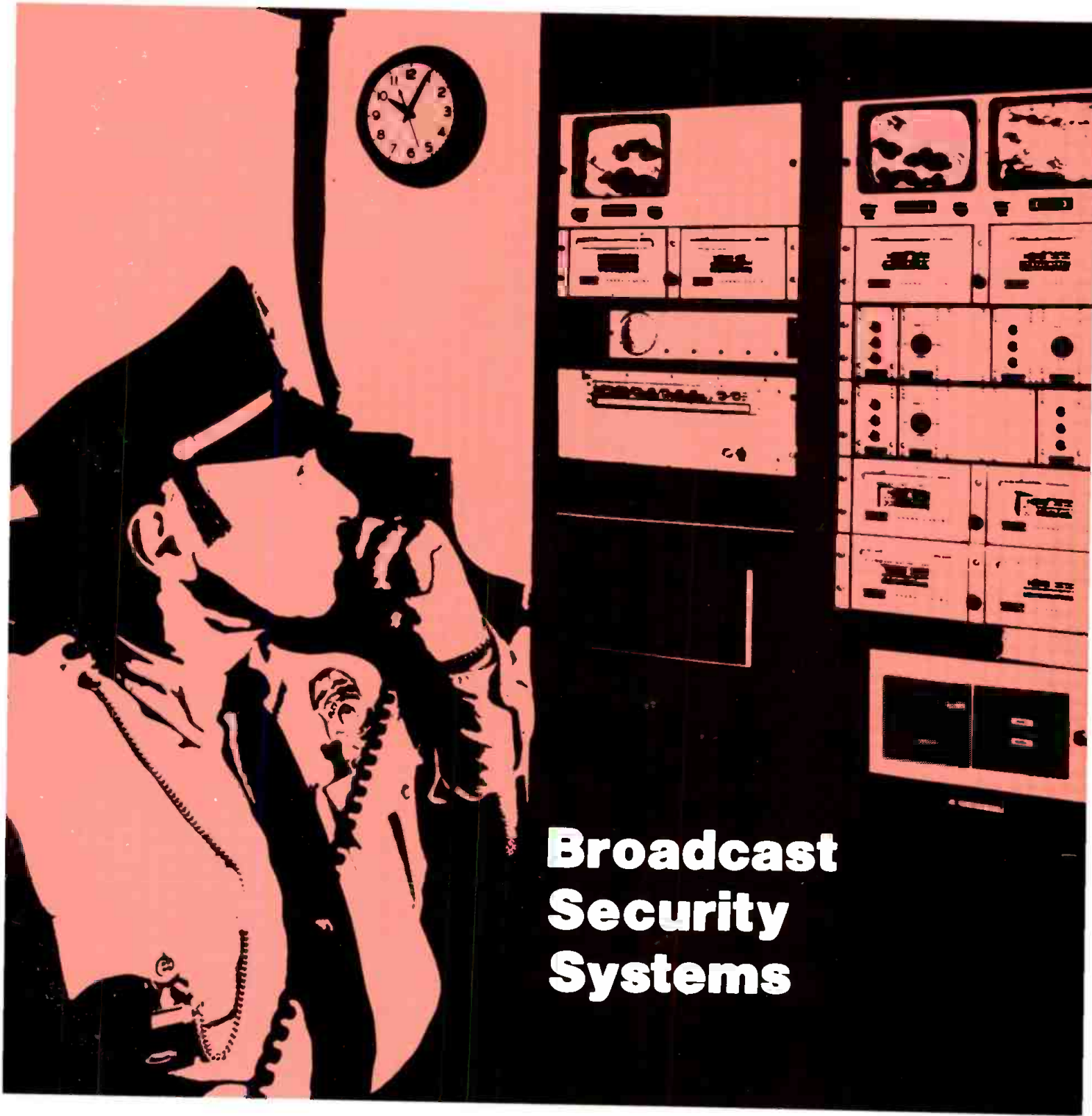


February, 1973/75 cents

# BROADCAST **engineering**

*the technical journal of the broadcast-communications industry*



## **Broadcast Security Systems**

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The Setchell Carlson Model DEM 911 UHF/VHF television demodulator is a modestly priced, all solid-state

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**BEST OF ALL...the DEM 911 is priced under \$300.00\*.**

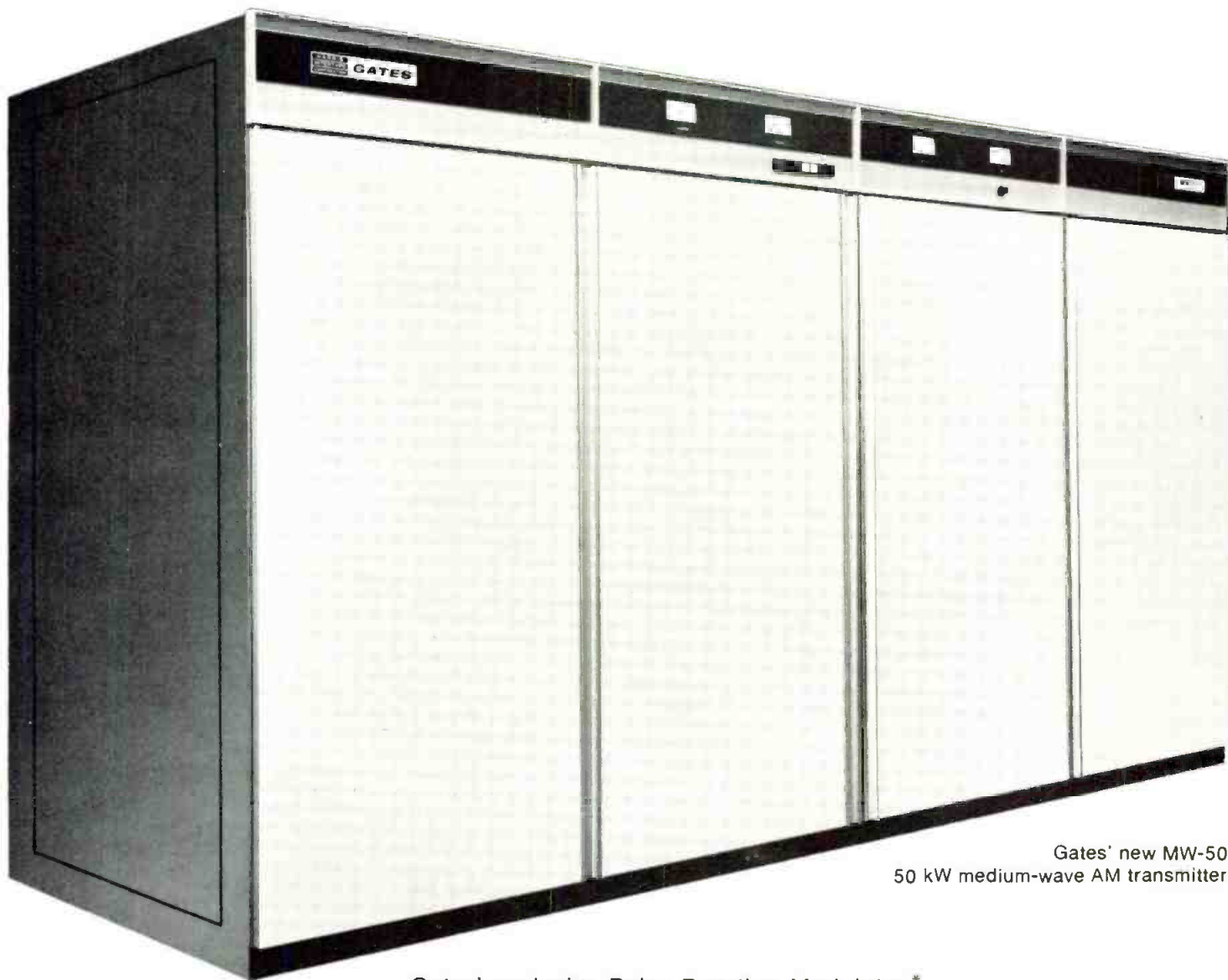
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Gates' exclusive Pulse Duration Modulator\* System is 90% efficient. That's why Gates' new MW-50, 50 kW medium-wave transmitter operates at greater than 60% overall efficiency. With greater reliability, greater frequency response, and lower power consumption than any other AM broadcast transmitter in the same power range.

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# BROADCAST engineering®

The technical journal of the broadcast-communications industry

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### ABOUT THE COVER

The cover this month shows a security officer visually checking his building. Even if your station is in a small market, we have some ideas that will bolster your security on page 18. (Picture courtesy of Cohu. Layout by Webb Streit.)

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 CARL BABCOKE, Technical  
 MORRIS COURTRIGHT, Automation  
 PAT FINNEGAN, Maintenance  
 HOWARD T. HEAD, FCC Rules  
 ROBERT A. JONES, Facilities  
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# NEW! BORDERLINE GENERATORS

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THE GVG BORDERLINE WILL-----

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PRODUCE OUTLINE LETTERING FROM  
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## 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 enhance 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 switching systems and 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.

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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 both NTSC and PAL/CCIR standards.

An optional plug-in Colorizer for coloring the insert is available with Models 3272 and 3273. With the Model 3271, insert colorizing is easily accomplished through the associated switcher or special effects.

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# DIRECT CURRENT FROM D. C.

February, 1973

by Howard T. Head

## Commission's "Re-regulation" Program Relaxes Additional Broadcast Rules

The Commission is continuing its "re-regulation" program to simplify and eliminate outdated broadcast rules, and has made a number of further changes in the rules (See Dec. 1972 BE). Changes have been made in a number of areas, the most important being in the requirement for visibility of AM and FM transmitters from the operating position, and the unattended operation of one-hop STL's. The new rules become effective April 4, 1973. A special article in next month's BE will cover the details of the changes.

In adopting this second batch of simplified rules, the Commission has concluded that the first phase of re-regulation, in which simple non-controversial matters can be disposed of, is essentially completed. The Re-Regulation Task Force will next turn to more involved matters, such as rules governing AM directional antennas, a subject of considerable concern in view of seasonal propagation effects and the difficulties which many directional licensees experience in maintaining monitoring point values within license limits. Notices of Inquiries in this and other areas are expected to issue from the Commission shortly.

## Emergency Broadcast System Closed-Circuit Tests Resume

The Commission has announced plans to resume closed-circuit tests of the Emergency Broadcast System (EBS). Such tests have been suspended since an attempt at a random closed-circuit test on September 14, 1971 ended in confusion (See Nov. 1971 D.C.).

New Commission Rules intended to eliminate earlier errors were adopted in April, 1972 and the necessary provisions to implement the new rules have been made.

## First Domestic Communications Satellites Authorized

After seven years of indecision, the Commission has finally authorized the first U.S. domestic communications satellite. Authorizations were issued to Western Union for the construction of three satellites to provide common carrier communications service. Seven earth stations are also planned.

Western Union plans to use the satellites initially for telegraph, Telex and private line services. The satellites may also be used for TV relaying.

# Ampex honored as “one of the real heroes” of the 20th Olympiad

We are proud of this letter of appreciation from ABC's Vice President in charge of Broadcast Operations and Engineering, Julius Barnathan.

American Broadcasting Company 7 West 66 Street New York New York 10023 Telephone 212 LT1-7777

Julius Barnathan  
Vice President in charge of  
Broadcast Operations and Engineering

October 16, 1972

Mr. Donald V. Kleffman  
Marketing Manager  
Audio-Video Systems Division  
Ampex Corporation  
401 Broadway  
Redwood City, California 94063

Dear Don:

Now that some of the smoke and dust of the Olympics has settled down, I would like to take this opportunity to tell you of one of the real heroes of ABC's Olympic coverage. They were the twelve AVR-1 recorders we used in Munich to record, edit and transmit over sixty-four and a half hours of programming.

We actually recorded over eight hundred hours in order to make the sixty-four and a half hours that went on the air.

The AVR-1's performed magnificently during the seventeen day period. I must point out the machines were backed up by your excellent maintenance people who were assigned to the Munich Games.

Please express to all your people who were assigned to the Munich Games our sincere gratitude.

Sincerely,



JB:pay

Ampex  
AVR-1 Broadcast  
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Recorder



If you would like to know more about the role Ampex played in the Olympic games TV coverage, write for "Olympics Brochure" to the address below.

**AMPEX**

Ampex Corporation, Audio-Video Systems Division, 401 Broadway, Redwood City, CA 94063.  
For More Details Circle (6) on Reply Card

Completion of the Western Union system is expected to require approximately two-years' time. A communications satellite for Telesat Canada was launched from Cape Kennedy on November 9, 1972.

#### Cable TV Performance Test Deadline Postponed

The Commission has extended by one year--from December 31, 1972 to December 31, 1973--the deadline for conducting performance tests to determine the extent to which cable systems comply with the technical standards adopted in April, 1972. The extension applies only to cable systems which were already in operation on March 31, 1972 (See Dec. 1972 D.C.).

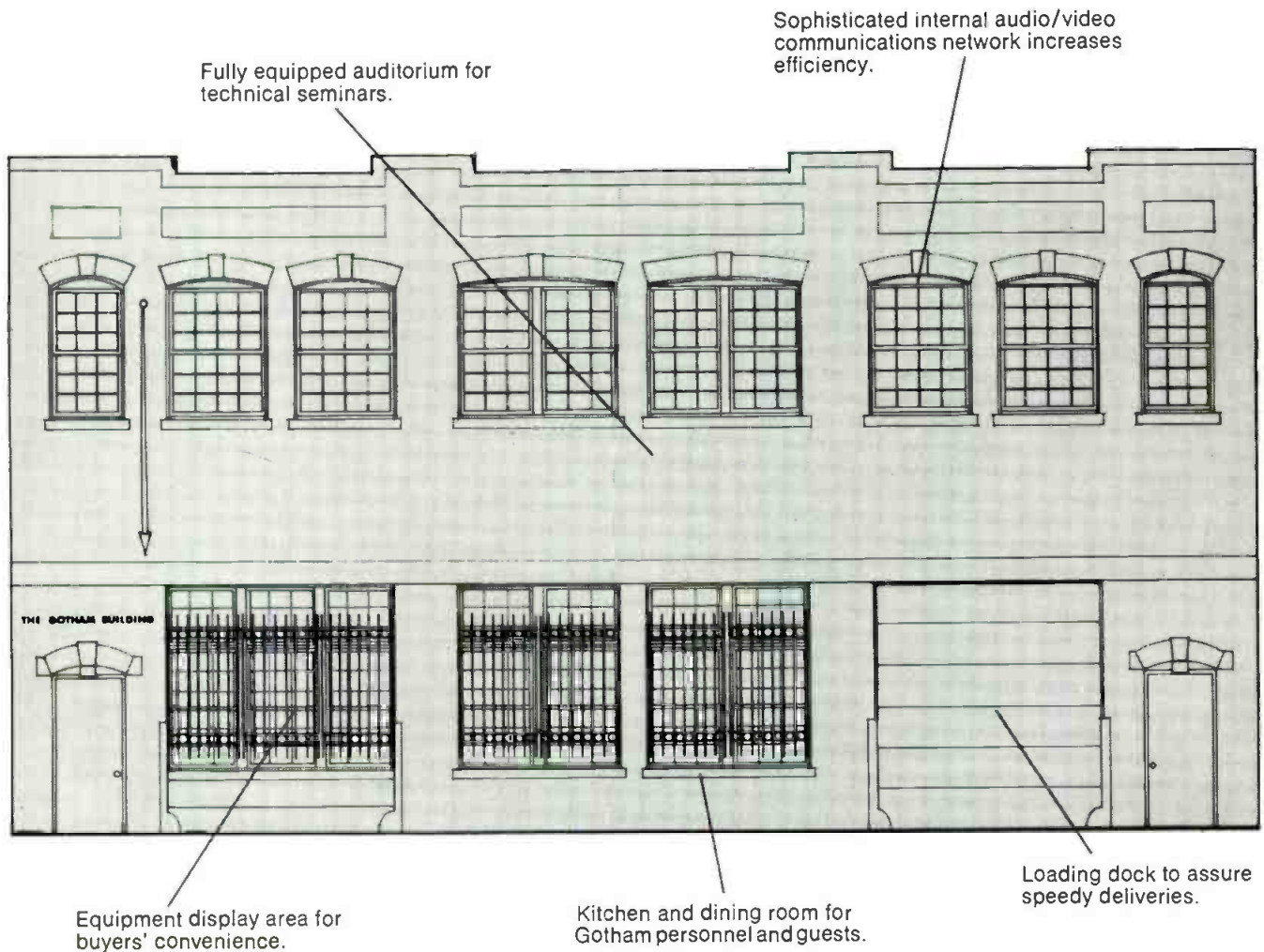
The Commission has also instituted an inquiry into special problems confronting the smaller CATV systems. The Commission noted the difficulty and expense of conducting full-scale equipment performance tests, but noted that it receives hundreds of subscriber complaints each year, and concluded that such problems could not simply be ignored. The Commission has invited comments on the possibility of relaxed technical rules to be applied to the smaller systems.

#### Short Circuits

The Commission's prototype Chicago Regional Frequency Spectrum Management Center is now in regular operation...Power flux density limits have been established near Boulder, Colo. to protect Commerce Department research work from radio interference...The Commission has proposed to increase from 20 to 30 seconds per hour the time which TV and FM translator stations may devote to locally-originated announcement...NCTA has issued a call for technical papers for the annual convention in California in June; abstracts should be submitted to NCTA, 918 16th Street, N.W., Washington, D.C. 20006 before March 1, 1973...Breathe easier: the Commission has informed the American Vegetarian Union that TV stations need not consider the matter of meat-eating vs. vegetarian diets to be a matter of public controversy... And we're nearing that time of year when we've got to start making plans to attend the March conventions. The SBE probably will precede the NAB. This year's NAB convention will be held in Washington, D.C.



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You're looking at an architect's drawing of the new Gotham Building at 741 Washington Street.

Located in downtown New York City, it took three years to design and build this ultra-modern installation.

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## LETTERS TO THE EDITOR

### Engineering Apprenticeship

**Dear Editor:**

I've studied with interest the exchange of ideas in the Letters to the Editor column over the past months regarding the license/title controversy and would like to add my observations to those of my colleagues.

The basis of the entire question seems to be tied directly to the present FCC licensing setup. The first class license, thus accessibility to the title of engineer, is available to anyone who can pass the appropriate exam elements. This license also opens a broad selection of fields to the holder, in that he or she is considered legally qualified to work in any technical capacity within the AM, FM, and TV broadcast industry or in the communications industry. I believe we should have a license giving this type of flexibility, but I do not feel it is proper to award this level of license solely on the basis of having passed an examination.

We should always be alert to ways of improving the quality of our product, i.e., the air signal, the condition of our equipment, and the operation of same. I feel that one useful method of improvement lies in an age-old tradition that we in electronics seem to have largely thrown out! **Apprenticeship.** It seems to me that the FCC should apply some delineation in the licensing program; e.g. changing the concept of broadcast licensing to require different licenses for working in the various services, allowing progression by a combination of experience level and acquisition of technical knowledge. The top of this progress ladder could be a license with privileges similar to the present first class license, with higher scholastic requirements and more experience being necessary than for other licenses.

This may sound like incentive

licensing, and it is. But I believe that a system such as this, if it could be equitably worked out, could improve the sound from your radio and the picture on your screen by virtue of having made engineers interested in becoming more professional in their jobs. Then there would be no arguments arising concerning the use of the title, as those who obtained the first class license would have well proven their scholastic and practical abilities and would have earned the right to be called an engineer.

To summarize, I would say continue giving licenses to those who attend school or study correspondence courses and pass an exam. But place a few restrictions on these individuals and require a period of service in the field before upgrading a licensee to a higher license.

Experience in any field generally changes a person's concept of that field, and definitely improves his performance if he is even slightly motivated to progress. The profession would command more respect and engineers would be better qualified to carry the title of broadcast engineer if they were required to obtain a level of experience before being designated "engineer".

**Joseph L. Comer**  
Asst. to the CE  
WPTZ-TV  
Plattsburgh, N.Y.

### Comments On Monitor Reading

**Dear Editor:**

I would like to comment upon the letter (Oct. 1972 BE) about "offsetting" the carrier control on an older modulation monitor in order to read higher modulation than the present scale permits. By

doing what the fellow indicates, one incurs serious error in modulation readings.

Take a simple example:  $M(t) = c K w_m(t)$  where  $M(t)$  is the modulation reading on the meter,  $K$  is the percentage of modulation being transmitted,  $w_m(t)$  is the transmitted modulation frequency, and  $c$  is the constant of the carrier control.

If the constant term is lowered to 0.8 of its value, (80 percent instead of 100 percent), as the writer suggests, the meters indication would indeed read 80 percent when actually transmitting 100 percent. However, when the modulation is raised to, say 10 percent greater or 110 percent, we find that 0.8 times 110 percent is 88 percent and not 90 percent as indicated by the writer. Working back, we find that a reading of 90 percent on the meter represents 112.5 percent. Carrying this one step further, a reading of 100 percent on the modulation meter corresponds to 125 percent modulation actually transmitted, or a 5 percent error, which would

clearly indicate that the writer is treading on thin ice. The implication is that one adds 20 percent to the reading when in reality the relationship is proportional.

I am assuming that the monitor is in perfect linear condition, which, if that old, is doubtful. Any non-linearity would further complicate the error. Rarely can one get something for nothing these days as the writer seems to imply.

**Robert E. Klacza**  
**Modulus Recording**  
**Taylor, Mich.**

## The Ultimate Rig

**Dear Editor:**

The little poem below alludes to a heart attack that I had in 1969. It hangs at my transmitter to remind a tired old country engineer to offer his thanks to the man upstairs.

### "A Country Engineer's Prayer"

Thank you Lord for letting me stay

To see the dawn of each new day

I remember the night they watched the scope

And all I had was one slim hope

When my crystal failed, and drive was low

And overload lights were all aglow

Then a hand from way on high

Pushed the button for one more try

Thanks again, oh Heavenly hand,

A few cycles off, but still in the band

So when my carrier leaves the air  
Give me a place to work up there

I've worked them all both small and big

But never worked on a golden rig.

**Marlin W. Moss, CE**  
**WWKE Radio**  
**Ocala, Fla.**

---

**SEND YOUR  
LETTERS TO THE EDITOR  
to  
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# What they don't hear... can do wonders for your ratings!

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Now you can broadcast discs, cartridges, and tapes with little or no distortion, full dynamic range and very low noise.

The Dynamic Noise Filter is an automatically variable bandpass filter whose bandwidth changes rapidly with each musical note and whose high and low frequency cutoffs are independently controlled by the spectral content of the input signal.

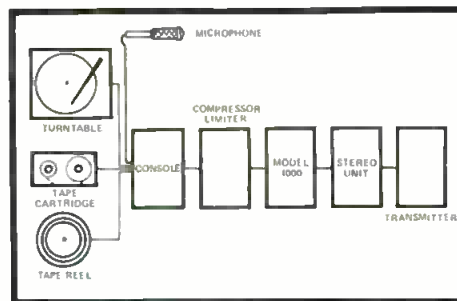
No signal encoding is required. When installed in your broadcast chain, the Dynamic Noise Filter will reduce the cumulative noise from all sources preceding it 10-11 dB with no audible effect on the music or speech. This is

accomplished with no less than 40 operational amplifiers and other precision components which provide 100 dB dynamic range with high accuracy, flat response over the entire range.

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# The History Savers at work.



David Hall and Sam Sanders discuss a fine point.

The Rodgers and Hammerstein Archives of Recorded Sound encompass virtually the entire history of recorded sound. But to get these early (and often irreplaceable) discs onto tape wasn't easy. Because until the recording industry established its own standards, playing speeds, groove widths and depths were widely varied.

Stanton engineers worked closely with Archive Head David Hall and engineer Sam Sanders when the Archive Preservation Laboratory was being set up. Standard Stanton 681 cartridge bodies were chosen for their superior reproduction characteristics. However, some 30 different stylus types had to be prepared to give the tape transfer operation the variety needed to match the various old groove specifications. Each was hand-made by Stanton engineers to fit a particular disc's requirements. One of the special styli will enable every last bit of material to be extracted from these recorded rarities.

It goes without saying that a company willing to take such care in helping to preserve recorded history must also be interested in superior reproduction of today's high fidelity pressings. Which is one reason why Stanton cartridges remain the choice of professionals the world over.

*For an informative brochure about our professional-quality cartridges, write to Stanton Magnetics, Inc., Terminal Drive, Plainview, N.Y. 11803.*



**STANTON**

All Stanton cartridges are designed for use with all 2 and 4 channel matrix derived compatible systems.

## EBS Will Try Again

The October 14, 1971 order suspending closed circuit tests of the Emergency Broadcast System has been revoked and resumption of the tests authorized by the FCC.

EBS, which went into effect December 30, 1970, underwent its first random closed circuit test on January 11, 1971. This test disclosed a number of operational deficiencies. On February 20, 1971, an employee of the U.S. Army Strategic Communications Command transmitted an Emergency Action Notification in error, causing considerable confusion among the broadcast stations

making up the EBS. While recommendations for changes in the EBS were under consideration by the Commission, another random closed circuit test was conducted on September 14, 1971. Again, a large number of operational deficiencies were disclosed. On October 14, 1971, the Commission ordered a suspension of closed circuit tests of the EBS until further notice.

After a review of recommendations for revisions of the system, the Commission adopted new EBS rules designed to eliminate errors in an order adopted April 5, 1972.

## WBRU to 50,000 Watts



WBRU-FM's student managing staff stand proudly beside the station's new 50,000 Watt tower in Providence, R.I. They are (left to right, bottom row), John Rodman, Program Director; Bette Schultz, Business Manager; Mike Jucean, News Director; (top left) David Percelay, General Manager and Carl Chalek, Chief Engineer. WBRU is owned by the Brown Broadcasting Service Inc. a non-profit corporation, whose board is comprised of Brown University Alumni.

In reinstating the tests, it said that since the equipment and services for the new system have been installed, and the system tested from the originating points to the networks and wire services, it is appropriate that plans be developed for scheduled and random closed circuit tests of the entire National-Level interconnecting systems.

## Automatic Tone Warning Bleeped

In response to views by broadcast licensees expressing a preference for pre-recording "on the air" telephone conversations and contending that there is no longer a need for a "beep tone," the FCC has waived automatic tone warning requirements for recording two-way telephone conversations for broadcast.

The "beep tone" requirement, adopted November 26, 1947 and May 20, 1948, was based upon "the importance and desirability of privacy in telephone conversations" (Docket 6787). It specified that "the use of recording devices should be permitted only when measures are in effect that assure notification to the parties that their conversation is being recorded." At that time, the transmission of a distinctive "beep tone" was considered the best of optional modes available, and for the past 25 years, the "beep tone" has been recognized as an automatic audible warning to a party that a call was being recorded and he had the option of asking that the recording be stopped or of ending the conversation.

In 1970, the Commission adopted new broadcast rules in Docket 18601 which require that a broadcast licensee, prior to recording a telephone conversation for broadcast, inform the other party to the call that the station intends to broadcast the conversation.

The Commission said that the new rules make the "beep tone" unnecessary because if a broadcast licensee complies with the new rules, the parties to the conversation are aware that the licensee intends to put it on the air, and they

## Translator Announcements Time

Amendment of the rules to allow TV and FM translator stations to increase time from 20 to 30 seconds an hour for the broadcast of locally originated announcements, has been proposed by the Commission

in a rulemaking notice.

The proposal would amend the TV translator rules Section 74.731 (f), and the FM translator rules Section 74.1231 (f). The National Translator Association (NTA) asked that the rules be amended to increase the period of time during which locally generated signals may be transmitted over UHF TV broadcast translator stations.

Section 74.731(f) currently permits the transmission of still photographs, slides and recorded voice announcements for a period not to exceed 20 seconds at intervals of not less than one hour. NTA pointed out that at the time the rule was adopted, in Docket 15971, TV stations were using 20-second commercials, but the general practice now seems to be to use 30-second commercials. When a translator originates its own commercial announcement of 20 sec-

have already agreed to the loss of privacy that would otherwise be protected by the "beep tone."

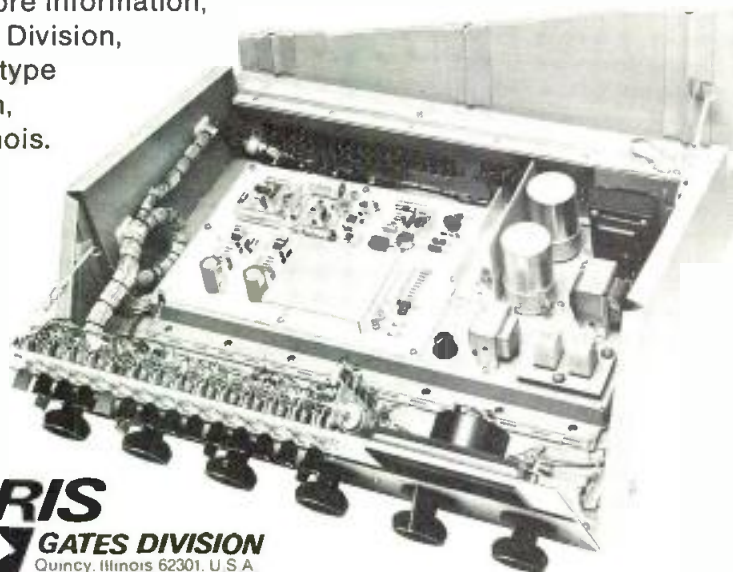
The Commission, noting that the Bell System had indicated that if the "beep tone" is waived then its companies would amend the tariffs to provide for an appropriate exception for the recording of two-way telephone conversations for broadcast purposes, authorized the American Telephone and Telegraph Company to file such tariff revisions.

## Once you look inside the STUDIOETTE 80, you'll buy it.

You'll see why the new Studioette 80 is the quality buy of solid state, 4-channel audio consoles.

In the Studioette 80, 13 inputs into 4 mixing channels provide maximum flexibility. All inputs and outputs are protected by isolation transformers. Wire-wound, step-type attenuators, used in each of the 4 mixer channels, assure quiet and reliable audio operation.

For more information, write Gates Division, Harris-Intertype Corporation, Quincy, Illinois.



**HARRIS**  
GATES DIVISION  
Quincy, Illinois 62301, U.S.A.

onds, NTA said, it is left with 10 seconds of the primary station's commercial and this is confusing to viewers.

The Commission said it could not accept NTA's request as a petition for rule making because it does not comply with the rules governing petitions for rule making

but was issuing the notice on its own motion. Interested parties may file comments by January 29, 1973, and replies by February 8, 1973. (Action by the Commission December 14, 1972, by Notice of Proposed Rule Making. Commissioners Burch (Chairman), Robert E. Lee, Johnson, H. Rex Lee, Reid, Wiley and Hooks.)

cerning the appropriate methodology for performing the tests, a scarcity of testing equipment and too few qualified engineering consultants to conduct the tests. In addition, it said that the testing was a burdensome expense to smaller systems. Comments were received from a substantial portion of the cable TV industry, two engineering consulting firms and the Association of Maximum Service Telecasters (AMST).

The Commission said that based on the information it received "there is little doubt that the necessity of complying with Section 76.601(c) is causing many problems throughout the cable television industry." Since cable systems have been on notice for more than a year that they would have to conduct performance tests, the Commission said, industry efforts to prepare for compliance "could have been more strenuous."

## Cable Tech Rules Postponed

The final date for cable TV operators who were in operation on March 31, 1972 to comply initially with Section 76.601(c) of the Commission's rules which requires each cable system to conduct complete performance tests of the system at least once each calendar year (at intervals not to exceed 14 months) has been postponed from December 31, 1972 to December 31, 1973 by the FCC.

The performance tests are to determine the extent to which the system complies with all the tech-

nical standards set forth in Section 76.605. The cable TV rules became effective March 31, 1972, and so the first performance tests were required by December 31, 1972.

In response to a petition by the National Cable Television Association (NCTA) urging that the compliance date be postponed to December 31, 1973, the Commission, by Public Notice of October 16, 1972, requested interested parties to comment on this matter. NCTA argued that there was uncertainty within the industry con-

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## Call goes out for SBE tech articles

Through these pages, provided by special arrangement with the publisher of *Broadcast Engineering* magazine, members of the Society of Broadcast Engineers, Inc., may now communicate with each other. SBE headquarters can pass along information to the general membership, report and announce information concerning their meetings or other activities, and we can air issues of vital concern to all of us who are employed one way or another in the field of broadcast engineering.

A means of communication is vital to any organization. Let's realize the potential of this unusual opportunity which is now made available to us.

Here are some reminders from SBE Headquarters: **Chapter Chairmen:** Be sure not to overlook obtaining annual rebates from SBE headquarters. A rebate of up to \$100 is possible based on membership attendance for the previous year. To obtain this rebate it is necessary to complete the Annual Attendance Report Form which may be obtained from Virginia Doss, Asst. Sec'y-Treas., SBE,

P.O. Box 88123, Indianapolis, Ind. 46208. Virginia would also like chapters to remind members that attractive SBE tie tacks are available from her for \$3.50 (members only).

When corresponding with SBE about your membership, include your membership number. Be sure

to submit change of address promptly.

Letters to The Editor, Chapter News, Articles, and other information for publication should be sent to the SBE Editor, P.O. Box 131, Dunmore, Pa. 18512. We are in need of technical articles for publication.

## Chapter news review

### Chapter News

**Chapter 1—Binghamton, N. Y.**  
**Chairman: Larry Taylor,**  
**WENY TV, Mark Twain Hotel,**  
**Elmira, N. Y. 14901**

"An Introduction Into the World of IC's" was the topic presented by Ron Shoemaker on Dec. 12th at the Owego Treadway Inn. The talk was preceded by dinner at 6 PM. A business session was included, along with a raffle of Christmas cheer. Gaylord Ewing displayed early era radios, including an Atwater-Kent, a few Federals, and a crystal set.

**Chapter 2—Northeastern, Pennsylvania**

**Chairman: Charles Morgan,**  
**Chief Engineer, WARM, Avoca,**  
**Pa. 18641**

The chapter met on December 4th at 8 PM at the Airport Conference Room, to hear Ed Gately, president of Gately Electronics, talk on Multi-Channel Mixing Consoles and Their Application in Radio and Television Broadcasting. Also discussed were applications and features of professional tape recorders as are available from Sculley Recording Instrument Co. The chapter board of

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2	a. _____ b. _____				

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 Field of Activity: \_\_\_\_\_ Radio \_\_\_\_\_ Television \_\_\_\_\_  
 Other \_\_\_\_\_

EDUCATION:

TYPE OF SCHOOL	NAME AND ADDRESS OF SCHOOL	COURSE	NUMBER OF YRS. COMPLETED	GRADUATE? DEGREES?	LAST YEAR ATTENDED
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Trade or Mechanical					
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I agree to abide by the Constitution and By-Laws of the Society if admitted.

ADMISSIONS COMMITTEE ACTION: Date \_\_\_\_\_ Approved for Grade \_\_\_\_\_  
 Action Deferred for More Information \_\_\_\_\_ Candidate Notified \_\_\_\_\_  
 Chairman's Signature \_\_\_\_\_ Entered in Records \_\_\_\_\_

Be Sure To Sign



directors, having been selected as a nominating committee by the chairman, have picked a slate of nominees for the election, now scheduled for the January meeting.

**Chapter 9 - Phoenix, Arizona**  
**Chairman: Charles Deen, KOOL TV**

**511 W. Adams, Phoenix, Ariz. 85003**

(Editors note: The preceding issue of the Journal did not include a report on meetings of Chapter 9. Since then, the information included herein has been received).

The September meeting was held at KOOL TV and centered around a program on Digital Techniques Applied to Television. The program was presented by Telemation.

The October meeting, held October 20th at the Electrical Engineering Laboratory, University of Arizona at Tucson, was conducted by engineering professors Dr. R. L. Call and Dr. D. J. Hamilton. The professors hosted a tour of the integrated circuits fabricating laboratory. This was followed by a computer demonstration of the PDP-9 in the simulation of dynamic systems using Dare I and Dare II simulation languages by Ralph Martinez, T.A. The program was arranged by SBE member Charles M. Glickman, senior electronics technician of Electrical Engineering and chief TV engineer of the new "Microcampus" worldwide teaching by video tape.

Chapter 9 has encouraged its members to begin or continue education by means of "Microcampus". Microcampus is described as the new University of Arizona College of Engineering Learn-At-Work Program which brings the classroom to students via videocassette. Courses are for credit or just for knowledge improvement. At least 125 people around Arizona are enrolled in courses.

The December meeting included the annual Christmas party which was held at the Islands, in Phoenix. The party was preceded by a technical session on Lasers, Masers, and Holography, which was provided by Fred Morrisson, an instructor in the electronic division at

Phoenix College.

The January meeting centered on a talk by Jack Williams, President of Pacific Recorders and Engineer Corp. His talk on Ampex recorders will be reported in greater detail in the next issue.

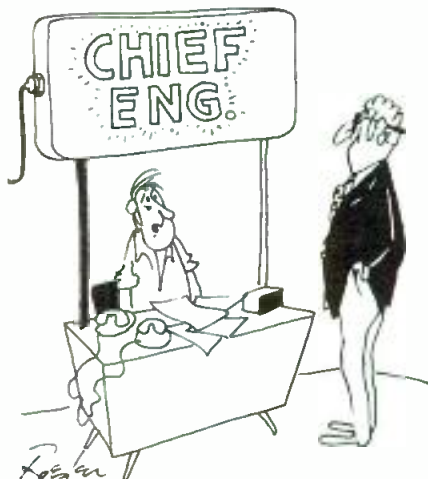
Chapter 9 has arranged for a continuing address for the Arizona chapter: Society of Broadcast Engineers, Chapter 9, P.O. Box 615, Phoenix, Ariz. 85001.

**Chapter 15 - New York, N. Y.**  
**Chairman: Frank Garufy, WOR Mutual TV,**  
**1400 Broadway, New York, N. Y. 10018**

Details on recent meetings have not been received. However, the chapter would like all interested persons to feel welcome to attend its meetings, held the 2nd Thursday of each month at the WQXR studios on 43rd St., New York, and to use the cafeteria facilities of the New York Times. Further information on the New York chapter meetings may be obtained from Mr. Garufy, address given above, or from Edwin T. Karl, consulting communications engineer, 63 Cranberry St., Central Islip, New York 11722, telephone (516) 234-4851.

**Chapter 16 - Seattle, Wash.**  
**Chairman: Clay Freinwald,**  
**KMO Radio, Box 1277, Tacoma, Wash. 98401**

Usually the chapter meeting date is the 2nd Wednesday. This month,



"THANKS FOR THE NEW TITLE, BUT I'D RATHER HAVE THE RAISE."

it was held on the 2nd Tuesday, December 12th, at the Black Angus Restaurant. A social hour at 11:30 AM was followed by lunch at noon, then a discussion by Robert Manahan, district sales manager for TV equipment, and Vern Killian, TV RF Products manager, both of Gates Division, Harris Intertype, on the new Gates dual TV transmitters with IF modulation. Bob Dietsch, local FCC engineer, reported on new rules going into effect the same week as the meeting.

A chapter news item of national significance is that KING TV's NW Mobile TV production truck was loaded on the carrier TICONDEROGA for pool network coverage of the Apollo splashdown. Personnel involved were Stan Carlson, Don Mingst, and Bob Howard of NW Mobile; and Bud Johnson and George Kasahara of KING TV, plus others from Portland and California doing the crew duties.

**Chapter 17 - Minneapolis - St. Paul, Minn.**  
**Chairman: Lance Raygor, CCTV,**  
**University of Minnesota, Minneapolis 55413**

The December meeting was cancelled because it was not possible for the speaker to keep the meeting date. A January meeting, announced about deadline time for this issue, was scheduled for January 17th at KTIS radio station, 7:30 PM, was to include a talk by Lewis Munn, network engineer for Northwestern College Radio, on the Uses of Computers in the Design of AM Directional Arrays.

Chairman Raygor has advised the chapter's membership that some openings exist on various committees. Persons interested in being considered for these openings should contact Mr. Raygor at the earliest opportunity. This is an unusual chance to play an important part in helping to run one of the largest and most important chapters of the SBE.

**Make Plans  
For Convention  
Now!**

**Chapter 20 - Pittsburgh, Pa.**  
**Chairman: Henry R. Kaiser,**  
**WWSW,**  
**1 Alleghany Square, Pittsburgh, Pa.**  
**15212**

At the November 16th meeting, held at Buddies Restaurant, as is usual, Chairman Kaiser gave a rundown on the SBE's recent arrangement with **Broadcast Engineering** to publish our Journal as a supplementary insert. The chairman also gave a brief "whats new" review, covering a 2-kW water-cooled transistor heat sink, the H.P. pocket Electronic Calculator, the new NASA Illiac IV, 200-million-bit super computer, new FCC regulations reducing operating logging to 3-hour intervals and once-a-week transmitter inspections. The main program was a presentation and demonstration of video cassettes. Off-air news, recorded during the luncheon was played back on another machine, in full color; equipment and presentation was arranged by Anthony Viviano and Bob King of Radio Parts Co., and Frank M. Davis, of 3-M Company.

**Chapter 23 - Portland, Maine**  
**Chairman: Roland A. Desjardines,**  
**WCBB TV, Box 958, Lewiston,**  
**Maine 04240**

Despite a record snow storm and extremely hazardous road conditions, attendance at the Holiday Inn on November 14th was fairly good. Members and guests heard Steve Kerman, manager, Tektronix Product Development, and former chief engineer of WRPI, speak on "The Tektronix Answer System" which is a system that enables remote monitoring of TV performance over conventional voice-grade telephone circuits by digitizing the television waveform. With the advent of remote control of television transmitters and TV station involvement with common carrier intercity relay work, the introduction of this new equipment is very timely. Potentially considerable savings can result from its use.

**Chapter 26 - Chicago, Ill.**  
**Chairman: Bradley Anderson,**  
**Univ. of Illinois, Box 6998, Chicago,**  
**Ill. 60680**

As a result of election at the meeting of December 13th, officers

and directors of the chapter are now:

Chairman: Bradley Anderson, University of Illinois, Box 6998, Chicago 60680. Vice Chairman: Robert Churchill, Telemation 3200 West Lake Ave., Glenview 60025. Sec'y-Treas.: James L. Grinnell, American Broadcasting, 190 N. State, Chicago. Past Chairman: Kenneth Steininger, Broadcast Communications 2425 Main St., Evanston. Directors: Richard Woodka, N B C; Warren Schultz, WKFM.

Also, appointed as publicity chairman was Robert Jones, 72 S. LaGrange Rd., LaGrange, Ill. 60525.

**Chapter 28 - Milwaukee, Wisconsin**  
**Chairman: Ed Wille, KenCom**  
**7835 W. Caldwell St., Milwaukee,**  
**Wisconsin 53218**

In spite of inclement weather, good attendance prevailed at the Dec. 12th meeting at WTMJ studios. Mr. Lucien Feldt of Rhode and Schwarz covered the latest broadcast related test gear offered by his company including the R&S demodulator and the new Videoskop III. The special features were explained in detail. A question and answer period followed.

During the business session of the chapter the motion was carried by voice vote that "Chapter 28 of the Society of Broadcast Engineers endorse the proposal made by Hartford N. Gunn, Jr., President of Public Broadcasting Service, in which he suggests the establishment of a joint committee comprised of broadcasters, common carriers, and TV set manufacturers for the purpose of studying ways to improve the technical quality of television program audio, by offering our chapter's assistance in any way which is within the capabilities of our membership."

**Chapter 29 - Corpus Christi, Texas**  
**Chairman: Arthur T. Jones,**  
**KCCT Radio, Corpus Christi,**  
**Texas**

The chapter met on November 14th at Luby'd Cafeteria. Presiding officer was Claude E. Sessions, Jr., chapter Secretary-Treasurer. A committee was appointed to nominate members for the positions of Chairman, Vice-Chairman, and Secretary-Treasurer. The committee is headed by Leo Burch of KRYS radio; he is assisted by Mark Parma of KEYS radio and Bob Douglas of Douglas Electronics.

## Four New Chapters Forming

The following locations represent possible future chapters. Information on any planned organizational or technical meetings may be obtained from the individual listed as the contact in each case. Anyone interested in information of a chapter in other locations may

contact SBE President Robert Flanders, P.O. Box 88123, Indianapolis, Indiana, 46208, or at WRTV, 1330 N. Meridian St., Indianapolis. It is also requested that you keep the SBE Journal editor advised at P.O. Box 131, Dunmore, Pa. 18512.

Location	Contact
Tucson, Arizona	H. J. "Bart" Paine, Telephone 882-6644 or Chuck Deen, KOOL TV, 511 W. Adams, Phoenix, Telephone 271 2345
Miami, Florida	John Blattner, 11001 N. Kendall Dr. Apt. A107, Miami 33156
St. Louis, Mo.	Arthur H. Rounds, 1321 Aspen Drive, Florissant, Mo. 63031
Puerto Rico:	Bob Buerket, Asst. Chief Engineer, WRIK TV, Ponce/San Juan, Puerto Rico. Phone (809) 724-7575

# CABLE engineering

*in this issue...*

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**Cable News** ..... CE-2      **New Products** ..... CE-10



# Cable Employment Predictions Soar

The U. S. Department of Commerce Office of Telecommunications, investigating new areas of employment for presently unemployed technical and engineering personnel, predicts that the cable television industry may need up to 50,000 additional technicians and engineers in the next five years.

This prediction is based on DOC's analysis of a manpower requirement survey distributed by NCTA in cooperation with DOC, the Institute of Electrical and Electronics Engineers, American Institute of Aeronautics and Astronautics, National Society of Professional Engineers and the Electronic Industries Association. The questionnaire, which requested detailed employment data from cable system operators, cable construction companies and cable and equipment manufacturers, was sent out last May.

Based on DOC's evaluation of the responses and its growth predictions for the CATV industry, the study concludes that "... there are jobs open at the present time in the CATV industry. Many more openings are anticipated, particularly in the top 100 markets where CATV has yet to arrive."

It recommends that immediate steps be taken to draw up and implement joint government-industry plans for training and re-training technicians and engineers for employment in the CATV industry. The study presents 45 provisional job specifications to act as guidelines for drawing up industry-wide job specifications. It announces that the Department of Labor has agreed to include these specifications and related data in its computer program matching jobs to job applicants (National Registry for Engineers and Scientists.)

Edward J. Roth, consultant to DOC's Office of Telecommunications, who wrote the study, stresses that its survey statistics

are "ball park" figures intended to be accurate but not precise. DOC estimates there are more than 2,000 technical jobs now open in the CATV industry and that 7,000 more positions will open up in the next 15 months.

## Huge Cable Growth Coming

In their response to the survey questionnaires, cable system operators predicted that their engineering and technical manpower needs would expand 70% by 1973 and 199% by 1977. Extrapolating from these predictions, the DOC study estimates that between 15,000 and 29,000 new technical jobs will open up in the cable systems operation side of the industry

by 1977.

Based on cable construction firms' predictions of a 349% growth in their engineering and manpower requirements by 1977, the study predicts that from 10,500 to 21,000 new jobs will open up in the cable construction field by 1977. And based on cable and equipment manufacturers' estimates of a 328% growth rate for engineering and technical requirements, the study predicts from 3,275 to 6,550 new jobs will open up in that phase of cable television by 1977.

The DOC study represents a unique government-industry cooperation effort to define a problem and take the first steps toward solving it. A summary is available from NCTA.

## TheatreVision Starts In Florida

TheatreVisioN, Inc., a Chromalloy American/Laser Link affiliate, has launched in Sarasota the first extensive market test of its pay television system.

Dore Schary, former production chief of both MGM and RKO and TheatreVisioN's president and chief executive officer, said that the company planned to have 1,000 of its electronic "ticket boxes" in-

stalled in homes in the Sarasota area by Jan. 1.

In addition, Schary said, TheatreVisioN is installing an additional 500 units in four Sarasota-area motels.

Schary was joined at the opening ceremonies at the University Club here by actor Ralph Bellamy, a member of TheatreVisioN's board of directors.

Based on the Sarasota test results, Schary said, TheatreVisioN plans to announce additional multiple-production entertainment packages in cable TV market areas already committed to the company.

The TheatreVisioN experiment, the only such home test underway in the East, is being carried to viewers in Sarasota via cable television facilities leased from Storer Broadcasting Co. The test is also Storer's first venture in the new pay television field.

TheatreVisioN had already announced an extensive hotel test of its system at the 135-room

*Continued on CE-8*



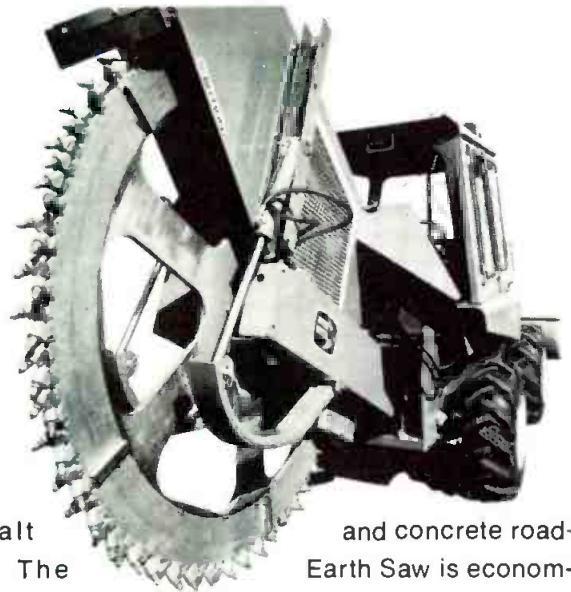
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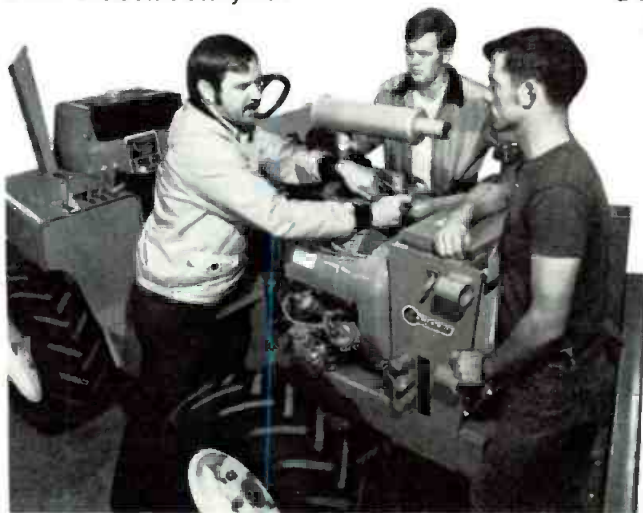


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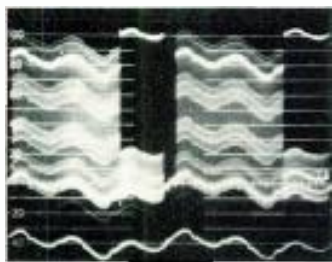
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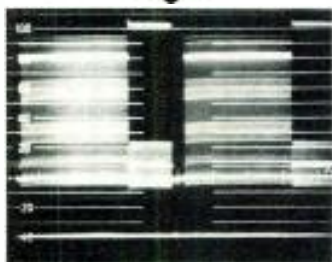
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CE-4

## Part 1 of a Series

# Annual Measurements For Cable TV

By Archer Taylor

This series of six installments has been prepared in an effort to help cable television technicians better understand the test procedures required under the new FCC Technical Rules. The theme of the series is to explain how a small system can comply with the annual measurement rule without excessive cost.

It is not the intent of this series to outline the best techniques of measurement. In fact, many of the procedures to be described are crude, and imprecise. Certainly, any professional engineer asked to perform measurements to determine compliance would expect to use professional methods, with sophisticated (and necessarily costly) equipment.

It should be understood, however, that the annual measurements required by Sec. 76.601(c) need only represent a bona fide effort, "directed at determining the extent of compliance". They are not a "proof of performance" required to "prove compliance" beyond any reasonable doubt. FCC Field Engineers (the "RI") may someday be in a position to issue citations for non-compliance with one of the technical standards, and additional tests may be required, from time to time, in accordance with Sec. 76.601(d) and 76.601(c).

Unfortunately, experience in broadcasting provides little assurance that FCC Field Engineers may not, on occasion, issue unreasonable citations. There is probably no way to protect against such an occurrence. But, if the annual tests have been undertaken seriously, with all the ingenuity possible, utilizing equipment already on hand or obtainable at reasonable cost, there is simply no reason to expect the consequences to be any more serious than to be required to

do some extra, and perhaps needless, paper work, and possibly to do some additional, and perhaps more rigorous testing. Fines and other penalties will be reserved for willful and continued non-compliance, or falsification of documents.

It is hoped this series of articles will be helpful.

### Annual Measurements

The Federal Communications Commission recently adopted Technical Performance Standards for Cable Television. For the present, these Standards apply only to Class I channels (broadcast signals received), and, in some cases, only to those which are received within the Grade B contour. A portion of these Rules is reproduced in Figure 1.

While existing operations are not required to comply with the performance standards until March 31, 1977 annual measurements must be performed in the meantime, even though performance is shown to be substandard. The Commission has just granted a one-year extension of time, announcing that the first such measurement must be made during the 1973 calendar year.

An engineer charged with the construction and maintenance of millions of dollars worth of cable television plant serving several scores of thousands, or even hundreds of thousands, of subscribers will devise reliable and technically sophisticated methods, and will use the latest precision test instruments. But experience in broadcasting suggests that smaller operators will, necessarily, develop many ingenious techniques, using inexpensive instrumentation. After all, not many TV broadcasting stations have the full com-

plement of color bar generators, VITS keyers, sine-squared pulse and bar generators, vectorscopes, field intensity meters, or group delay measuring equipment which would be required to completely and precisely check transmission.

Similarly, I hope to show in this series that Cable TV performance can be measured, at least for these purposes, without such expensive, though enormously useful, instruments as a \$10,000 Spectrum Analyzer.

### Frequency Measurement

The new rules specify that the visual and aural carrier frequency of Class I cable television signals shall be maintained at  $1.25 \pm 0.025$  MHz above the lower boundary of the standard VHF channel on which it is carried, and that the intercarrier frequency shall be  $4.5 \pm 0.001$  MHz. If the signal is processed by the commonly available heterodyne signal processors (Channel Commander, Channeler, Scientific Atlanta, Benevac, etc.) for on-channel carriage, the same local oscillator is used for both down and up conversion. Therefore, the visual carrier and inter-carrier frequency are controlled solely by the originating broadcasting station. In such cases, which probably represent over half of the Class I channels carried on existing systems, no measurement of frequency is necessary to determine compliance.

On the other hand, any visual carrier carried on cable on a different channel from the original broadcast is subject to error and should be measured. This is particularly important in the case of UHF to VHF conversions.

Furthermore, if the broadcast signal is reduced to its video baseband, either for processing or for microwave relay, the re-modulated visual RF carrier frequency bears no necessary relationship to the broadcast frequency, and therefore must be measured.

Except in rare cases, the aural carrier is most commonly processed or relayed as a 4.5 MHz sub-carrier in the video baseband, both in heterodyne and baseband systems. Therefore, unless the aural

sub-carrier is itself demodulated to baseband audio, the 4.5 MHz inter-carrier frequency is controlled solely by the broadcast transmitter even in baseband systems. Thus, it is almost never necessary to measure the frequency of TV aural carriers on Class I cable channels.

### Grated Counters

The most commonly used instrument for frequency measurement

today is the gated counter. Prices range from \$800 to over \$2,500. (A counter is now available from Heathkit at less than \$800). The overall, long time accuracy of the time gate should be at least 1 ppm, or  $10^{-6}$ , and must read at least six digits, preferably more. Counters relying on the accuracy of the 60 Hz power source frequency are probably not accurate enough, and should be avoided, notwithstanding their attractive price.

### Figure 1

#### Technical Standards

**76.601 Performance tests.**—(a) The operator of each cable television system shall be responsible for insuring that each such system is designed, installed, and operated in a manner that fully complies with the provisions of this subpart. Each system operator shall be prepared to show, on request by an authorized representative of the commission, that the system does, in fact, comply with the rules.

(b) The operator of each cable television system shall maintain at its local office a current listing of the cable television channels which that system delivers to its subscribers and the station or stations whose signals are delivered on each Class 1 cable television channel, and shall specify for each subscriber the minimum visual signal level it maintains on each Class 1 cable television channel under normal operating conditions.

(c) The operator of each cable television system shall conduct complete performance tests of that system at least once each calendar year (at intervals not to exceed 14 months) and shall maintain the resulting test data on file at the system's local office for at least five (5) years. It shall be made available for inspection by the commission on request. The performance tests shall be directed at determining the extent to which the system complies with all the technical standards set forth in 76.605. The tests shall be made on each Class 1 cable television channel specified pursuant to paragraph (b) of this section, and shall include measurements made at no less than three widely separated points in the system, at least one of which is representative of terminals most distant from the system input in terms of cable distance. The measurements may be taken at convenient monitoring points in the cable network, provided that data shall be included to relate the measured performance to the system performance as would be viewed from a nearby subscriber terminal. A description of instruments and procedure and a statement of the qualifications of the person performing the tests shall be included.

(d) Successful completion of the performance tests required by paragraph (c) of this section does not relieve the system of the obligation to comply with all pertinent technical standards at all subscriber terminals. Additional tests, repeat tests, or tests involving specified subscriber terminals may be required by the commission in order to secure compliance with the technical standards.

**76.605 Technical standards.**—(a) The following requirements apply to the performance of a cable television system as measured at any subscriber terminal with a matched termination, and to each of the Class 1 cable television channels in the system.

(1) The frequency boundaries of cable television channels delivered to subscriber terminals shall conform to those set forth in 73.603(a) of this chapter: provided, however, that on special application including an adequate showing of public interest, other channel arrangements may be approved.

(2) The frequency of the visual carrier shall be maintained  $1.25 \text{ MHz} \pm 25 \text{ kHz}$  above the lower boundary of the cable television channel, except that, in those systems that supply subscribers with a converter in order to facilitate delivery of cable television channels, the frequency of the visual carrier at the output of each such converter shall be maintained  $1.25 \text{ MHz} + 250 \text{ kHz}$  above the lower frequency boundary of the cable television channel.

(3) The frequency of the aural carrier shall be  $4.5 \text{ MHz} \pm 1 \text{ kHz}$  above the frequency of the visual carrier.

With a little ingenuity, any counter can be calibrated against WWV, to substantially increase the clock accuracy. Furthermore, since TV stations are required to maintain frequency within  $\pm 1$  kHz, and usually operate within  $\pm 250$  Hz, they are usually a good secondary standard against which to check the accuracy of the counter. (Caution: be sure you know whether the TV station is assigned an offset frequency, and whether it is plus 10 kHz or minus 10 kHz.)

For frequency measurement of signals carried on a cable television system, however, two problems must be overcome: 1. The carrier to be measured must be separated from its own aural carrier and all other carriers on the cable; and 2. The effect of amplitude must be considered and counting errors avoided.

The direct approach using a "black box" with selectable or tunable filtering, and clipping or limiting circuitry, has been used effectively, and is quite convenient. A simple and available procedure, however, is the old method of accurately setting a stable transfer oscillator to the same frequency and measuring its frequency with the counter.

While a TV set could be used to detect the zero-beat as a "venetian blind" co-channel interference effect, it is not as easy as it sounds. The unknown TV signal consists of a carrier, flanked by a series of prominent upper and lower sidebands at intervals of 15.75 kHz above and below the carrier. Unfortunately, it is not easy to distinguish the beats occurring when the transfer oscillator frequency is equal to the carrier, from those occurring when it is equal to one of the sidebands. The difference is that the proper carrier beat is precisely parallel to the raster lines, but the sideband beats have a very slight slope. It is possible to do it this way, but difficult, and a mistake of  $\pm 15.75$  kHz is very easy to make.

### **Using The FSM-Signal Level Meter**

By far the simplest procedure is so obvious one wonders why it seems to have been overlooked.

The most popular models of Signal Level Meter (FSM) used in cable television are equipped with a DC coupled video output terminal. Headphones or a loudspeaker connected to this terminal can be used very effectively to detect the audio zero beat which occurs when the transfer oscillator is nearly equal to the unknown carrier. There is no problem at all in distinguishing it from the sideband beats, which are inaudible, if the transfer oscillator level is higher than that of the unknown.

Because of some confusion caused by the 30, 60, and 120 Hz hum components in the TV signal, it is probably not possible to set the "zero beat" closer than about  $\pm 200$  to 300 Hz. But even after adding possible counter errors of 200 Hz (1 ppm at Channel 13) the overall accuracy is still considerably better than  $\pm 1$  kHz. Therefore, if the unknown frequency is determined in this way to be within  $\pm 24$  kHz, it can properly be certified to be within the FCC limit.

Thus, the ubiquitous Signal Level Meter (sometimes improperly called a Field Strength Meter, or FSM) is the "black box," serving both as a filter for easily isolating the unknown carrier from its frequency - division - multiplex companions, and as a detector for setting the unmodulated transfer oscillator to the unknown frequency.

### **The Marker Generator**

Furthermore, it turns out that the commonly available RCA WR-99 TV Marker Generator (less than \$300) serves quite acceptably as a transfer oscillator. For a low cost instrument, it is remarkably stable, and easily holds its setting for the short time required to make a transfer measurement. In fact, if the Counter, Marker Generator, Signal Level Meter and unknown carrier are all properly connected together through hybrid splitters, the measurement can actually be made in a matter of milliseconds by simultaneously observing the counter while listening for the zero beat. The only new instrument required is the counter, costing no more than \$800.

It would be even less costly (\$130) to acquire a surplus LM-30, using the SLM for detecting the zero beat. This is somewhat more tricky, however, since harmonics of the LM-30 would be used. Furthermore, to obtain the best accuracy, the LM-30 should be calibrated against WWV or a TV carrier rather than the internal crystal.

### **At The Converter**

A careful reading of the wording of Sec. 76.605(a) (2) seems to indicate substitution of 250 kHz, when converters are used, for the 25 kHz tolerance otherwise required. The intent of the rule, however, is (or should be) that the visual carrier frequency at the input to the converter be within 25 kHz in all cases, with a drift allowance of 250 kHz for the converters.

Since the rule is not clear, it is recommended that the carrier frequency be measured at the input of the converter, and that the 250 kHz stability of the converter be demonstrated separately. For example, with a correct visual carrier frequency at the converter input, adjust the converter fine tuning control so that the output frequency is also correct, as nearly as possible. Then let the converter warm up for an hour and remeasure the output frequency. If it has changed less than 250 kHz, it would be difficult to successfully argue that it did not comply with the rule.

There are certain advantages in employing the services of consulting engineers for cable television performance tests, particularly for the first time, though of course there is no such requirement by the FCC.

1. Educational value in learning the rules, and how to comply.
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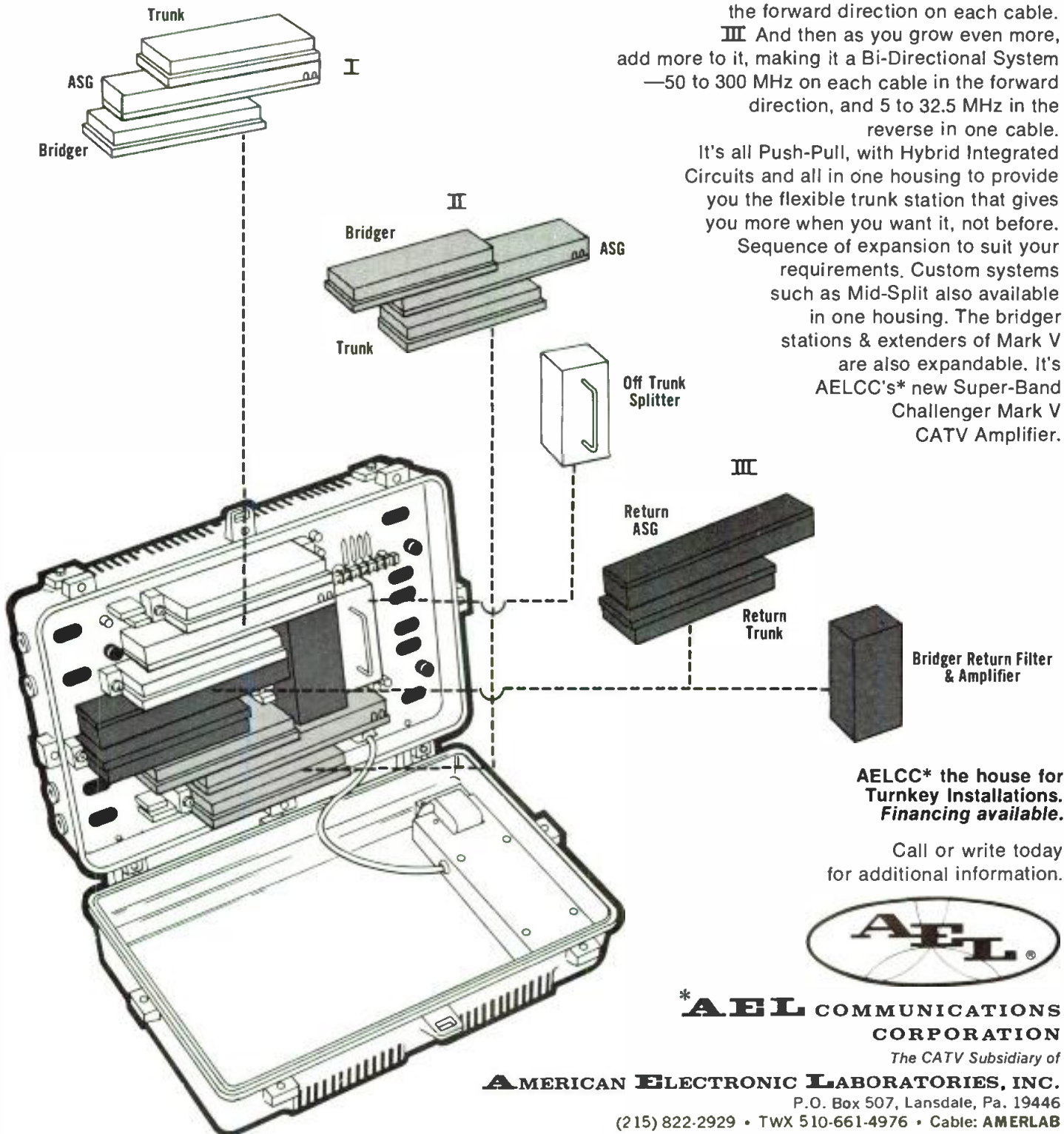
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tion and surveillance of Boards of Registration for professional Engineers.

One way to obtain the use of precision equipment for tests is the equipment rental companies, such as Rental Electronics, Inc. (Pep-sico) and Rentronix, both of which have offices or representatives located throughout the country. Laboratory equipment such as oscilloscopes, spectrum analyzers, vector voltmeters, noise figures meters, field intensity meters, sweep generators, reflectometers,

frequency counters, and signal generators are generally available. Broadcast type equipment such as wave form monitors, VITS generators, or vectorscopes are not. Rental fees, based on list prices, are about 4% for one week, 7% for two weeks, and 9% for a month. Thus, the \$10,000 Spectrum Analyzer would cost about \$400 for one week. While these costs may seem rather high for so short a time, it is certainly more economical than purchasing equipment which would be used only occasionally.

**Editor's Note:** Part 2 of this series will deal with carrier levels, isolation, and frequency response. Meanwhile, we expect Mr. Taylor's practical approach to the technical cable rules to provide the "how to do it" groundwork for small and medium sized systems. As Mr. Taylor suggests, there need not be a lot of high priced test equipment sitting on the shelf. It can be rented. However, this does not mean that other less expensive test equipment need not be purchased.

### Continued From Page CE-2 TheatreVision

Sheraton-Penn-Pike Motor Inn in Fort Washington, Pa., last month.

This test is being conducted jointly by TheaterVision and Philco-Ford Corporation's Telesound Department, headquartered in Blue Bell, Pa. The project could lead to a full-scale commercial arrangement between the two companies. Telesound has some 2,000 established leased television customers in the hotel and motel industry.

TheatreVision subscribers in Sarasota are initially being offered a package of six major motion pictures and a special classical music program produced by Swannsway Productions of New York.

#### Now The Price

In order to view the pictures, which are carried in eight-hour cycles, the viewer simply inserts a previously purchased encoded ticket in the TheatreVision "ticket box," which can be attached to a TV set by the viewer himself. The ticket can be withdrawn from the box at any time before the feature is completed if the viewer wants to watch the attraction at a different time.

The TheatreVision system was designed by Laser Link Corp., which has patents pending on its principles of operation.

After an initial subscription of \$15, which includes seven feature attractions and installation of the ticket box, the home viewer can purchase tickets for future attractions either in \$15 series or individually at \$2 per program.

## Pennsylvania Cable Assn. On Non-duplication

The Pennsylvania Cable Television Association has taken formal action strongly objecting and protesting to the rules and regulations of the Federal Communications Commission governing the reception, carriage and nonduplication of television signals by cable TV systems as being unfair, unreasonable and discriminatory.

The Association says that the rules are an unwarranted interference with the television reception of off-the-air signals and against the public's freedom to receive the signals of television stations licensed by the Commission to serve them, or which can be received off the air by such systems.

Precipitated by recent FCC action forcing cable systems in Wilkes-Barre, Hazleton, Ashley Borough, Berwick and other nearby communities in Pennsylvania to delete signals of three Philadelphia television stations which had been received by the public in those areas for many years, the resolution by PCTA calls such action a "great disturbance and detriment to the subscribers to the cable television service in those areas."

The cable association's resolution urges the Congress of the United States to adopt legislation establishing a national policy for cable television, "to protect the public from unfair, unreasonable and discriminatory treatment under the cable television rules adopted by the Commission under the

present broadcast statutes; and to provide for the full and proper development of the cable television industry to realize its full potential for benefiting and serving the public."

Cable television started in Pennsylvania in the late 1940's and a great percentage of the equipment used today in systems throughout the world is manufactured in Pennsylvania, according to William Dimmerling of Pottsville, president of PCTA. "Millions of people in our state are being deprived of a freedom of program choice and we believe it is time to express formally and publicly the magnitude of our protest," Dimmerling explained. "If, indeed, the FCC is concerned about the public interest, then cable television subscribers should be able to choose the programming they'd like to see, rather than the programming the Commission would like them to see," he continued.

"We have waited with the hope that the public's interest would be served through the normal process of government, but we cannot wait any longer," Dimmerling said. "The people of this state deserve the right to select which channels they would like to view, particularly when they were viewing them for years and now have been interrupted because of unfair rules. We want action now," Dimmerling concluded.

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# NEW PRODUCTS

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## General Purpose TV Camera

TeleMation, Inc., announces the development of a low cost, general purpose television camera, the TMC-1100. Company President Lyle O. Keys said that, while the camera is primarily designed as a low-cost surveillance camera, it has many other applications, such as monitoring teacher training or lab experiments. Its "sync" options allow it to operate at full RS-170 broadcast standards either self-contained or externally driven.



The camera has a 40,000:1 (forty thousand to one) automatic light control range, an automatic black level and .01 (one-hundredth) foot-candle faceplate sensitivity. These features allow the TMC-1100 to operate well over a wide range of light conditions without operator adjustment. The TMC-1100 may be operated without operator adjustment. The TMC-1100 may be operated with separate mesh, integral mesh vidicons or silicon diode tubes without any circuitry changes.

With the camera's cover removed, the TMC-1100's components are completely accessible. Maintenance is further simplified because circuit boards are easily plugged in or removed. Even the tube and yoke assembly can be removed from the camera in seconds.

According to Keys, other 'saleable' features of the TMC-1100 in-

clude its multiplexed audio monitor option, two mounting channels and its thermal and short circuit protection. "This is the most versatile, the most stable, and most sensitive general purpose camera ever offered to the American market," Keys said. "Its versatility includes three internal as well as three external drive modes. Its extreme sensitivity is achieved through a combination of a low noise FET pre amp automatic control of video amplifier gain plus a new bandwidth compression technique. Its stability derives from the use of new analog and digital integrated circuits and from a stabilizing technique known as 'junction matching' pioneered by TeleMation."

For More Details Circle (49) on Reply Card

## Weather Forecaster for CATV

MetroData Corporation, Seattle manufacturer of automated TV display and control systems for the CATV industry, has introduced a low cost character generation device to display local weather forecasts supplied by the National Weather Service.

Designed for cable operators who maintain a channel devoted to display of local weather conditions, the MetroData forecaster unit automatically recognizes and stores



local or zone forecasts coming over the national teletype wire. Local forecasts are displayed until updated. Storm warnings are instantly displayed.

The forecaster unit, known as the F-100, also comes equipped with an auxiliary keyboard to facilitate local messages on the bottom four lines of the viewing screen.

Weather forecasts and local messages are displayed in color. Four line message segments prepared by the keyboard appear in different color combinations to heighten viewer impact.

The forecaster features a solid state memory which accommodates up to 32 four-line messages (over 4000 characters capacity). Message segments on the screen repeat continuously on a sequential basis until updated.

The auxiliary keyboard is designed to be operationally similar to a standard office typewriter so any typist can enter messages without special training.

The forecasting system has been designed from a cost standpoint to replace cameras scanning static art boards or fixtures.

For More Details Circle (50) on Reply Card

## CATV Cable

A new ultra-low-loss aluminum sheathed CATV cable has been introduced by Cerro Wire & Cable, Freehold, N.J. Called STYRA-FOAM, the new Cerro cable uses expanded polystyrene dielectric.

STYRAFOAM is light, easy to handle and Cerro claims it causes considerably less attenuation than conventional aluminum sheathed coaxial cables. With STYRA-FOAM, trunk line amplifiers can be spaced 20 percent further apart.

Further, every reel of STYRA-FOAM is automatically identified. Built-in recording facilities compare the physical and electrical properties of each length of cable with the conditions under which it was produced. This facilitates in-process quality assurance.

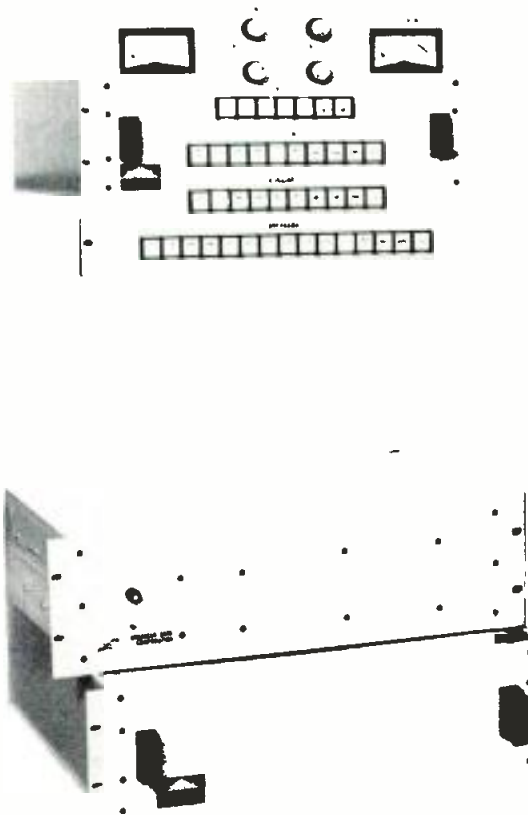
The new cable utilizes copper clad aluminum center conductors. It can be ordered with a polyethylene jacket, jacketed with .109 galvanized steel messenger, or unjacketed.

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# Broadcast Security Systems

By R. H. Coddington

If the signaling device to be used is a dialer only, it may be possible to dispense with a separate control unit. The dialer usually is equipped with its own latching arrangement, so that a momentary external contact closure will initiate its entire calling cycle. For this, sensors must close a contact when a door is opened, be wired in parallel, and the shunt lock inserted in series with the sensor line and be electrically opened to disarm the system. This arrangement will work as well as the conventional series loop, except that the sensor line is not supervised.

When contemplating a control circuit, it is well to bear this in mind: in alarm systems, **simplicity is a virtue**. The fewer the components, the less likely is a failure causing either false alarms or loss of protection. And particularly where there are strong RF fields, good old metallic circuits, without transistors or tubes, have much to commend them.

In our introduction to security systems in the January issue, we covered the basic types of systems. In this second part, we will look into the various types of sensors and their uses.

The control system receives its input from sensors, which come in a variety of forms. The most popular are those which provide **perimeter** protection, meaning the guarding of access to the premises from the outside. Doors, windows, and sometimes walls and roofs are fitted with sensor devices that respond to unauthorized entry. Others provide **area** protection within the premises by sensing motion, body capacity, etc. These may be combined in almost any number and combination to op-

erate a single control unit.

Each has its merits and its limitations. A basic acquaintance with them will help the system designer to make the best choice.

## Door Contacts

The most widely used sensor is the **door contact**. In its commercial form, it has two parts: the switch module and the magnet module. The switch, magnetically actuated, mounts on the door frame, and its companion module, containing a powerful magnet, is attached to the door. The two parts are placed as close together as possible, but they do not touch.

Door contacts are available in SPST and SPDT types. They usually are used in a normally-open (NO) configuration, meaning that they are electrically open when they are not activated—when the magnet is not near. Thus, they work in a series-connected, supervised protective loop, as shown last month in Figures 2 and 3.\* If normally-closed (NC) contacts are used, they must be wired in parallel and connected to terminals A in Figure 3, and the shunt lock wired to suit.

Commercial types of magnetic door contacts are relatively inexpensive, and "consumer" grades are beginning to appear in neighborhood electronics houses. The former, at least, are relatively reliable, although if they are not hermetically sealed, they may suffer from the effects of condensation when they are chilled by outside air seeping around the door. Also, if they are to be mounted on steel or steel-clad doors, the "shorting" effect on the magnetic field must be offset by spacing the contacts about a sixteenth of an inch off the steel surface. Matching spacers are available for this purpose.

Popular as they are among commercial installers, magnetic contacts are not necessary. Any switch arranged so as to be actuated by the door, in the manner of interlocks on a transmitter, will serve as well. The choice is only a matter of installation convenience and appearance. Neither is their application limited to building doors; obviously, tuning houses, antenna gates, and other limited-access locations can be similarly equipped.

## Window Foil

Second in use only to magnetic door contacts in commercial installations is window foil. In its traditional form, this is a plain lead foil, either  $\frac{3}{8}$  inch or  $\frac{1}{2}$  inch wide. It is affixed to the window in a nearly-closed loop, spaced between three and six inches from the pane's edge (depending on the window's size), with connections made to the loop's ends. When the window is broken, the fragile, inelastic foil tears apart and opens the circuit, thereby tripping the control unit.

Such foil is applied by first brushing a stripe of clear varnish around the window's inside surface. When this has dried enough to be "tacky", the foil is laid on top and pressed into the varnish. Then, after the first coat has dried, another is applied to the foil itself, to seal it tightly against separation caused by moisture.

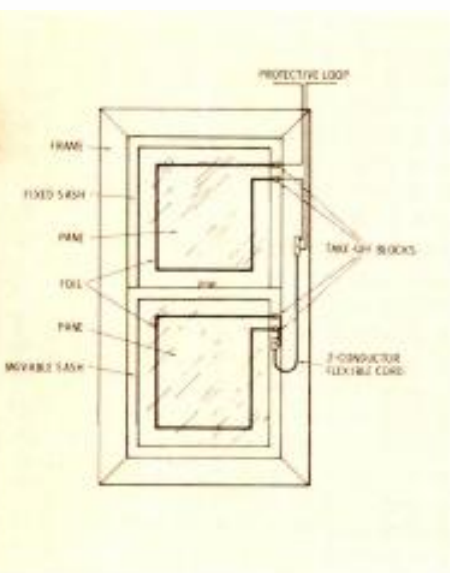
A new variation is self-adhering foil, which is applied about as easily as is masking tape. Either foil, however, probably is available only through security system dealers and installers.

When foil is installed, some excess is left loose at the ends for connection to the foil "takeoffs." These are small, insulated terminals that are fastened to the

window frames. Some are designed to clamp the loose ends of the foil itself; others have a cat's-whisker wire that is soldered to the foil. In the latter case, the excess foil is doubled back on itself to simplify the tricky job of soldering to the thin lead, and then sealed with varnish.

While these foil takeoffs are a security field specialty, any broadcast engineer can fashion his own scheme. He also can devise his own door and window cords—flexible two-conductor cords with mounting and connecting blocks on both ends—that must be used to carry the foil circuit across door hinges or from moveable sash to stationary window frame. See Figure 4.

Window foil unquestionably affords reasonably reliable protection against intrusion via broken panes. However, it is a bit difficult for the novice to apply neatly, and it is susceptible to damage from routine window washing. The system designer must weigh the probability of entry through windows against these drawbacks, and make his own decision.



**Fig. 4** Notice that the most effective and economical way to protect windows with foils is to wire them into a protective loop. Any window broken in the loop will sound the alarm. (See Part I, Jan. 1973 for Fig. 1, 2, and 3.

### Other Sensors

Door contacts and window foil are the mainstays among commercial installers. They afford reasonably effective perimeter protection, combined with simplicity, reliability, and low cost. They are positive devices, being either open or closed, without threshold problems.

There is a great variety of other sensors on the security market, most of which suffer from limitations that require careful consideration. Few offer the year-after-year reliability of the simple mechanical circuit interrupter. Nevertheless, several are worthy of mention here for the sake of those special applications where they may be particularly useful.

### The Pressure Mat

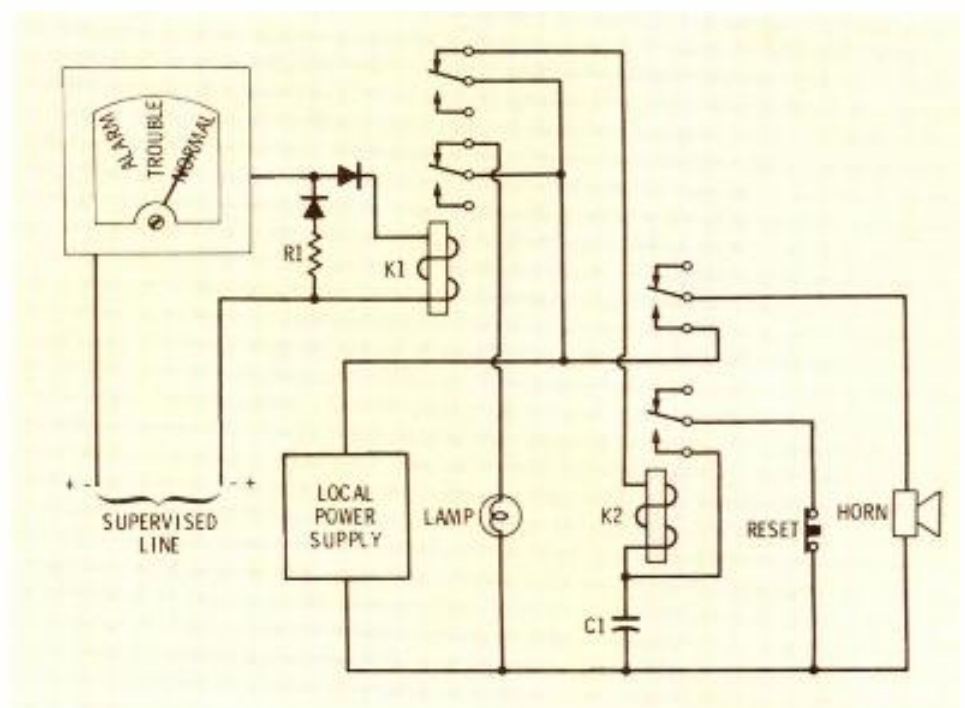
The pressure mat is a simple device, functionally speaking. Designed to be placed on a stairstep or in a doorway where the unwary intruder is likely to step on it, the mat may be useful in a few unusual situations. However, it is difficult to really conceal because it is

thicker than the ordinary rubber mat. Too, it is impractical to make a normally-closed pressure switch when it takes the form of a large number of possible contact points spread over an area, so the mat is NO. This makes it incompatible with the series protective loop system; it must be separately wired (in parallel with any other mats) to the control unit. The dubious value of the mat in all but a few exceptional cases may not justify the extra wiring effort.

### The Photo-Cell

The photo-cell sensor is useful for those premises where a single light beam may protect a number of doors and/or windows, or where a critical hallway or passage must be monitored. That single beam may be diverted around corners and obstructions by simple mirrors, and any momentary interruption of it by an intruder—or rat, bird, or whatever—will trigger the alarm.

The conventional photo-cell transmitter uses an automotive-type lamp behind a collimating lens. An infra-red filter may be



**Fig. 5** A central station signal device monitored with a supervised line.

used to make the beam virtually invisible.

The receiver has a lens to focus the received beam onto the photo-cell. A dry cell and a sensitive relay complete the receiver's essentials. Contacts on the relay are wired into the alarm system's protective loop.

Depending on the number of mirrors and other losses, this photo-cell device may be used for beam paths up to about 200 feet. However, its lamp requires substantial current, which calls for a storage battery if reliable DC backup is required. Also, the simple photo-cell is readily "fooled" by nothing more than a flashlight aimed into the receiver from a suitable angle.

There are other, more sophisticated photo-electric sensors. One, for instance, has its transmitter and receiver cleverly disguised to look like ordinary duplex AC receptacles. It uses a "modulated" gallium arsenide infra-red laser beam. Its current requirements are very small; it is not susceptible to defeat by foreign light sources, and it is said to have a working range of up to 75 feet. It normally is available only to established security system firms.

### **Motion Detectors**

The variety of available motion detectors seems endless. Some, the so-called "radar" types, utilize a small UHF transmitter/receiver that fills a small volume with RF energy. Motion of an object within its range is detected by either doppler shift or change in the standing-wave pattern in the near field. Upon detecting such motion, a relay is actuated to trigger the alarm control unit.

Other motion detectors use supersonic acoustic fields in much the same manner, and at least one uses an audible frequency fed to ordinary public-address type horns. The sound of this one may alone be enough to discourage an intruder!

Motion detectors in general share common drawbacks. First, their threshold of detection is rel-

ative, rather than absolute. Unlike the door contact, which is either open or closed, or the narrow light beam, which is interrupted or is not, the motion detector's reaction depends on its distance from the moving object, the object's size, and the speed and sometimes even the direction of the motion. It also depends on the device's sensitivity, which is adjustable.

The premises owner's natural desire to protect as large an area as possible often results in initial sensitivity settings that invite false alarms. Sometimes the causes of sporadic false triggering can't be determined, and the only solution is to reduce the detector's sensitivity to the point where its reliable coverage extends over an unsatisfactorily small area. This is a problem with most sensors designed for area protection.

Another drawback to motion detectors lies in their electronic sophistication. The very number of transistors, diodes, and even integrated circuits, along with their related components, invites eventual failures that either produce false alarms or loss of protection. These failures often manifest themselves intermittently, to the considerable displeasure of the police and equally considerable consternation of the premises' owner. To an excessive degree, the reliability of sophisticated products offered to the security market has been unsatisfactory, and motion detectors have contributed their share of faults.

### **Sound Detectors**

Another approach to intrusion detection is the automatic monitoring of sounds made by an intruder. In a sound detection system, the premises are equipped with miniature loudspeakers used as microphones. One model, designed to respond principally to the repetitious sounds of someone breaking through a roof or a wall, uses an electronic "accumulator". Any sound-generated audio signal that exceeds the pre-set threshold discharges a pulse into the accumulator, where it leaks away very

slowly. Subsequent sounds produce additional pulses; if they arrive within a few seconds of each other, each will raise the accumulated total until it "spills over" and trips the alarm. The number of pulses required to fill the accumulator is adjustable; usually four or five are selected.

This scheme renders the system more or less immune to isolated sounds such as thunderclaps and building expansion/contraction noises. Further, high pass audio filters make it responsive only to the upper audio frequencies, on the theory that noises external to the building lose most of their higher frequencies in penetrating the walls.

Certain interior noises from machinery can be "cancelled" by a microphone placed close to the noise source and connected to a cancelling input. It may be necessary to do this for a telephone whose bell must be left active during the hours of protection. Otherwise the bell, repetitious and rich in high frequencies, may trigger the sound detector. And watch out for crickets!

Intrusion sound detectors share the shortcomings of motion detectors: a relative threshold of detection, and electronic complexity. In their commercial versions, they also are quite expensive, meaning a few hundred dollars.

### **Proximity Detectors**

Another device used in certain security installations is the proximity detector. This basically is the body-capacity-sensitive oscillator familiar in principle to most electronics men. It is used to protect safes, jewelry displays, etc., all of which may be floated above electrical ground.

Since most broadcast equipment is housed in grounded racks and cabinets, the proximity detector probably can't be used for them. It might, though, be adapted for windows, door locks, or wooden storage cabinets, as well as costly office machinery.

Most of the undesirable charac-



teristics of motion detectors and sound sensors apply to the proximity detector. It probably is not widely applicable to the broadcaster's needs.

### **Vibration Pickups**

Vibration sensors sometimes are used for premises protection. They may be cemented to window panes as a simple substitute for foil, or fastened to doors, steps, walls, ceilings, or other structural members that may be subject to impact during forced entry.

The vibration sensor is nothing more than a sensitive mechanical switch, fitted with a weight so that it will be inertially responsive to any sharp structural vibration.

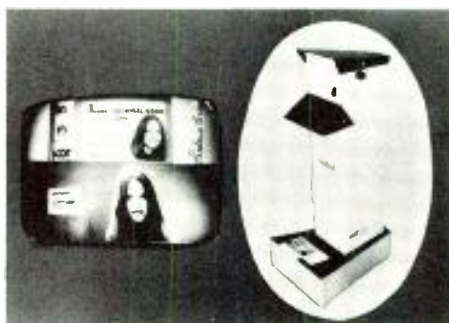
The contacts are adjustable, which makes the vibration sensor another variable-threshold device. Thus, while it is not electronically sophisticated, it does pose some difficulty in selecting the optimum sensitivity consistent with immunity to "innocent" stimuli.

### **Sensors for Other Purposes**

An intrusion detection system may double in brass. Once a premises is wired to produce an alarm of some sort when unauthorized entry occurs, there is very little added complexity in arranging the alarm to respond to other urgent situations.

One of those is fire. A local bell may attract someone who can call the fire department as readily as they would the police; a central station system may have a coding system by which they can distinguish between fire and burglar alarms; and some dialers provide a second channel that can be programmed to call the fire department directly.

Another urgent situation is hold-up. While it is relatively rare for a broadcast station to experience a hold-up attempt, its personnel do work unorthodox hours, possibly in unsavory neighborhoods, and a "panic" button to summon help can provide some psychological



### **VIDEO VERIFICATION**

Visual Methods, Inc., manufacturers of the Twin Lens, has incorporated their unique product into their new Series 710 security system. When combined with a closed circuit TV system, it provides remote monitoring of many building entrances with just one guard.

When a person enters, you first see him on the monitor. When he places his ID card into the verifier unit, you can remotely compare image and photo. This also allows signature comparisons as well as a talk-to/talk back audio circuit.

Another feature is the optional video recorder hookup. Then face and card, audio, and time can be entered at the same time for the record.

Called the "Twin Teller", the 710 is 27 inches high by 13 by 10 inches. (Visual Methods is located in Westwood, New Jersey at Box 644, The ZIP is 07675.)

reassurance. The button, or several of them, can be wired to trip the regular burglar alarm. The police must respond to a call, even if a tape tells them that it is a burglary and it is during business hours.

### **Fire Sensors**

The simplest fire detector is a thermostatic switch that responds to temperatures of about 140°. A number of these may be fastened to the ceilings in likely places—above furnaces, power panels, etc.—and connected to the alarm system control unit. These fire sensors usually come in a NO contact configuration.

An earlier fire warning can be given by a smoke detector. This may use a light source and a photo-

cell, calibrated to trigger when smoke density reduces the light transmission. Or it may use an ionization chamber sensitive to smoke particulates in the air. Either of these types requires power sources not normally available from a simple control unit.

### **Hold-up Buttons**

An ordinary doorbell button makes a perfectly good panic button, provided that it is located where it won't be pressed accidentally. It also should be so situated that it can be operated unobtrusively, so that a hold-up man would be unaware that an alarm has been sent.

Commercial hold-up buttons are available that require an intentional pressure of two fingers to activate them, thereby minimizing the chance of accidental operation. There are also foot-operated models, and cash drawer trips that close a contact when the bottom one of a stack of bills is removed.

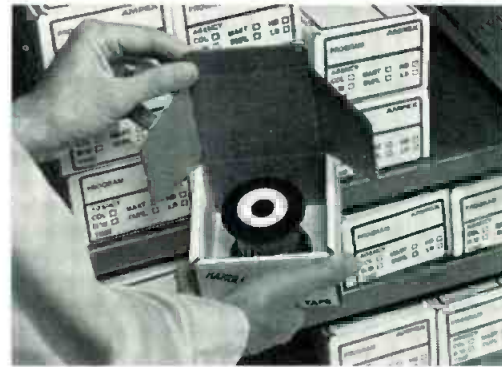
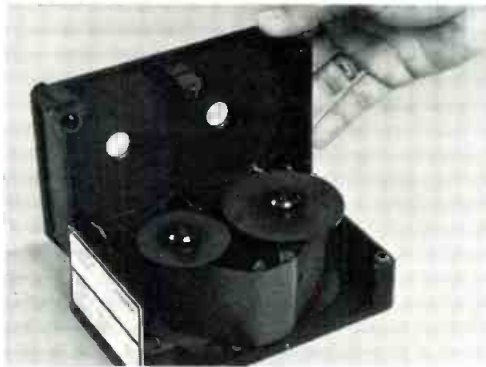
It is important that the hold-up button not be disabled by the shunt lock used to disarm the intrusion sensors. It must be "hot" at all times that any personnel may be in the building. Provided that it has NO contacts, the panic button(s) can be connected to terminals A in Figure 3 of the first part of this series. So, too, can the fire sensors, to give 24-hour warning protection for fire. □

\* There is some confusion in the security field between the designations NO and NC. In the usual sense, referring to switches in the non-activated state, the series loop requires NO contacts. However, when all doors are closed, all switches are activated, and therefore closed. From the point of view of the control unit, this is the "normal" condition, while an opened door, causing an opened circuit, is "abnormal" and the alarm is sounded. Thus the control unit terminals for this loop may be marked for "NC" sensors, and those for parallel branches marked "NO".

THE NEW DIMENSION IN BROADCASTING AND PRODUCTION

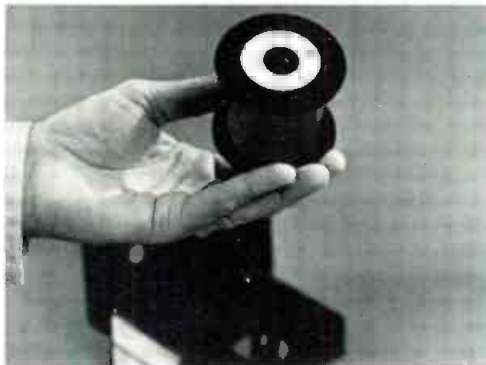
# ACR-25

The ACR-25 cassette recorder/reproducer is the ultimate in quality recording—and much more. It's the most versatile production tool yet made—and much more. It's the quickest, most flexible, no-hands automatic spot and short-segment program player, hands down. It will have as much impact on TV broadcasting as the first commercial video tape recorder, our VR-1000—and the first high-band VTR, our VR-2000.



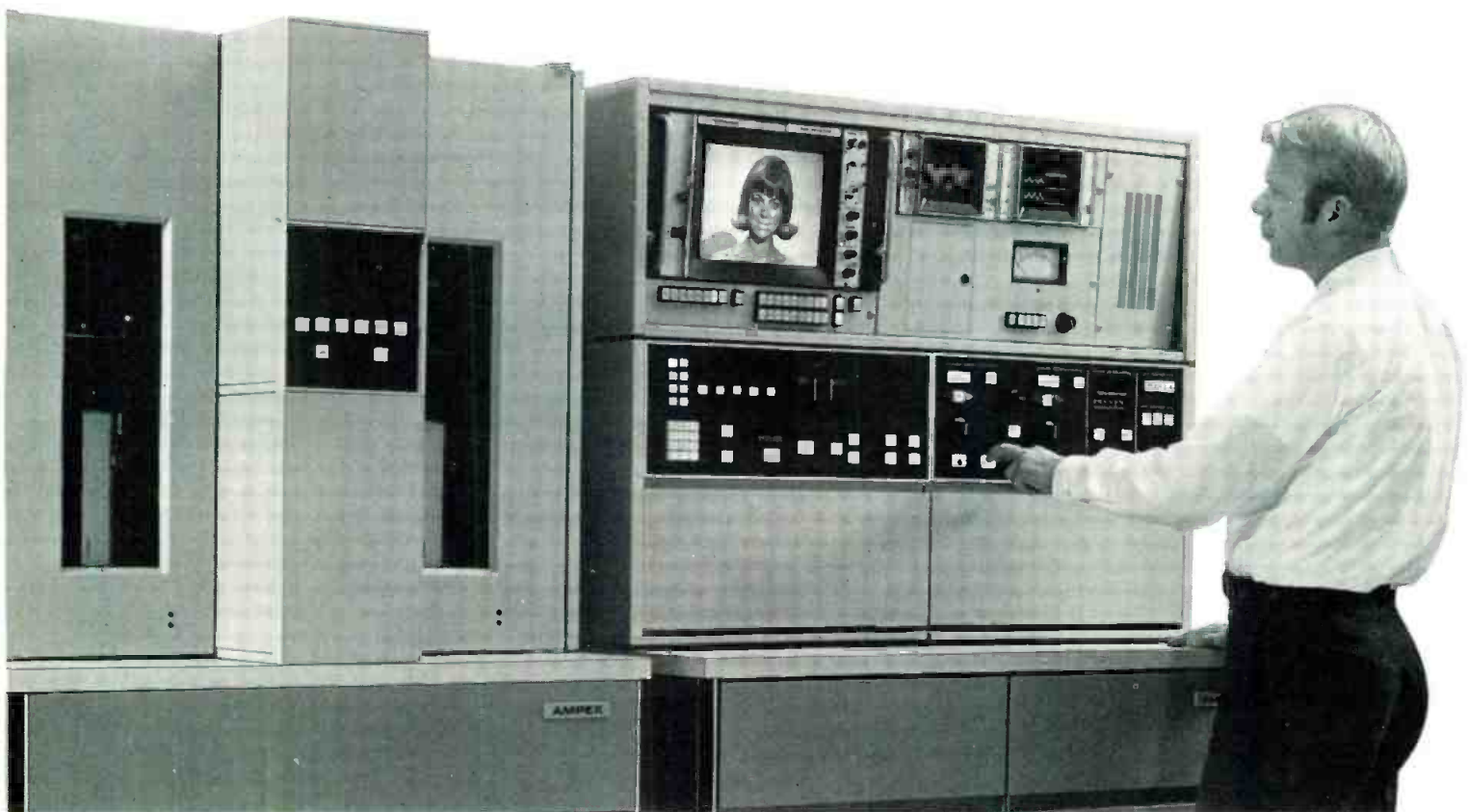
## The ACR-25 is much more than a spot player

Certainly the ACR-25 solves the problems of multiple spotting. But it does it quicker and with more flexibility, selectability and automation than any other unit made. It provides continuous play of :30's, ID's and hitchhikers—with no black air. It doesn't just do things better. It does things no other machine can do—and never will be able to without basic design changes.



## The ACR-25 is a production tool unmatched anywhere

It does more than solve today's problems, it will meet new requirements years in the future. But paramount is the challenge its capabilities present to imaginative producers. They'll be able to create things quicker, simpler and better than ever before—or perhaps things they have never been able to do before. Here's why:



### The ACR-25 cassette

The rugged cassette is high impact, molded plastic to take care of all the rough handling you can give it. It's absolutely unique. The following features are exclusive . . . no cartridge or other cassette has them:

There are no bearings in the cassette itself. Why subject them to accidental misalignment or damage? Precision bearings are in the ACR-25 where they belong.



The cassette holds and protects the tape, that's all. Once in the transport, it has no function. The machine's bearings support the spools and the tape is lifted away from the cassette with gentle vacuum columns.

A cassette can be reloaded by the operator in seconds. It opens with three thumb-twist screws and closes just as easily.

Spools lift out to be stored or shipped in small, spool-size boxes . . . not heavy cartridges. This relieves storage space, cuts shipping costs and eliminates expensive cartridge inventory, a substantial saving in both investment and operating costs.

Each cassette can hold up to 6 minutes of tape at 15 ips. In the interest of interchangeability, the standard spool holds 3 minutes of tape plus sufficient leader for threading up a reel-to-reel VTR.

### The carousel—random access or sequential

The ACR-25, and only the ACR-25, offers fast, shuffle-free random-access. Load and program the machine for sequential play if you like, but you also have the option of true random-access programming. Saturation spot schedules, schedule changes, and make-goods are all accomplished by simply punching up a new program. No duplicate cassettes or manual reloading of the carousel are necessary.

For removal, any cassette can be reached, right side up with the label in reading position in one second!

### The transports

There are two of them, so one segment can follow another immediately, with no black air.

A minute spot finished on one transport can be stopped, rewind, unthreaded, returned to the carousel and the next spot loaded, threaded and cued in less time than it takes to play a :10 ID on the other transport. A full six minute cassette takes only 20 seconds!

### Control

Although manual and semi-automatic control are available at any time, automatic control is standard on every ACR-25. It may even be directly controlled by an external computer with the proper interface, but the standard ACR-25 programmer is always there to back it up.

The ACR-25 can program up to 40 events, divided into as many sequences as desired—several hours worth, depending on the programming.

Think how simple that could make what is now a five VTR station break! Or an hour newscast, complete with your on-the-scene production, network dubs, sports, weather, multiple spots and cuts to the anchorman.

### The ACR-25 as a recorder

Translate all the above broadcast features into recording capabilities—from multiple sources—and you can see what a versatile production tool the ACR-25 can be; for example, you can dub both A and B rolls, plus cassette or cartridge audio, onto an ACR-25 cassette, pre-set it with a button for any spot in the programming and play it—all without taking the cassette out of the machine! The possibilities for the inventive producer are almost limitless!

Segments of all sizes from all sources can be gathered quickly and simply into one smooth, continuous program to be broadcast automatically. No splicing, no winding and rewinding reels, no frantic switching and reloading of VTR's.

### ACR-25, the most valuable equipment in your studio

Here is, without a doubt, the most versatile production/broadcast unit ever available—the closest thing to a complete studio you'll find.

It saves money, manpower and mistakes in so many ways. It can release as many as 3 to 5 VTR's for other duties—or retirement.

Both Management, who pays for it, and Production, who gets to work with it, will agree it's the best investment since the first VTR.

# AMPEX

Ampex Corporation  
Audio-Video Systems Division  
401 Broadway  
Redwood City, Calif. 94063

# Remote reset circuit for digital timers

By Roy Trumbull\*

The use of digital timers in radio and television stations has become very common. The cost for IC's and readouts per decade is in the \$8 to \$15 range, so it is very practical to build your own timers and clocks.

Figure 1 shows the block diagram for a typical timer capable of a maximum count of 9:59. Common IC logic circuits run off a +5 volt supply (not indicated in diagram).

The boxes marked "scalars" indicate an IC which is little more than a collection of flip flops. A common one used for timers contains a divide by 2 and a divide by 5

circuit which can be strapped for a divide by 10. To get other divisions, there are reset gates which can be used to reset the scaler to a zero state or a nine state.

The output of the scaler consists of four outputs in binary coded decimal. Therefore, if you use diode logic you can connect two of the outputs, which are in the plus 5 volt state at a logic six, over to the zero resets. This will give you a count of: 0, 1, 2, 3, 4, 5, 0, 1, 2, etc.. This is one way to get a divide by 6 scaler.

## The Reset Gates

Most of the advantages and disadvantages in a given scaler rest

with the reset gates. If they are left disconnected, they will climb toward a logic 1 and cause resetting. If a reset is never to be used, it must be grounded. If it is to be used it must be left looking into a low resistance toward ground when not in use. In general, the more reset gates across a reset buss, the lower the resistance should be that they are looking into.

You get into real problems when the reset voltage (a logic 1 = +5 volts) is to originate from a remote location because the chance that electrical noise will get into the reset circuit is rather high. It is best to achieve some form of isolation between the remote reset source and the scaler resets.

## Reset Pulses

Another problem comes up when different reset pulses are of different lengths. The timer will not start counting until the reset pulse is gone. This can affect your timing accuracy.

In one timer application, the starting of any cartridge machine in the air control room was to trigger a reset to zero of the timer, which was located in the announce booth. Some of the cartridge machines involved were older models that used a start relay closure lasting two seconds (cue defeat relay), while the newer machines had a closure lasting perhaps 250ms. If the timer remained reset a full two seconds when an older machine started, it would be useless.

First it was determined what resistor values would keep the combined reset gates from climbing to reset. We found that 100 ohms would work fine for this particular timer. Next, it was decided that regardless of the length of contact

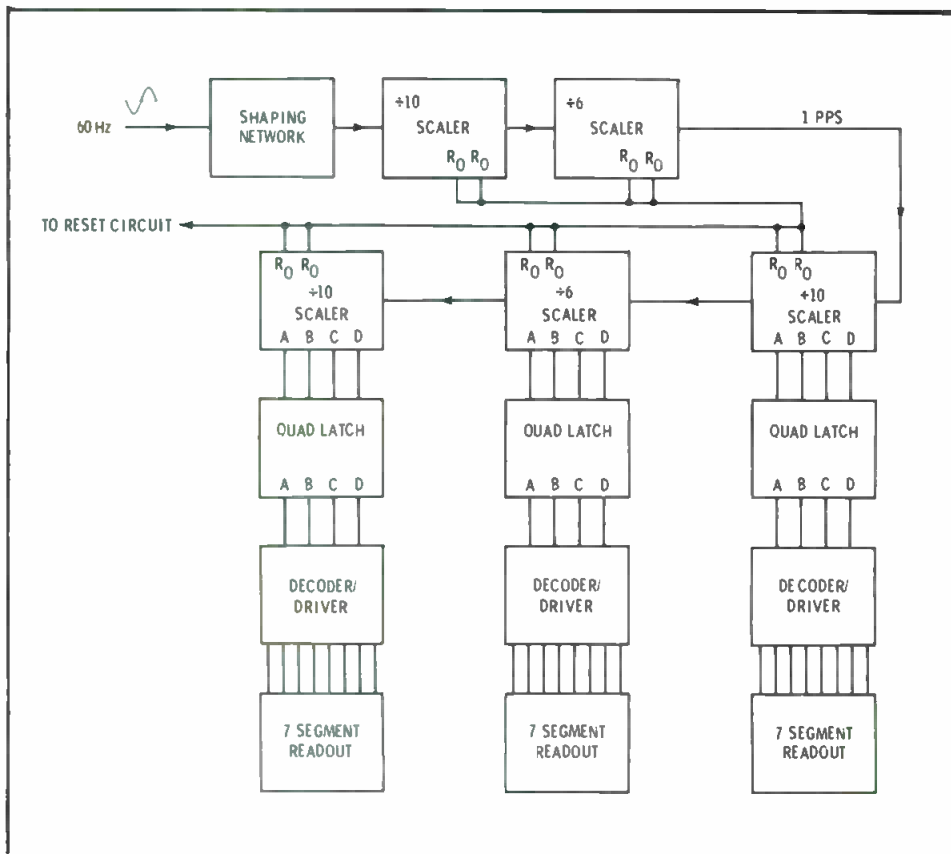


Fig. 1 Block diagram of a typical timer capable of a maximum count of 9:59.

HIGH.....73  
 LOW.....55  
 PRESENT.....72  
 HUMIDITY.....62%  
 BAROMETER.....  
 WINDS..... AT

A  
C  
T  
I  
O  
N  
C  
O  
R  
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closure, the pulse to the reset gates should be of uniform length.

### Enter The Unijunction

At this point we must introduce the unijunction transistor to those of you unfamiliar with it. This device has two bases and one emitter. When the emitter is raised to a voltage which is a given percentage of the voltage from base to base, conduction will take place. As soon as the voltage drops below that point, conduction stops. The percentage at which conduction occurs is fairly independent of the actual voltage base to base.

In Figure 2 you see a circuit making use of the unijunction for remote resetting. The RC combination of the 39K and the 50 microfarads charges across the supply voltage until at 5RC there is 5 volts across the capacitor. If a remote

contact is closed, the 50 microfarad capacitor is connected to the emitter of the unijunction where it fires the unijunction and rapidly discharges, producing a positive going pulse across the 100 ohm resistor and thus resetting the scalars.

You will note that should the remote reset contact remain closed, the voltage at the emitter of the unijunction remains limited below the firing voltage due to the ratio of the 39K resistor to the 10K resistor. Roughly 1 volt is present after the capacitor discharges. As soon as the contact is released, the 50 microfarad capacitor can charge again.

The diode and the .02 microfarad capacitor are used to give additional noise immunity, although the key part is the 10K resistor which serves to desensitize the unijunction to noise. □

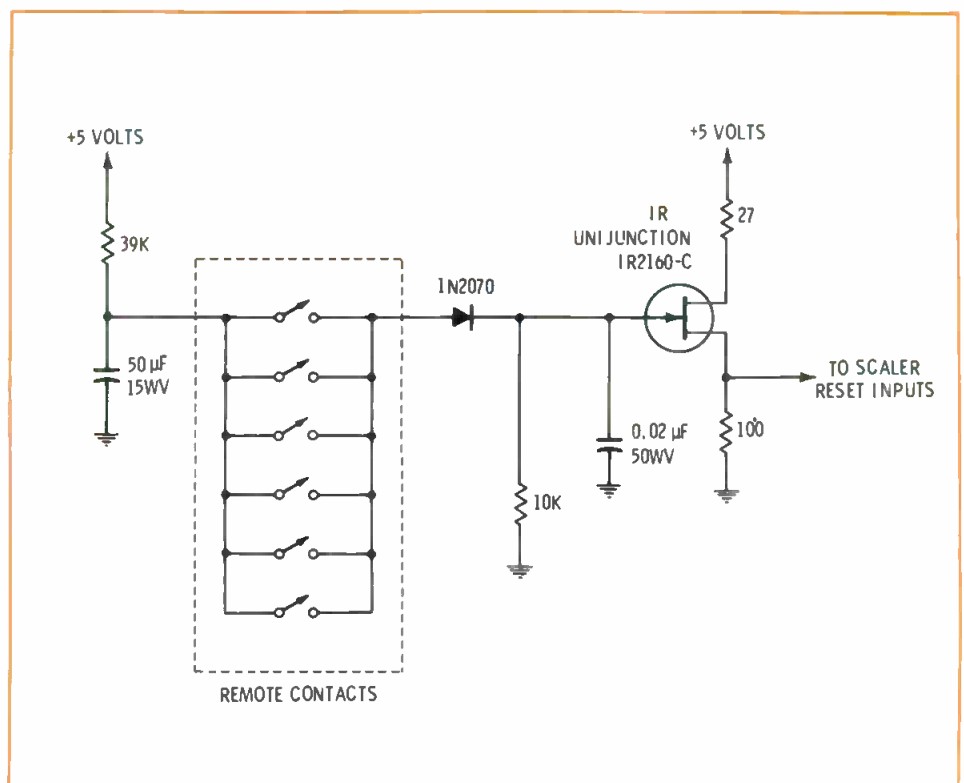
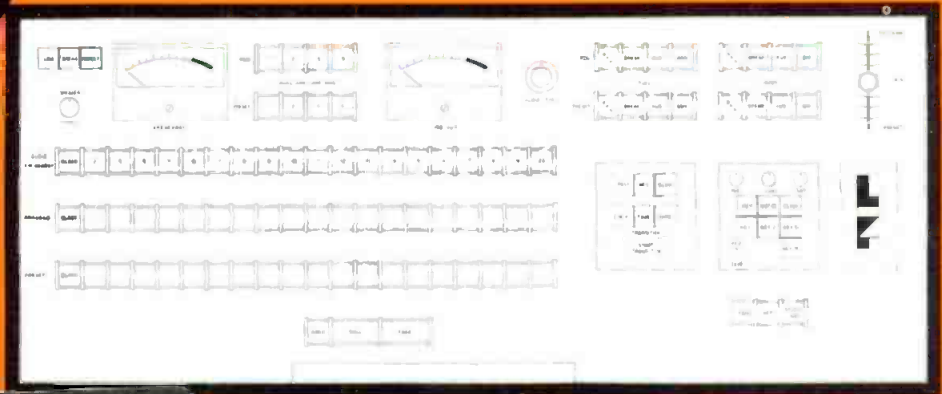


Fig. 2 The timer reset circuit shown here uses ½ Watt resistors at 5 percent.



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# WGIC/WBZI

## An ecology-minded small market combination

By Vernon Baker,  
Charles Sears, and Richard Moran\*

After three years of FCC hearings, the construction permit for WGIC was granted. In September 1963, with construction permit in hand, two of the authors arrived on the scene in Xenia, Ohio, with a card index file of record companies and a shoe box full of miscellaneous notes on radio station operation.

Space for studios was very scarce in Xenia and after searching many days, an available house was found in a business zone. The living room was used as an office for several weeks until the family occupying the house vacated. The rooms in the house then were converted into a production studio, an AM studio and business offices. All the supports for the main con-

soles and production consoles were built locally of modular construction so the units could be disassembled and moved if necessary.

WGIC went on the air on November 11, 1963 with a community oriented local news and middle of the road format. Due to intense sales planning, WGIC was at the break even point after the first month of operation. WGIC operated with minimum but adequate facilities in the house until moving to a new building in 1971.

After going through the rule making process for FM stations and about three years of trying for a permit, WBZI (FM) went on the air in 1967 and used the former production studios of WGIC for its main studio. A new production studio was constructed in a small laundry room of the house. Over a period of seven years in the house and several station engineers, with an add-on circuit here and wires

run there, the station wiring began to follow "Murphey's Law" (everything that can happen will happen) and began to look like the proverbial "rat's nest". We kept saying how nice it would be to strip everything down and move to a completely new building.

It was decided to erect a new building for AM and FM studios at the AM tower site where we had five acres. Both the AM and FM transmitters were operated by remote control from different sites. This was inefficient with three locations. Two sites would be better.

After much wishing and planning, our specifications for the new building developed to include: A building that was architecturally designed to fit the area. Since the site area was virtually surrounded by houses, a building on which we could get a high loan value was a must. We did not want to disturb the ecology of the area any more than absolutely necessary. The

\*Vernon Baker is Pres. & Dir. of Engineering, Charles Sears is an Engineer, Broadcast Technical Maintenance Service, and Richard Moran is VP and Gen. Manager of WGIC/WBZI.

**Fig. 1** The new facility, while not disturbing the suburban ecology, also is a compatible working environment.

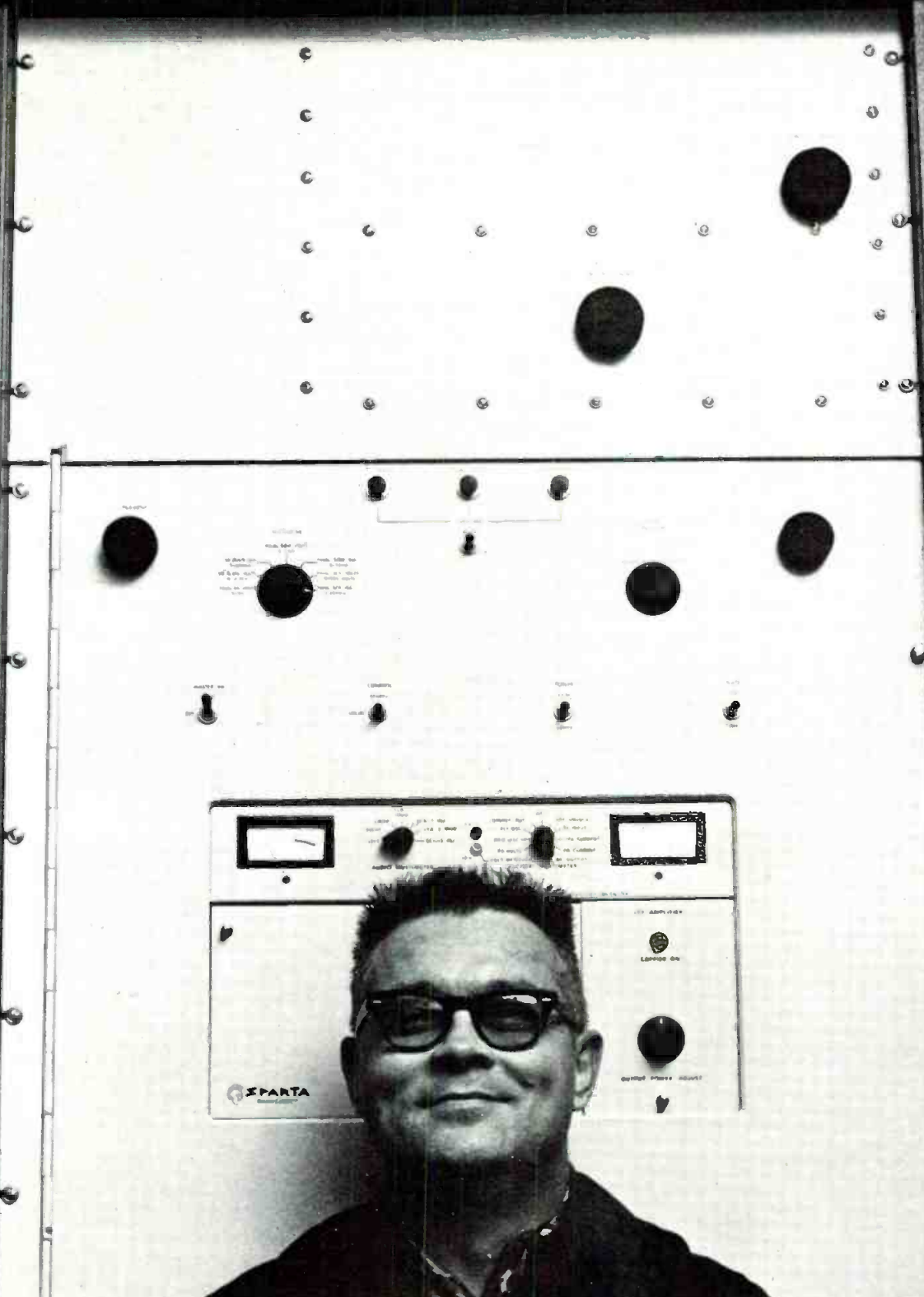




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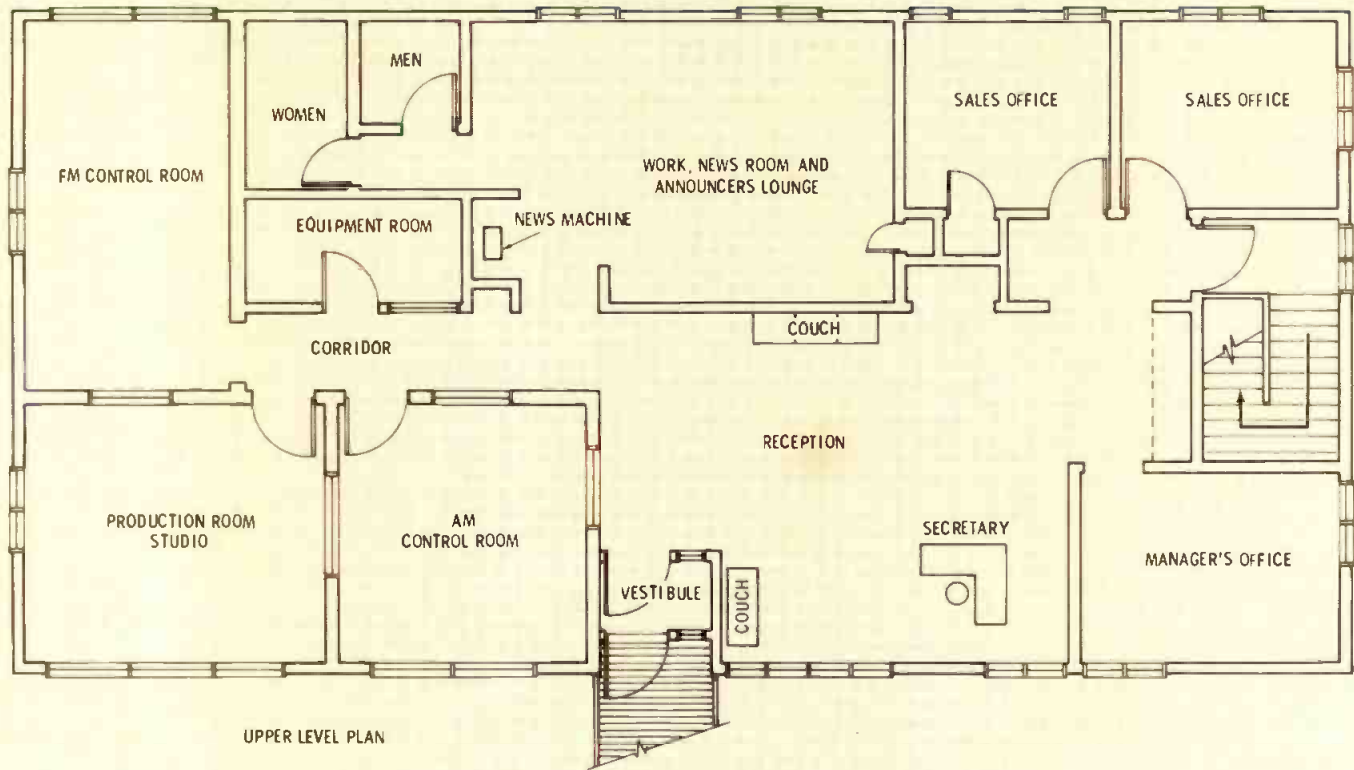


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**Fig. 2** The upper level floor plan. Lower level contains an engineering work room, studio and community room, the FM sales office, and storage areas.

area had several hundred trees, two springs, a creek and swamp with many wild animals and birds. (Sightings have been made at the area of pheasants, quail, squirrels, rabbits, chipmunks, snakes, fox, deer, racoon, ground hogs and hundreds of birds.)

The building was to be centrally air conditioned with dehumidification and electrostatic air filtering of the two floors with fixed windows, sound resistant walls between studios made of double walls with insulating fiberboard between the walls.

It was decided that with new close talk microphones and carpeting, the real expensive design for sound proofing, as some stations have built, was not necessary. In fact, all of the studios have wood paneling on the walls which was installed over sound insulating fiberboard applied to the studs with fiberglass insulation between the

studs. Draperies on the windows and carpeting on the floors give the studios enough sound control. Last, but not least, we wanted an attractive modern office for sales and management staff for conferences on sales and community programs with civic participation.

### ***New Electronics***

Actual specification for the wiring and electronics include: 1. The stations must be wired so one person could operate both stations if necessary. 2. Remotes, from remote radio pick-up, facilities for dial phone voice coupler pick up; arrangement for permanently terminating 25 to 50 phone pairs in rotary switches so that telephone people would not have to come to the station when remote phone lines to churches or businesses were ordered. 3. Extension of meters so either AM or FM operator

could control or read the meters of either station. 4. Networks for separate or duplicate programming. 5.

Facilities so commercials and programs could be audited by telephone by sponsors, citizens and civic leaders. 6. Provisions for network switching. 7. Provisions for ease of conducting an audio proof. 8. Production studio that could be used as a spare control room for AM or FM as well as a recording production studio. 9. Adequate monitors for off the air AM, FM and network. Monitors and amplifiers and instruments in separate racks in separate rooms so they could be serviced without interfering with control room on-the-air operations. 10. Locally fabricated remote control for AM and FM transmitters without stepping relays.

All of these features were designed and built into the new

studio-office building. When moving day came, the AM studio equipment was moved at night and no air time was lost. For the FM, WBZI signed off the air two hours early one night and moved all studio equipment. We were ready to sign on at the new studios the next morning at 6:00 a.m.

### Summary and Comments

In the new building, the staff members are more efficient and the sales staff now invites clients and community leaders to the offices. At the old studios, this was avoided. The increased space improved morale and a more positive mental outlook. The electronic air filter has greatly reduced maintenance on tape recorders and other electronic equipment by removing tobacco smoke and dust particles from the air.

Most of the materials for the new building were obtained from local station sponsors, and financing was by a local savings and loan association. This created goodwill and resulted in increase in business for all concerned. The building was erected with a minimum destruction of trees so that the five acre site remains very close to its natural original condition.

The remote pick-up arrangement for radio remote, telephone lines, off-the-air for other stations, and the improved switching arrangement for voice-coupler, telephone connections greatly increases the

efficiency of operations, especially the switches for telephone remote lines. Telephone service people do not have to come to the station as all new connections are made in the telephone company central office.

By locating all monitors and patch panels in a separate room, this equipment can be serviced by engineering personnel without disturbing announcers on the air. Patch panels were arranged for ease of conducting audio proofs for

the AM and FM stations. It has been found that announcers in general like switches better than patch panels, so for this reason, no patch panels were installed in the control rooms.

After a year's experience at the new studios, the efficiency of operations has greatly improved and all the new investment is more than paying for itself by improvements in business and service to the public. □



Fig. 3 The FM control center.



Fig. 4 AM control room with AM remote control and switching unit at center. The AM transmitter remained in the old station facility.

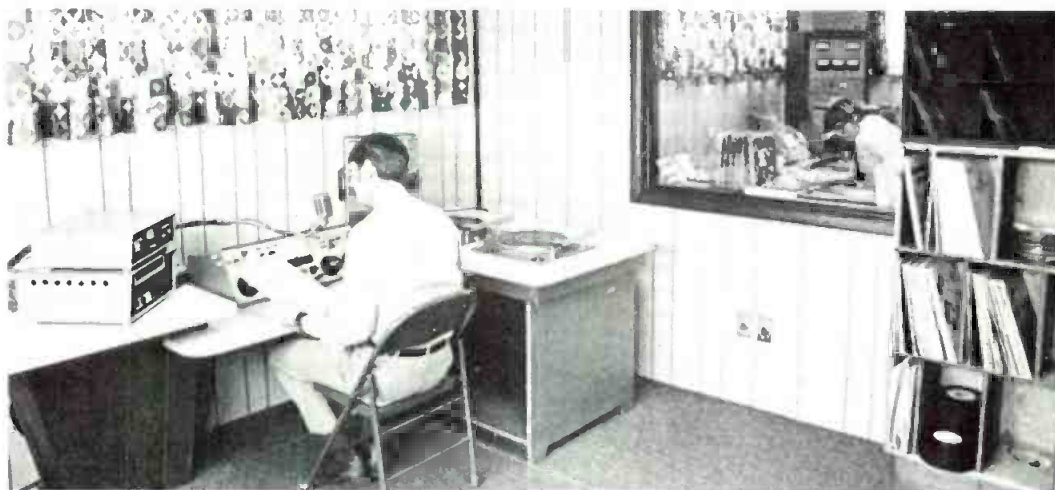


Fig. 5 Production console and turntable arrangement can be used as a backup or spare for AM or FM operations.

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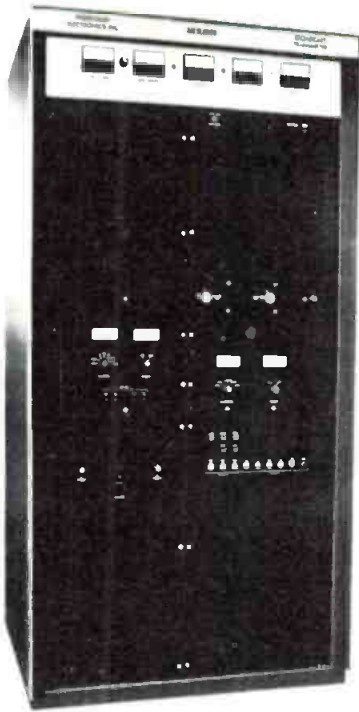


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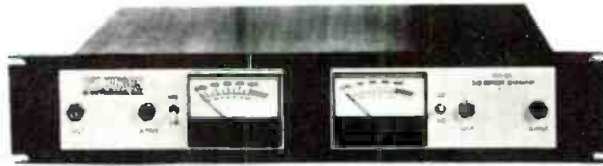
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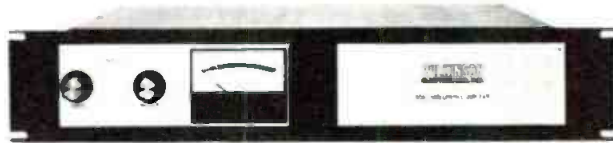
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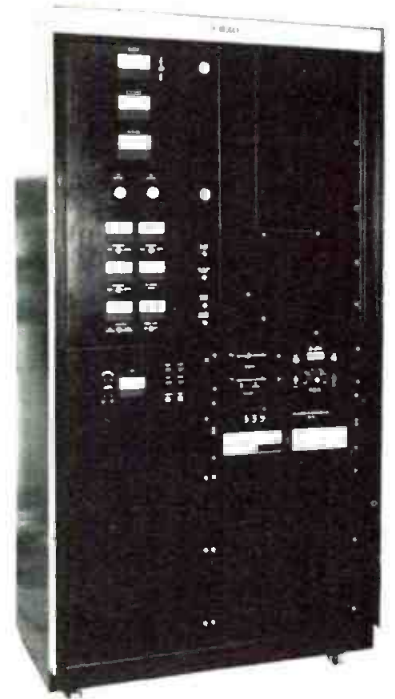
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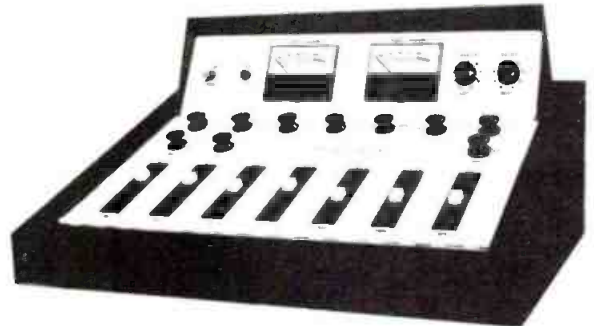
REMOTE AMPLIFIERS



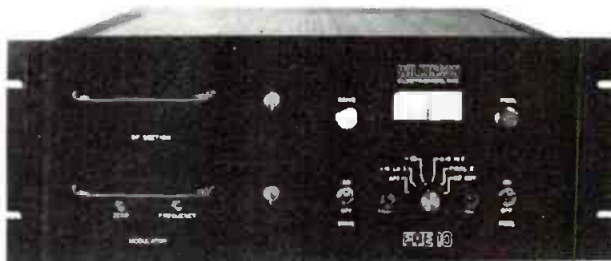
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250W - 1 KW - 2.5 KW - 5 KW  
7.5 KW - 10 KW - 20 KW - 40 KW



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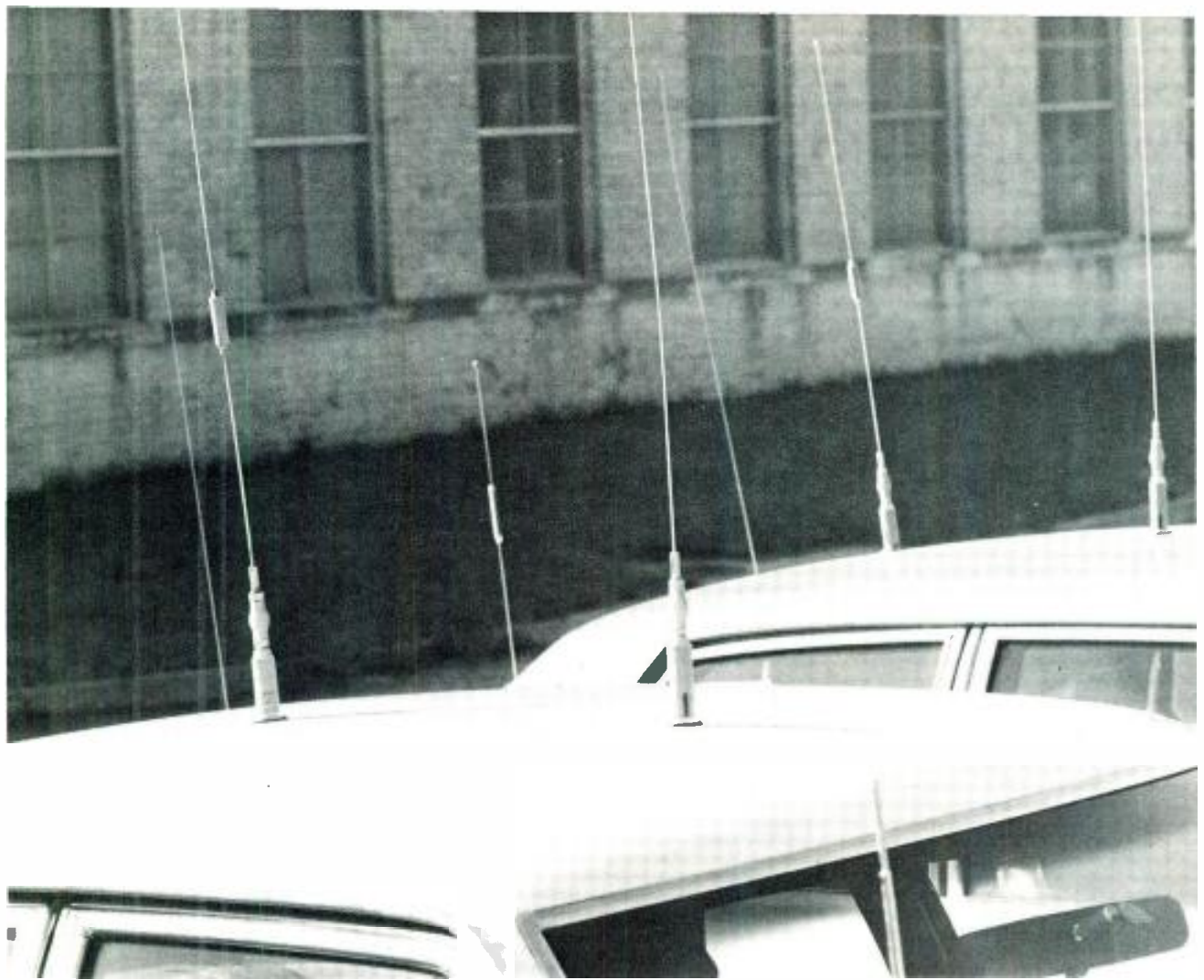
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WBAP mobile unit antennas indicate there is something different in the system. So far as we know, this is a first of a kind system for broadcasters.

## New relay repeater system for mobile units

---

*By Ron Merrell*

---

Station WBAP-TV/AM has developed a new, custom made relay repeater system for use in its mobile units that has solved most of the interference problems encountered in mobile units from geographic and terrain obstacles and from other transmissions.

The new two-way system was designed for the station's mobile units by Rupert Bogan, director of engineering. It may very well be the only one of its kind in the country. Each of the station's cars is equipped with a UHF and VHF remote pickup unit (UHF and

VHF are the transmitting and receiving bands). These units and the UHF and VHF base stations at the studio are also equipped with a quiet channel which keeps the receiver muted until a certain tone is transmitted and the receiver is triggered to "turn on" and accept the message.

### **Repeater Relay**

But in order to supply better coverage of the Greater Fort Worth and Dallas metro areas, a repeater relay system was added. In a nut shell, this means that the signal being transmitted will have a better path clearance and better reception because it travels directly to the base station at the studio as well as to the relay system. Both signals are received

simultaneously and with greater strength.

The mobile relay repeater system is mounted on the station's transmitter tower at Cedar Hill. When one of the mobile units is transmitting to the station, the signal is picked up on either UHF or VHF channels at the tower, depending on which one has taken precedence, and relayed to the receiver at the station at the same time it is being directly picked up there. If the repeater or relay is not operational, mobile units can transmit directly with the base station. If the relay is repeating or relaying a UHF mobile transmission, the VHF mobile can transmit directly from car to base station and vice versa.

The Automatic Relay is built to

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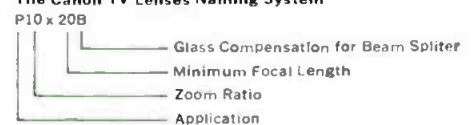
Shown on this page are only a few examples of the quality lenses Canon has available to more than meet your particular demands. Specify Canon to stay ahead.

The following are Canon TV Zoom Lenses for the Plumbicon® color cameras currently available on the market:

Size of Image tube	Lens	Image format covered
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	P17 x 30B1	
	P17 x 30B2	
1" Plumbicon® color camera	PV10 x 16B1	12.8 x 9.6mm (16mmφ)
	PV10 x 15B2	
	PV17 x 24B1	
	PV 6 x 18B1	

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#### The Canon TV Lenses Naming System



Applications	Image Format	Pick-up Tubes
P	21.4mmφ	1 1/2" Plumbicon
PV	16mmφ	1" Plumbicon

Apart from the above, Canon has available TV zoom lenses for 3" or 4-1/2" image orthicon cameras and can also build special lenses to fit your requirements.

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comply with Section 74.438 of the FCC rules. Figure 2 shows the scheme in block form.

The frequencies received are 450.05 MHz and 170.135 MHz. To comply with the FCC rules, a monitor receiver "on" the same frequency as the relay transmitter will lock out the transmitter if another signal is being received.

Each relay receiver feeds a

lockout selector, which means that whichever signal is received first locks out the relaying of the other.

As can be seen from the block diagram of Figure 2, if the monitor receiver fails, the relay transmitter is locked out. At the present time WBAP has nine cars equipped with a UHF and VHF unit. There also are UHF and VHF base stations.

Each car has a two frequency

UHF receiver, which affords the capability of receiving directly from the base station, the other cars, or from the relay. The UHF base has a two frequency receiver also. The VHF frequency can also be received directly at the base station and in the cars.

### System Reliability

Figure 1 shows the combinations for reliability of the system. Figure 3 shows the location of the system on the candelabra tower which is located approximately equidistant—or 20 miles between the cities of Fort Worth and Dallas.

To comply with section 74.438 of the FCC rules, the monitor receiver is equipped with safeguards so that if a signal of two microvolts exists across the receiver terminal at the same frequency that is being transmitted, a "lockout" circuit will develop and the transmitter will not transmit. In other words, there is no chance of receiving and sending two separate messages at the same time. If the monitor receiver is not working, the transmitter will not turn "on" and mobile units will transmit directly with the base station. When the UHF channel is repeating, the VHF channel is automatically "locked out" and when the VHF channel is repeating, the UHF channel is inoperable. Each transmitter turns the relay "on" by a subaudible continuous tone.

Bogan developed the system to replace the two-way units that had been in use since 1959. A construction permit from the FCC was approved, the unit was designed and installed and then closed down until the license to operate was received. Notification to the area engineer for the FCC in Dallas and the headquarters in Washington, D.C. was sent two days before actual use was begun the last of September. □

**Editor's Note:** Pictures and parts of this article were made available to BE by Rupert Bogan. We appreciate his cooperation, meanwhile, we invite your ideas for regular articles and for our Engineer's Exchange.

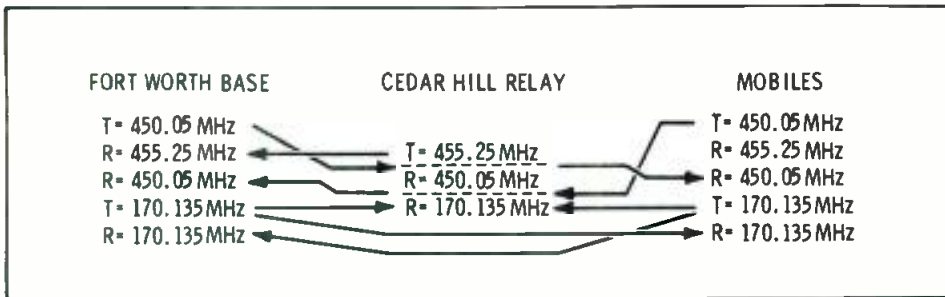


Fig. 1 Relay repeater capabilities and path description.

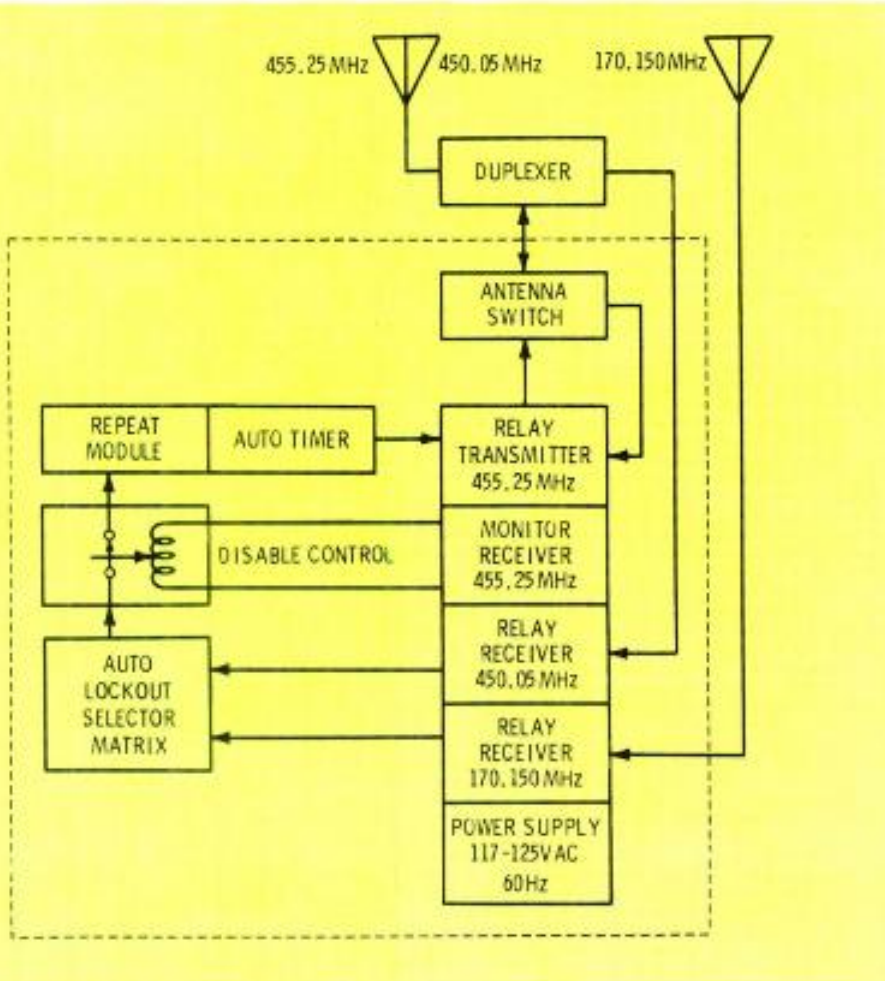


Fig. 2 Block diagram of automatic relay station mounted in weather proof cabinet attached to TV and FM tower at Cedar Hill. See Figure 3.



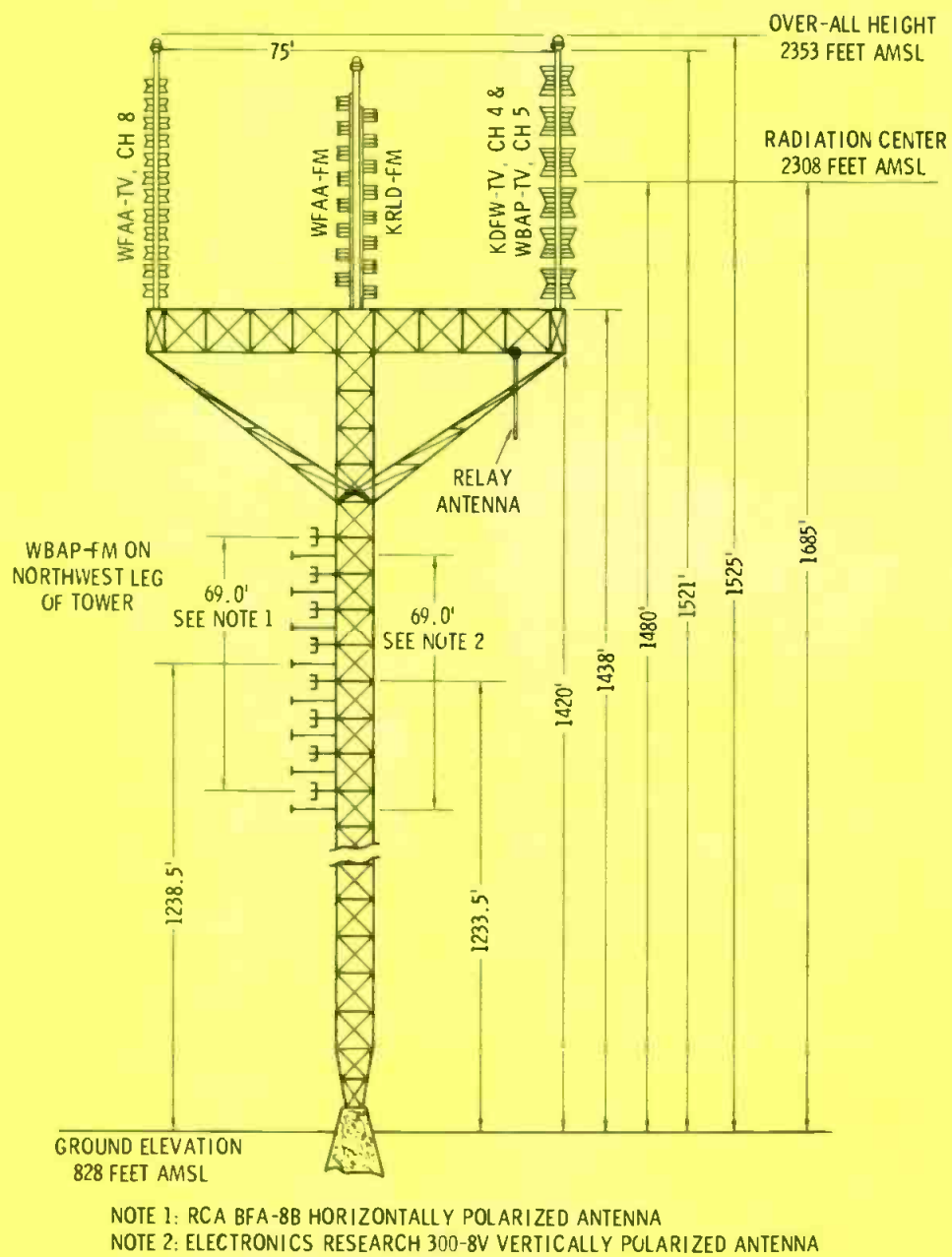
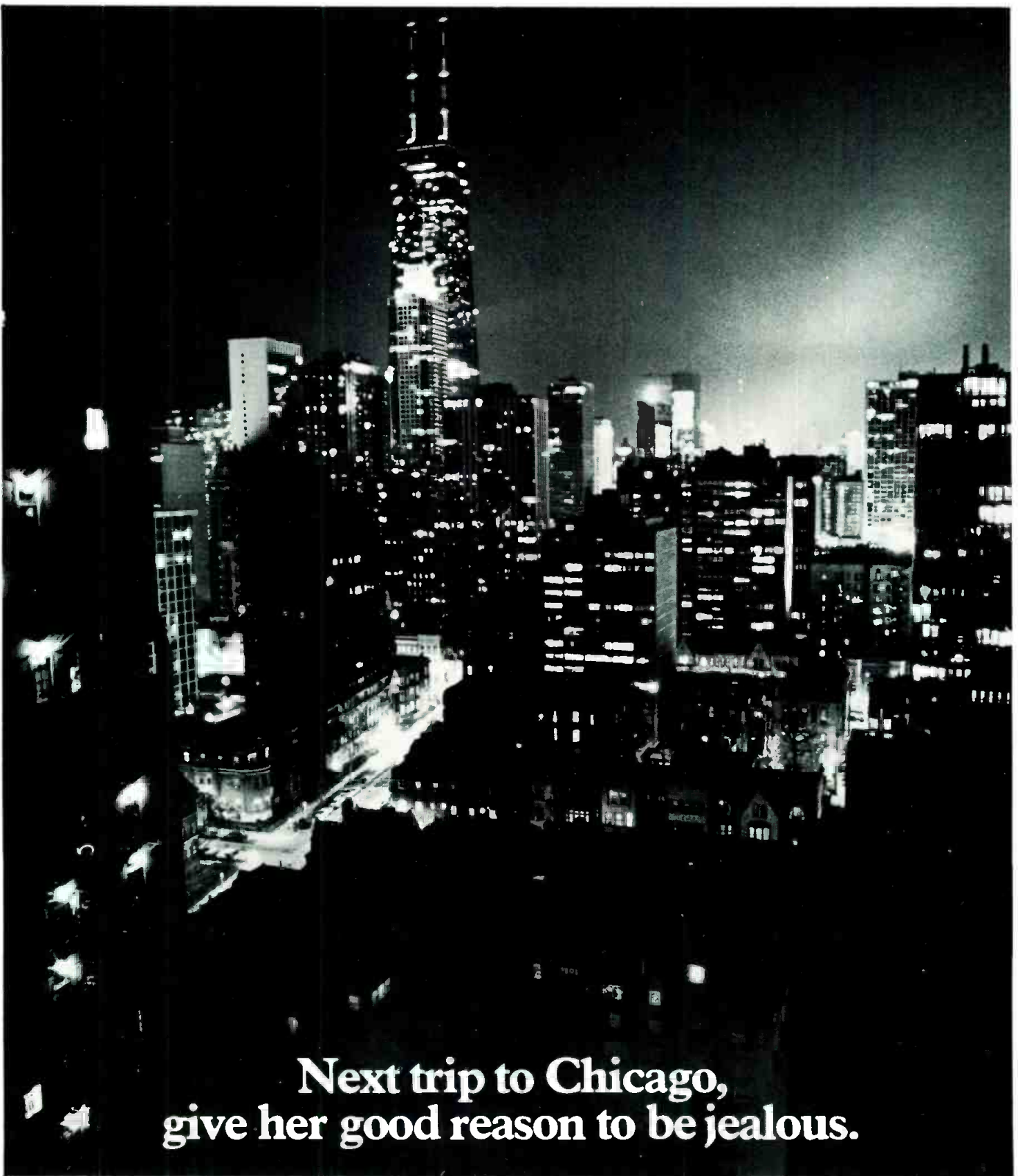


Fig. 3 Antenna arrangement showing location of all station antennas and the automatic relay placement.

Fig. 4 Inside one of the mobile units showing control heads and scanners.

Fig. 5 Base station equipment rack at studio in Fort Worth.





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# Let's get on channel

By Pat Finnegan\*

Correcting deviations of the carrier frequency and the station frequency monitor can be a relatively simple procedure, but it can become very confusing under certain circumstances. Some stations have their own frequency measuring equipment, but many others rely on an outside frequency measuring service. This service may not always be convenient.

## Problems

In many areas for FM and TV and especially UHF TV stations, the Measuring Service is at too great a distance for a direct signal pickup. Portable equipment is taken out on a circuit that passes within range of the station. When measurements are made in this manner, unless the carrier is far from the assigned or out of tolerance, a report in the mail is the only notification the station gets. Depending upon mail deliveries, this report will reach the station within a few days to a week. Correcting the carriers a week after measurements were made provides the greatest opportunity for confusion.

TV transmitter provides the greatest source of confusion, because it not only has two interdependent carriers, but also the station monitor has two interdependent measuring circuits. This means four oscillators to adjust and there is great interaction.

## Correction Adjustments

To program in a greater chance for confusion, as an example, let's consider a typical UHF TV report. This report is received a week after

\*BE Maintenance Editor

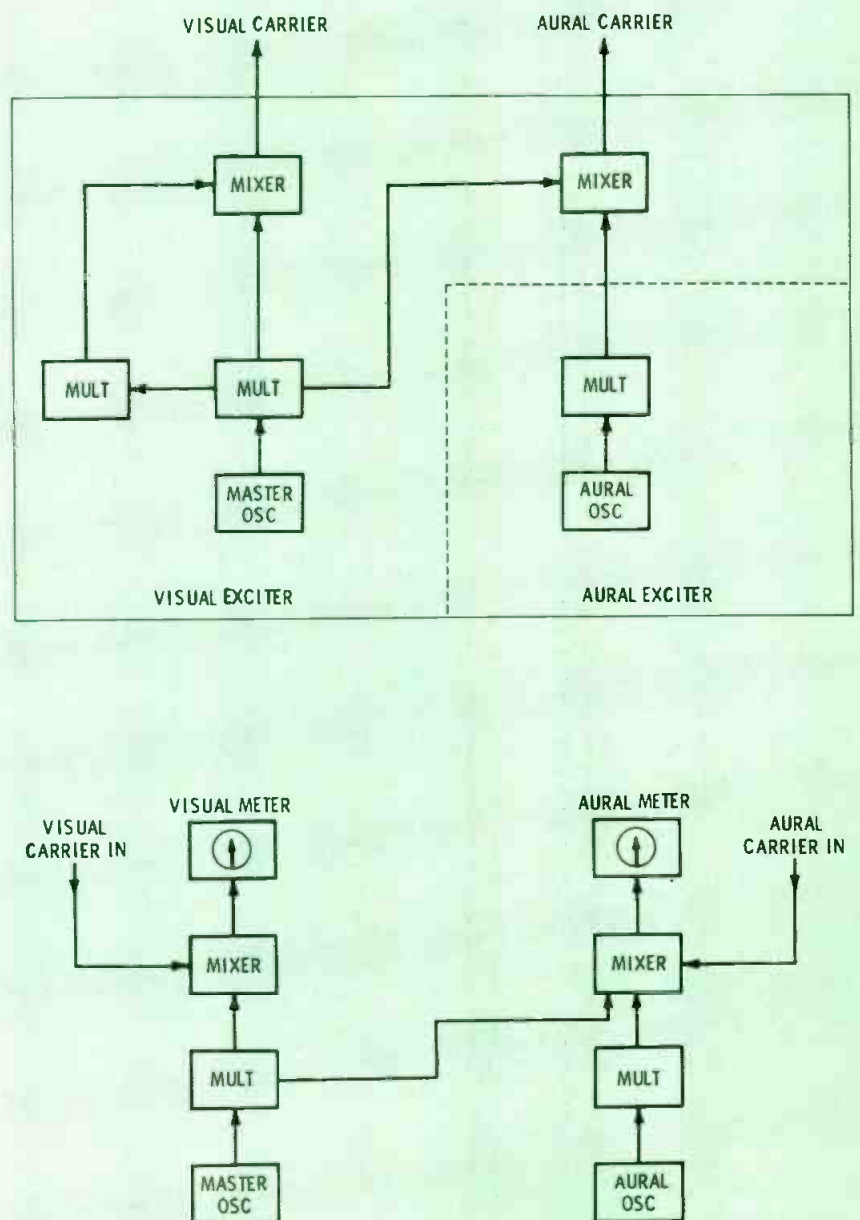


Fig. 1 A very simple set of block diagrams transmitter exciter and station monitor that show how adjustments interact.



Creating truly fundamental bass with an acoustic suspension speaker system is often an exercise in frustration. It requires substantial power, plus a speaker that can move extreme distances without distortion. And as the woofer cone area is reduced the problem becomes more and more acute.

Luckily the typical distribution of energy in the lowest octaves for most music is usually modest, so that speakers are called upon to produce deep bass much less often than commonly supposed, even when reproducing organ and orchestral music. Nevertheless, the capability to accurately reproduce the lowest octaves is one greatly sought after and highly prized.

A re-examination of audio basics, primarily inspired by research by A. N. Thiele, has led E-V to develop new speakers based not on the ubiquitous sealed box concept, but rather on a sophisticated analysis of the vented enclosure. The first new system using this basic approach is the Interface:A. Unlike small sealed systems, the woofer excursion for this system actually diminishes as the system approaches resonance, thus permitting an extension of low frequency response without major penalties in efficiency or increased size.

To achieve the low frequency limit of 32 Hz (3 dB down point) from this 6th Order Butterworth-tuned system, research results suggested the use of an 8-inch woofer, matched to the enclosure volume with the equivalent of a 10-inch diameter, 20-foot long vent. But examination of the system reveals neither vent nor duct! Instead a vent-substitute is employed. This takes the form of a 12-inch cone assembly that is controlled in mass and compliance to be the mechanical analogue of the desired acoustic vent system. It has no voice coil or magnet but moves solely in response to the motion of the 8-inch woofer. It is fascinating to watch the 12-inch vent-substitute moving vigorously at 32 Hz in response to the woofer whose motion is barely detectable!

In combination with an active equalizer that adds a modest 6 dB boost at 35 Hz, Interface:A extends low frequency response well below that of a sealed system of equivalent size and efficiency, yet without increasing woofer excursion.

The same principles of vented system design have also been applied by Ray Newman, E-V Senior Product Engineer, in creating the new Sentry III monitor system. In this instance, high efficiency for studio use was a major design goal, and it is achieved with a larger enclosure, a 15-inch woofer and a "real" vent. The result is a system capable of low frequency performance uncommon in past high level monitor systems.

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MEASURED	MONITOR READ	MONITOR ERROR	MONITOR READS NOW	AFTER CORRECTION MONITOR READS	
-300 Hz	-50 Hz	HI 250 Hz	+50 Hz	-200 Hz	VISUAL
+100 Hz	-50 Hz	LO 150 Hz	+50 Hz	-50 Hz	AURAL

Fig. 2 A rough chart with all the important figures will keep the information straight. Shows what the monitor will read after correction but before transmitter correction.

the measurements were made, so there has been opportunity for changes to have taken place. The first thing to do, of course, is to pull the log for the date of the measurement. Note the monitor reading for the time nearest the time the measurement was taken. A helpful device is a rough chart drawn up to keep all the information straight. For each carrier, write down the measured frequency, monitor reading, how high or low the monitor error is in Hertz. Another helpful hint: use the work (high) or (low) instead of (+) (-) for the monitor error.

In our example, the visual carrier measured -300 Hz, the aural +100 Hz. At that time, the monitor read visual -50 Hz, aural -50 Hz. The carriers are drifting apart, affecting separation, and the monitor obviously needs calibration. On the day the report is received, however, the monitor now reads visual +50 Hz, aural +50 Hz.

At the time of measurement, the visual monitor was reading high by 250 Hz, aural monitor reading low by 150 Hz. The monitor must be corrected first. Adjust the monitor master oscillator to correct the visual error (may be aural in some monitors). Before correction, the monitor is reading visual at +50 Hz. LOWER this reading to -200 Hz, since the error is high by 250 Hz. The master oscillator adjustment also moved the aural, so that it now also reads -200 Hz. Adjust the monitor aural oscillator to RAISE this reading to -50 Hz, since the error was low by 150 Hz. The monitor is now calibrated.

Next, adjust the transmitter itself, using the calibrated monitor as a guide. Adjust the master oscillator in the visual exciter until the monitor reads zero frequency deviation on the visual meter. The master oscillator moved the visual frequency higher, but it also moved the aural carrier higher another 200 Hz, so that the monitor now reads +150 Hz. Adjust the oscillator in the aural exciter to lower the aural to zero frequency deviation. Both the monitor and the carriers are calibrated and on the assigned frequencies.

Be sure to make entries on the maintenance log for both dates: the date of measurement and the date of corrections. Entry on one date need be only a reference to the other log date.

Adjustments to transmitters and monitors are usually critical, so adjustments should be done in very small increments. If you can't see the monitor meters while making the transmitter adjustments, get someone to watch it for you. Otherwise, you can get off frequency easy, get lost and have a most difficult time finding your way back on frequency.

### Summary

Correcting the carrier frequencies can be relatively easy if precautions are taken; a small chart drawn up to present all information as you go along, and not get plus and minus signs mixed up. Get careless, and the transmitter can be out of tolerance, while a miscalibrated monitor says all is well. □

## Patent Granted For Two-Way Video System

A two-way communications system successfully tested among CATV viewers in New York City in 1971 has been granted a U.S. patent, it was announced by its developer Video Information Systems, Inc., a subsidiary of Cable Information Systems (OTC).

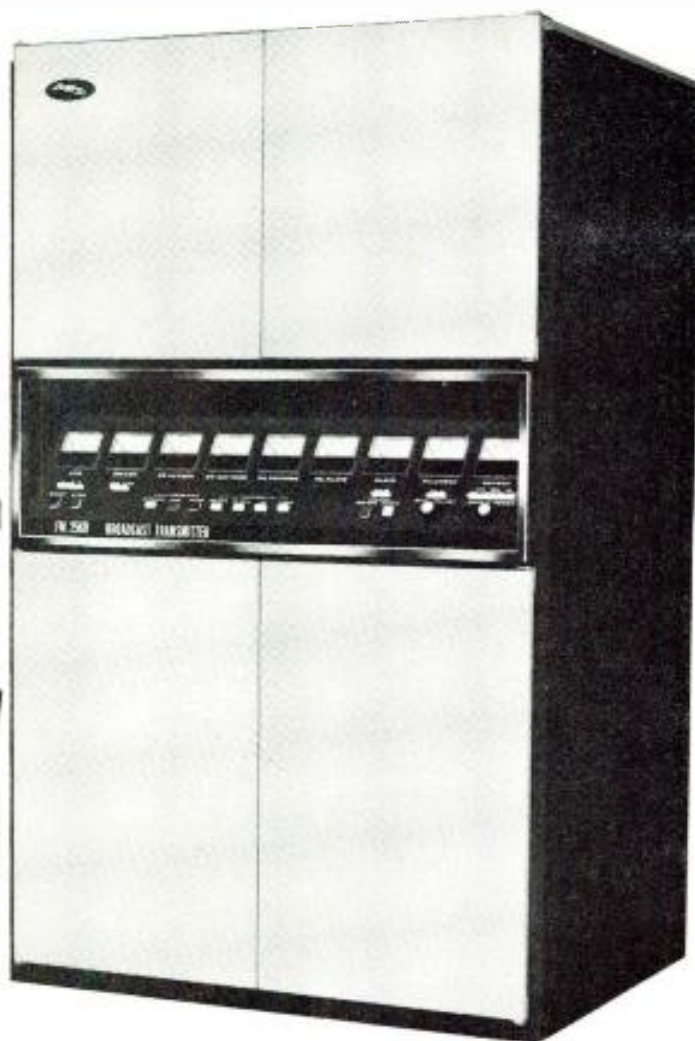
According to the company, the patent was granted just as the company was completing plans and commencing construction in South Orange, New Jersey to make that municipality the first in the country to have extensive two-way communications capability. By the end of 1973, it is expected that between 2,000 and 4,000 TV viewers in South Orange will be able to shop, vote, be polled, engage in pay TV events, and report fires or burglaries, among its many use—all pressing certain buttons or by the computer's automatic monitoring a converter box attached to their TV sets.

Video Information is a pioneer in the technical development and programming of two-way communications, a system which links home TV sets to a centralized computer by means of a special converter box.

According to Peter Nisselson, president of Cable Information Systems, the newly patented system is lower in cost than most competing models and is well ahead of the rest of the two-way communications field in provability and technical competence.

Essentially, two-way communications allows a TV viewer to make selections by pressing certain buttons on a converter unit attached to his set. The button impulses are fed into a computer which records the viewer's vote, takes his shopping order or whatever the case may be. The system is called two-way communications because for the very first time a TV viewer will be able to transmit messages and instructions of all types from his TV set rather than only receiving them as in the traditional mode of TV reception.

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# Maximum service telecasters meet in Puerto Rico

By Lester Lidlow\*

The Board of Directors of the Association of Maximum Service Telecasters, Inc. (MST) concluded its fall three-day meeting on December 1 at the Cerromar Beach Hotel in Puerto Rico. The meeting featured a complete review of current activities of the Association. Particular emphasis was given to recent filings with the FCC in Docket 19554, the paycablecasting proceeding, as well as serious short separation problems raised by an

\*Executive Dir. MST, 1735 DeSales, N.W., Washington, D.C. 20036

application filed with the Commission by station WETA-TV, a Washington, D.C., UHF educational station which is proposing to conduct a limited experiment utilizing Channel 12 with a view towards ultimately operating on this frequency on a permanent basis.

The WETA-TV application would present large short separations to two co-channel stations in Richmond, Virginia and Wilmington, Delaware, and two adjacent channel stations in Baltimore, Maryland.

Terry Lee, Vice President,

Storer Broadcasting Company, Miami Beach, Florida, is President of MST and conducted the meetings along with Lester W. Lindow, Executive Director of the Association and Roy W. Easley, Assistant Executive Director.

At the meeting, five station applications for membership were approved. The new members are WMAL-TV, Washington, D.C., WLVA-TV, Lynchburg, Virginia, WCIV-TV, Charleston, South Carolina, WKEF-TV, Dayton, Ohio and KATU-TV, Portland, Oregon.

*Continued...*

*Board of Directors of MST at December workshop meeting.*



**Standing—left to right:** Messrs. John T. Murphy, AVCO Broadcasting Corp., Cincinnati, Ohio; Ralph S. Jackson, Orion Broadcasting, Inc., Louisville, Kentucky; Willard E. Walbridge, Capital Cities Broadcasting Corporation, Houston, Texas; Norman P. Bagwell, WKY-TV, Oklahoma City, Oklahoma; Howard Lane, LOIN-TV, Portland, Oregon; Willard Schroeder, WOTV, Grand Rapids, Michigan; F. Wright, WTOK-TV, Meridian, Mississippi; C. Wrede Petersmeyer, Corinthian Broadcasting Corp., New York, NY; James M. Moroney, Jr., WFAA-TV, Dallas, Texas; A. M. Herman, WBAP-TV, Fort Worth, Texas.

**Seated—left to right:** Messrs. Joseph B. Epperson, Scripps-Howard Broadcasting Co., Cleveland, Ohio; Ogden Prestholdt, A. D. Ring and Associates, Washington, D.C.; Charles H. Crutchfield, Jefferson Pilot Broadcasting Co., Charlotte, North Carolina; Clyde G. Haehnle, AVCO Broadcasting Corporation, Cincinnati, Ohio; Howard Head, A. D. Ring and Associates, Washington, D.C.; Ernest W. Jennes, Covington and Burling, Washington, D.C.; Terry H. Lee, Storer Broadcasting Company, Miami Beach, Florida; Lester W. Lindow, AMST, Washington, D.C.; Franklin C. Snyder, WTAE-TV, Pittsburgh, Pennsylvania; Jack Harris, KPRC-TV, Houston, Texas; A. James Ebel, KOLN-TV, Lincoln, Nebraska; Roy W. Easley, AMST, Washington, D.C.

# Free Broadcasting System Campaign

A year-long on-the-air campaign to provide information and education about the American free broadcasting system has been recommended by the Public Relations Committee of the National Association of Broadcasters.

In a meeting here yesterday, the Committee asked the Association's Executive Committee to approve plans for the three-stage campaign to be conducted during 1973.

The campaign will be designed to make the American people more aware of the many contributions our free radio and television system provides the nation in news, entertainment, public affairs and public service. The vital role of advertising in keeping it free also will be stressed.

NAB's radio members will be sent three recordings of on-air spot announcements during the year probably in January, May and September. The annual observance of National Radio Month will be integrated into the overall effort.

The Committee, under the chairmanship of J. Kenneth Marston, WDXI, Jackson, Tenn., also was briefed by NAB's Public Relations staff on the upcoming NAB seminar on minority ownership opportunities in radio and television, ac-

tivities and projects of the Radio Information Office, the Editorial and Speech Exchange programs, and the Public Relations activities on License Renewal.

In addition to Marston, Committee members are Leslie G. Arries, WBEN-TV, Buffalo, N.Y.; George R. Comte, WTMJ-TV, Milwaukee, Wis.; Carl Fisher, KUGN, Eugene, Ore.; John F.

Hurlbut, WVMC, Mt. Carmel, Ill.; Dan McKinnon, McKinnon Enterprises, La Jolla, Calif.; Dale Moore, KGVO-TV, Missoula, Mont.; Thad M. Sandstrom, WIBW, Topeka, Kan.; Philip Spencer, WCSS, Amsterdam, N.Y.; Peter Storer, Storer Broadcasting, Miami Beach, Fla.; and Robert F. Wright, WTOK-TV, Meridian, Miss.

## Commission Rejects Proposal

A proposal by The Value Line Special Situations Fund, Inc. (Fund) on voting stock holdings in broadcast licensees to eliminate problems its ownership may present under the FCC's multiple ownership rules has been rejected by the Commission.

Commission rules prohibit the ownership of 3 percent or more of the voting stock of broadcast licensees by mutual funds if such ownership results in a violation of the multiple ownership rules.

On July 19, 1972, the Commission granted an application of Bartell Broadcasting of Missouri, Inc. to acquire the license of KRCH (FM), St. Louis, Mo. Bartell Broadcasting of Missouri is owned 100 percent by Bartell Media Cor-

poration which in turn is controlled by Downe Communications, Inc. Downe controls stations WOKY (AM), Milwaukee, Wis., KCBQ (AM), San Diego, Calif., WADO (AM), New York, N. Y., WMYQ (FM), Miami, Fla., and WDRQ (FM), Detroit, Mich.

In the same action, the Commission requested the Fund, which holds 3.4 percent of Downe Communications stock and 5.51 percent of Pacific and Southern Broadcasting Co., to make the necessary divestiture of its stock holdings in broadcast licensees (or their parent corporations) so that its interests would be in compliance with the Commission's multiple ownership rules, and to submit within 15 days a statement of their actions.



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### **Association Background**

MST is an Association of over 155 television stations, VHF and UHF, commercial and educational, operating at maximum power. It was organized in 1956 to meet the serious threats at that time to the basic system of television channel allocations being considered by the FCC and various Congressional committees. It is primarily concerned with the fundamental problem of maintaining high technical standards for television and to combat existing and anticipated threats to signal degradation.

The Association, over the years, has made numerous appearances and has participated in proceedings before the Commission, as well as various committees of both the House of Representatives and the United States Senate dealing with the subject of television allocations and assignments, either directly or indirectly. It also maintains close liaison with the Office of Telecommunication Policy and various other governmental agencies.

Through the years, MST has conducted and participated in a number of technical studies and factfinding activities to obtain solid technical data bearing on its interests. It was one of the key elements in the Television Allocations Study Organization (TASO), a study organization developed at the request of the FCC which obtained extensive data in the field of allocations. The results of this study have become basic source material for much of the allocations work in past years and is still in regular use.

Headquarters of the Association are in Washington, D.C., and operates under the direction of a 21-man Board of Directors composed of some of the outstanding leaders in the broadcasting field. In addition to the staff, it draws on legal support from the firm of Covington and Burling and engineering

counsel from the firm of A.D. Ring and Associates, both of Washington.

The membership of the Association meets at least once each year, usually at the time and place of the NAB annual convention. The 1973 meeting will be scheduled in Washington, D.C. at the Shoreham Hotel on the afternoon of March 25.

Assisting the Board is an outstanding group of station engineers which serves as the MST Engineering Committee under the chairmanship of Clyde Haehnle, AVCO Broadcasting Company, Cincinnati, Ohio. Several of the members of that committee also serve on the Board of Directors.

### **Representing The Industry**

The Association has also been very active in proceedings before the FCC dealing with land mobile radio, and has conducted studies to determine ways and means in which more efficient use of the non-broadcast portion of the spectrum can be achieved.

MST continues to be involved in matters pertaining to use of communications satellites, particularly in the area of satellite-to-home broadcasting. In addition to Lee, the officers of the Association are: Arch L. Madsen, Bonneville Communications Corporation, Salt Lake City, Utah-first vice-president; Robert F. Wright, WTOK-TV, Meridian, Mississippi-second vice-president; Franklin C. Snyder, WTAE-TV, Pittsburgh, Pennsylvania-secretary-treasurer; Lester W. Lindow, AMST, Washington, D.C.-assistant secretary-treasurer.

The Board of Directors, in addition to the officers, is composed of the following individuals: Norman P. Bagwell, WKY-TV, Oklahoma City, Oklahoma; Charles H. Crutchfield, Jefferson Pilot Broadcasting Company, Charlotte,

North Carolina; A. James Ebel, KOLN-TV, Lincoln, Nebraska; Joseph B. Epperson, Scripps-Howard Broadcasting Company, Cleveland, Ohio; Jack Harris, KPRC-TV, Houston, Texas; A. M. Herman, WBAP-TV, Fort Worth, Texas; Ralph S. Jackson, Orion Broadcasting, Inc., Louisville, Kentucky; C. Howard Lane, KOIN-TV, Portland, Oregon; August C. Meyer, WCIA, Champaign, Illinois; James M. Moroney, Jr., WFAA-TV, Dallas, Texas; John T. Murphy, AVCO Broadcasting Corp., Cincinnati, Ohio; C. Wrede Petersmeyer, Corinthian Broadcasting Corp., New York, New York; A. Louis Read, WDSU-TV, New Orleans, Louisiana; Lawrence H. Rogers, II, Taft Broadcasting Co., Cincinnati, Ohio; Willard Schroeder, WOTV, Grand Rapids, Michigan; Willard E. Walbridge, Capital Cities Broadcasting Corp., Houston, Texas; Harold Essex, director emeritus; and Harold C. Stuart, director emeritus.

In addition to the Chairman, Haehnle, the Engineering Committee is composed of: Albert Chismark, WHEN-TV, Broadcast Division/Meredith Corp., Syracuse, New York; Harold A. Dorschug, WTIC-TV, Hartford, Connecticut; A. James Ebel, KOLN-TV, Cornhusker Television Corporation, Lincoln, Nebraska; Joseph B. Epperson, WEWS-TV, Cleveland, Ohio; Ralph L. Hucaby, WLAC-TV, Inc., Nashville, Tennessee; Carl G. Nopper, WMAR-TV, Baltimore, Maryland; Daniel H. Smith, WPVI-TV, Capital Cities Broadcasting Corp., Philadelphia, Pennsylvania; and Leonard A. Spragg, Storer Broadcasting Company, Miami Beach, Florida.

The Board of Directors meets from four to six times each year, and the Engineering Committee meets two or three times each year.

□



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"We've tested other cartridges. A lot of other cartridges. Our tests showed no cartridge superior to the Audiopak A-2 in ruggedness, mechanical design, or (most important of all) consistency in phase stability."

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

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

"Since all our music is on carts, they must be dependable. Without a doubt, the A-2 gives us the reliability we need."

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

**WXLO 98.7**  
**FM**  
**STEREO**

Audio Devices, Inc.  
A Capitol Industries Company  
100 Research Drive  
Glenbrook, Conn., 06906

For More Details Circle (65) on Reply Card

**New**  
**Audiopak® A-2**  
**Broadcast**  
**Cartridges**



The Minimobile shown here at a remote site with camera operated from a special front platform.

## Renting your way into remotes

By Ron Merrell

There was a time when certain local shows were really not economically feasible. This was especially true with the smaller market stations, because the investment in origination equipment—especially remotes—would take too long to pay off.

But new approaches to meet the broadcaster's special needs have been found. First, an entire complement of station equipment could be rented with options to purchase later; and then there was specialized test equipment that could be rented for special or unique tests. Meanwhile, Editel was taking another direction.

Until 1969, Editel was a videotape production house in Montreal, Quebec. Because they work so often with studio cameras, Editel wanted to do a heavier job with lighter equipment. They had to redesign equipment, especially for the portable color TV camera business. The cameras available then were big, heavy and allowed almost no mobility or flexibility to the producers. To achieve its goal, Editel wanted a small, light hand-held color TV camera.

It was suggested that Editel purchase a standard camera that could

be taken apart and re-built in a smaller size.

An Ampex BC-230 model was bought and the wire cutters put to it. Research and imagination reduced size and weight as much as possible. The results were quite interesting and featured a smaller and lighter camera weighing 33 pounds compared to a normal 100 pound TV camera. In November 1970, this new camera travelled world-wide.

Editel was satisfied with the performances of the MARK II, but wanted mobility improvements. Warren Smith, motion picture cameraman/inventor, had the task of cutting down, simplifying and reducing while keeping the same quality production. "Our objective was to reduce the whole thing to basic essentials. We looked at it from a film camera standpoint and aimed for a camera that was small, durable and dependable" says Warren Smith. He worked on the project until he had the same features, but a 13 pound lighter camera, the MARK III.

To obtain the essential ruggedness, they decided to assemble the core casting in the same fashion as the crank case in a car, with the

yoke assemblies being like cylinders, in order to obtain the smallest, strongest assembly possible. With these new directions, the MARK III color TV camera could feature versatility and the freedom of movement.

### **Sports Remotes**

Since January 1972, the MARK III camera has been used at the Sugar Bowl Game, the Andy Williams Open Golf Tournament, the Silver Broom World Curling competitions in Germany, the XX Summer Olympics in Munich, and is in constant use on NHL Hockey from Montreal. In addition, the MARK III has been used all across U.S. and Canada to shoot commercials and TV series.

Editel has decided to produce six additional units. Of those six cameras, two have been sold to Radio-Quebec, the production house set up by the Provincial Government of Quebec, to produce educational programs. To satisfy everyone, Editel is using the cameras, being first of all a production house, but also sells them or rents them.

### **Going Mobile**

Editel also has decided to com-

plement its camera with an entire mobile production unit in miniature size. Once again, Warren Smith (who designed the MARK III camera) was the man who had the job of creating a small unit with complete equipment. As he did for the camera miniaturization, he tried to keep only the essential parts and instruments to make the entire production unit as small as possible, without reducing its qualities and production uses. The result of all his work and research is called the Minimobile.

Inside a 8' x 22' x 8' high trailer where three crew members and four production people can work, the MARK III camera is operating from batteries, generator of conventional 110V power supply. The camera and camera control unit are mounted in shock proof cases which can be removed if required.

Complete support equipment consists of a camera control unit, a VR 3000 Ampex tape machine (with color playback) 6-channel audio console, ¼-inch audio tape machine and color monitor. There

is also a vectorscope, an audio and video jack fields, an audio monitor and amplifier, a 10 x 1 switcher for picture matching as well as a 10 x 2 switcher at the production desk.

On the side of the Minimobile, in the exterior bulk head, 6 mike inputs, 4 audio lines (2 in, 2 out) are provided with provisions for telephone lines, video lines (in and out), and 3 intercom outputs also with program interrupt.

The minimobile is supplied with a provision to add a second camera control unit and another VR 3000. It is also interesting to note that two Minimobiles can work together providing four mobile cameras. This Minimobile may also be orbiculated to any larger multi-camera mobile.

Provisions for a camera platform, front, sides and rear, allow an installation within minutes. There is also a built-in roof camera platform. The unit also carries complete lighting and gripp equipment with quartz lights, stand reflectors, flags, etc. The rear storage compartment, which can

be used as a dressing or make-up room, houses a 1000 feet of camera cable.

The unique Editel Minimobile can operate at high speed, carrying a production crew. With the camera being powered on route, ready to shoot on arrival at production site.

All these production facilities are housed in a comfortable trailer providing two air conditioning systems (36,000 BTU) operating from the engine, and (12,000 BTU) operation from built-in generator or 110 Volt power source. An individual suspension system allows minimal vibrations. □

Editor's Note: As it has always been with BE coverage of new equipment and new broadcast services, we take credit only for their exposure to the industry. There are U.S. companies who sell remote vans, but we felt the Editel Minimobile was unique. This kind of approach to TV remotes will meet its real test in the marketplace of broadcast ideas.

# automatic

## VTR editing system

### a precision tool for creative people



Only the Central Dynamics PEC-102 offers all this:

- Computer control
- CRT readout with mimic display
- SMPTE time code
- Video production interface for complete effects control
- 600 scene mass storage file (optional)



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U.S.A.-230 LIVINGSTON ST., NORTHVALE, N.J. 07647

For More Details Circle (52) on Reply Card

## A Color Balop For The TK27 Chain

*By Max Jones  
KTIV, Sioux City, Ia.*

Why build a Color Balop? We at KTIV had the following reasons: A Color Polaroid of a news event or a commercial could be printed and on the air in a short period of time. Our main reason was we used a black and white time and temperature Balop for inserts in the Today and Tonight Shows, which we wanted in color. Since it has been in use it has been put to other good use, like showing the location of severe weather.

A Color Balop for use with the RCA TK27 film chain. From the Photograph 1, you can see that it takes up very little space, with no

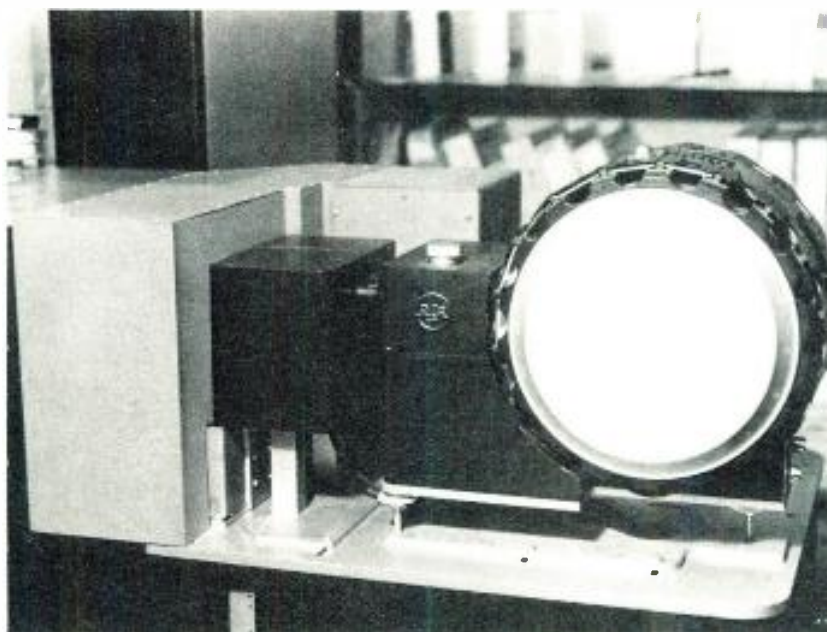
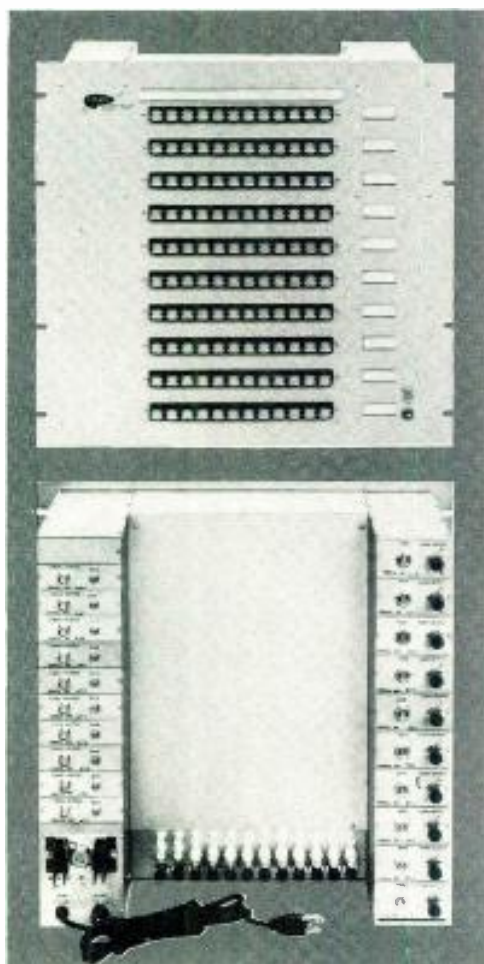


Photo 1



## Patch Cable Eliminator

Forget about messy patch cables and the tedious task of re-patching to change distribution. DYN AIR's Series-X-Switchers provide pushbutton distribution of either 6 or 12 inputs to as many as 12 outputs. A high degree of input-to-output isolation allows any input to be switched to any or all outputs without loading the source.

Series-X Switchers are also available for simultaneous switching of video and audio, further simplifying distribution. All isolation amplifiers are silicon solid-state and full-broadcast quality. Audio and video amplifiers and the power supply are all plug-in modules which may be easily removed for maintenance. A 12-MHz bandwidth and excellent differential gain and phase characteristics assure quality color performance.

**Wouldn't a Series-X Switcher  
solve some of your distribution problems?**

*Write today for full details.*

**DYN AIR Electronics, Inc.**  
6360 Federal Boulevard  
San Diego, Calif. 92114  
Telephone (714) 582-9211



problems of loading slides.

The machine is built on an L-shaped piece of 1/8" steel, so by unplugging the power and control cable, and loosing the two bolts holding it firmly to the table top, it can now be removed for repairs.

The machine was built with an electric drill, hand tools, and an arc welder, except for the cover. There is no real critical assembly problems. There might be a few problems in duplicating the parts, since I used parts from a well stocked junk box. I see no reason that with a little ingenuity, why someone else could not substitute or make the parts with as good or better results.

We have been using it on the air for five months with no problems, except for a loose screw or two, and moving the light a bit closer to make up for need of more light due to a modification of the TK27 film chain. There is no light servo, so therefore, the light has to be moved closer or farther away to give the same light level as the other three sources.

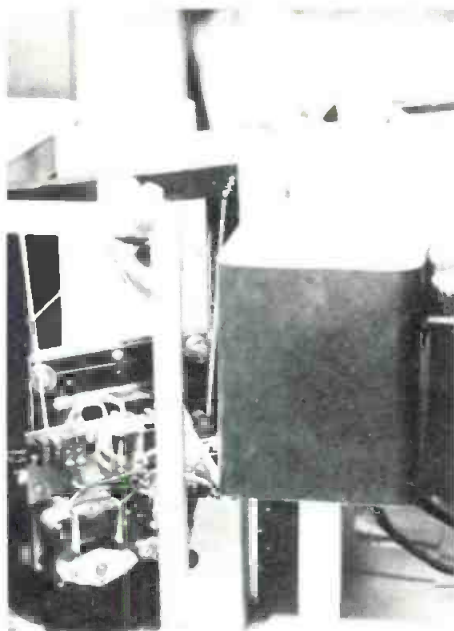


Photo 2

Photograph 2 shows the movable mirror in the down position. When the show button is pushed the mirror moves up, turning on the light and fan. At top of travel it closes show light switch and opens the micro-switch to the motors. By momentarily pushing show button again, show relay closes, applying power to motors long enough for

*Spotmaster*

The incomparable **Ten70**



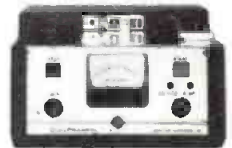
**World's finest  
cartridge tape  
equipment**

Here is the bold new standard in cartridge tape performance, versatility and ruggedness—the equipment that has *everything!* Five models of the magnificent Ten/70 are offered to meet every recording and playback application. All have identical dimensions. Any combination of two will fit in our sleek 19-inch roll-out rack panel, just 7 inches high.

Control features and options include manual high-speed advance, exclusive Auto-Cue with automatic fast-forward, automatic self-cancelling record pre-set, front panel test of cue and bias levels, built in mike and line level mixer, color-coded design for easiest possible operation.

Inside is a massive U.S.-made hysteresis synchronous "Direct Drive" motor, solid state logic switching, modular construction and premium components throughout, separate heads for A-B monitoring, full bias cue recording, transformer input and output, flip-top access to heads and capstan.

**THE CLASSIC 500 C SERIES.** Long the industry standard, SPOTMASTER'S 500 C series is still offered. Performance and specifications are second only to the Ten/70.



For complete details about SPOTMASTER cartridge units (stereo, delayed programming and multiple cartridge models, too), write or call today. *Remember, Broadcast Electronics is the No. 1 designer/producer of broadcast quality cartridge tape equipment . . . worldwide!*

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A Filmways Company

8810 Brookville Road, Silver Spring, Maryland 20910 • (301) 588-4983

**\$50<sup>00</sup>**

**SPOTMASTER  
DISCOUNT  
CERTIFICATE**

**\$50<sup>00</sup>**

Limited time offer—Get any Spotmaster tape cartridge machine or system for \$50.00 off the regular price!

**SAVE THIS VALUABLE CERTIFICATE  
AND SEND WITH ORDER**

Offer applies to Spotmaster Ten/70, 500 and 400 series and all multi-cart players including new 303 and 305 Mini-Series, Five-Spot and Ten-Spot. Limit: One Discount Certificate per order.

Can be redeemed through local authorized distributor, or call or write for catalog and price list: BROADCAST ELECTRONICS, INC., 8810 Brookville Road, Silver Spring, Maryland 20910 • (301) 588-4983

Offer expires April 30, 1973

# CCA ELECTRONICS Announces a 25 KW FM

**AIR COOLED TRANSMITTER  
WITH INDEPENDENT 3 KW  
DRIVER AND ONE POWER  
AMPLIFIER TUBE**



**CCA ELECTRONICS  
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# SOLID STATE AM MONITORS ACCURATE @ 125%



- Positive and Negative Peaks Read Simultaneously
- Digital Frequency Display Unaffected by Modulation
- Flashers and Meters "Remoteable"
- Both Monitors Can Mount In One 5 1/4" Space

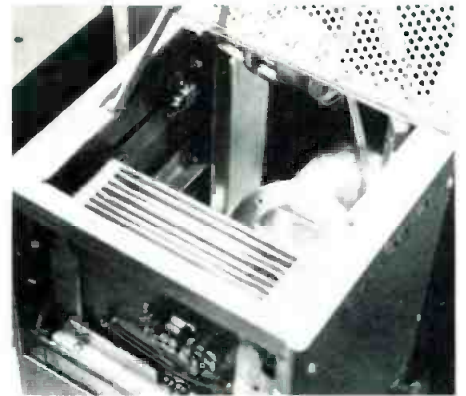
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CORPORATION**  
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N. J. 08030 • Phone: (609) 456-1716  
**No. 1 in AM and FM**

mirror to start down, allowing top micro-switch to close. The top and bottom micro-switches for motors are in series, paralleled by the show relay.

The stationary and movable mirrors are mounted on bolts, in a triangle configuration, thus the mirrors can be tilted to make for easier centering of image on film chain. The lens should also be on a movable plate to let it slide back and forth for setting image size.

From Photograph 3, the balop holder, light, lens and stationary mirror are visible. The holder holds eight cards plus a time and temperature balop, which is mounted on back of holder. By pushing rack forward it is ready for use anytime. The card holder is moved forward by means of a gear and ratchet arrangement activated by a solenoid. With each push of the change button it is moved one position.

Changing motion of the cards is comparable to a fast camera card pull. The motion of the mirror is a bit more noticeable than the multiplex mirrors, since it uses slower motors. A single motor could be used if it had twice the horsepower



**Photo 3**

of the one that I used. The helper pull-up springs probably then would not be needed.

The light is a 650 Watt quartz spot with the reflector changed to give a more horizontal pattern. This should be mounted so that it can be moved forward and backward, obtaining the light level that is needed. □

## PARTS

Lens—Demonstration Lens Set, from Edmund Catalog 715, #40,414; Mirrors—5/7 Front Surface, from Edmund Catalog 715, #40,043; Motors—Dayton 35rpm 1/100 HP.

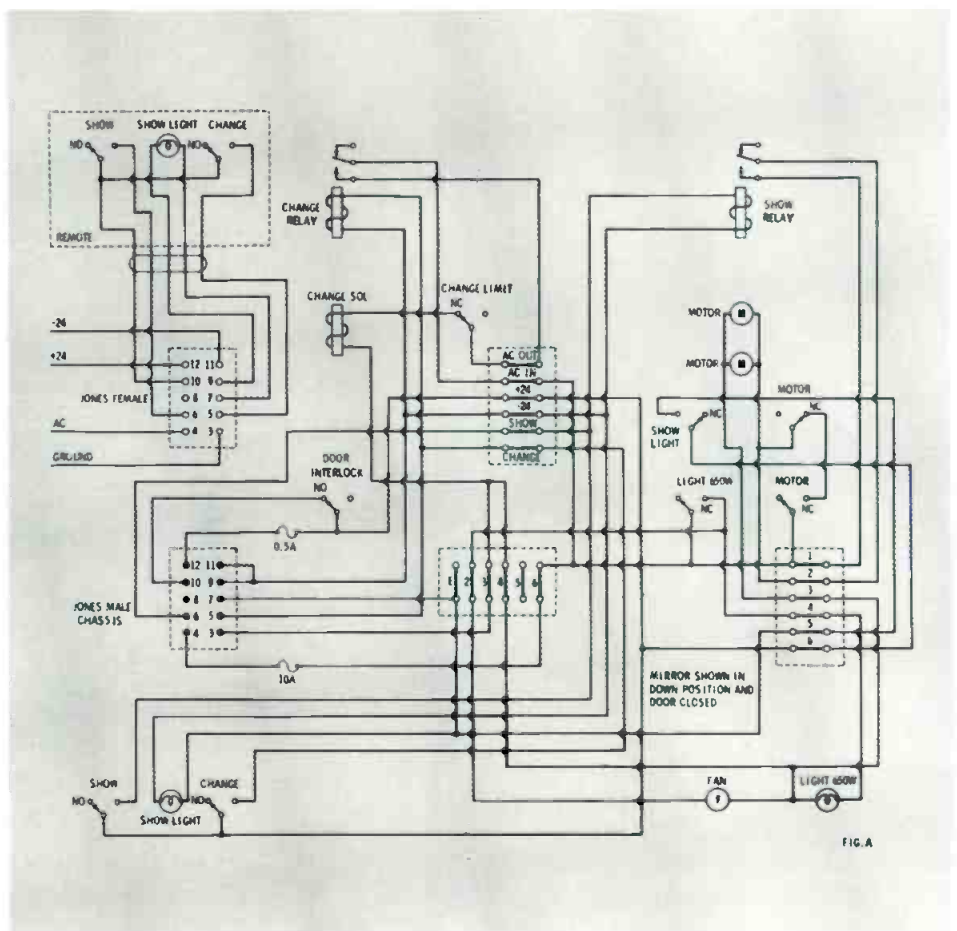


FIG. A

# NEW PRODUCTS

(Use circle number on reader service card for further information)

## Solid State Triggered Sweep Scope

The new EICO Model TR-410 claims to be the industry's lowest priced lab quality wide-band triggered sweep oscilloscope. It is expressly designed for speedy servicing, lab work, production test-



DC balance controls are adjustable with a screwdriver from the front panel for convenience and accuracy; vertical and horizontal selection of AC or DC modes of amplification; gate signal is available at a jack to enable user to synchronize other equipment to trace on scope; astigmatism control is on the rear panel because once it has been set, readjustment is seldom, if ever, required; removable sides, top and bottom for easier and more accurate servicing and calibration; standard bezel and bushings for camera mounting; solid construction and conservative design for longer life.

For More Details Circle (53) on Reply Card

ing, and vocational instruction with such advanced features as: sweep automatically "locks in" with complex TV signals; 10MHz bandwidth; all solid state design with protected FET input stage; a single dual probe enables you to convert quickly from direct to 10:1 low capacity operation; human-engineered controls layout; 3-way operation: standard 120 volt line, low 100-volt, and 220-230 volts—all 50 and 60 Hz; quick-connect BNC connector at Vertical Input.

It has three calibration voltages: 2, 5 and 10; horizontal and vertical

## Background Music

An automatic background music system with an announcement programmer is now available for use with CATV transmission facilities according to the system's manufacturer, Tape-Athon Corp.

Called the Channel-Caster Carousel, the equipment consists of two reel-to-reel tape playback transports for music programming and a rotary tape cartridge mechanism that holds 24 messages, all

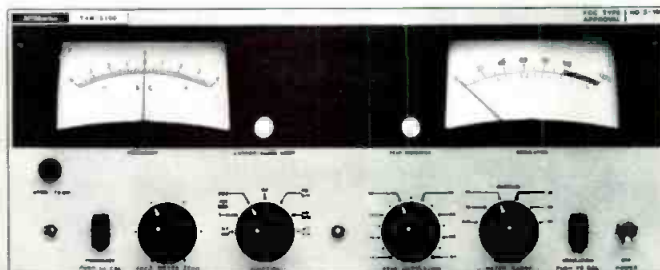
(Continued on page 52)

FM monaural  
FREQUENCY  
and MODULATION

# monitor

TBM-3700  
\$1350

built in calibration  
sca/stereo add on  
am fm s/n and  
remote metering  
for complete information  
please contact  
the Director of Sales  
Dept. B-37



**McMartin** MCMARTIN INDUSTRIES INC., 605 NORTH THIRTEENTH STREET  
OMAHA, NEBRASKA, 68102 TELEPHONE (402) 342-2753.

For More Details Circle (26) on Reply Card

February, 1973

## QRK CARTRIDGE EQUIPMENT



	PLAYBACK	R/P
MONO	\$495	\$695
STEREO	\$725	\$995

- DIRECT DRIVE
- BUILT IN 150 Hz TONE
- COMPACT—ONLY 5 3/4" WIDE
- UNEXCELLED SPECIFICATIONS

QRK

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GLOUCESTER CITY, N. J. 08030  
PHONE: (609) 456-1716

WEST

1568 NORTH SIERRA VISTA  
FRESNO, CALIF. 93703  
PHONE: (209) 251-3008

A subsidiary of

CCA ELECTRONICS CORP.

QRK

## "FUTURA" CONSOLES



	MONO	STEREO
6 CHANNEL	\$1095	\$1695
10 CHANNEL	\$1995	\$2495
6 CHANNEL PREWIRED SYSTEM	\$2095	\$3145

QRK

EAST

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**No. 1 number for  
tape cartridge  
equipment  
309-828-1381**



**3D SERIES REPRODUCER**

A collect call to the above number will bring you all the facts you need to know about tape cartridge equipment. One call will establish a working relationship between you and our broadcast oriented people...a relationship that delivers dependable performance at a truly competitive price. The relationship will last as long as you use ITC equipment...in the selection of equipment, proper servicing, and adaptation of machines to your broadcast requirements. If you're thinking tape cartridge equipment, find out why hundreds of stations depend on ITC.

**WRA SERIES RECORDING AMPLIFIER**



**Call collect for  
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2425 South Main Street,  
Bloomington, Illinois 61701

For More Details Circle (23) on Reply Card  
52

**New Products**  
(Continued from page 51)

housed in a standard 77" rack. In operation, the system transmits background music and messages on an unused or weather scan channel over the CATV subscriber lines. By using a series of switches in the system's amplifier/control section, the station operator may select the music transport sequence and intermix any of the 24 announcements as required, all operating automatically.

A typical sequence of programming might consist of two musical numbers, then a cartridge message with weather, two more music plays and then a commercial, etc. The user can program in an unlimited number of ways. Once programming is set, the system turns itself on, plays according to the programmed setting, and then shuts off at the end of the broadcast day, all unattended and automatically.

The tape cartridges may be recorded locally to provide voice messages such as weather, station identification, commercials, etc. and changed whenever required.

The Channel-Caster Carousel can be made even more versatile by the addition of auxiliary tape units. Based on a "building-block" design, the system can accommo-

date as many as four music tape transports and two Carousel players. With a capacity of approximately 200 musical numbers per



reel, and 24 messages per Carousel, a maximum system could operate for greatly extended periods before repeating.

Specifications and full details on the system are available on request from the Marketing Dept., Tape-Athon Corp., 502 S. Isis, Inglewood, CA 90301.

For More Details Circle (54) on Reply Card

**On-The-Air  
Mic-Headset**

Telex is now offering a professional headphone/microphone combination for live broadcasting, (fixed station or remote). The new CS-90 has been dubbed the "Sportscaster headset" because of the large number of applications expected to be found in the area of professional sports announcing. According to Sid Kitrell, director of marketing, broadcast and industrial products, the CS-90 features the finest professional quality headphone and boom microphone available.

The CS-90 is binaural and is supplied with non-terminating cordage, so it can be adapted to the equipment in use. One channel can be used for program monitoring and the other for cueing. In appli-

cations where cueing isn't required, the earphones can be wired in parallel for standard monaural use.

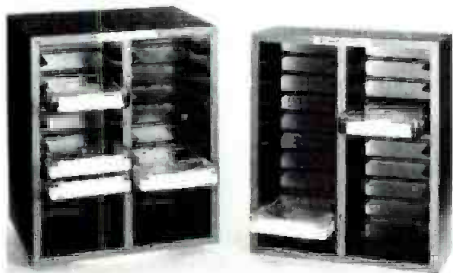


**BROADCAST ENGINEERING**



### Cartridge Racks

Broadcast Electronics announces the availability of a new series of cartridge racks. This series of walnut woodgrain finished cabinets are designed to hold 20 or 40 "A" series cartridges. The DM-20 pictured measures 9½ inches wide, 4 inches deep and 10 13/16 inches high. These units may be stacked.



The DM-40 is supplied with a lazy susan base, designed to house 40 cartridges, 20 per cabinet face. It is 8 inches deep with other dimensions approximating those of the DM-20 and is ideally suited for table-top operation.

For further information, send your request to the company at 8810 Brookville Rd., Silver Spring, Md. 20910.

### Variable Focus Lens

The new Cooke Varotal 35 mm variable focus (zoom) motion picture lens was featured by Rank Precision Industries at the 1972 meeting of the Society of Motion Picture & Television Engineers (S.M.P.T.E.) in Los Angeles.

This variable focus lens is the first designed by Rank Taylor Hobson\* as a standard 35 mm motion picture format lens. The new lens was exhibited on the new Arriflex BL-35 camera, as well as on the new Mitchell studio camera and on a Mitchell BNC camera, as modified by Cinema Research.

A feature of the Cooke Varotal is its inclusion of major focal lengths in one lens. Its basic 5:1 ratio is 20mm to 100mm and makes the new lens extremely versatile for use in a wide variety of shooting conditions.

The Cooke Varotal's minimum object focal distance of only 13.4 inches between subject and front of  
*(Continued on page 54)*

## Before you buy an audio console... look inside the GATESWAY 80.

One look will convince you that the Gatesway 80 monaural 8-channel console is the best buy for your money. Here's why:

- Modular solid state plug-in amplifiers
- Program, cueing, and monitor amplifiers all interchangeable
- Step-type attenuators
- Leaf-type key switches throughout
- Excellent frequency response 20-20kHz ± 1dB
- 18 inputs into 8 mixing channels provide versatility

These are a few advantages.

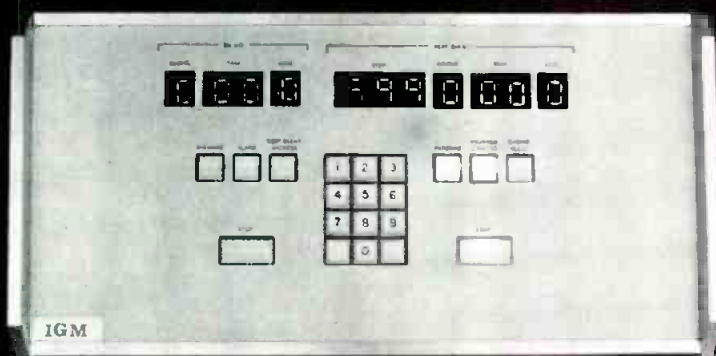
For more information, write Gates Division, Harris-Intertype Corporation, Quincy, Illinois.



**HARRIS**  
GATES DIVISION  
Quincy, Illinois 62301, U.S.A.

For More Details Circle (28) on Reply Card

## IT'S A MONEY-MAKING MEMORY



IGM's MOS memory minds the store for you, all day, all week, and never misses a sale. It has such a wide range of capability that it's mind-blowing. Write or phone for complete information.

3950 Home Road  
Bellingham, Wash. 98225  
(206) 733-4567

**IGM**

For More Details Circle (29) on Reply Card

**Products**

(continued from page 53)



the lens, 18 inches from film plane, combined with its wider angular field of view (58° horizontally), makes it ideal for shooting on smaller sets, close-in situations and locations, according to Rank.

For More Details Circle (56) on Reply Card

**Field Strength Meter**

An all-new VHF/FM/UHF Field Strength Meter, for lab or in-the-field use has been introduced by Blonder-Tongue Laboratories.

The Model FSM-2 boasts an accuracy of  $\pm 1.5$  dB over its entire frequency range which extends from 54 to 216 MHz and from 470 to 890 MHz and, with a maximum sensitivity scale of 100 microvolts,

readings of as little as 10 microvolts, or as high as 3 Volts, can be taken.

Front panel switches select average or peak readings, UHF or VHF scales and 120 Volt AC or battery operation. The all-transistor superheterodyne circuitry results in up to 50% longer battery life and a wide range regulated power supply requires no adjustment as batteries age.

The meter movement of the FSM-2 is a rugged, taut-band wide-scale 1 milliampere unit that easily withstands the rigors of field use.

Completely shielded for operation in strong magnetic fields, the new model comes equipped with a removable dust-proof cover with safety lock which, when closed, automatically turns off the unit.

As a precision laboratory instrument, the FSM-2 Field Strength Meter also is equipped with a DC output connection for making field strength surveys using a graphic recorder and a modulation test jack.

Input connection is made through a type F connector, sup-

plied on the front panel and input impedance is 75 Ohms.

For More Details Circle (57) on Reply Card

**Audio**

**Broadcast Console**

CCA has announced its "Futura" professional Audio Broadcast Console. CCA is now offering, in both mono and stereo versions, a new line of audio consoles with capacities of 6 and 10



faders. These units feature modern, slide attenuators, plug-in electronics, full accessibility, switchable meters and independent, but identical, audition and program

**Handle Cable on Power Reels**

Specify Hannay electric rewind reels to handle long lengths of live power cable or for coaxial cable storage. Positive chain and sprocket rewind mechanism assures smooth, dependable rewinding at the touch of a button.

Send for complete catalog of power and manual rewind reels to handle cable.

# HANNAY REELS

## Introducing the expensive dual-trace scope that doesn't cost a lot.

The B&K Precision Model 1470. The compact 5-inch solid-state 1470 is specially designed to meet 80% of all your scope applications. It has DC to 10 MHz bandwidth with 10 mV/cm sensitivity. Sixteen triggered-sweep speeds range from 1  $\mu$ sec/cm to 0.2 sec/cm. Triggers on input signals as low as 5mV.

\$499<sup>95</sup>

Sound good? Our prices become even more remarkable once you see our specs. Call your B&K distributor. Or write Dynascan Corporation.

**Very good equipment at a very good price.**

Product of Dynascan Corporation  
1801 West Belle Plaine Avenue, Chicago, Illinois 60613

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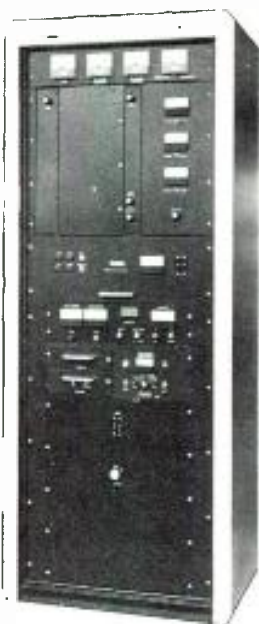
CLIFFORD B. HANNAY & SON, INC., WESTERLO, NEW YORK 12193  
For More Details Circle (39) on Reply Card

channels. These consoles are also available in prewired audio systems and can be purchased from CCA Electronics Broadcast Division in Gloucester City, N. J. and CCA's subsidiary, QRK Electronic Products in Fresno, Calif.

For More Details Circle (58) on Reply Card

### 2.5 kW FM Transmitter

Wilkinson Electronics announces the introduction of a new, single tube, 2500 Watt FM transmitter. This unit incorporates the Wilkinson FME-10 exciter followed by a 60 Watt solid state IPA driving a 5CX-1500 pentode final which is rated for 3200 Watts.



The FM-2500E features the exclusive Wilkinson method of final tuning and loading using variable vacuum capacitors. These tuning circuits use no sliding shorts or variable inductances. The fixed inductance is adjusted at the factory.

Wilkinson self-testing silicon rectifiers are used in all power supplies.

For More Details Circle (59) on Reply Card

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On Items Advertised  
Use Our  
Reader Service Cards

# Stepping Stones to a Better Job in Broadcasting

## 8 new and recently revised texts from Sams.

### WORKSHOP IN SOLID STATE

By Harold E. Ennes

An outstanding training text, complete with exercises at the end of each section (answers in back of book). Provides the engineer-technician trained in vacuum-tube circuitry with a rapid, practical and effective transition to the mastery of solid-state circuitry in all broadcast applications. 384 pages, hard cover. No. 20735—\$9.95.

### TELEVISION BROADCASTING:

Equipment, Systems, and Operating Fundamentals

By Harold E. Ennes

This comprehensive, new reference volume for practicing technical personnel and student tv technicians and operators covers the NTSC color system, camera chains, sync generators, signal distribution, recording systems, studio lighting, studio equipment operation, microwave relay systems, antennas, transmitters, and operating procedures. 656 pages, hard cover. No. 20786—\$14.95.

### TELEVISION BROADCASTING:

Camera Chains

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### NORTH AMERICAN RADIO-TV

STATION GUIDE, 7th Edition

By Vane A. Jones

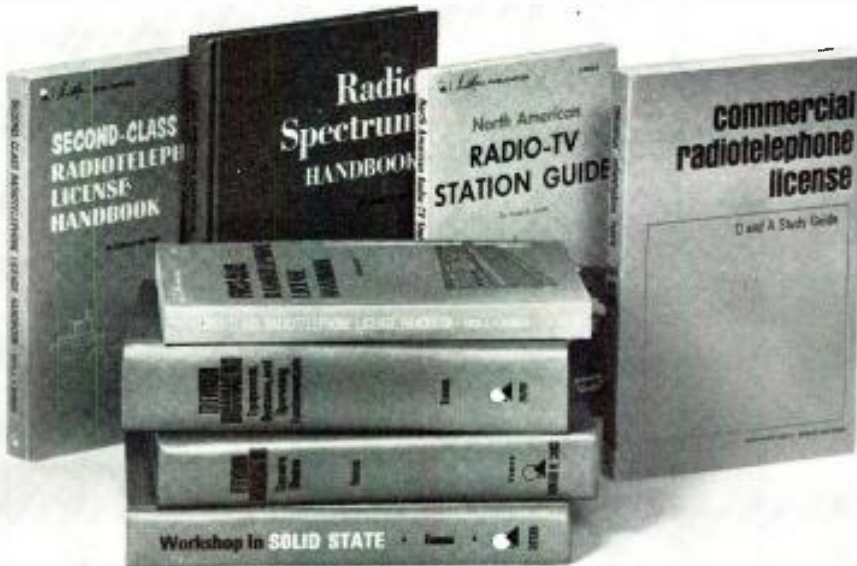
This updated and expanded edition provides a comprehensive one-source reference to all commercial broadcast stations in North America. Lists frequencies, call letters, and locations for a-m, fm, and tv stations. 160 pages, softbound. No. 20843—\$3.95.


### COMMERCIAL RADIOTELEPHONE LICENSE

Q AND A STUDY GUIDE

By Woodrow Smith and Robert Welborn

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# TECHNICAL DATA

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**103. ANN ARBOR TERMINALS, INC.**—A new two-color data sheet describing Series 200 Video Terminal Controllers, plus compatible free-standing keyboards and monitors, is now available. The new literature emphasizes the application of Series 200 units in conjunction with, or as a substitute for, hardcopy TTY terminals. Particular emphasis is placed on the superiority of the Series 200 equipment in terms of noiseless operation, full display/preview/edit capability, high speed, and exceptional reliability—features not available on electromechanical data capture terminals. Additional features described include the Series' compat-

ibility with existing keyboards, and data capture terminals, and its capability for driving multiple standard TV sets or 525-line video monitors.

**120. COHU, INC.**—A portable TV camera in an environmental housing only 3" in diameter operates from a 12 or 24V DC power supply, such as an automobile battery. Data Sheet 6-591, four-pages long, contains complete specifications on this camera that can be used with either separate or integral mesh vidicons.

**121. GTE LENKURT INC.**—A 16-page illustrative pamphlet describing all elements of the type 46V high-capacity coaxial cable transmission system is now available. The 46V is a family of equipment providing broadband terminal and line transmission facilities for 300, 960, 2700 and 10,800 voice-frequency channels in a bandwidth ranging from 1.3 MHz to 60 MHz. A 12-MHz system also can transmit a video signal plus 1200 voice-frequency channels and a 60-MHz system will transmit up to six one-way video channels per coaxial tube. Systems are suited for common carrier as well as industrial applications over 0.174-inch (4.4 mm) and 0.375-inch (9.5

mm) coaxial tubes. Meeting CCITT Recommendations and U.S. industry standards, 46V systems are specially adapted for the extension of microwave radio circuits, for expansion of heavy density communications routes in locations where microwave frequency congestion exists, and for general applications of short- or long-haul communications.

**110. MOUNTAIN WEST ALARM**—A new alarm equipment catalog, designated the M-73, is now available. The 80-page catalog describes and offers over 400 intrusion and fire alarm products. Many are UL listed. The broad product lines presented provide a one stop source of supplies for alarm installers, dealers, and skilled industrial electronic and electrical technicians who require alarm systems, parts, and accessories. The alarm equipment offered ranges from relatively simple kits with instructions to the latest ultrasonic, radar, and infrared intrusion detectors. Major product categories include Intrusion Systems, Fire Systems, Fire and Intrusion Detectors (Radar, Infrared, Ultrasonic, CCTV, Switches, Heat, Smoke), Remote Controls, Annunciators (Bells, Horns, Sirens, Oscillators, Lights), Telephone Dialers, Lock Specialties, Tools, and Books.

**111. NORTRONICS CO., INC.**—A new Design Catalog describes the company's comprehensive line of magnetic heads for professional audio master recording. The new 12-page, two-color publication details mechanical and electrical characteristics and specifications

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**112. RCA**—A completely revised eight-page catalog describes RCA COS/MOS digital IC's. The catalog contains logic diagrams with terminal designations and quick selection data charts for 52 IC's including gates, flip-flops, latches, multivibrators, shift registers, counters, display/counter/decoders/drivers, multiplexers, arithmetic circuits, memories, and phase-locked loop. Information on COS/MOS high-reliability types conforming to MIL-STD-883 and MIL-M-38510, COS/MOS chips, and COS/MOS technical publications are also given.

**122. RHG ELECTRONICS LAB., INC.**—A new four-page product bulletin (LA-301) listing their expanded line of standard log amplifiers for radar and communications applications, is now available. New features, photos and improved specifications for standard and miniature models and new Hybrid IC and new Super Log Series are listed. Reduced prices on many models are also included. A log amplifier test set is described in detail including "Super Log" scope displays obtained while using the RHG test set.

**123. ROHDE & SCHWARZ**—The new Rohde and Schwarz Short Form Catalog G-1 for Precision Electronic Test Equipment contains a selection of the most important Rohde and Schwarz electronic test and measurement instruments, including automated and programmable equipments. The instrumentation covered includes power, sweep, noise, AM/FM-Synthesized and Programmable signal generators; Pre-

cision Terminations, fixed-variable and programmable attenuators; Wave Analyzers and Selective Microvoltmeters; Field Strength Meters; Spectrum Analyzers; Wideband Microvoltmeters and Power meters; Impedance and Reflection Meter; R, L, C and Q Meters; Diode, Transistor and IC Testers.

**113. SHALLCO INC.**—A 16-page attenuator and audio products catalog is now available. The Catalog/Handbook 102 provides application data, charts, graphs, and tables relating to the use and selection of the appropriate attenuator for audio and RF circuits. Complete technical and mechanical data is given for many standard types suitable for new and replacement requirements.

**114. SWITCHCRAFT**—A totally new concept in extruded aluminum jack panels which accept up to 56 telephone jacks mounted to 14 module inserts is described in a new product bulletin. Independent module insert design permits greater freedom for telephone designers, installers and field repairmen in adding to, or servicing telephone jacks. Module inserts or jacks can be removed without disrupting lines to other jacks. New Series "JP" Modular Jack Panels are designed primarily for voice frequency interconnecting applications including telephone central offices, testing and patch panels, computer and data processing equipment, multiplex gear, and commercial and industrial patching and control uses. Standard, extension and flush mounting types are available. Panel lengths are offered in both standard 19- and 23-inch sizes.

**115. TRIPLETT CORP.**—A new illustrated 16-page, All-Line Test Equipment catalog featuring its newest digital V-O-M's, hand size portables and general multi-purpose V-O-M's, Fet V-O-M's with Micro Power, Low Power Ohms and Auto Polarity features, laboratory accuracy 1 1/2-3 percent V-O-M's, special industrial mainte-

(Continued on page 58)



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**Tech Data**

(Continued from page 57)

nance analyzer kit, portable panel instrument kits, electrical compensation type temperature tester, a very wide assortment of accessories, sales and service data plus a unique V-O-M selector chart, is now available. The new catalog is designed for use by test laboratory engineers, television and radio repair and service companies, industrial

maintenance departments, technical and vocational training schools, electronic equipment circuit designers and manufacturers, communications engineering personnel, experimenters, electronic kit builders and hobbyists, appliance and camera repair servicing personnel, and the many others involved in electronic and electrical testing.

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**116. XCELITE, INC.**—New Product Bulletin 572L contains complete information including list prices, on two new hand tools for the electrical/electronic trades, the No. 590 Coax Stripper/Cutter and the No. 80 Heat Sink. The Bulletin describes and illustrates the pre-set, three-position operation of the No. 590 Coax Stripper/Cutter in either cutting both insulation and conductor or stripping off individual layers of insulation and shielding found on the popular RG-59U coaxial cable. Described also is the function of No. 80 Heat Sink in protecting delicate electrical/electronic components during soldering operations by absorbing and dissipating heat. Compact physical specifications are given, together with materials of construction and their particular advantages.

**126. WESTINGHOUSE**—The 1972 Westinghouse Semiconductor Condensed Catalog lists the industry's widest variety of power semiconductor devices, and is now available. The 16-page publication covers rectifiers, thyristors (SCR's), transistors and prewired heat-sink assemblies, including the highest voltage ratings commercially available, for industrial and military applications. The condensed catalog's easy-to-use format refers the designer to individual product line selectro guides for more complete information on specific devices. Listed in the updated brochure are rectifiers rated 1 to 2000 amperes, 50 to 4000 Volts; silicon

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The voices of KAAT, Denver's newest radio station, gather beside the station mascot and symbol, a Rocky Mountain lion. Pictured from left to right are KAAT broadcast personalities Ed (Weatherman) Bowman, Art Peterson, Tim Sullivan, Ben Avery, Evan Slack, and Don Roberts.

## NAB Comments On Exclusive Licenses

The National Association of Broadcasters said the Justice Department has "misstated the law and misconceived the facts" in proposing a time limit on exclusive licenses for non-network programs.

NAB said in comments filed with the Federal Communications Commission that exclusivity practices "are critically necessary to successful programming" by commercial television stations; that all parties except Justice and cable interests agree that a fixed rule limiting their duration "would be contrary to the interests of all concerned, including the public."

"NAB urges the Commission to recognize," its filing said, "that tampering with the finely-tuned competitive mechanism which now exists in the program supply market will not serve the public interest since diversity would not be promoted and the very UHF (ultra high frequency) stations the Commission seeks to aid would be hurt."

The Association said the Justice Department "misstated the Anti-Trust doctrine" and used "false premises" in reaching its conclusion that exclusivity agreements are unreasonable and a time limit would reduce the cost to broadcasters and promote competition.

It said the department was "naive and illogical" in arguing that, since new, first-run non-network programs are licensed for one season, it was unreasonable to permit exclusivity beyond one year for subsequent runs of such material.

"The value of any new program is speculative," NAB said. "Neither the producer nor the broadcaster knows what share of the audience the program will garner or how much advertising revenue its sale will produce. Therefore, substantial risk is involved . . . (and) to extend this risk with a long-term exclusivity license would be senseless . . ."

"After the first run has been completed, audience and revenue

potential are known factors and the program is a product of ascertainable value . . . Whereas broadcasters cannot afford the risk of a long-term exclusive license for a new, unproven program, they will bargain for long-term exclusive licenses for successful, valuable programs.

"The comparison made by the Justice Department is simply unrealistic."

NAB submitted statistical data to show there has been no "warehousing" of program material—the licensing of material so it can be kept on the shelf and unavailable to a possible competitor. NAB, which has condemned "warehousing," said the study shows that attractive programming is available in many markets and exclusive non-network program licensing "produces no anti-competitive effect."

## WRTV Is A Good Neighbor

Indianapolis, Indiana WRTV, Channel 6, Indianapolis, has received a "Good Neighbor Award" from the Indianapolis Cleaner Air Week Committee at a special awards luncheon.

WRTV was cited "for bringing our environment and the quality of the air we breathe to the attention of our citizens through documented features and daily news coverage, making air quality a matter of concern to the entire community."

This was the first year in the 23 year history of the Indianapolis Cleaner Air Week Committee that the news media was so honored. Awards in past years had been limited to various community leaders and industries for their work in pollution control.

The award was accepted in behalf of WRTV by Jim Hetherington, the station's Editorial Editor. The award presentations were made by Indianapolis native William Ruckelshaus, head of the U.S. Environmental Protection Agency.

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**Computer Dictionary and Handbook, Second Edition**, has been written by Charles J. Sippl and Charles P. Sippl. Computers are quickly becoming commonplace in today's technological society. This dictionary and handbook is designed especially to keep abreast with the constantly changing computerized world.

It's new and updated and compiled from an information base of over 22,000 separate definitions and concept explanations. Each entry in the first edition has been checked and rechecked. Whenever necessary, the definition has been revised to reflect the present state of the art—or to give added meanings to the term. Also the hundreds of new terms—not in use when the first edition was produced—have been clearly defined and added.

Over 450 pages are devoted to defining computer-related terms. Principles and procedures of computer systems, computer systems personnel, operations research, number systems, mathematical definitions, and computer languages are just a few of the subjects covered in the 13 appendices. The book concludes with a sound report on the progress, impact, and future of computers.

This book is available through Howard W. Sams & Co., Inc., Indianapolis, Ind.

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## IC Systems Design

The 324 page indexed and illustrated "Electronic Integrated Systems Design" was written by Hans R. Camenzind.

In his preface the author states that this book is intended as an "interpreter"; a means of bridging the widening gap between the equipment designer and the semiconductor device manufacturer. That there is a need for such a book is unquestionable in the light of the premium on development time burdening today's design engineers. It is a gratification that this book accomplishes a large measure of this bridge-building within its 5 parts and 22 chapters, to the extent that it contains useful information for anyone using integrated circuits.

Starting with the fundamentals of IC design philosophy and processing, the author then progresses through a discussion of integrated components such as resistors, capacitors, NPN and PNP transistors, diodes, zener diodes, Schottky-barrier diodes, junction and MOS FET's, and special devices. This section in itself is the backbone of the book, occupying 128 pages. In this section the characteristics (and

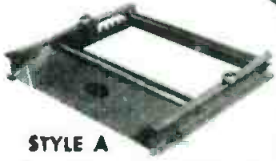
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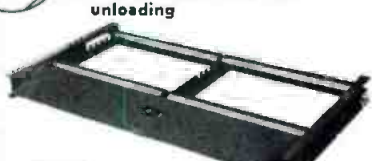
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idiosyncracies) of IC componentry are illustrated in practical terms which enables understanding of what can at times (in other contexts) be difficult material.

The next section concerns itself with partitioning a system or instrument, illustrating the application of digital and linear IC design techniques and building blocks for various circuits and subsystems. Of particular value is a special section of alphabetically sequenced standard circuit building blocks which formulate the bulk (or portions of) many of today's standard IC's.

A section on IC design techniques discusses the processes involved in the generation of a custom IC, including breadboarding techniques using monolithic "kits", wire bonding, and finally, custom metal masks which result in a custom, user specified IC. Also treated are computer aided design, and testing considerations.

The final section of the book discusses packaging and reliability of IC's.

This book serves to communicate the intricacies of monolithic IC's with a good balance between depth and breadth. The detail of treatment is adequate for user's of IC's and should more details be necessary in any one area, with work is well referenced at appropriate points. In this fashion the author has managed to combine a great deal of useful information into a volume which will be attractive to many because of both its content and style.

This book review was written by Walt Jung, BE's Solid State Editor.

This book is available through Van Nostrand Reinhold Company, Inc., New York.

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**Installing & Servicing Electronic Protective Systems**, written by Harvey Swearer, has everything you need to know to break into the challenging field of installing and servicing electronic fire and theft security systems. The up-to-date handbook not only covers virtually every available system, but also provides guidance for technicians who want to build a career in the growing alarm system field.

The author fully covers the subject, and explains how to select the right system for any particular job, how to estimate costs, how to install and check the system, and even how to build and expand one's business, train help, and finance the operation. The text is supplemented by over 160 photographs and illustrations, including complete schematic diagrams of various protective devices.

This book is available through Tab Books, Blue Ridge Summit, Pa.

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# PEOPLE IN THE NEWS

**Frank H. Forehand** has been appointed manager industrial engineering, Magnet Wire Products at General Cable Corp ... **C-COR Electronics, Inc.**, has appointed **Derald D. Cummings, Ph.D. E.E.**, manager of systems engineering and special products ... **TeleVision Communications Corp. (TVC)** has named **Jack L. Williams** as director of programming for TVC cable television systems throughout the country ... **Donald R. Shaner** has been appointed Section Head-Mechanical Design for the CATV Equipment & Installation Operation of GTE Sylvania Inc ... The CATV Equipment & Installation Operation of GTE Sylvania Inc. has also appointed **Wallace T. Thompson** as Section Head-Terminal Devices ... **Martin L. Zelenz** has been appointed Senior Staff Electronics Engineer at C-COR Electronics, Inc ...

CATV Equipment & Installation Operation of GTE Sylvania Inc. has appointed **Orville D. Page** to the new position of General Manager and **Robert A. Sherwood** has been appointed to the new position of Section Head-Transmission Systems ... Scientific-Atlanta,

Inc. announces the appointment of **James H. Cook** as Manager of its Telecommunications Product Line ...

**Glenn A. Oliver**, manager of systems development for Signetics Memory Systems, Inc., has been elected a vice president of the corporation ... **Robert E. Bachus** former head of Research and Development for Vital Industries, is now heading a new company, Comtech Electronics, Inc. of Gainesville, Fla. Comtech builds video products for the OEM market ... **Richard J. Elkus**, known nationally and internationally as an industrialist and banker, was elected chairman of the board of directors of Ampex Corp ... **Russ Molloy** has been appointed to the newly created post of director of corporate development and **Tom Winkofsky** was named advertising and sales promotion manager at Koss Corporation ... **John Boyle** has joined the Altec Division as assistant sales manager for the University Sound product line ... The RCA Board of Directors elected **Lester Bernstein**, Managing Editor of Newsweek magazine, as Vice President, RCA Corporate Communications effective January 3 ... **William M. Levens** has been appointed Treasurer of Ameco, Inc ... **Leo G. Darian** has been appointed to the position of Engineering Manager for RF Systems, Inc ...

**Richard E. Muller** has been named Vice President, Operations at Philips Broadcast Equipment Corp ... **Carlo Anneke** has been named Vice President/Marketing of Video Cassette Industries by the Los Angeles based firm's President Hal Dasbach.

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**HELP WANTED TECHNICAL** We are looking for additional Rep's to sell our products. Must already be in broadcast equipment sales field. Send photo & resume to Box 275, Broadcast Engineering, 1014 Wyandotte St., Kansas City, Mo. 64105. 2-73-11

**CHIEF ENGINEER** for established major Deep-South 5KW AM, 100 KW Stereo FM. Exceptional opportunity for a young, Sound Specialist with a super-sensitive ear for top quality audio. Facilities include brand new studios. Excellent fringe benefits, including a house. Salary commensurate with ability. Send resume and picture including references to: Dept. 274, Broadcast Engineering, 1014 Wyandotte St., Kansas City, Mo. 64105. 1-73-21

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**TAPEMASTER TCM, INC.**, Box 662, Rockville, Maryland 20851

1-72-TF

**FOR SALE:** Good reconditioned and recalibrated to standard accuracy G. R. Gates and R.C.A. AM frequency monitors, one mint condition. To your frequency at reasonable prices, monitor trade-ins accepted. Eidson Electronic Co. Box 96, Temple, Texas. 76501. (817) 773-3901. 2-73-11

**FAIRCHILD 663 LIMITERS** - five available at \$100.00 each Fairchild Model 675 Dynamic Dessler - one available at \$100.00 **ACCURATE SOUND CORPORATION**, P. O. Box 2159, Garland, Texas 75041 (214) 278-0553. 12-72-4t

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**ONE STOP** for all your professional audio requirements. Bottom line oriented. **F. T. C. Brewer Company**, P.O. Box 8057, Pensacola, Florida 32505 7-71-1f

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**HELIX-STYROFLEX**, Large stock—bargain prices—tested and certified. Write for price and stock lists. **Sierra Western Electric**, Box 23872, Oakland, Calif. 94623 Telephone (415) 832-3527. 1-73-1f

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Ampex VTR-1000 parts. GE Master Monitor Scope. Kay Markasweep. Mincom Dropout Comp. Misc portable Monitors. Ed Rehm, 637 Emerald, Mundelein, Ill. 60060. 2-73-1t

AMPEX 7500 Color Video Tape Recorder—mint condition—complete. \$1,200.00. Stan Nazimek, Jr., 506 Mount Prospect Avenue; Clifton, New Jersey 07012. 1-73-2t

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### CORRECTION NOTICE:

The telephone number in the above ad for Radio Research Instrument Co. is now correct. The phone number appeared incorrectly in previous insertions of this ad. The staff at Broadcast Engineering apologizes for this error.

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**CRYSTAL & MONITOR SERVICE.** Frequency change, repair or replacement of oven type broadcast crystals. Also frequency change and recalibration or repair of AM frequency monitors, and H-P FM monitors. Fast service at reasonable prices. 30 years experience! Call or write: Eidson Electronic Co. Box 96, Temple, Tx. 76501 Pho 817 773-3901 9-70-tf

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**WANTED TV studio lighting & equipment.** Gifts to non-profit schools are tax deductible. Contact Robt. Jungels, Rhode Island School of Design, 2 College St., Prov. R. I. 02903. 2-73-2t

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Phone (602) 774-8206

## SESCO, Inc.

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P. O. BOX 518

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FRIDAY HARBOR,  
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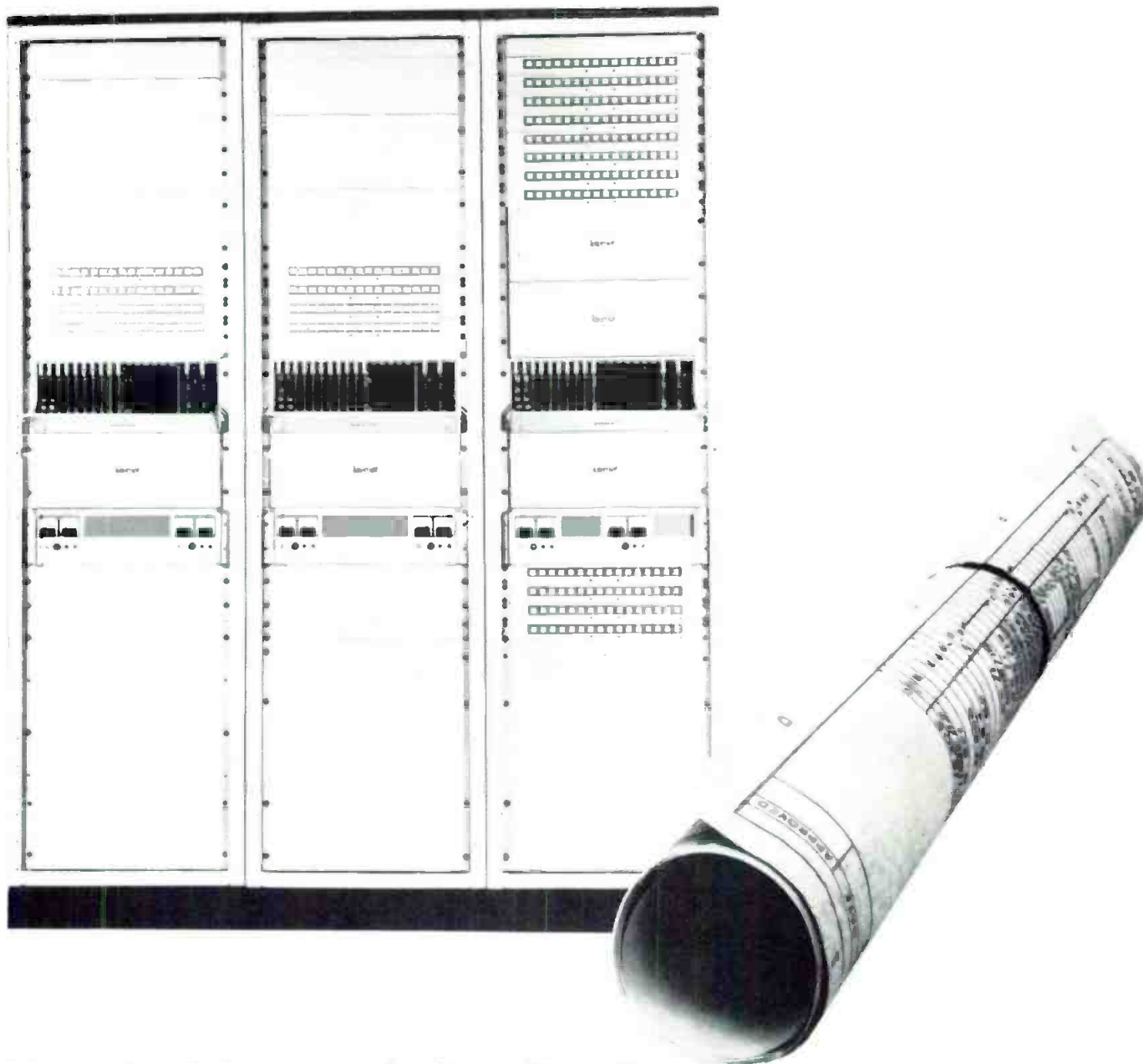


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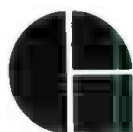


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