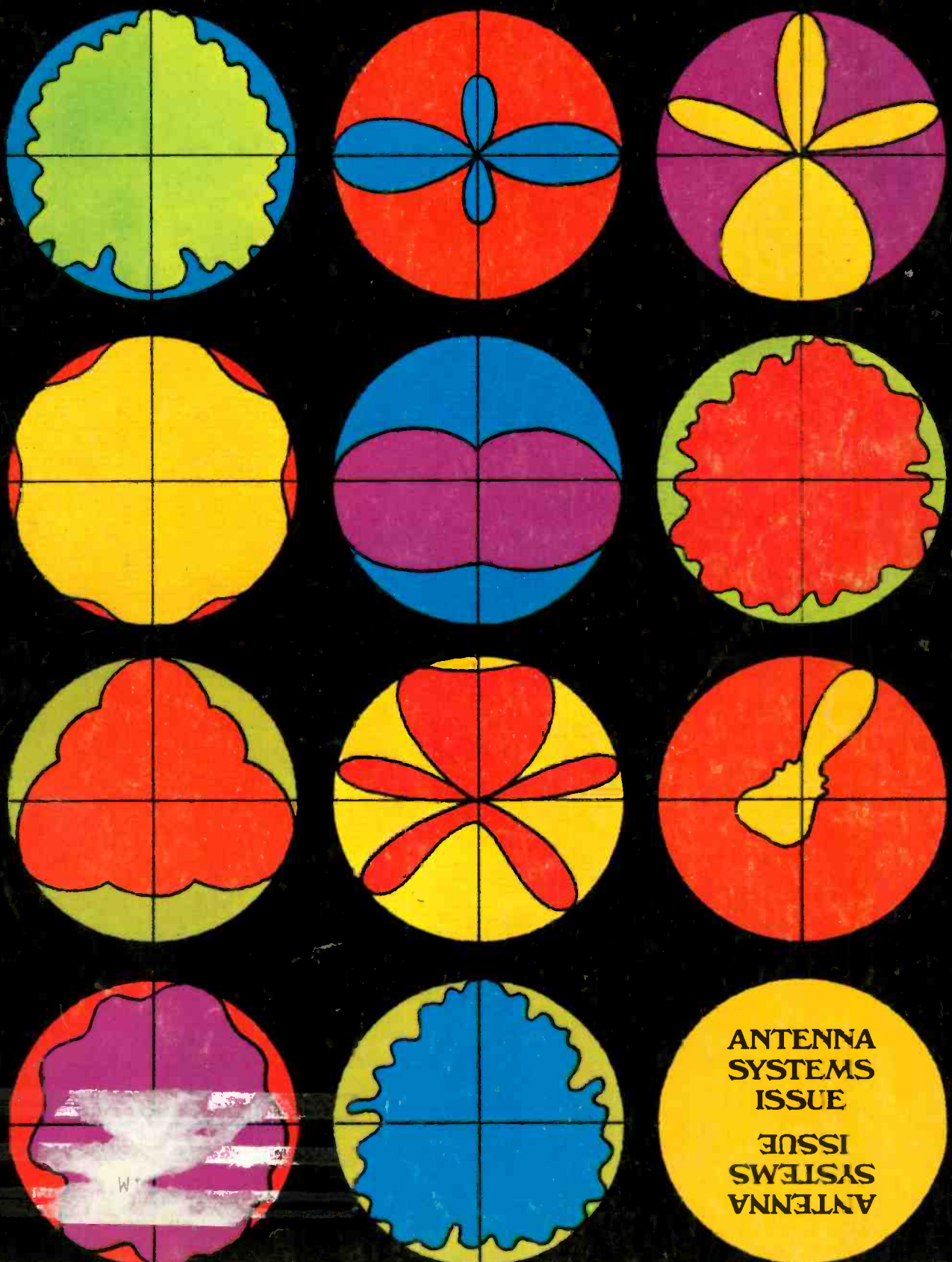
A MACTIER PUBLICATION | JANUARY 1958

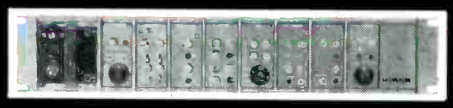
BM/E

BROADCAST MANAGEMENT/ENGINEERING



ANTENNA SYSTEMS ISSUE

how to simplify continuous quality control of television signals



Here's how every TV broadcast station can be assured of constant high quality picture transmission. Through use of a Riker Automatic Vertical Interval Test Set, you can keep a continuous check on transmission characteristics such as phase, gain and video level during actual program time. By transmitting the standard video test signals (multiburst, linearity, window, $\sin^2$) simultaneous with the program material even the slightest deterioration of transmission quality can be immediately detected and corrected. All the standard test signals are individually selectable and can be automatically sequenced into the composite video program.

The all solid state circuit design of the Riker VITS plug-in modules assures the utmost in long term stability and reliability.

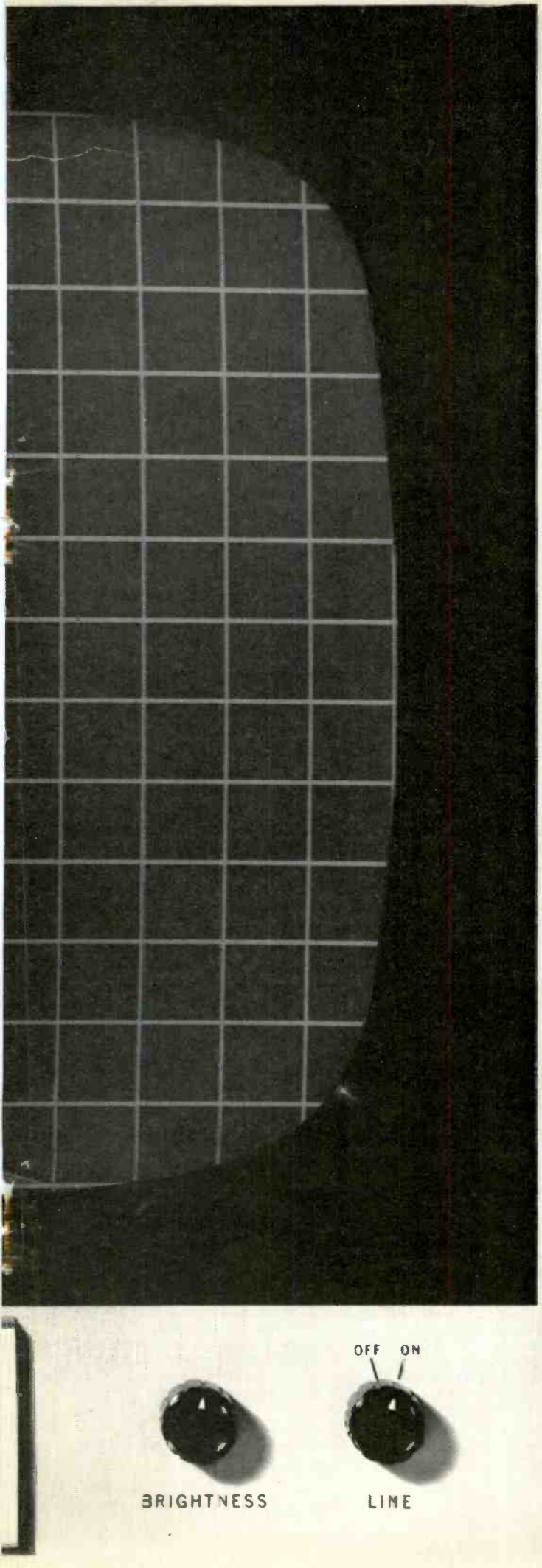
If you're interested in building the video test and quality control capabilities of your station, write or call Riker—the one company in the TV broadcast industry offering a complete line of all solid-state instrumentation for video analysis, simulation and control.

RIKER

PRODUCTS FOR VIDEO ANALYSIS, SIMULATION & CONTROL

RIKER VIDEO INDUSTRIES 100 PARKWAY DRIVE SOUTH HAUPPAUGE, L.I., NEW YORK 11787 (516) 543-5200

Circle 1 on Reader Service Card



UNRETOUCHED PHOTOS

hp VIDEO MONITOR

THE NEW STANDARD OF PERFORMANCE

Advanced Circuit Techniques Achieve Increased Reliability and Improved Picture Quality

MAINTENANCE FREE OPERATION

All Solid State Circuitry • No periodic alignment or adjustment required • Highest quality components and workmanship.

EASE OF OPERATION

Display linearity independent of size adjustment • Unique deflection circuits have feedback active over entire raster • No sync controls — synchronization is automatic on both North American and CCIR Standards.

IMAGE QUALITY

Displays $\sin^2$ T/2 pulse without distortion (62.5nsec) • Feedback active over full video band • Unity interlace results from novel sync circuitry • Keyed back porch clamp assures less than 1% black level shift for 100% video amplitude change • Less than 1.5% geometric distortion overall.

OTHER IMPORTANT FEATURES

Fully regulated high voltage and low voltage power supplies • Balanced input with loop-through facility • 46 db input common mode rejection • Model 6946A—Price $950.

For more information, call your local HP field engineer or write Hewlett-Packard, 100 Locust Ave., Berkeley Heights, New Jersey 07922. Europe: 54 Route des Acacias, Geneva.

HEWLETT hp PACKARD

COMMUNICATION INSTRUMENTS

Circle 3 on Reader Service Card

21704A

JANUARY 1968/VOLUME 4/NUMBER 1

BM/E

BROADCAST MANAGEMENT/ ENGINEERING

Co-Publishers:
HAROLD. H. SHORT
JAMES A. LIPPKE

Editor:
JAMES A. LIPPKE

Assistant Editor:
ALBERT P. LAHNDT, JR.

Broadcast Consulting Editor:
VERNE M. RAY

Cable Distribution Consulting Editor:
LON CANTOR

Art Director:
SUSAN CUTTLER

Production Manager:
ARLINE G. JACOBS

Circulation Director:
JAMES R. ASTOR

Advertising Services Manager:
JILL FISHER

Reader Service Manager:
R. R. BELL

Promotion Manager:
OREN HELMING

President:
RALPH RICHARDSON

This month's cover: Although this issue promotes the use of computers for calculating and plotting antenna patterns and although art, too, has been generated by computer, the antenna patterns on **BM/E's** cover are purely the fancy of illustrator/artist Suddith.

Mactier Publishing Corp.
820 Second Ave., New York, N.Y. 10017, 212 661-0450

Publishers also of:

BROADCAST EQUIPMENT BUYERS GUIDE
EEE
ELECTRONIC PROCUREMENT

BPA

BM/E, Broadcast Management/Engineering, is published monthly by Mactier Publishing Corp. All notices pertaining to undeliverable mail or subscriptions should be addressed to 820 Second Ave., New York, N.Y. 10017.

BM/E is circulated without charge to those responsible for station operation and for specifying and authorizing the purchase of equipment used in broadcast facilities. These facilities include a-m, fm, and TV broadcast stations; CATV systems; ETV stations, networks and studios; audio and video recording studios; consultants, etc. Subscription prices to others are: U.S., its possessions and Canada—$5.00 one year, $9.00 two years; elsewhere—$7.50 one year, $14.00 two years.

Copyright © 1968 by Mactier Publishing Corp., New York City.
Controlled Circulation postage paid at Duluth, Minn.

This is the FM Volumax.
It prevents FM overmodulation—without distortion.
It eliminates SCA crosstalk.
It solves your pre-emphasis problem.

It's yours absolutely free! (for 30 days)

Overmodulation. An FM station engineer's headache. Use a clipper and you get distortion. Use a common limiter and you get pumping. You could reduce modulation levels. But that's not the answer.

CBS Laboratories has the answer. A solid state FM limiting device that replaces common limiters and clippers. And it is unconditionally guaranteed to prevent FM overmodulation and SCA crosstalk *without distortion.*

Hard to believe it does everything we say? Just send this page and your station letterhead. We'll send you the FM Volumax.

Use it 30 days. After that, send it back if you can part with it. We'll even pay the return freight. Or keep it for only $695. Double that if you want the stereo model.

AM broadcasters were quick to respond to our free 30-day Audimax and Volumax offer. Now with the FM Volumax we can make you the same offer. Write or call us collect (203) 327-2000.

PROFESSIONAL
PRODUCTS
CBS LABORATORIES
Stamford, Connecticut. A Division of
Columbia Broadcasting System, Inc.

Circle 4 on Reader Service Card

BROADCAST INDUSTRY NEWS

Broadcast EVR To Be Available in 68

A Broadcast EVR form of the Electronic Video Recording (EVR) system announced recently (see October *BM/E*) by Columbia Broadcasting System, Inc., will be available in 1968 for U.S. educational television, said Dr. Peter C. Goldmark, CBS Laboratories' president. The EVR makes it possible to show on conventional television sets, in the home or classroom, pre-recorded programs at low cost, and will for the first time enable educational stations in the U.S. to reproduce color programs from inexpensive coded black and white EVR film. The full color transmission can be done at about one-sixth the present cost using videotape playback machines.

Broadcast EVR does not employ the player attachment used for EVR in the classroom or home. It does, however, require a low-cost EVR camera to produce color television signals. The simplified electronic equipment required at the television station will cost about one-third that of presently used color film transmission apparatus, Goldmark said. CATV operators are expected to be able to use the low-cost but network-quality system.

Research Shows Reach of Radio

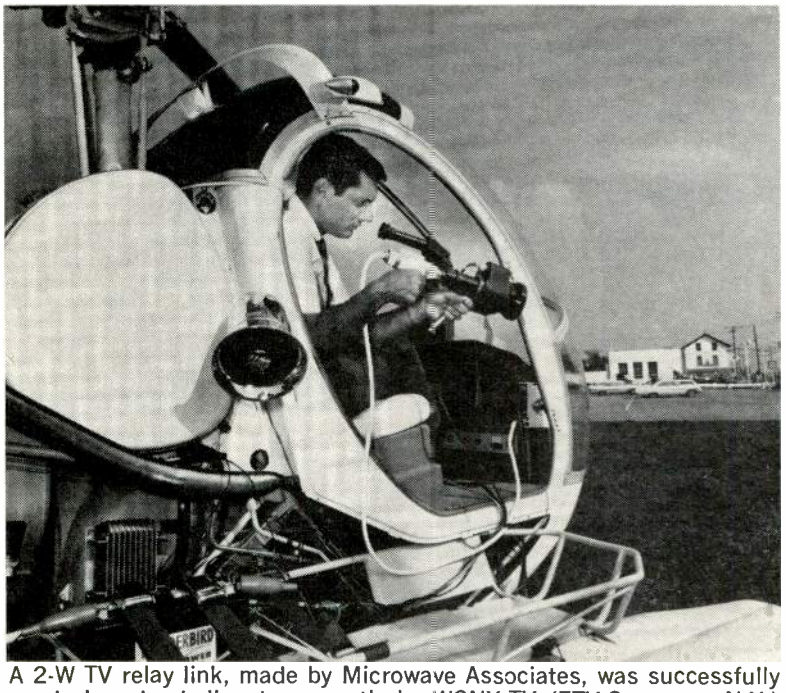
Multiple impressions can reach a large audience and do it at a reasonable cost, according to WIP-AM, Philadelphia, Pa.

WIP Radio ordered from ARB a special tabulation of the different people exposed (reach) and the number of times each of these people was exposed (frequency) to specific schedules of announcements on WIP. Both reach and frequency data are based on listening recorded in ARB diaries during the survey period, April 13 through May 10, 1967.

The data indicates that as spot levels on WIP are increased not only frequency but also reach are appreciably increased. For example: 10 spots reach 18.7 percent of all adults 25-49 an average of 2.0 times, 24 spots reach 30.7 percent of all adults 25-49 an average of 3.2 times, 36 spots reach 34.2 percent of all adults 25-49 an average of 4.5 times.

WIP uses the research data effectively to sell against other radio stations.

TV STL From Helicopter . . .



A 2-W TV relay link, made by Microwave Associates, was successfully used aboard a helicopter recently by WCNY-TV (ETV-Syracuse, N.Y.) during a recent demonstration of airborne television coverage. WCNY-TV conducted successful tests of airborne helicopter real time relay over Syracuse, New York to their studio roof-top receiving location in an evaluation of live airborne television coverage of community events of public interest.

A General Electric engineer is shown making final adjustments to a new GE lightweight TV camera prior to helicopter flight tests.

Fm Radio Sales at New High

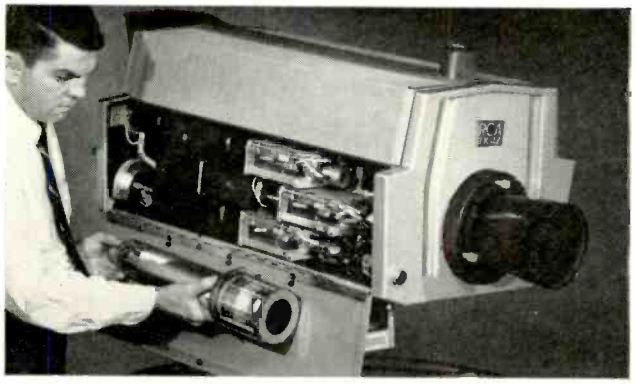
More than 16 million fm radios were sold in 1967, close to 43 percent of all radio sales. Fm sales are likely to equal sales of a-m radios next year. At this rate of growth, says William B. Keepin, manager of the Norelco Radio Dept. of North American Philips Co., Inc., fm receiver sales will jump to 60 percent of the total radio volume by 1970. Keepin attributed this gain to the increase of fm stations from 800 in 1960 to over 1800 today, more diversified fm programming, and new technological developments.

Special TV Vans for Winter Olympics

F&M Systems is constructing for ABC a mobile six-camera color telecast facility capable of operating at heights of up to 10,000 feet especially for the 1968 Winter Olympics. The new system will feature in a single mobile telecast van, production and audio facilities in addition to video control and communications. A separate van will be equipped to generate the necessary ac power.

For the Best Color from Your RCA TK-42 and TK-43 Cameras

USE THE RCA-4536 IMAGE ORTHICON



The RCA-4536 Image Orthicon in the luminance channel of your TK-42 and TK-43 color cameras is the perfect companion tube for the RCA-4493, -4494 and -4495 Vidicons... designed specifically for RCA cameras and carefully quality-tested in the actual camera components.

The RCA-4536 gives a signal-to-noise-ratio 25% greater than the previous standard, 4492 Image Orthicon. The electronically-conducting glass target assures non-stick and anti-burn operation over a long operating life.

Improved over the 4492, the RCA-4536 Image Orthicon assures the best color... the best in-studio service. Ask your RCA Broadcast Tube Representative for full details about the RCA 4½" Image Orthicon that's "tailored" for your TK-42 and TK-43 cameras. *Available from your RCA Broadcast Tube Distributor*

RCA ELECTRONIC COMPONENTS AND DEVICES

The Most Trusted Name in Electronics

NAEB Millennium Reached at 43rd Meet

It was a big week, Nov. 5-8, for educational broadcasters. Some 3500, anticipating it would be so, travelled to Denver to celebrate the beginning of a new era. It was the week President Johnson signed into being the Public Broadcasting Act of 1967. Conventioneers heard and later witnessed via videotape the ceremony. It was the week the Public Broadcasting Laboratory premiered its interpretation of what public TV should be. It was the week educational broadcasters cloaked themselves with the responsibilities of trying to save the nation and the world from itself. Shoulders stooped with the weight of the responsibility and knees exhibited some tremulousness, but heads remained high, as educational broadcasters saw the vision.

The President called for a network for knowledge—an Electronic Knowledge Bank—that could become international "in a partnership to share knowledge and enrich mankind." Leonard H. Marks, director of the U.S. Information Agency, proposed a world information grid employing computers and satellites to transfer man's knowledge to any point on earth.

Keynoter Buckminster Fuller declared TV was a third parent. The big tube mirrors the world. The young viewer adopts the world as his home and no longer feels primary responsibility to his parents and their ideas. "Young people can become loyal to the whole human race," Fuller said. The job is to make the whole world work —work better than ever before. This can come about, Fuller said, with automation producing wealth and education showing how to use one's head.

Defense Secretary Robert McNamara charged the group, not directly, but by example. McNamara described three Department of Defense programs that are succeeding: 1. Open housing —housing off base personnel without discrimination. 2. Project 100,000—reclamation of poverty-scarred youth who failed selective service minimum standards. In a pilot effort 98 percent of 49,000 once rejected were converted to successful soldiers—by giving them the Secretary said, a "worth of importance." 3. Project Transition

FCC Commissioner Hyde tells educational broadcasters their applications will be expedited.

—helping released servicemen into useful civilian jobs.

Ben Holman of Community Relations Service, U.S. Dept. of Justice, underscoring the racial issues thrust on the group by the PBL broadcast, quietly charged that it was imperative that noncommercial broadcasters get to know the ghetto problems. "I suggest that you get to know the black or brown community as well as you know other aspects of your community," he said. Conventioneers applauded but said that they didn't know how to go beyond describing the situation. Answers to remedying the situation were wanted. Black faces present were sought out for advice on how to get a genuine dialogue going.

Some attendees, incensed over NAEB's inability in the past to achieve any substantial integration within educational broadcasting and the decline of some Southern states to carry the first PBL broadcast, apparently because of its racial overtones, got the Board of Directors to agree to study the problem.

TV is a third parent, declared Buckminster Fuller.

Two-thirds of the world's population is functionally illiterate, and 300-million children today go without regular instruction, declared Vernon Bronson of NAEB's research group. The problems can't be licked by conventional methods and traditional resources, he said. Total systems planning using multichannel distribution emanating from super production centers (using all possible aids) is needed, he said. Bronson asked for NAEB to vote $50,000 in additional funds to help the work of NAEB's Research and Development Office.

NAEB President Harley, in commenting on passages of the Public Broadcasting Act, said educational broadcasters were now launched into a new era and will live in a bright spotlight of high visibility. NET President John F. White earlier told NET affiliates to rise to the occasion. "It is . . . critically important that the steam that has been generated in the boiler of public television be maintained and increased." FCC Chairman Rosel H. Hyde added that if educational broadcasters fail to take advantage of the new legislation, "you will have failed in large measure to provide the kind of programming that the public has been led to believe it will receive from this serivce." Chairman Hyde told delegates that the FCC is "establishing a separate processing line

for educational television and radio applications to expedite the grant of construction permits for new facilities or for major modifications in existing facilities.

Leaders of NAEB and NET called for cooperation and an avoidance of a free for all in getting a piece of the pie from the new Corporation for Public Broadcasting. And don't sell out for political patronage, they warned. Chairman of the National Association of Broadcasters, Grover Cobb, of KVGB, Great Bend, Ind., criticized noncommercial broadcasters for accepting the language which forbids educational stations from editorializing. He called it a poor precedent.

Keeping courage and faith was the rallying call of White and Thomas F. Hoving, chairman of National Citizens Committee for Public Television. Hoving said public broadcasting has all of the vibrancy and confusion of the human process. Giving air time to a series (PBL) over which you have little control in face of local community and state pressures is a sign of courage that has made public television come as far as it has, Hoving said. Hoving praised the first PBL broadcast as ". . . having human involvement" and being "timed under the most difficult of circumstances." White said the PBL series is an experiment and thus has the right to fail in any given program segment and almost an obligation to fail on occasion as it pushes into the unknown. "Reserve your hard judgment until after at least four programs," he asked.

Radio broadcasters, getting a boost in morale by being recognized as a vital communication link in the charter of the Corporation of Public Broadcasting, urged more aggressiveness. William Greenwood, public affairs director, National Educational Radio (and affiliated with WAMU-FM, Washington, D.C.), said commercial networks only scratched the surface by covering news that breaks each day. "It's time someone presented in-depth investigation of many neglected but still important issues . . . The lone broadcaster with his tape recorder has an important job to do," he said.

Program dissemination to NER broadcasters has moved ahead. In the last year 81-million feet of tape-recorded programs have been distributed to 144 member stations.

Continued on page 56

This new concept in outer sleeve design guarantees positive pin alignment; pins *cannot* be bent or damaged by mismating. The double-sleeve design also prevents injury to mating threads and protects against knocks, drops and abuse from studio rolling stock.

Heavy-duty rubber compression gland provides an effective seal at rear of connector. All pins and sockets on the new TV-85C insert are front release, rear removal, and crimp to cable conductors. Woven cable grip and rugged molded boot provides both bend relief and pull-out protection.

Completely compatible with existing 85 pin connectors used for TV, BIW's new TV-85C connectors are machined from 7075-T6 aluminum, and are precision built for trouble-free performance.

Go BIW all the way — connectors, camera cables (American or European), broadcast panels. Write for details.

Cable concepts grow at... BIW

Boston Insulated Wire & Cable Co.

45 Bay St., Boston, Mass. 02125/141 Nevada St., El Segundo, Calif. 90245
118 Shaw St., Hamilton, Ont./International, 1 Place Ville Marie, Montreal, Que.

Circle 5 on Reader Service Card

FOCUS ON
CATV

Supreme Court Takes on Second CATV Decision

In addition to considering the San Diego case involving FCC jurisdiction over CATV, the U.S. Supreme Court has agreed to hear the United Artists Television, Inc. Fortnightly Corp. copyright case. In a ruling last May the United States Court of Appeals for the Second Circuit held that a CATV system must pay the owner any copyrighted material it relays. The Supreme Court will decide now if CATV systems are in fact guilty of copyright infringements when they relay to their subscribers television broadcasts that include copyrighted material.

Good Times or Bad For Manhattan Cable?

Most CATV advertising has been via direct mail or salesmanship since potential subscribers are located in relatively small clusters, but Manhattan Cable Television made a big splash by entering the mass media with a $50,000.00 16-page, color supplement in the Sunday, November 27th, *New York Times*. Could such a large advertising expenditure (paid for in part by supporting equipment manufacturers) bespeak trouble? Or is it bold promotion?

The holder of the lower Manhattan CATV franchise, Manhattan Cable, has signed about 3,000 of its close to 400,000 potential subscribers, and appears to be having tough sledding signing many more. A 30-day free trial and waiver of the $19.95 (just reduced by the City to $9.95) installation charge are being used to entice subscribers, a free volume of Time/Life's (one of Manhattan Cable's owners) *Great Ages of Man* is offered just for a home visit to explain the service, and the landlords have been offered a 5 percent cut of the gross revenue from apartment houses. Although the density of New York City's population would promise a profitable operation, the major problem seems to be that Manhattan Cable must sell CATV service purely on a promise of better reception and is not able to offer the usual benetional programming, including a 24-hour news ticker, weather, fits of additional stations (additentertainment and stock market reports, is provided by Manhattan Cable). Evidently, black and white viewers will accept marginal to passable signals free rather than to pay $5.00 a month for a clearer picture. And so the success of a $25-million investment in a system with a 12-channel capability could depend on an increase in the number of color television sets in the area or the interference caused by the new World Trade Center—or many more channels.

Pay TV Pushed Back Another Year

Once again the broadcast and theatre owners' lobbying has caused Congress to lower the boom on Pay TV. The House Commerce Committee passed a resolution requesting the FCC to hold off action on Pay TV for a year pending house hearings on Pay TV's impact on broadcasting and the report of the Presidential Task Force. According to Rep. James Harvey (R.-Mich.), new hearings will be broader than previous ones and will be a full-fledged effort to relate Pay TV to commercial television, public television, CATV, networks, and spectrum allocation. The resolution toned down an earlier House

These stations

McMartin®
McMartin Industries, Inc.
3104 Farnam Street
Omaha, Nebraska 68131

Communications Subcommittee proposal that would have in effect told the FCC it had no authority to act on the Pay TV question.

Cease and Desist

Difficulties caused by interpretation of FCC rules on carriage and nonduplication continue to multiply necessitating eventual clarification by the Commission. Recent Bluefield Cable Corp. action (see *BM/E*, Dec. p. 68) might indicate an even tougher attitude toward cable operators in these areas. In ordering Bluefield to show cause why it shouldn't carry the Grade B signal of WCYB-TV, Bristol, Virginia, the Commission stated that the rule requiring carriage hinges *not on whether a grade B signal is received in Bluefield, but on whether the community lies within the grade B contour of the station.* Bluefield Cable has contended that WCYB-TV could not be received in Bluefield. Clarifying its statement at the CATV Task Force's request, the Commission said waiver would not be justified merely because a satisfactory signal is not being received if carriage is technically feasible. The Task Force interpreted this statement as indicating that Bluefield could be ordered to relocate its head end site to permit carriage of the station. The Commission's last word was that carriage is in the public interest and "it will be up to Bluefield to decide what steps, if any, it will take to meet the requirements of Sec. 74.1103 of the rules."

Welch Antenna Co., CATV system operator in Welch, W.Va., has been directed to show cause why it should not cease and desist from refusing program exclusivity to WHIS-TV, Bluefield, W.Va., although Welch says that WHIS-TV is not transmitting high quality color programming and their black and white is not up to par either.

Winona TV Signal Company, CATV system operator in Winona, Minnesota, ordered to cease and desist from further violation of Sec. 74.1103(e) and to provide program exclusivity to station KAUS-TV, Austin, Minn.

Shinnston, W.Va. CATV operator, Bettervision Systems, Inc., and Mountain National Corp. required to show cause why it should not cease and desist from operation of the system in violation of program exclusivity requirements of Sec. 74.1103(e) of the rules with regard to signal of station WBOY-TV.

FCC denies petition of Southwestern Cable Co. requesting that the Commission vacate part of its order restricting expansion of the company's CATV system until completion of the San Diego CATV hearings.

FCC Commissioners and the Cable Industry

At the close of the series of regional NCTA meetings, the cable industry was still interpreting the remarks of FCC Commissioners who addressed some of the meetings. The fact that five of the seven commissioners did speak at meetings was in itself considered a favorable sign . . . their remarks ranging from the eager enthusiasm of Nicholas Johnson to the skeptical cautiousness of Commissioner Cox to Commissioner Loevinger's indications that he could be relied on to take the cable industry's side, saying there would be enough time for the FCC to step in and regulate cable television once the agency understood it better. In general, the FCC attitude was summed up by Sol Schildhause, CATV Task Force chief, who said that in coming months CATVers will meet an environment less hostile than a year ago at the FCC.

all use

McMartin FM Monitors

And this is not all of them. Over 1,500 stations in every state of the U. S. and in many foreign countries are now using one or more of the many types of monitors we make for FM Stereo, SCA and FM monaural transmission. **No one** has as many years experience as McMartin in making monitors for **every** type of FM transmission. For better monitoring, buy the monitors that most other stations use. Please write for our Broadcast Monitor bulletin for complete information.

McMartin®
McMartin Industries, Inc.
3104 Farnam Street
Omaha, Nebraska 68131

McMartin®
McMartin Industries, Inc.
3104 Farnam Street
Omaha, Nebraska 68131

Circle 6 on Reader Service Card

Distant Signals

FCC authorizes General Cablevision of Palatka Inc. to operate its proposed CATV system at Palatka, Florida, with carriage of distant signals. In action the Commission denied petitions for special relief by Washington Post Co., licensee of station WJXT-TV Jacksonville, Rust Craft Broadcasting Co., permittee of WJKS-TV Jacksonville, Florida-Georgia Television, Inc. interim operator of WFGA-TV Jacksonville and Hubbard Broadcasting Inc., permittee of channel 51, Ocala, all in Florida. Commissioner Cox dissenting.

Commission has reaffirmed its decision granting to Waitsburg TV Cable, operator of Waitsburg, Washington, CATV system, a waiver of carriage and program exclusivity rules. It denied petition for reconsideration of action by Columbia Empire Broadcasting Corp., licensee of KNDU-TV, Richland, Wash. FCC said the ruling would benefit Waitsburg viewers more than it would hurt Columbia. Commissioner Cox dissenting.

The Commission has granted motions deferring consideration of waiver petitions of eleven companies that propose to set up CATV systems in Connecticut. Time for filing opposition and responses to waiver requests was extended until 30 days after final disposition of related appeals pending in Connecticut state courts or until July 1, 1968, whichever is first.

A STAR IS BORN

FILMLINE'S MODEL FE-50

A Processor for Ektachrome Film

Processes 16mm Color Emulsions at 50 FPM.

Who knows more about building film processors than Filmline? Nobody. And everything we've learned has gone into our newest Ektachrome processor, the FE-50. It is top quality equipment at a sensible price . . . the result of Filmline's productive know-how. Designed and engineered to fulfill the requirements of both large and small TV stations the FE-50 is the most versatile, fully automated Ektachrome processor ever built.

- **EXCLUSIVE OVERDRIVE SYSTEM** — guarantees against breaking or scratching film. The system is so sensitive that film can be held manually while machine is in operation, without breaking film or causing lower film assemblies to rise.
- Provisions for extended development to increase ASA indexes to 250 and higher are incorporated. Machine threadup allows use of standard ASA indexes or accelerated indexes because of Filmline's Film transport system features.
- **EASY-TO-OPERATE**—automated controls make this an ideal machine for unskilled personnel.
- **VARIABLE SPEED DRIVE**—speed range of 5 FPM to 60 FPM for Ektachrome emulsions.

ADDITIONAL FILMLINE FEATURES:

▪ Stainless steel air squeegee ▪ Impingement dry box ▪ Torque motor for takeup ▪ Leakproof pumps for chemical solutions ▪ Temperature controlled by precision thermistor controllers ▪ Construction — all metal ▪ Tanks and component parts are type 316 stainless steel.

Recent FE-50 Installations: WEAT-TV, WCKT-TV, WMAL-TV, NBC, CBS, WTOP-TV, A-1 Labs, Precision Labs, Film Service Lab.

Now available: Filmline FE-30 Ektachrome Processor. Speed — 30 FPM. Complete with Replenishment System . . . $15,750. F.O.B. Milford, Conn.

For more details write: *Dept.* BMJ-68

Filmline CORPORATION
MILFORD, CONNECTICUT

Circle 7 on Reader Service Card

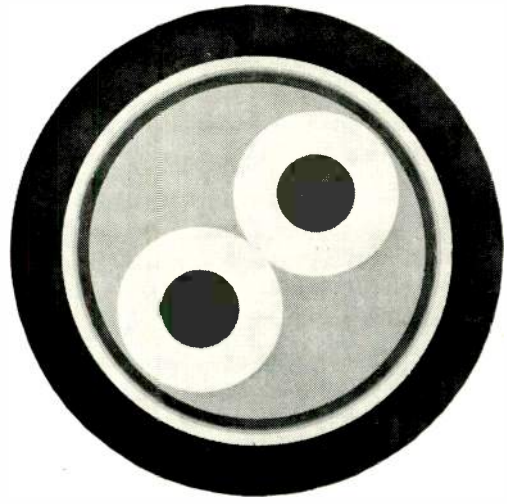
BUSINESS OF ETV

Georgia Senator Applauds His State's ETV Progress. U.S. Senate heard Georgia's Senator Herman E. Talmadge say that in just two years his state has become a national leader in ETV. Almost a million students, he asserted, had benefited from education courses telecast over the 10-station network.

Sylvania's 'Blackboard-by-Wire' Reaching 15 School Districts. High school courses are being transmitted to 15 school districts surrounding Texas A&M University via Sylvania's "Blackboard-by-Wire teaching system. The system, which transmits voice communications and handwriting over telephone lines for long distance illustrated lectures, is being operated over a 70-mile radius by Creative Application of Technology to Education Center, a pilot program financed by a Federal grant to the A&M Consolidated School District.

ETV Satellites. The head of a communications task force at Cutler-Hammer Inc., Peter Sielman, has made detailed plans for television satellites that could educate the world's 700-million illiterate people. The entire cost of such an educational television system, Sielman says, using two or more satellites to blanket the globe, would be about $328-million, a fraction of the cost of U.S. foreign aid each year.

Maryland ETV Announces First Production. The Marvland Educational-Cultural Broadcasting Commission has appointed an advisory committee to assist in planning the first television production for the state ETV network. A series of 20 to 30 half-hour programs on Maryland history will be developed. The first shows will be filmed during 1968 and aired when the network goes on the air early in 1969.



WHEN YOU GO LOCAL ORIGINATION...
YOU NEED SUPERIOR'S VIDEO PAIRS!

Superior Video Pairs are *balanced pairs,* individually shielded, that eliminate AC hum and maintain studio-quality picture transmission. So, for high-definition television transmission from studio to head-end, from remote pick-up points to head-end or from remote pick-ups to studio to head-end . . . insist on Superior Video Pairs. Flexible Video Pairs for patchcords and flexible video leads also available.

Write or call for information and prices to
Superior Sales and Service Division P. O. Box 2327 Hickory, North Carolina 28601 Phone 704/328-2171

Frequency vs. Attenuation	
Frequency	db/1000ft. @ 68°F
3 MHz	2.8
5 MHz	3.7
10 MHz	5.2
15 MHz	6.4

SUPERIOR CONTINENTAL CORPORATION

Circle 8 on Reader Service Card

INTERPRETING THE FCC RULES & REGULATIONS

New Rules Revise Station Id Requirements

THE SO-CALLED "ID RULES" are found in Section 73.117 (a-m), 73.287 (fm), and 73.652 (TV). Briefly, they require the licensee to "identify" the station by announcing the call letters and location (city of license). For a-m and fm stations, these id's must be given at the beginning and ending of each time period of operation and (1) within two minutes of the hour, and either the half hour or the quarter and three-quarter hours; (2) in the case of a single consecutive speech, play, religious service, symphony concert, or operatic production, at the first interruption of the entertainment continuity and at the conclusion of the program; or (3) in the case of variety shows, athletic contests, and similar programs of longer duration than 30 minutes, within five minutes of the times given above. For TV, the id's must be given both visually and aurally at the beginning and ending of each time period of operation and (1) during the operation on the hour or (2) in the case of a single consecutive speech, play, religious service, symphony, concert, or operatic production, at the first interruption of the entertainment continuity and at the conclusion of the program.

The id rules were promulgated at the very beginning of broadcast regulation, first by the Department of Commerce and later by the Commission. In the past, the underlying reason for the requirement was to *assist the regulatory agency in its monitoring.*

On January 25, 1967, the Commission adopted a Notice of Proposed Rule Making (FCC 67-114) to prohibit broadcast licensees in station identification announcements, promotional announcements or any other broadcast matter from leading or attempting to lead members of the listening or viewing public to believe that their stations have been assigned to cities other than those specified in their licenses. (In the matter of amendment to Part 73 of the Commission's Rules and Regulations relating to station identification requirements, Docket No. 17145, Report and Order, released 8/30/67.)

Efforts of certain licensees to mislead the public as to the licensed location of their stations have long been a matter of concern to the Commission. *Gulf Television Co.,* 12 RR 447; *Tulsa Broadcasting Co.,* 12 RR 1256. More recently, *McLendon Pacific Corp.,* 8 RR 2d 1187 (the licensee of station KABL), the Commission found such practices by a licensee undesirable (but under the particular circumstances of that case not in violation of existing rules) because the call letters and city in which the station was licensed were announced at the time specified for station identification.

This case is most interesting and informative because it was instrumental in galvanizing the Commission to review the entire station "id" problem, institute a rule making, and adopt the Report and Order mentioned above.

KABL's alleged violation of the station identification rule was based upon its conduct in making announcements required by the rule at specified intervals and in its "local color" announcements at other than the specified intervals. In making the required station identification, KABL coupled the announcement of its call letters and location with language concerning its coverage of San Francisco.

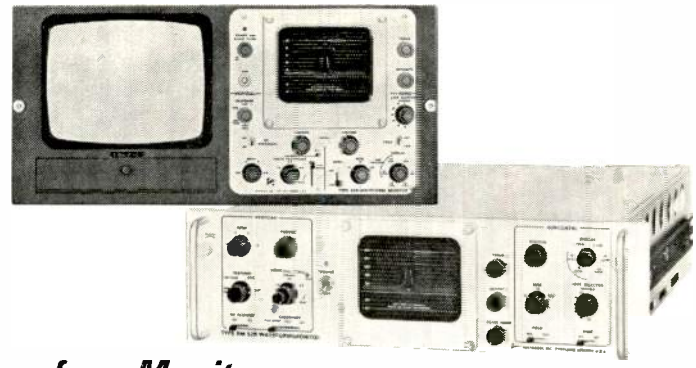
The Commission's Order involving KABL arose as the result of complaints by city officials of Oakland, to which KABL is licensed, that the station consistently identified itself with San Francisco rather than with Oakland. Following receipt of the complaint, Commission monitoring disclosed the following announcement at station identification times:

"This is Cable—K-A-B-L, Oakland 960 on your dial, in the air everywhere in San Francisco." (Clang-clang of cable-car bell) At other times, other than the times specified for mandatory id's announcements or "promos" such as the following were broadcast:

> This is Cable—K-A-B-L music on aisle 96 from San Francisco. Serenade in the morning from aisle 96 on your San Francisco dial. . . . . This is KABL, in the air everywhere over the great Bay area, constantly in fashion with beautiful San Francisco. . . . . This is KABL, 960 on your San Francisco dial, with enchanting melody for San Francisco, the world's most enchanting city. . . . . This is KABL music, the voice of San Francisco from aisle 96 on your radio dial. . . . . A symphony of sound on KABL designed for San Fancisco.

This section, providing broad interpretation of FCC rules and policies, does not substitute for competent legal counsel. Legal advice on any given problem is predicated on the particular facts of each case. Therefore, when specific problems arise, you would be well advised to consult your own legal counsel.

measuring picture quality in terms of K-factor



. . . with a Tektronix Type 529 or RM529 Waveform Monitor

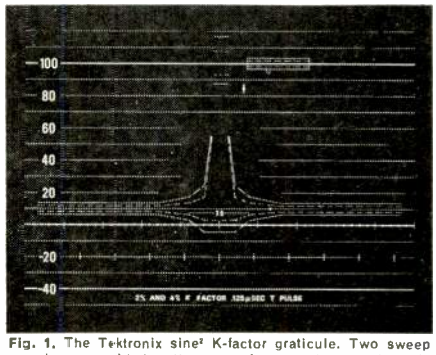


Fig. 1. The Tektronix sine² K-factor graticule. Two sweep speeds are provided on these waveform monitors so that this graticule can be used for 0.125 μs T-pulse testing on such applications as studio and network transmission lines, and for 0.250 μs 2T-pulse testing on such applications as video tape recorders and transmitters.

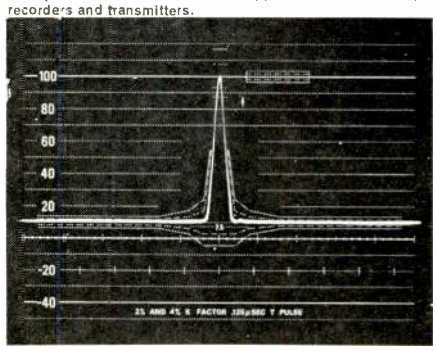


Fig. 3. Display of an undistorted 0.125 μs sine² pulse at 0.125 H/cm magnified 25X. A T-pulse with its base on the +10 IEEE unit line will reach the +100 IEEE unit line if the video system has 6.7 MHz equivalent bandwidth. At 4 MHz, pulse height will be reduced by 18%.

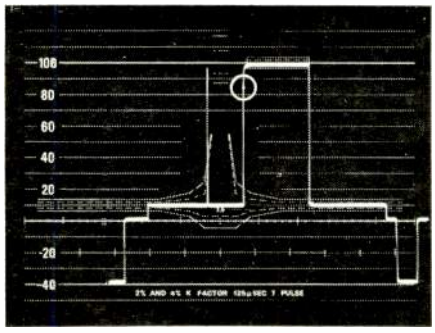


Fig. 5. Display of a bar signal at 0.125 H/cm with the base on the +10 IEEE unit line and the rising edge aligned with the arrow (encircled). The top of the bar signal should be at the +100 IEEE unit line. The inner and outer lines of the box at this point show the 2% and 4% K-factor limits.

Measurements of TV picture quality in terms of K-factor can be made simply and precisely using the sine² graticule of a Tektronix Waveform Monitor. These measurements can be made when a sine² pulse and bar is transmitted during the vertical blanking interval of normal broadcast operation.

Figure 1 shows the sine² graticule — marked in percent of K-factor for signal-distortion measurements when using a sine² pulse and bar and also marked in standard IEEE units for normal signal-level measurements. Figure 2 shows an undistorted sine² pulse and bar.

T-pulse measurements. The phase response of a video system can be determined by observing the leading and trailing edges of the sine² pulse. Figure 3 shows an undistorted pulse. Phase distortion causes asymmetrical aberrations, such as shown in Figure 4. Any display of symmetrical ringing on both the leading and trailing edges of the pulse indicates bandpass degradation without phase distortion.

Bar Measurements. The critical mid-band frequency and phase response of a video system can be determined by observing the amount of tilt in the flat-topped portion of the bar. If the video system has ideal response, the bar will be transmitted as shown in Figure 5. Impaired response in the system will cause tilt or sag, such as that shown in Figure 6, with streaking or smear in the picture.

Type 529 Waveform Monitor $1085
(8¼" high, 8½" wide, 19" deep, weighs 24 lb.)
Rack Mount Type RM529 . . . . . $1135
(5¼" high, 19" wide, 20" deep, weighs 27 lb.)
Power consumption of each model is ~80 watts — no fan used.

U.S. Sales Prices f.o.b. Beaverton, Oregon

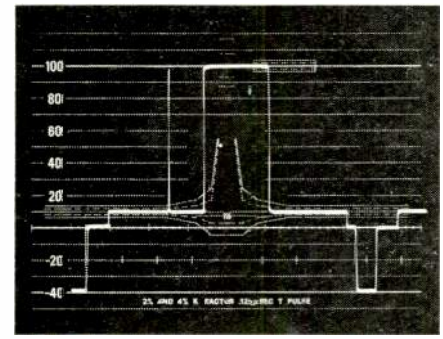


Fig. 2. Display of a sine² T-pulse and bar. Waveform shows the following the horizontal sync pulse on the —40 IEEE unit line, the backporch on the 0-level line, the 10% offset or base for the pulse and bar, and the sine² or T-pulse on the +10 IEEE unit line, and the bar on the +100 IEEE unit line.

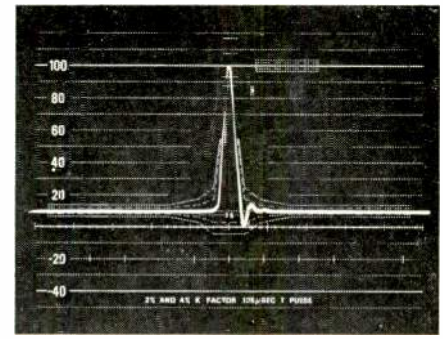


Fig. 4. Display of a sine² T-pulse showing some phase distortion. Phase distortion will appear as aberrations on the leading or trailing edges of the T or 2T-pulse. The K-factor system relates the amplitude of ringing vs the displacement of the ring from the transient in terms of picture degradation.

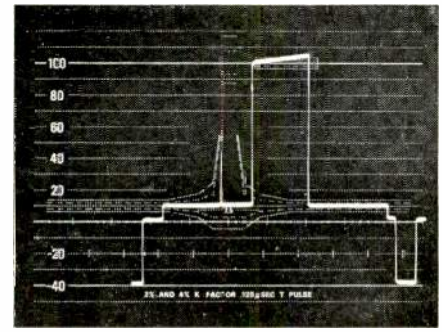


Fig. 6. Display of a bar signal at 0.125 H/cm, showing tilt which exceeds the 2% to 4% K-factor tilt limits.

For a demonstration, contact your nearby Tektronix field engineer or write: Tektronix, Inc., P. O. Box 500, Beaverton, Oregon 97005.

Exacting standards of component manufacture

. . . part of the Tektronix commitment to technical excellence

Circle 9 on Reader Service Card

The Commission ordered a hearing (Docket 16214) to determine whether an Order of forfeiture in the amount of $10,000 or some lesser amount should be issued. In an order released December 13, 1966, the Commission found that by announcing the station's call letters and the city of license, KABL *complied with the literal provisions of the rules and nothing more was required!*

Consequently, the Commission concluded, after review of information coming to light regarding misleading station identification announcements, that it was necessary to amend the rules. It further believed that nothing short of a general prohibition of the broadcast of misleading matter on this subject would cover all situations and prevent the defeat of the intent and purpose of the station identification rules. Accordingly, it adopted a notice of a proposal to amend Part 73 of the rules to provide that:

> A licensee shall not in station identification announcements, promotional announcements or any other broadcast matter either lead or attempt to lead the station's listeners to believe that the station has been assigned to a city other than that specified in its license. (The amendment to the rules relating to television stations substitutes the word "audience" for "listeners.")

The Rules Analyzed

The majority of the parties submitting comments supported the proposed rule or its purpose, and one urged the Commission to go further and specify that even in nonbroadcast forms of advertising and promotion stations may not identify themselves with communities other than those in which they are licensed. However, most of the parties favoring the rule asked clarification (1) to specify that stations licensed to more than one city or authorized to use multiple-city identification may in all program matter identify themselves accordingly, and (2) to specify that stations licensed to one city but providing substantial service to other cities or nearby areas may so describe the scope of their coverage — provided no attempt is made to mislead the audience as to their licensed location. One of the parties in this group asked the Commission to state that licensees shall be entitled to declaratory rulings under Section 1.2 of the Rules. *The Commission emphasized that it was not its intent in proposing the rule making to infringe on any authorization for multiple-city identification or to inhibit the broadcast of truthful statements about a station's coverage area.*

A minority of the comments opposed the rule. Many of these comments were based on misconceptions of its effect in the areas described above; i.e., the use, where authorized, of multiple-city identification and the right to broadcast accurate statements regarding a station's coverage area. However, several submitting opposition comments professed fear that the rule would impose many other prohibitions upon the programming of stations whose licensed locations are suburban communities. Among the consequences conjured up by this group were prohibitions against (a) the broadcast of any public service announcements or programs on behalf of organizations located in the principal city; (b) the broadcast of programs designed to serve the needs and interests of the entire coverage area of the station; and (c) the broadcast of advertising sponsored by businesses located in the principal city. A few of those submitting comments even professed fear that a suburban station would be required to delete or severely restrict the amount of news broadcast about events occurring in the adjacent principal city — lest the Commission hold that the broadcast of such news would mislead the station's listeners as to its location.

The Commission set forth that all such fears in the terms stated above were groundless. It repeatedly stated that a station has an obligation to serve its entire coverage area, and the broadcast of public service announcements and other programming, including news, which pertains to or is of interest to persons in its entire coverage area is not inhibited by the proposed rule. However, as set forth in Section 73.30(a) of the Rules, *the primary responsibility of a licensee is to "serve a particular city, town, political subdivision or community which [is] specified in its station license." The further obligation to serve its entire service area may not be used as justification to ignore the licensee's primary responsibility or to mislead a station's audience as to its licensed location.*

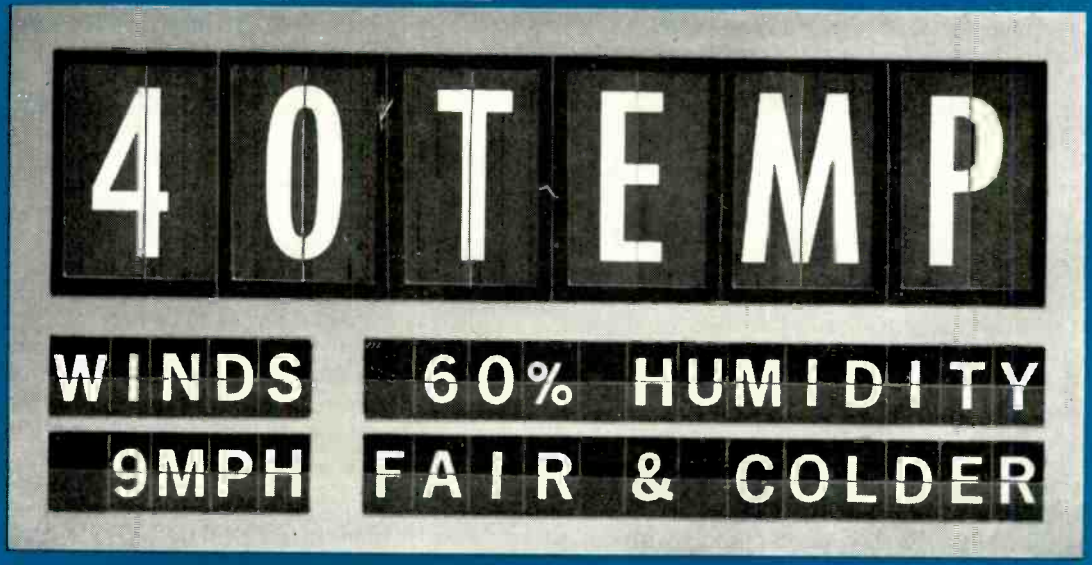
In his statement concurring with the Rule Making, Commissioner Johnson raised numerous questions going to the Commission's basic allocation policies, and invited comments thereon. In response, some filing comments urged that the Commission abandon the principle of licensing stations to individual communities and permit them to identify themselves with entire metropolitan areas. In support of this view, it was urged that (1) the concept of community service is anachronistic; (2) stations in metropolitan regions now actually serve homogeneous areas rather than political entities, and (3) the people in such metropolitan areas have the same interests. Although such arguments merit consideration, the commission did not propose in this proceeding to consider the revision of its historic concept of station allocation. The proceeding was instituted to determine whether a rule should be adopted to prohibit misleading announcements regarding station location as presently assigned. As Commissioner Johnson recognized in his concurring statement, the Commission has in some areas permitted a substantial increase of interference in order to grant applications for first local transmission services. If the Commission were now to relieve such licensees of their local service obligations, it might well reconsider the need for so many facilities in some metropolitan areas.

Until such time as it may consider revising its basic policy in allocating facilities, the Commission shall continue to license stations primarily to serve their own communities and secondarily to service their entire coverage areas. Although the contention has been made that all metropolitan areas are now homogeneous and have the same programming needs, the Commission found no evidence was presented to support such a proposition. In fact, the Commission mentioned that the tremendous growth of suburban newspapers in recent years would lead to the conclusion that although many suburbanites work in the principal city, they retain their interest in the political, civic, cultural, social and educational affairs of their

TEMP 40 HUMIDITY 60
WINDS 9

not just this . . .

but all this with SOLARI



Go with SOLARI Teleindicator Display Modules . . . the most versatile system there is!

Why limit your displays to numbers only, or to a single size? With other display systems you have no choice . . . With SOLARI, you can build a complete alpha/numeric system using your choice of 3 models, 7 character heights, up to 40 vertical or horizontal flaps per module, 24 character colors, up to 15 characters per flap, normal, narrow, or small script, and as many alpha/numeric permutations and combinations as you can think of. And, SOLARI Teleindicator Display Modules can be interfaced to operate from a Videograph®, computer, or virtually any applicable control system.

And when you've had it with back-lighted letters and numerals that produce flare, ghosts, burned-out bulb problems, you're ready to up-date to ambient-lighted SOLARI display units. Remember — only SOLARI Teleindicator Display Modules offer you the versatility and convenience of model-choice to suit your program requirements.

VISUAL ALSO DISTRIBUTES A COMPLETE LINE OF SOLARI DIRECT-READING CLOCKS. PLEASE WRITE FOR BROCHURES.

the Blue Ribbon Line

FIRST BY ANY STANDARD

Distributed nationally by:

VISUAL ELECTRONICS CORPORATION

356 west 40th street • new york, n.y. 10018 • (212) 736-5840

Circle 10 on Reader Service Card

home communities.

In releasing its Notice of Proposed Rule Making the Commission recognized that if such a rule were finally adopted, it would be desirable to issue a supplementary list of examples of its application for the guidance of licensees. It did not release a list of examples at that time because it believed that comments of interested parties in the proceeding would be of assistance in preparing the examples. After considering all suggestions and questions of interpretation submitted in the comments, the Commission incorporated, by reference in the rule, examples of ways in which it intends to apply the rule to specific practices. It previously followed this practice with respect to rules on sponsorship identification and fraudulent billing practices, and it apparently has proved helpful. The list of examples will be enlarged as experience dictates, and they should answer most of the specific questions posed in the comments. Most importantly, they will serve to negate the criticism advanced in some comments to the effect that the rule is vague and lacks clearly defined standards.

Following are examples set forth by the Commission illustrating the application of the rule to certain kinds of broadcast statements — whether or not broadcast at the time at which station identification is required.

1. Station xxxx's licensed location is Central City. It broadcasts an announcement: "This is Station xxxx, Central City," or otherwise refers to its location as in Central City.

Ruling: Such statements comply with the rules.

2. Station xxxx has been granted authority by the Commission to use dual-city identification. It broadcasts an announcement: "This is Station xxxx, Central City and Nearby City."

Ruling: The announcement complies with rules, assuming that the named cities are those specified in the dual-city authorization.

3. Station xxxx is licensed to a suburban community, Suburbia, but also provides primary coverage to substantially all of the adjacent metropolitan area. It broadcasts an announcement: "This is xxxx, Suburbia, serving the greater Principal City area."

Ruling: The announcement complies with the rules. Similarly valid announcements, provided the station's coverage data support the claims, might be:

"Station xxxx, Millville, serving the Green River Valley."

"Station xxxx, Millville, serving Millville, Rushville and Oakville."

"Station xxxx, Millville, serving the Tri-City area."

4. Station xxxx is licensed to Central City only. It broadcasts an announcement: "Station xxxx, serving Central City—Nearby City."

Ruling: The announcement violates the rule because it appears designed to lead listeners to believe that xxxx has been authorized to identify with Nearby City as well as Central City.

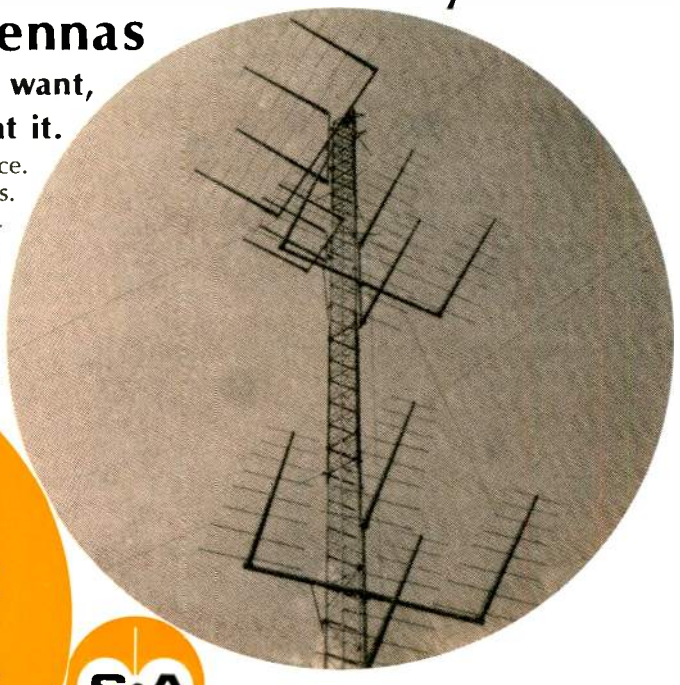
5. Station xxxx is licensed to Suburbia. It broadcasts an announcement either at the time for station identification or at any other time: "This is xxxx, covering the greater Principal City area."

for Translator and CATV systems:

"Quadrate Channeler" antennas

receive the signal - and only the signal - you want, and put it where - and only where - you want it.

Eliminate co-channel interference.
3 models cover 12 VHF channels.
Superior black/white and color reception.
Very low sidelobe level; very high front-to-back ratio.
Narrow beamwidth; high gain; wide bandwidth.
Weatherproof construction, complete packaged assembly



and

GUARANTEED ANTENNA PERFORMANCE

Consult with Scientific-Atlanta on your particular antenna problem. We will advise you frankly whether our CHANNELER ANTENNAS can solve it. If, based on our recommendation you buy and install one of our antennas and are not completely satisfied with its performance, you can return it within 30 days for a full purchase price refund.

S·A

For more information contact
Mr. Tom Smith or Mr. J. B. Weston at

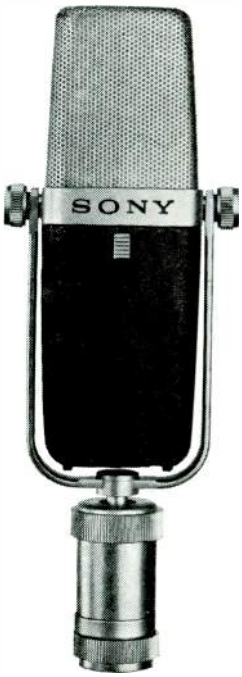
SCIENTIFIC-ATLANTA, INC.

Box 13654, Atlanta, Ga. 30324, 404-938-2930, TWX 810-716-4912

Circle 11 on Reader Service Card

SONY

SOLID-STATE C37-FET CONDENSER MICROPHONE



the World's Finest Professional Microphone

NOW PACKS ITS OWN POWER

The new Sony Solid-State C37-FET Condenser Microphone is designed to give you the ultimate in professional capabilities wherever you may need them. A revolutionary Field Effect Transistor (F E T) replaces the conventional vacuum tube, eliminating the external power supply and bulky connecting cables. Power is now supplied by a built-in replaceable 9-volt battery, delivering 300 hours of continuous power.

The C37-FET retains all the warm, natural quality, the unbelievable flat frequency response free of resonant peaks and dips—so characteristic of its illustrious predecessor the world-famous C-37. Musicians, conductors, soloists and sound engineers prefer the C37-FET for its wide dynamic range which captures the splendor of choral groups...for its faithful flat reproduction of high, middle and low registers to capture the magnificence and true timbre of strings, woodwinds and piano.

Add to this the outstanding signal-to-noise ratio specifications, unusually high front to back rejection of cardioid pattern, a built-in battery that delivers up to 300 hours of continuous power, and you have a microphone whose performance is unparalleled whether in the studio or on location.

$325.00

Color It Warm and Natural

SONY F-121 CARDIOID DYNAMIC MICROPHONE

. . . the instrument Sony engineered to provide the ultimate in performance under difficult conditions. Whether you wish to reproduce the rich warmth of strings and woodwinds or the fine upper registers of a soprano, this superb Sony instrument will fulfill your most discriminating expectations. Designed to meet the exacting requirements of professional use, the Sony F-121 offers a cardioid pattern with exceptional front-to-back rejection ratio without compromising the normal frequency response. An integrated wind screen assures immunity against any wind-produced noise or blast effect, while the convenient on-off switch permits immediate operation. The Sony F-121 is the ideal selection for the recording enthusiast who wants professional characteristics in a microphone whose operation is foolproof. Complete with 20-foot microphone cable, desk stand, clip-on holder, and deluxe carrying case, just $59.50.

F-121 Features and Specifications: Select from three impedances (50, 150 and 10,000 ohms). On-off switch has electrical safety interlock to prevent accidental cut-off. Change single wire to switch impedances. Unidirectional characteristic. Frequency response, 30 - 18,000 Hz. Hum induction level, below 6 db/mgauss. Wind noise, less than 50 db in all directions. Dimensions: 7" x 1 9/16" max. dia., 1" min.

SONY® SUPERSCOPE®

8150 VINELAND AVENUE • SUN VALLEY, CALIF. • 91352

Circle 12 on Reader Service Card

No Strings!

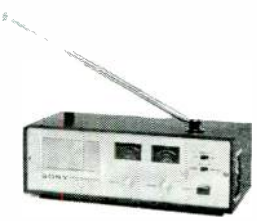
...With the SONY Solid-State CR-6 F.M. Wireless Microphone

Tessie Mahoney of the syndicated Winchell-Mahoney Television Show.

Sony brings new freedom to the profession — a **totally** cordless communication system that meets the most critical industry standards!

Take a compact, lightweight, solid-state FM transmitter and professional-caliber condenser microphone. House them in a tiny capsule less than three inches long. Attach a small battery pack and you'll move freely through crowds for on-the-spot interviews with a hand-held probe. Or, pocket the cigarette-size extra power pack, wear the capsule as a lavalier.

Anywhere indoors or outdoors, the Sony solid state AC/DC receiver is ready to capture every sound — flawlessly. Distortion and interference usually found in conventionally designed wireless microphones is completely eliminated by the CR-6's Sony-special frequency modulation system. And you'll never worry about a power source — the Sony CR-6 F.M. Battery operated receiver packs its own power. Available in three frequencies — 42.98 MCS, 35.02 MCS or 33.14 MCS (must be specified at time of order).



$450.00

Sony offers you professional performance . . . with no strings attached.

Circle 13 on Reader Service Card ➔

ONLY THE ADVANCED VR-2000B has what everyone needs to do his color best. This latest version of our Emmy Award winning VR-2000 brings your studio the world's only complete teleproduction recorder, user-improved. It outmatches any competitor in: ① Superior picture quality, perfect color fidelity automatically controlled by Ampex-developed Amtec™, Colortec™, Auto-Chroma and Velocity Compensator units. ② World's finest color dupe quality (demonstrated to ten generations) with exclusive Ampex Mark Ten rotary transformer head, K-Factor specified less than 1% compared to 1.5% in other VTR's. ③ Exclusive Editec™ programming of splices, animation, cues; instant "film style" creative freedom. ④ New audio system of master studio quality. ⑤ Man/machine

Your people will outmatch everyone in sight with the newest of highband VTR's... the VR-2000B

designed. Primary controls logically placed waist-high. ⑧ Instantly interchangeable printed-circuit modules throughout; new system harness pre-wired to plug-in any accessory. ⑦ Ampex experience-proven necessities such as non-scratch erase head, removable tape path cover, exclusive "Record lock-out" to prevent erasure of master tapes, precision reel-centering hold-down knobs, up-front indicating circuit-breakers, built-in monitor video DA; and switchable color, monochrome low- or high-band with instant plug-ins for all international standards. ⑧ An unmatchable record of color performance in 1000 high-band recorders in stations networks and studios throughout the world. For details, contact Ampex, Redwood City, CA.94063.

AMPEX
THE ONE OTHERS TRY TO MATCH

BBRC's Mark 21...*The Wave Maker*

This is the Mark 21-RM, full-rack version of Ball Brothers Research Corporation's Mark 21 Waveform Monitor. It provides the video signal information you most often need to keep your video systems performing perfectly. It works with the precision and reliability born of good design and solid-state construction. You'll find more sophisticated waveform monitors on the market, selling at considerably more sophisticated prices. But for making general waves, ours is the one. Data sheets, and an evaluation of the Mark 21 in your operation, are available on request.

BBRC BROADCAST TELEVISION EQUIPMENT · BALL BROTHERS RESEARCH CORPORATION · BOULDER, COLORADO 80302 · TELEPHONE: 303/444-5300

Circle 14 on Reader Service Card

← Circle 13 on Reader Service Card

Ruling: The announcement violates the rule, since it appears designed to lead listeners to believe that xxxx is licensed to Principal City rather than Suburbia.

6. Station xxxx correctly identifies itself as located in Suburbia at the times specified in the Rules for mandatory station identification, but at other times refers to its locations as "Here in Principal City" or it makes other references which would be inconsistent with the station's assignment to Suburbia.

Ruling: Such statements and references violate the rules, since they attempt to lead listeners to believe that xxxx has been assigned to a city other than that specified in its license.

7. Station xxxx is licensed to Suburbia. It broadcasts public service announcements not only for organizations located in Suburbia but for those located in Principal City as well.

Ruling: The mere broadcasting of public service announcements or other program matter relating to Principal City or any other city is not a violation of the station identification rule. However, the primary responsibility of xxxx is to serve Suburbia.

8. Station xxxx is licensed to Suburbia. At the times specified in the rules for mandatory station identification, it gives its call letters and licensed location, but at other times it broadcasts such statements and references as the following:

"In the air, everywhere, over Principal City."

"This is xxxx, a symphony of sound designed for Principal City."

"This is xxxx with enchanting music for Principal City, the world's most enchanting city."

"xxxx, the tiger of Principal City radio."

"Principal City's best music station."

"From the good guys of Principal City Radio."

Ruling: Since such announcements "either lead or attempt to lead the station's listeners to believe that the station has been assigned to a city other than that specified in its license," they violate the rule.

9. Station xxxx, licensed to Suburbia, broadcasts announcements: "Station xxxx, Suburbia, in the air everywhere over Principal City."

Ruling: Although the station's license location is given, the announcements appear designed to create the impression that xxxx is licensed to both cities or, indeed, to Principal City alone, and therefore violate the rule. Such announcements are to be distinguished from those recited in Example 3, since the areas there described as being served included the city specified in the station's license.

10. Station xxxx, licensed to Suburbia, broadcasts many "vignettes" referring to places or historical events associated with Principal City. The wording of the "vignettes" makes it evident that they are designed to create the impression that xxxx is assigned to or located in Principal City.

Ruling: This is a violation of the rule.

Of course, no all-encompassing pronouncement with innumerable examples relating to station "id's" and promos will be able to answer all of the specific problems that arise. In those instances, consultation with communications counsel is recommended.

Help stamp out dropouts

Clean tape heads with MS-200*

Oxide dust on tape heads and helical scan recorders is a frequent source of dropouts. Some engineers still clean them the hard way, with swabs, but many have found a better way: MS-200 Magnetic Tape Head Cleaner. MS-200 sprays away dust and dirt in seconds. You can even apply it safely while the tape is on the air. Finally, users report more than twice as many passes of tape between cleanings with MS-200 as with swabs. Recommended by leading tape manufacturers.
Write on letterhead for literature and prices.

miller-stephenson chemical co., inc.

ROUTE 7, DANBURY, CONNECTICUT

*U.S. and foreign patents pending

Circle 15 on Reader Service Card

Buy a Custom Tailored

If a store-bought standard antenna fits your needs, and there are plenty to choose from, fine. But if you want a customer tailored outfit, call on the man with a computer. No tedious calculations involved.

- ☐ **Fashions in fm are circular polarized**
- ☐ **For uhf directionals it's zig-zag or vee-zee**
- ☐ **For CATV anything that cuts co-channel interference is popular**

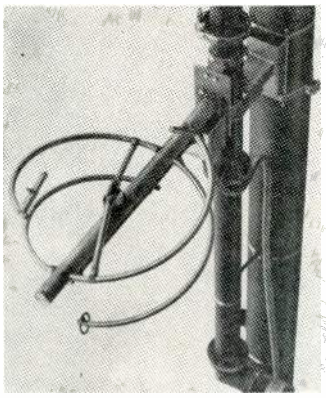
THE MOST SIGNIFICANT single new development in antennas last year was the announcement of the fm circularly-polarized antenna for simultaneous transmission of horizontal and vertical signals. But emphasis has been shifting in all areas. Here's a capsule summary (and a guide to those topics discussed in detail in this issue).

Fm—Big development was the availability of single circular antennas that radiate both horizontally and vertically polarized signals. RCA, Collins, Gates, CCA, Jampro have them. See article by Jampro.

A-m—No new technical developments but pre-sunrise rule introduced power reduction problems. See solution by Multronics. Problems of maintaining directional patterns are becoming more frequent. See article on retuning directionals and detuning re-radiating elements.

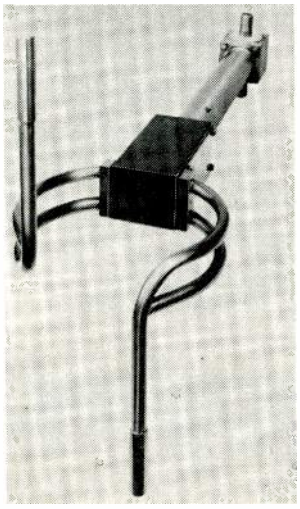
TV—Most customers are buying uhf antennas (for commercial and educational stations). A great many U's want directional patterns so the zig-zag (a little more flexible than others) is selling well. See brief article by Etkin on RCA type. The disc rod type solved some problems in 1967. Ready availability of computer time for solving antenna problems was and is being underscored. See article by Kearney of GE.

CATV—Reduction of co-channel interference continues to be a problem. See article by Peter Gureckis on a folded unipole and article by SKL on computer help. Hosken perfected a parabolic antenna for color reception.

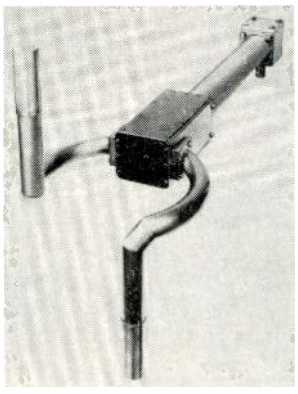


1

Fig. 1. RCA circularly polarized antenna.
Fig. 2. Gates circularly polarized antenna is designated dual cycloid.
Fig 3. Collins circularly polarized unit clearly shows vertical tuning stubs.



2



3

Fm Circulars

Until now dual polarization has been usually accomplished by adding separate vertically-polarized antennas to supplement horizontally-polarized systems. This may no longer be the best approach.

The new circular antennas offer only about half the weight and wind loading of that of a combination system. It may not be practical to add separate vertically polarized antennas, particularly if the tower is near its peak loading. The single antenna costs about $4000 less (for six bays) and offers definite economies in installation costs.

Any form of dual polarization is a decided advantage, particularly in improved reception in automobile radios. As M.S. Siukola of RCA writes, the broadcaster, by going dual polarization, can either double the total transmitted power or double the total gain without exceeding licensed horizontal maximums. If the transmitter is now operating at maximum power output, feeding both a horizontally-polarized and vertically-polarized bay, one circularly polarized type can replace the combination while retaining the same gain performance.

A look at the electrical specs of all makes of circularly-polarized antennas reveals them to be about the same: similar gain per element, similar azimuth patterns, good vswr, and broad bandwidth.

Several manufacturers offer a wider range of power ratings and, therefore, price than others. CCA Electronics, for example, stresses that it has low power 1-kW versions ($300 per bay) as well as medium and high power types, so that educational, class A and local channel stations need not incur the expense of buying power capability that may not be used. (Higher power types are about $1000 per bay.)

Other differences exist in the materials (brass or steel), mounting features, deicing provisions, etc.

The actual designs do vary. RCA describes its BFC type as two resonant halfwave dipoles curved into one-turn helices and mounted in interlaced position resembling the threads in a double threaded screw. (See Fig. 1.)

Although the Gates (Fig. 2), and Collins (Fig. 3) circularly-polarized antennas are manufactured by Electronics Research Inc., Gates uses a dual cycloid configuration. CCA Electronics types (Fig. 4), are made by Shively Laboratories and appear somewhat more rectangular. Jampro's new circularly-polarized type is a four-armed twisted dipole in the shape of a square. (See article by Peter Onnigian.) Both CCA Electronics and Jampro can divide the power unevenly. Bernard Wise of CCA says that with the adjustable configuration, the elements can be adjusted to produce radiation equal in both fields, or, if the broadcaster can't afford a new transmitter, he can possibly achieve rated erp in

Antenna This Year

the horizontal plane and some reduced power in the vertical plane.

Both RCA and Jampro stress that their antennas are true circular polarization (90° phase differences in fields) and not at elliptical (phase not exactly 90°).

Siukola of RCA says exact phase relationship wouldn't be important if receiving antennas were pure vertically polarized and pure horizontally polarized. But since they are not, phase may be important for maximum reception.

The operating principle of the RCA one-turn interlaced helix antenna is described in *Broadcast News*, Vol. 134, June, 1967, pp 20-27. (This issue also has an excellent article on a-m and fm antenna considerations, type leads, etc.) Jampro's design is described briefly in this issue. The Gates, Collins and CCA types essentially use the ring design of the horizontally-polarized cycloid but the fixed end plates are replaced with vertical elements. The vertical sections of the Gates and Collins units have adjustable caps for a fine adjustment of the horizontal/vertical radiation pattern.

TV: Zig Zags vs Helicals vs Slotted Cylinder

Ask RCA and they report the single slotted cylinder (RCA Pylon) is the uhf workhorse and constitutes about 70 percent of all FCC filings. Ask GE and they indicate about 70 percent of all requirements being filled by zig-zag types—this is true for uhf application, at least. The remainder are helical types. And about 70 percent of all TV antennas being sold are for uhf purposes. Jampro votes with zig zags as fitting most applications.

RCA reports that they have shipped about 200 uhf Pylons since 1952, and that's a significant figure. Eight new models have recently been added to a family that now numbers 21 types.

Minimum tower loading (there are no exposed radiators or transmission lines) and lightning protection offered by the steel outer shell account for much of the Pylon popularity, according to RCA. The Pylon is simple, consisting of a slotted steel cylinder with a concentric copper coaxial feed line. Energy is coupled from the field inside the antenna to radiating slots by means of an aluminum bar coupler. The horizontal pattern is independently controlled by the number of slots and their location. The outer cylinder serves both as a radiation and as a supporting structure, thus eliminating any field distortion caused by a separate support.

Although the zig zag offers good directional pattern flexibility, the slotted cylinder Pylon has a number of directional types including those that produce peanut, skull and tri-lobe patterns.

The disc-rod antenna is being used by Bogner Antenna Systems to provide directional patterns. Bogner combines the slotted cylinder with the disc-rod director to provide a low cost and efficient method of parsitically shaping the horizontal plane pattern. Gains of over 150 at no premium in price are claimed. The FCC 15-dB minimum rule is reportedly easy to avoid.

There was a brisk business in 2500-MHz antennas for educational ITFS service. Prodelin Inc. reports installation of some 30 systems in this past year. The transmitting antennas are both omnidirectional and directional. Phased arrays of dipoles mounted on four panels in a square is the basic design approach. Beam tilt and null fill-in can be specified to improve close in coverage.

A new omnidirectional transmitting antenna for ITFS use which provides a broad, fully-vertical pattern to at least 15 degrees below horizontal has just been introduced by Technical Appliance Corp. (TACO), subsidiary of The Jerrold Corp.

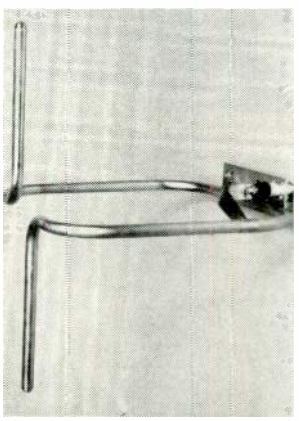
Unlike previous omnidirectional 2500-MHz antennas which concentrate energy to the horizon, the new Jerrold ETO-11H antenna assures uniform coverage of all receiving locations within a 360° azimuth without requiring oversize receiving dishes at close-in locations.

The antenna efficiently distributes energy in the vertical plane accompanied by a desirable 10-dB gain at the horizontal. It uses an 8-bay array of tri-slot radiators. The antenna has excellent circularity with gain variations no greater than plus-or-minus 1.5 dB through the entire vertical pattern from horizontal to minus 15 degrees.

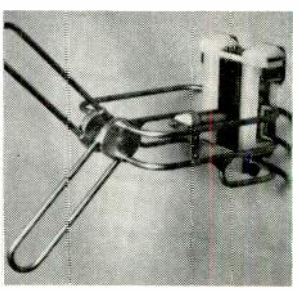
The unit is a compact package for ease of installation. A life ring provides easy handling without damage to the antenna. [*Ed. Note: This is a new antenna. For more information circle 202 on reader service card.*]

In the 6- and 11-GHz microwave band, TACO recently announced one 10-foot parabolic antenna that handles both frequencies.

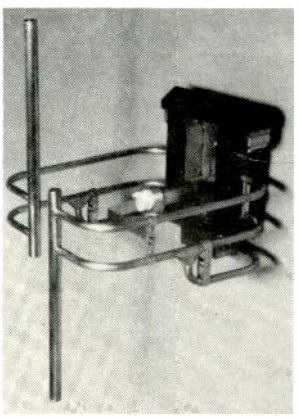
The new four-port, dual-frequency polarized antenna thus eliminates the need for two separate antennas and permits six 2-way crossband diversity



4a



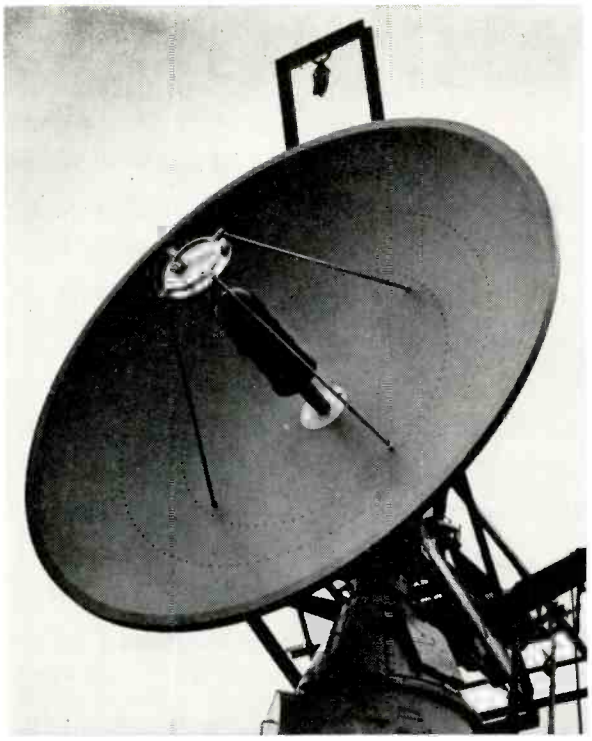
4b



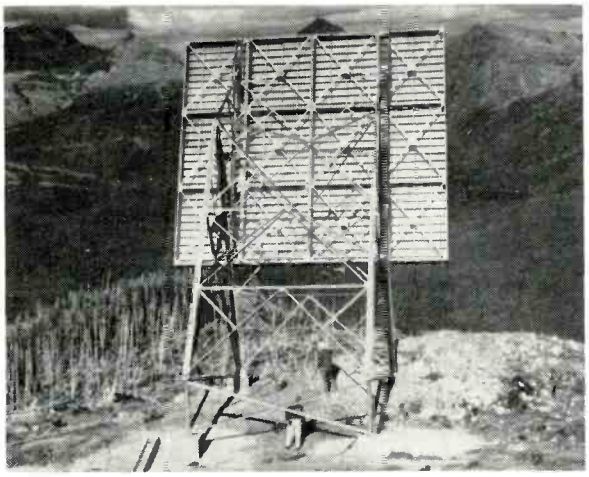
4c

Fig. 4. Various CCA versions: a. low cost unit, b. adjustable unit varies power division, c. high power unit.

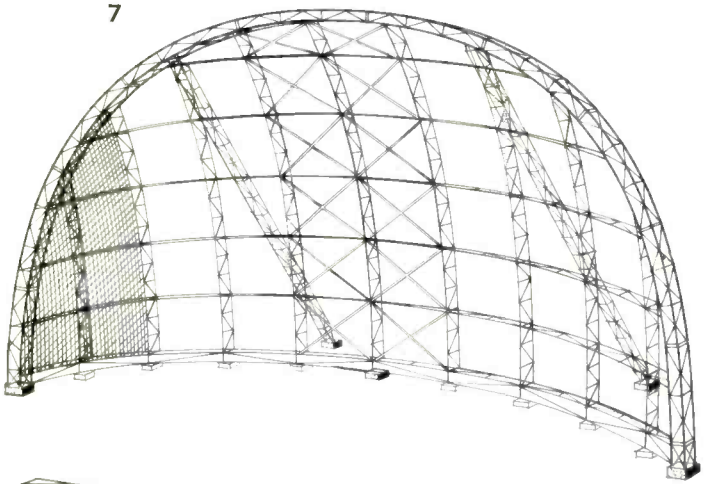
5



6



7



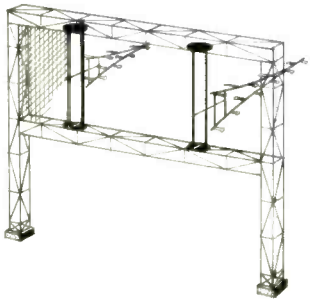
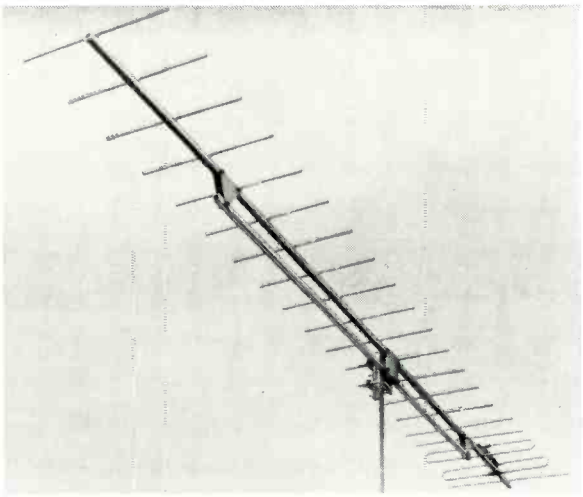
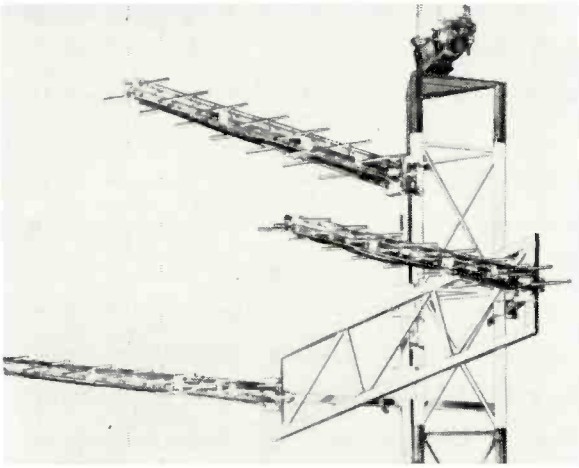


Fig. 5. Dual frequency Taco antenna handles both 6 & 11 GHz.
Fig. 6. Billboard type passive repeater from Microflect.
Fig. 7. True curve tropospheric CATV antenna by Hosken.
Fig. 8. Super high band CATV yagi from Jerrold has gain of 14 db.
Fig. 9. Log periodic array for color from Jerrold has good co-channel rejection.
Fig. 10. Scientific—Atlanta CATV antenna has low side lobe arrays.

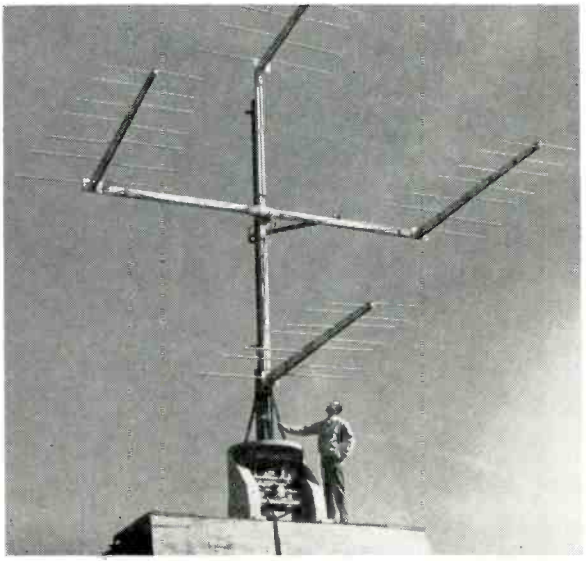
8



9



10



channels previously available only with more expensive horn-reflector types.

The four-port feed system incorporates both 11- and 6-GHz units as one integral assembly. The entire feed mounts into the reflector from the rear through the vertex. Both high- and low-band assemblies are capable of 360-degree rotation independent of each other. The phase centers of both feeds occupy the same point concentrically, yet they do not interfere with each other mechanically and only minimally electrically.

Another new product in the microwave area is a flat, elliptical reflector for 356 MHz from Microflect.

CATV Under the Gun

CATV operators at one time worked hard at pulling in signals they *wanted* to receive going so far as to install large diameter parabolics and troposcatter systems. They may now have to work just as hard to receive signals they *don't want*. Recent FCC ruling on carriage priorities such as that applied to the Bluefield Cable Co., Bluefield, Va., indicates that if a station's Grade B signal can be found anywhere in a CATV system area, this station may have to be carried.

Thus, there should be renewed interest in high gain antennas. Among other things this will generally add weight to a tower that may be overloaded now. The bigger antennas will have to be stronger.

Jerrold recently announced a new line of ruggedized single channel yagi antennas. One model is the Super Imperial high band yagi which provides a high gain of 14.2 (dBi relative to isotropic source) for channel 7. This compared to a gain of 12 for a 10-element yagi. The additional gain increased the weight from 7 to 20 lb.

To improve reception one can add gain to the antenna or add height. Doubling the elements of a yagi increases the gain about 3 dB. Doubling the height of an antenna increase gain about 3 dB. There is a limit to all of these moves as losses increase.

Victoria Cablevision Ltd., Victoria, B.C., Canada, recently switched from a cumbersome stock of four 10-element yagis to an exponential curve type. With the yagi, the signal on channel 4, had been +1 dBmV, sound −4 dBmV. With the exponential, pix +10 dBmV, and sound +7 dBmV. On channel 5 with the yagi, the pix had been −2 dBmV, sound −6 dBmV. With the exponential, the pix increased to +7 dBmV and sound to +4 dBmV. For channel 7 before, pix +4 dBmV, sound 0 dBmV; after, pix +6 dBmV, sound +3 dBmV.

The increase in uhf stations and FCC protection being given to U's makes uhf antennas of keen interest. Parabolic types in array forms appear to be working well.

Hosken Cable TV Antennas Ltd., has recently perfected a true curve troposcatter antenna to receive weak color transmissions. Complete redesigning of the b&w troposcatter parabolic was required. In the past, the large 300-ft reflectors would capture considerable signal, focusing both in-phase and out-of-phase power at the focal point. Hosken's new parabolic antenna has almost the accuracy of a microwave parabolic, and is almost perfect curve in both the horizontal and vertical planes. Each antenna is manufactured to full scale at the Ajax plant. The base layout is all completed so that a special survey is not required in the field. This new troposcatter parabolic has gain exceeding older, larger models. It is superior, Hosken says, to all other antenna arrays or parabolics in elimination of co-channel, adjacent channel or electrical noise interference. The new link chain screen gives front to back rejection of 32 to 40 dB when antenna site is high enough to permit signal to fill antenna.

Co-channel interference is always a problem. SKL has employed a computer to help solve the problem using cable phasing rejection. (See p. 41.) Scientific-Atlanta's low side lobe arrays have solved difficult problems of this type. See photo.

Circular Polarized Fm Antennas

By Peter K. Onnigian

RF RADIATION consists of an electromagnetic wave composed of an electric field and a magnetic field. When the electric field is transmitted in a plane parallel to the earth's surface, it is said to be horizontally polarized. If the electric field lies in a plane perpendicular to the earth's surface, it is vertically polarized.

Circular polarization occurs when the electric vector describes a circle in a plane perpendicular to the direction of propagation. It makes one circle per radio frequency cycle. The horizontal field vector must lead or lag the vertical field vector by 90°, that is, they must be in phase quadrature, to be truly circularly polarized. The ratio of the horizontal and vertical components must also be equal.

Advantages of Circular Polarization

Some fm receiving antennas are horizontally polarized, such as outdoor yagis, and some are vertically polarized, such as automobile whips. Others vary from short pieces of wire, to capacity coupling to the ac cord. The polarization of the receiving antenna is usually not pure and it lies in any plane between horizontal and vertical. Therefore, it is highly important for the broadcaster to transmit a signal which will penetrate these receiving antennas as efficiently as the state of the art permits.

By actual measurements, it has been proven that dual polarization, and its refinement, circular polarization, improves reception[1]. An extensive measurement project using an fm station, with and without the vertical radiation, as a test source was used. Signals along miles of roads were measured, as well as hundreds of home and office fm receivers. The averaged results were as follows:

Antenna Tested	Average dB Improvement	Power Increase
Outdoor-homes	4.2 dB	2.63
Built-in consoles	5.68 dB	3.69
Pig-tails-homes	7.75 dB	5.95
Automobiles-whips	16.00 dB	39.81

The improvement ratio was achieved by adding an equal amount of vertically polarized radiation to the existing horizontally polarized radiation.

[1]"A Study into the Effects of Vertically Polarized Radiation in fm Broadcasting," by Peter Onnigian, Jampro Antenna Company, 1965.

Mr. Onnigian is general manager, Jampro Antenna Company, a division of Computer Equipment Corporation.

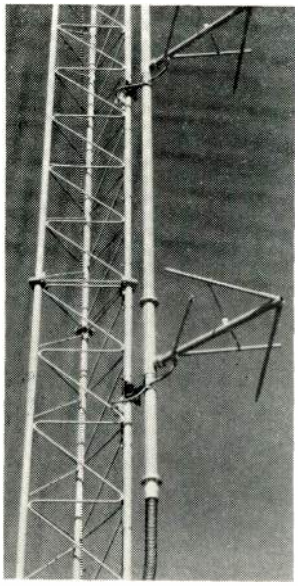


Fig. 1. Twisted square radiating element using dipoles produces circular polarization.

Dual Polarization Methods

There are two common ways to get an antenna system which transmits dual polarized radiation.

Ring antennas with added vertical stubs transmit dual polarized radiation but do not meet all the criteria for circular polarization. Some linear and elliptical polarization may result from the use of these antennas. The basic problem with rings and stubs is that the point source is not the same for the horizontal and vertical components. This point source difference results in space phase, in varying amounts, in different azimuths. Also, vertical radiation does not meet the 90-degree phase lead or lag requirement, because the ring circumference is not large enough, electrically.

Another way to achieve dual polarization is with separate vertically and horizontally polarized radiating elements (quite common in the past three years). Dual polarization consists of linear polarization, with different point sources and in most cases, no particular phase relationship between the horizontal and vertical components. While dual polarization is a great step forward in improved fm reception, the ultimate state of the art now demands circular polarization.

Circular polarization eliminates phasing problems which may occur in some receiving locations from dual polarized antennas. It has the advantage of putting signal in any type of receiving antenna orientation. There are several mechanical advantages with circular polarization. These include a reduction in the number of radiating elements, (over dual polarization) since the one element can radiate both vertically and horizontally polarized radiation.

Principles of Operation

The circularly polarized radiating element must transmit the horizontal and vertical components, in 90-degree phase quadrature, from a common point source. In order to do this, Jampro developed the twisted square radiating element[2]. The element using two dipoles, is shown in the photograph. The four arms of the square are each one quarter wavelength long. The two "hot" arms are fed in phase, and the remaining two arms are parasitically excited. Space phasing, from the common feed point provides the 90-degree phase quadrature necessary for true circular polarization. Radiation is broadside to the element.

If the mechanical plane formed by the four arms is paralled to the ground, the radiation is nearly 100 percent horizontally polarized. If however, the two corners of the square are twisted, as shown in the photograph, as to form an angle of 45 degrees, the radiation is 50 percent horizontally polarized and 50 percent vertically polarized. By changing this important angle, between zero and 45 degrees, any ratio between 50/50 and 100 percent may be obtained. This feature is unique with the Jampro circular fm antenna. Due to transmitter power limitation, costs, and other factors, it may not be desirable to have 50/50 horizontal to vertically polarized gain ratios. The twistable design makes other than 50/50 power ratios readily available. This is possible because the square construction does not require a certain pitch angle, as is the case with a small diameter side fire single turn helix.

Construction

The Jampro circularly polaried fm antenna is supported by a horizontal arm which also contains the internal feed coax. A single teflon insulated end seal is used which may be pressurized. The rugged support arm bisects the two opposite corners of the radiating square. Heavy marine brass tubing is used for corrosive free construction. Mechanical design is for 50 lb/ft^2 with ¼ in. of ice coating. Wind loading is extremely low.

Two different feed systems are available for the CP fm antennas. One uses a 3-⅛ in. rigid coax line running vertically across which several bays are shunted. Equal power per bay is provided through a series of internal step transformers.

The second feed system uses Jampro's power divider system, with several interbay cables, from one common power divider. With 15 or more bays, two power dividers and a splitter are used.

The two dipoles bent into a square provide excellent bandwidth. There is no capacity loading, and the length to diameter ratio of the radiating arms is 15 to 1. The vswr on normal size towers is under 1.1 to 1 for a bandwidth of 400 kHz.

Factory installed deicers are available at 500 W power consumption per bay. Kits with interbay boxes, cables and two-step thermostat are provided.

Horizontal Radiation Patterns

By spacing the CP antenna 0.1 wavelength away from the tower leg or face, the horizontal pattern circularity of the horizontally polarized radiation is within ± 1.5 dB. The circularity of the vertically polarized radiation is affected by the vertical tower leg, conduits, other coaxial lines and is approximately ± 2.0 dB. Both patterns are smooth, without noticeable nulls or lobes.

[*Ed. Note: This antenna has not been previously announced. Circle 201 for more information.*]

2 U.S. patents pending

Panel-Type Uhf Antennas

By Harry Etkin

PANEL-TYPE UHF ANTENNAS with either omnidirectional or directional patterns can be stacked around a tower, the top of which is used to support antennas for other services. They are also useful as top-mounted ultra-gain omnidirectional or directional antennas. Beam tilt and null fill may be designed into the vertical patterns.

The panel types are designated "Vee-Zee" or "Zee" type by RCA, and, therefore, are useful supplements to the standard RCA Pylons (slotted cylindricals) that have proved ideal for both omnidirectional and certain types of directional patterns in top-mounted applications.

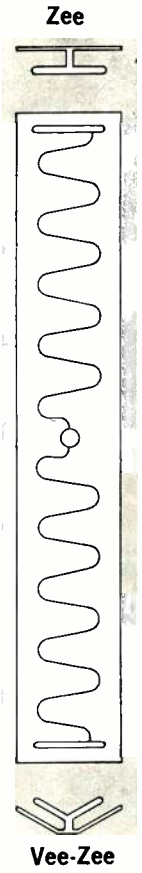
The Zee antenna comprises conventional zig-zag radiating elements branching two ways from a central feedpoint along a flat reflecting plane. The Vee-Zee has the same configuration except that both the elements and the reflecting panel are bent along a central longitudinal line to form a forward opening Vee (see Fig. 1).

The basic radiator operates on the proven traveling wave principle. An "end-loading" design is incorporated, one at each end of the radiating elements to provide true traveling wave operation and vswr stability.

While both types of radiating elements are similar in electrical concept, their physical shapes affect the basic horizontal patterns and each offers advantages for particular requirements. The 120-degree pattern of one Vee-Zee radiator on each of three tower legs, so as to fire tangentially around the tower (Fig. 2) is useful when the top is used for other purposes.

Where the antenna is to be mounted on top of

Mr. Etkin is a consulting engineer based at Levittown, Pa.



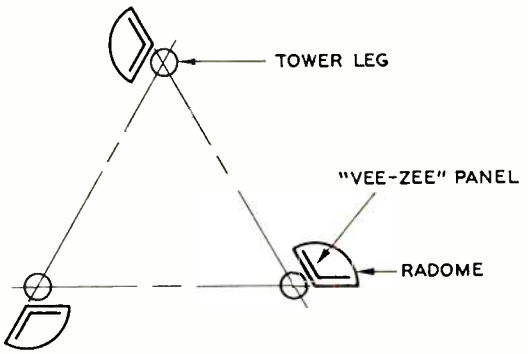
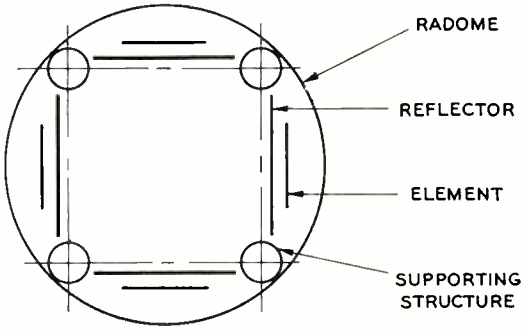


Fig. 1. (left): Sketch of Vee Zee and Zee panel type uhf antenna radiating elements.

Fig. 2. (above): Sketch of three tangentially firing Vee-Zee panels with individual radomes.

Fig. 3. (below): Sketch of four radially firing top-mounted Zee panels enclosed within common radome.



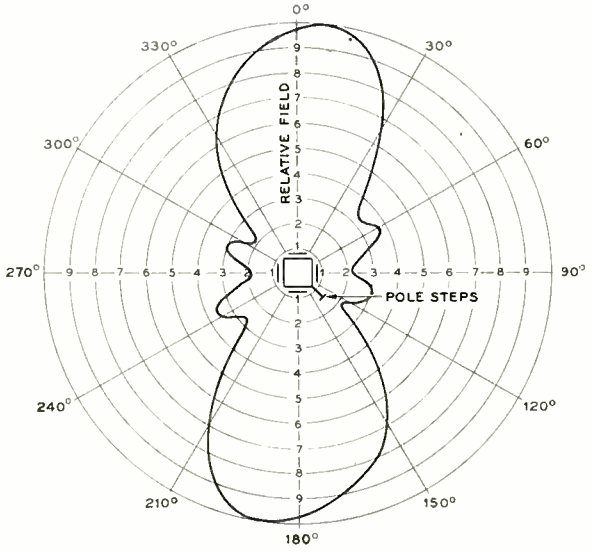


Fig. 4. (above): Horizontal pattern of WAND-TV. Power division and phasing was used to feed different power levels to each antenna section.

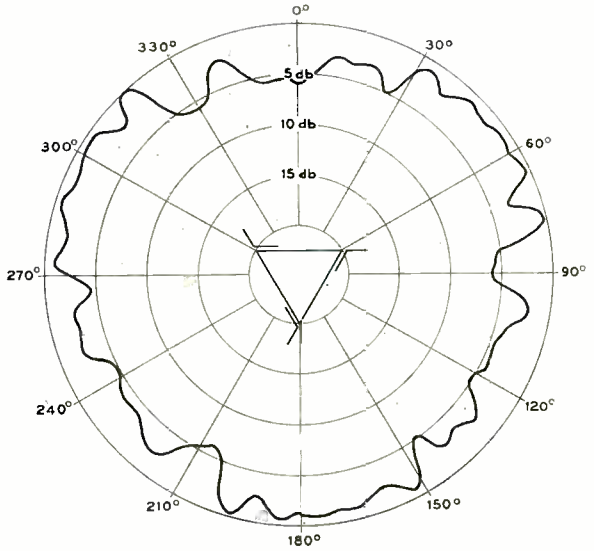
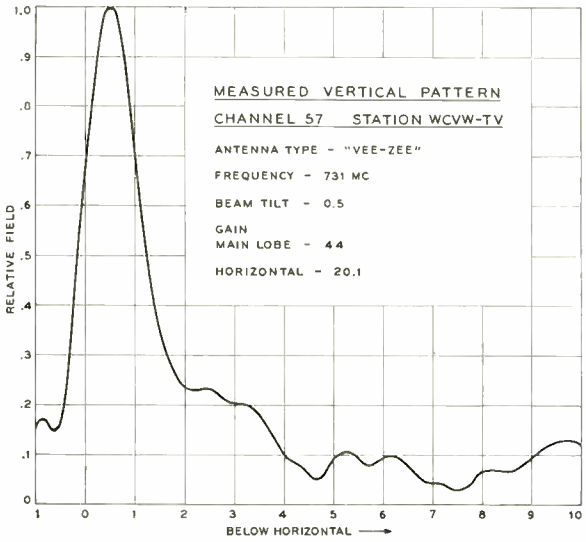


Fig. 5. (right): Measured horizontal pattern of the channel 57 WCVW-TV Vee-Zee panel antenna.



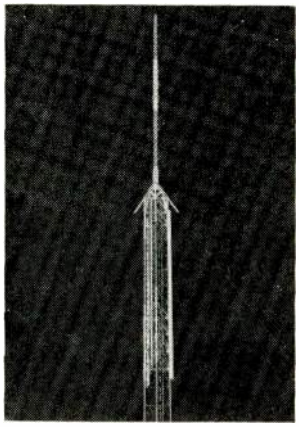


Fig. 6. (Above). Vertical pattern of channel 57 Vee Zee. **Fig. 7.** (Left). An aerial view of the WCVE tower showing both the channel 23, 13.6-ton, 118.3-foot top mounted TFU-46K Pylon antenna and the leg-mounted channel 57 WCVW-TV Vee Zee panel antenna just below.

the tower, three Vee-Zee radiators firing tangentially, or four Zee panels with their 90-degree patterns firing radially (Fig. 3), can be used, depending on the shape of the pattern desired.

With each element complete and electrically independent in itself, a great flexibility in application is achieved through a building block approach. Almost any desired antenna pattern can be achieved by the proper placement of one antenna panel relative to other panels, and by varying the relative power input and phase of the signal. The large aperture of each element, fed from a single feedpoint, strikes a balance between the mechanical complexity of many feedpoints and a lack of flexibility in pattern shaping, resulting from too few feedpoints.

A directional Zee panel, designed to be top mounted on a supporting triangular tower approximately 1000 feet in height, is used at station WAND-TV located in Decatur, Ill., operating on channel 17.

The antenna consists of four individual Zee panels assembled around a square supporting frame forming an antenna section. There are four sections fastened together and stacked as a complete antenna assembly, which is enclosed in an easily removable radome, for protection from atmospheric conditions. See Fig. 4.

Another panel installation is located at WCVW-TV, Richmond, Va. This channel-57 omnidirectional Vee-Zee panel antenna is mounted ten panels high on each of the three legs of a 577-foot-high, 7-foot face triangular tower used to support a Pylon antenna. The 30 Vee-Zee panels are stacked around the tower beginning approximately 98 feet below the tower top.

Power Divider For Pre-Sunrise Operation*

*Based on a paper delivered at the 17th IEEE Broadcasting Symposium, by John H. Mullaney, P.E.

POWER DIVIDER CIRCUITS capable of handling large ratios of power can be used by broadcasters to reduce a station's power in compliance with requirements of FCC Pre-Sunrise rules, Section 73.99. The purchase of a second low-power transmitter is not necessary.

Two forms of these power divider networks are shown in Fig. 1. (They have been previously used successfully to divide power into a two tower directional system.) R_C is the reactance of the transmission line (50 or 70 ohms) and is equal to the dummy load resistance. It can be demonstrated that the net impedance will always be equal to the dummy load and transmission line impedance ($R_{DL} = R_C$), therefore at the feedpoint the reactance will always be 50 or 70 ohms regardless of the power divider (or reactance section) of the two branches.

Convenient equations are power division = $M = \sqrt{P(hi)/P(low)}$ where P(hi) is power dissipated in dummy load and P(low) is power fed to transmission line or common point of DA. The value of the reactance for $X_L = R_{DL}/M$. The value of the reactance for $X_C = -MR_C$.

Assuming a station (1300 kHz) is required to reduce its pre-sunrise power to 100 W from 1 kW and that the output impedance is 50 ohms, the values of X_L and X_C can be calculated. Since 900 W must be dissipated in dummy load, the power division is $M = \sqrt{900/100} = 3$.

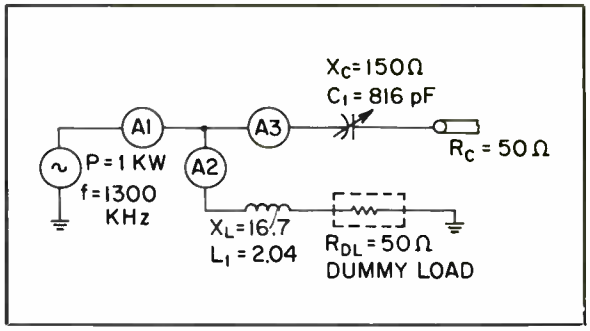


Fig. 1. Inductor in high power branch of power divider.

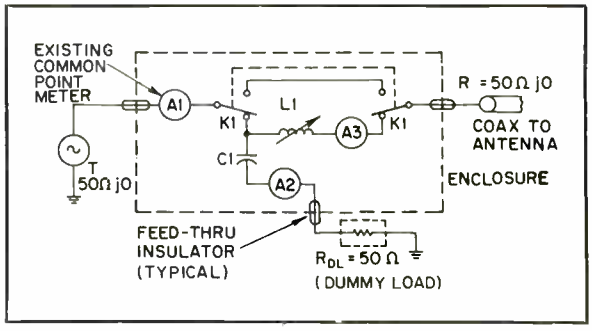


Fig. 2. Capacitor in high power branch.

Selecting an inductor for the dummy load (high power branch),

$$X_L = R_{DL}/M = 50/3 = 16.7.$$

Since an inductor is inserted in the high power branch a capacitor is required in the low side:

$$X_C = -MR_C = -3 \times 50 = -150.$$

Solving for L and C we would find L = 2.04 mH and C = 816.2 pF (calling for a variable capacitor and coil in series). These values are shown in Fig. 1. The impedances can be reversed as shown in Fig. 2. This illustration also shows a practical method of implementing the change.

In practice the station's dummy load and its transmission line or common point reactance may differ by several ohms. The current may have to be adjusted by changing the ratios of reactances. This will alter the common point reactance. However, the entire system will have to be measured to determine true power and the proper common point can be determined by bridge measurements to satisfy FCC requirements. [*Ed. Note. Multronics, Inc. is now supplying power divider kits for broadcasters affected by the Pre-Sunrise rule. Circle 200 for more information.*]

Minimizing Co-Channel Interference With Phased Antenna Arrays

By Argyle W. Bridgett

BEFORE CONSIDERING the use of antennas to cancel co-channel signals, let us first quickly review a few of the fundamentals of the TV signal as it travels through the ether. Fig. 1 is a representation of a wave traveling to the right. The solid lines represent locations where the field is of maximum strength in the positive direction. The dotted lines represent locations where the field is strongest in the negative direction. The arrow represents the direction of travel of the field. If this field encounters a metallic horn, as shown in Fig. 2, the field lines would be bent and the direction of travel will be as shown by the arrows. Notice that the field which encounters the open end of the horn appears to travel in curved lines down the horn toward the termination at the small end. Also, the field outside the mouth of the horn is disturbed and appears to travel down the sides of the horn. At some distance in back of the horn most of the curvature will be gone and the wave will appear more like it is shown in Fig. 1.

Fig. 3 illustrates what happens when a wave encounters a metallic wire or some form of antenna. The wave will induce currents in the conductor which will in themselves set up a field. The total of the two fields will be as shown in Fig. 3. Notice that the wave appears to be aimed at the antenna and a large amount of energy in the wave will be picked up by this antenna. Notice, too, that the field is disturbed for quite some distance *in front of, in back of,* and *to the sides* of the antenna. In this respect, even a simple wire behaves in a manner similar to a horn antenna. If there were two antennas

Mr. Bridgett is associated with Spencer-Kennedy Laboratories, Inc.

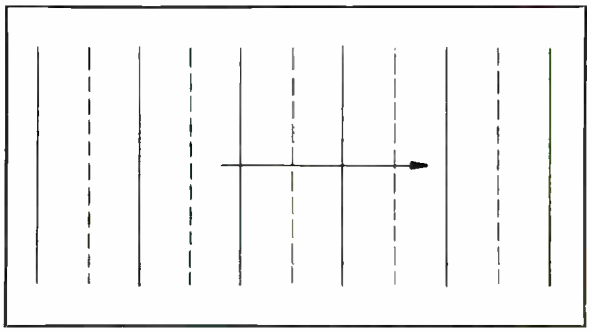


Fig 1. Signal traveling to the right.

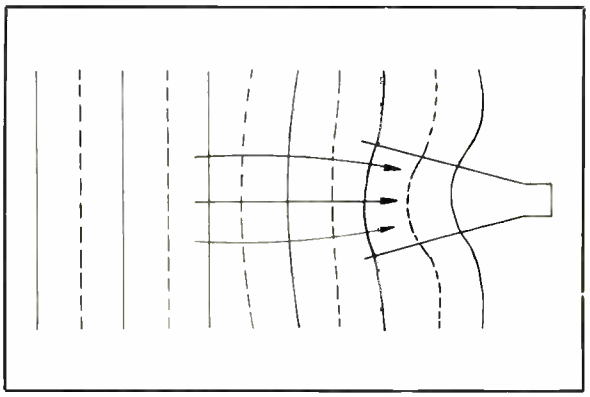


Fig. 2. Signal encounters a metallic horn.

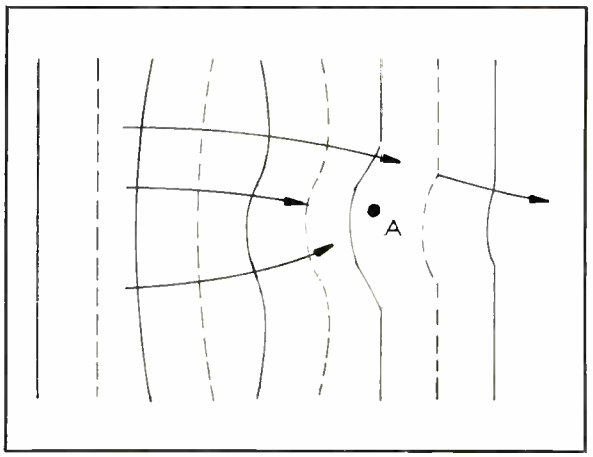


Fig. 3. Wave encounters a conductor at point A.

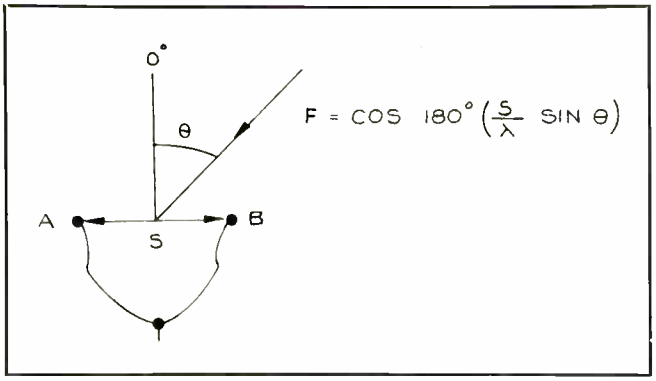


Fig 4a. Two omnidirectional antennas (A and B) spaced distance S apart.

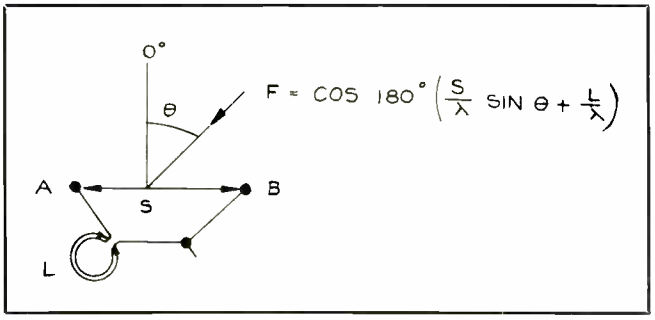


Fig. 4b. Spaced distance S apart and combined with harness with extra length L in leg.

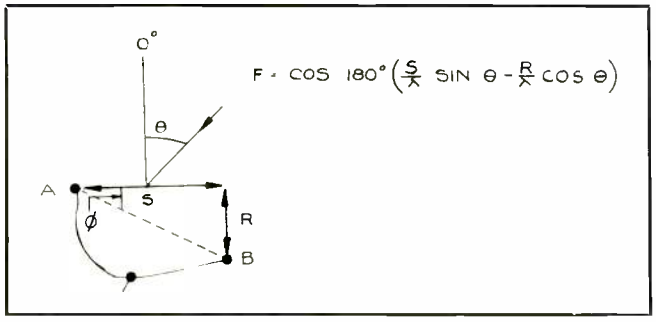


Fig. 4c. Spaced distance S apart and offset by distance R. Harness cables are of equal length.

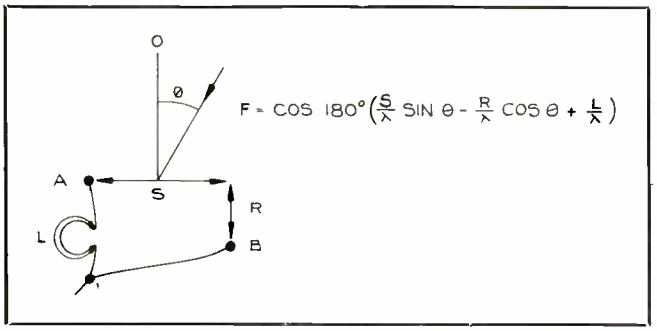


Fig 4d. Offset plus unequal harness lengths.

in the field very close together, it is obvious that the disturbance in the field caused by each antenna would affect what was picked up by the other antenna. However, if we were to place two antennas sufficiently far apart, and on the same solid line of the field, both antennas would receive essentially the same signal and in the same phase. But, if we place one antenna farther back than the other in the direction of wave travel, the two antennas will receive signals of different phase.

Consider a pair of antennas located at points *A* and *B*, a distance *S* apart, as shown in Fig. 4a, with a harness having equal lengths of cable from each antenna to the common point of connection. Let us see what happens to the signal as the wave arrives from different directions represented by the angle θ on the diagram. The equation for the signal strength *F*, shown on the figure, assumes both antennas to be omnidirectional, i.e., receive equally well from all directions. If the individual antennas are not omnidirectional the pattern of the combination can be found by multiplying the value of *F* by the response of the individual antennas in each direction. Note that the signal strength depends both on the spacing of the antennas and on the direction of arrival of the signal. How the signal strength varies is shown on the top row of Fig. 5. Notice that as the spacing between antennas gets wider, the signals from the side get weaker until, at a spacing of ½ wavelength, we get a null in the 90-degree direction. As spacings get still wider, we get additional nulls, some of which come closer to the zero-degree direction. It is therefore possible, by proper spacing of the antennas, to place a null in any direction we wish. However, in some cases there might be practical difficulties, as some angles would require excessively wide spacing. These nulls occur because at certain angles of arrival of the signal, one antenna will be sufficiently behind the other so that the two signals received by the two antennas will be exactly 180 degrees out of phase.

There are other ways of achieving this out-of-phase condition. Fig. 4b shows the antennas connected together by a harness which has an extra length *L* inserted in one leg. Other patterns which can be achieved this way are shown in Fig. 5. Observe here that the angles at which nulls are achieved are quite different, depending on the added length *L;* the angles at which the maximum signals are received also depend on the added length *L*. Another method which has been used to control the position of the antenna pattern is shown in Fig. 4c where one of the antennas is offset by a distance *R*. If the harness cables are of equal length, as in Figure 4a, the only effect of this offset is to rotate the antenna pattern by an angle θ.

A more satisfactory method would require the position of the nulls to be under control without affecting the position or strength of the maximum lobe at zero degrees. The arrangement shown in Fig. 4d can accomplish this. Here, antenna *B* is offset a distance *R*, and the signal from antenna *A* is delayed an equal amount by the length of cable *L*. This causes signals arriving from zero degrees to reach the combining point in phase, and therefore the maximum lobe (0°) is not disturbed as it was in the previous two methods. By suitable choice of offset *R*, the position of two nulls can be completely determined. The conditions which maintain a maximum signal at 0° while placing a null at the angle θ_n for *L-R* are as follows: $S \sin \theta_n + R$

$(\cos_n) = n + \frac{1}{2}$; where n is an interger and θ_n is the angle where null is required. The calculations are generally performed either graphically or with the aid of a small computer. A few words of caution are in order however. In order that the calculations meet conditions in the field, it is necessary that the two antennas be identical. This, of course, is difficult to achieve because of the proximity of the antennas to each other and to the tower and mounting hardware. For this reason, it is desirable to plan the locations of the antennas on the tower very carefully, keeping in mind that each antenna should have a clear line of sight to both the desired signal and the undesired signal.

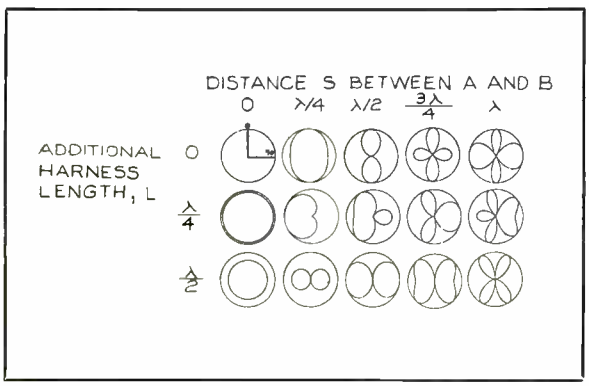


Fig. 5. Antenna patterns.

Even with great care in the matter, there will be some differences between the fields which arrive at the two antennas. It will therefore be necessary to make final adjustments to both the offset and the length of cable *L* after the antennas are placed in position. The adjustment to the length *L* is best made by alternately switching in and out various short lengths of cable in a systematic manner. To achieve the best null, while making these adjustments, one must be able to observe the co-channel beat to much lower levels than possible by merely observing the TV picture on a receiver. It is therefore, very desirable that the 10- or 20-kHz beat between the two carriers be observed on an oscilloscope or a meter. Because of the strong 15,750-Hz sync signals present, good filters will be necessary. The filter should peak at the frequency of offset between the two carriers and provide very great rejection to 15,750-Hz and harmonics of the sync signal. Final adjustments to achieve the deepest null may be obtained by a small variable capacitor and a potentiometer in the combining network. It is well during the adjustment procedure, however, to observe also the desired picture on a receiver in order to avoid the possibility, through severe misadjustment, of cancelling out the desired signal instead of the undesired signal.

This technique has been used very satisfactorily over a period of years and has adequately proved itself. In general, the best results will be obtained by using excellent antennas to begin with. Antennas which have good side and rear rejection will provide that much more co-channel rejection when this method is used. This method can also be used to cancel out a strong adjacent channel signal if the proper attention is paid to the difference in frequency when calculating the harness and offset distance. •

A Simple Method of Isolating CATV Antennas On Standard Broadcast Towers

By Peter V. Gureckis

TRANSMITTING TOWERS of a-m radio broadcasting stations have long been used to support other antennas ranging from large fm, vhf- and uhf-TV transmitting types to small two-way radio antennas. Today, with broadcasters getting into CATV, a-m towers are being used to carry CATV receiving antennas. Use of an a-m tower in this manner provides the height required for the other services to obtain the needed coverage and results in considerable savings in tower construction costs.

Such joint antenna use does bring up the serious problem of carrying the transmission lines for these ancillary antennas across the base insulator of the a-m tower without causing any loss of a-m transmitting efficiency, and in the case of an a-m directional array, without disturbing the array parameters. There are many devices for obtaining such isolation, included among which are special coupling transformers for isolation at a-m frequencies, quarter wave stubs, and choke coils wound out of the vhf or uhf transmission lines. Such devices have not in all cases proven satisfactory, particularly where the number of antennas is high and increased later.

Now with CATV systems being added, a simpler technique is called for which can be met not only on nondirectional a-m operations, but also at standard broadcast stations with directional antennas.

The author in his consulting practice was called upon to provide a solution to such a problem for radio station WKPA, New Kensington, Pennsylvania, who were experiencing serious interaction problems between their a-m operation and a complex CATV installation. WKPA operates on 1150 kHz with 1000 W daytime only, utilizing a two element unequal height directional antenna system. They also operate radio station WYDD-FM on 104.7 MHz with an erp of 50,000 W. The fm antenna is located on their number one tower (450 feet). In addition to joint use of WKPA's number one tower for a-m and fm, they also have sixteen CATV antennas on the tower.

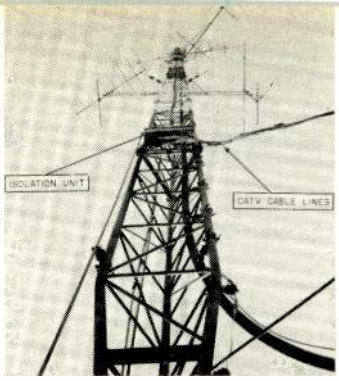
Satisfactory isolation and readjustment of WKPA's directional antenna system was accomplished by converting WKPA's number one tower to a one fold, folded-unipole type of antenna feed.

This method of feed does not cause disruption of the a-m or fm system. In this method the a-m tower is grounded. If it already has a base insulator in use, the base insulator is shorted out with heavy copper ground straps. The a-m tower is then fed as a folded unipole vertical antenna. Thus, with the base of the tower grounded, lighting lines and other transmission lines on the tower can be brought right down the tower to ground, even buried underground, and carried into the operating building without any special isolation transformers, chokes, or quarter wave stubs.

WKPA's Previous Isolation System

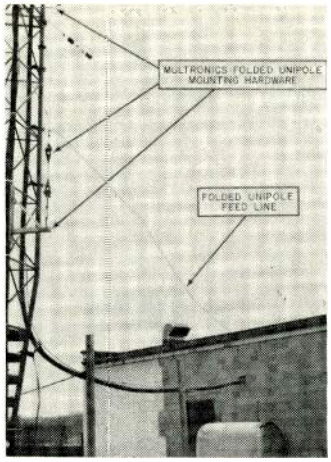
Fig. 1 is a photo looking up WKPA's number one tower showing the CATV antennas, transmission

Mr. Gureckis is associated with John H. Mullaney & Associates.

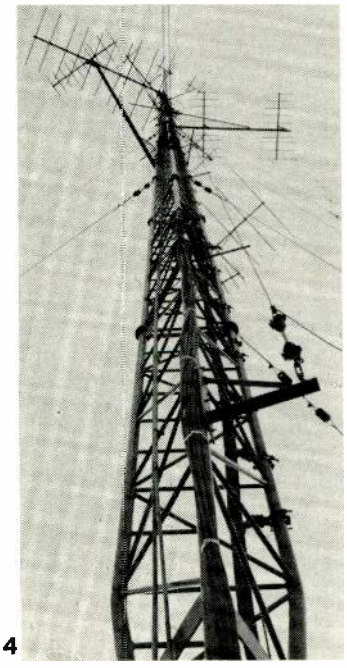


1

2



3



4

Fig. 1. Before modification, isolation unit used.
Fig. 2. Before modification, closeup of isolation unit.
Fig. 3. Folded unipole feed line method eliminates isolation coupling.
Fig. 4. Another view of folded unipole feed shows CATV cable lines coming down the tower.

Photos credit: Gateway Broadcasting Enterprises.

line, the CATV transmission lines, and the isolation unit mounted on the tower.

Fig. 2 shows two different closeup views of the CATV isolation unit and the transmission lines.

This type system created substantial interaction between the a-m and CATV systems; so much so, that WKPA seriously considered removing the CATV system and finding a separate location.

The Solution

The folded-unipole method of feeding a vertical antenna is not new. It has been used quite often[1]. In fact, it is quite commonly used for nondirectional a-m stations as a method of feed. It is also used by a-m stations operating an fm and/or TV antenna simultaneously on their a-m nondirectional tower.

However, it has not yet come into its own in a-m arrays, probably mainly because station engineers usually employ the familiar method already mentioned rather than trying something novel.

The folded unipole for a-m antennas offers the advantages of lower cost due to no base insulator, ease of adjustment, stable adjustment under varying weather conditions, simplicity of coupling unit design, and the ability to carry ancillary transmission lines to ground without harmful interaction between the a-m array and the fm or CATV antennas.

Figs. 3 and 4 illustrate WPKA's new configuration using the folded-unipole feed. It should be kept in mind that WKPA's number one tower is a 5/8 wave a-m tower which is one element of a two-tower a-m array. There are sixteen CATV antennas in this installation, and in addition the station had mounted its fm transmitting antenna on top of the a-m tower. Thus, the isolation problem across the base insulator of the tower was of considerable magnitude.

Originally, when WKPA's fm antenna was mounted on its number one tower, the first approach to the problem of isolation was use of the usual quarter wave stub technique on the fm transmission line. This performed quite well, before the CATV antennas were mounted. With the installation of the CATV antennas, however, isolation became a source of trouble. A special multiple transformer coupler was fabricated by the CATV system manufacturer, but a-m operation with this coupler on the tower proved unstable and caused loss of a-m transmitted power. Then the folded-unipole feed was tried.

A Multronics type number D293[2] Folded-Unipole Kit was procured and mounted on the tower. The feed cable was brought down the side of the tower on fiberglass rod standoff insulators, after being securely fastened and suspended from a sturdy bracket at the 200-foot level on the side of the tower. At the bottom, a similar bracket was used, with a strain insulator and turnbuckle, thus keeping the feed cable taut. The feed cable was connected to the antenna tuning unit, which in this case was in the transmitter building adjacent to the tower. The base insulator was shorted out with heavy two-inch copper straps, and particular attention was given to the ground buss between tower base, ground screen, and transmitter phasing and coupling unit.

Adjustment of the folded unipole was quite simple. With the usual rf bridge connected to the feed point inside the building, a rigger on the tower moved an adjustable shorting jumper up between tower feed cable until a height (120 feet) was found which gave a favorable input impedance for the existing T network in the tuning unit. In fact, had it been desired to do so, the shorting jumper could have been adjusted to give an exact 50-ohm resistance plus positive reactance reading on the rf bridge. In the case of a single tower this is the easiest way of adjusting the folded unipole. However, it will not usually be possible in the case of a directional array, because adjustment of the array phasing and current ratios will cause the feed point impedance to change, requiring compensating changes in the coupling unit, as is usual in all directional arrays. With the single tower, however, the advantages of setting the input impedance to 50 plus jX_L are quite apparent. The coupling unit can then consist of merely a single variable vacuum capacitor whose reactance is equal and opposite to that of the feed point, thus matching the feed point exactly to 50-ohm coaxial line. (The folded unipole will match any feed line.)

In this particular installation all the ancillary transmission lines were connected to the tower at several points along their length, brought down and across the shorted base insulator, and buried. •

Ed. Note: Although this article refers to a CATV system owned by an a-m broadcaster, success in this joint towers use suggests CATV operators might lease a-m tower spaces.

1. Mullaney, John H., "The Folded-Unipole Antenna for Broadcast," **Broadcast Engineering**, June 1960.

2. Multronics Folded-Unipole Kit Type D293. Multronics, Inc., 5712 Frederick Avenue, Rockville, Maryland 20852.

Retuning The Directional Antenna

Don't lose sleep or get grey hairs over DA arrays that go astray. Retune and refile as outlined here.

By Barry Atwood

THERE COMES A TIME in the life of many directional antenna arrays when, despite careful maintenance, the system no longer does what it was designed to do. The array simply fails to provide specified values of field intensity at one or more monitoring points.

The problem results from a change in the environment of the system, which encompasses not only the immediate vicinity of the array, but the entire coverage area. When excessive fields are noted, the station engineer usually tries to restore the monitoring point field intensity to normal by adjusting the antenna parameters, as close as possible, to the values specified on the station license. This usually does not work, since the conditions that existed when the array was first installed are no longer present. It thus becomes necessary to retune the antenna system.

The many articles covering the design of directional antenna systems prove to be of little value in the readjustment of an existing array. However, the method outlined, sometimes with slight variations, has been used by many consulting engineers in the final adjustment of an array after the design values have been established. Rare, indeed, is the directional antenna system that works exactly as designed with the original computed values. The refined "cut-and-try" procedure set forth in this article has no connection with any existing array, or any type of array, but rather serves to illustrate the principles involved.

First, Check The Monitoring System

Before proceeding with any actual retuning, test carefully to make sure that the monitoring system is functioning properly. The first thing is to be certain that you are in the exact location specified for the monitoring point. Most descriptions of monitor point locations pinpoint the location as an exact, specific number of feet from some fixed object, such as a road marker or telephone pole. Measure off the distance exactly, since an error of only 10 feet or so can cause an erroneous reading, particularly in deep null locations.

The second step is to check for correct antenna parameters. Check the station license, and make sure that the values of common point current, antenna phasing, and antenna base current ratios are as specified by the license. After you have verified that all of the antenna system parameters are correct, you should establish that the common point impedance is of the correct value. Actual measurements are best, but an approximate check can be made by computing the operating power by the indirect method.

Next, check the accuracy of the antenna base and common point ammeters. A meter of known accuracy should be inserted in series with each meter and a comparison of the two readings made.

The antenna phase monitor should also be checked. To do this, first remove all of the antenna sampling lines except for the line connected to the reference tower. Then, connect a capacitor (.01 μF or so) from the reference tower input jack of the monitor to the next input jack. Set up the phase monitor to read the phase angle between the two inputs. You should read a 90° phase difference.

Now check the field intensity meter. This can be accomplished by direct comparison with another meter, preferably one that has been recently calibrated by the factory.

The last thing to be checked is to make sure that the monitoring points which yield high values of field intensity have not gone "bad." This is done by making field intensity measurements at other points on the radial to see how they compare with the readings obtained in the same locations during the original proof.

A very careful check should also be made of the antenna ground system. Usually, a fault in the ground system will cause the field intensity to drop at all monitoring locations since this type of fault reduces the antenna efficiency. However, a break in the main ground buss to one tower, or faults in the radials around one tower, may upset the pattern. If all of these checks prove positive, the only way to reduce the monitoring point field intensity is to retune the antenna system.

Next, Get FCC Clearance, Prepare Work Sheets

Before proceeding with any actual tuning, it will be necessary to obtain the authority of the FCC. A telegram should be sent to the FCC in Washington, D.C., requesting authority to operate the antenna system at variance from licensed

Barry Atwood is chief engineer, WBKY-FM, University of Kentucky at Lexington.

parameters to facilitate retuning. Once this authority is granted, the telegram from the FCC is posted alongside the station license and you are ready to proceed with actual retuning.

First, prepare a work sheet such as shown in Fig. 1. The work sheet illustrated is for a three tower array with four monitoring points. Any array configuration and number of monitoring points can be accommodated. The first six vertical columns list the phasor control settings. The first three relate to the phasor current controls, and the next three relate to the phasing controls. For example, "1A" refers to the tower number one current control on the phasor, "2A" is for the tower number two current control, and so on. A two tower array would have only four columns for phasor controls, an array with four towers would have eight, and so forth.

The *horizontal* row, fourth from the top, lists the present dial settings of the phasor controls, since most phasors have some form of counter dial on the controls. After the entries for phasor controls, entries are made for monitoring points. Be sure to list *all* of the monitoring points specified by the station license. Under the location of each monitor point, list the maximum permissible field intensity in mV/m for that point. In the fourth horizontal row, list the readings obtained at these points. In this example, the reading obtained at the first monitoring point is above limits. The reading is 27 mV/m, and the maximum permitted is 18 mV/m. The object in this example is to reduce the field intensity at monitoring point number one to below 18 mV/m.

Under each column entry for phasor controls, is an entry of "cw" and "ccw." These describe the movements that will be made of each control, first in a clockwise direction, then in a counterclockwise directon. The object of the game is to move each phasor control first one way and then the other, and observe the changes that occur in field intensity at each monitoring point location. Under each monitor point entry, there is a space to record the change in field intensity that occurs as the number one tower current control is varied in a clockwise direction. Just below that entry, there is a space to record the change as the tower number one current control is varied in a counterclockwise direction, and so on for each phasor control and monitor point. The exact procedure to be used will be detailed later. Some phasors do not have any controls for the reference tower in the system, since the other controls can be varied with reference to this tower. If this is the case with your phasor, simply omit the entries for this tower.

Obtain Needed Equipment

Before you start to turn the phasor controls, make sure you have the necessary equipment. You already have a field intensity meter and have tested it to assure yourself it is accurate. Do obtain fresh batteries for the instrument, since it will be in use quite a bit.

An accurate impedance bridge of some sort is also necessary, since readjustment of the array will change the common point impedance. The handiest type of bridge to have is the inline, operating impedance bridge. It is best to try to gain access to a standard rf impedance bridge, signal generator, and detector combination. It may be impossible to return to the original value of common point impedance, and it will be necessary to run new impedance curves in this case.

You should have some form of two-way radio system for communication between the transmitter phasor site and the various monitor points. For this type of operation, two engineers are required, one at the phasor controls, the other at the monitor points. One man can do the job without a two-way radio, but it takes a lot more time, particularly with a large array and many monitor points. If you obtain a two-way radio system, one unit should be set up at the transmitter site in some convenient location so that the transmitter engineer can converse by radio and manipulate the phasor controls. The second unit should be installed in a car. The mobile unit is then driven to the various monitoring point locations. Don't forget to keep a log of the transmissions made over the two way radio as required!

Some Initial Considerations

Before taking off in the car for the first monitor point, a few facts should be kept in mind. The first thing to consider is the change that will occur in the common point impedance as the phasor controls are varied. It will be necessary, therefore, to determine the operating power by the indirect method for the time being, and the transmitter engineer must keep a close watch over the power output. He should determine the plate current required for the normal power output of the transmitter, and disregard the reading of the common point meter.

Another factor to consider is the weather. Rain has an adverse effect on many directional antenna systems. Even after a rain, the array may exhibit some instability until the area has thoroughly dried out. It is best to start actual retuning only after you have some insurance of favorable weather conditions.

The last factor to consider is the time of day that field intensity measurements are made. Measurements should be made only within the period of from two hours after sunrise to two hours before sunset. Skywave interference may preclude valid readings at other than these times, particularly when dealing with very low values of field intensity. This type of interference increases very rapidly after sunset. If the station is licensed for operation with a nighttime power less than that of the daytime power, adjustment should be made on high power. (This assumes that the actual phasor configuration is the same for both day and night operation, and only the transmitter power is changed, since both day and night patterns are dependent on the same phasor

PHASOR CONTROLS						MONITOR POINTS			
CURRENT			PHASING			#1 160°	#2 175°	#3 185°	#4 210°
1A	2A	3A	1Ø	2Ø	3Ø	18.0 mv/m	7.0 mv/m	34.5 mv/m	22.0 mv/m
3425	5029	4096	6395	2435	7253	27.0	5.2	29.6	19.1
CW									
CCW									
	CW								
	CCW								
		CW							
		CCW							
			CW						
			CCW						
				CW					
				CCW					
					CW				
					CCW				

PHASOR CONTROLS						MONITOR POINTS			
CURRENT			PHASING			#1 160°	#2 175°	#3 185°	#4 210°
1A	2A	3A	1Ø	2Ø	3Ø	18.0 mv/m	7.0 mv/m	34.5 mv/m	22.0 mv/m
3425	5029	4096	6395	2435	7253	27.0	5.2	29.6	19.1
CW						25.8	5.0	28.0	19.3
CCW						27.2	5.3	28.9	18.3
	CW					26.2	5.9	29.0	18.0
	CCW					24.1	6.0	28.7	16.9
		CW				22.9	5.6	27.0	19.5
		CCW				24.0	6.6	26.8	20.1
			CW			16.3	7.5	27.3	18.9
			CCW			31.2	9.6	30.5	21.3
				CW		19.5	6.3	30.1	21.6
				CCW		15.1	5.0	28.3	18.5
					CW	29.6	9.8	36.6	25.3
					CCW	21.6	8.3	32.1	21.6

Fig 1 (left). Sample worksheet with initial conditions filled in.

Fig 2 (left below). Examples of data entered. No 2 phase control ccw one turn brings field intensity to within required readings.

Fig 3 (below). Log listing all new parameters.

ORIGINAL READINGS			11/6/66		
1A	2A	3A	1Ø	2Ø	3Ø
3425	5029	4096	6395	1435	7253
TUNED TO					
1A	2A	3A	1Ø	2Ø	3Ø
3425	5029	4125	6395	1435	6283
ADJUSTED TO BRING 1/3 BASE CURRENT					
RATIO AND 1/3 PHASE INTO LIMITS					
			D.E.R.		

settings.) In the event the station uses a different pattern shape (not to be confused with pattern size) for day and night operation, this procedure will have to be performed twice, once for each pattern. Such a system would have two separate phasors, or a switching system to change phasor components. For stations that are nondirectional during the day, and directional at night, adjustments will have to be made on the directional antenna system at the nighttime power, but during the day.

The Actual Tuning Procedure

With the transmitter engineer at the phasor controls and two-way radio, the field operator should proceed to the first monitor point. The car should be driven as close as possible to the actual point of measurement and a reading taken. Now, set the field intensity meter on the roof, or hood of the car, and rotate the meter for maximum pickup, as in making normal field measurements. (The meter should be placed somewhere on the car that will permit the operator to watch the meter and converse with the transmitter engineer over the two-way radio.) Adjust the gain control of the meter to give the same reading as was obtained on foot at the exact monitor position.

The field operator now instructs the transmitter engineer to vary the first phasor current control one turn in the clockwise direction. When the control has been moved to this position, the transmitter engineer informs the field operator that the move has been made. The field operator now enters the field intensity reading in the appropriate place on the work sheet.

For example, let us assume that the field operator has gone to the first monitor point and measured 27 mV/m. This reading is entered under monitor point number one on the work sheet as shown in Fig. 2. The field operator then instructs the transmitter engineer to move the tower number one phasor current control one turn in the clockwise direction. Now, let us assume that after the transmitter engineer has made this move, that the field operator now reads 25.8 mV/m. He would then enter this reading directly below the original reading of 27 mV/m as shown in Fig. 2.

After the reading has been logged for the first move, the field operator instructs the transmitter engineer to move the first current control one turn in the counterclockwise direction from the original position. (This actually requires him to move the control two turns in the counterclockwise direction, since the object is to get one turn counterclockwise past the original setting of the control.)

After recording the ccw readings, the field operator now instructs the transmitter engineer to return the control to the original setting. (This would be one turn in the clockwise direction.) The field operator should now verify that the field intensity is the same value as originally read. For the example given in Fig. 2, the reading should return to 27 mV/m. The reason for this check, is that some phasor controls may exhibit some backlash and may not return to the exact same spot on the coil, even though the counter dials indicate the same reading. If this occurs,

Fig. 4. Work sheet for antenna proof of performance measurements.

215° loc #	day orig	day 1966	day ratio	nite orig	nite 1966	nite ratio
1102	125	118	.944	56	42.5	.759
1103	73	73	1.0	32	42.8	1.34
1104	82	73	.89	35	30.9	.883
1105	55	51	.928	23	22.8	.992
1106	69	69	1.0	30	28.5	.861
1107	42	42	1.0	26	26	1.0
1108	36	22	.613	23.2	16.3	.704
overall radial average			.942			.966
daytime measurements made 9/20/66						
nightime measurements made 9/23/66						
220° loc #						
1201						
1202						
1203						
1204						
1205						
1206						
1207						

the transmitter engineer will have to juggle the control slightly while the field operator watches the meter, until the reading returns to the original value.

This procedure is now repeated for the rest of the current controls, and then again for the phase controls, and the results of each move entered on the work sheet. It will probably be found that the phase controls have a more pronounced effect on the readings than the current controls.

After readings are obtained at the first monitoring point for all variations of the phasor controls, the field operator should proceed to the next monitor point and repeat the procedure followed at the first point. The transmitter engineer should keep tabs on the transmitter power using the indirect method of measurement. The field operator should establish that the field intensity at each monitor point has returned to the original value before proceeding to the next point.

After the readings for all of the monitor points have been taken, the field operator can look at the completed work sheet and decide which move of the phasor controls yields the best results. Referring to Fig. 2, at first glance, it would appear that moving the number one phase control one turn in the clockwise direction will bring the reading at the troublesome point, number one, to within limits. However, closer inspection reveals that this move also puts the reading at monitor point number two out of limits.

Moving the number two phase control one turn in the counterclockwise direction, as shown in Fig. 2, will bring all of the readings to within limits. This move is, therefore, the move that would be made, and this would complete the tuning procedure.

It will probably be found that the array will not be quite so cooperative, and it will be necessary to repeat the entire procedure several times before the desired results are obtained. For example, referring again to Fig. 2, if the move of the number two phase control one turn in the counterclockwise direction reduced the reading at the first monitor point to say, 19 mV/m, and left the other readings the same as indicated for this move, this would be the best initial move to make. The procedure would then be repeated with a fresh work sheet. It should be noted that it is best not to rotate the controls more than one turn at a time, for it may be noted that further rotation of the control will cause the reading at one point to go one way, and then reverse and go the other. In fact, if this condition is observed in the tuning process, the controls will have to be moved in increments of less than one complete turn, otherwise results will be invalid.

Check, and Adjust Common Point Impedance

With the array adjusted to yield the desired intensity at all monitor points, it is now necessary to check the common point impedance with the bridge. If the impedance has changed from the original value, an attempt should be made to return to this value.

If it is not possible to return to the original value, try to choose some value that will give some leeway for future adjustment in the position of the coil taps. Also, try to choose some value that you can live with, that is to say, a value that yields a convenient figure of common point current. Be sure that this new value of common point current will fall within the range of the common point ammeter as required by FCC rules. If a new value of common point impedance is established, it will be necessary to obtain authorization from the FCC to determine operating power by the indirect method, pending approval of the new common point impedance measurement report.

Determine New Parameters

With the common point impedance adjusted, and the antenna tuned to the new values, it would be wise to make up some type of table listing all of the new parameters. This list should include the measured common point impedance, common point current for direct method of power measurement, transmitter plate voltage and current, antenna phase monitor readings, remote meter readings, and antenna base current readings.

It is best to take an average of several base current readings for each tower, taken every hour or so over a period of several days, and establish this average of each tower as the base current.

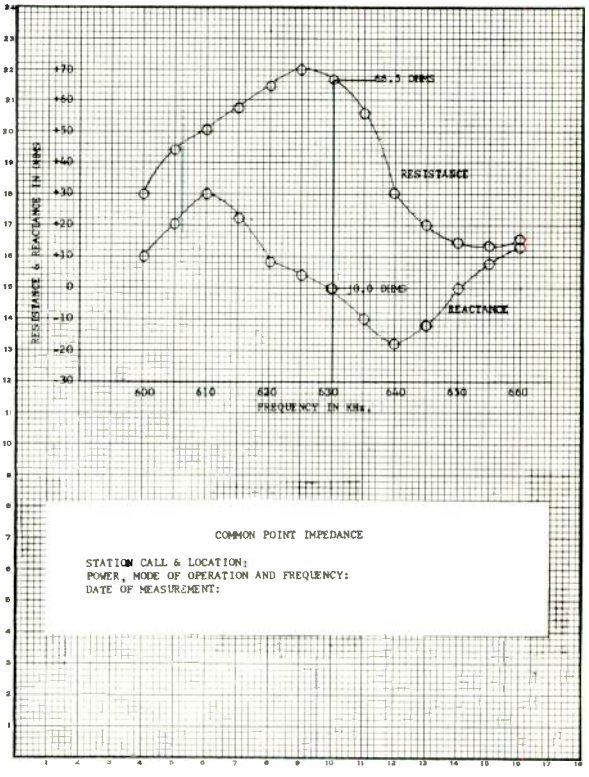


Fig. 5 Impedance characteristic plot.

This chart should also list the limits for all parameters. It will also be found helpful to maintain a running log of any future phasor adjustments. A stenographer's note pad is quite handy for this purpose. Readings of phasor control settings should be entered in this book before any adjustments are made. The phasor dial readings after adjustment should also be entered, along with the date, explanation of why the phasor was adjusted, and the initials of the engineer who made the adjustments. This log will provide the station engineer with some means of accurately returning to original phasor settings, should anything go wrong. It is a good idea to log any adjustments that are made of the common point impedance, or of antenna tuning units. Fig. 3 illustrates one format for such a log.

Running the Proof

With the array in final adjustment, it will now be necessary to run a "skeleton" proof of performance of the antenna system to prove that the pattern is basically unchanged. Field intensity measurements will have to be made on at least five consecutive points on each radial. These measurements will have to be made in the same locations as measured in the original antenna proof of performance. It is best to make at least seven measurements, since some readings may prove to be invalid and have to be discarded.

A work sheet such as shown in Fig. 4 should be prepared. Graph paper with one-quarter-inch squares is ideal for this form. In the left hand column, list the radial bearing, and the location numbers obtained from the original proof. Vertical columns should be established to list readings obtained in the original proof, and the present readings for each pattern. The average of the original and the present readings should be noted for each location, and the overall average for the entire radial should also be tabulated. Some locations may yield an average which is abnormally high or low, but these readings may be discarded, so long as you end up with readings for at least five consecutive points. After all of the radials are measured, the average of each radial should be checked. If the average of two or more radials falls outside the limits of 0.8 to 1.2, further retuning will be necessary. This is rather unlikely, however. As illustrated in Fig. 4, the reading obtained at location number 1108 on the 215° radial was discarded, since it would upset the average.

The dates that the readings are made should also be entered on the work sheet. Remember to make all field intensity measurements within the period of from two hours after sunrise to two hours before sunset. Before starting out each day, make measurements at the monitoring point locations to insure that the adjustment of the array has not shifted.

After all of the radials have been run, tabulate the overall average of all the radials. This is the average of all the radial averages. After the skeleton proof is completed, the common point impedance curves should be run. This step can be omitted if it was found possible to return to the original value of common point impedance. The impedance should be measured at the station frequency in steps of 5 kHz out to 30 kHz, either side of the station frequency. These measurements should be compiled in columnar form, and curves of the impedance characteristic plotted as shown in Fig. 5.

Compiling the Proof

After all of the necessary data has been taken, it should be assembled into neat order. The skeleton proof of performance should be submitted as one report, and the common point impedance as a separate report. These reports may be submitted in the form of three-ring notebook. The skeleton proof, and the common point impedance report should contain a signed and notarized affidavit, signed by the engineer who made the measurements. This affidavit should contain the qualifications of the engineer who made the measurements, a statement that he made the measurements, and his relationship to the station.

The next page of each report should contain a description of the method used in making the measurements, the name of the manufacturers of the instruments used, and the rated accuracy. The date, accuracy, and by whom each instrument was last calibrated, along with the serial number of each instrument should also be included.

The next page of the skeleton proof should contain a tabulation of all the antenna and transmitter final stage parameters. The skeleton proof is then completed with a separate page for the readings of each radial, including all of the information shown in Fig. 4. Readings of abnormal averages should be omitted from the report.

The final page of the antenna skeleton proof of performance is a tabulation of the field intensity at all of the monitoring point locations. The common point impedance report is then completed with a tabulation of the measured impedance at each frequency, and a graph of the tabulated data as shown in Fig. 5.

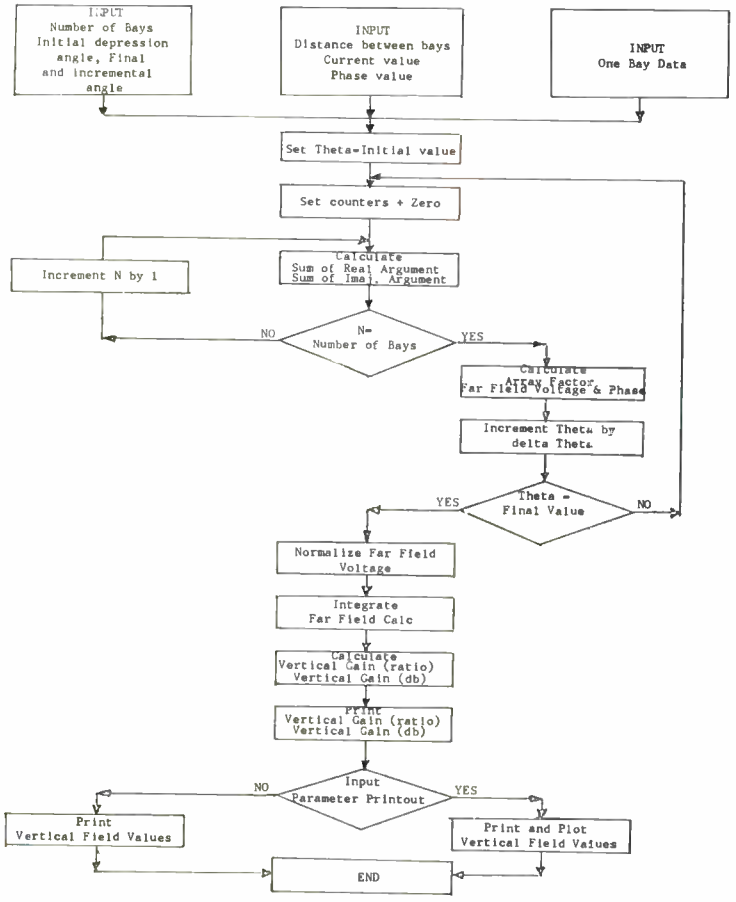
File for Modified License

After all of the reports are completed, the station should file for a modified station license. This is done on FCC Form 302. This form and all reports must be filed in triplicate. ●

Before you can retune you may have to detune powerline poles and other structures. An article on the subject will appear in a forthcoming issue.

Customized Antennas with Time Sharing Computers

By James D. Kearney



Attention to specific requirements of antennas can now be afforded due to the speed and availability of time sharing computers.

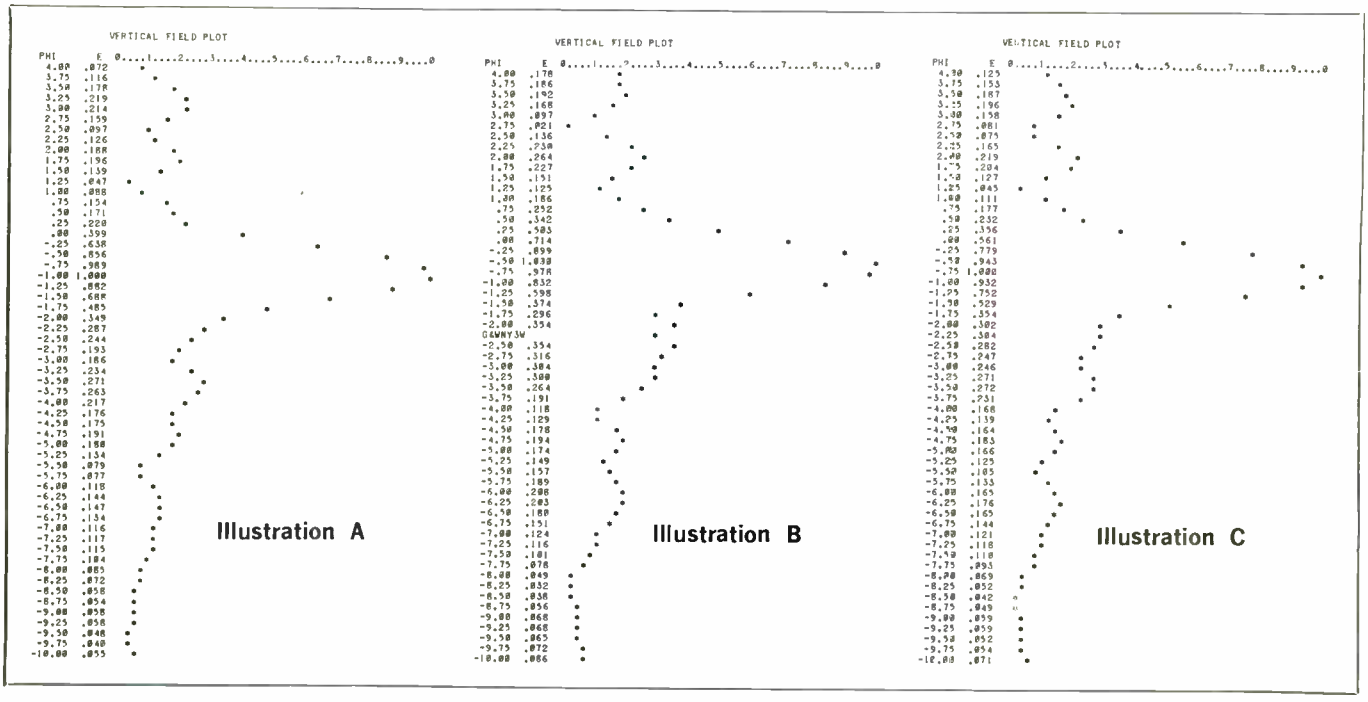
THE VERTICAL FIELD of a helical or zig-zag TV antenna can be calculated by a computer in ½ hour. The theoretical formulas, boundary conditions, etc., for calculating the far field of such antennas have been well documented and converted to computer programs. The flow chart, Fig. 1, indicates how the computer tackles the problem. The input data is set forth in three blocks. This is done so that nondependent variable parameters can be changed readily to optimize the vertical pattern.

The input data for number of bays, wavelength, initial, final and incremental angle of depression are usually fixed by the specific antenna application. However, bay spacing and

Mr. Kearney is in the Transmitter and Antenna Engineering Section, Visual Communications Products Department, General Electric Company

Fig. 1 (left). Flow chart for solving vertical field patterns of antenna.

Fig. 2 (below). Vertical field plots. Illustration A is based on experience data. Illustration B is the result after changing phase circuit once, and meets criteria more closely. One more change, illustration C, produces the desired plot.



amplitude and phase of current to each bay are subject to the designers judgment. Likewise, the one bay data can be either a cosine² function or the more practical measured one bay data as collected from scale model or production antennas. Since the array factor is the vector sum of the individual elements, it is not practical to synthesize from overall requirements because of an infinite number of solutions. Therefore, the designer's experience dictates a starting point and the parameters may then be optimized one by one to meet or exceed the contractual requirements.

For instance, Fig. 2, illustrates three vertical patterns as calculated and plotted by the time-shared computer for a six-bay General Electric zig-zag antenna. The requirement is for ¾° beam tilt, 30 percent null fill with no nulls less than 4 percent field. Illustration A shows the starting point with experience dictating input data. Both beam tilt and null fill have to be adjusted. By changing the phase of currents, illustration B shows that the beam tilt requirement is correct but that null fill is still below the required 30 percent. Illustration C is the next computer run with slight changes of data so that null fill and beam tilt are correct; a pattern that fulfills all specifications.

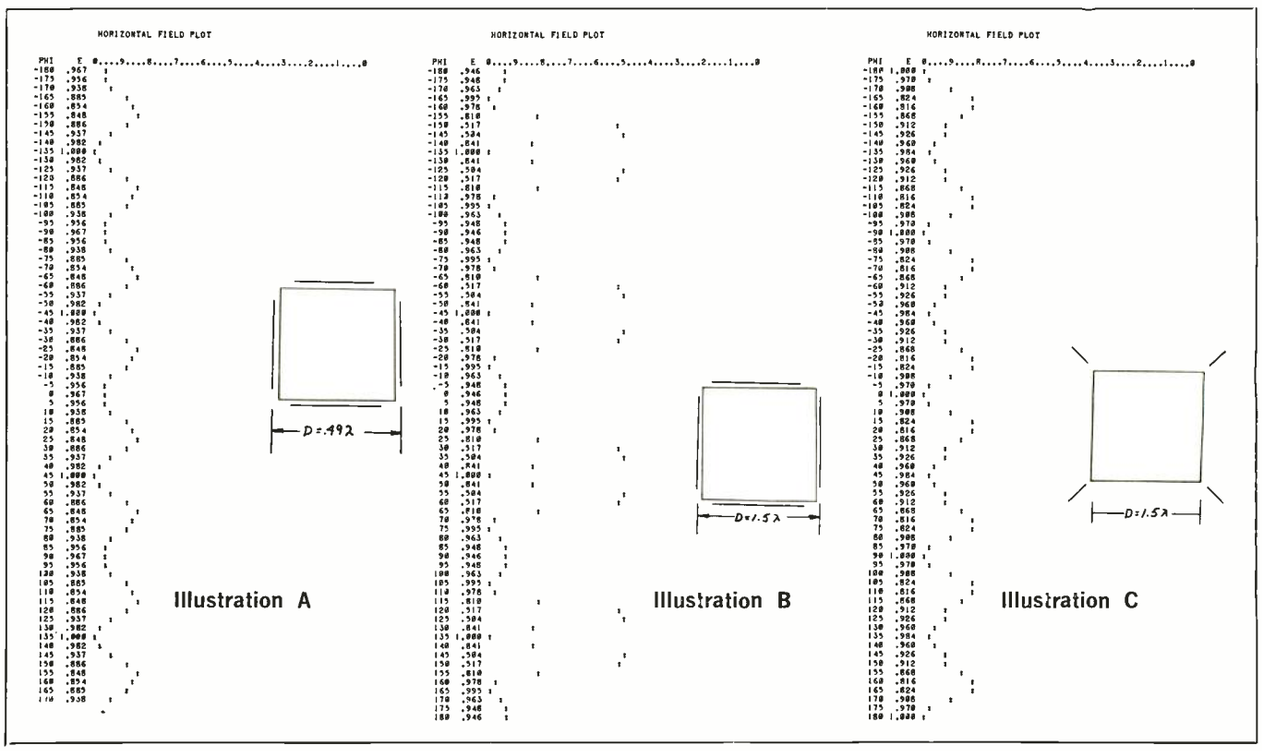
With the time sharing computer, the entire sequence takes less than ½ hour. With an ordinary computer, the calculating time is quite the same, but the logistics of supplying data to a programmer, having him batch-process it and return it to the designer, would probably take at least four days. Calculating mathematically or with vector plots would take approximately 32 hours.

Another area where the time-sharing computer is used to full benefit is in the actual production assembly of an antenna. Again a six-bay antenna is taken as an example. Once the parameters as in Illustration C of Fig. 2 have been fixed, the various subassemblies of the antenna are assembled and tested. The bottom bay is built and tested for proper moding, beamwidth, etc., and this one-bay data is compared to that one-bay data on which the entire array was originally computed. Minor differences are sometimes noted. In these cases, the new array is recalculated with the actual measured data to assure that the antenna will perform as specified. If so, assembly is continued; and if not, changes in the one bay are made until it does meet requirements. If time-sharing were not available, production delays could become impossible. Likewise, the bottom two-bay, bottom-three bay, top-bay, top-two-bay and top-three-bay patterns are computed and compared against measured results, so that when the assemblers and test men marry the complete antenna, they can have complete confidence that with only minor touch up, the antenna will meet both the specifications and shipping deadlines.

Horizontal Patterns

A few simple modifications of the basic vertical pattern program yields a program for computing the horizontal field of an antenna. Due to the ever increasing need for directionalized antennas, especially in the uhf area, the backlog

Fig. 3 (below). Horizontal plot for various tower sizes.



The language of the computer is covered quite thoroughly in the literature; however, a brief review is worthwhile to demonstrate its capability.

A program is a set of directions, a recipe, that is used to provide an answer to some problem. Any problem must fulfill two requirements before it can be carried out. The first is that it must be presented in a language that is understood by the "computer." The second requirement is that it must be completely and precisely stated. This requirement is crucial when dealing with a digital computer, which has no ability to infer what you mean. The computer can act only upon what you actually present to it.

The general logical steps used in solving a problem are usually formulated before writing a specific program. This is called flowcharting. Fig. A shows two programs, one that a computer could follow, another that an average technician could wade through. The problem is to solve the current flowing through a simple R-L-C series circuit with different values of resistance from 1 to 50 ohms at frequencies between 10 and 1000 Hz. It may be noted that the computer language and directions written in Fortran are even simpler for the technician to understand and manipulate.

The flow chart for such a problem is shown in Fig. B. Here the logic is formalized even though specifics (such as formulas) are not. Once a logical approach can be made to a problem, the computer detail language can be mastered. It becomes quite evident that the DO LOOP is the most powerful tool in the computer language. A range of variables can be set and the computer will calculate the results swiftly and accurately. A computer

CALCULATE CURRENT THROUGH
SIMPLE R,L,C CIRCUIT

COMPUTER PROGRAM	TECHNICIAN PROGRAM
00 90 INPUT,E,H,C,	INITIAL VALUES
10 PI = 3,14159	E = 10
20 DO 20,R = 1,50	H = .001
30 DO 20,F = 10,1000,10	C = 27 UUF
40 X = 2*PI*H*F-1/(2*PI*C*F)	LETF = 10 AND R = 1
50 Z = SQRT(R*R+X*X)	CALCULATE A USING FORMULAS,
60 A = E/H	X = 2 X 3.14 X H X F-1/(2 X 3.14 X 27 X F)
70 20 PRINT,F,R,A	$Z = \sqrt{R^2 + X^2}$
80 END	A = E/Z
	REPEAT LETTING F = 20,30,...1000
	LET F = 10 AND R = 2 AND REPEAT
	FOR FREQS UP TO 1000.
	LETTING R INCREASE IN INCREMENTS
	OF 1 UP TO A MAXIMUM OF 50,
	REPEAT FOR ALL FREQS.
	COLUMNIZE RESULTS LISTING
	FREQ, RESIS, AND CURRENT

Fig. A. Program for computing current in RLC circuit.

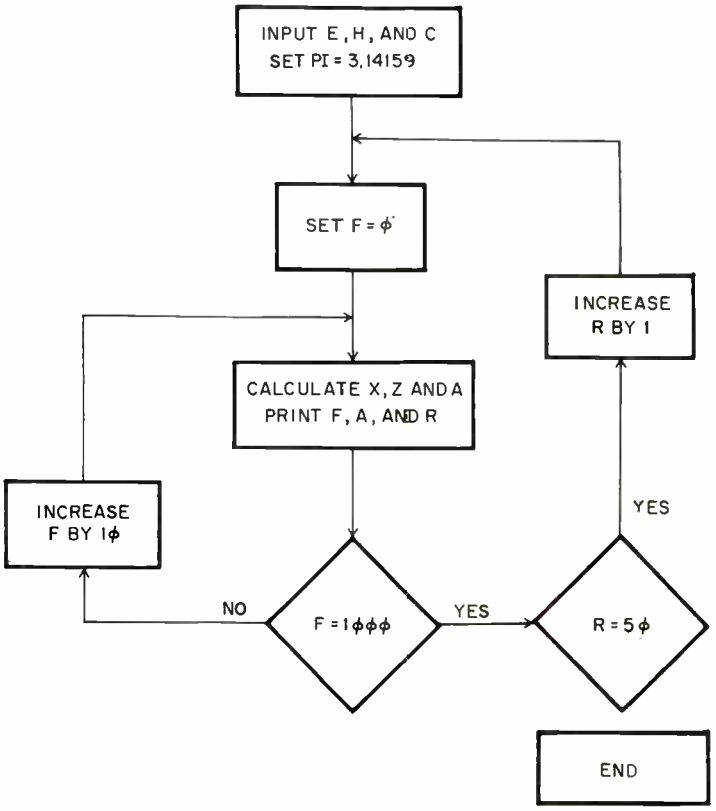


Fig. B. Flow chart for solving current in RLC circuit.

must be given explicit instructions for each step toward the solution. You need to know the numerical methods as well as a computer language.

The time-sharing computer—the type used in the applications discussed in this article—is a relatively new concept in computer service. Time-sharing, or the simultaneous access to a central computer system from many remote locations, is ideally suited for solutions of problems and for program updating and editing.

The master control console and remote consoles are connected to the computer system through telephone lines—either private, PBX extensions or public facilities—using Data-Phone service or TWX service on a dialup basis. Up to 40 remote consoles can be accommodated simultaneously through the automatic switching system. This is possible because the response of the computer and the response of the printing units have at least one order of magnitude time differential. The computer assigns priority to all sequences so that even with all consoles in use, delays are nominal. A typical sequence for an engineering program might be 25 seconds of computer time, 3 minutes for data printout and a maximum of 30 seconds "holding" time while the computer is time-shared to a different problem.

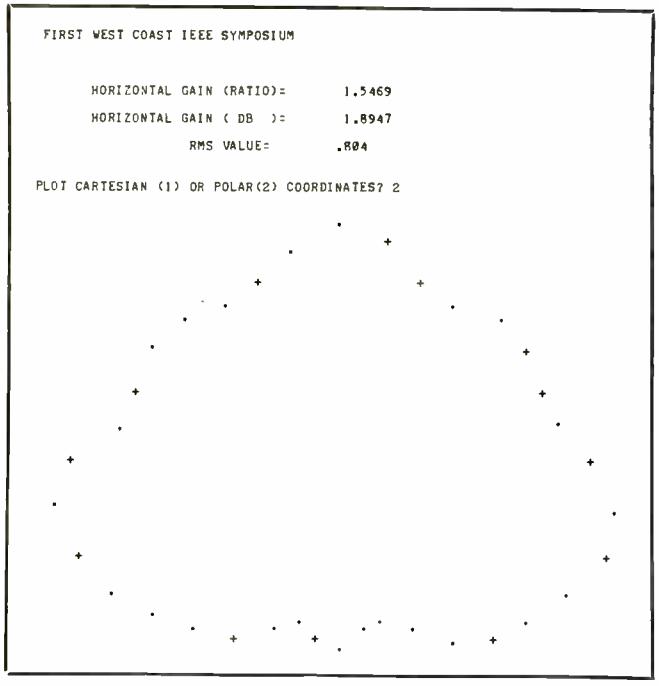


Fig. 4 (left top). Polar co-ordinates quickly produced by computer.

Fig. 5 (left middle). Antenna gain at all radial angles.

Fig. 6 (left bottom). Computer plot of FCC (50/50) curve.

of requests for pattern information could not have been met without the time-sharing computer or a great increase in experienced personnel. The flow chart for programming is much the same as that for the vertical pattern program except the designer must now account for the size of the tower or mast structure, number of panels, the azimuth and skew angles as well as the currents as phases to each panel. Fig. 3, A & B illustrates the effect of two otherwise equal antennas mounted on different size tower sections. Illustration C will show that even with such a large tower as in B, other parameters, such as azimuth and skew angle can be changed to bring the antenna back to tolerable limits. Again, this process would take the designer less than an hour with time-sharing with no interruption in his logical approach to problem-solving.

As an extension of the horizontal pattern program, the output may be plotted in more easily visualized polar coordinates rather than Cartesian co-ordinates as seen in Fig. 4. This polar plot may be then transferred directly to a translucent overlay and, when used with topographic maps of the area to be served, provides a very powerful tool in designing a directional pattern with a minimum of tradeoffs.

Other Applications

Once the immediate problem of programming for a specific application and the language of the computer is at least familiar, many other applications come to mind. For instance, having calculated the vertical pattern and the vertical gain of the antenna, a modification of the horizontal pattern program will compute the antenna gain at all radial angles as in Fig. 5. Not only is the power gain ratio computed, but the ratio converted to dB and the necessary information for FCC filing such as the gain at the horizon (0 degrees) and the associated field at 0 degrees. The effective radiated power at all radials is also computed.

It is quite a simple but menial task to hand calculate the familiar FCC (50/50) curve, for the principal city, Grade A and Grade B contours for a specified erp. The time-sharing computer does this in 4 seconds, as in Fig. 6. With such instant response, it becomes a simple matter to calculate the contours at reduced erp such as in an emergency condition, and thus formulate plans for redundancy in transmitting equipment to insure an economic level of operation. The program for these calculations would take approximately half an hour to write; at least less time than it would take to plot contours at a single value of radiated power. ●

PWR GN 16:54 ℄ SAT 11/04/67

N	D	PHI	THETA	A	ALPHA
1	.72	45.00	45.00	.50	.00
2	.72	135.00	135.00	1.00	.00
3	.72	-135.00	-135.00	1.00	.00
4	.72	-45.00	-45.00	1.00	.00

HORIZONTAL GAIN(RATIO)= 1.5688 HORIZ GAIN (DB) 1.9557
RMS VALUE= .7984
POWER GAIN COMPUTED ON VERTICAL GAIN OF 30.92
VERTICAL GAIN AT 0 DEGREES= 19.56
ERP CALCULATION BASED ON PWR INPUT TO ANTENNA(KW)= 27.50

AZIMUTH ANGLE	RELATIVE FIELD	MAXIMUM PWR GAIN (RATIO)	MAXIMUM PWR GAIN (DB)	HORIZON PWR GAIN (RATIO)	HORIZON PWR GAIN (DB)	ERP (KW)
-180	1.000	48.507	16.858	30.686	14.869	1334.
-175	.963	44.976	16.530	28.452	14.541	1237.
-170	.868	36.548	15.629	23.121	13.640	1005.
-165	.770	28.784	14.592	18.209	12.603	792.
-160	.725	25.470	14.060	16.112	12.072	700.
-155	.776	29.186	14.652	18.463	12.663	803.
-150	.855	35.486	15.501	22.449	13.512	976.
-145	.939	42.784	16.313	27.065	14.324	1177.
-140	.966	45.272	16.558	28.639	14.570	1245.
50	.479	11.110	10.457	7.028	8.468	306.
55	.461	10.297	10.127	6.514	8.138	283.
60	.396	7.604	8.810	4.810	6.822	209.
65	.342	5.688	7.550	3.598	5.561	156.
70	.341	5.645	7.516	3.571	5.528	155.
75	.439	9.335	9.701	5.906	7.713	257.
80	.574	15.990	12.039	10.115	10.050	440.
85	.691	23.134	13.643	14.635	11.654	636.
90	.759	27.910	14.458	17.656	12.469	768.
95	.775	29.145	14.646	18.437	12.657	801.
100	.760	28.032	14.477	17.733	12.488	771.
105	.752	27.412	14.379	17.341	12.391	754.
110	.766	28.426	14.537	17.982	12.548	782.
115	.826	33.084	15.196	20.929	13.207	910.
120	.890	38.429	15.847	24.310	13.858	1057.
125	.951	43.834	16.418	27.729	14.429	1205.
130	.972	45.827	16.611	28.990	14.622	1260.
135	.981	46.663	16.690	29.519	14.701	1283.
140	.963	45.013	16.533	28.475	14.545	1238.
145	.933	42.260	16.259	26.734	14.271	1162.
150	.848	34.861	15.423	22.053	13.435	959.
155	.768	28.592	14.562	18.087	12.574	786.
160	.718	24.989	13.978	15.808	11.989	687.
165	.765	28.411	14.535	17.973	12.546	781.
170	.865	36.290	15.598	22.957	13.609	998.
175	.961	44.838	16.516	28.365	14.528	1233.
180	1.000	48.507	16.858	30.686	14.869	1334.

COVERAGE AS PREDICTED BY FCC(50,50)CURVES
CHANNELS 7-13

316 KW ERP

AZIMUTH ANGLE (DEG)	HEIGHT ABOVE AVE TERRAIN (FT)	DISTANCE PRINC CITY (MI)	DISTANCE GRADE A (MI)	DISTANCE GRADE B (MI)
0	1200	38.98	45.99	63.76
45	800	35.05	42.79	60.12
90	500	27.10	35.03	51.97
135	700	32.71	40.67	57.83
180	1100	40.64	47.23	65.23
235	1500	46.10	51.52	70.36
270	2000	53.00	61.00	80.02
315	1800	49.98	56.13	75.26

The TH Varotal series of lenses comes in several models, each with a number of variations. Color and B & W. Indoor or outdoor use. Servo or manual controls. And each basic optical model is convertible to various camera image formats so that changes in camera technology do not necessarily obsolete the lens. We can now offer these 10:1 lenses for immediate delivery. (Sorry, due to demand there is still a short wait for our 16:1 models).

For more information, call Jim Tennyson at (914) 358-4450. Or write Albion, 260 N. Route 303, West Nyack, N.Y. 10994. Telex 137442

albion

Taylor Hobson V.F.L.* lenses now in stock

*VARIABLE FOCAL LENGTH

Circle 16 on Reader Service Card

Okay.
So you talked to the competition.

And they probably told you that we had a delivery problem. Because we did.

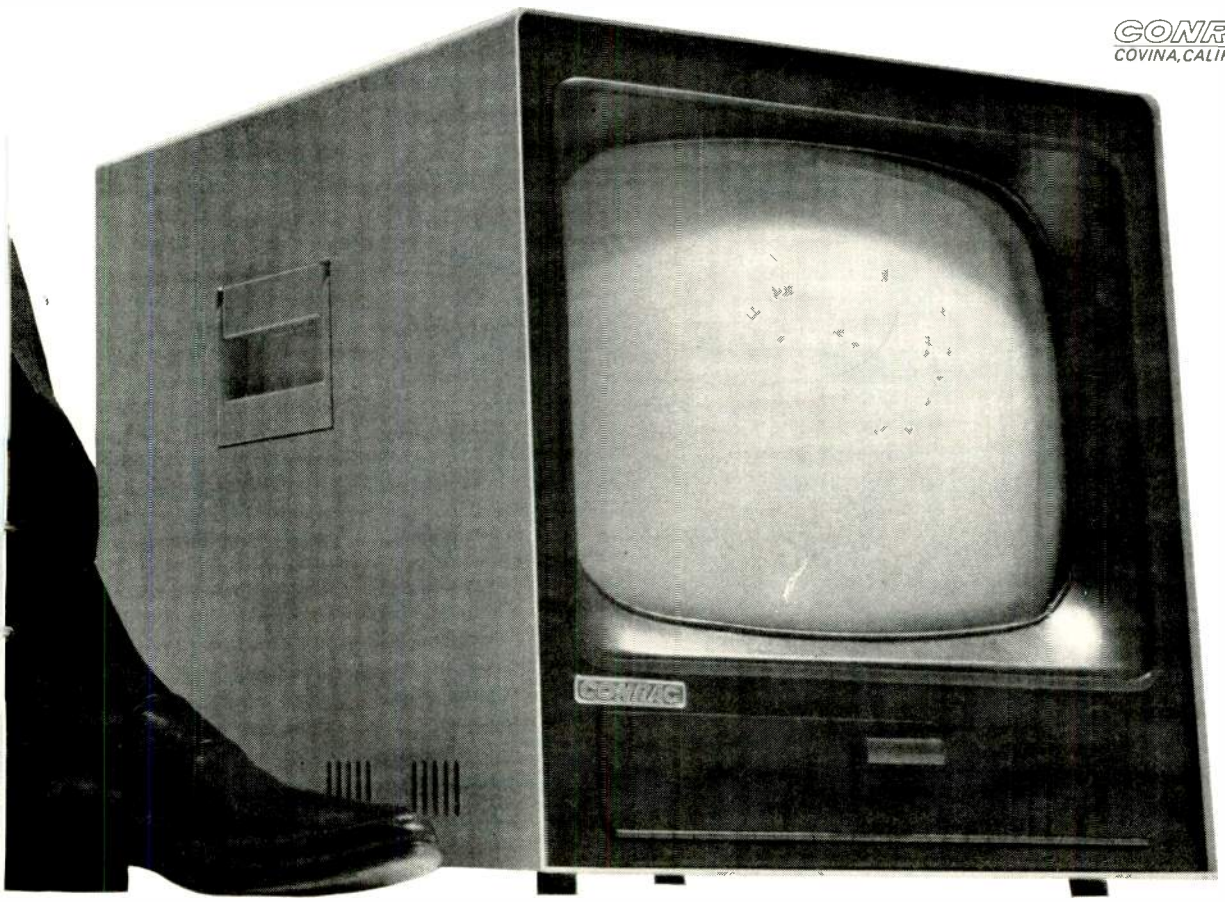
Have they told you that we don't have a delivery problem any more? Because we don't.

Anyway, now we can get back to basics. Like Conrac is the fastest selling monitor in the world.

Which is why we had the delivery problem.

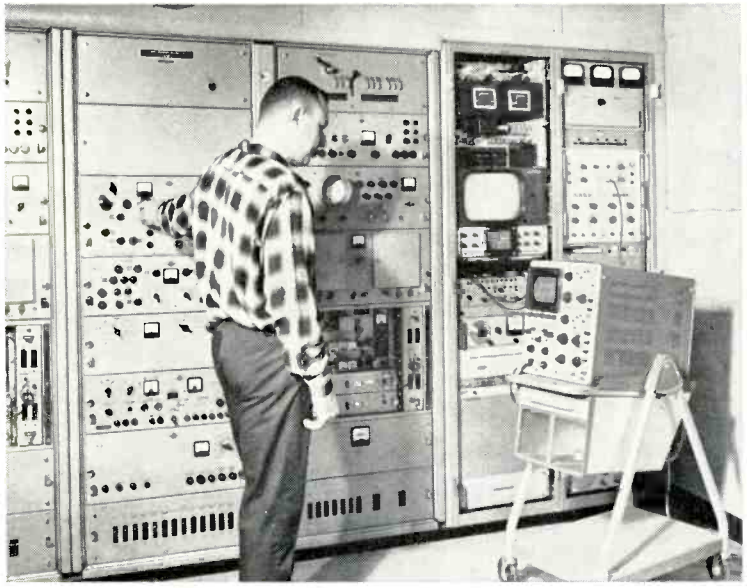
Did the competition tell you that?

CONRAC
COVINA, CALIFORNIA



Circle 17 on Reader Service Card

check the stations that . . .



(Photo courtesy WFLD Chicago. Marconi 50KW UHF Tx)

check TV transmission with . . .

MODEL 2360

the Marconi TV sideband analyzer

An ultra flat sweep generator and receiver combination for checking video or displaying overall transmitter sideband response.

- Tests channels 2 thru 83
- Measures dynamic response of transmitter
- Permits insertion of sync. and blanking pulses on sweep signal
- Sweep signal harmonic content less than 2%
- Sweep response: Asymmetric 0 to 20mc
  Symmetric 7-0-7 mc
- Steady state response: use as sync. mixer with external oscillator for trap setting, etc.

MARCONI
INSTRUMENTS
Division of English Electric Corporation
111 CEDAR LANE • ENGLEWOOD • NEW JERSEY 07631
TELEPHONE: 201-567-0607

Circle 18 on Reader Service Card

BROADCAST EQUIPMENT

Dual Channel Console Takes 34 Audio Inputs

A self-contained dual channel audio console designed for use in broadcast and recording is available from McCurdy Radio Industries, Inc., Danvers, Mass. The all solid-state console (Model SS-4360) mixes 10

channels and accommodates up to 34 program sources. Any input mixing channel may be used for high or low level operation by using the proper plug-in input module. Mixer positions 1 through 9 have 3-position input selector switches. Mixer position 10 has a 5-position pushbutton selector in addition to the 3-position key for remote and network inputs. A comprehensive cue-intercom system in the SS-4360 provides for use of an internal, separate talkback microphone and cue speaker.

Circle 100 on Reader Service Card

Improved VTRs

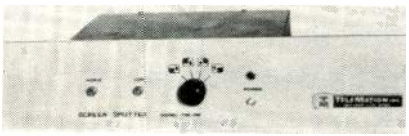
Two improved high band color videotape recorders have been placed on the market by Ampex Corporation of Redwood City, Calif. The VR-2000B (shown in photo) features completely redesigned audio system that greatly improves sound quality through better signal to noise ratio and improved frequency response.

Either NAB equalization standard or Ampex equalization standard may be selected at the flip of a switch. Improvements on the VR-1200B over the VR-1200A include a reduction of the "K" factor (an evaluation of picture quality) to 1.5 percent, better signal to noise characteristics, improved frequency response, improved differential gain and differential phase and a reduction of moire. Four monitor options are available —any of which may be mounted overhead as in the VR-1200A. The VR-2000B is priced from $66,500 to $100,000, depending on accessories; the VR-1200B, from $55,000 to $90,000. All recorders are available in 525/625-line standards operating on all three major broadcast color standards—NTSC, SECAM and PAL.

Circle 101 on Reader Service Card

Versatile Screen Splitter

A low-cost special effects generator designed primarily for use in ETV, CATV and industrial television systems is now available from TeleMation, Inc., Salt Lake City, Utah. The



TSE-100 Screen Splitter mats pictures from two synchronous sources into a single video image. Horizontal split screen, vertical split screen and corner inserts are possible, using either composite or noncomposite video sources. The TSE-100 and two television cameras can operate with industrial 2:1 interlace or full EIA broadcast scanning standards. The RC-100 split-arm horizontal and vertical wipe control is also available for remote control of the TSE-100.

Circle 103 on Reader Service Card

Tape Degausser Erases Faster

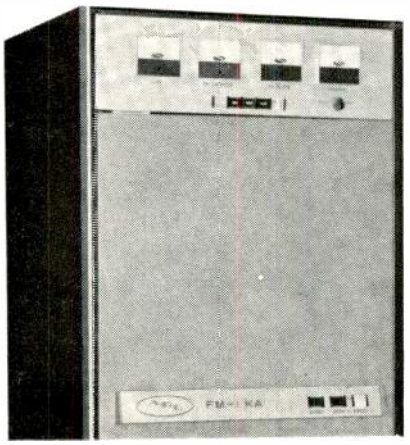
Model 3603A Tape Degausser, made by Hewlett Packard of Palo Alto, Calif., automatically erases magnetic tape in 32 s, "faster than other known professional tape degaussers." Unit

requires no coiling between degaussing cycles—it can be used continuously. Degausser erases to at least 90 dB below recorded level. It accepts tape reels from 3 to 15 in. in diameter with ¼- to 1-in.-wide tapes. EIA or NAB type reels with 5/16- or 3-in.-diameter hubs are accommodated; an accessory hub-adapter fits digital computer-type reels. Unit measures 16¾ × 8¾ × 16⅜ in. Model 3603A may be used on the bench or installed in a standard-width rack with hardware provided. Degausser is priced at $900.

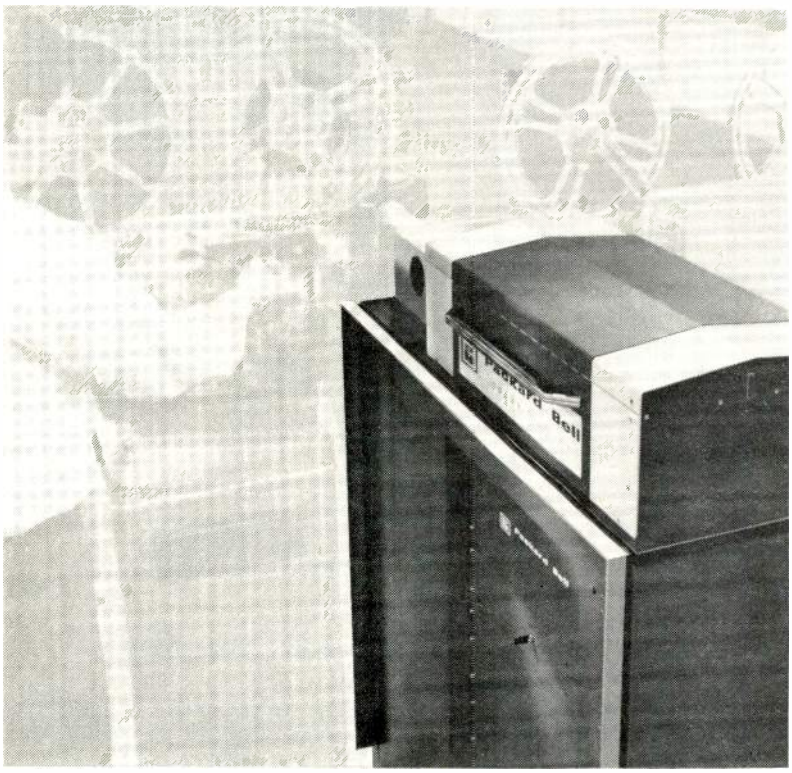
Circle 102 on Reader Service Card

Tetrode Fm Xmtr

American Electronic Laboratories, Inc., Lansdale, Pa., recently announced a new FCC Type Accepted broadcast transmitter, the FM-1KA. Final power amplifier is a 4CX1000K power tetrode which requires less than 10 W rf drive. Tube incorporates a solid screen ring connected directly to ground, providing maximum isolation between input and output circuits and eliminating need for neutralization. The 4CX1000K's gain factor also eliminates the need for an intermediate power amplifier. The FM-1KA requires 2 3 kW line power and is designed for remote



4-TUBE PERFORMANCE 3-TUBE SIMPLICITY



Only new Packard Bell Color Camera for film chains combines all these high-performance features in one economical package

Complete matched system—camera plus optical multiplexer permits wide projector flexibility.

Full EIA/NTSC compatibility obtained with optional plug-in EIA sync modules and encoder.

Unmatrixed monochromatic signal for maximum definition and contrast.

Combination of precision fixed optics and 3-vidicon simplicity provides 4-channel standards of resolution, contrast and ease of registration.

Superior sensitivity—150 foot-lamberts high light-reflectance.

Write today for full information and prices. C86

Packard Bell | PB

Lawrence & Arnold Drive, Newbury Park, Calif. 91320 • Tel: (805) 498-6601

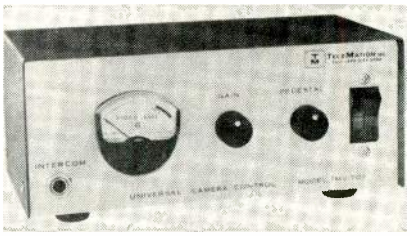
Circle 19 on Reader Service Card

control (including plate tuning). The transmitter measures 76 × 28 × 28 in. and is priced at $5990.

Circle 104 on Reader Service Card

Universal Camera Control

A new camera control unit, which will upgrade most industrial cameras to EIA and broadcast standards, was recently introduced by TeleMation, Inc., Salt Lake City, Utah. The

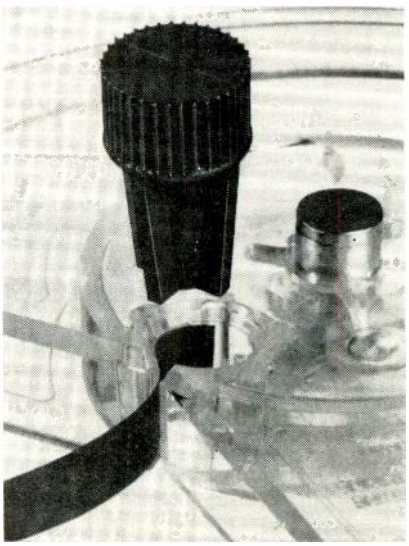


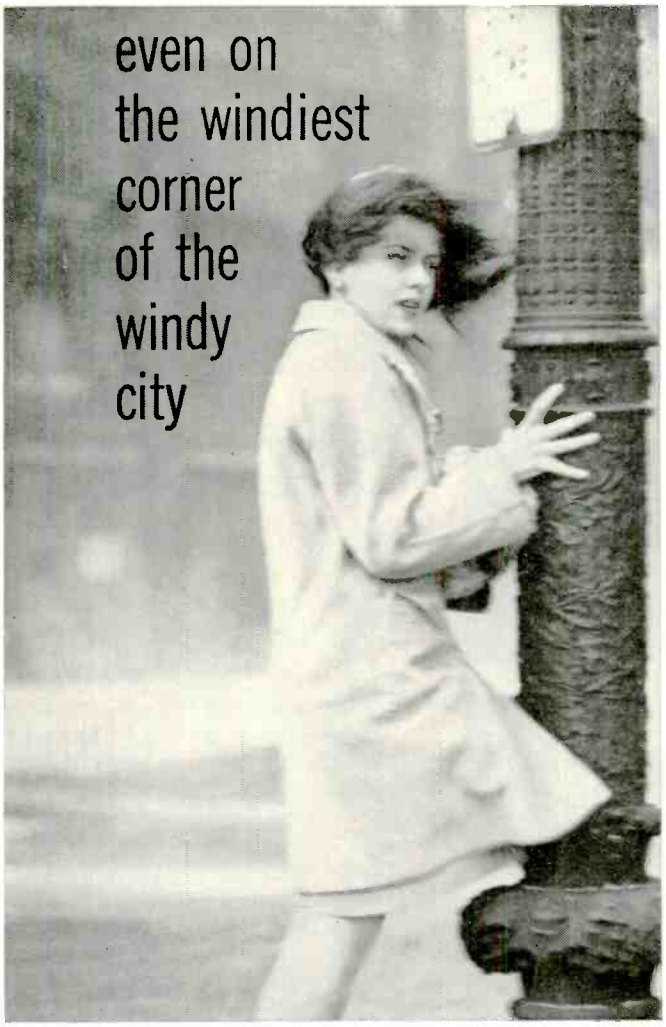
TMV-707 distributes power, drive, pulses, intercom and tally voltage to the camera. It also processes the industrial grade camera video to meet EIA and broadcast specifications. It includes three source-terminated video outputs, with sync optional on each, and a built-in video level meter. The intercom circuit can be used with headsets or as an amplified system when operated with an external amplifier.

Circle 105 on Reader Service Card

Device Secures Tape To Reel

A new device for securing magnetic tape to reels has been developed by Turner Co., Darien, Conn. Called Tape-It-Easy, the nonmetallic threader prevents tape from slipping out of the take-up reel, once it has been inserted in the slot found in standard reels. It does this by pressing the tape against the side of the





Shure's remarkable new SM50 omnidirectional dynamic microphone is SELF-WINDSCREENED! It is strikingly immune to wind noises and explosive breath sounds—making it ideal as a dependable "workhorse" microphone for remote interviews, news, sports pick-ups and a variety of field and studio applications. The five-element built-in windscreen makes it virtually pop-proof in close talking situations. And unlike other "built-in" windscreens, this one is "unitized" and self-contained with no bits or pieces to re-assemble after cleaning. In fact, you can actually rinse dirt, saliva, lipstick and other screen-clogging foreign matter out of the windscreen assembly under running water as often as needed—or replace the "unitized" assembly if necessary in a matter of seconds.

Additionally, the SM50 is the cleanest sounding professional microphone at anywhere near its price class. It delivers highly intelligible, natural and pleasing speech and vocal music that is especially full-bodied and rich in the critical mid-range.

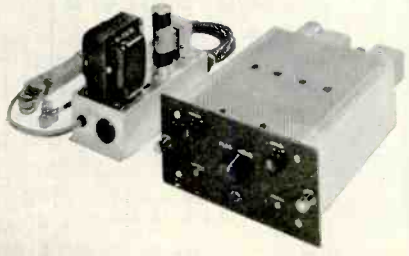
It is extremely rugged and will require little or no down time as the years go by. Too, when comparing it to other moderately priced omnidirectionals, it is lighter in weight, supremely well-balanced for "handability," has a detachable cable, and a rubber mounted cartridge for minimizing handling noises. The SM50 is worthy of your most serious consideration.

For additional information, write directly to Mr. Robert Carr, Manager of Professional Products Division, Shure Brothers, Inc., 222 Hartrey Avenue, Evanston, Illinois.

SHURE SM50

OMNIDIRECTIONAL DYNAMIC MICROPHONE

SHURE STATION-TESTED AUDIO CIRCUITRY EQUIPMENT



Shure stereo equalizer and preamplifiers are praised as MAJOR contributions to upgrading station quality by broadcasters.

SE-1 Stereo Transcription Preamplifier
Provides precise RIAA equalization from magnetic phono reproducers at line levels. Separate high and low frequency response trimmers. Lowest distortion, noise level, susceptibility to stray RF fields.

M66 Broadcast Stereo Equalizer
Passive equalizer compensates recorded frequency to three playback characteristics: RIAA, flat, roll-off. Provides precise equalization from magnetic pickup at microphone input level.

Circle 20 on Reader Service Card

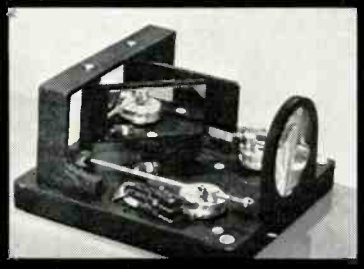
Optical Multiplexer

For broadcast and ETV studios

The Model TMM-203A is designed for selective projection of two 16mm film projectors and one 2" x 2" slide projector into a single television camera. A rugged pedestal base with the precisely machined, cast aluminum optical transfer assembly assures permanent optical alignment.

OPTICAL TRANSFER ASSEMBLY

First surface mirrors are operated by electric motors for fast, yet gentle "wipe" switching. Mirror action eliminates the need for separate projector dousers.



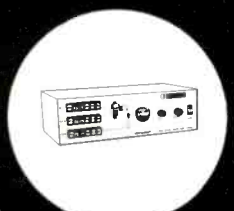
Plus Features —

- LAMP VOLTAGE CONTROLS provided for projectors
- LOCAL and REMOTE CONTROL provisions
- CUSTOM MOUNTING available for all brands and types of cameras and slide projectors

For complete details, request Form TPB-50

Model TMM-203A ONLY $1,295.00

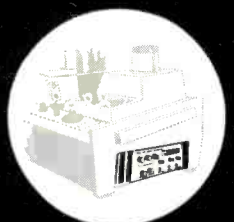
Television Equipment for Education, Industry and Military . . .



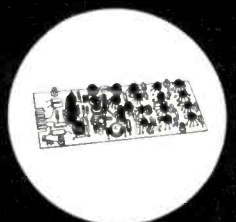
MULTICASTER™

PORTA-SYNC™

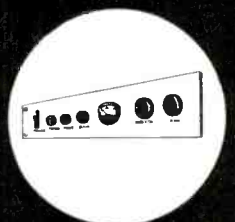
TELECTERN™



VR 660 Video Processor



2:1 Interlace Sync Generator



EIA Camera Control

. . . . from TeleMation — where experience powers pacesetting products!

TELEMATION, INC.

2275 So. West Temple / Salt Lake City, Utah 84115

Telephone (801) 486-7564

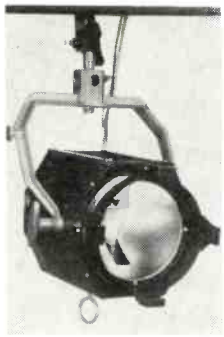
Circle 21 on Reader Service Card

hole into which the tape end is threaded. Tape being unwound in a recorder slips past the threader without damage to the tape. The threader may be withdrawn after one or two turns of a reel or it may be left in since its light weight does not upset reel balance. Tape-It-Easy is sold in a two-reel package which contains two of the tape threaders and two plastic holders which may be mounted on or near the recorder. Pack price is $2.00.

Circle 106 on Reader Service Card

Floodlamp Has 6:1 Focus Ratio

Berkey-ColorTran, Inc. of Burbank, Calif., introduces a compact and lightweight variable beam floodlight with accurate focusing from spot to flood at a ratio of 6:1. Model LQV-10 accepts a choice of sixteen single-ended tungsten-halogen "quartz" lamps operating at 120 V ac or dc. These lamps are available in 500, 750 and 1000 W, in frosted and clear

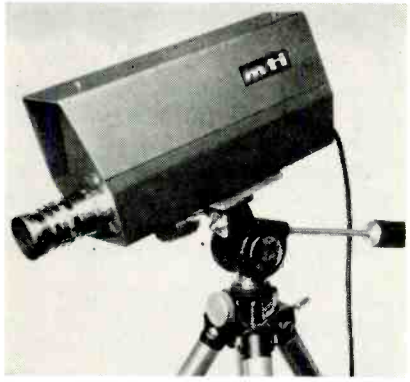


versions. Using a 1000-W 3200°K clear lamp, the Vari-Beam "1000" produces 151 to 948 fc at 10 ft from the flood to spot focus positions. The TV version (LQV-10/TV) weighs 8½ lb and is supplied with a yoke incorporating a C-clamp for mounting on an overhead rail or pipe. Focusing the TV model is accomplished by a steel loop (for pole operation) at the bottom of the housing or a control lever at the rear of the housing. Television version is priced at $89.00.

Write on Company Letterhead Stationery

Sensitive Vidicon Camera

Model VC-11 vidicon television camera, made by Maryland Telecommunications, Inc., Cockeysville, Md., produces usable pictures with illumination level of 0.05 fc on the vidicon faceplate, maintaining sweep linearity within 2 percent. Regulated power supplies of camera perform



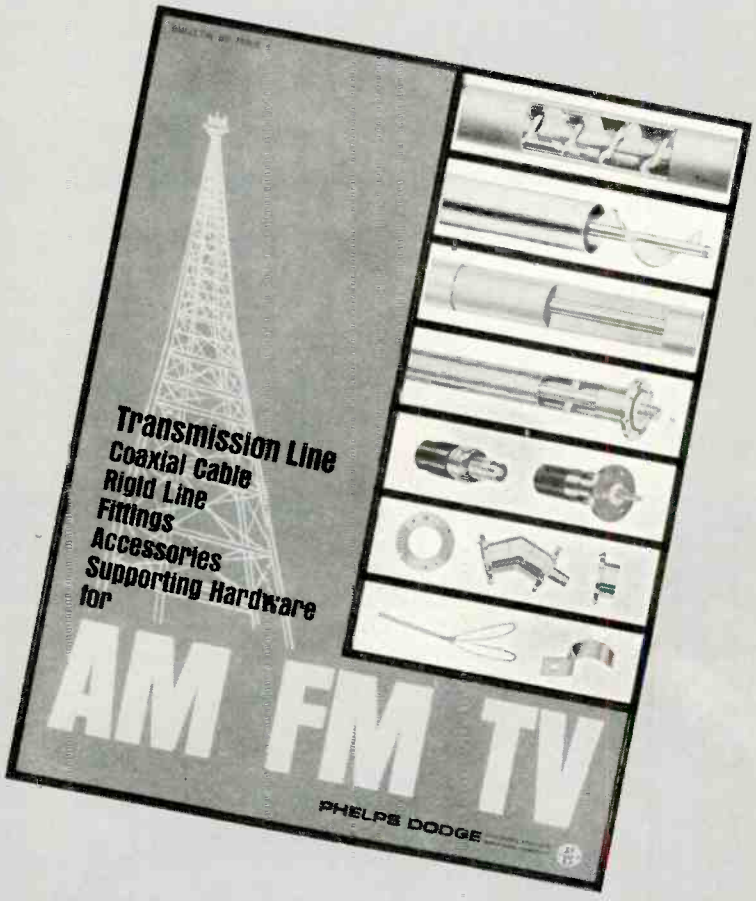
between 100 and 130 V ac. Weighing 9 lb and drawing less than 20 W, the VC-11 is available in a self-contained or remote controlled version, housed in a splash-resistant case with either a single C mount lens plate or an optional three-lens turret. Horizontal resolution is in excess of 600 lines and the composite video output is black negative, 1 V peak-to-peak or 1.4 V peak-to-peak terminated into 75 ohms. Video bandwidth is 8 MHz. Unit measures 12½ × 6⅜ × 4 5/16 in., and is priced at $795 less vidicon tube: with V-220 vidicon, $924.50.

Circle 107 on Reader Service Card

20 Hz to 20 kHz Monitor Amplifiers

Two new solid-state plug-in type monitor amplifiers that deliver sine-signal power at an output of 10 W over the frequency range of 20 Hz to 20 kHz have recently been announced by Langevin, Santa Ana, Calif. Models AM 10 AP (no output transformer) and AM 10 APT (with 1:1 output transformer) are recommended for use as control room program monitors. Output short-circuit and input overdrive protection are provided without causing distortion during normal operation. A thermally actuated cutoff switch removes power from the system in case of prolonged overload or short. Response is ±0.5 dB at a level of +30 dBm into rated load. An input of 70 mV rms is sufficient to drive the amplifier at full rate output of +40 dBm (10 W). Harmonic generation does not exceed 0.3 percent

The complete story on our broadcast communications components and capability...no charge!



Why not write for your copy today?

Coaxial Cable Air dielectric and foam dielectric types offer reliability and lower loss characteristics.

Connectors Type N, HN, UHF, TNC, LC, EIA, splices and end seals. From stock delivery.

Coaxial Cable Accessories Off-the-shelf delivery of cable grips, grounding kits, tubing cutters, two-stage regulators, automatic dehydrators.

Rigid Line Available in four diameters. Meets or exceeds EIA RS225 specifications.

Rigid Line Accessories Miter elbows, gas barriers, reducers, tee assemblies, adapters, flanges are available.

Supporting Hardware Anchor fittings, hangers, braces, supports, clamps, bulkhead fittings.

PHELPS DODGE ELECTRONIC PRODUCTS NORTH HAVEN, CONNECTICUT

Circle 22 on Reader Service Card

PROGRESS IN AN EXPLODING TECHNOLOGY

EXHIBITS
NEW YORK
COLISEUM

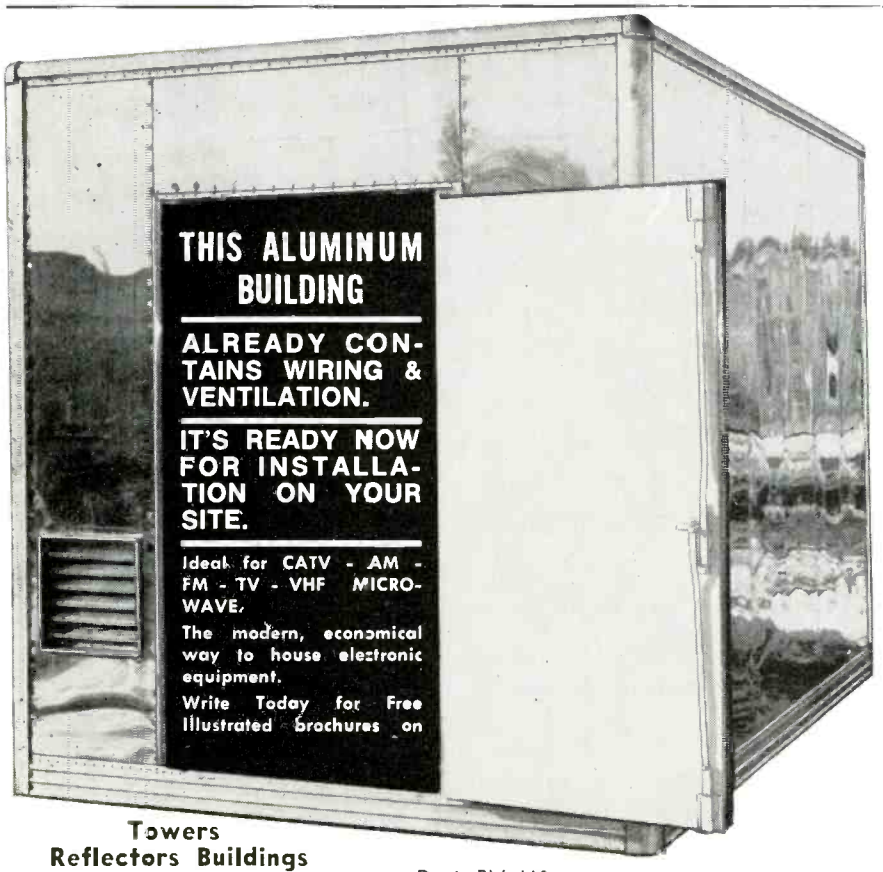
TECHNICAL
SESSIONS
NEW YORK
HILTON

Monday through Thursday

- 48 GENERAL SESSIONS at the New York Hilton. Hours: 10:00-12:30; 2:00-4:30.
- FOUR FLOORS OF EXHIBITS at the N. Y. Coliseum including over 750 firms. Hours: 10 a.m.-8 p.m. 4 Days.
- GALA ANNUAL BANQUET—Wednesday 7:15 p.m. N. Y. Hilton Grand Ballroom—$16.00.
- FREE SHUTTLE BUSSES between the Hilton and the Coliseum—every few minutes.
- REGISTRATION—Good all days—General Sessions and exhibits. In and out privileges.—IEEE Members $3.00. Non-members $6.00. Ladies $1.00. High School Students $3.00 if accompanied by an adult—One student per adult; Thursday only—limit of 3 students per adult.
- REG-IDENT CARD speeds request for exhibitors' literature. Ask for one when registering.
- ESCALATORS/EXPRESS ELEVATORS to the Fourth Floor.

IEEE Exhibition MARCH 18-21,1968

Circle 23 on Reader Service Card



Towers
Reflectors Buildings

Advance Industries

Dept. BM 168
705 Douglas St.—Sioux City, Iowa 51101

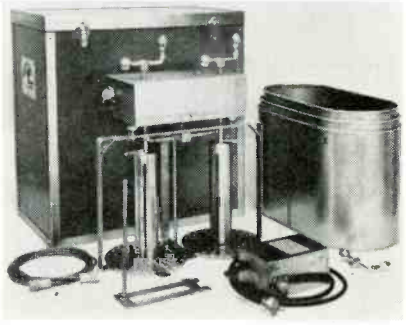
Circle 24 on Reader Service Card

over a range of 30 Hz to 15 kHz when operated at rated power output into rated load. Noise generation is below −40 dBm total, unweighted over the 6-Hz to 100-kHz range. Amplifiers may be rack mounted in a special mounting frame, and two amplifiers occupy 5¼ in. of vertical space.

Circle 109 on Reader Service Card

Portable Film Processor

Houston Fearless Corporation of Beverly Hills, Calif., announces Model 79PP portable film processor.

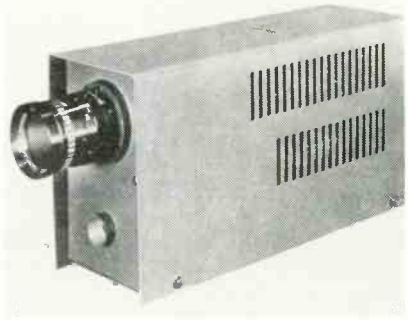


Processor and case weigh approximately 110 lb. The case, which contains all necessary elements, measures 24 × 14 × 24½ in. Roll film width of 70mm, 5, 7, or 9½ in., and lengths from 5 to 500 ft can be accommodated by the processor.

Circle 108 on Reader Service Card

Low-Cost Vidicon Camera

Vikoa of Hoboken, N.J. has introduced a solid-state vidicon camera providing 350-line resolution and 4000:1 automatic light compensation. Model ST-903 can be switched



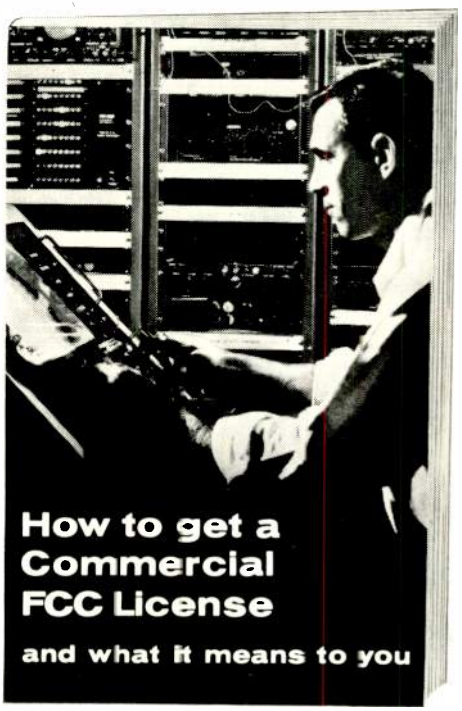
to either a video or an rf output. It comes complete with 1-in. lens and a Class A vidicon. Scanning system is random interlace. Video output is between 54 and 88 MHz at voltage level of 1.5 peak-to-peak. Camera consumes 12.5 W and is equipped with f1.9 25mm C mount lens. ST-903 is priced at $190.

Circle 112 on Reader Service Card

Want a permanent career in broadcasting?

This free book may change your life

It takes the mystery out of getting the FCC License you need for security and success



NO WONDER you're interested in a career in broadcasting. It puts you right "where the action is"—behind the scenes of show business, news reporting, politics. You meet famous people. You're the first to know the big news about fires, riots, plane crashes. You get to hear wonderful music. You feel in contact with an audience of thousands.

And one of the most secure high-pay jobs in the field is that of the licensed Broadcast Engineer. He's the key man required on the job by the United States Government

New job opportunities are opening up constantly for qualified license-holders. Many more will be needed to operate and maintain the countless new UHF-TV stations expected to begin operation, now that all new TV sets can receive UHF.

So if you dream of making broadcasting your life work, you need that Government FCC License.

But how do you go about getting it? Where do you apply, and when? How do you get ready for it?

To help you, we have published a 24-page booklet, "How to Get a Commercial FCC License." It tells you exactly which types of licenses and permits are issued by the Federal Communications Commission, and what kinds of electronic equipment each type allows you to operate and maintain.

You will learn which subjects must be mastered for each kind of license. Thirty typical exam questions will give you an idea of the level of training required. You'll be told where and how often the exams are held, and how to find out about the exams held nearest your home.

Frankly, the FCC exams are rough if you're unprepared. Two out of three applicants fail to pass. Some fail seven or eight times.

But with the right preparation, it's easier than you would imagine. Better than 9 out of 10 CIE-trained men pass the exam with no difficulty. Our record is so good that we are able to promise every student in writing: *after completing your CIE course, you'll be able to pass your FCC exam, or CIE will refund your tuition in full.*

We'll send you a free copy of our school catalog in addition to your free FCC booklet. Then you can see for yourself how thorough our home study courses and teaching methods are. No obligation, of course.

To receive both books free, just mail coupon below. If coupon is missing, write to Cleveland Institute of Electronics, 1776 East 17th Street, Dept. BM-5, Cleveland, Ohio 44114. Do it right now—if you want a solid career in broadcasting, this could be the turning point in your life.

"I GIVE CLEVELAND INSTITUTE CREDIT FOR MY 1ST CLASS COMMERCIAL FCC LICENSE,"

says Matt Stuczynski, senior transmitter operator, Station WBOE. "Even though I had only six weeks of high school algebra, CIE's AUTO-PROGRAMMED™ lessons make electronics theory and fundamentals easy. After completing my CIE course, I took and passed the 1st Class FCC Exam. I now have a good job in studio operation, transmitting, proof of performance, equipment servicing. Believe me, CIE lives up to its promises. I really enjoy my work and I'm on my way up."

ENROLL UNDER NEW G.I. BILL

All CIE courses are available under the new G.I. Bill. If you served on active duty since January 31, 1955, or are in service now, check box in coupon for G.I. Bill information.

MAIL COUPON FOR FREE BOOKS

CIE Cleveland Institute of Electronics
1776 East 17th Street, Cleveland, Ohio 44114

Please send me, without cost or obligation, your 24-page booklet, "How to Get a Commercial FCC License," together with your school catalog of license-preparation courses.

NAME _____ AGE _____
(Please Print)

ADDRESS _____

CITY _____ STATE _____ ZIP _____

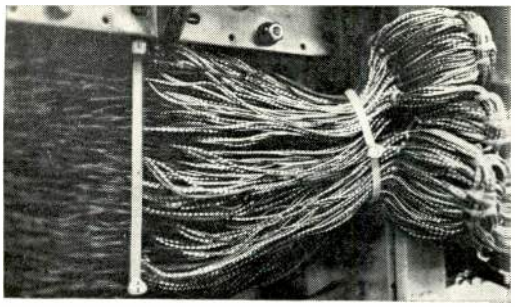
☐ **ADVANCED COURSE FOR LICENSE HOLDERS.** Check box if you already have an FCC License and desire information about our Advanced Communications Engineering Course which has helped many broadcast engineers reach the top of their profession.

☐ **Check here for G.I. Bill information.**

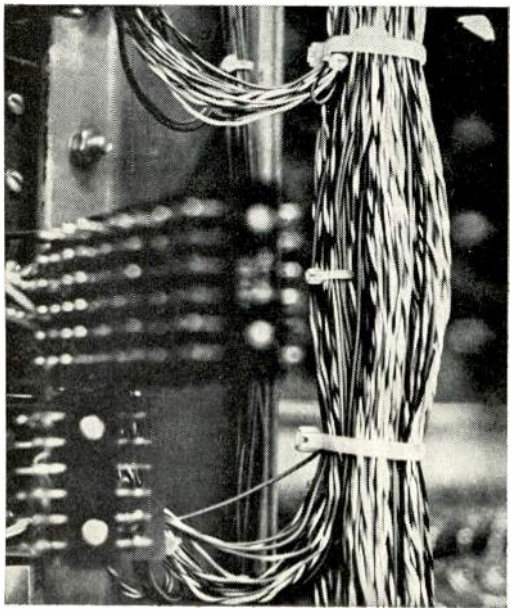
Accredited Member National Home Study Council
A Leader in Electronics Training... Since 1934

BM-5

Circle 25 on Reader Service Card



Reduce Costs of Communications Wiring with *TY-RAP*® Cable Ties



Over the past 6 years, thousands of installers have adopted the modern way to reduce costs and improve appearance in wire bundling. A quick inspection of your facilities will point up the many places where you can save money and gain tying convenience with TY-RAP ties and clamps.

The self-locking TY-RAP ties help reduce the costs of installation — they almost tie themselves. The art of making a neat, reliable tie is built into the product. The tough, nylon gives you a new degree of reliability. The uniformity of the ties enhances the over-all wiring appearance.

You'll be surprised to see the convenience and savings of this modern TY-RAP tying method. Write for samples and literature.

The Thomas & Betts Co., Incorporated • Elizabeth, New Jersey
In Canada, Thomas & Betts Ltd. • Iberville, P.Q.

Sold exclusively through authorized T&B Distributors.

T&B ENGINEERED **THOMAS & BETTS**

Circle 27 on Reader Service Card

Four years ago it was less than 60-million feet. John F. Feldhuser, chairman of the Education Psychology Section, Purdue University, told one session that creativity is not something hereditary, but something that can be taught by radio broadcasts in the classroom.

Other conclusions from the three day multifaceted program included:

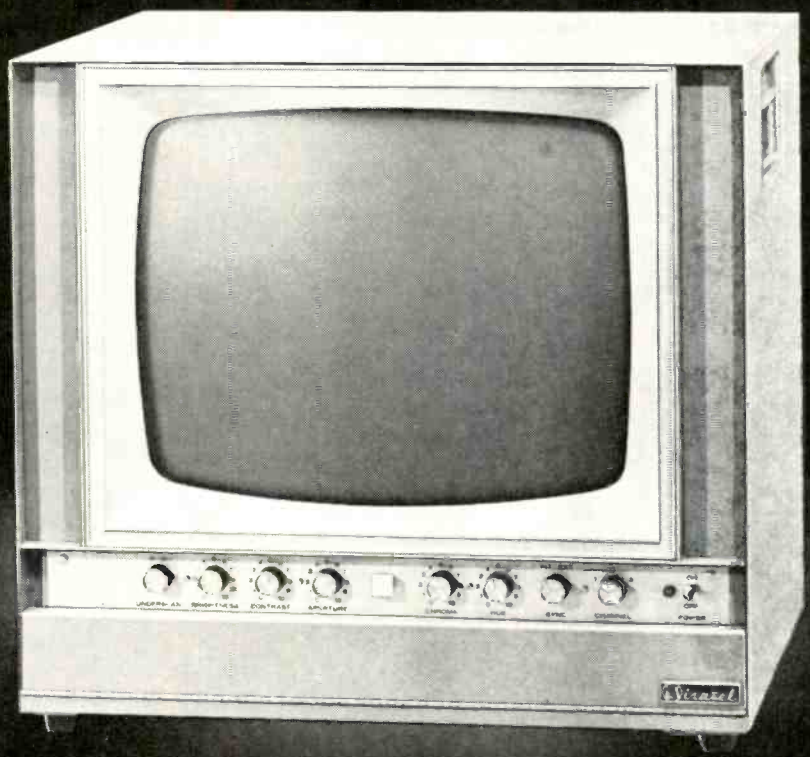
- Instructional TV can be effective if everyone in the school works towards it being successful.
- ITV is only being used superficially to solve major educational crises facing large cities' schools. No real money for ITV in budgets.
- ETV and ITFS groups must start cooperating—along lines existing in Central New York and the Greater Cleveland area.
- Color TV hasn't proved to be essential in increasing learning from televised instructional material.
- The Copyright Bill now before the Senate is so crippling it could negate the gains educational broadcasters expect from the Public Broadcasting Act of 1967. Educators must convince their legislators that complicated clearance and payment systems can stifle educational broadcasting.
- CATV is and can help educational TV but ETV stations are leary of distant ETV signals being imported into their area since it competes with local stations and may undermine local financial support.

Among the honors passed out at NAEB was the man of the year award given to Dr. James C. Killian Jr., who headed the Carnegie Commission on ETV and Morris Novik, public service broadcasting consultant, who received the National Educational Radio "Special Services" award.

The first recipient of Visual Electronics Corporation's $1,000 Annual EDUCOM Scholarship Award was John D. Hutchinson, Jr., a sophomore at the University of North Carolina. The presentation was made at the NAEB annual banquet. Mr. Hutchinson won the award on the basis of his scholastic achievement in his current communications courses, augmented by an essay explaining why he desires a career in the field of Radio and Television.

(Continued)

BBRC/Miratel *Brings You...*



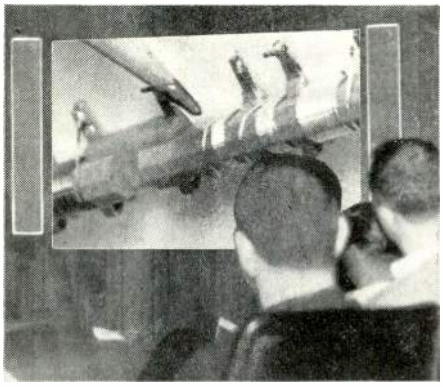
The Phantom – This is probably the newest and least-known broadcast television color monitor available to the industry today. It's reliable. It has exceptional color fidelity. It's priced from $775 to $1275. And it's available off the shelf right now. We think it's the answer to your color monitor needs. You probably would, too. If you knew more about it. A look at our color monitor data sheet, followed by an evaluation of the MC19 in your operation, will settle that matter.

Ball MIRATEL

MIRATEL DIVISION • BALL BROTHERS RESEARCH CORPORATION • 3600 RICHARDSON STREET • NEW BRIGHTON • ST. PAUL, MINNESOTA 55112

Circle 26 on Reader Service Card

MAKE YOUR TV CAMERA or VTR* seem 9 FEET TALL!



Small detail can clearly be seen with..

Tele-Beam®
by KALART

Behind the projected image is Tele-Beam, Kalart's large screen television projection system. Projection TV provides the great magnification of detail which is so necessary for improved and more effective teaching and communication.

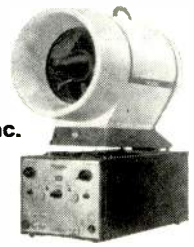
A single, dramatically large TV picture permits greater concentration by students and accommodates large viewing groups. Tele-Beam projects closed circuit television outputs from TV cameras, video tape recorders, and film chains and can be supplied to project ETV programs from "off-the-air" broadcasts. (We simply add an 82 channel UHF/VHF tuner inside the control unit.)

Tele-Beam is simple to operate, compact and lightweight, can be used for either front or rear projection and supplied to project either a 4½ x 6 foot, 6 x 8 foot, or 9 x 12 foot image.

Tele-Beam distributors are factory trained for service and installation and can provide a Tele-Beam demonstration for you. Write today for more information.

*Video Tape Recorder

TELE-BEAM Division
Dept. BM-1
The Kalart Company, Inc.
Plainville, Conn. 06062



Model A912

Circle 28 on Reader Service Card

Technical Considerations Get Evaluation

A general updating on technical progress was the theme of many papers. Robert Nissen, of Rosner Television Systems, Inc., predicted much more use of cable in distributing signals to schools (and homes). Broader-band waveguides may be important in the distant future to carry all of the channels desired. Satellites will be used for long distance hops. Laser "light" pipes do not appear practical at this time, Nissen said. Holagraphy as a means of 3d TV is also far in the future. The CBS electronic video recording (EVR) method of producing film from videotape by electronic beam scanning may be a breakthrough. Time will tell if the price will be right. The thermoplastic film recording publicized by General Electric several years back is not being developed for broadcasting use, Nissen said. Monolithic integrated circuits will make a big impact because so many functions can be performed cheaply (a few cents per circuit). Small size of new devices will make them portable and flexible.

Cable systems for interlinking colleges and universities were described by Marvin L. Thall of Jerrold Electronics and telephone link—MATV school installations were discussed by William Lewis of Delaware ETV network.

Of keen interest to those who must select videotape recorders was the session on Slant-Tract (helical) VTR standards. There is currently no general industry standard nor is there likely to be one until one tape format or the other captures such a large market that other manufacturers will abandon their own standard and take up that of another. Reasons for the approaches taken by Ampex, Sony and International Video Corporation for various machines were made by engineering personnel of these companies. A devastating report showing the poor bandwidth response of ½-inch and many 1-inch VTRs was given by Charles Hiker, WHA, Madison, Wisc. (An expanded report on this session will appear in a future issue of *BM/E*.)

Next Month NAEB Products

Among the new products unveiled at NAEB were Vital Industries' new video switcher, VTRs by Ampex, Diamond Power, International Video, and RCA, and a new monitor by Conrac. Many others to watch for in February.

Multiple choice—every one a right answer!

Bauer's line of audio consoles

There's a compact Bauer console that's right for any audio operation, simple or complex. Each console is self-contained and highly versatile, for speed and accuracy in cueing, monitoring, mixing and programming. Each is of typical Bauer high quality and reasonably priced.

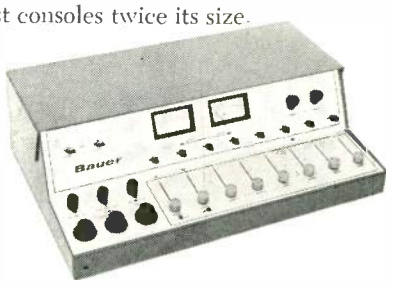
Model 915—for the remote TV truck; 8-microphone versatility with multiple inputs for turntables, tape units, projectors.

Model 912S—for 5-channel stereo in studio production and control rooms. Handles tape prerecording, remote interviews, panel shows, commercial ETs, ID spots, etc. As on-the-air console, gives fast, precise control over 13 inputs.

Model 912—a 5-mixer model for production preprogramming in studio or on remote location; excellent primary, on-the-air unit for smaller stations.

Model 910S—8-mixer stereo console with all the inputs and controls needed by any station, AM or FM, large or small.

Model 910D—dual unit, easily handles two programs simultaneously; 8 mixing channels and more useful features than most consoles twice its size.

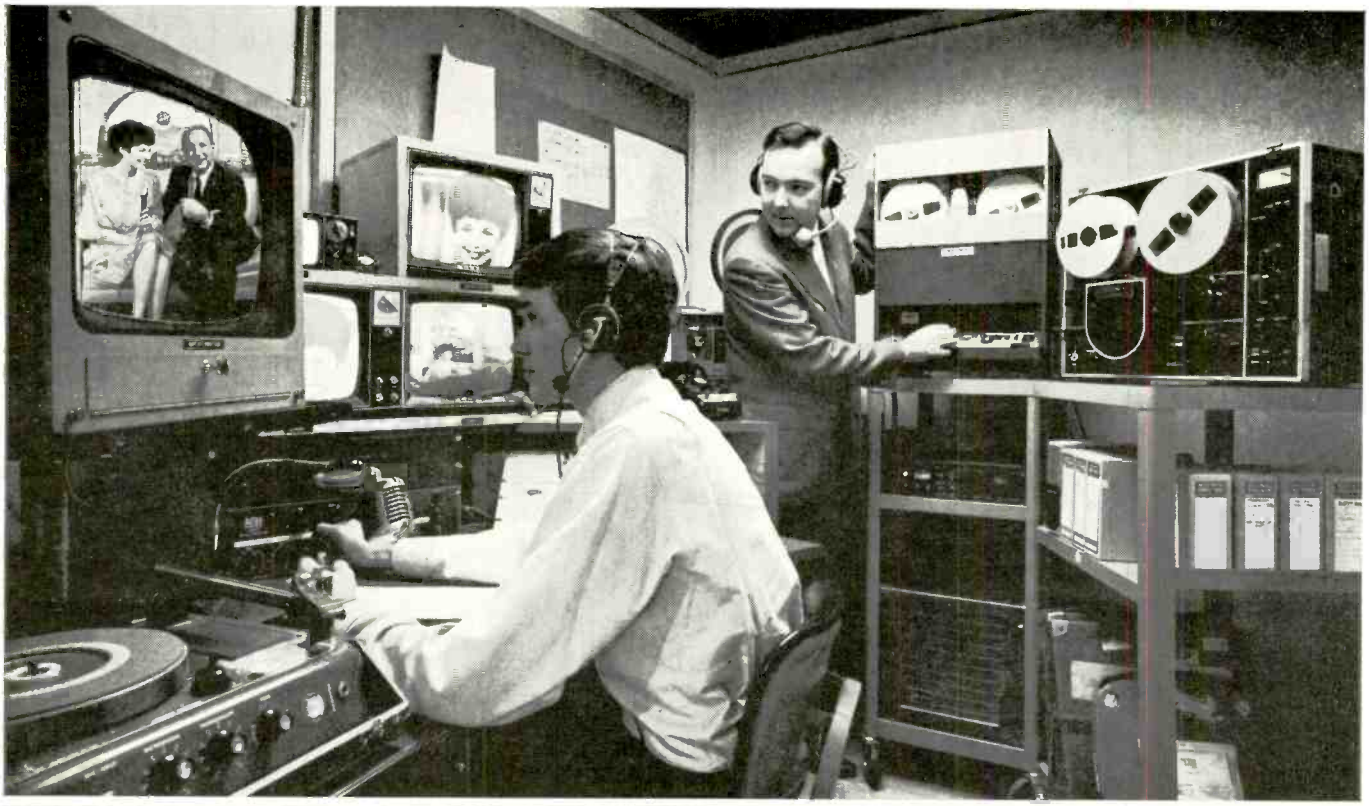


Let a Bauer add new dimensions to your audio capabilities: modern, high-speed control, versatility, simplicity, and convenience. Write to us for full technical information.

Bauer
ELECTRONICS CORPORATION
1601 California Ave.
Palo Alto, California 94304

A Granger Associates COMPANY

Circle 30 on Reader Service Card



CLOSES THE CIRCUIT

— AT

ROSSMOOR LEISURE WORLD

Nestled in a corner of Clubhouse No. 1 at Leisure World, the all-adult community in Laguna Hills, California, is a CATV station that boasts the world's largest single-cable audience.

More than 11,000 subscribers watch Channel 6 as it beams programs of information, education and entertainment over a $1.5 million cable during its 30 weekly broadcasting hours.

In a studio that is unique in arrangement and design, station producer/director Thom Keith, program coordinator Elizabeth Livingston and technical director Dane Keller handle all station chores. Six Sony monitors are part of the specially-designed console. All taping is done on Sony BV-120U and EV-200 Videocorders.®

"Stars" of the basic programs are residents of the community and members of the administrative staff. Lively ex-actress Hope Sansbury and Director of Community Relations and former songster Harry Babbit are regular features on Channel 6. Programming on a variety of subjects is taped for replay and exchanged with Leisure World's sister CATV station in Walnut Creek, California.

Says producer Keith, "We've designed and specified the equipment here specifically to apply to the situation. All anyone needs to become a TV mogul in a station like this are Sony Videocorders and some Sony monitors...and away you go!"

To find out how you can close the circuit on a CATV installation... and make it a profitable operation...write or call us today.

For complete details on this application, ask for APB 105.

SONY®

RESEARCH MAKES THE DIFFERENCE

SONY CORPORATION OF AMERICA
INDUSTRIAL DIVISION
516 W. Florence Ave., Inglewood, California 90301

Circle 29 on Reader Service Card

BROADCASTERS SPEAK

Sirs:
Mr. Ben Akerman's article on "Economics of Engineering" in your November issue together with Eimac's William McAulay's replies, prompts me to rise to Ben's defense.

Narrowing the field of discussion down to 4-400A versus the 833, my experience confirms all of Ben's claims. The days of cantankerous, short and unexpected life of broadcast tubes began with the 4-400 and have continued up to the 4CX series. In the days of my extreme youth one normally took wanton risks with the "oldies," if the filament was visible through a white hot 212D or 833 plate; one just slacked off a little with no after effects. Today, I feel tensed and ready to drop from the mere thought of an expensive tube failure while adjusting tuning—a failure that no overload is quick enough to prevent.

Even the latter day triode will withstand a little heavy handling from careless tuning or component failure, but the daily loss of positive half-cycle modulation, almost weeks after installation, always breaks my heart. I die a little along with my 3CX friends.

All this for a "saving in design space," aw come on, William, you gotta be kidding.

To those unfortunates with an "all 4-400A" kilowatt, use the Penta 6775 for rf and replace the modulator rack with transformer-driven 833's that modulate the rf screens as well as the plates. To les miserables with tired 5-kW's using one 3CX series, fit a second one in parallel and watch the continued stable carrier conditions. These changes can be approved by the FCC if fully detailed together with a photograph perhaps of your antenna field littered with 4-400A's or 3CX2500's showing the need of such changes.

My happiest daily moments are spent patting the massive sides of three rigs using 892R's some having more than 25,000 hours hardly "a savings in design space," but . . . .

Alan L. Roycroft
Chief Engineer
KORL, KKUA, KIKI, KTRG, KHAI, KLEI, KNDI, KCCN, KUMU, KFOA-FM, KIKU-TV,
Honolulu, Hawaii

Sirs:
I was very interested in your article "Focus On Automation" in the September issue, especially the part concerning nonduplication CATV switches.

I have been in the CATV business since 1952, and now own and operate three small systems in Texas. Being directly associated with designing and engineering of CATV equipment, I have long been interested in automatic nonduplication switching, such as is described by Mr. Levenson.

I have developed a switch which receives and compares the fm component of the TV broadcast signal and switches within two seconds after a difference is noted. This method has proven very satisfactory since no additional equipment is required in the transmitting station.

Anyone interested in obtaining information about one of these units should contact me. . . .

Louis Bone
Cable-Vision
Gatesville, Texas

Sirs:
Could you please tell where I could get the proof-of-performance forms that were illustrated in the May issue of *BM/E*?

The information would be appreciated.

Homer Hubbell
Chief Engineer
KTTS-AM-FM
Springfield, Mo.

It took us a while to find out, H.H., but we understand that they're available from the NAB Engineering Office in Washington.

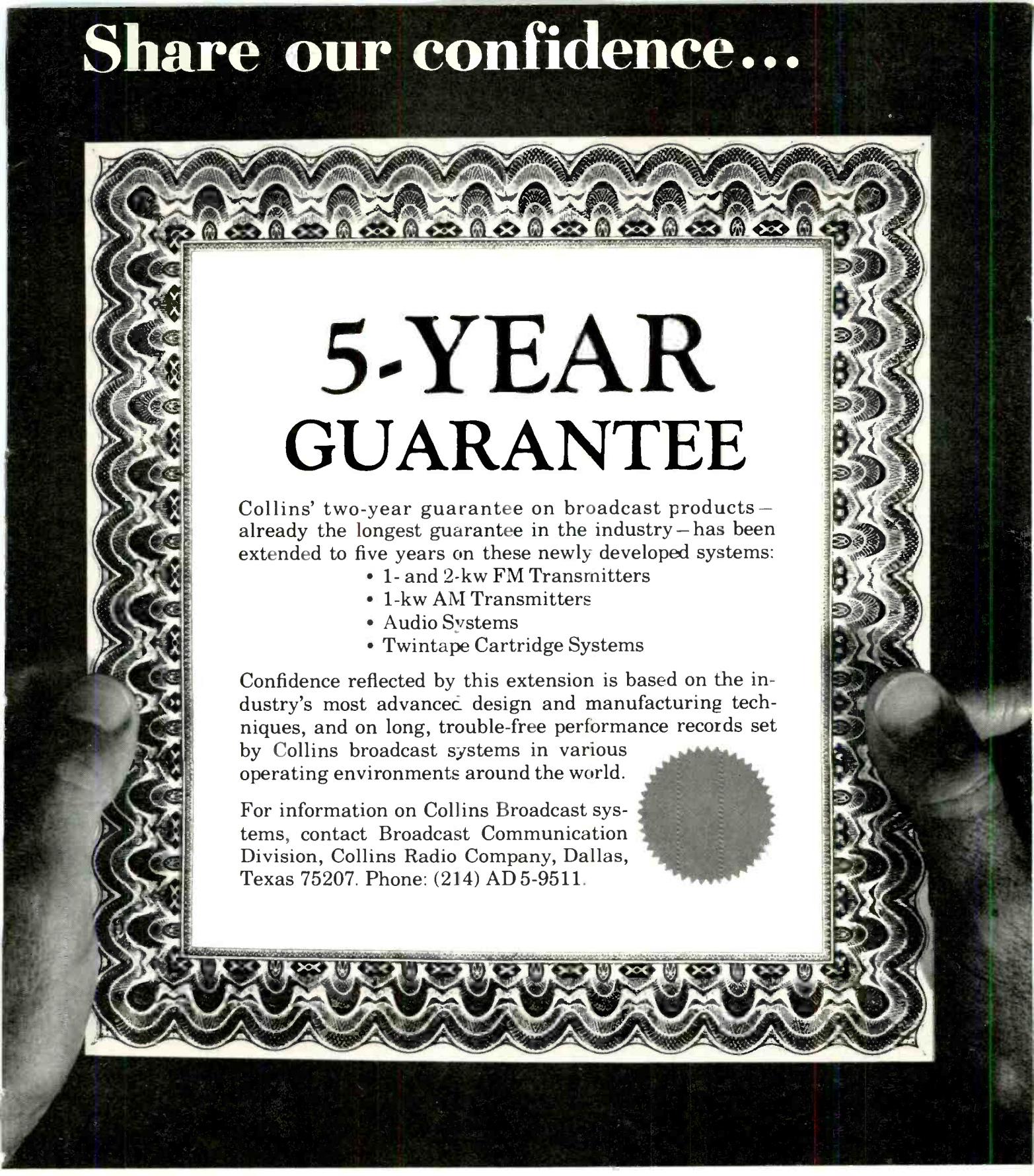
SYMBOL OF CATV QUALITY!

The Ameco "Flying A" stands for advanced products and services used in the most modern cable television systems today.
Quality products through more than 14 years of practical experience and scientific knowledge in CATV. Quality service through years of building cable TV systems to serve tomorrow's customers.
We first introduced solid-state to CATV when others were still tube-type infants.
We built the first all-transistorized system before anyone else even thought of producing solid-state equipment.
And now, we set the CATV pace again with our newest solid-state advancement – the "Channeleer" heterodyne headend!
When you need Quality CATV—think of the Ameco symbol of Quality. It works for you!

ameco
2949 W. Osborn Rd. Phoenix, Ariz. 85017
(602) 262-5500
Circle 31 on Reader Service Card

View Chicago's Loop from Chicago's Lake
LAKE TOWER inn
Lake Shore Drive at Ohio Street
250 delightful rooms offering motel informality and convenience with hotel luxury and services
Free inside parking • Free continuous station wagon service to and from the loop, theatres, shopping • Free TV/radio in every room • Free ice dispensers on every floor • Dining Room • Coffee Shop • Cocktail Lounge • Room Service • Automatic Dial Telephones • Individual room controls for air-conditioning and heating • Meeting and banquet facilities.
Singles from $12. Doubles from $16.
Phone (312) Superior 7-4700
TWX 312-222-0108

Share our confidence...



5-YEAR GUARANTEE

Collins' two-year guarantee on broadcast products—already the longest guarantee in the industry—has been extended to five years on these newly developed systems:

- 1- and 2-kw FM Transmitters
- 1-kw AM Transmitters
- Audio Systems
- Twintape Cartridge Systems

Confidence reflected by this extension is based on the industry's most advanced design and manufacturing techniques, and on long, trouble-free performance records set by Collins broadcast systems in various operating environments around the world.

For information on Collins Broadcast systems, contact Broadcast Communication Division, Collins Radio Company, Dallas, Texas 75207. Phone: (214) AD 5-9511.

COMMUNICATION / COMPUTATION / CONTROL

COLLINS

COLLINS RADIO COMPANY / DALLAS, TEXAS • CEDAR RAPIDS, IOWA • NEWPORT BEACH, CALIFORNIA • TORONTO, ONTARIO
Bangkok • Frankfurt • Hong Kong • Kuala Lumpur • Los Angeles • London • Melbourne • Mexico City • New York • Paris • Rome • Washington • Wellington

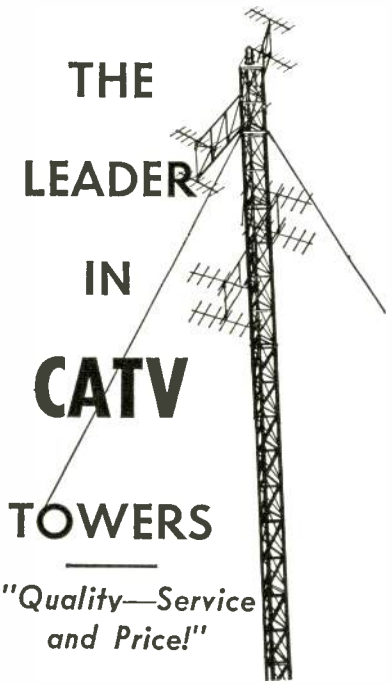
Circle 32 on Reader Service Card

LITERATURE of INTEREST

For additional data, circle No. shown on Reader Service Card.

Loudness analyzer—Model 8051A—is described with application data in "A Powerful New Instrument for Noise Abatement Studies"—an 8-page booklet from Hewlett-Packard. **150**

Telecourses available from The Great Plains National Instructional Television Library are listed in a 112-page catalog now available. **151**



THE LEADER IN CATV TOWERS

"Quality—Service and Price!"

Yes, quality, service and price on CATV systems are the reasons for Forth Worth Tower's position as the industry's leading supplier. Experience gained as a pioneer supplier of CATV enables Fort Worth Tower to provide you with a quality product at a price that is reasonable and attractive.

Take advantage of our experience. For assistance in systems planning, engineering and complete systems quotations . . .

CALL OR WRITE TODAY

Fort Worth Tower

COMPANY, INCORPORATED

P. O. Box 8597, Fort Worth, Texas
(817) JE 6-5676

— Associated Companies —
Tommy Moore, Inc.
Big State Engineering, Inc.
Tower Construction Finance, Inc.

Circle 33 on Reader Service Card

Japanese electronics manufacturers, subsidiaries, their sales representatives and importers, are presented in a comprehensive directory available for $10.00 from Starnetics Co. **152**

Broadcast industrial tubes, image orthicons, vidicons and special purpose tubes are listed in "Industrial Tube Guide," available from authorized GE distributors. **153**

Power and voltage ratios expressed in decibels are tabulated and illustrated on a supplementary graph in "Tech Topics," issue 33 from Ameco. "Business Booster" discusses devoloping local press relations. **154**

Vidicons and special purpose tubes available from General Electrodynamics Corporation are presented with optical and camera equipment in Bulletin QRC-402. **155**

Vswr measuring equipment and a discussion or error analysis and comparision are presented in 8-page booklet from Telonic. **156**

Silicon rectifier tube replacement data is contained in 13-page illustrated booklet from Unitrode Corp. **157**

Fm transmitter (miniature) designed for airborne telemetry applications is described in 4-page brochure from Sonex, Inc. **158**

Telephone cable—aluminum-shielded—suitable for aerial, duct or direct-burial installation, is presented in brochure from Anaconda Wire and Cable. **159**

Rf power measurement equipment, a vswr nomograph and other rf measurement data are presented in 60-page catalog from Bird Electronic Corp. **160**

"How to Make Meetings More Meaningful" is one of seven articles of interest to management-oriented personnel contained in Volume 47/Number 2 of "Trained Men" from International Correspondence Schools. **161**

"IC Op Amp Sparks 20-Watt Audio" is the title of an article appearing in Vol. 5/No. 2 of "Motorola Monitor." **162**

Augmentation of the broadcasting and television network in Bulgaria is among several interesting articles appearing in the 27th edition of "News From Rohde & Schwarz." **163**

Synthetic fiber optics and fiber optic devices is the subject of a 5-page brochure from Poly-Optics, Inc. **164**

"Your Future In The High Fidelity Industry" is the title of a 128-page book available for $4.00 from the Institute of High Fidelity. **165**

Sound intensity analysis and evaluation is the topic of three articles contained in the November/67 issue of "Hewlett-Packard Journal." **166**

Symptoms and remedies of poor VTR performance are presented in Bulletin T160 from Ampex. **167**

Photographic equipment and instrumentation are presented in a 179-page illustrated and indexed catalog from Burke and James. **168**

"Monsanto Electronic Instruments"—an 8-page condensed catalog—describes digital frequency snythesizers, counter/timers, clocks and pulse generators. **169**

Books on all phases of radio-TV-CATV, many unavailable from other sources, fully described and illustrated in 18-page literature package from TAB Books. **170**

Zip codes—over 35,000—are tabulated in 6- × 10-in. booklet. "National Zip Code Directory" is available from Zip Code Publishing Co., Inc., for $1.00 plus 25¢ for postage and handling. **171**

Standard frequency and time services are described in 11-page NBS publication. "Miscellaneous Publication 236, 1967 Edition" gives detailed description of services including standard radio frequencies, standard musical pitch, standard time intervals, time signals, etc. Publication is available from Superintendent of Documents for 15¢. **172**

Variable resistors, trimming potentiometers, resistance networks and precision wire-wound resistors are presented in Short Form Catalog from Reon Resistor Corp. **173**

SPOTMASTER Tape Cartridge Winder

The new Model TP-1A is a rugged, dependable and field tested unit. It is easy to operate and fills a need in every station using cartridge equipment. Will handle *all* reel sizes. High speed winding at 22½" per second. Worn tape in old cartridges is easy to replace. New or old cartridges may be wound to any length. Tape Timer with minute and second calibration optional and extra. Installed on winder or available as accessory. TP-1A is $94.50, with Tape Timer $119.50.

Write or wire for complete details.

Spotmaster

BROADCAST ELECTRONICS, INC.
8800 Brookville Road
Silver Spring, Maryland

Circle 34 on Reader Service Card

No more hard-to-handle, cracking cable jackets when you're installing CATV drop cable in winter's icy blast. Now all Times vinyl drop cable comes clothed in a new covering that features greater resistance to low temperature hardening than conventional PVC.

That means high-flexibility performance no matter how low the thermometer drops. This cable can be easily handled in the cold—and quick, safe, simple terminations are possible in winter, as in any other time of year.

No increase in cost. But a marked increase in installation savings. Write for full details on the new Times cold-weather cable today. Times Wire & Cable, a division of The International Silver Company, 358 Hall Avenue, Wallingford, Conn. Or call (203) 269-3381.

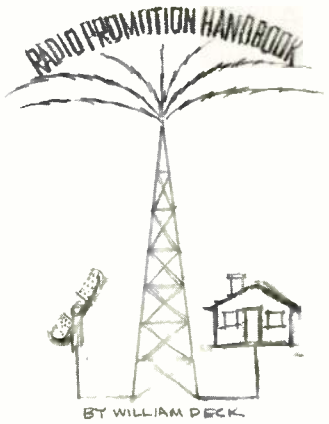
The Cold-Weather Cable

TIMES WIRE & CABLE
DIVISION OF THE INTERNATIONAL SILVER CO.
Wallingford, Connecticut

Circle 35 on Reader Service Card

SAVE $2.00 ON THIS SPECIAL PREPUB OFFER!

A Complete Guide on Ways to Develop Better Ratings, Improve Results, & Increase Sales!



- BRAND NEW
- 256 PAGES
- 14 CHAPTERS
- UP-TO-DATE
- ONLY $7.95

Indispensable For:

- Managers
- Program Directors
- Sales Managers
- Executives
- Disc Jockeys
- Copywriters
- Producers
- Advertising Personnel
- Sportscasters

It's a proven fact! Clever and well-planned promotional campaigns lead to bigger audience ratings and greater sales! This brand-new publication, by noted station promotion authority William Peck, is aimed at helping broadcast stations reap benefits of bigger and better promotional campaigns. Jam-packed with literally hundreds of ideas, and complete with scores of factual examples to spark hot, new ways of promoting a station, "RADIO PROMOTION HANDBOOK" is a book no progressive station should be without. The author, drawing on many years work with a variety of formats and advertising agency experience, tells how to make everything that happens at your station help to PROMOTE your station.

CONTENTS

- CONTESTS IN GENERAL
- "YOU PHONE US" CONTESTS
- "WE'LL PHONE YOU" CONTESTS
- TREASURE HUNTS
- "DROP US A CARD OR LETTER" CONTEST
- NUMBERS GAMES
- STUNTS
- PROGRAMMING AS PROMOTION
- PUBLIC SERVICE AS PROMOTION
- THE NEWS AS PROMOTION
- OFF-AIR PROMOTION
- SALES PROMOTION
- SALES SPARKERS
- COPY IDEA SPARKERS

Both on-air and off-air campaigns are included: How to integrate on-air promotions with programming by means of contests, stunts, games, jokes, promotional announcements, station breaks, etc. Also, how to develop and tie-in off-air campaigns, personal appearances, sales promotionals, public relations, and advertising in other media. Chapter 1 looks into contests in general—what is a good contest and what makes a contest not so good. Chapters 2 through 7 describe specific types of promotions—"You Phone Use," "We'll Phone You" and "Drop Us A Card" contests, numbers games, treasure hunts, and stunts. Chapter 8 treats programming as promotion, tells how to program to attract attention, how to develop a theme, promotional announcements, IDs, etc. Chapters 9 and 10 suggest ways to use public service and news programming to promote your station. Ideas include benefits, recruiting drives, employment opportunities, current news, mobile units, etc. An entire Chapter on off-air promotion tells how to tie-in the off-air theme with the on-air theme, the use of outdoor, transportation, newspaper, and broadcast advertising, mobile studio, direct mail and sponsor tie-ins. The final Chapter includes many sales promotion ideas; sales presentation material, trade-oriented advertising, direct mail, using your own station, "personal" promotion, entertaining, station parties, internal promotion, etc. Ideas to develop specific client sales campaigns and many actual sample copy examples are included in the appendices.

"RADIO PROMOTION HANDBOOK" will be available on Jan. 30th, 1968. Order now at the Special Prepublication Price of only $7.95 (offer good only through Feb. 28th, 1968; regular price is $9.95) . . . at our risk . . . for 10-day FREE examination. SEND NO MONEY! Simply fill in and mail NO RISK coupon below for this indispensable volume! (Note—3 or more copies ordered at one time are subject to a 10% discount.)

PUBLISHER'S GUARANTEE

Put the information in this book to work for you for 10 days. If it doesn't prove to be worth several times its cost, return it and we'll cancel invoice.

NO RISK COUPON—MAIL TODAY

TAB BOOKS, Blue Ridge Summit, Pa. 17214
Please send me.....copies of "RADIO PROMOTION HANDBOOK" at the special prepublication price of only $7.95 (10% discount on 3 or more copies).
I enclose $.....
☐ Please invoice on 10-day FREE trial
Name .....
Company .....
Address .....
City ..... State..... Zip.....
Save postage by remitting with order BR18

Circle 36 on Reader Service Card

BM/E CLASSIFIED MARKETPLACE

CLASSIFIED ADVERTISING RATES

SITUATIONS WANTED: 15¢ per word; $2.00 minimum
HELP WANTED: 20¢ per word; $2.00 minimum.
ALL OTHER ADVERTISING: 25¢ per word; $3.00 minimum.
BLIND BOX NUMBERS: No extra charge. Send replies to address below.

DISPLAY CLASSIFIED ADVERTISING: $21.50 per inch 1x; $20.00 per inch 6x; $18.50 per inch 12x. Professional Cards $15.00 12x.
CASH DISCOUNT: 2% cash discount if remittance accompanies order.
CLOSING DATE: 5th of the second month preceding issue date.

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

BUSINESS OPPORTUNITIES

Growing CATV system for sale or lease-Southern Kentucky. Excellent return on investment. Reason for selling, relocation of owner. Box 168-1, c/o BM/E, Blue Ridge Summit, Pa. 17214.

POSITIONS WANTED

DEEJAY-NEWSMAN

Can you use a guy who lives radio 24 hours a day? Mature. Single. MOR. Third phone. Able writer.

Sal Raguso
128 Moulson St., Rochester, N.Y.

Attention top 40 stations looking for DJ with class but not a prima donna. I'm looking for a solid management station (prefer midwest) who just isn't interested in being number 2. Want a good place to raise my family. Experience includes former combo man, DJ/announcer/ engineer/newscaster, and studio engineer for Chicago's number 1 top 40 station. Production minded, dependable, looking for opportunity for advancement, and pro trained. Let me know about you and I'll see you get all the necessary information. Box 168-2, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Top notch station manager with strong sales background looking for real challenge with good potential. Eager to tackle tough situation on a salary-percentage basis. Have sure fire formula of proper programming, energetic sales effort, and enthusiastic community involvement that can't miss. Will not rule out small to medium market. Excellent background and references. Your station giving you a headache? Relief is just a phone call or letter way. Call (301) 733-7656 or write Box 583, Hagerstown, Maryland 21740.

Station ailing, or station doing well but can do better? Or do you simply need a good management personnel? Professionalism and humanity are the keys. This 38-year-old professional has the sense, experience, ability, control, and solidity to do the job, right, and permanently. Don't expect fancy presentation or useless correspondence. Write Box 168-32, c/o BM/E, Blue Ridge Summit, Pa. 17214, then expect my call and personal visit, expenses shared.

Creative Producer-Director, writer, supervisor manager, TV-Radio, film, P. R. outstanding record, agency, major network affiliate, University ETV, International Education, experience. Seeks real challenge, stable opportunity which will reward loyal, imaginative hard work and ability. Presently employed. Will consider any location or overseas. Box 168-19, c/o BM/E, Blue Ridge Summit, Pa. 17214.

General Manager: currently general sales manager excellent property one of the top three markets. Desire General Management (full responsibility) large market, Aggressive, responsible creative & top salesman. Organizer. 40, with family, A-1 character. 18 years radio. Rounded background. Box 168-20, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Versatile announcer desires position with quality progressive station. Eight years experience. Currently morning man producer of industrial show for World-Wide Corporation and member of sports staff. Married, college graduate. Box 168-3, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Young ambitious college student seeking weekend position as rock and roll DJ in Connecticut, New Jersey, or New York surburban area. Limited experience, but have swinging style. Jerry Shannon, 111-17 66th Avenue, Forest Hills, New York 11375.

Southeast—Sales manager with announcing and play-by-play experience seeking future management, ownership opportunity. Prefer small market sportsminded station, 33, family, excellent character, college graduate. Box 168-34, c/o BM/E, Blue Ridge Summit, Pa. 17214.

POSITION WANTED (cont'd.)

Broadcast engineer with control room, Special events, remotes and motion picture projection, recording total of 20 years' experience. What have you got to offer me? Box 168-21, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Negro announcer, authoritative newscaster, family man, tight board, non floater, non prima donna. Graduate of New York broadcasting school. Have third class ticket. Box 168-22, c/o BM/E, Blue Ridge Summit, Pa. 17214.

BEGINNER: No experience. Seeks start in radio. Experience in newspaper. Married, some college, no draft problem. Call collect Timothy Benford, 201-436-6786 or write 779 Avenue A, Bayonne, New Jersey 07002.

TV News Director—Currently employed in major Calif. market. Young, aggressive, proven administrative ability. Journalism degree. No air work. Will relocate. Box 168-4, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Financial adminstration group, station, production. Heavy profit planning, cost control, systems, and labor relations. Prefer group or major market. Box 168-5, c/o BM/E, Blue Ridge Summit, Pa. 17214.

DJ-announcer seeking summer job. Student, currently employed. 2½ years experience AM, FM-stereo. 1st phone. Can work any format. Ambitious, references. Box 168-7, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Young, dynamic PD, MD, DJ. Top production, first phone. Modern C&W, Top-40, contemporary MOR. Want to settle mid or far West. Available now! Box 168-6, c/o BM/E, Blue Ridge Summit, Pa. 17214.

A well trained announcer seeking position in radio or nightclub MC, NY or Conn. area. Box 168-23, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Negro D.J. announcer newscaster top 40 MOR, recent grad, family man, 3rd endorsed. Box 168-24, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Seeking radio/TV technician work N.Y., N.J., Conn. First phone. UHF/TV experience. Three years college. Draft exempt. Box 168-33, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Newscaster-analyst: mature, writer; full-time or part time, day or evening. NJ-NY-Phila., area. Box 168-37, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Announcer, newscaster, bright personality and crisp delivery. Family man, willing to settle, run a tight board. Box 168-9, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Major market announcer-Newsman desires position in New York City or surrounding area. Will be in area soon for auditions and interviews. Box 168-8, c/o BM/E, Blue Ridge Summit, Pa. 17214.

No. 1 rated afternoon drive-man looking for move to nice size medium to large market. Top 40 only. Box 168-11, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Soul jock—3rd endorsed, tight board. Draft exempted. College training, relocate. Box 168-25, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Negro DJ announcer, 3rd endorsed. School graduate. Family man relocate. Box 168-35, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Hot 100 format personality ready for larger market. Production and promotion minded. Box 168-36, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Kovacs-type TV personality/writer. Brilliant. Funny. Reasonable. Box 168-10, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Negro DJ/announcer. Tight board. Middle of road or jazz format. 3rd phone. Will relocate. William McRae, 522 W. 136th St., N.Y.C.

HELP WANTED

ENGINEERS—TV—Sunny California. Discover job security, and a new way of life in California. Have top openings for qualified Maintenance Engineers, especially Video Tape and Live Color Video. Send resume or letter to The AMPS Agency—3924 Wilshire Boulevard, Los Angeles, California 90005. 388-3116
By Broadcasters — for Broadcasters

HELP WANTED (cont'd.)

Combo engineer announcer for an AM FM station in South Florida market of 50,000. Good pay ($135-$150 weekly). Good benefits. Best climate. Modern equipment to work with. Engineering background necessary, some announcing required. Send resume and audition tape to Box 168-27, c/o BM/E, Blue Ridge Summit, Pa. 17214.

"Wanted—1st class engineer-announcer, Radio Station WNKY, Box 248, Neon, Ky.

W-A-N-T-E-D

BY LARGE EXPANDING CATV MULTIPLE OWNER

REGIONAL MANAGERS

SYSTEMS MANAGERS

TECHNICIANS

INSTALLERS

SEND RESUME AND SALARY REQUIREMENTS

IN CONFIDENCE TO

Box 168-12, c/o BM/E
Blue Ridge Summit, Pa. 17214

First Class Engineer for TV-Radio operation in medium size North Central market. Will train new man. Ability and attitude more important than experience. Latest RCA equipment. Good salary and fringe benefits. Please send resume and photograph to Box 168-13, c/o BM/E, Blue Ridge Summit, Pa. 17214.

1st class FCC license engineers. Prefer experienced man, strong on MCR operations, switching, VTR, and projection. Good salary and benefits. Reply Kaiser Broadcasting Corp., WKBD-TV, Box 359, Southfield, (Detroit) Michigan, 48075. Attention Al Martin, Chief Engineer. Equal opportunity employer.

Full color station needs engineer with experience and knowledge of RCA tape machine—RCA color camera—also need experienced microwave maintenance engineer first phone requirement—send details to J. W. Robertson, Vice President-Engineering, P.O. Box 1457, Lexington, Kentucky.

IMMEDIATE OPENINGS — Qualify for any of the following positions: Technicians for RCA closed Circuit Television equipment — Camera men — Maintenance men — Video Tape Men — Video Engineers. RCA Rep. 143-08 94th Ave., Jamaica, New York, or (212) 297-3344.

Looking for experience. Live color, color VTR, and color film with new modern equipment. WREX-TV, Rockford, Ill. has an opening for a first class engineer. TV experience desirable but not necessary. Contact Chief Engineer WREX-TV.

WANTED—First Phone licensed engineer to work in South. Must have four to five years experience in TV broadcasting as studio maintenance engineer. Send resume with salary requirements to Box 168-14, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Chief engineer, excellent opportunity for another Chief Engineer for the Goldman Group, Excellent working conditions. Send resume and pertinent information to: Si Goldman, Goldman Group, P.O. Box 1139, Jamestown, New York 14701.

Immediate engineering opening in top AM-FM, Atlanta. Send resume and availability to Technical Director, WQXI, Atlanta, Georgia. List phone and maintenance experience. No board work.

HELP WANTED (cont'd.)

Needed immediately — Experienced announcer with first phone. 5000 watt NBC affiliate with MOR adult format. Good pay and fringe benefits. Contact Larry Collins, WBCK, Battle Creek, Mich. 49015.

First Class engineers, maintenance background, no board work. Immediate openings. Excellent growth opportunity with independent group. Rush reply by letter to C. Dingmen, WCTC, 385 George St., New Brunswick, N.J.

If you have a First Class license, experience and ability, and are worth $150 per week to start, a well-run east coast station would like to hear from you. Box 168-28, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Needed-Experienced combination salesman & announcer. Good future, security, living conditions, hours & pay. Excellent recreation. Southeastern location. Box 168-29, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Immediate opening for engineer-first phone Television Station, operation—no announcing. Location—Northern Lower Michigan. Box 168-26, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Wanted! Broadcast technicians to enter aircraft electronics. Numerous jobs everywhere. Write: Avionics, Reno/Stead Airport, Reno, Nevada 89506.

Immediate opening for Chief Engineer. Experienced only, Salary open. Many fringe benefits. Call or write, Manager, WITY, Danville, Illinois.

"N.M. CATV group desires producer-salesman-announcer; double commissions: "505-437-7258." Box 168-30, c/o BM/E, Blue Ridge Summit, Pa. 17214.

WCOD FM on Cape Cod wants "take over" manager. Must have strong sales background. Write Room 804, 59 Temple Place, Boston, Mass. 02116.

Chief engineer: Heavy maintenance airwork if desired—M.O.R.—good pay and working conditions—WWHG-AM-FM Hornell, New York, Phone 1-607-324-2000.

Large New England radio and television operation has openings for qualified engineers with first class license. Box 168-16, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Facility expansion has created openings for two first phone operating engineers. Contact Chief engineer WICD, Television, Inman Hotel, Champaign, Illinois. Phone Area 217-352-7673.

WANTED—Experienced CATV technician to work in South. Send resume with salary requirements to Box 168-15, c/o BM/E, Blue Ridge Summit, Pa. 17214.

First phone announcer for MOR network affiliate on beautiful Ohio River. Salary open. Send resume, photo and tape to WORX, Madison, Indiana, 47250.

Massachusetts 1 kw station has opening for chief engineer. No announcing. Take full charge of technical operations. Contact manager, WALE, Fall River, Mass. 1-617-674-3535.

Announcer with first ticket. Job open in southern California on MOR operation. Box 168-31, c/o BM/E, Blue Ridge Summit, Pa. 17214.

EQUIPMENT FOR SALE

All types of Electron Tubes for Communications

LEWISPAUL ELECTRONICS

303 W. Crescent, Allendale, N.J. 07401

(201) 327-7200

Andrew 8-bay Multi-V antenna, 103.7 but will tune any frequency, $1,500. 15 20-foot sections Andrew rigid 3⅛ coax, Steatite insulators, cleaned, $60 section or $775 for 15. 10% discount above if bought together. Bendix Station Guardian Model SG33-46 like new $95. Directional coupler for above, Model 44259, handle 20kw, like new $140. Concertone Model 20/20, 7½-15, good condition $175. Ken Freeman, CE, WBBQ, Box 1443, Augusta, Ga. 30903. 803-824-5441.

EQUIPMENT FOR SALE (cont'd.)

Spotmaster cartridge equipment and accessories, Crown tape recorders, QRK, REK-O-KUT, RUSSCO (turn-tables and preamplifiers) Gray and Euphonics tonearms, Metron modulation monitors, Universal audio products, Pultec, Norelco-AKG microphones, Fidelipac and Audiopak cartridges. Write for special money saving offers. Audiovox, Box 7067-55, Miami, Fla. 33155.

EQUIPMENT, Audio, Broadcast, Video, Bought-Sold-Traded through our national listing. Contact: The Maze Corporation, Box 6636, Birmingham, Alabama 35210.

EQUIPMENT TELEVISION

New-Demo Close Outs

TELEVISION CAMERA SYNCHRONIZING SYSTEM

MTI S-501 synchronizing generator with BNC connector—provides EIA timing pulse . . . MTI Ortho III camera with Orthicon tube, f3.5 165mm Carl Meyer lens, f5.6 14" Carl Meyer lens, f1.8 50mm Angenieux and multi-extension tubes . . . MTI Ortho III remote camera control unit . . . Iris control Ortho III (industrial TV). List Price $15,984. SALE $9,931.

MTI S-501R synchronizing generator with UHF connector . . . MTI VC 6 vidicon camera with audio (no lenses) . . . MTI VC-6 remote camera control unit S/N 600 with audio modifications. List Price $6,240. SALE $3,204.

TELEVISION CAMERA

GE TE-9 camera (without lenses)—available—extra . . . GE Pan & Tilt TE9A . . . GE electric pan & tilt control (without base). List Price $5,575. SALE $2,990.

POWER TRANSFORMER

PX-68A GE power transformer. List Price $90. SALE $50.

VIDEOTAPE RECORDER

Ampex 660-B Videotape Recorder with Edicon. List Price $8,000. SALE $6,500.

TELEVISION PROJECTOR

TeleBeam Model A912B. List Price $2,820. SALE $1,527.

TELEVISION MONITORS

Sony Monitor. List Price $215. SALE $115.

GE 17" Monitor (vacuum tube). List Price $240 SALE $149.

GE 21" Monitor. List Price $270. SALE $199.

Conrac 17" Monitor. List Price $350. SALE $188.

MTI 17" SL monitor (vacuum tube). List Price $345. SALE $150.

TELEVISION SWITCHER

Dynair US-6A 6 position. List Price $110. SALE $59.

TRIPODS

Hercules tripod with 5202 pan head. List Price $125. SALE $75.

Hercules Dolly. List Price $86. SALE $60.

Samson tripod model BI head. List Price $150. SALE $58.

TELEVISION ACCESSORIES

4PX65B1 junction box . . . PX67-A cable assembly control. List Price $260. SALE $125.

PHONE OR WRITE

WATLAND INCORPORATED

7724 South Claremount Avenue

Chicago, Illinois 60620

Area Code 312/778-4400

AMPEX authorized Sales and Service. New and used equipment for sale. 48 hour service on most repair including head rebuilding. Other professional equipment also available. ACCURATE SOUND COMPANY, 15 N. Tyler, San Angelo, Texas AC 915 949-1904.

EQUIPMENT FOR SALE (cont'd.)

Largest supply of G.E. & Motorola radio and mobile telephone equip. in the U.S. (30-50), (150-174), (450-470), Base, repeater, and dial equip. Dealers invited. Western Mobile Telephone Company, 200 South Anaheim Blvd. Anaheim, Calif. (714) 774-0520.

APT Satellite pictures. Late model Facsimile Receivers, copy direct, or tape record and playback. Ready to go! Lowest price anywhere. Call Ray Newsome person-to-person (313-676-7460) or write Newsome Electronics, Dept. BC, 2670 Pinetree, Trenton, Mich. 48183.

TUBES—Complete Stock From #10 to #89, 1AB5 to 38022, OC3 to 117z6, and most of the rest. List free. Harold Goldman, 43 Clinton Ave., Rockville Centre, N.Y. 11570—Phone 516-536-6697.

Ampex 300, 350, 352, 400, 450 users, for greater S/N ratio, replace first playback stage 12SJ7 with our plug-in transistor preamp. For specifications write VIF INTERNATIONAL, PO Box 1555, Mtn. View, Ca. 94040.

Brand new remote amplifiers, 2 channel remote microphone amplifiers, 2½ inch VU, battery operated, 7 transistors $95.00 FOB Kokomo. **Gredco, Inc.,** 1830 S. Webster, Kokomo, Ind. 46901. Area 317-883-5688.

Browning model BR-3A-67 and BT-3A-67 Background Music SCA receivers—67kc. Some require service. As is $35.00 each—House of Sound, 714—2nd Avenue, South Minneapolis, Minn. 55402.

Ampex AG-350-2 Recorders. Unmounted, condition like new. 3-position head machine, $1,850. 4-position head machine, $1,900. J. M. Edelman, M.D., 4550 North Blvd. Baton Rouge, La. 70806. Phone 504-924-6266.

RCA TT-5A, CHANNEL 5 transmitter with sideband filter, WM-12, WM-13 Visual Modulation Converters and Power Supply. No control console. R. E. Oldfield, Southern Colorado State College, Pueblo, Colorado 81005.

Complete equipment 1-KW FM Station. 95.9 MC. 10 months old. Gates, Jampro, McMartin, QRK, Tapecaster, Bauer Xmtr. remote. Priced to move. Write for list. KFRW-FM, Box 2073, Quincy, Calif. 95971.

For Sale: Ampex 601-2. Completely restored to new condition. New heads and motor, $600.00. Glenn L. Allen, 5 South Street, Plymouth, Connecticut 06782.

FOR SALE—At clearance prices. Ampex VR-1000 A & B component units. Perfect condition. Write for list. Chief Engineer, WRVA-TV, P.O. Box 2370, Richmond, Virginia 23218.

CARTS, CARTS, CARTS, CARTS, CARTS. LIK-NU Cart Corp. re-builds your cart tapes lik-nu. New pads, tape for as low as 90¢ for 70 sec. 5-day service. Box 2608, Fort Wayne, Ind.

Whatever your equipment needs . . . check first with Broadcast Equipment and Supply Co., P.O. Box 359, Mountain City, Tenn. 31683

AMPEX PR 10 TWO TRACK STEREO RECORDER-PORTABLE, LIKE NEW $650. Box 168-17, c/o BM/E, Blue Ridge Summit, Pa. 17214.

AMPEX 354-U stereo tape recorder, mint condition, $1250.00. Graves Recording Service, P.O. Box 1416, Eugene, Oregon, 97405.

For sale—McMartin FM monitor TRM 3500 like new. 11 months old. Make offer. Tom Talbot WJJL. Niagara Falls, N.Y.

CONSOLE MOUNT CABINET FOR AMPEX 350 SERIES—COMPLETE—LIKE NEW—BEST OFFER—P.O. BOX 8325, WEST PALM BEACH, FLA.

Towers, broadcast, microwave, CATV, TV, new and used, phone 224-9922 Tower Maintenance, Inc., 2408 Old St. Rd., Tallahassee, Fla.

New Gates producer used 100 hours, no modifications. Best offer over $400. Box 965, Fremont, Nebraska. 721-1176, Mr. Nelson.

Protect your records. Send for our free Lp supply lists. Record Supplies, Hillburn, N.Y. 10931.

GOVERNMENT Surplus Electronic catalog — 25¢. Meshna, Nahant, Mass. 01908.

New & Used tower ground wire available. Bill Angle, Box 55, Greenville, N. C. Tel. 752-3040.

MISCELLANEOUS FOR SALE

SALE ON ELECTRONICS BOOKS! 5 for $3.98! Guaranteed retail value of $16.50! Grab Bag of 5 electronics books on testing, test equipment, TV, radio, hi-fi, stereo, etc. Clearance of books which sell for as high as $4.50 each. Send check or money order to: Grab Bag, Dept. BO7, Box 304, Emmitsburg, Md. 21787.

SIGNS, NAMEPLATES, LABELS, Decals, Badges, Trophies, Plaques. Seton Corp., Dept. BM/E. New Haven, Conn. 06505.

Professional Electronics Projects — $1 up. Catalog 25¢. PARKS, Box 15265, Seattle, Wash. 98115.

Japanese electronics catalog, $1.00. Dec, 10639A Riverside Drive. North Hollywood, California 91602.

Helpful Books that Belong in Every Station Library — Now Available for 10-day FREE Trial

RADIO
TV
CATV
COMMUNICATIONS

TAB BOOKS
THURMONT, MARYLAND

FREE

NEW CATALOG REVIEWS OVER 100 BOOKS OF DIRECT INTEREST TO YOU!

To obtain a copy, simply fill in coupon below or Circle No. 47 on Readers' Service Card.

TAB BOOKS, Blue Ridge Summit, Pa. 17214

Please send me ..... copies of your NEW FREE Catalog reviewing over 100 Books.

Name .....

Company .....

City .....

State ..... Zip.....

B18

Circle 37 on Reader Service Card

MISCELLANEOUS FOR SALE (cont'd.)

FREE DISCOUNT PRINTING CATALOG. WAGNER COMPANY, 6200BM WHITEWOOD. LIBRARY, PENNA. 15129.

EQUIPMENT WANTED

Wanted to buy. Used 1 KW FM transmitter (preferably with 3-power antenna system) or used 3KW FM transmitter. Box 168-18, c/o BM/E, Blue Ridge Summit, Pa. 17214.

Wanted: Lampkin Frequency Meter, Type 105B either alone or with model 111 crystal calibrator. In good condition, complete with manual and charts. Box 168-38, c/o BM/E, Blue Ridge Summit, Pa. 17214.

we pay
CASH for TUBES

Lewispaul Electronics, Inc.
303 West Crescent Avenue
Allendale, New Jersey 07401

PROGRAMS WANTED

Wanted. Harmony Isle 15 minute transcriptions. (Macgregor?) 2889 21st Street, San Pablo, Calif. 94806.

TECHNICAL SERVICES

AMPEX HEAD ASSEMBLY relapping and replacement head service for all AMPEX professional studio model recorders. Our precision relapping extends head life for maximum use. Brand new shelf stock replacement heads of our manufacture available when relapping not advisable. Prices include thorough assembly cleaning, optical and electrical inspection and complete testing on Ampex equipment. Monaural assembly relapping . . . $35.00 complete. Monaural assembly replacements . . . $119.50 complete. "Loaner" assemblies available. For more data, contact LIPPS, Inc., 1630 Euclid St., Santa Monica, Calif. 90404 (213) EX 3-0449.

CAMBRIDGE CRYSTALS
PRECISION FREQUENCY
MEASURING SERVICE
SPECIALISTS FOR AM-FM-TV
445 Concord Ave. Phone 876-2810
Cambridge, Mass. 02138

VIDEO TAPE RECORDER
AUDIO HEAD ASSEMBLY SERVICE
Precision relapping of all heads and supporting posts, includes cleaning and testing. AMPEX VTR audio assembly . . . $75.00 complete. Brand new shelf stock replacement heads of our manufacture available when relapping not advisable. RCA units also serviced. LIPPS, Inc., 1630 Euclid St., Santa Monica, Calif. 90404 (213) EX 3-0449.

Radio Program log analysis service. Too many commercials? Too little public affairs? Find out before renewal time. Broadcasters will analyze your composite week program logs; compute all FCC-Required figures for interim check or renewal application. Costs less than doing it yourself. Broacasters Workshop, Box 99, Blawenburg, N.J. 08504.

BROADCAST EQUIPMENT REBUILDERS has moved! Our new address is P.O. Box 276, Hickory, N.C. 28601. B-E-R still offers the same professional service on cartridge rewinding, and all work is fully guaranteed. Write Quin Morrison about your used equipment needs.

TALL TOWERS, Guyed, Self-supporting, Inspections—Registered Engineer, Antenna, Tower repairs and painting. Globe Industrial Contractors, Inc., Henderson, Ky. AC 502-827-1831.

Broadcast maintenance — five inspections $30.00 week plus hourly. Mailtronics, 109 Pinetree Drive, Woodbridge, Va.

PROGRAM SERVICES

"DEEJAY MANUAL" is a folio of Gags, Ideas, Breaks, Gimmix, Fun for the working deejay. Special $3.00 with this ad. Write for free "Broadcast Comedy" catalog. Show-Biz Comedy Service (Dept. E) 1735 E 26 St., Brooklyn, New York 11229.

Background Music Service
For
FM Multiplex-Wire Line-
CATV Systems
Magne-Tronics, Inc.
21 East 40th Street, New York, N.Y. 10016

Deejays! 6000 classified gag lines, $5.00! Comedy catalog free. E. Orrin, Box 679 Boyer Road, Mariposa, Calif. 95338.

Deejays! Monthly gag service exclusive for jocks. "Hollywood Gag Digest" 711 No. Cherokee, Hollywood, Calif. 90038.

CARTOON SPECIAL
New lab prints free with each order
Contact the CATV program specialists
American Diversified Services
Box 975. Kingsport, Tennessee 37662
Phone area 615 239-9301

INSTRUCTION

R.E.I.'s famous (5) week course for the First Class Radio Telephone License is the shortest, most effective course in the nation. Over 98% of R.E.I. graduates pass F.C.C. exams for 1st class license. Total tuition $350.00. Job placement free. Write for brochure Radio Engineering Institute of Electronics, 1336 Main Street, Sarasota, Florida—or 3123 Gillham Road, Kansas City, Missouri—or 809 Caroline Street, Fredericksburg, Virginia.

FCC License in six weeks from the nation's largest license school. Compare reputations and success rates before you invest. Professional announcing training on the nation's only fully school-operated commercial station used solely for training. School locations in Dallas, Atlanta, Chicago, New Orleans and Minneapolis. Write Elkins Institute, 2603 Inwood Road, Dallas, Texas 75235.

FCC License preparation by correspondence. Also, associate degree in electronics by three semesters in correspondence and two semesters in resident classes. Free details on either course. Write: Grantham Desk 7-B, 1505 N. Western Avenue, Hollywood, Calif. 90027.

F.C.C. First phone quickly and easily via new concept in correspondence training. Easy terms. Mid-America Broadcasting Service, P.O. Box 7522, Milwaukee, Wisconsin 53222.

CONSULTANTS

VIR JAMES
CONSULTING RADIO ENGINEERS
Applications and Field Engineering
345 Colorado Blvd.
Phone: (Area Code 303) 333-5562
DENVER, COLORADO 80206
Member AFCCE
TWX 910 931/0514

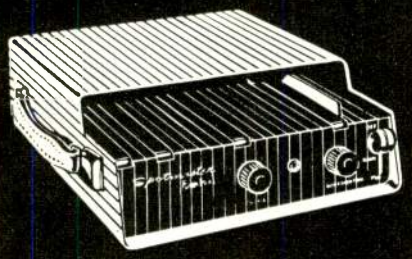
ROSNER TELEVISION SYSTEMS

ENGINEERS	CONTRACTORS
120 E. 56 St.	230 Newtown Rd.
New York	Plainview
N. Y. 10022	N. Y. 11803

JANSKY & BAILEY
(Jansky & Bailey Broadcast-Television Department—Atlantic Research Corporation)
Consulting Engineers
1812 K St., N.W.
Wash., D. C. 20006 296-6400
Member AFCCE

M. RETTINGER, Consultant on Acoustics, Analysis, Room Design, Noise Reduction. 5007 Haskell Ave., Encino, Calif. Tel: (213) 784-3985.

SPOTMASTER



PortaPak I Cartridge Playback Unit

Your time salesmen will wonder how they ever got along without it! Completely self-contained and self-powered, PortaPak I offers wide-range response, low distortion, plays all sized cartridges anywhere and anytime. It's solid state for rugged dependability and low battery drain, and recharges overnight from standard 115v ac line. Packaged in handsome stainless steel with a hinged lid for easy maintenance, PortaPak I weighs just 11½ lbs. Vinyl carrying case optional.

Write or wire for full information.

Spotmaster

BROADCAST ELECTRONICS, INC.
8800 Brookville Road
Silver Spring, Maryland

Circle 38 on Reader Service Card

ADVERTISING SALES OFFICES

NEW YORK
820 Second Avenue
New York, New York 212-661-0450

New York City & Upper New York
William H. Baldwin

Long Island & Westchester
F. F. "Pete" McAdams

New Jersey
Richard M. Millar

Southeastern States
Charles C. Lenz, Jr.

NEW ENGLAND
41 Stevens Lane
Cohasset, Massachusetts 617-383-0029
Donald B. Kennedy

MIDWEST
612 North Michigan Avenue
Chicago, Illinois 312-642-3774
Charles E. Moodhe
Richard W. Moore

WEST COAST
1245 East Walnut Street
Pasadena, California 213-795-1528
(Los Angeles) 213-684-0590
Lawrence C. Papp
Thomas Boris
Jules E. Thompson Co.
1111 Hearst Building 415-362-8547
San Francisco, California
William Healey

JAPAN
Nippon Keisoku Inc.
P.O. Box 410
Central Tokyo, Japan
Yoshi Yamamoto

BM/E

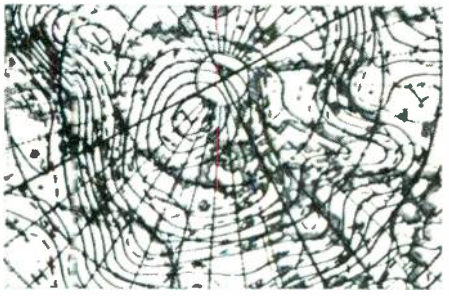
ADVERTISERS INDEX

*See ad also in
BROADCAST EQUIPMENT
BUYERS GUIDE

Dramatize TV weather

Alden facsimile weather data recorders reproduce pictures direct from satellites . . . all broadcast weather charts and data . . . vividly — permanently — economically.

APT- Satellite cloud pictures from ESSA, NIMBUS, ATS enlarged to 10" x 10" for easier interpretation . . . using one of Alden's complete tracking/receiving systems or via land line from another system.



Weather Charts via radio from United States and international broadcasts.

Weather Charts via land line from U.S. Weather Copy Bureau in handy filing size (8½" x 11").

PLUS . . . remote hard copy reproduction of any weather radar scope presentation via slow scan TV over ordinary telephone lines.

Alden facsimile recorders are rugged and reliable — excellent for land or marine environment. Several models are available to suit space, application, and radio environment including Weather Bureau/Navy/Air Force standard units. If you already have an Alden 18 Weather Chart recorder, consider the Alden 11 Tactical Recorder for back-up . . . adding a second network . . . getting APT pictures. Several operating modes, all using Alfax paper for unlimited storage, tone shade response, permanent printing — and the color gives outstanding results on Television!

Purchase a recorder and build your own system or purchase a complete system from

ALDEN
ELECTRONIC AND IMPULSE RECORDING EQUIPMENT CO., INC.
Washington Street, Westboro, Massachusetts
Tel: (617) 366-4467

(Dept. BB-1)

☐ Send information on the Alden 11 Tactical Recorder and complete Satellite Picture Receiving Systems.

☐ Call me at once. My telephone number _____

NAME _____

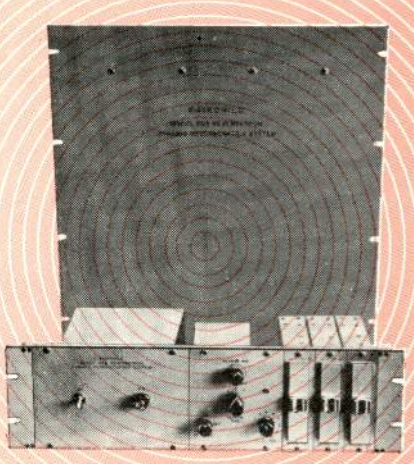
COMPANY _____

ADDRESS _____

_____

Circle 39 on Reader Service Card

REVERBERATION UNLIMITED!



only with

FAIRCHILD REVERBERTRONS

Now with the FAIRCHILD REVERBERTRON you can reproduce the thrilling reverberated sounds of the Grand Canyon or the colorful reverberation qualities inherent only in good acoustical chambers. In addition, because reverberated sound is apparently louder than the same non-reverberated signal, by utilizing the FAIRCHILD REVERBERTON in motion picture, radio and television studios you can create realistic sound effects and attention holding commercials.

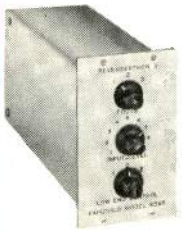
No longer do you need expensive reverberation chambers or special "on location" recordings. The FAIRCHILD REVERBERTRON costs less than you imagine and is available in economy model too.

The advantages of a FAIRCHILD REVERBERTRON in your studio are virtually unlimited for creating wide audience appeal and impact and literally hundreds of "ear appealing" sounds.

The next time you want to "glue" your audience's ears to the sound you're making be sure to use a FAIRCHILD REVERBERTRON!

SPECIFICATIONS OF MODEL 658A (Pictured above)

The 658A is a complete solid state reverberation system with electronically controlled reverb time adjustments up to 5 seconds; mixing control for adjustment of reverberated to non-reverberated signal ratios; reverb equalization at 2, 3, and 5 KHZ. Size: 24½ x 19".



ECONOMY MODEL 658B ALSO AVAILABLE

Compact, reverberation system for the 'big' sound in a small space. Contains reverb equalization in mid and low frequency range; level control; sold state design. Size: Only 5¼ x 3 x 10" deep.

Write to FAIRCHILD – the pacemaker in professional audio products – for complete details

FAIRCHILD
RECORDING EQUIPMENT CORPORATION
10-40 45th Ave., Long Island City 1, N. Y.

Circle 40 on Reader Service Card

FROM THE EDITOR

Come Let Us Reason Together

At one time or another in the past we have expressed disappointment that broadcasters and cable operators seemed so willing to go to court rather than trying to establish satisfactory working relationships amongst themselves.

The ad hoc committee on copyrights headed by broadcaster George C. Hatch and Alfred R. Stern is a fine example of a group with varying interests getting together to define issues and to point the way to areas of negotiation. Their ten-point agreement and two points of disagreement statement* renews our faith that men can work cooperatively and need not always quickly run to some ultimate authority for ruling making.

The tone set by the Hatch-Stern committee which is hopeful of solutions is far better than the more rigid positions taken in the past by NCTA, the NAB Future of Television Committee and, more recently, ACTS (All Channel Television Society).

The belligerent and hostile acts of ACTS are cause for dismay. They would like to see a long deep freeze of CATV, if not its death. But the fight of these desperate men is what happens when the referee seems unable to keep the contest fair. Too many CATV operators are hitting below the belt of nonduplication protection. As a consequence, struggling U's find their market being diluted by indiscriminate practices. ACTS is also unhappy about unrestricted CATV competition in smaller markets outside the top 100.

On the other hand, there are cable operators who feel they are being discriminated against when they are ordered to carry so called priority signals that they can't receive.

As a consequence, both sides think they are victims of injustice and every man fights for himself, breaking rules as he sees fit. Little wonder that the CATV Task Force can't referee the situation.

Predicted grade B contours are the messy point here, and it's time a standard method of measuring the actual contour be adopted.

We are encouraged to hear of Commissioner Bartley's plan to break the log jam (220 requests) existing for waiver for distant signal importation rules. We'd like to see an ad hoc committee of broadcasters and cable operators tackle these issues of carriage and distant signals.

The public interest demands, we believe, free TV, the right to pay or be taxed for additional programming and local expression outlets in every community (as envisioned by the FCC in 1952). A system must evolve which permits these plurality of values.

It's the time of the year when we can re-embrace the idea: Come let us reason together. Let's hope 1968 is such a year.

James A. Lippke

*1. No fee in grade B areas. 2. Compulsory license in underserved areas. 3. No fee for unserved areas outside grade B contour. 4. & 5. Statutory fee for nonprofit groups and common carrier. 6. Some form of grandfather clause to prevent disruption of existing service. 7. Protect radio on cable also. 8. Provide a simple system for notice of broadcaster-copyright contracts and exclusivity provisions. 9. Review copyright protection of live programs carefully. 10. Give special consideration to uhf. Unresolved: effect of local origination on copyright obligation of cable operators and applicability of restrictive convenant in underserved areas.

Look the same? Right, they look the same. But the one on top is the old TDA2 . . . the first and original Transistorized Distribution Amplifier on the commercial market, and the standard of the industry. The new one is the TDA2-D. The D stands for Differential Input, which we have added to the TDA2. And not only did we add a differential input, we subtracted 30 dollars from the price. Now you can order the new TDA2-D for $295.00. Let us send you more information.

TDA2-D Specifications.

Printed Circuit—All Transistor—Bridging input—4 to +12 db gain—4 outputs at 75 ohms—Differential phase less than 0.5 degrees—Differential gain less than 1%—Draws 4 watts of power—weighs 4 lbs. —Frequency response flat within ± 1/4 db from 10 cycles per second to 10 megacycles. Differential Input has common mode rejection of 26 db, a maximum common mode voltage of 3 p-p and is effective over a wide frequency range. Differential Input can be disconnected if desired.

Write or wire or phone collect:

Ray Weiland, President
INTERNATIONAL NUCLEAR CORPORATION
608 Norris Avenue
Nashville, Tennessee
(615) 254-3365

"Transistorizing the Television Industry"

INTERNATIONAL NUCLEAR CORP.

The Old One

The New One

Circle 2 on Reader Service Card

FOR BEST ALL AROUND FM SOUND...

...GO TRUE CIRCULARIZED!

JAMPRO CP-IX FM ANTENNAS

The only true circularly polarized FM antenna with variable power ratio

VARIABLE HORIZONTAL TO VERTICAL RATIOS are available only in JAMPRO circularized antennas. These ratios may be adjusted from 50-50 or varied to other percentages up to 90% horizontal and 10% vertical.

EXCLUSIVE DIGITAL TUNING END STUBS allow extremely low VSWR. JAMPRO guarantees a VSWR of under 1.1 to 1 when mounted on your tower, then field trimmed to 1.08 to 1, carrier, ± 200 KC.

AVAILABLE IN TWO DIFFERENT FEED SYSTEMS
PARALLEL SYSTEM using individual interbay cables from one power divider, resulting in the best possible FM antenna performance
SHUNT SYSTEM with elements across a single 3⅛" rigid coaxial line.

TAKE A CIRCULAR STEP!
Write for full specifications, or make a circular motion on your phone dial (916) 383-1177.

JAMPRO

A Division of Computer Equipment Corp

ANTENNA COMPANY

6939 POWER INN ROAD | SACRAMENTO, CALIFORNIA 95828

Circle 41 on Reader Service Card