That fact emerged in a sampling survey BM/E made of production houses that use both film and tape, television stations and film producers. One of the useful points made several times was that the ultra-portable news-gathering video cameras which are sweeping the industry (BM/E, January) do not have, nor claim to have, the qualities for documentary or dramatic productions that need extremely well-controlled picture shading, lighting, color balance, etc.

If the highest "studio" quality is wanted, the producer needs studio-quality cameras connected to quad VTR's or high quality motion picture camera. If the program requires a large number of "location" shots this means the video cameras and quad equipment would have to be mobile, requiring an investment much too large for many small and medium-sized stations.

The producer can do this kind of a job at a fraction of the cost, and with far greater mobility, with motion picture cameras. That is just what several producers BM/E spoke to were doing. For example, Donald D. Gerdts, director of operation and production for KOCE-TV, non-profit community district station in Huntington Beach, California, told how the station produced adult teaching films that included location shots in many parts of the world.

In recent years more than 1500 people have signed up each year for the televised adult education courses offered by KOCE. One of the most popular has been "Dimensions in Culture," a three-unit course in cultural anthropology. For the course the KOCE camera crew went to Egypt, Europe, Asia, South Africa, shooting more than 100,000 feet of color film. This was edited together with videotape material into the 30-half-hour programs, each aired twice weekly.

Mr. Gerdts points out that the cost of doing the foreign shots on videotape, at the quality level the station wanted, would have been far beyond the resources of the station.

"There are certain kinds of picture quality you can get readily with tape," Mr. Gerdts said. "We have trained our cameramen to work carefully for the full exploitation of the strengths of the film medium. We are getting the results we want and will continue to get them this way."

*The other day we got a call from a book editor asking for a photo of an "electronic news camera" reporting instant news "from some remote part of the world." We said we had photos of TV cameras on city streets in St. Louis but live coverage in unusual places was generally only possible if some prearrangements had been made to link up with a microwave system or satellite. Our caller settled for a photo of a film camera shooting in the Everglades.

# Our customers get results from the 1440 Automatic Video Corrector.


**FROM WM. VANDERMAY,**
**CHIEF ENGINEER**
**KATU CHANNEL 2, PORTLAND, OR.**

"The most remarkable device for video control to appear on the market in the last decade is, without challenge, the Tektronix 1440 Automatic Video Corrector."

"Together with all of its bonus features this instrument is a must for every transmitter installation."

**FROM RCA BROADCAST NEWS**
**OCTOBER, 1974.**
**T. M. GLUYAS, STAFF ENGINEER**

"We have found that a most convenient way to automate modulation levels and signal parameters is to use a Tektronix model 1440 Automatic Video Corrector in a closed loop mode around a transmitter, such as an RCA TT-30FL or TT-50H."

**FROM JOHN KEAN, VICE PRESIDENT**
**CONNECTICUT EDUCATIONAL**
**TELEVISION CORP.**

"The 1440 has revolutionized our transmitter operation. . . . No trade-offs in signal quality are involved."

"The visual RF drive control becomes the only on-shift operating control."

"To be able to adjust power with no apparent sync or video level changes is something I am not used to yet."

"Our Hartford transmitting operation has become precise and nearly automatic. The power output stability exceeds FCC standards by a factor of ten to one. The VIR operated signal corrector is the major reason for this."

**FROM JOHN HITT, CHIEF ENGINEER**
**KSLA-TV, SHREVEPORT, LA.**

"Our transmitter is about nineteen years old. The Tektronix 1440 automatic color corrector has stabilized our output signal to a degree never before attainable."

"The one most noticeable improvement is the maintenance of proper sync-video ratio during line voltage variations."

"With the 1440 in use the transmitter excitation control can be adjusted to vary the transmitter output power from fifty to one hundred percent with the sync-video ratio remaining correct."

"Our transmitter has some differential phase, but having the 1440 match burst to VIR phase results in a very acceptable picture. In fact, an AB test between transmitter output and microwave receiver output does not indicate any difference in the two pictures."

"When the show on VTR is a network play back, the VIR will control the six parameters available. The most impressive thing here is that the VTR operator can vary the color phase control on the VTR with no noticeable change of color phase being observed on the air picture."

"Our 1440 has been in service several months and is doing a beautiful job. We seldom have to make an adjustment in our nineteen year old transmitter."

**FROM ROBERT F. SCHLIEMAN,**
**ENGINEERING MANAGER**
**WMHT-TV, SCHENECTADY, N. Y.**

"I just wanted to let you know how pleased we are with the 1440 Automatic Video Corrector. This unit will be the key to allowing us to have automatic power control of our UHF transmitter. As we automatically control the 110 KW output with a computer control system, the 1440 will maintain the correct percentage of modulation."

Tektronix customers have proved that the 1440 Automatic Video Corrector takes the work and the worry out of video signal quality control . . . with FULLY AUTOMATIC CORRECTION of overall video gain, black level, color saturation, burst phase and gain, and sync level.

Call your Tektronix Television Field Engineer for a special packet of information about automatic video correction. He can demonstrate how the 1440 and other correction products will work for you at incoming network feed, remote feeds, master switcher output, transmitter input and at other key points.

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For demonstration Circle 122

*KOCE-TV demonstrates value of film camera in shooting part of cultural anthropology series in Africa.*

*Editing film is easy. Here cinematographer takes close look at some of the footage exposed in Africa trip.*

## New color film for news introduced

A new color film aimed directly at television news coverage was announced late in January by Eastman Kodak Company. Called "7240 (tungsten)," the new Ektachrome film gives television news departments a flexibility in choice of exposure index ratings. With 10 foot-candles of illumination, the film provides normal density ratings with typical camera equipment, with quality, Eastman says, fully equal to that of Kodak Ektachrome EF 7242 (tungsten). When shot at higher ratings and force processed, it has significantly improved grain character as compared with the 7242 Ektachrome.

The film is also pre-hardened in manufacture, eliminating the need for prehardener and neutralizer steps in processing; the process for the film, called VNF-1, is compatible with current machinery and is faster and is less costly than current processes, because of the elimination of the two steps.

The film is now on trade trial and will be marketed generally about mid-year.

# 9 REASONS WHY YOUR PRESENT LENSES JUST BECAME OBSOLETE.

The remarkable new Fujinon lenses with EBC are revolutionizing the television industry, and here's why:

**1. Glass** — Any lens can only be as good as the glass it's made from. So, to assure ourselves that we get absolutely the finest quality glass, we make our own. Traditionally, glass manufacturers use clay crucibles for the melting of their raw materials. However, at the extremely high temperatures required, reactions take place between the clay and the molten glass resulting in minute optical impurities in the finished glass. At Fujinon we use expensive platinum crucibles, thus eliminating all possible reactions between glass and clay.

**2. Computers** — The designing of sophisticated lenses involves calculations that would take an expert mathematician years to complete. Therefore, at Fujinon, one of the most modern computer installations in the world constantly works to maintain the superb quality of our lenses.

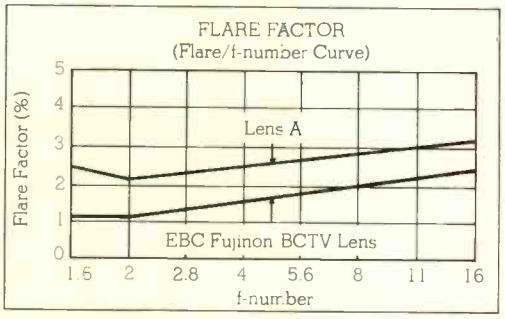
**3. Electron Beam Coating** — Fujinon's unique and exclusive coating process is the most advanced in the world, and it holds several advantages over conventional coating systems: One is that thinner and more uniform coatings can be applied. Another is that there is a greater range of substances that can be used for coating. Thirdly, a greater number of coatings can be applied to a surface.

| Lens Surface (k) | Transmittance (%) | | | |
|---|---|---|---|---|
| | Uncoated T=(0.95)$^k$ | Single Layer T=(0.98)$^k$ | Triple Layer T=(0.995)$^k$ | EBC T=(0.998)$^k$ |
| 2 | 90 | 96 | 99 | 99.6 |
| 4 | 81 | 92 | 98 | 99.2 |
| 6 | 73 | 88 | 97 | 98.8 |
| 10 | 59 | 81 | 95 | 98.0 |
| 20 | 35 | 66 | 90 | 96.0 |
| 30 | 21 | 55 | 86 | 94.1 |
| 40 | 13 | 45 | 81 | 92.3 |
| 50 | 8 | 36 | 78 | 90.4 |
| 60 | 5 | 30 | 74 | 88.6 |

Fujinon lenses with Electron Beam Coating (EBC) can have up to 11 separate coatings; and it is these coatings that make our lenses the almost perfect transmitters of light.

**4. Optical Transfer Function** — The exceptional performance resulting from the Electron Beam Coating of Fujinon lenses can be measured in several different areas. The optical transfer function is a measure of total lens performance; resolution, sharpness plus various kinds of aberration and contrast. By this critical criterion the Fujinon lenses clearly deliver superior optical performance.

**5. Flare Factor** — This is stated as the percentage of the light reflected by the lens' surfaces, the inside of the lens' barrel and the internal mechanism.




Here again Fujinon lenses have lower flare figures than comparable conventional lenses.

**6. Spectral Transmission** — Color definition is determined by the degree to which a lens transmits the various wavelengths in the light spectrum. Fujinon's use of rare earth elements in making their optical glass; plus their exclusive Electron Beam Coating make their lenses the ultimate in color transmission.

**7. Fringe Transmission** — One common drawback to many zoom lenses is inferior fringe transmission, especially in their extreme wideangle position. Not so with Fujinon lenses and their Electron Beam Coating. These lenses enjoy outstanding fringe transmission.

**8. '72 Winter Olympics** — The exceptionally fine picture quality transmitted from Sapporo, Japan during the '72 Winter Olympics was acclaimed by both the public and commercial broadcasting companies the world over. Fujinon zoom lenses were utilized throughout by NHK (Japan Broadcasting Corporation), which originated the coverage of the Games.

**9. First Time Available in the U.S.A.** — Up until now you may not have been very familiar with Fujinon broadcast lenses, but there's a very simple reason why: This marks the first time they'll be available in the United States. So if you want to get the jump on your competition by a marked improvement in the quality of your picture transmission, then your next lens has got to be a Fujinon.

For information on the complete Fujinon optical systems, contact Fujinon in New York.

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CLIP AND SAVE

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Jack Moss, head of Moss Communications, New York producers of documentaries, TV commercials, and other material on both film and tape, emphasized similar ideas. He said that the producer of recorded visual programs today needs a good grasp of the technical capacity and comparative cost, for a wide range of uses, of both film and tape. He must decide with each job and even each part of the job which medium will do better, what is wanted, at the lower cost.

Even in the news gathering area, where the new videotape systems are making such spectacular inroads, film is still used far more than tape. This may not continue to be true over some long period of time, but the changeover, if that is what we will see, will take several years at the least.

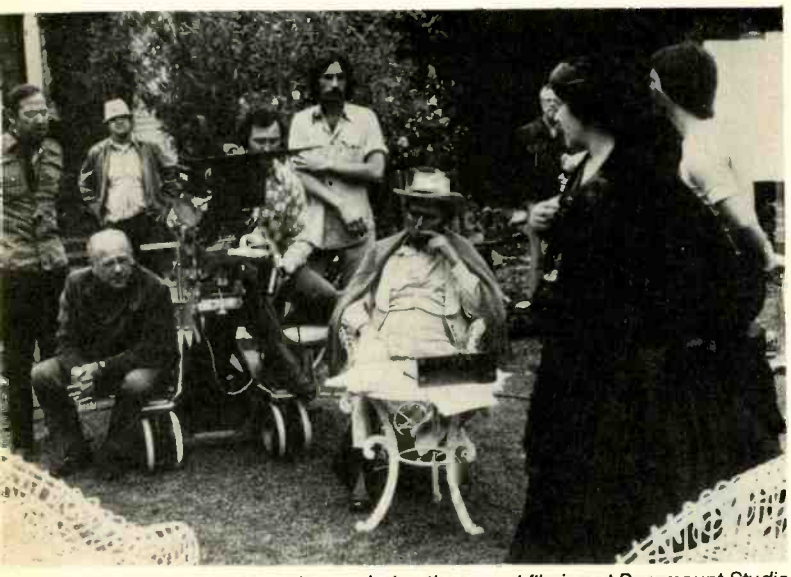
In the meantime, film is doing a splendid job at many stations; and we can be sure that the technology of the film and the cameras will not stand completely still either.

These viewpoints and others concerned with film in news are well expressed in the following excerpts by Edmund DiGiulio, president of Cinema Products Corp., in an address at the winter meeting of the Society of Motion Picture and Television Engineers, held at San Francisco in January. Di Giulio had the unenviable job of being the only film man to appear at the session which described how ENG was being used at KPIX, WLAC and the CBS network. Session moderator was Joseph A. Flaherty of CBS Television Network.

# Today's 16mm Cameras Are Designed For Television News Gathering

First of all, I want to say that I resent appearing to be "the man in the high button shoes," fighting the last ditch defense for newsfilm. My company has been in existence for seven years, the date I left Mitchell Camera and started Cinema Products. And we were primarily in 35mm equipment until we did make our entry in 16mm TV-newsfilm. In those short seven years, we have become the largest camera manufacturer in the United States.

When TV news exploded suddenly in the early 50's, equipment manufacturers were pretty well caught unawares. The TV news people were desperately looking for equipment. It seemed that the little Auricon Cine Voice 100 ft. camera had a good number of features that made it suitable. It was a silent camera, it was simple and reliable. But it didn't completely fill the bill. So a number of enterprising rental equipment companies made conversions of it, to add Mitchell magazines, and add power supplies and such. F&B/CECO, General Camera, Gordon Yoder, and a number of others, did an excellent job of doing this. And these conversions basically were the thing that we suffered with for the better part of twenty years. And I don't think that was very good performance on the technical side in serving such a vital and growing industry.



*CP-16R Reflex shown in use during the recent filming at Paramount Studio of "Sandburg's Lincoln." Six one-hour episodes of this network TV special were produced by David L. Wolper Productions. Producer/Director is George Schaefer; Director of Photography is Howard Schwartz.*

We introduced the CP-16 at the SMPTE Conference in November of 1971 in Montreal. We took a systems approach. I was glad to hear Mr. Flaherty relate to a total systems concept. I think it's the only way one can consider these things. I think they did an admirable job at KMOX. We looked at the total system and considered what had been done. We recognized that the Auricon movement was a good, simple, rugged and reliable movement, the recording heads and such had become a standard in the industry, so we unabashedly copied these features. However, the rest of the camera became a totally new system. We pioneered the development of a crystal controlled DC drive which was exceedingly efficient. As you well know, synchronous motors running from AC inverters consume a heck of a lot of power, and weigh a hell of a lot too. So with this drive, we could incorporate a very small plug-in rechargeable Nicad battery. This gave us a very compact, lightweight, self-contained system. We then, over a period of time, added system elements to the basic camera. We pioneered the development of a built-in Crystasound amplifier with AGC and automatic switching between live and record modes for operator monitoring. And this then became the "one-man-band" that was mentioned earlier. Subsequent to that, we introduced the reflex version of the CP-16 and this camera was well received.

We note at this time that our sales are running approximately three to one in favor of the reflex over the non-reflex camera. The appeal is that the reflex camera provides a great deal more flexibility in the selection of lenses. You can use wide angle fixed focal length lenses, super fast lenses, as well as any number of zooms. Also, the full ground glass bright viewing enables the cameraman to compose and develop his shots as he goes along. We have continued to add system components. We introduced recently a wireless radio receiver that was developed in close cooperation with Vega Electronics.

Mr. Flaherty gave us a good detailed presentation of

continued on page 34

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continued from page 32

the KMOX operation. And he presented some cost data. And of course I can't question the validity of his data. I was a bit surprised, though to see that the capital equipment cost was so nearly the same for film and videotape, when I know that the comparable video camera and its recorder cost about 8-10 times what our film camera does. I was also rather amused to see the announcement in the trade press in which they describe the total conversion cost to go to electronic news gathering at KMOX. They indicated that the total investment was approximately $400,000. Projections of saving on film, film processing, and additional technicians needed for the old system show that the network should make its money back within seven years. Now I ask you, gentlemen, how many of you would invest $400,000 with the expectation that you will break even in seven years? I think if it were an apartment building, I might be inclined since I don't expect the technology of apartment buildings to move too far forward in seven years. But I don't know that any one of us would dare say the same for electronic news gathering.

There's another wry observation I would make: while there was a and film processing, there was none whatsoever for videotape . . . am I to understand that all the TV news directors are going to immediately erase the videotape the morning after they've recorded it? I know I've tried scrounging around Hollywood with Stan Zieve and others to get film short ends or out-takes so I could practice in my cameras. And I was always told that their legal departments would not allow any piece of film which is a valuable archival record to leave their premises. So I guess we're going to change the ground rules as far as electronic news gathering is concerned, otherwise those numbers won't come out.

I also liked the way that newsman came right out of the van, fully loaded down with all of the stuff hanging from him! A film cameraman with a CP-16 one-man-band operation on his shoulder is taking film the minute his foot hits the sidewalk outside the car.

I think that developments and progress will be made in film. Eastman Kodak has never been known to be a shrinking violet, and Cinema Products isn't either. We're going to develop new hardware, we're going to develop new techniques, and we're not going to go "smilingly into the sunset." We're going to *enjoy the competition*. We're going to welcome what's done electronically.

I could frankly make a number of other comments. As I said, I could make invidious comparisons of the advantages of film over tape. But I think that the more important thing to consider is that it is a total system concept. There were some brief mentions of the fact that there are other considerations. I would say that some of the labor and union considerations have not been talked about. And perhaps this is not the proper forum, but let us not forget them. Let's consider the total system in a news gathering operation. Let us consider what the appropriate role of film is and the appropriate role of videotape. **BM/E**

**Vote For The Best Great Idea**
**See Page 50**

# Transmitter Remote Control--A Status Report

By John E. Leonard, Jr.

The basic concepts of remote control and some systems currently available are described here for both managers and engineers. In the accompanying material, how remote control is used at WWL AM-FM-TV, New Orleans, and WFUN, Miami, is covered.

When we talk about remote control in our industry we usually mean the unattended operation of the broadcast transmitter and its associated physical plant—antennas, tower lights, etc. Transmitter remote control was first authorized by the Federal Communications Commission in 1953. At that time, operation was limited to non-directional standard broadcast (AM) stations with power levels through 10kW. More recently, the FCC Rules were altered to allow all television stations to remote control their transmitters. Today any broadcaster whose transmitter is located away from the studio may decide to employ remote control equipment. The intent of this article is to familiarize both managers and engineers with the basic concepts of remote control and some of the systems currently available. No effort will be made to relate these concepts to specific operational or technical requirements. (Editor's note: see separate article on WFUN and WWL-AM-FM-TV.)

In the past 22 years, the technology of transmitter remote control has advanced greatly. In this time, remote control systems have evolved from basic passive-relay-switch systems to computer-aided systems. These changes have resulted in designs that *enable better control and observation of the transmitter than is possible by an operator actually at the transmitter site*. Improvements in technology allow, for example, extremely accurate metering of power and other operating parameters.

Before exploring the hardware aspects of remote control, a review of "what is remote control" seems in order. Information flows in both directions between the studio or remote control point and the transmitter site. These are typically identified as *control* or *commands* and *metering* or *telemetry*. Commands are fed from the remote control point (usually the studio) to the transmitter site. Metering functions are returned from the transmitter to studio. A channel-type approach is used by manual remote control systems. Normally, a channel provides the capability of issuing two command functions and observing one metering function. This configuration is unique to broadcast transmitter needs where, as an example, plate voltage can be increased or decreased while observing the actual plate voltage. The two command functions are referred to as "Raise" and "Lower." Other commonly used terminology for command functions is "On/Off" and "Start/Stop," or the like. Most commercially availabe remote control systems provide dry contact closures as outputs at the transmitter site for universal interface to the transmitter and other equipment. For metering purposes, a low potential DC voltage is developed to represent the actual parameter. This DC voltage, called a "sample," is directly proportional and must track any changes of the desired parameter. Recent practices are toward making both the sampling and control functions floating and isolated from ground and other parameters. Further information is given below on the functions possible with remote control equipment.

**Mr. Leonard, Jr.,** is marketing manager for Moseley Associates, Inc., Goleta, Calif.

### The first decision—telephone or RF interconnect

In considering remote control, normally the first decision is the method or interconnection circuit to be used for relaying information between the studio and the transmitter site. This decision can affect the equipment to be utilized for remote control. Typically, two different modes of interconnect facilities are available—leased telephone circuits or independent (station owned) radio interconnect. Several block diagrams are included to exemplify these different modes. Selection of one interconnect facility over the other is normally based upon the actual operating costs as well as reliability. A number of stations utilize both interconnect circuits in an effort to provide redundancy to obtain a higher reliability factor.

### Many functions can be controlled or monitored

The actual functions to be controlled and monitored have changed drastically since the beginning of remote control. Early systems were typified by performing of only basic functions. Many present-day systems are designed to allow observation of even the most minute transmitter plant and environmental parameters. The actual functions should, of course, be determined by station engineering and operating personnel who are intimately familiar with the plant's operation. The personnel operating the transmitter plant know the absolutely necessary functions, the desirable functions, and those that need not be observed. In selecting the functions, care must be taken to insure compliance with current Rules and Regulations. Fig. 4 shows some of the typical functions.

After establishing functions of interest, selection of remote control equipment selection then becomes somewhat simpler. Functions typically are divided into three basic categories—command, telemetry and status. Command functions are simply those controls which can be accomplished from the studio. Among these would be filament on/off, plate on/off, power raise/lower, etc.

## TRANSMITTER REMOTE CONTROL

Telemetry functions are simply the meter readings to be observed. Included here are not only transmitter parameters such as plate voltage and plate current, but also any other parameter which can be expressed in an analog manner, such as AC line voltage, tower light current, building environment, etc. Status indications typically fall into the category of optional items. These are go/no-go type indications. Among these are illegal entry, transmitter fault lamps, smoke sensors, and the like. In the selection of remote control equipment, the overall capacity should be considered in light of possible future expansion. Likewise, the ease with which functions may be rearranged or modified should be considered if long-range plans are being formulated.

### Types of equipment available

The equipment available for transmitter remote control varies from a simplified analog system to very sophisticated computer-assisted digital systems which could take complete control of a transmitter plant. The earliest analog remote control systems were those utilizing simple DC techniques. With these systems, the DC continuity of the telephone circuit was utilized to convey voltages for directly activating relays for control functions. A second DC circuit was utilized for return of the DC sample voltages. Fig. 5 is a photograph of one of these systems.

In the evolution of remote control, the next step was to a system using a single DC telephone circuit. Both the AC and DC properties were used for these systems. Control was accomplished by audio tones impressed on the telephone line. The DC continuity of the circuit provided for metering. In many parts of the country, telephone circuits having DC continuity have become unavailable. For this reason, analog systems were converted to types utilizing only audio tones for relaying the desired information. A simplified block diagram of a system utilizing audio tones is shown in Fig. 6. This system uses a form of pulse duration modulation for relaying command information. The audio tone that actually appears on the telephone circuit for relaying command information is

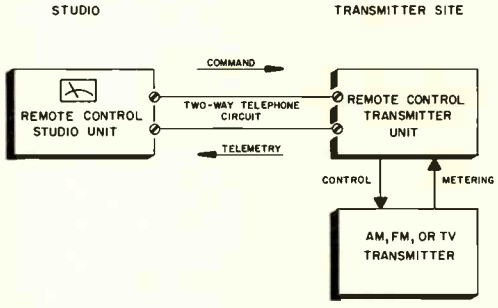



*Fig. 1 Block diagram of telephone line remote control system. Only a single telephone circuit is required between studio and transmitter site.*

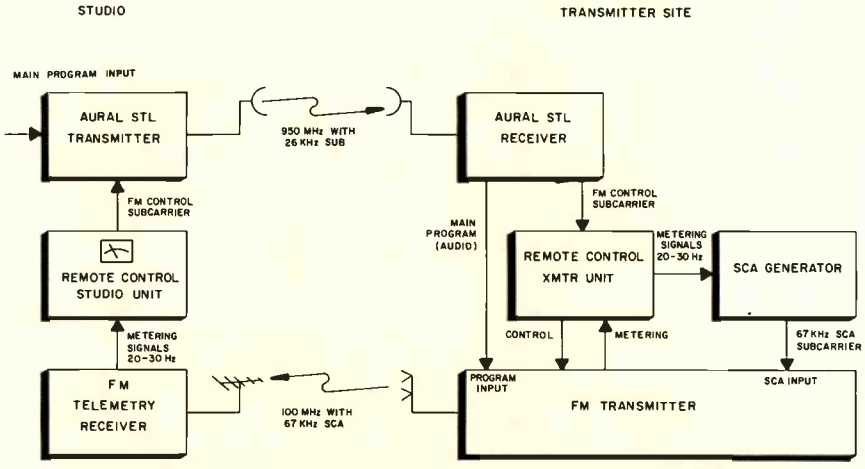



*Fig. 2 Block diagram of typical wireless remote control system for FM transmitter operation. Requiring the use of an aural studio-transmitter link (STL). Command information is relayed to the transmitter site by an FM subcarrier multiplexed on the STL. Currently produced remote control equipment contains provisions for internal subcarrier generator and detector. Metering information is returned via the SCA channel.*

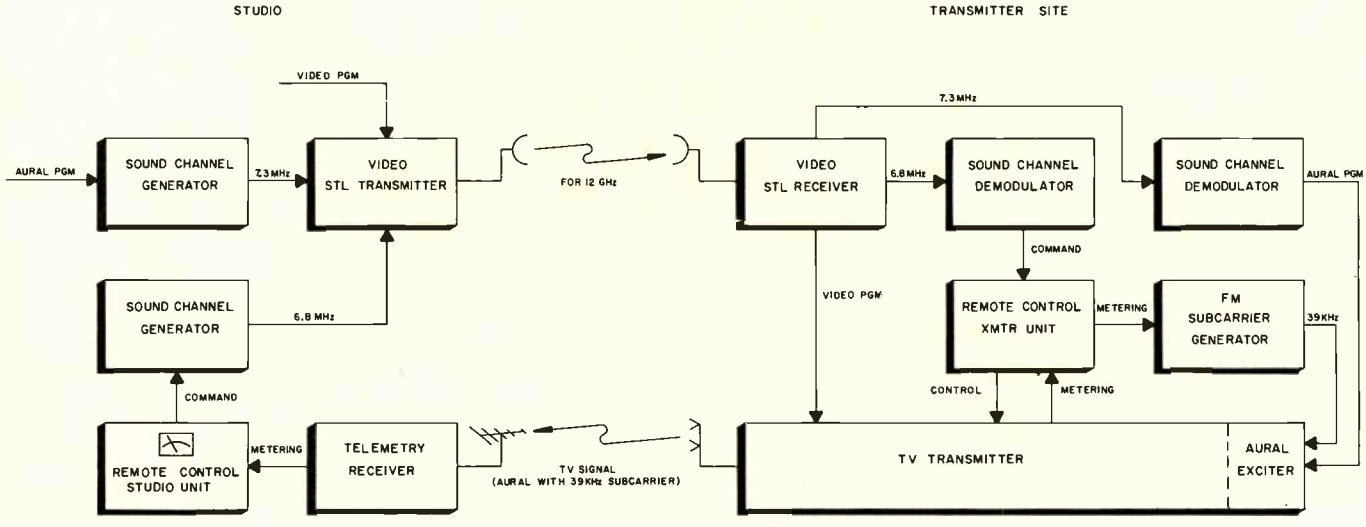



*Fig. 3 Block diagram of typical wireless TV remote control configuration is quite similar to the FM system. A sound channel in the video STL relays command information to the transmitter site. An FM subcarrier is multiplexed on the aural carrier for metering return.*

actually shifted in frequency to transmit the desired information. Telemetry is returned via an FM scheme. In this case, a stable and linear voltage-controlled oscillator in the system has its frequency controlled by the sample voltage. Only a single audio tone appears on the telephone circuit for metering. The frequency of this tone determines the meter deflection at the studio. Careful selection of the audio frequencies for command and metering at the time of system design enable operation over a single telephone line. As an example, the system shown in Fig. 6 uses audio frequencies in the 300 Hz to 400 Hz spectrum for command. Metering occupies the 800 Hz to 1200 Hz spectrum. These tones fall within the normal range of speech and allow for use of inexpensive telephone circuits. Systems of this type have been used successfully over standard dial type circuits covering over 3000 statute miles. Of course, tones of this type are easily relayed by radio circuits.

Digital transmitter remote control systems are available in a number of sizes and configurations. These systems perform basically the same tasks as the analog system just mentioned. However, digital techniques are utilized which result in improved overall reliability. Among the advantages of the digital system is display of actual parameters numerically. This simplifies the recording of parameters by unskilled operators. Likewise, tally-back measures are typically included to verify the accomplishment of command functions. Larger system capacities for command, telemetry and status are extremely easy with a digital system. Expansion after installation is quite simple with several currently available systems. Likewise, the number of transmitter plants controllable with one system is increased with digital systems. The integrity of the information transmitted between the studio and transmitter is also much higher utilizing digital techniques. Parity, framing, and similar coding schemes are used for transmission integrity. This assures activation of the proper command functions without the issuance of false commands or the receipt of false metering parameters. These are but a few of the attributes associated with digital systems.

### Role of the computer

The advent of digital systems brought with it the use of computers. Generally, two types of computer systems exist—the computer-based system and the computer-assisted system. For the braodcasting industry, the computer-assisted approach for transmitter remote control is the most commonly used. Digital systems are currently being employed mainly in television stations. A basic digital remote control system providing command, telemetry and status functions is established. A computer is then utilized to assist overall operation. Visual display of many channels simultaneously with a cathode-ray tube (CRT) display is possible. Likewise, tolerance checking of each parameter against upper and lower limits can easily be accomplished. In some installations, double limits are established to provide early warning of a pending problem. The computer-assisted system also enables various forms of automatic parameter logging. Various printing devices allow recording of only required parameters or, if desired, every parameter appearing on the system. As mentioned previously, with the addition of a computer, totally automated operation is then feasible. Such computer operation has been made economically

## Typical Remote Control, Metering, Control and Status Functions

**Control Functions:**

1. Transmitter Start (Filaments, Blowers and Pumps ON)
2. Transmitter Stop (Filaments, Blowers and Pumps OFF)
3. High Voltage On (TV includes Aural/Visual)
4. High Voltage Off (TV includes Aural/Visual)
5. Power Raise (TV includes Aural/Visual)
6. Power Lower (TV includes Aural/Visual)
7. Normal Power Operation
8. Low Power Operation
9. Driver On (Typically TV only)
10. Driver Off (Typically TV only)
11. STL Changeover to Auxiliary Receiver
12. Transfer Switch Activate (to change to auxiliary antenna or transmitter)
13. Auxiliary Generator Start/Stop
14. Auxiliary Equipment On/Off (Heaters, Air Conditioner or Tower Lights)

**Metering Functions:**

1. Filament Voltage
2. Plate Voltage (TV includes Aural/Visual)
3. Plate Current (TV includes Aural/Visual)
4. Power (TV includes Aural/Visual)
5. Driver Power (Typically TV only Aural/Visual)
6. Phase Angle/Loop Current (AM Directional)
7. Common Point (AM Directional)
8. Tower Lights
9. Line Voltage (Single/Three Phase)
10. Room Temperature
11. Exhaust Air Temperature (From Air Ducts)
12. Reject Load (TV only)

**Status Functions:**

1. Building Security
2. Fire Alarm
3. Smoke Alarm
4. Telemetry Fail-Safe (TV only)
5. Auto Restart Override
6. S.W.R. (AM/FM/TV)
7. Driver Overload (For TV Visual/Aural)
8. Amplifier Overload (For TV Visual/Aural)
9. Air Flow (For TV Visual/Aural)
10. Water Flow (where applicable)
11. Aux Generator On/Off
12. Water Emerson Heaters (where applicable)
13. Dummy Load Water On/Off

*Fig. 4 List of remote control, metering and status functions.*

*Fig. 5 Typical dc telephone line system studio unit. Unit shown is Gates RDC-10AC.*

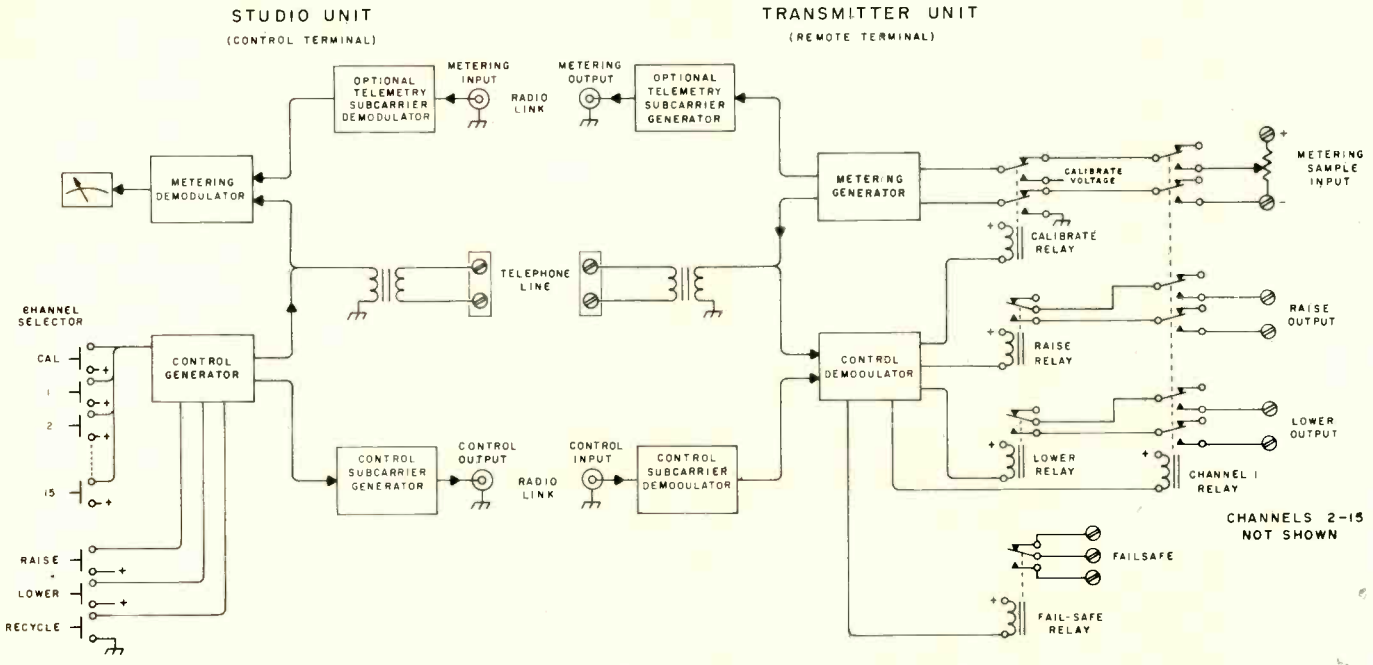



*Fig. 6 Block diagram of a remote control system using only audio tones. Such a system can be used with either telephone line or wireless interconnection facilities.*

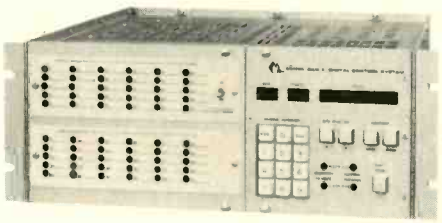


*Fig. 7 Digital remote control system studio unit. Unit shown is Moseley Model DCS-2 Control Terminal.*

*Fig. 8 CRT display used with computer-assisted remote control system enables the simultaneous presentation of 30 metering or status functions. All command functions are entered through keyboard.*

feasible with the advent of the minicomputer. Changes in software can then enable the control hardware to be reprogrammed to comply with the changes in operation of the station.

Outside the United States, digital transmitter remote control systems enable extremely efficient operation. Requirements by licensing agents allow stations more freedom in their approach to remote control. As an example, Hong Kong Television Broadcasts Limited (HK-TVB) in Hong Kong utilizes a series of translators for full coverage. A multi-site digital remote control system is used to control all sites. This particular system can accommodate up to 16 different transmitter sites. Using a minicomputer, this system enables observation of all sites, total logging of all parameters, and absolute control of the entire RF broadcast system. As a side note, the system uses 450 MHz RF links for interconnection to all transmitter sites.

### Automatic logging can be integral part

Automatic logging is also typically considered part of the remote control equipment. With the relaxed transmitter logging requirements, many stations are re-evaluating the use of this equipment. The outstanding point to consider is that, even with relaxed requirements, a burden of proof still remains with the licensee to prove that the transmitter was operated within the specified limits. Mechanized logging equipment, of course, provides a permanent record free of operator error. It is for this reason that many stations do install automatic logging equipment. Originally, hardware of this type consisted of a chart recording device. Early tests were conducted using both strip chart and circular chart approaches. Current equipment utilizes printing devices such as teleprinters. These record parameters directly as a typewritten number.

### Monitoring tomorrows automatic transmitter

On the horizon for remote control of broadcast transmitters is the automated transmitter. With the anticipated advent of automated transmitters, which are not approved at this writing, one of the most often asked questions is what will be the role of remote control equipment. Because of large capital investments in a remote transmitter site, most stations concur that, even with an automated transmitter, it will be extremely desirable to maintain a means of monitoring the transmitter as well as seizing manual control. It is anticipated that remote control systems currently in existence would provide such capability. Until rules are developed for automated transmitters, this point must remain speculative. **BM/E**

# Remote Control of Radio Station WFUN*

By V.C. Roberts, Chief Engineer

Rounsaville Radio Station WFUN, South Miami, Florida, achieved remote operation on 26 June 1974. While planning for remote operation had begun some two years previously and certain equipment such as an STL with subcarrier possibility and a new remoteable antenna monitor were installed during this time, purchasing of major equipment was delayed pending final FCC approval of license for remote operation. Approval was received 1 November 1973, at which time orders were immediately placed for the remainder of the necessary equipment.

Studio and transmitter sites at WFUN are separated by seven miles, most of which is heavily trafficked city streets. At the transmitter site there are two transmitters, main and alternate main, operating at 5 kW on 790 kHz into a six tower array spread over 47 acres of Everglades fringe. All six towers are used in Day Array while only four are in use during Night Array. Power is constant in both modes. In remote operation we are, therefore, presented with the necessity of reading six loop currents and five phases on day pattern and four loop currents with three phases on night pattern together with other FCC readings normally required.

In addition to an occasional hurricane, South Florida normally has some 80 odd inches of rainfall per year. Statistically it is more susceptable to lightning storms than any other area on earth. Because of these conditions, interruptions to both telephone and commercial primary power service frequently occur. Substitutes for failed facilities are necessary. Much of such equipment had already been automated over the past 15 years to accomodate fast recovery from casualty (and to allow dependable station operation with a single operator on duty at the transmitter.) WFUN operates 24 hours, seven days a week. Motor-generator sets had been installed at both studio and transmitter locations, which activate on failure of commercial power. Pattern change from one condition of antenna array to the other was a single pushbutton operation. Switching between the two transmitters occurred automatically when the one on the air failed for any reason. A stand-by program tape, activated when no program was received at the transmitter from the studio for a thirty second period, was automatically fed into the transmitter at that location. A complete test of the EBS (including transmitter of-ons, tone, and voice announcements) was initiated by a single pushbutton at the transmitter site.

Most of the foregoing was readily adaptable for interface with remote control equipment by using such standard items as Moseley's Sampling and Reversible Motor Kits PVK-1, MBB-1, TSK-3, RFK-1, and RMK-1. A number of special devices had to be fabricated on the spot to accomodate certain metering and control necessities peculiar to WFUN's requirements.

We felt that extensive metering and control of both manual and automated operations, occurring in an unmanned building seven miles away, was essential to dependable station operation. Automated facilities sometimes require human help, in the form of judgement, as to manual start-up, abort after auto-start, etc. When static crashes are evident in the air monitor, when black squall lines are visible and moving in toward the transmitter site area, when the low sky is laced with lightning, then human judgement dictates manual start-up and transfer of power source from commercial to auxillary motor-generator supplies. Such action anticipates transients on commercial power lines and the sudden demise of transistors. At such times it is advisable to monitor the status of voltage, oil pressure, water and oil temperature of the motor-generator as well as fluctuations of the commercial power source. We can head off catastrophes.

Accordingly, WFUN installed two each Moseley TRC-15A units with 26kHz and 67kHz subcarrier generators which operate through the previously installed Moseley PCL 404 STL System. This system carries our main program and control signals from both TRC-15A Units from studio to transmitter. While Moseley equipment has the capability for metering using sub-audible tones returned to the studio via WFUN's carrier, we opted to use RT telephone circuits for the metering return path. The reasons for this decision were, *1* we would not loose our metering path simply because of a failure which caused neither transmitter to come up on line, *2* we can by-pass the subcarrier generators in the TRC-15A Units (demodulators at transmitter end) and send control function pulses to the transmitter via the RT circuit while simultaneously receiving metering at the studio on the same circuit. Program at such time can be sent to the transmitter via 15Hz equalized telephone loop which is maintained as back-up for the STL. This allows operation if the PCL 404 System is down for any reason. Furthermore, metering can be done with telephone lines having low frequency response and/or high noise content—and even with one side of the line at dead ground. Another factor, was the Program Department's absolute distaste for any reduction in carrier modulation to accomodate subaudible tones on the carrier. While we may in the future install the subaudible equipment for purpose of redundancy, operational experience to date has not justified that action.

WFUN's Studio TRC-15A unit with 26kHz subcarrier was factory modified during construction to add one set of dry contacts each to the "Raise" and "Lower" function controls. The purpose of this modification was to allow operation of the relay on a Potomac Instrument RMP-19 Remote Loop and Phase Meter Panel installed at the studio control point. The RMP-19 Panel duplicates, exactly, the metering in the Potomac Instrument AM-19 Antenna Monitor, earlier installed at the transmitter. While making measurement of Loop Current and Phase, the meter of the TRC-15A is disconnected with the output of the meter demodulator being channeled to the RMP-19 for readout on the appropriate instrument face. This action was greatly simplified for the operator by the minor modification to the 26kHz TRC-15A. At the time WFUN was installing remote equipment,

*Any account of this project would be grossly incomplete without the mention of those who are indeed as much a part of the accomplished project as is the writer. The wisdom and guidance of Paul B. Cram, Technical Director Emeritus of Rounsaville Radio and the ability and hard work of Michael D. Lee, who has since become the Chief Engineer of Rounsaville Radio WMBR, Jacksonville, Florida, went into the project in generous portions from conception to completion.

## TRANSMITTER REMOTE CONTROL

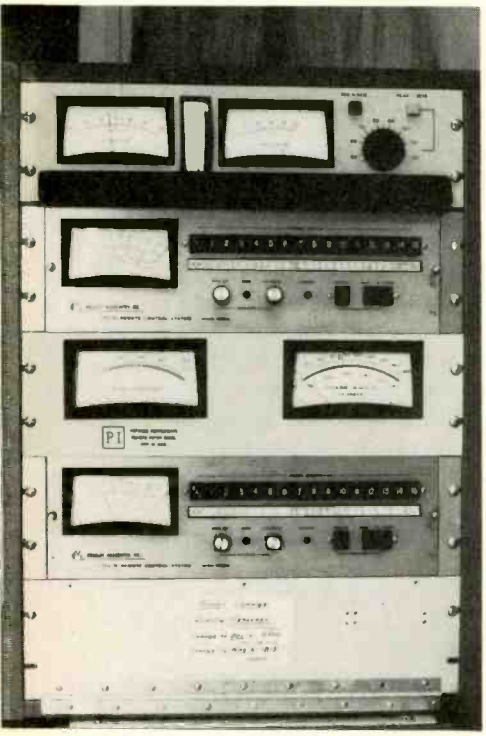
Potomac Instruments did not have their RSA-19 Switching Adapter in production. This device forms the interface between the AM-19 Antenna Monitor and the remote control equipment. Therefore it became necessary for us to construct a 12 relay switching device, essentially equivalent to the RSA-19.

The switcher was fabricated on a standard 19″ rack panel 10″ wide using Potter-Brumfield plug-in relays and installed at the transmitter close to the AM-19 Monitor. One pair of relays is associated with each channel, 8 through 13 of the TRC15A 26kHz Unit, with each of these channels representing one of our six towers; i.e., Channel 8 reads Tower No. 1, Channel 9 reads Tower No. 2, etc. One coil of each pair of relays is actuated by the "Raise" function of the TRC-15A and the other coil of the pair by the "Lower" function of the respective channel. The total result is that at the studio we may select Channel 8 (Tower No. 1), whereon Loop Current may be read by depressing the "Raise" function and Phase may be read by depressing the "Lower" function. Channel 9 selects Tower No. 2 with the same operation being repeated in order until all 12 operating parameters for the six towers have been read.

All FCC required readings and control functions for the two transmitters as well as the six towers, are operable using only the 26kHz TRC-15A. In addition to metering the Common Point Current, Plate Voltage, Plate Current, Loop Ratios, and Phase, we can start and/or stop both transmitters, adjust plate voltage (adjusts power into the common point), change antenna feed from one transmitter to the other, change to either day or night array, activate the automated EBS device and/or automated program tape (previously described) and abort these two devices at any point in their cycle. Almost as a bonus we may also measure air temperature in the final stage compartments and that in the exhaust duct above each of the transmitters.

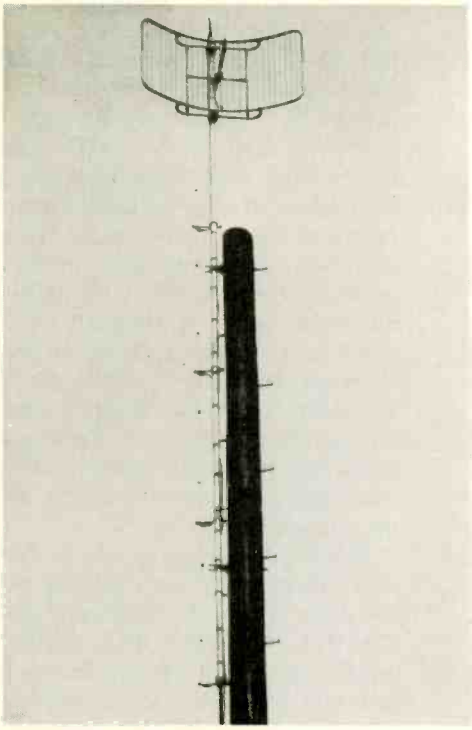
It may be of interest that some of our metering is in the nature of multi-step logic. One instance is associated with antenna pattern change. A single channel of the 26kHz TRC-15A with its "Raise" and "Lower" functions perform all of the following:

- The Antenna system aligns itself for Day Array when the Raise key is pressed. Then when all relays and contactors in Phasor and six Tower Houses have assumed correct position, the TRC-15A meter indicates ⅔ full scale showing that the command has been properly executed. This allows the transmitter to automatically come up to feed the antenna approximately one second later. (At this point a meter reading above the high end of the scale (10 plus) indicates that one or more of the relays or contactors did not align in Day Array position—which would, of course, prevent the transmitter from coming back on line.) Conversely, a reading of Zero on the meter indicates failure of only the metering power supply—which does not inhibit return of the transmitter provided that all relays and contactors have assumed correct position.)
- When the same channel is locked in for change to Night Array, the "Lower" key is depressed to effect the change. Normal change to night pattern is indicated by a



*WFUN Remote Control Panel at studio. From top down, Belar AMM-1 Monitor, Moseley 26 kHz TRC-15A Remote Control upon which all required readings are taken, Potomac Instrument RMP-19 Loop Current and Phase Meters, 67 kHz TRC-15A unit for control and metering of auxillary transmitting equipment. On backside of the hinged panel at bottom of rack are terminal blocks for entire unit.*

*Here disc jockey Bradford Baad operates Remote Control Panel. The equipment sets atop a very sturdy metal typing stand. Casters on stand allow the equipment to be easily moved. All lines to and from the control panel are formed into a long umbilical cord which permits moving from studio to studio.*



*STL Antenna at studio atop a 70-foot telephone pole is fed from the multiplexed Moseley PCL-404 Transmitter (mounted in the Master Control Racks). The receiving antenna is mounted at the 200 foot level on one of the six towers at the transmitter site and feeds through an Isocoupler at the tower base into the Aural STL Receiver. Colinear array, on pole, is two-way mobile.*

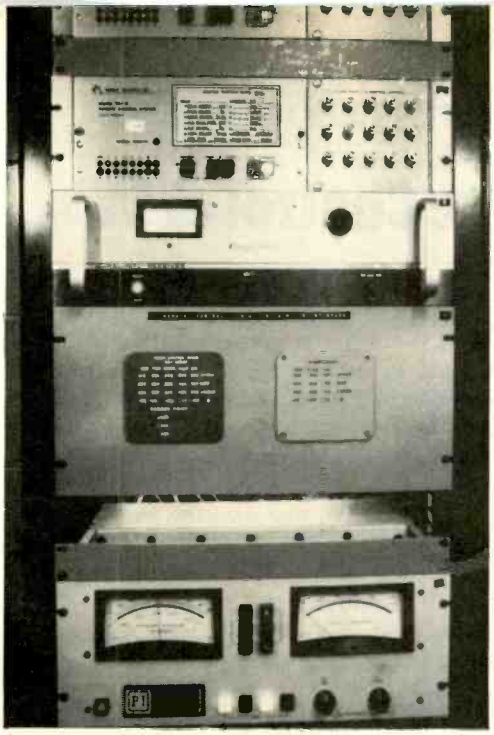
meter reading of ⅓ scale or 3. In this instance a reading of 6 indicates the array has remained in the day condition (no change occurred), Zero indicates failure of the metering system, and 10 plus indicates one or more relays or contactors is improperly aligned (split pattern). There are 16 Johnson R.F. Contactors and 31 pilot, metering, and AC power relays in the WFUN phasor, power divide, distribution, and antenna tuning system all of which must be properly aligned for pattern change to be completed and the transmitter to be brought up on line.

During integration of this large system with interface for remote control, judicious application of a number of Zener Diodes and similar small solid state components produced the multi-step logic states as described above. Similar circuitry has been used as refinement dictated throughout the WFUN installation.

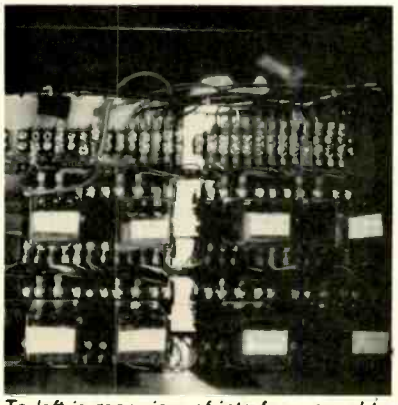
The second TRC-15A Remote Unit (67kHz) is used to monitor and control functions at the transmitter which although not required per se by the FCC are none the less essential to rapid location of trouble, either impending or after the fact, smooth station operation, and generally *just staying on the air* which is undoubtedly the name of the game.

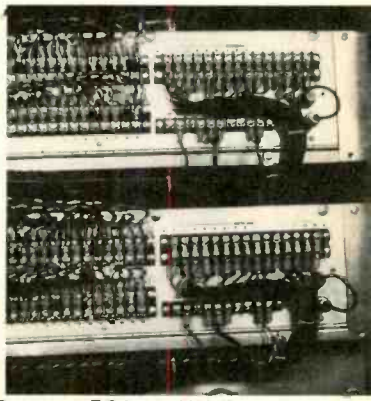
The following functions are controlled and/or metered by the 67kHz TRC-15A:

1. Analog indication of audio input at transmitter feed;
2. control of transmitter power output allowing observation of applicable metering at any channel of the 26kHz Unit simultaneously;
3. switch transmitter input to output of either the STL or the Equalized Telco Loop and indicate which is feeding the transmitter;
4. change antenna feed to and energize either transmitter which was not on line at the time and indicate which transmitter is feeding the antenna (multi-state logic);
5. analog indication of DC current being drawn from power supply by metering relays;
6. command a 180° phase shift of the antenna monitor and indicate each tower in succession to allow channel gain check and/or adjustment of Antenna Monitor;
7. analog indication of STL microwave signal strength at transmitter site;
8. indication, in groups of three towers, the status of lighting including whether top beacons are flashing;
9. indication whether transmitter building is drawing power from commercial source or from auxillary motor-generator;
10. command transmitter building to lock onto commercial primary power or to resume normal automated operation and indicated acknowledgement of either command;
11. command transmitter building to lock onto auxillary motor-generator supply or to resume normal automated operation and indicate acknowledgement of either command;
12. multi-step logic indication of status of commercial primary power, i.e., not available, available but unreliable during past thirty minutes, both available and reliable;
13. analog indication of output voltage of motor-generator;
14. indication if any flag is up on annunciator of auxiliary motor-generator system (failure of oiling, cooling, etc. indicated);
15. floodlight control for security perimeter of transmitter building with indication as to status on or off.



*A portion of rack equipment at transmitter site. From top to bottom, lower edge of the 67 kHz TRC-15A Transmitter Remote Terminal, the 26 kHz TRC-15A Remote Terminal, the Aural STL Receiver, Antenna Monitor Interface Panel, Potomac AM-19 six-tower Monitor. Open space above the antenna monitor will house interface for remote log printout.*





*To left is rear view of interface panel to Potomac RSA-19. Unit "pushes buttons." Two relays are necessary for each tower. To right is rear view of TRC-15A transmitter remote panel. Wiring harness permits terminal panels to hand downward.*

Several channels are not presently in use but are scheduled for use with equipment which has not as yet been installed.

A Belar Model RFA-2AM RF Amplifier was installed at the studio which directly feeds a Belar Model AMM-1 Frequency and Modulation Monitor moved in from the transmitter building to the studio control point.

WFUN is scheduled to add automatic Operation Log print out with tolerance alarm and including print out of selected auxiliary metering (eleven items) in addition to all readings required by the FCC. This phase of the project is believed to be approximately 75% complete with some of the equipment presently installed and in the test stage. Continuing effort to explore, implement, and improve the myriad possibilities of remote control and automation is being made.

After round-the-clock operation seven days a week for the past eight months, a conservative evaulation of the WFUN Remote Control System could be no less than VERY SATISFACTORY IN ALL RESPECTS.

# Remote Control of WWL-AM-FM-TV Transmitters*

The studios and offices of WWL-AM-FM-TV are located in the French Quarter of New Orleans. Two TV transmitters (25 kW main and alternate), the FM transmitter (20 kW) and an auxiliary AM transmitter (1 kW) are on one site about 4.2 miles from the studio. The 50 kW main clear-channel AM transmitter and a 10 kW alternate are at a second site. A move is currently underway to relocate the second site to Marreno, about 8 miles southwest of the studios. At that time the alternate AM will also be increased to 50 kW and the 10 kW unit will become the auxiliary at site one. WWL has operated the main AM transmitter remotely via land lines from the FM/TV site since 1965. A staff of six were responsible for operating and maintaining all transmitters.

In 1973, WWL decided to remote control all transmitters from the studio in accordance with new FDC rules. It has been fully operational since July 1974. The objective was a system that would minimize on-site operational control and monitoring while maximizing reliability and performance. Now a staff of three do on-site work including preventative maintenance and repair. The remaining three of the original crew have been transferred to the studio.

WWL prizes reliability both from a professional and profit point of view. In talking to chief engineer Hugh Burney, you get a strong impression that down time is the worst thing that could befall him. The AM and FM operate 24 hours a day. TV has a 20 hour day schedule; it hopes to go 24 hours. Because of the insistence on reliability, microwave links are used instead of land lines and there is complete redundancy in the remote control system.

If using interconnecting microwave links, as WWL chose to do, control information requires a unidirectional transmitter/receiver path and a separate unidirectional transmitter/receiver path operating in the reverse direction for monitoring information. Modeley Associates STL (Studio/Transmitter Link) microwave circuits are used. The regular system is the Moseley DCS-2, in a two-transmitter site configuration, and the emergency backups are Moseley TRC-15 ARS for the AM transmitters and Moseley PBR-20 for TV/FM control. A 951.5 mHz STL controlling the FM/TV site transmits three signals: the composite stereo FM program on its FM carrier; regular control on one FM subcarrier and emergency control on a second FM subcarrier. The control information controls the TV main and alternate transmitters, the FM transmitter, and auxiliary AM transmitter. A double hop 949 mHz and 947 mHz STL to the AM site (routed via the TV/FM site) will transmit AM program audio on an FM carrier, as well as regular control on one FM subcarrier and emergency control on a second FM subcarrier.

The off-air television, FM and auxiliary AM radiated signals provide the return transmission path to the studio for all telemetry and test signals required of these transmitters. Until the new AM site is completed, AM transmitter telemetry to the studio is returned via land lines. After the move, return will be via a double hop radio link in the 960 mHz band. Since this band is reserved for business use it requires FCC waiver to permit operation in this manner. In this situation, the broad bandwidth requirement of the DCS-2 telemetry return does not permit the use of an AM subcarrier for that purpose and an alternate frequency allocation had to be utilized. In the emergency mode of remote control, return telemetry of all three AM transmitters is by means of sub-audible tones in the 20-30 Hz range of the off-air AM radiated signal.

System functions are classified as either control or monitoring. Control is by binary commands, either "on/off" or "raise/lower," The Moseley DCS-2 equipment utilizes frequency shift keying (FSK). The Moseley TRC-15 equipment uses pulse duration, and the PBR-30, discrete audio tones.

In WWL's system, an override exists at the transmitter site so that the operator can take over. (An alarm located at the transmitter building exit warns the engineer that whenever the transmitter site is being vacated and locked, remote control must be reassigned to the studio before the alarm can be shut off.)

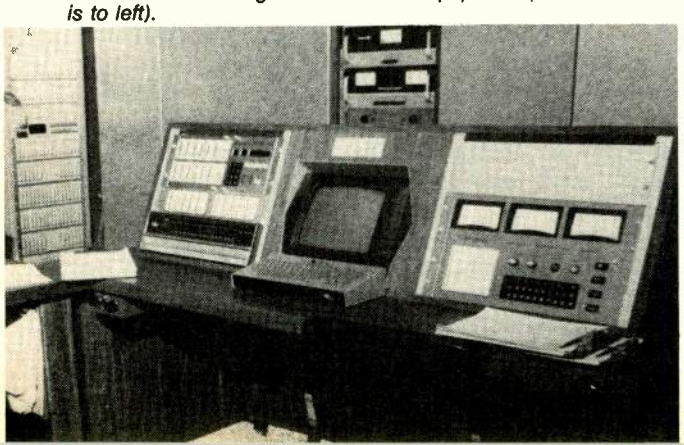
Monitoring functions are based on telemetry information of analog and binary parameters of the transmitter. The analog parameters such as plate current and plate voltage are converted to digital coding for FSK transmission in the Moseley DCS-2 system. The binary parameters, or status indicators, such as tower lights on/off, transmitter site intrusion alarm, emergency generator on/off indication, are also transmitted back by means of FSK telemetry in the DCS-2 equipment.

WWL decided to go beyond FCC Part 73 minimums. To gather as much information as possible to assure reliability, the station wanted out-of-tolerance information on subsystems, and status information on all pieces of equipment in the system. This called for a minicomputer. The studio has cathode ray tube (CRT) display for control system monitoring with a keyboard for addressing the system. The CRT display has a Master Page display, which presents the minimal FCC required on-air parameters. These parameters are presented as part of 15 telemetry measurements and 15 status readings (five telemetry and five status for each of the three on-air

continued on page 44

*Technical details for this section were first described in a paper delivered to the IEEE Broadcasting Symposium, October 1974. Authors were Francis Jacob, Jr, retired chief engineer of the station, I.S. Rosner of Rosner Television Systems, Inc., and John Leonard of Moseley Associates. RTSI and Moseley were consultants to WWL. Current information and photos were supplied by Hugh Burney, current chief engineer of the station.

*WWL studio showing remote control equipment (master control is to left).*



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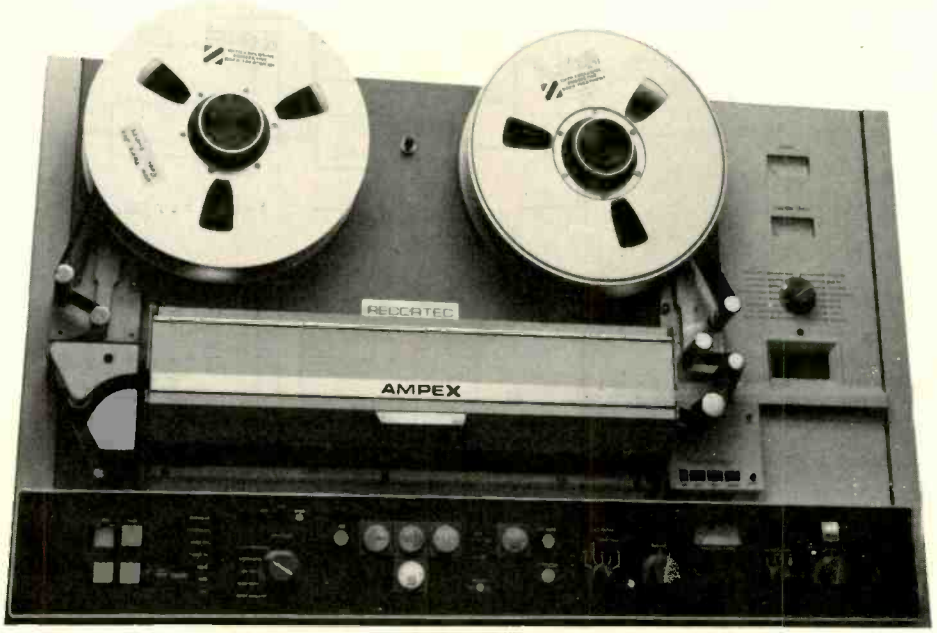


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- **CONSISTENT LOCK-UP TIME**

R-MOD is a modification package which can be easily installed in the field to provide constant tension for your quadruplex VTR.

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

VIDEO TAPE CONDITIONER
VIDEO TAPE EVALUATOR
VIDEO TAPE TIMER

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

**See us at**

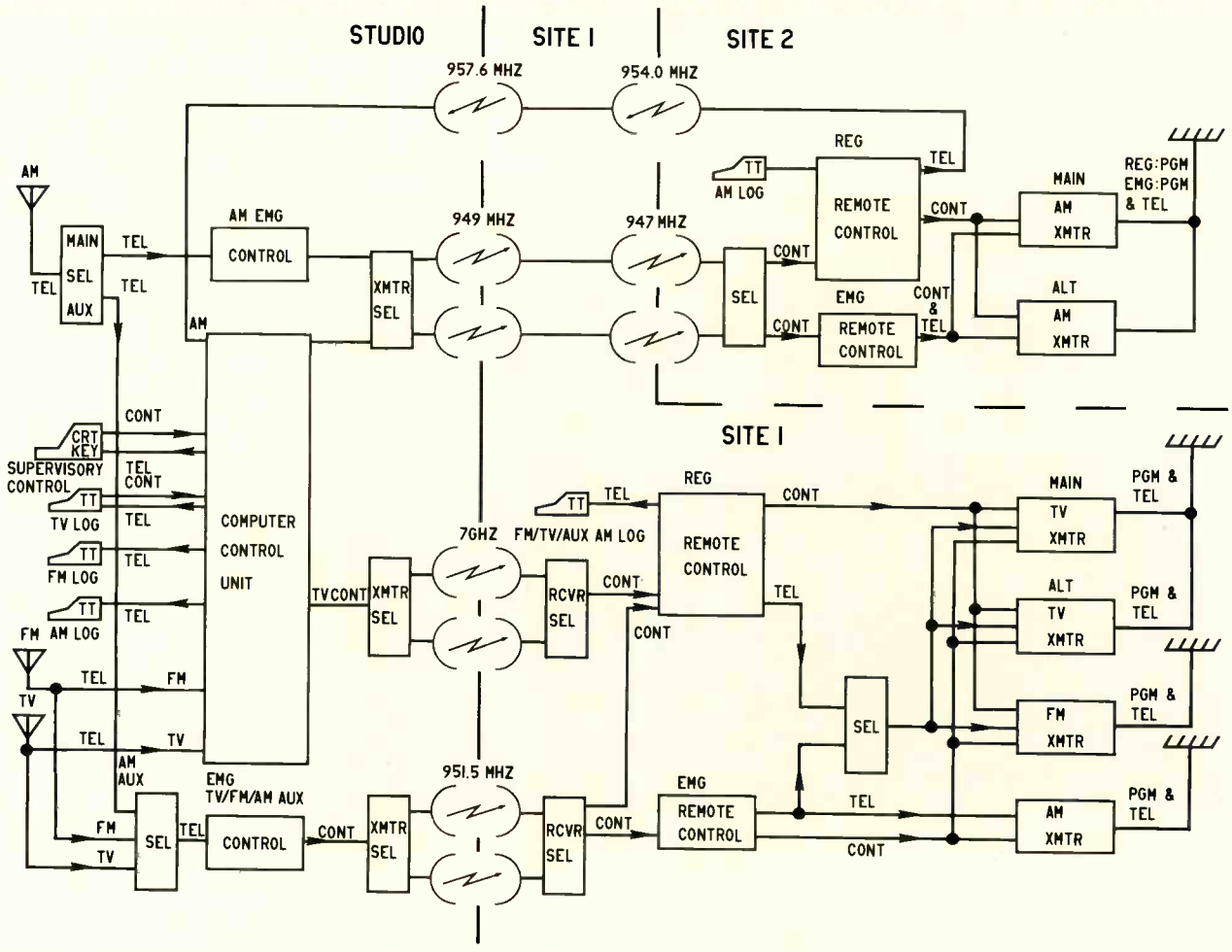
**NAB in March**

**International TV Symposium at Montreux in May.**

## RECORTEC, INC.

777 PALOMAR AVENUE • SUNNYVALE, CALIF. 94086 • PHONE (408) 735-8821

**Circle 126 on Reader Service Card**




*Overall simplified diagram of WWL-AM-FM-TV remote control system.*

transmitters). In addition to the Master Page, there are five more pages of display from the FM/TV site and four pages from the AM site. Each of the first three pages from the FM/TV site displays thirty telemetry measurements for a total of ninety. Each of the first two pages from the AM site displays thirty telemetry measurements for a total of sixty. The remaining two pages from each site are used for status display—thirty status readouts per page for a total of sixty.**

The capacity of the studio CRT and keyboard is 150 control commands to the remote sites, 150 telemetry measurements from the sites and 120 status readouts from the sites. The CRT display and keyboard are the minicomputer's input and output. The computer processor is interconnected to three Teletype printers, each capable of twenty columns for log printing. All three machines are Teletype Model 38 ASR, used for AM and FM & TV logging. The machines used for TV logging is wired to input the minicomputer directly, when required.

The data rate for the regular WWL system is 300 baud for control information and 1200 baud for telemetry. This relatively high speed telemetry return rate is possible because of wider bandwidth the radio links chosen. This rate permits the speed for updating telemetry in response to a control command to be 200 milli-seconds. Rapid telemetry response is desirable so that the remote control operator can get an instantaneous response to control actuation. A standard full page scan takes 1.5 seconds to complete. Of course, a longer interval is required before these parameters can again be updated because three pages are utilized for the FM/TV site and two for the AM site.

The speed and capacity of the backup system is less than that described for the regular system. The backup system is conventional telemetry utilizing relatively slow speeds of transmission. The CRT pages and the studio teletypes are not driven from the backup system.

WWL has added several ancillary features to its remote control system. Vertical interval test signals from the TV transmitter are monitored. Fail safe units have been added to the TV transmitter (not shown on the diagram.) Any failure in the telemetry function to provide information necessary to comply with FCC logging requirement shuts the transmitter down in 20 seconds.

WWL allowed six weeks for a trial and shakedown period. Once all bugs were worked out, the system has functioned perfectly since. The back-up system has never had to be used and chief engineer Burney is sleeping well. Not a second of air time has been lost with the new system.

**Status displays include such things as unauthorized intrusions, fire alarms, AC power line measurements, STL modes.

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

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

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

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

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

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

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

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

Kodak

Circle 127 on Reader Service Card


## Introducing MINIMAG II, a SMPTE CODE* Synchronizer. (at a price of $4950 we don't have to shout.)

Automated's MINIMAG II Synchronizer employs the SMPTE Standard Time and Control Code* to automatically synchronize and interlock any two multi-track tape machines... video or audio, sprocketed or unsprocketed. At a price of only $4950 it provides every essential function. Use it for maintaining perfect sync... for audio "sweetening", including offsets... for simulcasting TV and stereo FM... remote overdub recording... for combining an audio mix with a visual medium. **Comparable SMPTE Standard Time and Control Code* Synchronizers cost over $10,000!**

The SMPTE Standard Time and Control Code* generated by MINIMAG II is recorded on both the "master" and the "slave" units. This can be accomplished before, or simultaneously with, the recording of program material. The synchronizer will automatically compare the code played back from the slave tape with the code on the master tape, generating a capstan control signal to lock the two tapes in perfect sync. Tapes need not be in alignment before starting because MINIMAG II has a 24-hour capture range. A thumbwheel switchbank conveniently located on the front panel permits offsetting or shifting between tapes to achieve lip sync or delay effects. This offset can be as much as ±49.9 seconds in .1 frame increments.

All functions... fast forward, rewind, stop, and play... are slaved, causing the slave machine to move precisely as commanded by the master tape. Switches provide for 30, 29.97 or 25 frame rates, either 115V or 230V operation, at 50 Hz or 60 Hz at the user's option. Connection is readily accomplished by rear panel connectors and screw terminal binding posts. Tape machines designed for DC servo operation are controlled directly; synchronous motor machines are controlled through a capstan drive amplifier.

MINIMAG II is compact... 3½" high, 19" wide and 15" deep, for standard RETMA rack mounting.

MINIMAG II is a "second generation" SMPTE Standard Time and Control Code* synchronizer from Automated Processes (the original MINIMAG is still the lowest-priced... under $2000... professional quality synchronizer on the market and utilizes the MAGLINK sine wave time code). Our consoles and audio components have long been recognized for their quality and performance, reflecting our reputation for excellence based upon dedication to the development of superior technology.

*American National Standard Time and Control Code, C 98.12-1975.

**AUTOMATED PROCESSES, INC.**
**80 MARCUS DRIVE, MELVILLE, NEW YORK 11746 · 516-694-9212**

Circle 129 on Reader Service Card

# GREAT IDEA CONTEST

## Starting Now—The Second Great Idea Contest

*The rules are slightly changed and the prizes are different — read about it on the adjoining page. And don't forget to vote on the Reader Service Card.*

## 1. Logging the New EBS Weather Warnings.

*James P. Howley, WFMJ, Youngstown, Ohio.*

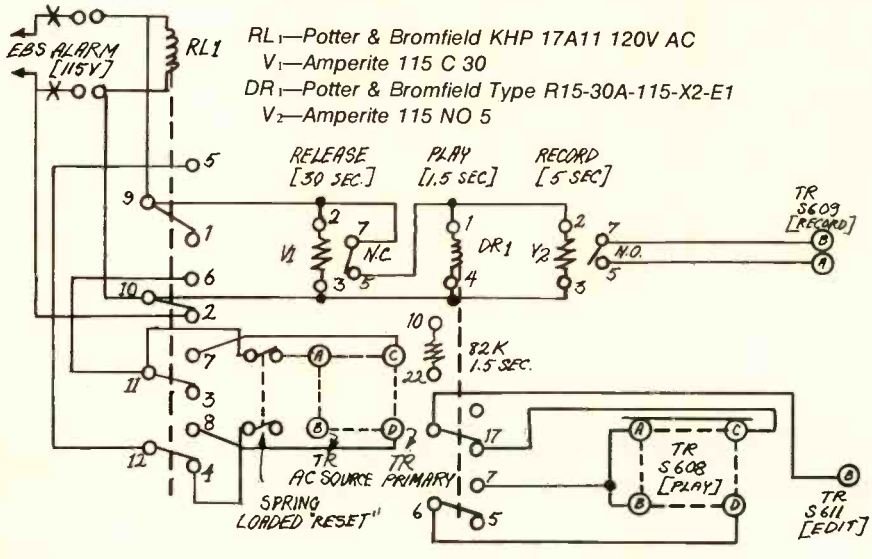
**Problem:** To log severe weather warnings from the National Weather Service transmitted via EBS. In July 1974, the broadcasting stations in a five-county area of Ohio and Pennsylvania were notified by the National Weather Service that all Severe Weather Warnings will be disseminated via EBS. Only two stations in the area are now notified by telephone; the others obtaining weather warnings from either of these stations and then rebroadcast them.

With only 15 seconds notice available via EBS, it is impossible to be prepared to record such messages on a 24 hour basis, day in and day out. Yet, it is necessary to devise some method to record these warnings automatically.

**Solution:** We designed an automatic starter for an Ampex AG-440, to be activated by the EBS alarm. The alarm was modified slightly by replacing the alarm relay, with one having more contacts, so that in addition to switching the alarm buzzer, it also switches a 117 VAC source to activate the starter. This 117 VAC source latches relay RL1's coil across the AC source of the recorder. Another set of contacts on RL1 simultaneously turns on the AG-440. The starter is now independent of the EBS alarm, which may be turned off. Delay relay DR1, after a 1.5 second delay, activates the Play switch and relay and V2, after a three-to-five second delay, activates the record switch and relay. At this point the tape recorder is under the control of the starter and cannot be stopped or turned off.

After 30 seconds from starter activation, V1 releases the play and record switches, but not their respective relays. The TR will continue to record until stopped, or can now be operated as desired. Power remains applied to the TR primary until the spring-loaded Reset switch is operated, opening that circuit.

A Disable switch can be added at X, for use when the monitored station is off the air. As can be seen, the TR is recording within five seconds of the first carrier interruption. The weekly EBS tests are good trials for the system.




*Howley's relay system automatically turns on the AG-440 tape recorder when an EBS signal is received.*

## 2. Flexible AM/FM Stereo Changeover Chooses the Studio.

*Bill Taylor, Chief Engineer, WNHV AM/FM, White River Junction, Vermont.*

**Problem:** To provide changeover operation at an AM-FM stereo station from either of two studios.

**Solution:** At WNHV, the changeover system used to consist of two 12-pole switches and two patch cords in a patch panel. After rebuilding, the entire unit was housed in a 13 × 5 × 3-in. aluminum box and

continued on page 50

# HIGH FIDELITY IN SUPER-8 THE BEAULIEU "5008S"

Sound. The newest dimension in Super-8 movie making. With Kodak's new sound movie cartridges, you are now able to film perfect lip synchronized sound movies using only a sound-on-film Super-8 camera and a microphone.

Beaulieu was first to take this concept of sound-on-film Super-8 and give it a professional touch with the introduction of the "5008S".

## Professional "High Fidelity" Sound

Insert a new Super-8 sound-on-film cartridge. Plug in the mike. Then, focus. That's all the preparation you need. With the Beaulieu "5008S", you're now ready to start filming professional quality, high fidelity sound Super-8 movies.

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

The "5008S" modulates the single system sound recording automatically. Or, you can modulate the sound "manually" as you are filming (by using the VU meter).

## From the "Widest" Wide Angle . . . To An Extremely Long Telephoto

Imagine what you could do in 35mm still photography with a 35-400mm zoom lens!

You can achieve this comparable effect with the Beaulieu-Optivaron 6-66mm (11 to 1 zoom ratio) lens on your "5008S".

## Continuously Variable Power Zoom

The power zoom of the Beaulieu "5008S" is continuously variable. You can travel the full focal length range in 2 seconds, or 12 seconds *(or any speed in between).*

## Macrocinematography (Special Effects)

Film macrocinematography (insects, coins, stamps, and other small objects) *—without the use of attachments or additional accessories—*at any distance ranging from the front lens element to five feet.

A unique, additional feature of the Beaulieu macro system is the ability to create special effects such as soft-focus fade-ins and fade-outs.

## Fully Automatic Exposure Control

The diaphragm of the "5008S" operates automatically and *stops instantly* at the right aperture. Exposure accuracy is governed by a new Reflex-matic Motor (Beaulieu-patented). (This feature has "Manual Override".)

## Lens Interchangeability

Although the "5008S" comes equipped with a 6-66mm zoom lens . . . you can interchange an unlimited number of other lenses in order to create a certain feeling or effect in your films. The camera accepts all "C" mount lenses, as well as 35mm still camera lenses (when using the proper adapter).

For full information on the new Beaulieu "5008S" HIGH FIDELITY SOUND Super-8 Camera, please write to:

**HERVIC CORPORATION**
14225 Ventura Boulevard
Sherman Oaks, California 91423


**The Beaulieu "5008S" Sound Movie Camera**
**(equipped with a Beaulieu-Optivaron 6-66mm zoom lens)**

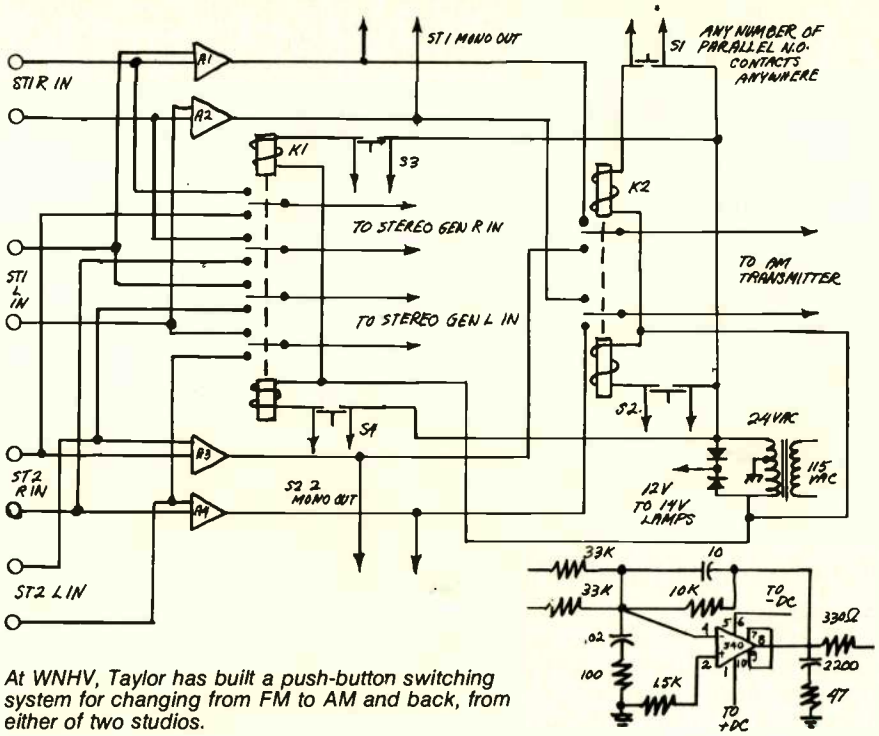
Circle 130 on Reader Service Card

## GREAT IDEAS

mounted in a rack panel. There are four changeover inputs; the two stereo outputs of both studios.

Latching relay, K1, selects the studio to be connected to the stereo generator. Pushing S3 places studio 1 on FM; pushing S4 places studio 2 on FM. Both sides of the balanced line outputs of the studios are mixed so that the output of A1 and A2 form a balanced L+R signal from studio 1. Likewise, the outputs of amplifiers A3 and A4 form a balanced L+R signal from studio 2. These mono outputs are selected by K2, controlled by S1 and S2. The output of this relay goes to the AM transmitter, or to signal-compression equipment. An added bonus here is that we have an L+R signal for each studio regardless of which one is on the air. This L+R signal can be fed back to the studio or anywhere and be bridged to a console input, or to record-

continued on page 52




*At WNHV, Taylor has built a push-button switching system for changing from FM to AM and back, from either of two studios.*

## Enter Now
## Great Idea Contest 1975—More Prizes

BM/E continues the Great Idea Contest in 1975 starting with the April issue. Prizes are expanded—three Grand Prizes plus ten secondary prizes. Top prizes are 19-inch Panasonic color TV sets. Secondary prizes are Panasonic AM-FM Clock radios. Eligibility will be the same as in 1974, but categories are changed slightly. Major change is to recognize control circuits and systems separately.

To enter now use the entry form below.

### Entry Form for BM/E Great Idea Contest—1975

**Mail to: Editors, BM/E**
**274 Madison Avenue**
**New York, New York 10016**

**Name** _____ **Title** _____

**Station Call Letters** _____

**Address** _____

**City** _____

**State** _____ **Zip** _____

**Telephone No.** _____

**Licensee** _____

**Class of Station at which idea is used (check one)**

**TV**_____ **FM**_____ **AM**_____

**Category: Audio**_____ **RF**_____ **Video**_____ **Control**_____

**Objective or Problem:** *(in few words; use separate sheet for details)* _____

**Solution:** *(Use separate sheet—500 words max)*

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

*Signed* _____ *Date* _____

** If you feel credit for prior work or antecedents should be given to someone outside of the station, indicate to whom and when:*

**Rules for BM/E's Great Idea Contest**

1. **Eligibility:** All station personnel are eligible. Consultants to the industry may enter if the entry indicates the specific station or stations using the idea or concept. Manufacturers of equipment or their representatives are not eligible.

2. **How to Enter:** Use the Official Entry Form on this page or simply send *BM/E* a description of your work. State the objective or problem and your solution. Include diagrams, drawings, or glossy photos, as appropriate. Artwork must be legible but need not be directly reproducible but not exceeding three in number. Camera reproducible material is preferred. Length can vary, but should not exceed 500 words. *BM/E* reserves the right to edit material. Entry should include: Name, title, station affiliation, and the class of station—TV, FM, AM. Indicate if idea is completely original with you.

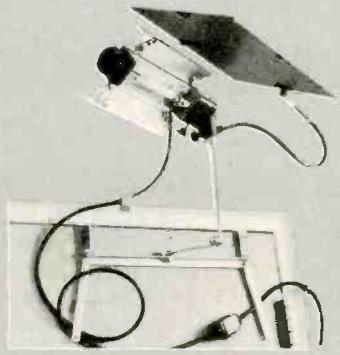
3. **Material Accepted for Publication:** *BM/E* editors will make all decisions regarding acceptability for publication. If duplicative or similar ideas are received, *BM/E* editors will judge which entry or entries to accept A $10 honorarium will be paid for each item published.

4. **Voting:** Every reader of *BM/E* is entitled to rank the ideas published. This can be done on the Reader Service Card in the magazine or by letters or cards sent to the *BM/E* office. To vote, readers should select the three ideas they like best and rank them 1, 2, or 3.

5. **Winners:** Relative ranking of each month's entries will be published periodically. Top-rated entries for various categories will be republished in late 1975 for a second and final round of scoring. Final winners will be picked in February 1976 and notified by mail. Winners will be published in the March 1976 issue of *BM/E*.

6. **Prizes and Awards:** Three top prizes will be awarded: a color TV set for the entry receiving the most votes in the respective categories of AM, FM and TV. Ten AM-FM radios will be awarded as secondary prizes for the highest voted entries in the following additional categories (except the three top winners): audio (three prizes one each in categories AM, FM, TV; (three prizes one each in the categories of AM, FM, TV); Control (three prizes one each in the categories of AM, FM, TV); Video (one prize in TV).

# Location lighting's not what it used to be.

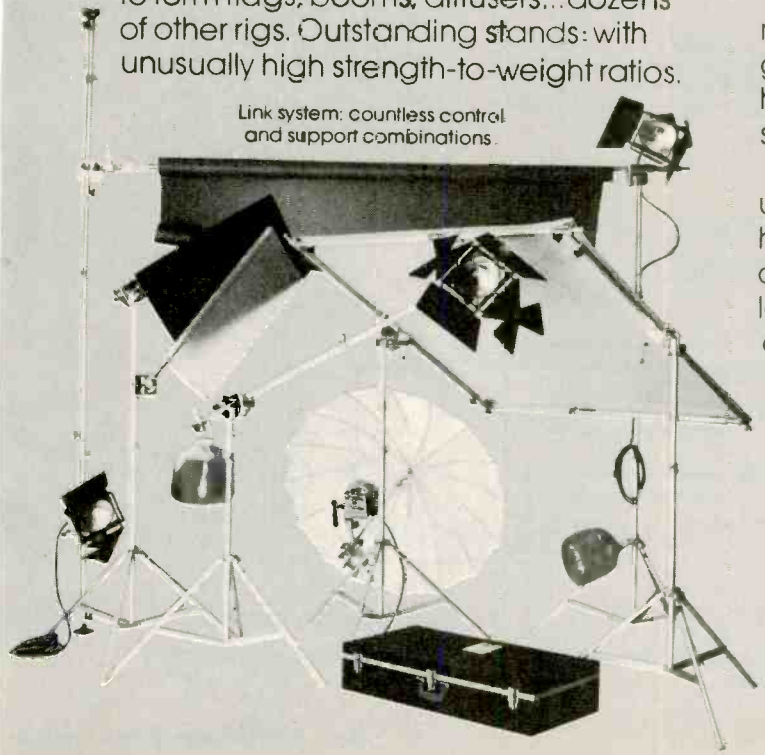


Tota-Light: new flexibility in mounting and control.

Location lighting imposes a number of unique requirements for well-thought-out, durably-built equipment. Over the last fifteen years, Lowel systems have proven themselves in a wide variety of applications in motion pictures, still photography and video. And, in the process, changed location lighting from a compromise to a creative tool.

**Tiny Tota-Light.** More than a small 1000, 750 and 500-watt light with an ultra-wide, even pattern: it's the first professional quartz light built like a system camera, with lock-on mounting and control accessories.

**Modular Link System.** Solves grip and control problems as they occur on location. Rugged, lightweight components interlock to form flags, booms, diffusers...dozens of other rigs. Outstanding stands: with unusually high strength-to-weight ratios.



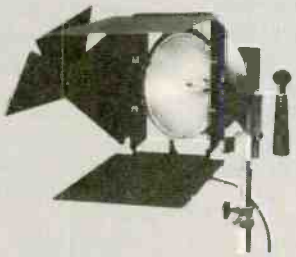
Link system: countless control and support combinations.

**Folding Softlight 1500.** Only a fraction of the weight of studio units, it makes soft-shadow location lighting a reality. Delivers more output than most 2K softlights with two 750-watt lamps. Mounts or clamps anywhere...folds into compact case for travel.

Softlight 1500: the large, soft shadow source that fits in a small case.

**Roll-up Variflector II.** The only truly portable, professional reflector. Complete flood control through 3:1 ratio, to adjust brightness and spread. Rolls up to fit in compact case with stand.

Variflector II: the only roll-up, flood-out reflector.



Quartz "D": 7-1 focusing plus high intensity.

**Workhorse Quartz "D."** Studio versatility in a compact, lightweight focusing unit with wide (7:1) spot/flood ratio and interchangeable 1000, 750 and 500-watt lamps. Quick-change accessory-reflector system transforms it from a versatile general-purpose light to a high-intensity, long-throw source.

**Lowel-Light.** The tape-up, clamp-on light that helped change the industry's approach to location lighting, and introduced Gaffer-Tape.™ Some of the original units are still going strong, after 15 years of rental.

The Antique.

For more information on Lowel products see your dealer or contact us.

lowel

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

ing equipment.

The amplifier, A, is almost identical to one proposed by Walter Jg in his *Op Amp Cookbook*. The two 33K input resistors, while decreasing the amplifier gain to less than unity, have the advantage of isolating the left signal from the right one. The 330 ohm output resistor aids in decreasing the loading of a 600 ohm load. With a simple pi-filter bipolar power supply, the amplifier is capable of a peak output of about 14 dB. The amplifier has about an 8 dB loss so peak inputs of up to 20 dB are handled by the amplifier quite easily.

The Signetics 540 is listed by the manufacturer, not as an op amp, but as a power driver. It gets quite warm during operation and a Wakefield HE-105C heat sink is recommended. Also, the 540 can oscillate unless lead length is kept short, and the supply voltage to the 540 is bypassed with a 1 $\mu$F capacitor within an inch or so of the IC.

The system has been in operation for over three months. We use Switchcraft PL-1032 illuminated switches for S1-S4; these are located in both studios. Relays in parallel with K1 and K2 (Potter and Brumfield KB23AG with 24 VAC coils) serve to switch control and metering functions. The lamps located in the pushbuttons are type 330's, and are powered by the relay power transformer to help lengthen bulb life.

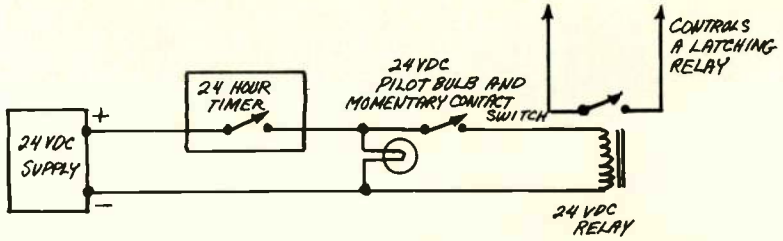
## 3. 24-Hour Timer Helps to Pinpoint Transmitter Switch-on.

*William B. Sevenbergen, Chief Engineer, KRIB-AM, Mason City, Iowa.*

**Problem:** To give the announcer on duty a visual reminder to switch transmitter power; to make it switchable from his operating position; to make the system non-operative at all other times.

**Solution:** At this station, the boss is very concerned that personnel switch power to the transmitter at the precise moment. A 24-hour timer will switch at close to the specified time, but very seldom does it make contact at the exact second. The system shown, while subject to human error, is still more reliable than relying solely on a timer.

An Intermatic timer's trip arm was adjusted for a certain closure time using a trial-and-error method. The momentary-contact switch it energizes is activated sooner than required. The tab that runs the trip arm was bent back slightly so the switch is left activated longer. Now the switch is activated approximately five minutes before the set time, and de-activated about the same time aftward. While the switch is on, a pilot lamp at the operating position indicates that power can be applied to the transmitter via the momentary contact switch. During the ten minute period the lamp is lit, the announcer can switch transmitter power "on the nose."




*The operator is alerted by a signal light that it's transmitter turn-on time, with Sevenbergen's system.*

## 4. Automation Controller Allows Studio to Cut In or Out.

*"Muffin" Steelman, Chief Engineer, KJOI, Los Angeles, Calif.*

**Problem:** To interface a live studio to the automation equipment without having to contend with patch cords, a continuous-running cart and numerous switches.

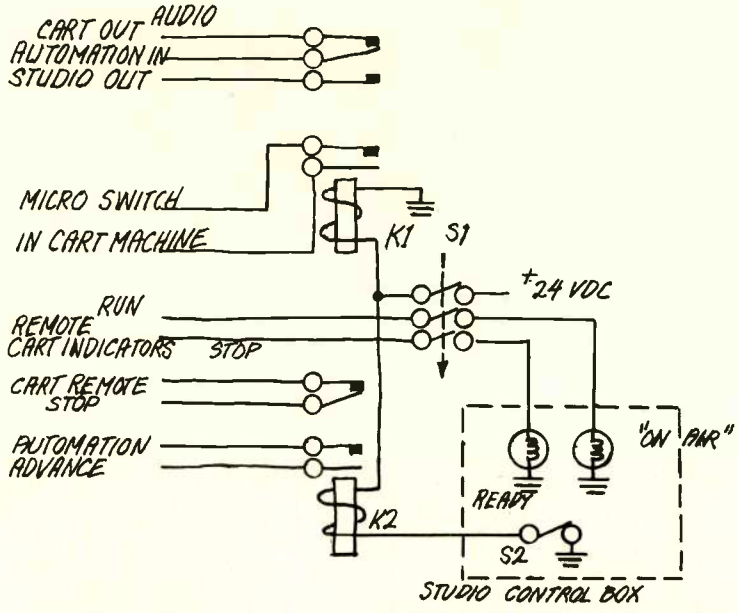
**Solution:** An automated cart machine was converted to accept live operation with a couple of switches and relays. Switch S1, in one position, routes card audio through the automation in the normal manner. The secondary and stop cue tones are unaffected. The other position of S1 switches audio from the cart machine to the studio. Relay K1 indicates a cart's presence in the machine, which activates a ready light in the studio. K2 is also activated, and advances the automation when S2 is pressed. The automation calls for the cart machine and starts by giving the studio an on-air light. The studio is live; when the announcer is finished, he presses S2, which advances the automation rig and turns off the cart machine, thus turning off the on-air light. S2 is run through S1, so the automation can't be advanced unless the switch is in the studio position. This eliminates advancing while the Studio is in a production mode.

## 5. Remote Tower Light & De-icer Indicator.

*Art Gumble, Transmitter Supervisor, WLWT, Cincinnati, Ohio.*

**Problem:** To signal tower light burn-out, or de-icer failure with a

continued on page 54




*Steelman designed this system to interface an automation system with a live studio.*

# The new Volumax® Model 4300.

# Anything else is a limited limiter.

When it comes to automatic peak controlling, the new Volumax is the smoothest operator around! It's the latest in our quest for the ultimate AM limiter. The only similarity between the Model 4300 and conventional peak limiters is that they both prevent overmodulation. And here the similarity ends!

Volumax patented control action assures maximum utilization of each watt of carrier power, without overmodulating the transmitter and with absolute minimal signal distortion. The Model 4300 features: more precise limiting at maximum allowable limits, easier set-up and proof-of-performace procedures, and extended control range of over 15dB, with less than 1% harmonic distortion.

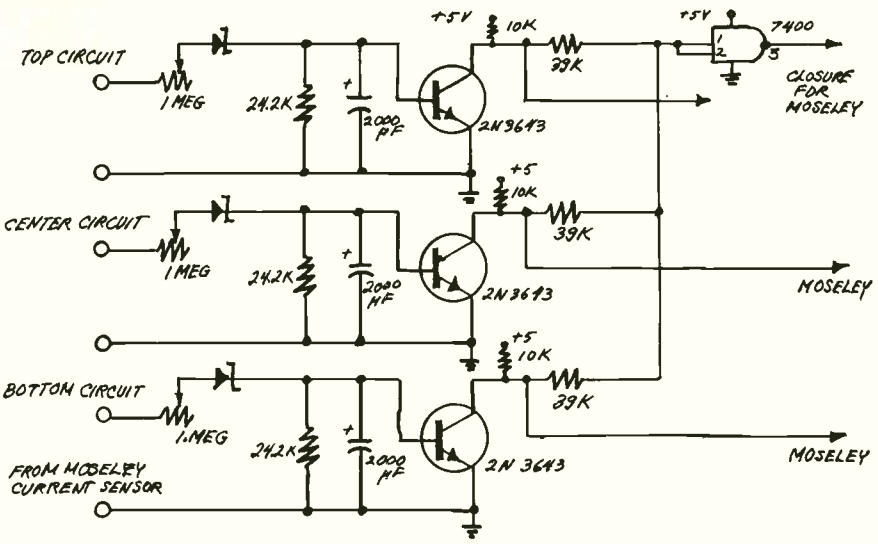
With automatic peak phasing, negative speech asymmetry is silently inverted for positive modulation to the maximum allowable limit of 125%.


Try a 4300 and listen. You'll see why other limiters are limited. And why we think the new Volumax Model 4300 is the ultimate limiter.

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

commercial remote control. Our Moseley remote control uses four current sensors, one for each of our three tower light circuits and one for our de-icer. These sensors deliver about 1.5 to 2 VDC. The Moseley equipment requires a closure to turn on the LED indicator. We wished to monitor the four indications, and to also keep tabs on tower light problems.

**Solution:** Our circuit takes the small sensor DC voltage to drive a transistor which gives the necessary closure. The transistor turn-on threshold is set with the 1 megohm pot with all lights on. When one or more lamps are out, the voltage drops; the transistor turns off to indicate trouble. The RC network filters out current ripple caused by the beacon flashers so that the turn on/off voltage is constant. In addition, so we can use the voltage for log print-out, I wired these circuit outputs to feed a NAND gate. The IC is off with all light circuits on, but when one or more tower lights burns out, the gate goes high, indicating trouble. The de-icer is a duplicate of any one of the tower light circuits and indicates circuit status also.

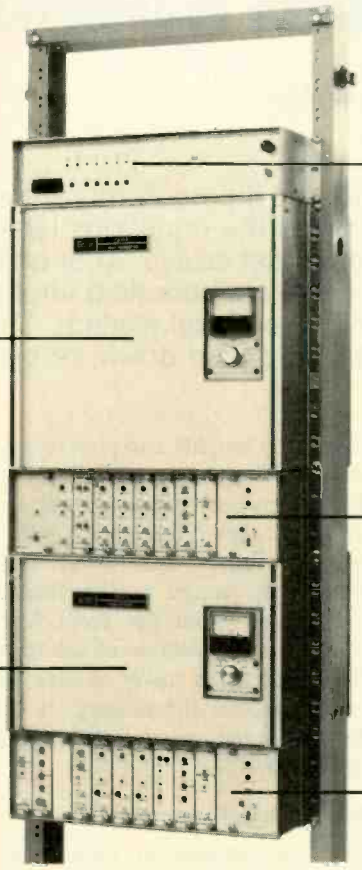



*To get information on tower lights and deicing equipment, Gumble added this circuit to the remote control.*

## You Say You Like The Great Idea Contest— So Please Vote Every Month!

For our first contest, which ran in 1974, we had an outpouring of entries and a flood of favorable comment, but the vote on the entries was lighter than we would have liked. During the 1975 contest, which is starting now, vote each month for your preferences. Use the Reader Service Card in the back of the book.

# Farinon Makes It..




# With Practical Advantages..for video relay in the CARS band.

**FV13F All-Solid State Fixed Microwave** is one of the new Farinon series of IF Heterodyne microwave systems for point-to-point relay (intercity and STL) of video signals in all frequency bands from 2 GHz to 13 GHz. Practical advantages include:

• **The High Selectivity** inherent in the advanced dual-conversion design allows close parallel-channel spacing without spurious tones.

• **Excellent Video Performance** is assured with such typical figures as: 65 dB signal-to-noise ratio; 56 dB signal-to-hum ratio; 0.5 dB differential gain and 0.7 degree phase differential **(over a seven-hop-system).**

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# The Directional Antenna Pattern

By T. Frank Ritter

Mr. Ritter goes into directional antenna theory in more depth than one usually encounters. The text gives the equations needed to describe the directional pattern from most arrays. After analysis, an engineer should be better equipped to attribute field strength problems to actual difficulties in his directional system. Thus localized, the problem might better be traced down, or professional advice sought.

Few texts give clear and adequate accounts of the processes involved in calculating theoretical directional antenna patterns. Although the basic equations for describing directional antenna systems have been "well known" for over thirty years, they have rarely been clearly explained. It is our purpose to remedy that situation in a two part article.

The horizontal radiation pattern formed by an array of several vertical antennas, all supplied with RF power at the same frequency, is a function of both the magnitude and phase of the current in each tower, as well as the individual heights and positions of the towers. The *phase* of the resultant RF field from each tower is due to two variables: the original phase of the current flowing in each tower, and the time delay caused by the distance of each tower from the Field Strength Point. The *magnitude* of the resultant field from each tower is also due to two variables: the amount of current flowing in the tower, and the height of the tower.

**Mr. Ritter** is vice president of Dantco, 2524B Glen Springs Way, Austin, Texas. 78741.

### The Physical Process

In an attempt to understand the physical factors which increase and decrease signal from a directional antenna system—the radio frequency "pattern"—let us first take a simple case of two equal-height towers spaced one-half wavelength apart, and fed in phase with equal currents. With two towers we can visualize the principles involved without being too confused by details. Later we can apply the same concepts to more complicated cases. As in Fig. 1, tower 1 will be South, tower 2 North. Tower 2 will thus be placed 180° distant, to the North, at bearing 0°, from tower 1.

RF energy in the form of electromagnetic waves radiates from each tower at the speed of light. Because even light has a finite speed, it takes some time for the waves to cross the distance between the towers. It is this time delay that is to result in phase differences between the waves from the two towers at different bearings.

continued on page 58

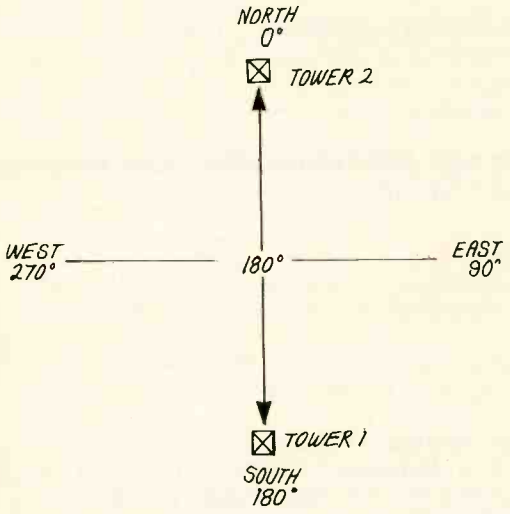


*Fig. 1 Simple two-tower array with tower 2 180 degrees away from tower 1.*

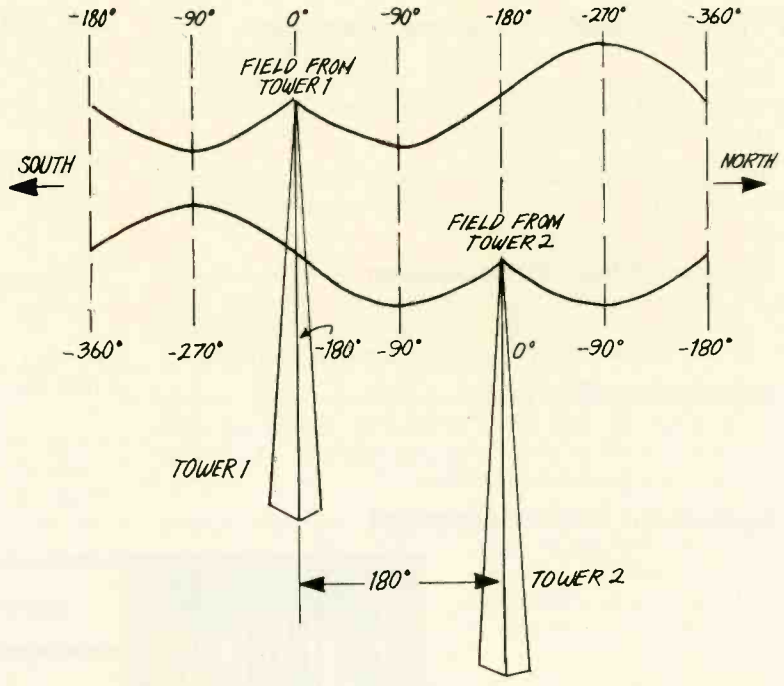


*Fig. 2 When the signal from tower 1 moves past tower 2, the phase is opposite that of tower of tower 2 and the effect is a cancellation.*

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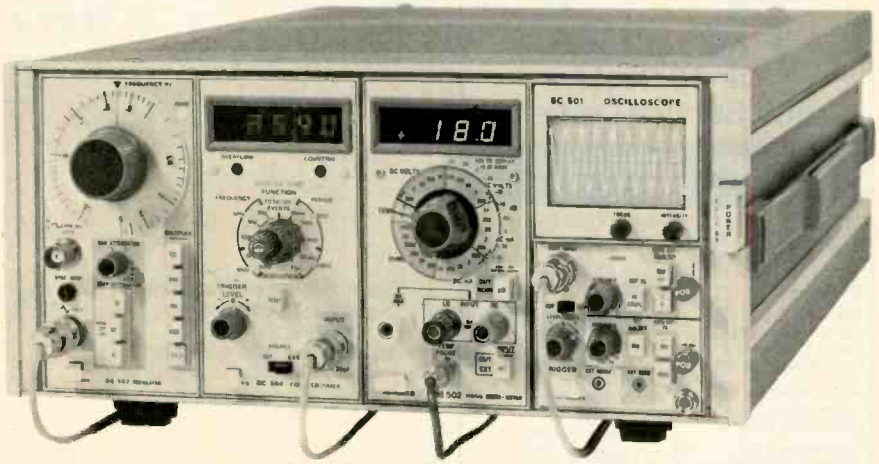

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## ANTENNA PATTERN

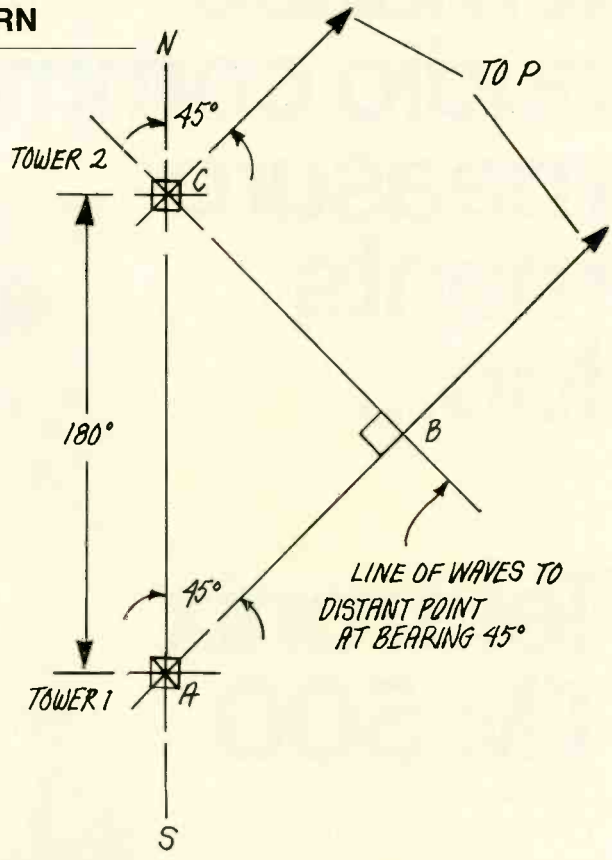


*Fig. 3 Radiation directions to a distant point are shown here. From this diagram, equations can be written to determine phase difference and magnitude.*

At a far distance from the towers, the magnitude of the field delivered by each single tower will be almost exactly equal; whatever wave interference effects we see will be due almost entirely to phase shift between the waves arising from the distance difference of each tower to any far point.

We know that as the signal from tower 1 moves past the position of tower 2 (see Fig. 2), the phase of the RF wave from tower 2 is exactly opposite that of tower 1, and thus at far distances will cancel the wave from tower 1. To the North, then, we have a null. Since each tower is fed similarly, by the same logic as above, there is also a null to the South. To the East and West, there is no distance difference between the two towers, and thus no phase shift between the two waves, so the energy from each tower adds directly, forming a "lobe," twice as strong as the field from either tower alone. Intuitively, this is a maximum; just what the value of the resultant wave would be at other bearings can be analyzed by considering the distance difference to a far point.

At bearings 270° and 90° (West and East) there is no distance difference between a far point and the two antennas; the waves add in-phase, and the magnitude of the resultant is naturally twice that from one tower alone. At bearings 0° and 180° (North and South) the distance difference is ½ wave, resulting in the combination of two similar waves 180° out-of-phase; thus cancelation. Fig. 3 shows the radiation of energy to bearing 45° (NE). Note that the distance to a far point from tower 1 is equal to the distance to the far point from tower 2 *plus some*. This extra distance is the distance from point A to point B. Using trig, we find the distance difference to be distance AC (180°) multiplied by the cosine of angle CAB (which is the same as the bearing angle: 45°).

$$D = S\cos\phi$$

where: D = distance difference
S = distance between towers
$\phi$ = bearing being investigated

Thus the distance difference is 180° × cos 45° = 180° × .866 = 127°; the wave from tower 1 being delayed 127° compared to tower 2, or the wave from tower 2 being advanced in phase 127° from tower 1; both statements have the same meaning. Now we know the phase difference between the two waves upon their arrival at the far point, and the next problem is to find the magnitude of the resulting wave.

### Combination of Waves

Finding the result of the combination of waves of the same fre-

continued on page 60

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## ANTENNA PATTERN

quency involves complex or vector algebra. A continuous sine wave may be represented in polar form by its relative magnitude and phase compared to another wave of the same frequency. The rectangular (x, y) representation must be used to add complex values. To find the rectangular representation of a polar complex value, we use equation 2.

$$[(A \times \sin B) + j(A \times \text{Cos } B)] = A < B$$
$$\text{RECTANGULAR} \longleftarrow \text{POLAR}$$

When we use equation 2 we must be careful to properly observe the signs of the sine and cosine functions, and should also note that math angles are not the same as bearing angles. Mathematical convention has established that math angles are measured counter-clockwise from the X-axis (due East). Navigational conventions have established bearing notation to be measured clockwise from North (math 90°). Not only does each system have a different reference direction, but the angles are measured in opposite directions. Fortunately, to convert from one system to the other, only one equation is necessary, equation 3.

$$< B = 450° - < A$$

where: A = angle in either math or bearing notation
B = same angle as A in opposite notation

Returning to our problem, we have one wave with a magnitude of 1 and an angle of 127° (from tower 2), and another wave with a magnitude of 1 and an angle of zero degrees. The polar form $1 \angle 127°$ is expressed in rectangular form as $(1 \times \cos 127°) + j(1 \times \sin 127°)$, or $(-.606 + j.796)$. Likewise, $1 \angle 0°$ in polar form is $(1 \times \cos 0°) + j(1 \times \sin 0°)$ or $(1 + j0)$ in rectangular. The resultant wave is the real and imaginary parts of each component wave summed separately: $(.393 + j.796)$. This is the resultant wave in rectangular form, but we want its magnitude of which can be found by converting to polar form by equation 4.

$$\left[(\sqrt{x^2 + y^2}) \angle \arctan \frac{Y}{X}\right] = x + jY$$
$$\text{POLAR} \longleftarrow \text{RECTANGULAR}$$

The polar form of $(.393 + j.796)$ is found to be $.888 \angle 63.6°$. The phase angle does not interest us (who knows or cares about the phase of a received radio wave with respect to its origin) but it is sometimes convenient to perform the complete conversion. The relative wave magnitude and field strength at bearing 45° is thus found to be .888; as it is at bearing 135°, 225°, and 315° also. The relative field at bearing 60° would be found as above, below:

1) distance difference = $180 \times \cos 60° = 90°$
2) $1 \angle 90° = (0 + j1)$
3) resultant wave = $(1 + j0) + (0 + j1) = (1 + j1)$
4) $(1 + j1) = 1.41 \angle 45°$. (magnitude = 1.41)

The process of finding relative field patterns to this point can be represented, perhaps more simply, by equation 5.

$$E = \sum_{k=1}^{k=n} 1 \angle S_k \cos \phi$$

where: E = resultant wave
$S_k$ = distance of tower k from reference (degrees)
$\phi$ = azimuth bearing being investigated

Note the use of summation notation with subscripts. What the equation means is: "To find the resultant field,

sum the complex numbers representing the fields from each tower, including all towers from number 1 through tower n, the last tower."

### The development—adding the variables

So much for the easy pattern, now for complications. Should tower 2 not be fed in phase with tower 1, the phase difference would produce a different wave interaction, just as did the changing distance difference to the field strength point? Thus the different phase of tower 2 should be added to the phase difference caused by apparent spacing differences, as in equation 6.

$$E = \sum_{k=1}^{k=n} 1 \angle \Psi k + Sk \cos \phi$$

where: $\Psi k$ = current phase in tower k

If more current flows in one tower than the other, the waves from that tower would be stronger than those from the other, and no longer could they be completely canceled out; no longer would the nulls go down to zero. In this case the equation should be modified so that the magnitudes of the complex number representing each wave represents its relative field strength, as shown in equation 7.

$$E = \sum_{k=1}^{k=n} f(k) \angle \Psi k + Sk \cos \phi$$

where: f(k) = relative field strength from tower k

note: f(k) is proportional to base current in equal-height towers

When tower positions are not as described in our simple example, or when there are more than two towers, it is convenient to have an easy way of expressing the location of each tower so that it may be easily operated on. If the tower positions are referred to some reference point (perhaps one of the towers) in polar form: "so many degrees distant from the reference point at such and such a bearing," the more complete formula for finding the resultant wave from an array of n towers, fed with any currents, arranged in any manner, can be written as equation 8.

$$E = \sum_{k=1}^{k=n} f(k) \angle \Psi k + Sk \cos (\phi - \phi k)$$

where: E = complex resultant wave
f(k) = relative field strength from tower k
$\Psi k$ = relative current phase in tower k
Sk = physical distance of tower k from space reference

continued on page 62

## ANTENNA PATTERN

$\phi$ = azimuth bearing being investigated

$\phi_k$ = physical bearing of tower k from space reference

For the purposes of pattern computation, tower positions may be referenced to any point in or near the array; one convenient space reference point is the position of the phase reference tower, less convenient would be the center of the array. Inspection of equation 8 will reveal that distance differences (and thus phase differences) are found to a point infinitely-distant from the array. The towers need be accurately space-related to one another (by distance and bearing from a reference point), but no physical location of the space reference will modify the distance differences between the towers, when measured to a far point. For the purposes of equation 8, any number of space-reference descriptions of the same array will result in exactly the same pattern.

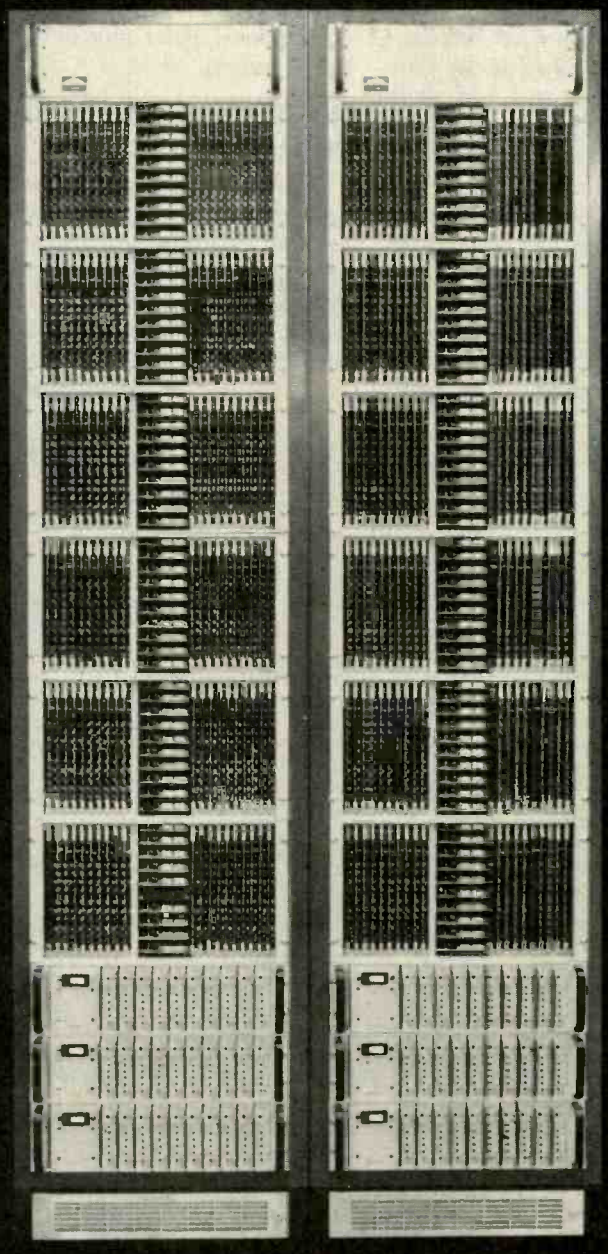
### The method—grouping concepts for calculation

Note that equation 8 takes into account the variables. The formula simply says that we start with one of the towers (tower k = 1), take the cosine of the angle difference between the physical bearing of tower k and the azimuth bearing being investigated ($\phi$-$\Psi_k$), that number multiplied by the physical distance of the tower from the space reference point f(k)—gives the apparent spacing difference due to orientation of the tower. To this add the relative current phase of that tower $\Psi_k$ which gives the relative phase of the wave from that tower along the bearing being investigated. The relative phase of the field from any tower at any bearing can now be found.

The magnitude of the field radiated by each tower depends upon the ccurrent in the tower, and tower height. For now it is sufficient to say that fields from different towers of the same height are proportional to the currents flowing in them. This may be represented as a ratio, since only relative patterns and field strengths are now being calculated. The relative magnitudes of the fields from each tower may now be found if all the towers are of equal height.

A field magnitude for each tower is now available, as well as its relative

continued on page 64



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## ANTENNA PATTERN

field phase to any particular bearing. This data is used to calculate the sum of the fields representing radiation from the entire array. By converting the magnitude and phase of the field from each tower into rectangular form, all fields to a particular bearing may be summed. Converting the result into polar form gives the magnitude of the resultant wave from the entire array to that one bearing; the magnitude is then plotted versus the bearing on polar graph paper (see Fig. 4). The same process is followed for each bearing angle to be investigated, usually at 5 or 10 degree increments, producing the conventional polar plot of the directional pattern.

### The practical meaning of the frequency

These equations were developed to find the radiated field patterns from an antenna array at a great distance over a conductive flat surface. It should be apparent that the pattern will not hold true at short distances. Near the array, predicted nulls cannot be deep, and

continued on page 66

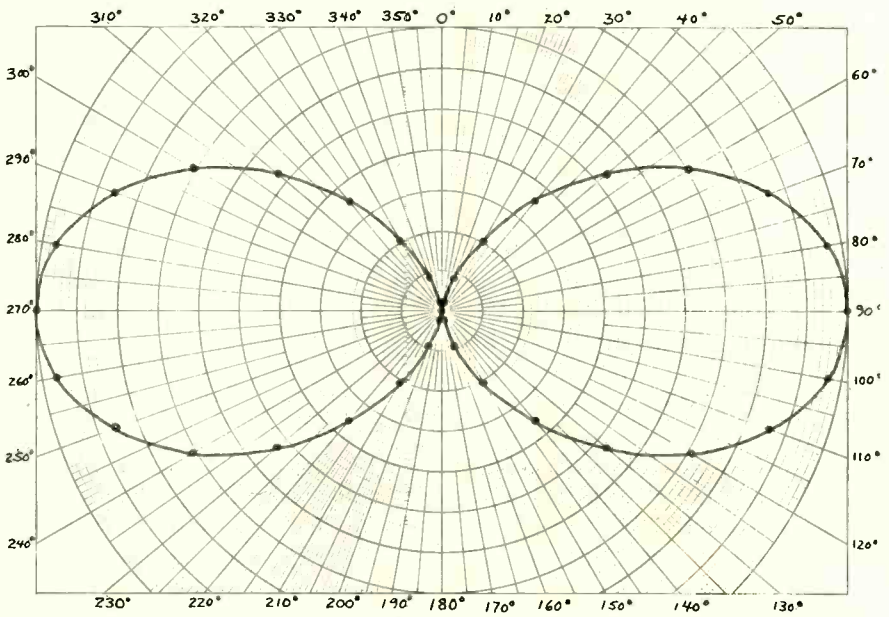
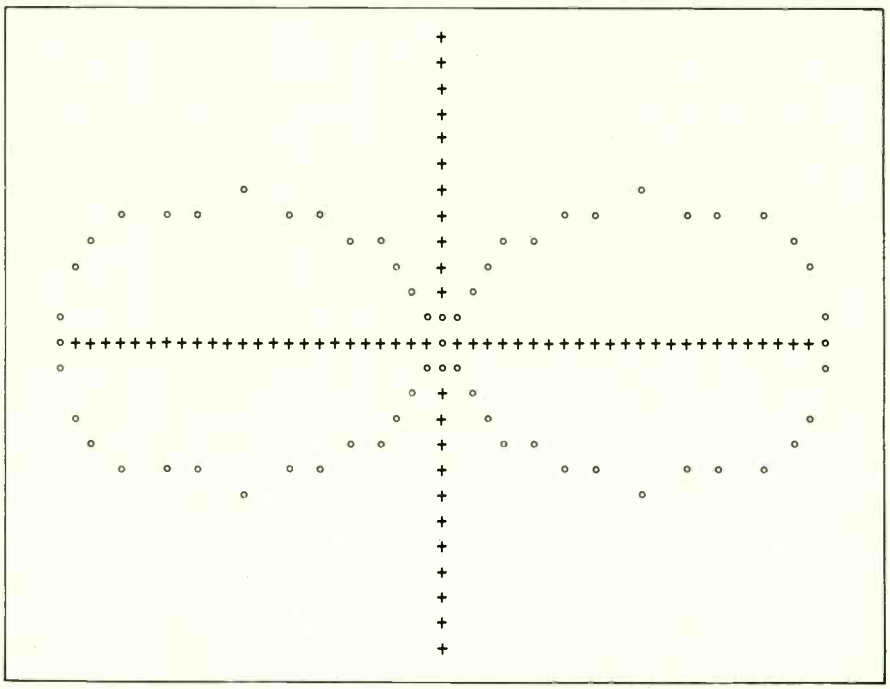



*Fig. 4 A plot of magnitude versus bearing angle—as plotted by hand and computer.*



## ENERGY PROBLEM

cont. from page 24

They're paying for it in lower efficiencies of light output. They're paying a higher electric bill because they're consuming more power. They're paying for higher air conditioning loads. All because they refuse to do the necessary maintenance on a regular basis.

**BM/E:** At a television studio, other than network or affiliate, who actually should do this type of maintenance?

**TOM:** This varies. In one station, it might be the chief engineer's responsibility. At another station in the same town, the engineer will maintain the cameras and video equipment, while the lights will be production's responsibility.

**JOE:** Most broadcasters have never sat down and said, "How much will it cost to maintain," as opposed to, "How much am I spending for repairs and electricity and all other items?" They've never really looked at lighting as a *management* problem. It's been a catch-as-catch-can solution depending on who's doing what and nobody's taking the responsibility for providing education and direction.

**BM/E:** But station management should be concerned.

**JOE:** Yes. While station management isn't usually technically involved, they should realize that they can save *dollars* as well as *energy*.

**BM/E:** Isn't one of the points, then, that station management should really pinpoint somebody with this responsibility?

**JOE:** Yes. Most big companies today have a high-level person responsible for cutting down energy use. The same type of thing must happen in the studio. Once a person is charged with that responsibility, he'll start looking around. He'll ask the lamp manufacturer and the fixture manufacturer. He'll start to analyze what he's spending. And, I think he'll be shocked at what he finds.

**MOE:** Maintenance isn't just in fixtures, though. But the power distribution, dimming equipment, plugs and receptables, connector strips. This gear begins to deteriorate and pit when its not tended and replaced on a systematic basis. At most stations nobody even records or measures losses to determine how inefficient the operation might be.

**TOM:** Let's take maintenance of control consoles. They're notoriously misused. Nobody would do to an audio or video console what happens to a lighting control console.

**MOE:** No one ever asks, "What happens if I pour a cup of coffee over a TV console?" But every lighting type does. They expect it to happen. They assume that's standard operating procedure.

**JOE:** Gene Rudolph of Lite-Trol Services—who does our maintenance work on the east coast—says nine out of ten repairs on the control console of a dimming system are cleaning out coffee or soft drinks that have been slopped into the system.

**TOM:** If that were to happen with a video system, the operator would be fired. Or executed! I was taking a customer in to see one of the beautiful consoles we built for one station. For maintenance purposes, we hinged the panels. So I lifted up the panel to show the wiring and there sat somebody's lunch and a copy of Playboy.

*In a future issue BM/E will present Part III: More Efficient Equipment, the last in a three-part series.*

## ANTENNA PATTERN

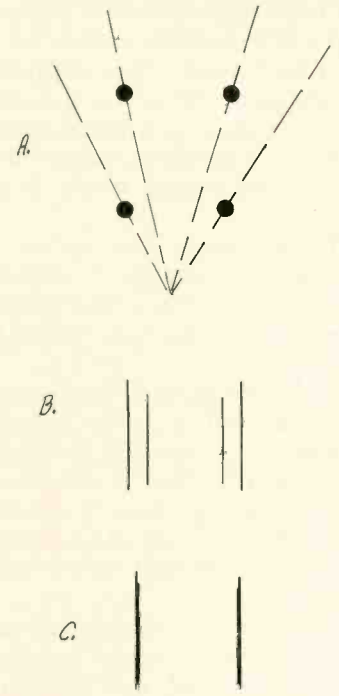



*Fig. 5 These diagrams indicate how parallax can confuse understanding.*

may not seem like nulls at all, due to parallax effects (see Fig. 5) and the inductive field. It is sometimes said that the "tower vectors are not well-formed" near the array. At great distances, the field will be distorted by geographic variations in ground conductivity and contour, so the theoretical pattern shape will not exist at far distances either. Nevertheless, it is upon these equations and patterns that most directional antenna systems have been developed, and from them that most theoretical patterns have been made.

The theoretical pattern is the result of equations based on a particular set of assumptions; the results do not exactly "map" reality. Nevertheless, different sets of patterns can be directly compared only because a particular standard process has been used to derive them. Although the equations may be seriously in error outside their most accurate ranges, their results give the engineer a "feel" for the resultant pattern. Indeed, in this way he can isolate sources of distortion from the theoretical shape.

I have just described the procedure for finding the electromagnetic radiation pattern for a simple-case broadcast antenna array of "n" towers. To be described in Part II are the effects of different height antennas, conical patterns at various vertical angles, and pattern sizing. **BM/E**

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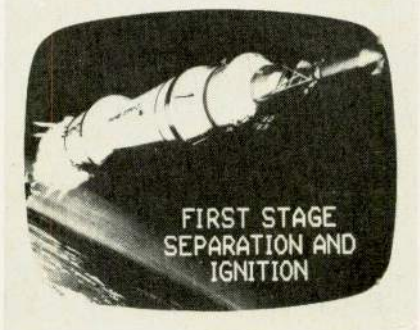


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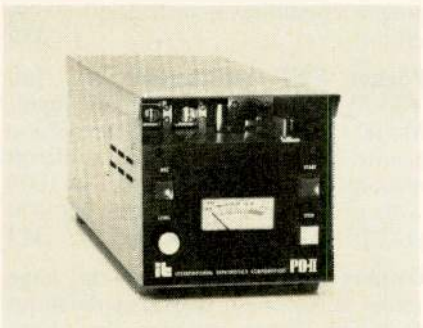
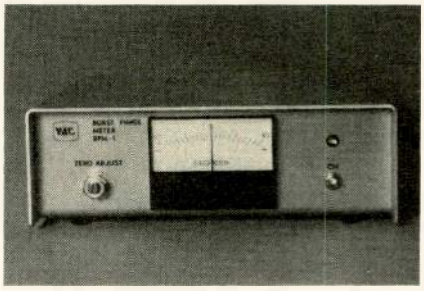


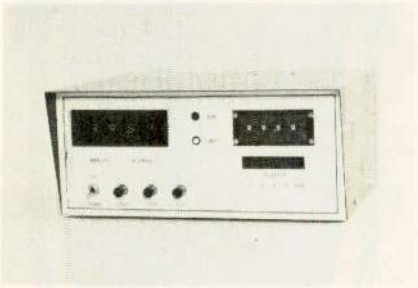
rack, and include both reproducer and recorder/reproducer models. INTERNATIONAL TAPETRONICS CORP. **303**

**Burst phase meter** is a low cost replacement for a vectorscope in many applications. Model BPM-1 indicates phase shift in the burst relative to the color sub-carrier, to maintain con-



sistent color phase when using special effects, and chromkey during production. VIDEO AIDS CORPORATION OF COLORADO. **304**

**Digital timer** counts up or down from thumbwheel preset time. The "Cue Clock" shows a light at end of count,



can be remotely operated, has a capacity of 99 minutes, 59 seconds. It also can start turntables, tape decks or other units automatically, uses TTL logic, with outputs for interface with automation. ELECTRONEERING, INC. **305**

**New "soft" chroma keyer** includes the functions of the Chromatech, with a decoder added. Thus user can reproduce shadows, look through smoke, etc., while having linear chroma key action. $4,000. ASTRIONICS DIV. OF TECHNICOLOR. **306**

**Conversion package** turns CP-16R camera into a studio type, suitable for all television specials, theatrical documentaries, etc. "Studio Rig" includes

a riser bloc, matte box rods, follow-focus mechanism, matte box unit and an assortment of filters. $2000. CINEMA PRODUCTS CORP. **307**

**Transient clipper** protects equipment from damage caused by voltage transients introduced onto cable systems. Model TZ-1 can be used in 30- and 60-volt systems, has a peak pulse power dissipation of 15,000 watts and clamping time of less than $10^{-12}$ seconds. AEL COMMUNICATIONS

continued on page 68

## PRODUCTS

CORP. **308**

**Reconditioned magnetic tapes** are bought from government agencies, cleaned, degaussed. Tapes are certified, sold for ⅓ to ¼ original cost. Original manufacture is by 3M, Ampex, IBM, Memorex, and others. GENERAL SUPPLY AND EQUIPMENT CO. INC. **309**

New series of **video tapes** for helical scan recorders is designed for highband color. The 190 Series is called a premium master grade helical scan video tape, with chroma performance above current standards. AMPEX CORP. **310**

**Remote lens control** gives variable speed fingertip iris control for fixed focal length lenses with motorized iris. Model V104C has electronic drive circuitry to isolate variable speed feature from variations in torque. VICON INDUSTRIES, INC. **311**

**Desoldering system** is totally self-contained, with internal pressure and vacuum systems. Model SX-300 has equipment for work on microelectronic systems and capacity for large component assemblies as well. $460. PACE, INC. **312**

**Pocket FET multimeter** has full VTVM ranges, 10 megohm input. Model 350 has complete protection against overload, meter with 1 millivolt resolution, voltage ranges 0.1 to 1000 volts and seven ohms ranges. HICKOK ELECTRICAL INSTRUMENT CO. **313**

**Display oscilloscope** with extra large screen is for sweep/signal applications requiring large picture for low-frequency X-Y performance. Model DU-720 drifts less than 10 microvolts/degree C, has four ranges with a vernier: 1 mV, 10 mV, 100 mV and 1 volt. JERROLD ELECTRONICS CORP. **314**

**High-stability delay line** is for TV broadcast equipment operating under severe temperature conditions. Model 27-200 has operating frequency of 27 MHz, delay of 1H nominal, adjustable delay stability of 1 nsec or less over the range −20°C to +50°C to user's system. Temperature controlled oven operates from 115 volt AC source. WALTHER M.A. ANDERSON, INC. **315**

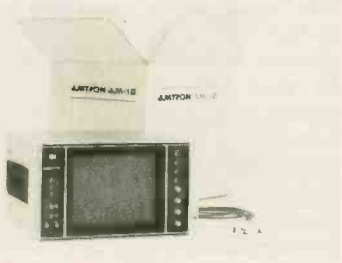
**Coaxial SPDT diode switch** has isolation of more than 65 dB to 220 MHz, 55 dB to 300 MHz, with insertion loss of less than 0.5 dB. Model DS-2, is the RF version, Model DS-2V the video version (DC to 10 MHz). Power consumptions i 20 mA, ± 10 volts. PECA, INC. **316**

**Analog voltmeter/amplifier** covers 5 Hz to 12 MHz, voltage ranges 100

continued on page 69

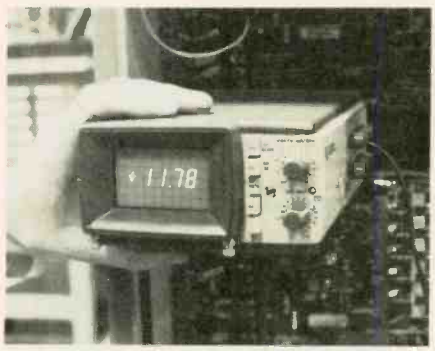
microvolts to 1 kilovolt in eight 20 dB steps. Model 3056A has an average responding meter reading decibels linearily and volts logarithmically. A 100 KHz low-pass filter allows satisfactory measurements to be made in the presence of high-frequency noise. As an amplifier the instrument has a voltage gain of 80 dB from 10 Hz to 10 MHz. $410. BALLANTINE LABORATORIES. INC. **317**

**Video color monitor** has a single-gun 12-inch picture tube. Model AM-12 has separate R, G, and B. gun switches



and switchable underscan, internal/external sync. $975. AMTRON CORP. **318**

**Digital multimeter** and 1 MHz oscilloscope are combined into a single compact instrument weighing 3.7 lb. Model 213 is completely portable, provides true rms reading of AC voltages 0.1 v to



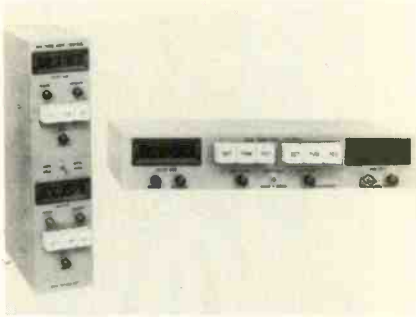
1000 v, comparable DC, current, and resistance ranges. Readout is 3½ digits. Oscilloscope covers DC to 1 MHz with calibrated sensitivity from 20 mV/div to 100 V/div, sweep rates 2 microsec/div to 500 msec/div. $1200. TEKTRONIX. **319**

**Color encoding, image enhancing and automatic balancing** are combined in new unit for use with any three-tube RGB color camera. Series 9900 has automatic black and white balance, two-level horizontal and vertical detail enhancement, vertical interval reference insertion capability. COHU, INC. **321**

**Tape edit timing control** provides fast frame-accurate editing. Model 601 (vertical) and 602 (horizontal) require

continued on page 70

## PRODUCTS



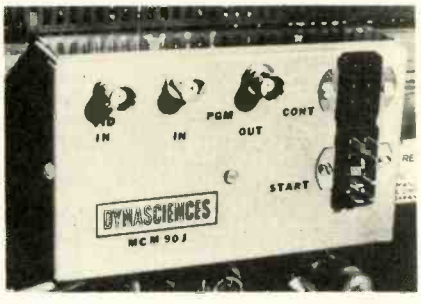
no modification of VTR transport or control circuits, nor use of a time code reader. $3100. BETA TECHNOLOGY, INC. **320**

**Miniature mainstation** cable TV amplifiers are intended for systems requiring one-way distribution, but covering the full 40 MHz to 300 MHz bandwidth. The Series 4-M Microline amplifiers includes trunk, bridger and distribution units at prices below standard units. MAGNAVOX CATV DIVISION. **322**

**Integrated attenuator pads** with low-pass or band-pass filters cover microwave frequencies, 40 MHz to 4 GHz. The PL and AB Series supply a customer-specified 3 to 20 dB pad, with 2 to 10 filter sections available, impedance 50 ohms to 100 ohms. $60.00. TEXSCAN CORP. **323**

**Phase-locked signal generators** covers 1 MHz to 520 MHz, with built-in AM and FM capability. Model 3000 can be digitally set to an overall accuracy of ±0.001%, with resolution of 1 KHz. Calibrated output can be set from −137 dBm to +13 dBm, flat to within ±.75 dB over the whole frequency range. $1975.00. WAVETEK INDIANA INC. **324**

**Automatic movie programmer** is a sequential switcher intended for use with video cassettes for programming




movies and other multi-reel events. Model MCM-90 can be used with an external timer for automatic play at scheduled times. MCM-90S is for Sony machines; MCM-90J with JVC cassettes. DYNASCIENCES. **325**

**Line of monochrome and color monitors** includes models with screens from 5" to 18". VM Series has DC restoration, resolution up to 700 lines horizontal, video loop through, external sync, decoder circuitry (color models), aperture correction, etc. HITACHI SHIBADEN CORP. **326**

Sweep generator for 250 KHz to 1000 MHz covers 1 to 1000 MHz with a single sweep. Model 1210 (75 ohms) and Model 1240 (75-ohm) have .5 volt output, ±.5 dB flatness, and 1% linearity. $1695.00 TELONIC ALTAIR. **327**

**New receivers for the two-tone EBS** alert system is all solid-state, rack mounted; two-tone generator meeting the requirements of new system is also available. TRI-TRONICS PROFESSIONAL ELECTRONICS. **328**

**RF "compositor"** is a remotely controlled RF switcher for composite channel applications. Compositor can be used also to facilitate non-duplication, or as a manual RF over-ride for emergency situations. The system has two units: a battery operated control/transmitter, and a receiver/switcher; pushbutton operation on transmitter effects choice of one of three programs in switcher, through coaxial relays. Additional channel capacity is optional. VIDEO OPERATIONS SYSTEMS, INC. **329**

# LETTERS/ FEEDBACK

Dear Editor:
Your great ideas contest series has been of tremendous help to our station. We have taken many useful ideas from it. I do hope that you will continue the series, if not as a contest, then as a regular feature for BM/E.
Eugene V. Bossieux
Chief Engineer, WJMA, Orange, VA

*Editor's Note: Great Ideas continue in BM/E and the 1975 contest is underway. See page 48 in this issue. First prizes are 19-inch Panasonic Color TV sets; secondary awards are Panasonic AM-FM clock radios. Entry blank is on page 50.*

Dear Editor:
I read with much interest an article appearing on Page 74 of your February issue of BM/E, under Letters/Feedback. The article written by Mr. Eric Small made a lot of sense. At the conclusion of the article you listed four papers dealing with this subject. My question is, where can I get a copy of these papers for my evaluation and knowledge.

As a final note, I just could not be without your fine publication. I look forward to receiving it every month.
Reynold P. Lark
Chief Engineer, WYOO AM & FM Stereo Radio

*Editor's Note:*
*A number of other readers have asked us the question Mr. Lark asks, so here are the addresses of the organizations putting out the papers listed by Mr. Small:*

1. Davis, Michael D. "Transmitter Limitations in Achieving High Amplitude Modulation Percentages," Audio Engineering Society Preprint #994 (paper presented at September, 1974 AES Convention): address Audio Engineering Society, 60 East 42nd St., New York, N.Y.
2. Endres, George C. "The Evaluation and Correction of AM Transmitter Deficiencies," Technical Papers, NAB Engineering Convention, 1973*; address Engineering Dept., National Association of Broadcasters, 1771 N. St., N.W. Washington, D.C. 20036.
3. Cox, Brian C. "Enhancing AM

continued on page 72

*A complete transcript of all technical papers at the 1973 NAB Engineering Conference is available from TAB Books. Blue Ridge Summit, PA 17214 (Order 173, $10).

## LETTERS

Signal Coverage Through Improved Modulation Techniques," Proceedings, 28th Annual Broadcasting Engineering Convention (1974), NAB. Address given above.
4. McKnight, John G. "The Distribution of Peak Energy in Recorded Music, and Its Relation to Magnetic Recordings Systems," Journal of the Audio Engineering Society, Vol. 7:2, 1958, pg. 65; address AES above.

### Some Thoughts on Saving Energy

Dear Editor:
We constructed WOR-AM, 50,000 watts in 1933/1934. A power demand of 350 kW to generate 50 kW output, reflected a vast heat loss, which we converted into a duct system to heat our building.

There was no central heating system. Building heat was generated by conversion loss. The building was designed with no windows, merely front and rear doors. To provide residual heat during time off air, we installed electric heaters.

It was estimated during the 33 years of operation at Carteret, New Jersey, that WOR saved a total of $133,000 on heating bills through judicious recirculation of internal generated transmitter heating.

The use of filters to maintain clear air avoided the necessity of interior wall painting. We repainted only once in 33 years, and then only to change the wall color.

Much energy saving can be accomplished during the original design of a building. With the advent of power transistors there is a savings in power. New circuitry and the ingenuity of engineers can accomplish more.

There is much to be accomplished not only in this area, but in the entire use of electrical circuits, which have, in the past, been developed with little thought to "Save-A-Watt." Further, energy savings progress can be accomplished with the use of sensitive camera picture tubes which require reduced studio lighting, thereby reducing air conditioning.

J.R. Poppele
Former Vice President, WOR-Mutual & former director, Voice of America

*Editor's Note:*
*Mr. Poppele's reply was in response to a note in the February issue, page 76, asking for ideas in saving energy. We know many stations have used transmitter heat to warm building's, but we're interested in re-publicizing such efforts and the dollars saved. Send us your thoughts.*

### Correcting Time Base Correction Information

Dear Editor:
Thank you for this opportunity to correct some misunderstandings and somewhat inaccurate information concerning the Edutron TBC-110 Time Base Corrector.

In the otherwise excellent January, 1975 article, "Time Base Correctors: Now It's a Wide Open Field," the following discrepancies were noted: The TBC-110 is priced at $2995.00 list, not $2950.00 as the article quoted. Its window of correction is 10 microseconds overall—not ± microseconds. The unit does not offer dropout compensation since the prerequisite for dropout compensation is a delay of at least 1 H.

In the February issue, BM/E's report on TBCs at the NAEB convention refers to the Edutron, Inc. time base corrector as ". . . a bottom of the line unit . . ." and ". . . a shift register type . . ."

While I can see how you and many others may attribute our low price to shift register savings, this is not so. Also, I want to register a strong protest to the "bottom of the line" label.

The TBC-110 time base corrector is a high quality, state-of-the-art piece of equipment that offers some *standard* features that are *optional* on some TBC's at three times the price. These include:
1. Stand-alone digital EIA sync generator with gen-lock;
2. A dull complement of outputs including Composite Sync, Composite Blanking, H-Drive, V-Drive, Burst Flag and Sub-carrier. The sync is individually adjustable within 1 microsecond lead to ½ microsecond lag with reference to sync on outgoing video;
3. Video level, Chroma Level, Chroma Phase and Set-Up are front panel contrasts. All of these controls are push-pull type with preset for internal unity gain;
4. The TBC-110 strips blanking interval information and reinserts EIA sync, burst blanking and provides luminance white & black clipping without distorting color information.

While I cannot divulge proprietary information, I can say that the price of $2995.00 is a result of our unique AC-Delay™ Active Delay technique. This technique allows us to eliminate the analog-to-digital and resultant digital-to-analog conversions, thereby eliminating that cost.

Eugene A. Zeak, Jr.
Customer Service Manager

# BM/E CLASSIFIED MARKETPLACE

**CLASSIFIED ADVERTISING RATES**

DISPLAY CLASSIFIED ADVERTISING: $32.50 per inch 1x; $30.00 per inch 6x; $27.50 per inch 12x. ALL OTHER CLASSIFIED ADVERTISING 35¢ per word; minimum $3.50. BLIND BOX NUMBER: $1.00 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.

**BM/E, Monterey and Pinola Avenues, Blue Ridge Summit, Pa. 17214 Phone 717/794/2191**

## EMPLOYMENT OPPORTUNITIES

### FIELD SERVICE ENGINEER

Extensive Travel. All Benefits. Experience in Color video and switching systems preferred. Contact: **Mr. Buzan, Vital Industries, Inc., 3700 N.E. 53rd Avenue, Gainesville, FLA. 32601 Phone: (904) 378-1581.**

## POSITION WANTED

Are things really changing? I am an experienced black newscaster-announcer-D.J. with some college. Third phone; will relocate. Tape and resume available. Box 1174-I, c/o BME, Blue Ridge Summit, PA. 17214.

### TELEVISION EQUIPMENT FOR SALE

FILM CHAIN: 1 RCA TK22, 2 B.&H. JAN type projectors, 1 Selectoslide projector and GE multiplexer.

STUDIO CAMERAS: 1 GE 4PC14 with pedestal and dolly, GPL—Singer 1200 with 10-1 zoom.

MISC: 250 hour rolls and 50 2-hour rolls of helical scan 2" tape, 1 Conrac CVA17 video monitor, 2 Ampex 660 VTR's.

FOR FURTHER INFORMATION CONTACT: Thomas G. Siglin, Sr., Chief Technician Elmira City School District, EFA—AV/TV at rear 933 Hoffman Street, Elmira, N.Y. 14905 (607) 734-4261.

SEALED BIDS ONLY WILL BE ACCEPTED, and should be directed to: Mrs. Dorene C. Novick, District Clerk Elmira City School District, 951 Hoffman Street, Elmira, New York 14905.

DATE OF BID OPENING: *2:00 p.m. May 15, 1975* (5/15/75).

All envelopes to the Clerk should be clearly marked: "Bid on TV Equipment" Due 5/8/75.

## EQUIPMENT FOR SALE

Broadcast mixer for remote out of studio programming. Can be used as inexpensive second console for college and small radio stations. D.J.'s can now originate programming at home. Simultaneous mixing of two stereo phonographs, a tape machine and a microphone. Precue for all inputs with built-in monitor headphone amplifier. Send for literature. $325. Professional discount, use letterhead. GLI, Box 2076, DEPT BM/E. Brooklyn. N.Y. 11201 Phone: (212) 875-6992.

BROADCAST AND RECORDING EQUIPMENT: Scully, V.I.F. International, Metrotech, Langevin, Electrodyne, Q.R.K., Micro-Trak, MRL, Nortronics, McMartin, U.R.E.I., E.V., A.K.G., Stevenson, Gately, D.B.X., Advent, Altec, Fairchild, Audio Designs, 3M, Magnecord, Telex, Inovonics, Nagra, Uher, Tape-Athon, Package Deals, Installations, Service, Request Flyer. Weigand Audio, Middleburg, PA. 17842. (717) 837-1444.

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., 1033 N. Sycamore Ave. Los Angeles, Calif. 90036. (213) 934-3566.

HIGH BAND QUAD, available in April. VR-1100 with complete high band signal system and TMI time base correction. $35,000 complete with new Mark 10 head; D.O.C., Vel Comp extra. J.D. Ivey Corporation, 617 West Central Blvd., Orlando, FL 32801. (305) 843-8982.

VTR's, IVC 960, 900, 820, 825, 700, 600. Great prices, well cared for machines. 900's have all the latest mods, including 3-sec lock-up. Also, used time base correctors. J.D. Ivey Corporation, 617 West Central Blvd., Orlando, FL 32801. (305) 843-8982.

MAGNECORD-VIKING-TELEX PARTS: Largest stock in the country. Factory prices. Try us for hard to find items. Dept. M, DUNN INDUSTRIES, 12157 Valliant Dr., San Antonio, TX 78216. (512) 349-2953.

STODDART NM-30A radio interference-field intensity meter. 20-400 MHz. Like New condition—1966 Manufacture. Complete with AC PS, Dipole antennas, cables, tripod, and inst. book. Calibrated prior to shipment. $1,595. Surcom Associates. (213) 382-6985.

## EQUIPMENT FOR SALE (Cont'd)

AC power line lightning arrestors. 120 VAC 25.00 per leg. 220 VAC 27.00 per leg. Single phase to three phase converters, any size transmitter. G. DuVall Co., 6838 N. Ottawa, Chicago, Ill. 60631.

MICA AND VACUUM transmitting capacitors. Large stock; immediate delivery. Price lists on request. SURCOM ASSOCIATES, 1147 Venice Boulevard, Los Angeles, Calif. 90015. (213) 382-6985.

I-T-C "ENCORE" R/P cart machine. 8 months old. Good condition, used only occasionally by production company, $600. COMPARE! Jim Pastrick, 22 Jean Terrace, Buffalo, N.Y. 14225. (716) 633-5171.

Used Ampexes, Scully's, Volumax and Audimax. Big discounts. Also new Scully's, Accu-Five mixer in stock. Write, wire or call for information on complete stock. Schafer Electronics Corporation, Goleta, CA. (805) 968-0755.

RCA TT10AH/TT25BH hi band VHF transmitter tuned to Channel 10 with sideband filter, diplexer, harmonic filters, dummy load, and some spare parts. Contact C.E., KOLR, East Division Street Rd., Springfield, Mo. (417) 862-7474.

745' Stainless G-5 TV tower, in service $17,000-cash or trade. 880' RCA 6⅛" transmission line $12,000. Write WXON-TV, Box 20, Walled Lake, Michigan 48088 or call (313) 355-2900.

WHATEVER YOUR EQUIPMENT NEEDS—new or used—check us first. We specialize in broadcast equipment. Send $1.00 for our complete listings. Broadcast Equipment and Supply Co., Box 3141, Bristol, TN 37620.

EBS RECEIVERS, dependable, all solid state. Hundreds sold since 1972. Tri-Tronics, Box 1067, Lillington, N.C. 27546.

## EQUIPMENT WANTED

WE NEED USED 250, 500, 1KW, 5KW AM Transmitters, 250, 1000 Watt FM transmitters. No junk. Guarantee Radio Supply Corp., 1314 Iturbide St., Laredo, TX. 78040.

MODULATION TRANSFORMER for RCA BTA-1L AM transmitter. WBUT, Butler, PA. 16001.

## FRANCHISES AVAILABLE

### VILLAGE OF FREDONIA AND TOWN OF POMFRET, NOTICE TO BIDDERS

Request for Proposals—The Village of Fredonia and Town of Pomfret, New York hereby invite the submission of sealed bids on a Cable Television Franchise for the above named Village and Town. Bids will be received until 4:30 P.M., Eastern Standard Time on the 15th day of April, 1975, at the Village Clerk's Office, Village Hall, at which time and place all bids will be publicly opened and read. Applications shall be prepared and submitted in accordance with specifications and notice to bidders available from the Village Clerk. Any bid submitted will be binding for 180 days subsequent to the date of bid opening.

The town of Dunkirk, NY, hereby invites the submission of field bids on a cable television franchise for the above named town. Bids will be received until 4:30 PM, EST, on the 15th day of April 1975, at the town clerks office, 11171 Urban Road, Dunkirk, NY 14048, at which time and place all bids will be publicly opened and read. Specifications and instruction for biders may be obtained at the same office on business days, other than Saturday, Sunday and holidays. The town assumes the right to reject any or all bids. Bids received after the stated hour and day shall be rejected. Any bid submitted will be binding for 180 days subsequent to the date of bid opening.

## FRANCHISES AVAILABLE (Cont'd)

### VILLAGE OF VICTOR LEGAL NOTICE

The Village of Victor in Ontario County, State of New York invites applications for a cable television franchise. Applications shall be prepared and submitted in accordance with a "Request For Proposals" available from the undersigned. Applications will be accepted until 8:00 p.m. EDST June 23, 1975 at the Village Clerk's office, Village Hall, 5 West Main Street, Victor, New York 14564. All applications received will be available for public inspection at the Clerk's Office during normal business hours.

by: Marion Carra
Village Clerk
(716) 924-3311

## PROGRAM SERVICES


"FREE" CATALOG . . . Everything for the Deejay! Custom I.D.'s, Promos, Airchecks, Wildtracks, Books, FCC Tests, Comedy, and more! Write: Command, Box 26348-A, San Francisco 94126.

Deejays! New Comedy! 11,000 classified one-line gags, $10. Catalog FREE! Edmund Orrin, 2786-M West Roberts, Fresno, CA. 93705.

## INSTRUCTIONS

First phone through tape recorded lessons at home plus one week personal instruction in Washington, D.C., Atlanta, Boston, Detroit, New Orleans, Minneapolis, Seattle, Denver, Portland, Los Angeles. Proven results. Our 17th year teaching FCC license courses. Bob Johnson Broadcast License Training, 10000 Duncan, Manhattan Beach, Calif. 90266. 213-379-4461.

Broadcast Technicians: Learn advanced electronics and earn college degree by correspondence. Free brochure. Grantham, 2006 Stoner Ave., Los Angeles, CA. 90025.

## PROFESSIONAL CARDS

**McCLANATHAN & ASSOCIATES**
*Consulting Engineers*
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PORTLAND, OREGON 97207
Phone: 503/246-8080

**Midwest Engineering Associates**
Consulting Engineers
F.W. Hannel, P.E.
BSEE; MSEE
7304 N. Oxford, Peoria, Illinois 61614
(309) 691-3426

continued on page 74

## PROFESSIONAL CARDS (Cont'd)



# NEW LIT

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

**Directory of Public Telecommunications,** 1975 edition, shows personnel, facilities and associations of all public and educational telecommunications organizations in the US. It was prepared by the National Association of Educational Broadcasters, costs $9 a copy from NAEB at 1346 Connecticut Ave., NW, Washington, D.C. 20036.

**Power transistors** for 125-watt, 400-volt applications are described in new brochure. International Rectifier Corp. **250**

Brochure describes **mini-television transmitter,** with 10 watts visual output, 1 watt on aural, for VHF, with complete switching facilities for broadcasting both tape and live programs over a local area. Acrodyne Industries. **251**

**Broadcast headphones** and private listening devices are covered in eight-page catalog, with extensive technical data. Telex Communications. **252**

**New spectrum analyzer** for CATV system measurements, Model 8557A, is overed in detail in 10-page technical catalog with extensive application notes; also available is Application Note 150-6, a 24-page treatment in depth of technology of spectrum analyzers as CATV proof of performance instruments. Hewlett-Packard. **252**

**Seven-segment numeric readouts,** in a variety of character sizes, are described fully, with technical application data, in new literature. Info-Lite Corp. **254**

Series of wide-range, **solid-state DC modular power supplies** are subject of four-page catalog, showing 32 models in eight voltage ranges, 500 to 2800 watts. Sorenson Company. **255**

New technical data sheets cover **two microphones:** Model 598S, unidirectional dynamic with hand-held lightweight case; Model SM82, hand-held dynamic with built-in kube-level-output amplifier and battery. Shure Brothers. **256**

Catalog of ancillary and **accessory equipment for CATV** includes power supplies, pilot carrier generators, CATV test equipment, connectors, taps, etc. AEL Communications Laboratory. **257**

New 48-page catalog covers entire line of **general purpose and stepping relays,** with specs, dimensional drawings, application data, complete information for relay users. Guardian Electric Mfg. Co. **258**

**Power supplies** (up to 3000 watts) and **line conditioners** are subjects of designer's handbook, showing specs, mechanical characteristics, technical application notes for large line. Tele-Dynamics. **259**

Application note covers **SCR's** their parameters, specifications, ratings, characteristics, in a wide range of applications, with detailed description of basic technology. International Rectifier Corp. **260**

**Temperature compensating miniature ceramic capacitors** are described in new catalog. Murata Corporation of America. **261**

## SALES OFFICES

**Broadband Information Services, Inc.**
274 Madison Ave.
New York, New York 10016

**EASTERN & MIDWESTERN STATES**
274 Madison Avenue
New York, New York 10016
212-685-5320
Kenneth F. Luker, Jr.

**WESTERN STATES**
1212 Hearst Building
San Francisco, California 94130
415-495-0990
William J. Healey & Associates

P.O. Box 4902
Los Angeles, California 90049
213-476-6451
Art Mandell

**JAPAN**
Nippon Keisoku Inc.
P.O. Box 410
Central Tokyo, Japan
Tokyo (03) 667-7681
Yoshi Yamamoto

## ADVERTISERS' INDEX

# BM/E-CM/E READER SERVICE CARD April 1975 Issue

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**100-249: ADS** **250-299: LITERATURE** **300-399: EDITORIAL**

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 100 | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 |
| 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | 131 | 132 | 133 | 134 | 135 | 136 | 137 | 138 | 139 |
| 140 | 141 | 142 | 143 | 144 | 145 | 146 | 147 | 148 | 149 | 150 | 151 | 152 | 153 | 154 | 155 | 156 | 157 | 158 | 159 |
| 160 | 161 | 162 | 163 | 164 | 165 | 166 | 167 | 168 | 169 | 170 | 171 | 172 | 173 | 174 | 175 | 176 | 177 | 178 | 179 |
| 180 | 181 | 182 | 183 | 184 | 185 | 186 | 187 | 188 | 189 | 190 | 191 | 192 | 193 | 194 | 195 | 196 | 197 | 198 | 199 |
| 200 | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 |
| 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 | 231 | 232 | 233 | 234 | 235 | 236 | 237 | 238 | 239 |
| 240 | 241 | 242 | 243 | 244 | 245 | 246 | 247 | 248 | 249 | 250 | 251 | 252 | 253 | 254 | 255 | 256 | 257 | 258 | 259 |
| 260 | 261 | 262 | 263 | 264 | 265 | 266 | 267 | 268 | 269 | 270 | 271 | 272 | 273 | 274 | 275 | 276 | 277 | 278 | 279 |
| 280 | 281 | 282 | 283 | 284 | 285 | 286 | 287 | 288 | 289 | 290 | 291 | 292 | 293 | 294 | 295 | 296 | 297 | 298 | 299 |
| 300 | 301 | 302 | 303 | 304 | 305 | 306 | 307 | 308 | 309 | 310 | 311 | 312 | 313 | 314 | 315 | 316 | 317 | 318 | 319 |
| 320 | 321 | 322 | 323 | 324 | 325 | 326 | 327 | 328 | 329 | 330 | 331 | 332 | 333 | 334 | 335 | 336 | 337 | 338 | 339 |
| 340 | 341 | 342 | 343 | 344 | 345 | 346 | 347 | 348 | 349 | 350 | 351 | 352 | 353 | 354 | 355 | 356 | 357 | 358 | 359 |
| 360 | 361 | 362 | 363 | 364 | 365 | 366 | 367 | 368 | 369 | 370 | 371 | 372 | 373 | 374 | 375 | 376 | 377 | 378 | 379 |
| 380 | 381 | 382 | 383 | 384 | 385 | 386 | 387 | 388 | 389 | 390 | 391 | 392 | 393 | 394 | 395 | 396 | 397 | 398 | 399 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
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| 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | 131 | 132 | 133 | 134 | 135 | 136 | 137 | 138 | 139 |
| 140 | 141 | 142 | 143 | 144 | 145 | 146 | 147 | 148 | 149 | 150 | 151 | 152 | 153 | 154 | 155 | 156 | 157 | 158 | 159 |
| 160 | 161 | 162 | 163 | 164 | 165 | 166 | 167 | 168 | 169 | 170 | 171 | 172 | 173 | 174 | 175 | 176 | 177 | 178 | 179 |
| 180 | 181 | 182 | 183 | 184 | 185 | 186 | 187 | 188 | 189 | 190 | 191 | 192 | 193 | 194 | 195 | 196 | 197 | 198 | 199 |
| 200 | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 |
| 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 | 231 | 232 | 233 | 234 | 235 | 236 | 237 | 238 | 239 |
| 240 | 241 | 242 | 243 | 244 | 245 | 246 | 247 | 248 | 249 | 250 | 251 | 252 | 253 | 254 | 255 | 256 | 257 | 258 | 259 |
| 260 | 261 | 262 | 263 | 264 | 265 | 266 | 267 | 268 | 269 | 270 | 271 | 272 | 273 | 274 | 275 | 276 | 277 | 278 | 279 |
| 280 | 281 | 282 | 283 | 284 | 285 | 286 | 287 | 288 | 289 | 290 | 291 | 292 | 293 | 294 | 295 | 296 | 297 | 298 | 299 |
| 300 | 301 | 302 | 303 | 304 | 305 | 306 | 307 | 308 | 309 | 310 | 311 | 312 | 313 | 314 | 315 | 316 | 317 | 318 | 319 |
| 320 | 321 | 322 | 323 | 324 | 325 | 326 | 327 | 328 | 329 | 330 | 331 | 332 | 333 | 334 | 335 | 336 | 337 | 338 | 339 |
| 340 | 341 | 342 | 343 | 344 | 345 | 346 | 347 | 348 | 349 | 350 | 351 | 352 | 353 | 354 | 355 | 356 | 357 | 358 | 359 |
| 360 | 361 | 362 | 363 | 364 | 365 | 366 | 367 | 368 | 369 | 370 | 371 | 372 | 373 | 374 | 375 | 376 | 377 | 378 | 379 |
| 380 | 381 | 382 | 383 | 384 | 385 | 386 | 387 | 388 | 389 | 390 | 391 | 392 | 393 | 394 | 395 | 396 | 397 | 398 | 399 |

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Station or Co. .....

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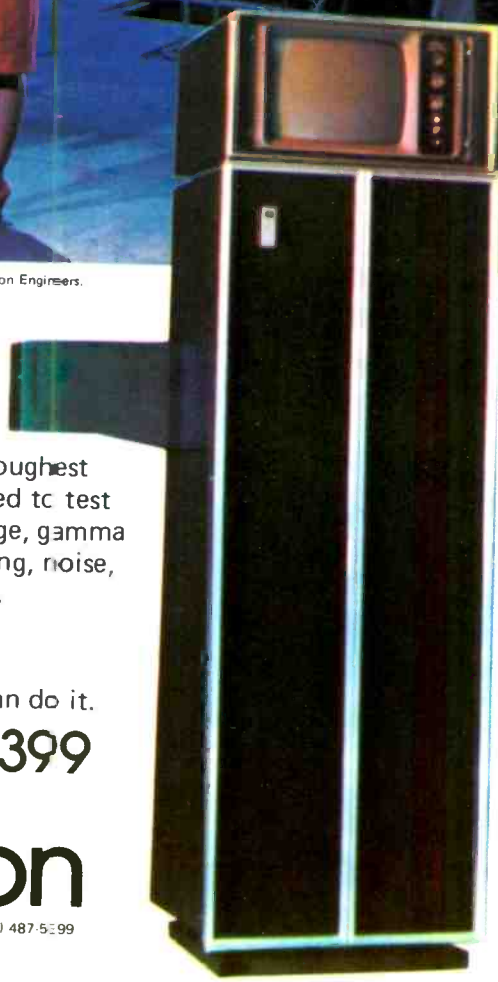

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