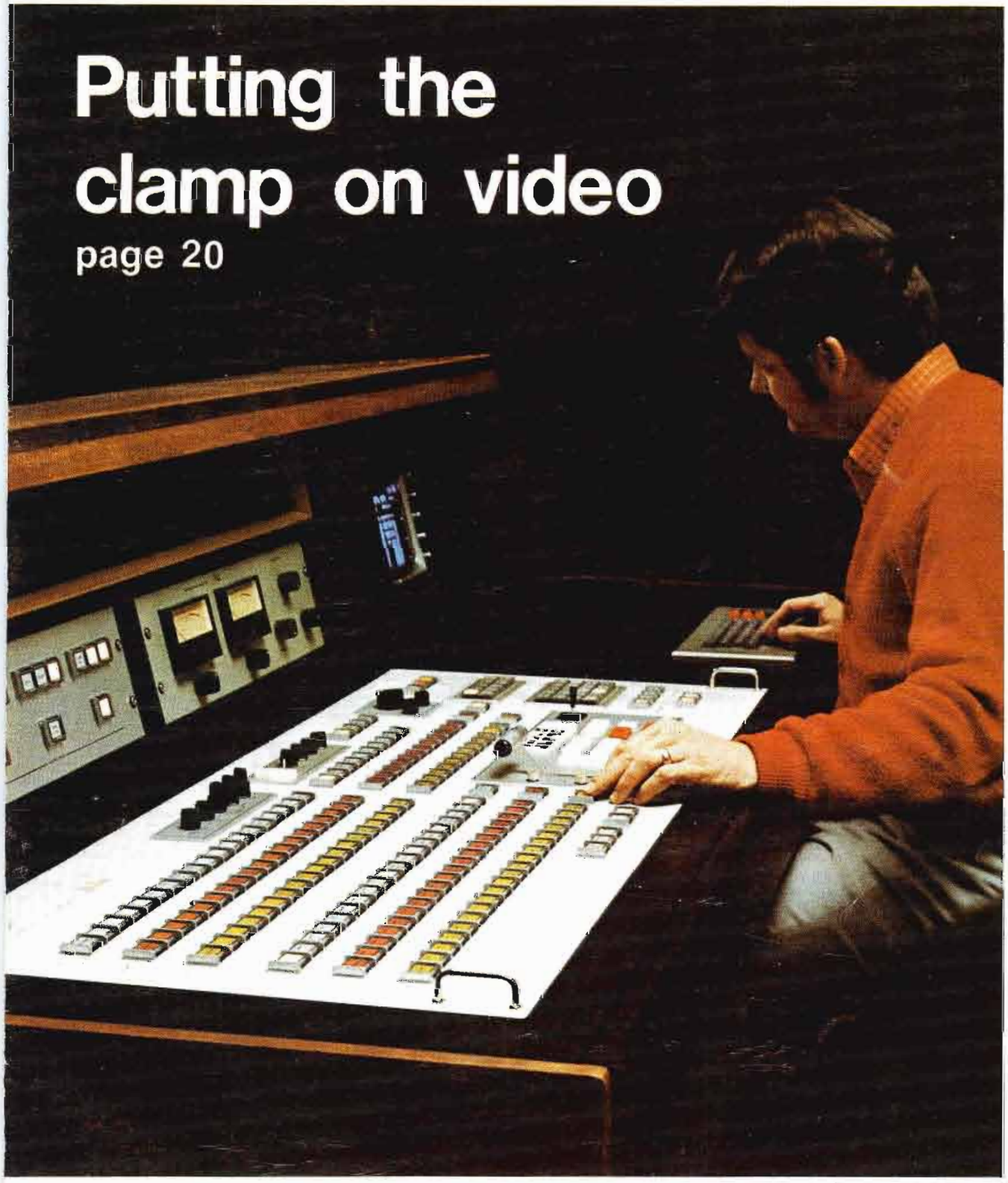
November, 1973/75 cents

BROADCAST ENGINEERING®

the technical journal of the broadcast-communications industry



Putting the clamp on video

page 20

Tape Deck Alignment
Monitor Speakers
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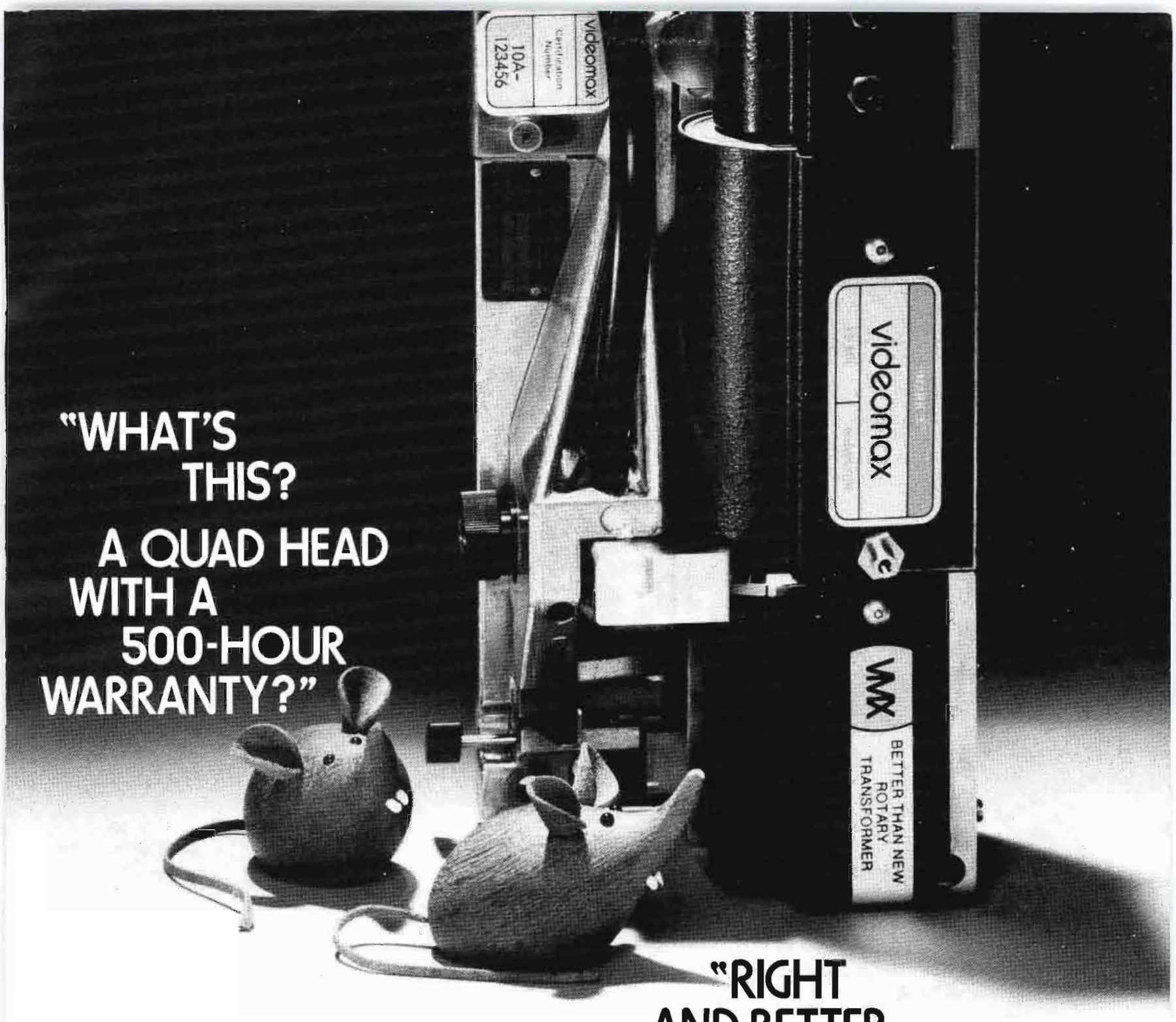

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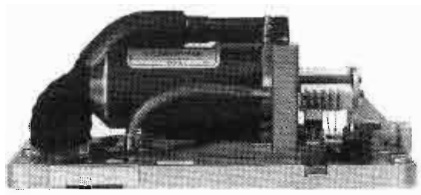

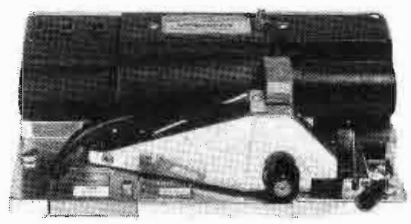

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November, 1973 • Volume 15, No. 11

BROADCAST ENGINEERING®

The technical journal of the broadcast-communications industry

in this issue...

ABOUT THE COVER

Our cover picture this month was supplied by The Grass Valley Group. And on the subject of video, be sure to read the article on page 20, Putting The Clamp On Video.

DEPARTMENTS

BROADCAST ENGINEERING is published monthly by Intertec Publishing Corp., 1014 Wyandotte Street, Kansas City, Missouri 64105. Telephone: 913 888-4664.

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DIRECT CURRENT FROM D.C.

November, 1973

by Howard T. Head

Wider Use of VHF TV Channels Urged

The White House Office of Telecommunications Policy (OTP) has urged the Commission to study the possible "drop in" of additional VHF television channels in the nation's top 100 television markets. According to OPT, their studies indicate that about 85 such drop-ins could be made in the top 100 markets.

OTP admits that few, if any, VHF drop-ins could be made unless the Commission's present engineering standards are considerably relaxed. The OTP studies were based on a ten percent reduction in the present co-channel mileages of 170 miles for Zone I, 190 miles for Zone II, and 220 miles for Zone III. Consideration was also given to the use of directional transmitting antennas, and possible use of precise carrier frequency control as a means of interference reduction.

The purpose of proposing more intensive use of the VHF TV channels is far from clear. UHF channel assignments are still abundantly available, and the great majority of receivers in use today have all-channel tuning capability. It also isn't apparent whether "85 channels in the top markets" means added channels for the really large metropolitan areas, or four channels each for the lowest 22 of the top 100 markets.

Station Fined for Bad Coverage Map

A North Carolina AM station has been fined $10,000 for several rule violations and questionable activities, including the publication of a coverage map which the Commission held to exaggerate the actual coverage area of the station. This latter act is believed to be the first of its kind.

The published map claimed coverage out to the station's 0.1 mV/m contour. The Commission's Standards recognize the 0.5 mV/m contour as the normally-protected contour, and most AM stations are subject to objectionable interference beyond the 0.5 mV/m contour, and often within it. The Commission cited these reasons in disagreeing with the station's coverage claims, and, in addition, objected because the map was based on field-strength measurements made by the station's chief engineer in a manner not in accordance with the Commission's Technical Standards.

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1047

(Continued from page 4)

Troublesome aspects of the Commission's opinion include the fact that the Commission's Rules provide no definition of what constitutes commercial coverage, nor were the measuring procedures prescribed by the Technical Standards necessarily intended to define service for this purpose.

NASA Preparing ATS-F Launch

The National Aeronautics and Space Administration (NASA) is now planning to launch the experimental ATS-F satellite early in 1974. Several of the experiments are of particular interest to broadcasters.

The satellite will initially be positioned over the Rocky Mountain region, from which it will broadcast educational television programs for a school year. Transmission will be broadband FM in the 2500-2690 MHz band, and reception and distribution will be accomplished at about 350 locations in the Rocky Mountain region, using existing CATV systems facilities. At the same time, relaying will be tested to remote locations in Alaska.

Following the Rocky Mountain tests, the satellite will be drifted over India, where educational TV programs will be transmitted in the 800 MHz band. No transmissions in this frequency range, which is in the UHF TV band, are now planned for the Continental United States.

Short Circuits

A. U.S. District Court has, at the Commission's request, ordered shut down a shipboard transmitter broadcasting on 1600 kHz just outside the three-mile limit off the New Jersey coast...Educational FM applications and petitions for channel changes near the U.S.-Mexican border are not being accepted until the Commission can implement rules reflecting the new FM Agreement with Mexico...An Indiana consultant has proposed that the Commission authorize all Class IV local channel stations to utilize five-eighths wavelength antennas...The Commission has turned down a complaint by a UHF TV station asking that a CATV system carry the station on the cable on a low rather than a high VHF channel...The Commission has solemnly concluded the "fairness doctrine" does not require broadcasters to provide equal time to respond to Polish jokes.

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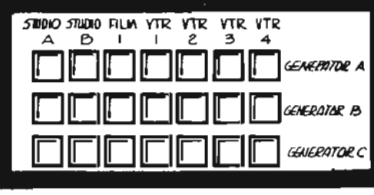

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LETTERS TO THE EDITOR

Modular Facility

Dear Editor:

I just read the article in the August issue about modular station construction. Here at WSJM we have had an SAI modular building since January. We originally placed our order in October, but due to a fire at the SAI plant, delivery was delayed over a month. Our building is on a slab and it was assembled in two working days during a snow storm and it took two more weeks to get all the internal connections completed.

Stations considering this approach should check their local building codes thoroughly. We found that the St. Joseph building code prohibited trailer homes, and the zoning board seemed to think this was a version of a house trailer. After they studied the blueprints they concluded that this structure was indeed better constructed than a conventionally built building.

When we designed the layout, we had SAI include special conduit runs for the audio cables and separate power mains for each studio. The only problems we have encountered so far are (1) a small roof leak where the modular unit joins the existing transmitter building and (2) the volume of air coming from the airconditioning vents was inadequate. These problems have been resolved and the defects were traced to the subcontractor who was responsible for the on site assembly.

Our cost was around $23/ft.^{2} compared with conventional bids of $30/ft.^{2}. The modules were built to our specifications and the soundproofing has been very good. Anyone planning on new facilities should consider this approach from the time, cost, and flexibility points of view.

Noel M. Moss, CE
WSJM-AM-FM
St. Joseph, Mich.

KUSF Needs Book On RCA BTF-5A

Dear Editor:

We at KUSF are in the process of installing a RCA BTF-5A transmitter for our station. However, we only have an incomplete manual for this transmitter, and RCA cannot furnish us with another one. We would appreciate borrowing a complete copy from someone having one long enough to xerox it. We would also appreciate any suggestions, etc., on its operation along with any spare parts that any station might have laying around.

We also have a Western Electric 1 kW FM transmitter which we will donate to (or trade with) any other college station. It is complete with exciter and should work.

Please contact me at KUSF, 2130 Fulton St., San Francisco, Calif. 94117, (415) 387-3803 or at my home (415) 668-6851.

Bill Ruck
Chief Engineer
KUSF Radio
San Francisco, Calif.

Ant. Protection Comments

Dear Editor:

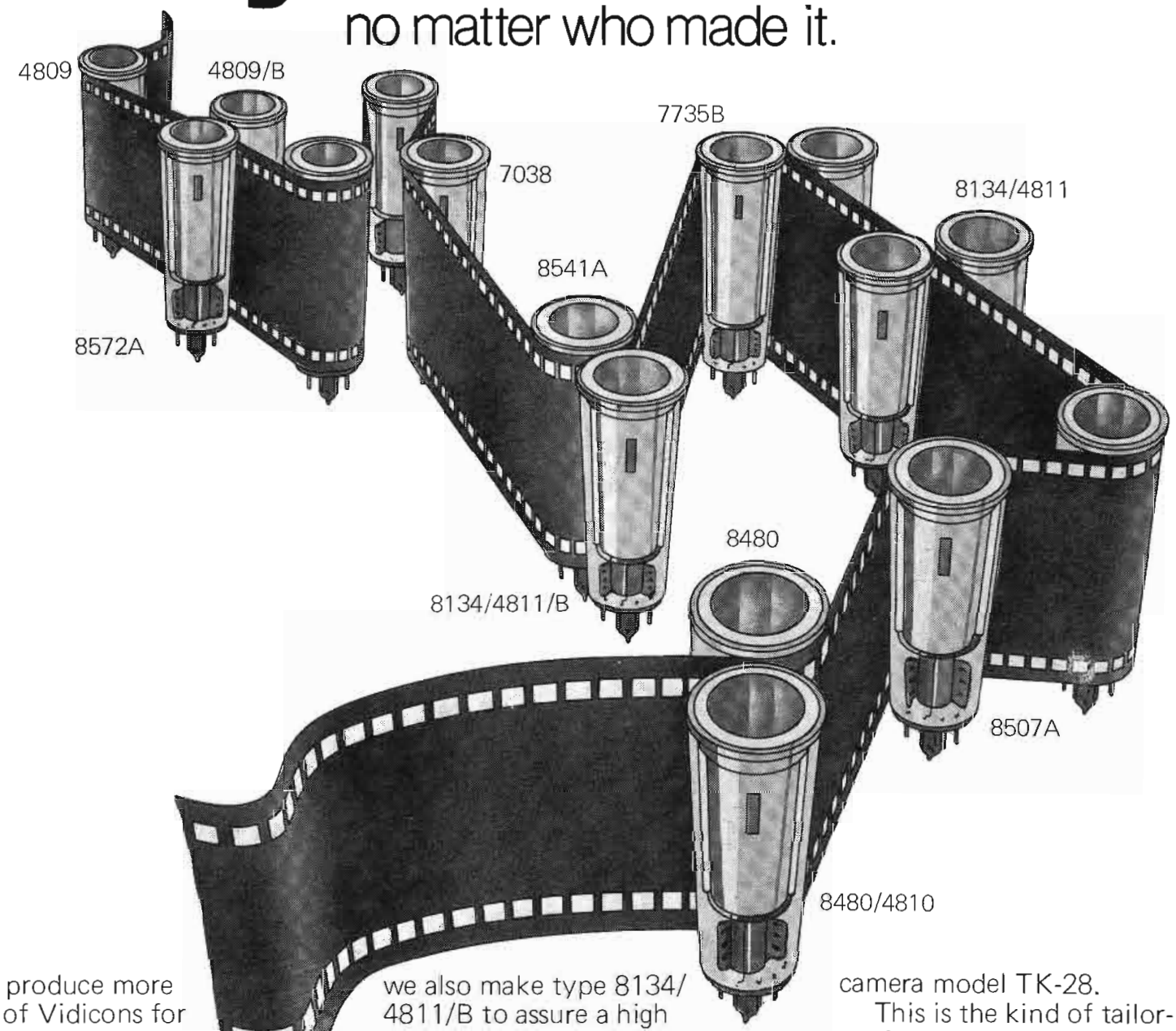
We would like to make some comments regarding "Antenna and Transmission Line Protection" (August 1973), while the subject is still fresh in your readers' minds.

We fully agree with author Pat Finnegan's warning that protection of costly transmitter installations from damage due to sudden (or gradual) rise in VSWR is essential and that an interlocking arrangement with a reflected power meter relay provides such protection at a fraction of plant repair costs. The

(More...)

Select RCA film pick-up vidicons for your camera...

no matter who made it.



We produce more types of Vidicons for film pick-up than anybody else.

We make so many because we've learned that top film camera performance requires tailoring Vidicons to camera requirements. And our applications engineers have studied them all.

Take our 8480/4810 and 8134/4811 film pick-up Vidicons, for example. The specifications defining their performance characteristics are controlled to provide exceptional service in the RCA camera model TK-27. And we also make type 8134/4811/B to assure a high blue-channel sensitivity for this camera.

Or consider our 4809 and 4809/B Vidicons. They're recommended because they are specifically designed, manufactured and tested to produce best performance under conditions imposed by today's 3-tube color film pick-up requirements. The 4809/B is specifically processed and tested to meet blue-channel sensitivity requirements. Both of these tubes have been successfully applied in the RCA camera model TK-28.

This is the kind of tailor-made performance you can count on throughout the full RCA Vidicon line. Take advantage of it now. Just call your RCA Camera Tube Distributor or RCA Representative for complete information. Or write Commercial Engineering, RCA, Harrison, N.J. 07029 for your copy of the new RCA Camera Tube Product Guide (CAM-703B).

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LETTERS TO THE EDITOR

technical details of the article, however, were based entirely on the construction of one specific make of "sentry" equipment, which requires operator adjustments and then only reads VSWR correctly as long as forward power remains constant. The circuit described also includes time delay relays, which our customers have found undesirable in cases of "catastrophic" line or antenna failures.

The "sentry" unit we manufacture, the Bird WATTCHER®, is used in conjunction with a THRU-LINE® line section, which most broadcast stations (FM or TV) already have installed in their transmission line for FCC approved RF power measurement. The dual meters of our WATTCHER® are indicating accurate forward power and reflected power continuously, and furnish, therefore, meaningful information not only on line reflections (due to unusual weather or moisture conditions), but also on forward power, and on power fed into the antenna (net power P_f minus P_r).

All this information is displayed in addition to providing the transmitter protective functions you describe, in a choice of two modes (Fail-Safe and Non-Fail-Safe). An audible alarm not only alerts the operator, but can be used for setting the desired protection point on the reflected power meter relay (with the transmitter interlock shunted), without kicking the transmitter off the air.

Herbert H. Heller
Senior Staff Engineer
Information Services
Bird Elect. Corp.

Author's Note:

In my article "Antenna & Transmission Line Protection" (August, 1973), the position of the time delay relay shown in block diagram (Figure 1) could be misleading as to its action. This time delay relay will not effect or delay the action of the protection unit in any way should the VSWR rise on the line. Once the rising VSWR operates the Meter Relay, the tripping action is immediate.

In this particular unit, the time delay relay is both a safety and a fail-safe feature. When first turned on, this relay will not allow the transmitter to come on until the protection features are "in position" and monitoring the line. Should the unit lose its AC power, the TD will open immediately and trip the transmitter.

Other sentry models may not have this relay, and you will find more or less features according to the manufacturer.

Patrick S. Finnegan
Muncie, Ind.

Screeching Tape Problem

Dear Editor:

Much has been written about magnetic tape and tape systems, but there is one problem I have never seen discussed in the pages of **BE** and that problem is **tape screech**.

From time to time over the past twenty years I have come across tapes that squeal **audibly**—causing the output to be distorted with a high-pitched screech superimposed on the program material. If it happens when recording, the screech is recorded also.

The problem, being somewhat of a rarity, is usually disposed of by junking the offending tape into the nearest waste receptacle.

It wasn't until I got involved with tape automation that I really ran into the problem. I have since found, through bitter experience, that at least one well-known brand of tape will screech after about twenty months service. I have had better luck with another brand's tapes which have remained largely screechless over a period of from five to seven years.

John Carlini
Liberty, N.Y.

Editor's Note:

I suspect the screeching tape is a tape lube problem, John. But let's see what the engineers in the field have to say. If anyone has a solution, drop John a line, or send your ideas to BE, 1014 Wyandotte, Kansas City, Mo. 54105.

Filmchain Projection Simplified

The new Bell & Howell Model 562 Optical/Magnetic Filmchain projector is delivered complete with a base which contains the projector controls and height adjustment to align the projector with TV camera or multiplexer. The projector is very much like the reliable 500 series design manual thread 16mm projector which is widely used in industry and education.

The Model 562 utilizes a synchronous motor, chain-driven film transport system including an automatic loop restorer to assist in providing picture and sound into the camera for transmission over closed circuit or antenna-signal distribution. The pedestal includes facility for easily installing remote operation from a control panel.

Other Features You'll Like

Optical or magnetic sound play back. Choose from a wide variety of standard lamps and Bell & Howell lenses to obtain the optimum lumen input to the camera. A special torque release lever is provided when using reels with small hubs.

Other Important Details

Projector reel arms are gear driven, which provides quiet, reliable operation and constant take-up torque. The "Stellite," 3-tooth shuttle and ground and polished aperture plate, provides careful film handling in the projector transport system.

Self-lubricated bearings and other fine engineering details provide long life. The 500 series product design is well known to the hundreds of Bell & Howell service stations across the country, providing a ready facility to service any projector when maintenance or repair is required.

A Final Thought

The instruction books and service manuals provide the details necessary for installation, both electrical and mechanical, as well as remote control. Contact Bell & Howell, Chicago, for technical literature and the name of the local sources who will help you select the best combination of lens, lamp and equipment to project 16mm films for TV program distribution or local display.

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INDUSTRY NEWS

Broadcast Price Controls

The National Association of Broadcasters has asked the Cost of Living Council to exempt the broadcasting industry from price controls.

NAB said the industry meets the criteria laid down by President Nixon for exemption because its record "demonstrates that the forces of the market place are sufficient to assure that its pricing will not cause inflationary pressures if it is decontrolled."

Also, NAB said, "retention of controls over broadcast pricing will adversely affect the capability of the broadcast industry to effectively and efficiently carry out its obligation to serve the 'public interest, convenience and necessity.' "

In addition, NAB pointed out, broadcasting meets the Council's own criterion for exemption because application of the economic stabilization regulations will result in gross inequity.

It said the industry's pricing "is based upon anticipated and actual response to programs as expressed in terms of size and composition of audience, rather than costs."

It said the exemption for broadcasting is "even more strongly justified by the reasons which led to a continuation of exemption for the motion picture and television production industry which supplies virtually all of television broadcasting's entertainment programming."

Marketing Guide Available From NCTA

"The Complete Guide to Cable Marketing," the official transcript of NCTA's second annual marketing workshop, is now available from the association.

Copies of the transcript can be ordered by sending a check or money order to: Marketing Workshop Transcript, National Cable Television Association, 918 - 16th Street, N.W., Washington, D.C., 20006.

Send Your Industry News To Broadcast Engineering For Better Coverage

Task Force Investigates Kickbacks

In the wake of recent publicity and charges that engineering firms have engaged in "kickbacks" and other forms of unethical or illegal activity in order to secure contracts from public bodies, the National Society of Professional Engineers is establishing a special task force to study the basic question of what effective action may be taken by the engineering profession to avoid such alleged activity.

In announcing the new task force, NSPE President Robert L. Reitinger, P.E., said that the engineering profession has a duty to move promptly and vigorously to determine if there are deficiencies in the applicable laws, procedures, or ethics related to the problem. "Obviously, we are not passing any judgment on guilt or innocence of any individuals or firms," he said, "but we recognize that recent publicity of such allegations demands that we face up to the problem and try to offer constructive suggestions to protect the public interest against any conduct which contravenes the high ethical standards demanded of all engineers."

NSPE represents some 70,000 engineers across the country and is composed of 54 state society affiliates and 534 local chapters.

Australia Airs First Computer Radio Program

On August 20th station 2CH in Sydney, Australia broadcast for the first time ever aired a fully computer aided radio program.

The remotely controlled broadcast originated from the convention site of the Institute of Radio and Electronic Engineers in Melbourne, Australia. The DP-1 (Digital) completely automated radio broadcast system on show at I.R.E.E. convention is manufactured by Sono-Mag Corporation of the United States and distributed by Systems Marketing Corporation.

IEEE Announces Convention Plans For 1974

Plans for the 1974 IEEE Intercon convention and exposition in New York next Spring have been formally announced to the electronics industry.

In an exhibit prospectus mailed to about 6000 manufacturing organizations, the big event was announced for Tuesday through Friday, March 26-29, in New York City. Exhibits will occupy two floors of the New York Coliseum, and technical program sessions will be held in the Statler Hilton Hotel.

"Getting down to business" is the theme of the 1974 exposition. Frederick T. Van Veen, who is director of corporate relations, Teradyne Inc. and IEEE Intercon exposition director, noted that "The theme for 1974 is an accurate reflection of what we all know to be true—that the electronics industries are in the business of designing and producing systems for all kinds of applications that few people envisioned even a couple of years ago.

Burch Questions Proposed Regs

Possible changes in broadcast regulations that would assess an annual levy on the profits of broadcasters, auction broadcast licenses to the highest bidder, and grant broadcasters the First Amendment guarantees of printed media, free from the requirements of the Fairness Doctrine, have been questioned by the Commission.

The FCC views were contained in a letter from Chairman Dean Burch to Senator William Proxmire (D., Wis.), Chairman of the Senate Appropriations Subcommittee.

Senator Proxmire had asked the Commission for further comments on these matters at appropriations hearings held by his Subcommittee on May 2, 1973.

The FCC's position on possible extension of First Amendment rights to broadcasters was stated separately by Commissioner Richard E. Wiley, who is in charge of a task force considering revisions in the Fairness Doctrine (Docket 19260).

Commenting on the question of taxing broadcasters' profits, in excess of the present fees, Chairman Burch said that a basic problem lies in determining the baseline against which profits should be measured in order to make a valid approximation of the going rate of return.

"There simply is no way to state that broadcasters as a class enjoy 'X' percent profits or 'Y' percent profits, or, indeed, any profits at all," Chairman Burch asserted. He commented that what was actually involved here was taxation, and said that taxation was a matter for Congressional action only. Pending Supreme Court rulings on the exact limits of the Commission's fee schedules, he said, the FCC has no authority to impose fees producing a total revenue in excess of its operating budget.

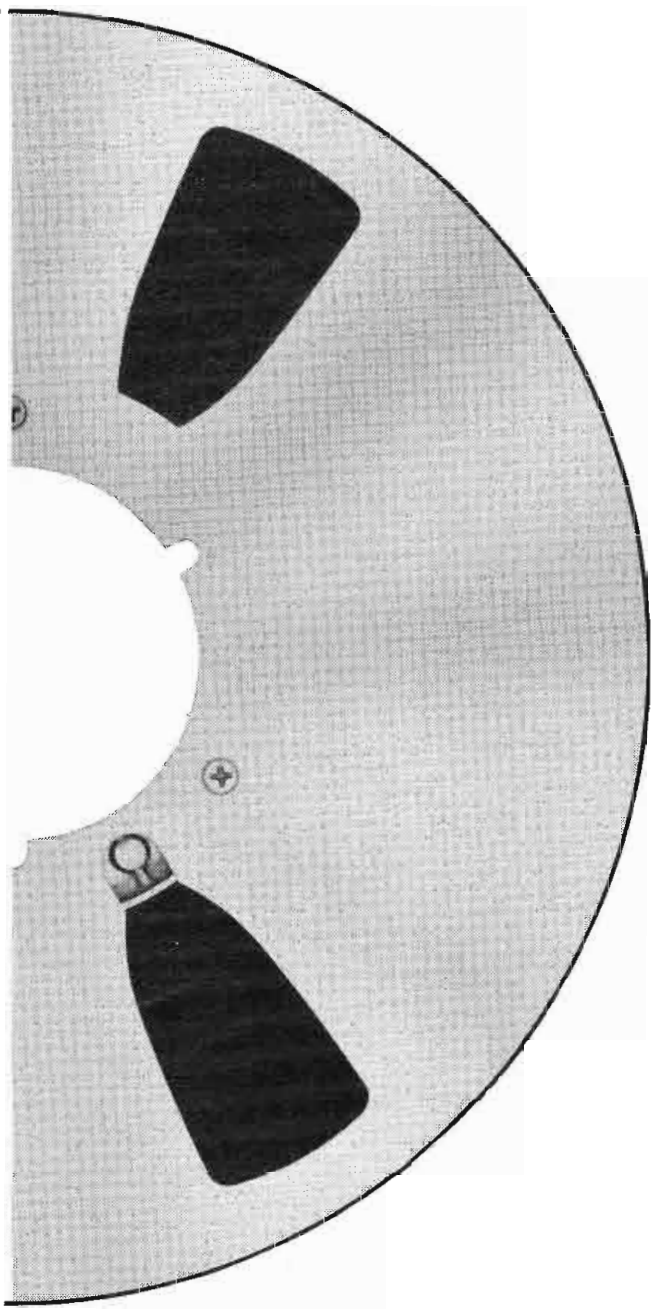
The Chairman observed that the core of the idea of auctioning broadcast licenses is to let the free marketplace decide the fair value of a broadcast license through competitive bidding, and to award each license to the highest bidder, either in perpetuity or for a long term. Within predetermined technical parameters, the licensee would then have absolute rights of the use of the station, including re-assignment rights.

Incumbent licensees could be reimbursed for their assets, both tangible and intangible, and the number and type of potential assigned frequencies for a given market could be established in advance of the bidding.

If there is to be bidding for radio and television frequencies, however, Chairman Burch asked if there should not be bidding for any and all portions of the radio spectrum.

He also noted that the Commission has always considered spectrum allocation and management as perhaps its primary responsibility, and questioned whether it would be better to substitute open bidding for the "reasoned decision-making of an expert body accountable for its actions to Congress."

if we told you you could cut your tape costs by at least half, would you buy that?



No, it's not a load of hot tape. Or seconds. You do it with our new, super slow speed Voice Logger Model 400. It'll rack up more than 600 hours of audio on one 7200 ft. reel of .5 mil triple play tape. And it'll do it, unattended, 24 hours a day for 12 days. (Or 24 days with one reel reversal.) That's about double the normal amount. And that's how you cut your tape dollars by more than half.

That's not the only feature. If a tape should break, a stand-by system can take over. At the same time, the transport control circuitry notes the failure and a memory logic system remembers (A) which pass giving track and direction and (B) record status. In case of power failure the memory will automatically re-start the logger in the last operating mode when power is restored.

Maintenance is simple, too. The whole deck pivots out. All electronics are in a slide drawer. And you can set up separate or simultaneous monitoring of up to 4 tracks.

The picture here shows a handy little accessory. The Model 4400 Time Code Generator/Reader so you can encode time without dedicating an extra track.

Quite a nice little package, right?

You can get all the specs (or a machine) by writing or phoning (415) 968-8389 TLX 345524 475 Ellis Street, Mountain View, California 94040

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For More Details Circle (15) on Reply Card

SOCIETY OF BROADCAST ENGINEERS, INC
P. O. Box 88123 Indianapolis, Indiana 46208

This Is Your Journal

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

A means of communication is vital to any organization. Let's utilize this unusual opportunity which is now available.

Chapter 1 - Binghamton, N.Y. Chairman: Larry Taylor, WENY AM FM, Mark Twain Hotel, Elmira, N.Y. 14902

Richard Gilmore of the New York Telephone Company spoke to the chapter on September 11th at the Treadway Inn, Owego, N.Y. on radio pairs, switching pairs, program lines, and how the telephone company services and maintains all of them. Dick presented a most interesting meeting, based on his twenty-plus years broadcast transmission line problems of all types in the Elmira, N.Y. area, and handled many questions put to him from the floor later.

Chapter 2 - Northeastern Pa. Chairman: Paul Evanosky, WVIA FM TV, Old Boston Road, Pittsdon, Pa. 18640

On September 7th a meeting was held at WVIA, the purpose of which was to organize for the coming months. Paul Evanosky presided. John Kowalchik offered to plan the next meeting which was designed to be of interest to younger engineering people in broadcasting, especially those studying or working in broadcasting in colleges. Charles Morgan, elected in April as a Director of the SBE told of a directors' meeting held recently in Washington and the SBE's plan for certification of broadcast engineers.

Chapter 9 - Phoenix, Ariz. Chairman: Charles Dean, KOOL TV, 511 West Adams, Phoenix, Ariz. 85003

KOOL TV Director of Engineering, Al Hillstrom, described and demonstrated KOOL's new Sarkes Tarzian Video Switcher on July 5th. A progress report was given by H. J. Bart Payne on the newly formed Tucson SBE chapter.

Chapter 11 - Boston, Mass. Chairman: Ross Kauffman, WCVB TV, 5 TV Place, Needham, Mass. 02194

Officers of chapter 11 report that meetings are held the 2nd week of each month, September through June, usually at 8 PM, but at varied locations in the Boston area. Information on exact dates and times may be obtained from chairman

Ross Kauffman at WCVB (617) 449-0400; vice chairman Mike Goldberg, WGBH TV, (617) 868-3800; Steve Cohn, secretary-treasurer, WSNW-TV, (617) 852-0027; or Steve DeSatnick, SBE director, also at WCVB TV.

Chapter 15 - New York, N.Y. Chairman: John M. Lyons, WWRL AM, 41-30 58th St., Woodside, N.Y. 11377

Preceding summer recess for the chapter, Bernard Wise, president of CCA Electronics, and Charles Hallinan, for SBE President, and now District Representative for CCA, spoke on "State of the Art of Radio, Television and the Broadcast Industry, in General". On September 13th, Norm Sternberg, chief engineer of WHLI AM/FM, Hampstead, Long Island covered both the practical and mathematical aspects of a directional antenna system and related these to new requirements as outlined by the FCC. For the October 11th meeting, Anthony Ramsden and Irving Silberg, both representing Marconi Instruments, were expected as the guest speakers who would cover a number of measuring techniques using Marconi instruments.

The New York chapter invites anyone interested to attend their meetings which are held at the WQXR Presentation Theater, 9th floor, 229 West 43rd St., and to get there early enough to join members for dinner in the **Times** cafeteria on the 11th floor. For advance information, check with chairman Lyons (202) 335-1600; Art Silver at Gates Radio, (212) 889-0790; or Bob Woerner, at (212) 535-1000.

Chapter 16 - Seattle, Wash. Chairman: John Maxson, KETO (FM), 17425-63rd Place, S.E., Issaquah, Washington 98027

Ampex Research and Development Engineering sent Chuck Anderson on September 12th to speak on video recording standards, video cartridge machine design, and state of the video recording art. The meeting took place at the Norselander Restaurant following a 12-noon luncheon. Bob Dietsch, head of the local FCC office covered what's new out of Washington.

Chapter 18 - Philadelphia, Pa. Chairman: Jack Jones, WCAU TV, City Line and Monument Avenues, Philadelphia, Pa. 19131

At the usual meeting place, on September 24th, Dr. Jacob Farber of Forway Industries spoke on "Radiation and Impedance Problems - Practical Applications." Dr Farber is a recognized expert in the field of the design of antenna and radiating systems. A question and answer period followed. A report on the October meeting, scheduled for the 22nd, will be provided in the next issue.

Chapter 21 - Spokane, Wash. Chairman: T. O. Jorgenson, KXLY TV, West 500 Boone Avenue, Spokane, Wash. 99201

Chairman "Jorgey" Jorgenson reports that Monday noontime meetings continue each week at the Castle Restaurant meeting room. Covered during the August meetings were "Effects of Ground Currents and Interference in Cables"; "KSPS Educational Television

Mobile Van"; demonstration and discussion of the new 2-gun lightweight color camera by Northwest Electronics of Spokane, through the courtesy of Richard Jones; and discussion of the new Video Cartridge Machine TCR100 at KXLY. Meetings for September covered: Discussion of the TK630 seminar in Seattle; Power Reduction Problems; and FM Stereo Proof of Performance. Meetings are open to all interested persons, members or not. More information can be obtained from Jorgey at (509) 328-9084.

Chapter 22 - Central New York Chairman: Hugh Cleland, WCNY TV/FM, 506 Old Liverpool Rd., Liverpool, N.Y. 13088

Tektronix Television Specialist Bob Mahoney discussed the "Vertical Interval Reference Signal (VIR)" and demonstrated the Tektronix Model 1440 Automatic Video Corrector, at the Hilton Northway Motor Inn, Seven North Street, Syracuse, N.Y. The Northway has advised the chapter that they have instituted a 5 PM to 7 PM "Happy Hour" when potent beverages are half price.

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

On August 28th, members assembled in the lobby of the Illinois Bell Telephone Building preceding a tour of the IBT facilities; the major emphasis was on the special services audio test board. Members took advantage of the circumstances to get acquainted with the program test people serving all of the broadcast people in the area. On September 18th, members met at Stereo Masters for a short course in the art of making records. The October meeting will be reported in the next issue. Schedule for November called for RCA and ABC-TV to provide a program on a newly completed video tape room including the TCR-100. The December meeting will be by Norelco. Refreshments usually follow each meeting. The chapter expresses appreciation to NABET, a sustaining member of the chapter.

Chapter 28 - Milwaukee, Wisc. Chairman: Ed Wille, KENCOM, 7835 W. Caldwell Ct., Milwaukee, Wisc. 53218

On September 18th, the chapter held the first meeting of the season at Radio City Auditorium, WTMJ, Inc.; Vern Killion, Specialist - RF Products, Gates Division of Harris Intertype, talked on IF-Modulated Transmitters and the Dualtran Switching System. Bob Truscott, program chairman for the chapter and National SBE Secretary-Treasurer has promised an interesting series of speakers and topics for the season. For further information on future meetings call Ed Wille's office, (414) 781-3084.

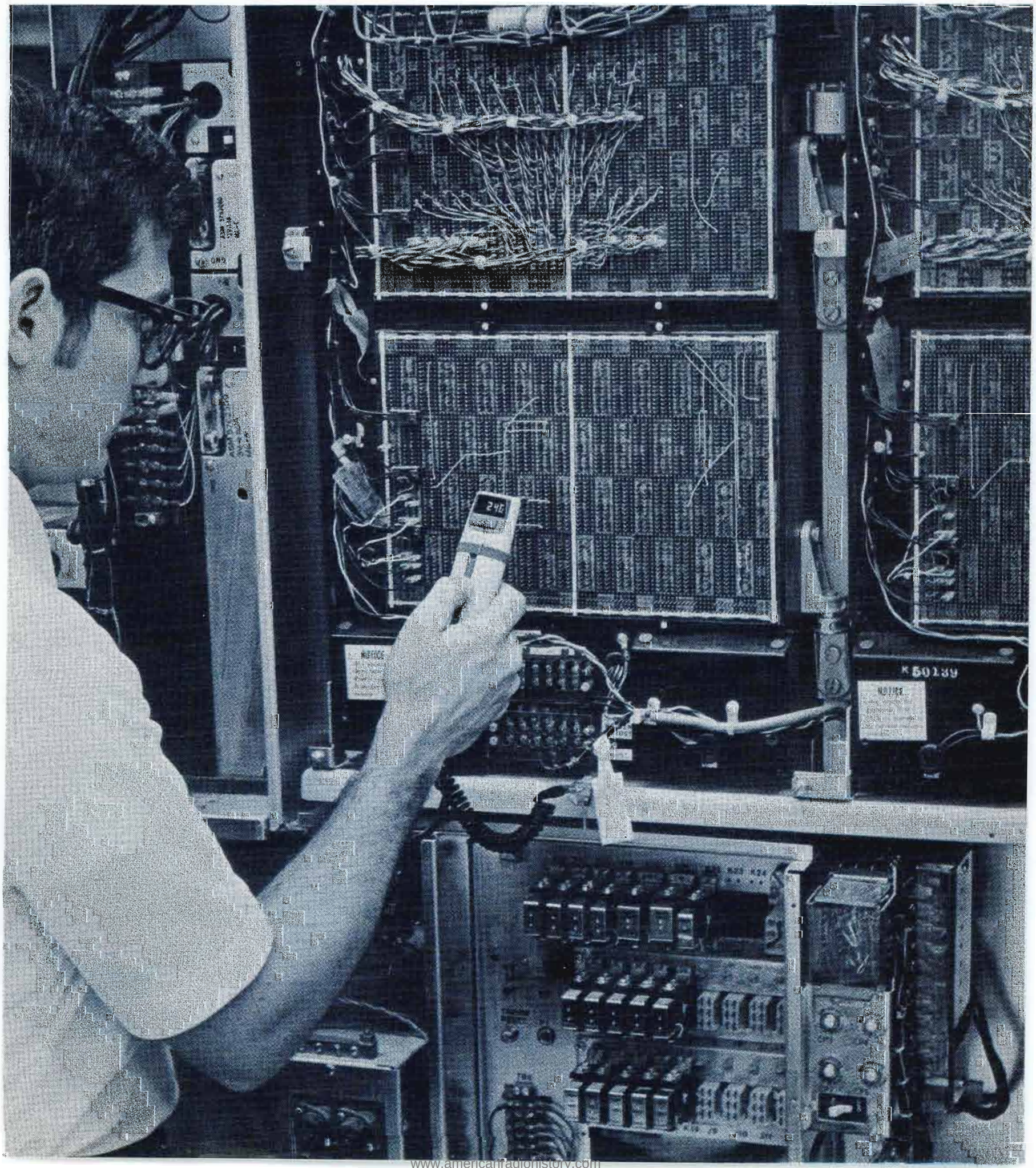
Chapter 30 - Elkhart, Ind. Chairman: Chris Frederick, WJVA, South Bend, Ind.

The chapter has established regular meetings and invites members living in the South Ben/Elkhart area to attend. All others interested are also invited. For further information contact Mark A. Carey, Secretary-Treasurer, at WTRC, Elkhart, (219) 293-5611; or Chris Frederick, (219) 234-1111; or Louis Swift, (219) 293-8616.

November, 1973

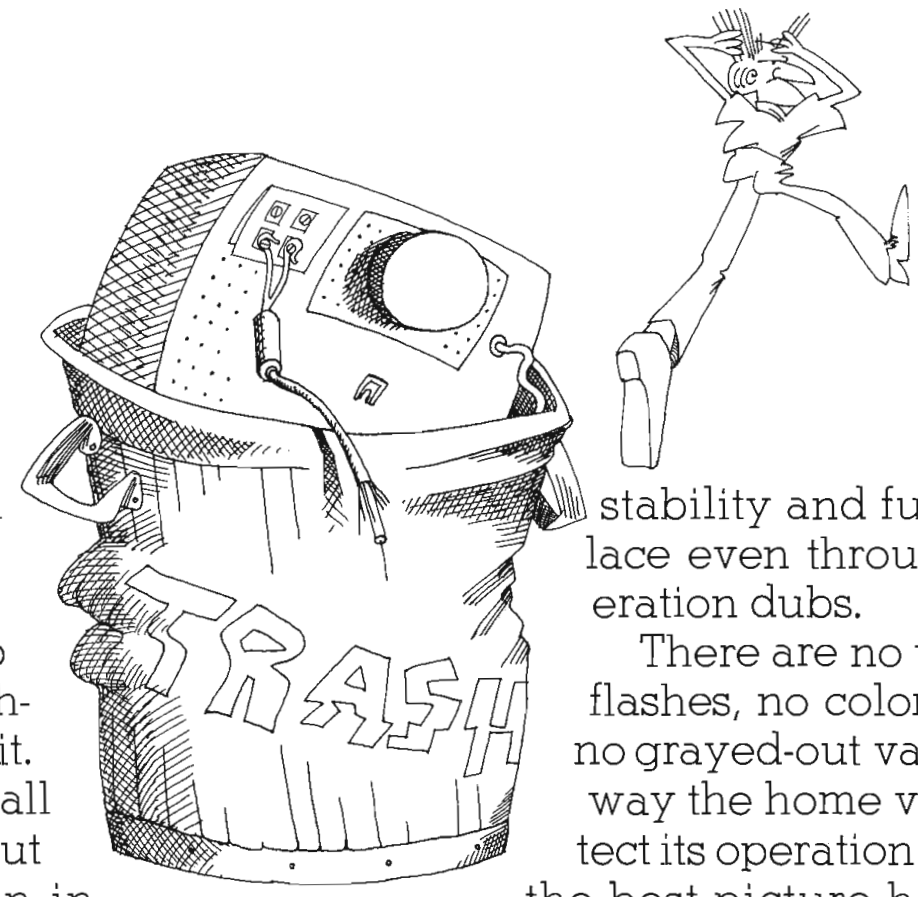
CABLE ENGINEERING

in this issue....



Eliminate the dropouts from your helical playbacks.

And maybe a few from your subscriber list.



Nobody's happy with video dropouts. Not you, and certainly not your customers. But up till now, there was nothing you could do about it.

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It replaces all lost video information—in color or monochrome—with signals exactly matched for luminance and chrominance while maintaining video stability and full color interlace even through multi-generation dubs.

There are no white or color flashes, no color mismatches, no grayed-out values. The only way the home viewer can detect its operation is that he gets the best picture he's ever had, which ought to make both you and him happy.

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For More Details Circle (56) on Reply Card

Troubleshooting digital logic circuits

By Pat Finnegan

Many communications equipment items today make use of Digital Logic circuitry for many control functions. These are found not only in complex equipment such as video tape machines and automation programmers, but in audio cartridge tape machines, and clocks. All indications are that this trend will continue.

From the more familiar control circuitry of the past, these differ both physically and electronically. Physically, due to the PC Boards with all the IC's, and electronically, because of IC's instead of the many relays and switches.

In many ways, our present test equipment cannot do an adequate job of assisting us in troubleshooting problems as it is often too cumbersome, awkward, or may not give adequate answers. There is a growing family of specialized test equipment designed specifically for troubleshooting digital logic circuits. We will discuss a few of these in the article.

Problems

Consider first some of the problems of present test equipment in relation to the logic signal and the physical size of the components. Since most of the logic is built around the multi-pinned IC's, it is often very difficult to maneuver large probes, alligator clips and test leads into the confined areas around the IC's. It is very easy to short out pins, and this can damage or ruin an IC.

Voltmeters are not always effective as they may not be fast enough to respond to fast pulses, and there is need for constantly changing meter scales. We are all familiar with the notoriously inaccurate readings of an ohmmeter when measuring in solid state circuits. Even the oscilloscope can be "overpowered" so that we see too much, that is, things that don't affect the operation but can lead our reasoning astray. All these instruments can still be effective once we narrow the problem to a specific area and into the "area of competence" of these instruments.

The Signal

The logic signal is most often a single DC pulse either turning on or off, called "high" or Logic 1, and "low" or Logic 0. The low pulse is not zero voltage, but is a voltage near 0.5 Volt. There may also be pulse trains at a repetition rate anywhere from 60 Hz to 2 MHz. The majority of this logic has been with DTL or TTL logic circuitry, and this operates in the range of 5 to 10 Volts.

Signal Tracing

As with other equipment problems, signal tracing is the speediest method of isolating a problem quickly to a specific area or even to

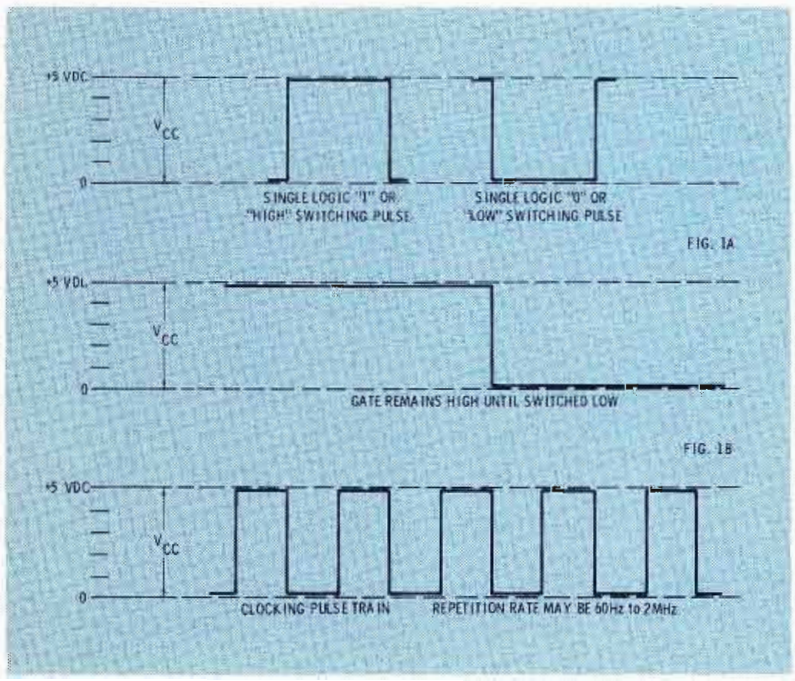

Fig. 1 Typical logic signal. It may be a single pulse that goes "high" or "low". A pin may be at a steady "high" until it is switched "low". And some circuits require clock pulses.

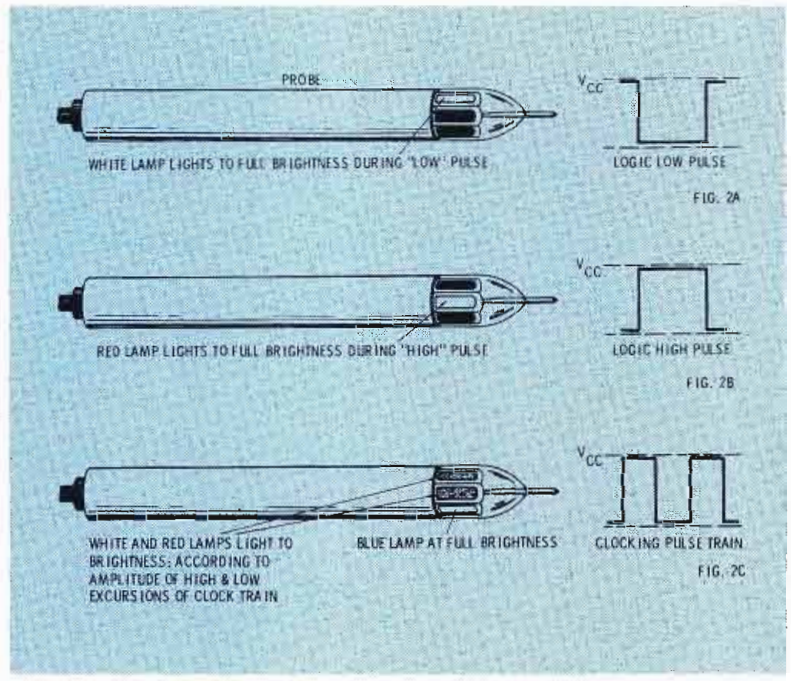

Fig. 2 Logic probe with three lamps in the readout window. Each lights according to the signal at the sample pin.

the particular component that is at fault. In signal tracing, we are testing the equipment in a dynamic mode. We can observe the signal at various places and compare this to what is supposed to be at any particular point. While the logic signal is different from audio, video or RF signals, it is still a signal that can be observed and compared to what is normal.

Test Equipment

The series of logic test equipment is designed for dynamic signal tracing. In signal tracing, we need some type detector. The logic probe is such an instrument. There are several models made by different manufacturers. The later probes can provide more usable information.

Physically, the probe is a tubular device about 5 inches long and about ½-inch in diameter. Internally, there is circuitry that will detect the logic state of the circuit under test and display this on one or more lamps in a small window of the probe. At the front end is a thin needle like pointer that is touched to the part of the circuit we desire to test or to a normal test point on the PC board.

The Probe requires external power, but this is obtained from the power supply of the circuit under test through a cable to the probe. Not only the voltage of the power source is important, but the logic levels in the circuit are important in operation of the probe. It is wise to select a probe that can operate in the logic levels of your equipment. The probe can be damaged from either end. That is, logic levels on the tip or from the power supply through the cable. For example, the probe is designed for logic levels up to 10 Volts. If the tip is touched to 24 VDC relay voltage, it can burn out the probe. If the power cable is attached to the 24 Volt supply, this can also burn out the probe.

One style probe contains three lamps in its window and these are color coded. The white lamps indicates a logic low, the red lamp indicates a logic high, while the third lamp is blue to indicate repetitive pulse trains, such as an oscillator. This probe can tell us many things about the point in the circuit under test. If the tip of the probe is on an IC pin, and this pin is at logic low, the white lamp will glow at full brightness. If the pin goes high, the white lamp will go out, and the red lamp will glow brightly. This detects the normal high and low logic pulses. The brightness of the lamp will also indicate the amplitude of the pulse.

If the pulse is only half amplitude, the lamp will glow at half brightness. If the pin is being pulsed or clocked by a high frequency, repetitive pulse, the blue lamp will also glow to indicate a pulse train, while the red and white lamps will go on and off following (if they can) the changing conditions at the pin. During the pulsing, the red and white lamps will indicate the relative amplitudes of the high and low pulses by glowing at the brilliance representative of the amplitudes they experience.

There are two other important features of this probe. First, it can detect noise in the circuit. If the pin is low logic, for example, but there is noise present, the white lamp will glow only dimly. The second feature is the ability to detect an open pin or circuit. Many of the older probes could not do this. An open pin to an old style probe indicated a high, which is electronically correct, but very misleading. (The logic IC considers an open pin as a high.) In this new probe, if the pin is open, none of the lamps will light at all.

The Clip

Probes do have their limitations, and one is the fact you can only observe one point in the circuit at a time. The clip satisfies this limitation in that you can observe all of the pins on an IC in action at the same time.

Physically, the clip is built like an old fashioned spring type clothespin. It is about 3 inches long, with 16 pin contacts in the jaws of the clip, and a window at the opposite end. The window contains 16 LED's (light emitting diodes), one for each pin of the IC it represents. Each one of these diodes will be lit or turned off according to the logic

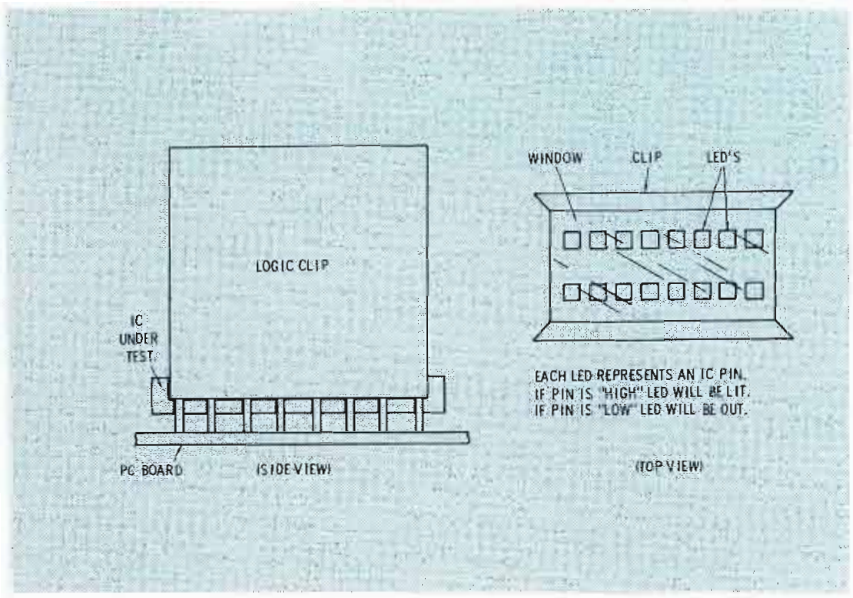

Fig. 3 The Logic Clip allows the action at all pins to be observed at the same time. Each pin had an LED associated with it.

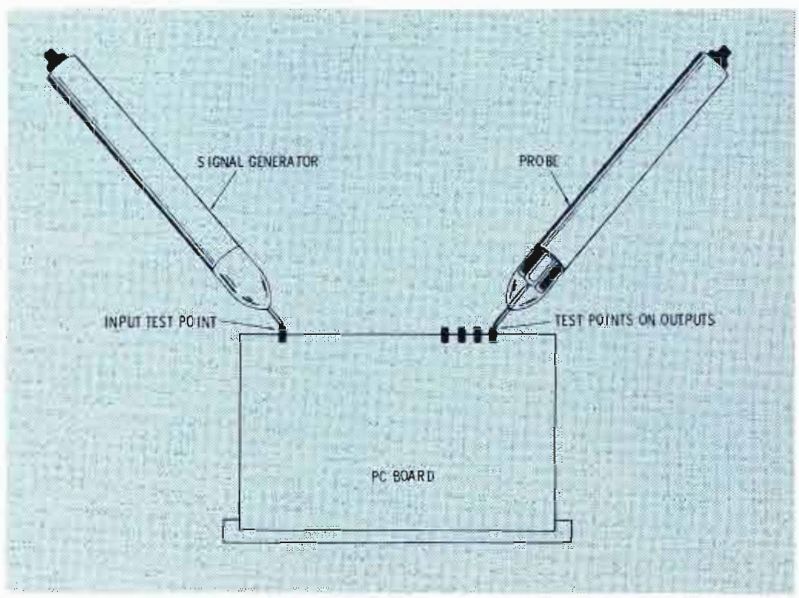

Fig. 4 On the edge mounted PC boards, use the edge test points for signal tracing and isolation of the fault to that board.

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Our people. Your people. Freight people. We've put too much time, care and effort into the manufacture of the best coaxial cable you can buy.

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When we take care of our reputation, we take care of yours.

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Warehouse locations: San Rafael and Chula Vista, California; Dallas, Texas; Tampa, Florida; Seattle, Washington; Sherrills Ford and Angier, North Carolina; Woodbridge, New Jersey; Rock Island, Illinois.

Comm/Scope Company
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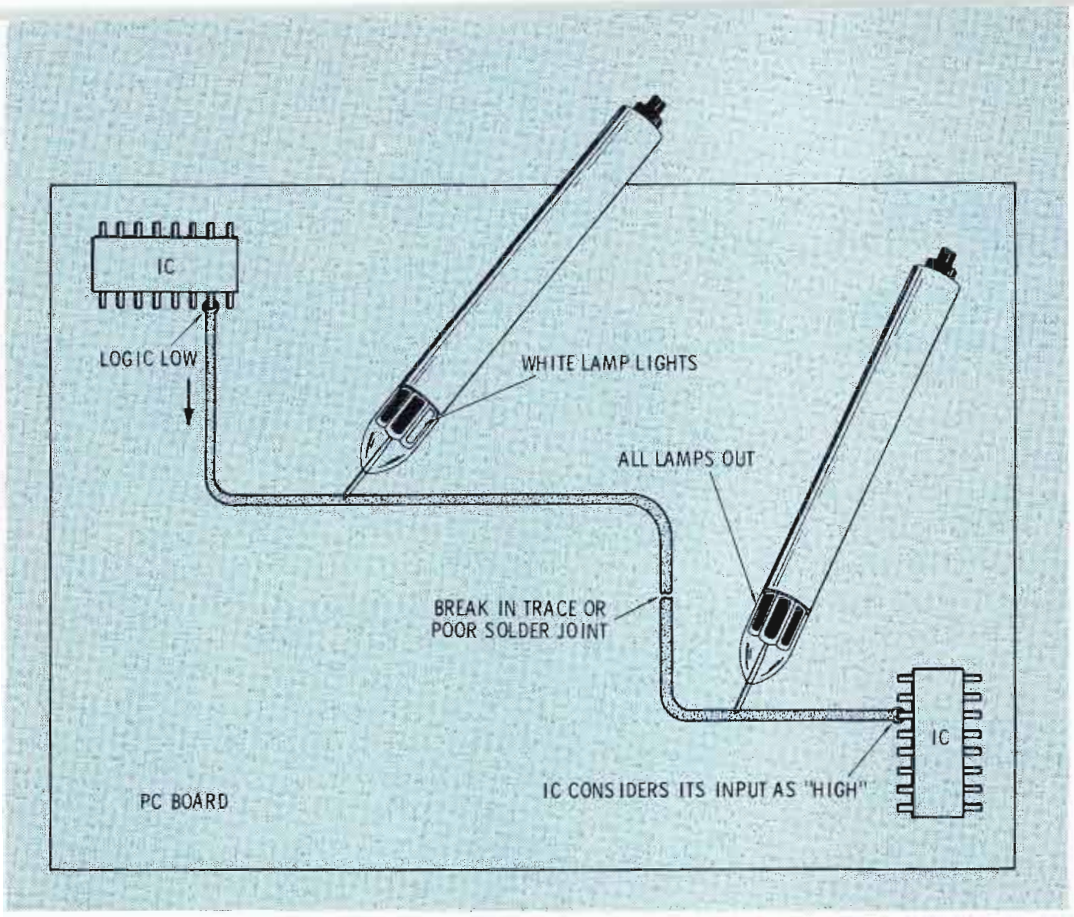


Fig. 5 Finding an open trace or a bad solder joint. Pulse the circuit so the circuit is "low". The white probe lamp will indicate a low. Run the probe pin along the trace. As soon as the break is passed, the light will go out. (In old style probes the light will come on, indicating a high.)

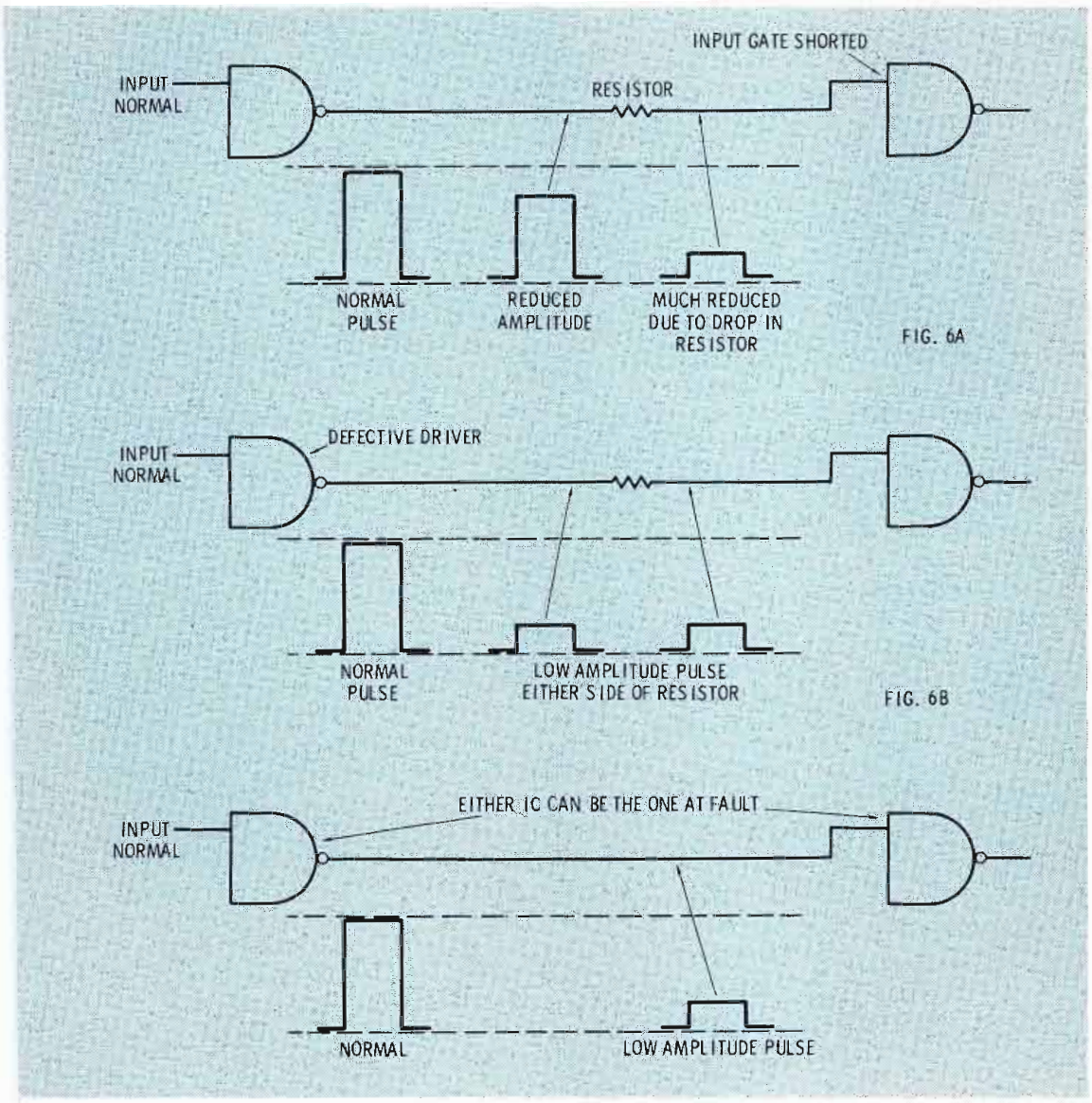


Fig. 6 A low amplitude "high" pulse can be caused by either IC becoming defective. If there is a series resistor in the trace, it will help you decide which IC to change.

high or low at each pin. The Clip is designed for troubleshooting DTL and TTL logic and its greatest advantage is the fact you can observe the operation of all the IC pins at one time.

The clip is limited to logic levels under seven Volts, unless special current limiting precautions are taken. Space is another limitation to its use. The PC board must be on an extender card, or out in the open so the clip can be attached directly to the IC to be tested. Of course, to be of any value, you must be able to see the diodes in the window.

Signal Source

In signal tracing, either the normal circuit signal or an artificial signal is necessary. The Probe and Clip are detectors. For a signal source, the normal circuit signal can be used. But in many instances, this is not the most desirable situation because all the external equipment may also have to run through its paces. This could be the case with an Automation System programmer.

Test signal sources are available. A small signal generator built into a probe case. The signal is often a selectable one, that is, its repetition rate, or single pulses. This little signal generator has an output level compatible with TTL logic and can be very useful in checking a specific circuit without at the same time causing many other things to happen. For example, with a Clip or Probe on the output pins or pin, a pulse from the generator can be applied to the input pin of the IC. That particular IC can be examined for proper operation.

Other Equipment

Other test equipment is available, as well as many test devices that assist in bringing the signal out through cables and clips so that it is easier to test. Several Companies build test equipment for Logic Testing. Hewlett/Packard Company and Kurz-Kasch, Inc. are but two of these.

Troubleshooting

When a failure occurs, it is best not to shut the equipment off un-

less it is burning up. Often, turning off the equipment will break up the fault and it may not be repeatable if it is an intermittent. Work from the block diagrams and use the major test points provided at the edge of the boards. Often the board input and output or outputs will be available at edge test points. The probe can be useful here and you may run the problem to a particular board.

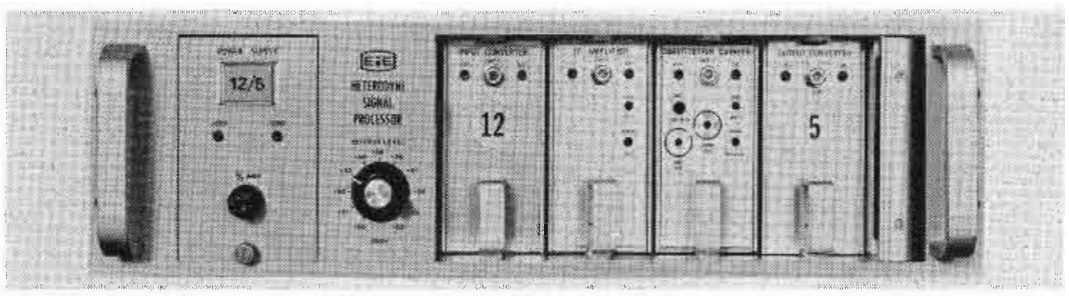
In other cases, you can still use these input output testpoints with the probe and the system signal, or better yet, with the signal generator. You can apply the correct pulse and observe the output for a correct pulse. If the problem is isolated to a particular board, then pull it out and place it on an extender card. With the card exposed, attach all the probes and clips that are available to strategic spots. Pulse the board with the signal generator and observe the various readouts. The more readouts you have, the quicker it is to localize the specific component or IC at fault.

An open trace or a poor solder connection can cause problems. When you have localized the open to a particular area, run the tip of the probe along the trace. The older style probe can be misleading if that trace is supposed to be reading high. With the newer probe, as soon as you pass the break or joint, the probe will read either the high or go out.

An IC can short internally and load the preceeding circuit down so it also appears to be at fault or the fault. If there is a series resistor, (pulse it so that the circuit is high at that point), the amplitude before the resistor will be higher than following the resistor, although neither will be normal amplitude. This indicates a drop in the resistor, so probably the following IC is shorted. If the amplitude is the same on either side of the resistor, the driving IC is at fault. However, if there is nothing but a trace between the two IC's, you have a 50-50 chance of guessing the correct one to pull. And, according to Elmer's Law in this situation, you will pull the wrong one first. ☐

NEW PRODUCTS

Signal Processors



Electronic Industrial Engineering, a Division of RCA, announced the introduction of two heterodyne signal processor models. Model CTSP1 is the basic unit which will accept any standard VHF television signal and convert it to any channel in the 10-30 MHz or 54-270 MHz bands. Model CTSP2 incorporates the additional ability to synchronize the RF output to a co-channel thereby permitting cable usage of a local broadcast channel allocation.

Both models employ keyed AGC and are equipped with a standard video IF carrier which is activated upon loss of input signal. Two options are available which accommodate emergency announcements. Option "Y" permits sound modulation following operation of an override function. Option "Z" permits video as well as sound modulation following the override operation.

Convenience features include IF patching at the rear of the housing to facilitate IF switching applications and local oscillator patching to accommodate on-channel conversions.

For More Details Circle (72) on Reply Card

Customized Mini Console

The customized mini console, a flexible new concept for the surveillance and security market has been developed by **Vicon Industries, Inc.,** of Farmingdale, New York.

This handsome, new console permits the user to utilize only the components he requires to suit his needs, from a single unit covering a small area to a multiple unit with a maximum capability of switching up to 20 cameras, control 6 pan and tilts, 6 motorized lenses, 6 scanners and provide a video/alarm intrusion surveillance protecting 20 areas.

The Mini Console will accept single 9" or dual 9" or triple 5" monitors. In addition, they can be cascaded side by side.

All components delivered off-the-shelf.

For More Details Circle (73) on Reply Card

Color TV Camera

A new color CCTV camera featuring three plumbicons for low-light level self contained operations is being marketed by **GBC Closed Circuit TV Corp.**

The color CCTV camera, Model CTC-3XP, is a relatively inexpensive, high performance camera designed to yield outstanding results in CCTV studio applications and in mobile or remote color casting.

In addition to such features as a 5" viewfinder monitor, Auto Iris control, and remote control availability, the Model CTC-3XP also provides for interchangeable lenses including zoom lenses, with a built in full EIA sync generator and color endcoder. The only cable connections required are for an AC line cable and signal output coaxial cable.

The camera also features six turret type color temperature correction filters for high fidelity of color reproductivity. Remote CCU is optionally available.

For More Details Circle (74) on Reply Card

Extended Spectrum Coaxial Cables

Comm/Scope Company, a division of Superior Continental Corp., exhibited their coaxial cable line that includes aerial or direct burial. The company guarantees long-term signal stability and specified impedance uniformity up to and beyond 300 MHz.

For More Details Circle (75) on Reply Card

Portable Digital Multimeter

Weston Instruments, Newark, New Jersey has introduced a new low cost high accuracy portable digital multimeter. The new Model 4442 DMM, a battery operated 3½ digit portable instrument, is small enough to be carried in a standard attache case. It features an accuracy of .05%.

The 4442 digital multimeter is designed specifically for field use. It is light weight and shock-proofed, and can be carried anywhere. A self-contained rechargeable battery pack provides up to 12 hours of continuous operation. The instrument's circuitry is designed to maintain stated accuracies over a broad temperature span in the field.

Twenty ranges cover 200mV (100uV resolution) to 1000 Volts AC/DC, 200 Ohms (0.1 Ohm resolution) to 20 megohms, plus AC and DC current. Accessory plug-in shunts are available to extend the AC and DC current ranges. The Model 4442 DMM features solid stated LED readouts designed specifically for the unit, a Dual Slope* high impedance bipolar A/D converter for excellent accuracy and long term stability, a single MOS LSI plug-in chip for all of the logic circuitry, auto-polarity, automatic blanking of unused digits to conserve battery life, overload protection with spare fuses, and a custom molded high impact plastic case.

The Model 4442 DMM is supplied with four nickel cadmium "C" cells and a battery charger which plugs into a standard 117V, 60Hz outlet. The instrument can be used for normal measurements while the batteries are being recharged. The Model 4442 weighs less than 2½ pounds and is housed in a shock-resistant plastic case that will protect the unit in virtually every field environment.

For More Details Circle (76) on Reply Card

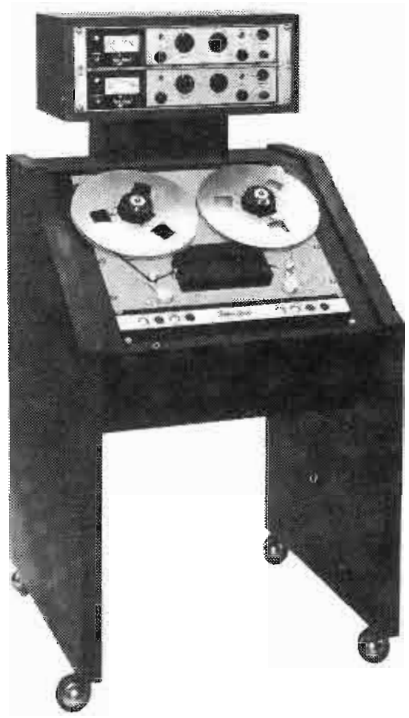
Digital IC Testing

American Electronic Laboratories, Inc. (AEL) Product Assurance Division, announces the immediate availability of a new service providing functional and parametric testing of all families of digital integrated circuits.

AEL's new Digital IC Test System readily lends itself to use by companies requiring incoming inspection assistance, screening programs or qualification programs.

For More Details Circle (77) on Reply Card

Electronic editing so precise you might kiss tape splicing goodby!



The new Tape-Athon 1001 Recorder/Reproducer has everything the professional studio demands in a precision instrument, plus some exciting innovations we've added to make the 1001 a must-see-it-before-you-invest. Here are the basics: dual capstan, closed loop tape drive for clean, even tape travel with minimum wow and flutter; tach-controlled motion sensing to eliminate tape breakage, stretching or spillage; newly designed tape head section for easy threading, fast lifting; illuminated push button controls, flush mounted.

Now for the innovations, take a look at this control panel.

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Putting the clamp on video

By Pat Finnegan

Holding the signal to a fixed reference point is important in station equipment. Here is a practical approach to enhancing system stability through clamp circuits.

How has your video or pulse system been behaving lately? Having intermittent horizontal streaks in the picture, poor pulse waveform or instability problems? It's possible that a clamp circuit is working on the ragged edge somewhere in the system.

These systems tend to become a little "freewheeling" unless we keep a rein on them. This is done by clamping the system to fixed reference points at various points in the system. The reference may be either a fixed DC voltage or ground, depending upon the placement in the system.

The Need To Clamp

Video and pulse signals contain both an AC component and a DC component. The major portion of actual video picture information is an AC component. Consider first what constitutes a DC component and an AC component.

In a circuit the voltage may reach a given amplitude, say 10 Volts, and remain at this level until it is turned off again. This is a DC voltage, or to say it another way, a DC component. If the circuit is turned on and the voltage rises to a maximum value, say 10 Volts, then in the same time interval decreases to zero, on to a negative 10 Volts and again back to zero, and repeats, we have an AC voltage.

This is the basic sine wave and the basic definition of AC voltage. The basic ingredient here is that the amplitude changes within a time interval. The term "AC component" has been extended to mean any voltage that is changing amplitude, even though a full cycle is not present or even repeated. Thus, a signal with a voltage which varies its amplitude in any manner contains an AC component, regardless of how slow the change may be. This changing amplitude or AC component will pass through AC systems, provided the change is compatible with the system components for that **rate** of change.

Consider the video signal. The beam in the camera tube scans the picture focused on its target, line for line. If there is no change in gray scale on that line, the charge on the target will be even, and the beam output current will be constant. The output for that line of information will be a DC voltage. But if the gray scale varies so that the target charge for that line varies, the beam current and output voltage for that line will fluctuate in accordance with the gray scale scanned. This fluctuation will be an AC component.

The pulse signal has fixed DC and AC components, besides the repetition rate of the pulse itself. Consider the pulse starting from zero voltage, abruptly rising to a maximum amplitude of 10 Volts, remaining at this amplitude for the duration of the pulse, and then abruptly dropping back to zero voltage. The two transition points, at the leading edge of the pulse and the trailing edge constitute an AC component as the change in amplitude is very rapid. Translated into frequency, it is many times higher than the actual repetition rate of the pulse, although harmonically related to the repetition rate. During the period the pulse amplitude does not change, the DC component is present.

In the video signal, there will be varying amounts of AC and DC component, but the sync and blanking are strictly pulses and

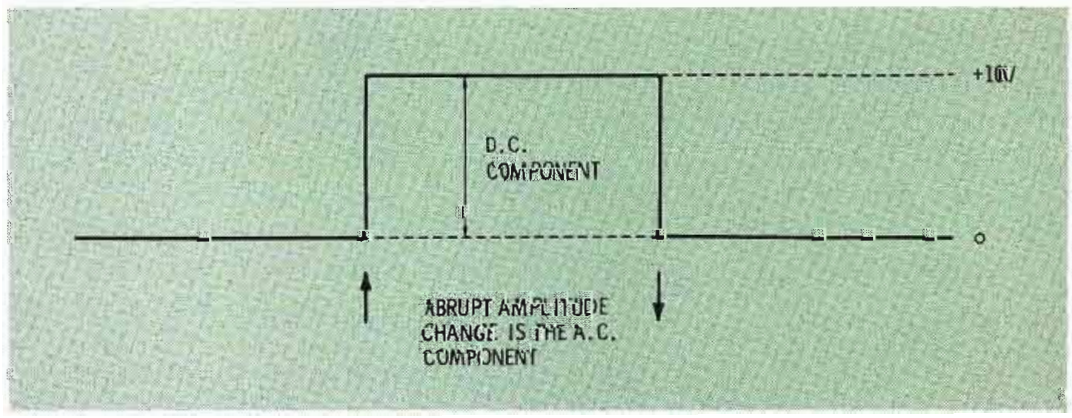

Fig. 1 Here you see a positive going pulse. The abrupt change in amplitude at the leading trailing edge of the pulse is an AC component. The steady amplitude during the center area is a DC component.

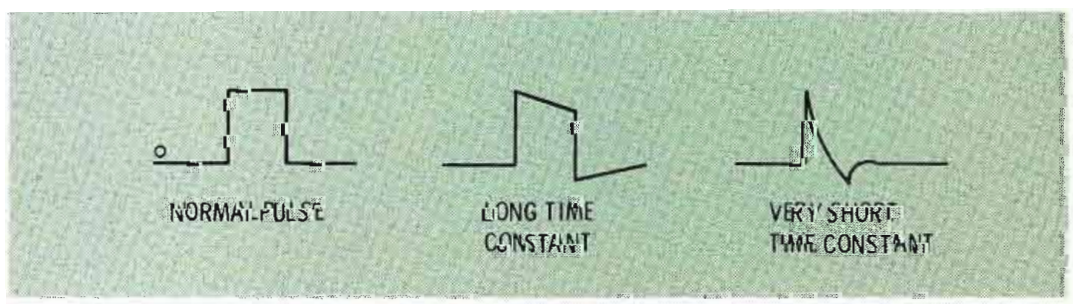

Fig. 2 Now you can see what happens when a RC component is in the path of a pulse. A very long time constant can tilt or slope off the top of the pulse. A short time constant removes most of the DC component.

have fixed amounts of both AC and DC components.

The Culprit

Many amplifier stages or other parts of a system must use capacitors to couple signal from one circuit to another. These may be used to contribute their effect on the signal, such as frequency discrimination, or DC blocking to prevent differing values of DC voltage from interfering with other circuits. Unless a stage is DC coupled (and this offers some design problems), there is usually a coupling capacitor to block the DC voltage from the one stage to the following stage. The signal must pass through the capacitor. And here is where the trouble starts.

As the video and pulse signals have both an AC and a DC component, the AC will pass but not the DC, and this distorts the waveform. When the signal is applied across the input circuit of the next stage (which also includes the coupling capacitor), the AC will pass, providing the capacity is of a value that no discrimination occurs. The DC component will charge the capacitor exponentially. During the periods when the DC component is not trying to get across, the charge on the capacitor will begin to leak off until the next DC component comes along. The net result is a shift in DC bias on the following stage. Since the DC bias sets the operating point of the stage, this shift is causing the stage operation to shift. Besides the shift in operating point, an amount of differentiation is taking place in the pulse itself.

Pulse differentiation circuits have their place, but if the circuit is to pass a pulse undistorted, differentiation is most undesirable. To what degree differentiation of the pulse occurs will depend upon the time constant of the resistance of the circuit and the coupling capacitor. A very short time constant can eliminate almost all the DC component, allowing only the leading and trailing edge of the pulse to pass. This results in a couple of triggers, but no pulse.

A very long time constant will cause the capacitor to charge exponentially during the DC component, so the flat top of the pulse will be sloped. Other time constants in between will produce varying effects, but in all cases, the pulse is not identical in shape with the original.

Effects

A shifting DC level in the video will cause various stages in the system to work at various operating points. This may not be too troublesome, unless the shift would cause a stage to become non-linear or clip the signal. The DC level does not continue to build up, but will leak off as soon as the DC signal component passes. Thus it is a varying level of charge.

From a practical standpoint, consider that the capacitor charges mostly during the blanking pulses and then begins to leak off as soon as the pulse has passed. This occurs with both horizontal and vertical blanking pulses. On a monitor or receiver kinescope, this shift in DC level will cause the blanking or black level to follow the brightness of the video signal. Most of us are familiar with the older receivers or monitors. When the operator at the studio faded to black, the receiver faded to gray.

Many pulse circuits are dependent upon a fixed pulse amplitude, as well as its width and shape. Shifting DC levels can cause a stage to interpret an incoming pulse as one having a higher or lower amplitude than it really is and act accordingly. Distortion of the pulse can affect those circuits which de-

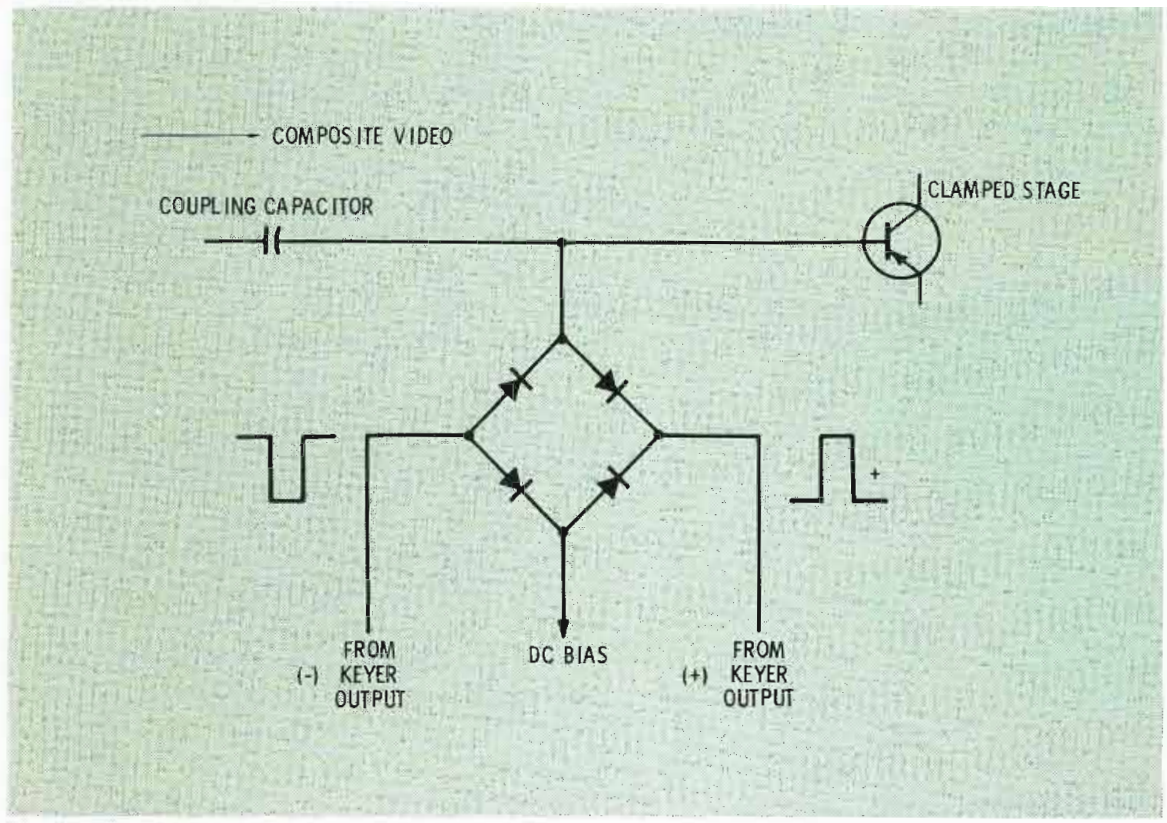

Fig. 3 The switch part of the clamp consists of four diodes. The opposite polarity keying pulses derived from horizontal sync short out diodes during each horizontal blanking back porch interval. This restores normal bias to the clamped stage.

pend upon the width of the pulse for proper action..

Consider a gate circuit. The pulse opens the gate, keeps it open during its interval, and then closes the gate at the end of the pulse. The gate assumes the pulse amplitude will remain constant during the pulse period. If the interstage capacitor has eliminated most of the DC component, the pulse amplitude is far from constant and the gate will close long before it is due. The gate may be keying into another circuit a definite number of pulses and other circuits may be dependent upon the correct number of the pulse gated in. If the gate is not open long enough, the other circuits will not get the correct number and may go beserk!

The Circuits

The DC restorer is one of the simple circuits used in early TV receivers and monitors to restore the DC level at the kinescope cathode or grid, depending upon which was driven by the signal. During the blanking pulse in the video signal, the charge from the DC component would cause the diode to conduct and provide a low resistance path around the high kine input resistances. The discharge path was either to ground or, most likely, to the bias voltage. A small capacitor was included to assist the action and to slightly backbias the diode during the video levels so that the diode would not drift in its action.

Since the biasing on the kinescope set the black level, the DC restorer helped maintain a constant bias and thus the black in the picture from changing too much. Later sets discontinued use of the restorer as an economy measure.

Present day color sets use an updated version of the DC restorer. The simple restorer in this case gets an assist from blanking pulses picked up in the horizontal and vertical output stages of the set so the restorer action is more positive. The new name is blanking or blanker stage.

The Keyed Clamp

There are many instances when it is desirable to have a firm positive control, rather than depend upon the charge on the capacitor for action. The keyed clamp is such a positive control circuit. Keying pulses are created from the incoming sync and used to operate the clamp at a definite rate of speed. The time of operation may be either the tip of sync period or the back porch of blanking. Sync tip clamping is used on some occasions, but generally back porch clamping is done in video systems. This method is particularly true of the transmitter modulator as the blanking level must be maintained at a fixed level.

Unlike the simple DC restorer, the clamp uses four diodes in a bridge or quad arrangement. The top end of the quad is attached to the circuit to be clamped, while the low end is attached to the reference point where clamping is desired. This may be ground or the stage bias. The quad will not conduct unless it is keyed, and thus acts as a high impedance circuit across the input impedance of the stage. The keying pulses are applied across the two arms of the quad, causing it to conduct or short out, providing a short circuit path for the DC charge on the capacitor around the circuit input impedance to its bias source, restoring the normal stage bias.

These keying pulses must be identical in time, width, amplitude, but exactly opposite in polarity. They must completely cancel each other in the quad, otherwise that which is uncancelled will be added to the video signal and passed on. A set of keying pulses short the quad each time a horizontal blanking pulse is being applied to the clamped stage input.

There has been some confusion over terminology. In the keyed clamp, the stage whose input circuit is controlled or clamped, is called the clamped stage. The blanking pulse that appears at the clamped stage input is the clamp pulse. The pulses which short the quad are the keying pulses.

The entire circuitry of the clamp involves several stages devoted entirely to developing the keying pulses and the quad. The first stage is an amplifier stage to develope the composite signal to the desired level, and it also acts as a buffer to the main video stages. This is followed by a sync separator, a sync amplifier, a pulse former, key output stage and the diode quad. After the sync pulse has been stripped from video, amplified, it is fed to the pulse former. This stage has a highly damped resonant circuit in its output. As the sync pulse is applied, the leading edge causes an abrupt change of current through the resonant circuit, causing it to "ring". Since the resonant circuit is highly damped, only one half cycle will appear on the output. The trailing edge of the sync pulse will cause an abrupt change of current through the resonant circuit in the opposite direction and again create

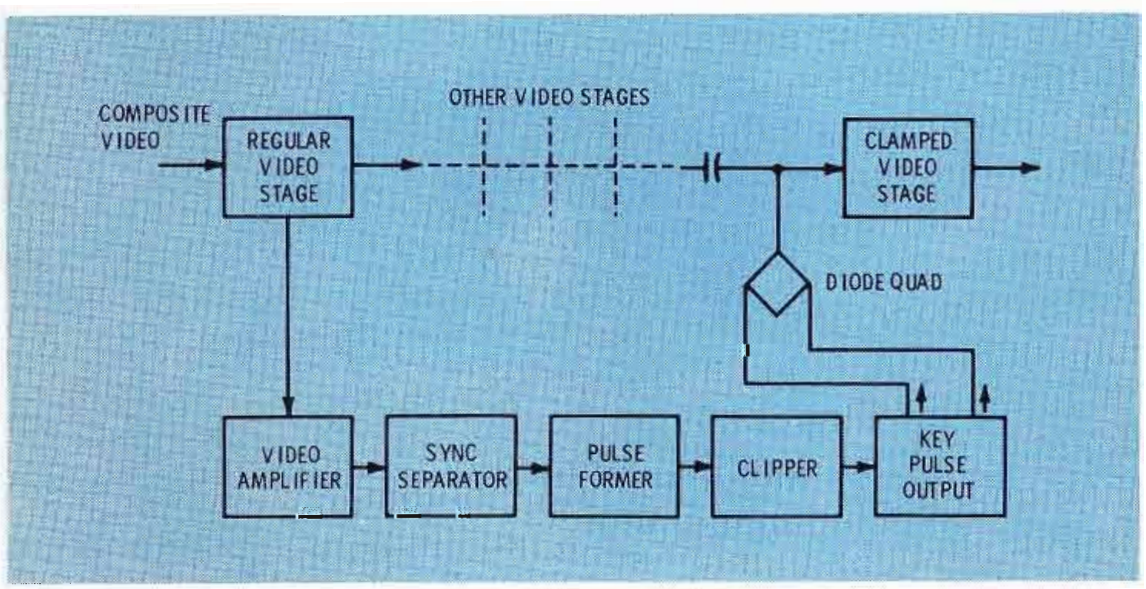

Fig. 4 Block diagram of the keyed clamp. These circuits amplify the sync from regular composite video, strip it, amplify it, and shape it into keying pulses to operate the diode quad at the clamped stage.

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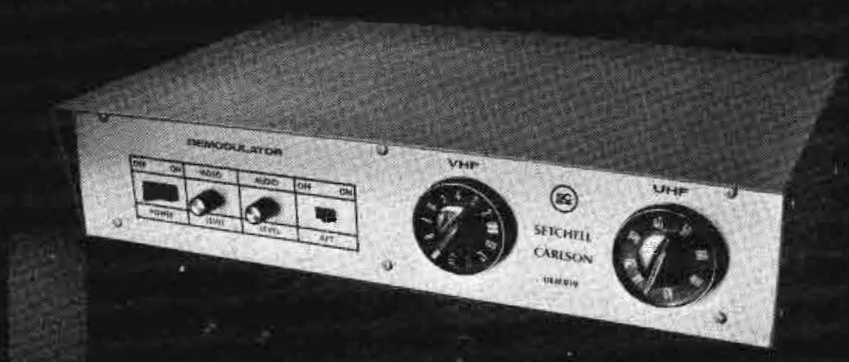

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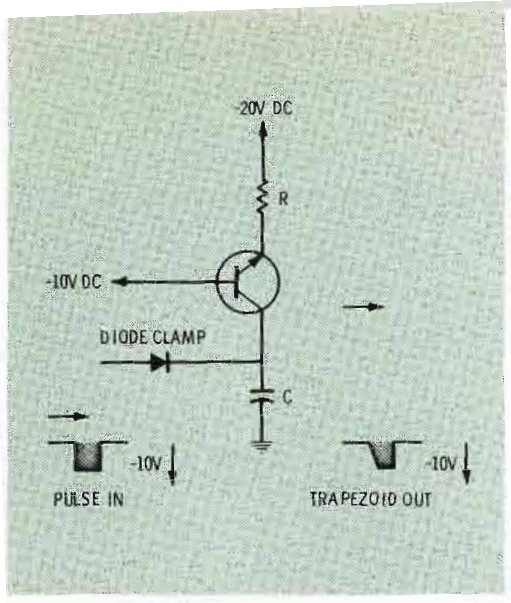


Fig. 5 Typical trapezoid pulse generator in a VTR servo. The diode acts as a clamp to hold the maximum amplitude of the trapezoid to the amplitude of the input pulse.

one half cycle to do the damping. But this cycle will be opposite in polarity to that caused by the leading edge of the pulse.

Since we are interested in clamping the back porch of blanking, the half cycle created by the trailing edge of the sync pulse is selected by a clipper which removes the other pulses. The selected pulse is then fed to the keying output stage. Since balanced pulses of opposite polarity are required, these are taken from the plate and cathode, or the collector and emitter of the output stage. The leading is adjust- d so that the pulses are equal in plitude. The keying pulses are fed to the quad to short it out. the composite signal is also a signal having a color burst on k porch of horizontal blank- e clamp will destroy this less precautions are taken. l resonant circuit is placed with the clamp lead which nt at the subcarrier fre- This presents a high im- the burst frequency, but e to the DC and other that must be shorted

enefits

iding stability, and black level refer- clamp will also e low frequency as hum. Hum ignal to follow e as it goes newave excur- is keyed at a very high rate (in comparison to the low frequency disturbance), it literally chops the hum to pieces, as each horizontal blanking pulse is pulled back to the reference level. This effectively eliminates the hum from the signal.

Pulse Circuits

The term clamp is often used in a general way to describe all the circuits which produce an action designed to hold a stage or circuit to a fixed DC reference level. So it is a good idea to investigate the circuit and determine which type clamp circuit is in use, so that confusion will not result when working with the circuit or troubleshooting it.

Many pulse circuits use a simple diode or transistor or both to stabilize and hold a pulse level to a specific amplitude. For example, a trapezoid pulse generator used in servo systems. The trapezoid pulse was found to be more linear and sensitive than a sawtooth, so it is often used in the servo.

In Figure 5 a resistor, capacitor, transistor and diode clamp, generate a trapezoid waveform from a square pulse. During the pulse off time, the diode effectively bypasses the capacitor so that it cannot charge. When the pulse comes on (circuit calls for a negative going pulse), the diode is shut off due to the back bias provided by the pulse. Once the diode shuts off, the capacitor begins to charge exponentially towards the DC voltage, shaped by the series resistor. As this charge reaches the level of the input pulse, the diode will experience foreward biasing again and thus conduct. When it conducts, the capacitor charge cannot increase any higher. As soon as the input pulse passes, the capacitor charge reverts to zero again awaiting the next input pulse. The diode then effectively holds or clamps the maximum amplitude of the trapezoid pulse to the maximum amplitude of the input pulse.

Maintenance

While clamps do much to enhance the system, the clamps themselves are subject to component or operational failure, and to outside interference. Failure of the clamp can produce all sorts of reactions in addition to those which would occur if the clamp were not used at all.

For example, consider the keyed clamp in the transmitter modulator. Should the keying pulses fail to operate the clamp, three clues will be quickly evident. The transmitter power output meter will be indicating several percent higher power. The display on the waveform monitor will show thick lines on horizontal blanking and sync tips line. The vertical display will show the serrations in the vertical sync interval as an exponential charge on a capacitor. The picture on the monitor will change gray scale and if the picture faded to black, the screen would become gray. There will most likely be seen vertial retrace lines.

The same symptoms will be displayed on a monitor and WFM in other sections of the system when a clamp fails. Since the transmitter is not involved, there will be no power change.

Remedial action at the transmitter would call for switching the modulator to AC coupling so as to take the clamp out of the circuit altogether. Next, "shotgun" all the tubes in the clamp section, assuming the exciter is a tube model. If a tube has failed, new tubes will correct the problem and the program can continue without interruption. If the problem was not a tube, or if the circuit is solid state, signal tracing with a scope will quickly run the problem into a corner. A component failure that does not also take out a circuit breaker can operate until after programing hours. The air program will not appear as it should since the black level will be shifting and the transmitter power will be somewhat unstable, but programing can continue to sign off.

Once signal tracing has narrowed the fault to a single stage, shift to voltage measurements, and finally with the power off, to resistance checks of the components.

The video input signal level itself can be a source of trouble because the sync to operate the keyed clamp is taken from the composite video

signal. If this signal is too low, there will be insufficient pulse to generate keying pulses.

In transmitter exciters, the video gain control is often a ganged control, so that adjusting the input level will also adjust the level of the special video stage driving the clamp section. This control operates opposite the gain control. That is, lowering the video input control would increase the gain of the special video stage, and the opposite action would occur when the gain control is increased. If for some reason the operation of the modulator stage is so misadjusted that it requires very much less video input to fully modulate the transmitter, the clamp section may have insufficient level to operate properly.

The remedy here is correction of the misadjustment to the modulator itself. Check the video input level to the exciter. The instruction manual will indicate what the proper peak-to-peak composite level should be, although generally it is 1 Volt peak-to-peak. The misadjustment to the modulator tube can often be done while programing. The bias on the stage sets its operating point and, thus, the amount of composite video required to drive the transmitter to full modulation.

Watch the recovered waveform on a scope with the chopper going, drop the transmitter power output about 20 percent. Adjust the bias on the modulator so its metering is indicating near its correct reading, and at the same time reduce any sync stretch and increase the video input gain to the transmitter. These can be done without making large, abrupt changes that will be noticed by the home viewer. In most cases, the changes can be made without any one but the operator knowing the difference. Restoring the modulator and the input gain will then allow the clamp to operate reliably. In the other mode, it may be inoperative or borderline.

Noise

Sharp impluse noise can wreak havoc on a keyed clamp when the pulses reach down into the sync region. Such noise pulses can be generated by a number of means and picked up in the system. For example, dirty brushes on an electric motor, ignition system from automobiles or similar generators all can prove a headache. For those stations who receive video signals off the air and process for rebroadcast, ignition noise can make the pickup almost useless because of the clamps. This noise can be in the video, viewed on a picture monitor, and the only disturbance seen may be small white or black specks in the picture. Although in the sync region, the receiver sync circuits still may be able to maintain proper control . As viewed after the signal has passed through a clamper, however, the picture monitor will exhibit random, intermittent horizontal black streaks across the picture.

Here's what is happening. The noise pulses that extend past black and into the sync region are accepted by the sync separator as simply pulses. The video is stripped off, the noise pulse is amplified and fed down the chain to generate keying pulses for the clamp. The clamp operates, but it is now in video, so the noise is making the clamp pull the video down to black level, creating a black streak across the picture.

Cure for noise begins as with all noise problems, building a system which is least susceptible to noise. If an off-air pickup, the antenna height, location and etc. should be selected for the least ignition noise pickup. The clamper used on the video should be adjustable to improve noise immunity. That is, the clipping level of the sync separator set to clip closer to sync tip and farther away from video. If the noise pulse is equal to or exceeds the amplitude of the sync pulse, changing the clipping level will not help.

Another modification technique adds RC combinations to the sync stage to integrate the sync pulse and then clip near the peak of th integrated pulse. This adds an e ment of time which the noise p does not have.

Processors designed for tape machines have develo higher degree of noise imm the clamp circuits. Besi techniques previously disc gate circuit is added whi only during the horizontal interval. During intervals blanking, noise pulses c into the clamp circuit. I ence of a very noisey sync separator level a justment are still cri ments to preserve the

Componen

Components of and do fail. If t type, many fa tubes themsel become weak. cient level fo tubes may

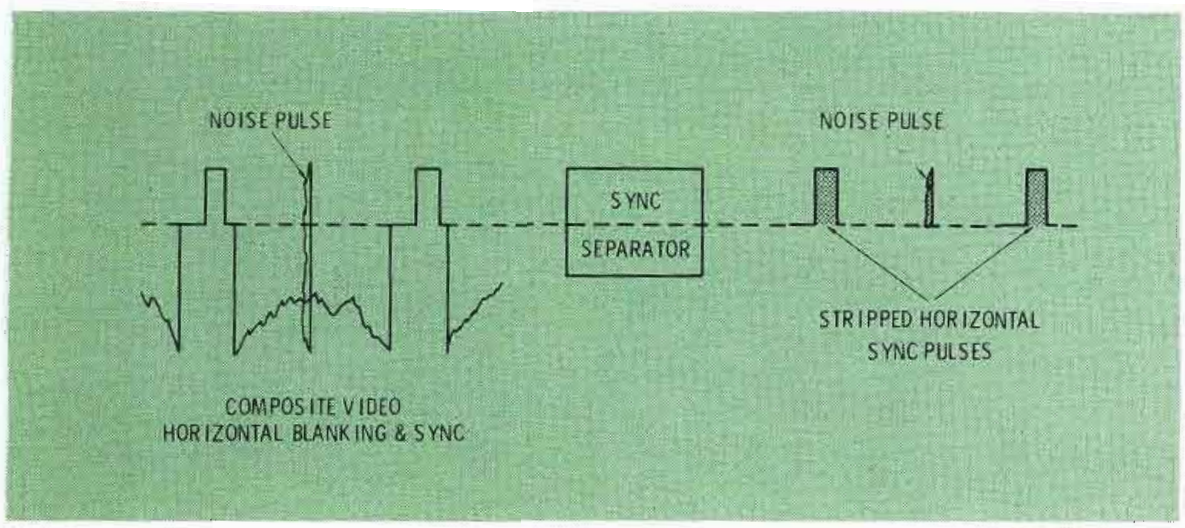


Fig. 6 Noise pulse reaching into the sync region will be stripped off the video as are the sync pulses. The noise pulse will then go on to create keying pulses which cause the clamp to operate during video.

the clamp to operate on video. Or, a tube may simply die and disable the clamp.

Other components, such as transistors, diodes, resistors and capacitors can fail, change value or the diode or transistor short, open etc. Each will affect operation or non-operation of the clamp. What is important in replacing defective components is this: those parts of the circuit which are critical in nature, should be replaced with parts as near the original value as possible.

For example, the damping resistor across the resonant circuit in the pulse former. Incorrect damping can generate too many cycles and too many keying pulses, or the clamp can operate in the wrong time interval rather than back porch. The replacement components should produce the correct pulses and pulse amplitudes shown in the instruction manual. If one of the keying pulses is lower in amplitude than the other, the remaining pulse will be passed along in the video, while if one pulse is missing, the clamp cannot operate correctly if at all.

The diodes used in the quad should be as nearly identical to each other as possible so that a balanced condition occurs and remains. Tube diodes can become noisy and send this noise along with the video information. There are special low noise versions of some diodes, such as the type 5726 low noise version of a 6AL5 tube. In solid state diodes, the leakage plus forward and back resistance of each diode should be as nearly identical as possible. Leakage in any of the diodes will cause unbalanced clamping action, while a shorted diode will cause the clamp to fail.

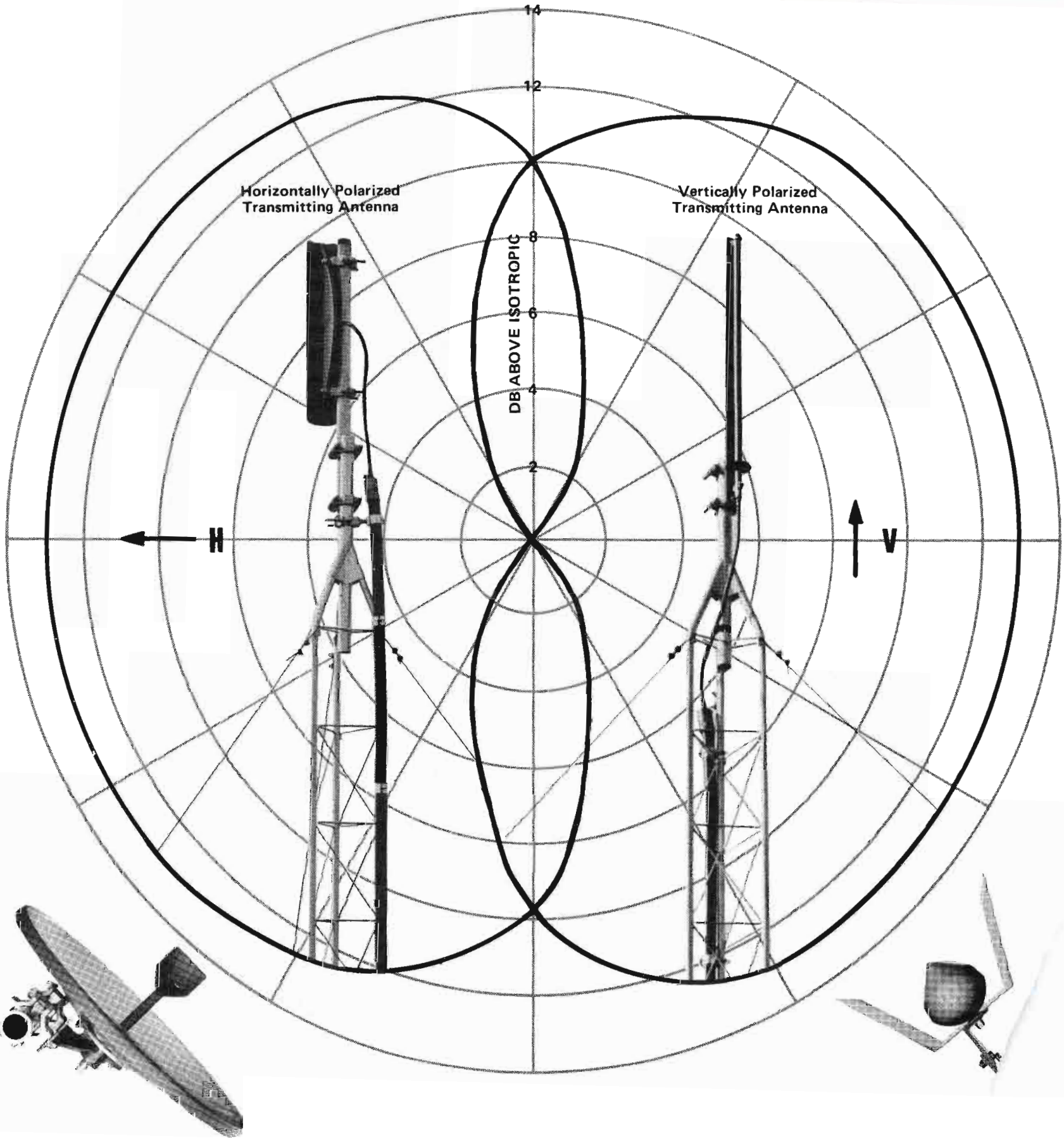
Sweeping

Sweeping a circuit containing a clamp will not work properly or give correct results unless the clamp circuit is disabled and the clamped circuit bias restored. In the transmitter, there is normally a switch to cut the clamp out and switch in a manual bias. A video amplifier must have the bias restored through resister.

Summary

Clamp circuits enhance system stability, maintain video black levels and eliminate low frequency hum from the video signal. In pulse circuits, the clamp not only maintains fixed references, but sometimes used in forming pulses. There are several types of clamp circuits, performing in different manners, but with the general intention of holding the signal to a fixed reference.

While the article approach was somewhat basic, it was intended to provide a practical understanding of clamp action, clear some confusion over terms, and point out some problems and cures. □



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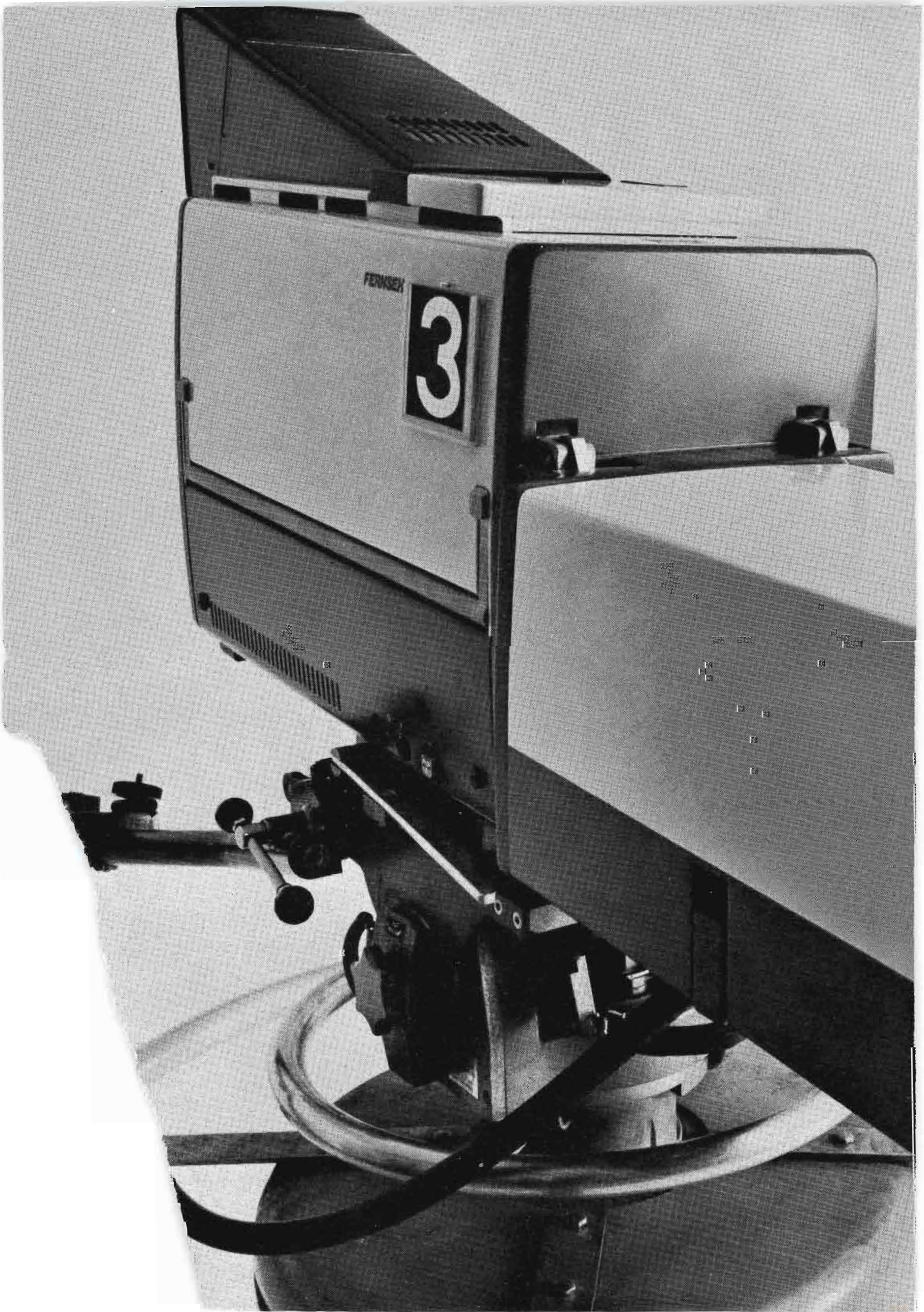

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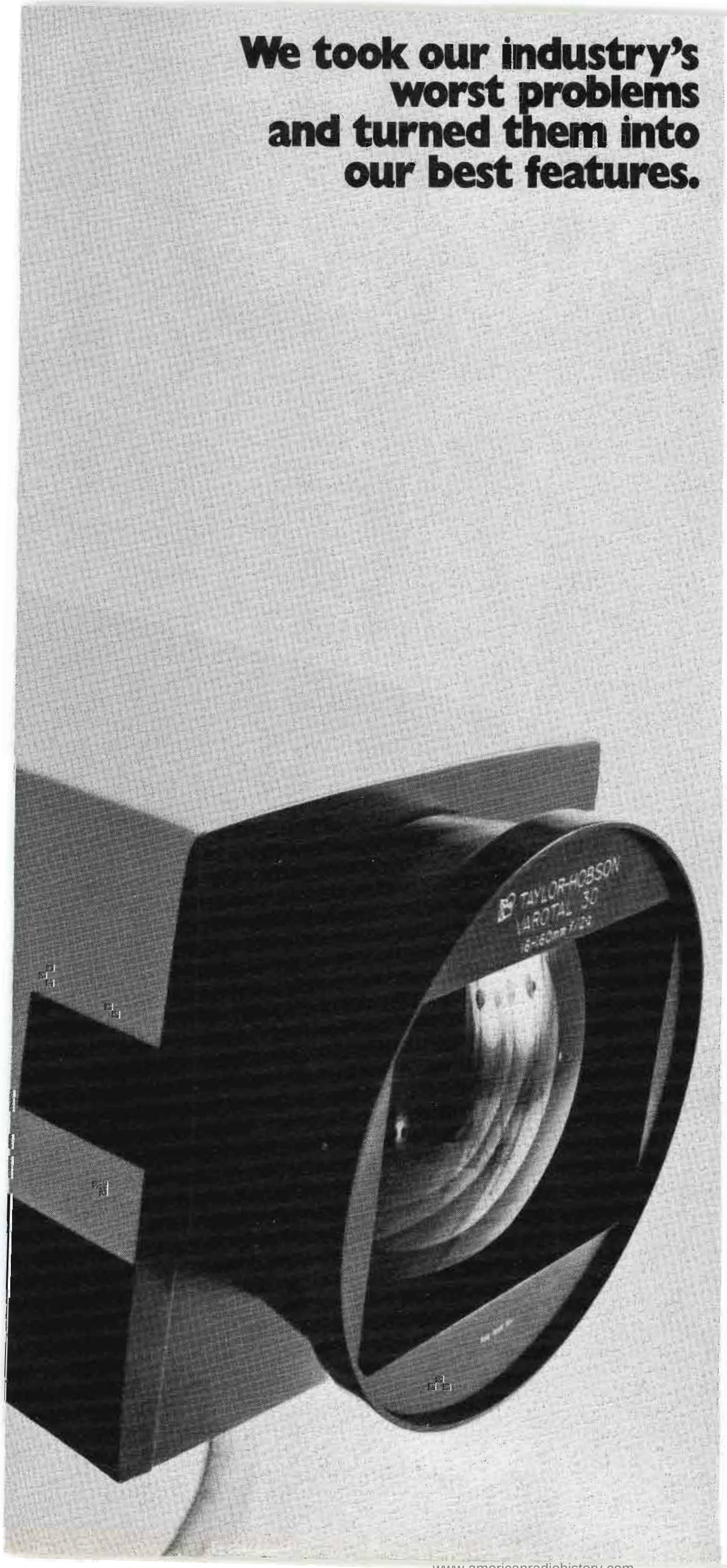

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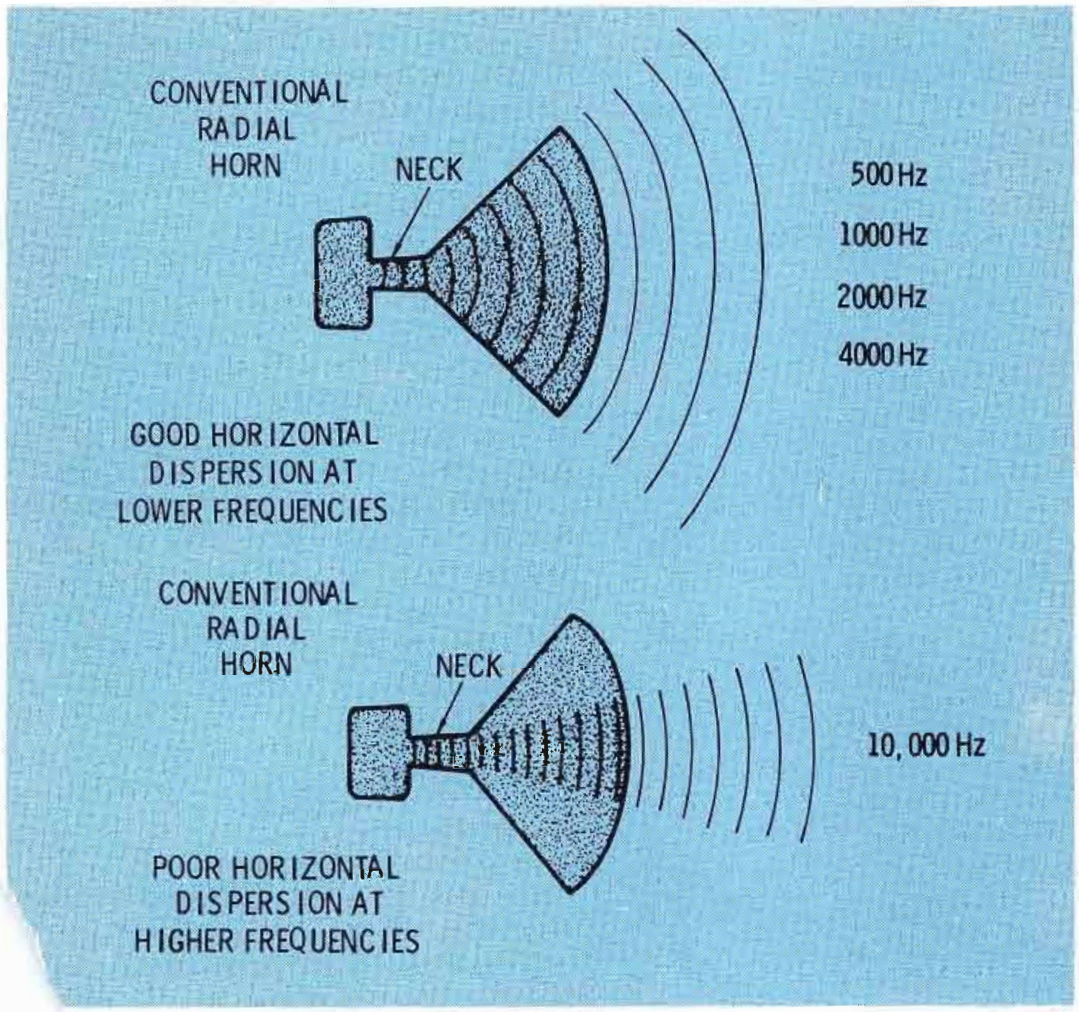
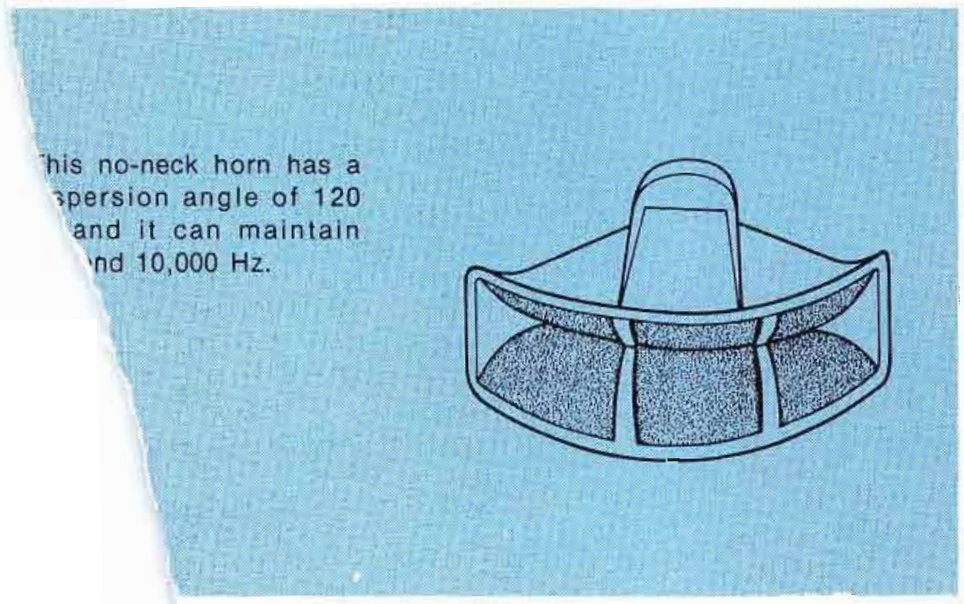
Design considerations for efficient monitor systems

By Jim Long
Electro Voice



Conventional radial horns displaying good horizontal dispersion at lower cies. But note what happens to horizontal dispersion at higher frequen-



There is certainly nothing new about high-efficiency speakers. Most of the earliest speaker designs for broadcast and home high-fidelity applications were in the high-efficiency class. It was simply a matter of necessity—of getting the most sound out of the then-available 10 Watt amplifiers.

Even today, with amplifiers in the hundreds-of-Watts class widely available, high-efficiency transducers still provide the only means to get the very high peak sound pressure levels associated with live music and professional entertainment sound reinforcement, without clipping the power amplifier or destroying the speaker.

A "typical" low-efficiency bookshelf system in a typical studio would require a 250-Watt (IHF) amplifier to faithfully reproduce the levels of a symphony orchestra. This requirement is, at the least, a strain on the budget. The greater demands of rock music could require a 2,500 Watt (IHF) amplifier. Even if the budget could stand the strain, the speaker couldn't!

In contrast, the use of high-efficiency transducers can satisfy these level requirements with 1/10th the amplifier power and virtually no risk of speaker destruction.

The Compromise Of High Efficiency

Unfortunately, the high-efficiency loudspeakers most widely employed in the past have been little more than loud. Serious compromises in frequency response and uniformity of dispersion are a part of most, if not all, designs. These and other major defects often cause broadcasters to reject such designs in favor of low-efficiency bookshelf type systems.

The speakers used to illustrate this article on basic speaker design

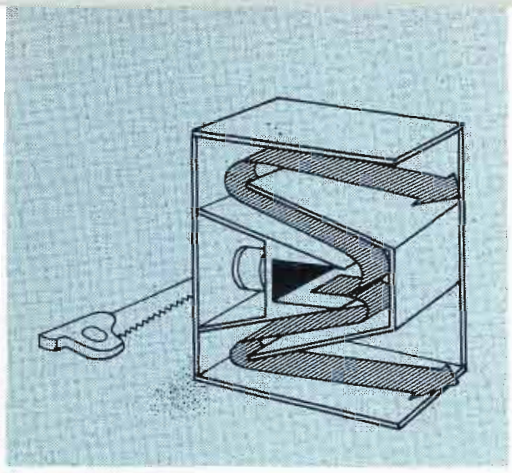


Fig. 3 Shown here is a cutaway of the Sentry IVA enclosure.

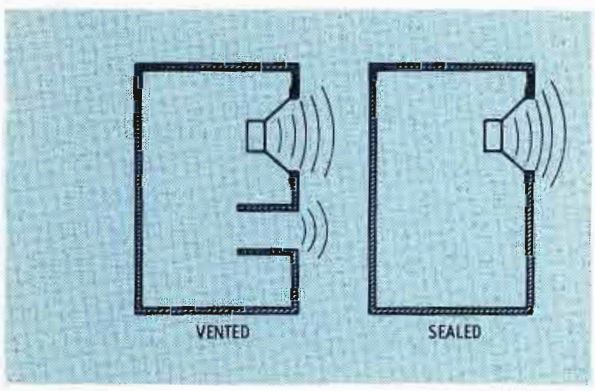


Fig. 4 Which method is best? The author insists we shouldn't give up on the vented box quite yet.

were developed from a determination to provide high efficiency without significant compromise. Several very critical areas of speaker performance were involved.

Focusing On The High-Frequency Problem

Obtaining very high efficiency means using a horn loudspeaker. A horn better "matches" the minute motions of the speaker diaphragm to the surrounding air environment, so that more of the power poured into the speaker gets out. The problems that arise, however, are frequently serious.

Radial Horns

Some of the most widely-used high-efficiency speakers use a horn-type called "radial," or "sectoral." These names have to do with the shape of the horn when viewed from the top: the sides are formed by the **radii** of a circle and the overall wedge shape of the horn is a **sector** of a circle. The major difficulty in horns of this type is obtaining dispersion that is uniform at all frequencies in both the horizontal (side-to-side) and vertical (up-and-down) planes.

Many existing designs produce a uniform horizontal dispersion through the upper mid-range, but their beamwidth collapses in the 8 to 10 kHz range, due to constructional details. In the lowest three octaves or so of a radial horn's operating range, a spherical wavefront is formed whose dispersion pattern is precisely like a view from the top of the horn would indicate.

At higher frequencies, however, the long neck that joins the driver to the main horn is the controlling factor. The highs never get the luxury of "seeing" the sides of the horn and, instead, tend to beam straight ahead.

Vertical dispersion for conventional radial designs also decreases with frequency, but starting from the lowest frequency handled by the horn right on up. At crossover, wavelengths are long, compared to the vertical horn dimension, and the sound is diffracted, or widely dispersed. As frequency increases, wavelengths get smaller and the diffraction effect decreases, reducing dispersion. The net effect is not unlike the narrowing high-frequency dispersion of a large cone loudspeaker.

Drivers

In addition, the drivers used on conventional radial horns have a prodigious task. Their relatively large moving assemblies have a high-frequency response that begins to fall in the midrange and may be down from 10 to 15 dB at 10,000 Hz. Some designs, too, have an associated transient response far inferior to that of the small tweeters used in low-efficiency bookshelf type systems, or separate component tweeters covering limited band width.

Acoustic Lenses

Some speaker systems employ acoustic lenses in front of the treble horns. One popular example maintains very uniform dispersion in the horizontal plane (good), but the vertical dispersion becomes very narrow at high frequencies (not so good).

Solving The High-Frequency Problem

The Sentry III and Sentry IVA employ a midrange radial horn that, on the surface, looks like other designs. In fact, in its lower octaves, the horn works just like the other horns.

But this horn is unique in that its basic 120-degree horizontal dispersion angle is maintained to beyond 10,000 Hz. This state of affairs results because we have dispensed with the long "neck" that causes the high-frequency problems in other horns.

Vertical Dispersion And Frequency Response

Unfortunately, the vertical dispersion of the Sentry midrange horn is no better than older designs, gradually narrowing as frequency increases. Also, the frequency response of the horn-and-driver combination rolls off in the upper midrange and higher frequencies, both due to the driver response and the horn's wide dispersion. Alas.

Saved By a Tweeter!

The ST350A radial tweeter deals with these problems, operating in the frequency range above 3,500 Hz. It is essentially a miniatur version of the midrange horn. lightweight moving system has g transient response and it sup the additional high-frequency gy required, all with the same and uniform horizontal dispe that characterizes the midi horn.

In addition, since the ve dimension is much smalle that of the midrange horn, i cal dispersion at any giver cy is substantially wider. tweeter, then, serves to s improve the vertical di formity for the entir "coming in" just w range horn needs he

Low-Frequen

Designers of wi efficiency system

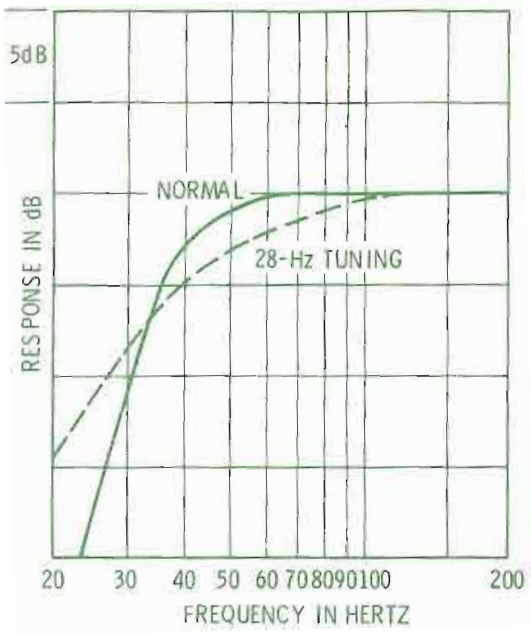


Fig. 5 28 Hz Tuning

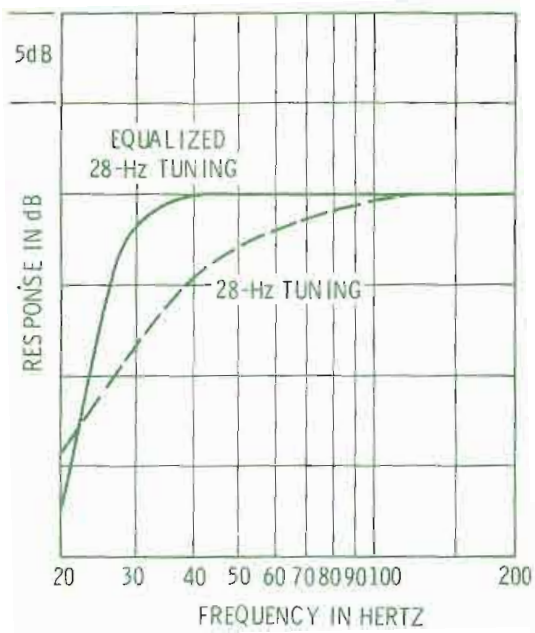


Fig. 6 Equalized 28 Hz tuning.

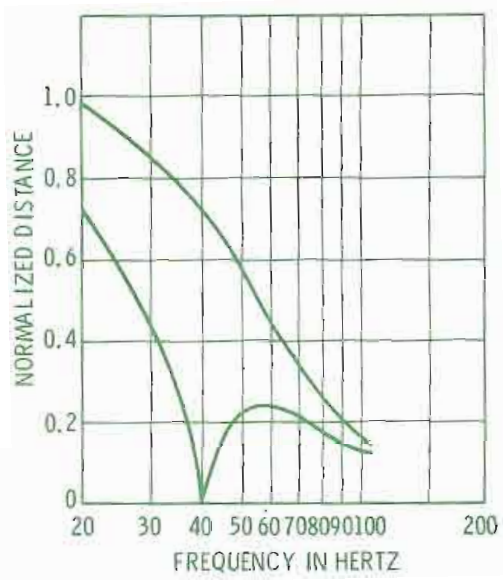


Fig. 7 Cone excursion comparison.

the problem of finding a low-frequency transducer as efficient as the high-frequency transducer as efficient as the high-frequency horns and drivers. For one reason or another, many of the available alternatives employ direct-radiator woofers which are almost, by definition, much less efficient than the treble horns. Unless the high-frequency assembly is drastically "padded down," which rather defeats the whole goal of high efficiency, the resulting system has a frequency response which tends to rise with frequency. Two of the most popular monitor systems used in the recording industry have a frequency response which rises nearly 10 dB from 50 Hz to the upper midrange. That this characteristic wreaks havoc with the monitoring process is something of an understatement!

ow-Frequency Solution

e Sentry IVA low-frequency
n opts for highest efficiency,
a low-frequency limit that
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of the low-frequency
s the midrange level,
large enough, with
ather than expo-
maintain this extra
to just above the
frequency of 50 Hz. At this frequency, response is down 3 dB when the horn is placed on a large floor or at the intersection of a wall and floor. **Bass-reflex/short-horn hybrid enclosures are simply not capable of this performance.**

For high-power applications, the low-frequency horn adds to the high basic reliability of the woofers by reducing the cone excrusion required for a given acoustic output, relative to a sealed-box system with similar response.

Additionally, cone excursion is well controlled even below cutoff by the high stiffness of the air behind the woofers, provided by a chamber less than two cubic feet in size.

Vented or Sealed?

The bulk of design effort in the last decade has focused on the sealed box. It is thought in many circles that this is **the** way to construct a low-frequency speaker system. Today, most home high-fidelity loudspeakers are examples of the sealed, or acoustic suspension box. A recent monitor speaker design abandoned the bass-reflex box in favor of the sealed box.

Analyses have shown that three essential factors are inextricably related in sealed box designs: low-frequency limit, efficiency, and box size. Choose any two factors and the third is determined. Design lends itself very well to the number-crunching computer, and high-performance, computer-designed sealed woofers are routinely developed in the audio industry.

In contrast, the vented box has become something of a stepchild. It has appeared in acoustic history under a variety of names—bass reflex, tuned box, Helmholtz resonator. There was the vague sense that such boxes were inherently "high efficiency." It's not surprising, then, that the most widely used studio monitors have been vented designs and that the vented enclosure was very much a part of the early days high fidelity.

The basic idea is quite attractive: by somehow using the energy inside the box, it seems reasonable that low-frequency performance could be improved. Hobby magazines have been full of advice on how to do it; (1) take the best woofer you can afford, with the biggest magnet and the lowest free-air resonance, (2) build the biggest box you can squeeze (or sneak) into the house, (3) tune the box to the free-air resonance of the woofer, and (4) enjoy perfection. Most people **did** enjoy, but perfection was elusive. Many such systems were distinctly weak in real fundamentals—like below 50 or 60 Hz—and perhaps had a prominent bump in response above that in the mid-bass range. Once the enthusiast heard **real** bass out of the diminutive sealed box that came along in the mid-1950's, the vented enclosure was relegated to the "boom box" category.

"Saving" the Vented Box. It turns out, however, the vented box's difficulties were not at all inherent but occurred only because its more complex nature was not completely

understood. In 1961, about the time that the sealed acoustic suspension woofer was achieving prominence, an Australian researcher, A. N. Thiele (pronounced "Teel"), was busy comprehensively analyzing the vented box. His analysis was every bit as thorough as that accorded the sealed box. Unfortunately, his analysis was not published in this country until a full ten years later. Had it been published, it is fair to say that the sealed, acoustic suspension box would have never achieved the prominence it has.

In place of mystique, cut-and-try, and old wives' tales, Thiele makes a coherent scientific presentation of vented boxes based on electrical filter response characteristics. His analysis emphasizes that the three important variables—efficiency, low-frequency limit, and box size—are just as closely related in vented boxes as they are in sealed designs. In other words, optimization is involved, not just "bigger is better." Thiele also demonstrates that vented boxes are not inherently high-efficiency only, but can cover a wide range of efficiencies, depending on other design choices. He shows how to manipulate the vented box into a variety of unseeable forms, or "alighments."

The Vented Boxes Essential Advantage. The most exciting part of Thiele's analysis, however, may be stated as follows. If a designer is satisfied with a particular sealed system, by changing to a **correctly-designed** vented system (involving some changes in the speaker itself), he may choose any one or a mixture, of the following: 1/2 octave more bass, OR 4 dB more efficiency, OR an enclosure 1/3 the size.

And Lower Distortion Too. In a general way, low-frequency distortion is related to speaker excursion. Non-linearities in the cone suspension, voice coil motion, and even the magnetic flux, combine to give higher distortion levels as excursion increases.

In a sealed system, excursion rises dramatically as the system's low-frequency limit is approached. In our vented system, however, excursion rises more slowly, reaches a maximum at about 58 Hz, and actually drops to a minimum at the low-frequency limit of 40 Hz.

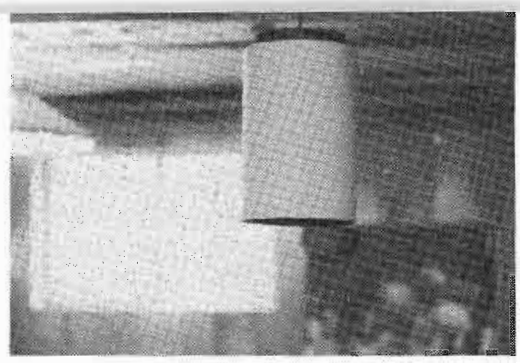
At this frequency, virtually all of the radiated acoustic power is coming from the vent, with the woofer cone barely moving. With a full 50 Watts power input, it will radiate nearly one acoustic Watt at 40 Hz at a total harmonic distortion just under 1 percent, a remarkably small amount by sealed-system standards.

High performance broadcast monitor speaker systems are a direct aid in better program production, improved sales presentations, and maintaining good engineering standards. An adequate system will have the following performance attributes: (1) Wide, smooth axial frequency response; (2) Wide, uniform dispersion; (3) High conversion efficiency; (4) High acoustic power output; (5) Uniform acoustic power output; (6) High power capacity; and (7) Low distortion.

A kit of free information on broadcast monitor speaker systems is available from: Electro-Voice, Inc., Buchanan, Michigan 49107. □

How to hear your sound and use it

By Ron Merrell



This is a Soundolier ceiling speaker. It can be mounted flush or dropped, depending upon ceiling height or decorative intent.

Whether your program format is C&W or classical - or somewhere between - about the only one in your station who has a chance of hearing your sound is the man at the console.

But even the man in the Control Room may not be using a high quality set of headphones. What's more, he is probably monitoring input. What comes out the other end may not sound quite so great. And if the DJ takes off his phones, what does he hear. In most cases, he is listening to the program through an ancient bargin basement speaker tacked on the wall. Or, he may be blessed with a couple of old base reflex monster boxes that yield few highs and show the scars of years of Control Room misuse.

Meanwhile, down the hall outside the CR, there is no program sound. Station visitors and clients are met with a business atmosphere devoid of the product you sell. On the other hand, a receptionist may have a small transistor radio on her desk, where the program is unfaithfully being reproduced on a two or three-inch speaker flush mounted and encased in a small, high impact plastic box.

Admittedly, not all formats lend themselves to total facility monitoring. It might be enough to jangle your nerves...even if it does sell.

At The Other End

At the receiving end, the reproduction systems are ever improving. And, unfortunately, your listeners may be hearing you better than you're hearing your own signal. This is probably more true for FM than AM, but this doesn't let AM off the hook. After all, even the stereo buff or quad enthusiast takes time out to catch your news or sports origination. And that doesn't mean he's going to turn off his console or component arrangement and flick on his pocket transistor radio!

Admittedly, production rooms and recording booths often get

Management Highlights

- you hear your own
- As well as your lis-
- More emphasis on monitoring of your
- ill improve your
- lients and visitors,
- have a better idea
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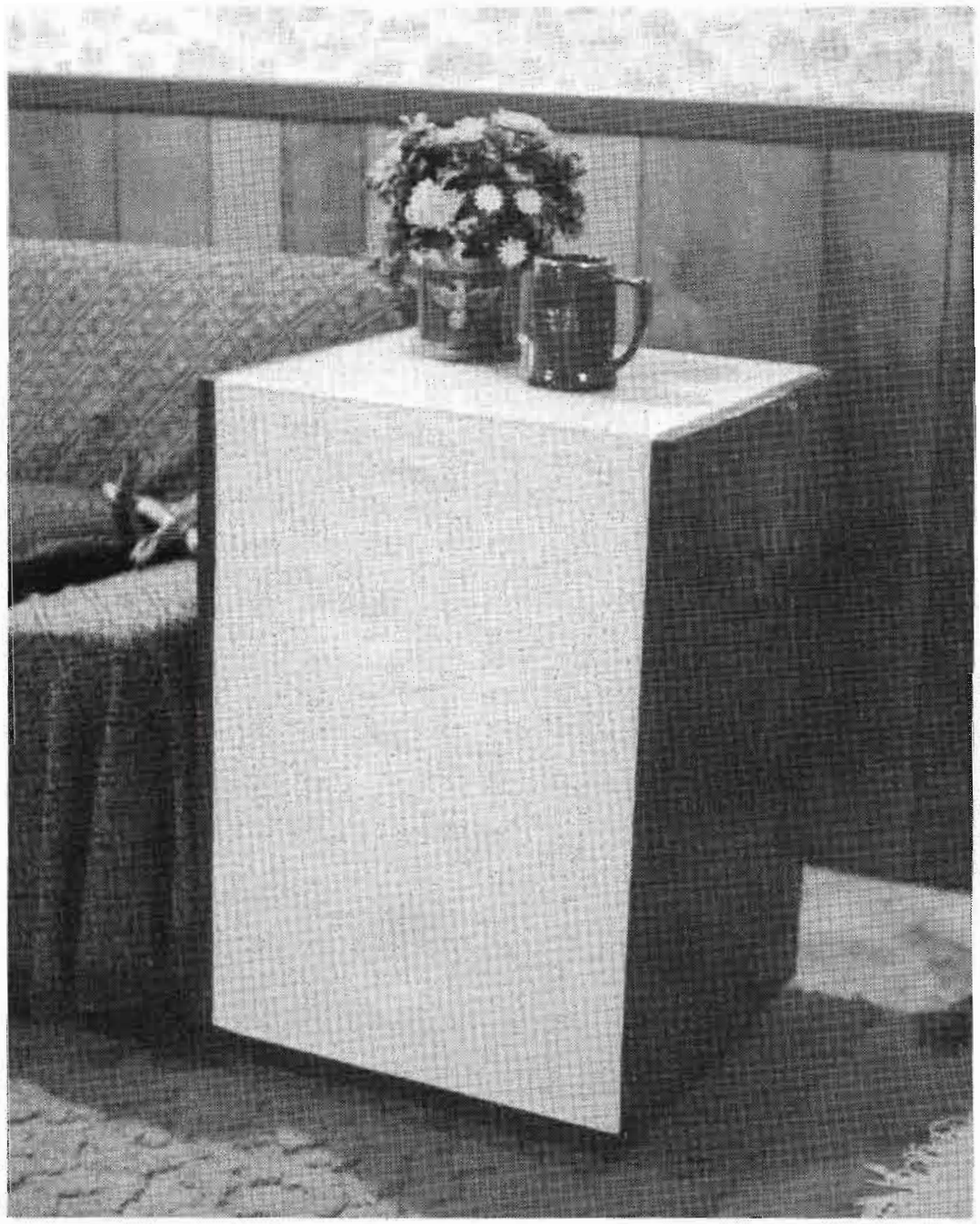
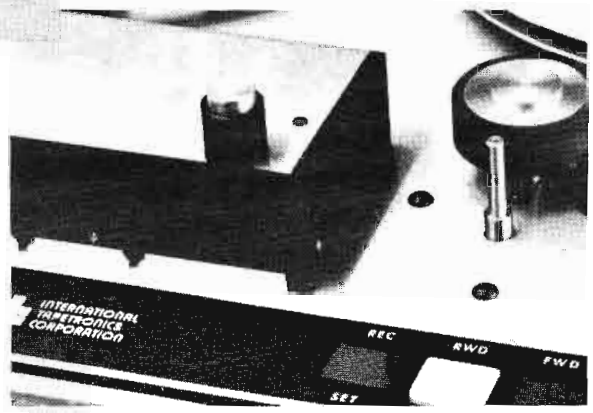


Here's our functional version of a vented speaker enclosure. Around the studio, it pays to use an enclosure that is built for broadcast use.

the first reel to reel with the rugged reliability of itc

After years of concentration on building the finest tape cartridge equipment, it was inevitable that ITC would design a reel-to-reel machine with the rugged reliability that is inherent in the International Tapetronics' name. And here it is . . . incorporating all those features most wanted by broadcasters. Examples: motion sensing, multi-function edit mode, ITC's proven air damped solenoids for super quiet operation, automatic tape lifters, TTL logic circuitry, capabili of handling dissimilar size reels, selective play/record synchronization, 10½″ or 14″ reels, 3¾ - 7½ IPS or 7½ - 15 IPS and the superior specifications you'd expect. Some of our customers are buying sight-unseen because of our reputation for dependable performance and service. Our standard procedure is a 30 day guarantee of satisfaction in addition to a one year warranty. Just c us collect and say you w to try the new ITC "850 Series. We'll make all arrangements.

Exclusive, but optional, is the micro-mark tape marker to make editing easy and precise. Find the critical spot in the tape, press the button, and the tape is marked clearly and accurately. Who would have thought of it but ITC?



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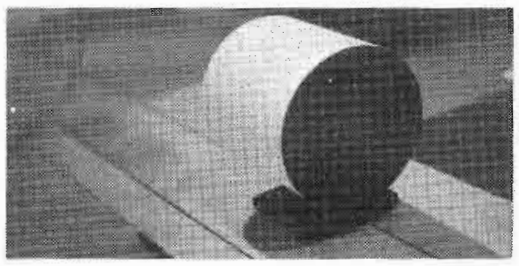


The wall speaker shown here shoots sound from front and back. There are other versions that pivot for a more versatile control of direction.

second class treatment. And, of course, what difference does it make if all you hear inside the entrance is the clacking of a secretary's typewriter? Or...down the halls are the distant sounds of a teletype machine and the clomping of heels on lineolium? After all, there **is** that one room in the station where it's all happening. And at the other end there are listeners who really hear your product. Is there really a need for anything between the CR and the listener's front room?

Speaker Systems

You probably already know that you can spend a great deal of money on speaker systems. And I think it also is true that we don't all hear the same range or care to. You might find an economical system that sounds as good to you as some of the $400 or $500 systems.

It's also true that there are as many cabinet styles as there are speaker systems. Some of them ht work out quite well in your or lounge (if you're lucky h to have one), but the cabi- may not be suited for CR, ding booth, or production use. Fact is, these are heavy areas where overflowing ash and steaming coffe cups nd. They get kicked (accident- , leaned on and sat upon. tever you use here must be dy enough to take the punish- that will surely come with

ng mostly to build a simple, stem that would improve specially over converted d stand up under high d and overweight DJ's, pair of Heath AS-27's cabinet construction ons as a starting

nch three-way com- They use a woofer, mid-range, and horn-loaded compression super tweeter within a single unit. They are capable of 80 Watts peak power, with crossover at 600 and 4000 Hz. The cone resonance is 30 Hz, and a high frequency level control is included.

The box we built really has no frills. It's constructed of 1-inch plywood on all sides. We tried ½-inch plywood on the back for easier reentry into the box should the need arise. However, the pressure in the box (even though it is port tuned) kept forcing the back side loose, causing it to rattle and vibrate excessively. We tried both ¾ and 1-inch plywood on the back, and they both worked nicely.

To get away from some of the damaging prospects, we covered the cabinet top with formica. That you're not likely to find on commercial versions. But it will raise the cost of the system. However, we felt the ability to withstand cigarette burns and coke stains was worth the extra dollars.

We also got the cabinet off the floor. Two to three inches should keep most feet away from the grill cloth and out of the port hole.

We used 2 by 4 slats on the bottom. This would - with the 1-inch sides - withstand the crunch of even the office "heavy one".

When you construct this kind of cabinet, be certain to make it solid at all points. We used heavy wood screws, but that's not enough. While you're holding the sides together, insert a good grade wood glue along the touching edges. Believe it or not, that pressure in the box and the vibrations can drive the whole unit into vibrating pieces if something starts to work loose. At first it will sound as if a cone is breaking down.

Inside, be sure to follow acoustic insulating rules. We started by caulking all the inside seams.

This was our first experience at building a speaker cabinet, so we're not claiming that by some stroke of genius we have built a system that would attract the admiration of professional cabinet makers. Yet, it is attractive, reproduces more accurately than our older system, and it will withstand the crunch of time.

Down The Hall And In The Lobby

While we were putting this system together, we thought about those dead hallways and silent lobbys. After all, it might not be convenient to have your program resounding and pulsating throughout the building.

There are several companies manufacturing decorative speakers that add to the decor of lobbies and hallways. We investigated one of these and decided on experimenting with an overhead and a hallway speaker with an attractive enclosure.

No doubt about it, we were prepared for the worst: good looks and poor sound. But, we were pleased with a set from Soundolier. The enclosures were acoustically insulated, and the speakers (at four inches) had a cone resonance of 85 Hz. In addition, these units were available in various colors and styles.

Called the 4+ line, these speakers are capable of 10 Watts of program audio with a frequency response of from 60 to 18,000 Hz.

If you like music down the hall, here is one answer. Because one model can be wall-mounted, it will send sound down the hall. Overhead speakers will shoot mostly downward. And if your floor is carpet covered, the sound may lie in pockets along the hall. Of course, this may be exactly what you want.

It is possible to suspend speakers in such a way that the sound is directed below onto people seated in your lobby or entrance. In this way, the receptionist (our gal Friday) will not have to talk over the sound level to answer the phone or lose concentration on her work. The sound can be at a pleasant listening level in another part of the same room and yet not bother her.

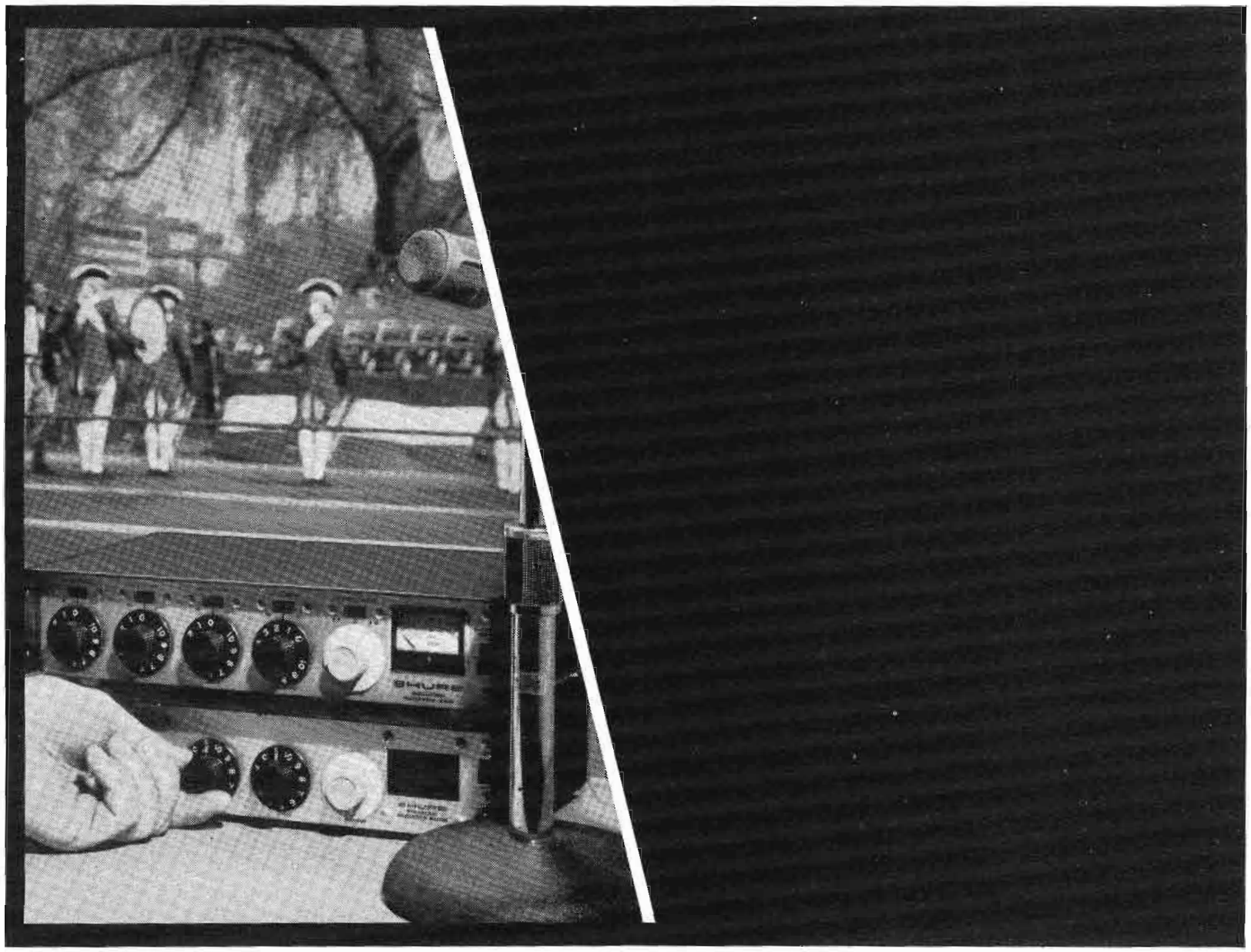
If you want to go all the way with sound closer to maximum fidelity, be sure to read our other speaker article in this issue.

Let's Hear It

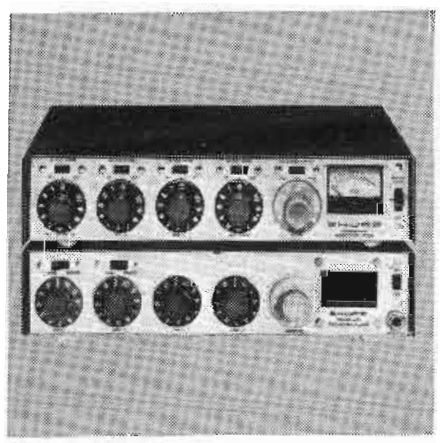
Don't hide your sound. Use it to sell every time you get a chance. These ideas should help direct you away from a turned-off station to a station atmosphere that becomes the modern broadcast facility. If you've got a good sound, let's hear it! □

Editor's Note:

Soundolier, Inc., is located at 9380 Watson Industrial Park, St. Louis, Mo. 63126.



A production console* for $325.80!



Eureka! A complete remote and studio production console for a fraction of what you'd expect to pay for a console with comparable features and performance! Simply purchase a new *Shure M675 Broadcast Master* and the extremely popular Shure M67 Professional Microphone Mixer. By combining these two units*, you get inputs to handle microphones, turntables, phone lines and tape machines — *with cuing provision on line and magnetic phono inputs.* Result? A versatile low-noise, low-distortion broadcast production console for in-studio, remote, and standby assignments; a complete CATV console; a studio production console. All for $325.80! For complete technical data, write:

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For More Details Circle (25) on Reply Card

Adapting to the new operator rules

David W. Sawyer
Chief Engineer
KFKA
Greeley, Colo.

With the recent adoption of new rules permitting operation of DA's by third class operators, KFKA was faced with a problem common to many such stations: The required interlocking of the antenna system to prevent putting the transmitter on the air in the event of a relay failure. Since we operate by remote control, our first thought was to interlock the towers through the remote control system. We discarded that idea, since we didn't want the two systems to be dependent upon each other. Besides, we wanted to tie a second much needed function into the new system.

The way our system was initially designed, it required four separate steps to change from day pattern to night, and back again. After the operator dialed the position for the change, he had to manually return the transmitter to the air by resetting and dialing "plate on". This resulted in at least two seconds of dead air—more if he got in a hurry and didn't push the right switch at the right time. We felt we could automate this function by tying it in with the interlocking circuitry—making the pattern change easier, quicker, and more dependable. The circuit we came up with does the job very nicely.

To be effective (and to conform to the rules) any interlocking system must be initiated at the towers themselves. This means you need the newer type of antenna contactors equipped with auxiliary micro-switches. Since our system was built in 1948, we first had to install new contactors, and run wiring back to the building from each tower. Once that was done, the rest was easy.

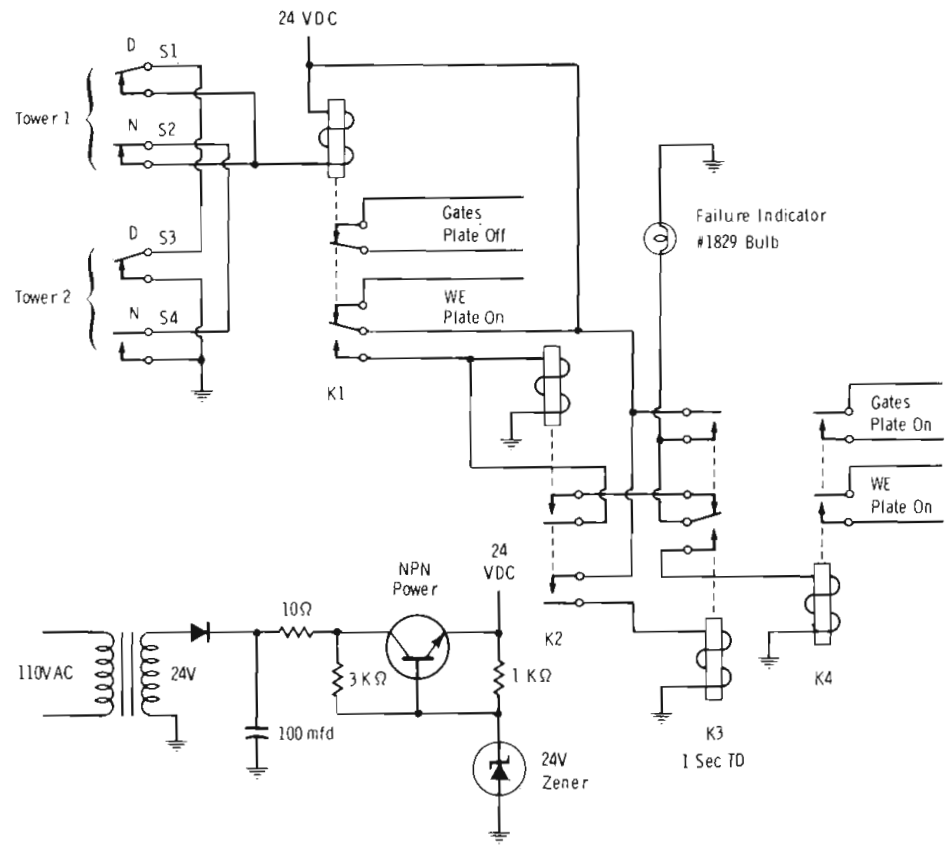
Here's how our system works: The supply voltage is applied to the coil of K1, which is grounded through the tower micro-switches. The "day" switches are in series with each other, as are the "night" switches—so both relays must be in the proper position to energize K1. (Any number of relays may be so connected to include additional towers and phasor relays.)

The transmitter "plate off" circuit is seriesed through the contacts of K1—if it isn't energized, the transmitter cannot be put on the air. So much for the interlocking.

During the instant that the tower contactors are changing from one position to the other, K1 is relaxed, closing the third set of contacts, which energizes K2. K2 is latched through its own normally closed contacts, and the normally open contacts of K3 (a one-second time delay). K2 remains latched until K3 energizes. Since the coil voltage has now been removed from K3, K3's action is only momentary—but enough to close K4 which returns the transmitter to the air.

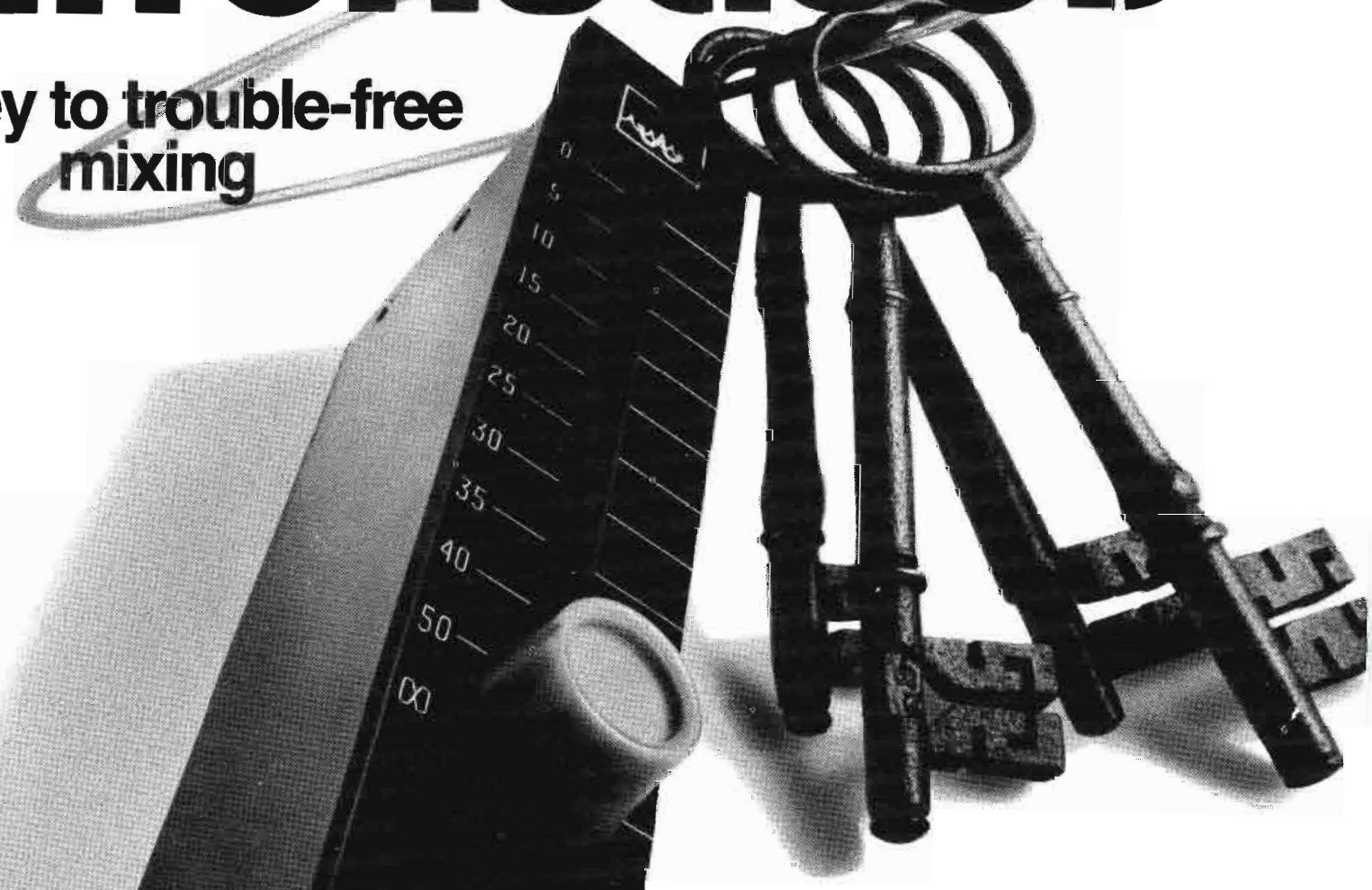
Should the K1 coil circuit remain open due to a contactor failure, K2, 3 and 4 will remain energized, lighting the failure indicator, and of course, preventing the transmitter from returning to the air.

Our system operates in the same manner if either the main or auxiliary transmitters are in use. However, it should be noted that K4 closes the plate on circuits to both simultaneously. This poses no problem to us, as the remote control failsafe permits operation of only one transmitter at a time. In a station where either transmitter could be activated at any time, this would have to be modified. Of course, if only one transmitter is used, the second set of contacts on K1 and K4 could be eliminated.



Waters Attenuators

key to trouble-free mixing



With a complete line of professional audio attenuators, Waters Manufacturing has solved the noise problems usually encountered in conventional fader controls.

The answer is MystR®—Waters' proprietary conductive plastic resistance element. MystR's glass-hard, smooth wiping surface achieves noise levels below 20 μV (at least 100 db down) over a trouble-free life of at least ten million operations. Precision engineered to provide professional "feel," Waters' attenuators also feature adjustable damping. Zero to 90 db of truly "stepless" attenuation is achieved with Waters' computer-controlled curve-shaping technique which actually tailors the attenuator resistance element assuring superior tracking accuracy.

For your key to trouble-free mixing send for Waters' Audio Attenuator brochure which describes their complete line of linear and rotary attenuators and pan pots. Use the coupon provided, or better yet, phone 617-358-2777 for immediate service.

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Optimizing tape deck performance

By Dennis Ciapura

Although tape machine manufacturers usually provide the user with more or less "easy to follow" maintenance and adjustment instructions, these procedures are sometimes a bit confusing, particularly if you are confronted with the maintenance of several different tape decks by various manufacturers, each with its own adjustment procedures.

The task need not be as formidable as it might at first seem, because all audio tape devices have certain basic characteristics in common and do, therefore, have certain adjustment procedures in common. If the basics of tape record and playback bias and equalization schemes are known, a general scheme which can be applied to all of the tape equipment at the station can be evolved.

A simpler and more universal approach to tape deck maintenance can mean more efficient utilization of time and, hopefully, a more thorough and accurate adjustment job. We have found that one of the best allies of simplification is organization. Toward that end, we will group these general adjustment procedures into three major categories: preliminary procedures, playback system ajustments and record system adjustments. The procedures should be performed in the sequence listed and every effort should be made to use the simple test equipment recommended. The cumulative effects of "aligning by ear" can render a good tape deck unable to meet original specs when most units will quite easily exceed advertised specs when properly set up.

Preliminary Steps

1. Clean all tape heads and guides with an approved head cleaner.

2. Inspect heads for wear and wear pattern.

If one or more of the heads is wearing in a trapezoidal pattern, the zenith (see Figure 1) has not been correct. Do not re-adjust the zenith until the head is replaced. It usually does more harm to try to.

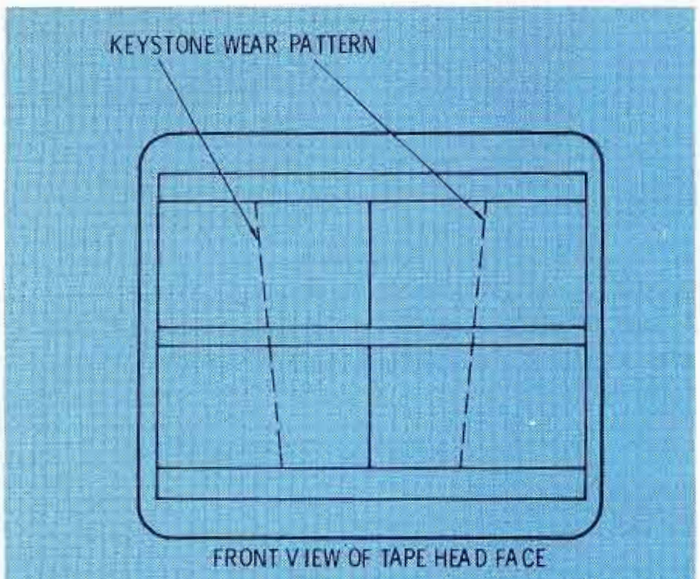


Fig. 1 Zenith error, a costly problem, shown on head face.

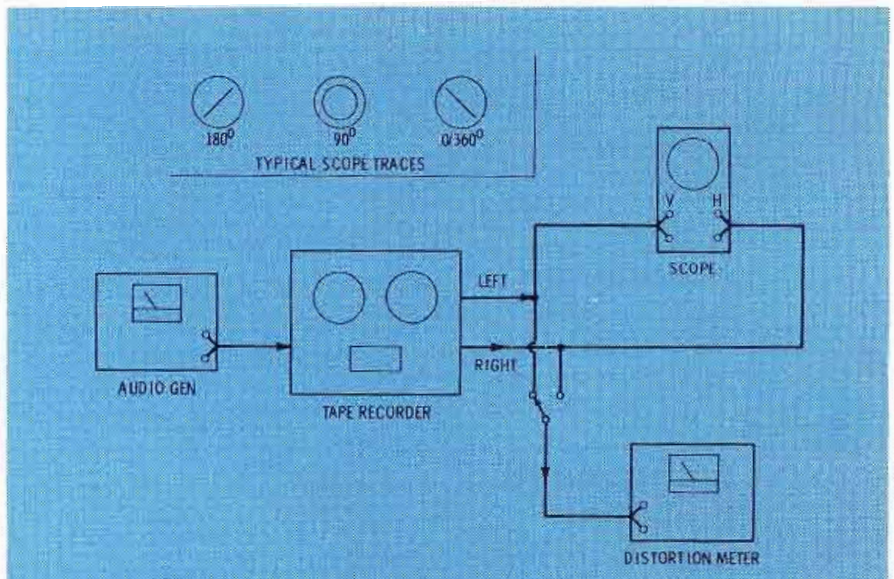


Fig. 2 Test equipment connections and typical scope traces.

Management Highlights

Here is a universal approach to tape deck maintenance that can mean efficient utilization of time and more accurate adjustments. Yes, you'll also sound better.

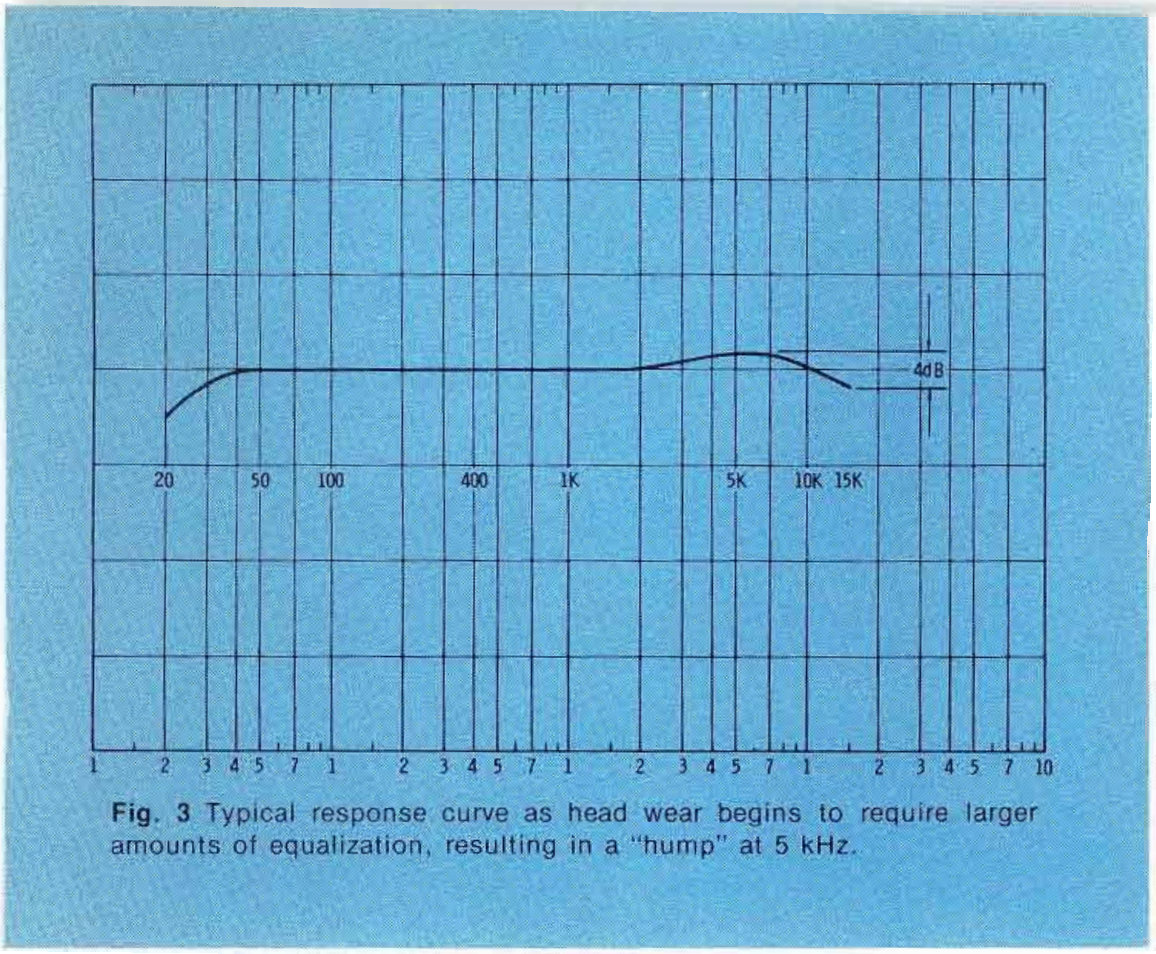


Fig. 3 Typical response curve as head wear begins to require larger amounts of equalization, resulting in a "hump" at 5 kHz.

Author discusses tape quality control with station executive Mike Vince.

correct for an off-zenith condition after head wear is visible because a second "flat" will be generated making it extremely difficult to obtain proper tape to head contact. Instead, make a note of which end of the trapezoid is wider, top or bottom, and install the next replacement head tilted slightly in the opposite direction. **Ideally, one of the optical alignment aids should be used to insure proper zenith whenever a new head is installed.**

3. De-magnetize all heads and guides.

4. Clean pressure roller with an approved rubber drive cleaner. A dirty or worn pressure roller can cause uneven tension across the width of the tape, resulting in unstable azimuth.

5. Connect the test equipment as shown in Figure 2.

Playback System Adjustment

1. Play the 700 or 1000 Hz "O" level reference tone of a good reproduce alignment tape and observe the output of the deck as indicated by the unit's metering circuit. If the deck has a calibrated "O" output level mark or switch position, the accuracy of the calibration may now be checked and adjusted if required.

Both meters of a stereo unit should read "O" with playback level controls in about the same position. If not, something may be wrong in the playback head or pre-amp causing a low-gain condition in the lower of the two channels. However, it's always a good idea to check the actual output voltage at the output connector with an audio voltmeter to be sure that the tape deck's meters are properly calibrated before proceeding to pre-amp gain tests, etc.

2. Cue the test tape to the 700 or 1000 Hz - 10dB reference tone and adjust the external and/or internal voltmeters to give a convenient indication and record this reading in dB for reference.

3. The test tapes usually begin the frequency response run at 15 kHz and work down to the low end. Cue the tape to the frequency response at -10dB test segment and play the tape through while observing the oscilloscope as the 15-12 and 10 kHz tones are reproduced. A straight diagonal line would indicate perfect phasing, something you are not likely to see at the high end of the audio band. See Figure 2 for examples of patterns that you're likely to observe.

The playback head azimuth should be adjusted to produced the pattern that is most like the straight diagonal line while reproducing the 10, 12 and 15 kHz tones. The higher the tone, the more unstable and difficult to adjust the pattern will be. With some decks it may be necessary to adjust the azimuth using the 10 kHz tone only and disregarding the 12 and 15 kHz displays if they are too unstable to be useful. In any case, **always double check the phasing in the midrange (400, 700 or 1000 Hz) to be sure that your final azimuth adjustment is the one that produces the best phasing across the band.**

At the high end, you will be able to adjust the phase through 180° and back to 0° and get the same display again at 360° out of phase. The mid-range phase check would show up this erroneous adjustment right away and, of course, the voltmeters on the tape deck output would show a sharp decline in high frequency response. The quickest method of adjustment for most decks is to play the 10 kHz tone and adjust the playback head azimuth for maximum output, then refer to the Lissajous pattern on the scope to make the final fine alignment for optimum phasing.

4. Now play the frequency response test all the way through and note the results obtained. Adjust the playback equalization controls for the same response at 15 kHz that was recorded for the 1 kHz - 10dB reference tone and re-run the test again. Many tape decks will produce a hump in the 5 kHz region when equalized to produce flat response at 15 kHz. If this hump is excessive, re-adjust the equalization for, say a 2dB loss at

15 kHz and look at the 5 kHz response again. For most broadcast applications, a rise of more than 2dB at 5 kHz is excessive.

As the playback head wears, the high frequency response of the head will fall off requiring more boost from the pre-amp equalization circuits which eventually will begin to reach down into the upper mid-range causing the 5 kHz hump. Figure 3 illustrates this phenomena and shows the proper adjustment for a head about through its normal life span. In this case, to keep the rise at 5 kHz within 2dB, the 15 kHz response is down 2dB. A 4dB variation over 1½ octaves is usually acceptable and within the manufacturer's specs, but a real quality-conscious engineer would start to look for a replacement head.

If the response is satisfactory at the high end, run the test all of the way through again, looking at the phasing on the scope (the equalization controls sometimes affect the phase) and the response at the low end. Some decks have low frequency equalization controls too, but most do not.

This completes the calibration of the playback system which will now be used to calibrate our recording circuitry. It is imperative that the playback adjustments be done as precisely as possible because proper alignment of the record sections requires accurate playback facilities for off the tape monitoring and metering.

Record System Adjustment

1. Start by selecting a sample of the tape that is most often used at your facility or the tape that is used for the most critical application and use this sample of your "standard" tape to perform the bias and equalization adjustments that follow.

2. Record a 700 or 1000 Hz tone at 0dB onto the tape while monitoring the output on the distortion meter. Adjust the bias control for the lowest distortion figure that can be obtained. Be sure to re-adjust the distortion analyzer each time a new bias level is set because the recorded level will vary with the bias.

Figure 4 shows the effects of bias mis-adjustment on both harmonic and I.M. distortion. As you can see, optimum bias for low harmonic distortion and low I.M. distortion occur simultaneously, but incorrect bias has somewhat different effects on each. Most professional tape recorders have a bias monitoring capability so that once the optimum bias for the tape to be used is determined, the bias meter reading can be recorded, or on some machines, the meter can be calibrated to read "O" at the proper bias level.

Many engineers keep a record of optimum bias settings for several different tape types that they encounter and are, therefore, able to set their recording machines to exactly the right bias each time a different type of tape is employed by utilizing the recorder's bias monitoring facilities.

3. Record a 10 kHz tone while monitoring the playback on the scope and adjust the record head azimuth for the best phasing obtainable using the same procedures that were employed in the playback head ajustment. Once this adjustment is complete, any tape made on the machine will be recorded to match the standard azimuth setting and will be compatible with any properly calibrated playback system.

4. Record a 700 or 1 kHz tone at 10dB below "O" level and set the internal and/or external playback meters to give a convenient deflection and record the reading in dB. Now record a 15 kHz tone of the same level without re-adjusting the record level controls on the tape recorder. Adjust the record equalization control to obtain identical 1 kHz and 15 kHz levels at playback

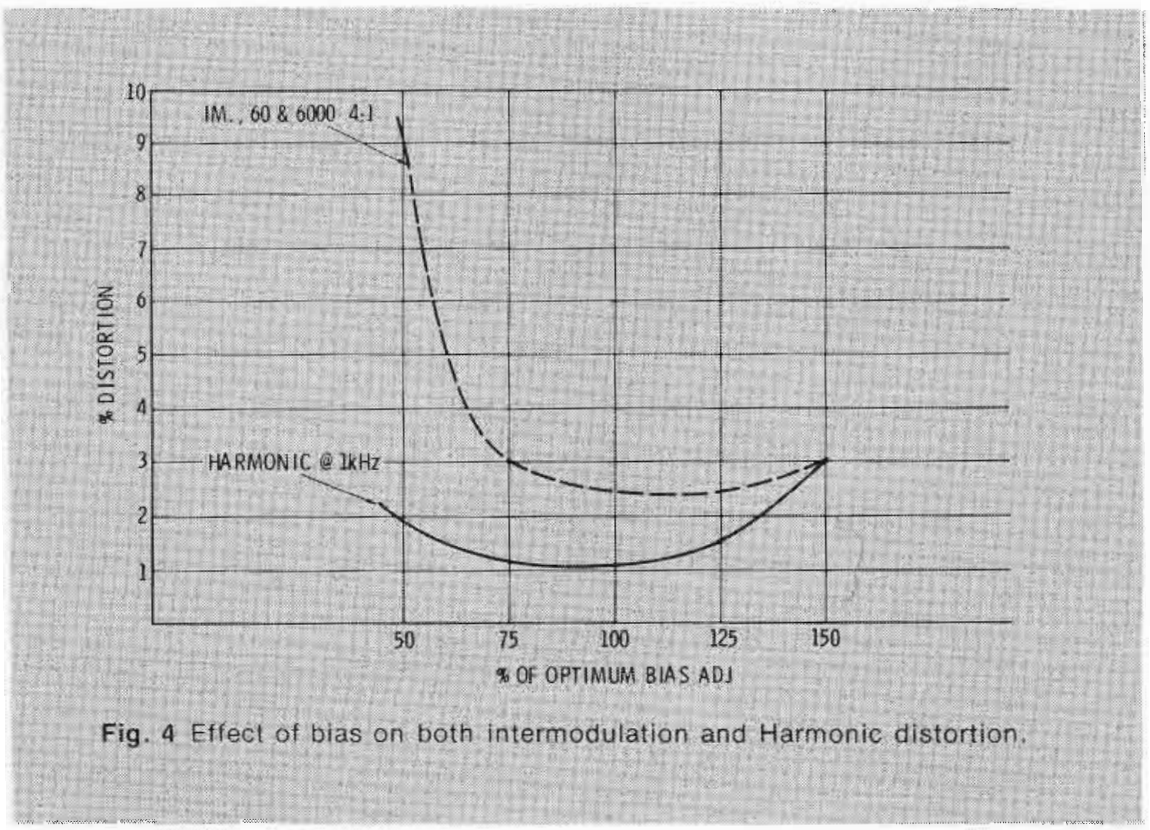


Fig. 4 Effect of bias on both intermodulation and Harmonic distortion.

Author adjusts azimuth as part of routine tape deck maintenance.

system output.

Now run a complete frequency response run while observing the playback meters. If the record frequency response is very much worse than the response of the playback system above, the record head may be "over the hill". If flat response was obtained, the recorder is now aligned to produce a virtual duplicate of the original standard reproduce alignment tape employed.

While the procedures described are directed primarily to the adjustment of reel-to-reel equipment, they apply also to cartridge units, with the additional considerations relative to the tape's path through the cartridge case, of course.

If you become involved in testing various tapes to see which type available to you yields the best performance in your machine, try running a frequency response test at "O" level. Do not attempt to re-equalize the machine, but simply record the results to see which tape has the highest treble saturation level. If your format calls for reproducing sustained high level treble passages, you may find a tape that is audibly superior.

Also bear in mind that a quick check of record-play signal-to-noise ratio can be made while checking the distortion after bias adjustment by switching to the voltmeter section of the distortion meter and reading the residual noise when the signal input is removed.

If you wish to compare the signal-to-noise ratio to the manufacturer's specs, use a 15 kHz low pass filter at the voltmeter input, as many manufacturers use this weighted method to eliminate the residual bias noise which, though inaudible, would add to the noise indication.

Frequent tape equipment performance checks serve as an instructional aid and skill building mechanism in addition to giving an early indication of component deterioration. Each of the little perfection oriented adjustments has the cumulative effect of tailoring the tape recorder into an accurate, transparent reproducer making the best "sound" of all — no sound of its own. □

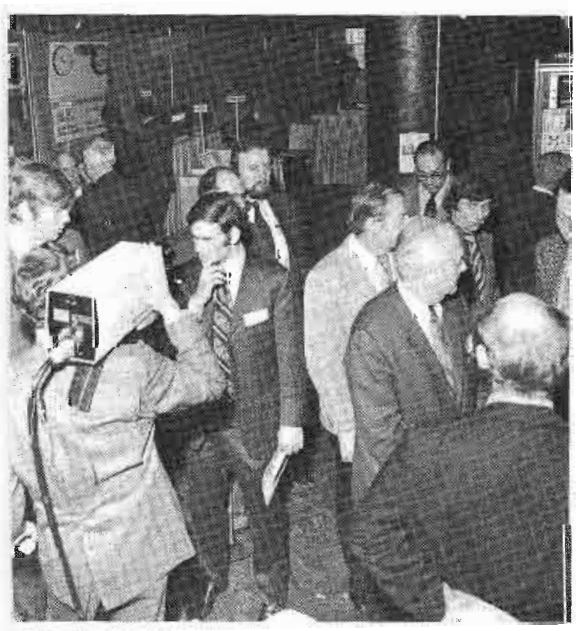
Getting in on the action?

By Joseph Roizen
Telegen and Video Editor of BE.

The year is 2562 B.C. and the place Asphyxia, Babylon. In the press room of King Peridontal's (the smiling monarch) marble palace on the shore of the Euphrates an unusual meeting is taking place. Abednego M. Shadrach, the king's director of proclamations and the first "cum laude" graduate of the Babylonian Cuneiform Institute, is in session with Metaxis Kamentut, his counterpart from far-off Egypt. They are trying to reconcile a clay tablet announcement that is to be circulated throughout both kingdoms, and they have finally agreed on "owl before hippopotamus except after ostrich", unless the series begins with a preposition like snake, monkey or rat.

Abednego was not only impressed by Metaxis' obvious skill in hieroglyphics but was also greatly taken by his superbly curled beard which fell in symmetrical, shimmering ringlets down to the third row of gold coins on his breastplate.

By the time Dr. Kamentut boarded his slave galley to begin the long sea and land journey back to Alexandria, he had agreed with Prof. Shadrach to form the Society for Hieroglyphic and Hirsute Sciences and scheduled the first quintennial scientific congress to be held in 2557 (travel was slow in those days) on the banks of the Nile. It has been since reported that the papers presented at the Nile conference described some of the technical breakthroughs of that period; however, a few of the prognostications led to bitter opposition from the rank and file membership. Scribe Theophilus, a young apprentice from Thebes U. predicted that the recently discovered papyrus (a thin white membrane) in combination with a black pigmented solution made of water and pulverized charcoal, would eventually replace the clay and stone tablets.



An ad hoc working group formed to study this ominous development finally suggested that the Guild of Mallet and Chisel, to which most of them belonged, be asked to petition the authorities to outlaw such new materials on the grounds that they did not have the permanency of the tried and true methods.

Human inclination towards forming specialized affinity associations with peer groups has certainly not abated since those times, and there is hardly an activity worth its salt that doesn't have its "society for the preservation or proliferation of". Choosing the right society can be a very important decision in one's life. In some cases the constraints that already exist may exclude you from membership. If you come from a long line of Cohens or Goldbergs, then your likelihood of joining the DAR is somewhat limited. Similarly, if you are a high school dropout who pumps gas for a living, your application to the American Neurosurgical Society will probably be summarily rejected.

Some social groups formed for religious, political or financial pursuits thrive on sheer snobbery, the ultimate of which was the Farragut Society and its most noteworthy member Robert Benchley. Noted personalities of that era visiting Benchley's home were struck by the imposing portrait of Admiral Farragut over his fireplace. Asked about its origin, Benchley would explain that only members of this exclusive club could hang the Admiral's likeness and enjoy some of the other benefits, which he would proceed to expound upon at length. He would then solicit his visitor to apply for membership, with the assurance that he would personally endorse the application. Of course, he could not guarantee acceptance by the others, as there was a secret ballot involved.

A few weeks later Benchley would sorrowfully inform the latest applicant that he had been blackballed by a single vote, and no reprieve was possible. It was not until after Benchley's death that it was discovered that he had invented the society and was its only member.

There are, however, an ample number of societies, institutes and associations that serve the television engineer very well, and it is the purpose of this article to define and describe the organizations that are worth joining and what benefits might accrue from such membership.

Why Join?

Becoming a member of a technical association or society obviously imposes a few responsibilities. First,

Management Highlights

It pays to belong to your state and national groups. With greater participation more ideas will be shared, more can be accomplished, and the voice of communicators will be stronger. Besides, the equipment exhibits at conventions allow the decision-making team to talk with exhibitors and in a hands-on situation.

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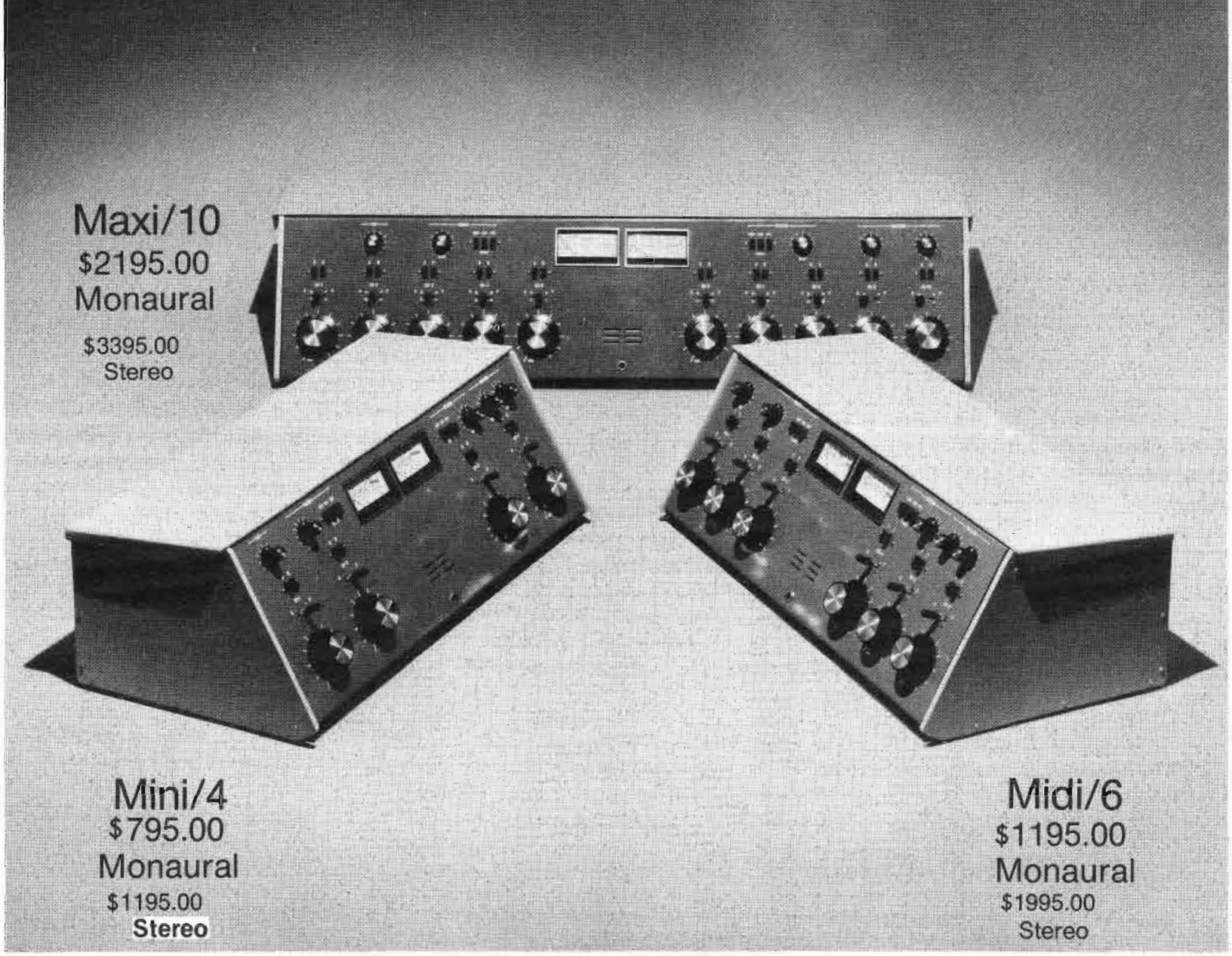

For More Details Circle (97) on Reply Card

none of them are free, and the usual yearly dues seem to come around every four months. Then there is the matter of going to meetings which never fail to fall on your child's graduation or wife's birthday. Attendance isn't mandatory, but missing meetings makes you feel like you aren't pulling your weight.

Some wag once described the difference between an alcoholic and a drunk as the drunks not having to go to the damned meetings.

Last, but certainly not least, is the matter of filling out a lot of forms with personal information, some of which you can't or would rather not remember, then find a sponsor to attest to the veracity of all your fine points and foibles!

But many of your peers do belong to one society or another, and they find it worthwhile, so there must be a lot of pluses you don't know about. There are many benefits, and they can be categorized as personal, professional and Philosophical. Let us examine in some detail how joining an engineering fraternity can affect you.

Personal

Today's highly mobile and plastic society confronts the average engineer with at least a few major moves while pursuing a lifetime career. The engineering school may be in another town, the first job in another state, and that great promotion or opportunity in another country. As a member of a widespread society of like-minded and similarly occupied individuals, you have "instant roots" wherever a local chapter exists. Even if you never leave home, meeting occasionally with members who talk your technical language, share your peeves and problems, and give you a platform for expressing your viewpoint, is a very satisfactory situation.

Most societies have social events that can include your mate. These can increase your range of friends and acquaintances beyond the traditional family and employment-oriented personal associations.

Many societies have health, accident and life insurance policies for members and families that are based on the large group's buying power formula and give good benefits at reasonable cost. This is especially useful for self-employed members or those in small organizations that don't carry or qualify for normal employee policies.

More recently, technical affinity groups have begun to utilize their inherent structures to take advantage of travel and vacation plans that offer charter rates, even when travelling on regular carriers. Discount buying through the societies' arrangements with volume suppliers is also in its beginning stages.

Where else can you, for a small annual investment, make friends, have fun, save money, and then deduct the dues as a business expense when doing your income tax?

Professional

Engineering societies are basically intended to enhance the status of their particular discipline, and in turn, of the individual members. As a member in good standing,

with your certificate neatly framed on your office wall, you are more readily accepted as a bona fide activist in your chosen field. Employers generally view your membership with favor and will often pay your dues as a legitimate expense.

Some societies publish technical journals on a monthly basis, which help to keep you abreast with the new technology; they hold local meetings that involve visits to industrial or scientific facilities where knowledgeable members address the group on topical subjects; and they sponsor annual (or more frequent) conferences and conventions of national and international scope.

Members are encouraged to offer papers describing their work that can be presented at local or national meetings and can then be published in the journal. This is an excellent way out of today's "publish or perish" syndrome in the academic or research field, but even at the normal engineering level, there are few people who would not like to see their names on the conference program roster or in print.

If a member is in the process of becoming an employer or employee, the societies often act as placement agencies through either personal contacts or journal advertisements. The publications often carry surveys or articles on engineering salary scales related to specific work specialities, locations, academic standing, or industry experience. These are always helpful in assessing one's own position.

Professionalism in one's chosen field is best recognized by those who labor in the same green pastures, and if your contribution is significant, your society will usually have scaled rewards in proportion to your accomplishment. This can range from a plaque or scroll for a technical treatise to the hometown chapter to being named a "Fellow" of the institution, with all the trimmings of investiture.

Philosophical

Few humans are resistant to the desire of leaving some personal imprint on the progress of civilization as we observe it. Public service at any level may suffice for many individuals who can either afford it or make their living thereby.

Engineers as a group are not particularly inclined in this direction (the way lawyers are), and membership in a technical society provides an outlet for some activities of redeeming social value. Serving as an officer, a sessions chairman, or a conference organizer is a way of contributing to your fellow members. Writing for the journal or teaching at society-sponsored seminars lets you share your knowledge with the rank and file to their benefit. Working voluntarily as a committee member on standardization efforts or participating in ad hoc groups reviewing industry problems can provide a very satisfactory outlet for your extra energies while elevating your social stature among your colleagues.

As a matter of fact, if you have a real cause to espouse that you

consider to be of considerable import, what better arena than the one provided by your co-members? Their threshold of understanding is already somewhat parallel to yours, and if there are any pitfalls to your scheme, you will be brought down more sympathetically than in a non-related forum.

Sociologists tell us that after survival and sex, status is the next most necessary aspect of a contented existence. Belonging to the right engineering society may go a long way towards contributing toward your status quotient.

How to Join

If you are an interested individual, a student, a working member, or an oldtimer in a given professional field, you probably qualify to belong to several organized groups that serve it. Most technical societies have categories such as Student Member, Associate Member, Member, and Senior Member, with varying dues and differing levels of participation. Voting rights, for instance, may be limited to full members at the maximum dues rate. Since these societies are in constant membership drives, a note to headquarters or a hint to a member will usually bring you an application form. Virtually all societies of this type require sponsorship by one or more members, but in general this is relatively easy to obtain, since the sponsor need only attest to his acquaintance with you and your work without assuming any financial or moral responsibilities.

Select the right category, fill the forms in legibly, get a friend or two to sign on the sponsorship line, and make the dues check out for the right amount, and the rest is almost a matter of form! In a few weeks you will receive your "diploma" with your name in gothic print, a lot of new papers to fill out, meeting notices, conference announcements, ballots for candidates you've never heard of—and, of course, the journal. The joys of membership be with you! □

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Assn. for Broadcast Engineering Standards Inc. (202) 293-5528. 1730 M St., N.W., Suite 700, Washington, D.C. 20036.

Assn. Canadienne de la Radio et de la Television de Lange Francaise Inc. (514) 849-9351. 1454 Rue de la Montagne, Suite 400, Montreal 107.

Assn. of Maximum Service Telecasters Inc. (202) 347-5412. 1735 DeSales St., N.W., Washington, D.C. 20036.

Audio Engineering Society. (212) 661-8528. 60 E. 42nd St., New York, N.Y. 10017.

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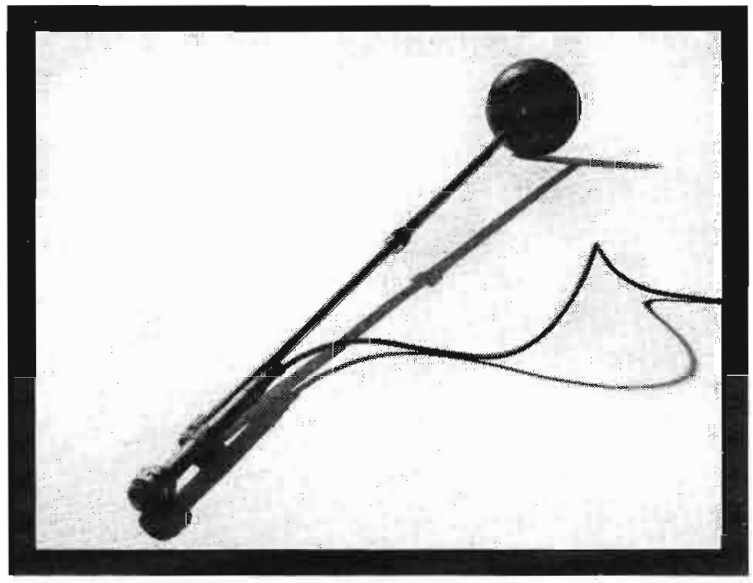

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Clear Channel Broadcasting Service. (202) 296-4855. 1776 K St., N.W., Washington, D.C. 20006.

Educational Television and Radio Assn. of Canada. (403) 432-4962. 252 Bloor St. W, Toronto 5.

Independent Television Stations Inc. (212) 489-6420. 1 Rockefeller Plaza, New York City, N.Y. 10020.

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National Assn. for Educational Television. (612) 645-0471. 1640 Como Ave., St. Paul, Minn. 55108.

National Assn. of Broadcasters. (202) 293-3500. 1771 N St., N.W., Washington, D.C. 20036.

National Assn. of Educational Broadcasters. (202) 667-6000. 1346 Connecticut Ave., Washington, D.C. 20036.

National Assn. of FM Broadcasters. (212) PL5-9330. 420 Madison Ave., Suite 803, New York, N.Y. 10017.

National Assn. of Television and Radio Announcers. (312) 939-5170. 1408 S. Michigan Ave., Chicago, Ill. 60605.

National Assn. of Television Program Executives Inc. (717) 569-0181. Box 5272, Lancaster, Pa. 17601.

National Broadcasters Club. (202) 638-3535. 1727 DeSales St., N.W., Washington, D.C. 20036.

National Cable Television Assn. (202) 466-8111. 918 16th St., N.W., Washington, D.C. 20006.

National Religious Broadcasters. (201) 377-4400. Box 512, Madison, N.J. 07940.

The Radio Club of America Inc. (201) PL5-3093. Box 2112, Grand Central Station, New York, N.Y. 10017.

Society of Motion Picture & Television Engineers. (212) TN7-5410. 9E. 41st St., New York, N.Y. 10017.

Station Numbers Increase

A recent FCC release shows that there are 8,334 commercial and non-commercial AM, FM and TV stations on the air. It's far too early to predict what the lifting of the AM freeze will do to the total AM listing, but we can expect an increase in this service—especially in certain classes of stations.

The greatest growth has come in FM, especially on the commercial side. And, it is likely that FM will continue to grow through at least 1975. Below is a comparison of the over-the-air totals for 1970, '71, '72, and '73.

	1970	1971	1972	1973
AM Radio	4291	4344	4367	4386
FM Radio	2134	2258	2352	2438
Educational FM	420	460	521	582
UHF TV				
Commercial	181	185	190	192
VHF TV				
Commercial	510	512	511	512
UHF TV				
Educational	108	114	125	132
VHF TV				
Educational	83	87	89	92
Station Totals	7727	7960	8155	8334
Growth Over				
Previous Year	141	233	195	179

PEOPLE IN THE NEWS

Broadcast

American Electronic Laboratories, Inc. (AEL) announced the appointment of **Warren Burtis** as Field Engineer, AEL Broadcast Division....**Christopher T. Kastner** has been named General Manager of General Electric Company's Communication Systems Business Division, Lynchburg, Va....**Richard P. Gifford** has been named Vice-President, Communication Projects, for General Electric Company's Special Systems and Products Group, Lynchburg, Va.... Ampex Corporation has announced that **Charles V. Andersen** has been named vice president-manufacturing....**Herb Didier** has been appointed manufacturer's representative by English Electric Valve for the Rocky Mountain area.

Robert H. Wilson has been named engineering manager of Ameco, Inc.....**Robert O. Kolts** has joined the Signalite Division of General Instrument Corp. as Marketing Manager....TeleMation, Inc. announced the appointment of **Don Harvey** as new manager of TeleMation's Kansas City, Kansas office....**Sherrill D. Dunn** has been named Director, Public Relations, for Community Tele-Communications, Inc....**H. Brooks Dawson** has been appointed assistant advertising and sales promotion manager for Electro-Voice, Inc.

J. Leonard Reinsch, president of Cox Broadcasting Corporation, has been appointed to the U.S. Advisory Commission on Information for a three-year term...V. J. Steele, Sr., Chairman of the Board of Owensboro On The Air, Inc., Owensboro, Ky., recently announced that **Robert H. Steele** has been elected president of the corporation.... In an expansion of the Broadcast Division of Combined Communications Corporation, the appointment of two executives was announced by Karl Eller, President of CCC, and Alvin G. Flanagan, Broadcast Division. **Ralph W. Beaudin** has been named Radio President, Broadcast Division of CCC. He also will become President and General Manager of KTAR Radio, Phoenix. **George Guyan** has been appointed Administrative Assistant to the President of the CCC Broadcast Division.

William C. Taylor, assistant vice president and manager of East Coast Technical Operations, has been promoted to director, Technical Operations of ITT World Communications....**Kenneth R. Schwenk** has been appointed Director of Marketing for Telemet....**James N. Porter** has been appointed Director of Marketing for CMX Systems, a joint Memorex/CBS company....Several new marketing appointments have been made at International Video Corporation. **Gerald G. Heitel** has been appointed to the newly created post of director of sales. **Herbert Van Driel** has returned to his former post as midwest region distributor sales manager. He last held a similar position with Panasonic. **Donald E. Diesner** has been transfered from midwest region distributor sales manager to western regional distributor sales manager. Five broadcast sales engineers have recently joined the company: **Robert E. Martin, Donald E. Carlsen, Larry H. Conner, John A. Nash,** and **Lee L. Caput.**

Nortronics Company, Inc. has promoted **Greg J. Ehalt** and **Matthias J. Grundtner** to expanded management responsibilities....**Everette L. Harper** has been elected vice president-corporate development for the government group by Ratheon Company's board of directors....Consoli-

dated Video Systems has named **Charles D. Corbett** manager of national field sales force and **Daniel J. Yomine** has accepted the post of president, chief executive officer and member of the board of directors.

Anthony Como has been appointed Engineering Manager of Editel Special Products....**Robert L. Ruyle** assumed direct sales responsibilities in the San Diego based firm's Midwest Sales Region....Hank Bogardus has joined Visual Educom Incorporated as Western Regional Sales Manager for DAGE and MTI Television Products, EDUCOM Audio Products and INFONICS Tape and Cassette Duplication Products....The appointment of **Virgil D. Jelsma** as manufacturing engineering supervisor has been announced by Nortronics Company, Inc.

M. Peter Keane has been appointed a national accounts market specialist for the Norelco VCR (video cassette recorder) at Philips Broadcast Equipment Corp....Eastman Kodak Company has announced the appointment of **James G. Sucy** as manager of Education Markets Services, a new office created to coordinate the company's marketing activities in the educational community....K'Son Corporation announces the appointment of **David M. Weisbrod** as sales manager for all company products....Bill Pastori is now Sales Manager of Receiver Products for Ailtech. Also for Ailtech, **John Kistner,** formerly Northern Regional Sales Manager located in Burlington, Mass., is being moved back to Farmingdale to become Sales Manager for Spectrum Analyzer products. Replacing Kistner in the Burlington office is **Walt Miles. Anne Rohback** has been named Sales Office Supervisor, East Coast Operations.

Radio-TV

WSNL-TV, Channel 67 UHF has announced the appointment of **Gary A. Gunter** as head of its news department.... **Robert J. (Joe) Atkins** has been named chief engineer for WRCB/TV, Chattanooga, Tenn....**Greg Seibold,** a veteran in radio sales management, has joined the staff of WAYE radio in Baltimore as Sales Manager....New Director of Engineering for KETC-TV, Channel 9, St. Louis, is **Andrew R. McMaster.**

WSNL-TV, Channel 67, Long Island, N.Y. has also announced the appointment of **David A. Grimm** as vice president of sales....**Anne Doyle** has joined TV 13's Eyewitness News team, Grand Rapids, as general assignment reporter with primary responsibility for city government coverage....WZZM-TV and WZZM-FM have named **Sabina Noble** account executive with the television station and **Ruth Ann Turner** with the radio station. **Graig James** has also joined the television station Eye witness News team.

CATV

Bill Gaylord has joined Anixter-Pruzan as manager of national accounts....**Tore B. Nordahl** has been named Vice President, Marketing of Ameco, Inc....GBC Closed Circuit TV Corp. has announced the appointment of **John Gray** as Vice President in charge of Branch Operations and Government Sales....**Earl T. Ake** will leave his position as Manager of The Dalles, Oregon cable system to assume new duties on Cox Cable Communications, Inc. corporate engineering staff in Atlanta. **John D. Jones** will succeed Ake as Manager of The Dalles cable system. **Jerry L. Raines** will assume the responsibilities of Northwest Regional Engineer for the five Cox Cable Systems in Oregon and Washington. **King Karamatic** will succeed John Jones as System Engineer of the Astoria system.

bookreview

Using Scopes In Transistor Circuits

The usefulness of the scope in troubleshooting and analyzing vacuum-tube circuits is well known. **Using Scopes in Transistor Circuits,** written by Robert G. Middleton, demonstrates that it can be equally effective in the study of transistor circuits.

For intelligent use of the scope a good understanding of transistor action is necessary. Therefore, circuits are explained wherever they have a direct bearing on waveform analysis. The reader is assumed to be familiar with the operation of service scopes; this allows the book to be devoted entirely to the transistor circuits themselves.

Many diagrams and waveforms are presented to illustrate clearly the theoretical and practical discussion in the text. Topics included are: rise time, square-wave response, boost circuits, waveform analysis, signal tracing, limiting, clipping, waveshaping, tuned and

untuned transformers, black-and-white TV, color TV, computers, machine logic, and many others.

The text treatment presents a combination of the practical and the theoretical that will make the book valuable alike to the practicing electronic technician or to the serious-minded student.

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

Lightning Protection

A natural phenomenon that has always fascinated man, lightning performs the function of maintaining a balance in the global electrical system. But apart from this, lightning is an extremely destructive force.

Lightning Protection, written by J. L. Marshall, provides an examination of lightning—its nature, effects, and principles of protection. The book contains 190 pages.

The book's comprehensiveness makes it a valuable resource for structural, electrical, communication, and broadcasting engineers and architects.

The book is available through Wiley-Interscience, New York, N.Y.

Video Tape

Magnetic video tape has advanced the opportunities for more sophisticated television programming. Its advent changed the course of television development, and now it is considered as a fact and taken completely for granted. The how's and why's of television tape and its applications are a basic part of the studies of anyone interested in television technology.

Television Tape Fundamentals, written by Harold E. Ennes, covers all aspects of video tape from A to Z. Rotation-head theory, time-space errors, modulation and demodulation processes, video-signal processing, servo systems, setup procedures, head optimization, recording procedures, tape editing, maintenance procedures, and many other subjects are included in this volume.

Numerous easy-to-follow diagrams, line drawings, and actual photos enhance the author's practical explanations. The book is designed to serve the need for a ready reference for broadcast station personnel, as well as a basic text for homestudy or classroom use.

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

NEW PRODUCTS

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

Hand Held Digital VOM

Ideal for field or bench service, on the bench or in the lab, this new completely self-contained pocket-sized Model 970A Digital Multimeter from **Hewlett-Packard** measures AC and DC volts and ohms over five ranges.

All electronics, including the display and batteries, are in one small, hand-held package. There is only one function control to set, and only two input terminals to use instead of the usual three to eight.

The Model 970A **automatically** selects the right range, making it easy to use by technicians, repairmen, telephone craftsmen and engineers. This battery-operated probe is the first known hand-held DMM incorporating solid-state autoranging technology. All solid-state switching is in its one MOS integrated circuit.

HP uses a five-digit LED (Light Emitting Diode) cluster in their 3½-digit DMM, so that all probe voltage readings are in volts, and resistance readings in kilohms. There are no scales to misinterpret. Decimal placement is automatic.

DC voltage from .1000 V full scale to 500 V is read to an accuracy of ± (0.7% of reading + 0.2% of range). Full scale ranges are 0.1, 1, 10, 100,

1000 V (500 V maximum input).

AC voltages from 1 Volt through the highest range, (500 Volts rms maximum) from 45 Hz to 1 kHz, are read to + (2% of reading + 0.5% of range).

Input resistance on the voltage ranges is 10 megohms. Input capacitance on AC is less than 30 pF. On all voltage ranges, the Model 970A is protected to 1000 Volts peak. Input of the probe, measuring resistance, is fuse protected up to 250 V rms for up to 10 seconds; blowing the fuse will not damage the instrument. It can be easily replaced in its clips without soldering.

Nickel-cadmium rechargeable batteries and a battery charger come with the Model 970A.

For More Details Circle (78) on Reply Card

Low Light Level CCTV Cameras

Two low light level video cameras for taping or CCTV under extremely difficult light conditions—one of them equipped with an automatic iris and a six-to-one zoom lens, and the other a C-mount usable with a variety of optional fixed or zoom lenses—are available from **AKAI America, Ltd.**

The cameras, used in conjunction with an AKAI ¼-inch video tape deck and an ultrasonic wave sensor, comprise a major part of a new intrusion detector system that allows police and surveillance personnel to video-tape at night using light from street lamps or automobile headlights.

The camera with the automatic iris is the VC-200. According to Robert R. Owen, executive vice president of AKAI America, it utilizes a ⅔-inch silicon target vidicon and is burn-free and highly sensitive.

"The automatic iris allows the camera to video-tape from starlight to full sunlight," Owen said, explaining that the camera adjusts automatically to any light level. "At night, the camera can be used with assurance because it is built to record at extremely low light levels. But it can also be used in bright sunshine, like any video camera."

For More Details Circle (79) on Reply Card

Temperature Sensing Kit

Moseley Associates, Inc., has recently introduced the Model TSK-3 Temperature Sensing Kit. This new unit replaces the existing Model TSK-2 Temperature Sensing Kit.

Building temperature, inlet, exhaust, or similar temperatures can be effectively sampled. A truly linear indication of air temperature between

0° to 140°F is provided - no conversion table or graph is required when read on an appropriate meter scale.

The new TSK-3 includes a self-contained 120/240 VAC, 50/60 Hz power supply, and functions with all current Moseley Associates Remote Control and automatic systems.

For More Details Circle (80) on Reply Card

AM Modulation Monitor

Time and Frequency Technology, Inc. has received FCC type-approval for and is now shipping the new Model 732 AM Modulation Monitor. Whereas in the past the AM broadcaster was required by law to operate FCC type-approved monitors for both frequency **and** modulation, he is now only required to operate a type-approved monitor for modulation measurement such as the TFT Model 732.

The TFT Model 732 is a state-of-the-art superheterodyne receiver/monitor for off-the-air or direct-connection monitoring of percent modulation of AM transmitters. Since no RF amplifier is needed for off-the-air monitoring, interference due to the intermodulation products of unwanted signals is substantially reduced.

In addition to the peak reading modulation meter, two LED peak modulation flashers are provided; one is always set to indicate negative 100% modulation while the other indicates when either plus or minus (pushbutton selectable) peaks exceed the modulation percentage set on digital thumbwheel switches. The positive peak limit is adjustable from 50% to 129% in 1% increments.

The high accuracy and resolution of the digitally-settable peak flashers in the Model 732 allow the transmitter modulation to be maintained at the maximum allowable without fear of exceeding FCC regulations.

For More Details Circle (81) on Reply Card

Camera Remote Control

Remote camera controls manufactured by **Cohu, Inc.**, Electronics Division, San Diego, enable television camera operators to exercise direct controls over certain camera functions.

The modular designed Cohu Model 2380 Series permit remote control of accessory pan-and-tilt units or motorized lens to be accomplished at distances up to one mile, and camera functions up to 1000 feet with suitable cable.

For More Facts On Ads And New Products Use Our Reader Service Card

The distance to which camera functions can be remotely controlled is dependent on the bandwidth of the returning video and the amount of allowable degradation. At the narrowest bandwidth, 8 MHz, the video signal can be transmitted up to a maximum of 1000 feet from the camera over RG-11 foam type cable without additional video amplifiers.

Remote control of accessory pan-and-tilt units or lenses can be accomplished at distances up to one mile with suitable cable.

For More Details Circle (82) on Reply Card

Equipment Brochure

AEL Communications Corporation (AELCC) presents a new brochure covering its colorvue line of supplementary CATV equipment and accessories.

The comprehensive brochure includes descriptive data and features for AELCC's power inserters, directional couplers, splitters, power supplies, pilot carrier generators, fail safe equipment, test equipment, connectors and bi-directional retrofit kite.

For More Details Circle (83) on Reply Card

Time Announce Control

Control Design Corporation announces the immediate availability of their CD60T Time Announce Control Unit.

This unit, designed to add versatility to virtually all broadcast automation systems, permits the use of 2 single play cart machines, 2 reel-to-reel transports or a combination of cart and reel-to-reel for time announcements. Designed for total reliability - no motors or stepping relays for switching - its internal power fail safety device precludes airing of incorrect time announcements following a shut-down until the unit has been reset.

All solid-state construction, the CD60T also features: 60Hz line locked time standard; Front panel controls; 1 minute cycle time with a one minute announcement always ready to air.

Standard EIA rack mounted, the CD60T works on 110 VAC 60 Hz with export models available.

For More Details Circle (84) on Reply Card

Splice-Erase System

An automatic Splice Finder and Erase system (SFE-1) for all NAB tape cartridges has been developed by the Senstrol Division of **UMC Electronics Co.**, North Haven, Connecticut.

The unit will locate any splice and

automatically stop the cartridge with the splice located within an inch beyond the capstan, permitting transcriptions without the annoying noise and skips associated with sound-on-splice during playback.

The device operates on a principle of pressure sensitivity and does not require any prerecorded signal in its function. A heavy duty bulk eraser is also incorporated in the unit as an added convenience.

For More Details Circle (85) on Reply Card

The Code Synchronizing System

QUAD-EIGHT ELECTRONICS introduces -TCS- time code synchronizing system. This series of components is designed for synchronization of multitrack audio tape machines with similar slave units, VTR, or sprocketed film interlock systems.

The basic system features SMPTE Generator, Reader, and Synchronizer. A family of optional accessories is also offered, including a Motor Drive Amplifier and "Search and Find" match-up system.

The TCS 180 (Synchronizer) is the heart of our system. Operating with the TCS Reader, it provides the requisite speed up or down error signals to capstans that can be either AC Synchronous or DC Servo controlled.

The TCS 181 (Generator) is NTSC or 60 Hz data rate selectable. A provision for optional data display and lever-wheel code preset allows SMPTE hours, minutes, seconds and frames to be read and/or pre-selected.

The TCS 182 (Reader) receives time codes from master or slave machines and provides a large character display of SMPTE encoded tapes at NTSC or PAL frame rates.

For More Details Circle (86) on Reply Card

Portable Color Monitor

The new **World Video** CP5002 5" Portable Color Monitor, utilizing the Trinitron tube for added brightness and transparency-like pictures, is a lightweight color monitor designed for use in remote applications with portable cameras and video tape recorders such as the PCP-90, VR3000 and others.

The CP5002 is fully isolated and can be operated from any 110 Volt AC source, car or boat battery or its own rechargeable battery pack.

The light weight of this unit lends itself to use in recording on the spot news, sports and remote production enabling the VTR operator to verify color information as it is being recorded when previously this could be done only after replaying the tape at the studio.

The CP5002 is equipped with its own rechargeable battery pack and a cover to protect the screen in transit.

For More Details Circle (87) on Reply Card

Quadraphonic Encoder

CBS Laboratories, a Division of Columbia Broadcasting System, Inc. and **Sony Corporation** announces an arrangement for CBS Laboratories' Professional Products Department to distribute the Sony SQ Encoder/ Mixer Model SQE-2000 exclusively in the United States and Canada.

The new encoder was designed by CBS and Sony to enable FM broadcast stations to originate local "surround sound" quadraphonic broadcasts, and to produce quadraphonic commercial announcements.

While an encoder is not needed to broadcast SQ quadraphonic records in ordinary two-channel stereo, the SQE-2000 expands the broadcaster's quadraphonic capability by allowing him to transmit 4-channel tapes, and to produce local 4-channel live programs. Employing the CBS SQ™ encoding techniques invented by CBS Laboratories and adopted by major record labels, the SQE-2000 produces signals compatible with all stereo and mono receivers. These signals are matched to the SQ decoders now offered in virtually every brand line of quadraphonic home receivers.

For More Details Circle (88) on Reply Card

Cart And Cassette Loaders

Ramko Research of Sacramento, California, has expanded their line of automatic cartridge and cassette loaders. Five models give tape length measuring, tone sense and winding speed options, ranging from 30 ips to 60 ips.

The ACL-25 series for blank tape loading features a digital control panel to set tape length exactly at 30 ips winding speed, and a one button reset /run for fast operation.

The ACL-60 series offers blank tape loading, tone detection or the combination of tone and blank options in one machine at 60 ips winding speed.

All models have exclusive torsion control for proper tape pack and winding of various hub sizes, utilizing TTL digital control circuitry. The ACL-60 series will accept up to 14" pancakes as standard. Optional on ACL-25.

For More Details Circle (89) on Reply Card

Circular FM Antennas

A series of six FM educational antennas have been added to the series of circularly polarized antennas offered by **Phelps Dodge Communications Company.**

Because of the normally lower powers required in educational service, the new antennas are fabricated of 7/8 inch stainless steel tubing. The circularly polarized antenna is a 1-1/2 turn helix and the strictly horizontal element has a "U" configuration. These antennas are complete with matching harness of RG type cables designed to mount on tower legs or support pipes 1-1/4 inch to 2-3/4 inch diameters. The multi-element arrays are designed for an element spacing of 10 feet.

Power gain ratings range from 0.43 to 2.99; field gain from 0.65 to 1.73; and, gain in dB from -3.66 to 4.76. FS at one mile, 1 kW, MV/M is from 90 to 239.

Incorporating the general design concepts of other Phelps Dodge Communications circularly polarized antennas, the new FM educational series are less susceptible to corona and assure phase coincidence in the centers of both vertical and horizontal components.

For More Details Circle (90) on Reply Card

Long-Reach Microphone

The DL42 Cardiline® microphone from **Electro-Voice** is new in long-reach microphones. Featuring sound rejection at the sides (where most noise originates) this microphone can work at a great distance. And the more uniform polar response insures that all sound pickup is quality sound —including the lower level off axis response. Therefore the DL42 covers the scene with less racking and panning.

To prevent wind noise during outdoor use or for rapid panning in the studio, the DL42 is equipped with an Acoustifoam™ windscreen. Shaped low-frequency response also reduces wind noise problems.

The entirely new shock-mount included with the DL42 reduces susceptibility to mechanical shock. A special coil cord is provided to diminish shock transference from the mounting bail to the microphone.

For More Details Circle (91) on Reply Card

All Function Digital Multimeter

Systron-Donner has recently introduced an all new 5½-digit, Model 7205 Multimeter. Exclusive features include lead compensation for resistance measurements, AC voltage response to 1 MHz, new in-line in-plane Sperry display that provides positive indication of overrange, advanced MOS/LSI circuitry, and 10 ranges of built-in DC and AC current.

The new 5 function 26 range Model 7205 offers 5 ranges of DC voltage to a maximum of ± 1u Volt resolution with 1000 Volt protection on all ranges, 5 ranges of AC voltage measurement with 500 Volt protection and 1 MHz response, 6 ranges of resistance with a maximum resolution

of 1 milliohm featuring advantages of 4-wire resistance without the complexity of 4 leads, and 10 ranges of built-in DC and AC current to 1.3 amps.

Overrange is 30% on the large in-line, in-plane ½ inch display. Input impedance is greater than 1000 megohms on the three lower DC voltage ranges. Common mode and normal mode noise rejection is greater than 140 dB and 60 dB respectively with 500 Volts common mode voltage capability. Current ranges are fused and all resistance ranges are protected to 150 Volts rms. Package size is half-rack with 3½ inch height.

For More Details Circle (92) on Reply Card

Character Generator

Laird Telemedia Inc. has introduced a new video character generator system. A basic configuration of the equipment includes standard features such as Program and Preview Outputs, 10 Line by 25 Character Format, 250 Character Solid State Memory, Switchable Video Polarity, Non-Additive Mix and Horizontal Edging. Standard Keyboard control functions permit selective Underline, Overline, Crawl, Roll, Box and Flash, as well as a unique Window Format Position feature.

The 3600 Character Generator was designed with versatility, expandability and economy as prime considerations. Several separate solid state memories may be incorporated and unlimited access to both internal and external data sources is possible.

A single Character Generator is capable of producing many simultaneous, but independent, video signals of identical or different information as well as combinations thereof. By this method, data sources such as Fixed Title, Time/Date and Up/Down Counter may appear in various modes and screen positions on any or all output displays, with or without data composed from the keyboard.

An inexpensive audio cassette recorder and audio interface option are available as supplemental memory.

For More Details Circle (93) on Reply Card

Film Camera Remote Battery Cable

Cinema Products Corporation announces that a remote battery cable is now available for CP-16 and CP-16/A camera models. The new remote battery cable permits the removal of the battery from CP-16 or CP-16/A cameras for placement in the cameraman's pocket (or some other protected area) when filming in extreme cold.

Cinema Products' nicad battery, which powers the entire CP-16 **or** CP-16/A camera system, is extremely compact (measuring 5" X 1 1/4" 2 1/8"), and slips easily into the cameraman's shirt pocket.

For More Details Circle (94) on Reply Card

Standby Power For Disital Clocks

Chrono-log series 70,000 IC digital clocks operating from 115 V. (or 230 V) AC power sources can now be assured of time-keeping accuracy in ease of power failure, with introduction of an internal standby power battery and a line-synced internal oscillator.

With the standby power feature, Ni-Cad batteries are included within the clock housing and are kept under constant charge. Should power failure occur, the standby batteries take over and provide a minimum of 3 hours of uninterrupted operation for a Digital Clock or at least 2 hours for a clock with calendar. During power failure, the timekeeping operation continues and digital BCD outputs are available but the LED display is OFF. Upon resumption of power, the LED display comes back ON.

For More Details Circle (95) on Reply Card

advertisers' index

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Cambridge, Mass. 02138

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For ads on which replies are sent to us for forwarding, there is an additional charge of $2.00 to cover department number, etc., which is printed in advertising copy, and processing of replies.

Classified columns are not open to advertising of any products regularly produced by manufacturers unless used and no longer owned by the manufacturer or a distributor.

WANTED

WANTED: All surplus broadcast equipment especially clean A.M. & F.M. transmitters, contractors, capacitors. Surpluss Equipment Sales, 2 Thorncliffe Pk. Dr. Unit 28 Toronto 17, Ont; Canada. 1-73-tf

TUBES WANTED—All types-CeCo 2115 Avenue X, Brooklyn, N.Y. 11235, 212-646-6300-Anytime. 7-73-12X

WANTED: USED 35 MM TV PROJECTOR WITH LENS. GOOD WORKING CONDITION. STATE DETAILS AND PRICE. Write to: Broadcast Engineering, Box 292, 1014 Wyandotte St., Kansas City, Mo. 64105. 11-73-1t

WANTED (Cont.)

WANTED: Two used 3,000 to 5,000 Watt late model FM transmitters with associated stereo and SCA generators. One 3,000 Watt AM transmitter. Other associated equipment necessary with the establishment to complete AM and FM station operation. Contact: Jim Davis, P.O. Box 727, Deland, Florida 10-73-3t

WANTED 8 OR 4 TRACK Ampex or Scully Recorder. Send price condition and model no. to David P.O. Box 485, Barbourville, Ky. 40906. 10-73-2t

EQUIPMENT FOR SALE

MOTORS FOR SPOTMASTERS
NEW Paps hysteresis synchronous motor HSZ 20.50-4-470D as used in series 400 and 500 machines. Price $39.00 each prepaid, while they last. 90 day warranty. Terms check with order only, no COD's. Not recommended for Tapecaster series 600 or 700.
TAPECASTER TCM, INC., Box 662,
Rockville, Maryland 20851
1-72-TF

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

QUALITY AUDIO CONSOLES are our specialty. Modern styling with slide potentiometers and "soft" audio switching. We manufacture 8 standard consoles at very competitive prices. However, we'll manufacture a custom system to your specifications if you prefer. Also plug-in audio modules including distribution amplifiers, preamplifiers, monitor amplifiers, etc. Write or phone for pricing and specifications. **SYSTEMS ENGINEERING COMPANY,** P.O. Box 49224, Atlanta, Ga. 30329. 404-482-2446. 2-73-12t

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SURPLUS MICA AND VACUUM TRANSMITTING CAPACITORS. Large stock; immediate delivery. Price lists on request. SURCOM ASSOCIATES, 1147 Venice Blvd., Los Angeles, Ca. 90015 (213) 382-6985. 5-73-12t

NATIONAL TAPE CARTRIDGE SERVICE SPECIAL Pressure Sensitive Labels. Fits All Cartridges. Comes in 5 Colors. Write for FREE Sample. MASTERTONE COMPANY, 1105 Maple West Des Moines, Iowa 50265 515-274-2551 8-73-tf

NATIONAL TAPE CARTRIDGE SERVICE CARTRIDGES RECONDITIONED - NEW TAPE 12 Years Experienced Personnel. Write for new and reconditioned price sheet. Mastertone Co., 1105 Maple, Dept. B-E 1, West Des Moines, Iowa 515-274-2551 8-73-tf

"PARTS — for SPOTMASTER cartridge units. IN STOCK — IMMEDIATE DELIVERY, overnight to PA, NY, & NJ. COMMUNICATION MEDIAS, Box 54, Allentown, PA 18105 (215)-437-0607 or 437-9447. 10-73-12t

PROFESSIONAL RECORDING AND TEST EQUIPMENT for recording studios and broadcasters-Altec, Ampex, 3M, GR, HP, Tektronix-new and used. Free equipment list or drop in. CHAS. E. WASHBURN CO., 6114-B SANTA MONICA BLVD., HOLLYWOOD, CALIF. 90038. 9-73 3t

FOR SALE: 2 - Bell and Howel Model 614, 16 mm TV Film Projectors, Mah./Opt. sound, suitable for color operation, asking $2,500. KORN-TV, Mitchell, South Dakota 57301. 11-73-2t

EQUIPMENT FOR SALE CONT.

CARTRIDGE TAPE EQUIPMENT—Rebuilt. New paint, heads, flywheel, pressure roller, belts, etc. Spotlessly clean and thoroughly tested. 30 day money-back guarantee, 90 day warranty. Also contact us for discounts on new equipment and accessories. AUTODYNE, Box 1004. Rockville, Maryland 20850. (301/762-7626). 7-72-tf

AM RADIO STATION 5,000 KW Eastern Arizona - substantial cash. KHIL, Willcox, Arizona, 384-2780 - 384-2367 8-73-4t

BUILD YOUR OWN TV AND RADIO PRODUCTION EQUIPMENT. Easy, inexpensive, (mostly IC). Plans or kits: Special Effects Generator, Automatic Logger, Vertical Interval Video Switcher, Solid State Lighting Board, Preset Audio-Video Board, Preset Lighting Board, Crystal Controlled Wireless Mikes with matching receivers. Subsonic Tone Control for audio tapes, 8MM SOF Cameras and Projectors, Distribution Amplifiers (Sync, Video, Audio), Audio Control Boards (Studio & Remote) Proc-Amp with compensation and regeneration for adapting Helical Scan VTR's to broadcast standards. PLUS specialized correspondence courses in Telephone Engineering ($39.50), and Integrated Circuit Engineering ($49.50). Plans from $5.95 to $15. SUPER CATALOG plus years updateing of new devices Air Mailed $1.00. Don Britton Enterprises, PO Drawer G, Waikiki, Ha. 96815. 4-73-12t

NORELCO PC-70S used color camera in good condition. Needs new plumbicons. 4400 hours. WEMT-TV 41 Farm Road Bangor, Maine. 10-73-2t

FOR SALE: GATES 'top level' peak limiter. $200.00 GATES top level rf amplifier with power supply. $85.00 Both units in good condition. Includes manuals. Contact Ace Simpson or Jim Harden, KNAC, 320 Pine, Long Beach, Calif. 90812 (213) 437-0366. 11-73-1t

FOR SALE: KRS 'six stack' SB6AP six channel stereo cartridge reproducer and KRS SB1 1 stack recorder/reproducer, including 75 carts and cabinet for 'six stack.' 3¾ ips only. Many carts are 60 minutes. Makes mini automation system. Includes manuals. $500.00. Contact Ace Simpson or Jim Harden, KNAC, 320 Pine, Long Beach, Calif. 90812 (213) 437-0366. 11-73-1t

"AMPEX VIDEO RECORDER Model VTR 7000. Factory rebuilt. 10 hours use $750. Radio TV Reports, 1723 W. Howard, Evanston, Illinois 60202." 11-73-1t

SPECIAL SALE—Spotmaster 5-Spot $995, Sparta "4-deck" with spare deck $770, Spotmaster 500 (Rack Mount) $425, Tapecaster 700PS (Stereo) $350, Sparta 600P (Stereo) $295, Kahn Symmetrapeak $195. All equipment rebuilt & guaranteed. Autodyne, P.O. Box 1004, Rockville, Md. 20850, 301/762-7626 11-73-2t

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"CHIEF ENGINEER wanted for small Southern California UHF TV station. Salary approximately $1,500 per month. Send resume to: Broadcast Engineering, Box 291, 1014 Wyandotte St., Kansas City, Mo. 64105. 11-73-1t

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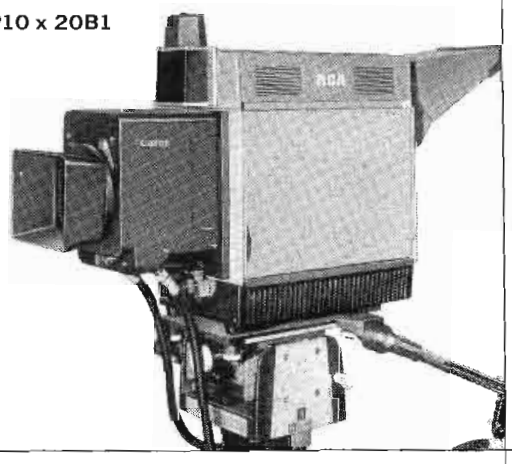

P17 x 30B1

P17 x 30B2

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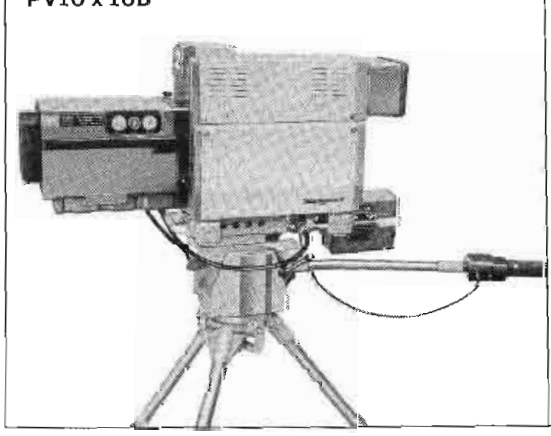

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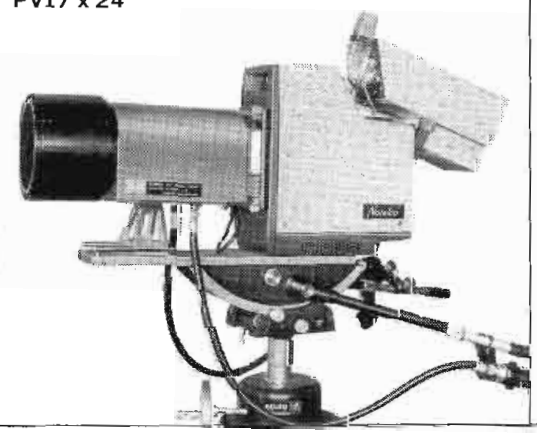

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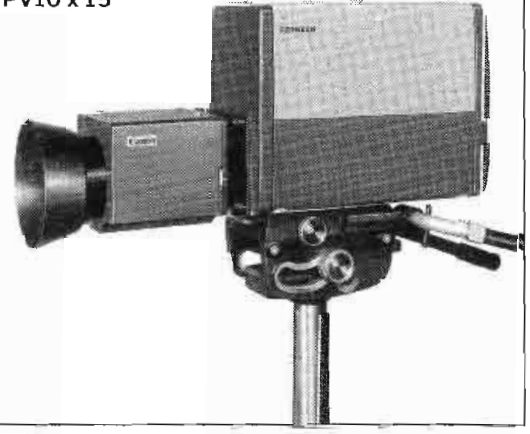

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Shown on this page are only a few examples of the quality lenses Canon has available to more than meet your particular demands. Specify Canon to stay ahead.

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Size of image tube	Lens	Image format covered
1¼" Plumbicon® color camera	**P10 x 20B4** **P17 x 30B1** **P17 x 30B2**	17.1 x 12.8mm (21.4mmφ)
1" Plumbicon® color camera	**PV10 x 16B1** **PV10 x 15B2** **PV17 x 24B1** **PV 6 x 18B1**	12.8 x 9.6mm (16mmφ)

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The Canon TV Lenses Naming System

P10 x 20B

- Glass Compensation for Beam Spliter
- Minimum Focal Length
- Zoom Ratio
- Application

Applications	Image Format	Pick-up Tubes
P	21.4mmφ	1¼" Plumbicon
PV	16mmφ	1" Plumbicon

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

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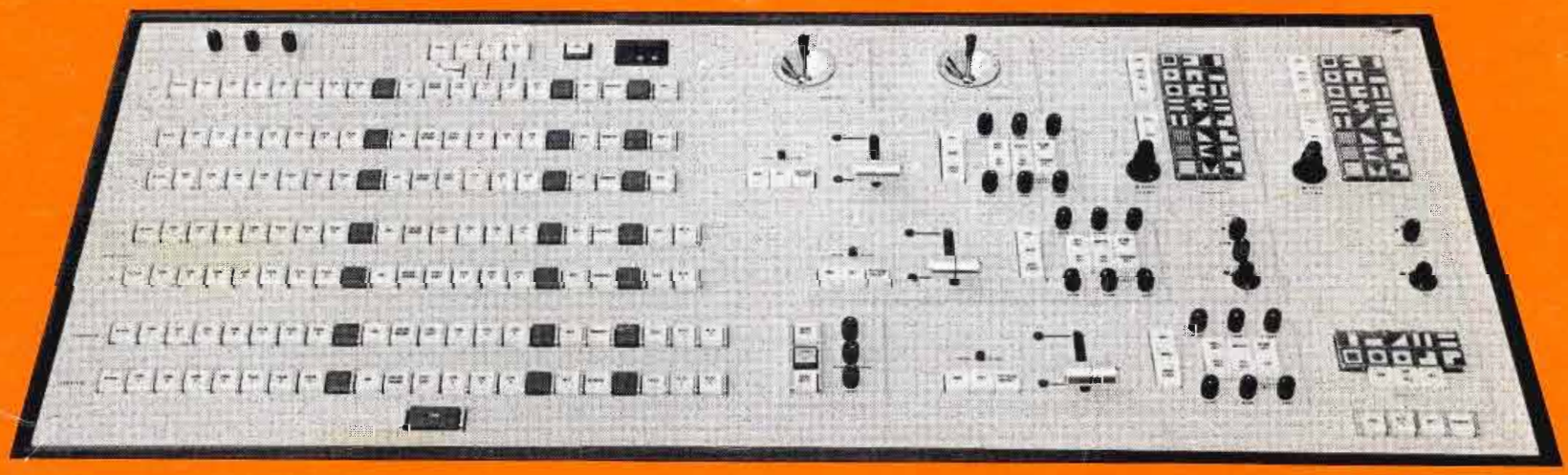

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